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DATE: March 31, 2020

31 mars 2020

FILE NUMBER: ACS2020-PWE-WTS-0001

SUBJECT: **MUNICIPAL DRINKING WATER SYSTEMS – 2019 SUMMARY REPORTS**

OBJET : **RÉSEAUX MUNICIPAUX D'ALIMENTATION EN EAU POTABLE –
RAPPORTS SOMMAIRES DE 2019**

EXECUTIVE SUMMARY

The purpose of this memorandum is to provide Members of Council with the City of Ottawa's 2019 Drinking Water Summary Reports in fulfillment of Schedule 22 of O.Reg.170/03, which requires a Summary Report be prepared annually and circulated to

all Members of the Municipal Council by March 31st of the following calendar year. The report also satisfies the requirement that Owners of municipal drinking water systems “be informed,” as part of their responsibilities under the Standard of Care (Section 19) of the *Safe Drinking Water Act (2002)*.

The report is based on the operational period from January 1st, 2019 to December 31st, 2019, and reviews the eight municipal water systems owned and/or operated by the City of Ottawa:

- Britannia Water Purification Plant
- Lemieux Island Water Purification Plant
- Carp Drinking Water System
- Kings Park (Richmond) Drinking Water System
- Richmond West (Richmond) Drinking Water System
- Munster Hamlet Drinking Water System
- Shadow Ridge (Greely) Drinking Water System
- Vars Drinking Water System

This report details all aspects of Ottawa’s municipal drinking water systems including operational performance, water quality, flowrates, capital projects, inspections, regulatory requirements, and any items of non-compliance noted during the year. A thorough review of Licenses, Permits, Regulations, and Ministry Inspection Reports indicates that Ottawa residents were provided with safe drinking water during 2019.

In preparation of this report, technical staff intensively reviewed 35 sets of regulatory requirements for each of Ottawa’s eight municipal water systems. Some notable highlights and challenges experienced during the 2019 year are summarized below.

- All of Ottawa’s municipal water systems achieved an excellent rating of 100% by Ontario’s Chief Drinking Water Inspector with the exception of Lemieux Island WPP which received 99.3% due to one non-compliance event that did not affect the quality of the drinking water.
- More than 100,000 laboratory and operational tests were conducted to ensure the safety of Ottawa’s drinking water supply. The monitoring program includes 75 continuous analyzers and 8 laboratories analyzing more than 330 test parameters. The results confirm that Ottawa residents continue to be supplied with high quality drinking water.
- Ottawa’s water systems complied with all drinking water regulatory requirements with the exception of (4) items of minor non-compliance. The non-compliance items were technical and/or administrative in nature and did not affect the quality of drinking water supplied to the public.
- Each day, an average of 286 million litres of drinking water was treated and distributed to Ottawa residents and businesses, representing 0.28 % of the Ottawa River flow volume.
- Several substances of concern were highlighted in the media such as: microplastics, PFAS compounds, pharmaceuticals, cyanobacteria, and

radioactivity. In all cases, test results from Ottawa's monitoring program demonstrated the safety of Ottawa's drinking water supply. Ottawa continues to be an industry leader in monitoring, evaluating, and responding to emerging issues in water quality.

- Two Boil Water Advisories were issued by the Medical Officer of Health for localized areas of the water distribution system, affecting 60 households in one case, and 14 households in the other. Both advisories were issued on a precautionary basis and once the repair work was complete, and clear test results indicated safe water quality, the advisories were lifted.
- Despite challenging operational conditions during the 2019 Spring Freshet, the Britannia and Lemieux Island water purification plants provided an uninterrupted supply of safe drinking water to Ottawa residents.
- On April 23rd, 2019, a new municipal water supply – the Richmond West well system – was commissioned to supply water to the Western Lands Development area in Richmond.
- In June 2019, the Lemieux Island Water Purification Plant hosted a Doors Open event that garnered over 1,300 visitors and showcased our historically significant water treatment plant.
- In the Fall of 2019, City staff responded to more than 500 customer requests for lead testing in older Ottawa homes following media coverage of Health Canada's lower guideline for lead in drinking water. On September 25th, 2019, Council approved an updated Lead Pipe Replacement Program and new corrosion control strategy to help residents keep their tap water lead-free.

The City remains committed to continually improving our water supply through research, process optimization, quality management, public reporting, and diligence in complying with provincial regulations and Health Canada guidelines for safe drinking water.

RÉSUMÉ

La présente note de service vise à fournir aux membres du Conseil municipal les rapports sommaires de 2019 de la Ville d'Ottawa sur l'eau potable, en application de l'annexe 22 du Règlement de l'Ontario 170/03, qui exige que, chaque année, des rapports sommaires soient préparés et remis aux membres du Conseil au plus tard le 31 mars de l'année civile suivante. Ces rapports répondent aussi à l'exigence selon laquelle les propriétaires de réseaux municipaux d'eau potable doivent être tenus informés, dans le cadre de leurs responsabilités en lien avec l'article 19 (degré de diligence) de la *Loi de 2002 sur la salubrité de l'eau potable*.

Les rapports couvrent la période qui va du 1^{er} janvier au 31 décembre 2019, et portent sur les huit réseaux municipaux d'eau potable qui appartiennent à la Ville d'Ottawa ou qui sont exploités par elle.

- Usine de purification de l'eau de Britannia
- Usine de purification de l'eau de l'île Lemieux
- Réseau d'eau potable de Carp

- Réseau d'eau potable de Kings Park (Richmond)
- Réseau d'eau potable de Richmond Ouest (Richmond)
- Réseau d'eau potable de Munster Hamlet
- Réseau d'eau potable de Shadow Ridge (Greely)
- Réseau d'eau potable de Vars

Par ailleurs, les rapports détaillent tous les aspects des réseaux municipaux d'eau potable, notamment le rendement opérationnel, la qualité de l'eau, le débit, les projets d'immobilisations, les inspections, les exigences réglementaires, ainsi que les points de non-conformité relevés au cours de l'année. Un examen rigoureux des licences, permis, règlements et rapports d'inspection du ministère a montré que l'eau potable consommée par les résidents d'Ottawa en 2019 était salubre.

Lors de la préparation des rapports, le personnel technique a examiné 35 séries d'exigences réglementaires visant les huit réseaux municipaux d'eau potable. Voici certains des principaux points forts et points à améliorer relevés en 2019.

- L'inspecteur en chef de l'eau potable de l'Ontario a accordé une note parfaite – 100 % – à tous les réseaux municipaux d'eau potable à Ottawa, à l'exception de la station de purification de l'eau de l'île Lemieux, qui a obtenu la note de 99,3 % en raison d'un incident de non-conformité qui n'a pas affecté la qualité de l'eau.
- Plus de 100 000 analyses en laboratoire et vérifications du fonctionnement ont été effectuées pour assurer la salubrité de l'eau potable distribuée à Ottawa. Le programme de surveillance comprend 75 analyseurs continus et 8 laboratoires qui analysent plus de 330 paramètres. Les résultats confirment que les résidents d'Ottawa continuent d'avoir accès à une eau potable de qualité.
- Les réseaux d'Ottawa répondent à toutes les exigences réglementaires en matière d'eau potable; seuls quatre points de non-conformité mineurs ont été relevés. Ils étaient de nature technique ou administrative, et n'ont donc pas affecté la qualité de l'eau potable distribuée au public.
- Chaque jour, ce sont en moyenne 286 millions de litres d'eau potable de grande qualité qui ont été traités et acheminés aux résidents et aux entreprises d'Ottawa, ce qui représente environ 0,28 % du débit de la rivière des Outaouais.
- Les médias ont signalé la présence de plusieurs substances préoccupantes : microplastiques, composés perfluoroalkylés, produits pharmaceutiques, cyanobactéries et produits radioactifs. Dans tous les cas, les résultats des analyses effectuées dans le cadre du programme de surveillance ont confirmé la salubrité de l'eau potable. Dans le secteur, Ottawa demeure un chef de file en matière de surveillance, d'évaluation et de résolution des problèmes émergents qui concernent la qualité de l'eau.
- La médecin chef en santé publique a émis deux avis d'ébullition de l'eau dans des secteurs précis du réseau de distribution; ils ont touché 60 et 14 ménages respectivement. Il s'agissait de deux avis préventifs, qui ont été levés une fois que les travaux de réparation ont été effectués, et que les résultats des analyses ont indiqué que l'eau était salubre.

- Malgré des conditions d'exploitation difficiles au printemps 2019, en raison de la crue nivale, les usines de purification de l'eau de Britannia et de l'île Lemieux ont continué d'alimenter les résidents en eau potable de qualité.
- Le 23 avril 2019, un nouveau système d'alimentation municipale en eau, le système de puits de Richmond Ouest, a été commandé pour approvisionner les terrains d'urbanisation de l'Ouest, à Richmond.
- En juin 2019, l'usine de purification de l'eau de l'île Lemieux a tenu un événement portes ouvertes, qui a attiré plus de 1 300 personnes et mis en valeur notre usine d'importance historique.
- À l'automne 2019, le personnel de la Ville a répondu à plus de 500 demandes d'analyse de la teneur en plomb de l'eau potable, présentées par les propriétaires de vieilles maisons, à la suite de la couverture médiatique entourant le resserrement de la directive de Santé Canada sur le plomb dans l'eau potable. Le 25 septembre 2019, le Conseil a approuvé la nouvelle version du Programme de remplacement des conduites en plomb, ainsi qu'une nouvelle stratégie de prévention de la corrosion, afin d'aider les résidents à s'assurer que l'eau de leur robinet ne contient pas de plomb.

La Ville demeure résolue à améliorer de façon continue l'approvisionnement en eau, par la recherche, l'optimisation des processus, la gestion de la qualité, les rapports publics et le respect diligent de la réglementation provinciale et des directives de Santé Canada concernant l'eau potable.

DISCUSSION

Description of Ottawa's Water Supply

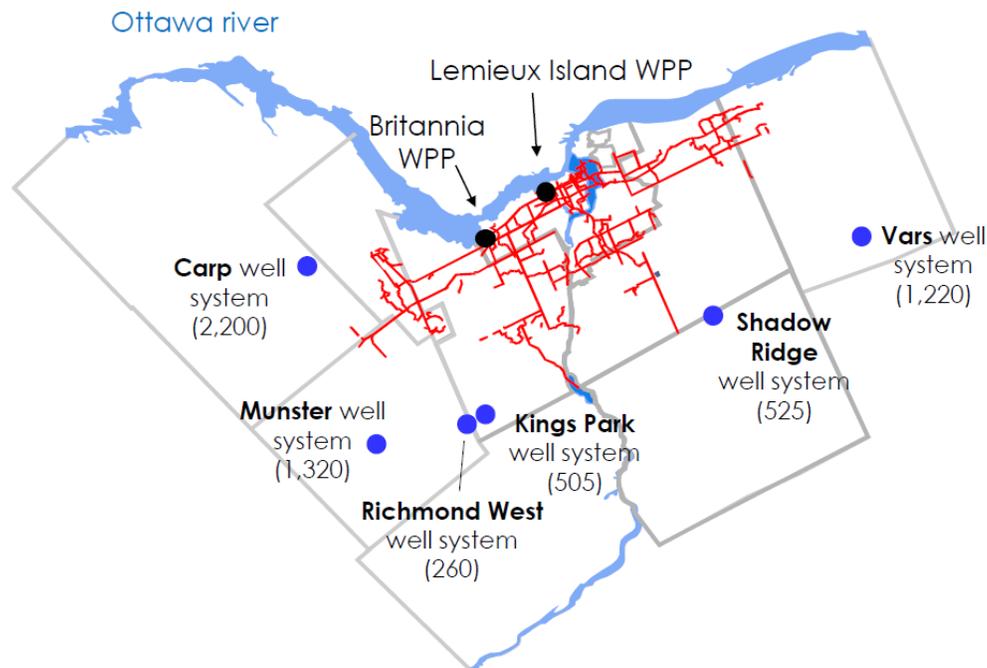
The City of Ottawa provides treatment, storage, and distribution of drinking water to approximately 918,000 residents, businesses, and institutions. The central water system supplies roughly 90% of Ottawa's population and includes two surface water treatment plants, the Britannia Water Purification Plant (c.1961) and the Lemieux Island Water Purification Plant (c.1932). Both plants draw source water from the Ottawa River and utilize a multiple-barrier treatment process to remove microorganisms, particles, organic matter, and other impurities in order to produce safe drinking water for Ottawa residents and businesses.

Treated drinking water from both plants is pumped into a vast water distribution network that includes 14 pumping stations, 5 reservoirs, 4 elevated tanks, and over 3000 km of water mains. The total volume of water stored in reservoirs is 275 Million Litres, which is roughly equivalent to the daily amount of water consumed in Ottawa. All treatment, pumping, and storage systems are controlled by a dedicated computer control system and monitored by certified Water Treatment Operators 24 hours per day. The central system also provides a direct water supply to Russell Township.

In addition to the central water supply, the City operates six municipal well systems that provide drinking water to rural communities located in Carp, Richmond (Kings Park), Richmond West (West Development Lands), Munster, Greely (Shadow Ridge

subdivision), and Vars. Collectively, these systems provide municipal water to approximately 1% of Ottawa's population, while approximately 9% use private wells.

The map below shows the layout of Ottawa's water supply and municipal well systems, with the service population for each system:



Regulation of Municipal Drinking Water

In Canada, municipal drinking water is regulated by provincial legislation, and governed by the Ministry of Environment, Conservation and Parks (MECP, or "Ministry"). In Ontario, the *Safe Drinking Water Act (2002)* was created in response to the waterborne outbreak in Walkerton in order to ensure the provision of safe drinking water throughout the province. Under the authority of the *Safe Drinking Water Act*, several key regulations for drinking water have been established:

- O.Reg.170/03 – Drinking Water Systems Regulation
- O.Reg.169/03 – Ontario Drinking Water Quality Standards
- O.Reg.248/03 – Drinking Water Testing Services
- O.Reg.128/04 – Certification of Drinking Water Systems Operators
- O.Reg.188/07 – Licensing of Municipal Drinking Water systems
- O.Reg.170/03 (Sch.15.1) – Community Lead Testing Program
- O.Reg.287/07 – Source Water Protection Regulation
- O.Reg.588/17 – Asset Management Planning for Municipal Infrastructure

These regulations cover all aspects of municipal water supply, including treatment requirements, quality standards, test frequency, operations and maintenance, operator qualifications, laboratory testing, inspections, reports, and public notification.

Regulatory directions for each municipal drinking water system are provided through O.Reg.170/03 and a combination of Licenses, Permits, Provincial Officer Orders, and Annual Inspections conducted by the Ministry. This report reviews the 2019 operational performance of Ottawa’s municipal water systems in comparison to these regulatory requirements.

License & Permits

In Ontario, all owners of municipal drinking water systems are required to obtain a Municipal Drinking Water License (MDWL) for each drinking water system. Each license is comprised of five elements: Permit To Take Water (PTTW), Drinking Water Works Permit (DWWP), Operational Plan, Accreditation as an Operating Authority, and a Financial Plan.

Municipal Drinking Water Licenses for each municipal system are issued for a 5-year period and renewed by the Ministry through a comprehensive application and review process every five years. On June 13th, 2019 the City received updated MDWL licenses and DWWP permits for all eight municipal water systems, as listed in the table below:

Table 1 – Ottawa’s Municipal Drinking Water Licenses and Permits

Water System	Municipal Drinking Water License No.	Drinking Water Works Permit No.	Permit to Take Water
Britannia Water Purification Plant	008-102	008-202	8782-8AEJKS
Lemieux Island Water Purification Plant	008-102	008-202	7340-BBHRLT
Carp Well System	008-101	008-201	2167-9PAN8Y
Kings Park Well System	008-103	008-203	8507-9PAHKL
Richmond West Well System	008-107	008-207	3821-AF9PUV
Munster Well System	008-104	008-204	4044-AASLU7
Vars Well System	008-108	008-208	5156-9HDRJ7
Shadow Ridge Well System	008-106	008-206	1867-8NAQXQ

All changes and revisions reflected in the new licenses were highlighted and tracked by operational staff through the Drinking Water Quality Management System (DWQMS). Although most of the changes in the new licenses were relatively minor, there was a new requirement for the City to develop a Harmful Algal Bloom response plan for Ottawa's surface water treatment plants. Accordingly, an algal bloom risk assessment and response plan was developed and endorsed by Ottawa Public Health (OPH) and the Ministry. The plan involves monthly testing of raw and treated water at both plants along with trigger levels and response actions. It is important to note that the river intakes for both treatment plants are considered to be low risk for algal bloom events, and cyanotoxins have not been detected during routine monitoring in 2016, 2017, 2018, and 2019. The new response plan was implemented as a Standard Operating Procedure (SOP) effective January 1st, 2020.

Provincial Officer Orders

During 2019, there was one Provincial Officer Order issued as regulatory relief for daily chlorine testing in the Vars Water System. O.Reg.170/03 requires 7 weekly measurements of chlorine residual concentrations in the distribution system. In the Vars system, these measurements were previously taken from watermain blow-off lines. However, due to concern for back-flow protection, the sample sites were decommissioned on December 12th, 2019. At the City's request, the Ministry granted temporary relief to measure 4 weekly chlorine samples until a replacement sampling system can be installed. It is important to note that the Vars chlorine concentration is continuously monitored by a dedicated process analyzer as water leaves the treatment plant. The alternate sampling system must be installed by May 31st, 2020.

Results of Ministry Annual Inspections

Through the office of Ontario's Chief Drinking Water Inspector, each of Ottawa's municipal water systems undergoes an annual inspection by the Ministry. The inspection process is indeed comprehensive and includes approximately two days of on-site review with technical staff in each water system. Each inspection requires a significant amount of staff time (about 1 week) for the collection and submission of water quality data, documentation, and operating records.

The inspection focuses on regulatory compliance, plant operations, data records, process trends, operator certification, record keeping, and management practices over the past year. Following each inspection, the Ministry issues a full inspection report of findings, including a final Inspection Rating, which is a risk-weighted score derived from approximately 100 regulatory questions covering 15 inspection categories.

The table below summarizes the annual inspection results for 2019, which include any Provincial Officer Orders, Non-Compliance Items, and Best Practice Recommendations, along with a final % Inspection Rating.

Table 2 – Summary of Ministry Annual Inspection Results for (8) Water Systems

System	Inspection Date	Prov. Officer Orders	Non-Compliance Items	Best Practice Items	Final Inspection Rating
Britannia	Feb. 12, 2020	0	0	0	*100%
Lemieux	Jan. 21, 2020	0	1	0	99.3%
Carp	June 20, 2019	0	0	0	100%
Kings Park	Sept. 4, 2019	0	0	0	100%
Munster	Dec 4, 2019	0	0	0	100%
Richmond West	Mar. 4, 2020	0	0	0	100%
Shadow Ridge	Oct. 1, 2019	0	0	0	100%
Vars	Oct. 1, 2019	1	0	0	100%

*2018 inspection rating cited since 2019 final inspection report not yet received

During 2019, all water systems received an excellent inspection rating of 100% with exception of the Lemieux Island WPP which received a rating of 99.3% due to a non-compliance item noted with respect to incomplete operator log-book entries. This item is described further below in the report.

Compliance with Drinking Water Regulations

The primary purpose of this report is to review Ottawa's compliance with provincial drinking water regulations during the period January 1st to December 31st, 2019. To achieve this, a staff team of engineers, technologists, and managers spend approximately 2-3 weeks each year during Q1 to conduct a comprehensive review of operational performance of each water system in relation to 35 categories of regulatory requirements.

Each year, staff prepare a detailed compliance tracking table for each municipal water system, listing all 35 categories of regulatory requirements in comparison to results achieved during the previous year. A summary table of compliance for all (8) systems is presented in Document 1. A quick perusal of this table illustrates both the comprehensive nature of provincial drinking water regulations and the diligence of staff in measuring and tracking compliance.

During 2019, Ottawa's municipal water systems met all regulatory requirements under Ontario's *Safe Drinking Water Act* with the exception of (4) items noted below.

Items of Non-Compliance

During 2019, there were (4) incidents of non-compliance noted for Ottawa's municipal drinking water systems. Each incident is described below, including corrective actions taken and the impact on water quality.

- (1) Loss of filter turbidity data for 10 hours at Lemieux Island WPP – on August 25th, 2019, a failure of the computer control software resulted in the loss of filter turbidity data for approximately 10 hours. During this time, filters operating normally and were controlled by a dedicated PLC device, including alarm settings and operator notifications. There was no interruption of the filtration process and drinking water quality was not affected. However, approximately 10 hours of filter process data was not recovered and could not be reviewed by an operator within 72 hours as required by regulations. The Ministry Inspector was promptly notified of the incident.
- (2) pH in main drain outside target range at Lemieux Island WPP – the continuous pH analyzer on the main drain recorded two events with a measurement slightly below the effluent target of pH=6 for 33 minutes on November 30th and 43 minutes on December 30th. For both events, the operator adjusted the sodium hydroxide dose to increase the pH, but the process took longer than 30 minutes to respond due to hydraulic changes. In both cases, City staff are seeking to clarify the criteria for effluent discharge since the license requires only 4 grab samples to be taken per year. For the purposes of the report, these occurrences were considered to be non-compliance events.
- (3) Operator log-book entries for Lemieux Island WPP – during the Lemieux Island WPP inspection, it was noted by the inspector that some of the entries in the logbooks did not meet the requirements of O.Reg.128/04. In some cases, it was unclear who the Overall Responsible Operator (ORO) was for a given shift. Refresher training will be provided to plant operators during 2020 to review the requirements of the regulation with respect to logbook entries. A Standard Operating Procedure (SOP) is also being created to provide guidance for logbook entries.
- (4) Measurement of daily chlorine levels in Vars Well System – due to concern for back-flow protection, two routine sample lines were decommissioned on December 12th, 2019 in the Vars well system. As a result, only (4) weekly measurements could be taken instead of the required (7) readings. At the City's request, the Ministry granted temporary relief to take (4) weekly chlorine measurements until a replacement non-freezing sample system could be installed. It is important to note that the Vars chlorine concentration is continuously monitored by a dedicated process analyzer as water leaves the treatment plant. The alternate sampling system must be installed by May 31st, 2020.

In all cases, staff took corrective actions to promptly address each of the non-compliance issues. Most importantly, the non-compliance incidents noted were technical and/or administrative in nature and did not affect the quality of drinking water supplied to the public.

Water Quality

The Ontario Drinking Water System Regulation O.Reg.170/03 defines requirements for water quality sampling and testing based on categories of test parameters: microbiological, operational, inorganic, and organic. Water quality is carefully monitored from source-to-tap using on-line analyzers, field instruments, process lab instruments, Ottawa's ROPEC Laboratory, and eight external laboratories that provide specialized water quality analysis. Certified operators and water quality technologists also perform routine water tests at over 70 sample locations throughout the distribution system (eg. pump stations, reservoirs, fire halls, schools) and respond directly to customer inquiries and concerns about water quality.

In order to fully characterize drinking water quality, the City of Ottawa conducts additional testing for other trace organic, inorganic, pharmaceutical, and radiological substances. In total, more than 100,000 water quality tests are conducted each year covering over 330 specific test parameters. Ottawa's water quality monitoring program is one of the most comprehensive in Canada and goes well beyond the minimum regulatory requirements. All water quality test results are reported annually and posted on www.ottawa.ca for public awareness and transparency.

During 2019, all test results were well within safe drinking water standards, with any exceptions noted in the Adverse Water Quality Incident section of the report. All chemical test results (organic, inorganic, metals, radiological) were within the Maximum Acceptable Concentration (MAC) levels as per Ontario Drinking Water Standards.

As a general comparison of water quality, the table below shows 2019 test results for common parameters in each of Ottawa's municipal water systems. The test results are expressed as an average concentration measured in the treated drinking water. Differences between systems reflect the unique source waters used for treatment in each case (eg. groundwater well vs. river source):

Table 3 – Comparison Table of Water Quality in Ottawa’s Municipal Water Systems

	Units	Britannia	Lemieux	Carp	Kings Park	Munster	Richmond West	Shadow Ridge	Vars
Physical									
Turbidity	NTU	0.06	0.07	0.70	0.35	0.39	0.46	0.09	0.27
Temperature	°C	8.9	9.6	10.9	10.1	10.4	10.5	9.3	11.4
Conductivity	µmhos/cm	144	124	623	1145	874	709	873	517
Microbiological (number of exceedances)									
Total coliforms	cfu/100mL	0	1	0	0	1	0	0	0
E.coli	cfu/100mL	0	1	0	0	0	0	0	0
HPC bacteria	cfu/mL	0	0	0	0	1	0	0	0
Chemical									
pH	log ₁₀	9.40	9.48	7.99	7.51	7.65	7.76	7.59	7.67
Alkalinity	mg/L	32	32	220	282	268	242	192	220
Total Hardness	mg/L	29	28	195	364	274	289	317	210
Calcium	mg/L	8.1	7.9	50.7	79.7	58.7	73.9	89.4	64.7
Magnesium	mg/L	2.1	2.1	16.6	39.9	30.9	25.4	22.7	11.8
Potassium	mg/L	0.7	0.7	4.5	6.3	5.3	3.1	3.1	3.8
Chloride	mg/L	6.0	5.9	55.6	173.2	81.3	61.3	102.6	18.3
Fluoride	mg/L	0.69	0.66	0.56	0.41	0.65	0.26	0.05	0.15
Phosphate	mg/L	0	0	0.05	0	0	0	0	0.02
Sodium	mg/L	17.3	17.5	58.7	93.1	80.0	35.4	51.5	27.0
Sulphate	mg/L	25.1	25.5	29.5	57.7	71.7	44.8	88.7	28.0
Nitrate	mg/L	0.17	0.18	0	0.02	0.02	0	3.41	0
Nitrite	mg/L	0	0	0	0	0	0	0	0
Iron	mg/L	0	0	0.01	0.48	0.27	0.22	0	0.04
Manganese	mg/L	0	0	0.02	0.01	0.01	0.01	0	0.01
Trihalomethane	mg/L	32.4	37.8	42.8	8.3	25.8	19.9	4.8	44.4
Haloacetic acids	mg/L	25.7	31.1	13.8	2.7	5.4	3.5	0	41.7

	Units	Britannia	Lemieux	Carp	Kings Park	Munster	Richmond West	Shadow Ridge	Vars
Radiological									
Alpha activity	Bq/L	<0.04	<0.04	0.11	0.12	<0.04	<0.04	0.13	<0.04
Beta activity	Bq/L	<0.1	<0.1	0.13	0.38	0.26	<0.1	0.22	0.12
Tritium	Bq/L	2.4	2.5	n/a	n/a	n/a	n/a	n/a	n/a

Overall, the 2019 test results demonstrate that drinking water supplied from Ottawa’s municipal water systems was of high quality and met the Ontario Drinking Water Standards (O.Reg.169/03) and the Health Canada Guidelines for Canadian Drinking Water Quality.

For further details on water quality, please refer to the 2019 Annual Reports which are posted on the www.ottawa.ca website for each municipal water system. The website also provides a detailed Water Quality Summary Table for each water system, which lists for all test parameters analysed during the year.

Adverse Water Quality Incidents

O.Reg.170/03 identifies several “Indicators of Adverse Water Quality” for which the waterworks must immediately notify health officials and the Ministry. An Adverse Water Quality Incident (AWQI) refers to any operational measurement or laboratory test that does not meet a provincial water quality standard. During 2019, there were a total of 21 AWQI results reported in Ottawa’s municipal water systems, which is similar to previous years and not unexpected given the size of the system and the number of tests conducted (100,000 tests per year). Of the 21 events, 17 occurred in the central water distribution system, 2 at the Lemieux Island WPP, and 2 in the municipal well systems.

For each Adverse Water Quality Incident (AWQI), City of Ottawa staff must immediately notify the Ottawa Public Health Department and the Ministry as required by regulations. Corrective actions, re-sampling, reporting, and documentation are required in each case.

The AWQI events for 2019 are summarized in the table below for laboratory test results and operational field measurements, including corrective actions taken and resolution of the incident.

Table 4 – Summary of 2019 Adverse Water Quality Incidents (AWQI)

Test parameter and number of occurrences	Summary of Reported Events
E. Coli bacteria (2 samples)	<ul style="list-style-type: none"> • (1) Lemieux Island WPP routine sample of treated water, re-samples were clear; and • (1) Orleans Fire Hall routine sample of distribution system water, re-samples were clear.
Total coliform bacteria (3 samples)	<ul style="list-style-type: none"> • Two routine samples following watermain breaks in the distribution system, re-samples were clear; and • Munster well system routine sample of treated water, re-samples were clear.

Sodium advisory >20 mg/L (2 samples)	<ul style="list-style-type: none"> • Lemieux Island treated water = 26.9 mg/L • Richmond West well system = 32.7 mg/L
Low chloramine <0.25 mg/L (12 events)	<ul style="list-style-type: none"> • (5) events due to a closed valve in distribution system; valve opened, and the system flushed; and
Improperly disinfected water directed to system (2 events)	<ul style="list-style-type: none"> • (7) events due to low water usage. The systems were flushed to bring the residuals up. • (1) public fountain was connected to fire hydrant that had not been disinfected; hydrant was isolated, disinfected, and re-installed; and • (1) broken sewer main found near repair site of broken watermain; precautionary Boil Water Advisory was issued until clear bacteriological results were obtained.

For the AWQI events observed during 2019, there were no indications of unsafe drinking water being directed to residents. In a few cases, drinking water advisories were issued as a precaution to warn residents until water quality could be verified as safe.

For further details on AWQI events, please refer to the 2019 Annual Report for each municipal water system, which are posted on www.ottawa.ca.

Drinking Water Advisories

Advisories are issued by Ottawa's Medical Officer of Health in consultation with Water Services, in cases where there is potential for contamination of the drinking water supply. In most cases, advisories are issued on a precautionary basis rather than in response to evidence of contamination. Drinking Water Advisories are typically in effect for several days and help to safeguard public health until water quality tests can be taken to verify safe drinking water.

During 2019, there were two Drinking Water Advisories (DWA) issued for localized portions of the water distribution system. The two events are summarized below:

Orient Park Drive watermain break (January 18th, 2019) – this event occurred as a result of sustained loss of pressure >24 hours due to a watermain break within an area where there was a gas leak. Repairs were delayed until the area was clear for entry following the gas leak. OPH was consulted and a Boil Water Advisory was issued for the area due to the extended time limit of the depressurization. The advisory affected approximately 60 households and was in effect for a duration of two days.

Simpson Road main watermain break (December 26th, 2019) – this event occurred as result of a broken sewer pipe that was observed in the excavation during a watermain break repair on Simpson Road. Since this represented a Category 3 main break, Ottawa Public Health issued a precautionary boil water advisory for the local portion of the distribution system isolated for the watermain repair. The advisory affected approximately 14 households and was in effect until two sets of clear bacteriological samples were obtained. The advisory was lifted after a duration of three days.

In each case, residents received hand-delivered advisory notices prior to restoring water pressure in order to prevent inadvertent consumption of drinking water during the advisory. As soon as clear water quality test results were obtained, the advisory was lifted and residents were directly notified. It is important to note that both advisories were issued on a precautionary basis and there was no evidence of contamination in the water supply.

Lead in Drinking Water

The City of Ottawa's treated drinking water is lead-free. The watermains throughout the distribution system are also lead-free. Trace amounts of lead, however, can be dissolved in water as it travels through a lead service line or when it comes in contact with household plumbing components such as lead solder and brass fittings. The water service line refers to the small pipe that transports water from the watermain to the house. It is estimated that there are approximately 30,000 homes in Ottawa, built prior to 1955, that are currently supplied with a lead service pipe. Each year, City staff conduct lead testing in hundreds of these older homes to verify lead concentrations in household tap water. Two 1-Litre samples are taken from the customer's tap following a 30-minute stagnation period.

Over twenty-four rounds of testing between 2007 – 2019, the average lead concentrations measured in Ottawa homes with lead supply pipes are 2.6 (ppb) parts per billion in Litre-1 and 2.7 (ppb) in Litre-2. The 90th percentile concentrations are 4.3 (ppb) and 5.4 (ppb) in Litre-1 and Litre-2 respectively. The 90th percentile lead concentrations comply with the current Ontario Drinking Water Standard of 10 (ppb) for lead in drinking water, but will be slightly above the standard when it is phased in for Ontario. Accordingly, a strategy has been developed to address the new more stringent health target of 5 ppb.

For decades, the City's water treatment process has included a corrosion control step using pH control in order to limit the dissolution of metals from household plumbing and fixtures. As a result, Ottawa lead concentrations have consistently met the Ontario regulatory standard of 10 (ppb) measured at the customer's tap. However, in March 2019, Health Canada lowered the acceptable concentration to 5 ppb for lead in drinking water due to increasing concerns about health effects in children. It is expected that Ontario will lower the provincial lead standard from 10 ppb to 5 ppb accordingly, although an implementation date has not yet been announced.

Following a major release of news media articles in September about the new lead guideline, the City of Ottawa saw a sharp increase in requests from residents asking to have their tap water tested for lead. During the period immediately following the news

articles (Oct-Nov 2019) the number of customer requests increased to over 500 homes, whereas the typical number of homeowner requests for lead sampling is 2-3 per week.

In anticipation of Health Canada's lower lead guideline, the City of Ottawa carried out a 4-year pilot study (2015 – 2018) to evaluate various treatment options to further minimize lead concentrations in older homes. Based on the experimental findings, the City has decided to implement a new corrosion control strategy with the addition of low-level phosphate. The City is currently in the design phase and is hoping to implement this new treatment strategy in 2022.

The City also has renewed and expanded its Lead Pipe Replacement Program (LPRP) to better assist homeowners in replacing their lead service pipes. The revised program was approved by Council on September 25th, 2019 and is scheduled to launch in April 2020. During March/April of 2020, the City is planning to mail out approximately 30,000 letters and brochures to (pre-1955) homes in order to inform residents about the revised LPRP program and provide advice on how to keep their tap water lead-free. Due to concerns about COVID-19, all in-home testing was suspended on March 16th, 2020 until further notice. Customers however are being provided with phone advice on practical measures to minimize their exposure to lead from drinking water.

Partnership with Ottawa Public Health

Ottawa Public Health is a key partner in the provision of safe drinking water for Ottawa residents and businesses. Over the years, a strong relationship has developed between Water Services and OPH to review and respond to potential risks related to drinking water, such as drinking water advisories. Both Water Services and OPH maintain a 24/7 response system to address potential water quality issues. In the event of a water emergency or Adverse Water Quality Incident, procedures are in place to ensure close cooperation between the Medical Officer of Health, the City of Ottawa, and the Ministry to provide effective communication and protection of public health.

To maintain continuity and responsiveness, Water Services and OPH staff meet bi-monthly to review water quality test results, adverse incidents, communication protocols, and potential risks of new and emerging issues in drinking water. In addition, a formal meeting is held each year during Q2 to review the water quality results achieved over the last year. The joint review meeting for 2019 was held on June 20th at the Britannia Water Purification Plant.

Flow Rates and System Capacity

The license and permit documents for each municipal water system set out maximum rates of water taking and treatment capacity. During 2019, all drinking water systems operated within the permitted volume and capacity limits. The table below shows the daily flowrates observed during 2019 including the average and maximum values, in relation to the system rated capacity.

Table 5 – Summary of 2019 water production rates vs. rated capacity

Water System	Average daily flow	Maximum daily flow	Rated capacity
Britannia Water Purification Plant	134.1 ML/d	190.0 ML/d	360 ML/d
Lemieux Island Water Purification Plant	151.8 ML/d	216.5 ML/d	400 ML/d
Carp Well System	518 m ³ /d	992 m ³ /d	2782 m ³ /d
Kings Park Well System	140 m ³ /d	305 m ³ /d	2620 m ³ /d
Munster Well System	232 m ³ /d	1221 m ³ /d	2160 m ³ /d
Richmond West Well System	156 m ³ /d	1677 m ³ /d	2420 m ³ /d
Shadow Ridge Well System	179 m ³ /d	334 m ³ /d	550 m ³ /d
Vars Well System	335 m ³ /d	729 m ³ /d	2290 m ³ /d

ML/d = Megalitres per day = Million Litres per day

During 2019, the combined flowrate from Britannia and Lemieux Island treatment plants was 285.8 ML/d which represents the water demand for Ottawa's urban water supply. While this is a large volume of water, it represents only 0.28 % of the Ottawa River flowrate.

For a detailed table of 2019 water flowrates for each municipal water system, please refer to Document 2.

Financial Expenditures

For the City of Ottawa to maintain the safe and efficient operation of the waterworks, capital expenditures are required above baseline operating and maintenance costs. The table below lists some of the major expenditures for upgrades and new capital investment in Ottawa's municipal water systems during 2019:

Table 6 – 2019 Expenditures for Maintenance and Capital Improvements

System	Project	Time period
Britannia & Lemieux	• Chemical System Upgrades: (\$610,000)	• 2016-2019
		• 2019-2019
Britannia	• Settling Basins 4 & 5 Improvements (\$7,200,000)	• 2016-2019
	• Gas Generator (G-4) Compliance Upgrades (\$380,000)	• 2016-2019
	• HVAC Upgrades (South pump house) (\$620,000)	• 2016-2019
	• Highlift flowmeter replacement (\$800,000)	• 2018-2019

Lemieux	<ul style="list-style-type: none"> • Intake Functional Design Project (\$8.2 million) • High Lift Pump Building Ventilation Upgrades (\$1.3 million) • High Lift Pipe Vault and Tunnel Repairs: (\$1.0 million) • Services Building Chiller Replacement (\$1.5 million) • Washwater Tank Discharge Valve Replacement (\$300,000) 	<ul style="list-style-type: none"> • 2016-2019 • 2018 -2019 • 2018 • 2018 • 2018-2019
Munster	<ul style="list-style-type: none"> • Permanent Generator and new MCC Project (\$1,400,000) 	<ul style="list-style-type: none"> • 2016-2019
Carp	<ul style="list-style-type: none"> • Diesel Pump (\$1,000,000) • Granular Activated Carbon treatment and Electrical Upgrades (\$4,900,000) 	<ul style="list-style-type: none"> • 2019 • 2018-2019
Vars	<ul style="list-style-type: none"> • Upgrades - Functional Design (\$178,000) 	<ul style="list-style-type: none"> • 2017-2019
Shadow Ridge	<ul style="list-style-type: none"> • Lifecycle Replacement of Hydro-pneumatic Tanks and Tank Header (\$72,000) 	<ul style="list-style-type: none"> • 2019

Source Water Protection

Under the authority of the *Clean Water Act*, the Source Water Protection Regulation O.Reg.287/07 was established to assess and manage potential contamination risks and protect source waters that are used for municipal drinking water supply. The City submitted its annual report on February 1st, 2020, to local Source Protection Authorities (Conservation Authorities) on the status of the Source Protection Plans. The implementation of Risk Management Official activities and municipal activities is ongoing, and the City continues to be compliant with the requirements of the regulation. The Negotiation of Risk Management Plans with private landowners, engaged in significant drinking water threat activities, is ongoing and expected to be complete in 2020.

A notable change to the City's Source Protection Program in 2019 was the addition of a new drinking water system, the Richmond West Municipal Well System. Accordingly, the Rideau Valley and Mississippi-Rideau source protection plans were updated with revised well-head protection zone mapping and threats assessments. Groundwater pumping at the new well system also affects two existing Wellhead Protection Areas for the King's Park and Munster municipal well systems. On March 11th, 2019, the Ministry (MECP) approved an amendment to the *Mississippi-Rideau Source Protection Plan and the*

Rideau Valley Assessment Report. The approved amendment took effect on March 25th, 2019. More information about Drinking Water Source Protection and the City's Source Protection Program can be found at: www.Ottawa.ca/SourceProtection.

Operator Certification and Licenses

The City of Ottawa ensures that all municipal water systems are operated by certified operators, licensed by the Ministry (MECP). Operator certification levels range from Level I to Level IV and are attained through a combination of education, operating experience, training, and examinations. Ottawa's treatment plants and distribution system are classified as Level IV and III respectively due to their size and complexity.

In Water Services, there are approximately 75 certified operators working in water treatment and 50 in the water distribution system. To maintain their operating license, each operator must receive 40 to 50 hours per year of job-related training. Water Services has developed a training program involving a combination of mandatory training courses, on-the-job training, and certified CEU courses on relevant topics in drinking water. The training program represents a major undertaking in staff time and financial support to ensure that operators receive the required hours of training to maintain their certification.

During 2019 all operators operating within the treatment facilities and distribution system maintained the required certification.

Quality Management System

Ottawa's municipal water systems operate under a comprehensive quality management system which is required in Ontario through the *Safe Drinking Water Act, 2002*. The Drinking Water Quality Management System (DWQMS) was established in 2007 to ensure proper oversight and management of the drinking water supply.

The DWQMS is composed of 21 Elements that cover all aspects of drinking water supply including: plant operations, infrastructure, maintenance, risk assessment, water quality testing, staff training, documentation, and continual improvement. Collectively, these elements help to ensure the provision of safe drinking water to the public.

The City of Ottawa is the Operating Authority for all eight of the municipal water systems. It has received and maintained its accreditation since 2011 through annual external audits completed by an external accreditation body. In 2019, NSF International Strategic Registrations completed a surveillance audit and found the City's DWQMS to be in full conformance with the Drinking Water Quality Management Standard.

On April 23rd, 2019 a new well system was commissioned in Richmond serving the Fox Run subdivision. For the Richmond West Well system, a full scope on-site audit was completed by NSF International Strategic Registrations in May 2019. The Richmond West Well System was found to conform to the Drinking Water Quality Management Standard and was awarded its full accreditation in 2019. Going forward, this drinking water system will be aligned with the auditing cycle already established for the existing drinking water systems.

In 2019, the annual DWQMS Management Review report was completed following a series of meetings in April and July 2019 that included a comprehensive review of the City's drinking water systems and its operations throughout the previous calendar year. As a requirement of the DWQMS Management Review process, Top Management identified deficiencies and action items to address them. The results of the annual management review were then summarized and presented to the Standing Committee on Environmental Protection, Water and Waste Management (SCEPWWM) and City Council on September 17th and 25th, 2019, respectively.

New and Emerging Issues in Drinking Water

The City of Ottawa has always been a leader in evaluating new and emerging issues for drinking water. Technical staff from Water Services work closely with industry experts and university researchers to evaluate new substances of concern and to anticipate future regulations and standards for drinking water. Results from exploratory testing are made available to the public through annual reporting and through specific data requests.

During 2019, some of the current issues and concerns that have garnered attention within the drinking water industry include the following:

- Cyanobacterial toxins
- Perfluoroalkyl substances (PFAS)
- Microplastics
- Legionella bacteria
- Radioactivity
- Pharmaceutical substances
- Manganese
- Strontium

Water Quality staff have conducted testing for all of these substances in Ottawa's municipal water systems, including both source and treated water samples. In most cases, the substances have not been detected or have been found at natural background levels. Water Quality staff continue to watch developments for these emerging areas of concern and evaluate any new and proposed drinking standards and guidelines. Staff also provide comments on new drinking water guidelines through industry associations and committees such as the Water Quality Committee of the Canadian Water and Wastewater Association (CWWA) and the Ontario Drinking Water Advisory Council.

If further information is desired on any of these substances of concern, please contact the Drinking Water Quality Branch for more details or up to date test results.

Research and Optimization

For many decades, the City of Ottawa has been recognized as a North American leader in drinking water quality and process optimization. A pilot plant research facility (located within the Britannia WPP) was built in 1992 to allow for on-site research experiments to optimize the treatment process and evaluate new methods of treatment. Many of the

research studies have been carried out in collaboration with a number of universities and external research agencies.

Over the last 25 years, the research program has resulted in treatment process upgrades, improved water quality, and operating/capital cost savings in the range of \$50 million. In addition, Ottawa's technical staff have presented over 75 technical papers at water industry conferences covering all aspects of treatment, risk analysis, management, and drinking water quality. These efforts in research and optimization align with the Quality Management System directive for continual improvement of drinking water quality.

Overall Review

We are pleased to report that a thorough review of Licenses, Permits, Regulations, and Ministry Inspection Reports indicates the provision of safe drinking water during 2019. During the preparation of this report, technical staff intensively reviewed all 35 sets of regulatory requirements in relation to the operating performance for the eight municipal water systems.

From the review, several items of non-compliance were noted and described in the report. These incidents were minor and did not affect the quality of drinking water supplied to the community. In all cases, staff took appropriate response actions, and reported the incidents to the Ministry and Ottawa Public Health. The City remains committed to continual improvement of our drinking water supply through research, process optimization, public reporting, and diligence in complying with provincial regulations.

Overall, the findings confirm that residents of the City of Ottawa continue to be supplied with reliable and high quality drinking water. Should you have any questions, please contact the undersigned at 613-580-2424 extension 23931 or tammy.rose@ottawa.ca.

Tammy Rose, P.Eng.

Director, Water Services, Directrice/Services d'eau

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CC: Senior Leadership Team
General Manager, Public Works and Environmental Services
Director, Public Information and Media Relations
Program Manager, Media Relations and Outreach
Public Works and Environmental Services Leadership Team
Medical Officer of Health, Ottawa Public Health
Manager, Environmental Health Protection, Ottawa Public Health

SUPPORTING DOCUMENTATION

Document 1
Document 2

Combined Compliance
Flow Summary