



MEMO / NOTE DE SERVICE

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SUBJECT: MUNICIPAL DRINKING WATER SYSTEMS – 2022 SUMMARY REPORT

OBJET : RÉSEAUX MUNICIPAUX D'ALIMENTATION EN EAU POTABLE – RAPPORT
SOMMAIRE DE 2022

EXECUTIVE SUMMARY

The purpose of this memorandum is to provide Members of Council with the City of Ottawa's 2022 Drinking Water Summary Report 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 31 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 1, 2022 to December 31, 2022, 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 key 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 Licences, Permits, Regulations, and Ministry Inspection Reports indicates that Ottawa residents were provided with safe drinking water during 2022.

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 2022 are summarized below.

- **Water Quality Monitoring** – during 2022, more than 100,000 laboratory and operational tests were conducted to ensure the safety of Ottawa's drinking water supply. The monitoring program includes more than 75 continuous analyzers and eight laboratories analyzing more than 341 test parameters. The results confirm that Ottawa residents continue to be supplied with high quality drinking water.
- **Annual Inspection Ratings** – All eight Ottawa municipal water systems were inspected for 2022, but ratings for these systems have not been received.
- **Radioactivity in the Ottawa River** – during 2022, radioactivity levels at both water treatment plants remained very low and representative of natural background levels, meeting all radiological drinking water standards. As a means of protecting our source water, City technical staff have been actively engaged in reviewing the proposed Near Surface Disposal Facility at Chalk River. The City of Ottawa submitted comments as part of the Public Hearing Part II, on May 31, 2022. This submission aligns with previous staff comments and the direction from Council

carried [April 14, 2021](#). For the proposed Nuclear Power Demonstration (NPD) Decommissioning project in Rolphton, the final Environmental Impact Statement (EIS) report has been delayed into 2023 with further public consultation expected in early 2024. Recently, the City of Ottawa was granted membership on the Environmental Stewardship Council for the Chalk River Laboratories, which will provide awareness of site activities and future projects that could impact water quality.

- **Regulatory compliance** – Ottawa’s municipal water systems complied with all drinking water regulatory requirements with the exception of two items of minor non-compliance. These non-compliance items were technical and/or administrative in nature and did not affect the quality of drinking water supplied to the public.
- **Water production rates** – each day, an average of 287 million litres of drinking water was treated and distributed to Ottawa residents and businesses, which represents a small fraction of the Ottawa River flow (0.3 per cent).
- **Emerging issues in drinking water** – a number of substances continue to be highlighted in the media such as: microplastics, Perfluoroalkyl substances (PFAS), pharmaceuticals, 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.

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.

SOMMAIRE

La présente note de service a pour but de fournir aux membres du Conseil le rapport sommaire de 2022 sur l’eau potable de la Ville d’Ottawa, conformément à l’annexe 22 du Règlement de l’Ontario 170/03, qui exige qu’un rapport sommaire soit préparé chaque année et distribué à tous les membres du Conseil au plus tard le 31 mars de l’année civile suivante. Ce rapport répond 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 la norme de diligence (article 19) prescrite par la *Loi de 2002 sur la salubrité de l’eau potable*.

Le rapport couvre la période qui va du 1^{er} janvier au 31 décembre 2022, et porte sur les huit réseaux municipaux d’eau potable qui appartiennent à la Ville d’Ottawa ou qui sont exploités par elle, soit :

- l’usine de purification de l’eau de Britannia;
- l’usine de purification d’eau de l’île Lemieux;
- le réseau d’eau potable de Carp;
- le réseau d’eau potable de Kings Park (Richmond);
- le réseau d’eau potable de Richmond Ouest (Richmond);
- le réseau d’eau potable de Munster Hamlet;

- le réseau d'eau potable de Shadow Ridge (Greely);
- le réseau d'eau potable de Vars.

Ce rapport détaille les principaux aspects des réseaux municipaux d'eau potable d'Ottawa, 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 2022 était salubre.

Lors de la préparation de ce rapport, le personnel technique a examiné 35 séries d'exigences réglementaires visant les huit réseaux municipaux d'eau potable d'Ottawa. Voici le résumé de quelques faits saillants et difficultés rencontrées au cours de l'année 2022 ci-dessous :

- **Surveillance de la qualité de l'eau** — Au cours de l'année 2022, 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 instruments d'analyse et huit laboratoires qui analysent plus de 341 paramètres. Les résultats confirment que les résidents d'Ottawa continuent d'avoir accès à une eau potable de qualité.
- **Résultats des inspections annuelles** — Les huit réseaux municipaux d'eau potable d'Ottawa ont été inspectés en 2022 et les rapports d'inspection finaux ont été reçus pour quatre réseaux à ce jour, mais les résultats de ces réseaux n'ont pas encore été communiqués.
- **Radioactivité dans la rivière des Outaouais** — Au cours de l'année 2022, les indices de radioactivité dans les deux usines de traitement de l'eau sont restés très faibles et représentatifs des concentrations naturelles, respectant toutes les normes de salubrité de l'eau potable en ce qui a trait aux paramètres radiologiques. Afin de protéger notre eau de source, les membres du personnel technique de la Ville participent activement à l'examen du projet d'installation de gestion des déchets près de la surface à Chalk River. La Ville d'Ottawa a soumis des commentaires dans le cadre de la deuxième partie de l'audience publique le 31 mai 2022. Cette proposition est conforme aux commentaires précédents des membres du personnel et aux directives du Conseil adoptées le [14 avril 2021](#). En ce qui concerne le projet de la mise hors service de l'installation de démonstration nucléaire de Rolphton, le rapport final de l'étude sur les répercussions environnementales a été reporté à 2023 et une nouvelle consultation publique est prévue pour le début de l'année 2024. Récemment, la Ville d'Ottawa s'est fait attribuer le statut de membre du Conseil d'intendance environnementale pour les Laboratoires de Chalk River, ce qui lui permettra d'être informée des activités sur le site et des projets à venir qui sont susceptibles d'avoir des répercussions sur la qualité de l'eau.
- **Conformité aux règlements** — Les réseaux municipaux d'eau potable d'Ottawa répondent à toutes les exigences réglementaires en matière d'eau potable. Seuls deux points de non-conformité mineurs ont été relevés. Il s'agit de points de nature

technique ou administrative qui n'ont, donc, pas affecté la qualité de l'eau potable distribuée au public.

- **Taux de production d'eau** — Chaque jour, ce sont en moyenne 287 millions de litres d'eau potable qui ont été traités et acheminés aux résidents et aux entreprises d'Ottawa, ce qui représente une faible proportion (0,3 pour cent) du débit de la rivière des Outaouais.
- **Nouvelles préoccupations en matière d'eau potable** — Les médias continuent de signaler la présence de plusieurs substances préoccupantes comme : les microplastiques, les substances perfluoroalkylées, les produits pharmaceutiques et les produits radioactifs. Dans tous les cas, les résultats des analyses effectuées dans le cadre du programme de surveillance d'Ottawa 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 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 la salubrité de l'eau potable.

DISCUSSION

Description of Ottawa's Water Supply

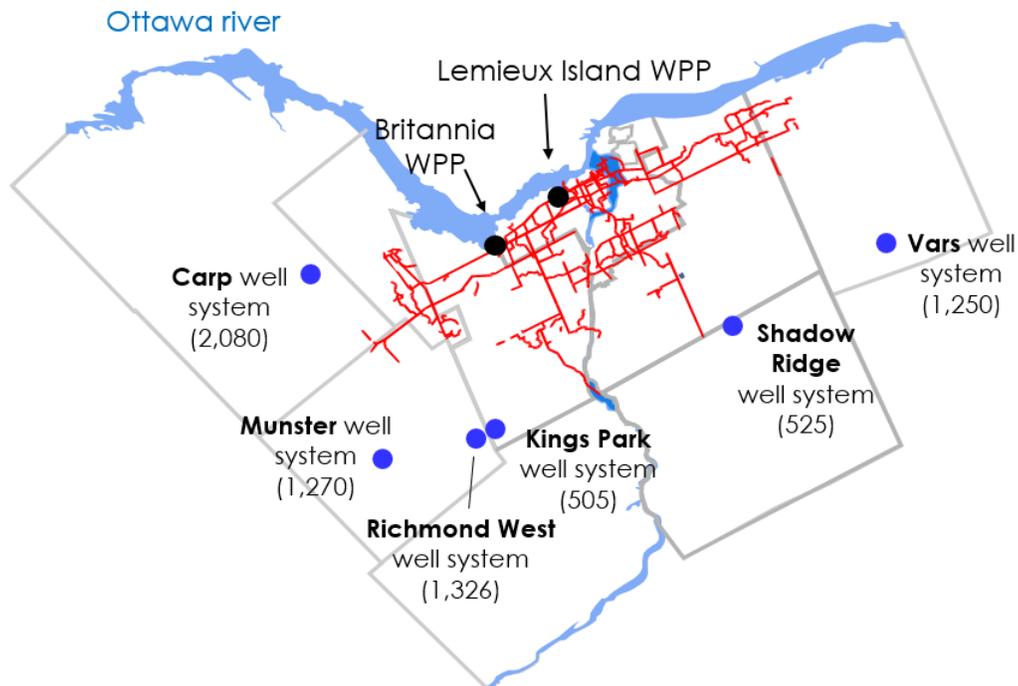
The City of Ottawa provides treatment, storage, and distribution of drinking water to approximately 974,000 residents, businesses, and institutions. The central water system supplies roughly 90 per cent of Ottawa's population and includes two surface water treatment plants, the Britannia Water Purification 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 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 16 pumping stations, five reservoirs, four elevated tanks, and over 3000 km of watermains. 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 per cent of Ottawa's population, while approximately 9 per cent 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 Licences, Permits, Provincial Officer Orders, and Annual Inspections conducted by the Ministry. This report reviews the 2022 operational performance of Ottawa’s municipal water systems in comparison to these regulatory requirements.

Licences & Permits

In Ontario, all owners of municipal drinking water systems are required to obtain a Municipal Drinking Water Licence (MDWL) for each drinking water system. Each licence 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 Licences for each municipal system are issued for a five-year period and renewed by the Ministry through a comprehensive application and review process every five years. On June 13, 2019 the City received updated licences and permits for all eight municipal water systems, as listed in the table below:

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

Water System	Municipal Drinking Water Licence 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

Provincial Officer Orders and Regulatory Relief

No Provincial Officer Orders were issued in 2022. Regulatory relief from MECP in-home community lead testing was received due to COVID-19 limitations and is discussed later in this report.

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. It is important to note that each of the eight inspections require 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 operational categories.

The table below summarizes the most recent annual inspection results, which include any Provincial Officer Orders, Non-Compliance Items, Best Practice Recommendations, and per cent Inspection Ratings. At the time of this report, all systems have been inspected and, while completed inspection reports have been received for all systems except Britannia; the corresponding ratings for these systems have not yet been released. Inspection Reports for the remainder of the systems were completed in Q1 2023 and reported findings and results are still pending for these systems.

Table 2 – Summary of Most Recent Ministry Annual Inspection Results for Ottawa’s Drinking Water Systems

Water System	Inspection Date	Prov. Officer Orders	Non-Compliance Items	Best Practice Items	Inspection Rating
Britannia	Feb. 6, 2023	-	-	-	95.88%*
Lemieux	Dec. 20, 2022	0	1	0	100%*
Carp	Dec. 21, 2022	0	0	0	100%*
Kings Park	Feb. 7, 2023	0	0	0	99.2*
Munster	Feb. 7, 2023	0	0	0	98.1%*
Richmond West	Feb. 7, 2023	0	0	0	100%*
Shadow Ridge	Sept. 13, 2022	0	0	0	100%*
Vars	Sept. 13, 2022	0	0	0	100%*

*2021 inspection rating cited since 2022 inspection rating not yet received

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 1 to December 31, 2022. To achieve this, a staff team of engineers, technologists, and managers spend approximately 2-3 weeks each year during the first quarter of the year 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 eight water systems is presented in Document 1. This table illustrates both the comprehensive nature of provincial drinking water regulations and the diligence of staff in measuring and tracking compliance.

During 2022, Ottawa's municipal water systems met all regulatory requirements under Ontario's *Safe Drinking Water Act* with the exception of two items noted below.

Items of Non-Compliance

During 2022, there were two non-compliance items noted for Ottawa's municipal drinking water systems. 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. Each incident is described below, including corrective actions taken and the impact on water quality.

- (1) Delayed resolution notification of Adverse Water Quality Incident (AWQI): A low chlorine residual was reported, in a distribution system water sample, from a watermain on Fallowfield Road on October 31, 2022 and was not closed off (form 2B) within the required time limit of seven days from date of resolution. Field staff verbally notified the Ministry and Ottawa Public Health and provided the required written notification but did not send the resolution (form 2B) within the required seven days from resolution. Additional training was provided for Water Distribution staff to review AWQI reporting requirements and going forward the Distribution branch has added AWQI follow-up to their weekly meetings
- (2) Training related to Harmful Algal Bloom (HAB) monitoring: As part of the harmful algal bloom monitoring requirements under the MDWL, all relevant drinking water staff are to be trained each year on the HAB monitoring plan, in addition to the reporting and sampling procedures, prior to the summer season. When the plan was first implemented, staff were trained during the biannual operator training sessions. Further training of plant operating staff has not been repeated since the sampling is being completed by a smaller team of trained operators from the Water Quality Assurance unit. The City will provide training to relevant staff prior to further HAB monitoring seasons and will document the completion of the training in accordance with our MDWLs.

Once these non-compliance items were identified, staff took corrective actions to promptly address each of the issues.

Regulatory relief due to COVID19 restrictions

In March of 2020, as a result of the COVID-19 pandemic, all in-home lead sampling was suspended in order to protect both residents and City staff. Since the MECP lead sampling requires water operators to enter the resident's home to conduct testing, the City of Ottawa applied for and received regulatory relief for the winter and summer lead sampling sessions (December 15, 2021 – April 15, 2022, and June 15 – October 15, 2022) in the Richmond West well system and the central water system. Sampling resumed in January 2023.

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 Robert O. Pickard Environmental Centre (ROPEC) Laboratory, along with eight external laboratories that provide specialized water quality analysis. Certified operators and water quality technologists also perform routine water tests at over 50 sample locations throughout the distribution system (eg. pump stations, reservoirs, fire halls) and respond directly to customer inquiries and concerns about water quality. During 2021, as a result of COVID-19, the sample locations were restricted to pump stations and reservoirs but were sampled multiple times each week to ensure water quality was maintained across the system. In 2022, regular sampling gradually resumed across the city as staff regained access to some of the original sampling locations and added several new locations to their routines. By the end of 2022 sampling had resumed at 54 locations across the City.

The City conducts additional testing for many other trace organic, inorganic, pharmaceutical, and radiological substances. In total, more than 100,000 water quality tests are conducted each year covering over 341 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 2022, all test results were well within safe drinking water standards, with any exceptions noted in the Adverse Water Quality Incident section of this report. All chemical test results (organic, inorganic, metals, radiological) were well within the Maximum Acceptable Concentration (MAC) levels as per Ontario Drinking Water Standards.

As a general overview of water quality, the table below shows 2022 test results for common parameters in each of Ottawa's municipal water systems. The values in the table represent average concentrations 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

		Drinking water guideline	Britannia	Lemieux	Carp	Kings Park	Munster	Richmond West	Shadow Ridge	Vars
	Units									
Physical										
Turbidity	NTU	5	0.04	0.07	0.59	0.37	0.49	0.28	0.08	0.24
Temperature	°C	15	11.8 (0.1–27.1)	11.2 (0.4–26.1)	11.5	10.6	10.5	10.4	9.7	11.7
Conductivity	µmhos/cm		146	147	666	1166	884	724	960	542
Microbiological (number of exceedances)										
Total coliforms	cfu/100mL	0	0	0	0	0	0	0	0	0
E.coli	cfu/100mL	0	0	0	0	0	0	0	0	0
HPC bacteria	cfu/mL	500	0	0	0	0	0	0	0	2
Chemical										
pH	log ₁₀	7.0 – 10.5	9.41	9.49	7.90	7.42	7.58	7.64	7.65	7.74
Alkalinity	mg/L	30 – 500	31.9	32.9	214	274	269	237	209	224
Total Hardness	mg/L	80 - 100	31.3	31.4	215	376	284	294	326	220
Calcium	mg/L		9.0	9.0	55.9	82.2	61.2	75.4	92.6	68.0
Magnesium	mg/L		2.2	2.2	18.2	41.3	31.8	25.7	23.1	12.3
Potassium	mg/L		0.7	0.6	5.1	6.5	5.5	3.1	3.3	4.3
Chloride	mg/L	250	5.9	6.1	61.6	181.6	81.3	62.4	120.7	19.7
Fluoride	mg/L	1.5	0.67	0.66	0.52	0.39	0.61	0.26	0.05	0.16
Phosphate	mg/L		0	0	NA	NA	NA	NA	NA	NA
Sodium	mg/L	20 / 200	17.9	18.3	57.1	93.4	78.2	36.1	70.4	32.3
Sulphate	mg/L	500	25.2	24.8	32.6	57.1	69.7	44.4	84.4	31.2
Nitrate	mg/L	10	0.18	0.17	0	0	0.05	0	3.37	0
Nitrite	mg/L	1	0	0	0	0	0	0	0	0
Iron	mg/L	0.3	0.002	0.002	0.03	0.46	0.20	0.18	0	0.04
Manganese	mg/L	0.12	0.003	0.002	0.02	0.01	0.01	0.01	0	0.01
Trihalomethanes	mg/L	100	32.2	40.0	22.5	7.7	25.3	19.7	3.9	54.4
Haloacetic acids	mg/L	80	23.4	32.7	6.7	4.1	7.2	4.8	0	50.2
Radiological										
Alpha activity	Bq/L	0.5	<0.04	<0.04	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Beta activity	Bq/L	1.0	<0.1	<0.1	0.21	0.21	0.20	0.11	<0.10	0.15
Tritium	Bq/L	7000	2.3	2.3	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1

Note: < indicates below laboratory detection limit

Overall, the 2022 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 2022 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 results 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 result that does not meet a provincial water quality standard. During 2022, there were a total of 26 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). All these occurred in the central water distribution system.

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 2022 are summarized in the table below including corrective actions taken and resolution of the incident.

Table 4 – Summary of 2022 Adverse Water Quality Incidents (AWQI)

Test parameter and number of occurrences	Summary of Reported Events
Total coliform bacteria (13 samples/12 events)	<ul style="list-style-type: none"> • (1) routine sample following watermain breaks in the distribution system, follow up samples were clear; • (2) routine samples, (1) at a customer investigation and (1) at the distribution location in the Vars well system, re-samples were clear; • (1) routine sample from a temporary service, resamples were clear; • (9) samples that were taken at locations of low chlorine residual/closed valves. (3) of these were resamples, (1) event had 2 positives reported.

<p>Low chloramine <0.25 mg/L (9 events)</p>	<ul style="list-style-type: none"> • (6) events due to a closed valve in distribution system; valve opened, and the system flushed;(3) events due to a dead end causing low water flow in watermain; system was flushed.
<p>Sodium > 20 mg/L (4 events)</p>	<ul style="list-style-type: none"> • (4) sodium exceedance events. Sodium is required to be reported every five years. Events from routine reporting for the Carp, Munster, Vars and Kings Park Well systems.
<p>Improperly disinfected water directed to system (1 event)</p>	<ul style="list-style-type: none"> • (1) foamy water out of a temporary service hose hooked up for watermain replacement. Flushed and took samples.

For the AWQI events observed during 2022, there were no indications of unsafe drinking water being directed to residents.

For further details on AWQI events, please refer to the 2022 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 relevant drinking water staff, 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 2022, there were no Drinking Water Advisories issued.

Perfluorinated alkyl substances (PFAS) in drinking water

Perfluorinated alkyl substances (PFAS) have become an increasing concern for the environment and human health. These substances are stable and persistent organic compounds that are widely used in industry and consumer products including firefighting foams and stain-resistant fabrics. Health Canada previously established guidelines and maximum acceptable concentrations (MAC) for two PFAS substances: PFOS with a MAC of 600 ng/L and PFOA with a MAC of 200 ng/L. Health Canada is looking to update these in the coming year to be more consistent with other jurisdictions that have established more stringent MAC values. While there are no provincial regulations for PFAS, the City collects treated water samples annually from all eight municipal water systems. These samples are analyzed for up to forty different PFAS by

accredited laboratories. Further monitoring was completed for the Carp well system since historical results have shown low concentrations of PFAS in the source water wells. In 2021, a granular activated carbon (GAC) filter system was installed in Carp to address taste/odour concerns and has since been shown to be effective for the removal of PFAS substances.

Sodium in Drinking Water

Ground water systems tend to have elevated levels of sodium due to naturally occurring geological formations. In cases where the sodium level exceeds 20 mg/L, the City of Ottawa is required to notify the MECP and the Medical Officer of Health on a five-year basis. While these concentrations are not a concern for most residents, it may be a contributing source of sodium for those on sodium-restricted diets. If residents are concerned, it is recommended that they speak with their medical provider.

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 testing every winter and summer in a subset of older homes to verify lead concentrations in household tap water. For regulatory purposes, two 1-litre samples are taken from the customer's tap following a 30-minute stagnation period.

For decades, the City's water treatment process has included corrosion control using pH adjustment to minimize 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.

As mentioned previously, the City of Ottawa received relief for both sessions of lead testing in 2022 for the Central system and Richmond West well system and are resuming this testing in 2023. Of the previous 25 rounds of testing in the Central system between 2007 – 2020, the average lead concentrations measured in older Ottawa homes with lead supply pipes are 2.5 parts per billion (ppb) in litre-1 and 2.6 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 would be slightly above the revised Health Canada guideline of 5 ppb. Accordingly, a strategy has been developed to address the more stringent health target of 5 ppb. Following a four-year pilot study (2015 – 2018),

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 2025.

Partnership with Ottawa Public Health

Ottawa Public Health (OPH) 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 drinking water staff and OPH to review and respond to potential risks related to drinking water, such as drinking water advisories. Drinking water staff 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, drinking water staff and OPH staff meet 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, in the second quarter of each year, to review the water quality results achieved over the last year. The joint review meeting for 2022 was held virtually on June 10.

Flow Rates and System Capacity

The licence and permit documents for each municipal water system set out maximum rates of water taking and treatment capacity. During 2022, all drinking water systems operated within the permitted volume and capacity limits. The table below shows the daily flowrates observed during 2022 including the average and maximum values, in relation to the system rated capacity.

Table 5 – Summary of 2022 water production rates vs. rated capacity

Water System	Average daily flow	Maximum daily flow	Rated capacity
Britannia Water Purification Plant	136.6 ML/d	224.7 ML/d	360 ML/d
Lemieux Water Purification Plant	150.8 ML/d	216.6 ML/d	400 ML/d
Carp Well System	611 m ³ /d	1190 m ³ /d	2782 m ³ /d
Kings Park Well System	139 m ³ /d	230 m ³ /d	2620 m ³ /d
Munster Well System	225 m ³ /d	440 m ³ /d	2160 m ³ /d
Richmond West Well System	202 m ³ /d	770 m ³ /d	2420 m ³ /d
Shadow Ridge Well System	130 m ³ /d	267 m ³ /d	550 m ³ /d
Vars Well System	365 m ³ /d	1230 m ³ /d	2290 m ³ /d

ML/d = Megalitres per day = million litres per day

m³/d = cubic meters per day

During 2022, the combined average flowrate from the Britannia and Lemieux Island purification plants was 287.4 ML/d which represents the water demand for Ottawa’s urban water supply. While this is a large volume of water, it represents only 0.3 per cent of the Ottawa River flowrate.

For a detailed table of 2022 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 treatment systems, recently completed or ongoing in 2022:

Table 6 – Expenditures for Maintenance and Capital Improvements

Water System	Project	Duration
Britannia & Lemieux	• Chemical System Upgrades: (\$610,000)	• 2016-2023
	• G2 Generator Replacements (\$10,400,000)	• 2019-2024
	• Surge Protection Devices Upgrades (1,000,000)	• 2021-2023
	• Phosphoric Acid and Aqueous Ammonia upgrade (\$13,500,000)	• 2020-2025
	• Audible Process Alarm System Upgrade (\$650,000)	• 2022-2023
Britannia	• Lime Tower and Clearstory windows (\$384,000)	• 2021-2022
	• High lift/Low Lift pump replacement (\$2,500,000)	• 2020-2023
	• High-lift flowmeter replacement (\$1,200,000)	• 2020-2023
	• Roof Repair/Renewal Project (\$1,800,000)	• 2018-2023
	• SCADA HMI upgrade project (\$3,500,000)	• 2021-2023
	• Trolleys and Rails Project (\$160,000)	• 2021-2022
	• Carlington Heights Pumping Station Upgrade (\$13,500,000)	• 2021-2024
Lemieux	• Plant Intake Replacement Project (\$38,000,000)	• 2016-2025
	• Asphalt Surface Repairs (\$98,000)	• 2022-2023
	• Administration Building Roof Repairs (\$130,000)	• 2022

	<ul style="list-style-type: none"> • Filter Pipe Gallery Ladder Replacements (\$38,000) • Turbidity Analyzer Replacement (\$159,000) • Brittany Drive Pumping Station Replacement (\$7,740,000) • Hurdman’s Bridge Pumping Station Upgrades (\$18,130,000) • Ottawa South Pumping Station Upgrades (\$16,300,000) 	<ul style="list-style-type: none"> • 2022 • 2022 • 2020-2023 • 2021-2024 • 2021-2024
All Well systems	<ul style="list-style-type: none"> • Well systems Aquifer Assessment and Inspection (\$700,000) 	<ul style="list-style-type: none"> • 2021-2023
Carp	<ul style="list-style-type: none"> • Granular Activated Carbon treatment and Electrical Upgrades (\$4,900,000) 	<ul style="list-style-type: none"> • 2018-2022
Vars	<ul style="list-style-type: none"> • GAC Contact Tank A & B Side Entry Hatch Modification (\$130,000) • Greensand Filter Media Replacement (\$33,000) • Well Pump Replacement (\$45,000) 	<ul style="list-style-type: none"> • 2020-2023 • 2022-2023 • 2022
Shadow Ridge	<ul style="list-style-type: none"> • New, Deeper Source Wells (\$3.6 million) 	<ul style="list-style-type: none"> • 2020-2024
Kings Park	<ul style="list-style-type: none"> • Electrical Service Upgrade (\$260,000) 	<ul style="list-style-type: none"> • 2020-2023

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 1, 2022, to local Mississippi-Rideau Source Protection Region Authorities on the status of Source Protection Plan policy implementation. Implementation of Risk Management Official activities and municipal activities is ongoing, and the City continues to be compliant with the requirements of the regulation and works cooperatively with local Source Protection Regions and the Ministry Source Protection Programs Branch.

Notable work accomplished in 2022 to support the City’s Source Protection program:

1. Lemieux Island Water Purification Plant Source Protection updates: The City is undergoing a project to relocate the primary intake for the Lemieux Island Water Purification Plant (WPP) within the Ottawa River due to issues related to frazil ice buildup at the existing intake; the new intake will be located deeper within the Ottawa River. Source protection technical studies to map an Intake Protection Zone (IPZ) were completed by the City and submitted in January 2021 and deemed complete to the satisfaction of the Rideau Valley Source Protection Authority. The Rideau Valley Source Protection Assessment Report and the Mississippi-Rideau Source Protection Plan were revised by the Source Protection Region to include the new IPZ, in consultation with the City and the MECP. Public consultation and consultation with implementing bodies took place during September and October 2022. The revised source protection reports were submitted to the MECP for approval on December 22, 2022.

The new intake for the Lemieux Island WPP is to be located on the Quebec side of the Ottawa River. Regulations to protect source water within Quebec follow Quebec's Water Withdrawal and Protection Regulation, administered by the Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC). The City conducted a review of Quebec's *Water Withdrawal and Protection Regulation* versus local Source Protection Plan policies developed under the Ontario's *Clean Water Act* to determine differences and risks of implementing one regulation versus the other. In general, potential drinking water threats would be comparably managed by implementing the Quebec or Ontario regulations for the new Lemieux Island WPP Intake. As such, the City formally requested that the MELCC implement source protection regulations within Quebec to protect the new drinking water intake (letter dated March 23, 2021). The MELCC confirmed they will protect the intake based on Quebec regulations (letter dated June 21, 2021). Detailed information was requested by the MELCC related to the water taking permit application, including information related to source protection. The City is currently compiling information and completing assessments related to the MELCC data request, expected by Q4 2023.

2. Shadow Ridge Well System Update: The existing municipal supply wells for the Shadow Ridge development in Greely extract water from the overburden sand aquifer. The supply wells have experienced issues related to elevated nitrate levels (approaching, but not exceeding, half of the Maximum Acceptable Concentration for drinking water). The nitrate source is likely anthropogenic due to shallow contamination potentially from private septic systems, agricultural nutrient application (manure or chemical fertilizer) and storage of non-agricultural source material (i.e. compost) within the existing wellhead protection area. The City of Ottawa initiated the Nepean Aquifer Study in December 2016 to explore the potential to deepen the Shadow Ridge Municipal well system to the Nepean Aquifer and gain information about the hydrogeologic properties of the Nepean Aquifer within Greely. Early results indicate that the Nepean Aquifer is a viable and prolific groundwater source and

interim project deliverables were used to support the new municipal well system design.

The City moved forward with drilling two new deeper production wells in Q4 2022 and Q1 2023. Aquifer sampling and pump tests will be completed in Q2 2023. If the testing identifies that another well is required to support capacity requirements, then a third well will be drilled and tested later in 2023. Data from well testing will support the undertaking's Class Environmental Assessment (EA), the detailed design of system modifications and upgrades, as well as any resulting source protection technical work.

A Notice under subsection 48 (1.1) of Ontario Regulation 287/07 under the Clean Water Act was sent to the Source Protection Authority on January 28, 2022 to inform the Source Protection Region of the new municipal well project. Terms of Reference were developed for the source protection technical work and a consultant was selected to complete the work. Source protection technical work includes the delineation of a Wellhead Protection Area (WHPA) for the proposed new wells and the identification of existing significant drinking water threat activities within the new WHPA. Source protection technical studies could commence, in the first half of 2024, following the pump tests on the new wells and completion of the necessary EA.

3. Official Plan and Zoning By Law Conformity: The City of Ottawa's Official Plan was amended and passed by City Council on October 27, 2021, and adopted by Council as of November 24, 2021. The Plan was approved by the Ministry of Municipal Affairs and Housing on November 4, 2022. Source protection policies in the City's new Official Plan conform to local Source Protection Plans and can be found in Section 4.9.5 of under the heading "Implement the policies of the Mississippi-Rideau Source Protection Plan and the Source Protection Plan for the Raisin-South Nation Source Protection Region". Source protection policies were developed in consultation with the local Source Protection Regions.

Following approval of the new Official Plan, the City has initiated the process of amending zoning by-laws to conform to source protection policies, draft amendments are expected in 2023. Source Protection Regions will be consulted on zoning by-law amendments related to source protection policies.

4. Risk Management Plans and the Fuel Tank (Home Heating Oil) Incentive Program: Home heating oil (fuel storage) is considered a significant drinking water threat within the highest vulnerable areas near municipal supply wells. Local Source Protection Plans policies require Risk Management Plans (RMPs) for fuel storage within these zones to manage the threat; the RMP requires that the fuel tanks meet specific design and operational standards and are inspected regularly. There are currently 12 residences with home heating oil tanks that are considered significant drinking water threats to municipal well systems. Six are managed through RMPs and six do not currently have RMPs due to non-responsive or non-compliant landowners. City staff

and Conservation Authority staff have been working towards RMP negotiations since 2017 using a 'soft approach' (politely requesting compliance, multiple visits). Options to move forward with managing the existing fuel threats are enforcement (i.e. enforce a RMP) or revise the approach to work cooperatively with the landowners and provide incentives for compliance.

The Fuel Tank Incentive Program was approved by The City of Ottawa Agricultural and Rural Affairs Committee on May 5, 2022 and City Council on May 11, 2022. The program offers financial incentives to remove existing fuel oil tanks that are considered significant drinking water threats to municipal wells and replace them with an alternate heating source (air source heat pump or natural gas), that is not considered a significant drinking water threat. Additional incentives will be provided to support a green energy option (air source heat pump), to coincide with the City's climate change initiatives. The goal of the fuel tank incentive program is to eliminate the existing fuel threats and protect the shared drinking water resource. The program is expected to be complete by 2024.

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 Licences

The City of Ottawa ensures that all municipal water systems are operated by certified operators, licenced by the Ministry. 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.

There are approximately 74 certified operators working in water treatment and 90 in the water distribution system. To maintain their operating licence, each operator must receive 40 to 50 hours per year of job-related training. The department 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 2022 all operators operating within the treatment facilities and distribution system maintained the required certification.

Quality Management System

Ottawa's municipal drinking water systems operate under a comprehensive quality management system, which is a provincially mandated requirement under Ontario's *Safe Drinking Water Act, 2002*. The Standard for the Drinking Water Quality Management

Standard (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 of the municipal water systems. It has received and maintained its Full Scope accreditation since 2011 through annual external audits completed by an external accreditation body. In 2022, NSF International Strategic Registrations completed a surveillance audit (virtually) between September 6th and September 8th and found the City's DWQMS to be in full conformance with the Drinking Water Quality Management Standard.

The annual DWQMS Management Review Report was completed following a series of meetings held between March – May 2022. The report presented a comprehensive review of the City's drinking water systems and its operational performance during the previous year. In accordance with DWQMS requirements, the report was reviewed by Top Management on May 12, 2022 and was subsequently summarized and presented to the Standing Committee on Environmental Protection, Water and Waste Management (SCEPWWM) on June 21, 2022 and City Council on July 6, 2022.

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 2022, some of the current issues and concerns that have garnered attention within the drinking water industry include the following:

- Cyanobacterial toxins
- Perfluoroalkyl substances (PFAS)
- Pharmaceuticals and Personal Care Products
- Microplastics
- Radioactivity
- Manganese
- Strontium
- MPA (Microscopic Particulate Analysis)
- 1,4-Dioxane

Water Quality staff have conducted testing for these emerging 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 (radioactivity). 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.

It was through this testing that it was discovered that one of the groundwater systems (Carp Well System) showed trace amounts of PFAS substances in Well #2. These compounds are readily removed through the granular activated carbon (GAC) filters which were commissioned in July 2021 to improve taste/odour in Carp's water supply.

If further information is desired on any of these substances of concern, please contact the Drinking Water Quality Unit 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 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 \$80 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 Licences, Permits, Regulations, and Ministry Inspection Reports indicates the provision of safe drinking water during 2022. 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:

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SUPPORTING DOCUMENTATION

Document 1	2022 Summary Table of Regulatory Compliance
Document 2	2022 Flow Summary