2020
PUBLIC WATER SUPPLY SYSTEM
ANNUAL REPORT

Brandon, Manitoba

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Annual Report

Contents

INTRODUCTION

1.0 PREAMBLE

The City of Brandon Water Supply System is pleased to present this year's Annual Report. This report provides information about the quality of water services delivered to the City of Brandon every day. The goal is to provide all water users with a safe and reliable drinking water supply and to inform existing and future users of the efforts made to continually improve the water supply system.

The City of Brandon (the City) owns and operates its public water supply system and it is regulated by Manitoba Water Stewardship's Office of Drinking Water to produce potable water under the *Drinking Water Safety Act*. In accordance with the *Drinking Water Safety Act*, the City's water supply system operates under a provincial licence. The Operating Licence has a five-year term and prescribes the terms and conditions required in order for the Utility to remain in compliance with the *Act*. The *Act* and supporting regulations can be viewed at the following website: Drinking Water Quality Standards Regulation, M.R. 41/2007 (gov.mb.ca)

In February 2016, the City's Operating Licence was amended, specifying that an Advisory Notification Plan be maintained and submitted to the Office of Drinking Water by May 1st of each year. Through the team effort of Development Services, Police, Corporate Communications, Emergency Management, and other Departments, the City's Water Supply System Public Emergency Notification Plan was developed and submitted prior to the May 1st deadline. The Plan has been updated and maintained annually ever since.

The Senior Regional Drinking Water Officer conducted the 2020 annual compliance audit of the City's water supply system. The purpose of this audit was to confirm compliance with *The Drinking Water Safety Act,* applicable regulations, and the terms and conditions of the Operating Licence.

This annual report will cover all compliance and non-compliance issues within the regulations and will discuss any corrective actions required to bring non-compliance issues within compliance as per the regulations.

2.0 DESCRIPTION OF THE WATER SUPPLY SYSTEM

The City's Water Supply System provides potable water to over 49,000 residents. The treated water that the water system produces has a defined number of parameters that are used to establish and monitor potable water quality. These parameters are to be in compliance with the Province of Manitoba *Drinking Water Quality Standards Regulation* under the *Drinking Water Safety Act*.

2.1 Water Treatment Source Water Supply

The City's Water Treatment Facility draws its source from the Assiniboine River. The Assiniboine's flow is controlled by the Shellmouth Dam located north of Russell, Manitoba. Major tributaries to the Assiniboine River are the Qu'Appelle River from the west, and the Little Saskatchewan River from the north, with dams at Minnedosa, Rapid City, and Rivers, Manitoba.

Water flows from the Assiniboine River to the intake wells through four gates located in the intake structure on the riverbank. From these gates, the water flows into two separate intake chambers and then through 1500 mm pipes from each chamber to a central circular well. From the circular well, the water flows through a 1500 mm pipe approximately 300 meters to the raw water wells located inside the Water Treatment Facility.

Potassium permanganate and activated carbon are added to the raw water, prior to entering the Water Treatment Facility, to help reduce taste and odor producing compounds during the spring and summer months.

2.2 Water Treatment Process

The City of Brandon currently utilizes a conventional water treatment process. The multiple barrier treatment approach is the guiding principle for providing safe drinking water. Low lift pumps deliver the raw water directly to three solid contact units inside the Water Treatment Facility. These units have a combined nominal design capacity of 54 Mega liters per day. The two smaller process trains each have a nominal design capacity of 13.6 Mega liters per day. The largest process train has a nominal design capacity of 27.2 Mega liters per day. Each process train combines the functions of solids contacting, mixing, coagulation, flocculation, solids-water separation and sludge removal inside a single tank. Alum is added at the low lift pumps for coagulation and anionic polymer is added to the solids contact unit for flocculation. Lime and soda ash are added into the solids contact units to soften the water.

Chemicals are added to the solids contact units by feed pipes from the various chemical feed systems. These pipes extend down into the reaction zone of the solids contact units. The excessive sludge that is formed settles and is removed from the process by blow down valves at the bottom of each of these units. This sludge goes to a receiving station where the heavier particles settle to the bottom and the clear water overflows a weir and goes back to the river. The heavier sludge is pumped to a gravity thickener inside the Sludge Dewatering Facility where it is mixed with anionic and cationic polymers, then pumped onto belt presses where the water is separated via the belt presses. The dried sludge from the Sludge Dewatering Facility is transported and used on farmers' fields for soil conditioning purposes. Approximately 42-63 tonnes of sludge is removed per day.

Following the treatment softening process in the solids contact units, carbon dioxide is diffused through the water in a re-carbonation basin to control the pH level in the water so that it is suitable for human consumption and provides corrosion control for pipes. The stabilized water from the re-carbonation basin flows through 16 rapid sand filters into clear well storage located

inside the Water Treatment Facility. Before the finished water is pumped to the distribution system, chlorine is added to the water for disinfection and fluoride is added for tooth protection. To provide an extra measure of safety, the water is finally disinfected with ultraviolet light before it is distributed from the Water Treatment Facility.

2.3 Distribution System

The high lift pumps at the Water Treatment Facility convey water to the distribution system and the 9th Street Reservoir. There are also two transfer pumps inside the Water Treatment Facility that can pump directly to the Reservoir, bypassing the distribution system. These transfer pumps can act as a backup for the high lift pumps to move water through the City. The Reservoir provides a short term water reserve for the City if additional water demand is required. There are four booster pumping stations located on the distribution system which help to maintain constant water pressure throughout the City, in addition to the pumping station located at the Reservoir.

2.4 Groundwater Supply

The City maintains two emergency supply wells along the Assiniboine River Valley. These wells were completed in 1996 in order to provide the City with a short-term emergency back-up source of water in the event that the Assiniboine River source becomes temporarily interrupted. Although the annual groundwater withdrawal is limited, since 2011, the City has been authorized to use the wells to blend with the river source during spring runoff and other periods when the river turbidity is high or the quality is poor from elevated organic carbon and hardness. Turtle Crossing Well will hopefully be back in service in 2021 after extensive damage due to flooding.

WATER QUALITY

3.0 WATER QUALITY STANDARDS

The following regulatory requirements form the basis of the City's water supply system operation in regards to monitoring and reporting in accordance with the Operating Licence. The standards are unchanged from the previous year.

3.1 List of Water Quality Standards

The Province of Manitoba has adopted a number of health-based parameters that the water supply system is required to achieve. The water quality standards are specified in **Table 1**.

Table 1. Water Quality Standards

Parameter	Quality Standard
Total coliform	Less than one total coliform bacteria detectable per 100 mL in all treated and distributed water
E.coli	Less than one *E. coli* bacteria detectable per 100 mL in all treated and distributed water
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
Ultraviolet Disinfection	• 95% of water produced per month is disinfected within validated conditions
Turbidity	• Less than or equal to 0.3 NTU in 95% of the measurements in a month of the effluent from each operating filter • Not exceed 0.3 NTU for more than 12 consecutive hours of filter operation • Not exceed 1.0 NTU for any continuous measurement
Total trihalomethanes (THMs)	Less than or equal to 0.10 mg/L as locational running annual average of quarterly samples
Total haloacetic acids (HAAs)	Less than or equal to 0.08 mg/L as locational running annual average of quarterly samples
Arsenic	Less than or equal to 0.01 mg/L
Benzene	Less than or equal to 0.005 mg/L
Ethylbenzene	Less than or equal to 0.14 mg/L
Fluoride	Less than or equal to 1.5 mg/L
Lead	Less than or equal to 0.005 mg/L in the water distribution system
Nitrate	Less than or equal to 45 mg/L measured as nitrate (10 mg/L measured as nitrogen)
Trichloroethylene	Less than or equal to 0.005 mg/L
Tetrachloroethylene	Less than or equal to 0.03 mg/L
Toluene	Less than or equal to 0.06 mg/l
Total xylenes	Less than or equal to 0.09 mg/l
Uranium	Less than or equal to 0.02 mg/L

4.0 WATER QUALITY RESULTS

The results of the City's water testing program are detailed, as required, in the following sections.

4.1 Bacteriological

As indicated in **Table 1,** the Office of Drinking Water directive on regulatory information for public water systems requires less than one *Escherichia Coli (E. coli)* per 100-milliliter sample of water, and less than one Total Coliform per 100-milliliter sample of water, collected from the water distribution system.

The Water Treatment Facility Operators collect weekly water samples from the Assiniboine River, the laboratory tap in the Water Treatment Facility, and 13 separate locations throughout the entire City to confirm bacteriological compliance. In 2020, there were over 800 routine tests performed for Total Coliform and *E. coli* from the City's water distribution system.

4.2 Disinfection

On Monthly Disinfection Reports, the City must record and report the results of disinfection monitoring to the Senior Regional Drinking Water Officer. Corrective Action Report forms must also be completed in instances where adequate chlorine residuals have not been met.

The minimum chlorine residual entering the distribution system following at least 20 minutes of contact time at the Water Treatment Facility is 0.5 mg/L. The chlorine residuals at the Water Treatment Facility are to be controlled to ensure that this requirement is met. This is an extremely important part of the operation in order to disinfect the water against bacteria and viruses. Chlorine residuals are also maintained throughout the distribution system to ensure adequate disinfection. It is continuously monitored and controlled by an online analyzer on the treated water leaving the facility to keep enough chlorine in the water to safeguard against viruses and bacteria. With over 107,000 online samples taken in 2020, there were no incidents where the residual was less than 0.5 mg/l.

Every week the Water Treatment Facility Operators test the water for chlorine residuals at each of the bacteriological sample locations throughout the City. The City is required to maintain at least 0.10 mg/L free chlorine residual in the distribution system. With over 800 free chlorine samples collected in 2020, there were no incidences where the residual was less than 0.1mg/L.

To guard against an outbreak of Giardia lamblia and Cryptosporidium, the Water Treatment Facility practices a multi-barrier approach, utilizing coagulation/filtration along with chlorination and ultraviolet disinfection of the water before it leaves the facility. The Water Treatment Facility's ultraviolet (UV) light disinfection equipment and controls must be maintained to achieve results greater than or equal to 95% of the water produced per month undergoing UV light disinfection within validated conditions and at a minimum dose of 24

mJ/cm^2. In 2020, the Water Treatment Facility operated and maintained the ultraviolet disinfection systems as required by the regulators. Regular monthly ultraviolet disinfection reports are submitted to the Office of Drinking Water.

4.3 Turbidity

The water supply system has to meet specific turbidity standards and ensure that appropriate monitoring and reporting programs are in place to demonstrate compliance with the standards. The Water Treatment Facility has 16 rapid sand filters, each with online turbidity instruments that measure the turbidity continuously. These readings are recorded on trend charts and spreadsheets on the computer system every five (5) minutes.

The turbidity standard readings of the water leaving the filters are to be less than or equal to 0.3 NTU (turbidity units) in 95% of the measurements in a month, not to exceed 0.3 NTU for more than 12 consecutive hours of filter operation and not to exceed 1.0 NTU for any measurement. In April of 2020, there were five incidents where the filters did not meet these standards. Corrective actions were taken and the multi-barrier treatment approach ensured that there was no risk to public health.

4.4 Chemical

The annual audit report indicates that the majority of chemical results from the treated water samples met the water quality standard, with the exception of Haloacetic Acids (HAAs) and Trihalomethanes (THMs). The 2020 results are summarized in **Table 2**, **Table 3**, and **Table 4**.

Table 2. Treated Water Chemical Sample Results

Parameter	Water Quality Standard	Source Water (mg/L)	Civic Works Sample (mg/L)
Arsenic	Less than or equal to 0.01 mg/L	0.00744	0.00119
Benzene	Less than or equal to 0.005 mg/L	<0.00050	<0.00050
Ethylbenzene	Less than or equal to 0.14 mg/L	<0.00050 mg/L	<0.00050 mg/L
Fluoride	Less than or equal to 1.5 mg/L	0.173	0.540
Lead	Less than or equal to 0.005 mg/L in the water distribution system	0.00074	<0.00005
Nitrate	Less than or equal to 45 mg/L measured as nitrate (10 mg/L measured as nitrogen)	0.131	.0203
Trichloroethylene	Less than or equal to 0.005 mg/L	<0.00050	<0.00050
Tetrachloroethylene	Less than or equal to 0.03 mg/L	<0.00050	<0.00050
Toluene	Less than or equal to 0.06 mg/L	<0.00050	<0.00050
Total xylenes	Less than or equal to 0.09 mg/L	<0.00064	<0.00064
Uranium	Less than or equal to 0.02 mg/L	0.00341	0.000111

Note: Results are quarterly sample averages for the year

Table 3. HAAs Sample Results

Date	Sample Location				Limit (mg/L)
	Willowdale 7-11 (mg/L)	Reservoir (mg/L)	Civic Works (mg/L)	1st Street Booster Station (mg/L)	
Feb 27/20	0.036	0.050	0.051	0.035	0.08
May 4/20	0.045	0.058	0.053	0.045	
Aug 6/20	0.086	0.109	0.119	0.070	
Nov 3/20	0.038	0.036	0.039	0.035	
Average	0.050	0.060	0.070	0.050	

Note: HAAs results were below the locational running annual average of quarterly samples, which are to be less than or equal to 0.08 mg/L to meet provincial standards

Table 4. THMs Sample Results

Date	Sample Location					Limit (mg/L)
	Water Plant (mg/L)	Chalet (mg/L)	Waverly (mg/L)	Civic Works (mg/L)	River Heights (mg/L)	
Feb 27/20	Not available	0.071	0.056	0.080	0.077	0.10
May 4/20	0.073	0.087	0.084	0.097	0.086	
Aug 6/20	0.119	0.219	0.191	0.223	0.243	
Nov 3/20	0.043	0.104	0.078	0.091	0.113	
Average	0.078	0.120	0.102	0.123	0.130	

As defined in the Operating Licence, the THMs quality standard is to be less than or equal to 0.10 mg/L as locational running annual average of quarterly samples. The Office of Drinking Water has identified sample locations and months for collecting samples for THMs for the City.

Based on these results and past reports, the City understands the non-compliance with the THM standard stated in the Operating Licence; therefore a number of steps have been taken to address this issue. As part of the Water Treatment Facility Master Plan, consultants reviewed the water source and treatment system information, identifying the Water Treatment Facility upgrades necessary to meet this regulatory requirement. Further, the City has employed a subsequent consultant to design the necessary upgrades to be constructed. The future Water Treatment Facility is based on a new ultrafiltration/nanofiltration (UF/NF) Membrane Treatment Facility capable of providing approximately 50% of the City's design year Maximum Day Demand. The balance of water demand would be made up from the existing Water Treatment Facility processes. The membrane technology will remove raw water organics that react to form THMs and blend the membrane treated water with the existing facility's treated water, which once combined, will meet Provincial Standards.

Additional information regarding trihalomethanes can be located on the following Government of Manitoba website and Guidelines for Canadian Drinking Water Quality website: factsheet_thm.pdf (gov.mb.ca)

4.5 Lead

The City of Brandon continues to address the issue of lead water service connections that exist in certain areas of the City's distribution system. The City of Brandon Lead Water Services strategy was developed to address issues precipitating from a draft provincial study released in

2013. The study indicated that in some older Brandon homes where lead water service connections were present, lead concentration levels at the water tap were found to be in excess of the National Drinking Water Guideline of 0.01 mg/L at the time of the testing. The National Drinking Water Guideline for lead has since been reduced to 0.005 mg/L.

As part of the City's strategy, several types of messaging were undertaken by the City of Brandon to stress to residents and the wider public that the water supply leaving the City's Water Treatment Facility meets the Provincial Standards and National Guidelines for lead concentrations. The concentration concerns arise strictly from the individual water service connection pipe material in specific, older areas of Brandon.

A major piece of this messaging was the delivery of informational packages to approximately 5,200 properties in Brandon, based on the age of the property, that have the potential to have a lead water service connection, either: from the water main to the property line, from the property line to the house, or both. The package contained information on how residents could determine if they had a lead water service connection coming into their home, the health risks associated with lead in drinking water, how they could test their drinking water for lead concentrations, and what steps to take if their test results were found to be above the current National Drinking Water Guidelines. All of this information has been made publicly available on the City of Brandon website at:
http://www.brandon.ca/water-treatment/lead-water-services-information

Subsequent to the informational campaign, the City developed and rolled out a 2016 Water Filter Rebate Program, to provide eligible property owners/residents with a cash rebate of up to $100 to assist with the purchase of water filtration systems and/or filters which meet the NSF/ANSI-53 certification for the removal of lead. This program has continued annually since that time, including in 2020. This program will continue to run in 2021. In the long-term, the City of Brandon hopes to evaluate the potential use of orthophosphate dosing in the water treatment process to mitigate lead leaching in effected service connections.

4.6 Fluoride

Manitoba Health and Healthy Living funds and monitors the fluoridation program. They recommend a fluoride range of 0.5-0.9 mg/L, with 0.7 mg/L as the optimal level in drinking water. The City has adjusted and monitors fluoride dosing in the drinking water to comply with this recommendation.

SYSTEM OPERATION

5.0 LICENCE TO IMPOUND WATER

In order to divert water from the Assiniboine River for treatment and consumption, the City of Brandon is required to operate under a provincial Licence in accordance the provisions of *The Water Rights Act*. The City's current Licence expires in 2022.

6.0 OPERATIONAL REQUIREMENTS

The City of Brandon Public Water Supply System has met its regulatory testing and monitoring requirements in 2020.

7.0 WATER USE

In 2020, approximately 50 percent of the water distributed was used for domestic purposes such as washing, food preparation, lawn sprinklers, toilets, and bathing. In addition, industry consumed approximately 24 percent, commercial customers used approximately 18 percent, and the remaining 8 percent for institutions including schools, government, and churches.

8.0 DRINKING WATER SAFETY ORDERS AND ACTIONS TAKEN IN RESPONSE

Due to low water pressure in the distribution system caused by a watermain break, a Boil Water Advisory was issued for the 400 block on 23rd Street. The Boil Water Advisory was issued through the Office of Drinking Water via Manitoba Health on October 26, 2020. The Boil Water Advisory was lifted on November 5, 2020 after repairs were completed and the bacteriological testing results met regulatory requirements.

9.0 WARNINGS ISSUED OR CHARGES LAID ON THE PUBLIC WATER SUPPLY SYSTEM

There were no Drinking Water Safety warnings issued or charges laid on the City of Brandon Public Water Supply System in 2020.

10.0 WATER SUPPLY SYSTEM UPGRADES IN 2020

These renewals and construction will improve service reliability in the surrounding areas.

10.1 Distribution Watermain Replacements

Distribution water main replacements in 2020 included:

- 22nd Street – 100, 200, 300 & 400 blocks
- Garwood Drive – Elderwood Drive to Richmond Avenue
- Hazelwood Crescent – entire crescent

- Inglewood Street – entire street
- 34th Street – McDonald Avenue to Pacific Avenue

10.2 Distribution New Watermain Installations

Distribution system expansion in 2020 included:

- 1st Street – Maryland Avenue to the South End Lift Station

10.3 Water Treatment Facility Expansion & Upgrades

In 2020, the preventative maintenance program at the Water Treatment Facility and Booster Stations met internal targets. The existing facilities also saw reinvestment as part of the regular facility maintenance program. This included variable frequency drive (VFD) replacements, piping renewals, as well as pump and motor rebuilds and replacements.

The City of Brandon has retained the services of Jacobs Engineering to assist in the design and construction of the Water Treatment Facility expansion and future upgrades to the existing Facility. The expansion will consist of a new Membrane Treatment Facility, a new Chemical Building, a new raw water Intake and Settling Pond, as well as upgrades to the existing Facility to prolong their useful life span.

The first phase of the expansion will be the Chemical Building. The significant change with the completion of this project will be the replacement of chlorine gas with liquid sodium hypochlorite as the secondary disinfectant for the City's potable water. Construction began in October 2019 and should be completed by November in 2021.

The next phases of the expansion and upgrades are dependent on the availability of federal and provincial funding, with a projected completion date for the entire project in 2025.

11.0 WATER DISTRIBUTION MAINTENANCE

The water distribution system at times requires both emergency and preventative maintenance. Watermain breaks are repaired by City staff as quickly as possible on an emergency basis. Preventative maintenance programs help to reduce emergencies, with the watermain flushing program being the most extensive.

The watermain flushing program is a technique used to clean water distribution pipes of sediments that build up over time. This is accomplished by strategic manipulation of fire hydrants and valves to force water at high velocities through the system from previously flushed sections, from source to extremities. The flushing program is conducted annually and also provides the following system benefits:

- Improved water quality

- Improved system hydraulic capacity
- Improved system operation by identifying weak or problem areas
- Improved/restored chlorine residual
- Increased life of system components including, valves, pumps, etc.

The City's watermain flushing program begins in the spring and runs into the late fall each year. The program goal is to have all zones in the City of Brandon flushed as a preventative maintenance.

12.0 CLOSING

The City recognizes the importance of informing all water users of the system's operation. For any questions related to this report or the water utility, please contact the City by phone at: 204-729-2190 or by email at: a.howe@brandon.ca.