

ALBERNI CLAYOQUOT REGIONAL DISTRICT

BAMFIELD WATER SYSTEM

ANNUAL REPORT 2023

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1.0 Background

Purpose of the Annual Report

This annual report provides an overview of the Alberni-Clayoquot Regional District's (ACRD) Bamfield Water System (BWS). It is the ACRD's responsibility to the community to share this information. This report is for the water consumers to review their individual water system in order to be aware of the service 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 Vancouver Island Health Authority (Island Health) 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 communities. As part of these regulations, water systems are required to have operators qualified by the Environmental Operators Certification Program (EOCP) to the same classification level of a system.

Management

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

Bamfield Water System Overview

The community of Bamfield is a significant part of Electoral Area "A" which has a population of 256 (2021 Census). Bamfield sees a significant influx of people during the summer months that is estimated to be in the thousands. The majority of the BWS was originally constructed in 1979 and 1980 and water is supplied from Sugsaw Lake which is now treated by a Dissolve Air Floatation (DAF) water treatment plant. The DAF water treatment plant was commissioned in August 2018 to address the high organics in the source water and related formation of disinfection byproducts (DBP) in the drinking water. Intensive water quality testing has shown the treatment plant is effective at significantly improving the water quality, including colour and taste, and has reduced levels of DBP in the drinking water.

The BWS complexity is partially due to the subsurface water lines crossing the inlets in various locations. These underwater marine water lines are challenging to repair and often under layers of sediment. The BWS has a Water Treatment 3 Classification and a Level 2 Water Distribution Certification. The daily operation of the distribution and the treatment plant is performed by a contracted operator who is certified by EOCP for these classifications.

The Bamfield Water System includes:

- Water source: Sugsaw Lake
- Water treatment plant: Dissolved Air Floatation (DAF) with UV and Chlorine disinfection
- Two bolted steel reservoirs: 517 m³ capacity
- Current metered service connections: 239
- Total Length of mains: 18 km
- Water main material: Polyvinyl Chloride (PVC) and High Density Polyethylene (HDPE)
- Average daily flow: 199 m³

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 treated water
- 4) Meet the 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 for consumption. Each water system is provided with an Operational Certificate by Island Health that may outline specific requirements such as individual tests and the frequency.

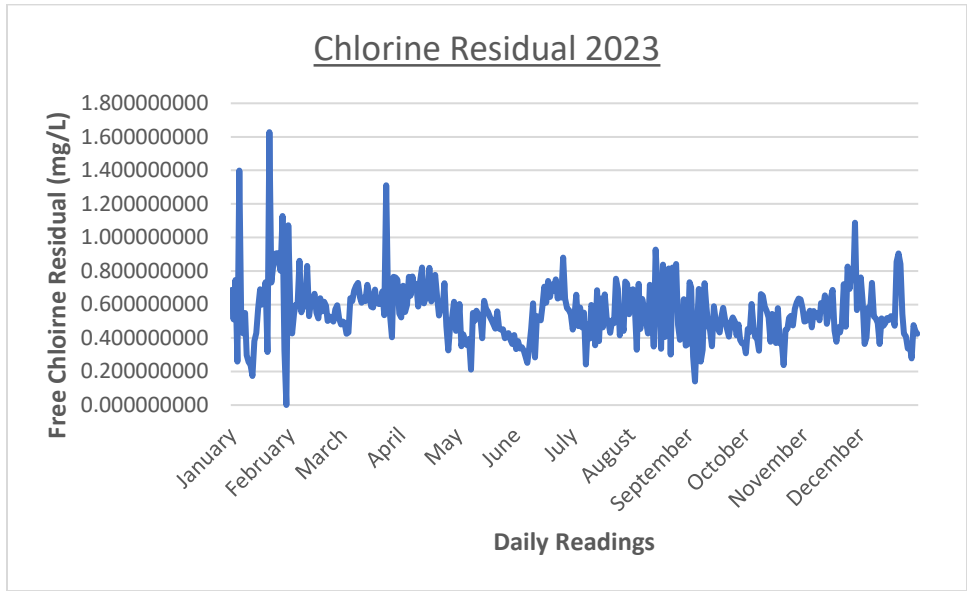
Target 1 – No E. coli and No Total Coliform in any Water Samples

Bacteria testing is performed monthly at multiple locations for Total Coliforms and E. coli. The locations are spread throughout the distribution system to capture a monthly representation. Island Health's 2023 Water Sample Report shows that all 64 samples taken tested negative for any bacteria.

The Total Coliforms and E. coli organisms 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.

Target 2 - Minimum 0.20 mg/L Chlorine Residual

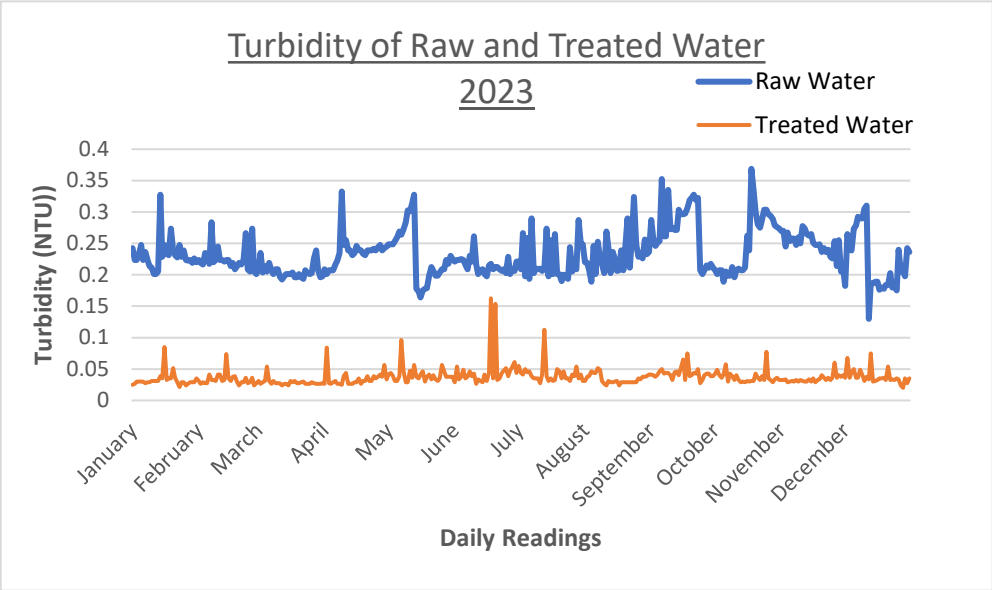
As water flows within a distribution system, the chlorine is slowly eaten up by organics in the water or any material built up in the pipes. Residual chlorine is an immediate test to measure if the water is safe to drink, although water without a chlorine residual is not necessarily unsafe. Other tests 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 for increased flushing.



The graph above shows that the free chlorine level leaving the water treatment plant is usually between 0.2 and 0.8 ppm with some fluctuations above or below. This variation has significantly reduced since the operation of the treatment plant began, prior to which levels would range between 0.2 and 3.0 ppm. The water system has additional chlorine injection at the reservoirs to ensure the entire water system has adequate disinfection.

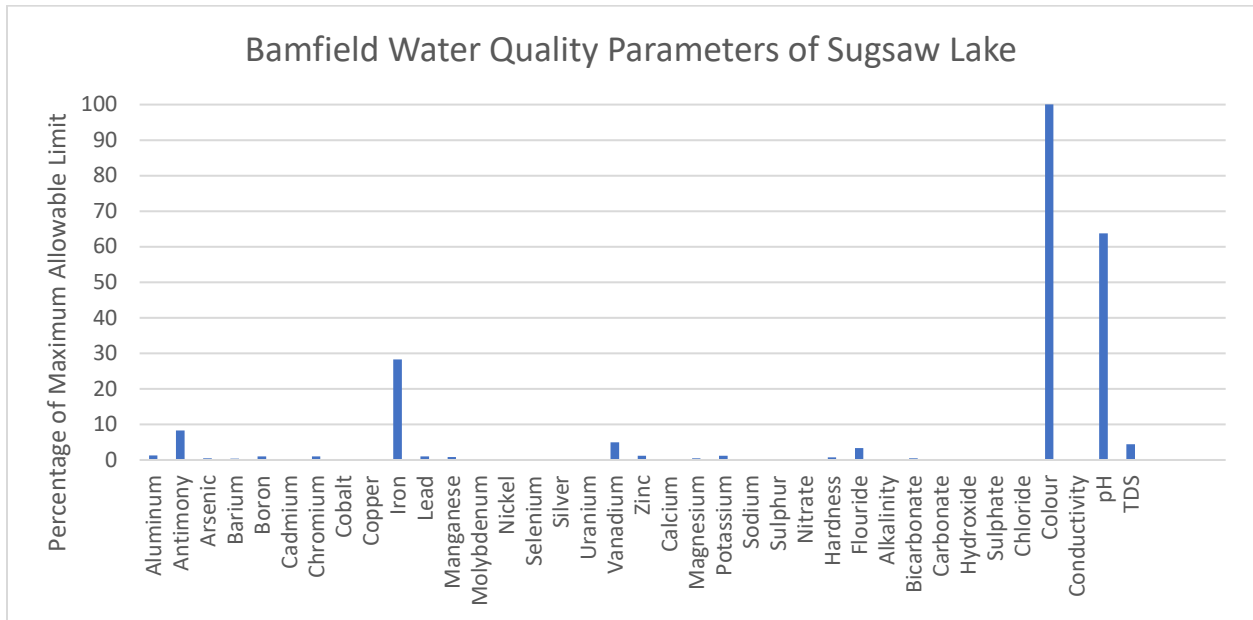
Target 3 - Less than 1 NTU Turbidity in the Treated Water

Turbidity is the cloudiness or haziness of a fluid caused by the suspension of individual particles. This parameter is continually monitored as it effects the ability of chlorine to disinfect. The following graph shows that there was high turbidity in the raw water source in June and November due in part to heavy rains. It also communicates a period in early July where the Programmable Logic Control (PLC) with the pumps within the pumphouse failed for a short period. Typically, the treated water’s turbidity is consistently between 0.02 and 0.04 NTU. This demonstrates that the water treatment plant is very effective in removing the turbidity from the raw water.

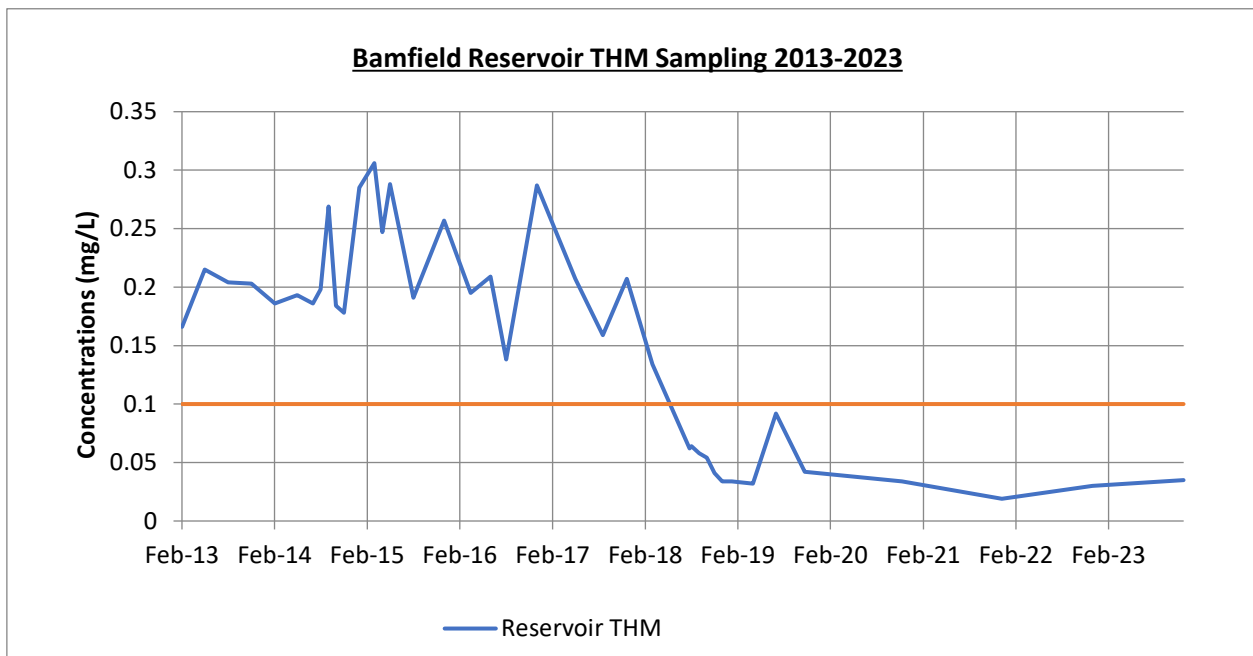


Target 4 - Meet the Drinking Water Quality Guidelines

The ACRD regularly performs tests to ensure that the water is meeting all standards. The water system's latest complete potability sample is shown in the following Water Quality Parameters graph.



The colour is above the acceptable limit in the raw water due to high dissolved organics in Sugsaw Lake but once treated the water exceeds the standards. Although colour alone is not harmful, the associated organics in water often causes disinfection byproducts (DBP). The treatment plant is successful in removing the precursors of DBP (colour and organics) and the graph below illustrates the effectiveness of the water treatment plant in the reduction in Trihalomethanes (THM), a key DBP.



Cost-Effective Targets:

- 1) Total water demand below 626 m³/day
- 2) Peak Demand Ratio of less than 2:1 PDD: ADD
- 3) O&M cost per customer less than \$1,500

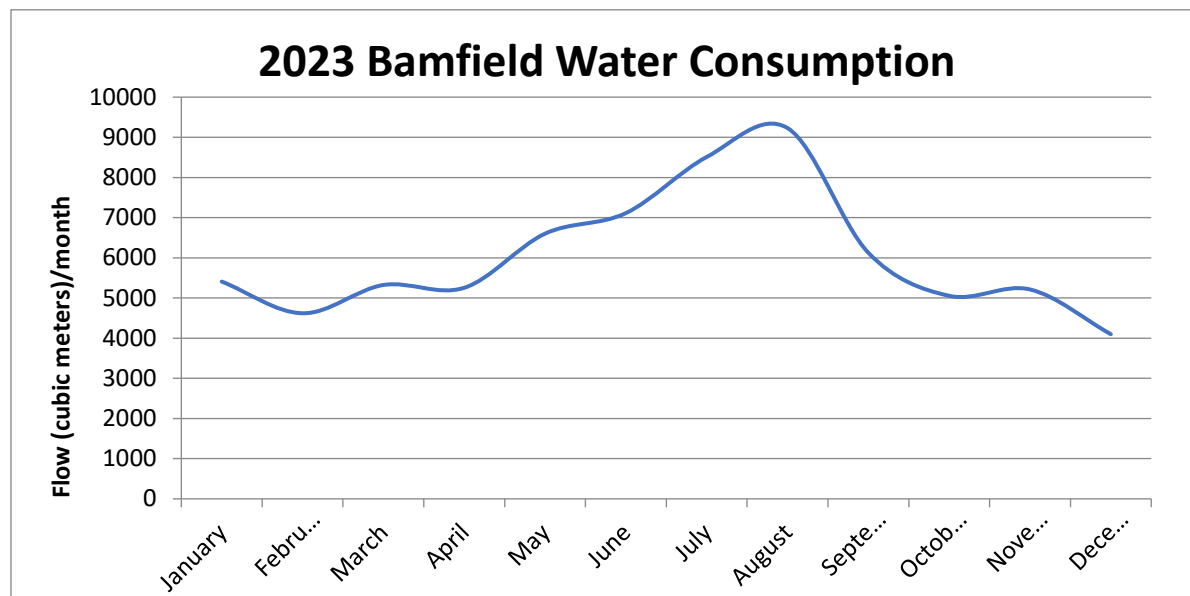
There are many factors that affect how cost effective a system is running. Effective management and planning, good operational practice and changing water demands can all affect system costs.

Cost-Effective Target 1 - Total water demand less than 626 m³/day

The new treatment plant has a maximum capacity of providing 626 m³/day. In 2023, the water system provided 72,554 cubic meters of water to the community water system for an average of 199m³/day demand. In the summer, the peak day demand was 239 m³/day. Both of these are well below the targets.

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

A water system must be designed to provide the peak demand and fire flow. If peak demands are excessively high, then the water pipes are required to be oversized which is expensive and creates the operational challenge of keeping water fresh in the lower flow time periods. The target is to have the peak day demand (PDD) less than twice as much as the average day demand (ADD). Peak day demand is 239 m³/day compared to average daily demand of approximately 199 m³/day providing the Peak Demand Ratio of 1.21:1. The consumption graph below shows the additional demand and strain the summer months place on the water system.



Cost-Effective Target 3 - O&M Cost per Customer less than \$1,500

In 2023, the total operating costs for the Bamfield Water System were \$266,790 which excludes both capital contributions and debt repayment. Dividing this cost by the 239 services in the system, results in

a cost of \$1,116 per customer for 2023. This is higher than the cost per customer in 2022 which was \$1054, yet still below the target. Factors causing this included, increased cost of supplies, additional transport costs both by road and sea, and the stepped increases to the water operator contract in January and July 2023.

Reliability Targets:

- 1) Unaccounted water loss less than 15%.
- 2) Maximum # of breaks less than 5/year.
- 3) Annual Contribution to capital meets AMP targets of \$905/year

Reliability Target 1 – Unaccounted for Water Loss less than 15%.

In 2023, the water system provided 72,554 m³ of water to the community water system. The total water consumed in Bamfield through all water meters for 2023 was 60,107 m³. The difference between two values is called the unaccounted for or non-revenue water loss. This loss can be attributed to filter backwash, meter error, water main breaks, flushing, unauthorized consumption and leaks. The unaccounted for water loss for 2023 was 12,447 m³ which made up 17% of all water produced. The 2022 unaccounted for water loss was at 25%, therefore there was a large reduction, getting us closer to our target of 15%. With the cost of producing water getting more and more expensive, it is important to continue to focus on ways to reduce the unaccounted for water loss. The largest culprit for water loss is leaks within the system, which continues to be an area of focus in 2024.

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

In 2023 we had a total number of nine (9) leaks within the system, down significantly from 25 in 2022. Leaks can be hard to detect within the system, but the water operator monitors flows and works to detect them as soon as possible. One leak occurred on the West Bamfield submarine line and was quickly repaired.

Reliability Target 3 – Annual Contribution to capital meets AMP targets

In the Fall of 2021, an Asset Management Plan (AMP) was created for the Bamfield Water system to ensure that we are renewing our infrastructure to minimize service interruption, risks, and overall costs. Along with the Infrastructure Renewal and Long Range Plan developed by Koers and Associates, these plans have assessed the age and condition of all of the system's assets to determine the replacement costs and calculated an annual amount that is required to be invested in capital infrastructure of \$321,000 each year. This target will inform us whether we are collecting enough money to proactively replace failing infrastructure. Replacement costs can be offset through the savings in the reduction in non-revenue water loss and a reduction in corrective and emergency repair costs.

A total of \$98,481.27 was contributed to the capital fund in 2023. The AMP states that approx. \$321,000 should be contributed annually, which when divided by the 247 parcels is \$1,300 per parcel. The 2023 total of \$399 per parcel being contributed is above the amount contributed in 2022, but still well below the target.

Summary of Target Results for 2023

This past year, most of the targets were met except for the amount of unaccounted for water loss, the number of breaks and capital contributions.

The water treatment plant has allowed the BWS to consistently exceed all water quality targets.

The unaccounted for water loss was down significantly from 25% in 2022 to 17% in 2023. As the cost of producing water continues to rise it is important that ways to reduce this number continue to be focused upon. The eventual replacement of the West Bamfield submarine line, a continued source of leaks within the system, should help reduce this number.

	Target	2023 BWS
Bacteria Results	0	0
Chlorine Residual	> 0.20 mg/l	> 0.20 mg/l
Turbidity	< 1.0 NTU	< 1.0 NTU
CDWQG	100%	100%
Total Demand	< 626 m ³ /day	199 m ³ /day
Peak Demand Ratio	< 2	1.21
Cost per customer	< \$1,500	\$1,116
Contribution to Capital	\$1,300	\$399
Water Loss	< 15%	17%
Breaks	< 5	9

3.0 Improvement Plan

2023 Projects Completed

Submarine Line Repair

The West Bamfield submarine transmission line experienced another leak on October 12 (Repair Clamp #9). The leak was patched with a stainless clamp with restraints rather than a larger repair which would have required the issuing of a boil water advisory. It was not as large as some of the previous leaks and did not require divers to complete the repair like some of the others did.

ICIP Grant Awarded for the West Bamfield Submarine Line replacement

It was officially communicated to the ACRD in December 2023 that we were successful in the Investing in Canada Infrastructure Program (ICIP) grant application that was submitted in February 2022. This grant will fund 73.33% of the submarine line replacement, which amounts to \$861,802. With confirmation of the grant approval, this project will move forward in early 2024.

Upcoming Projects 2024

West Bamfield Submarine Line Replacement Project

The engineering design and contract administration request for proposal will be issued in early 2024 for the replacement of the West Bamfield submarine transmission line. This is the highest priority capital project for the Bamfield Water System. At the 50% design stage a two part tender will be issued for construction services. The selected applicant will be brought on for the completion of the design project, ensuring that project materials and budget are adequate and realistic. The ACRD will have the option of continuing with the selected construction company for the construction portion of the project if we are satisfied with the work performed on the design portion and the tendered price for the services. The

ACRD is aiming for the design to be completed by the midway point of 2024, and the replacement project timeline will then depend upon the time taken to obtain the necessary construction permits. This would be the most significant project for the BWS since the completion of the water treatment plant in 2018 and its completion will allow staff to focus on other capital replacement projects.

Long-Term Financial Strategy

The development of a long-term financial strategy for the system will be a focus of the Finance Department in 2024. A stepped rate increase was implemented in the Fall of 2022 which resulted in increased monthly water rates in January and July of 2023, but these only reflected the increase costs of the waterworks contract.

The current funding gap between money contributed to capital reserves and the amount needed is significant, a gap of approximately \$222,579 which needs to be filled in order to upgrade undersized water mains and those poorly constructed with subpar material that leads to leaks and associated costs to the system. Staff will work on identifying adequate funding options for infrastructure renewal and replacement, including potential rate and/or parcel tax increases.

Pumphouse Control Panel Replacement

The failure of the variable frequency drive at the pumphouse in late 2023 highlighted the need to replace the aging control panel. This replacement would include new programmable logic control and human interface programs. The new Intertek certified control panel will be programmed with modifications made to the SCADA program and will greatly improve the reliability at the pumphouse.

Reservoir Inspection and cleaning

Both of the reservoirs will have their interiors inspected with a remotely operated vehicle (ROV), and a comprehensive report will be provided. The tanks will then be cleaned with a remotely operated robotic crawler and the ROV. The reservoirs will remain online while being cleaned, and the water quality will continue to be monitored.