KENORA AREA DRINKING WATER SYSTEM 2022 ANNUAL REPORT

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Contents

1.0 Background

This report has been written to meet to requirements of both Section 11 and Schedule 22 of Ontario Regulation 170/03: Drinking Water Systems (O. Reg. 170/03), under the Safe Drinking Water Act 2002 (SDWA). The purpose is to inform the public and Municipal Council on pertinent information.

Section 11 requires the following information be provided to the public:

- A brief description of the drinking water system, including a list of water treatment chemicals used by the system.
- A summary of all adverse water quality incidents reported to the Ministry of the Environment, Conservation and Parks (MECP) and the corrective actions taken.
- A summary of results from tests required under O. Reg. 170/03.
- A summary of major expenses incurred to install, repair or replace required equipment.

Schedule 22 requires the following information be provided to Municipal Council:

- A summary of incidents of regulatory non-compliance and the corrective actions taken.
- A summary of the quantities and flow rates of water supplied, with a comparison to the rated capacity and approved flow rates of the system.

This report is available free of charge to anyone who requests a copy. An electronic copy is available on the City of Kenora website, and anyone wanting to be provided a paper copy can make arrangements to pick one up from the Water Treatment Plant. Staff at the Water Treatment Plant can be contacted to assist in the interpretation of this report if required.

2.0 System Information

2.1 System Description

The Kenora Area Drinking Water System (DWS # 220001423) services the Kenora area, as well as providing water to two subsystems. Subsystems are located on Rocky Heights Road, and on Wauzhushk Onigum Nation.

The Kenora Area DWS distribution system is designated as Class 2, and is comprised of five booster stations, three standpipes and approximately 136 kilometers of watermains.

The Kenora Water Treatment Plant (WTP) is located adjacent to Lake of the Woods, and has a rated capacity of 25,270 cubic meters per day. It is a conventional filtration plant with an upflow clarifier and dual media sand/anthracite filters. Raw water flows by gravity into the lowlift chamber, where it is pumped up to the clarifier by lowlift pumps. Coagulation and flocculation is achieved using aluminum sulfate as a coagulant and Solenis Norfloc 122 polyelectrolyte as a coagulant aid. After filtration, chlorine is added in the mixing chamber prior to the clearwell for primary disinfection. Fluoridation also occurs at this point. Once primary disinfection requirements have been met in the clearwell, the highlift pumps direct the water to the distribution system. Prior to entering the system, trim chlorine is added

to prepare the water for chloramination, sodium hydroxide is added for pH adjustment, and ammonium sulfate is added to produce chloramines as a secondary disinfectant.

2.2 Chemicals Used in Treatment

There were no changes to the chemicals used in treatment in 2022.

Table 1: Chemicals Used in Treatment	
Chemical	Purpose
Chlorine Gas	Disinfection
Aluminum Sulfate	Coagulation
Solenis Norfloc 122 Polymer	Coagulant Aid
Sodium Hydroxide	pH, Alkalinity Adjustment
Sodium Silicofluoride	Fluoridation
Ammonium Sulfate	Chloramination

2.3 Summary of Significant Expenses Incurred

Table 2: Summary of Significant Expenses Incurred			
Project	Expense Type	Location	Value
WTP Backup Generator	Replacement	WTP	$573,604
7th Ave S from 6th St S to 8th St S - Watermain	Replacement	Distribution	$400,290
2nd St S from 6th Ave S to 7th Ave S - Watermain	Replacement	Distribution	$341,505
2nd Ave S from Mike Richards Way to 6th St S - Watermain	Replacement	Distribution	$301,735
2nd St S from 5th Ave S to 6th Ave S - Watermain	Replacement	Distribution	$294,970
Hwy 17 E - Watermain	Replacement	Distribution	$122,270
WTP Transformer	Replacement	WTP	$90,000
Backwash Pump Checkvalves	Replacement	WTP	$28,289
Norman Booster Pump	Replacement	Distribution	$23,354
Standpipe ROV Inspections	Inspection	Distribution	$21,319
Second SCADA Computer	Installation	WTP	$15,721
Distribution Chlorine Residual Analyzers	Installation	Distribution	$14,858
PLC Programming Updates	Upgrade	WTP	$13,409
Trim Chlorine Analyzer	Replacement	WTP	$12,934
Clarifier pH Analyzer	Installation	WTP	$7,362

3.0 Operational Parameters and Regulatory Sampling

3.1 Turbidity and Free Chlorine Monitoring for Primary Disinfection

Turbidity values and chlorine residuals used for the purpose of determining primary disinfection are continuously monitored with online analyzers. This data must be recorded at minimum intervals to satisfy the requirements of O. Reg. 170/03. Chlorine residual measurements must be recorded at least every five minutes, and turbidity values every fifteen minutes.

Filtrate turbidity values must not exceed 1 Nephelometric Turbidity Unit (NTU), and must remain below 0.3 NTU 95% of the time or greater. The free chlorine residual measured as it exits the clearwell must never drop to a point where CT is no longer being met.

There were no occurrences in 2022 where primary disinfection was inadequate. Filter turbidities did not exceed 1 NTU at any time, and periods over 0.3 NTU were negligible. The clearwell chlorine residual dropped below the low alarm setpoint of 0.60 mg/L on one occasion, and operators confirmed adequate primary disinfection using a calculation based on residual value, contact time, pH and temperature factors.

Table 3: Schedule 7 –Chlorine Residual Continuous Monitoring for Primary Disinfection

Monitoring Location	Units	Minimum Value	Maximum Value
Clearwell Effluent	mg/L	0.52	1.93

Table 4: Schedule 7 – Filtrate Turbidity Continuous Monitoring for Primary Disinfection

Monitoring Location	Units	Minimum Value	Maximum Value
Filter #1 Filtrate	NTU	0.019	0.153
Filter #2 Filtrate	NTU	0.016	0.158
Filter #3 Filtrate	NTU	0.018	0.259
Filter #4 Filtrate	NTU	0.020	0.314

3.2 Combined Chlorine Monitoring for Secondary Disinfection

Chlorine residuals are tested in the distribution system twice per week to ensure adequate secondary disinfection. Six samples are taken at the beginning of the week in conjunction with bacteriological samples, and three more samples are taken later in the week at least 48 hours after the first set, and at least 48 hours prior to the beginning of sampling the following week.

Chlorine residuals are also tested in the distribution system for non-routine occurrences such as watermain repairs, boil water advisories, and temporary or seasonal service lines.

A minimum of 0.25 mg/L of combined chlorine must be maintained at all points in the distribution system. Residuals must also remain under the 3.00 mg/L prescribed standard for chloramines. In 2022 there were no adverse events related to distribution chlorine levels.

Table 5: Schedule 7 - Distribution Chlorine Residual Sampling

Sample Type	Samples Taken	Minimum Residual (mg/L)	Maximum Residual (mg/L)	Standard Limits (mg/L)	
Distribution	456	0.62	2.19	0.25	3.00
Dist. (non-routine)	133	0.41	2.19	0.25	3.00

3.3 Raw Water Monitoring

A raw water sample is collected weekly and tested for turbidity, pH and color. Changes in raw water quality can indicate to operators when adjustments to plant processes may be required.

Table 6: Schedule 7 - Raw Water Monitoring

Parameter	Samples Taken	Units	Minimum Value	Maximum Value
Turbidity	52	NTU	0.421	1.82
pH	52	N/A	6.78	8.44
Color	52	Units PtCo	3	41

3.4 Microbiological Sampling

Microbiological samples are taken weekly and are tested for E-coli and Total Coliform, as well as Heterotrophic Plate Count (HPC) in treated water and at least 25% of distribution samples. One sample is taken weekly from both the raw water entering the plant and the treated water leaving the plant, as well as six samples from the distribution system. Samples taken from the distribution system are spread out geographically so that they give an accurate representation of the entire system.

E-coli and Total Coliform should always be absent, and if they are present in any number this is reported to the MECP as an adverse event. In 2022, there were no incidences where total coliform or e-coli were detected in a distribution sample.

Table 7: Schedule 10 - Microbiological Sampling

Sample Type	Samples Taken	Results Range E-coli (CFU/100 ml)		Results Range Total Coliform (CFU/100 ml)		HPC Samples Tested	Results Range HPC (CFU/1 ml)	
Raw	52	0	4	0	365	N/A	N/A	
Treated	52	Absent		Absent		52	0	4
Distribution	312	Absent		Absent		108	0	2
Dist. (non-routine)	64	Absent		Absent		0	N/A	

3.5 Lead Sampling

Under Schedule 15.1 of O. Reg. 170/03 the City of Kenora meets the requirements for reduced sampling. Previous rounds of residential plumbing sampling indicated lead levels did not meet the threshold required for continued annual testing, so lead samples are currently taken from distribution locations every three years. Sampling requirements in 2022 were limited to alkalinity and pH, so no lead sampling data is available for this reporting period.

3.6 Organic Parameters

Sampling occurs annually for the organic parameters listed in Schedule 24 of O. Reg.170/03. Samples are collected from the treated water leaving the Water Treatment Plant. No organic parameters exceeded the prescribed standards in 2022.

Table 9: Schedule 24 - Pesticides

Parameter	Sample Date	Units	Result	Standard Limit
Alachlor	Jan 24, 2022	µg/L	<0.10	5
Atrazine + N-dealkylated metabolites	Jan 24, 2022	µg/L	<0.20	5
Azinphos-methyl	Jan 24, 2022	µg/L	<0.10	20
Carbaryl	Jan 24, 2022	µg/L	<0.20	90
Carbofuran	Jan 24, 2022	µg/L	<0.20	90
Chlorpyrifos	Jan 24, 2022	µg/L	<0.10	90
Diazinon	Jan 24, 2022	µg/L	<0.10	20
2,4-Dichlorophenol	Jan 24, 2022	µg/L	<0.30	900
Diclofop-methyl	Jan 24, 2022	µg/L	<0.20	9
Dimethoate	Jan 24, 2022	µg/L	<0.10	20
Diquat	Jan 24, 2022	µg/L	<1.0	70
Diuron	Jan 24, 2022	µg/L	<1.0	150
Malathion	Jan 24, 2022	µg/L	<0.10	190
Metolachlor	Jan 24, 2022	µg/L	<0.10	50
Metribuzin	Jan 24, 2022	µg/L	<0.10	80
Paraquat	Jan 24, 2022	µg/L	<1.0	10
Pentachlorophenol	Jan 24, 2022	µg/L	<0.5	60
Phorate	Jan 24, 2022	µg/L	<0.10	2
Prometryne	Jan 24, 2022	µg/L	<0.10	1
Simazine	Jan 24, 2022	µg/L	<0.10	10
Terbufos	Jan 24, 2022	µg/L	<0.20	1
2,3,4,6-Tetrachlorophenol	Jan 24, 2022	µg/L	<0.50	100
Triallate	Jan 24, 2022	µg/L	<0.10	230
2,4,6-Trichlorophenol	Jan 24, 2022	µg/L	<0.50	5
Trifluralin	Jan 24, 2022	µg/L	<0.10	45

Table 10: Schedule 24 – Herbicides

Parameter	Sample Date	Units	Result	Standard Limit
Bromoxynil	Jan 24, 2022	µg/L	<0.20	5
Dicamba	Jan 24, 2022	µg/L	<0.20	120
2,4-Dichlorophenoxyacetic acid (2,4-D)	Jan 24, 2022	µg/L	<0.20	100
Glyphosate	Jan 24, 2022	µg/L	<5.0	280
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	Jan 24, 2022	µg/L	<0.20	100
Picloram	Jan 24, 2022	µg/L	<0.20	190

Table 11: Schedule 24 - Volatile Organic Compounds (VOCs)				
Parameter	Sample Date	Units	Result	Standard Limit
Benzene	Jan 24, 2022	µg/L	<0.50	1
Carbon Tetrachloride	Jan 24, 2022	µg/L	<0.20	2
1,2-Dichlorobenzene	Jan 24, 2022	µg/L	<0.50	200
1,4-Dichlorobenzene	Jan 24, 2022	µg/L	<0.50	5
1,2-Dichloroethane	Jan 24, 2022	µg/L	<0.50	5
1,1-Dichloroethylene (vinylidene chloride)	Jan 24, 2022	µg/L	<0.50	14
Dichloromethane	Jan 24, 2022	µg/L	<5.0	50
Monochlorobenzene	Jan 24, 2022	µg/L	<0.50	80
Tetrachloroethylene (perchloroethylene)	Jan 24, 2022	µg/L	<0.50	10
Trichloroethylene	Jan 24, 2022	µg/L	<0.50	5
Vinyl Chloride	Jan 24, 2022	µg/L	<0.20	1

Table 12: Schedule 24 - Other Organic Parameters					
Parameter	Parameter Type	Sample Date	Units	Result	Standard Limit
Benzo(a)pyrene	Polycyclic aromatic hydrocarbon	Jan 24, 2022	µg/L	<0.0050	0.01
Total PCBs	Polychlorinated biphenyl	Jan 24, 2022	µg/L	<0.035	3

3.7 Inorganic Parameters

Sampling occurs annually for the inorganic parameters listed in Schedule 23 of O. Reg.170/03. Samples are collected from the treated water leaving the Water Treatment Plant. No inorganic parameters exceeded the prescribed standards in 2022.

Table 13: Schedule 23 – Inorganics				
Parameter	Sample Date	Units	Result	Standard Limit
Antimony	Jan 24, 2022	µg/L	<0.60	6
Arsenic	Jan 24, 2022	µg/L	<1.0	10
Barium	Jan 24, 2022	µg/L	<10	1000
Boron	Jan 24, 2022	µg/L	<50	5000
Cadmium	Jan 24, 2022	µg/L	<0.10	5
Chromium	Jan 24, 2022	µg/L	<1.0	50
Mercury	Jan 24, 2022	µg/L	<0.10	1
Selenium	Jan 24, 2022	µg/L	<1.0	50
Sodium	Jan 11, 2021	mg/L	11.8	20
Uranium	Jan 24, 2022	µg/L	<2.0	20

3.8 Nitrate and Nitrite

Sampling occurs quarterly for nitrate and nitrite, and samples are collected from the treated water leaving the Water Treatment Plant. Nitrate and nitrite did not exceed the prescribed standards in 2022.

Table 14: Nitrate and Nitrite

Parameter	Sample Date	Units	Result	Standard Limit
Nitrate	Jan 24, 2022	mg/L	0.177	10
	Apr 11, 2022	mg/L	0.192	10
	Jul 04, 2022	mg/L	<0.020	10
	Oct 03, 2022	mg/L	0.037	10
Nitrite	Jan 24, 2022	mg/L	<0.010	1
	Apr 11, 2022	mg/L	<0.010	1
	Jul 04, 2022	mg/L	<0.010	1
	Oct 03, 2022	mg/L	<0.010	1

3.9 Trihalomethanes

Sampling occurs quarterly for THMs, and samples are collected from the furthest point in the distribution system. THMs did not exceed the prescribed standard in 2022.

Table 15: Trihalomethanes (THMs)

Sample Date	Units	Results	Quarterly Average	Running Annual Average	Standard Limit
Jan 24, 2022	µg/L	25.8	27.0	51.0	100
Mar 28, 2022	µg/L	28.2			
Apr 04, 2022	µg/L	34.1	46.3		
Apr 11, 2022	µg/L	33.6			
Apr 19, 2022	µg/L	34.7			
Apr 25, 2022	µg/L	43.9			
May 02, 2022	µg/L	45.5			
May 09, 2022	µg/L	53.6			
May 24, 2022	µg/L	55.1			
May 30, 2022	µg/L	53.5			
Jun 06, 2022	µg/L	54.3			
Jun 13, 2022	µg/L	54.8			
Jul 04, 2022	µg/L	62.5	62.5		
Oct 03, 2022	µg/L	68.1	68.1		

3.10 Haloacetic Acids

Sampling occurs quarterly for HAAs, and samples are collected from a mid-point in the distribution system. HAAs did not exceed the prescribed standard in 2022.

Table 16: Haloacetic Acids (HAAs)					
Sample Date	Units	Results	Quarterly Average	Running Annual Average	Standard Limit
Jan 24, 2022	µg/L	23.7	24.0	38.7	80
Jan 24, 2022	µg/L	24.2			
Apr 11, 2022	µg/L	34.7	34.7		
Jul 04, 2022	µg/L	42.1	42.1		
Oct 03, 2022	µg/L	53.8	53.8		

3.11 N-Nitrosodimethylamine (NDMA)

Sampling occurs quarterly for NDMA as required by the City of Kenora Municipal Drinking Water License (MDWL), and samples are collected from the furthest point in the distribution system. NDMA did not exceed the prescribed standard in 2022.

Table 17: N-Nitrosodimethylamine (NDMA)			
Sample Date	Units	Results	Standard Limit
Jan 24, 2022	ng/L	3.2	9
Apr 11, 2022	ng/L	<0.8	
Aug 08, 2022	ng/L	2.3	
Oct 13, 2022	ng/L	3.3	

4.0 Adverse Water Quality Incidents and Corrective Actions Taken

Schedule 16 of O. Reg. 170/03 requires that any adverse sample results or observations are reported to the MECP and the local Medical Officer of Health. The City of Kenora reported two Adverse Water Quality Incidents (AWQIs) in 2022. The first was a bacteriological sample which was present for total coliform, taken from an isolated temporary watermain not yet connected to consumers. It was later determined not to meet the criteria for an AWQI and wasn't required to be reported. The second was related to a watermain break at a construction site which led to a loss of pressure in the area.

4.1 AWQI #1

On July 22nd, a result from a bacteriological sample taken from a temporary watermain on July 20th was present for total coliform. The sample was taken as part of the commissioning process prior to connecting residences, so no consumers were impacted. The temporary main was flushed and superchlorinated a second time, and follow up samples taken July 25th and 26th were absent of total coliform or e-coli. A Notice of Resolution was submitted to the MECP on July 31st.

4.2 AWQI #2

On September 14th, a valve separated from a watermain on a construction site, leading to a distribution system pressure loss in the area. The leak was isolated and pressure was restored, and affected residents were placed on a Boil Water Advisory (BWA). Flushing was conducted at three locations in the affected area shortly after the separation, and chlorine residuals were taken to ensure an adequate disinfection residual was present. Five bacteriological samples were taken from locations representative of the affected area on Sept 14th and 15th. Prior to receiving results, the temporary service line was damaged by a vehicle overnight on September 16th. The section affected by this event was resampled on September 18th and 19th. Results for the original samples were received on September 20th, and the results for the resample were received September 21st. All samples were absent of total coliform and e-coli, and the BWA's were rescinded on September 20th and 21st. A Notice of Resolution was submitted to the MECP on September 21st.

5.0 Regulatory Compliance

An MECP Inspection of the DWS took place on April 15th, 2022. The final inspection rating was 96.92%. Two non-compliances were identified in the Inspection Report.

5.1 Non-Compliance #1

Non-Compliance: The Overall Responsible Operator (ORO) had not been designated for each subsystem. An ORO was designated at all times for the WTP; however, for a period of approximately six months, an ORO was not designated or identified in the logbooks for the distribution system. In accordance with O. Reg. 128/04, Condition 23. (1), "the owner or operating authority of a municipal residential subsystem shall designate as overall responsible operator of the subsystem an operator who holds a certificate for that type of subsystem and that is of the same class as or higher than that class of subsystem".

Summary of Events Leading to Non Compliance: A turnover in personnel led to a lack of awareness of the requirement to document ORO coverage in the logbook. Although it was not documented properly, the operational aspects of the role were being fulfilled.

Corrective Actions Taken: The distribution system immediately began documenting ORO coverage in the logbook. A letter was provided to the MECP on May 20th indicating that the Water and Wastewater Manager has been designated ORO, and procedure for temporary coverage in the absence of the Water and Wastewater Manager. This process was also included in the Personnel Coverage section of the City's Operational Plan. No further action is required.

5.2 Non-Compliance #2

Non-Compliance: Operators in Charge (OIC) had not been designated for all subsystems which comprise the DWS. An OIC was designated at all times for the WTP; however, on multiple occasions during the inspection review period, an OIC was not designated or identified in the logbooks for the distribution system. In accordance with O. Reg. 128/04, Condition 25. (1), "the owner or operating authority of a subsystem or a person authorized by the owner or operating authority shall designate one or more operators as operators in charge of the subsystem.

Summary of Events Leading to Non-Compliance: A turnover in personnel led to a lack of awareness of the requirement to document OIC coverage in the logbook. Although it was not documented properly, the operational aspects of the role were being fulfilled.

Corrective Actions Taken: The distribution system immediately began consistently documenting OIC coverage in the logbook. A letter was provided to the MECP on May 20th indicating a procedure for the delegation of OIC in the distribution system. This process was also included in the Personnel Coverage section of the City's Operational Plan. No further action is required.

6.0 Flow Data

6.1 Effluent Flow Data

In 2022 the Kenora WTP pumped a total of 2,268,211 cubic meters (m^3) of water to the distribution system. The highest daily flow took place in September, with a total of 9,061 m^3 being pumped on the 19th. This is 36% of the plants rated capacity of 25,270 m^3/day.

Table 18: Effluent Flow Values for 2022

Month	Total Monthly Flow (m^3)	Average Daily Flow (m^3)	Maximum Daily Flow (m^3)
January	177,864	5,841	6,476
February	168,182	6,124	7,643
March	191,887	6,318	7,440
April	184,221	6,315	7,692
May	185,316	6,157	7,128
June	179,998	6,185	7,175
July	196,617	6,540	7,308
August	196,559	6,527	7,283
September	209,437	7,169	9,061
October	207,578	6,874	8,591
November	177,599	6,099	6,996
December	192,953	6,406	7,150

6.2 Influent Flow Data

In 2022 the Kenora WTP pumped a total of 2,512,469 m^3 of raw water from Lake of the Woods. The highest daily flow took place in September, with a total of 10,070 m^3 being pumped on the 30th. This is 39% of the plants water taking limit of 26,000 m^3/day as set out in the Permit to Take Water (PTTW). The highest instantaneous rate at which water was taken from Lake of the Woods was 29,886 m^3/day, which occurred on September 21st. This is 115% of the limit of 26,000 m^3/day set out in the PTTW.

Table 19: Influent Flow Values for 2022

Month	Total Monthly Flow (m^3)	Average Daily Flow (m^3)	Maximum Daily Flow (m^3)
January	201,275	6,493	7,223
February	190,411	6,800	8,298
March	217,655	7,021	8,389
April	209,497	6,987	8,145
May	211,637	6,827	7,826
June	208,423	6,947	8,038
July	216,425	6,981	7,971
August	213,034	6,872	8,288
September	225,113	7,504	10,070
October	222,727	7,185	9,080
November	191,630	6,388	7,144
December	204,642	6,601	7,330

6.3 Historic Flow Data

Total effluent flow has remained relatively stable, with a slight decrease noticeable in 2016. There is no expectation of significant greater demand on the system in the near future.

Table 20: Historic Effluent Flow Values

Year	Total Effluent Flow (m^3)	Average Daily Flow (m^3)	Annual Change	2021 Comparison
2013	2,435,713	6,673	N/A	107%
2014	2,621,655	7,183	+7.6%	116%
2015	2,452,926	6,720	-6.4%	108%
2016	2,066,260	5,661	-15.8%	91%
2017	2,151,431	5,894	+4.1%	95%
2018	2,247,301	6,157	+4.5%	99%
2019	2,229,036	6,107	-0.8%	98%
2020	2,182,328	5,979	-2.1%	96%
2021	2,236,875	6,128	+2.5%	99%
2022	2,268,211	6,214	+1.4%	N/A