# The Corporation of the Municipality of Red Lake

COUNCIL RESOLUTION

MOVED BY: _____ NO. 53-22

SECONDED BY: _____ DATE: 21 March 2022

WHEREAS in accordance to Schedule 22 and Section 11 of the Ontario Drinking-Water System Regulation O. Reg. 170/03, made under the Safe Drinking Water Act, 2002, requires that the system and the quality of its water;

NOW THEREFORE BE IT RESOLVED that the Council of The Corporation of the Municipality of Red Lake hereby accepts the 2021 Drinking Water System Annual Reports for the period of January 1st, 2021 to December 21st, 2021, attached hereto as Schedule "A" and forming a part of this Resolution, as prepared by Northern Waterworks Inc. for the following:

Balmertown, Cochenour & McKenzie Island Drinking Water System
Madsen Drinking Water System
Red Lake Drinking Water System

BE IT FURTHER RESOLVED that the 2021 Drinking Water System Annual Reports be made available, without charge, to every person who requests a copy in accordance to Section 11 of O. Reg. 170/03.

| | | | | CARRIED ✓ DEFEATED _____ |
|---|---|---|---|---|
| Declaration of Interest (*) | NAME OF COUNCIL MEMBER | YEAS | NAYS | |
| | **BADIUK,** Warren | | | MAYOR |
| | **BUTTERFIELD,** Dale | | | |
| | **HAGER,** Janet | | | CLERK |
| | **KRISTOFF,** Jamie | | | |
| | **MOTA,** Fred | | | |
| * General Nature Thereof: | | | | |

Distribution: _____

# Annual Report

## Balmertown, Cochenour & McKenzie Island Drinking Water System

# 2021

Prepared by **Northern Waterworks Inc.**
on behalf of the **Municipality of Red Lake**

NORTHERN WATERWORKS INC.

RED LAKE
Opportunity...it's our Nature

# Contents

# 1 Introduction

## 1.1 Annual Reporting Requirements

This consolidated Annual Report (the Report) has been prepared in accordance with both section 11 (Annual Reports) and Schedule 22 (Summary Reports for Municipalities) of Ontario Regulation 170/03 (Drinking Water Systems Regulation). This Report is intended to inform both the public and Municipal Council about the operation of the system over the previous calendar year (January 1 to December 31, 2021).

Section 11 of O. Reg. 170/03 requires the development and distribution to the public of an annual report summarizing water quality monitoring results, adverse water quality incidents, system expenses and chemicals used in the water treatment process.

Schedule 22 of O. Reg. 170/03 requires the development and distribution to Council of an annual report summarizing incidents of regulatory non-compliance and associated corrective actions, in addition to providing flow monitoring results for the purpose of enabling the Owner to assess the capability of the system to meet existing and planned demand.

## 1.2 Report Availability

In accordance with section 11 of O. Reg. 170/03, this Report must be given, without charge, to every person who requests a copy. Effective steps must also be taken to advise users of water from the system that copies of the report are available, without charge, and of how a copy may be obtained. This Annual Report shall be made available for inspection by the public at the Red Lake Municipal Office and on the Municipality's website.

In accordance with Schedule 22 of O. Reg. 170/03, this Report must be given to the members of Municipal Council. Section 19 (Standard of care, municipal drinking-water system) of Ontario's *Safe Drinking Water Act* (SDWA) also places certain responsibilities upon those municipal officials who oversee an accredited operating authority or exercise decision-making authority over a system. The examination of this Report is one of the methods by which municipal officials may fulfil the obligations required by section 19 of the SDWA.

System users and members of Council are strongly encouraged to contact a representative of NWI for assistance in interpreting this Report. Questions and comments may be directed to the local NWI Operations Manager or by email to compliance@nwi.ca.

# 2 System Overview & Expenses

## 2.1 System Description

The Balmertown, Cochenour & McKenzie Island (BCMI) Drinking Water System must meet extensive treatment and testing requirements to ensure that human health is protected. The operation and maintenance of the system is governed by Ontario's *Safe Drinking Water Act* and the regulations therein, in addition to requirements within system-specific environmental approvals. Important system information is summarized in Table 1.

**Table 1:** System information

| | |
|---|---|
| Drinking-Water System Name: | Balmertown, Cochenour & McKenzie Island (BCMI) Drinking Water System |
| DWS Number: | 210000522 |
| DWS Category: | Large Municipal Residential |
| DWS Owner: | The Corporation of the Municipality of Red Lake |
| DWS Operating Authority: | Northern Waterworks Inc. |
| DWS Components: | • Raw water pumping station<br>• Cochenour Water Treatment Plant<br>• Balmertown Reservoir Pumping Station<br>• Cochenour & McKenzie Island water distribution system<br>• Balmertown water distribution system |
| Treatment Processes: | • Chemical coagulation, flocculation and clarification<br>• Dual media (rapid sand) filtration<br>• Free chlorine disinfection<br>• pH adjustment |

Water production begins as raw water flows by gravity from the intake structure located in Bruce Channel (Red Lake) and into an underground reservoir located at the raw water pumping station. Pumps at the station transfer water from the reservoir and through a transmission line directly to the treatment units at the Cochenour Water Treatment Plant. Aluminum sulphate (coagulant) and sodium carbonate solution (pH/alkalinity adjustment) are injected and rapidly mixed into the raw water immediately upstream from the three package treatment units, which each include a two-stage flocculation tank, clarifier and filter.

To promote floc formation water is gently mixed as it passes through the flocculation basins. Polymer solution (flocculant) is also added to the water at this stage of treatment to form larger and more stable floc aggregates. Process water then enters the clarifier where its velocity is reduced to allow for the separation and settling of floc. Supernatant overflows into the clarifier effluent launders and is directed to the filter unit; settled floc (sludge) is automatically removed from the bottom of the clarifier.

Impurities that were not captured and settled as floc in the clarifier are removed by passing water through a dual media filter composed of anthracite and silica sand. Chlorine gas (disinfectant) and sodium carbonate solution are added to the filtrate as it is directed from the filters to the treated water storage reservoir. The filters are periodically cleaned by using an air scour to agitate the entire media bed and reversing the flow of water through the filter.

A majority of the water produced is transferred through a transmission line from the Cochenour Water Treatment Plant (WTP) to the reservoir at the Balmertown Reservoir Pumping Station (RPS). Primary disinfection is achieved as disinfectant mixes with the water in the reservoirs at both facilities. Pumps located at the Balmertown RPS and Cochenour WTP then transfer treated water from the facility reservoirs to the Balmertown and Cochenour/McKenzie Island water distribution systems, respectively. Secondary disinfection requirements in the distribution systems are achieved by maintaining a free chlorine residual at all locations.

## 2.2 Water Treatment Chemicals

In accordance with section 11 of O. Reg. 170/03, this Report must include a list of all water treatment chemicals used by the system during the period covered by the report (summarized in Table 2). All chemicals used in the treatment process are NSF/ANSI 60 certified for use in potable water, as required by system approvals.

**Table 2:** Water treatment chemicals used in 2021

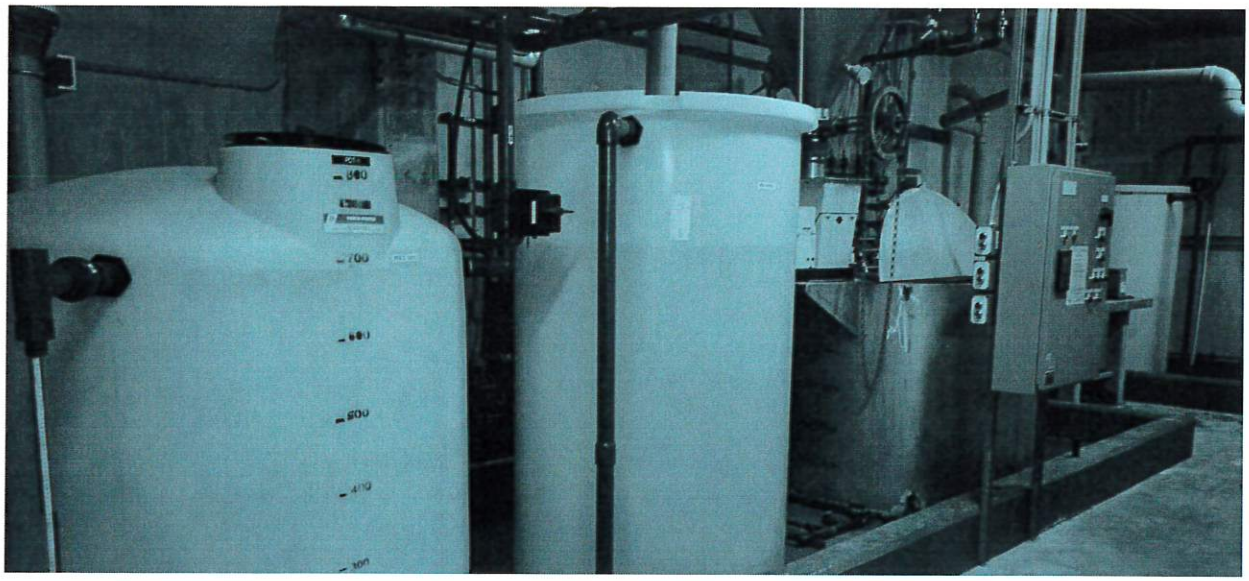
| Treatment Chemical | Application |
|---|---|
| aluminum sulphate | coagulant |
| sodium carbonate | pH/alkalinity adjustment |
| polymer (Polyfloc CP1160P) | flocculant |
| chlorine gas | disinfectant |

## 2.3 System Expenses

In accordance with section 11 of O. Reg. 170/03, this Report must describe any major expenses incurred during the reporting period to install, repair or replace required equipment. This Report also summarizes those expenses related to strengthening equipment inventories and to maintenance activities undertaken by subcontracted service providers. Major expenses incurred in 2021 are summarized in Table 3.

**Table 3:** Major expenses incurred in 2021

| Category | Description | Expense |
|---|---|---|
| Inventory/Replace | Quarter-turn electric actuators (2) | $5,293 |
| Replace | Uninterruptible power supply | $3,961 |
| Maintenance | Flow meter calibration verifications | $3,000 |
| Inventory | Gas chlorinator injector and rotameter | $2,804 |
| Replace | Lighting replacement | $2,648 |
| Replace | Unit suspension heaters | $2,535 |
| Maintenance | Raw water intake inspection | $2,500 |
| Inventory/Replace | Assorted tools | $2,199 |
| Maintenance | Backflow prevention device inspection and testing | $1,392 |
| Replace | Flocculator drive electric motor | $1,100 |
| Inventory/Replace | Natural gas boiler parts | $1,038 |



# 3 Water Quality

## 3.1 Overview

Water quality monitoring is conducted to determine and confirm that drinking water delivered to the consumer is safe and aesthetically pleasing. Monitoring is also required to assess compliance with legislation and to control the treatment process. In accordance with section 11 of O. Reg. 170/03, this Report must summarize the results of water quality tests required by regulations, approvals and orders. The following sections summarize the results of all required water quality tests and compare the results to applicable water quality standards.

## 3.2 Microbiological Parameters

Microbiological sampling and testing requirements are provided in Schedule 10 (Microbiological sampling and testing) of O. Reg. 170/03. In 2021, a total of 311 routine source, treated and distribution water samples were collected for microbiological analysis by an accredited laboratory. Samples were collected on a weekly basis and included tests for E. coli (EC), total coliforms (TC) and heterotrophic plate counts (HPC). Results from microbiological analyses are summarized in Table 4. All results were below the associated Ontario Drinking Water Quality Standards.

**Table 4:** Results summary for microbiological parameters

| Sample Type | # of Samples | EC Results Range[1] (MPN/ 100mL) | TC Results Range[1] (MPN/ 100mL) | # of HPC Samples | HPC Results Range (CFU/mL) |
|---|---|---|---|---|---|
| Raw Water | 52 | 0 to 3 | 0 to 276 | --- | --- |
| Treated Water (CWTP) | 52 | absent | absent | 51 | 0 to 1 |
| Treated Water (BRPS) | 52 | absent | absent | 50 | 0 to 1 |
| Distribution | 155 | absent | absent | 51 | 0 to >300 |
| Distribution (nonroutine) | 5 | absent | absent | --- | --- |

1. The Ontario Drinking Water Quality Standard for E. Coli and Total Coliforms in a treated or distribution sample is 'not detectable'. The presence of either parameter in a treated or distribution sample constitutes an exceedance.

## 3.3 Operational Parameters

In accordance with Schedule 7 (Operational checks) of O. Reg. 170/03, regulated operational parameters that must be monitored include raw water turbidity, filtrate turbidity and the free chlorine residuals associated with primary and secondary disinfection. Table 5 summarizes water quality results for regulated and selected unregulated operational parameters. In accordance with Schedule 6 (Operational checks, sampling and testing – general) of O. Reg. 170/03, certain operational parameters are continuously monitored. No Adverse Water Quality Incidents (AWQIs) pertaining to operational parameters occurred during the reporting period.

**Table 5:** Results summary for operational parameters

| Parameter (Sample Type)[1] | Number of Samples | Units | Min. Result | Max. Result | Annual Avg. | Adverse Result |
|---|---|---|---|---|---|---|
| Turbidity (Raw Water) | 119 | NTU | 0.66 | 3.89 | 1.18 | n/a |
| Turbidity (Filter 1) | Continuous | NTU | 0.030 | 0.299 | 0.054 | >1.0 |
| Turbidity (Filter 2) | Continuous | NTU | 0.010 | 0.290 | 0.048 | >1.0 |
| Turbidity (Filter 3) | Continuous | NTU | 0.037 | 0.290 | 0.060 | >1.0 |
| Turbidity (Treated) | 365 | NTU | 0.08 | 0.25 | 0.13 | n/a |
| pH (Treated) | 365 | --- | 6.6 | 9.1 | 7.4 | n/a |
| Alkalinity (Treated) | 234 | mg/L | 25 | 67 | 47 | n/a |
| Aluminum Residual (Treated) | 234 | mg/L | 0.018 | 0.089 | 0.046 | n/a |
| FCR (Treated - CWTP)[2] | Continuous | mg/L | 0.70 | 3.82 | 1.82 | n/a |
| FCR (Treated - BRPS)[2] | Continuous | mg/L | 0.29 | 2.63 | 1.65 | n/a |
| FCR (CMI Distribution)[3] | 380+ | mg/L | 0.53 | 2.19 | n/a | <0.05 |
| FCR (Balm. Distribution)[3] | 400+ | mg/L | 0.92 | 2.03 | n/a | <0.05 |

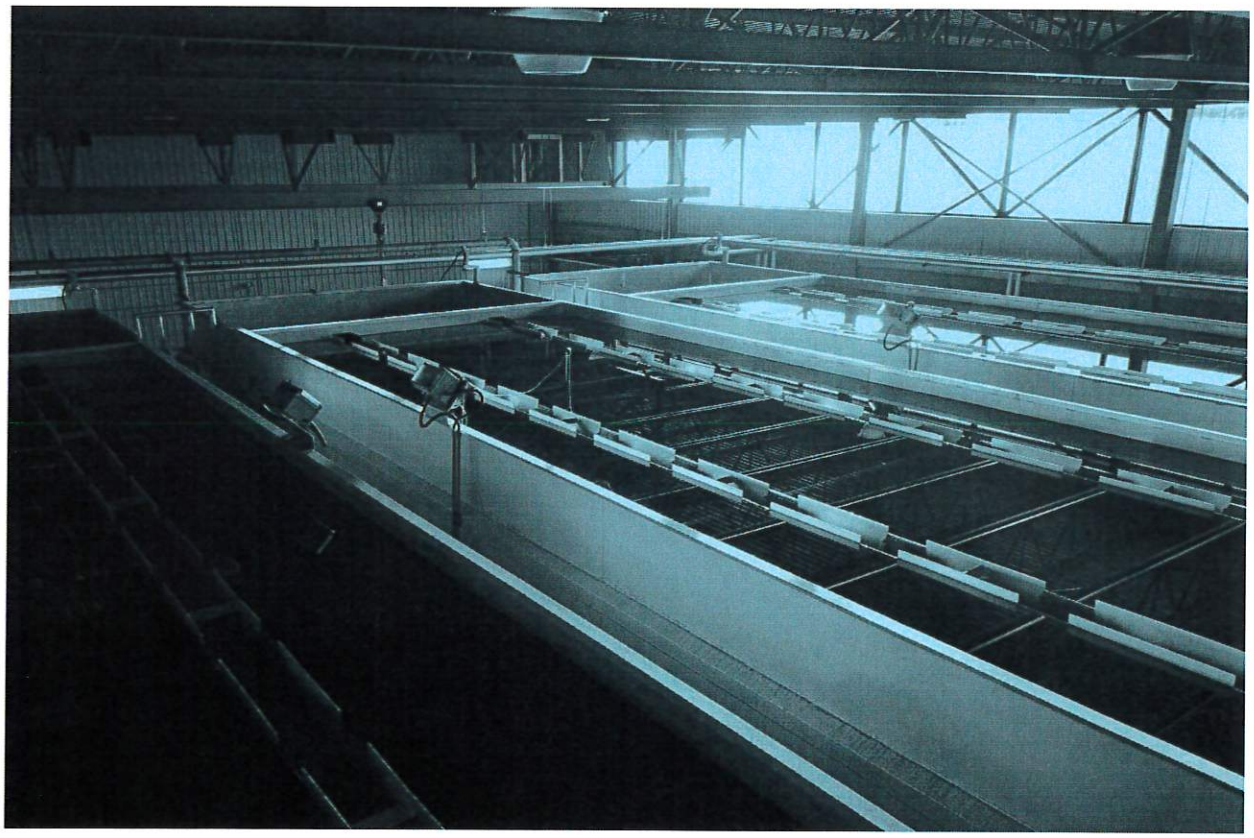
1. FCR = free chlorine residual; CMI = Cochenour & McKenzie Island; Balm. = Balmertown.
2. There is no adverse result corresponding to the treated water free chlorine residual. However, an observation of adverse water quality occurs if the residual is low enough such that water has not been disinfected in accordance with the system's *Municipal Drinking Water Licence*.
3. Free chlorine residuals are tested at various locations in the distribution systems. The free chlorine residual varies with water age and distribution system location, and the values in the table pertain to the minimum and maximum results collected across all locations in the calendar year.

## 3.4 Conventional Filtration Performance

In accordance with the system's *Municipal Drinking Water Licence*, conventional filtration facilities must meet certain performance criteria in order to claim removal credits for Cryptosporidium oocysts and Giardia cysts. In addition to continuously monitoring filtrate turbidity and other requirements, filtrate turbidity must be less than or equal to 0.3 NTU in at least 95% of the measurements each month. Table 6 summarizes filtrate turbidity compliance against the <0.3 NTU/95% performance criterion. Minimum and maximum values in the table correspond to the proportion of time that filtered water turbidity was less than or equal to 0.3 NTU in a calendar month in 2021. No AWQIs related to conventional filtration performance occurred during the reporting period.

**Table 6:** Filtration performance summary

| Filter | Minimum Result | Maximum Result | Adverse Result |
|---|---|---|---|
| Filter 1 | 100% | 100% | <95% |
| Filter 2 | 100% | 100% | <95% |
| Filter 3 | 100% | 100% | <95% |



## 3.5 Nitrate & Nitrite

Treated water is tested for nitrate and nitrite concentrations on a quarterly basis in accordance with Schedule 13 (Chemical sampling and testing) of O. Reg. 170/03. Nitrate and nitrite results are provided in Table 7. All results were below the Ontario Drinking Water Quality Standards.

**Table 7:** Nitrate and nitrite results

| Sample Date | Nitrate | | Nitrite | |
|---|---|---|---|---|
| | Result (mg/L) | ODWQS (mg/L) | Result (mg/L) | ODWQS (mg/L) |
| 16-Feb-2021 | 0.065 | 10 | <0.010 | 1 |
| 11-May-2021 | 0.036 | | <0.010 | |
| 25-Aug-2021 | 0.021 | | <0.010 | |
| 15-Nov-2021 | 0.050 | | <0.010 | |

## 3.6 Trihalomethanes & Haloacetic Acids

Trihalomethanes (THMs) and haloacetic acids (HAAs) are sampled on a quarterly basis from a distribution system location that is likely to have an elevated potential for their formation, in accordance with Schedule 13 (Chemical sampling and testing) of O. Reg. 170/03. Total THM and HAA results are provided in Table 8 and Table 9, respectively. Compliance with the provincial standards for trihalomethane and haloacetic acid concentrations is determined by calculating a running annual average (RAA). The 2021 running annual averages for THMs and HAAs were below the respective Ontario Drinking Water Quality Standards.

**Table 8:** Total THM results

| Sample Date | Result (µg/L) |
|---|---|
| 16-Feb-2021 | 52.2 |
| 11-May-2021 | 61.9 |
| 25-Aug-2021 | 121 |
| 15-Nov-2021 | 55.5 |
| Regulatory Average (RAA) | 72.7 |
| ODWQS (RAA) | 100 |

**Table 9:** Total HAA results

| Sample Date | Result (µg/L) |
|---|---|
| 16-Feb-2021 | 56.9 |
| 11-May-2021 | 66.6 |
| 25-Aug-2021 | 71.4 |
| 15-Nov-2021 | 41.2 |
| Regulatory Average (RAA) | 59.0 |
| ODWQS (RAA) | 80 |

## 3.7 Lead Sampling

Based upon favourable sampling results in the community, the BCMI DWS previously qualified for reduced lead sampling and ultimately became exempt from sampling at plumbing locations in accordance with Schedule 15.1 (Lead) of O. Reg. 170/03. Four (4) distribution system samples must now be collected every year and analyzed for pH and alkalinity. Additionally, these distribution system samples must be analyzed for lead in every third 12-month period after the plumbing sample exemption was activated. Table 10 summarizes the results of community lead sampling and related required tests.

**Table 10:** Distribution pH, alkalinity and lead sampling results

| Sample Date | Distribution Sampling Location | pH | Alkalinity (mg/L) | Lead Result (µg/L) | Lead ODWQS (µg/L) |
|---|---|---|---|---|---|
| 06-Apr2021 | McMarmac Bleeder | 6.96 | 41.7 | <1.0 | |
| 06-Apr-2021 | Hydrant, Edward Ave. Lot 30 | 6.91 | 42.6 | 4.4 | |
| 07-Sep-2021 | Hydrant, Detta Rd. & 1st St. | 7.3 | 43.8 | <1.0 | 10 |
| 07-Sep-2021 | Hydrant, Edward Ave. Lot 30 | 7.4 | 46.7 | 12.0[1] | |
| 15-Sep-2021 | Hydrant, Edward Ave. Lot 30 | 7.8 | 50.5 | <1.0 | |

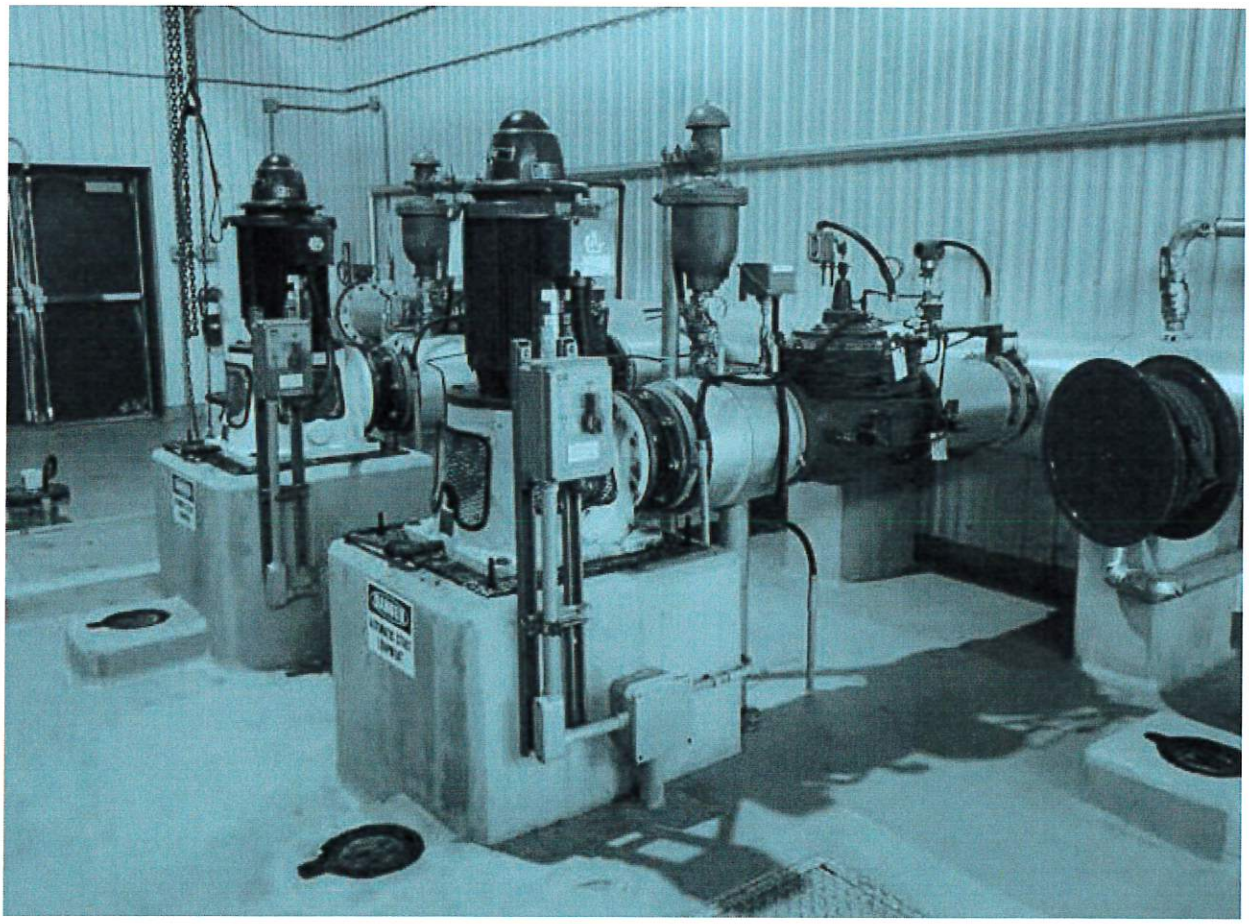
1. This result exceeded the Ontario Drinking Water Quality Standard for lead in drinking water (10 µg/L) and is associated with Adverse Water Quality Incident No. 155502. A resample collected from the hydrant on September 15 yielded a lead result of <1.0 µg/L. Refer to the *Compliance* section of this report for more information.

## 3.8 Environmental Discharge Sampling

The *Municipal Drinking Water Licence* for the BCMI Drinking Water System requires additional sampling associated with discharges to the natural environment. Specifically, samples must be collected from settling tank effluent on a monthly basis and tested for the parameter total suspended solids (TSS). This effluent is discharged to Bruce Channel and originates from the onsite treatment of the wastewater produced during plant operation. The *Licence* also requires that the effluent discharged to the environment has an annual average TSS concentration below 25 mg/L. Table 11 summarizes 2021 environmental discharge sampling results.

**Table 11:** Environmental discharge sampling results summary

| Number of Samples | Minimum TSS Result (mg/L) | Maximum TSS Result (mg/L) | TSS Annual Average (mg/L) |
|---|---|---|---|
| 12 | <3.0 | 101 | 19.1 |



## 3.9 Inorganic & Organic Parameters

Most inorganic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 (Chemical sampling and testing) and 23 (Inorganic parameters) of O. Reg. 170/03. The inorganic parameters sodium and fluoride are sampled every five (5) years in treated water in accordance with Schedules 13 and 23 of O. Reg. 170/03. The most recent inorganic parameter sampling results are provided in Table 12. All results were below the associated Ontario Drinking Water Quality Standards.

**Table 12:** Inorganic parameter sampling results

| Parameter | Most Recent Sample Date | Units | Result | ODWQS |
|---|---|---|---|---|
| Antimony | 25-Aug-2021 | µg/L | <0.60 | 6 |
| Arsenic | 25-Aug-2021 | µg/L | <1.0 | 10 |
| Barium | 25-Aug-2021 | µg/L | <10 | 1000 |
| Boron | 25-Aug-2021 | µg/L | <50 | 5000 |
| Cadmium | 25-Aug-2021 | µg/L | <0.10 | 5 |
| Chromium | 25-Aug-2021 | µg/L | <1.0 | 50 |
| Fluoride | 15-Feb-2018 | mg/L | 0.028 | 1.5 |
| Mercury | 25-Aug-2021 | µg/L | <0.10 | 1 |
| Selenium | 25-Aug-2021 | µg/L | <1.0 | 50 |
| Sodium | 15-Feb-2018 | mg/L | 15.5 | 20 |
| Uranium | 25-Aug-2021 | µg/L | <2.0 | 20 |

Organic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 (Chemical sampling and testing) and 24 (Organic parameters) of O. Reg. 170/03. These parameters include various organic acids, pesticides, herbicides, PCBs, volatile organics and other chemicals. Sampling for all organic parameters was conducted on August 25, 2021, and results are provided in Table 13. All results were below the associated Ontario Drinking Water Quality Standards.

**Table 13:** Organic parameter sampling results

| Parameter | Result (µg/L) | ODWQS (µg/L) | Parameter | Result (µg/L) | ODWQS (µg/L) |
|---|---|---|---|---|---|
| Alachlor | <0.10 | 5 | Diuron | <1.0 | 150 |
| Atrazine & Metabolites | <0.20 | 5 | Glyphosate | <5.0 | 280 |
| Azinphos-methyl | <0.10 | 20 | Malathion | <0.10 | 190 |
| Benzene | <0.50 | 1 | MCPA | <0.20 | 100 |
| Benzo(a)pyrene | <0.005 | 0.01 | Metolachlor | <0.10 | 50 |
| Bromoxynil | <0.20 | 5 | Metribuzin | <0.10 | 80 |
| Carbaryl | <0.20 | 90 | Monochlorobenzene | <0.50 | 80 |
| Carbofuran | <0.20 | 90 | Paraquat | <1.0 | 10 |
| Carbon Tetrachloride | <0.20 | 2 | Pentachlorophenol | <0.50 | 60 |
| Chlorpyrifos | <0.10 | 90 | Phorate | <0.10 | 2 |
| Diazinon | <0.10 | 20 | Picloram | <0.20 | 190 |
| Dicamba | <0.20 | 120 | Total PCBs | <0.035 | 3 |
| 1,2-Dichlorobenzene | <0.50 | 200 | Prometryne | <0.10 | 1 |
| 1,4-Dichlorobenzene | <0.50 | 5 | Simazine | <0.10 | 10 |
| 1,2-Dichloroethane | <0.50 | 5 | Terbufos | <0.20 | 1 |
| 1,1-Dichloroethylene | <0.50 | 14 | Tetrachloroethylene | <0.50 | 10 |
| Dichloromethane | <5.0 | 50 | 2,3,4,6-Tetrachlorophenol | <0.50 | 100 |
| 2,4-Dichlorophenol | <0.30 | 900 | Triallate | <0.10 | 230 |
| 2,4-D | <0.20 | 100 | Trichloroethylene | <0.50 | 5 |
| Diclofop-methyl | <0.20 | 9 | 2,4,6-Trichlorophenol | <0.50 | 5 |
| Dimethoate | <0.10 | 20 | Trifluralin | <0.10 | 45 |
| Diquat | <1.0 | 70 | Vinyl Chloride | <0.20 | 1 |

# 4 Water Production

## 4.1 Overview

In accordance with Schedule 22 (Summary Reports for Municipalities) of O. Reg. 170/03, this Annual Report must include certain information for the purpose of enabling the Owner to assess the capability of the system to meet existing and planned uses. Specifically, this Report must include a summary of the quantities and flow rates of the water supplied during the reporting period, including monthly average and maximum daily flows. The Report must also include a comparison of flow monitoring results to the rated capacity and flow rates approved in the system's *Municipal Drinking Water Licence*.

## 4.2 Flow Monitoring Results

Throughout the reporting period the BCMI DWS operated within its rated capacity and supplied a total of 419,903 $m^3$ of treated water. On an average day in 2021, 1,150 $m^3$ of treated water was supplied to the communities of Balmertown, Cochenour & McKenzie Island, which represents 19% of the rated capacity of the Cochenour Water Treatment Plant (6,065 $m^3$/day). The maximum daily flow in 2021 was 2,213 $m^3$/day, which represents 36% of the rated capacity of the treatment facility. Flow monitoring results are summarized in Figure 1 and Table 14. The capacity assessments provided in the table compare the average and maximum daily treated water flows to the rated capacity of the treatment facility.

**Figure 1:** 2021 average and maximum daily treated water flows

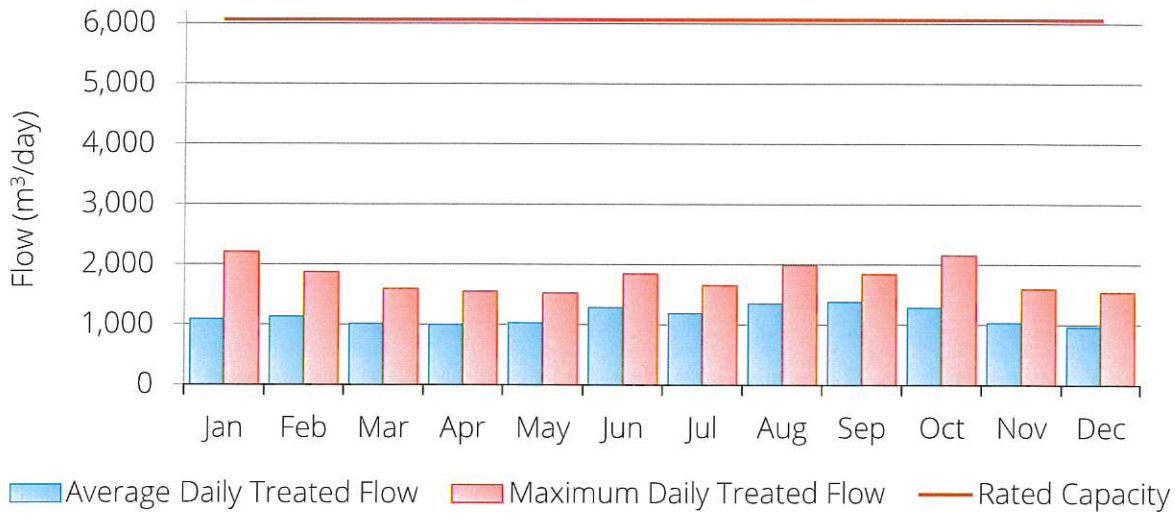
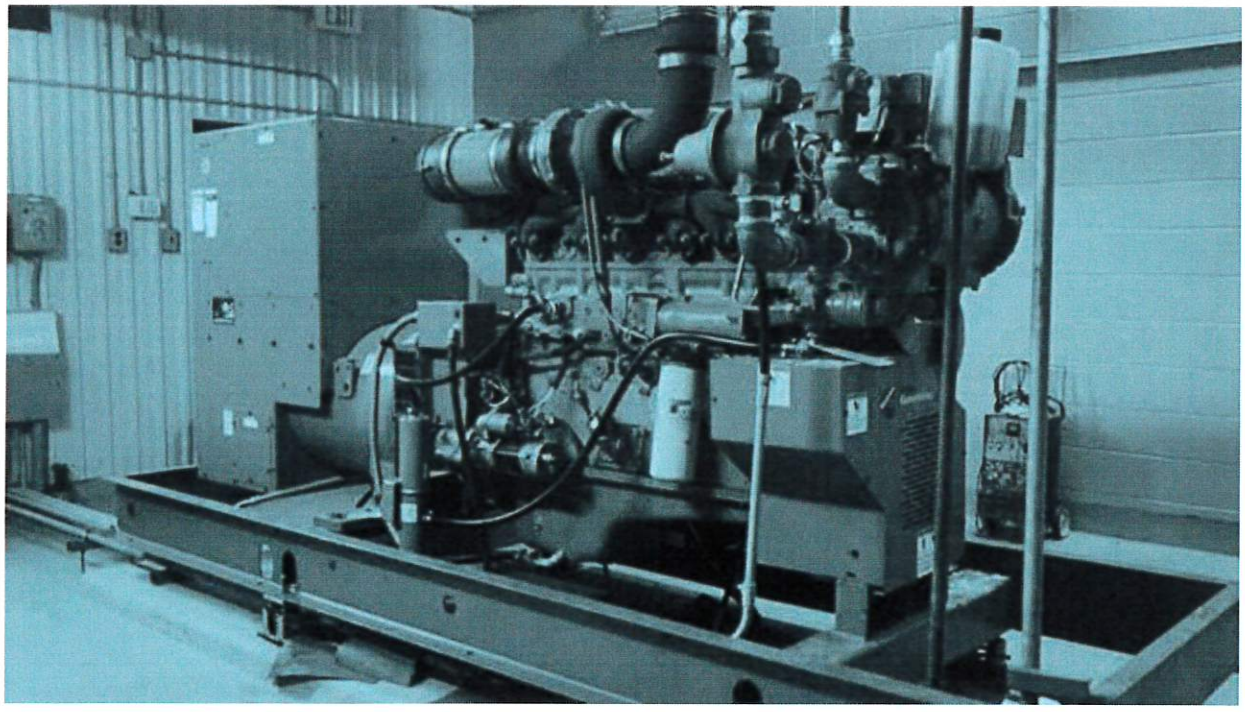


**Table 14:** 2021 water production summary

| Month | Total Volumes ($m^3$) | | Daily Flows ($m^3$/day) | | Capacity Assessments | |
|---|---|---|---|---|---|---|
| | Raw Water | Treated Water | Average - Treated | Maximum - Treated | Average - Treated | Maximum - Treated |
| Jan | 39,290 | 33,967 | 1,096 | 2,213 | 18% | 36% |
| Feb | 36,838 | 31,891 | 1,139 | 1,872 | 19% | 31% |
| Mar | 36,574 | 31,665 | 1,021 | 1,598 | 17% | 26% |
| Apr | 35,025 | 30,201 | 1,007 | 1,555 | 17% | 26% |
| May | 36,718 | 32,020 | 1,033 | 1,529 | 17% | 25% |
| Jun | 43,584 | 38,641 | 1,288 | 1,846 | 21% | 30% |
| Jul | 41,859 | 36,948 | 1,192 | 1,655 | 20% | 27% |
| Aug | 46,584 | 42,105 | 1,358 | 1,991 | 22% | 33% |
| Sep | 46,563 | 41,541 | 1,385 | 1,845 | 23% | 30% |
| Oct | 45,157 | 39,891 | 1,287 | 2,155 | 21% | 36% |
| Nov | 35,619 | 31,040 | 1,035 | 1,599 | 17% | 26% |
| Dec | 33,897 | 29,993 | 968 | 1,546 | 16% | 25% |
| Total | 477,708 | 419,903 | --- | --- | --- | --- |
| Average | 39,809 | 34,992 | 1,150 | --- | 19% | --- |



Over the reporting period, 74% (311,905 $m^3$) of the total amount of treated water produced was distributed to the community of Balmertown, with the remaining 26% (107,998 $m^3$) being distributed to the communities of Cochenour and McKenzie Island. On an average day in 2021, 855 $m^3$ of treated water was supplied to Balmertown and 296 $m^3$ was supplied to Cochenour & McKenzie Island. Table 15 provides a summary of flow monitoring results organized by the respective water distribution systems.

**Table 15:** 2021 water production summary – results by water distribution system

| Month | Balmertown | | | Cochenour & McKenzie Island | | |
|---|---|---|---|---|---|---|
| | Total Volume ($m^3$) | Average Daily Flow ($m^3$/day) | Proportion of Total (%) | Total Volume ($m^3$) | Average Daily Flow ($m^3$/day) | Proportion of Total (%) |
| Jan | 25,090 | 809 | 74% | 8,877 | 286 | 26% |
| Feb | 23,092 | 825 | 72% | 8,799 | 314 | 28% |
| Mar | 21,816 | 704 | 69% | 9,849 | 318 | 31% |
| Apr | 21,245 | 708 | 70% | 8,956 | 299 | 30% |
| May | 23,085 | 745 | 72% | 8,935 | 288 | 28% |
| Jun | 29,434 | 981 | 76% | 9,207 | 307 | 24% |
| Jul | 27,308 | 881 | 74% | 9,640 | 311 | 26% |
| Aug | 32,803 | 1,058 | 78% | 9,302 | 300 | 22% |
| Sep | 32,319 | 1,077 | 78% | 9,222 | 307 | 22% |
| Oct | 30,784 | 993 | 77% | 9,107 | 294 | 23% |
| Nov | 23,247 | 775 | 75% | 7,793 | 260 | 25% |
| Dec | 21,682 | 699 | 72% | 8,311 | 268 | 28% |
| Total | 311,905 | --- | --- | 107,998 | --- | --- |
| Average | 25,992 | 855 | 74% | 9,000 | 296 | 26% |

## 4.3 Recent Historical Flows

Table 16 summarizes recent historical flow monitoring results for the BCMI DWS. There was a modest increase in the volume treated water supplied in 2021 when compared to 2020, and flows have generally remained stable over the previous decade. Total annual volumes of treated water supplied in the near future may be expected to be between 300,000 $m^3$ and 450,000 $m^3$, which represents approximately 14% to 20% of the rated capacity of the Cochenour Water Treatment Plant.

**Table 16:** Recent historical water production summary

| Year | Total Volumes ($m^3$) | | Daily Flows ($m^3$/day) | | Annual % Change | |
|---|---|---|---|---|---|---|
| | Raw Water | Treated Water | Average – Treated Water | Maximum – Treated Water | Raw Water | Treated Water |
| 2009 | 481,351 | 406,151 | 1,113 | 2,007 | -13.8% | -9.3% |
| 2010 | 515,274 | 424,549 | 1,163 | 2,232 | +7.0% | +4.5% |
| 2011 | 471,032 | 409,384 | 1,122 | 2,240 | -8.6% | -3.6% |
| 2012 | 439,530 | 389,828 | 1,065 | 2,007 | -6.7% | -4.8% |
| 2013 | 443,266 | 408,492 | 1,119 | 2,369 | +0.8% | +4.8% |
| 2014 | 412,234 | 360,120 | 987 | 2,061 | -7.0% | -11.8% |
| 2015 | 439,868 | 390,982 | 1,071 | 1,878 | +6.7% | +8.6% |
| 2016 | 419,949 | 337,245 | 921 | 1,557 | -4.5% | -13.7% |
| 2017 | 436,670 | 341,391 | 935 | 2,015 | +4.0% | +1.2% |
| 2018 | 425,326 | 358,995 | 984 | 1,947 | -2.6% | +5.2% |
| 2019 | 422,149 | 363,215 | 995 | 1,874 | -0.7% | +1.2% |
| 2020 | 473,891 | 386,712 | 1,057 | 2,009 | +12.3% | +6.5% |
| 2021 | 477,708 | 419,903 | 1,150 | 2,213 | +0.8% | +8.6% |

# 5 Compliance

## 5.1 Overview

Northern Waterworks Inc. and the Municipality of Red Lake employ an operational strategy that is committed to achieving the following goals:

- Providing a safe and reliable supply of drinking water to the communities of Balmertown, Cochenour & McKenzie Island;
- Meeting or exceeding all applicable legislative and regulatory requirements; and,
- Maintaining and continually improving the operation and maintenance of the system.

The following sections will summarize incidents of adverse water quality and regulatory noncompliance that occurred during the reporting period. NWI is committed to employing timely and effective corrective actions to prevent the recurrence of identified incidents of adverse water quality and noncompliance.

## 5.3 Regulatory Compliance

In accordance with Schedule 22 (Summary Reports for Municipalities) of O. Reg. 170/03, this Report must list any requirements of the *Act*, the regulations, the system's approval, drinking water works permit, municipal drinking water licence, and any orders applicable to the system that were not met at any time during the period covered by the report (i.e., an incident of regulatory noncompliance). Additionally, this Report must specify the duration of the failure and the measures that were taken to correct the failure.

The most recent inspection by Ontario's Ministry of the Environment, Conservation and Parks was initiated on January 5, 2022. Three (3) incidents of noncompliance were identified. Information concerning the incidents is provided below.

- Noncompliance item no. 1

  With respect to the duties of an operator-in-charge (OIC), O. Reg. 128/04, subsection 26 (2) states: "An operator-in-charge shall...ensure that all equipment used in the processes within his or her responsibility is properly monitored, inspected, tested and evaluated and that records of equipment operating status are prepared and available at the end of every operating shift."

On October 5, 2021, at approximately 09:30, the treated water chlorine pen on the continuous monitoring back-up chart recorder ran out of ink. The absence of a chlorine trend on the back-up chart recorder was not noticed or acknowledged by the operator-in-charge (OIC) until October 11, 2021, at approximately 11:15. At this time, the pen was replaced by the OIC. For the period of time that the chlorine pen was without ink, the OIC did not properly monitor, inspect or evaluate all equipment used in the processes within their responsibility.

With respect to recordkeeping during operational activities, O. Reg. 128/04, paragraphs 27 (5) 5. & 6., state: "An operator-in-charge or a person authorized by an operator-in-charge shall record the following information in the logs or other record-keeping mechanisms in respect of each operating shift:

- Any unusual or abnormal conditions that were observed in the subsystem during the shift, any action that was taken and any conclusions drawn from the observations.
- Any equipment that was taken out of service or ceased to operate during the shift and any action taken to maintain or repair equipment during the shift."

On October 11, 2021, at approximately 11:15, the OIC on duty noticed the missing chlorine trend on the chart recorder and changed the pen on continuous monitoring back-up chart recorder; however, this abnormal condition and subsequent action (i.e., pen change) was not noted in the logbook by the OIC.

Finally, subsection 128 (2) of the Safe Drinking Water Act states that: "No person shall include false or misleading information in any document required to be created, stored or submitted under this Act."

On October 8, 2021, at 13:34, the OIC recorded in the logbook that they "changed charts, reviewed trending, verified compliance, (and) upon reviewing trending noticed gaps in trend times, used charts for time gaps". Although the chart on continuous monitoring back-up chart recorder #3 was in fact changed on October 8, 2021, the absence of the chlorine trend went unnoticed and unacknowledged by the OIC. As such, on October 8, 2021, the back-up chart recorder was not used to verify the gaps in SCADA trending from the previous 24-hours and compliance with respect to the chlorine residual was not verified, contrary to information written in the logbook.

Effective immediately, the Municipality of Red Lake and Northern Waterworks Inc. shall ensure that all duties of an OIC be fulfilled and that an OIC make all necessary records, in accordance with O. Reg. 128/04, sections 26 & 27. Furthermore, both parties shall ensure that all records pertaining to the operation of the DWS do not include false or misleading information. Compliance will be re-assessed during the next annual inspection.

- Noncompliance item no. 2

O. Reg. 170/03, Schedule 6, subsection 6-5. (1) states that "if a drinking water system uses continuous monitoring equipment for sampling and testing that is required under this Regulation, or under an approval, drinking water works permit, municipal drinking water licence or order, for a parameter set out in the Table to this section (i.e., section 6-5), the owner of the system and the operating authority for the system shall ensure that the following standards are met: The continuous monitoring equipment must, except when no water is being directed to users of water sampled by the equipment,

- test for the parameter with at least the minimum frequency specified in the Table, and,
- record the date, time, sampling location and result of every test for the parameter with at least the minimum frequency referred to in subparagraph i."

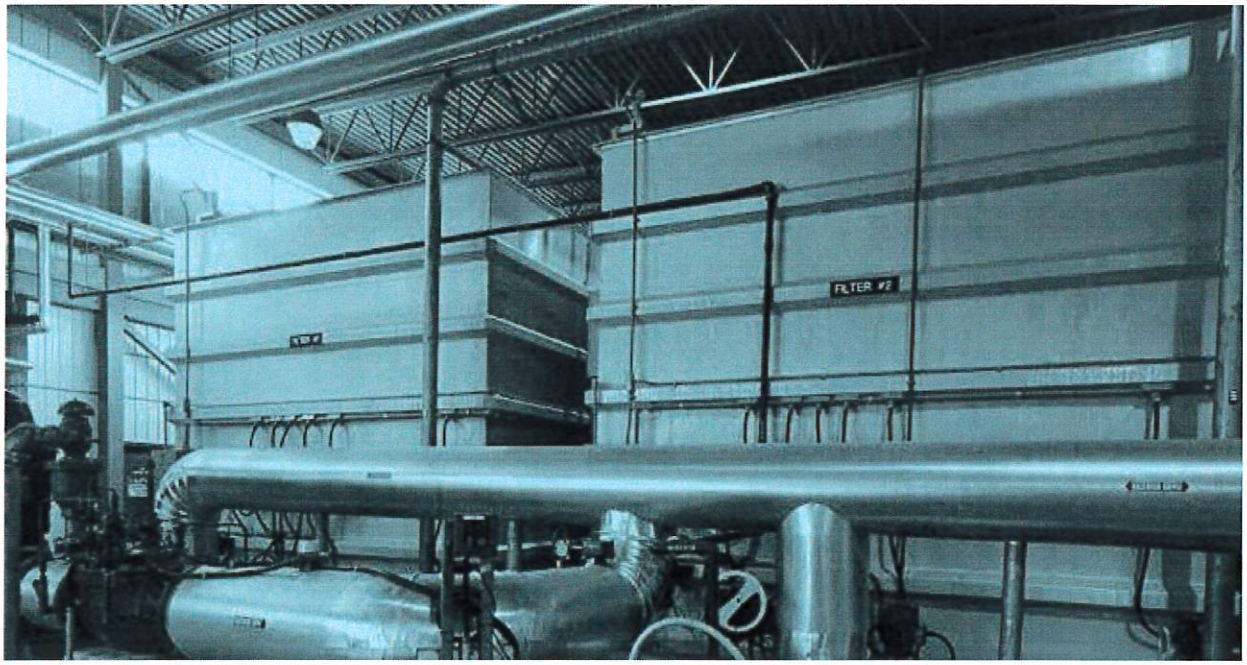
The "Table" referred to above states that the free chlorine residual for determining primary disinfection must be measured and recorded at least every 5 minutes. On October 5, 2021, at approximately 09:30, the chlorine pen ran out of ink on the continuous monitoring back-up chart recorder. On October 7, 2021, from 21:54 to 22:53 (i.e., 59 minutes), and again on October 8, 2021, from 00:12 to 00:24 (i.e., 12 minutes), communications from the programmable logic controller (PLC) to the Supervisory Control and Data Acquisition (SCADA) computer was interrupted, resulting in a loss of continuous monitoring data in the SCADA computer, including the final effluent chlorine residual. As the final effluent chlorine pen on the continuous monitoring back-up chart recorder had run out of ink on October 5, 2021, continuous monitoring data for final effluent chlorine was completely lost for the two time periods stated above.

Effective immediately, the Municipality of Red Lake and Northern Waterworks Inc. shall ensure that continuous monitoring equipment is measuring and recording the chlorine residual at the minimum frequency prescribed by O. Reg. 170/03, Schedule 6, section 6-5. Compliance will be re-assessed during the next annual inspection.

- Noncompliance item no. 3

In accordance with O. Reg. 170/03, Schedule 6, paragraph 6-5 (1) 3., continuous monitoring test results for final effluent chlorine residual and filter effluent turbidity must be examined by a certified operator within 72 hours after the tests are conducted. As referenced in noncompliance items no. 1 & 2 above, continuous monitoring data for final effluent chlorine was completely lost for two time periods on October 7 & 8, 2021. Had the OIC been examining the chlorine residuals on the back-up chart recorder during the periods of data loss in SCADA, they would have recognized and acknowledged the absence of a final effluent chlorine trend.

Effective immediately, the Municipality of Red Lake and Northern Waterworks Inc. shall ensure that a certified operator is examining continuous monitoring test results for final effluent chlorine residual and filter effluent turbidity within 72 hours after the tests are conducted, as prescribed by O. Reg. 170/03, Schedule 6, paragraph 6-5 (1) 3. Compliance will be re-assessed during the next annual inspection.



## 5.2 Adverse Water Quality Incidents

In accordance with section 11 (Annual Reports) of O. Reg. 170/03, this Report must summarize any reports made to the Ministry under subsection 18(1) (Duty to report adverse test results) of *the Act* or section 16-4 (Duty to report other observations) of Schedule 16 of O. Reg. 170/03. Additionally, this Report must describe any corrective actions taken under Schedule 17 of O. Reg. 170/03 during the period covered by the report. The three (3) adverse water quality incidents that occurred during the reporting period are summarized below.

- **AWQI No. 155502 (September 15, 2021)**

  NWI received notice from the licensed laboratory that a routine distribution water sample collected from a hydrant in Cochenour on September 7, 2021, yielded a lead result of 12.0 µg/L, which exceeded the Ontario Drinking Water Quality Standard for lead in drinking-water (10 µg/L).

  Corrective action was performed in accordance with Schedule 17 of O. Reg. 170/03 and included collecting a resample from the hydrant on September 15. The resample was collected following an extended period of flushing and yielded a result of <1.0 µg/L. No additional corrective actions were required.

- **AWQI No. 155931 (October 11, 2021)**

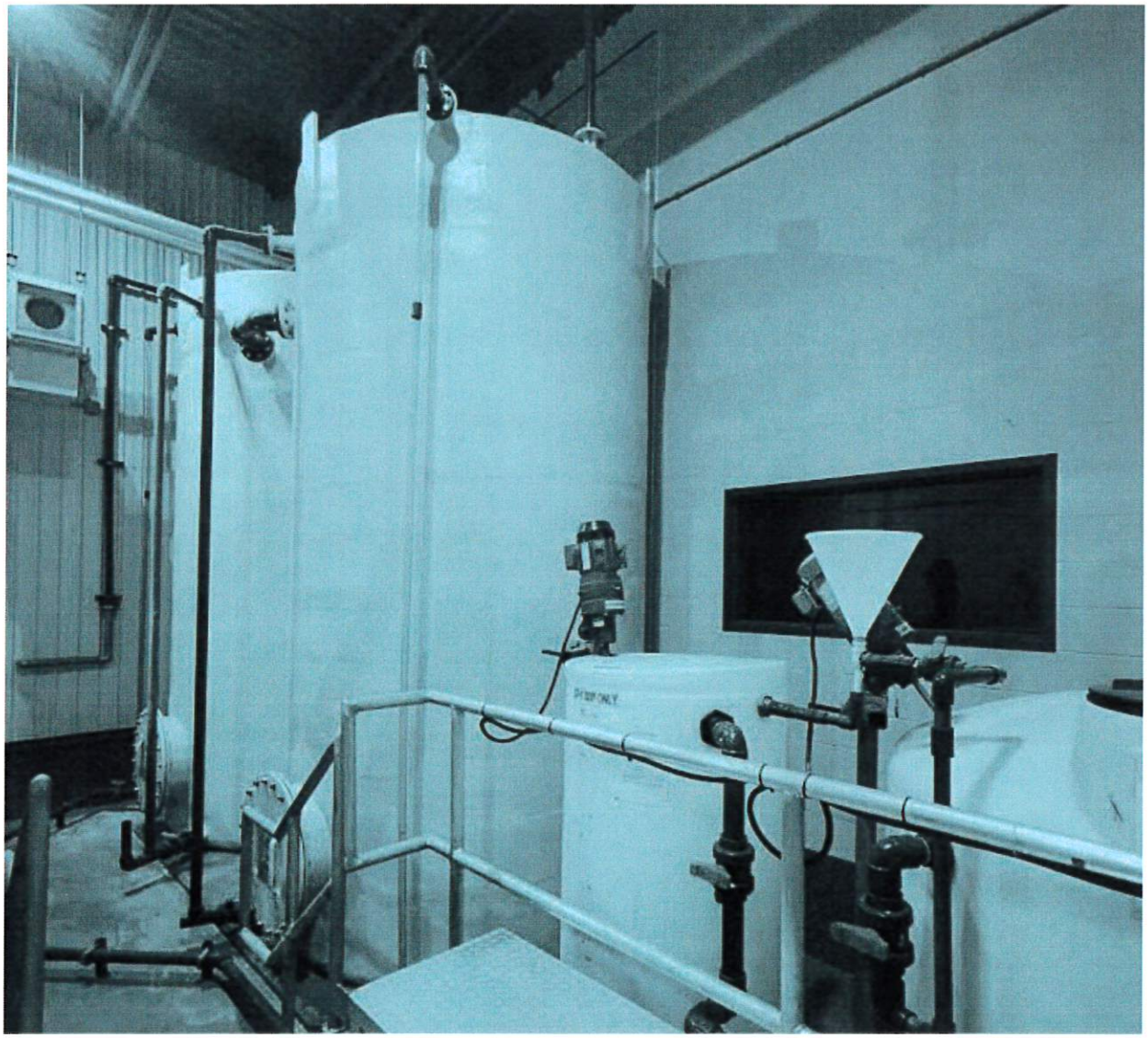
  An operational indicator of adverse water quality occurred following a loss of continuously monitored and recorded data for a regulatory parameter. Specifically, continuously monitored and recorded chlorine data was missing at the Cochenour Water Treatment Plant on October 7 from 21:54:11 to 22:53:26 and on October 8 from 00:12:45 to 00:27:00, for a total of 1 hour and 15 minutes. The data loss was the result of gaps in SCADA system trending coupled with a failure to record data on the backup paper chart recorder. The event was reported as an observation of improper disinfection as it could not be shown that primary disinfection was achieved at all times.

  Corrective action included restoring the recording of chlorine data. Digital chart recorders will also be installed at all facilities in 2022 as a more reliable backup (redundant) monitoring system.

- AWQI 156247 (October 28, 2021)

  As per Ontario's *Watermain Disinfection Procedure*, an emergency water distribution system repair at the intersection of Little Long Lac Avenue and Grizzly Street on McKenzie Island was classified as a Category 2 repair and resulted in a localized loss of pressure.

  Corrective actions included completing the repair, restoring pressure, issuing a localized and precautionary Boil Water Advisory and collecting drinking-water samples for microbiological testing. The samples tested absent for E. coli and total coliform parameters and the Boil Water Advisory was subsequently rescinded.



# Annual Report

## Madsen Drinking Water System

# 2021

Prepared by **Northern Waterworks Inc.**
on behalf of the **Municipality of Red Lake**

NORTHERN WATERWORKS INC.

RED LAKE
Opportunity...it's our Nature

## Contents

# 1 Introduction

## 1.1 Annual Reporting Requirements

This consolidated Annual Report (the Report) has been prepared in accordance with both section 11 (Annual Reports) and Schedule 22 (Summary Reports for Municipalities) of Ontario Regulation 170/03 (Drinking Water Systems Regulation). This Report is intended to inform both the public and Municipal Council about the operation of the system over the previous calendar year (January 1 to December 31, 2021).

Section 11 of O. Reg. 170/03 requires the development and distribution to the public of an annual report summarizing water quality monitoring results, adverse water quality incidents, system expenses and chemicals used in the water treatment process.

Schedule 22 of O. Reg. 170/03 requires the development and distribution to Council of an annual report summarizing incidents of regulatory non-compliance and associated corrective actions, in addition to providing flow monitoring results for the purpose of enabling the Owner to assess the capability of the system to meet existing and planned demand.

## 1.2 Report Availability

In accordance with section 11 of O. Reg. 170/03, this Report must be given, without charge, to every person who requests a copy. Effective steps must also be taken to advise users of water from the system that copies of the report are available, without charge, and of how a copy may be obtained. This Annual Report shall be made available for inspection by the public at the Red Lake Municipal Office and on the Municipality's website.

In accordance with Schedule 22 of O. Reg. 170/03, this Annual Report must be given to the members of Municipal Council. Section 19 (Standard of care, municipal drinking-water system) of Ontario's *Safe Drinking Water Act* (SDWA) also places certain responsibilities upon those municipal officials who oversee an accredited operating authority or exercise decision-making authority over a system. The examination of this Report is one of the methods by which municipal officials may fulfil the obligations required by section 19 of the SDWA.

System users and members of Council are strongly encouraged to contact a representative of NWI for assistance in interpreting this Report. Questions and comments may be directed to the local NWI Operations Manager or by email to compliance@nwi.ca.

# 2 System Overview & Expenses

## 2.1 System Description

The Madsen Drinking Water System must meet extensive treatment and testing requirements to ensure that human health is protected. The operation and maintenance of the system is governed by Ontario's *Safe Drinking Water Act* and the regulations therein, in addition to requirements within system-specific environmental approvals. Important system information is summarized in Table 1.

**Table 1:** System information

| | |
|---|---|
| Drinking-Water System Name: | Madsen Drinking Water System |
| DWS Number: | 210001479 |
| DWS Category: | Small Municipal Residential |
| DWS Owner: | The Corporation of the Municipality of Red Lake |
| DWS Operating Authority: | Northern Waterworks Inc. |
| DWS Components: | • Raw water pumping station<br>• Madsen Water Treatment Plant<br>• Madsen water distribution system |
| Treatment Processes: | • Pre-oxidation<br>• Chemical coagulation, flocculation and clarification<br>• Dual media (rapid sand) filtration<br>• Free chlorine disinfection<br>• pH adjustment |

Water production begins as pumps at the raw water pumping station transfer raw water from its source at Russett Lake to a storage reservoir located at the Madsen Water Treatment Plant. Upon transfer, potassium permanganate is added to the raw water to oxidize iron and manganese for precipitation and removal in downstream treatment processes. Pumps at the treatment facility then deliver the raw water from the storage reservoir directly to the package treatment units. Polyaluminum chloride (coagulant) is injected and rapidly mixed into the raw water immediately upstream from the two package treatment units, which each include a three-chambered flocculation basin, clarifier and filter.

To promote floc formation water is gently mixed as it passes through the flocculation basins. Polymer solution (flocculant) is also added to the water at this stage of treatment to form larger and more stable floc aggregates. Process water then enters the clarifier where its velocity is reduced to allow for the separation and settling of floc. Supernatant overflows into the clarifier effluent launders and is directed to the filter unit; settled floc (sludge) is automatically removed from the bottom of the clarifier.

Impurities that were not captured and settled as floc in the clarifier are removed by passing water through a dual media filter composed of anthracite and silica sand on a layer of support gravel. Sodium hypochlorite (disinfectant) and sodium carbonate solution (pH/alkalinity adjustment) are added to the filtrate as it is directed from the filters to the treated water storage reservoir. The filters are periodically cleaned by using an air scour to agitate the entire media bed and reversing the flow of water through the filter using pumps.

Primary disinfection is achieved as disinfectant mixes with the water in the reservoir. Treated water is then delivered from the reservoir to the water distribution system using pumps. Secondary disinfection requirements in the distribution system are achieved by maintaining a free chlorine residual at all locations.

## 2.2 Water Treatment Chemicals

In accordance with section 11 of O. Reg. 170/03, this Report must include a list of all water treatment chemicals used by the system during the period covered by the report (summarized in Table 2). All chemicals used in the treatment process are NSF/ANSI 60 certified for use in potable water, as required by system approvals.

**Table 2:** Water treatment chemicals used in 2021

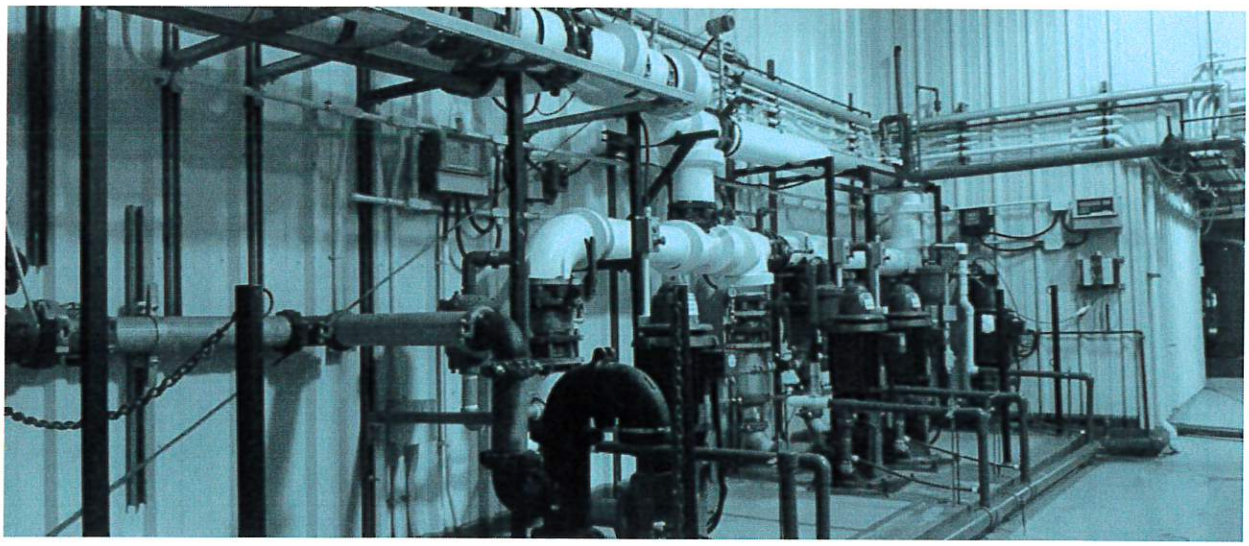
| Treatment Chemical | Application |
|---|---|
| potassium permanganate | oxidizing agent |
| polyaluminum chloride | coagulant |
| polymer (Polyfloc CP1160P) | flocculant |
| sodium hypochlorite | disinfectant |
| sodium carbonate (soda ash) | pH/alkalinity adjustment |

## 2.3 System Expenses

In accordance with section 11 of O. Reg. 170/03, this Report must describe any major expenses incurred during the reporting period to install, repair or replace required equipment. This Report also summarizes those expenses related to strengthening equipment inventories and to maintenance activities undertaken by subcontracted service providers. Major expenses incurred in 2021 are summarized in Table 3.

**Table 3:** Major expenses incurred in 2021

| Category | Description | Expense |
|---|---|---|
| Repair/Replace | Various automation and programming upgrades | $5,004 |
| Replace | Unit suspension heaters | $4,174 |
| Inventory/Replace | Free chlorine residual analyzer components | $2,807 |
| Replace | Lighting replacement | $2,421 |
| Replace | Uninterruptible power supply | $1,986 |
| Replace | Paper chart recorder supplies | $1,853 |
| New Equipment | Drum pump kit and accessories | $1,710 |
| Maintenance | Raw water intake inspection | $1,500 |
| Maintenance | Flow meter calibration verifications | $1,100 |
| Replace | Flocculator drive electric motor | $1,100 |
| Inventory/Replace | Assorted tools | $1,099 |
| Maintenance | Backflow prevention device inspection and testing | $1,069 |



# 3 Water Quality

## 3.1 Overview

Water quality monitoring is conducted to determine and confirm that drinking water delivered to the consumer is safe and aesthetically pleasing. Monitoring is also required to assess compliance with legislation and to control the treatment process. In accordance with section 11 of O. Reg. 170/03, this Report must summarize the results of water quality tests required by regulations, approvals, and orders. The following sections summarize the results of all required water quality tests and compare the results to applicable water quality standards.

## 3.2 Microbiological Parameters

Microbiological sampling and testing requirements are provided in Schedule 11 (Microbiological sampling and testing) of O. Reg. 170/03. In 2021, a total of 156 routine source, treated and distribution water samples were collected for microbiological analysis by an accredited laboratory. Samples were collected on a weekly basis and included tests for E. coli (EC), total coliforms (TC) and heterotrophic plate counts (HPC). Results from microbiological analyses are summarized in Table 4. All results were below the associated Ontario Drinking Water Quality Standards.

**Table 4:** Results summary for microbiological parameters

| Sample Type | # of Samples | EC Results Range[1] (MPN/ 100mL) | TC Results Range[1] (MPN/ 100mL) | # of HPC Samples | HPC Results Range (CFU/mL) |
|---|---|---|---|---|---|
| Raw Water | 52 | 0 to 5 | 3 to >2420 | --- | --- |
| Treated Water | 52 | absent | absent | 51 | 0 to 1 |
| Distribution | 52 | absent | absent | 51 | 0 to 2 |
| Treated Water (nonroutine) | 1 | absent | absent | --- | --- |
| Distribution (nonroutine) | 2 | absent | absent | 2 | 0 to 1 |

1. The Ontario Drinking Water Quality Standard for E. Coli and Total Coliforms in a treated or distribution sample is 'not detectable'. The presence of either parameter in a treated or distribution sample constitutes an exceedance.

## 3.3 Operational Parameters

In accordance with Schedule 7 (Operational checks) of O. Reg. 170/03, regulated operational parameters that must be monitored include raw water turbidity, filtrate turbidity and the free chlorine residuals associated with primary and secondary disinfection. Table 5 summarizes water quality results for regulated and selected unregulated operational parameters. In accordance with Schedule 6 (Operational checks, sampling and testing – general) of O. Reg. 170/03, certain operational parameters are continuously monitored. One (1) Adverse Water Quality Incident associated with a low treated water free chlorine residual occurred during the reporting period. Refer to the *Compliance* section of this report for more information.

**Table 5:** Results summary for operational parameters

| Parameter (Sample Type) | Number of Samples | Units | Min. Result | Max. Result | Annual Avg | Adverse Result |
|---|---|---|---|---|---|---|
| Turbidity (Raw Water) | 88 | NTU | 0.28 | 2.20 | 0.88 | n/a |
| Turbidity (Filter 1) | Continuous | NTU | 0.010 | 0.300 | 0.032 | >1.0 |
| Turbidity (Filter 2) | Continuous | NTU | 0.023 | 0.420 | 0.039 | >1.0 |
| Turbidity (Treated) | 365 | NTU | 0.11 | 0.94 | 0.30 | n/a |
| pH (Treated) | 365 | --- | 7.0 | 8.8 | 7.7 | n/a |
| Alkalinity (Treated) | 227 | mg/L | 38 | 60 | 50 | n/a |
| Alum Residual (Treated) | 225 | mg/L | 0.010 | 0.074 | 0.025 | n/a |
| FCR[1] (Treated)[2] | Continuous | mg/L | 0.00[3] | 3.25 | 2.04 | n/a |
| FCR[1] (Distribution)[4] | 365 | mg/L | 0.16 | 3.36 | n/a | <0.05 |

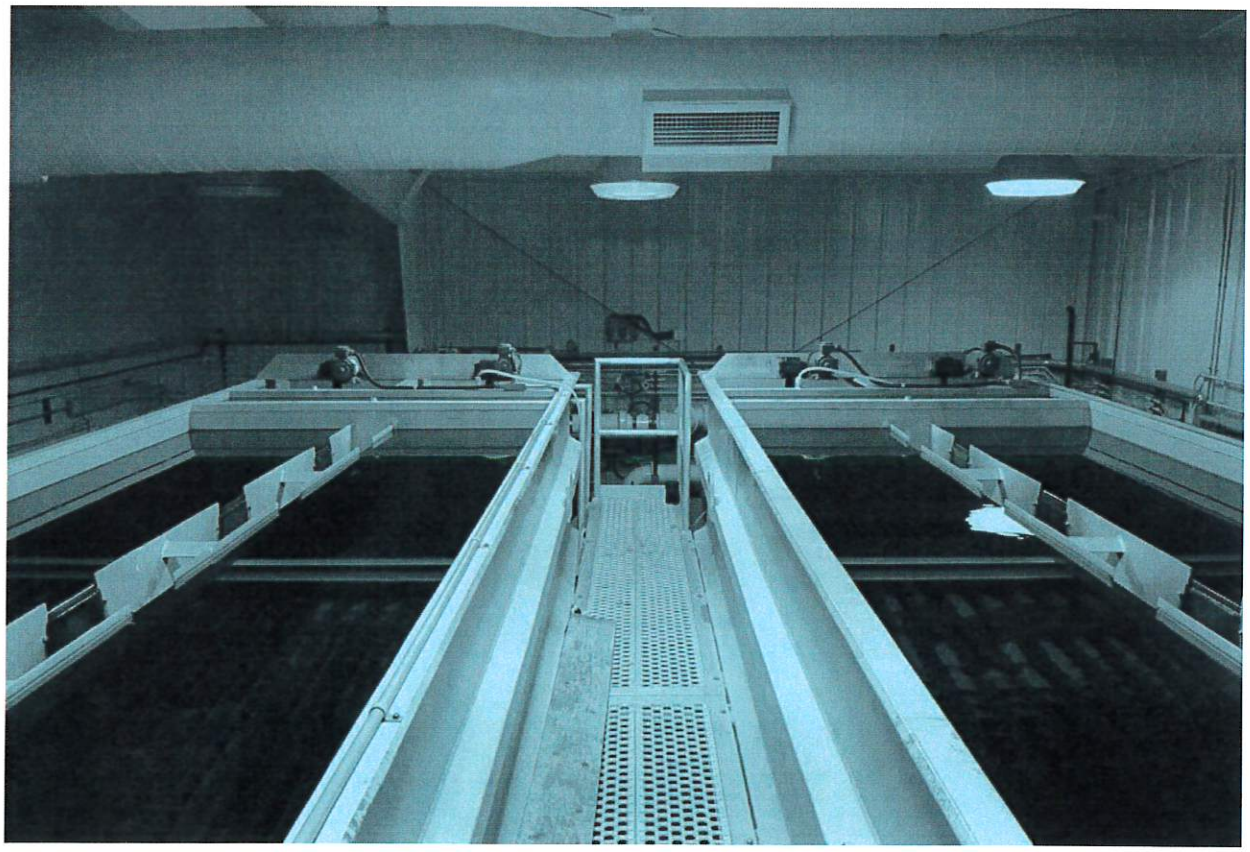
1. FCR = free chlorine residual.
2. There is no adverse result corresponding to the treated water free chlorine residual. However, an observation of adverse water quality occurs if the residual is low enough such that water has not been disinfected in accordance with the system's *Municipal Drinking Water Licence*.
3. This minimum result is associated with AWQI No. 154194. On June 1, a blockage of the sodium hypochlorite chemical feed system at the injector and other equipment failures interfered with dosing and resulted in a low chlorine residual in treated water.
4. Free chlorine residuals are tested at various locations in the distribution system. The free chlorine residual varies with water age and distribution system location, and values in the table pertain to the minimum and maximum results collected across all locations in the calendar year.

## 3.4 Conventional Filtration Performance

In accordance with the system's *Municipal Drinking Water Licence*, conventional filtration must meet certain performance criteria in order to claim removal credits for Cryptosporidium oocysts and Giardia cysts. In addition to continuously monitoring filtrate turbidity and other requirements, filtrate turbidity must be less than or equal to 0.3 NTU in at least 95% of the measurements each month. Table 6 summarizes filtrate turbidity compliance against the <0.3 NTU/95% performance criterion. Minimum and maximum values in the table correspond to the proportion of time that filtered water turbidity was less than or equal to 0.3 NTU in a calendar month in 2021. No AWQIs pertaining to conventional filtration performance occurred during the reporting period.

**Table 6:** Filtration performance summary

| Filter | Minimum Result | Maximum Result | Adverse Result |
|---|---|---|---|
| Filter 1 | 100% | 100% | <95% |
| Filter 2 | 100% | 100% | <95% |



## 3.5 Nitrate & Nitrite

Treated water is tested for nitrate and nitrite concentrations on a quarterly basis in accordance with Schedule 13 (Chemical sampling and testing) of O. Reg. 170/03. Nitrate and nitrite results are provided in Table 7. All results were below the Ontario Drinking Water Quality Standards.

**Table 7:** Nitrate and nitrite results

| Sample Date | Nitrate | | Nitrite | |
|---|---|---|---|---|
| | Result (mg/L) | ODWQS (mg/L) | Result (mg/L) | ODWQS (mg/L) |
| 16-Feb-2021 | 0.081 | 10 | <0.010 | 1 |
| 11-May-2021 | <0.020 | | <0.010 | |
| 25-Aug-2021 | 0.023 | | <0.010 | |
| 15-Nov-2021 | 0.039 | | <0.010 | |

## 3.6 Trihalomethanes & Haloacetic Acids

Trihalomethanes (THMs) and haloacetic acids (HAAs) are sampled on a quarterly basis from a distribution system location that is likely to have an elevated potential for their formation, in accordance with Schedule 13 (Chemical sampling and testing) of O. Reg. 170/03. Total THM and HAA results are provided in Table 8 and Table 9, respectively. Compliance with the provincial standards for trihalomethane and haloacetic acid concentrations is determined by calculating a running annual average (RAA). The 2021 running annual averages for THMs and HAAs were below the respective Ontario Drinking Water Quality Standards.

**Table 8:** Total THM results

| Sample Date | Result (µg/L) |
|---|---|
| 16-Feb-2021 | 31.8 |
| 11-May-2021 | 50.0 |
| 25-Aug-2021 | 68.3 |
| 15-Nov-2021 | 33.6 |
| Regulatory Average (RAA) | 45.9 |
| ODWQS (RAA) | 100 |

**Table 9:** Total HAA results

| Sample Date | Result (µg/L) |
|---|---|
| 16-Feb-2021 | 29.8 |
| 11-May-2021 | 34.8 |
| 25-Aug-2021 | 38.0 |
| 15-Nov-2021 | 23.3 |
| Regulatory Average (RAA) | 31.5 |
| ODWQS (RAA) | 80 |

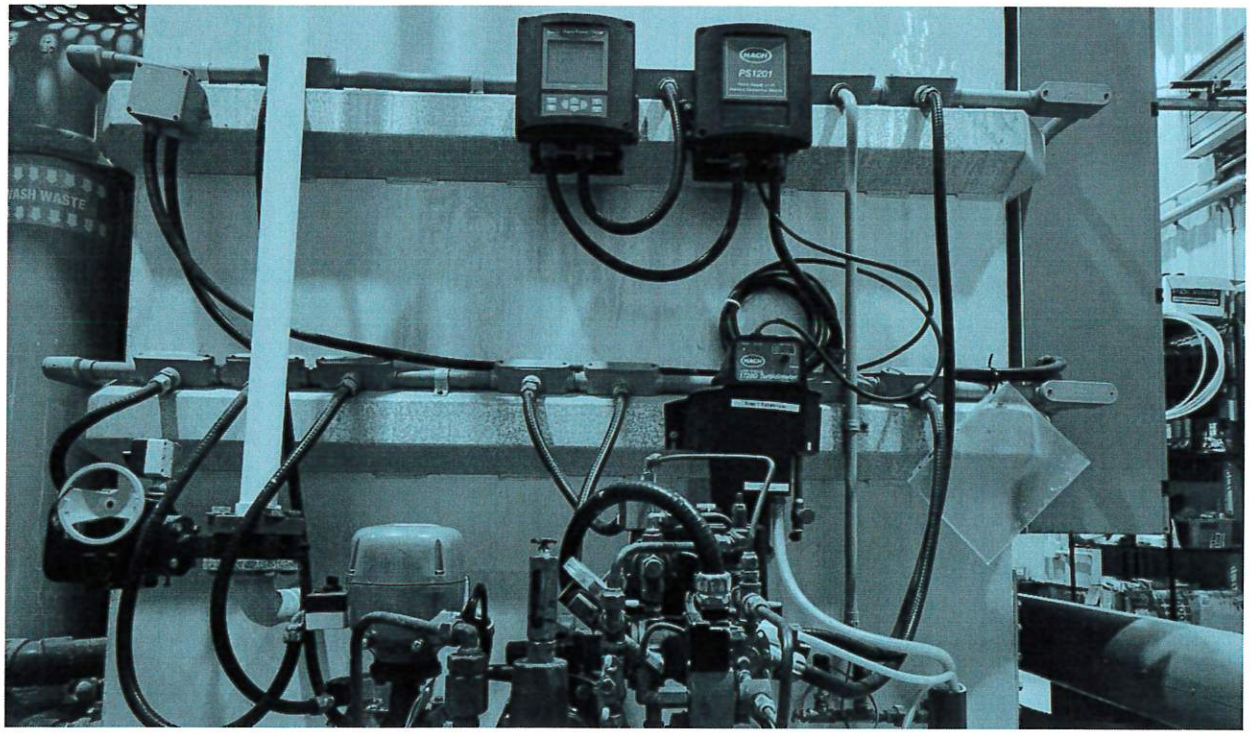
## 3.7 Lead Sampling

Based upon favourable lead sampling results in the community and in accordance with Schedule 15.1 (Lead) of O. Reg. 170/03, the Madsen Drinking Water System previously qualified for reduced lead sampling in the second half of 2017. Favourable results from reduced lead sampling conducted in 2019 and 2020 have allowed the system to qualify for an exemption from sampling at plumbing locations. Two (2) distribution samples must now be collected every year and analyzed for pH and alkalinity. Additionally, these distribution system samples must be analyzed for lead in every third 12-month period after the plumbing sample exemption was activated. Table 10 summarizes the results of lead sampling and related required tests.

**Table 10:** Distribution pH, alkalinity and lead sampling results

| Sample Date | Distribution Sample Location | pH | Alkalinity (mg/L) | Lead Result (µg/L) | Lead ODWQS (µg/L) |
|---|---|---|---|---|---|
| 09-Apr-2021 | Main Street Bleeder | 7.94 | 57 | Lead analyses not required in 2021[1] | 10 |
| 13-Oct-2021 | Main Street Bleeder | 7.61 | 49 | | |

1. Lead will next be tested in distribution samples during the Summer 2022 and Winter 2023 sampling periods.



## 3.8 Inorganic & Organic Parameters

Most inorganic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 (Chemical sampling and testing) and 23 (Inorganic parameters) of O. Reg. 170/03. The inorganic parameters sodium and fluoride are sampled every five (5) years in treated water in accordance with Schedules 13 and 23 of O. Reg. 170/03. The most recent inorganic parameter sampling results are provided in Table 11. All results were below the associated Ontario Drinking Water Quality Standards.

**Table 11:** Inorganic parameter sampling results

| Parameter | Most Recent Sample Date | Units | Result | ODWQS |
|---|---|---|---|---|
| Antimony | 25-Aug-2021 | µg/L | <0.60 | 6 |
| Arsenic | 25-Aug-2021 | µg/L | <1.0 | 10 |
| Barium | 25-Aug-2021 | µg/L | <10 | 1000 |
| Boron | 25-Aug-2021 | µg/L | <50 | 5000 |
| Cadmium | 25-Aug-2021 | µg/L | <0.10 | 5 |
| Chromium | 25-Aug-2021 | µg/L | <1.0 | 50 |
| Fluoride | 11-Feb-2019 | mg/L | <0.020 | 1.5 |
| Mercury | 25-Aug-2021 | µg/L | <0.10 | 1 |
| Selenium | 25-Aug-2021 | µg/L | <1.0 | 50 |
| Sodium | 11-Feb-2019 | mg/L | 20.1[1] | 20 |
| Uranium | 25-Aug-2021 | µg/L | <2.0 | 20 |

1. The parameter sodium is not considered a toxic element and is not associated with a Standard as prescribed in O. Reg. 169/03, although an exceedance of 20 mg/L requires reporting and corrective actions. The result in the table is associated with Adverse Water Quality Incident no. 144775, and a resample collected on February 26, 2019, yielded a sodium result of 15.3 mg/L.

Organic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 (Chemical sampling and testing) and 24 (Organic parameters) of O. Reg. 170/03. These parameters include various organic acids, pesticides, herbicides, PCBs, volatile organics and other chemicals. Sampling for organic parameters was conducted on August 15 & September 7, 2021, and results are provided in Table 12. All results were below the associated Ontario Drinking Water Quality Standards.

**Table 12:** Organic parameter sampling results

| Parameter | Result (µg/L) | ODWQS (µg/L) | Parameter | Result (µg/L) | ODWQS (µg/L) |
|---|---|---|---|---|---|
| Alachlor | <0.10 | 5 | Diuron | <1.0 | 150 |
| Atrazine & Metabolites | <0.20 | 5 | Glyphosate | <5.0 | 280 |
| Azinphos-methyl | <0.10 | 20 | Malathion | <0.10 | 190 |
| Benzene | <0.50 | 1 | MCPA | <0.20 | 100 |
| Benzo(a)pyrene | <0.005 | 0.01 | Metolachlor | <0.10 | 50 |
| Bromoxynil | <0.20 | 5 | Metribuzin | <0.10 | 80 |
| Carbaryl | <0.20 | 90 | Monochlorobenzene | <0.50 | 80 |
| Carbofuran | <0.20 | 90 | Paraquat | <1.0 | 10 |
| Carbon Tetrachloride | <0.20 | 2 | Pentachlorophenol | <0.50 | 60 |
| Chlorpyrifos | <0.10 | 90 | Phorate | <0.10 | 2 |
| Diazinon | <0.10 | 20 | Picloram | <0.20 | 190 |
| Dicamba | <0.20 | 120 | Total PCBs | <0.035 | 3 |
| 1,2-Dichlorobenzene | <0.50 | 200 | Prometryne | <0.10 | 1 |
| 1,4-Dichlorobenzene | <0.50 | 5 | Simazine | <0.10 | 10 |
| 1,2-Dichloroethane | <0.50 | 5 | Terbufos | <0.20 | 1 |
| 1,1-Dichloroethylene | <0.50 | 14 | Tetrachloroethylene | <0.50 | 10 |
| Dichloromethane | <5.0 | 50 | 2,3,4,6-Tetrachlorophenol | <0.50 | 100 |
| 2,4-Dichlorophenol | <0.30 | 900 | Triallate | <0.10 | 230 |
| 2,4-D | <0.20 | 100 | Trichloroethylene | <0.50 | 5 |
| Diclofop-methyl | <0.20 | 9 | 2,4,6-Trichlorophenol | <0.50 | 5 |
| Dimethoate | <0.10 | 20 | Trifluralin | <0.10 | 45 |
| Diquat | <1.0 | 70 | Vinyl Chloride | <0.20 | 1 |

# 4 Water Production

## 4.1 Overview

In accordance with Schedule 22 (Summary Reports for Municipalities) of O. Reg. 170/03, this Annual Report must include certain information for the purpose of enabling the Owner to assess the capability of the system to meet existing and planned uses. Specifically, this Report must include a summary of the quantities and flow rates of the water supplied during the reporting period, including monthly average and maximum daily flows. The Report must also include a comparison of flow monitoring results to the rated capacity and flow rates approved in the system's *Municipal Drinking Water Licence*.

## 4.2 Flow Monitoring Results

Throughout the reporting period the Madsen Drinking Water System operated within its rated capacity and supplied a total of 45,450 $m^3$ of treated water. On an average day in 2021, 125 $m^3$ of treated water was supplied to the community, which represents 18% of the rated capacity of the Madsen Water Treatment Plant (691 $m^3$/day). The maximum daily flow in 2021 was 308 $m^3$/day, which represents 45% of the rated capacity of the treatment facility. Flow monitoring results are summarized in Figure 1 and Table 13. The capacity assessments provided in the table compare the average and maximum daily flows to the rated capacity of the facility.

**Figure 1:** 2021 average and maximum daily treated water flows

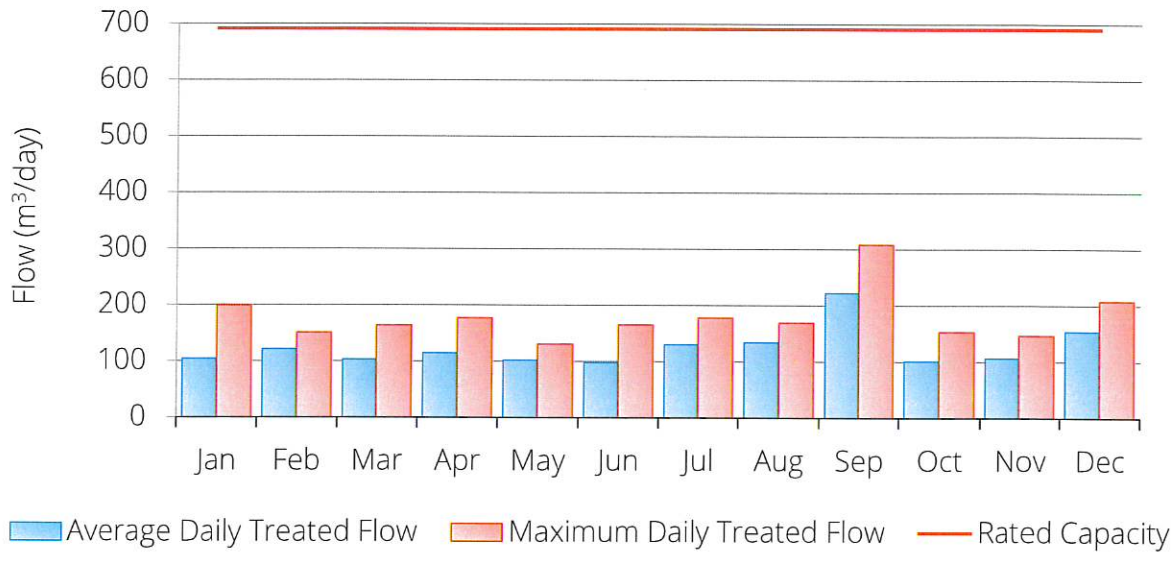
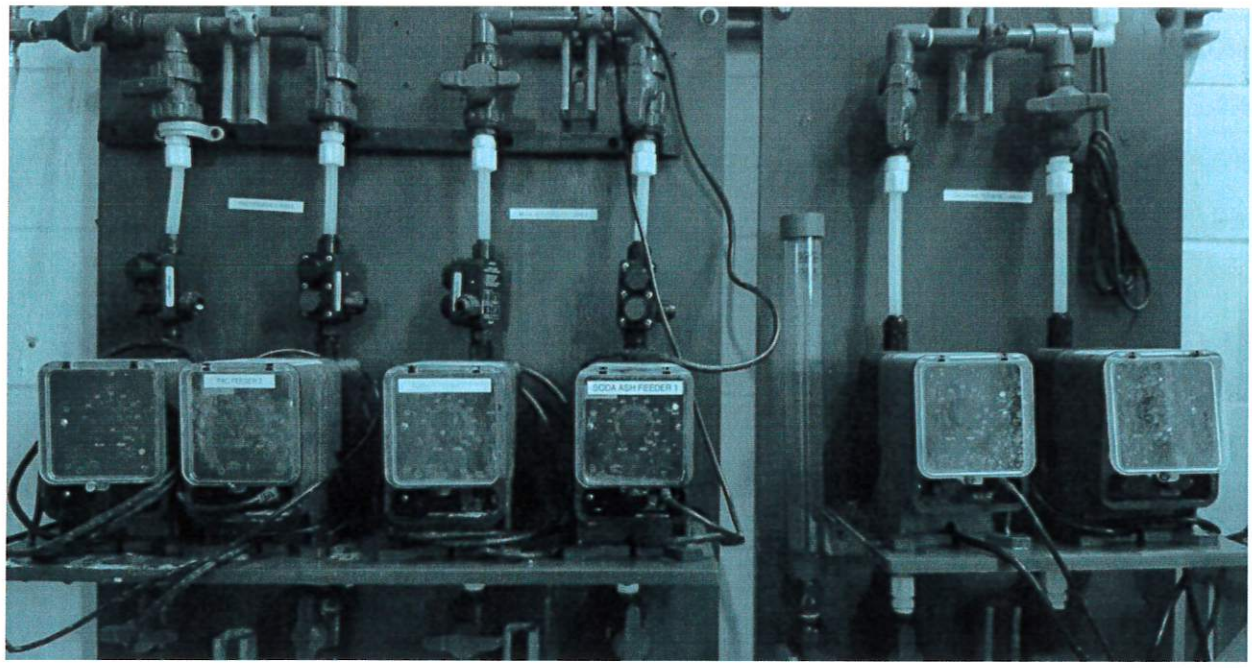


Table 13: 2021 water production summary

| Month | Total Volumes ($m^3$) | | Daily Flows ($m^3$/day) | | Capacity Assessments | |
|---|---|---|---|---|---|---|
| | Raw Water | Treated Water | Average - Treated | Maximum - Treated | Average - Treated | Maximum - Treated |
| Jan | 3,861 | 3,245 | 105 | 199 | 15% | 29% |
| Feb | 4,144 | 3,404 | 122 | 151 | 18% | 22% |
| Mar | 3,804 | 3,209 | 104 | 164 | 15% | 24% |
| Apr | 4,098 | 3,452 | 115 | 177 | 17% | 26% |
| May | 3,716 | 3,168 | 102 | 131 | 15% | 19% |
| Jun | 3,650 | 2,944 | 98 | 165 | 14% | 24% |
| Jul | 4,783 | 4,047 | 131 | 178 | 19% | 26% |
| Aug | 4,831 | 4,159 | 134 | 169 | 19% | 24% |
| Sep | 7,414 | 6,676 | 223 | 308 | 32% | 45% |
| Oct | 3,501 | 3,145 | 101 | 153 | 15% | 22% |
| Nov | 3,916 | 3,210 | 107 | 147 | 15% | 21% |
| Dec | 5,907 | 4,791 | 155 | 208 | 22% | 30% |
| Total | 53,624 | 45,450 | --- | -- | --- | -- |
| Average | 4,469 | 3,788 | 125 | -- | 18% | -- |



Corrective action was performed in accordance with Schedule 18 of O. Reg. 170/03 and included correcting the equipment failures and restoring disinfection, issuing a precautionary community-wide Boil Water Advisory, flushing the water distribution system and confirming secondary disinfection, and sampling and testing for microbiological parameters. All samples tested absent for E. coli and total coliform parameters, and the Boil Water Advisory was rescinded on June 7, 2021.

## 5.3 Regulatory Compliance

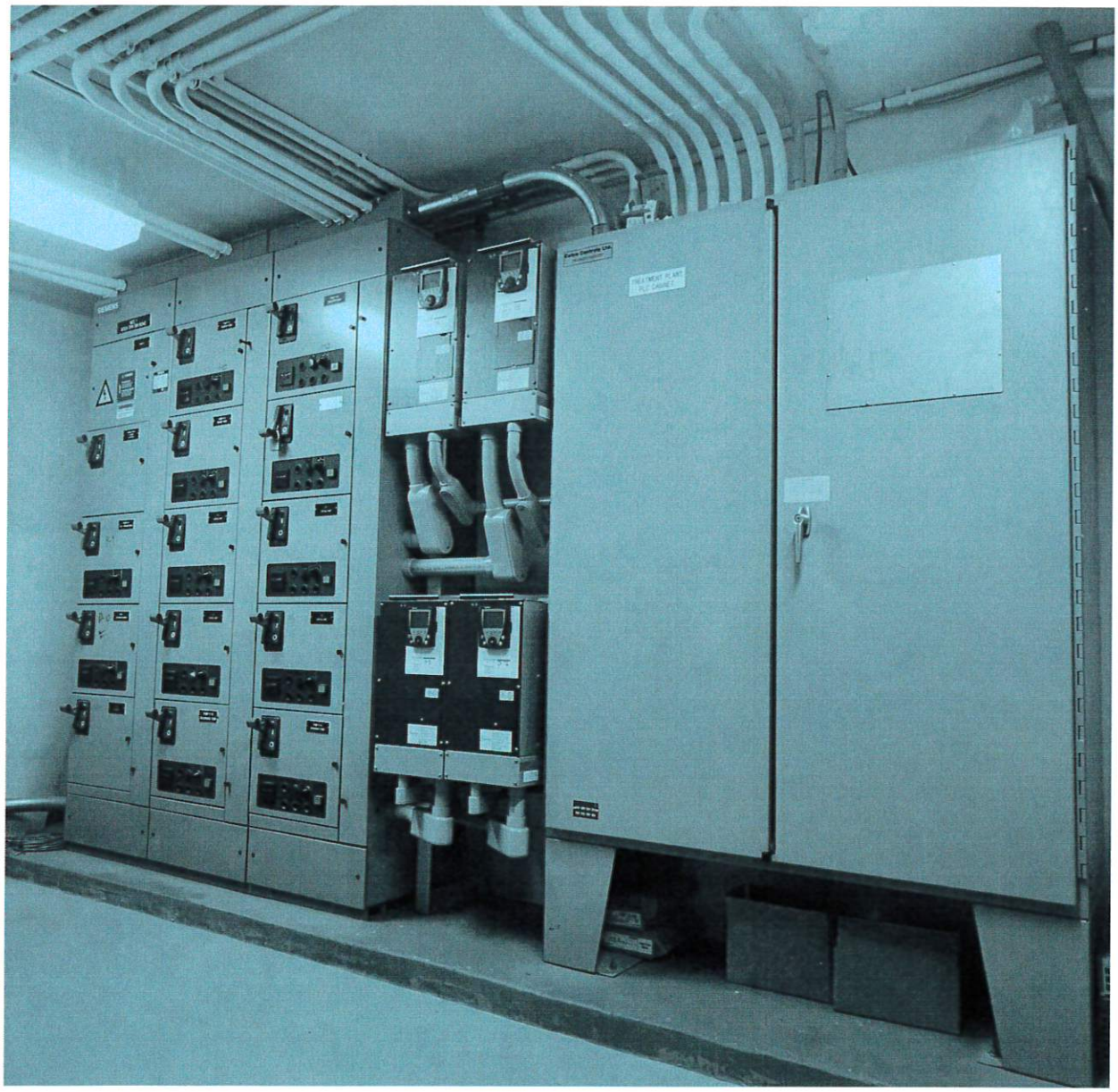
In accordance with Schedule 22 (Summary Reports for Municipalities) of O. Reg. 170/03, this Report must list any requirements of the *Act*, the regulations, the system's approval, drinking water works permit, municipal drinking water licence, and any orders applicable to the system that were not met at any time during the period covered by the report. Additionally, this Report must specify the duration of the failure and the measures that were taken to correct the failure.

The most recent inspection by Ontario's Ministry of the Environment, Conservation and Parks was initiated on July 16, 2021. The final inspection rating was 95.45% and one (1) incident of regulatory noncompliance was identified. Information concerning the duration of failures and the measures taken to address those failures is provided below.

- Noncompliance item no. 1

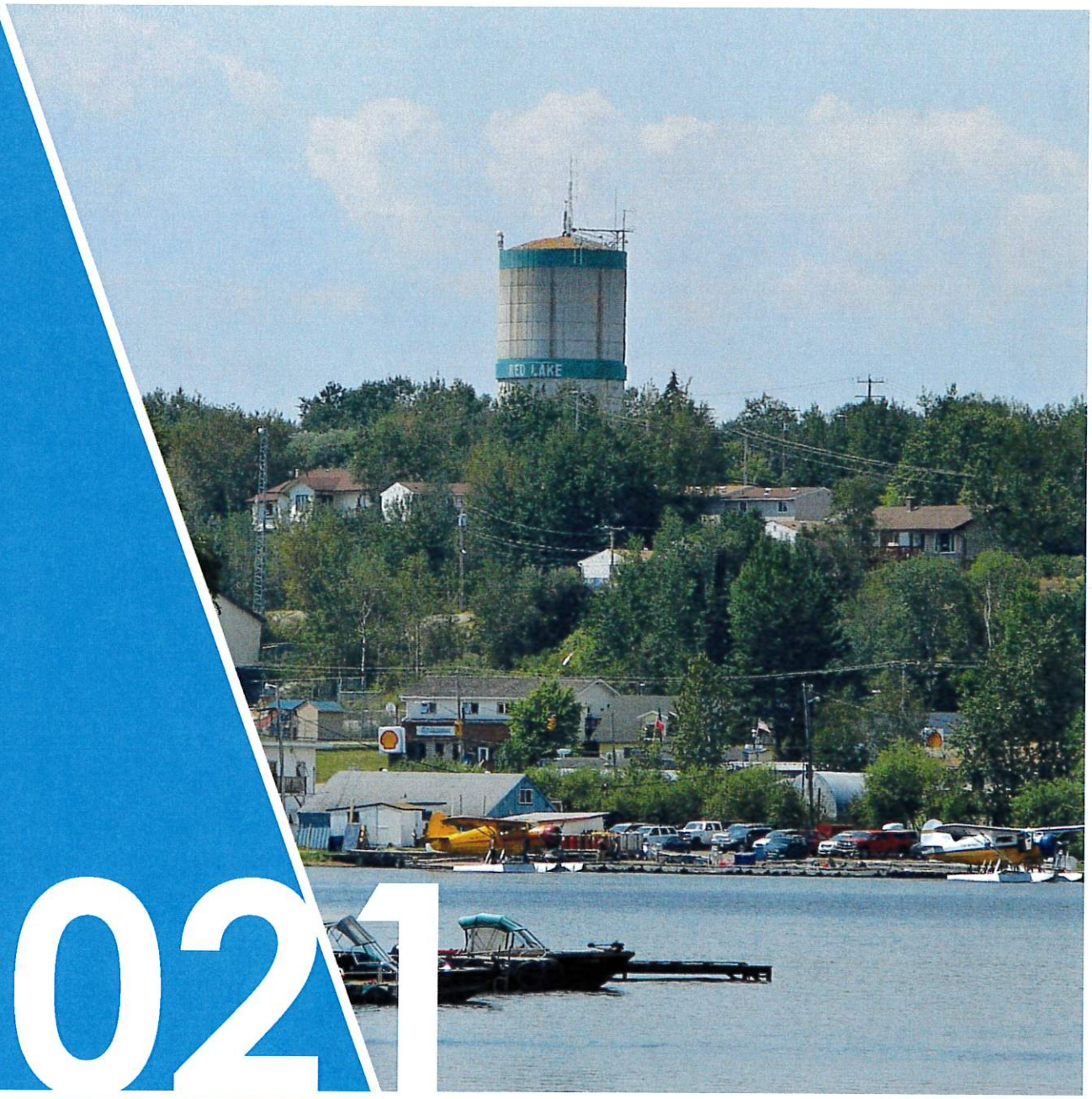
  A regulatory alarm at the treatment facility is immediately activated and transmitted to an on-call operator in the event that the treated water free chlorine residual drops below 1.30 mg/L or exceeds 3.00 mg/L. On June 1, 2021, at approximately 22:00, an operator responded to a low chlorine alarm at the Madsen WTP. Upon arrival, the operator disabled facility alarms through the SCADA computer by selecting the "Alarm Inhibit" function. After the operator disabled the alarms, they proceeded to investigate the cause of the low chlorine condition and eventually relieved an air lock in the chlorine injection system. The responding operator did not re-enable the alarms before leaving the facility, which is completed by selecting the "Alarm Enable" function on the SCADA computer. For approximately 5 hours thereafter, the continuous chlorine analyzer at the Madsen WTP was not equipped with an alarm or an automatic shut-off feature. During this 5-hour period, chlorine dropped below the low chlorine alarm set point and an operator was not notified as water continued to be directed to the water distribution system.

At all times, continuous monitoring equipment for treated water chlorine and filter effluent turbidity must be equipped with alarms or shut-off features that satisfy the standards described in Schedule 6, O. Reg. 170/03. Since the events of June 1, 2021, a timer feature has been programmed into the SCADA computer which will ensure that the facility alarms are re-enabled automatically after 30 minutes, in the event that an operator forgets to manually re-enable them. Additionally, a new process alarm condition for low chlorine was configured at the facility. This process alarm acts as a safeguard against regulatory alarm conditions that are not reset.



# Annual Report

## Red Lake Drinking Water System




# 2021

Prepared by **Northern Waterworks Inc.**
on behalf of the **Municipality of Red Lake**

NORTHERN WATERWORKS INC.

RED LAKE
Opportunity...It's our Nature

# Contents

# 1 Introduction

## 1.1 Annual Reporting Requirements

This consolidated Annual Report (the Report) has been prepared in accordance with both section 11 (Annual Reports) and Schedule 22 (Summary Reports for Municipalities) of Ontario Regulation 170/03 (Drinking Water Systems Regulation). This Report is intended to inform both the public and Municipal Council about the operation of the system over the previous calendar year (January 1 to December 31, 2021).

Section 11 of O. Reg. 170/03 requires the development and distribution to the public of an annual report summarizing water quality monitoring results, adverse water quality incidents, system expenses and chemicals used in the water treatment process.

Schedule 22 of O. Reg. 170/03 requires the development and distribution to Council of an annual report summarizing incidents of regulatory non-compliance and associated corrective actions, in addition to providing flow monitoring results for the purpose of enabling the Owner to assess the capability of the system to meet existing and planned demand.

## 1.2 Report Availability

In accordance with section 11 of O. Reg. 170/03, this Report must be given, without charge, to every person who requests a copy. Effective steps must also be taken to advise users of water from the system that copies of the report are available, without charge, and of how a copy may be obtained. This Annual Report shall be made available for inspection by the public at the Red Lake Municipal Office and on the Municipality's website.

In accordance with Schedule 22 of O. Reg. 170/03, this Annual Report must be given to the members of Municipal Council. Section 19 (Standard of care, municipal drinking-water system) of Ontario's *Safe Drinking Water Act* (SDWA) also places certain responsibilities upon those municipal officials who oversee an accredited operating authority or exercise decision-making authority over a system. The examination of this Report is one of the methods by which municipal officials may fulfil the obligations required by section 19 of the SDWA.

System users and members of Council are strongly encouraged to contact a representative of NWI for assistance in interpreting this Report. Questions and comments may be directed to the local NWI Operations Manager or by email to compliance@nwi.ca.

# 2 System Overview & Expenses

## 2.1 System Description

The Red Lake Drinking Water System must meet extensive treatment and testing requirements to ensure that human health is protected. The operation and maintenance of the system is governed by Ontario's *Safe Drinking Water Act* and the regulations therein, in addition to requirements within system-specific environmental approvals. Important system information is summarized in Table 1.

**Table 1:** System information

| | |
|---|---|
| Drinking-Water System Name: | Red Lake Drinking Water System |
| DWS Number: | 210000265 |
| DWS Category: | Large Municipal Residential |
| DWS Owner: | The Corporation of the Municipality of Red Lake |
| DWS Operating Authority: | Northern Waterworks Inc. |
| DWS Components: | • Red Lake Water Treatment Plant<br>• Red Lake water distribution system and standpipe |
| Treatment Processes: | • Chemical coagulation, flocculation and clarification<br>• Dual media (rapid sand) filtration<br>• Free chlorine disinfection<br>• pH adjustment |

Water production begins as raw water flows by gravity from the intake structure located in Skookum Bay (Red Lake) to underground reservoirs located at the Red Lake Water Treatment Plant. Pumps then transfer water from the reservoirs directly to the treatment units. Aluminum sulphate (coagulant) and sodium carbonate solution (pH/alkalinity adjustment) are injected and rapidly mixed into the raw water immediately upstream from the two package treatment units, which each include a four-chambered flocculation basin, clarifier and filter.

To promote floc formation water is gently mixed as it passes through the flocculation basins. Polymer (flocculant) is also added to the water at this stage of treatment to form larger and more stable floc aggregates. Water then enters the clarifier where its velocity is reduced to allow for the separation and settling of floc. Supernatant overflows into effluent launders and is directed to the filter unit. Settled floc is periodically removed from the bottom of the clarifier.

Impurities that were not captured and settled as floc in the clarifier are removed by passing water through a dual media filter composed of anthracite and silica sand on a layer of support gravel. Chlorine gas (disinfectant) and sodium carbonate solution are added to the filtrate as it is directed from the filters to the treated water storage reservoir. The filters are periodically cleaned by using an air scour to agitate the entire media bed and reversing the flow of water through the filter.

Primary disinfection is achieved as disinfectant mixes with the water in the reservoir. Treated water is then delivered from the reservoir to the community standpipe and water distribution system using pumps located at the treatment facility. The standpipe is used to regulate system pressure and to provide a reserve volume of water for emergency situations. Secondary disinfection requirements in the water distribution system are achieved by maintaining a free chlorine residual at all locations.

## 2.2 Water Treatment Chemicals

In accordance with section 11 of O. Reg. 170/03, this Report must include a list of all water treatment chemicals used by the system during the period covered by the report (summarized in Table 2). All chemicals used in the treatment process are NSF/ANSI 60 certified for use in potable water, as required by system approvals.

**Table 2:** Water treatment chemicals used in 2021

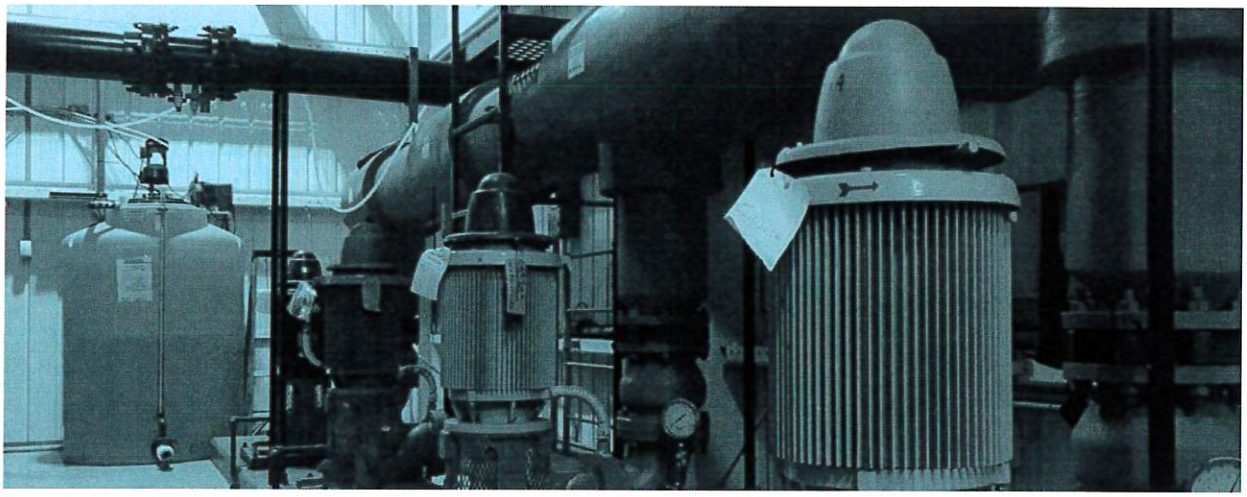
| Treatment Chemical | Application |
|---|---|
| aluminum sulphate | coagulant |
| sodium carbonate | pH/alkalinity adjustment |
| polymer (Polyfloc CP1160P) | flocculant |
| chlorine gas | disinfectant |

## 2.3 System Expenses

In accordance with section 11 of O. Reg. 170/03, this Report must describe any major expenses incurred during the reporting period to install, repair or replace required equipment. This report also summarizes those expenses related to strengthening equipment inventories and to maintenance activities undertaken by subcontracted service providers. Major expenses incurred in 2021 are summarized in Table 3.

**Table 3:** Major expenses incurred in 2021

| Category | Description | Expense |
|---|---|---|
| Replace | Generator automatic power transfer switch | $19,500 |
| Inventory/Replace | Gas chlorinator components | $ 5,416 |
| Inventory | Chemical metering pump | $5,097 |
| Replace | Lighting replacement | $3,527 |
| Replace | Hot water tank | $3,096 |
| Maintenance | Raw water intake inspection | $2,500 |
| Inventory/Repair | Automatic water flow control (Singer) valve components | $2,225 |
| New Equipment | Portable generator | $2,049 |
| Maintenance | Flow meter calibration verifications | $1,900 |
| Inventory | Inline turbidity analyzer primary and secondary standards | $1,666 |
| Inventory | 4-input analog switch | $1,513 |
| Inventory/Replace | Benchtop pH instrument probes | $1,157 |
| Inventory | Assorted tools | $1,099 |



# 3 Water Quality

## 3.1 Overview

Water quality monitoring is conducted to determine and confirm that drinking water delivered to the consumer is safe and aesthetically pleasing. Monitoring is also required to assess compliance with legislation and to control the treatment process. In accordance with section 11 of O. Reg. 170/03, this Report must summarize the results of water quality tests required by regulations, approvals and orders. The following sections summarize the results of all required water quality tests and compare the results to applicable water quality standards.

## 3.2 Microbiological Parameters

Microbiological sampling and testing requirements are provided in Schedule 10 (Microbiological sampling and testing) of O. Reg. 170/03. In 2021, a total of 255 routine source, treated and distribution water samples were collected for microbiological analysis by an accredited laboratory. Samples were collected on a weekly basis and included tests for E. coli (EC), total coliforms (TC) and heterotrophic plate counts (HPC). Results from microbiological analyses are summarized in Table 4. All results were below the associated Ontario Drinking Water Quality Standards.

**Table 4:** Results summary for microbiological parameters

| Sample Type | # of Samples | EC Results Range[1] (MPN/ 100mL) | TC Results Range[1] (MPN/ 100mL) | # of HPC Samples | HPC Results Range (CFU/mL) |
|---|---|---|---|---|---|
| Raw Water | 51 | 0 to 2 | 0 to 291 | --- | --- |
| Treated Water | 51 | absent | absent | 50 | 0 to >300 |
| Distribution | 153 | absent | absent | 50 | 0 to 45 |
| Distribution (nonroutine) | 1 | absent | absent | 1 | 0 |

1. The Ontario Drinking Water Quality Standard for E. Coli and Total Coliforms in a treated or distribution sample is 'not detectable'. The presence of either parameter in a treated or distribution sample constitutes an exceedance.

## 3.3 Operational Parameters

In accordance with Schedule 7 (Operational checks) of O. Reg. 170/03, regulated operational parameters that must be monitored include raw water turbidity, filtrate turbidity and the free chlorine residuals associated with primary and secondary disinfection. In accordance with the system's *Municipal Drinking Water Licence*, additional parameters that must be monitored include treated water pH and alkalinity. Table 5 summarizes water quality results for regulated and selected unregulated operational parameters. In accordance with Schedule 6 (Operational checks, sampling and testing – general) of O. Reg. 170/03, certain operational parameters are continuously monitored.

**Table 5:** Results summary for operational parameters

| Parameter (Sample Type) | Number of Samples | Units | Min. Result | Max. Result | Annual Avg. | Adverse Result[1] |
|---|---|---|---|---|---|---|
| Turbidity (Raw Water) | 94 | NTU | 0.32 | 1.37 | 0.72 | n/a |
| Turbidity (Filter 1) | Continuous | NTU | 0.024 | >2.0[1] | 0.040 | >1.0 |
| Turbidity (Filter 2) | Continuous | NTU | 0.027 | >2.0[1] | 0.052 | >1.0 |
| Turbidity (Treated) | 364 | NTU | 0.06 | 0.20 | 0.09 | n/a |
| pH (Treated) | 365 | --- | 6.6 | 8.6 | 7.8 | n/a |
| Alkalinity (Treated) | 243 | mg/L | 27 | 69 | 53 | n/a |
| Aluminum Residual (Treated) | 227 | mg/L | 0.018 | 0.140 | 0.046 | n/a |
| FCR[2] (Treated)[3] | Continuous | mg/L | 0.68 | 2.58 | 1.94 | n/a |
| FCR[2] (Distribution)[4] | 450+ | mg/L | 0.42 | 2.07 | n/a | <0.05 |

1. Adverse results for filtrate turbidity are prescribed within Schedule 16 of O. Reg. 170/03. There are additional factors not included in the table that are necessary to determine whether a result is adverse, such as the duration of the result.
2. FCR = free chlorine residual.
3. There is no adverse result corresponding to the treated water free chlorine residual. However, an observation of adverse water quality occurs if the residual is low enough such that water has not been disinfected in accordance with the system's *Municipal Drinking Water Licence*.
4. Free chlorine residuals are tested at various locations in the distribution system, and the values in the table pertain to the minimum and maximum results collected across all locations in the calendar year.

## 3.4 Conventional Filtration Performance

In accordance with the system's *Municipal Drinking Water Licence*, conventional filtration facilities must meet certain performance criteria in order to claim removal credits for Cryptosporidium oocysts and Giardia cysts. In addition to continuously monitoring filtrate turbidity and other requirements, filtrate turbidity must be less than or equal to 0.3 NTU in at least 95% of the measurements each month. Table 6 summarizes filtrate turbidity compliance against the <0.3 NTU/95% performance criterion. Minimum and maximum values in the table correspond to the proportion of time that filtered water turbidity was less than or equal to 0.3 NTU in a calendar month in 2021. No AWQIs pertaining to conventional filtration performance occurred during the reporting period.

**Table 6:** Filtration performance summary

| Filter | Minimum Result | Maximum Result | Adverse Result |
|---|---|---|---|
| Filter 1 | 98.87% | 100% | <95% |
| Filter 2 | 98.87% | 100% | <95% |

## 3.5 Nitrate & Nitrite

Treated water is tested for nitrate and nitrite concentrations on a quarterly basis in accordance with Schedule 13 (Chemical sampling and testing) of O. Reg. 170/03. Nitrate and nitrite results are provided in Table 7. All results were below the Ontario Drinking Water Quality Standards.

**Table 7:** Nitrate and nitrite results

| Sample Date | Nitrate | | Nitrite | |
|---|---|---|---|---|
| | Result (mg/L) | ODWQS (mg/L) | Result (mg/L) | ODWQS (mg/L) |
| 16-Feb-2021 | 0.075 | 10 | <0.010 | 1 |
| 11-May-2021 | 0.058 | | <0.010 | |
| 25-Aug-2021 | 0.029 | | <0.010 | |
| 15-Nov-2021 | 0.051 | | <0.010 | |

## 3.6 Trihalomethanes & Haloacetic Acids

Trihalomethanes (THMs) and haloacetic acids (HAAs) are sampled on a quarterly basis from a distribution system location that is likely to have an elevated potential for their formation, in accordance with Schedule 13 (Chemical sampling and testing) of O. Reg. 170/03. Total THM and HAA results are provided in Table 8 and Table 9, respectively. Compliance with the provincial standards for trihalomethane and haloacetic acid concentrations is determined by calculating a running annual average (RAA). The 2021 running annual averages for THMs and HAAs were below the respective Ontario Drinking Water Quality Standards.

**Table 8:** Total THM results

| Sample Date | Result (µg/L) |
|---|---|
| 16-Feb-2021 | 51.9 |
| 11-May-2021 | 67.6 |
| 25-Aug-2021 | 95.4 |
| 15-Nov-2021 | 67.3 |
| Regulatory Average (RAA) | 70.6 |
| ODWQS (RAA) | 100 |

**Table 9:** Total HAA results

| Sample Date | Result (µg/L) |
|---|---|
| 16-Feb-2021 | 41.6 |
| 11-May-2021 | 49.0 |
| 25-Aug-2021 | 60.2 |
| 15-Nov-2021 | 42.8 |
| Regulatory Average (RAA) | 48.4 |
| ODWQS (RAA) | 80 |

## 3.7 Lead Sampling

In 2011 and in accordance with Schedule 15.1 (Lead) of O. Reg. 170/03, a *Corrosion Control Plan* was required to be developed for the Red Lake Drinking Water System following unfavourable results associated with the community lead sampling program. Corrosion control measures were implemented at this time and involved maintaining treated water pH at a value of 7.8 +/- 0.2 units using a sodium carbonate chemical feed system. Corrosion control has been effective and has resulted in a 90% reduction in average lead levels and an 82% reduction in the 90th percentile lead concentration. The ODWQS exceedance rate has also been significantly reduced from 20.6% to 1.4% (i.e., 20.6% of plumbing samples collected prior to corrosion control exceeded the standard for lead in drinking-water), and there have been no lead exceedances in plumbing samples since 2011.

The system now adheres to the lead monitoring program outlined in its *Municipal Drinking Water Licence*, which requires the collection of distribution and plumbing samples on an annual basis. Table 10 summarizes the results of community lead sampling conducted in 2021. Distribution and plumbing samples were collected on September 8 & 9, 2021, and all results were below the Ontario Drinking Water Quality Standard for lead in drinking water.

**Table 10:** Lead sampling results summary

| Sample Type | No. of Sample Points | No. of Samples | Min. Result (µg/L) | Max. Result (µg/L) | ODWQS (µg/L) | No. of Sample Point Exceedances |
|---|---|---|---|---|---|---|
| Distribution | 2 | 2 | <1.0 | | 10 | 0 |
| Plumbing[1] | 12 | 24 | <1.0 | 2.6[2] | | 0 |

1. In accordance with the sampling protocol outlined in Schedule 15.1 of O. Reg. 170/03, two samples are collected and analyzed for lead at each sample point for plumbing samples.
2. Only two (2) samples tested above the lower analytical detection limit for lead in drinking water.

## 3.8 Inorganic & Organic Parameters

Most inorganic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 (Chemical sampling and testing) and 23 (Inorganic parameters) of O. Reg. 170/03. The inorganic parameters sodium and fluoride are sampled every five (5) years in treated water in accordance with Schedules 13 and 23 of O. Reg. 170/03. The most recent inorganic parameter sampling results are provided in Table 11. All results were below the associated Ontario Drinking Water Quality Standards.

**Table 11:** Inorganic parameter sampling results

| Parameter | Most Recent Sample Date | Units | Result | ODWQS |
|---|---|---|---|---|
| Antimony | 25-Aug-2021 | µg/L | <0.60 | 6 |
| Arsenic | 25-Aug-2021 | µg/L | <1.0 | 10 |
| Barium | 25-Aug-2021 | µg/L | <10 | 1000 |
| Boron | 25-Aug-2021 | µg/L | <50 | 5000 |
| Cadmium | 25-Aug-2021 | µg/L | <0.10 | 5 |
| Chromium | 25-Aug-2021 | µg/L | <1.0 | 50 |
| Fluoride | 15-Feb-2018 | mg/L | 0.021 | 1.5 |
| Mercury | 25-Aug-2021 | µg/L | <0.10 | 1 |
| Selenium | 25-Aug-2021 | µg/L | <1.0 | 50 |
| Sodium | 15-Feb-2018 | mg/L | 24.3[1] | 20 |
| Uranium | 25-Aug-2021 | µg/L | <2.0 | 20 |

1. The parameter sodium is not considered a toxic element and is not associated with a Standard as prescribed in O. Reg. 169/03, although an exceedance of 20 mg/L requires reporting and corrective actions. The result in the table is associated with Adverse Water Quality Incident no. 138780, and a resample collected on February 26, 2018, yielded a sodium result of 23.2 mg/L.

Organic parameters are sampled on an annual basis in treated water in accordance with Schedules 13 (Chemical sampling and testing) and 24 (Organic parameters) of O. Reg. 170/03. These parameters include various organic acids, pesticides, herbicides, PCBs, volatile organics and other chemicals. Sampling for all organic parameters was conducted on August 25, 2021, and results are provided in Table 12. All results were below the associated Ontario Drinking Water Quality Standards.

**Table 12:** Organic parameter sampling results

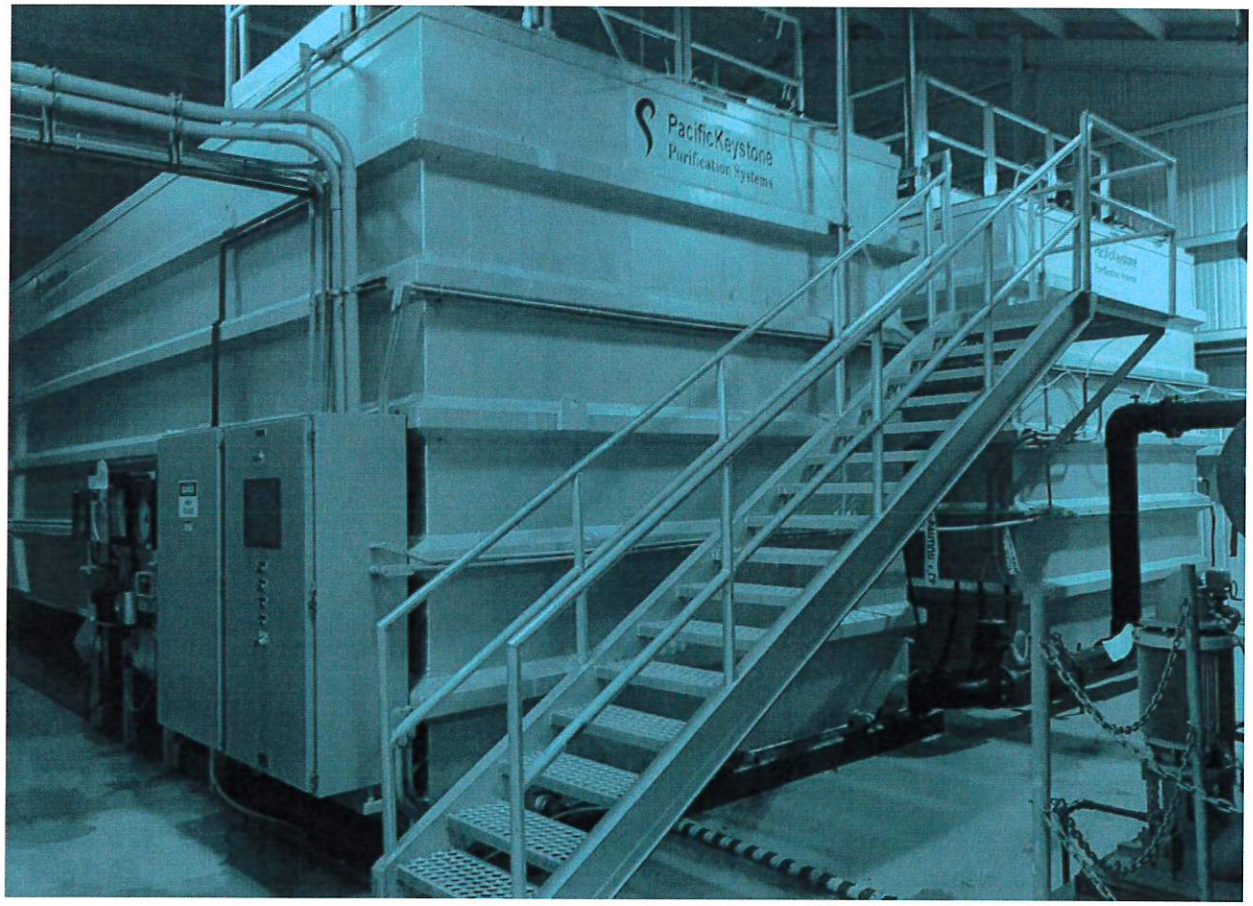
| Parameter | Result (µg/L) | ODWQS (µg/L) | Parameter | Result (µg/L) | ODWQS (µg/L) |
|---|---|---|---|---|---|
| Alachlor | <0.10 | 5 | Diuron | <1.0 | 150 |
| Atrazine & Metabolites | <0.20 | 5 | Glyphosate | <5.0 | 280 |
| Azinphos-methyl | <0.10 | 20 | Malathion | <0.10 | 190 |
| Benzene | <0.50 | 1 | MCPA | <0.20 | 100 |
| Benzo(a)pyrene | <0.005 | 0.01 | Metolachlor | <0.10 | 50 |
| Bromoxynil | <0.20 | 5 | Metribuzin | <0.10 | 80 |
| Carbaryl | <0.20 | 90 | Monochlorobenzene | <0.50 | 80 |
| Carbofuran | <0.20 | 90 | Paraquat | <1.0 | 10 |
| Carbon Tetrachloride | <0.20 | 2 | Pentachlorophenol | <0.50 | 60 |
| Chlorpyrifos | <0.10 | 90 | Phorate | <0.10 | 2 |
| Diazinon | <0.10 | 20 | Picloram | <0.20 | 190 |
| Dicamba | <0.20 | 120 | Total PCBs | <0.035 | 3 |
| 1,2-Dichlorobenzene | <0.50 | 200 | Prometryne | <0.10 | 1 |
| 1,4-Dichlorobenzene | <0.50 | 5 | Simazine | <0.10 | 10 |
| 1,2-Dichloroethane | <0.50 | 5 | Terbufos | <0.20 | 1 |
| 1,1-Dichloroethylene | <0.50 | 14 | Tetrachloroethylene | <0.50 | 10 |
| Dichloromethane | <5.0 | 50 | 2,3,4,6-Tetrachlorophenol | <0.50 | 100 |
| 2,4-Dichlorophenol | <0.30 | 900 | Triallate | <0.10 | 230 |
| 2,4-D | <0.20 | 100 | Trichloroethylene | <0.50 | 5 |
| Diclofop-methyl | <0.20 | 9 | 2,4,6-Trichlorophenol | <0.50 | 5 |
| Dimethoate | <0.10 | 20 | Trifluralin | <0.10 | 45 |
| Diquat | <1.0 | 70 | Vinyl Chloride | <0.20 | 1 |

## 3.9 Environmental Discharge Sampling

The *Municipal Drinking Water Licence* for the Red Lake Drinking Water System requires additional sampling associated with discharges to the natural environment. Specifically, samples must be collected from settling tank effluent on a monthly basis and tested for the parameter total suspended solids (TSS). This effluent is discharged to Red Lake and originates from the onsite treatment of the wastewater produced during plant operation (e.g., filter backwashing and clarifier solids removal). The *Licence* also requires that the effluent discharged to the natural environment has an annual average TSS concentration below 25 mg/L. Table 13 summarizes 2021 environmental discharge sampling results.

**Table 13:** Environmental discharge sampling results summary

| Number of Samples | Minimum TSS Result (mg/L) | Maximum TSS Result (mg/L) | TSS Annual Average (mg/L) |
|---|---|---|---|
| 13 | 4.4 | 167 | 21.9 |



# 4 Water Production

## 4.1 Overview

In accordance with Schedule 22 (Summary Reports for Municipalities) of O. Reg. 170/03, this Annual Report must include certain information for the purpose of enabling the Owner to assess the capability of the system to meet existing and planned uses. Specifically, this Report must include a summary of the quantities and flow rates of the water supplied during the reporting period, including monthly average and maximum daily flows. The Report must also include a comparison of flow monitoring results to the rated capacity and flow rates approved in the system's *Municipal Drinking Water Licence*.

## 4.2 Flow Monitoring Results

Throughout the reporting period the Red Lake Drinking Water System operated within its rated capacity and supplied a total of 394,204 $m^3$ of treated water. On an average day in 2021, 1,080 $m^3$ of treated water was supplied to the community, which represents 18% of the rated capacity of the Red Lake Water Treatment Plant (6,048 $m^3$/day). The maximum daily flow in 2021 was 1,943 $m^3$/day, which represents 32% of the rated capacity of the treatment facility. Flow monitoring results are summarized in Figure 1 and Table 14. The capacity assessments provided in the table compare the average and maximum daily treated water flows to the rated capacity of the treatment facility.

**Figure 1:** 2021 average and maximum daily treated water flows

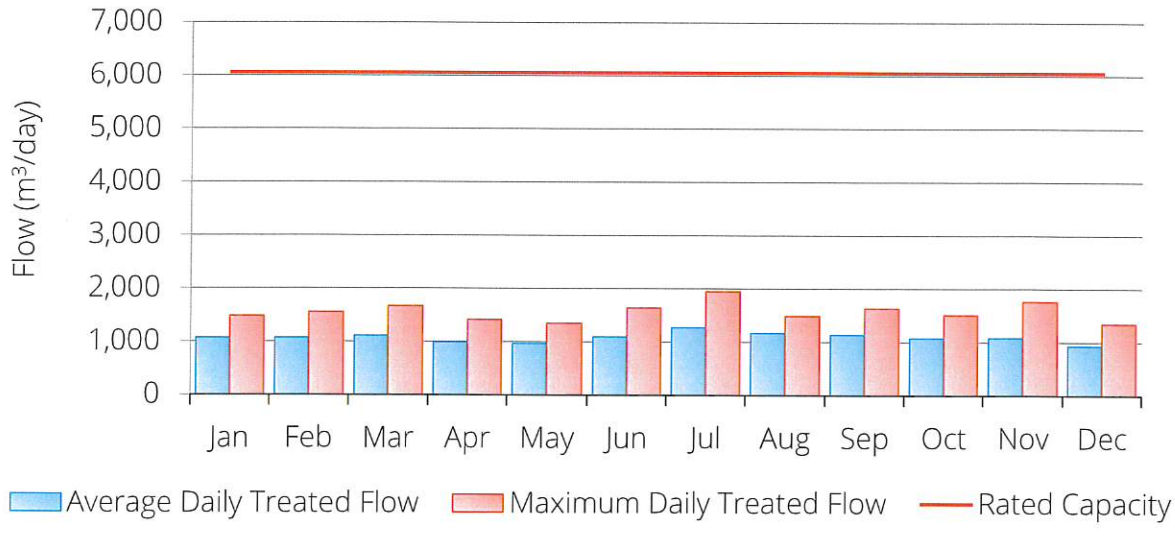
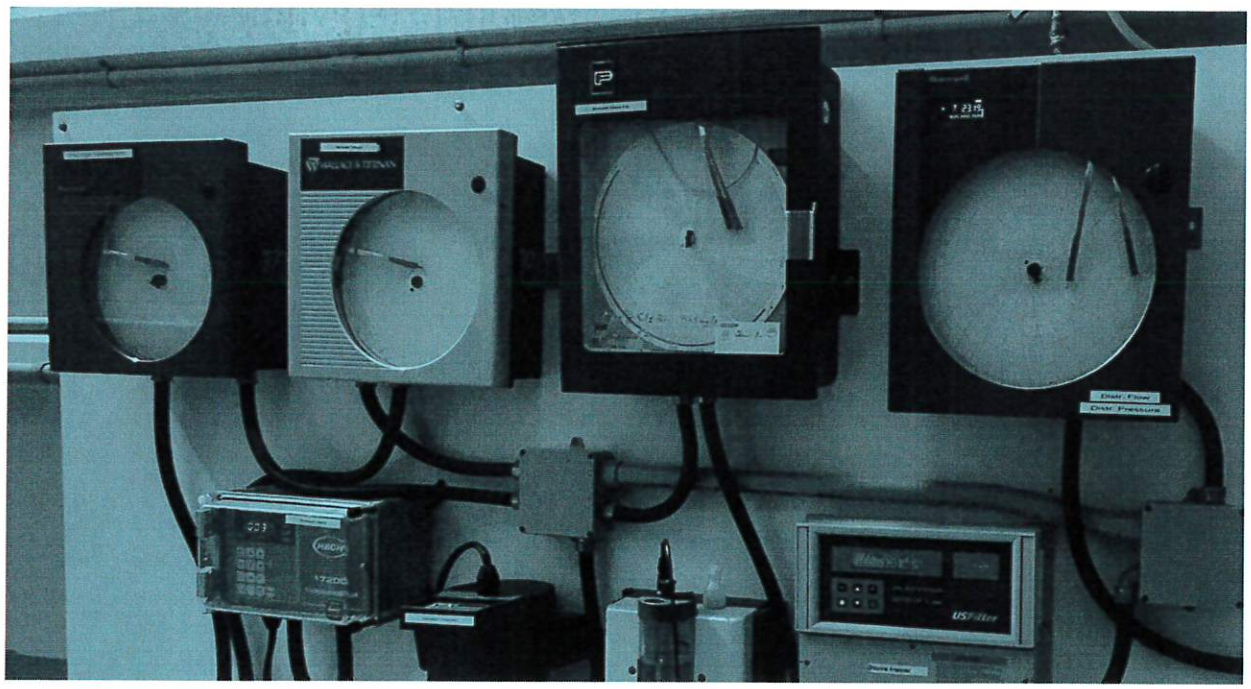


Table 14: 2021 water production summary

| Month | Total Volumes ($m^3$) | | Daily Flows ($m^3$/day) | | Capacity Assessments | |
|---|---|---|---|---|---|---|
| | Raw Water | Treated Water | Average - Treated | Maximum - Treated | Average - Treated | Maximum - Treated |
| Jan | 37,273 | 33,150 | 1,069 | 1,480 | 18% | 24% |
| Feb | 33,026 | 29,930 | 1,069 | 1,553 | 18% | 26% |
| Mar | 37,563 | 34,494 | 1,113 | 1,666 | 18% | 28% |
| Apr | 32,209 | 29,702 | 990 | 1,416 | 16% | 23% |
| May | 33,158 | 29,988 | 967 | 1,347 | 16% | 22% |
| Jun | 36,810 | 32,754 | 1,092 | 1,639 | 18% | 27% |
| Jul | 43,978 | 39,362 | 1,270 | 1,943 | 21% | 32% |
| Aug | 40,169 | 36,053 | 1,163 | 1,487 | 19% | 25% |
| Sep | 38,472 | 34,149 | 1,138 | 1,632 | 19% | 27% |
| Oct | 38,303 | 33,416 | 1,078 | 1,513 | 18% | 25% |
| Nov | 36,238 | 32,393 | 1,080 | 1,763 | 18% | 29% |
| Dec | 32,696 | 28,813 | 929 | 1,347 | 15% | 22% |
| Total | 439,893 | 394,204 | --- | --- | --- | --- |
| Average | 36,658 | 32,850 | 1,080 | --- | 18% | --- |



## 4.3 Recent Historical Flows

Table 15 summarizes recent historical flow monitoring results for the Red Lake Drinking Water System. There were slight decreases in the volumes of source water withdrawn and treated water supplied in 2021 when compared to 2020, and flows have generally remained stable over the previous decade. Total annual volumes of treated water supplied in the near future may be expected to be between 300,000 $m^3$ and 450,000 $m^3$, which represents approximately 14% to 20% of the rated capacity of the Red Lake Water Treatment Plant.

**Table 15:** Recent historical water production summary

| Year | Total Volumes ($m^3$) | | Daily Flows ($m^3$/day) | | Annual % Change | |
|---|---|---|---|---|---|---|
| | Raw Water | Treated Water | Average – Treated | Maximum – Treated | Raw Water | Treated Water |
| 2008 | 633,689 | 543,403 | 1,485 | 3,567 | -18.3% | -14.2% |
| 2009 | 548,288 | 472,192 | 1,294 | 3,157 | -13.5% | -13.1% |
| 2010 | 477,015 | 369,761 | 1,013 | 2,465 | -13.0% | -21.7% |
| 2011 | 429,785 | 295,498 | 810 | 2,112 | -9.9% | -20.1% |
| 2012 | 355,397 | 297,396 | 813 | 1,654 | -17.3% | +0.6% |
| 2013 | 350,834 | 304,087 | 833 | 1,567 | -1.3% | +2.2% |
| 2014 | 389,092 | 331,219 | 907 | 1,645 | +10.9% | +8.9% |
| 2015 | 413,969 | 357,230 | 979 | 1,886 | +6.4% | +7.9% |
| 2016 | 396,239 | 345,746 | 945 | 2,231 | -4.3% | -3.2% |
| 2017 | 381,516 | 334,669 | 917 | 1,700 | -3.7% | -3.2% |
| 2018 | 439,388 | 379,157 | 1,039 | 2,290 | +15.2% | +13.3% |
| 2019 | 410,962 | 358,997 | 984 | 1,917 | -6.5% | -5.3% |
| 2020 | 451,078 | 402,134 | 1,099 | 2,036 | +9.8% | +12.0% |
| 2021 | 439,893 | 394,204 | 1,080 | 1,943 | -2.5% | -2.0% |

# 5 Compliance

## 5.1 Overview

Northern Waterworks Inc. and the Municipality of Red Lake employ an operational strategy that is committed to achieving the following goals:

- Providing a safe and reliable supply of drinking water to the community of Red Lake;
- Meeting or exceeding all applicable legislative and regulatory requirements; and,
- Maintaining and continually improving the operation and maintenance of the system.

The following sections will summarize incidents of adverse water quality and regulatory noncompliance that occurred during the reporting period. NWI is committed to employing timely and effective corrective actions to prevent the recurrence of identified incidents of adverse water quality and noncompliance.

## 5.2 Adverse Water Quality Incidents

In accordance with section 11 (Annual Reports) of O. Reg. 170/03, this Report must summarize any reports made to the Ministry under subsection 18(1) (Duty to report adverse test results) of *the Act* or section 16-4 (Duty to report other observations) of Schedule 16 of O. Reg. 170/03. Additionally, this Report must describe any corrective actions taken under Schedule 17 of O. Reg. 170/03 during the period covered by the report.

No adverse water quality incidents were reported in 2021. However, a high filtrate turbidity event that occurred on October 19, 2021, constituted an adverse water quality incident and was not reported. Refer to section 5.3 for more information.

## 5.3 Regulatory Compliance

In accordance with Schedule 22 (Summary Reports for Municipalities) of O. Reg. 170/03, this Report must list any requirements of the *Act*, the regulations, the system's approval, drinking water works permit, municipal drinking water licence, and any orders applicable to the system that were not met at any time during the period covered by the report (i.e., an incident of regulatory noncompliance). Additionally, this Report must specify the duration of the failure and the measures that were taken to correct the failure.

The most recent inspection by Ontario's Ministry of the Environment, Conservation and Parks was initiated on November 30, 2021. Ten (10) incidents of regulatory noncompliance were identified. Information concerning the duration of failures and the measures taken to address those failures is provided below.

- Noncompliance item no. 1

  Operators-in-charge had not been designated for all subsystems which comprised the drinking water system. O. Reg. 128/04, section 25(1) states that 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 operator-in-charge (OIC) of the subsystem. Section 26 of O. Reg 128/04 (Certification of Drinking Water System Operators and Water Quality Analysts) outlines the responsibilities of an Operator-in-Charge (OIC). If multiple OICs are designated during an operational shift, it must be demonstrated what processes each OIC was responsible for.

  During the review period, the following problems with OIC coverage were identified:

  - Multiple OICs were listed on different occasions, but it was unclear which processes each OIC was responsible for;
  - On some occasions an operator was erroneously entered as an OIC;
  - Operators were designated as OIC only when they responded to an alarm; and,
  - After implementation of the electronic logbook system on July 28, 2021, there were a number of days where there were conflicting entries relating to OIC designation due to operators learning the new 'Shift Entry' system.

  As corrective action, the owner and operating authority were to develop a system that clearly defines who is to be designated as OIC on a particular day. OICs must perform the duties as outlined in subsection 26(2) in regard to the processes within their responsibility. Therefore, an OIC is expected to be responsible for a process or processes within a subsystem or facility. This responsibility needs to be clearly identifiable by other operators and verifiable by an Inspector. If multiple operators are logged in as OIC, logbook entries need to clearly demonstrate that those operators were performing the duties of an OIC, making independent decisions and were "in charge" of work being done to treatment processes for that day (i.e., fulfilled the duties of an OIC).

On February 14, 2022, the roles used in the electronic logbook were reconfigured to clearly identified who is OIC on a given day and/or for a specific operational task. These changes better aligned with existing internal policies that already included requirements for OIC coverage, including requirements for multiple OICs.

- Noncompliance item no. 2

The Safe Drinking Water Act, section 138 (2), states that no person shall include false or misleading information in any document required to be created, stored or submitted under the Act. In order to determine if the system meets the monthly filter effluent turbidity criteria, operators manually review the trending and calculate the length of time a filter is > 0.3 NTU while water is being sent to the next stage of treatment. Operators must then enter this data into the operational spreadsheet for the program to calculate the monthly run time.

During the review period there were multiple occurrences when the amount of time a filter was > 0.3 NTU (when water was being directed to the next stage of treatment) recorded in the logbook was different from the time recorded in the operational spreadsheet and did not reflect the trending values. As a result of the inspection, identified inaccuracies were corrected in the operational spreadsheet and it was demonstrated that the monthly filter effluent criteria continued to be met for the review period; however, the original data provided was inaccurate and misleading.

As corrective action, the operating authority was required to undertake steps to ensure that all operators are aware of how they are to obtain the correct information from their continuous data to accurately and consistently calculate the monthly filter effluent turbidity compliance. It was also recommended the SCADA system to be programed to automatically generate the amount of run time a filter is less than or greater than 0.3 NTU, when water is moving to the next stage of treatment.

On February 25, 2022, it was reported to the Ministry that where many of the monthly filtrate turbidity calculations were the result of inconsistent data provided by the automated SCADA daily report printout, operations staff were no longer consulting the report for these determinations. Specifically, operations staff are only consulting the SCADA trending application to determine turbidity compliance. Training on the Ministry's *Filtration processes technical bulletin* was also provided to all operations staff on February 24, 2022.

The automation service provider will also be troubleshooting and correcting the SCADA daily report. Ultimately, the inconsistent values provided by the daily report are the result of a mismatch with the SCADA trending polling frequency. Once the daily report is corrected and the values are confirmed to be accurate, operations staff will again rely on the report for filtrate turbidity compliance determinations.

- Noncompliance item no. 3

All required notifications of adverse water quality incidents were not immediately provided as per O. Reg. 170/03 16-6. O. Reg. 170/03, Schedule 16, section 16-6(1) requires that an immediate verbal report be made for adverse results of drinking water tests for the purpose of section 18 of the Act. Section 16-3(1), Schedule 16, of O. Reg. 170/03, for the purpose of section 18 of the Act, defines the following as an adverse test result for turbidity: If the drinking-water system is required to provide filtration and a report under subsection 18(1) of the Act has not been made in respect of turbidity in the proceeding 24 hours, a result indicating that turbidity exceeds 1.0 Nephelometric Turbidity Units (NTU) in,

(i) a grab sample of water taken from a filter effluent line, or
(ii) two samples of water from a filter effluent line that are tested by continuous monitoring equipment, if,
    (a) two samples were taken 15 minutes or more apart and the later of the two samples was the first sample that was taken 15 minutes or more after the earlier sample, and,
    (b) the filter effluent line is directing water to the next stage of treatment.

On October 19, 2021, filter #2 effluent turbidity exceeded 1NTU from 20:12:58 to 20:13:38 and again from 20:27:45 to 20:29:18. Since filter #2 effluent turbidity first exceeded 1 NTU at 20:12:58 and the first reading taken after 15 minutes from that time, at 20:27:59, also exceeded 1 NTU, this event was considered reportable.

An immediate verbal report was not made for this event as required by O. Reg. 170/03, Schedule 16. After this event was considered reportable, filter #2 effluent turbidity then continued to exceed 1 NTU from 20:39:43 to 20:45:22 and again from 20:48:20 to 20:50:20. Although the plant was not in continuous production from 20:12 to 20:50 during the times noted above, water was being sent to the next stage of treatment as filter effluent turbidity was > 1 NTU.

Notably, at 21:20 the #2 filter effluent turbidity analyzer read 0.276 NTU. A bench test sample taken at the same time had a turbidity result of 0.09 NTU, demonstrating the instrument was reading erroneously high. Since the initial reportable incident, operators were able to provide adequate information to demonstrate that the issue was related to the filter analyzer head not being securely in place and that filter effluent turbidity was not actually high. Despite this, the trending still resulted in a reportable event in accordance with O. Reg. 170/03.

As corrective action, the operating authority was required to undertake steps to ensure that all operators are aware of the requirement to report filter effluent turbidity > 1 NTU, as detailed in O. Reg. 170/03, Schedule 16, section 16-6(1). Training on the Ministry's *Filtration processes technical bulletin* was provided to all operations staff on February 24, 2022, and this training included reviewing the regulatory requirements for the filtration process and the protocol for turbidity adverse result reporting and corrective actions.

- Noncompliance item no. 4

Continuous monitoring equipment that was being utilized to fulfill O. Reg. 170/03 requirements was not performing tests for the parameters with at least the minimum frequency specified in the Table in Schedule 6 of O. Reg. 170/03 and/or was not recording data with the prescribed format. O. Reg. 170/03, Schedule 6, section 6-5, requires that treated water chlorine be measured at least every 5 minutes and filter effluent turbidity be measured every 15 minutes. The continuous analyzers at the Red Lake WTP measure and record free chlorine residual and turbidity every second.

On December 15, 2020, there was a gap in the SCADA trending from 11:00 to 14:00. The filter effluent turbidity trending for both filters was available on the chart record for this timeframe; however, an issue with the treated water chlorine chart recorder did not allow for the inspector to confirm the continuous monitoring for this parameter. Despite the missing data, all alarms remained operational during the time of data loss.

On November 16, 2021, there was a data gap from approximately 09:10 to 09:30. Filter effluent turbidity data for both filters were available on the chart record for this time; however, data was not available for the treated water chlorine. It appears as though when the treated chlorine chart record was changed on November 16, 2021, the old record was removed at approximately 08:55 and was not replaced until 09:30; therefore, the data was not available for the missing timeframe.

As corrective action, the operating authority was required to use every effort to ensure that filter effluent turbidity and treated water chlorine residual readings are being recorded at the required frequency. To this end, digital chart recorders were procured and will be installed in the first half of 2022. The digital chart recorders will ultimately replace the paper chart recorders at the facility.

- Noncompliance item no. 5

All continuous monitoring equipment utilized for sampling and testing required by O. Reg.170/03, a Municipal Drinking Water Licence or Drinking Water Works Permit or order, were not equipped with alarms or shut-off mechanisms that satisfy the standards described in Schedule 6 of O. Reg. 170/03.

During the review period there were occasions when the filter effluent turbidity reached the high alarm set point and the filtration process would shut down; however, the alarm would not call out until water was again being produced. As a result, a qualified person did not take appropriate action after an alarm condition prior to water being directed to users again [section 6-5(1)5], nor was there an immediate alarm that was assessed by a qualified person to determine if an immediate on-site response was required [section 6-5(1.1)1-3].

As corrective action, the operating authority was required to take the necessary steps to meet the requirements of O. Reg. 170/03, Schedule 6, section 6-5(1) or 6-5(1.1). To this end, programming changes at the facility will be completed in the first half of 2022 to ensure that filter effluent turbidity alarms are immediately transmitted, regardless of whether water is being produced.

- Noncompliance item no. 6

The owner/operating authority was not in compliance with the requirement to prepare Form 2 documents as required by the Drinking Water Works Permit during the inspection period. DWWP 234-203, section 4, allows for minor modifications to be made to the drinking water system provided certain conditions are met. In July 2021, operators were trying to increase flow through the plant to supply adequate pressure for the use and operation of sprinkler systems that were set up in the community to protect structures from encroaching forest fires. In an effort to increase flow into the plant, the static mixer was replaced with a vacant spool and a 4th low lift pump was installed. These minor alterations are permitted in the DWWP, provided that a Form 2 be prepared prior to the modified or replaced components being placed into service. A Form 2 was not prepared for these alterations. On September 7, 2021, these modifications were reversed. A second Form 2 should have been prepared to document these changes.

As corrective action, the necessary Form 2 documents were completed and submitted to the Ministry on February 25, 2022.

- Noncompliance items no. 7, 8 & 9

All microbiological water quality monitoring requirements for raw water (noncompliance no. 7), treated water (noncompliance no. 8), and distribution (noncompliance no. 9) samples were not met. O. Reg. 170/03, Schedule 10, section 10-4 requires raw water, treated water and distribution samples to be taken every week, to be tested for E. coli, total coliform bacteria and heterotrophic plate count. This requirement was met throughout out the review period except during the week of June 27, 2021. During this week, miscommunication between operators resulted in the samples not being shipped to the lab.

Since the week of the non-compliance, microbiological samples have been taken in accordance with O. Reg. 170/03, Schedule 10, section 10-4. Microbiological samples shall continue to be taken in accordance with the regulation.

- Noncompliance Item no. 10

All water quality monitoring requirements imposed by the MDWL or DWWP issued under Part V of the SDWA were not being met. MDWL 234-103, Issue 4, section 6, requires that Red Lake implement the Red Lake Drinking Water System Corrosion Control Plan. In addition, the MDWL requires that:

- annually, lead, alkalinity and pH be sampled from 2 locations in the distribution system and 14 locations from plumbing (10 private and 2 non-residential);
- every weekday by bench test, treated water alkalinity be tested;
- continuously or daily by bench test, pH be tested; and,
- annually, by March 31st, a Corrosion Control Evaluation Report, covering each calendar year, shall be prepared and submitted to the Director.

The above requirements were met for the review period, except for alkalinity testing. Alkalinity bench tests were not always completed every weekday.

As corrective action, the operating authority must ensure that a treated water bench test for alkalinity is completed every weekday.