

BEAVER CREEK WATER SYSTEM

ANNUAL REPORT
2018



ALBERNI-CLAYOQUOT
REGIONAL DISTRICT

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Table of Contents

Page #

1.0 Background.....1
 Purpose of the Annual Report.....1
 Regulating Authority.....1
 Management.....1
 Beaver Creek Water System Overview.....1

2.0 Goal and Targets.....2
 Potable Targets..... 2
 Potable Target 1 - No E.coli and No Total Coliform in any water samples.....2
 Potable Target 2 - Minimum 0.20 mg/L Chlorine Residual.....3
 Potable Target 3 - Less than 1 NTU Turbidity in the water4
 Potable Target 4 - Meet the Drinking Water Quality Guidelines.....4

 Cost-Effective Targets..... 5
 Cost Effective Target 1 - Average Water Demand less than 350 lpcd..... 6
 Cost Effective Target 2 - Peak Demand Ratio of less than 2:1 PDD:ADD..... 6
 Cost Effective Target 3 - O&M cost per customer less than \$400..... 6

 Reliability Targets..... 7
 Reliability Target 1 - Unaccounted water loss to be less than 15%..... 7
 Reliability Target 2 - Maximum # of breaks less than 5/year.....8

 Summary of Target Results for 2018.....8

3.0 Improvement Plan.....8
 2018 Projects Completed..... 8
 Upcoming Projects.....9

1.0 Background

Purpose of the Annual Report

This annual report provides an overview of the Alberni-Clayoquot Regional District's (ACRD) Beaver Creek Water System. It is the ACRD's responsibility to the community and provincial health authority to share this information. This report is for the water consumers to review their individual water systems in order to be aware of the service provided and of the annual activities.

Regulating Authority

The Province of British Columbia's Drinking Water Protection Act and Regulation prescribes the required performance of drinking water suppliers. The Island Health Authority (IH) is the body that oversees water systems in the ACRD, with the mission to minimize health risks to the public and to assist with providing safe drinking water to our communities. As part of IH regulations, water systems are required to have operators qualified by the Environmental Operators Certification Program to the same classification level as the system.

Management

The ACRD's Environmental Services Department is responsible for the overall management of the Beaver Creek Water System. The Beaver Creek Water System has an advisory committee made up of the Beaver Creek Electoral Director and volunteer members from the community. This committee provides guidance and advice to the ACRD management regarding infrastructure improvements, bylaws and costs.

Beaver Creek Water System Overview

Beaver Creek is a community of 2,873 (2016 Census) which borders the City of Port Alberni on the south, the Beaufort Electoral Area on the north and east, and the Sproat Lake Electoral Area on the west. The Stamp and Somass Rivers form the western boundary of Beaver Creek. The Beaver Creek Improvement District converted into a local service area of the ACRD on June 1st, 2012.

The majority of the Beaver Creek Water System was constructed in the 1960's. The water mains were originally constructed with asbestos cement pipe and more recent improvements with polyvinyl pipe (PVC). Historically, the source water was from the Stamp River but it is now from the City of Port Alberni through a bulk water agreement. The City's water is treated with chlorine and enters Beaver Creek at the Strick Road Booster Pump station where it is rechlorinated and distributed.

The water system is certified by the Environmental Operators Certificate Program (EOCP) as a Level Two Water Distribution System. There are two full time staff members that maintain and operate the system who are both certified as Level 2 Operators.

The Beaver Creek Water System includes:

- Concrete reservoir on Kitsuksis Road, Volume of 1,135 cubic meters

- Bolted steel reservoir on Beaver Creek Road, Volume of 273 cubic meters
- Glass fused reservoir on Kitsuksis Road, Volume of 1,135 cubic meters
- Strick Road Pump Station
- Darnley Road Pump Station
- North Reservoir Pump Station
- Stamp River Pump Station and Intake (currently not active)
- Service connections: 982
- Number of water parcels: 1,037
- Population: 2,873 (BC Stats 2016)
- Total length of mains: 46.3 kilometers
- Total number of fire hydrants: 114
- The majority (67.5%) of the distribution system is Asbestos Cement (AC)
- The remainder is made up of polyvinyl chloride (PVC)
- Average daily flow for 2018: 1044 cubic meters

2.0 Goal and Targets

It is our mission to provide potable, cost effective and reliable drinking water through continuous improvements

In order to achieve this mission, measurable targets for potability, cost-effectiveness, and reliability have been set.

Potable Targets:

- 1) No E.coli, no total coliform in any water samples
- 2) Minimum 0.20 mg/L chlorine residual throughout the distribution system
- 3) Less than 1 NTU turbidity in the water
- 4) Meet the Canadian Drinking Water Quality Guidelines for all parameters (including DBPs)

Regular potability sampling of drinking water is conducted for physical, chemical and biological parameters. This sampling is to ensure that the drinking water meets the Canadian Drinking Water Quality Guidelines and is safe to drink. Each water system is provided with an Operational Certificate by IH that may outline specific testing and frequency requirements.

Target 1 – No E.coli and No Total Coliform in any water samples

Bacteria testing is performed once a week at multiple locations for Total Coliforms and Fecal Coliforms (E.Coli). The locations are spread throughout the distribution system for broad representation. The Total Coliforms and Fecal Coliforms are tested as they are good indicator organisms. Indicator organisms are easy and inexpensive to test for, can be correlated with the potential contamination level and are not

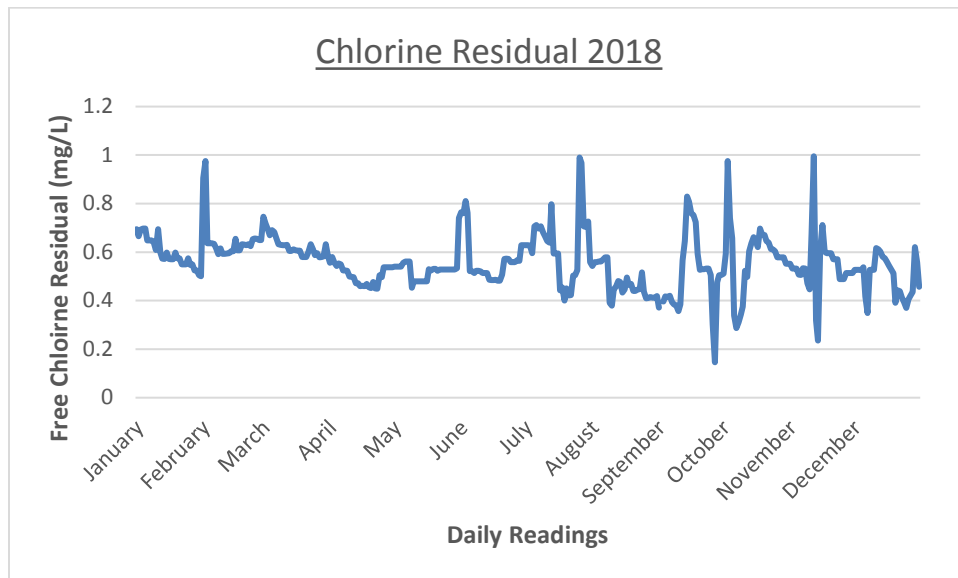
present in unpolluted waters. IH's Water Sample Range Report shows that all 198 samples taken in 2018 tested positive for bacteria.

Range Report Information		Water Sample Details	
Date range	Jan 1 2018 to Dec 31 2018	Samples that contain coliform	0 (0% of total)
Total number of samples	198	Samples that contain fecal coliform	0 (0% of total)
		Samples that contain e. coli	0 (0% of total)
		Number of consecutive samples that contain total coliform	0 (0% of total)
		Number of samples that contain total coliform in last 30 days	0 (0% of total)

For more information regarding bacteriological quality guidelines please refer to the [Guidelines for Canadian Drinking Water Quality](#).

Target 2 - Minimum 0.20 mg/L Chlorine Residual

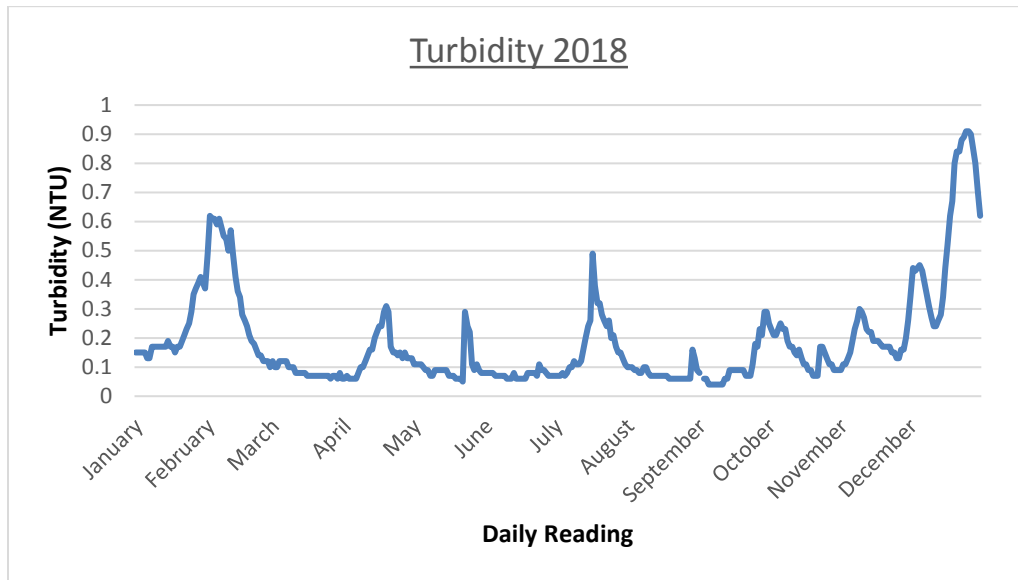
To ensure good water quality throughout the distribution system, water mains are regularly flushed to remove any accumulated silt in the water mains by creating an increase in velocity to scour the pipes. As water flows within a distribution system, the chlorine is slowly eaten up by organics in the water or any material built up in the pipes. Residual chlorine is an immediate test to measure if the water is safe to drink, although water without a chlorine residual is not necessarily unsafe, other tests to ensure safety (such as bacterial testing) require 3 to 4 days for results. Low to no chlorine residual in the water system can indicate poor circulation of water and a need to increase flushing.



The water system operators continually check the free chlorine disinfection levels with the aim to keep the free chlorine levels between 0.4 mg/l and 0.6 mg/l in the reservoirs and 0.2 mg/l at all the ends of the distribution system.

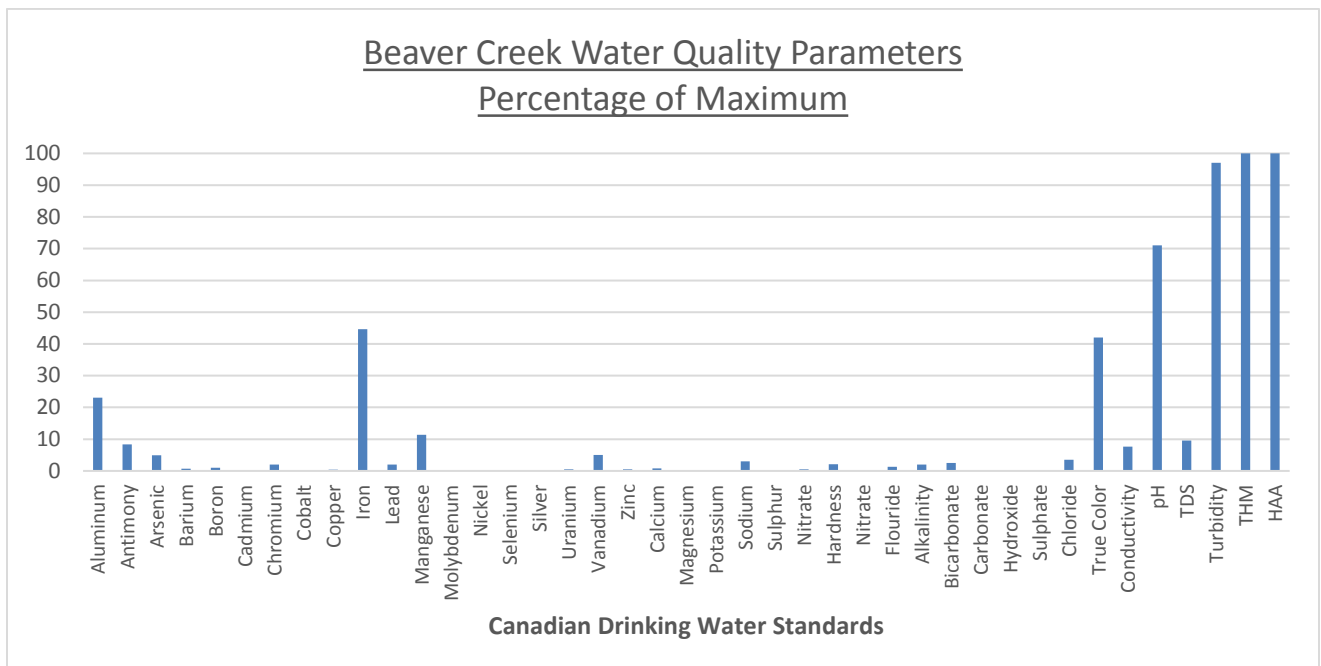
Target 3 - Less than 1 NTU Turbidity in the water

Turbidity is the cloudiness or haziness of a fluid caused by particles in the water. It is often increased in lakes and rivers after a heavy rain when soils enter the water body. This parameter is continually monitored as it negatively effects the ability of chlorine to disinfect.

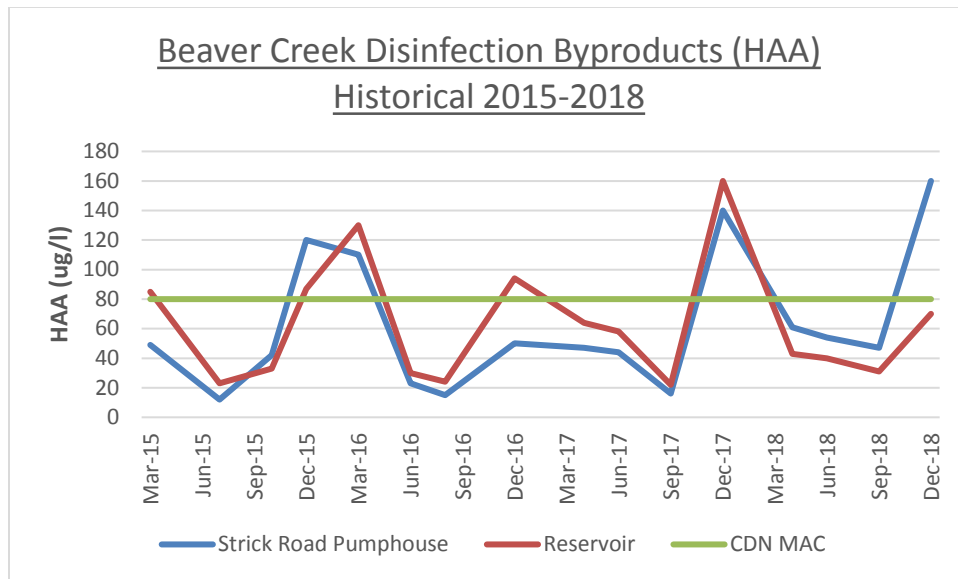


The turbidity readings are taken from the Strick Road Pump Station as water enters the system. The turbidity can have some variability due to events in the City’s water system such as water line breaks or source water changes. In the event of high turbidity entering the system, the automation in the pump house can stop pumping to protect the system.

Target 4 - Meet the Drinking Water Quality Guidelines



The ACRD regularly performs tests to ensure that water in the system meets or exceeds the Canadian Guidelines for Drinking Water Quality. Results from the December 2018 testing are shown in the graph above. There are over 40 parameters in the guidelines, all of which were met except for the exceedance of the maximum acceptable limit for Disinfection Byproducts (DBP) during the late December sampling period. DBPs are directly related to dissolved organics and turbidity of the source water. China Creek, the main source of water, has low dissolved organics and turbidity for the majority of the year. However, during heavy rain events, the turbidity increases above the maximum acceptable limit of 1 NTU, requiring the use of an alternate source which is Bainbridge Lake. The lake has higher dissolved organics than China Creek but does not experience spikes in turbidity.



The Total Haloacetic Acids (HAA) maximum acceptable concentrations (MAC) by the Canadian Drinking Water Guidelines are 80 ug/L based on a running average of a minimum quarterly sampling. The values obtained at the reservoirs were all under the MAC running average but the pump house MAC running average was just over, at 81 ug/L due to December's value at 160 ug/L.

Cost-Effective Targets:

- 1) Average Water Demand less than 350 lpcd
- 2) Peak Demand Ratio of less than 2:1 PDD:ADD
- 3) O&M cost per customer less than \$400

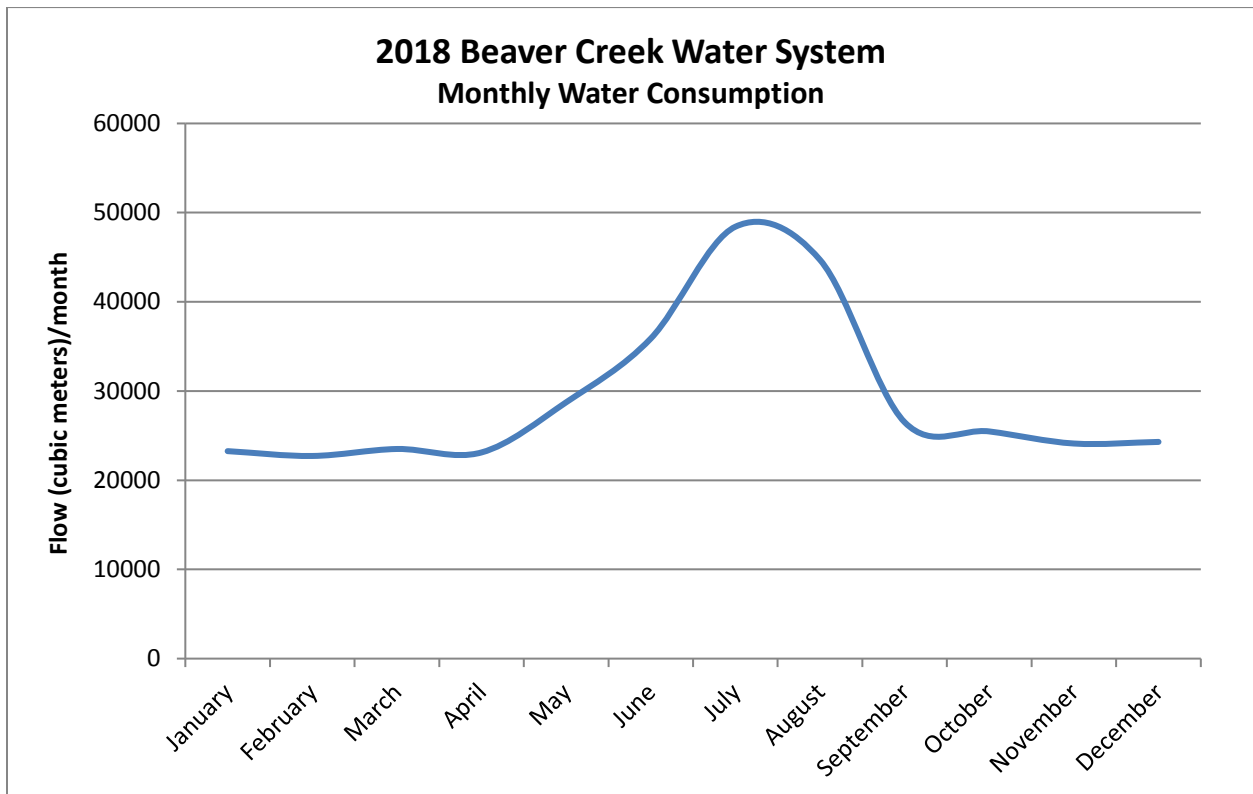
There are many factors that affect how cost effective a system is running. Effective management and planning, bulk water purchase and water demands can all affect system costs.

Cost Effective Target 1 - Average Water Demand less than 350 lpcd

The BCWS purchases bulk water from the City of Port Alberni at approximately \$0.41/m³. It must also treat and distribute water to meet the demands of the system. With a service area population of 2,873 and total water consumption of 380,922 cubic meters, this produces a daily average of 363 liters per person per day (lpcd). This is just above the target of 350 lpcd and well below the 2016 UBC Survey's provincial average of 494 lpcd.

Cost Effective Target 2 - Peak Demand Ratio of less than 2:1 PDD:ADD

A water system must be designed to provide the peak water demand and fire flows. If peak demands are excessively high, then the water pipes are required to be oversized which is expensive and causes operational challenges in keeping water fresh in the lower flow time periods. Peak summer demand is approximately 47,700 m³/day compared to the average daily demand of approximately 28,830 m³/day. This is approximately 1.65 to 1 ratio of peak to average demand. This is under the target of 2:1.



Cost Effective Target 3 – O&M cost per customer less than \$400

In 2018, the total operating costs for the system were \$563,833 excluding bulk water purchase and capital investment. Divided by the 1,037 parcels, this results in a \$544 cost per customer. Similar sized water systems typically have an operating cost per customer of between \$300 and \$400 per customer. This value is high because of water system failures and the small size of the system. Emergency breaks

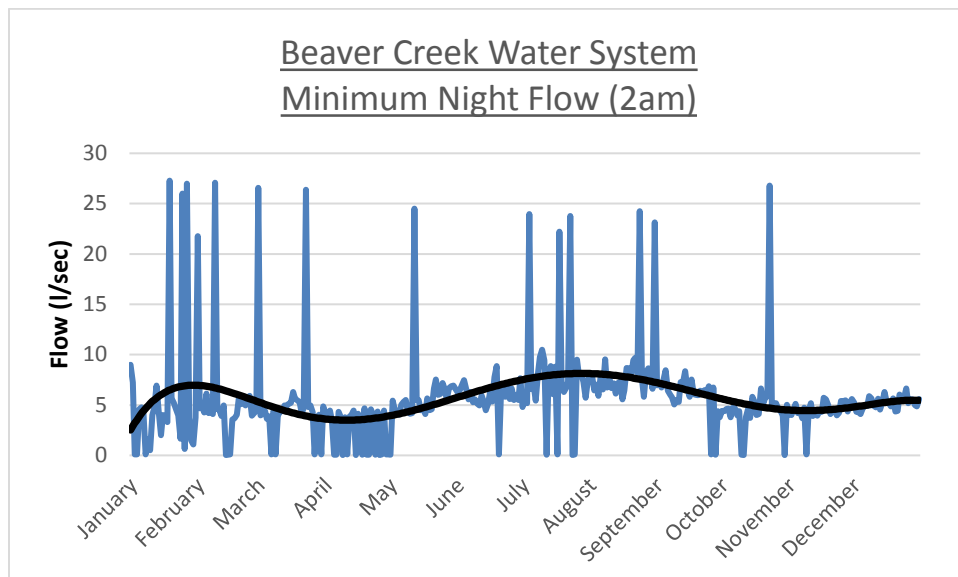
and repairs are costly and directly impact this number which was higher in 2018 than 2017 when we experienced more failures. These costs can be reduced by replacing aging infrastructure. The BCWS also has a comparatively high cost as operations require a minimum of two operators to provide holiday and on-call coverage, meet safety requirements and complete activities that require two people. Whereas other systems of similar size are often operated by a water department that runs multiple systems, allowing efficiencies of scale to occur.

8.0 Reliability Targets:

- 1) Unaccounted water loss to be less than 15%.
- 2) Maximum # of breaks less than 5/year.

Reliability Target 1 – Unaccounted water loss to be less than 15%.

In 2018, the City of Port Alberni provided 380,922 cubic meters of water to Beaver Creek through a bulk water agreement. The total water consumed in Beaver Creek through all water meters for 2018 was 270,105 m³. The difference between these two values is the unaccounted or non-revenue water loss. This loss can be attributed to meter error, water main breaks, flushing, unauthorized consumption and leaks. The unaccounted water loss for 2018 was 110,817 cubic meters which made up 29% of the bulk water. This also means that the 110,817 cubic meters of water was purchased from the city and generated no revenue, a potential loss of \$45,711. A certain amount of this volume is unavoidable loss including water lost due to main breaks and the flushing program. In order to better determine how much of this volume is unavoidable water loss, the system will begin measuring and recording the volume of water used in flushing.



The minimum night flow can be used to assist in the determination of system leakage. The average night flow is shown to be approximately 5 l/s, as shown in the graph. This value is used in determining

whether a leak is developing in the system. The spikes shown in the graph above illustrates high night flows which the operators can use to determine leak events.

Reliability Target 2 - Maximum # of breaks less than 5/year.

In 2018, the BCWS had two water main breaks and eight service line breaks. Through the water main replacement program, the number of total breaks should eventually be reduced as the mains that are breaking get replaced. Often a service line will break at the water main connection due to the asbestos cement pipe being fragile. Operating the pumps and subsequently increasing pressure during the night results in an increased likelihood of breaks as water consumption is at its lowest. Therefore, all efforts are made to operate the pumps and fill the reservoirs during higher consumption periods.

Summary of Target Results for 2018

This past year, the BCWS met most targets with a few exceptions. The system was successful in meeting the water quality targets with the exception of DBP of HAA that were over the CDWG annual average value. This HAA parameter is dependent on the source water that the City of Port Alberni provides. The other targets that were not met were the cost per customer, the number of water breaks and the water loss. These two targets are related as breaks increase costs due to machine time, parts and labor.

	Target	2018 BCWS
Bacteria Results	0	0
Chlorine Residual	>0.20 mg/l	>0.20 mg/l
Turbidity	< 1.0 NTU	<1.0 NTU
CDWQG	< 100%	99%
Average Demand	<350	363 liters per capita day
Peak Demand Ratio	<2	1.65
Cost per customer	\$300-\$400	\$544
Water Loss	<15%	29%
Breaks	<5	10

3.0 Improvement Plan

2018 Projects Completed

In 2018, approximately 700 meters of four inch aging asbestos cement water main on Drinkwater Road was replaced with six inch PVC and 5 new hydrants. A minor capital project was also completed that tied the water mains of Plymouth and Kerry Roads to eliminate a dead end and reduce the amount of flushing required in the area. A number of water quality test stations were installed to improve the ability to monitor the water. Several new household water connections were installed that reflects the increase in housing construction in the area. As well, all of the faulty meters installed during the 2017 meter exchange program were switched out in 2018. More accurate meter records, are expected in 2019 which will improve leak monitoring efforts.

In 2018, the Board developed an Asset Management Policy, following which the ACRD's Asset Management Coordinator created an asset management plan for the Beaver Creek Water System. The DCC bylaw was adopted in July 2018, which has replaced the capital charge previously charged in the system. As the new system is being implemented, staff are adjusting to the new process and will be reviewing the regulations bylaw for any necessary changes in 2019.

Upcoming Projects

Engineering Design Project – Walker, Fayette and Lamarque Road have been identified as the highest priority water mains for replacement in the system. As the mains are similar in length and location, there will be efficiencies in doing the engineering design work as one project. This may support a large grant application if more programs become available for water infrastructure work.

Walker Road Watermain Capital Upgrade – this project will replace the failing 4 inch AC main with 6 inch PVC main and increase hydrant locations. This project will also reduce emergency repairs for this main and improve overall fire flows. This project will help to reduce the number of breaks and water loss within the system.

WERP Update – The Water System Emergency Response Plan will be reviewed and updated to ensure we have adequate planning in place to address potential emergencies and review the costs and benefits of retaining the original Stamp River infrastructure for emergency supply. This will also review the current on-call program which has a limited staff pool to use.

Preventative Maintenance Review and Plan – Staff are working to create a comprehensive preventive maintenance plan and schedule to reduce corrective and emergency work as well as ensure adequate/appropriate resources are planned for the system. This will have a positive impact on operation and emergency maintenance costs.

Water Systems Review – will be completed to identify options to reduce the Operations Cost per customer. This will include looking at staffing allocation to services and other cost saving measures.

Rates and Bylaw Review – Staff will be updating the bylaw to streamline changes resulting from the DCC bylaw and other operational items. Staff will also be reviewing the current rates to ensure that adequate revenues are being collected to support the renewal and replacement program developed in the Asset Management Plan.

Water Loss Investigation – Staff will be reviewing water use records, meter accuracy, and flushing volumes to get a more accurate estimation of the leakage in the water system. Once this has been determined, leak detection and reduction options will be assessed and a plan to reduce leakage to below 15% will be developed.