TWP EC .ca | EDWARDSBURGH CARDINAL

2022

Cardinal Water Plant Summary Report

Prepared by: Eric Wemerman

Prepared For: Council

1/17/2023

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Introduction

Schedule 22 of Ontario Regulation 170/03 requires that summary reports are prepared and given to members of council by March 31st of each year. The report must include any requirements of the Act, Regulations, Permits, licenses, or orders not met and the actions taken to correct the failure. In addition, a summary of flow rates and quantities compared to the approved capacities are provided to assess the capability of the system to meet existing and planned uses of the system.

The facility is normally staffed with a licensed operator Monday thru Friday, with walkthrough inspections and operational rounds performed twice daily, by the rotational on-call operator, during weekends and holidays. The Cardinal Water Plant process is operated via a Supervisory Control and Data Acquisition (SCADA) system, monitored by a 3rd party security company which dispatches the on-call operator to respond to alarms or customer complaints. In-house and external laboratory sampling is performed to monitor the effectiveness of the treatment process and to ensure system is operating as designed and within regulatory compliance.

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Executive Summary

In 2022 the average daily treated flow leaving the Cardinal Water Plant was 411 m^3/day or 12 % of the rated capacity for the system. The maximum daily flow was 1162 m^3/day**.** Elevated water consumption typically occurs in the summer months, during semi-annual fire hydrant flushing and water main breaks. Routine 3rd party calibration and maintenance activities are performed as per manufacturers guidelines and Environmental Compliance Approvals. Three Adverse Water Quality Incidents occurred in 2022 and are summarized in this report. Operational and preventative maintenance, repairs and capital projects demonstrate the Cardinal Water System is being proactively maintained. A summary of system complaints and corrective actions completed are summarized in this report.

Common Acronyms

MECP: Ministry of Environment, Conservation, Parks

DWQMS: Drinking Water Quality Management System

PTTW: Permit to Take Water

SCADA: Supervisory Control and Data Acquisition

IECBL: Industrial Electric Brockville Limited

NSF: National Sanitation Foundation

PVC: Poly Vinyl Chloride

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Process Summary

The Cardinal Water System receives its raw water supply from the St. Lawrence River through a single intake line with an intake structure located approximately 60 meters off-shore at a depth of 6 meters. Water is taken into the water plant via gravity. Zebra mussel chlorination with Sodium Hypochlorite occurs at the intake structure when the river temperature increases to 12 degrees Celsius. Raw water chlorination occurs in the raw well when river temperature is below 12 degrees Celsius. Raw water passes through two basket screens to remove any larger debris before being pumped via one of three vertical turbine low lift pumps into two flocculation tanks. Polyaluminum-Chloride (PAC) is injected along the way and flash mixing occurs. Particulates in the raw water bind with the PAC to create floc before flowing via gravity to the four Ecodyne dual media filter systems. The Ecodyne filter media is comprised of one layer of anthracite-coal and one layer of sand removes the floc from the stream. Effluent from each filter is continuously monitored by an individual inline turbidity analyzers and results are trended via a SCADA system. Filtered water then flows via gravity through a discharge header to the clearwell and distributed into three clearwell chambers. Chlorine residual and pH of the water in the clearwell are monitored via an inline chlorine analyzer and trended on SCADA. Water is pumped from the clearwell chambers via one of three vertical turbine high lift pumps and is post chlorinated. It continues through parallel Trojan UV Swift 12 reactors (operated lead/stand-by). Potable water then passes through a magnetic flow meter before entering the distribution system to users. Post chlorine residual and pH are continuously monitored via an inline chlorine analyzer and results trended on SCADA System.

Primary disinfection is met through a combination of chlorination (virus), ultraviolet irradiation (giardia) and filtration. The ultraviolet system is designed to achieve a minimum 1-log removal of giardia, by providing a minimum dose of 40 mj/cm^2, minimum UV transmittance of 86 %, at a maximum flow rate of 41 l/s. The zebra / pre-chlorine system is operated to meet the required Contact Time,

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(CT), based on the Procedure for Disinfection of Drinking Water in Ontario. Secondary disinfection is met through chlorination alone and is operated to maintain a minimum of 0.20mg/L of free residual chlorine in all parts of the system.

The distribution system includes a single elevated storage tank with a capacity of 1938 m^3, 82 hydrants, 135 isolation valves, 6 isolated sample stations and a network of piping largely composed of 100 mm, 150mm and 200 mm diameter polyvinyl chloride (PVC), asbestos cement, and cast iron. The Cardinal Drinking Water System services approximately 790 households.

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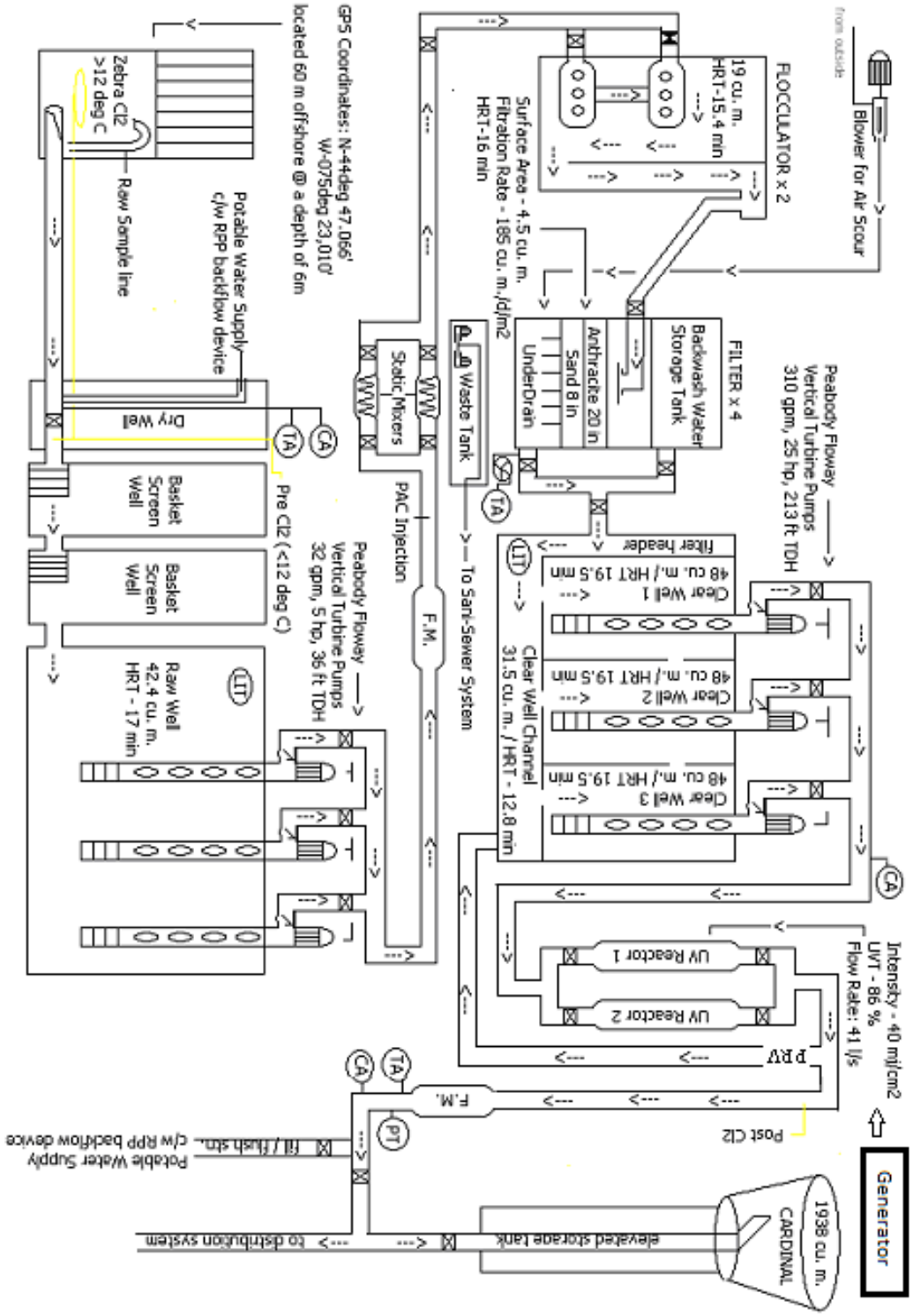
Below is the process schematic for the Cardinal Water Plant



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Staffing and Licensing

The table below lists the licensed operational staff at the end of the 2022 calendar year.

Name	Position	Licence #	Type	Class
Eric Wemerman	Chief Operator/ORO	61726	WT	II
		78182	WD	II
Aaron Campbell	Assistant Chief Operator	91541	WT	II
		95696	WD	II
Stephen Campbell	Operator	54771	WT	II
		73567	WD	II
Mark Simzer	Operator	93001	WT	II
		104867	WD	II
Tyler Selleck	Operator	113843	WT	I
Gordon Shaw	Director of Operations	58943	WT	III
		77743	WDS	II
Wayne Lefebvre	Public Works Operator	17952	WD	I

Failure to meet the Act, Regulations, System Approvals or Orders

The MECP conducted a focused inspection of the Cardinal Water Treatment Plant on November 10th, 2022. The inspection found no areas of non-compliance with regulatory requirements or recommended best practices.

Tabulation of Monitoring Data

The following chart provides you with the numerical values for maximum flow and day rates. The graphs on page nine and ten of this report plot the corresponding numerical value in reference to the Permit to Take Water and Drinking Water License. Based on the values, the water system has the capability to meet the present demands of the system users with some room for expansion**.** The average daily flow out of the facility was 411 cubic meters and the total water produced in 2022 was 150177 cubic meters. This represents a decrease in water production of approximately 3.5% over 2021 volumes of 155574 cubic meters.

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Month	Max Day Flow In (m^3/day)	Max Flow Rate In (L/min)	Max Day Flow Out (m^3/day)	Max Flow Rate Out (L/min)
January	506	1597	462	1549
February	532	1823	497	1188
March	517	1621	474	1184
April	627	1883	548	1181
May	756	1638	667	1179
June	776	1819	693	1186
July	983	1608	881	1983
August	722	1596	667	1214
September	726	1691	677	1252
October	701	1672	641	1624
November	474	1674	423	1210
December	1302	**2627**	1162	1421

Low lift Peak flow rate exceeded the 2460 L/min limit on December 21st for 29 seconds due to a water main break(167 L over the limit).

Potable Water Produced VS Water Consumed

As previously mentioned, potable water production for 2022 totaled 150,177cubic meters, (150,177,000 liters). Records show total system water consumption in the amount of 109,702 cubic meters (109,702,000 liters)

The difference between total water leaving the water plant and metered water from Rideau St Lawrence can be attributed to the following (but not limited to): Cardinal Water Pollution Control Plant, Public Works and Fire Hall water consumption, distribution leaks, semi-annual flushing of fire hydrants and water main breaks.

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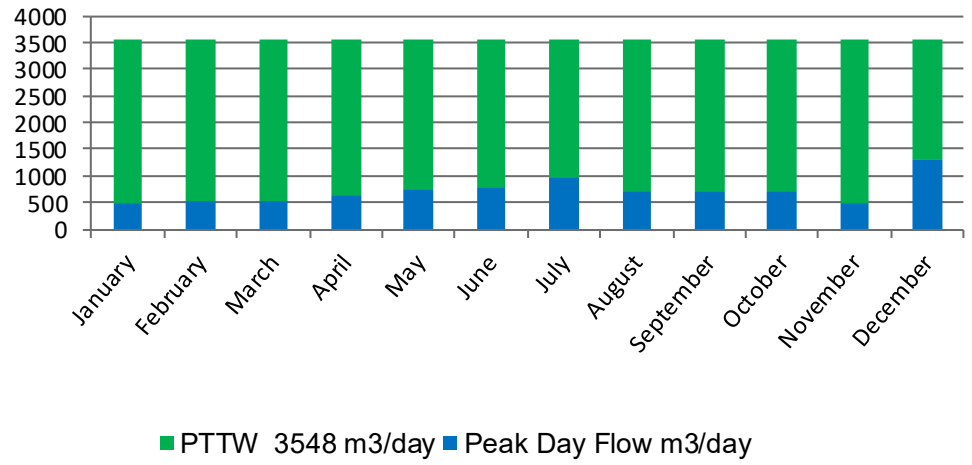
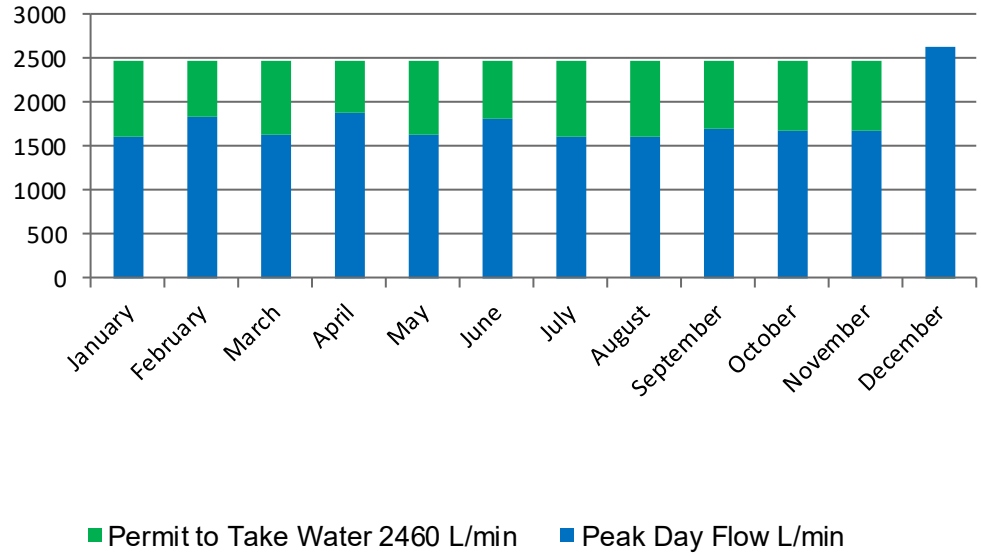
Maximum Raw Water Day (m^3/day) Flow In vs. PTTW



Raw Water Peak Flow Rate (L/min) vs. PTTW



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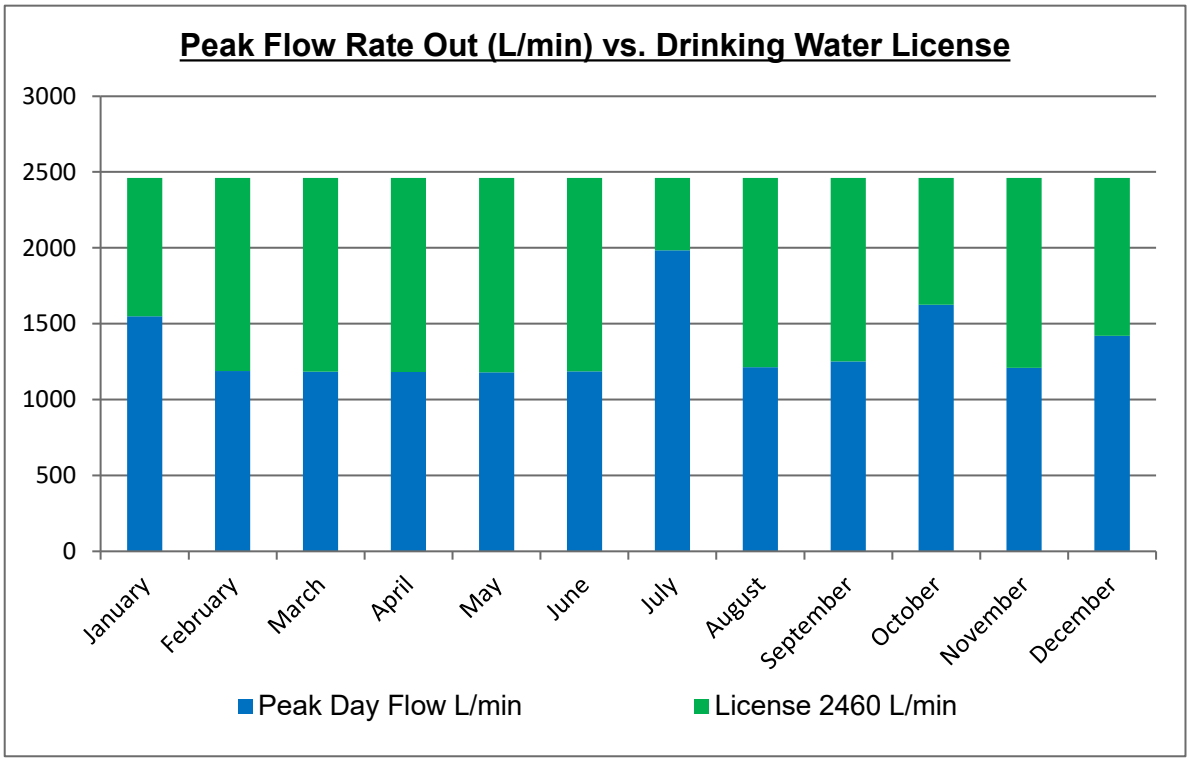

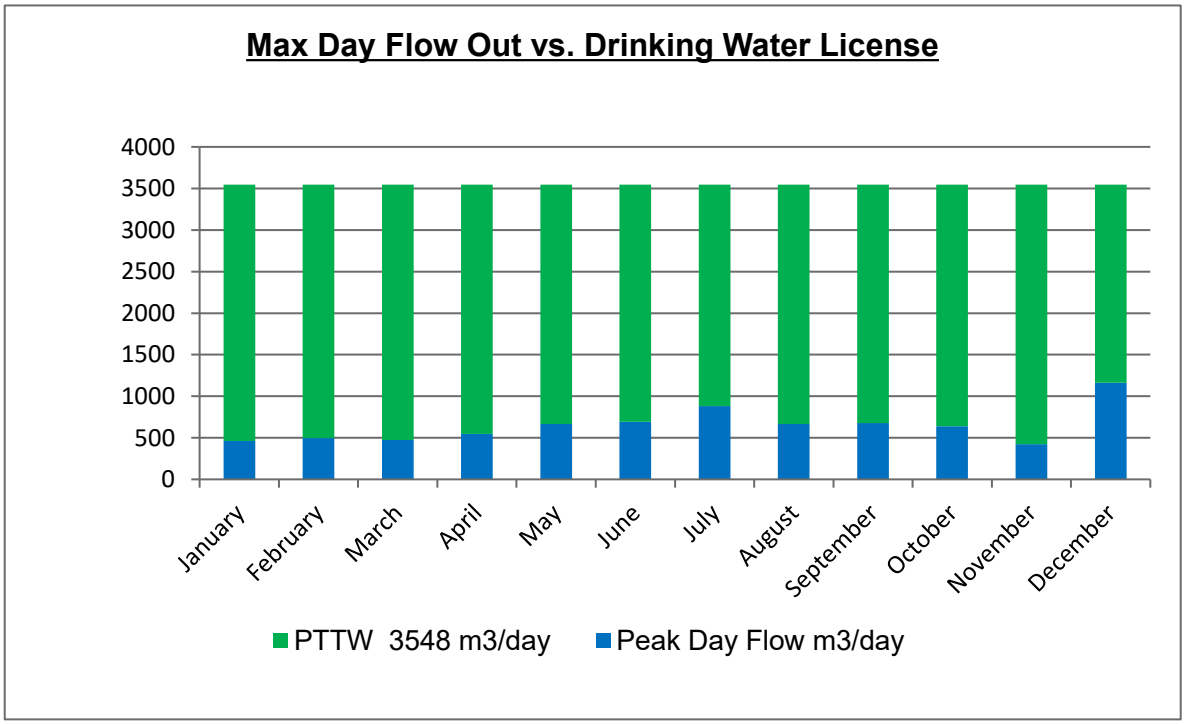

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Preventative Maintenance Program

Service Provider	System Component	Frequency
Capital Controls	Greyline Level Controllers/ Flow Meters- Service, repair, and verification.	Annual
Trojan UV	Trojan UV Swift 12	Semi-Annual
GAL Power	Generator	Semi-annual
Schneider Electric	SCADA System	Semi-annual
HACH	HACH laboratory equipment	Annual
Claude Bourck	Backflow Preventors	Annual
Dundee Marine	Intake inspection	Annual
Stelem	Repair and service Fire Hydrants	Annual
Landmark	ROV Inspection of Water Tower	Bi-annual
Drapeau Fire Protection	Fire Alarm System Inspection	Annual
Environmental Services	Inline Analyzer calibrations and laboratory equipment verifications.	Monthly
Environmental Services	Removal and inspection of basket screens	Semi-annual
Environmental Services	Drain and inspect filter system	Monthly
Environmental Services	Zebra & Raw chlorine System switchover	Semi-annual
Environmental Services	Pull, inspect, and clean basket screens	Semi-annual
Environmental Services	Fire Hydrant flushing and valve operation	Semi-annual

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2022 Capital Projects

Three capital projects were completed in 2022. The project, scope and cost are summarized below.

Project	Scope	Cost
Golden Anderson Pump Director	Replaced Golden Anderson Pump Director	$ 19,791.05
Filter Upgrade	Replaced Keystone Valve Positioners, Turbidity Analyzer, and filter media.	$9,861.15
SCADA	Replaced Communication switches and CPU Processor	Delivery delayed to 2023
County Road 2 Water Main Rehabilitation	Engineering and Geo Technical Work.	$64,741.59

Cardinal Water Plant 2022 Maintenance Summary

The following is a summary of scheduled and unplanned maintenance activities that occurred during the reporting period.

Date	System Component	Maintenance Activity
March 7, 2022	Backflow Preventer	Claude Bourck Plumbing repaired back flow preventor.
March 31, 2022	Post Chlorine Analyzer	Replaced pH probe
April 7, 2022	Chorine Analyzer	Purchased a spare chlorine analyzer.
May 26, 2022	Alarm Communication	Falcon Security installed a secondary DCS alarm communicator.

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Date	System Component	Maintenance Activity
July 20, 2022	High Lift Pump # 1	Replaced check valve.
August 10, 2022	Clearwell Greyline Level Transmitter	Capital Controls replaced Clearwell level transmitter.
August 24, 2022	Trojan UV Swift 12	IECBL replaced Siemens Power Supply Unit.
September 6, 2022	Water tower communication line	Bell Canada switched lines on circuit breaker.
September 13, 2022	Low Lift pipework	Selleck Mechanical replaced a section of stainless-steel pipework.
September 13, 2022	Polymer Injection	Replaced PAC injectors.
September 15, 2022	Sump Pump Panel	IECBL repaired overload pump relay.
September 26, 2022	Sump Pump Panel	IECBL replaced overload relays and switches.
September & October 2022	Pipework/Flooring	Re-painted filter pipework and flooring.
October 12, 2022	Chlorine Injection	Replaced post chlorine injector.
October 26, 2022	Sump Pump	Replaced Back-wash pit sump pump.
November 7, 2022	Filter Turbidity Analyzer	Capital Controls replaced Filter 2B analyzer.
November 17, 2022	Filter 1B pipework	Selleck Mechanical repaired pin hole leak in pipework.
December 1, 2022	UPS Battery Back up	Replaced battery back up unit for SCADA System.
December 12, 2022	Post Chlorine Analyzer	Capital Controls replaced analyzer.
December 28, 2022	Clearwell Analyzer	Replaced pH probe.

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2022 Cardinal Water Distribution Maintenance Summary

The following is a summary of scheduled maintenance activities that occurred in the Cardinal Distribution System.

Date	System	Maintenance Activity
January 28, 2022	Water Tower	Falcon Security replaced motion detection system.
February 15, 2022	Fire Hydrant	Repaired fire hydrant (struck by vehicle).
April 16, 2022	Water Meters	Repaired water meters and transponders in 5 residential homes.
April 24, 2022	Water Meters	Purchased upgraded Honeywell communication and programming systems with Rideau St Lawrence.
April 26, 2022	Water Meters	Repaired transponders in 3 residential homes.
July 14, 2022	Distribution System	Repaired water main break on Meadowlands Drive, flushed and collected a microbiological sample.
July 18, 2022	Distribution System	Private contractor live tapped and installed a new water service.
July 18, 2022	Water Tower	CCTV robotic inspection.
July 19, 2022	Fire Hydrants	Stelem serviced five fire hydrants
August 9, 2022	Sample Stations	Replaced Dundas St Sample Station.
November 24, 2022	Fire Hydrants	Stelem repaired one fire hydrant.
December 21-22, 2022	Distribution System	Repaired water main break on Medowland Drive, flushed and collected a microbiological sample.
December 22, 2022	Distribution System	Repaired water main break on County Road 2 at Dishaw Street. Flushed fire hydrant post repair.

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Drinking Water Quality Management System Activity Summary

The following DWQMS reviews and exercises were completed in 2022.

Date Completed	DWQMS Element	Review
January 25-26, 2022	19	Internal Audit
January 25, 2022	7-8	Risk Assessment
February 24, 2022	18	Emergency Table Top Exercise
March 30, 2022	14-15	Infrastructure
June 28, 2022	19	NSF 3rd Party Audit
September 12, 2022	20	Management Review

Adverse Water Quality Incidents

The following Adverse Water Quality Incidents occurred in the Cardinal Drinking Water System for the reporting period.

Date	AWQI	Parameter	Standard (mg/L)	Result (mg/L)	Corrective Action	Completion Date
June 28, 2022	158898	Lead Walter Stn	0.01	0.257	Reported, Re-sampled	June 30, 2022
July 13, 2022	159118	Sodium Water Plant	20	20.3	Reported, Re-sampled	July 14, 2022
Dec 22, 2022	161026	Notice of improper disinfection – Water main Break	N/A	N/A	Reported, flushed, and collected sample.	Dec 24, 2022

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Cardinal Water System Complaints

The following table summarizes the complaints received, frequency for the reporting period and corrective actions completed.

Complaint	Frequency	Corrective Action
Frozen water meter	2	Homeowner supplied with new water meter. Cost of meter and installation invoiced to owner.
Noisy water meter	2	Plumber removed and cleaned water meter. Follow up call, plumber replaced defective meter.
Low Water Pressure	2	Plumber removed and cleaned water meter.
Plumbing Leak	3	Curb stop shut off to repair leak in home.