KING STREET
WATER TREATMENT PLANT

2021 ANNUAL REPORT

Drinking Water System Number: 220001860
Drinking Water System Owner: City of Kingston
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 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 http://www.utilitieskingston.com. Notices of availability are generally made through the local newspapers and radio. More information on the Drinking Water Regulations can be found on the Ministry of the Environment web site at http://www.ene.gov.on.ca. For further information about this report or any questions regarding accessibility, contact Robert Cooney with email at rcooney@utilitieskingston.com, or call 613-546-1181 Ext 2291.

2 PLANT DESCRIPTION AND TREATMENT PROCESS

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°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.

Figure 1 – King Street Water Treatment Plant Process Flow Diagram

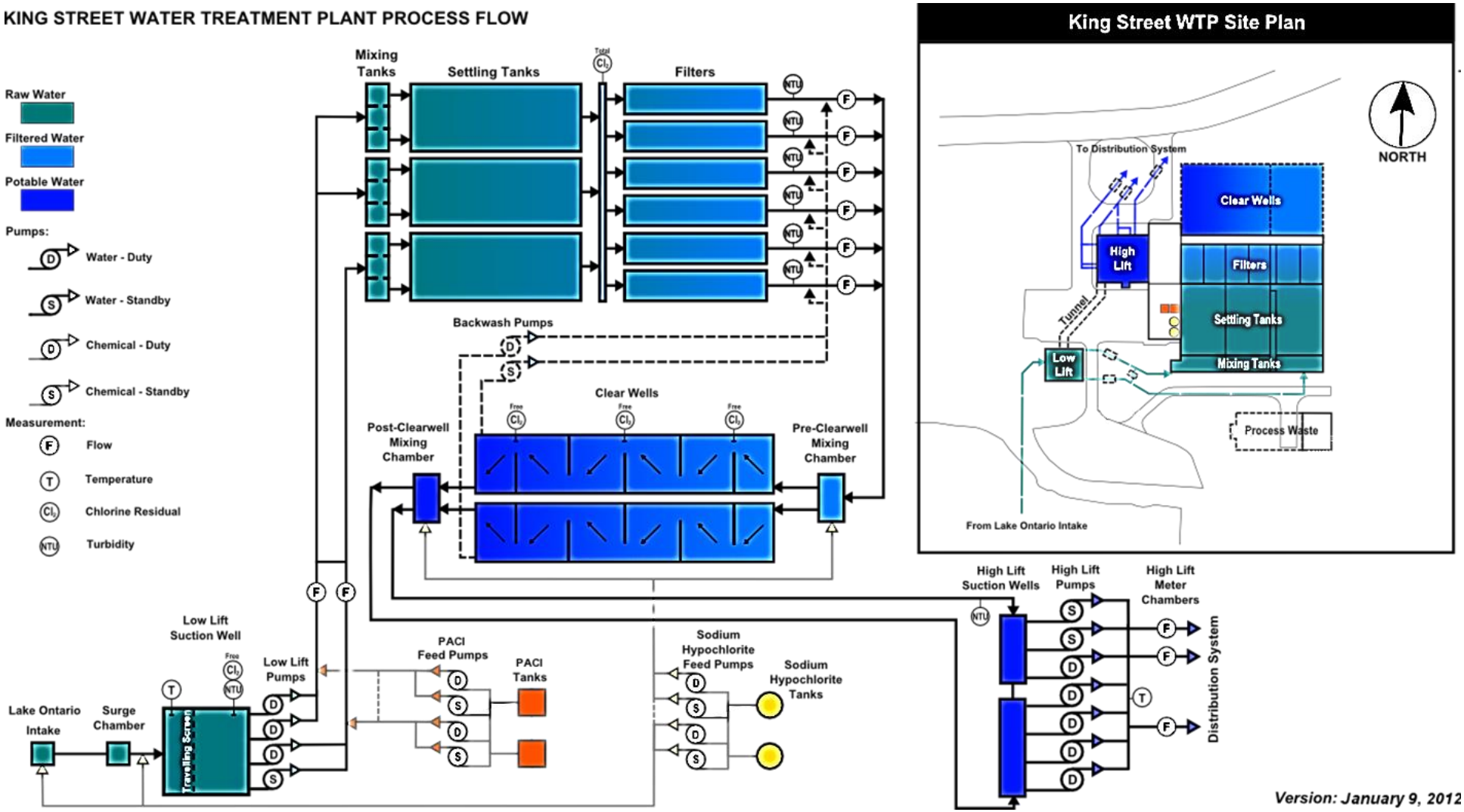
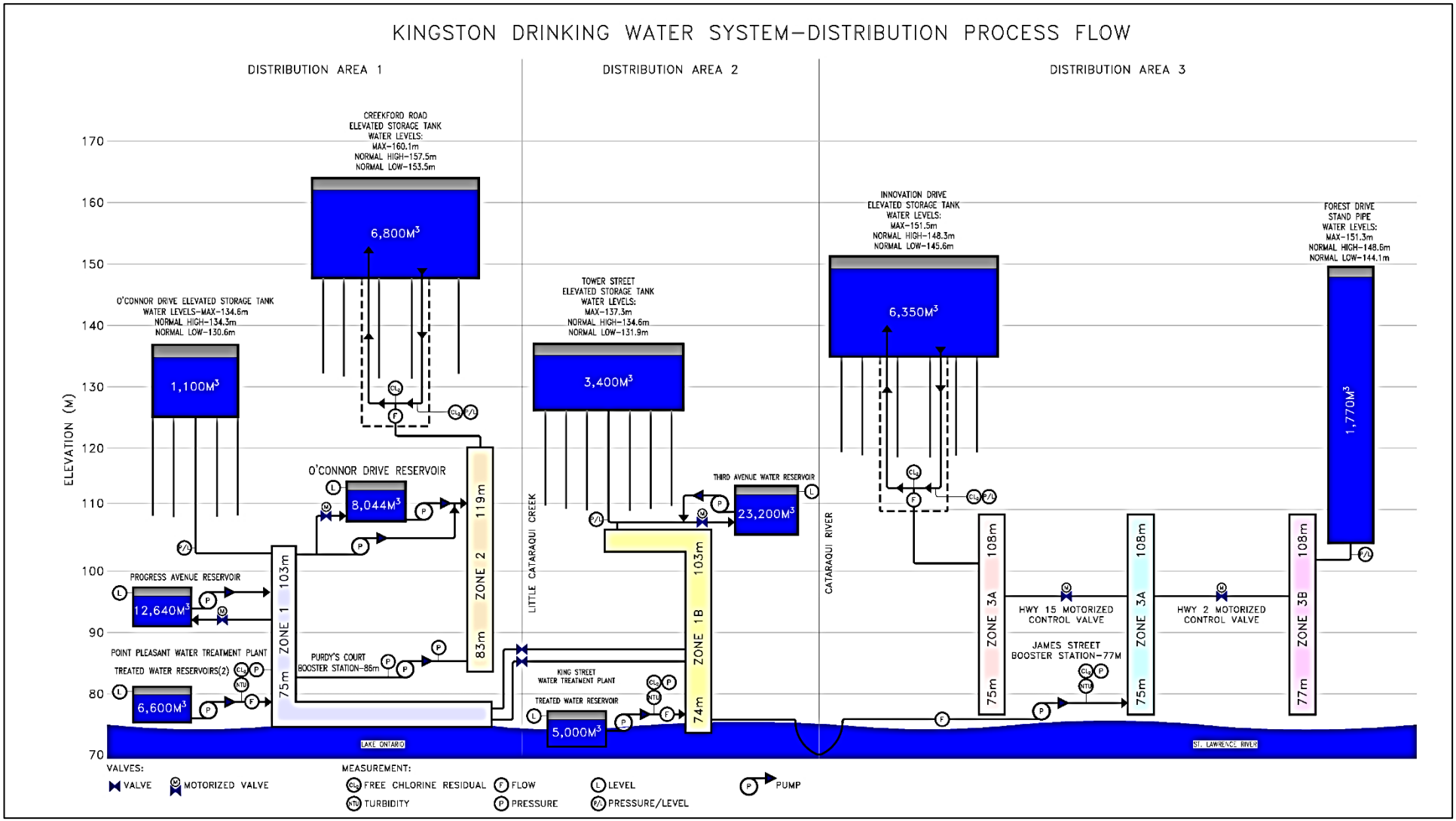


Figure 2 – Kingston Distribution System Process Flow Diagram



3 DISTRIBUTION SYSTEM

The Kingston Drinking Water System, which receives water from both the King Street Water Treatment Plant and the Point Pleasant Water Treatment Plant, has a service population of approximately 123,798 (population estimate based on growth rates from Census data for 2016). 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.

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 distribution Area 2. 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 distribution area.

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, 2 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. DND elevated storage facility was decommissioned in 2020 at the request of the Department of National Defence. The most recent upgrades at the James Street Booster Station facilitated the removal of DND tower, without any adverse impacts to distribution area 3.

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.

Major Expenses:

- Water main replacement projects throughout the city were continued throughout 2021.
- Extensive leakage testing, hydrant maintenance and replacement, valve maintenance and operation programs were also conducted on the system.
- Diesel fuel storage and delivery system upgrades
- GAC filter media replacement on 2 filters
- Coagulant feed system upgrades

- Drinking water intake inspection
- King Street Water Plant facility upgrades
- O'Connor Reservoir was cleaned out
- HVAC upgrades were completed at the James Street Booster Station
- Milton Tower hydro services were upgraded
- Distribution system upgrades were completed between pressure zones

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.

Events Requiring Notifications:

- Notification of an indicator of adverse water quality was received from Caduceon Environmental Laboratories regarding a sample collected on **August 8th** for Total Coliform (TC) with a count of **4 cfu/100mL**. Free chlorine residual at the time of sampling was **1.00 mg/L**. Notifications were made to the Spills Action Centre 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 a potential adverse water quality incident was provided to the Medical Officer of Health and Spills Action Centre on August 13th, when a water main break resulted in a loss of pressure in the water distribution system. 450 residences experienced a loss of pressure while repairs were being completed. No advisory was issued by the Medical Officer of Health. Two sets of bacteriological samples were collected and tested for E. coli and Total Coliform upon restoration of pressure in this zone. The bacteriological test results showed no evidence of contamination.
- Notification of an indicator of adverse water quality was received from Caduceon Environmental Laboratories regarding samples collected on **July 27th** for Lead, which showed results of **0.0138 mg/L (Sample #1) and 0.0194 mg/L (Sample #2).** The pH at the time of sampling was 7.46. Notifications were made to the Environmental Health Division of the local Ministry of Health. The homeowner was given a copy of the lab results along with an explanation of the information and a list of possible corrective actions to reduce Lead exposure.
- Notification of an indicator of adverse water quality was received from Caduceon Environmental Laboratories regarding a sample collected on **October 3rd** for a Total Coliform (TC) with a count of **1 cfu/100mL.** Free chlorine residual at the time of sampling was **1.32 mg/L.** Notifications were made to the Spills Action Centre 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 resamples 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 14th** for Total Coliform (TC) with a count of **1 cfu/100 mL**. Free chlorine residual at the time of sampling was **1.71 mg/L**. Notifications were made to the Spills Action Centre 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 resamples 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 **December 15th** for a Total Coliform (TC) with a count of **1 cfu/100mL.** Free chlorine residual at the time of sampling was **1.48 mg/L.** Notifications were made to the Spills Action Centre 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 resamples not indicating any adverse conditions, a contaminated sample bottle or sampling error is suspected.

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 (ppm).

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

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