

---

# 2015 ANNUAL REPORT ON DRINKING WATER QUALITY

JAN.1 – DEC. 31 2015

---

## KING ST. WATER TREATMENT PLANT

*Drinking Water System Number:* 220001860

*Drinking Water System Owner:* City of Kingston

*Drinking Water System Category:* Large Municipal Residential



# Utilities Kingston

## Drinking Water Quality

Utilities Kingston is proud to present this annual report on drinking water quality. This report has been prepared in accordance to 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 Summary report prepared in accordance to Schedule 22 of Ontario Regulation 170/03, are available by public request at any City of Kingston offices, at our water plant locations and at [www.utilitieskingston.com](http://www.utilitieskingston.com). Notices of availability are generally made through the local newspapers and radio. Further information on the Drinking Water Regulations can be found on the Ministry of the Environment web site at [www.ene.gov.on.ca](http://www.ene.gov.on.ca).

For further information about this report contact James Patenaude at [jpatenaude@utilitieskingston.com](mailto:jpatenaude@utilitieskingston.com), or call 613-546-1181 ex. 2525.

## Inside This Report

1. Plant Description and Treatment Process
  2. Monetary expenses incurred during this reporting period
  3. Notifications Submitted in accordance to the Safe Drinking Water Act
  4. Definitions and Terms
  5. Process Diagrams
  6. Water Quality Test Results
-

## 1. Plant Description & Treatment Processes

### *Raw Water Source.*

The source of water treated by this plant is Lake Ontario at the mouth of the St. Lawrence River. Our intake is located 1km directly south of the treatment plant, 4m off the lake bottom, at a depth of approximately 18m. A great deal of testing was carried out in choosing the location for the intake. This has ensured that the treatment process begins by using the best and most consistent quality source water available, and reduces its susceptibility to contamination. Known sources of potential problems are few, and contingency plans are in place in the event of raw water contamination.

### *Zebra Mussel Control.*

When the water temperature rises above 10<sup>o</sup> C (above this temperature zebra mussels are active), 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.

### *Pre Chlorination.*

The purpose of chlorination is to provide disinfection. 12% Sodium Hypochlorite is applied to the raw water in solution form.

### *Screening.*

A revolving screen in the suction well of the low lift building removes any large debris such as weeds, fish, etc.

### *Low Lift Pumps.*

These pumps lift the water from lake level to the main plant. There are two pipes from the low lift building directing the water to the mixing chambers.

### *Coagulation / Flocculation.*

Poly Aluminum Chloride (PACl) is used as the coagulant for the treatment process. The coagulant is added to the water as it leaves the low lift building.

### *Mixing Tanks.*

Water flows rapidly in these tanks in a spiral motion, allowing proper mixing of the chlorine and alum with the water. The particles in the water will collide with the PACl particles, and then join together to form larger particles called floc.

### *Settling Tanks.*

These are large tanks designed to reduce the velocity of water allowing the heavier floc particles to settle out. They also provide detention time, allowing the chlorine time to achieve disinfection.

### *Filters.*

Six 'rapid sand' filters with Granular Activated Carbon (GAC) and anthracite remove the particles that did not settle out in the settling tanks, as well as compounds that may cause tastes and odours. Water flows through the filters to a clean water reservoir called the clear well.

### *Backwash.*

Filters are washed daily to remove the particulates they have collected over the previous 24 hrs. Clean water from the clear well is pumped backwards through the filter, and the top layer of the filter is agitated to break up any large particles. Effluent water from the backwash process is directed to a process waste facility for further treatment.

### ***Process Waste Facility.***

Effluent from the filter backwash process and sludge from the settling process are directed to the process waste facility for further treatment. Effluent is directed to two equalization tanks at the head of the process. Magnafloc 120L is added to the water as it is pumped from the equalization tanks through plate settlers at which time the supernatant from the process is de-chlorinated using a 30% Calcium Thiosulphate solution, and then directed back to Lake Ontario. The sludge produced during the process is then pumped to the sanitary sewer system for further treatment at the Ravensview Wastewater Treatment Plant.

### ***Post Chlorination.***

Sodium hypochlorite is added to the water as it enters the clear well to create a 'chlorine residual' which remains throughout the distribution system. This ensures protection to the point of the customers' tap.

### ***Clear Well.***

Filtered water is stored here before being pumped to the distribution system or used for filter washing.

### ***High Lift Pumps.***

Five high lift pumps move treated water from the clear well into the distribution system.

### ***Standby Equipment.***

Diesel driven pumps are maintained to provide a continuous supply of water during power failures. These provide enough capacity to meet fire-fighting requirements as well as normal flows during power outages. A diesel generator provides electricity to run metering equipment and lighting in the water plant. Standby equipment is maintained for all critical processes.

### ***Distribution System.***

The Kingston Drinking Water System, which receives water from both the King St. Water Treatment Plant and the Point Pleasant Water Treatment Plant, has a service population of approximately 113,382 (population estimate based on growth rates from Census data for 2014). The distribution system is divided into three distribution areas.

#### **Distribution Area 1**

Distribution Area 1 is that area west of the Little Cataraqui Creek, south of Highway 401 and east of Coronation Boulevard, and north of Highway 401 along Sydenham Road northward to Mildred Street and eastward from Sydenham Road along Sunnyside Road for approximately 1.2 kilometers. Distribution Area 1 is comprised of approximately 220 km of water mains, 2 ground level reservoir/pumping stations, 2 elevated storage tanks, 4 booster stations, over 2,500 main line valves, and over 1,300 fire hydrants and their associated isolation valves.

The Point Pleasant Water Treatment Plant provides water to Distribution Area 1. The O'Connor Drive Elevated Storage Tank, O'Connor Drive Reservoir, Creekford Elevated Storage Tank and the Progress Avenue Reservoir are all located within this pressure zone.

#### **Distribution Area 2**

Distribution Area 2 is that area which is east of the Little Cataraqui Creek, west of the Cataraqui River, and south of Highway 401. A small area on the east side of the Cataraqui River upstream of the pumps at the James Street Booster Station is part of the Area 2 pressure zone. In addition, Collins Bay Institution, which is west of the Little Cataraqui Creek on Bath Road, is supplied with water from this area and from Area 1.

Distribution Area 2 is comprised of over 250km of water mains, 1 ground level reservoir/pumping station, 1 elevated storage tank, over 2,000 main line valves, and over 1,200 fire hydrants and their associated isolation valves. The King Street Water Treatment Plant provides water to Distribution Area 2. The Tower Street Elevated Storage Tank and the Third Avenue Reservoir are located within this pressure zone.

### **Distribution Area 3**

Distribution Area 3 is that area which is east of the Cataraqui River. Distribution Area 3 is comprised of over 70km of water mains, 1 water booster station, 3 elevated storage facilities, over 250 main line valves, and over 300 fire hydrants and their associated isolation valves.

Water is supplied to Distribution Area 3 from Distribution Area 2 through the James Street Booster Station.

## **2. Monetary expenses incurred during this reporting period**

Under Section 11 of Ontario Reg. 170/03, a description of any major expenses incurred during this reporting period must be included in the annual report. The major expenses for this drinking water system are listed below.

-Utilities Kingston began work to complete a Master Plan for Water Supply for the City of Kingston. The Master Plan has been undertaken to consider future requirements in the City of Kingston's overall drinking water treatment facilities and water distribution networks to satisfy the City of Kingston's current and projected drinking water demands including the provision of adequate fire hydrant flows and pressures.

-Water main replacement projects throughout the city were continued throughout 2015.

-Extensive leakage testing, hydrant maintenance and replacement, valve maintenance and operation programs were also conducted on the system.

- Low Lift diesel pump #2 and #4 at the King St WTP were rebuilt.

-Landmark performed an ROV (Remote, Inspection and Report) underwater inspection of the Creekford Road Elevated Storage Tank. The work included a thorough inspection of the structure including ladders, landings, handrails and appurtenances. The report contained a quotation for all recommended upgrades & repairs

## **3. Notifications submitted in accordance to the Safe Drinking Water Act**

Under Ontario Reg. 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 more closely monitor the parameter for a period of time.

The details of any events requiring notifications are listed below.

•Notification of an indicator of adverse water quality was received from Caduceon Environmental Laboratories regarding a sample collected on **January 13th** for Total Coliform (TC) with a count of 1 cfu/100mL. Free chlorine residual at the time of sampling was 0.57 mg/L. Notifications were made to the Spills Action Center and to the Environmental Health Division of the local Ministry of Health. Resamples were collected from the same location, upstream and downstream and sent to the lab for analysis. With the free chlorine residual present in the original sample and the subsequent re-samples not indicating any adverse conditions, a contaminated sample bottle or sampling error is suspected.

•Notification of an indicator of adverse water quality was received from Caduceon Environmental Laboratories regarding a sample collected on **April 24th** for over grown (OG) background count. Due to the high background count the sample was treated as OG TC and OG E. Coli (EC). Free chlorine residual tested at the time the sample was collected was 1.17 mg/L. Notifications were made to the Spills Action Center and to the Environmental Health Division of the local Ministry of Health. Two sets of resamples were collected; one set on April 25th and another on April 26th from the same location, upstream and downstream and sent to the lab for analysis. The tap used to collect the original adverse sample was found to have hot water dripping into the cold supply. With the high free chlorine residual present in the original sample and the subsequent re-samples not indicating any adverse conditions, the water coming from the hot water tank is believed to be the source of the OG background count in the initial adverse.

•Notification of an indicator of adverse water quality was received from Caduceon Environmental Laboratories regarding a sample collected on **May 21st** for TC with a count of 2 cfu/100mL. Free chlorine residual tested at the time the sample was collected was 1.37 mg/L. Notifications were made to the Spills Action Center and to the Environmental Health Division of the local Ministry of Health. Resamples were collected from the same location, upstream and downstream and sent to the lab for analysis. With the high free chlorine residual present in the original sample and the subsequent re-samples not indicating any adverse conditions, a contaminated sample bottle or sampling error is suspected.

•Notification of an indicator of adverse water quality was received from Caduceon Environmental Laboratories regarding a sample collected on **August 20th** for TC with a count of 7 cfu/100mL. Free chlorine residual tested at the time the sample was collected was 1.18 mg/L. Notifications were made to the Spills Action Center and to the Environmental Health Division of the local Ministry of Health. Resamples were collected from the same location, upstream and downstream locations and sent to the lab for analysis. With the high free chlorine residual present in the original sample and the subsequent re-samples not indicating any adverse conditions, a contaminated sample bottle or sampling error is suspected.

•Notification of an indicator of adverse water quality was received from Caduceon Environmental Laboratories regarding a sample collected on **September 2nd** for TC with a count of 8 cfu/100mL. Free chlorine residual tested at the time the sample was

collected was 1.14 mg/L. Notifications were made to the Spills Action Center and to the Environmental Health Division of the local Ministry of Health. Resamples were collected from the same location, upstream and downstream locations and sent to the lab for analysis. With the high free chlorine residual present in the original sample and the subsequent re-samples not indicating any adverse conditions, a contaminated sample bottle or sampling error is suspected.

- Notification of an indicator of adverse water quality was received from Caduceon Environmental Laboratories regarding a sample collected on **September 11th** for TC with a count of 1 cfu/100mL. Free chlorine residual tested at the sample was collected was 0.98 mg/L. Notifications were made to the Spills Action Center and to the Environmental Health Division of the local Ministry of Health. Resamples were collected from the same location, upstream and downstream locations and sent to the lab for analysis. With the high free chlorine residual present in the original sample and the subsequent re-samples not indicating any adverse conditions, a contaminated sample bottle or sampling error is suspected.

- Notification of an indicator of adverse water quality was received from Caduceon

Environmental Laboratories regarding a sample collected on **October 5th** for TC with a count of 1 cfu/100mL. Free chlorine residual tested at the time the sample was collected was 1.81 mg/L. Notifications were made to the Spills Action Center and to the Environmental Health Division of the local Ministry of Health. Resamples were collected from the same location, upstream and downstream locations and sent to the lab for analysis. With the high free chlorine residual present in the original sample and the subsequent re-samples not indicating any adverse conditions, sampling error is suspected. The initial adverse sample was collected from a fire hydrant.



## 4. Definition & Terms

**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 (ppm).

**ug/l** - Micrograms per litre, also called parts per billion.

**ng/l** - Nanograms per litre, parts per trillion.

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

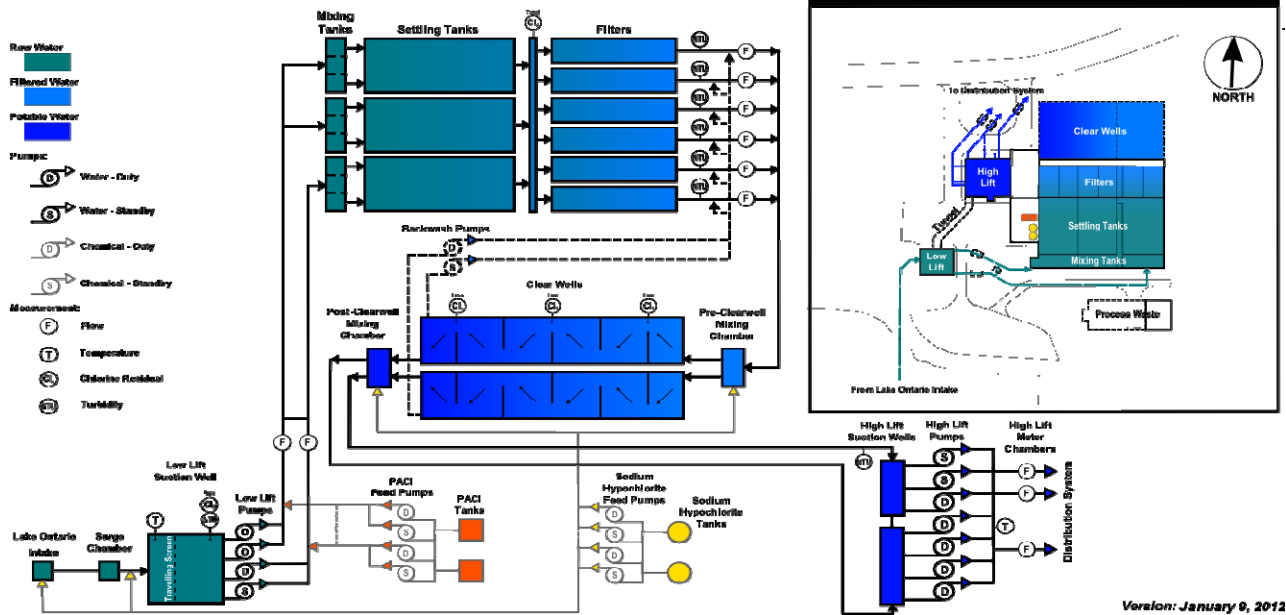
**AO** - Aesthetic objective. AOs are not health related, but may affect the taste, odour, colour or clarity of the water

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

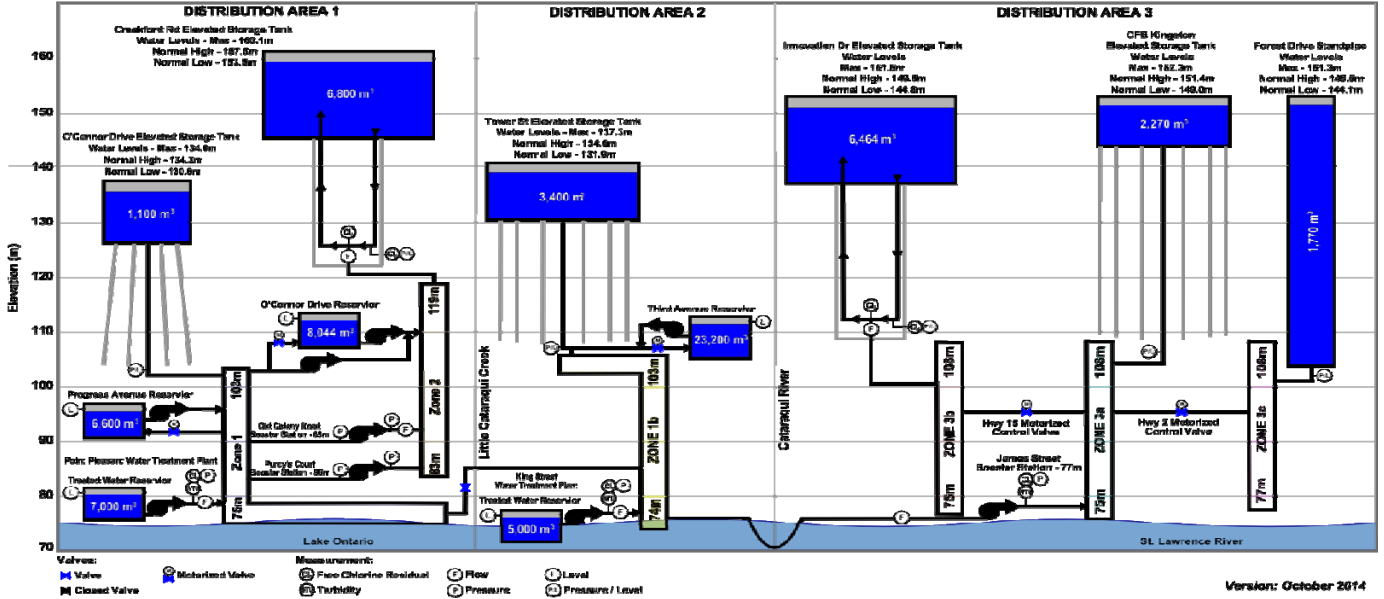
**MAC - Maximum Acceptable Concentration.** This is a health-related drinking water standard established for contaminants having known or suspected adverse health effects when above a certain concentration. The length of time the MAC can be exceeded without injury to health will depend on the nature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

## 5. Flow Diagrams

**KING STREET WATER TREATMENT PLANT PROCESS FLOW**



**KINGSTON DRINKING WATER SYSTEM - DISTRIBUTION PROCESS FLOW**





## 6. Water Quality Test Results

### Microbiological testing done under schedule 10, 11 or 12 of regulation 170/03, during this reporting period

	MAC (E. Coli & Total Coliforms)	Number of Samples	Range of E. Coli or Fecal Results (min # - max #)	Range of Total Coliform Results (min # - max #)	Number of HPC Samples	Range of HPC Results (min # - max #)
Raw	N/A	52	0-1	0 - >200		
Treated	*	52	0	0	52	<10 – 30
Kingston Drinking Water System  (Receives water from both King St. WTP & Point Pleasant WTP)	*	1383	0  Note: one result treated as E.Coli due to overgrown background bacteria result	0 – 8	718	<10 - 460

*\*Indicator of adverse water quality if detected*

### Operational testing done under schedule 7, 8 or 9 of regulation 170/03 during this reporting period

Parameter	MAC	Number of Samples	Range of Results  (min # - max #)	Unit of Measure	Parameter Description
Raw Water Turbidity	N/A	Continuous	0.081 – 1.47*	NTU	Turbidity is a measure of particles in water.
Treated Water Turbidity	N/A	Continuous	0.048 – 0.493*	NTU	Turbidity is a measure of particles in water.
Treated Chlorine Residual	See parameter description	Continuous	1.21 – 3.14	mg/l	Recommended level of at least 0.20 mg/l in distribution system to maintain microbiological quality. 0.05 mg/l minimum required.

James St. Booster Stn. Chlorine Residual	See parameter description	Continuous	1.2 – 2.71	mg/l	Recommended level of at least 0.20 mg/l in distribution system to maintain microbiological quality. 0.05 mg/l minimum required.
Distribution Chlorine Residual (Kingston Drinking Water System)  Receives water from both King St. WTP & Point Pleasant WTP	See parameter description	Continuous	0.11 – 3.22	mg/l	Recommended level of at least 0.20 mg/l in distribution system to maintain microbiological quality. 0.05 mg/l minimum required.
Filter # 1 Effluent Turbidity	1.0 NTU for >15 min.	Continuous	0.020 – 0.100	NTU	Turbidity is a measure of particles in water.
Filter # 2 Effluent Turbidity	1.0 NTU for >15 min.	Continuous	0.030 – 0.110	NTU	Turbidity is a measure of particles in water.
Filter # 3 Effluent Turbidity	1.0 NTU for >15 min.	Continuous	0.030 – 0.200	NTU	Turbidity is a measure of particles in water.
Filter # 4 Effluent Turbidity	1.0 NTU for >15 min.	Continuous	0.030 – 0.210	NTU	Turbidity is a measure of particles in water.
Filter # 5 Effluent Turbidity	1.0 NTU for >15 min.	Continuous	0.010 – 0.130	NTU	Turbidity is a measure of particles in water.
Filter # 6 Effluent Turbidity	1.0 NTU for >15 min.	Continuous	0.010 – 0.180	NTU	Turbidity is a measure of particles in water.

\* Note: For these parameters the range of results is determined through in house lab testing.

### Summary of additional testing and sampling carried out in accordance with the requirement of the Municipal Drinking Water Licence

Sample Location	MAC	Parameter	Number of Samples	Results Average	Unit of Measure	Parameter Description
Process Waste Facility Effluent	25	Total Suspended Solids	12	9.42	mg/l	A measure of the particulates collected in the filtration process.
Process Waste Facility Effluent	>0	Chlorine Residual	12	0	mg/l	Residual of 0 mg/l as required by the drinking water licence for this facility

## Summary of additional testing and sampling on the process wastewater effluent

Sample Location	MAC	Parameter	Number of Samples	Results Average	Unit of Measure	Parameter Description
Process Waste Facility Effluent	N/A	BOD5	12	<2	mg/l	Biological Oxygen Demand
Process Waste Facility Effluent	N/A	Aluminum	12	1.28	mg/l	Residual from treatment process
Process Waste Facility Effluent	N/A	pH	12	8.07		An indicator of the acidity of water.

## Summary of raw water testing analyzed by accredited laboratories during this reporting period

Parameter	MAC	Number of Samples	Results Range	Unit of Measure	MAC Exceedance	Parameter Description
Alkalinity (as CaCO <sub>3</sub> )	N/A	4	93 – 94	mg/l	No	A measure of the resistance of the water to the effects of acids. Expressed as calcium carbonate.
Aluminum	N/A	4	0.01 – 0.03	mg/l	No	May be naturally present.
Ammonia N	N/A	2	<0.05	mg/l	No	Occurs naturally from organic nitrogen containing compounds.
Antimony	N/A	2	0.0001-0.0002	mg/l	No	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder
Arsenic	N/A	2	0.0010 – 0.0015	mg/l	No	Naturally occurring in surface waters / mine drainage

Barium	N/A	2	0.022-0.025	mg/l	No	Erosion of natural deposits. Discharge from metal refineries, oil drilling wastes.
Boron	N/A	2	0.019-0.026	mg/l	No	Erosion of natural deposits, industrial waste effluents.
Cadmium	N/A	2	<0.00002-0.00003	mg/l	No	Industrial discharge
Calcium	N/A	4	33.5 – 38.2	mg/l	No	Naturally occurring.
Chloride	N/A	2	22.2 – 22.8	mg/l	No	A common naturally occurring non-toxic material that may produce a salty taste in water.
Chromium	N/A	2	<0.002	mg/l	No	Industrial residues
Colour	N/A	12	<2 – 4	TCU	No	Typically the result of organic matter in surface waters.
Conductivity	N/A	2	309 – 311	Us/cm	No	A measure of ability of water to carry an electric current due to the presence of ions.
Copper	N/A	2	<0.002-0.009	mg/l	No	Domestic plumbing (Aesthetic objective)
Dissolved Organic Carbon	N/A	4	2.0 – 2.7	mg/l	No	High DOC is an indicator of potential for chlorination by-product problems.
Fluoride	N/A	4	0.1 – 0.2	mg/l	No	Naturally occurring.
Hardness	N/A	4	120 – 133	mg/l	No	Naturally occurring from dissolved calcium and magnesium.
Iron	N/A	4	<0.005	mg/l	No	Leaching from natural deposits and plumbing materials, industrial wastes. (Aesthetic objective)

Lead	N/A	2	0.00005-0.00021	mg/l	No	Internal corrosion of household plumbing, erosion of natural deposits.
Manganese	N/A	4	<0.001- 0.003	mg/l	No	Erosion of natural deposits.
Nitrate	N/A	4	0.3	mg/l	No	Runoff from fertilizer use, erosion of natural deposits
Nitrite	N/A	4	<0.1	mg/l	No	A natural component of water at this level.
pH	N/A	12	8.09 – 8.23		No	An indicator of the acidity of water.
Selenium	N/A	1	<0.001-0.002	mg/l	No	Discharge from refineries, mines, chemical manufacture
Sodium	N/A	4	14.2 – 15.1	mg/l	No	Occurs naturally in the earth's crust.
Sulphate	N/A	4	24 – 25	mg/l	No	An inorganic constituent that may cause tastes at high levels.
Total Kjeldahl Nitrogen	N/A	4	<0.1 – 0.2	mg/l	No	Indicator of organic contamination or the potential for taste and odour problems.
Total Phenols	N/A	4	<0.001	mg/l	No	A chemical compound found in nature and used in a wide variety of products.
Uranium	N/A	2	0.00020-0.00027	mg/l	No	Erosion of natural deposits.
Zinc	N/A	4	<0.005	mg/l	No	An inorganic constituent that may cause tastes.

## Summary of treated water inorganic parameters tested during this reporting period

Parameter	MAC	Number of Samples	Results Range	Unit of Measure	MAC Exceedance	Parameter Description
Antimony	0.006	2	0.0001-0.0002	mg/l	No	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder
Arsenic	0.025	2	0.0012 - 0.0014	mg/l	No	Naturally occurring in surface waters / mine drainage
Barium	1.0	2	0.022-0.025	mg/l	No	Erosion of natural deposits. Discharge from metal refineries, oil drilling wastes.
Boron	5.0	2	0.019-0.025	mg/l	No	Erosion of natural deposits, industrial waste effluents.
Cadmium	0.005	2	<0.00002	mg/l	No	Industrial discharge
Chromium	0.05	2	<0.002	mg/l	No	Industrial residues
Lead	0.010	4	<0.00002 – 0.00003	mg/l	No	Internal corrosion of household plumbing, erosion of natural deposits.
Mercury	0.001	2	<0.00002	mg/l	No	Erosion of natural deposits, industrial discharges.
Selenium	0.01	2	<0.001-0.002	mg/l	No	Discharge from refineries, mines, chemical manufacture
Sodium	20	4	16.6 - 17.2	mg/l	No	Occurs naturally in the earth's crust.
Uranium	0.02	2	0.00017-0.00023	mg/l	No	Erosion of natural deposits.
Fluoride	1.5	4	0.10-0.20	mg/l	No	Naturally occurring.
Nitrite	1	12	<0.1	mg/l	No	A natural component of water at this level.
Nitrate	10	12	0.3 - 0.4	mg/l	No	Runoff from fertilizer use, erosion of natural deposits

## Summary of treated water organic parameters tested during this reporting period

Parameter	MAC	Number of Samples	Results Range	Unit of Measure	MAC Exceedance	Parameter Description
Alachlor	5	2	<0.3	ug/l	No	Agricultural herbicide
Aldicarb	9	2	<3	ug/l	No	Agricultural insecticide
Aldrin + Dieldrin	0.7	2	<0.02	ug/l	No	Residue from banned insecticide
Atrazine + N-dealkylated metabolites	5	2	<0.5	ug/l	No	Agricultural herbicide
Azinphos-methyl	20	2	<1	ug/l	No	Insecticide
Bendiocarb	40	2	<3	ug/l	No	Insecticide
Benzene	5	2	<0.5	ug/l	No	Discharge from plastics manufacturing, leaking fuel tanks
Benzo(a)pyrene	0.01	2	<0.005	ug/l	No	Formed from the incomplete burning of organic matter.
Bromoxynil	5	2	<0.3	ug/l	No	Agricultural herbicide
Carbaryl	90	2	<3	ug/l	No	Agricultural/Forestry/ Household insecticide
Carbofuran	90	2	<1	ug/l	No	Agricultural insecticide
Carbon Tetrachloride	5	2	<0.2	ug/l	No	Discharge from chemical and industrial activities
Chlordane (Total)	7	2	<0.04	ug/l	No	Residue from banned insecticide
Chlorpyrifos	90	2	<0.5	ug/l	No	Agricultural/ Household insecticide
Cyanazine	10	2	<0.5	ug/l	No	Agricultural/ Residential herbicide
Diazinon	20	2	<1	ug/l	No	Agricultural/ Livestock Operation/ Residential insecticide
Dicamba	120	2	<5	ug/l	No	Agricultural herbicide



1,2-Dichlorobenzene	200	2	<0.1	ug/l	No	Discharge from industrial chemical factories
1,4-Dichlorobenzene	5	2	<0.2	ug/l	No	Discharge from industrial chemical factories
Dichlorodiphenyltrichloroethane (DDT) + metabolites	30	2	<0.01	ug/l	No	Residue from banned insecticide
1,2-Dichloroethane	5	2	<0.1	ug/l	No	Discharge from industrial chemical factories
1,1-Dichloroethylene (vinylidene chloride)	14	2	<0.1	ug/l	No	Discharge from industrial chemical factories
Dichloromethane	50	2	<0.3	ug/l	No	Discharge from pharmaceutical and chemical factories
2,4-Dichlorophenol	900	2	<0.1	ug/l	No	Industrial contamination/ reaction with chlorine
2,4-Dichlorophenoxy acetic acid (2,4-D)	100	2	<5	ug/l	No	Agricultural/ Residential herbicide
Diclofop-methyl	9	2	<0.5	ug/l	No	Agricultural herbicide
Dimethoate	20	2	<1	ug/l	No	Agricultural/ Livestock Operation/ Forestry insecticide
Dinoseb	10	2	<0.5	ug/l	No	Herbicide residue
Diquat	70	2	<5	ug/l	No	Agricultural/ Aquatic herbicide
Diuron	150	2	<5	ug/l	No	Agricultural/ Industrial/ herbicide
Glyphosate	280	2	<25	ug/l	No	Agricultural/Forestry/ Household herbicide
Heptachlor + Heptachlor Epoxide	3	2	<0.1	ug/l	No	Residue from banned insecticide
Lindane (Total)	4	2	<0.1	ug/l	No	Agricultural/ Pharmaceutical insecticide
Malathion	190	2	<5	ug/l	No	Fruit & Vegetable / pest control insecticide

Methoxychlor	900	2	<0.1	ug/l	No	Agricultural/ Livestock Operation/ Residential insecticide
Metolachlor	50	2	<3	ug/l	No	Agricultural herbicide
Metribuzin	80	2	<3	ug/l	No	Agricultural herbicide
Monochlorobenzene	80	2	<0.2	ug/l	No	Discharge from industrial and agricultural chemical factories and dry cleaning facilities
Paraquat	10	2	<1	ug/l	No	Agricultural/ Aquatic herbicide
Parathion	50	2	<3	ug/l	No	Agricultural insecticide
Pentachlorophenol	60	2	<0.1	ug/l	No	Pesticide/ wood preservative residue
Phorate	2	2	<0.3	ug/l	No	Agricultural insecticide
Picloram	190	2	<5	ug/l	No	Industrial herbicide
Polychlorinated Biphenyls(PCB)	3	2	<0.05	ug/l	No	Residue from various industrial uses
Prometryne	1	2	<0.1	ug/l	No	Agricultural herbicide
Simazine	10	2	<0.5	ug/l	No	Agricultural herbicide or its residue
Total Trihalomethanes (NOTE: show latest annual average)	100 (Annual avg.)	12	14.8	ug/l	No	By-product of chlorination. * The MAC for THMs of 100 ug/l is based on a running annual average.
Temephos	280	2	<10	ug/l	No	Insecticide for Mosquito/Black fly control
Terbufos	1	2	<0.3	ug/l	No	Agricultural insecticide
Tetrachloroethylene	30	2	<0.2	ug/l	No	Leaching from PVC pipes; discharge from factories, dry cleaners and auto shops (metal degreaser)
2,3,4,6-Tetrachlorophenol	100	2	<0.1	ug/l	No	Wood preservative
Triallate	230	2	<10	ug/l	No	Agricultural herbicide

Trichloroethylene	5	2	<0.1	ug/l	No	Discharge from metal degreasing sites and other factories
2,4,6-Trichlorophenol	5	2	<0.1	ug/l	No	Pesticide manufacturing
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	280	2	<10	ug/l	No	Industrial herbicide residue
Trifluralin	45	2	<0.5	ug/l	No	Agricultural herbicide
Vinyl Chloride	2	2	<0.2	ug/l	No	Leaching from PVC pipes; discharge from plastics factories

### Summary of additional treated water testing analyzed by accredited laboratories during this reporting period

Parameter	MAC	Number of Samples	Results Range	Unit of Measure	MAC Exceedance	Parameter Description
Alkalinity (as CaCO <sub>3</sub> )	N/A	4	93 - 94	mg/l	No	A measure of the resistance of the water to the effects of acids. Expressed as calcium carbonate.
Aluminum	0.1 OG	12	0.05 – 0.15	mg/l	No	May be naturally present or a residual from the coagulation process.
Ammonia N	N/A	4	<0.01<0.05	mg/l	No	Occurs naturally from organic nitrogen containing compounds.
Calcium	N/A	4	33.5 – 38.2	mg/l	No	Naturally occurring.
Chloride	250	4	25.3 – 25.7	mg/l	No	A common naturally occurring non-toxic material that may produce a salty taste in water.
Colour	5	12	<2	TCU	No	Typically the result of organic matter in surface waters.

Conductivity	N/A	4	321 – 325	Us/cm	No	A measure of ability of water to carry an electric current due to the presence of ions.
Copper	1 OG	2	<0.002	mg/l	No	Domestic plumbing (Aesthetic objective)
Dissolved Organic Carbon	5 AO	4	1.5 – 2.3	mg/l	No	High DOC is an indicator of potential for chlorination by-product problems.
Hardness	100 OG	4	120 – 134	mg/l	No	Naturally occurring from dissolved calcium and magnesium.
Iron	0.3 AO	4	<0.005	mg/l	No	Leaching from natural deposits and plumbing materials, industrial wastes. (Aesthetic objective)
Manganese	0.05 AO	4	<0.001	mg/l	No	Erosion of natural deposits.
pH	6.5–8.5 OG	12	8.04 – 8.22		No	An indicator of the acidity of water.
Sulphate	500 OG	4	24 – 25	mg/l	No	An inorganic constituent that may cause tastes at high levels.
Total Kjeldahl Nitrogen	N/A	4	<0.1	mg/l	No	Indicator of organic contamination or the potential for taste and odour problems.
Zinc	5	4	<0.005	mg/l	No	An inorganic constituent that may cause tastes.

## Summary of the Kingston drinking water distribution system water inorganic parameters tested during this reporting period

Parameter	MAC	Number of Samples	Results Range	Unit of Measure	MAC Exceedance	Parameter Description
Antimony	0.006	2	0.0001-0.0002	mg/l	No	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder
Barium	1	2	0.022 – 0.024	mg/l	No	Erosion of natural deposits. Discharge from metal refineries, oil drilling wastes.
Boron	5	2	0.025	mg/l	No	Erosion of natural deposits, industrial waste effluents.
Arsenic	0.025	2	0.0013-0.0019	mg/l	No	Naturally occurring in surface waters / mine drainage
Cadmium	0.05	2	<0.00002-0.00002	mg/l	No	Industrial discharge
Chromium	2	2	<0.002	mg/l	No	Industrial residues
Lead	0.01	2	<0.00002 – 0.00031	mg/l	No	Internal corrosion of household plumbing, erosion of natural deposits.
Selenium	0.01	2	0.002	mg/l	No	Discharge from refineries, mines, chemical manufacture
Sodium	20	8	15 – 17.5	mg/l	No	Occurs naturally in the earth's crust.
Fluoride	1.5	2	0.2	mg/l	No	Naturally occurring.
Nitrite	1	2	<0.1	mg/l	No	A natural component of water at this level.
Nitrate	10	2	0.3 – 0.4	mg/l	No	Runoff from fertilizer use, erosion of natural deposits

## Summary of the Kingston drinking water distribution system organic parameters tested during this reporting period

Parameter	MAC	Number of Samples	Result Value	Unit of Measure	MAC Exceedance	Parameter Description
1,1-Dichloroethylene (vinylidene chloride)	14	2	<0.1	ug/l	No	Discharge from industrial chemical factories
1,2-Dichlorobenzene	200	2	<0.1	ug/l	No	Discharge from industrial chemical factories
1,2-Dichloroethane	5	2	<0.1	ug/l	No	Discharge from industrial chemical factories
1,4-Dichlorobenzene	5	2	<0.2	ug/l	No	Discharge from industrial chemical factories
Benzene	5	2	<0.5	ug/l	No	Discharge from plastics manufacturing, leaking fuel tanks
Carbon Tetrachloride	5	2	<0.2	ug/l	No	Discharge from chemical and industrial activities
Dichloromethane	50	2	<0.3	ug/l	No	Discharge from pharmaceutical and chemical factories
Monochlorobenzene	80	2	<0.2	ug/l	No	Discharge from industrial and agricultural chemical factories and dry cleaning facilities
Tetrachloroethylene	30	2	<0.2	ug/l	No	Leaching from PVC pipes; discharge from factories, dry cleaners and auto shops (metal degreaser)
Trichloroethylene	5	2	<0.1	ug/l	No	Discharge from metal degreasing sites and other factories
Total Trihalomethanes (NOTE: shows latest annual average)	100 (Annual avg.)	12	36.1	ug/l	No	By-product of chlorination. * The MAC for THMs of 100 ug/l is based on a running annual average.
Vinyl Chloride	2	2	<0.2	ug/l	No	Leaching from PVC pipes; discharge from plastics factories

## Summary of additional Kingston drinking water distribution system water testing analyzed by accredited laboratories during this reporting period

Parameter	MAC	Number of Samples	Results Range	Unit of Measure	Exceedance	Parameter Description
Alkalinity (as CaCO <sub>3</sub> )	N/A	8	87 – 95	mg/l	No	A measure of the resistance of the water to the effects of acids. Expressed as calcium carbonate.
Aluminum	0.1 OG	8	0.02– 0.15	mg/l	No	May be naturally present or a residual from the coagulation process.
Ammonia N	N/A	8	<0.05	mg/l	No	Occurs naturally from organic nitrogen containing compounds.
Calcium	N/A	8	31.3 – 38.2	mg/l	No	Naturally occurring.
Chloride	250	8	25.0 – 26.3	mg/l	No	A common naturally occurring non-toxic material that may produce a salty taste in water.
Colour	5	2	<2	TCU	No	Typically the result of organic matter in surface waters.
Conductivity	N/A	8	313 – 327	Us/cm	No	A measure of ability of water to carry an electric current due to the presence of ions.
Copper	1 OG	8	<0.002 – 0.003	mg/l	No	Domestic plumbing (Aesthetic objective)
Dissolved Organic Carbon	5 AO	8	0.9 – 2.6	mg/l	No	High DOC is an indicator of potential for chlorination by-product problems.
Hardness	100 OG	8	116 – 134	mg/l	No	Naturally occurring from dissolved calcium and magnesium.



Iron	0.3 AO	8	<0.005 – 0.07	mg/l	No	Leaching from natural deposits and plumbing materials, industrial wastes. (Aesthetic objective)
Manganese	0.05 AO	8	<0.001 - 0.03	mg/l	No	Erosion of natural deposits.
pH	6.5–8.5 OG	8	7.87 – 8.20		No	An indicator of the acidity of water.
Sulphate	500 OG	8	23 - 24	mg/l	No	An inorganic constituent that may cause tastes at high levels.
Total Kjeldahl Nitrogen	N/A	8	<0.1 – 0.5	mg/l	No	Indicator of organic contamination or the potential for taste and odour problems.
Zinc	5	8	<0.005 – 0.042	mg/l	No	An inorganic constituent that may cause tastes.

### Summary of residential & non-residential plumbing lead testing carried out in accordance with schedule 15.1 of regulation 170/03 during this reporting period

	MAC	Number of Sample locations (Dec.15/13- Dec.31/14)	Number of Sample Locations Results Exceeding Standard (0.01 mg/l)	Lead Results Range (mg/l)	pH Results Range
Residential	0.01	20	*1	0.00003 – 0.0102	6.58 – 7.86
Non-Residential	0.01	2	0	0.00002 – 0.0004	7.55

\*Notification of lead exceedance results and advice by the medical officer of health were given to the occupants of the locations which exceeded the standard for lead in accordance to Schedule 15.1-9 of Regulation 170/03.



### Summary of raw water testing analyzed by in house laboratory during this reporting period

Parameter	MAC	Number of Samples	Average Results	Unit of Measure	Exceedance	Parameter Description
Alkalinity	N/A	45	94	mg/l	No	A measure of the resistance of the water to the effects of acids. Expressed as calcium carbonate.
Hardness	N/A	45	121	mg/l	No	Naturally occurring from dissolved calcium and magnesium.
pH	N/A	365	7.93		No	An indicator of the acidity of water.
Temperature	N/A	365	0.1 – 24.5	Degrees Celsius	No	

### Summary of treated water testing analyzed by in house laboratory during this reporting period

Parameter	MAC	Number of Samples	Average Results	Unit of Measure	Exceedance	Parameter Description
Alkalinity	N/A	43	98	mg/l	No	A measure of the resistance of the water to the effects of acids. Expressed as calcium carbonate.
Aluminum	0.1 OG	361	0.072	mg/l	No	May be naturally present or a residual from the coagulation process.
Hardness	100 OG	43	122	mg/l	No	Naturally occurring from dissolved calcium and magnesium.
pH	6.5–8.5 OG	365	7.86		No	An indicator of the acidity of water.
Temperature	N/A	366	0.1 – 22.1	Degrees Celsius	No	