Mt. Washington Alpine Resort Water System Annual Report 2022

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1. Introduction

The following annual report describes the Mt. Washington Alpine Resort (MWAR) Water System and summarizes the water quality and production data from 2022. This report also includes a summary of any inquiries/complaints, repairs, completed maintenance, the Emergency Response Plan, treatment protocols, Cross Connection Control and water usages. It is a visual account of the utility's continuous efforts towards achieving an above-average product for our customers through continued management, operation, evaluation, and maintenance of the water system. This report demonstrates that the utility is striving to meet or exceed all regulations and identifies potential areas of improvement to increase operational efficiency and consumer confidence.

A copy of this report will be submitted to the Island Health Authority and posted online on the MWAR website.

2. Mt. Washington Alpine Resort Water System

The MWAR Water System was established in 1979 when the ski resort was first built. As the resort has increased in size, so has the water distribution system. Additional sources have been licensed and new reservoirs were built. Extensions were made to the existing distribution system to service new developments. Over the years, regulatory amendments have been introduced reflecting the increased importance of water quality and service in the mind of the general population. Mt. Washington is perpetually adapting to meet the needs and increasing expectations of our community.

The resort's water supply, treatment and distribution are completely self-contained. We do not depend on a separate purveyor for water delivery, and we are completely independent of the Comox Valley Regional District's other water utilities. Because of this isolation and the nature of operations at the resort, the water utility has its own unique set of challenges to contend with.

The water supply originates from three springs on the southwest face of Mt. Washington which are all within the resort's legal tenure. The water from each spring is collected then funneled to two raw water open reservoirs, the Middle and East reservoirs. From these reservoirs, the water is transported via gravity to the Water Treatment Facility, where it is treated with ultra-violet light and chlorinated. It is then pumped into a 4th reservoir, a covered storage tank. From there, the water is transported via gravity throughout the distribution system. In 2021, the MWAR Water System consisted of 238 residential connections and 17 resort connections, supplying roughly 631 total units. A backup generator is available and wired to turn on immediately during a power outage.

Provincial water withdrawal licensing allows the water utility to divert water from 5 different sources. Currently, only 3 of the sources are actively being used. Except for a few isolated occurrences, the maximum daily volumes consistently fall below the allowable withdrawal limits. Higher than maximum draws typically occur when one source is taken offline for scheduled maintenance or when an emergency out of our control (such as fire) takes place. The annual volumes are well below the allowable limits as highlighted in the following table.

Source	Max. Daily Volume Allowed (m^3)	Max. Daily Volume Used (m^3)	Max. Annual Volume Allowed (m^3)	Annual Volume Used (m^3)
West Spring	455	444	62046	52719
Middle Spring	455	330	62046	33431
East Spring	200	489	73000	42432
Duckenfield Creek	389	0	141852	0
Goss Creek	3845	0	145000	0

3. Water Sampling & Testing Program

Regularly scheduled water sampling and testing is performed on the distribution system. The following table includes a summary of all testing:

Frequency	Location	Tests
Daily	Water Treatment Facility	Turbidity, Chlorine Residual
	Raven Lodge	Chlorine Residual
Bi- weekly	Raw Water Sources	Total Coliform, E. Coli, Turbidity, pH
Bi- weekly	Potable Water	Total Coliform, E. Coli, Turbidity, pH, Chlorine Residual
Yearly	Raw and Potable	Full Metal/Chemical Analysis
Yearly	Potable Water	THM's/HAA's

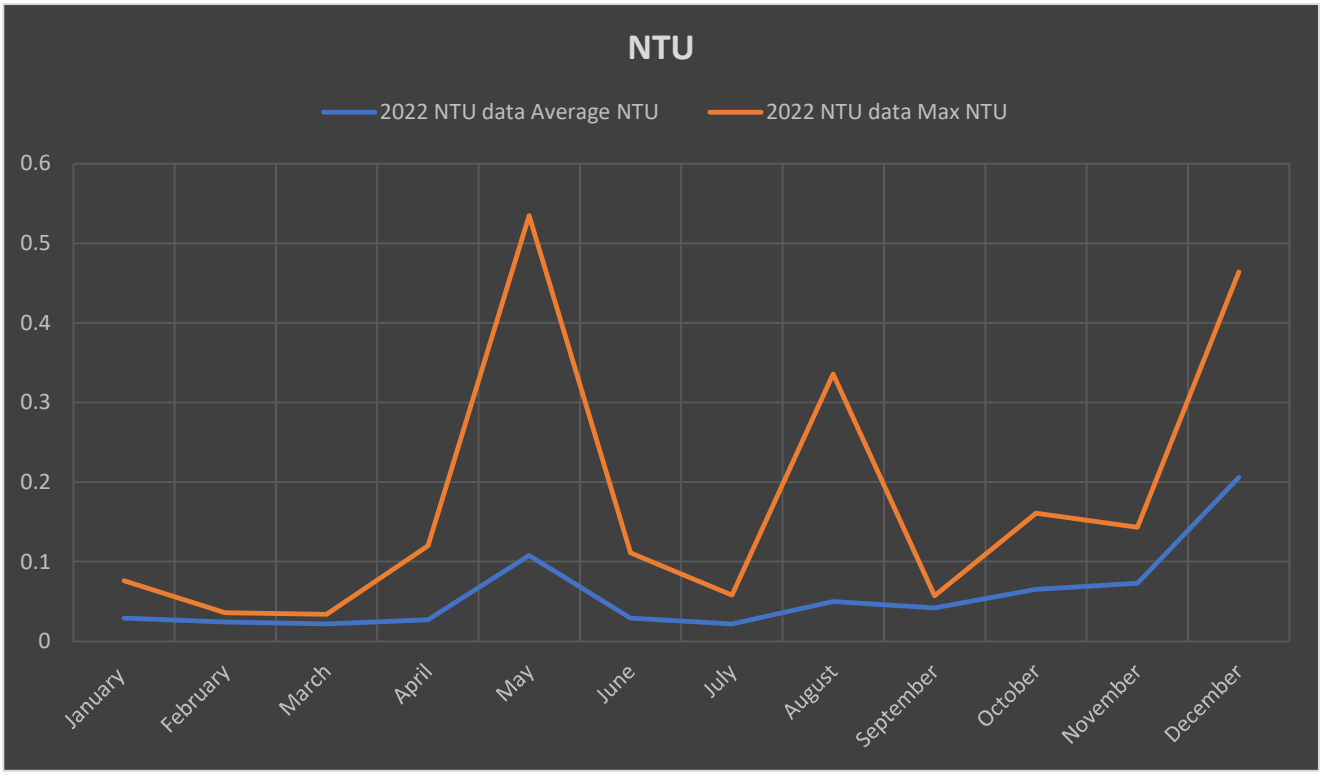
4. Water Quality – Source Water and Distribution System

A. Source Water & Distribution System

Up to date water quality reports and lab data are always available from the Utilities Department. Some of the more important parameters tested are turbidity, and chlorine residuals at the beginning and end of the distribution system.

Turbidity is a measurement of the cloudiness of water. Reported in nephelometric turbidity units (NTU), it is an optical measurement of water's ability to scatter and absorb light rather than transmit it in straight lines. Turbidity is caused by fine suspended particles of clay, silt, organic and inorganic matter, plankton, and other microscopic organisms that are picked up

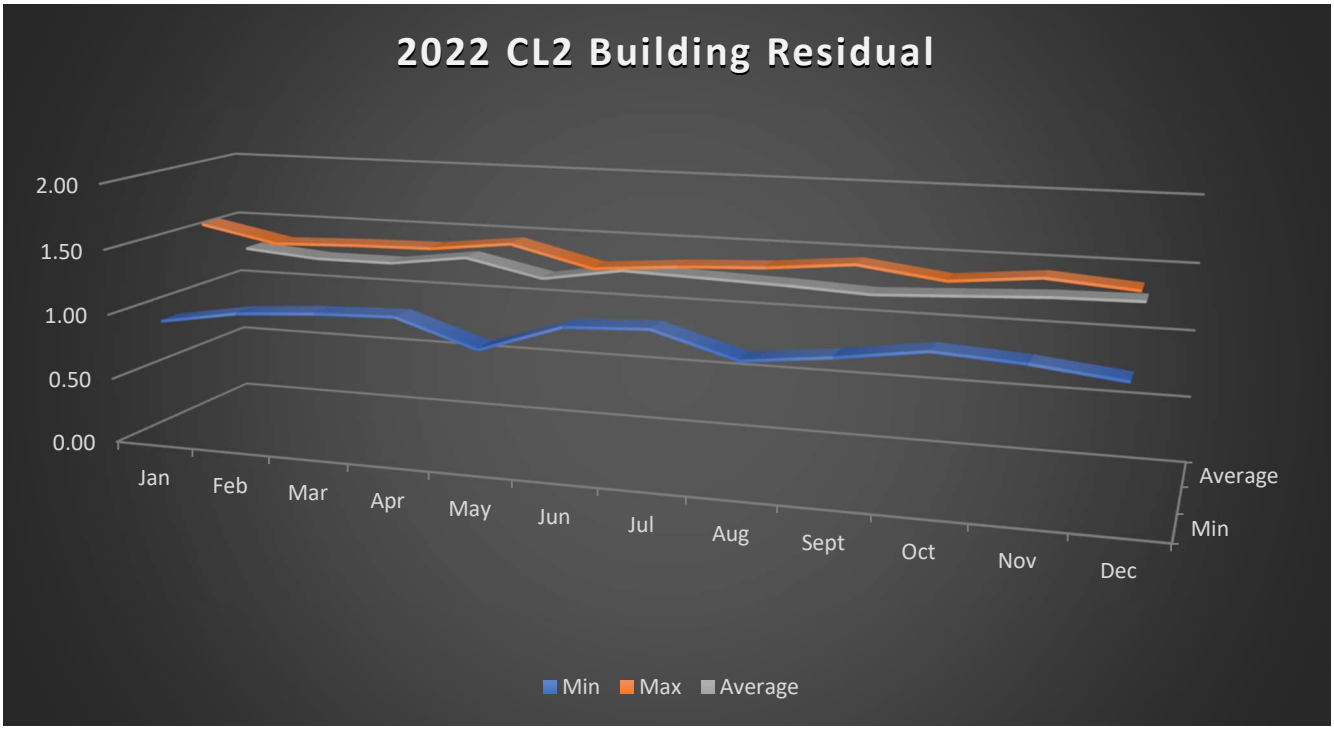
by water as it passes through a watershed. It is an important water quality indicator because contaminants such as bacteria and viruses can attach themselves to the suspended particles in turbid water. These particles can interfere with disinfection.



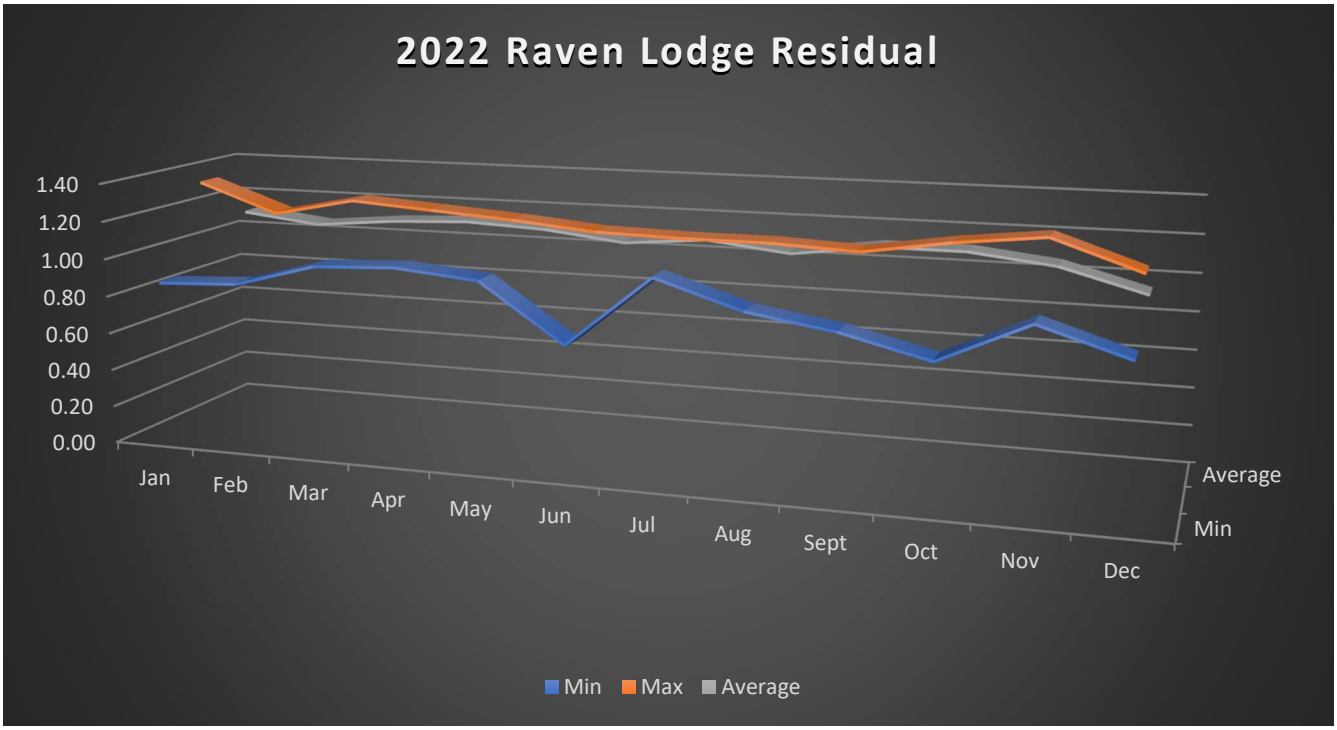
Due to the remote nature of the environment and the quality of the water from our springs, we have consistently low turbidity levels. Occasional high readings are observed, which typically coincide with heavy rain events, storms or rapid spring melts. As shown in the graph above, average values are generally well below 1.00 NTU.

Chlorine is one of the most used disinfectants for drinking water and is highly effective in the deactivation of pathogenic microorganisms. We use sodium hypochlorite in liquid form as our primary disinfectant. Relative to larger city operations, our raw drinking water is of excellent quality, so a smaller amount of chlorine is needed to disinfect.

Sodium hypochlorite is injected into the raw water as it is pumped up to the treated water storage tank. Allowing the solution to mix thoroughly in this tank provides sufficient contact time between the disinfectant and the water. Some of the chlorine is used up in the disinfection process. The residual chlorine is measured continuously by an online analyzer at the water treatment facility, the first tap on the distribution system. Our goal is to meet the 4-3-2-1 guidelines set out by Island Health. The following graph displays the maximum, minimum and average measured chlorine residuals for each month in 2022.



As chlorinated water travels through the distribution system, the chlorine available for disinfection will decrease. It is either used up by any organics or contaminants found in the distribution system, or it dissipates if water sits around for too long. It is important that potable water maintains a measurable chlorine residual throughout the entire system.



The Raven Lodge is the last connection on the distribution system. Mt. Washington utilities tests the chlorine residual at Raven using a Chlorometer daily. The Chlorometer is used to measure the degree of coloring, and correlates that to a measurement of residual in mg/L or ppm.

Our goal is to maintain a minimum chlorine residual of 0.2mg/L at the Raven Lodge consistently. Occasionally, during the off-season months, there is very little flow at the end of the distribution system, since the Raven Lodge and many other buildings in the area are closed. If the chlorine residual measured falls below the target of 0.2mg/L, we will briefly flush a hydrant in the area to pull fresher water into the end of the system. This typically happens once in June and again in October or November, as shown in the above graph.

B. Filtration Deferral and UV Disinfection

The Island Health Authority has implemented the federal '4-3-2-1' drinking water quality initiative. All water systems that use surface water sources are required to maintain the following treatment specifications:

- 4 log removal/inactivation of viruses
- 3 log removal/inactivation of Giardia cysts and Cryptosporidium oocysts
- 2 treatment processes, usually filtration and disinfection
- 1 NTU maximum turbidity in finished water

Most systems require a form of disinfection AND filtration, but the resort qualifies for a filtration deferral in which we must adhere strictly to 4 main objectives; **1)** Maintain 2 forms of disinfection that inactivate pathogens such as Giardia and Cryptosporidium. Mt. Washington does this by the aforementioned chlorine protocols as well as by operating 10 UV units within our Water Treatment Facility. **2)** The amount of E.coli in raw water does not exceed 20/100mL in at least 90% of the weekly samples from the previous 6 months. To accomplish this Mt. Washington has an above average testing protocol in which we test our raw water at a minimum of 2 times per month. We have zero instances of going above this concentration within the 2021 calendar year to report. **3)** Daily average source water turbidity of 1 NTU or less 95% of the time and not above 5 NTU for more than 2 days in a 12-month period. As seen above, the resort monitors its turbidity in real time using an in-line turbidity unit connected to an alarm that contacts an operator 24hrs a day. As seen in the above graph, we did not exceed these limitations at any time throughout the 2022 year. **4)** Finally, the resort is mandated to maintain a watershed control program that minimizes the potential for fecal contamination. We accomplish this in several ways. The sources are protected by fencing year-round to minimize animal interaction with sources. The location themselves has been chosen to meet these criteria. The remote nature of the sources is surrounded by steep terrain and are out of the way of known animal corridors. This makes interaction between people and animals much less likely.

5. Water Quality Inquiries and Complaints

We received no complaints regarding water quality during 2022. There were several complaints lodged with our accounting department regarding high water bills. We investigated the source of the high-water bills and found that plumbing issues or running toilets within the units were responsible for the high-water usage. Once a year, we include a list of reminders with utility bills. Checking for leaky toilets or faucets is always on this list.

A few times a year, we receive calls from customers who have found water pooling on the ground and are concerned that a water main has been broken. These calls typically happen in spring and early summer, and this year was no exception. As snow melts, water follows the path of least resistance and often collects in unusual areas, dammed by snowbanks and ice jams. We always investigate these calls to confirm that the water does not originate from our distribution system, usually by testing for chlorine residual.

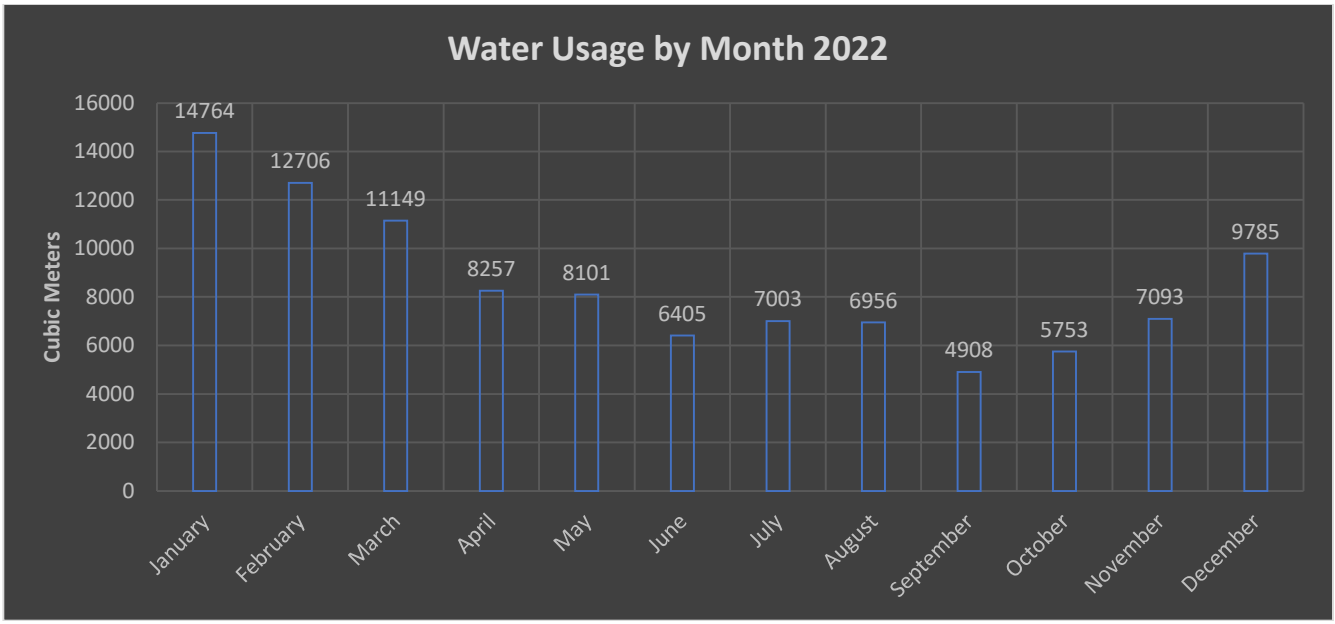
6. Water Leaks and Repairs

The utility dealt with **3** instances of leaks in the distribution system this year. Aging infrastructure was the primary catalyst for these incidents.

1. **January 19.** We located a leak in the maintenance shop yard after seeing that we were losing water somewhere in the system via our SCADA software. We decided to abandon the existing lines in that area as they lead to the old RV park and there was only one customer in that section of the system. We ran a temporary water line for the caretaker's house located behind the maintenance shop for the rest of the winter. A permanent line was run in the summer months that replaced the old lines in the shop yard.

2. **June 1**. Water loss was detected via the SCADA software, and we located the issue at an air relief valve across from building 78 in the old village. The utility replaced the cracked nipple from the main line and placed the air relief valve back in service.

3. **July 28**. The utility was made aware of water coming out of the ground in between the lodge and the Bradley building. Upon inspection, it was determined that the service line that feeds the Demo Center and the Ski Club building was obviously leaking. The utility decided to abandon this line due to its age and the difficulty of fixing a line under the courtyard. The two buildings that were fed off that line were reserviced later that summer to take their water from an alternate main line.



8. Maintenance Program

Inspections of the springs, reservoirs, chlorination equipment and pumps are conducted daily. This is done to decrease the risk of equipment failure and contamination of the water, and to ensure the consistent application of chlorine for disinfection.

All the gate valves in the distribution system are exercised once per year to ensure they will function properly in an emergency. Water main flushing and hydrant pressure testing is also done during the summer months.

An operator is always on call 24 hours a day to respond to any emergencies.

9. Water Operator Projects and Non-Leak Related Repairs

2022 Completed Projects

- **Deactivated the old RV park service line and installed a new service line to the caretaker's residence.**
- **Repaired the asphalt patch at the lodge.**
- **Fixed 2 hydrants in the village that had been having drainage issues.**
- Updated the Emergency Measures Manual.
- Removed trees and shrubs surrounding storage tank and hydrants.
- Continued ongoing operator education.
- Updated our Drinking Water Emergency Response plan.
- Moved the service lines for the ski club building and Mt. Tek rentals.

- continued with the project of servicing, repairing, and replacing water meter displays and readers that did not seem to be functioning properly.

10. Emergency Response Plan

The resort's utility department has an Emergency Response Plan (ERP) that contains procedures and contact information to efficiently respond to water system emergencies such as contamination of water supply, loss of supply, and pump failure. The ERP is reviewed and updated every year. Copies are available in the Water Reclamation Facility, the Water Treatment Facility, and on the company's internal computer network.

11. Cross Connection Control

A Cross Connection Control (CCC) Program was initiated in 2011 and is still ongoing. This is now performed by the contractor Caledonia Fire Protection Ltd for all resort buildings and fire suppression systems. The requirement for backflow prevention devices is mandatory for all buildings at Mt. Washington Alpine Resort as per our current water tariff.

12. Dam Safety and Maintenance Program

The Dam Safety Auditor visited us in the fall of 2018 to review the requirements of the necessary Dam Safety and Maintenance program and the changes made to the program. Operators on staff completed a Dam Safety course put on by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development in the late fall of 2019.

The southern side of the snow making reservoir is the dam that we maintain here at Mt. Washington. We visually inspect the dam daily, and annually we do the tree trimming and clearing of other vegetation out of the spill way and maintain it in good working condition.

13. Drought Response and Actions for fall/Winter 2022

The drought that affected the Mount Washington Alpine Resort community in the late fall of 2022 was an extraordinary event. Vancouver Island was in a level 5 (highest rating) well into late October and was a stage 4 in late November. Being that Mount Washington is situated at the top of our water shed areas, we experienced the full impact of the drought.

On November 16th, utilities staff had noticed and had been tracking that the water level in the middle spring basin was decreasing with every pump cycle refilling the treated water storage tank. Staff were able to get the middle spring basin back to full pool utilizing small pump cycles of water that was available in the east spring.

On November 21, the same trend (falling water levels) in the middle spring was once again happening, but this time in a more dramatic fashion. Utilities staff reported this to Island Health that day.

During the week of November 21-26 an alternate and temporary water source was chosen and samples were sent for testing by Island Health. Approval was given to use the alternate source on December 5th, and staff were able to manage the available water to allow the middle spring basin to recover.

With the help of the Mount Washington community, we were able to reduce the total consumption of water at the resort and we were able to operate through the month of December until we received significant rainfall on the 25th. The rainfall was enough to recharge our water sources and allow the resort and community to resume normal operations.

14. Closing

The annual report for the year 2022 will be prepared and will be submitted to The Island Health Authority. The annual report will also be posted on our website for the public.