The City of Flin Flon
Public Water System Annual Report 2023

The 2023 Annual Water System Report for the City of Flin Flon summarized the Water Utility's ability to produce safe drinking (potable) water that meets all provincial regulatory requirements.

Flin Flon

MANITOBA, CANADA

The City of of Flin Flon
Public Water System Annual Report 2023

Water System Information

Name of Public Water System: *Flin Flon Public Water System*

Name of the Legal Owner: The *City of Flin Flon*

Contact Person: *James Reitlo, Assistant Director of Public Works*

Phone: (*204) 687-0499*

Email: *jreitlo@flinflon.ca*

Website: *www.cityofflinflon.ca*

City Hall General Inquiries: (*204) 681-7511*

Emergency Phone Number: (*204) 687-0676*

Names of Water Treatment Plant Operators:

James Reitlo

Garett Pelly

Names of Water Distribution System Operators:

Michelle Kryschuk

Jon Evans

Mike Weseen

Brian Meikle

Shayne Chutskoff

Date Completed*: January 15th, 2023.*

James Reitlo

Assistant Director of Public Works

The City of Flin Flon

Contents

Introduction

The 2023 Annual Report of The City of Flin Flon outlines the City of Flin Flon Water Utility's capacity to generate safe potable water which meets the rigorous standards of the provincial regulations. This document aims to offer the public comprehensive information on the quality of the drinking water they use. The report will be accessible on the City of Flin Flon website at www.cityofflinflon.ca .

The potable water treated at the Water Treatment Plant aligns with the health and aesthetic standards specified in the Guidelines for Canadian Drinking Water Quality.

If you have additional questions, please contact:

James Reitlo, City of Flin Flon at jreitlo@flinflon.ca (204) 687-0499.

Classification and Certification

1. The water system facility classifications for the 2023 year:
    - Class III (3) - Water Treatment Facility Classification
    - Class II (2) - Water Distribution Facility Classification

2. The water system staff and certification levels for the 2023 year:

Employee	Water Treatment	Water Distribution
BAILEY, Regan		Class I
BATTESON, Anthony		Class I
BOUTEILLER, Tyler	Class II	Class II
CHURCH, Allen		
CHUTSKOFF, Shayne		Class I
CIANFLONE, Tony		Class II
EVANS, Jon	Class II	Class II
FORD, Curtis	Class I	Class II
FUNK, Mike	O/T	Class II
KITTLE, Ken		Class II
Kryschuk, Michelle	Class I	Class II
MEIKLE, Brian	O/T	Class I
WESEEN, Mike	Class II	Class II
PELLY, Garrett		
Reitlo, James	Class II	Class II

The table above does not include Wastewater Treatment and Collection Operator Certification (Class – other). Wastewater Treatment and Collection Operators repair and maintain the Water Distribution and Wastewater Collection systems. Certification and classification is done according to the Environment Act's Water and Wastewater Facility Operators Regulation.

Water System

The City of Flin Flon Public Water System provides potable water to approximately 5,099 persons, about 4,940 in Manitoba and 159 of who live in Flin Flon, Saskatchewan (Statistics Canada 2021 Census). With the new Water Treatment Plant being online as of August 2013, treated water currently meets all health and aesthetic objectives as regulated by the Guidelines for Canadian Drinking Water Quality.

The Water Treatment Plant is under The City of Flin Flon's operating license number: **PWS-08-136-03**

Water Supply Source

The City of Flin Flon's Cliff Lake Pumphouse receives water from Cliff Lake, located approximately 2.25 km North of the Water Treatment Plant (WTP), on the south shore of Cliff Lake. Raw water is pumped through twin feeder mains (installed in 2008) from the Cliff Lake Pumphouse to the Water Treatment Plant facility.

Cliff Lake Pumping Station was constructed in 1951 and upgraded in 1964. This facility previously provided a coarse intake screen, a basic rock filter, chlorine gas injection, and fluoridation (was discontinued in 2011). Upgrades in 2012 included a new gravity raw water intake line and DFO fish screen, 3 new pumps (98L/s + 10% waste stream for membrane system, reduced in size resulting from pumping directly into new WTP, not into the distribution system, and decommissioned the existing chlorination system).

The raw water supply to the Water Treatment Plant facility consists of two buried, parallel, 250-mm diameter HDPE raw water delivery mains. The two (2) buried pipe watermains allow for the recirculation of the raw water between the raw water pump house and the WTP, if required. The requirement for recirculation of water is to prevent freezing of the raw water within the pipe during winter months if the WTP is down for an extended period.

Water Treatment Process

The current Water Treatment Plant was constructed between 2011 and 2013 and was officially brought on-line in August 2013. The water treatment pre-filtration process consists of raw water flash mixing with Aluminum Chlorohydrate (ACH) to create a pin-floc coagulation pre-treatment before splitting to feed dual train spaghetti-style membrane-based ultrafiltration (UF) process trains to purify the water. Each train is sized to deliver 3,800 m^3/day (2,640 l/min) finished water at a designed recovery of 95%. These processes are designed to clarify the water and remove microbial contaminants, such as bacteria, and organic materials that are naturally found in surface waters before chlorination. The filtered water is chlorinated using chlorine gas and pH adjustment is achieved with Sodium Hydroxide (Caustic Soda) before being stored below the Water Treatment Plant in the dual cell 4,000 m^3 storage reservoir.

Gaseous chlorine serves as an additive to the treated water, aimed at neutralizing and eradicating residual microorganisms or pathogens post-filtration. Adequate residual chlorine levels within the distribution network, recognized as the residual free chlorine level, also serve to safeguard the quality of potable water by preempting recontamination. The free chlorine residual levels are continuously

monitored before the water's introduction into the distribution system at the Water Treatment Plant and at #1 Heating Plant. Supplementary chlorine is added to maintain adequate residual chlorine levels within the distribution network.

Water Storage Reservoirs

Water Reservoir	Capacity	675,000 gallons (3,068 m^3)
Water Treatment Plant	Capacity	879,877 gallons (4,000 m^3)

Total water storage represents approximately 1 day of potable water storage.

Distribution System

The City of Flin Flon's distribution system currently consists of a raw water pumphouse, two supply mains, water treatment plant (including below ground reservoir, distribution/re-circulation/heating plant), aground level reservoir, 1 heating/re-circulating plant, 1 secondary distribution plant, and a double main re-circulating system.

Water from the Cliff Lake Water Pumphouse is pumped to the Water Treatment Plant, which is the first distribution point. Water is then pumped from the Water Treatment Plant to the Hilltop Reservoir which

supplies No. 1 Heating Plant as a distribution point, and No. 3 Heating Plant as a secondary distribution point.

The distribution system is a double main re-circulating system that is fed by supply mains to all connections. Return mains bring unused water back to a common header where this water is then re-distributed by the supply mains. Due to above ground and shallow bury water mains, re-circulation is required to keep the water moving so it will not freeze during the winter months.

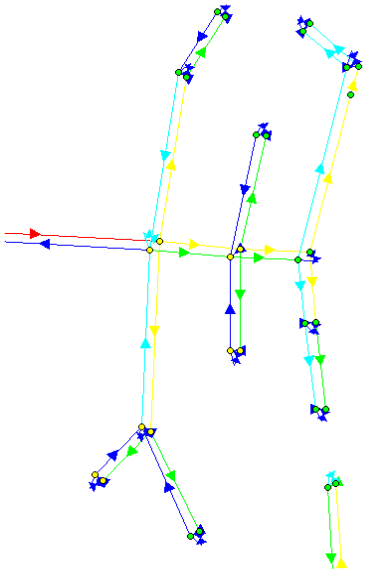
The distribution piping is mainly comprised of cast iron, ductile iron, PVC, polyethylene, and copper.

The water distribution system in Flin Flon was specifically designed to prevent freezing of watermains placed in shallow trenches or above ground utilidors. The water is heated and recirculated throughout the distribution system to prevent freezing. Freeze protection is required in the system primarily as a result of low water temperature at the supply source (lake) and depth of frost penetration greater than the depth of bury resulting from shallow Precambrian bedrock. Water and sewer mains are laid in a common box utilidor on the surface where rock is outcropping and at or near the surface in other sections.

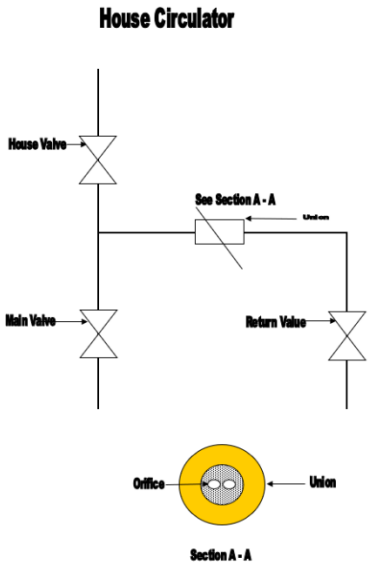
The double main circulation system is the type of water distribution system utilized in Flin Flon. The system generally consists of a series of loops of large diameter (200 mm and 150 mm) supply lines and small diameter (150 mm and 100 mm) return lines which originate and terminate at heating plants where heat input and recirculation pumping is provided. Smaller diameter supply (75 mm) and return (50 mm) lines branch off main loops to provide water supply to lesser areas. Building service connections consist of a supply (16 mm) line and a return line which recirculate the water through the house.

In addition to circulation through the building service lines, circulation is further maintained at the main loops by means of smaller diameter (13 mm) pipe interconnection of the supply and return mains. In building service connections, circulation is maintained by inserting an orifice plate where supply and return lines connect inside the house. This orifice plate allows a controlled circulation flow to be maintained in the building service line.

The above-grade timber frame utilidor box construction consists of both water and sewer mains installed in rough, treated lumber planking and filled with wood shavings for insulation. The utilidor is mainly constructed of 50 mm thick treated planking.



Typical Service Connection



Household Service Connection

Unique Distribution System

Number of Connections, Population Served and Types of Water Users

The City of Flin Flon is comprised of approximately 2280 service connections, 303 of which are metered, and the remaining are residential flat rate accounts. The City of Flin Flon Public Water System provides potable water to approximately 5,099 persons, about 4,940 in Manitoba and 159 of who live in Flin Flon, Saskatchewan (Statistics Canada 2021 Census).

Water Usage in 2023

The City of Flin Flon consumed a total of **1,489,645** m^3 (327,721,853 Imperial gallons) of treated water in 2023. In 2023, the monthly average consumption levels decreased with the repair of discovered underground leaks. The peak period of water consumption occurred in the month of March. September had the lowest monthly consumption of the year.

Based on the 2023 total consumption of water by all sources including residential homes, businesses, industrial operations within the city limits, and water lost to water main breaks, residents of the City of Flin Flon consumed 176 Imperial Gallons per person per day (IGCD) or 800 liters of water per person per day (LCD). There was a decrease over the past year, but the rate of consumption remains greater than the 2019 National Average of 411 LCD.

Disinfection System in Use

The final step in the treatment of safe water is disinfection. Disinfection is the selective destruction or inactivation of potential disease causing organisms in water. As per the Drinking Water Safety Act the City of Flin Flonis required to ensure a disinfectant residual of at least:

- 0.5 mg/L of Free Chlorine entering the distribution system following a minimum contact time of 20 minutes.
- 0.1 mg/L of Free available Chlorine at all times at any point in the water distribution system

Primary disinfection of the filtered water is accomplished using chlorine gas. Chlorine is added to the treated water to produce Free Chlorine. Chlorine gas is added to the water using a Wallace and Tiernan V-Notch gas feeder system. Sodium Hypochlorite is also added ti #1 Heating Plant using a diaphragm pump to assist in maintaining a safe level of chlorine in the drinking water.

Equipment Redundancy and Monitoring Requirements

Chlorine gas is stored in a separate room in 68 kg cylinders. Two chlorine cylinders are always connected to the chlorine feed system and an automatic transfer system is in place. Each cylinder can supply the full amount of chlorine required for disinfection at peak demand. Parts and maintenance kits for all chlorination equipment are always kept at the WTP.

Disinfectant Residual Overall Performance/Results

For 2023, the City of Flin Flon has met all regulatory requirements in regard to monitoring and reporting disinfection residuals in the water leaving the water treatment plant as well as in the distribution system.

Water Quality Standards

The Province of Manitoba has adopted a number of water quality standards from the Guidelines for Canadian Drinking Water Quality, developed by Health Canada. The parameters are health based and

they express the maximum acceptable concentration for a surface water supply source. Concentration values in excess constitutes a health-related issue and require corrective actions.

Samples are submitted to ALS Laboratory Group for analysis. All water quality test results are submitted to the provincial Office of Drinking Water for review.

Distribution Results:

Bacterial testing: Biweekly samples are tested with each set of samples consisting of one raw water, one treated, and a minimum of two distribution water samples for a requirement of having less than one total bacteria detectable per 100 mL in all treated and distributed water and having less than one total E. coli bacteria detectable per 100 mL in all treated and distributed water. If these bacteria are present in the water, it is an indication that disease causing organisms may also be present.

Disinfectant testing: Free chlorine is continuously sampled from water entering the distribution system following at least 20 minutes of contact time and a daily manual confirmation sample is taken at the online chlorine analyzer sampling point. Free and total chlorine levels are tested at the same times and locations as bacteriological distribution system sampling.

Trihalomethane testing: **Trihalomethane (THM's)** is formed as a by-product when chlorine is used to disinfect water. They result from the reaction of chlorine and organic matter in the water being treated. The THM's produced may have adverse health effects at high concentrations.

Haloacetic Acid testing: **Haloacetic acids (HAAs)** are a common undesirable by-product of drinking water chlorination. Exposure to such disinfection by-products in drinking water, at high levels over many years, has been associated with a number of health outcomes by epidemiological studies.

Water Quality Standards		***Percent Compliance***	***Corrective Action Forms***
Bacterial			
E. coli	Less than one E. coli bacteria detectable per 100 mL in all treated and distributed water	**100**	**0**
Total coliform	Less than one total coliform bacteria detectable per 100 mL in all treated and distributed water	**100**	**0**
Disinfection			
Chlorine Residual	A free chlorine residual of at least 0.5 mg/L in water entering the distribution system following a minimum contact time of 20 minutes A free chlorine residual of at least 0.1 mg/L at all times at any point in the water distribution system	**100**	**0**
Turbidity			

Turbidity	Less than or equal to 0.1 NTU in 99% of the measurements in a month of the effluent from each ultrafiltration unit Not exceed 0.3 NTU for any measurement	**100**	**0**
Membrane Integrity			
Membrane Integrity	Minimum log removal value (LRV) of 3.00 for Cryptosporidium and Giardia	**100**	**0**
Chemical			
Total Trihalomethanes (THMs)	Less than or equal to 0.10 mg/L as locational annual average of quarterly samples	**100**	**0**
HAA's	Less than or equal to 0.08 mg/L as locational annual average of quarterly samples	**100**	**0**
Lead	Less than or equal to 0.005 mg/L based on a sample(s) collected at a cold water tap or other appropriate location where water may be used for drinking or food preperation	**96**	**N/A**
Manganese	Less than or equal to 0.12 mg/L	**100**	**0**

Monitoring Requirements		***Percent Compliance***
Bacterialogical		
Total coliform and *E. coli*	Biweekly sampling program with each set of samples consisting of one raw, one treated and a minimum of two distribution samples	**100**
	Consecutive sample sets must be separated by at least 12 days	**100**
Disinfection		
Free chlorine (treated water)	Continuous sampling of water entering the distribution system following at least 20 minutes of contact time. A confirmation sample to be taken daily at the online chlorine analyzer sampling or effluent point.	**100**
Free chlorine (distribution system)	At the same times and location(s) as bacteriological distribution system sampling	**100**
Total chlorine (treated system)	One sample per day of water entering the distribution system following at least 20 minutes of contact time.	**100**

Total chlorine (distribution water)	At the same times and location(s) as bacteriological distribution system sampling	**100**
Turbidity		
Turbidity	One raw sample per day. Continuous sampling of the effluent from each ultrafiltration unit. A confirmation sample to be taken daily at the online turbidity analyzer sampling or effluent point.	**100**
Turbidity (distribution water)	At the same times and location(s) as bacteriological distribution system sampling	**100**

Membrane Integrity		
Membrane Integrity	Daily direct integrity testing for each ultrafiltration unit.	**100**
Chemistry		
General Chemistry	One Raw and one treated water sample every year	**100**
Total Metals (distribution system)	One sample taken at the same time(s) as general chemistry sampling at a mid-point in the distribution system	**100**
Total Trihalomethanes (THMs) (distribution system)	One preserved sample taken on a quarterly basis during February, May, August, and November, every second year at the furthest point in the distribution system	**100**
Total Haloacetic Acids (HAA's) (distribution system)	One preserved sample taken on a quarterly basis during February, May, August, and November, every second year at the furthest point in the distribution system	**100**
Lead	A minimum of 20 residential tap water samples collected throughout the year, with 2/3 of the samples being collected between June and October	**100**

Water Treatment Test Parameters

Chlorine

- A free chlorine residual of at least 0.5 mg/L in water entering the distribution system following a minimum contact time of 20 minutes.

Meter Type	Test Parameter	Standard	Average Result	Did the results meet the performance standard?	# of Samples in 2023
Desktop Meter	Free Chlorine Residual	>0.5 mg/L	0.755 mg/L	100% of the time the result met the standard	365
On-line Meter	Free Chlorine Residual	>0.5 mg/L	0.750 mg/L	100% of the time the result met the standard	Continuous

Turbidity

- Less than or equal to 0.1 NTU in 99% of the measurements in a month of the effluent from each ultrafiltration unit.
- Not exceed 0.3 NTU for any measurement.

Online continuous turbidity analyzer location	DWQG MAC	Average Result (# times >0.3 NTU)	Did results met the performance standard?
Filter Train #1 Effluent Turbidity	<0.1 NTU	0.023 NTU	Yes
	<0.3 NTU	0	Yes
Filter Train #2 Effluent Turbidity	<0.1 NTU	0.029 NTU	Yes
	<0.3 NTU	0	Yes

Portable confirmation sample	Test Parameter	DWQG MAC	Did the results meet the performance standard?
Filter Train #1 Effluent Turbidity	Turbidity NTU	≥ 0.10 NTU	100% of the time the result met the standard
Filter Train #2 Effluent Turbidity	Turbidity NTU	≥ 0.10 NTU	100% of the time the result met the standard

Lead Sampling

The City of Flin Flon is required to sample 20 locations within the city for lead. 24 samples were taken, six (6) locations required resampling. One (1) location's resample was above National Guidelines.

# Samples	Guideline (MAC) mg/L	Minimum Value	Maximum Value
24	0.005	0.000183	0.0703

# Resamples	Guideline (MAC) mg/L	Minimum Value	Maximum Value
6	0.005	0.00241	0.0126

Water System Failures and Corrective Actions

In 2023, there were no major water system failures or associated corrective actions required. There have been numerous distribution water piping repairs requiring localized depressurization during the year.

Water Treatment Plant Upgrades

The City of Flin Flon completed a Water Treatment Plant filter module replacement (108 filter modules) in 2023. Veolia (SUEZ) provided system controls and programming adjustments as required for the new membranes including adjustment of set points for permeate, backpulse, LRV, and airflow. The separated backwash sequence is a modified backwash sequence in which the modules are backpulsed and aerated separately. This modification reduces wear and tear on the membrane fibers and will increase the membrane's life cycle.

Drinking Water Safety Orders and Actions Taken in Response

In 2023, no Drinking Water Safety Orders were issued for the City of Flin Flon Public Water System.

Water Advisories and Actions Taken in Response

Water Advisories are issued for a drinking water system or a drinking water source by a Medical Officer of Health (Manitoba Health) due to a confirmed or suspected water quality problem. Affected residents and businesses are notified in the event an advisory is issued and provided with instructions on precautionary measures.

When the safety of the drinking water supply is confirmed, the boil water advisory will be lifted and the public will be told that they can drink the tap water again. In most instances, normal water use can continue as usual immediately following the lifting of the advisory.

Additional information and Fact Sheets can be found on the following link:

https://www.gov.mb.ca/sd/about/articles-and-publications/index.html?wg=odw&term=factsheetboil

Boil Water Advisories

In 2023, there were twenty-three (23) localized Boil Water Advisories (BWA) issued to sections of the Flin Flon Public Water System. The BWA's were for areas during the water main breaks/repairs causing depressurization of the piping.

Actions Taken in Response

N/A

Warnings issued or charges laid on the system in accordance with the Drinking Water Safety Act

In 2023, no warnings were issued for the Flin Flon Public Water System.

Past / Present /Future Initiatives for Improvement

City will continue with its effort to replace the aging water main infrastructure with a commitment to provide its citizens with a reliable water system and most importantly - safe drinking water.

Past:

Recent Major Infrastructure Upgrade Projects Done in 2019

The City of Flin Flon's above ground concrete Hilltop Reservoir was constructed in 1978 as part of a Manitoba Water Services Board project to provide additional in-town water storage. Structural remediation and the installation of a new drop-in low-density polyurethane liner in the interior of the cast-in-place concrete reservoir fixed the leakage plaguing the reservoir for years. As part of the upgrade, the exterior metal cladding, roofing, and insulation was removed and replaced.

Heating Plant #1 was constructed in 1950 and provides water supply and recirculation to approximately half of the City of Flin Flon, including the Ross Park, Hapont, and Callinan recirculation zones. The plant was upgraded when the Reservoir was constructed in 1978. The plant was retrofitted with new piping, pumps, boilers, electrical, and a backup generator.

Present/ On-going:

The City of Flin Flon completed a Water Treatment Plant filter module replacement (108 filter modules) in 2023. The City replaced the water and sewer lines along Aspen Grove. This was a major project including the upgrade of two sewage lift stations and forcemain which doubled their capacities.

Future:

The City will continue with its effort to replace the aging water main infrastructure with a commitment to provide its citizens with a reliable water system and most importantly - safe drinking water.

Appendix A

Sampling Summary

Water General Chemistry Sampling 2023

Samples Collected by the City in 2023	# Collected	# Required	# of Noncompliance	Notes
Raw Water - General Chemistry	1	1	0	Annual
Treated Water - General Chemistry	1	1	0	Annual
Distribution Water - General Chemistry	1	1	0	Annual

Water Treatment Plant Bacteriological Sampling 2023

Samples Collected by the City in 2023	# Collected	# Required	# of Noncompliance	Notes
Treatment Plant – E Coli.	26	26	0	Biweekly
Treatment Plant – Total Coliforms	26	26	0	Biweekly

Distribution System Bacteriological Sampling 2023

Samples Collected by the City in 2023	# Collected	# Required	# of Noncompliance	Notes
Distribution System - THM's & HAA's.	8	8	0	Quarterly
Distribution System - E Coli.	52	52	0	Biweekly
Distribution System - Total Coliforms	52	52	0	Biweekly

Annual General Water Chemistry Summary

Maximum Acceptable Concentrations: Health-based guidelines are established on the basis of comprehensive review of the known health effects associated with each contaminant, on exposure levels and on the availability of treatment and analytical technologies.

Aesthetic Objectives/Other Values: Aesthetic effects (e.g., taste, odour) are taken into account when these play a role in determining whether consumers will consider the water drinkable

Analytical Results for The City of Flin Flon 2023 Total Water Chemistry Parameters

Analyte	Units	Guide Limit #1		Raw Water 08-Mar-23	Treated 08-Mar-23	Guideline Met (Y/N)
Physical Tests (WATER)						
Colour, True	CU	15	-	17.1	<5.0	Y
Conductivity	umhos/cm	-	-	113	118	-
Hardness (as CaCO3)	mg/L	-	-	54.8	53.1	-
Langelier Index (4 C)	No Unit	-	-	-1.0	-1.0	-
Langelier Index (60 C)	No Unit	-	-	-0.23	-0.22	-
pH	pH units	7.00-10.5	-	7.78	7.82	Y
Total Dissolved Solids	mg/L	500	-	45	66	Y
Transmittance, UV (254 nm)	%T/cm	-	-	63.2	83.2	-
Turbidity	NTU	-	-	0.87	<0.10	-
Anions and Nutrients (WATER)						
Alkalinity, Total (as CaCO3)	mg/L	-	-	41.6	39.5	-
Ammonia, Total (as N)	mg/L	-	-	<0.010	<0.010	-
Bicarbonate (HCO3)	mg/L	-	-	50.8	48.2	-
Bromide (Br)	mg/L	-	-	<0.010	<0.010	-
Carbonate (CO3)	mg/L	-	-	<0.60	<0.60	-
Chloride (Cl)	mg/L	250	-	1.68	4.38	Y
Fluoride (F)	mg/L	-	1.5	0.068	0.062	Y
Hydroxide (OH)	mg/L	-	-	<0.34	<0.34	-
Nitrate (as N)	mg/L	-	10	0.0538	0.0456	Y
Nitrite (as N)	mg/L	-	1	<0.0010	<0.0010	Y

Sulfate (SO4)	**mg/L**	**500**	-	7.61	7.46	**Y**
Organic / Inorganic Carbon (WATER)						
Dissolved Organic Carbon	**mg/L**	-	-	10.60	7.30	-
Total Organic Carbon	**mg/L**	-	-	11.00	7.00	-

Bold, italics - indicates detection limit exceeds the guideline value.

Concentration exceeds the guideline value.

Analytical Results for The City of Flin Flon 2023 Total Water Chemistry Parameters

Analyte	Units	Guide Limit #1		Raw Water 08-Mar-23	Treated 08-Mar-23	Distribution 08-Mar-23	Guideline Met (Y/N)
Total Metals (WATER)							
Aluminum (Al)-Total	**mg/L**	**0.1**	**2.9**	**0.527**	0.0092	0.0092	**Y**
Antimony (Sb)-Total	**mg/L**	-	**0.006**	0.00605	0.00160	0.00160	**Y**
Arsenic (As)-Total	**mg/L**	-	**0.01**	0.02050	0.00089	0.00091	**Y**
Barium (Ba)-Total	**mg/L**	-	**2**	0.02050	0.0093	0.0094	**Y**
Beryllium (Be)-Total	**mg/L**	-	-	<0.00010	<0.00010	<0.00010	-
Bismuth (Bi)-Total	**mg/L**	-	-	<0.000050	<0.000050	<0.000050	-
Boron (B)-Total	**mg/L**	-	**5**	0.016	0.010	<0.010	**Y**
Cadmium (Cd)-Total	**mg/L**	-	**0.005**	0.001980	0.000251	0.000264	**Y**
Calcium (Ca)-Total	**mg/L**	-	-	14.9	14.4	14.3	-
Cesium (Cs)-Total	**mg/L**	-	-	0.000059	<0.000010	<0.000010	-
Chromium (Cr)-Total	**mg/L**	-	**0.05**	0.00137	<0.00010	0.00011	**Y**
Cobalt (Co)-Total	**mg/L**	-	-	0.00050	<0.00010	<0.00010	-
Copper (Cu)-Total	**mg/L**	**1**	**2**	0.0430	0.0049	0.0112	**Y**
Iron (Fe)-Total	**mg/L**	**0.3**	-	**0.995**	<0.010	<0.010	**Y**
Lead (Pb)-Total	**mg/L**	-	**0.005**	**0.00661**	<0.000050	<0.000050	**Y**
Lithium (Li)-Total	**mg/L**	-	-	0.0029	0.0022	0.0022	-
Magnesium (Mg)-Total	**mg/L**	-	-	4.27	4.13	4.00	-
Manganese (Mn)-Total	**mg/L**	**0.02**	**0.12**	**0.405**	0.00034	0.00022	**Y**
Molybdenum (Mo)-Total	**mg/L**	-	-	0.000150	0.000094	0.000094	-
Nickel (Ni)-Total	**mg/L**	-	-	0.00145	<0.00050	<0.00050	-
Phosphorus (P)-Total	**mg/L**	-	-	0.129	<0.050	<0.030	-
Potassium (K)-Total	**mg/L**	-	-	1.35	1.18	1.20	-
Rubidium (Rb)-Total	**mg/L**	-	-	0.00228	0.00116	0.00119	-
Selenium (Se)-Total	**mg/L**	-	**0.05**	0.000589	0.000106	0.000169	**Y**
Silicon (Si)-Total	**mg/L**	-	-	2.94	1.86	1.86	-
Silver (Ag)-Total	**mg/L**	-	-	0.000028	<0.000010	<0.000010	-
Sodium (Na)-Total	**mg/L**	**200**	-	2.18	2.16	1.89	**Y**
Strontium (Sr)-Total	**mg/L**	-	**7**	0.0373	0.0358	0.0358	**Y**
Tellurium (Te)-Total	**mg/L**	-	-	<0.00020	<0.00020	<0.00020	-
Thallium (Tl)-Total	**mg/L**	-	-	0.000020	<0.000010	<0.000010	-
Thorium (Th)-Total	**mg/L**	-	-	<0.00010	<0.00010	<0.00010	-
Tin (Sn)-Total	**mg/L**	-	-	<0.00010	<0.00010	<0.00010	-
Titanium (Ti)-Total	**mg/L**	-	-	0.02790	<0.00030	<0.00030	-
Tungsten (W)-Total	**mg/L**	-	-	<0.00010	<0.00010	<0.00010	-
Uranium (U)-Total	**mg/L**	-	**0.02**	0.000095	<0.000010	<0.000010	**Y**
Vanadium (V)-Total	**mg/L**	-	-	0.00223	0.00061	0.00055	-
Zinc (Zn)-Total	**mg/L**	**5**	-	0.226	0.0241	0.0251	**Y**
Zirconium (Zr)-Total	**mg/L**	-	-	0.000300	<0.00020	<0.00020	-

Bold, italics - indicates detection limit exceeds the guideline value.

Concentration exceeds the guideline value.