

DRINKING WATER ANNUAL REPORT 2015



May 23, 2016

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Executive Summary

The City of Enderby operates and maintains a community water distribution system in accordance with the Drinking Water Protection Act and the Guidelines for Canadian Drinking Water Quality. In 2015, the total water distributed from the City of Enderby Water Treatment Plant was 623,185 m³. The maximum one-day demand was on June 15 at 5,160 m³. In a month-by-month comparison with 2014, there are some fluctuations which are most likely attributed to the introduction of metered water rates and the unusual weather patterns, notably the early freshet and similarly early onset of summer high temperatures.

In 2015, the City of Enderby spent \$679,144 to provide safe drinking water, whereas in 2014 the City spent 461,364. The main cost drivers were investment in capital renewal (\$145,319) and labour and material costs which are receiving upward pressure as a result of maintenance challenges and emergency repairs associated with an aging system. It is anticipated that these operations and maintenance expenses will, on average, continue to escalate as the City of Enderby contends with its infrastructure deficit, which requires sustained capital investment.

The total replacement value for the City of Enderby water distribution system (such as pipes and pumps) is \$18,365,949. The remaining value after depreciation is \$10,205,180. The total replacement value for the City of Enderby water treatment system (such as buildings, clarifier, chlorinators, and ultraviolet) is \$3,579,153. The remaining value after depreciation is \$2,345,832. In 2015, \$151,297 was contributed to the City of Enderby water reserve fund and \$116,081 was withdrawn. The balance of the City of Enderby's water reserve fund as of December 31, 2014 is \$707,854.

The City had to contend with an unusual number of major events in 2015, which included the Shuswap Well booster pump failure, 7 water breaks, intake repairs, and two major repairs to the Water Treatment Plant. The City also had to perform a permanent repair to a section of Highway 97A where a water main had broken several years previous, as the temporary repair was failing.

The City continues its monitoring program and nothing of concern was discovered in the drinking water system. The City's Public Works staff are working towards obtaining certifications which match the classification of the treatment and distribution systems. The City completed a major step in its water conservation plan with the commencement of metered consumption billing in 2015. The City intends to revive its Cross Connection Control program in 2016 and will use a risk-based approach to addressing hazards. Finally, the City's Drinking Water Emergency Response Plan was most recently updated in March 2016.

Introduction

The City of Enderby operates and maintains a community water distribution system in accordance with the Drinking Water Protection Act and associated 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 Regulations, the City of Enderby provides the following Annual Drinking Water Report for 2015.

The goal of the City of Enderby is to provide clean, safe, and reliable drinking water. Our drinking water meets or exceeds the criteria used by the Federal-Provincial-Territorial Committee on Drinking Water in its definition of “high quality drinking water.” The Committee defines high quality drinking water as:

free of both disease-causing organisms and chemicals in concentrations that have been shown to cause health problems. Such drinking water has minimal taste and odour, making it aesthetically acceptable to the public for drinking.¹

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;
- Aesthetic objectives related to taste, colour, and odour; and
- Operational guidance values.

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.”²

There are a variety of potential hazards to drinking water which must be controlled. These threats involve chemical and microbiological contaminants that may be introduced at the source or intake, during treatment, or during distribution. These hazards are an ever-present threat to our drinking water supply which must be controlled. The City observes a robust water quality monitoring regime and uses multi-barrier treatment to manage these threats and protect the public.

Water System Overview

The Enderby water system consists of 3 main sources:

1. Brash Creek (surface water – decommissioned);
2. Shuswap Well (ground water; suspected of being under the direct influence of surface water);
and
3. Shuswap River (surface water).

The total amount of pipe in the distribution system is 30,266 meters. This consists of 11,648 meters of PVC pipe and 18,618 meters of concrete pipe.

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), 14.

² Ibid., 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.

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 m³ of reservoir capacity. Depending on demand, both systems can operate in conjunction. Each system can be isolated and run to the reservoirs alone. All water supplies can be operated with a portable generator.

It should be noted that, when water is drawn from the Shuswap Well supply, a number of customers east of the Enderby Bridge who are most proximate to the well source receive water that is not disinfected with UV light and has limited chlorine contact time. When all supply is from the Shuswap River source, 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 m³ per day. The ultimate source capacity, with infrastructure changes and assuming the capability to operate the Shuswap Well for twenty-four hours per day, is 6,135 m³.

Annual Consumption Data

Note: the below figures only describe the Water Treatment Plant effluent 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 effluent flow meter.

In 2015, the total water distributed from the Water Treatment Plant was 623,185 m³. The maximum one-day demand was on June 15 at 5,160 m³. At the time of this report, a potential error in one of the City's flow meters is being investigated, which may result in revision to the reported numbers.

In 2014, the total water distributed from the City of Enderby Water Treatment Plant was 624,476 m³ and the maximum one-day demand was 4,445 m³ on July 15. In 2013, the total water distributed from the Water Treatment Plant was 631,787 m³ and the maximum one-day demand was on August 21 at 4,429 m³.

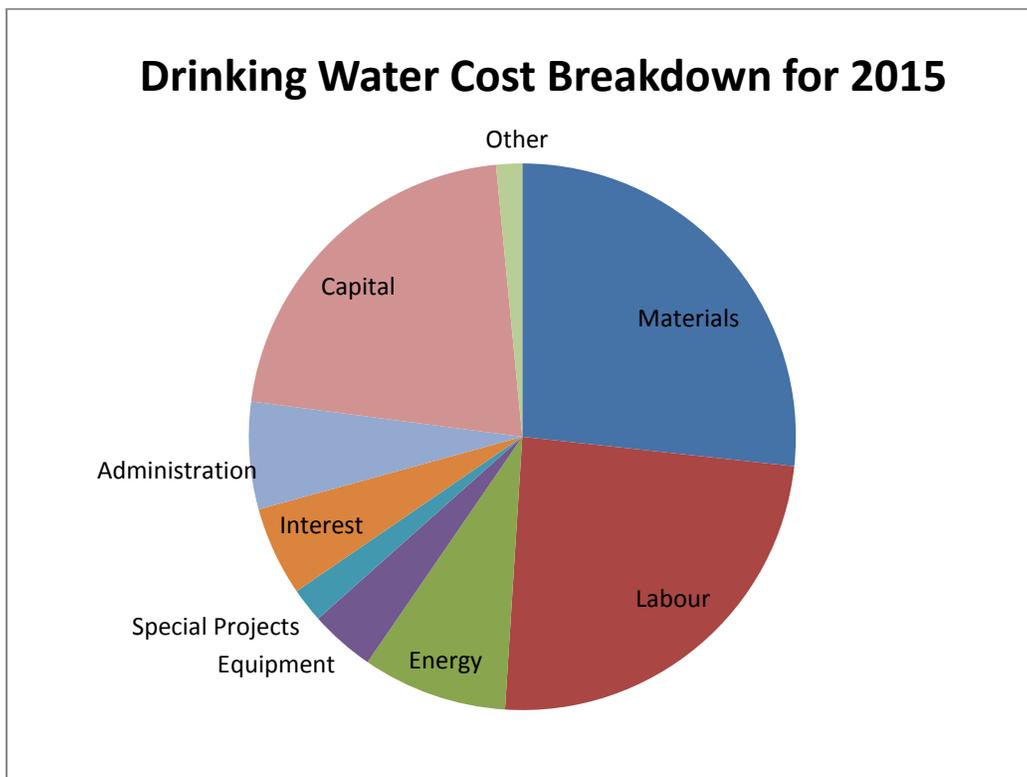
The following chart shows maximum and average daily demands from the Water Treatment Plant by month for 2014 and 2015. There are some fluctuations in usage which are most likely attributed to the introduction of metered water rates and the unusual weather patterns, notably the early freshet and similarly early onset of summer high temperatures.

Month	2014 Max. Daily Demand (m ³)	2014 Avg. Daily Demand (m ³)	2015 Max. Daily Demand (m ³)	2015 Avg. Daily Demand (m ³)
January	3131	1599	1310	1033
February	2314	1539	1666	1132
March	1889	1530	1506	1206
April	2362	1769	1744	1203
May	3500	2122	4808	2785
June	3579	2538	5160	3341
July	4445	2999	3093	2509
August	3197	2106	2610	2196
September	2058	1429	2395	1693
October	1811	1028	2725	1654
November	1336	1052	3933	1094
December	1430	1079	1586	1163*

* Adjusted to control for a prolonged outage associated with a repair.

Drinking Water Cost Breakdown

In 2015, the City of Enderby spent \$679,144 to provide safe drinking water. This includes water treatment processes such as chlorination, ultraviolet, and filtration as well as improvement, repair, and maintenance of the distribution system. The costs by expense category are:



The following chart describes the dollar value associated with each expense category and compares these values to 2014:

Category	2014 Value	2015 Value
Materials	141,256	181,490
Labour	135,958	164,920
Energy	59,055	58,165
Equipment	29,433	26,082
Special Projects	5,163	13,781
Interest	35,840	35,840
Administration	43,824	43,105
Capital	-	145,319
Other	10,835	10,442
Total	461,364	679,144

The main drivers causing costs to increase with respect to materials and labour involved the unusually high quantity and challenging quality of major events, which required a greater resource allocation than typical. Please see "Major Events," below. The remaining difference is the result of capital investment primarily associated with water main lifecycle replacement.

Water System Assessment and Infrastructure Deficit

The total replacement value for the water distribution system (such as pipes and pumps) is \$18,365,949. As of December 31, 2015, the total depreciation is \$8,160,769. The remaining value is \$10,205,180.

The total replacement value for the City of Enderby water treatment system (such as buildings, clarifier, chlorinators, and ultraviolet) is \$3,579,153. As of December 31, 2015, the total depreciation is \$1,233,321. The remaining value is \$2,345,832.

In 2015, \$151,297 was contributed to the City of Enderby water reserve fund and \$116,081 was withdrawn. The interest earned on the reserve fund was \$12,198. The balance of the water reserve fund as of December 31, 2015 is \$707,854.

The City invested \$145,319 into capital assets during 2015.

In order to address its infrastructure deficit, the City has committed to an incremental water utility tax increase of 1% per year. This amount will be dedicated to asset management.

Completed Major Projects and Forthcoming Major Projects

There were several major water infrastructure projects in 2015:

1. Completed major filter repair.
2. Completed clearwell valve repair.
3. Completed assessments of all confined spaces.
4. Commenced metered water billing.
5. Obtained jar testing equipment.

6. Partial completion of Vernon Street distribution system upgrades.

Some 2015 projects were deferred, such as the cleaning of Reservoir 2, the renewal of the cross-connection control program, and the completion of source protection planning. Subject to available resources, these projects will be completed in 2016. Also planned for 2016 is a renewal of the Water Treatment Plant's programmable logic controllers, installation of wifi communication to the Shuswap Well, and the purchase of a new chlorine analyzer.

In 2016, the major capital projects will include the completion of the remainder of the Vernon Street distribution system upgrades and the renewal of the supply lines on Cliff Avenue. The latter send water from the Water Treatment Plant to the Reservoirs and, as such, are among the most critical water mains in the City.

Major Events

The City had to contend with a number of emergency repairs and maintenance challenges in 2015. It is anticipated that, as the City's assets age, the costs involved in operations and maintenance will continue to escalate. These challenges include:

1. Shuswap Well booster pump failure in February.
2. Water break on Reservoir Road in April.
3. Water break in alley behind Cliff Avenue in May.
4. Hydrant replaced in June after being damaged by a vehicle.
5. Water break on Preston Crescent in June.
6. Water break on Mabel Lake Road in July.
7. Water break on Salmon Arm Drive in July.
8. Air relief valve repair on Mabel Lake Road in August.
9. Water break on Highway 97A in August.
10. Water break on Howard Avenue in September.
11. Repair to Water Treatment Plant filters in September-October.
12. Repair to clearwell valve in November-December.
13. Permanent repair made to a segment of Highway 97A which was damaged by a water break several years previous; required as a result of the failure of the temporary repair applied immediately following the break.
14. Water intake works to try and remove flow restrictions.

Water Quality Monitoring

Daily samples are collected at the Shuswap Well and Riverbank sites and tested for pH, temperature, and turbidity. Daily samples are also collected at the Water Treatment Plant and tested for testing pH, temperature, turbidity, and colour. The clearwell is also 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 at the furthest points in the distribution system. Residuals were above the minimum threshold for all sample locations and dates.

At least once per month, samples are collected at 10 monitoring stations for microbiological testing, including 3 sites in east Enderby, 4 sites in west Enderby, 3 sites in central Enderby. Monthly samples are also collected at the Shuswap Well and the Water Treatment Plant effluent point, as well as at both water sources. No Coliforms or E. Coli – which are measured in Colony-Forming Units (CFU) - were detected at any of the sample points with the following exceptions:

- 1) The Shuswap River raw (source) water sample location, which had Coliform counts ranging from undetectable to 410 CFU per 100 mL and E. Coli levels ranging from undetectable to 34 CFU per 100 mL. As Coliforms and E. Coli occur naturally in the environment, these levels are expected and are not indicative of the drinking water but rather the pre-treated water.
- 2) The clearwell had a Coliform count of 1 CFU per 100 mL on October 27, 2015. The clearwell was sampled the following week and nothing was detected. The detection was suspected to be the result of cross-contamination during the sampling process. Sampling practices were subsequently amended to reduce the potential for contaminating the equipment.

No E. Coli was detected at any point in the distribution system.

The BCA 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. 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 a range well below the maximum acceptable concentration, with concentrations ranging from 0.004 to 0.038 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 two years for comprehensive testing. Comprehensive tests were performed on the Shuswap River on August 25, 2015 as follows:

Test	Unit	Result
Coliforms, Total	CFU/100 mL	>= 110
Chloride	mg/L	0.44
Fluoride	mg/L	<0.10
Nitrate as N	mg/L	<0.010
Nitrite as N	mg/L	<0.010
Sulfate	mg/L	6.1
UV Transmittance @ 254nm	% T	91.7
Colour, True	CU	<5
Alkalinity, Total as CaCO3	mg/L	46

Test	Unit	Result
Cyanide, Total	mg/L	<0.010
Turbidity	NTU	0.8
pH	pH units	7.89
Conductivity (EC)	uS/cm	101
Hardness, Total (Total as CaCO ₃)	mg/L	45.9
Solids, Total Dissolved	mg/L	52.2
Aluminum, total	mg/L	<0.05
Antimony, total	mg/L	<0.001
Arsenic, total	mg/L	<0.005
Barium, total	mg/L	<0.05
Beryllium, total	mg/L	<0.001
Boron, total	mg/L	<0.04
Cadmium, total	mg/L	<0.0001
Calcium, total	mg/L	15.3
Chromium, total	mg/L	<0.005
Cobalt, total	mg/L	<0.0005
Copper, total	mg/L	0.006
Iron, total	mg/L	<0.10
Lead, total	mg/L	<0.001
Magnesium, total	mg/L	1.8
Manganese, total	mg/L	0.004
Mercury, total	mg/L	<0.00002
Molybdenum, total	mg/L	<0.001
Nickel, total	mg/L	<0.002
Phosphorus, total	mg/L	<0.2
Potassium, total	mg/L	<0.2
Selenium, total	mg/L	<0.005
Silicon, total	mg/L	<5
Silver, total	mg/L	<0.0005
Sodium, total	mg/L	0.4
Uranium, total	mg/L	0.0003
Vanadium, total	mg/L	<0.01
Zinc, total	mg/L	<0.04
Background Colonies	CFU/100 mL	> 200

Environmental Operators Certification

City of Enderby operators are progressing in obtaining their EOCP certifications. Interior Health requires that the City has a designated chief operator certified at Level III for Water Treatment and Level II for Water Distribution, but has accepted the existing level of certifications on the understanding that the City is working towards full compliance.

As of December 31, 2015, City of Enderby operators are certified as follows:

Name	Title	Water Treatment	Water Distribution
Kevin Walters	Systems Operator I	Level II	Level I
Clayton Castle	Lead Hand	Level I	Operator-in-Training
Jamie Prevost	Utility Worker III	Operator-in-Training	Operator-in-Training
Ray Brown	Utility Worker III	Operator-in-Training	Operator-in-Training
Jeremy Kozub	Utility Worker I	Operator-in-Training	Operator-in-Training

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, 2015, 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 which uses informational materials to raise awareness of our water resources.
 - b. Continuing compliance patrols and enforcement by a City of Enderby Bylaw Enforcement Officer with respect to sprinkling regulations.
2. Metering and Rates
 - a. Adopted a rate structure which balances conservation and equity.
 - b. Amended the Building Bylaw to include requirements for water meters.
 - c. Amended the Service Agreement with Splatsin to require water meters on reserve connections serviced by the City.
 - d. Amended policy for out-of-town service connections (e.g. Area F customers) to require water meters on connections serviced by the City.
 - e. Completed water meter installations on all residential, commercial, industrial and civic properties.
3. Loss Control
 - a. Completed a Loss Control Program in 2012, which estimated the total Unaccounted For Water at 6.5% or 12.05 m³ per hour.
 - b. Completed a Leak Detection Audit to identify and repair water leaks within municipal infrastructure.
4. Planning for the Future
 - a. Nearing completion of a Water Study to update for 20-year growth projections and infrastructure implications.

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. It is worth noting that, based on anecdotal information, the City of Enderby's progress compares favorably with other communities.

Below is a synopsis of the categories and status as of December 31, 2013:

Hazard	Quantity	Surveyed	Not Surveyed	Vacant	Compliant*
High	54	51	0	3	36 (71%)
Medium	44	24	18	2	12 (29%)
Low	90	32	55	2	18 (21%)
TOTAL:	188	107	73	7	66 (37%)

*Compliance percentages are based only on occupied sites which have been assessed/surveyed.

The City of Enderby intends to revive the Cross Connection Control program in 2016, and will follow a risk-based approach that focuses on premises isolation.

Emergency Response Plan

The City of Enderby Drinking Water Emergency Response Plan was completed in early 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 most recently reviewed in March 2016. At this time, a GIS map of the distribution system was added, as well as written procedures for positive bacteriological results such as E. coli and coliforms.