WATER
RIVERVIEW PARK AND ZOO

Annual Drinking Water Report 2024

Inside this Report

2024 Peterborough Utilities Commission

Mayor Jeff Leal	Chair
Councillor Lesley Parnell	Vice-Chair
Councillor David Haacke	Commissioner
Councillor Keith Riel	Commissioner
Councillor Don Vassiliadis	Commissioner

2024 Riverview Park and Zoo Advisory Committee

Name of Volunteer	**Date Appointed**
Wally Davidson	Lifetime Member
Shauna Moodie	January 2021
Susan Ramey	January 2021
Scott Baker	January 2022
Neil Hamilton	January 2022
Alan Ingram	January 2022

On the Cover

The original “Water Commission” was created in 1902 when the City bought the water pumping and distribution system in 1882. The Peterborough Utilities Commission (PUC) was formed in 1914 when the electric and water utilities formed under one commission. In 1933, Ross Dobbin the General Manager of the PUC was given two alligators during an American Water Works Association conference in Florida. This was the beginning of the Riverview Park and Zoo, which is still operational today. The park and zoo is located on the same property as the water treatment plant and is operated under the water utility, The cover features the reptiles are still maintained at the Zoo. On the cover is Lyle, a West African Dwarf Crocodile. We have two adults, Lyle (Male, 22) and Irwin (Female, 19). They are one of the smallest crocodilians, and the smallest true crocodile species. They can live up to 75 years! Lyle and Irwin had 3 babies successfully hatch last August (2024). They are still living here at Riverview Park and Zoo.

Questions or comments

Please contact us either by mail, phone or email.

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Introduction

All Peterborough Utilities Commission facilities are managed and operated under contract by PUG Services Corp. (PUGSC). The Water Utility section of PUGSC includes the following operating departments:

- Water Treatment Plant
- Water Distribution
- Water Engineering Services
- Riverview Park and Zoo

Financials

The audited financial statements for 2024 have been included in the City of Peterborough Financial documents.

Drinking Water System

Source Water

The source of raw (untreated) water for Peterborough's drinking water is the Otonabee River. The Otonabee River water is of good quality and can be described as a moderately coloured water of low turbidity. The river water temperature ranges from 0°C (winter) to approximately 26°C (summer). The raw river water is what we call a surface water supply, which means that it is an unprotected source.

Accordingly, we assume that raw water always requires full treatment at the Peterborough Water Treatment Plant to make it drinkable or potable.

The river water quality is monitored by staff at the plant as well as the Otonabee Region Conservation Authority (ORCA) and the Peterborough Health Unit (beaches only). The watershed is protected by planning and approvals processes through the City of Peterborough and ORCA. Since 1998, ORCA has monitored water quality in the Otonabee watershed under the Watershed 2000 Program and the Provincial Water Quality Monitoring Network.

Peterborough Utilities continued its participation in the Source Water Protection Committee in 2024.

Treatment Plant Operations

The plant is located at 1230 Water Street North, Peterborough, adjacent to the Riverview Park & Zoo. The plant was initially built in 1922 and expanded in 1952, 1965, 1995 and 2016. The conventional treatment process includes coagulation, flocculation, sedimentation, filtration and chlorine disinfection and a process waste treatment facility to dewater the backwash sludge.

Total raw water processed in 2024 was 11,437.72 megalitres (ML), this is an average of 31.34 ML daily (Table 1). The daily average consumption decreased slightly from 2023. The maximum daily pumpage of 40.56 ML, which occurred on September 17th, was a 6.76% increase from the maximum daily value (36.26 ML) recorded on June 1st, 2023.

Table 1

Water Treatment Plant Operations	2023	2024
Total Annual Raw Water	11,479.75	11,437.72
Average Day ML	31.45	31.34
Total Annual Treated Water	10,288.06	10,335,406
Average Day Consumption ML	28.18	28.23
Max. Daily Pumpage	36.99 – May 31	39.30 – Sept. 17
Max. Daily City Consumption ML	36.26 – June 1	40.56 – Sept 17
Peak Hourly Consumption Rate ML	70.96 – July 4 @ 09:00h	82,64 – Jan 9 @ 08:30h
Total Wash Water ML	182.34	179.80
Average of Plant Effluent	1.8%	1.8%
Total Zone #1 Pumpage	6,282.79	6,181.86
Average Day ML	17.21	16.89
Total Zone #2 Pumpage	4,005.27	4,153.55
Average Day ML	10.97	11.34

Reservoirs, Elevated Tanks, Water Booster Pumping Stations

Treated water is stored at various locations throughout the City in underground reservoirs and elevated storage tanks. Storage is used to supplement supply during times of high-water demand and in emergency situations such as firefighting. The water storage capacity in the system is 55.36 ML, including the Water Treatment Plant. Water storage around the city is as follows:

Water Treatment Plant	8.5 ML
High Street Elevated Tank	4.55 ML
Clonsilla Avenue Reservoir	18.18 ML
Towerhill Reservoir	22.73 ML
Sherbrooke Elevated Tank	2.3 ML
Milroy Elevated Tank	0.5 ML

Water Distribution

The water distribution system consists of approximately 469 kilometres of pipe (water mains), 2,501 hydrants and 28,348 individual water services. Hydrants are colour-coded according to the Ontario Fire Code requirements to indicate the available flow rate at a 20-psi residual pressure.

PTBO H_20

The Utilities' mobile drinking water station, named PTBO H_20 operated from May – October in 2024. This year PTBO H_20 participated in municipally sponsored events, concerts, sporting events and local festivals.

The mobile drinking water station was created to provide fresh clean tap water to event patrons. Visitors to the mobile station can use a fountain to have a drink or to refill water bottles while staff promotes our tap water and other conservation activities. The mobile unit compliments our corporate values on the Environment, with the promotion of resource conservation.

Capital Works Summary

The Water Treatment Plant underwent the following upgrades in 2024.

- Chlorine Contact chlorine analyzer was replaced with a Swan analyzer
- Raw Water turbidity meter was replaced with a Swan turbidity meters in the WTP.

- Electric valve operators were installed on Filter 10 and Filter 11 backwash valves.
- Rotary assembly and impeller were replaced on Low Lift Pump #3.
- New access ladders were installed in Flocculation Tanks 5 and 6.
- SCADA Assessment and strategy report was complete.

Water Main Replacement

Approximately 1300 m of distribution water mains were replaced on:

- Brealey Drive
- Lansdowne Street
- Armour Road

Watermain Appurtenances

- New Sampling Station (north end)
- New Automatic Flushing Station (east end)

Water Service Replacement

A total of 71 water services were replaced in 2024.

Water Distribution Upgrades

Cleaning and lining of approximately 2.7 km of existing distribution water mains took place on:

- Aylmer Street
- McDonnel Street
- London Street
- Water Street
- Murray Street
- Spurway Place
- Parkhill Road W
- Maiden Lane

Summary of Inspection & Compliance

Ministry of Environment Conservation & Parks Inspection

During 2024, there was a Ministry of the Environment, Conservation & Parks (MECP) Inspection on June 5, 2025, report #377450391. The Peterborough Drinking Water System received a 100% compliance rating. There were no recommended best practices noted in the report.

Adverse Water Quality Incidents

There was one incident of adverse drinking water quality test results in Peterborough for 2024

The adverse water quality sample was reported on November 20, 2024. The Water Distribution Department was performing regular hydrant maintenance activities on Duffus Street when a low chlorine residual result was recorded. The operators proceeded to flush the watermain until an acceptable chlorine residual was achieved. This was reported to the MECP, and no corrective action was required, and the issue was resolved.

Drinking Water Quality Management System

This Standard outlines requirements for a Quality Management System (QMS) to ensure high quality drinking water. In the development of a QMS, the Operating Authority must create an Operational Plan; this document will define the QMS and will be subject to external audits for accreditation. The Peterborough municipal water system received full scope accreditation in June 2011.

Accreditation Status

The Peterborough Drinking Water System maintained accreditation to the Drinking Water Quality Management Standard (DWQMS). In advance of the annual verification audit an internal audit was conducted in September 2024. The internal audit found three opportunities for improvement and that no corrective action

was required. The external audit, conducted by NSF International, on November 25, 2024, described that the management system was well documented and continues to be effective.

Water Flows

Permit to Take Water

The Ontario Water Resources Act, Regulation 387/05 authorized Peterborough Utilities Commission in accordance with Permit to Take Water (PTTW), 023-CWCS6X the withdrawal of 190.68 ML per day.

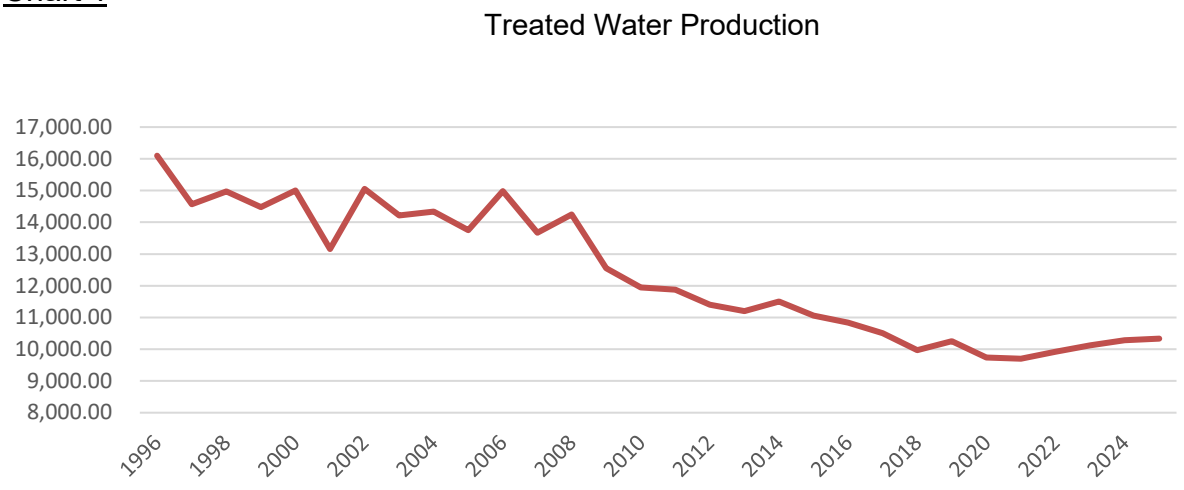
This PTTW was issued on October 29, 2023, and is valid for 10 years. Under this Regulation we are required to report the daily water taking annually by March 31st each year. In 2024, there were no instances of water taking more than this daily limit. The total volume of water pumped into the Water Treatment Plant was 11,437.72 megalitres (ML), this is an average of 31.34 ML daily.

Treated Water Production

The Water Treatment Plant produced 10,2335.41 megalitres (ML) in 2024, this is an average of 28.23 ML daily (Chart 1). Historically the highest water consumption recorded was in 1980 (18,621.20 ML).

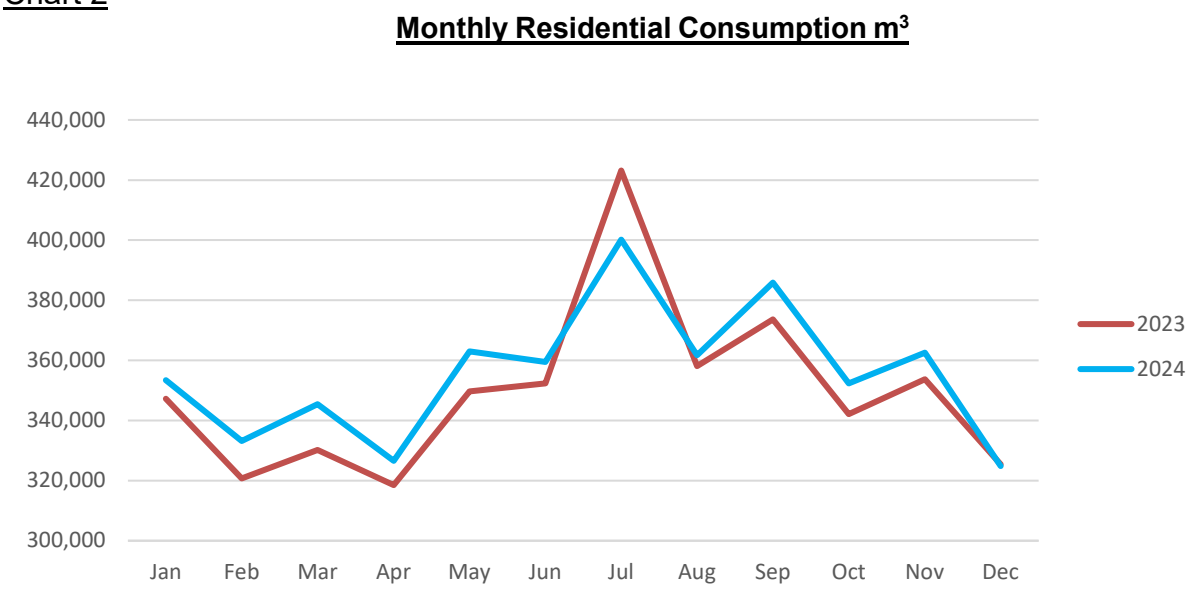
Peterborough Utilities monitors water usage through water meters, most of the water usage in 2024 was by industrial, institutional and large commercial users (Chart 2 & 3). There was a certain amount of water used for distribution system maintenance to maintain the water quality in the distribution system.

Chart 1



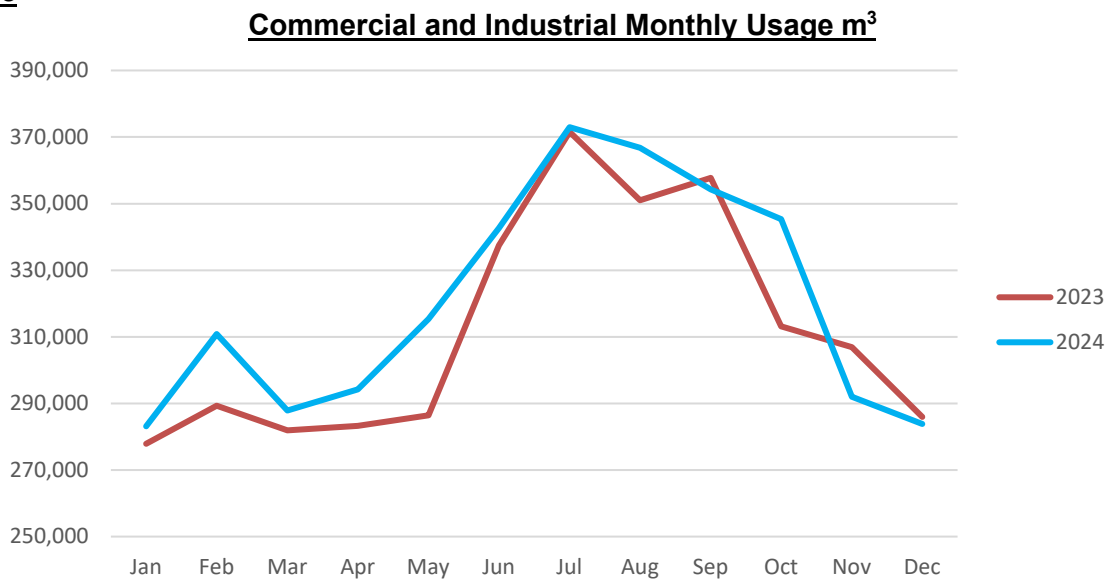
Treated water production was 10,335.41 ML in 2024

Chart 2



The residential water consumption pattern is driven by annual weather patterns, as shown in Chart 2.

Chart 3



The industrial water consumption typically peaks annually in the third quarter as shown in Chart 3.

Water Quality Results

Continuous monitoring of turbidity, chlorine, fluoride and pH levels happen at the Water Treatment Plant. Thousands of water samples are taken each year for chemical, physical and microbiological tests. These tests are carried out on water samples before and after treatment as well as on samples collected from different points in the water distribution system.

O. Reg. 169/03 contains the *Ontario Drinking Water Quality Standards* (ODWQS). The purpose of the Province's ODWQS is to establish parameter limits to protect public health. An exceedance of any parameter would result in an adverse water quality event with notification to the Medical Officer of Health and the MECP. Appropriate corrective action would have to be initiated to address the adverse incident.

A total of approximately 20,000 individual tests were performed on Water Treatment Plant and water distribution samples in 2024. Approximately 13,000 individual tests were performed in the Water Treatment Plant Laboratory and approximately 6,000 microbiological and chemical tests were performed by Peterborough Environmental Protection Laboratory.

Results of the laboratory testing continue to confirm that the Peterborough Water Treatment Plant produces good quality water, and this quality is maintained throughout the water distribution system to the customer's tap.

Chlorine Residual

The Peterborough Water Treatment Plant uses chlorine for disinfection against viruses and bacteria in accordance with O. Reg. 170/03. Sample results reported under Schedule 7 for plant effluent was 0.43 -2.29 mg/L.

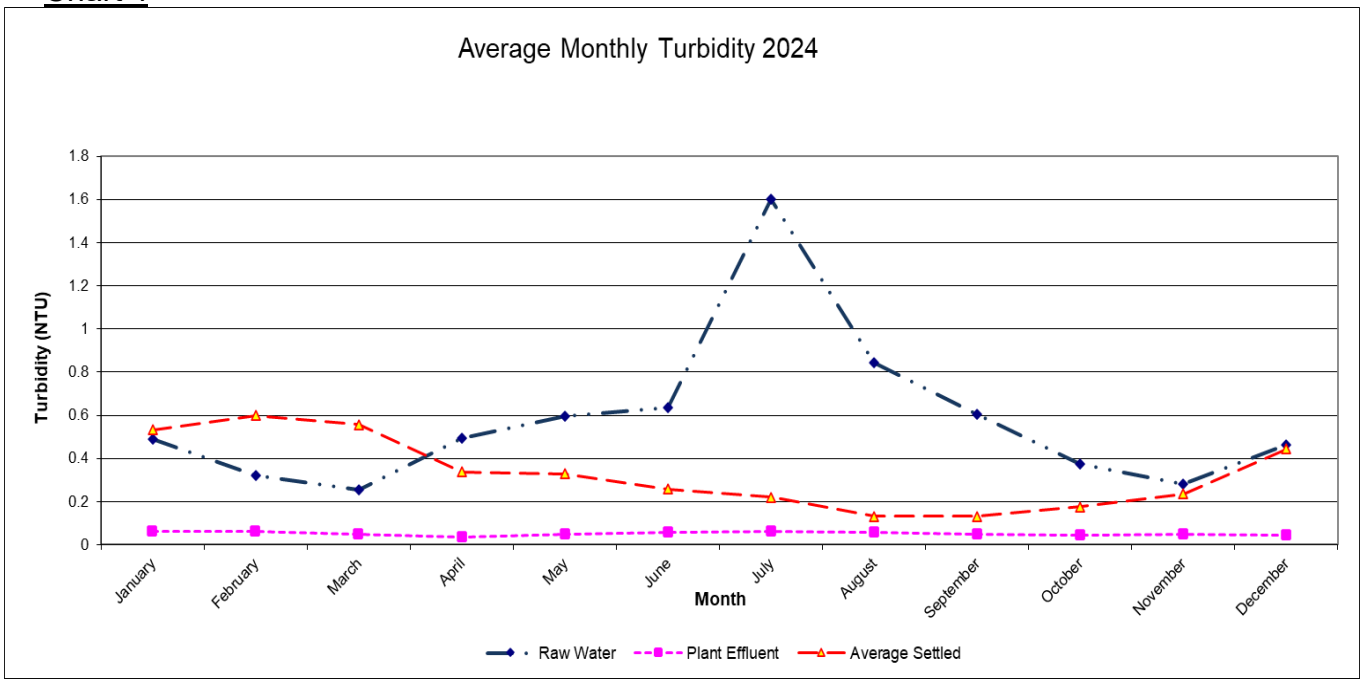
Turbidity

The average raw water turbidity in 2024 was 0.58 NTU; average during 2023 was 0.50 NTU. The monthly raw water turbidity peak occurred in July at 1.6 NTU as shown in Chart 4, the past 20- year average raw water turbidity was 0.56 NTU and treated water turbidity was 0.09 NTU.

The zebra mussel population in the river could also be a contributing factor for the cyclical increases and decreases in raw water turbidity. Raw water turbidity has slowly dropped since 2008.

The performance criteria for filtered water is 0.30 NTU for 95% of the time, without exceeding 1.0 NTU for more than fifteen minutes. The average filtered water turbidity was 0.04 NTU for 2024 and in 2023 it was 0.05 NTU. Filters are taken off-line when the turbidity reaches 0.15 NTU. The 2024 average treated water turbidity was measured at0.05 NTU.

Chart 4



Microbiological Standards Testing

Escherichia coli

During 2024, a total of 246 Escherichia coli (E. coli) samples were analyzed from the Otonabee River (at the WTP intake) to assist in determining the source of fecal contamination within our source water. Monthly values ranged from 0 to 220 Colony Forming Units (CFU) per liter.

A total of 1,743 E. coli samples were analyzed from the plant effluent and distribution system. All values in the treated drinking water samples were zero.

Total Coliform

The MECP regulation for Total Coliform are to have all samples collected from the plant effluent to be zero CFU per litre of water sampled. During 2024, a total of 245 samples were analyzed from the Otonabee River. Monthly values ranged from 10 to 1480 Colony Forming Units (CFU) per liter. A total of 1,743 Total Coliforms samples were analyzed from the plant effluent and distribution system. All values in the treated drinking water samples were zero.

Inorganic Parameters

No known health-related water quality guidelines for inorganic (Table 2) and organic (Table 3) parameters were exceeded in 2024 in Peterborough's drinking water. To ensure that Peterborough's water is safe to drink, water quality is carefully monitored and subject to constant surveillance.

Table 2

Schedule 23	Unit	2024 Results	MAC
Antimony	mg/L	<0.00006	0.006
Arsenic	mg/L	<0.00002	0.025
Barium	mg/L	0.0254	1.0
Boron	mg/L	0.007	5.0
Cadmium	mg/L	<0.000003	0.005
Chromium	mg/L	0.00014	0.05
Mercury	mg/L	<0.00001	0.001
Selenium	mg/L	0.00005	0.01
Uranium	mg/L	0.00017	0.02

Organic Parameters

Table 3

Schedule 24	Unit	2024 Results	MAC
Alachlor	mg/L	<0.00002	0.005
Atrazine + N-dealkylated metabolites	mg/L	<0.00001	0.005
Azinphos-methyl	mg/L	<0.00005	0.02
Benzene	mg/L	<0.00032	0.005
Benzo(a)pyrene	mg/L	<0.000004	0.00001
Bromoxynil	mg/L	<0.00033	0.005
Carbaryl	mg/L	<0.00005	0.09
Carbofuran	mg/L	<0.00001	0.09
Carbon Tetrachloride	mg/L	<0.00017	0.005
Chlorpyrifos	mg/L	<0.00002	0.09
Diazinon	mg/L	<0.00002	0.02
Dicamba	mg/L	<0.0002	0.12
1,2-Dichlorobenzene	mg/L	<0.00041	0.2
1,4-Dichlorobenzene	mg/L	<0.00036	0.005
1,2-Dichloroethane	mg/L	<0.00035	0.005
1,1-Dichloroethylene (vinylidene chloride)	Mg/L	<0.00033	0.005
Dichloromethane	mg/L	<0.00035	0.05
2,4-Dichlorophenol	mg/L	<0.00015	0.9
2,4-Dichlorophenoxy acetic acid (2,4-D)	mg/L	<0.00019	0.1
Diclofop-methyl	mg/L	<0.0004	0.009
Dimethoate	mg/L	<0.00006	0.02
Diquat	mg/L	<0.001	0.07
Diuron	mg/L	<0.00003	0.15
Glyphosate	mg/L	<0.001	1
Haloacetic acids (HAA)	mg/l	0.0635	0.08
Malathion	mg/L	<0.00002	0.19
2-Methyl-4-chlorophenoxyacetic acid	mg/L	<0.0000012	0.00012
Metolachlor	mg/L	<0.00001	0.05
Metribuzin	mg/L	<0.00002	0.08
Monochlorobenzene	mg/L	<0.0003	0.08
Paraquat	mg/L	<0.001	0.01
Pentachlorophenol	mg/L	<0.00015	0.06
Phorate	mg/L	<0.00001	0.002
Picloram	mg/L	<0.001	0.19

Schedule 24	Unit	2024 Results	MAC
Polychlorinated Biphenyls (PCB)	mg/L	<0.00004	0.003
Prometryne	mg/L	<0.00003	0.001
Simazine	mg/L	<0.00001	0.01
Terbufos	mg/L	<0.00001	0.001
Trihalomethane (THM)	Mg/L	0.063	
Tetrachloroethylene (perchloroethylene)	mg/L	<0.00035	0.03
2,3,4,6-Tetrachlorophenol	mg/L	<0.0002	0.1
Triallate	mg/L	<0.0001	0.23
Trichloroethylene	mg/L	<0.00044	0.005
2,4,6-Trichlorophenol	mg/L	<0.00025	0.005
Trifluralin	mg/L	<0.00002	0.045
Vinyl Chloride	mg/L	<0.00017	0.002

Trihalomethanes -THM

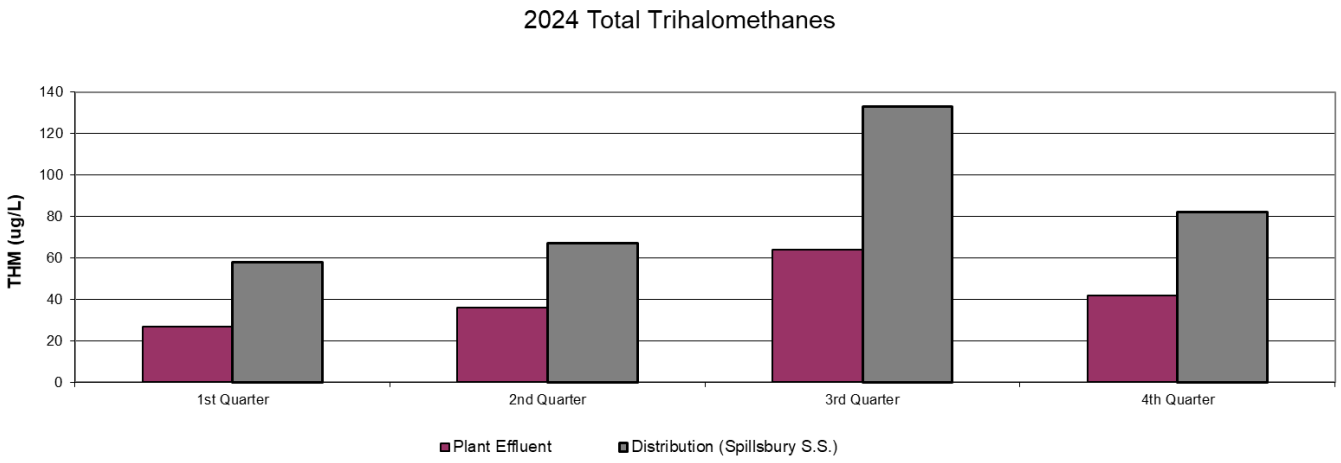
In Ontario, the Ministry of the Environment Conservation & Parks' Maximum Acceptable Concentrations (MAC) for total THM's (total concentration of chloroform, bromodichloromethane and dibromochloromethane) are set to 100. μg/L (running annual average) for the distribution system. According to O. Reg. 170/03, distribution THM samples must be collected and analyzed quarterly.

Trihalomethanes (THM's) are formed as a by-product when chlorine is used to disinfect water for drinking. The presence of organic materials along with the use of chlorine in the water treatment process can contribute to the formation of disinfection by-products. The THM's may have adverse health effects at high concentrations, and many governments set limits on the amount permissible in drinking water.

The THM average values found leaving the Water Treatment Plant during 2024 was 42.0 μg/L. The past 10-year average plant effluent has been 40 □g/L.

Distribution levels are always found to be higher than those leaving the Water Treatment Plant since THM's continue to form as the water travels through the distribution piping system. During 2024, one distribution location was selected to assist in determining areas of the city where THM's may be highest. The annual average THM value in the distribution system was 85 μg/L (Chart 5). The average THM value during 2023 was 63 μg/L. The 10-year average of distribution THM concentration was found to be 77 μg/L. The regulatory limit for distribution samples is 100 μg/L (running annual average); therefore, the Peterborough Drinking Water System maintained compliance.

Chart 5



Haloacetic Acid

HAA's are another group of chemicals that are formed as disinfection by- products like trihalomethanes (THM).

The 2024 average treated water HAA was 35.0 μg/L and the average distribution sample was found to be 63.5μg/L. O Reg. 170/03 was amended to include HAAs in 2021. The regulatory limit for distribution samples is 80 μg/L (running annual average); therefore, the Peterborough Drinking Water System maintained compliance.

Sodium

Sodium is not part of Schedule 23 or 24 but is required to be tested at least once every five (5) years. It has been sampled every year and was found to be below the ODWS aesthetic objective of 200 mg/L. In 2024, the sodium result was found to be 8.8 mg/L (10.7 mg/L in 2023). The local Medical Officer of Health must be notified when the sodium concentration exceeds 20 mg/L so that this information may be passed on to local physicians.

Lead

Lead sampling is required under O. Reg. 170/03, schedule 15.1. Peterborough requires 8 distribution samples to be collected and analyzed for lead, pH, and alkalinity every sampling period within the distribution. Peterborough is required to sample any residential house in the city that requests sampling for the same parameters mentioned above.

In 2024, 17 distribution points were sampled for lead. Customers are offered free testing of their private dwelling. The distribution sample results were less than 0.0005 to 0.0005 mg/L which indicates that the distribution system does not contribute to lead contamination.

Taste and Odour

During 2023, the primary source of taste and odour in our raw water was from the naturally occurring compounds geosmin (name derived from the Greek 'earth' and 'smell') and 2-MIB (2- methylisoborneol). These compounds are monitored as a precursor to taste and odour complaints (earthy/musty) of the water and are not a health concern. They can be detected by humans at very low levels (less than 10 ηg/L). The bacteria actinomycetes, zebra mussels and some species of algae can produce geosmin and 2-MIB, though all the contributing organisms are not known. Observations have shown that when we have greater zebra mussel and/or algae populations we experience higher amounts of geosmin and 2-MIB.

Previous annual data indicates that geosmin and 2-MIB would hit peaks at the same time during the summer months. There is usually a large peak near the end of the summer when the water temperature is highest, and sunlight hours are high. The concentration peaks for both taste and odour causing compounds occurred approximately July to November.

Geosmin is thought to originate higher in the water column and produce an earthy odour. The average raw water value during 2024 was 5.7 □g/L and the average plant treated water was 4.9 □g/L (Chart 6)

The 2-MIB is produced in the sediment or benthic layer and gives off a musty odour. 2-MIB can reproduce well when sunlight can penetrate down to the bottom of lakes and streams. The average raw water value during 2024 was 4.8 ηg/L and the average plant effluent was 4.1 ηg/L (Chart 7).

The reduction of geosmin and 2-MIB due to water treatment processes (coagulation, sedimentation, filtration, and chlorination) was negligible. Both geosmin and 2-MIB compounds resist oxidation (disinfection) and are difficult to remove by conventional water treatment processes.

Chart 6

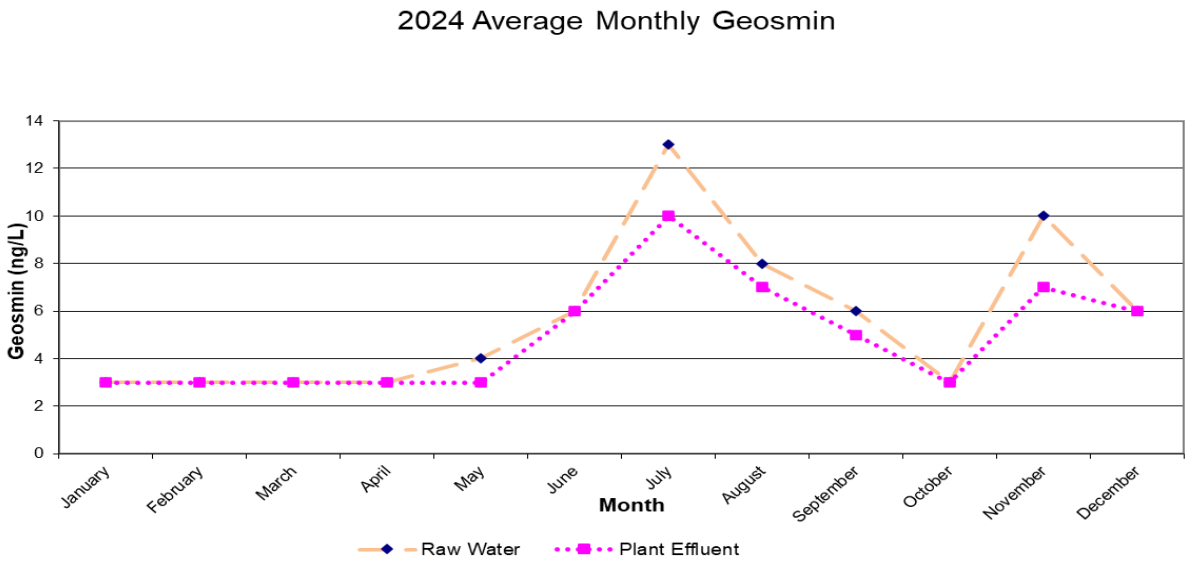
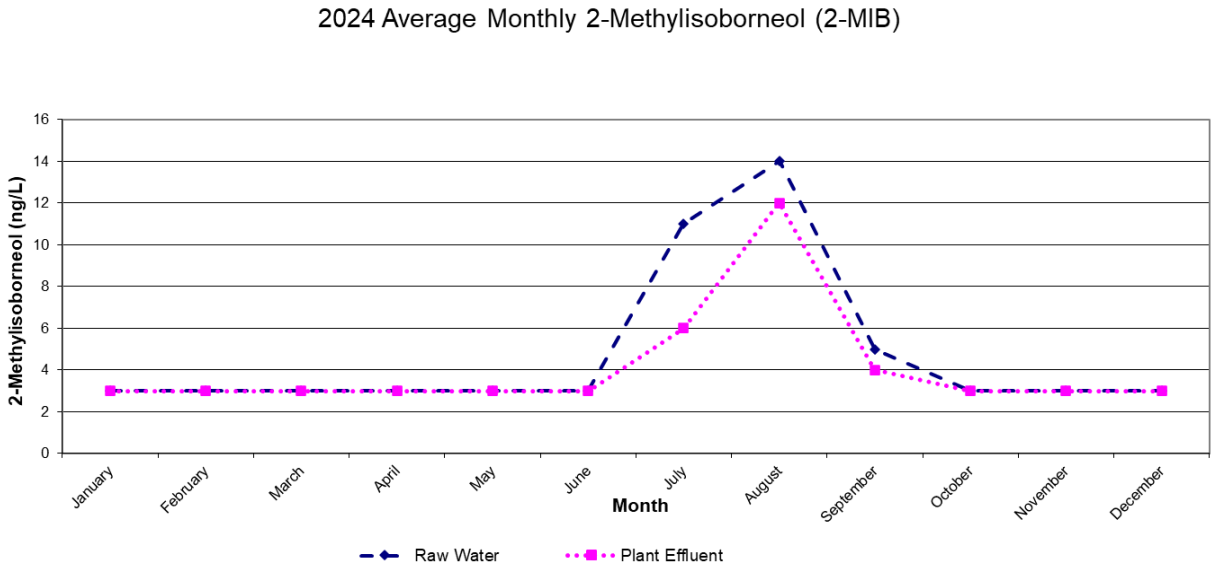


Chart 7



Summary Report

The summary of water delivered as per O. Reg. 170/03 Schedule 22 in 2024 is shown in Table 4.

Table 4

Month	Average Day (M^3/d)	Maximum Day (M^3/d)	Peak Flows (L/m)
January	25,257	31,698	22,013
February	25,689	29,646	20,588
March	25,479	30,333	21,065
April	26,004	27,992	19,439
May	28,645	33,417	23,206
June	30,336	34,371	23,869
July	32,874	36,091	25,063
August	32,299	37,964	26,364
September	29,090	31,645	21,976
October	25,945	28,259	19,624
November	25,444	26,686	18,532
December	25,609	34,186	23,740
Rated Capacity	----	104,000	----
Maximum Taken per day (Permit to Take Water 0232-CWCSS6X)	----	190,680	132,743 L/m

Chemical Consumption

Table 5

Chemical Use	2023	2024
Total Chlorine	38,486 kg	40,302 kg
Average Dosage	1.16 mg/L	1.20 mg/L
Total Aluminum Sulphate	873,938L	856,463 L
Average Dosage	49.8 mg/L	48.8 mg/L
Total Hydrofluosilic Acid	20,208 L	29,668 L
Average Dosage	0.68 mg/L	0.28 mg/L
Total Sodium Hydroxide	80,043	72,570
Average Dosage	5.9 mg/L	5.3 mg/L

Chlorine Dosage

The average dose of chlorine for 2024 was 1.20 mg/L (Table 5). This value fluctuates throughout the year as higher doses of primary chlorine are required during the summer months because it takes more chlorine to disinfect the water when the water is warmer.

Chlorine is also added into the treated water before it leaves the WTP. This secondary chlorine is added to help maintain the chlorine residual throughout the distribution system to comply with the Ontario Drinking Water Standards (ODWS).

Zebra mussel control for the Water Treatment Plant included adding approximately 0.5 mg/L of chlorine into the Water Treatment Plant intakes.

Hydrofluorosilicic Acid (fluoride)

Hydrofluorosilicic acid (fluoride) was added to the treated water to attain a combined concentration (target value) of 0.70 mg/L. Fluoride is added to the water depending on the total concentration required in the treated water and the concentration of the raw water. The average dosage of fluoride added to the water in 2024 was approximately 0.68 mg/L (Table 5). The average treated water fluoride residual was 0.69 mg/L. The average fluoride concentration found in the raw water (natural fluoride) during 2024 was 0.10 mg/L.

Sodium Hydroxide

Sodium Hydroxide (NaOH) is normally added to the plant effluent for corrosion control within the distribution system as well as plant effluent pH adjustment. The use of chlorine and aluminium sulphate (alum) during the water treatment process lowers the pH level causing the water to be slightly acidic (corrosive). The addition of NaOH increases the pH to a more acceptable value of 7.1.

Aluminium Sulphate

Aluminium Sulphate (alum) is used as our primary coagulant causing particles (silt, sand, algae, and bacteria) to coagulate or 'clump' to form a floc, which can settle in the sedimentation basins. The water is further treated by filtration. Alum was added to the water during 2024 at an average rate of 48.8 mg/L (Table 5). Aluminium residual found in the WTP treated water can be a by-product of the addition of alum. The average treated water aluminium residual for 2024 was 0.050 mg/L and the operational guideline for aluminium is 0.1 mg/L.

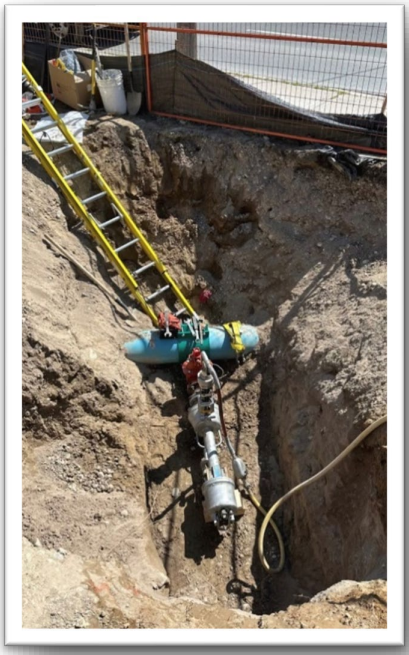
Water Treatment Plant

Annual maintenance was conducted at the Water Treatment Plant, Water Street Pumphouse, reservoirs, elevated tanks, and booster pumping stations.

Water Distribution

Annual water distribution review and maintenance programs are necessary to ensure the safe delivery of drinking water in Peterborough. These programs include:

- Valve maintenance
- Hydrant maintenance
- Dead end flushing
- Service post repairs



Impact of Climate Events

The temperature during June, July and August averaged approximately 25.7°C. This is above normal summertime temperature, as well as an increase from 25.5 °C recorded in 2023.

Environment Canada data describes the average normal value of 18.3°C (normal data 1981 – 2010). The summer months in 2024 were hotter than normal with 6 days where temperatures were higher than 30°C. Rainfall totals for the three summer months of June, July and August was 213.3 MM. This is slightly below normal rainfall value of 234 mm for the summer months.

The Otonabee Water Response Team met monthly from May – October 2024. There were no Low Water Advisory Conditions issued during the summer months in 2024.

Pilot Plant

The Peterborough Water Treatment Plant (WTP), has completed pilot-scale studies to optimize production, improve water quality, and investigate next-generation treatment technologies for the citizens of Peterborough.

A 5000:1 scale-model version of the main treatment facility, the pilot plant includes processes such as coagulation, tapered mixing, flocculation, settling and filtration. In addition to conventional water treatment studies, ozone and advanced oxidation applications have been investigated.

Ozone

The Peterborough Water Treatment Plant, working together with the University of Toronto's Drinking Water Research Group (DWRG), has continued research on ozone applications and integration at full-scale. The key objectives were to evaluate advanced oxidation processes (AOP) and the impact on disinfection by-product (DBP) formation reduction and improved water quality aesthetics for the public. Previous research at our facility has shown the effectiveness of ozone on the reduction of DBP formation and taste-and-odour compounds, geosmin (GSM) and 2-

methylisoborneol (2-MIB). Our current studies remained focused on integration of ozone into full-scale applications as a next generation technology.

Our current study focuses on evaluating ozone and advanced oxidation potential using hydrogen peroxide as a next generation technology. Hydrogen peroxide was added to the source water prior to ozonation to form hydroxyl radicals; a strong oxidant in the water to destroy organic compounds. Hydrogen peroxide was dosed at 0.5 mg/1.0 mg of ozone.

The process then underwent conventional treatment, using coagulation and passed through pilot-scale flocculation, sedimentation, and a filtration process. A filtration media configuration was used to assess the process at full-scale, including dual-media filtration (anthracite/sand) and granular activated carbon (GAC) filtration (GAC/sand). Filtration media was assessed for biological activity to determine if pre-oxidation would enhance filter performance; through the proliferation of non-pathogenic bacteria that would help reduce organics, decrease DBP formation and improve the biological stability of the drinking water.

Tracer Studies

The Peterborough Water Treatment Plant (WTP) conducted a study to determine the residence time in the distribution system. The Peterborough water treatment distribution system was designed to facilitate transportation of water under maximum water treatment plant flow conditions of 104 MLD. Since the 1990s, lawn watering restrictions, conservation, and education, as well as the installation of water meters have reduced the demand in the system. This has resulted in increased water retention time in the distribution system, creating conditions that can result in decreased chlorine residuals, increased disinfection by-product (DBP) formation, and taste-and-odour issues. Tracer studies are an effective in-situ technique to determine the hydraulic residence time (HRT) of contact tanks and clearwells to assess actual conditions under specific flow rates.

The tracer study results highlighted the increased retention time in the distribution of 12-days under low-flow water conditions. The increased retention time plays an important role in the deterioration of water quality, specifically, in the formation of regulated THMs and HAAs. Reservoir and elevated tank optimization may play an important role in both decreasing retention time and DBP formation. The information provided by the tracer studies can assist engineering staff in locating

automated flushing and bulk-fill stations in the distribution system.

Expanding water infrastructure into neighbouring municipalities to facilitate business growth will further increase retention time and may require examination of a chlorinated system for secondary disinfection if population growth, density, and demand does not increase.

Customer Service

Customer Calls

Customer concerns relating to water are tracked by WTP staff and logged using computer software. Some questions and concerns that were asked to our WTP staff were related to taste and odour, colour, hardness, general water quality, information on water treatment, sampling, operations, and questions to assist with school projects on water treatment.

In 2024, staff responded to a total of 18 inquiries, compared to 29 in 2023. The 18 inquiries were related to the following concerns: 28% of customer calls were relating to colour (usually rusty coloured water), 17% were relating to particulate matter, a total of 50% relating to taste and odour, and 5% relating to bacteriological concerns.

A further breakdown of the 9 taste and odour complaints revealed the following: 3 concerns were for an earthy musty odour, 3 concerns were for a chlorine taste and odour, and 3 concerns were for various other taste and odours, from metallic to medicinal.

Tours

Tours have been an important part of public education at the Peterborough Water Treatment Plant. In 2024 a total of 264 people toured the Water Treatment Plant.

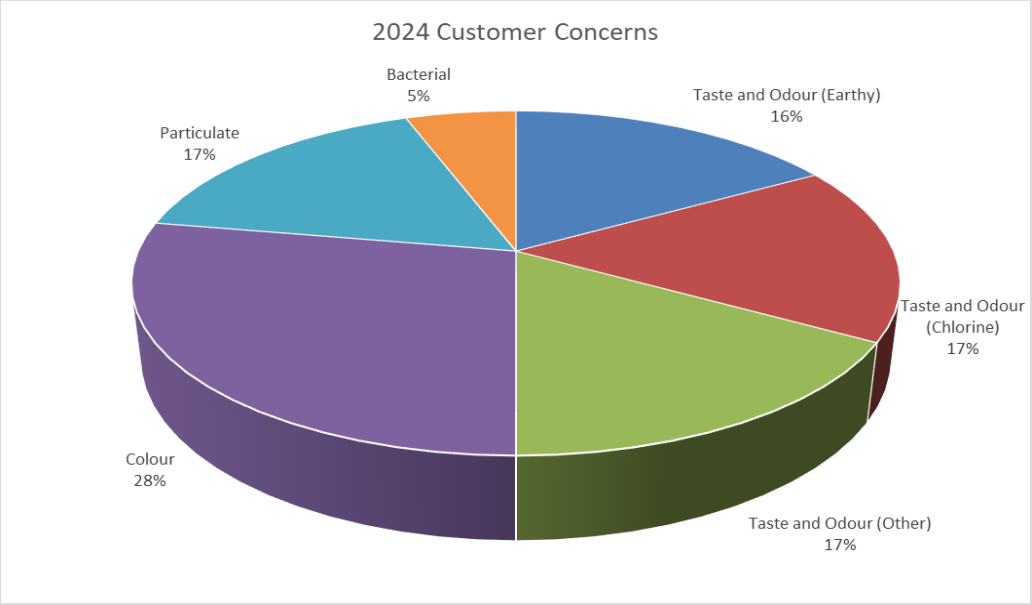


Chart 8

Riverview Park & Zoo

Park Operation & Facilities

In 2024, Riverview Park and Zoo (RPZ) was fully open and operated 365 days from 8:30 am until dusk. Attendance was stronger than ever, with a total annual attendance estimated to be over 300,000 visitors, mainly between the long May and September weekends. A strong website, social media marketing presence and accolades such as being voted the Top Outdoor Attraction in Ontario's Choice Awards in 2023 and was one of three top vote-getters for Ontario's Best Attraction overall, recognized by Ontario Tourism and Peterborough and the Kawarthas Tourism, encouraged more families, school boards, and tourists to travel from further jurisdictions to attend the only free-admission/by-donation accredited zoo in Canada.

Notably, in adherence to the RPZ long term growth and development plans, the snack bar, run by Kiwanis Club of Peterborough's vending contract had run its course ending in 2023. Due to the state of the portable building and foundation's structural integrity, it had been slated to be removed at the end of 2024. New plans to diversify and expand vending throughout the park area, outside of the Zoo Proper gates begin in 2025.

Invasive Species Management

With the help of 31 volunteers through the spring and summer, nearly 950 pounds of invasive plant material from three different species was removed from the RPZ site. These plants were removed mechanically, and strategically to minimize their spread and maximize efficiency. Additionally, over 400 square feet of park area was treated for invasive Japanese Knotweed and dog strangling vine (DSV). Currently, Japanese Knotweed is present in an isolated patch within the Zoo, therefore treating this area quickly decreases the chance of future spread. Treatment of DSV took place in the splash pad area with plans to replant local species in the treated area to prevent future growth of DSV in this area. RPZ received a $2,500 microgrant from the Invading Species Action Fund to remove invasive plant species at RPZ. This funding supported purchasing removal equipment, chemical treatment of invasive plants, and hosting multiple volunteer invasive species removal events.

Trees, Shrubs and Forbs Planted

In partnership with Otonabee Conservation, multiple volunteer planting events took place over a large area of shoreline through the spring and fall of 2024. A mix of trees, shrubs and flowering plants were planted across an area exceeding 3,600 m2. The growth and development of this area will be monitored annually to track planting success and species diversity in this naturalized space. This contributes to our goals of supporting the Bird Friendly Peterborough initiative while also protecting our source water area.

The season was particularly challenging for the train operations as a wet summer, and many rain days where the train operations

were not active. This was further compounded by a derailment in August, reported to the TSSA. After full investigation it was determined that three factors contributed to the incident. In part the wet and humid weather impacted the gravel underneath the tracks, along with heavy foot traffic by walkers after hours; thus resulting in the shift of the alignment of the track bend ahead of the station, making it slightly too wide; in addition to these factors, a large group of families put all the children in the front of the train and all the parents in the back of the train, which did not evenly distribute the weight on the ride. No one was harmed in the incident. Over twenty-five ties were damaged, and parts of the train had to be repaired. It took only a week for the train to be operational, but the track work took 2 weeks to repair based on the availability of the metal ties. Train revenue did not meet the budget and was significantly lower in the operating year of 2024.

Zoo Operations & Facilities

Animal collection status is healthy and moving toward goals of fewer, bigger, better exhibits with emphasis on conservation, increasing local native species, and animals acclimatized to our region, facilities, and staff capacity. The Animal Health Centre was audited for accreditation by the College of Veterinarians of Ontario (CVO) in 2024. Improvements were made to shifts and exhibition areas including expanding on bioactive flooring, improved enrichment and viewing opportunities for the public. More planting in the exhibits for brows, to offer shade and prevent 360 viewing was a focus.

In 2024 there were 5 births/hatchings including a domestic yak, and pheasants. As our species reach end of life expectancy, we saw 14 deaths of animals during the year that included a plated lizard, emu, Muscovy duck, turkey, chicken, Pot-bellied pig, axolotl, sloth, Catalina macaw, agouti, green iguana, and our senior barbary sheep. Postmortems were performed on those animals that had died, to determine the cause of death where possible. All in there were 13 new animals acquired during the year, including Linne's two-toed sloth, yellow-throated lizard, a blue racer snake, leopard tortoise, river otter, barbary sheep and Kune Kune pigs for the barnyard.

As of December 31, 2024, the animal collection on site consisted of 129 animals, representing a total of 48 species (excluding groups of fish and invertebrates). The collection had 32 animals in on loan and 9 animals out on loan.

Over 19,000 enrichment sessions were conducted by staff on all species throughout the year and over 300 training sessions for 8 species were specifically targeted for animal health procedures performed by staff to support animal health.

Table 6

2024 ANIMAL INVENTORY SUMMARY
(Individuals, Excludes Groups – Fish/Amphibians)

Class	January 1, 2024	Births/Hatchings	Acquisitions	Deaths	Dispositions	December 31, 2024
Owned & On Site	105	3	9	11	4	97
In On Loan	32	3	4	3	0	32
Out On Loan	11	0	0	0	2	9
Total Animals On Site (Including Loans)	137	5	13	14	6	129

Education

RPZ hosted over 10,000 students for education programs in 2024. These included school trips, classroom tours, self-guided tours, early childhood programming Zoo Crew, special accessibility groups, adult learning, university and college programs, high school workshops and community groups. Each education program includes aspects of both the Park and the Zoo with a curriculum-linked focus on conservation and the actions we all can take to protect animals and their habitats. Education at RPZ includes programs offered to a wide variety of audiences and staff through publications, exhibit interpretation, graphics, on-site presentations, tours, responsible pet ownership, Roberta Bondar Photography Challenge for youth, summer camps, meet-the-keepers' sessions, enrichment building engagements and teacher training. In 2024 the education department piloted a summer camp program that was tremendously successful as shown by the sell out time and the feedback from

participants and parents.

The Seasonal Conservation Exhibit showcased local, conservation initiative partnerships and native species of snakes, frogs, and turtles with the goal of sharing ways visitors can get involved to help. In 2024 the Dobbin building Conservation Exhibit welcomed over 11,000 visitors in July and August.

RPZ has earned a reputation of excellence in biodiversity conservation, at-risk species propagation, outdoor education, student mentorship job training, as well as being a notable accessible recreation space throughout the province.

Volunteer Program Summary

Two long standing volunteers were nominated and recognized by CAZA and Volunteer Peterborough for their efforts at RPZ. We continue to have active membership of the Association of Managers of Volunteers Services Peterborough. We had a total of 60 volunteers providing 800 hours in the summer of 2024 animating tours, touch tables and help in our gift shop, as well as offering expertise on volunteer committees including the Education Committee, Enrichment and Training, Animal Care, Advisory and Special Events.

RPZ hosts 8 placement student opportunities in 2024, including Conservation Biology students from Trent University performing ethograms and observations, Maintenance and Trade students from TASS and Adam Scott as well as research placements.

Conservation

RPZ supports other conservation facilities like the Ontario Turtle Conservation Centre (OTCC) with turtle food and equipment to home injured and orphaned turtles. This collaboration helps improve their capacity to support over 7000 animals in 2024.

RPZ engaged with multiple partners throughout the year to initiate new conservation projects and continue ongoing conservation work. New partnerships in 2024 include Fisheries and Oceans Canada and the University of Carleton. See below for partnership and project details.

Bird Friendly Peterborough and the Kawartha Lakes: Bird strike decals installed at no cost to RPZ at camel viewing glass. Clear Your Gear Station installed at Shelter 3 at no cost to RPZ.

Fisheries and Ocean's Canada: Funding contract initiative to develop and install a series of five educational signs along the RPZ shoreline on the topic of invasive aquatic species.

Otonabee Conservation: Otonabee Conservation staff assisted with planning for the large-scale shoreline planting including preparing area maps and plant recommendations, as well as recruiting volunteers to attend the planting events.

University of Carleton: Phone consultation with Ontario bat expert was arranged to discuss data collection of bat species living in RPZ area planned for spring 2025.

Capital Program

Further improvements were made to facilities, park infrastructure, and equipment in 2024. Among these items investments were new picnic tables, more pathway paving, improved parking infrastructure, improved educational and directional signage installed to support logistical operations at RPZ to help with capacity issues of the main season.

New metal roofs on the otter building and north washroom made possible through a large donation from Moffatt Roofing Ltd to compliment the capital budget allocated on state of good repair planning.

Investments in the otter exhibit windows to mitigate a leak, fire protection through metal siding of the barn building, significant improvements to animal exhibits and shifts were accomplished this year. A new black chain link fence at the barn yard and wallaby exhibits provide better protection and better visibility for visitors. Safety upgrades to animal exhibit facilities included new electrical wiring, insulation, monitoring systems, as well as new flooring installed in cat house, barn building, quarantine area and animal clinic.

Engineered designs were updated for improved storm water management in the wallaby and emu exhibits and the playground Accessibility Plan from 2018. In 2024 RPZ was the successful proponent for the Rotary Club of Peterborough Legacy Award for the Accessible Playground Project. The Rotary Club of Peterborough has committed to help raise $500,000 in three years to accomplish all 5 stages of the plan.

The conservation room was completed in 2024 by the Zoo Maintenance team, which will be ready for the Massasaugas Ex-Situ Conservation program in partnership with Toronto Zoo and the Ojibway Prairie Reptile Recovery Program, to begin in the spring of 2025.

A recognizable improvement in call outs after hours low temp alarms has been a welcome result in improving insulation values and putting in more efficient heaters in the barn and primate areas. Formal assessments of all animal exhibits were completed in preparation for CAZA inspection in 2025.

Continued efforts on climate resiliency planning for maintenance of the riparian zone at the shoreline, slope erosion and urban forest management from changing climate and damage acquired in the 2022 derecho storm.

Communications Report

Our social media pages continue to grow, and we have developed a social media strategy to help guide the content we create. Our focus is on public education about conservation, soliciting donations, and providing visitor information (e.g., if the train is operating etc.).

Social Media Programs

RPZ's Social Media Strategy was created in 2024. This will be a living document that will evolve with needs, but it offers a great guide for our staff to follow regarding our public communication via social media platforms.

- Instagram
  8,952 followers. Approximately 38K views per month.
- Facebook
  16.8K followers. Approximately 24.5K views per week.

CAZA Communication Committee

The CAZA Communication Committee meet every 2 weeks to work together on CAZA communication projects. This group support the communication between CAZA accredited facilities, publicly about CAZA and the work the affiliates across Canada do, the annual conference, and are also involved in government relations.

Appendix B – Abbreviations

Abbreviation	Full Description
2-MIB	2-methlisoborneol
CFU	Colony Forming Unit
COD	Chemical Oxidization Demand
CTS	Calcium Thiosulphate
DBP	Disinfection by-product
DWQMS	Drinking Water Quality Standard
DWRG	Drinking Water Research Group
EDC	Endocrine disrupting compounds
HAA	Haloacetic Acid
KM	Kilometers
L/m	Litres per Minute
m2	Square Meters
m3	Cubic Meters
MAC	Maximum Acceptable Concentration
mg/L	Milligram per Litre
ML	Megalitres
MECP	Ministry of Environment & Climate Change
MOH	Medical Officer of Health
ηg/L	Nanogram per Litre
NTU	Nephelometric Turbidity Unit
ODWQS	Ontario Drinking Water Quality Standards
ORCA	Otonabee Region Conservation Authority
ORP	Oxidative Reduction Potential
PACL	Polyaluminum Hydroxychloride
PUC	Peterborough Utilities Commission
PUGSC	Peterborough Utilities Services Inc.
RP& Z	Riverview Park & Zoo
STS	Sodium thiosulphate
THM	Trihalomethane
TOC	Total Organic Carbon
µg/L	Microgram per Litre
UVA	Ultraviolet Absorbance
WTP	Water Treatment Plant