CITY OF ENDERBY DRINKING WATER SYSTEM

ANNUAL REPORT 2021

November 25, 2022

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EXECUTIVE SUMMARY

The City of Enderby operates and maintains a community drinking water system in accordance with the Drinking Water Protection Act and the *Guidelines for Canadian Drinking Water Quality*.

In 2021, the total water distributed from the Water Treatment Plant was 541,433 m^3. The maximum one-day demand was on July 1, 2021 at 2,960 m^3. By contrast, in 2020, the total water distributed from the Water Treatment Plant was 462,316 m^3 and the maximum one-day demand was on August 28, 2020 at 3,146 m^3.

In 2021, the City of Enderby spent $953,582 to operate and maintain the community drinking water system. Of that value, capital investment represents 36% of the total expended by the City of Enderby in 2021.

The City continues its water quality monitoring program. Nothing of concern was discovered in the drinking water system in 2021.

The City's Public Works staff are certified to meet the legislative requirements of operating the Water Treatment Plant and distribution system.

The City has completed its Source Protection Plan for both sources and has taken action to implement its short-term recommendations. The City also completed its annual update to its Drinking Water Emergency Response Plan.

INTRODUCTION

The City of Enderby operates and maintains a community drinking water system in accordance with the Drinking Water Protection Act and Regulations, as well as the *Guidelines for Canadian Drinking Water Quality*. Pursuant to Section 15(b) of the British Columbia Drinking Water Protection Act and Section 11 of the British Columbia Drinking Water Protection Regulation, the City of Enderby provides the following Annual Drinking Water Report for 2021.

The goal of the City of Enderby is to provide clean, safe, and reliable drinking water. This means that the drinking water quality meets the standards specified in the *Guidelines for Canadian Drinking Water Quality* and the operation of the drinking water system is consistent with the BC Drinking Water Protection Act and Drinking Water Protection Regulation.

High quality drinking water must meet requirements with respect to the following:

- Maximum acceptable concentrations of microbiological contaminants such as bacteria, protozoa, and viruses such as *Giardia*, *Cryptosporidium*, and *Escherichia coli*;
- Maximum acceptable levels of turbidity;
- Maximum acceptable chemical and physical parameters; and
- Aesthetic objectives related to taste, colour, and odour.

The City accomplishes these requirements through a multi-barrier approach to treatment. A multi-barrier approach is required as "the limitations or failure of one or more barriers may be compensated for by the effective operation of the remaining barriers. This compensation minimizes the likelihood of contaminants passing through the entire system and being present in sufficient amounts to cause illness to consumers."[1]

There are a variety of potential hazards to drinking water, most of which involve chemical and microbiological contaminants that may be introduced at the source or intake, during treatment, or during distribution. The City has implemented a water quality monitoring regime and uses multi-barrier treatment to manage the risks to public health. The City has a Drinking Water Emergency Response Plan and a Source Protection Plan for both of its sources.

WATER SYSTEM OVERVIEW

The Enderby water system consists of two sources:

Shuswap Well (ground water; suspected of being under the direct influence of surface water); and
Shuswap River (surface water).

The total amount of pipe in the distribution system is 30,962 meters. There are booster stations by the Bawtree Bridge, at the bottom of Gunter-Ellison Road, and between the upper and lower reservoirs.

[1] Federal-Provincial-Territorial Committee on Drinking Water and the CCME Water Quality Task Group, "From Source to Tap: Guidance on the Multi-Barrier Approach to Safe Drinking Water" (Ottawa, Ontario: 2004), 17.

All water is chlorinated prior to distribution. The Shuswap River surface water is filtered through a two-stage rapid filtration system which reduces turbidity and minimizes the threat of giardia and cryptosporidium. The Shuswap Well is normally piped to the Water Treatment Plant clearwell, where it receives ultraviolet treatment in addition to the chlorination received on-site.

Under normal operation, water from the Shuswap River is filtered and chlorinated, then pumped from the clearwell through the UV disinfection system and into the distribution system to a water reservoir. Water from the Shuswap Well is chlorinated on-site and pumped to the clearwell, then through the UV disinfection system and to the reservoirs. There is a total of 3,782 m^3 of reservoir capacity. Each system can be isolated and run to the reservoirs alone.

It should be noted that, when the Shuswap Well is supplying water, a number of customers east of the Bawtree Bridge may receive water that is only disinfected with chlorine, meaning that it does not receive the two forms of treatment required for surface water (the Shuswap Well is suspected of being under the influence of surface water). However, when the supply of water is from the Water Treatment Plant, all customers receive fully treated water.

Under current operating parameters, the combined source capacity of the Shuswap River and the Shuswap Well is 4,753 m^3 per day. The maximum production capacity of the Water Treatment Plant is 3,150 m^3 per day under normal operating conditions at peak demand, although the rate of production is affected by source water turbidity, which increases backwashing frequency and reduces available production time. The ultimate planned source capacity, with expanded infrastructure, operational changes, and assuming the capability to run the Shuswap Well for twenty-four hours per day, is 6,135 m^3.

ANNUAL CONSUMPTION DATA

Note: the below figures only describe the Water Treatment Plant flow meter; this does not reflect the full quantity of water sent from the Shuswap Well, some of which is distributed to residents east of the Bawtree Bridge without being captured by the flow meter.

In 2021, the total water distributed from the Water Treatment Plant was 541,433 m^3. The maximum one-day demand was on July 1, 2021 at 2,960 m^3. By contrast, in 2020, the total water distributed from the Water Treatment Plant was 462,316 m^3 and the maximum one-day demand was on August 28, 2020 at 3,146 m^3.

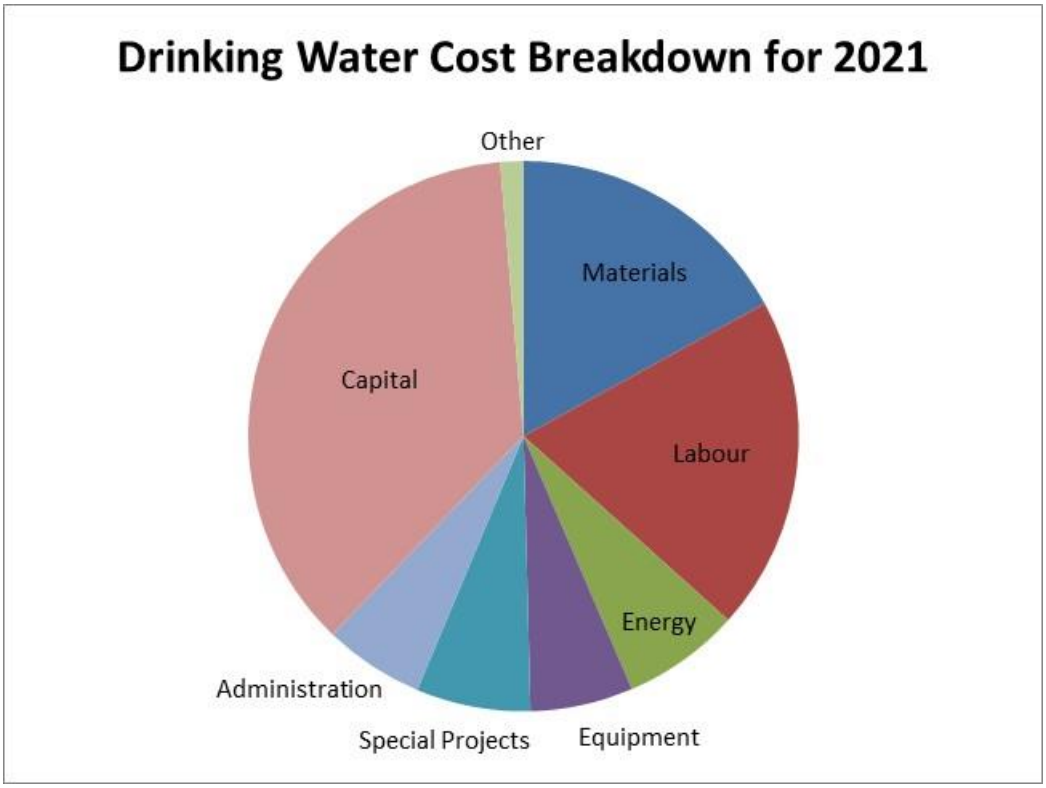
The following chart shows maximum and average daily demands from the Water Treatment Plant by month for 2020 and 2021.

Month	2021 Max. Daily Demand (m^3)	2021 Avg. Daily Demand (m^3)	2020 Max. Daily Demand (m^3)	2020 Avg. Daily Demand (m^3)
January	1227	1023	1225	989
February	1304	1077	1204	932
March	1218	1064	1370	1037
April	1634	1253	1368	1028
May	2247	1586	2474	1303
June	2901	2019	2032	1372
July	2960	2523	2536	1747
August	2588	2242	3146	2015
September	2117	1569	2451	1598
October	1473	1239	1493	1120
November	1266	1122	1654	1019
December	1265	1112	1325	1008

Year-to-year variations in demand tend to be influenced by the impact of weather upon consumption habits, particularly irrigation, while longer-range trends are influenced by the population growth rate offset by demand management initiatives such as water rates.

DRINKING WATER COST BREAKDOWN

In 2021, the City of Enderby spent $953,582 to operate and maintain the community drinking water system. Of that value, capital investment represents 36% of the total expended by the City of Enderby in 2021.



The following chart describes the dollar value associated with each expense category and compares the values to 2021:

Category	2021 Value	2020 Value
Materials	162,084	118,517
Labour	187,439	159,755
Energy	65,846	58,912
Equipment	57,583	52,524
Special Projects	64,011	12,097
Interest	-	-
Administration	56,250	52,393
Capital	347,390	646,417
Other	12,979	9,799
Total	953,582	1,110,414

WATER SYSTEM ASSESSMENT AND INFRASTRUCTURE DEFICIT

The total replacement value for the water distribution system (such as pipes and pumps) is $27,237,561. As of December 31, 2021, the total depreciation is $12,170,949.

The total replacement value for the City of Enderby water treatment system (such as buildings, clarifier, chlorinators, and ultraviolet bank) is $7,833,763. As of December 31, 2021, the total depreciation is $3,850,953.

The replacement values for both the water distribution system and the water treatment system were substantially revised from the 2018 values to reflect a 2019 appraisal.

In 2021, $238,676 was contributed to the City of Enderby water reserve fund and $299,802 was withdrawn, for a balance at the end of the year of $401,398.

In order to address its infrastructure deficit, the City has committed to an incremental tax increase of 1% per year to the water utility. This amount is dedicated to asset management. The anticipated 2022 contribution to water reserves is $243,423.

COMPLETED MAJOR PROJECTS AND FORTHCOMING MAJOR PROJECTS

There were a number of major water projects completed or forthcoming as of December 31, 2021:

1. Filter media replacement.
2. 3rd Avenue water main and service renewal.
3. Hubert Avenue from George Street to Sicamous Street water main and service renewal.
4. Knight Avenue from George Street to Belvedere Street water main and service renewal.
5. Mill Avenue from George Street to Sicamous Street water main and service renewal (forthcoming).
6. Planning for Water Treatment Plant expansion (forthcoming).

MAJOR EVENTS

The 2021 heat dome in late June/early July significantly drove up the City's daily water usage and illustrated demand challenges associated with climate change. This placed significant stress upon the City's water treatment and particularly distribution system, as the latter has insufficient storage capacity for prolonged high demand.

WATER QUALITY MONITORING

Daily samples are collected at the Shuswap Well and River and tested for pH, temperature, and turbidity. Daily samples are also collected at the Water Treatment Plant and tested for pH, temperature, turbidity, and colour. The clearwell is tested on a daily basis for pH, temperature, turbidity, colour, and free and total chlorine.

Weekly system checks and distribution samples are tested for chlorine residuals to ensure a minimum of 0.20 mg/L of free chlorine is found throughout the distribution system. Chlorine residuals were above the minimum threshold for all sample locations and dates.

At least once per month, samples are collected at 10 monitoring stations within the distribution system for microbiological testing. There was one positive test for coliforms on August 11, 2021 at both the Peacher and Booster 2 sample stations; per response guidelines, these stations were re-sampled the following week and both were returned negative for coliforms. No E. Coli was detected at any of the sample points within the distribution system.

The filter backwash is sampled on a bi-monthly schedule for pH, conductivity, turbidity, total suspended solids, aluminum, and microbiology.

On a quarterly basis, trihalomethane (THM) samples are collected from the Brash PRV, Booster #1, and Valcairn stations (the sample station at 487 Enderby-Mabel Lake Road was also tested for THMs in September and December of 2021 to help characterize the drinking water within this portion of the distribution system). THMs are by-products caused by the chemical reaction between chlorine and organic matter naturally present in water. High levels of THMs can have adverse health effects and, as a result, the *Guidelines for Canadian Drinking Water Quality* set a maximum acceptable concentration of 0.1 mg/L. All THM tests from the above sample stations reported below the maximum acceptable concentration, with concentrations never exceeding 0.0539 mg/L.

The Shuswap Well is tested monthly for nitrogen levels (including nitrates and nitrites) and microbiology. The Shuswap River is sampled monthly for microbiology. Both sources are sampled quarterly for total organic carbon.

The Shuswap River is sampled annually for comprehensive testing. The Shuswap Well is sampled every second year for comprehensive testing. Both sources were tested in 2021. The results are as follows.

Parameter	River	Well
Chloride	0.38	1.36
Fluoride	<0.10	0.17

Nitrate (as N)	<0.010	0.203
Nitrite (as N)	<0.010	<0.010
Sulfate	5.5	5.8
EPHw10-19	<250	<250
EPHw19-32	<250	<250
LEPHw	<250	<250
HEPHw	<250	<250
Langelier Index	-0.9	-0.9
Hardness, Total (as CaCO3)	42.8	49.4
Solids, Total Dissolved (calc)	51.4	62.9
Temperature, at pH	22.1	22.1
Colour, True	7.4	<5.0
Alkalinity, Total (as CaCO3)	45.1	54.1
Alkalinity, Phenolphthalein (as CaCO3)	<1.0	<1.0
Alkalinity, Bicarbonate (as CaCO3)	45.1	54.1
Alkalinity, Carbonate (as CaCO3)	<1.0	<1.0
Alkalinity, Hydroxide (as CaCO3)	<1.0	<1.0
Cyanide, Total	<0.0020	<0.0020
Turbidity	0.5	0.14
pH	7.7	7.68
Conductivity (EC)	91.4	113
Coliforms, Total	1300	<1
E. coli	13	<1
Acenaphthene	<0.050	<0.050
Acenaphthylene	<0.200	<0.200
Acridine	<0.050	<0.050
Anthracene	<0.010	<0.010
Benz(a)anthracene	<0.010	<0.010
Benzo(a)pyrene	<0.010	<0.010
Benzo(b+j)fluoranthene	<0.050	<0.050
Benzo(g,h,i)perylene	<0.050	<0.050
Benzo(k)fluoranthene	<0.050	<0.050
2-Chloronaphthalene	<0.100	<0.100
Chrysene	<0.050	<0.050
Dibenz(a,h)anthracene	<0.010	<0.010
Fluoranthene	<0.030	<0.030
Fluorene	<0.050	<0.050
Indeno(1,2,3-cd)pyrene	<0.050	<0.050
1-Methylnaphthalene	<0.100	<0.100
2-Methylnaphthalene	<0.100	<0.100
Naphthalene	<0.200	<0.200
Phenanthrene	<0.100	<0.100
Pyrene	<0.020	<0.020
Quinoline	<0.050	<0.050
Aluminum, total	0.0252	<0.0050
Antimony, total	<0.00020	<0.00020
Arsenic, total	<0.00050	<0.00050
Barium, total	0.0131	0.0101

Boron, total	<0.0500	<0.0500
Cadmium, total	<0.000010	0.00001
Calcium, total	14	15.1
Chromium, total	0.00066	0.00075
Cobalt, total	<0.00010	<0.00010
Copper, total	0.00251	0.00988
Iron, total	0.044	<0.010
Lead, total	<0.00020	0.00122
Magnesium, total	1.89	2.87
Manganese, total	0.00463	<0.00020
Mercury, total	<0.000010	<0.000010
Molybdenum, total	0.00074	0.00155
Nickel, total	<0.00040	0.00046
Potassium, total	0.84	1.11
Selenium, total	<0.00050	<0.00050
Sodium, total	1.31	2.76
Strontium, total	0.0653	0.0716
Uranium, total	0.000328	0.000247
Zinc, total	<0.0040	0.0065
Benzene	<0.5	<0.5
Bromodichloromethane	<1.0	<1.0
Bromoform	<1.0	<1.0
Carbon tetrachloride	<0.5	<0.5
Chlorobenzene	<1.0	<1.0
Chloroethane	<4.0	<4.0
Chloroform	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0
1,2-Dibromoethane	<0.3	<0.3
Dibromomethane	<1.0	<1.0
1,2-Dichlorobenzene	<0.5	<0.5
1,3-Dichlorobenzene	<1.0	<1.0
1,4-Dichlorobenzene	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0
1,1-Dichloroethylene	<1.0	<1.0
cis-1,2-Dichloroethylene	<1.0	<1.0
trans-1,2-Dichloroethylene	<1.0	<1.0
Dichloromethane	<3.0	<3.0
1,2-Dichloropropane	<1.0	<1.0
1,3-Dichloropropene (cis + trans)	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Methyl tert-butyl ether	<1.0	<1.0
Styrene	<1.0	<1.0
1,1,2,2-Tetrachloroethane	<0.5	<0.5
Tetrachloroethylene	<1.0	<1.0
Toluene	<1.0	<1.0
1,1,1-Trichloroethane	<1.0	<1.0
1,1,2-Trichloroethane	<1.0	<1.0

Trichloroethylene	<1.0	<1.0
Trichlorofluoromethane	<2.0	<2.0
Vinyl chloride	<1.0	<1.0
Xylenes (total)	<2.0	<2.0

ENVIRONMENTAL OPERATORS CERTIFICATION

Interior Health requires that the City has a Chief Operator certified at a level that matches the facility classification for Water Treatment and Water Distribution.

In November 2020, the Water Treatment Plant was reclassified from Class III to Class II. In December 2020, the Water Distribution system was reclassified from Class II to Class I.

During 2021, City of Enderby employed the following certified operators:

Name	Title	Water Treatment	Water Distribution
Clayton Castle	Lead Hand	Level II	Level I
Damon Kipp	Systems Operator II	Level II	-
Ray Brown	Utility Worker III	Level I	Level I

WATER CONSERVATION PLAN

The City of Enderby's Water Conservation Plan establishes strategies to reduce water demand throughout the community. Reducing water demand helps to protect our water resources, mitigate requirements for infrastructure expansion, and reduce operating and maintenance costs.

As of December 31, 2021, the City of Enderby has achieved a number of strategies within its Water Conservation Plan, including:

1. Education
    a. Implementing a Water Conservation Education program.
    b. Continuing compliance patrols and enforcement of sprinkling regulations.

2. Metering and Rates
    a. Adopted a rate structure which balances conservation and equity.
    b. Amended the Building Inspection Bylaw to include requirements for water meters.
    c. Amended policies and agreements for out-of-town service connections to require water meters.
    d. Completed water meter installations on all residential, commercial, industrial and civic properties.

    Loss Control
    e. Completed a Loss Control Program in 2012, which estimated the total Unaccounted For Water at 6.5% or 12.05 m^3 per hour.
    f. Completed a Leak Detection Audit to identify and repair water leaks within municipal infrastructure.

Planning for the Future

g. Developing infrastructure upgrade plans for both treatment and distribution, in order to pursue grant funding.

CROSS CONNECTION CONTROL PROGRAM

In 2003, Interior Health required all large water purveyors (City of Enderby included) to implement a cross connection control program as a condition of operating permit. The purpose of the program is to protect public health by ensuring that the drinking water provided by the City of Enderby is not contaminated due to a backflow incident.

The City adopted a Cross Connection Control Program in 2004 and began the program implementation with assessments of a number of commercial, industrial, institutional and agricultural customers in June, 2004. Under Enderby's program, owners were expected to implement the recommendations in a timely manner and were responsible for all costs associated with their backflow prevention systems.

For a number of reasons, including cost and internal capacity limitations, the Cross Connection Control Program has not been fully implemented. The City of Enderby intends to increase compliance with its Cross Connection Control program in 2023 and will follow a risk-based approach focusing on premises isolation.

SOURCE PROTECTION PLAN

In February 2017, the City completed its Source Protection Plan for both the surface water intake and the Shuswap Well. The Source Protection Plan characterized the sources, provided an inventory of potential contaminants and threats, characterized risks, and recommended various actions to mitigate risk. As a result of this plan, the City has completed analyses of both sources for herbicides, pesticides, and petroleum in order to characterize the source water better. The City has also reached out to relevant third parties to inform them of the locations of the City's drinking water sources and request that they notify the City in the event of an accident, spill, fire, or natural disaster. The City has also requested that the Regional District of North Okanagan refer development applications within the designated groundwater protection area.

EMERGENCY RESPONSE PLAN

The City of Enderby Drinking Water Emergency Response Plan was completed in 2013. The Emergency Response Plan includes provisions for public notification and response procedures for emergency situations, such as backflow incidents, broken water mains, chlorinator failure, source and/or reservoir contamination, and spills or vehicle accidents affecting the distribution system. It also provides an emergency contact directory.

The Emergency Response Plan was updated on January 7, 2022.