

ALBERNI CLAYOQUOT REGIONAL DISTRICT

BAMFIELD WATER SYSTEM

ANNUAL REPORT
2025



**ALBERNI-CLAYOQUOT
REGIONAL DISTRICT**

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1.0 Background

Purpose of the Annual Report

This annual report offers a comprehensive overview of the Alberni-Clayoquot Regional District's (ACRD) Bamfield Water System (BWS). As part of our commitment to the community, the ACRD provides this report to ensure transparency and keep residents informed. It serves as a resource for water consumers to better understand the status of their individual water system and stay updated on the annual activities and services provided.

Regulating Authority

The Province of British Columbia's Drinking Water Protection Act and Regulation prescribes the required performance of drinking water suppliers. Island Health is responsible for overseeing water systems within the ACRD, with the primary goal of minimizing health risks to the public and ensuring safe drinking water is supplied to communities. In accordance with these regulations, water systems are required to have operators certified by the Environmental Operators Certification Program (EOCP) at a classification level that aligns with the system's requirements.

Management

The ACRD's Community Services Department is responsible for the overall management of the BWS. The Bamfield Area Services Committee, consisting of the Bamfield Electoral Director, a Huu-ay-aht First Nations representative, a Uchucklesaht Tribe Government representative and community members, provides guidance and recommendations to ACRD management on matters regarding infrastructure improvements, bylaws and costs.

Bamfield Water System Overview

Bamfield makes up a significant portion of Electoral Area "A" with a population of 256 (2021 Census). During the summer months, the population swells to the thousands. The majority of the BWS was originally constructed in 1979-1980. Water is sourced from Sugsaw Lake and is treated by a Dissolved Air Flotation (DAF) water treatment plant. Commissioned in August 2018, the DAF plant addresses high organic content in the source water and the related formation of disinfection byproducts (DBP) in the drinking water. Water quality testing has shown that the treatment plant is highly effective in improving water quality, including reducing colour and taste issues and lowering DBP levels.

The BWS complexity is partially due to the subsurface water lines that cross the inlets in various locations. These underwater marine water lines are challenging to repair and are often buried under layers of sediment. The BWS has a Level 3 Water Treatment Classification and a Level 2 Water Distribution Certification through the Environmental Operators Certification Program (EOCP). Daily operations of the distribution system and treatment plant are managed by a contracted operator who is certified by EOCP in these classifications.

The Bamfield Water System includes:

- Water source: Sugsaw Lake
- Water treatment plant: Dissolved Air Flotation (DAF) with UV and chlorine disinfection
- Two bolted steel reservoirs: 517 m³ capacity
- Current metered service connections: 242
- Total Length of mains: 18 km

- Water main material: Polyvinyl Chloride (PVC) and High-Density Polyethylene (HDPE)
- Average daily flow: 209 m³

2.0 Goal and Targets

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

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 testing ensures the water meets the Canadian Drinking Water Quality Guidelines and remains safe for consumption. Each water system operates under an Operational Certificate issued by Island Health, which may specify testing requirements and sampling frequencies.

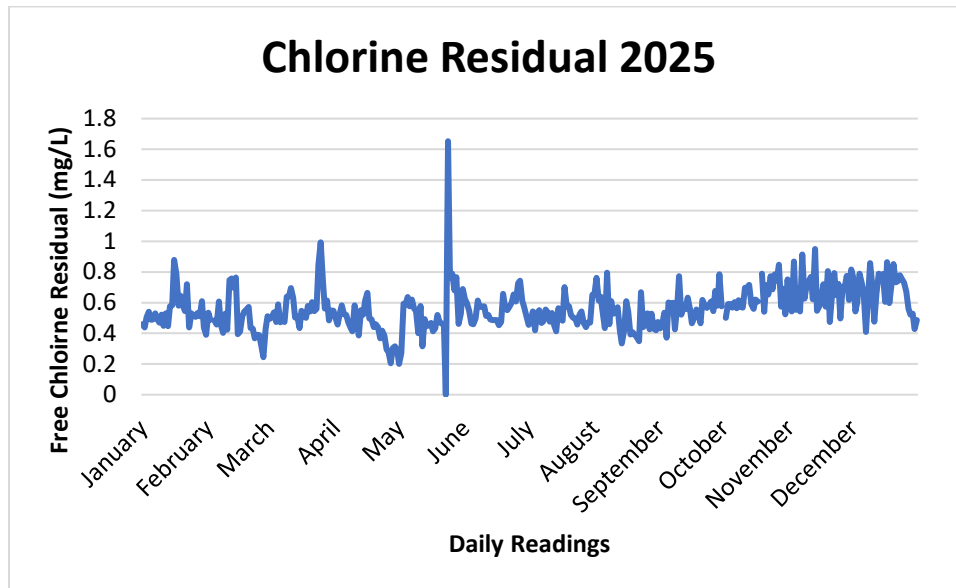
Target 1 – No E. coli and No Total Coliform in Any Water Samples

Bacteriological testing is conducted monthly at multiple locations throughout the distribution system to monitor for total coliforms and E. coli. Sampling locations are strategically selected to ensure a representative assessment of water quality across the system. According to Island Health's 2025 Water Sample Report, all 74 samples collected showed no presence of bacterial contamination.

Total coliforms and E. coli are routinely used as indicator organisms to assess drinking water safety. These parameters are widely accepted because they are practical to monitor and provide an early indication of potential contamination. Their absence in treated drinking water confirms that the system is operating effectively and that water quality standards are being maintained.

Target 2 - Minimum 0.20 mg/L Chlorine Residual

As water moves through the distribution system, chlorine residual is gradually reduced through reactions with organic matter in the water and materials that may be present within the pipes. Monitoring chlorine residual provides a quick and reliable indication of water quality within the system. While maintaining an adequate residual is important, low or absent chlorine levels do not necessarily mean the water is unsafe. They can, however, indicate reduced water circulation and may signal the need for targeted flushing to maintain water quality.

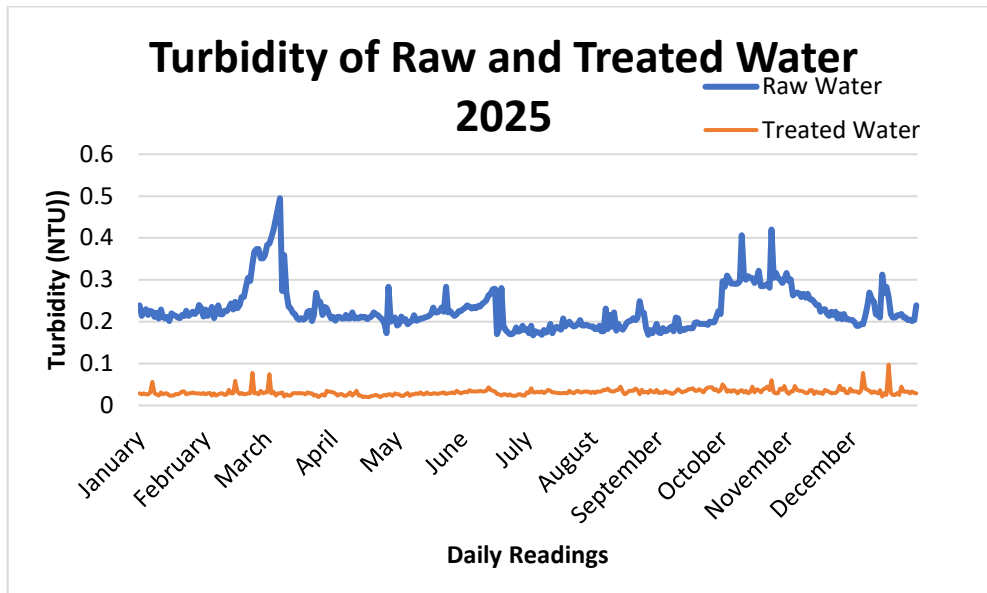


The graph above shows that free chlorine levels leaving the water treatment plant generally range between 0.2 and 0.8 ppm, with occasional variations outside this range. Since the water treatment plant became operational, chlorine levels have become more consistent. Previously, chlorine concentrations fluctuated more widely, ranging from 0.2 to as high as 3.0 ppm. To support consistent and effective disinfection throughout the distribution system, supplemental chlorine is added at the reservoirs.

The drop to zero followed by a temporary increase in chlorine residual observed in May was associated with a major water main break. This event resulted in a near complete loss of reservoir storage and caused extended service disruptions across the community. Sections of the system were shut down while repairs were conducted, reservoirs were isolated and refilled, and the distribution system underwent flushing. Once service was restored, additional flushing was completed, and water quality samples were submitted to Island Health for testing. Chlorine residual levels returned to their normal range after the system was fully restored, and regular operations resumed.

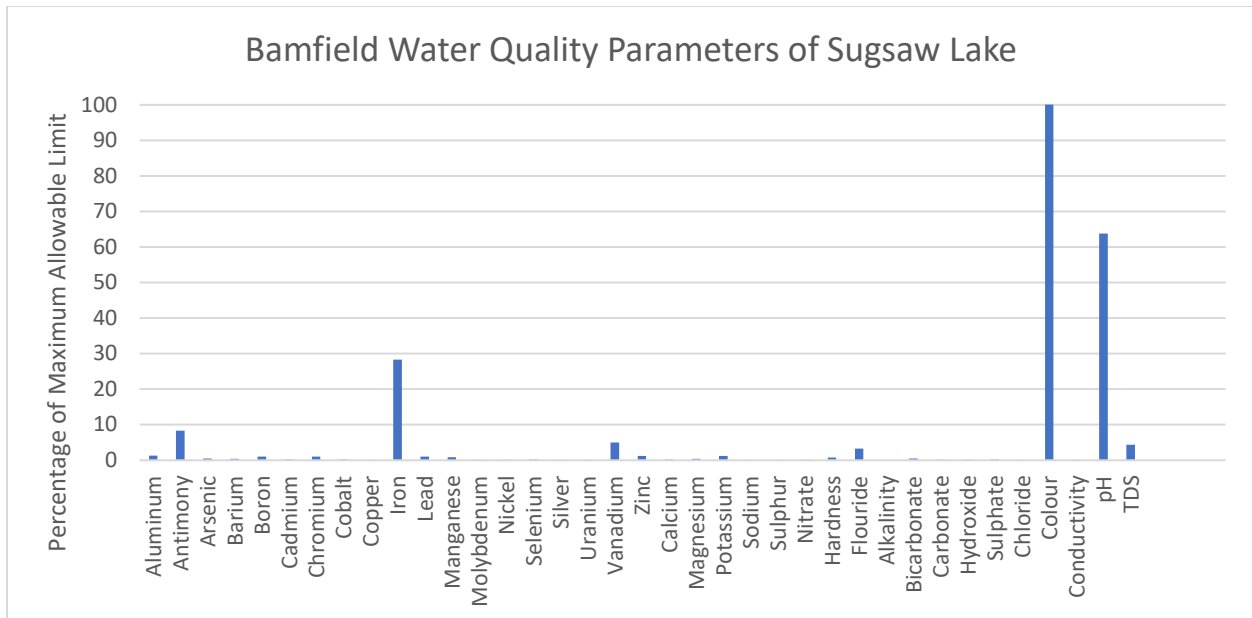
Target 3 - Less Than 1 NTU Turbidity in the Treated Water

Turbidity refers to the cloudiness or haziness of fluid caused by suspended particles and is continuously monitored due to its impact on chlorine disinfection effectiveness. The graph below shows elevated turbidity levels in the raw water source during periods of heavy rainfall, particularly in early March and October. These spikes occur as rainfall washes tannins and organic material from the surrounding forest into Sugsaw Lake and disturbs the shallow lakebed, increasing suspended particles. Turbidity can also increase during seasonal lake turnover events when warming temperatures cause mixing within the water column. Despite these fluctuations in raw water quality, the turbidity of treated water consistently remained between 0.02 and 0.04 NTU, demonstrating that the water treatment plant continues to operate effectively in removing turbidity.



Target 4 - Meet the Drinking Water Quality Guidelines

The ACRD conducts regular testing to ensure that water meets all required standards. The most recent comprehensive potability sample for the water system is presented in the following Water Quality Parameters graph.



The colour in the raw water from Sugsaw Lake exceeds the acceptable limit due to elevated levels of dissolved organic matter. Once treated, the water exceeds all quality standards. While colour itself is not harmful, the associated organics within it can lead to the formation of disinfection by products (DBPs). The treatment plant is effective at removing the DBP precursors (colour and organics).

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

Many factors influence the cost-effectiveness of a water system. Strategic management and planning, efficient operational practices and evolving water demands all play a role in shaping overall system costs.

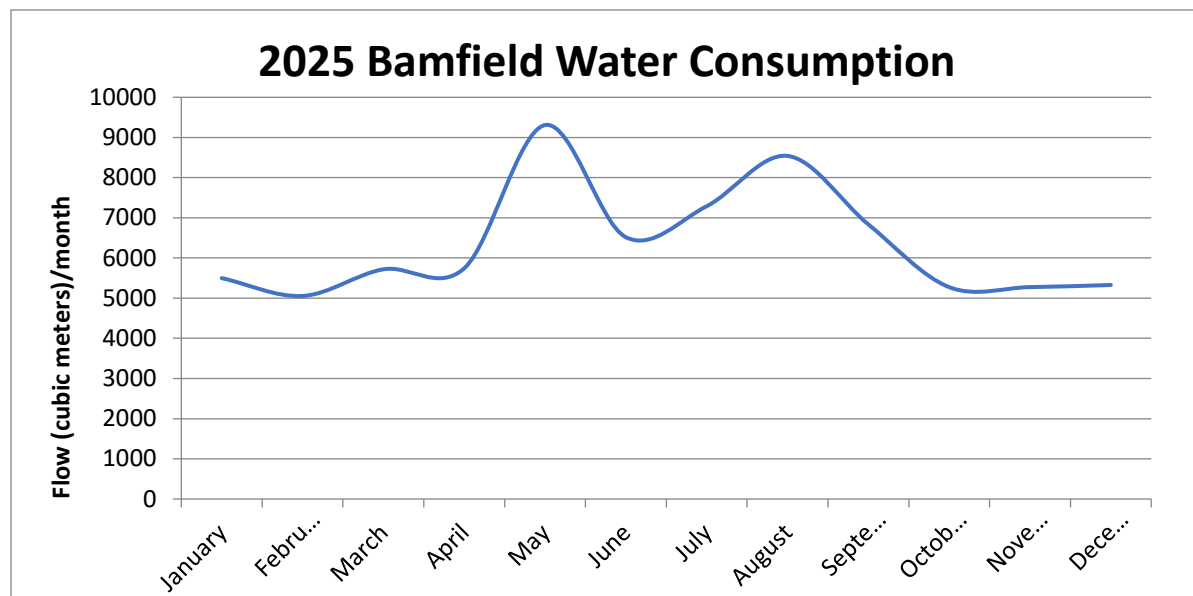
Cost-Effective Target 1 - Total Water Demand Less Than 626 m³/day

The treatment plant has a maximum capacity of 626 m³ per day. In 2025, the system supplied a total of 76,385 m³ of water to the community, with an average daily demand of 209 m³. During the summer, peak daily demand reached 246 m³. Both figures are well within the plant's capacity and below operational targets. The lower peak summer demand in 2025 is likely influenced by reduced tourism levels during the summer due to the forest fire event.

The spike in May shown in the graph is attributed to a major water main leak that rapidly drained the reservoirs and required an emergency shutdown to complete repairs. This event temporarily increased system demand as reservoirs were refilled, and the distribution system was flushed. A community-wide service disruption occurred, and a precautionary Boil Water Notice was issued while the system was restored and confirmed safe.

Cost-Effective Target 2 - Peak Demand Ratio of Less Than 2:1 PDD: ADD

A water system must be designed to meet both peak demand and fire flow requirements. When peak demands are excessively high, larger pipes are required, which increases costs and creates operational challenges in maintaining water quality during periods of lower flow. The target is to keep the peak day demand (PDD) below twice the average daily demand (ADD). In 2025, PDD reached 246 m³, compared to an ADD of 209 m³, resulting in a PDD ratio of 1.18 to 1. In comparison, the 2024 PDD was 304 m³ with an ADD of 225 m³, a ratio of 1.35 to 1.



Cost-Effective Target 3 - O&M Cost per Customer Less Than \$1,500

Total operating costs for the Bamfield Water system in 2025 amounted to \$285,091, excluding capital contributions and debt repayment. When divided among the 242 services connected to the system, this equates to an average cost of \$1,178 per customer. This represents an increase from the 2024 rate of \$1,058 per customer, while remaining below the established target.

Reliability Targets:

- 1) Unaccounted water loss less than 15%.
- 2) Maximum number of breaks less than 5/year.
- 3) Annual contribution to capital meets AMP targets of \$1294/year

Reliability Target 1 – Non-Revenue Water Less Than 15%.

The water system supplied a total of 76,385 m³ of water to the community, with 40,689 m³ recorded through customer meters. The difference between these values is reported as Non-Revenue Water (NRW), which represents water that is produced but not billed. NRW includes real losses such as leaks and water main breaks, apparent losses such as meter inaccuracies, and authorized unbilled uses including firefighting, system flushing, and maintenance activities. This approach aligns with current industry standards for reporting system performance.

In 2025, NRW totaled 35,696 m³, representing 47% of all water produced. This is an increase from 37% in 2024 and reflects ongoing challenges in managing system efficiency. A significant contributor was a major water main leak that rapidly drained the reservoirs before it could be identified and isolated. Leaks on the West Bamfield submarine line also contributed to elevated losses, as they are difficult to detect and can persist over longer periods. The submarine line remained in place throughout 2025 and was not replaced until 2026.

These results reinforce the need for continued investment in infrastructure replacement, system monitoring, maintenance, and proactive leak detection. Reducing NRW remains a priority, with distribution system leaks continuing to account for the majority of water loss.

Reliability Target 2 - Maximum # of Breaks Less Than 5/year.

In 2025, a total of ten leaks were reported within the system, an increase from five in 2024. This rise in leak occurrences contributed to higher overall water loss, as leaks that are not immediately detected or are difficult to locate can result in significant volumes of water being lost before repairs are completed. The water operator continues to closely monitor system flows to support early leak detection and prompt repair. Improvements to SCADA software and remote operating capabilities should help with proactive leak detection moving forward.

Reliability Target 3 – Annual Contribution to capital meets AMP targets

In fall 2021, an Asset Management Plan (AMP) was developed for the Bamfield Water System to support the long-term renewal of infrastructure in a way that minimizes service disruptions, reduces risk and controls lifecycle costs. In conjunction with the Infrastructure Renewal and Long-Range Plan prepared by Koers & Associates, the AMP evaluated the age and condition of system assets, identified replacement values and established an estimated annual capital investment requirement of \$321,000.

This annual funding target provides a benchmark to assess whether sufficient reserves are being set aside to support timely replacement of aging or failing infrastructure. Proactive investment in asset renewal can help reduce long-term costs by limiting non-revenue water loss and decreasing the need for emergency repairs.

In 2025, a total of \$78,332 was contributed to the capital fund. Based on the AMP, approximately \$321,000 should be collected each year, which equates to \$1,294 per parcel for the 248 parcels in the system. The 2025 contribution averaged \$316 per parcel, which is below the target and represents a decrease from 2024.

Summary of Target Results for 2025

Over the past year, most performance targets were achieved, with the exception of unaccounted-for water loss, system breaks and capital contributions. The water treatment plant continued to perform well and consistently met all water quality standards. Unaccounted-for water loss increased to 47% in 2025, up from 37% in 2024, highlighting a significant area for improvement. This increase was largely attributed to a major water main leak and ongoing challenges associated with leaks on the West Bamfield submarine line, which remained in service throughout 2025. As the cost of producing water continues to rise, reducing water loss remains a priority. The planned replacement of the submarine line, completed in 2026, is expected to support future reductions in system losses.

	Target	2025 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	209 m ³ /day
Peak Demand Ratio	< 2	1.18
Cost per customer	< \$1,500	\$1,178
Contribution to Capital	\$1,294	\$316
Water Loss	< 15%	47%
Breaks	< 5	10

3.0 Improvement Plan

2025 Projects Completed

Danger Tree Removal

In 2025, hazardous trees located near water system infrastructure were identified and removed to mitigate safety risks, prevent potential service disruptions, and protect critical assets. Trees highlighted were just above the water treatment plant, and near the hydro lines connected to the water treatment plant. Trees in the area will continue to be assessed as necessary to ensure continuity of service.

West Bamfield Submarine Line Replacement

In 2025, all required regulatory permits were successfully secured for the replacement of the West Bamfield Submarine Line, representing a major milestone for this critical water system infrastructure project. Following permit approval, construction began in October of 2025. The project involved a high level of complexity, including marine-based construction, environmental considerations and specialized diving operations. As a result, extensive planning and ongoing coordination was required throughout all phases of the work. Continuous collaboration was maintained between the ACRD, GreatPacific Consulting Ltd. (as project engineers) and Fraser Burrard Diving as the marine contractor to manage scheduling, logistics, safety and regulatory compliance. This coordinated approach helped ensure that construction activities were carried out efficiently while minimizing environmental impacts and service disruptions. The replacement of the submarine line is a key investment in improving the long-term reliability, resilience and performance of the Bamfield Water System.

SCADA Upgrades at Water Treatment Plant

Several updates were completed to the water treatment plant SCADA system in 2025 to improve ease of operation for system operators. Enhancements included displaying the status of both filters on the main screen, consolidating alarm setpoints and enabling controls into a single popup, adding the ability to direct flow to waste as required and ensuring all alarms are visible on the water treatment plant HMI. This allows for improved monitoring of the system remotely and decreases the number of necessary visits to the treatment plant to change settings.

Bamfield Waterworks Contract Issuance

A new three-year agreement was issued in late 2025 for the operations and maintenance of the Bamfield Water System, supporting the continued provision of consistent and sustainable system operations throughout the agreement period.

Upcoming Projects 2026

PLC Installation at Reservoir

In 2026, programmable logic controllers (PLCs) are planned to be installed at the reservoirs to improve monitoring and operational control. These upgrades will provide clearer, real-time visibility of flows entering and exiting the reservoirs and allow for improved control of the on-site chlorine pumps. The project will enhance operational oversight, improve system responsiveness, and support safe and reliable water treatment.

Standpipe ball valve replacements

A total of 13 standpipe ball valves within the Bamfield Water System have been identified for replacement. These valves are approximately 40 years old and, while still operational, present an increased risk of failure due to their age. In addition, routine operation has become more challenging, as access to the valve stems has deteriorated over time.

The estimated replacement cost is approximately \$2,500 per valve. To manage this work in a financially sustainable manner, \$10,000 has been allocated annually over the next three years within the capital budget. This phased approach will allow for the systematic replacement of the valves.

This initiative is considered a preventative maintenance measure aimed at reducing non-revenue water (NRW) and improving overall system reliability and operational efficiency.

WERP Update

The Water Emergency Response Plan will be reviewed and updated to ensure it reflects current system conditions, potential emergency scenarios, and appropriate response procedures. This update will help ensure staff are prepared to respond effectively to emergencies, support public health and safety, and maintain reliable water service during unforeseen events.

Sugsaw Lake Raw Water Intake Repair Investigation

The investigation of the raw water intake at Sugsaw Lake is planned to assess the condition of the structure and identify any required maintenance or repairs to support its long-term viability. Due to the intake's remote location and limited accessibility, proactive condition assessment is critical, as any future rehabilitation or replacement would require detailed planning and a comprehensive design approach.

The Sugsaw Lake intake represents the sole point of raw water entry into the water system. Its remote location, combined with its critical role, increases system risk in the event of failure. This investigation will help inform future capital planning, risk mitigation strategies, and long-term system reliability.

Capital Plan Contribution Investigation

Staff are in the process of investigating the contribution to capital, and ways to increase this contribution to help ensure sustainability long-term. A report will be brought forth to the Bamfield Area Services Committee later in 2026, with some potential funding options for sustained system asset management moving forward.