Outback Water Utility
2024 Annual Report

Regional District of North Okanagan
9848 Aberdeen Road
Coldstream, BC V1B 2K9

Prepared for: Interior Health & RDNO
Prepared by: RDNO Utility Department
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ACRONYMS

AO	Aesthetic Objectives
BWN	Boil Water Notice
CARO	CARO Analytical Services
CCCP	Cross Connection Control Program
CFU	Colony Forming Units
COP	Conditions on Permit
CT	Contact Time
DBP	Disinfection By-Products
DOC	Dissolved Organic Carbon
DRP	Deviation Response Plan
DTRT	Decision Tree for Responding to Turbidity Event in Unfiltered Drinking Water
DWPA	*Drinking Water Protection Act*
DWPR	*Drinking Water Protection Regulation*
DWO	Drinking Water Officer
DWTO	Drinking Water Treatment Objectives (Microbiologial) for Surface Water Supplies
E.coli	Escherichia coli
ENKI	Internet based data software system with centralized information management
EOCP	Environmental Operators Certification Program
ERP	Emergency Response Plan
GCDWQ	Guidelines for Canadian Drinking Water Quality
GVW	Greater Vernon Water
HAA	Haloacetic Acids
IHA	Interior Health Authority
MAC	Maximum Acceptable Concentrations
MPN	Most Probable Number
NTU	Nephelometric Turbidity Units
OBWB	Okanagan Basin Water Board
OBWU	Outback Water Utility
OCCP	Okanagan Collaborative Conservation Program
OP	Operating Permit
PS	Pump Station
RDL	Read Detection Limit
RDNO	Regional District of North Okanagan

RDNO Lab	Regional District of North Okanagan Laboratory
SCADA	Supervisory Control and Data Acquisition software
SS	Sample Station
SDWQG	Source Drinking Water Quality Guidelines
THAA	Haloacetic Acids
THM	Trihalomethane
TTHM	Total Trihalomethane
TOC	Total Organic Carbon
UVT	Ultra-violet Transmissivity
VOC	Volatile Organic Compounds
WQA	Water Quality Advisory
WQG-01	British Columbia Source Drinking Water Quality Guidelines
WQI	Water Quality Indicators

1.0 INTRODUCTION

As required by *Drinking Water Protection Act* (DWPA) *of BC*, the Regional District of North Okanagan (RDNO) provides the following annual report in accordance with our Conditions on Permit (COP) issued by Interior Health Authority (IHA) for the Outback Water Utility (OBWU).

This report provides an overview of the following:

- the OBWU water system,
- the operations of the water utility including management, Environmental Operator Certification Program (EOCP) classification, and operations programs,
- source assessment and watershed protection,
- the annual water quality monitoring program and a summary of water quality analysis,
- water consumption,
- emergency response,
- reporting requirements,
- annual completed works, and
- long term plans.

The annual reports are available to the public on the RDNO website.

2.0 WATER SYSTEM OVERVIEW

2.1. SYSTEM OVERVIEW

The OBWU is located within the Greater Vernon Water (GVW) service area however it is a separate system from GVW and is classified as a small water system in its Permit to Operate, facility #13-098-005778. The distribution system is a private system contained on the Outback Resort strata property and is maintained by the Resort. The Outback Resort supplies water to customers at the resort. Appendix A provides the water service boundary for OBWU. RDNO operators' complete day to day operation and maintenance tasks of the source and treatment of this system with oversight provided by the General Manager, Utilities and the RDNO Board of Directors. The operators are required to respond to emergencies, 24 hours a day, seven days a week. The water quality monitoring program is coordinated and monitored by RDNO water quality staff.

The OBWU system is comprised of the following:

- 1.4 km transmission main:
    - 270 meters from intake to the screens,
    - 550 meters from lake station to booster station,
    - 300 meters from booster station to the reservoir, and
    - 300 meters from the reservoir to the strata.
- lake pump station - with submersible pumps at the lake level, pumps raw water through a screened intake up to the booster pump station, which is 28 meters (92 feet) higher in elevation,
- booster station - the raw water is chlorinated with sodium hypochlorite and ultra-violet (UV) treated (dual disinfection), then approximately 30ML are pumped to the two celled reservoir, and
- enclosed reservoir - stores 2.0 ML of water. The reservoir is at an elevation 443 meter (1453 feet) above sea level which provides water to one pressure zone in the entire strata complex.

2.2. WATER SOURCE

OBWU draws water from Okanagan Lake through the intake located 270 meters from shore and at a depth of 23 meters.

2.3. TREATMENT REQUIREMENTS

The treated water quality objectives for all BC water systems using a surface water source need to meet the Drinking Water Treatment Objectives (Microbiological) for Surface Water Supplies (DWTO) in BC which include the following:

- 4 log removal or inactivation for viruses,
- 3 log removal or inactivation for protozoa (*Giardia* and *Cryptosporidium*),
- 2 treatment processes for surface water,
- 1 Nephelometric turbidity units (NTU) maximum turbidity, and
- 0 *Escherichia coli* (*E.coli*).

Currently, the OBWU source water is treated with chlorination and Utra-Violet (UV) at the booster station. Chlorination of the water is completed to ensure efficient contact Time (CT) to provide 4-log removal or inactivation of viruses. UV is completed to provide 3-log removal or inactivation of protozoa. OBWU meets the 2 treatment processes as well as the 3-log removal or inactivation for protozoa. The UV, turbidity and free chlorine residual are monitored continuously after disinfection by Supervisory Control and Data Acquisition software (SCADA). A comparison with a hand-held turbidity meter is completed weekly at the site to ensure the SCADA monitored meter is reading correctly. If turbidity increases above 1 Nephelometric Turbidity Unit (NTU) based on a 24 hour average, a Water Quality Advisory (WQA) will be issued.

See Table 1 for the water quality objectives established for OBWU, as well as an assessment of weather each objective was achieved.

3.0 OPERATIONS

3.1. MANAGEMENT

The OBWU is a function of the RDNO and managed by the RDNO Utilities department (Table 2). Operations and maintenance of the water supply and water treatment is completed by EOCP certified RDNO operators (Table 3). The distribution system is operated and maintained by the Outback Resort.

IHA is the regulator of water utilities and is responsible for ensuring compliance with legislation and Provincial standards. IHA issues the Operating Permit (OP) and associated COP. The IHA representative is often a Drinking Water Officer (DWO) who works closely with the water utility to ensure the COP are met.

3.2. EOCP CLASSIFICATION

Section 12 of the *Drinking Water Protection Regulations* (DWPR) refers to qualification standards for persons operating water supply systems. In this section, EOCP certification is a requirement of operators operating a water system. A person is qualified to operate, maintain, or repair a water supply must be certified by the EOCP for the water system as classified under the EOCP.

Operators with EOCP certification and employed by the RDNO can be found in Table 3. The RDNO operators are responsible for operating and maintaining the source, reservoir, and chlorination facility.

3.3. OPERATIONS PROGRAMS

3.3.1. FLUSHING AND HYDRANT MAINTENANCE

The distribution system and all hydrants are private as they are fully within the resort and maintenance is completed by the Outback Resort.

3.3.2. CROSS CONNECTION CONTROL PROGRAM

The RDNO has a Cross Connection Control Program (CCCP) for all water utilities owned by RDNO. The Cross Connection Control Program is managed by the Utilities Department as outlined in the RDNO *Cross Connection Control Regulation Bylaw No. 2651, 2014* available at: www.rdno.ca/ccc. As all the residents and facilities are fully within the resort, it is their responsibility to manage backflow issues into their distribution system.

3.3.3. SYSTEM CONTROL – SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SOFTWARE

The operation and maintenance monitoring of reservoir water levels, operating pumps, monitoring quality control equipment and maintaining a historical data file of the water systems operations is made easier by SCADA, a comprehensive monitoring software program used by RDNO. Connected by wireless links, the SCADA software monitors sensors at all RDNO owned reservoirs and pump stations. The system is automated and used SCADA software for monitoring and alarms. When a problem is detected within the system, the SCADA system issues alarms and RDNO operators respond.

4.0 SOURCE ASSESSMENT AND WATERSHED PROTECTION PLANNING

Currently, the watershed area surrounding the OBWU is minimally developed. With respect to activities on Okanagan Lake, RDNO participates in the Okanagan Collaborative Conservation Program (OCCP) projects around Okanagan Lake and the Okanagan Basin Water Board (OBWB).

5.0 WATER QUALITY MONITORING

The goal of the water quality program is to monitor the quality of the source water and treated water to detect the presence of microorganisms or other issues that can degrade water quality. As issues are found, operations and staff can respond to correct any issues or appropriately notify customers as required.

5.1. PROGRAM AND SCHEDULE

The Water Quality Program is based on the requirements of the following legislation, regulation, and guidelines:

- Guidelines for Canadian Drinking Water Quality (GCDWQ),
- British Columbia *Drinking Water Protection Act (*DWPA),
- *British Columbia Regulation* (DWPR),
    - *Schedules A and B*
- British Columbia Source Drinking Water Quality Guidelines (WQG-01),
- Drinking Water Treatment Objectives (microbiological) for Surface Water in BC (DWTO), (BC. MOH, 2012) and
- Decision Tree for Responding to Turbidity Event in Unfiltered Drinking Water (DTRT), (BC Ministry of Health, 2013).

The program is reviewed annually in the fall for implementation of the following year. The sampling program and schedules are provided in Appendix D. RDNO provides the updated Water Quality Monitoring Program (WQ Program) to IHA at the beginning of each year, which includes: the monitoring schedule, parameters, and frequency of samples taken at different times of the year.

To meet Schedule B in the DWPR for populations less than 5,000, a minimum of 4 distribution microbiological samples are required per month. In 2024, OBWU met this requirement by taking one sample weekly at the reservoir before entering the distribution system. The sample is dropped off at the RDNO Laboratory and water quality staff process for shipment to CARO Analytical Services (CARO), where samples are analyzed, the results go to IHA and RDNO.

5.2. SOURCE WATER QUALITY MONITORING

This section outlines the bacterial, turbidity, ultraviolet transmissivity (UVT), pH, temperature, Total Organic Carbon (TOC) and annual chemical results for the source water at OBWU.

RDNO submits monthly reports to IHA, which are available on the RDNO website: https://www.rdno.ca/dwu/waterquality.

5.2.1. BACTERIA

The OBWU states source water must meet the following:

- the number of *E.coli* in source water does not exceed 20/100 mL, or
- if *E.coli* data are not available (less than 100/100 mL of TC) in at least 90% of the weekly samples from the previous six (6) months.

In 2024, OBWU met the requirements for E. coli and Total Coliform in source water (Tables 1 and 4, and Figures 1 and 2).

5.2.2. TURBIDITY

Turbidity measurements relate to the optical properties of water. Turbidity is caused by suspended matter such as clay, silt, finely divided organic and inorganic maters, soluble coloured organic compounds, plankton and other microscopic organisms. Excessively high turbidity can have a negative effect on disinfection techniques. RDNO uses the provincial guidance document issued in April 2013, *the Decision Tree for Responding to a Turbidity Event in Unfiltered Drinking Water* (BC Ministry of Health, 2013) for guidance on public notification during turbidity events.

Turbidity at OBWU intake has historically been below 1 NTU the year except during freshet in 2018 as seen in Figure 3, which was both the year after and a flood year in Okaganan Lake. If turbidity is >1 NTU, the utility issues a WQA. If the turbidity increases >5 NTU the utility issues a Boil Water Notice (BWN).

In 2024, OBWU source water SCADA daily average turbidity results. In 2024, turbidity SCADA daily average of the source water never exceeded 1 NTU (Table 1 and 5, and Figure 4).

Monthly water quality reports and the GVW Water Quality Deviation Response Plan, provide further details regarding turbidity events and/or trigger levels for response and notification. When turbidity trends above 1 NTU on a 24-hour average, a Water Quality Advisory (WQA) is issued.

5.2.3. UV TRANSMISSIVITY

Ultraviolet Transmissivity (UVT) is important to measure as ultraviolet treatment (disinfection) is one of the primary treatment method for the OBWU with the other being chlorine. Measuring UV

light at the specified wavelength of 254nm measures the effectiveness of the UV light for disinfection of the drinking water. UV Transmittance (UVT) is not turbidity. The water's clarity is not an effective indicator, because both solid and dissolved material can absorb and diffract UV light. The 2024 SCADA UVT daily average summary is shown in Table 6 and figure 5.

5.2.4. TOTAL ORGANIC CARBON

Total Organic Carbon (TOC) and Dissolved Organic Carbon (DOC) are a measure of suspended carbon bound in organic molecules and organisms. These are important parameters as they are precursors for disinfection by-products (this is discussed further in Section 5.4.5 Disinfection By-Products (DBP)). The SDWQG MAC for TOC is 4.0 mg/L. There are no current health standards/guidelines for DOC but RDNO monitors to assess if there are changes which may impact DBPs.

Since 2018 the OBWU source water has a historical TOC range from 3.06 mg/L and 6.08 mg/L and an average of 4.19 mg/L (Figure 6). The historical average for TOC is above the SDWQG MAC of 4.0 mg/L.

In 2024, TOC is sampled monthly with results ranging from 3.90 mg/L to 5.18 mg/L with an average of 4.54 mg/L (Table 7). When compared to historical TOC data, the 2024 results are normal for this site. The OBWU normally exceeds the SDWQG MAC guideline (Figure 7). TOC will continue to be monitored at OBWU as it is above the SDWQG MAC.

5.2.5. ALGAE DENSITY

Algae density is routinely monitored at the source monthly from May to November. This monitoring is important, as algae contribute to organic loading in the system and certain species can impact water quality by causing taste and odor concerns. Routine monitoring is done to detect algae blooms early, allowing for timely intervention, with public notification is triggered based on IHA requirements.

5.2.6. FIELD PARAMETERS

Field parameters are taken at each site sampled. The parameters reported are turbidity, pH, and temperature. Turbidity is discussed in section 5.2.2. The Canadian Drinking water guideline (GCDWQ) for source for pH and temperature are:

- Temperature - Aesthetic Objective (AO) 15°C
- pH - range of 7.0-10.5 to maximize treatment effectiveness.

Table 8 summarizes the field temperature and pH for the source water in 2024. Temperature results range from 7.1°C to 19.7°C with an average of 12.5°C. There were three temperature readings above the AO. The four temperature readings above the AO were between June and September, with range of 16.9°C to 19.7°C. . pH results range from 7.1 to 7.6 with an average of 7.4.All pH results were within guidelines. These exceedances are not a health concern.

5.2.7. ANNUAL COMPREHENSIVE

Comprehensive sampling is completed annually in July or August each year. The 2024 comprehensive samples were taken on July 22nd and all parameters were well within the GCDWQ limits (Appendix B).

5.3. TREATMENT PROCESS

OBWU source water is treated with chlorination to provide CT for 4 log removal or inactivation for viruses and Utra-Violet (UV) to provide 3-log removal or inactivation of protozoa. In 2024, OBWU met the treatment objectives.

5.3.1. DISINFECTION

Under normal operations, the target residual after chlorine injection is normally between 1.00 to 2.50 mg/L. The large range is due to the size of the reservoir and turnover rate, which is different in the summer and winter. In the winter, the chlorine injection must be higher as there is very low water use and chlorine naturally breaks down over time.

Continuous online chlorine monitoring is completed with an analyzer that monitors the free chlorine just past the injection point at the booster station. In the event of a low-level chlorine alarm, the system is programed through SCADA to shut off the lake pumps automatically and notify the operator. This ensures that unchlorinated water is not pumped into the distribution system. The average daily SCADA free chlorine ranged from 0.93 mg/L to 1.98 mg/L with an average of 1.47 mg/L (Table 9).

Table 10 summarizes grab samples taken at the Outback Reservoir. The free chlorine ranged from 0.99 mg/L to 2.03 mg/L with an average of 1.38 mg/L.

Secondary disinfection of Okanagan Lake at the Outback booster station is done using a Wedeco UV reactor. The UV reactors design flow is 24 L/sec, operates with a minimum sensor intensity and UVT is used to determine the dose. The dose calculation given in the specs for this unit takes

a minimum UV intensity read from the sensor to create a curve plotting flow vs UVT. If UVT goes below 86%, operations reduce flow to the reactors with an upgraded pressure reducer (PR) at the lake station to stay on the treatment curve. 81% is the lower end of that style of sensor where the measurement is considered not reliable below. Operators follow the Deviation Response Plan when there are changes from acceptable levels.

Continuous online UVT monitoring is completed with an analyzer at the booster station. The analyzer location is for operational purposes, allowing operations to make sure the water is within the specification of meeting 40mJ/cm2. When the UVT is less than 86% it doesn't meet the UV reactor specifications at design flow, operations then reduce flow to meet UV reactor design, following the deviation response plan. See Table 6 and Figure 5 for The SCADA daily average. The online UVT range was 86.12% to 92.89% with an average of 89.54

5.3.2. BACTERIAL

The Guidelines for Canadian Drinking Water Quality and the *BC Drinking Water Protection Act Regulations* have established the following microbiological criteria for drinking water distribution systems or water following treatment. Schedule A of the DWPR requires the following criteria to be met for potable water:

1. **No detectable Escherichia coli (*E.coli*) per 100 ml.**

   In 2024, there were 53 samples analyzed using the CFU/100mL method and 4 samples analyzed in duplicate using the MPN/100mL method. All samples were non-detect for E.coli at the Outback Reservoir (Figure 1 and Table 11).

2. **At least 90% of samples have no detectable Total Coliform bacteria per 100 ml.**

   In 2024, there were 53 samples analyzed using the CFU/100mL method and 4 samples analyzed in duplicate using the MPN/100mL method. All samples were non-detect for Total Coliform at the Outback Reservoir (Figure 2 and Table 11) with 100% of samples being non detect for the year.

3. **No sample has more than 10 Total Coliform per 100 ml.**

   In 2024, all samples were non-detect for Total Coliform therefore, OBWU met this requirement (Table 11).

5.3.3. TURBIDITY

Turbidity is monitored with a handheld turbidity meter at the Outback Reservoir based on the monitoring program schedule. Field parameters are recorded on the submitted requisition sheets and RDNO water quality staff enters the data into RDNO's internet based database (ENKI).

In 2024, 57 turbidity grab samples were taken at the Outback Reservoir. The turbidity results ranged from 0.18 NTU to 0.43 NTU with an average of 0.28 NTU (Table 10).

5.3.4. OTHER FIELD PARAMETERS

Along with chlorine and turbidity, other field parameters such as pH, temperature and conductivity are monitored with handheld meters which are recorded on a worksheet.

The field pH readings (56 samples) ranged from 7.24 to 8.05, with an average of 7.68 (Table 10). The field temperature readings (57 samples) ranged from 3.8 °C to 14.9 °C with an average of 9.9ºC (Table 10). It is important to note that this is an aesthetic objective and not a health guideline and as such does not affect the quality of the water.

5.3.5. DISINFECTION BY-PRODUCTS

Trihalomethanes (THMs) and Haloacetic acids (HAAs) disinfection by-products are formed when organic compounds naturally present in the source water react to being chlorinated. The DWPA requires that THMs and HAAs be monitored in drinking water due to their potential health impacts and have been monitored since 2011. The level of THMs in treated water depends on numerous factors including: TOC, temperature, pH, water age, and chlorine dose. The level of HAAs in treated water depends on numerous factors including: bromide, temperature, pH, water age, and chlorine dose (Health Canada, 2017).

Ten distinct THM compounds are possible but only four occur to any significant degree in treated drinking water:

- Chloroform,
- Bromodichloromethane,
- Dibromochloromethane, and
- Bromoform.

Collectively the above THM compounds are referred to as total trihalomethanes (TTHMs). Further in this text TTHMs will refer to sample site averages of all four compounds, not the individual parameters. Table 12 and Figures 8 and 10 are reported as an average of all four compounds, therefore TTHMs.

The GCDWQ MAC for TTHMs is 0.1 mg/L and is based on a locational running average of a minimum of quarterly samples taken at the reservoir before entering the distribution system. Figure 8 provides the TTHM results, which shows the month of May being above the MAC with a TTHM average of 0.1042mg/L. Like due to high water age due to low flows and the need for higher chlorine levels to maintain residual.

Figure 10 displays the historical annual average of Total THMs since 2011 taken at the Outback Reservoir. In 2017 and 2018 THMs increase, likely due to the historic flooding, which raised TOC and organics in the source water. Since 2019, THMs have not returned to historically lower values. Reservoir mixers were installed (2022 & 2023) to improve water quality, reduce water age, and minimize dead zones.

Several distinct HAA compounds are possible but only five occur to any significant degree in treated drinking water:

- Monochloroacetic acid,
- Monobromoacetic acid,
- Dichloroacetic acid,
- Trichloroacetic acid, and
- Dibromoacetic acid.

Collectively the above HAA compounds are referred to as total Haloacetic acids (THAAs) respectively. Further in this text THAAs will refer to sample site averages of all five compounds, not the individual parameters. Table 13 and Figures 9 and 11 is reported as an average of all five compounds, therefore THAAs.

The GCDWQ MAC for THAAs is 0.0800 mg/L based on a locational running average of a minimum of quarterly samples taken at the reservoir before entering the distribution system. Figure 9 provides the THAA results, which shows three months (February, May and December) being above the MAC corresponding to low water use times (increased water age).

Figure 11 displays the historical annual average of THAAs since 2011 at the Outback Reservoir. Average annual THAAs have fluctuated around the guideline limit but have remained more consistently below the MAC than THMs.

5.4. DISTRIBUTION

The Outback Resort maintains the distribution system and the RDNO monitors the water leaving the reservoir before entering the distribution system.

6.0 WATER CONSUMPTION

Table 14 provides the monthly consumption in 2024 while Figure 12 provides a graph of the daily consumption and the previous years' daily average from 2018-2023. Figure 13 provides daily water consumption trend data from 2018 to 2024.

OBWU's historic water consumption trend follows a consistent trend, remaining relatively low for most of the year with high summer flows corresponding to the peak occupancy season. Usage begins to rise in June reaching its peak in July and August. In September, the trend shifts as monthly flows start to decline, continuing a gradual decrease thereafter except for in late December / early January that aligns with the Christmas Break.

The total consumption for 2024 was 23,280 m^3 with a monthly average of 1,940 m^3. 2024 saw a large increase in water use for during every season for the entire year. Staff will review this consumption with Outback Management to assess if this aligns to occupancy.

7.0 EMERGENCY RESPONSE PLANNING

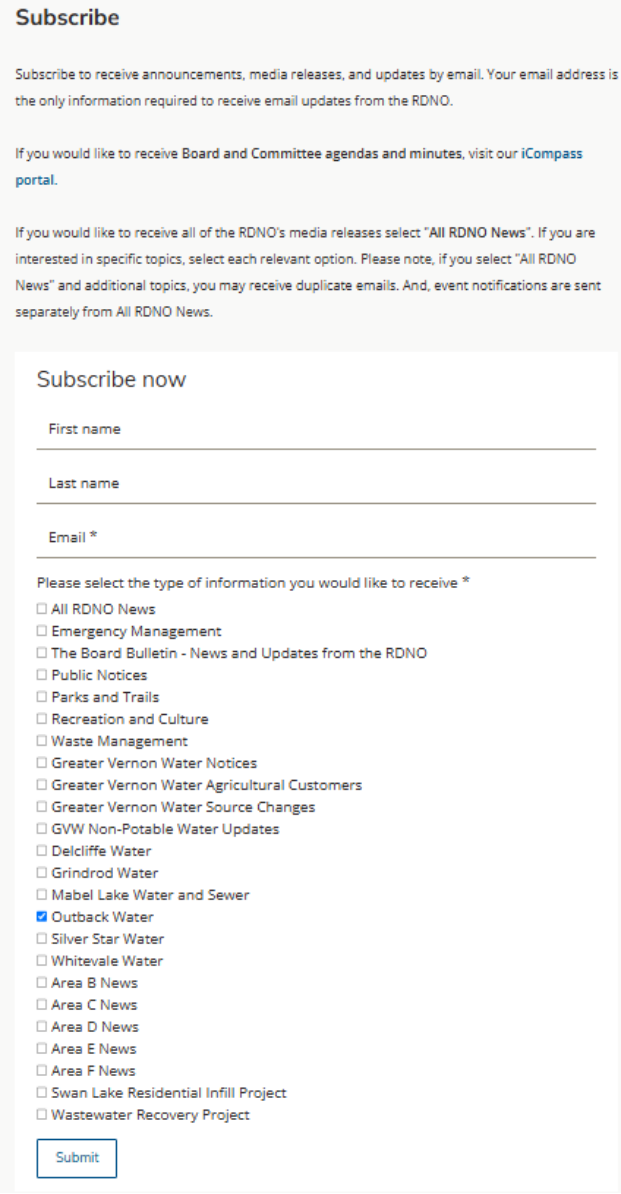
7.1. THE EMERGENCY RESPONSE PLAN

RDNO Utilities staff are all instructed on how to use the following supporting documents in times of water quality changes or emergencies:

1. GVW Emergency Response Plan (ERP), and
2. GVW Water Quality Deviation Response Plan (DRP).

The above documents contain the contacts, criteria, and procedures necessary to assist operators and staff to make timely, informed decisions. Staff participate in mock emergency training scenarios annually. The 2024 response plans have been provided to IH.

When required, a WQA or BWN) are delivered as quickly and efficiently as possible. Notification may include road signs, radio and/or media releases. Under specific circumstances notifications are hand delivered. In 2018, the RDNO developed a new method to provide notification to its customers about announcements, media releases and updates via email. Customers are advised to subscribe to the mailing list by going to www.rdno.ca/subscribe and clicking on “Subscribe for Updates” and subscribe to the OBWU email updates (shown below).



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- ☐ Greater Vernon Water Source Changes
- ☐ GVW Non-Potable Water Updates
- ☐ Delcliffe Water
- ☐ Grindrod Water
- ☐ Mabel Lake Water and Sewer
- ☑ Outback Water
- ☐ Silver Star Water
- ☐ Whitevale Water
- ☐ Area B News
- ☐ Area C News
- ☐ Area D News
- ☐ Area E News
- ☐ Area F News
- ☐ Swan Lake Residential Infill Project
- ☐ Wastewater Recovery Project

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7.2. INCIDENT TRACKING AND NOTIFICATIONS

Reporting of incidents is required by the RDNO when there is a deviation from normal operating procedure or a water quality issue. Incident reporting allows staff to track and review issues to assess if improvements could reduce the risks from each issue.

In 2024, there were no incidents or notifications sent out to the customers of the Outback resort.

8.0 REPORTING REQUIREMENTS

Monthly and annual reports are submitted to IH as per the COP and are available to the public on the RDNO website (www.rdno.ca). Monthly reports for the last 12 months are available on the website and if historical reports are wanted, please contact RDNO at 250-550-3700.

9.0 WORKS COMPLETED

Operational changes and improvement projects have been completed to increase the safety and reliability of the OBWU system. These include:

- Pulled booster pump 2 for service

10.0 PLANNED WORKS

10.1. LONG TERM PLANS

Long term plans are required for utilities that do not meet Provincial standards. Currently the OBWU has sufficient capacity to service its customers with no plans on expansion. Treatment does not meet standards as filtration is required unless a filtration exclusion is approved by IH which is dependant on source water quality. The RDNO in reviewing water quality trends and intends to apply for filtration deferral. The following are the long term plans for the OBWU:

- Improve asset renewal plans for the utility.

11.0 CLOSING

RDNO is pleased to present the 2024 OBWU Annual Report. If you have any questions about this report or want more information about water consumption and production, please contact the RDNO at 250-550-3700 or email utilities@rdno.ca.

TABLES

Table 1 2024 Water Quality Objectives

Objective	Standard	Objective Met
Treatment - removal / inactivation for viruses	4-log reduction	✅ Yes
Treatment - protozoa Removal/Inactivation (Giardia & Cryptosporidium)	3-log reduction	✅ Yes
Treatment Processes for Surface Water	Minimum of 2 processes	✅ Yes
Treatment - Turbidity Limit	≤ 1 NTU (max)	✅ Yes
Treatment - E. coli Limit (Drinking Water)	0 detectable per 100 mL	✅ Yes
Treatment - Chlorine Residual	1.00–2.50 mg/L after injection	✅ Yes
Number of distribution samples for populations less than 5,000	4 reservoir samples per month (before entering the distribution system)	✅ Yes
E. coli in Source Water	≤ 20 per 100 mL in at least 90% of weekly samples from previous 6 months	✅ Yes
Total Coliform in Source Water	≤ 100 per 100 mL in at least 90% of weekly samples from previous 6 months	✅ Yes
Total Organic Carbon (TOC) Limit	≤ 4.0 mg/L	❌ No (OBWU normally exceeds this)
pH in Source Water	7.0–10.5	✅ Yes
Escherichia coli (E.coli) (At the Reservoir before entering the distribution system)	No detectable Escherichia coli (E.coli) per 100 mL	✅ Yes
Total Coliform (At the Reservoir before entering the distribution system)	At least 90% of samples have no detectable Total Coliform bacteria per 100 mL	✅ Yes
Coliform per sample	no sample has more than 10 total coliform per 10 mL	✅ Yes
pH (At the Reservoir before entering the distribution system)	7.0–10.5	✅ Yes

Table 2: RDNO Utilities Department

RDNO Utilities	
Zee Marcolin, P.Eng	General Manager, Utilities
John Lord, P.Eng	Manager, Water Distribution
Sandy Edwards, AScT	Manager, Projects
Tricia Brett, MSc., PAg.	Manager, Water Quality
Connie Hewitt, AScT	Water Quality Technologist
Jamie Ferris	Water Quality Technician
Chris Cannon	Water Quality Technician
Nathan Betz	Engineering Technician
Kimberly Berndt	Engineering Technician
Mike Philips, AScT	Engineering Technologist / Bylaw Officer
Skyler Ganz, AScT	Engineering Technologist
Alec Busby, EIT	Assistant Utilities Engineer
Keiko Parker, AScT	Manager, Small Utilities
Jonathn McLuskie	Utilities Quality Assurance Inspector

Table 3: RDNO Water Operators EOCP Certifications

RDNO Operators			
Last Name	First Name	Certification #	Certification Held
Heidt	Dustin	4498	WDIII, WTIV
Hartwig	Corey	9378	WTI
Mykytuk	Becky	9086	WTIII
Beckett	Jemma	1001610	WTI
Cimon	Caroline	1001075	WTII
Lockwood	Ryan	1000755	WDI, WTII
Tucker	Chris	6489	WTIV, WDII
Radu	David	1002040	WTII

Table 4 2024 Source Water Bacterial Summary

2024 Source Water Bacterial Summary						
	Lab	Min	Max	Average	# Samples	# Deviations[1]
E. coli (MPN/100 mL)	Caro	<1	<1	<1	10	0

E. coli (MPN/100 mL)	RDNO	<1	1.0	0.4	24	0
Total Coliform (MPN/100 mL)	Caro	<1	156	19.6	10	0
Total Coliform (MPN/100 mL)	RDNO	<1	43.9	4.84	24	0

[1]*Drinking Water Treatment Objectives (Microbiological) for Surface Water Supplies in BC (2024): at least 90% of the samples in the past six months should not exceed 20 E. coli bacteria per 100 mL.*

Table 5 2024 Source Water – SCADA Turbidity Daily Average Summary

2024 Source Water SCADA Turbidity Daily Average Summary	
	Turbidity (NTU)
Minimum	0.10
Maximum	0.24
Average	0.16
# of days	366
Counts <1 NTU	366
Counts >1 NTU	0
Counts >5 NTU	0

Table 6 2024 Source Water – SCADA UVT Daily Average Summary

2024 Source Water SCADA UVT Daily Average Summary	
	UVT (%)
Minimum	86.12
Maximum	92.89
Average	89.54
# of days	365
# of Deviations[1]	0

Table 7 2024 Source Water - Total and Dissolved Organic Carbon Summary

2024 Source Water Total and Dissolved Organic Carbon Summary					
	Min	**Max**	**Average**	**# Samples**	**# of Deviations[1]**
Dissolved Organic Carbon (mg/L)	4.12	4.12	4.12	1	-----

Total Organic Carbon (mg/L)	3.06	6.08	4.37	11	7

[1]Drinking Water Treatment Objectives for Source Water Supplies in BC (2020); MAC Total Organic Carbon is 4.0 mg/L.

Table 8 2024 Source Water Field Parameter and RDNO Lab Results

2024 Source Water Field Parameters and RDNO Lab Results				
	Min	**Max**	**Average**	**# Samples**
pH	7.1	7.6	7.4	12
Temperature (°C)	7.1	19.7	12.5	12

Table 9 Outback Reservoir Daily Average SCADA Chlorine Summary

2024 Outback Reservoir SCADA Chlorine Daily Average Summary	
	Turbidity (NTU)
Minimum	0.93
Maximum	1.98
Average	1.47
# of days	366
# of Deviations[1]	0

[1]WQ Deviation Response Plan triggered when Free Chlorine < 0.20 mg/L

Table 10 Outback Reservoir Field Parameters Summary

2024 Outback Reservoir Field Parameter Summary							
	Min	Max	Average	# Samples	Chlorine <0.2 mg/L	Turbidity >1 NTU but <5 NTU	Turbidity >5 NTU
Free Chlorine (mg/L)[1]	0.99	2.03	1.38	57	0	-----	-----

Total Chlorine (mg/L)	1.15	2.2	1.5	57	-----	-----	-----
Turbidity (NTU)[1]	0.18	0.43	0.28	57	-----	0	0
pH	7.24	8.05	7.68	56	-----	-----	-----
Temperature (°C)	3.8	14.9	9.99	57	-----	-----	-----

[1]WQ Deviation Response Plan triggered when Free Chlorine <0.20 mg/L; Turbidity > 1.0 NTU

Table 11 Outback Reservoir Bacterial Summary

2024 Outback Reservoir Bacterial Summary					
	Min	Max	**Average**	**# Samples**	**# Deviations[1]**
E. coli (CFU/100 mL)	<1	<1	<1	53	0
E. coli (MPN/100 mL)	<1	<1	<1	8	0
Total Coliform (CFU/100 mL)	<1	<1	<1	53	0
Total Coliform (MPN/100 mL)	<1	<1	<1	8	0

[1]Drinking Water Treatment Objectives (Microbiological) for Source Water Supplies in BC (2020) (Sec 1.31): Potable drinking water must meet the drinking water treatment objectives for surface water and groundwater of no detectable E. coli.

WQ Deviation Response Plan triggered when Total Coliform > 10/100mL. At least 90% of samples have no detectable Total Coliform bacteria per 100ml and no single sample has >10 Total Coliform per 100mL.

Table 12 Historical Annual TTHM Average (2011 - 2024)

Historical Annual TTHM Average (2011 – 2024)		
Year	Average Longest Retention ug/L	GCDWQ MAC
2011	80	100
2012	63	100
2013	76	100
2014	51	100

2015	58	100
2016	81	100
2017	100	100
2018	124	100
2019	127	100
2020	89	100
2021	106	100
2022	92	100
2023	104	100
2024	90	100

Table 13 Historical Annual THHAs Average (2011 - 2024)

Historical Annual THAA Average (2011 – 2024)		
Year	Average Longest Retention ug/L	GCDWQ MAC
2011	82	80
2012	52	80
2013	76	80
2014	60	80
2015	70	80
2016	71	80
2017	88	80
2018	70	80
2019	77	80
2020	92	80
2021	65	80
2022	86	80
2023	85	80
2024	67	80

Table 14 2024 Monthly Water Consumption Summary

2024 Monthly Water Consumption Summary		
Month	Average Daily Consumption (m^3)	Total Monthly Consumption (m^3
January	40	1220
February	30	920
March	40	1100
April	60	1620
May	70	2150
June	80	2530

July	150	4450
August	140	4280
September	60	1830
October	40	1180
November	30	930
December	30	1070
Monthly Min	**30**	**920**
Monthly Max	**150**	**4450**
Monthly Average	**64**	**1940**
Annual Total (m^3)	**23280**	

FIGURES

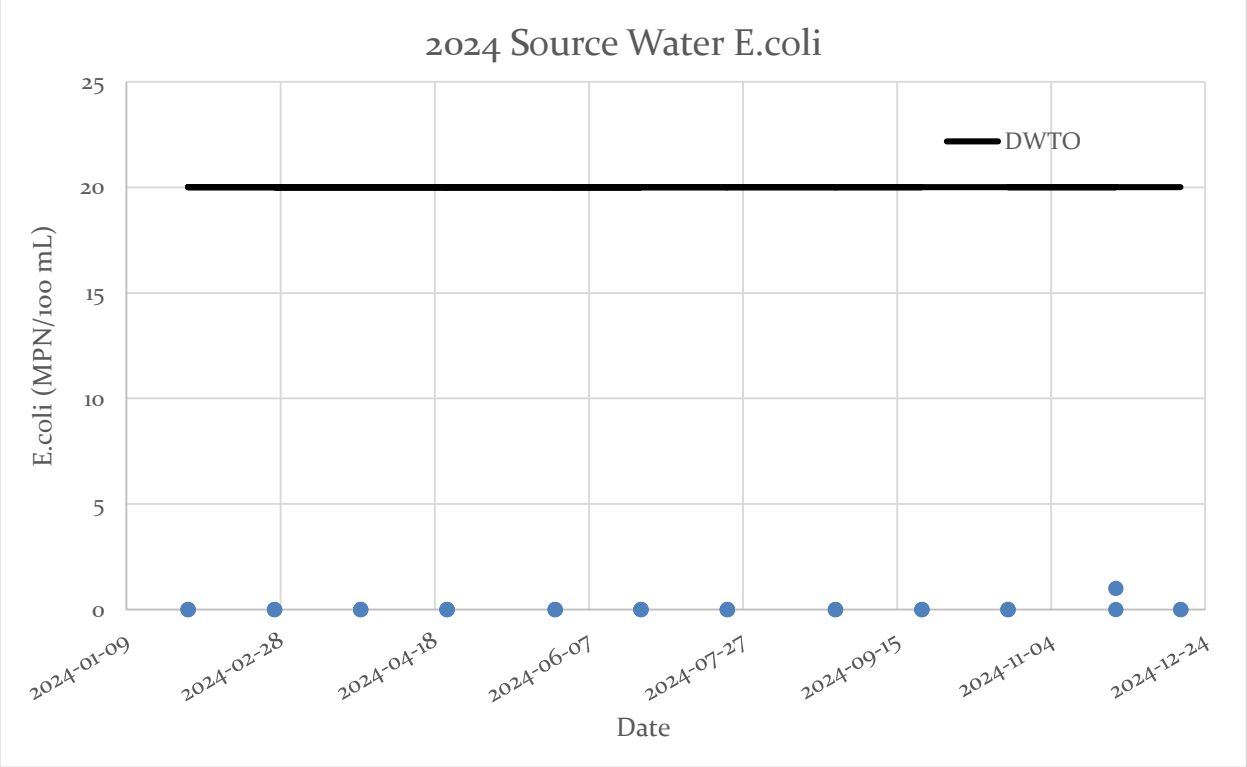


Figure 1 2024 Source Water E.coli Results

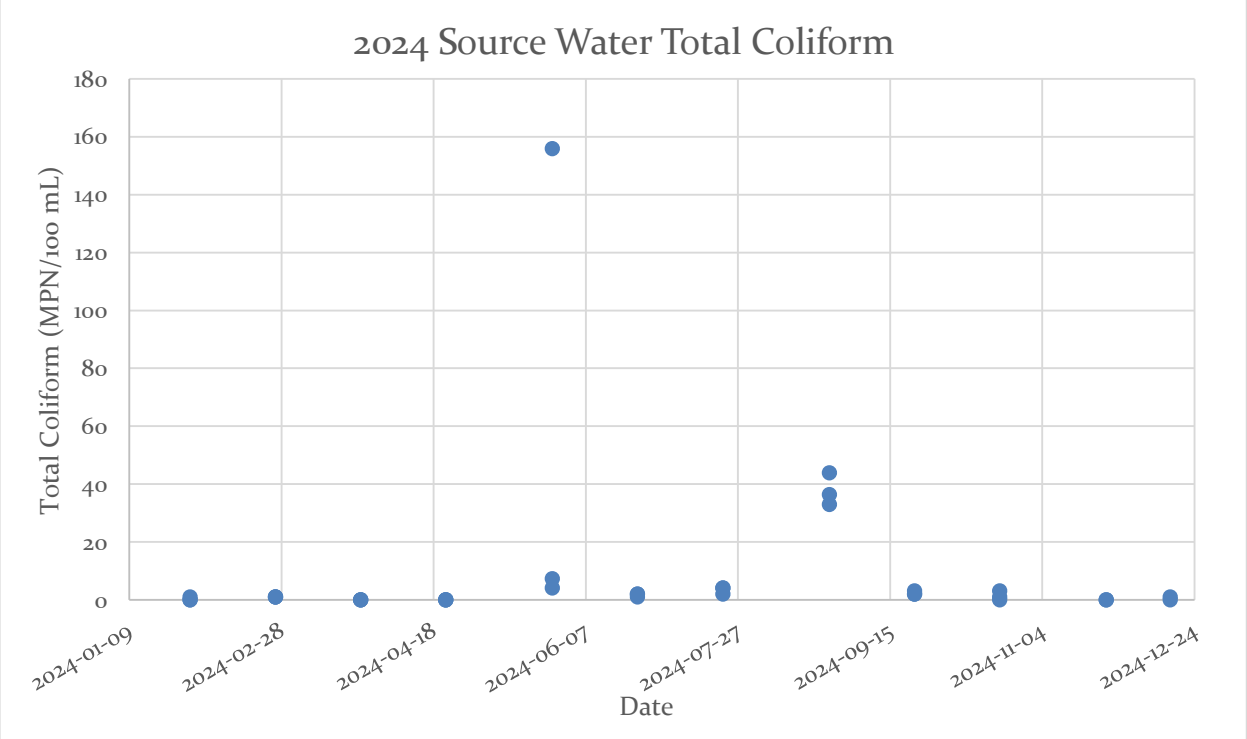


Figure 2 2024 Source Water Total Coliforms Results

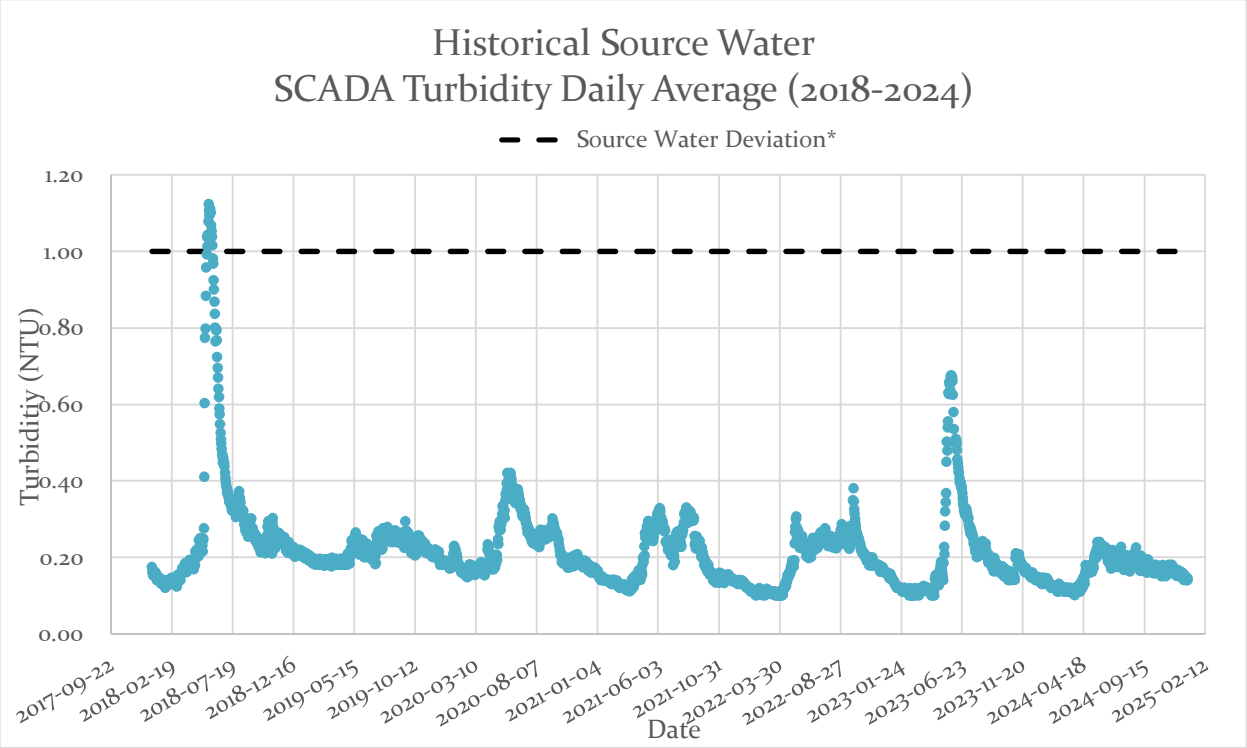


Figure 3 Historic Source Water – SCADA Turbidity Daily Average (2018–2024)

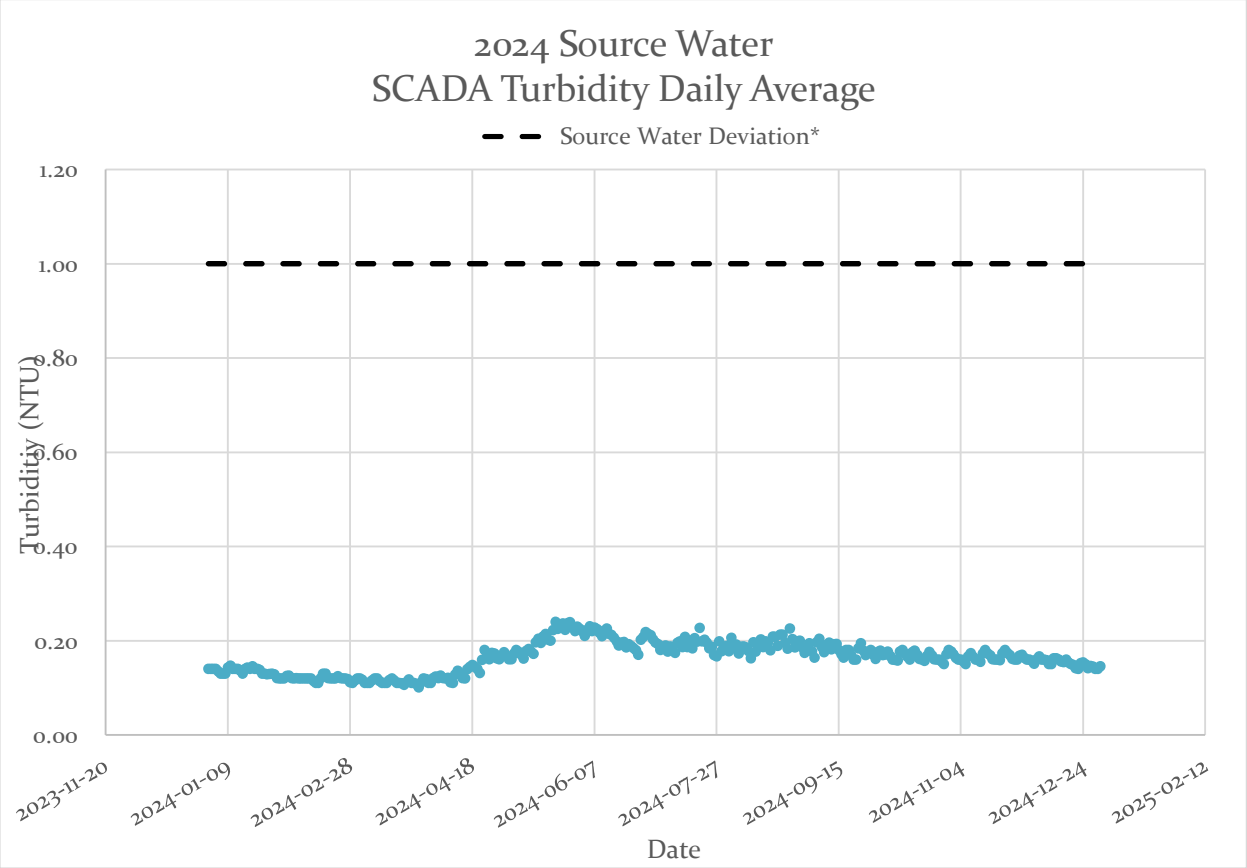


Figure 4 2024 Source Water - SCADA Turbidity Daily Average

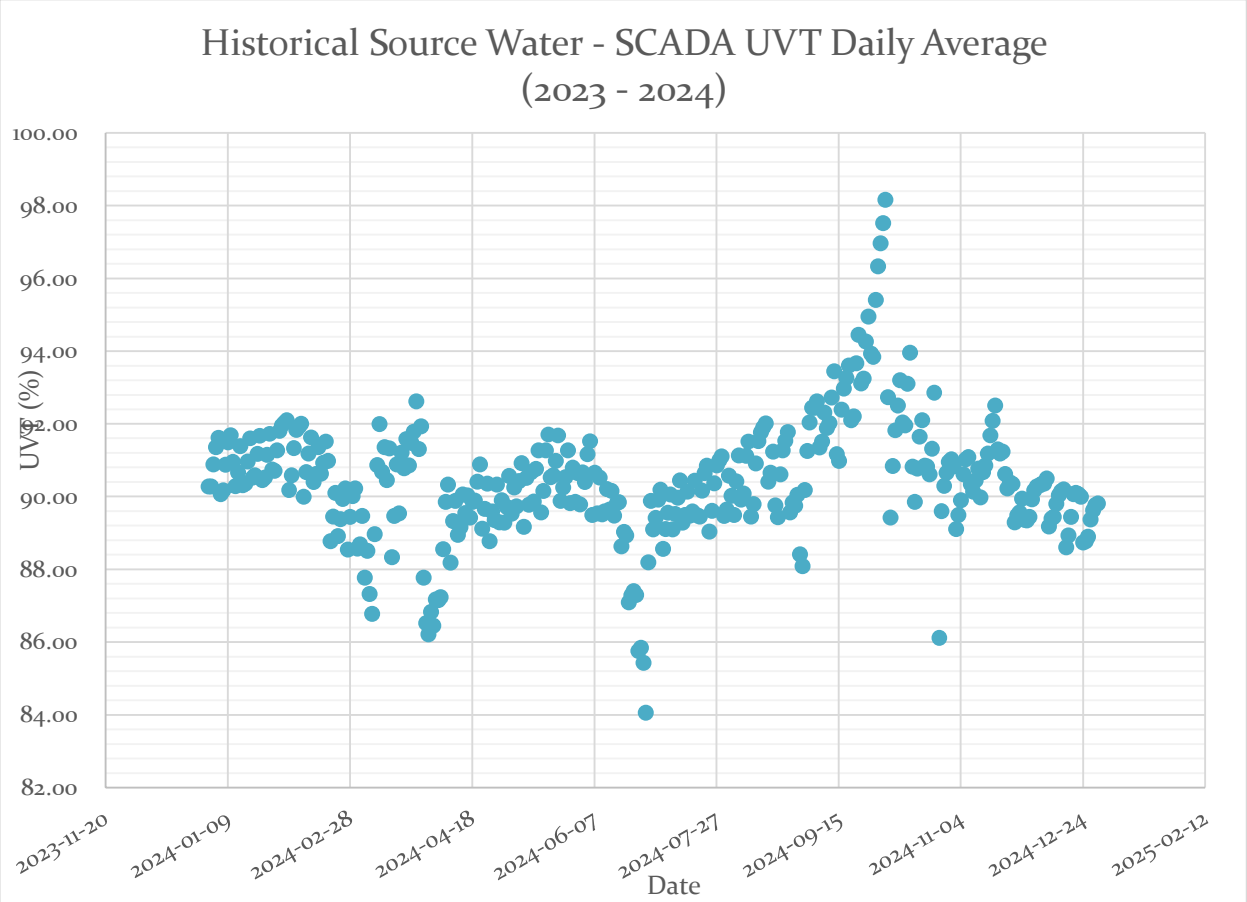


Figure 5 Historical Source Water – SCADA UVT Daily Average (2023-2024)

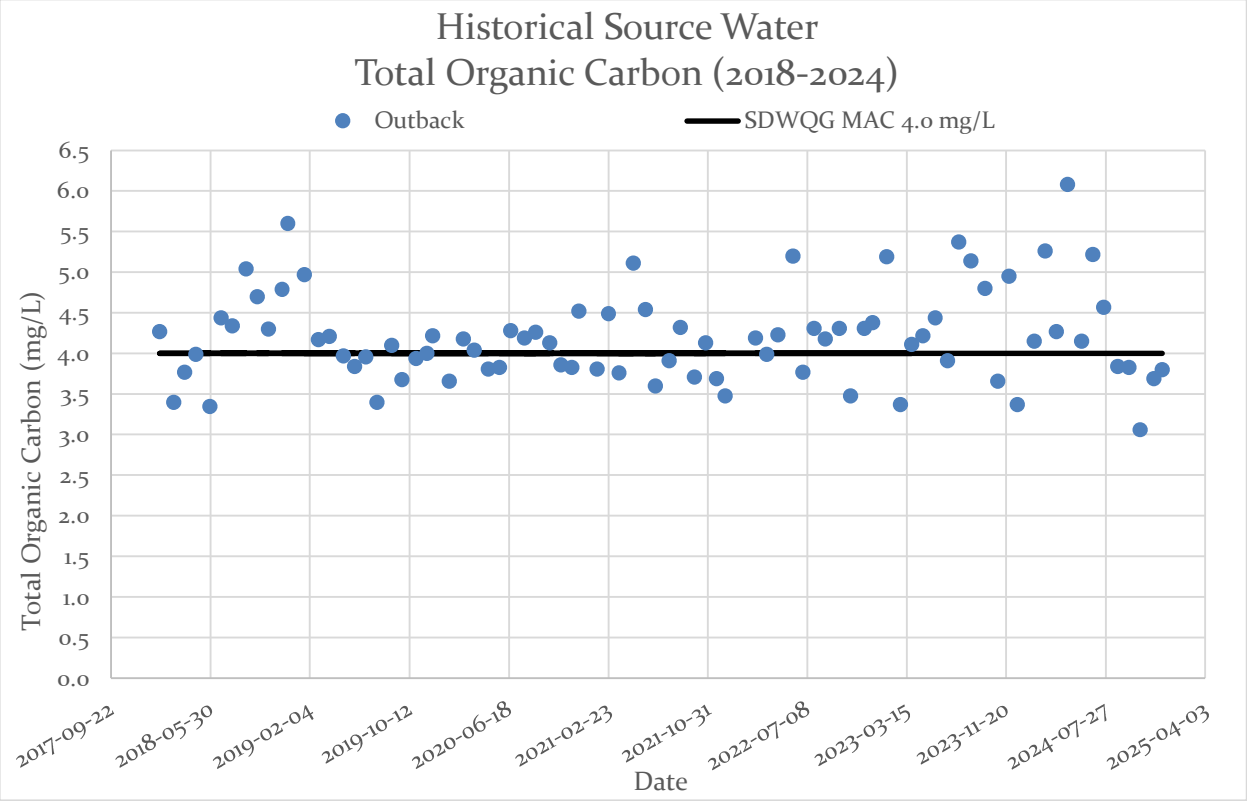


Figure 6 Historical Source Water - Total Organic Carbon (2018-2024)

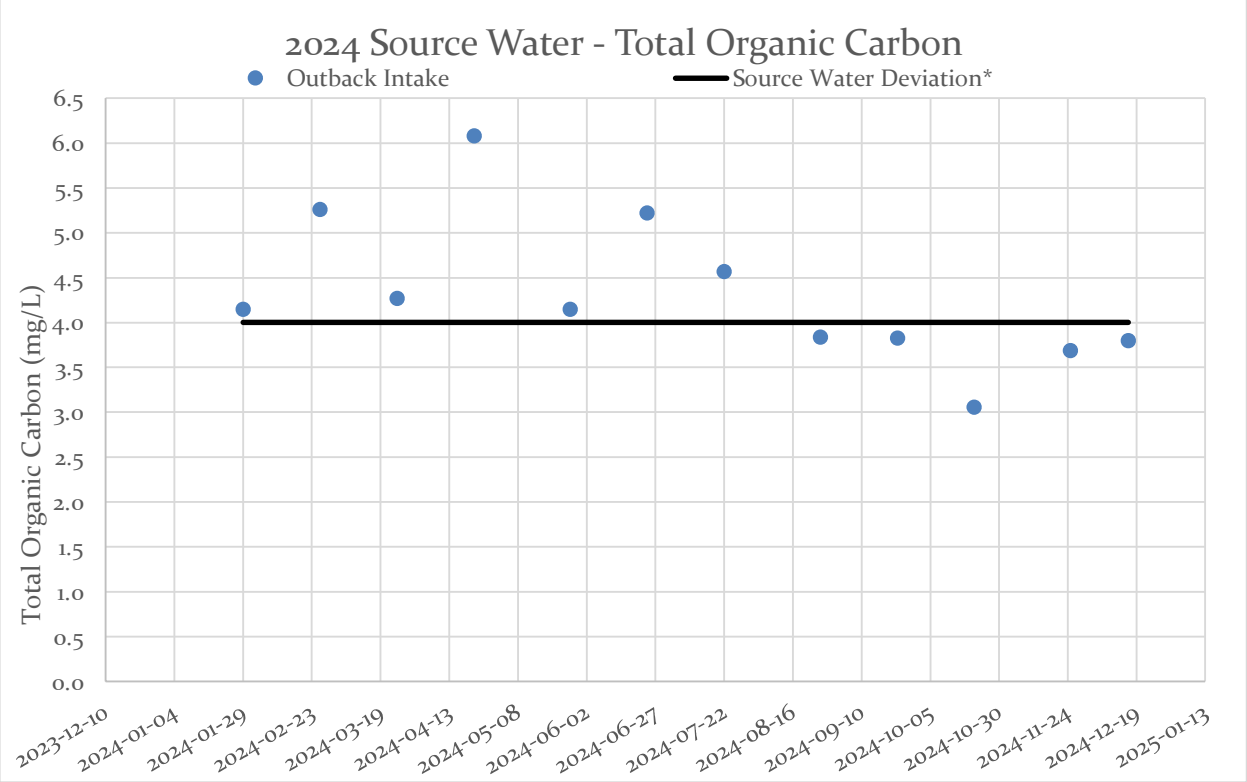


Figure 7 2024 Source Water - Total Organic Carbon

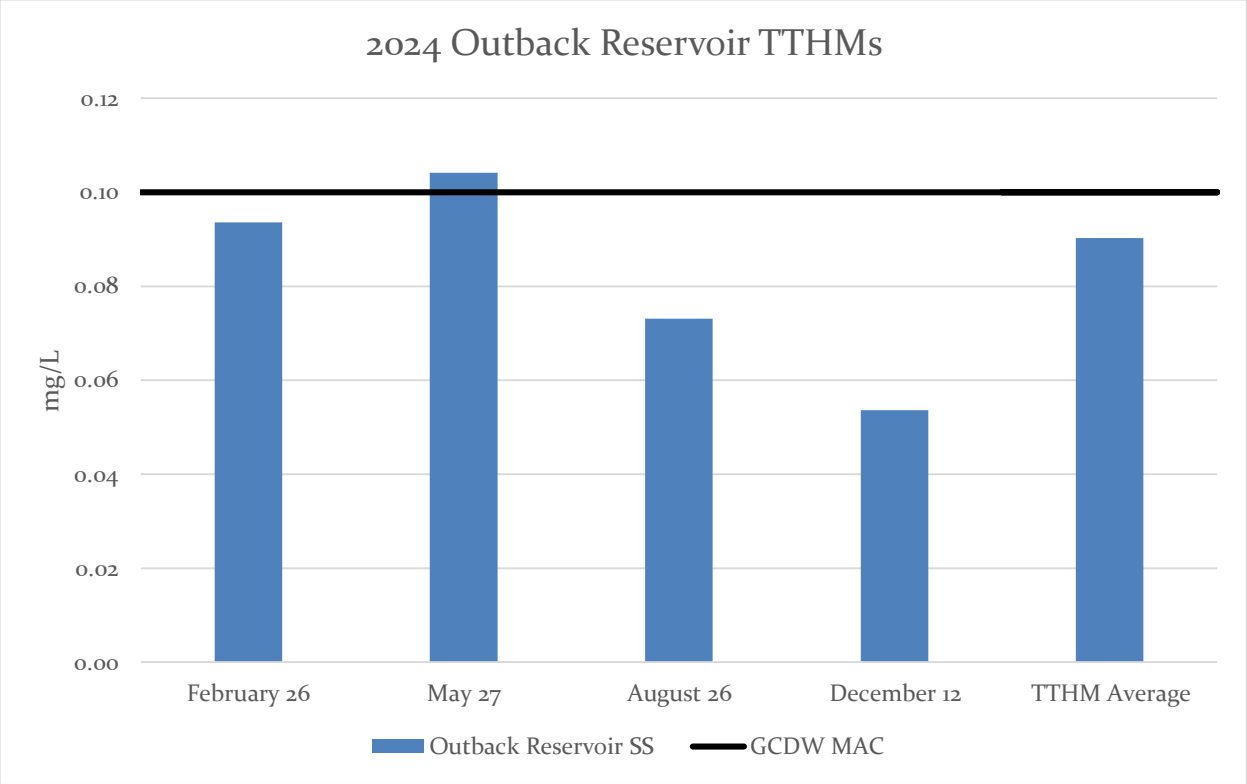


Figure 8 2024 Outback Reservoir TTHMs

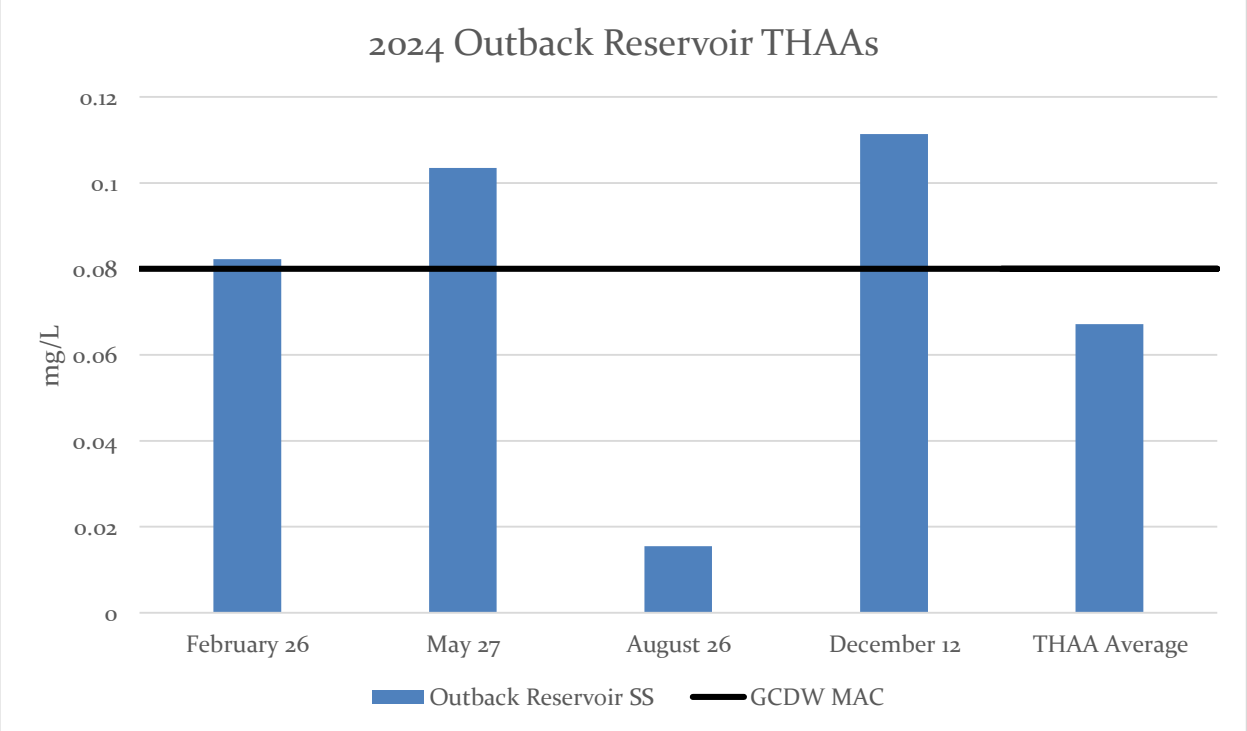


Figure 9 2024 Outback Reservoir HAAs

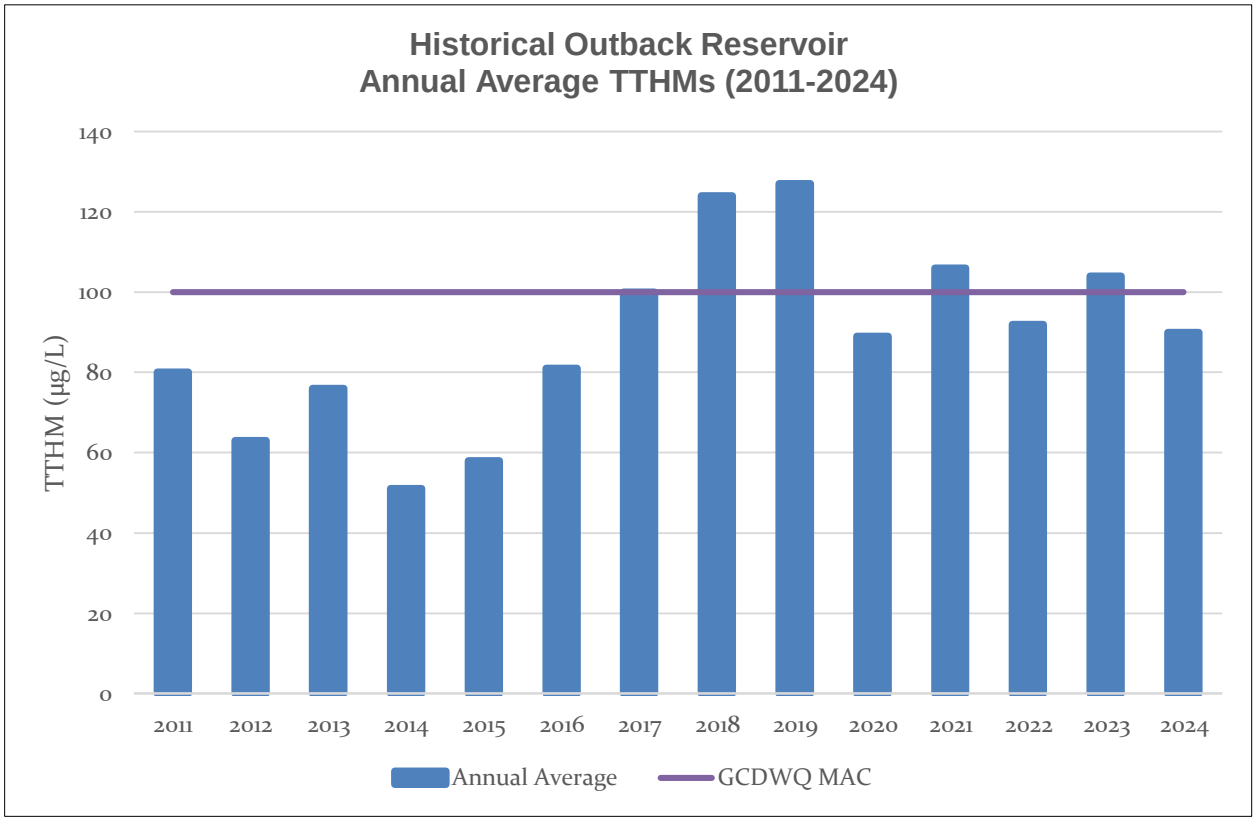


Figure 10 Historical Outback Reservoir – Annual Average TTHMs (2011-2024)

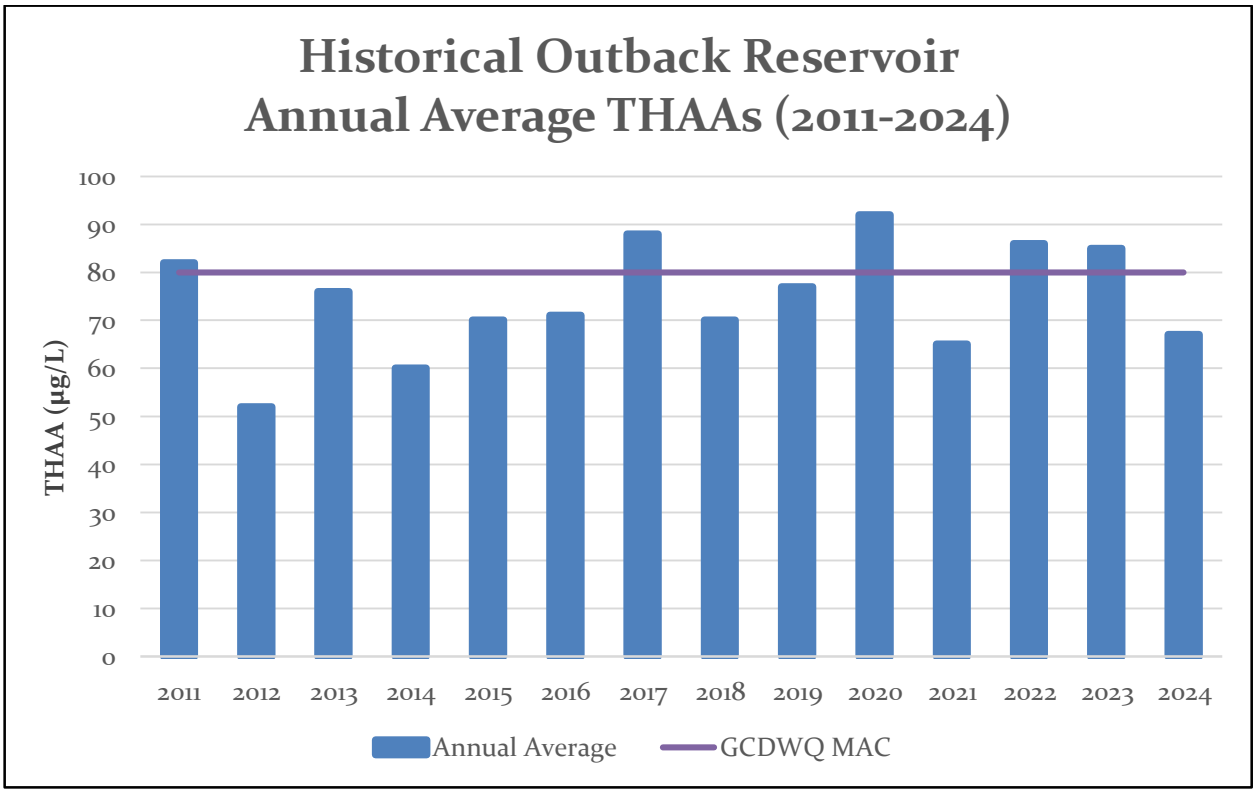


Figure 11 Historical Outback Reservoir – Annual Average THAAs (2011-2024)

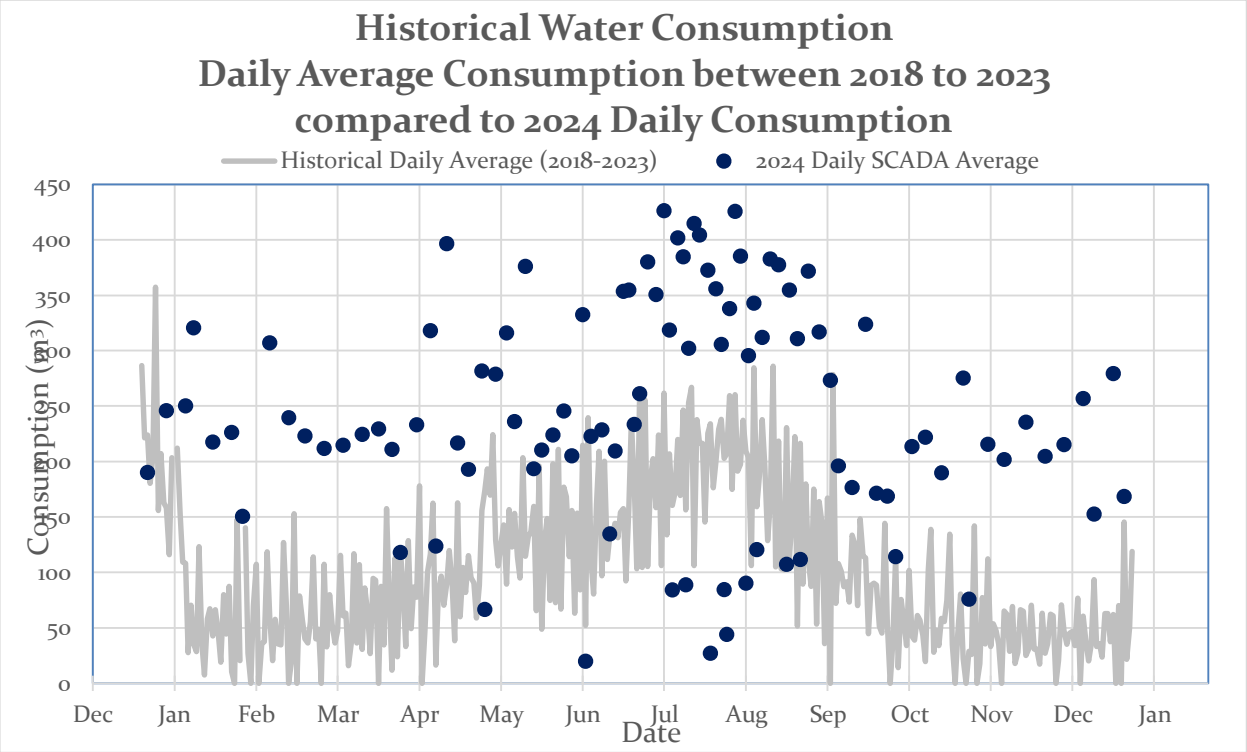
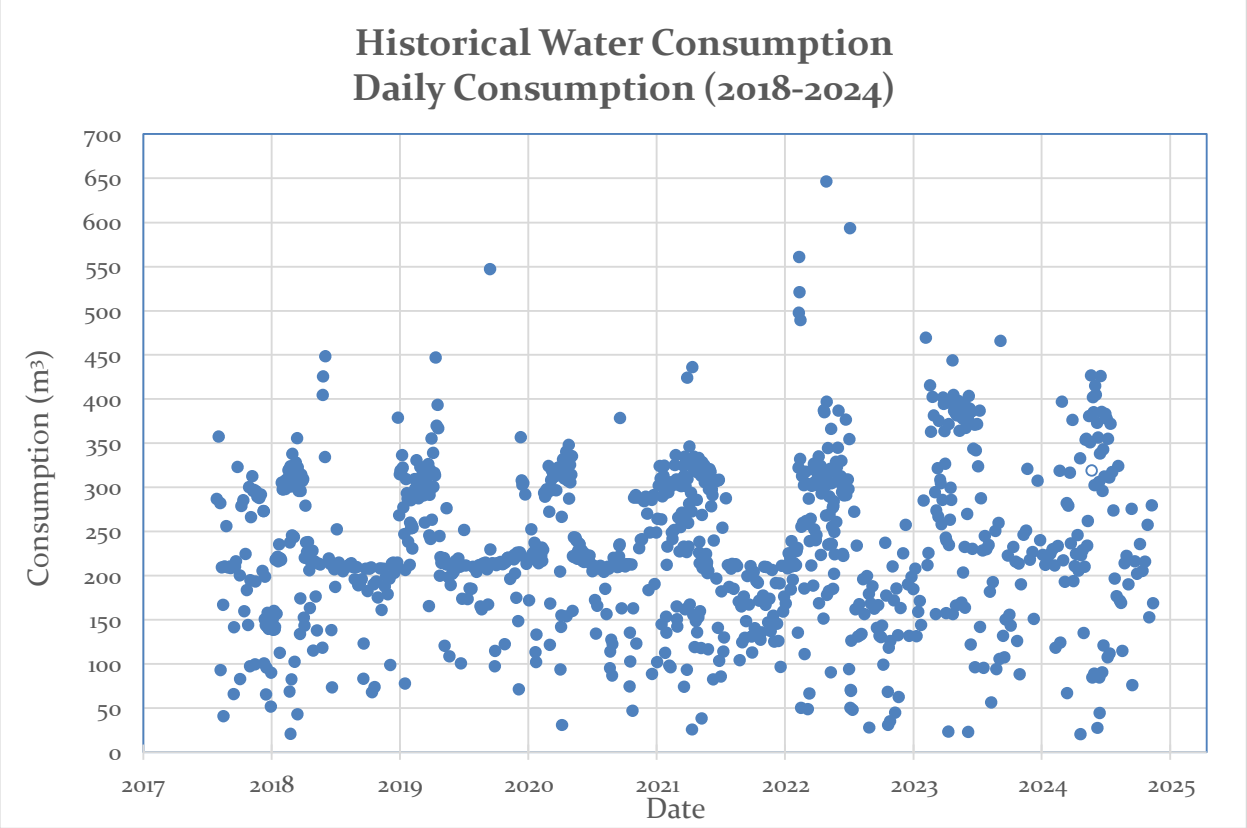


Figure 12 Historical Water Consumption - Daily Average Consumption between 2018 to 2023 Compared to 2024 Daily Consumption



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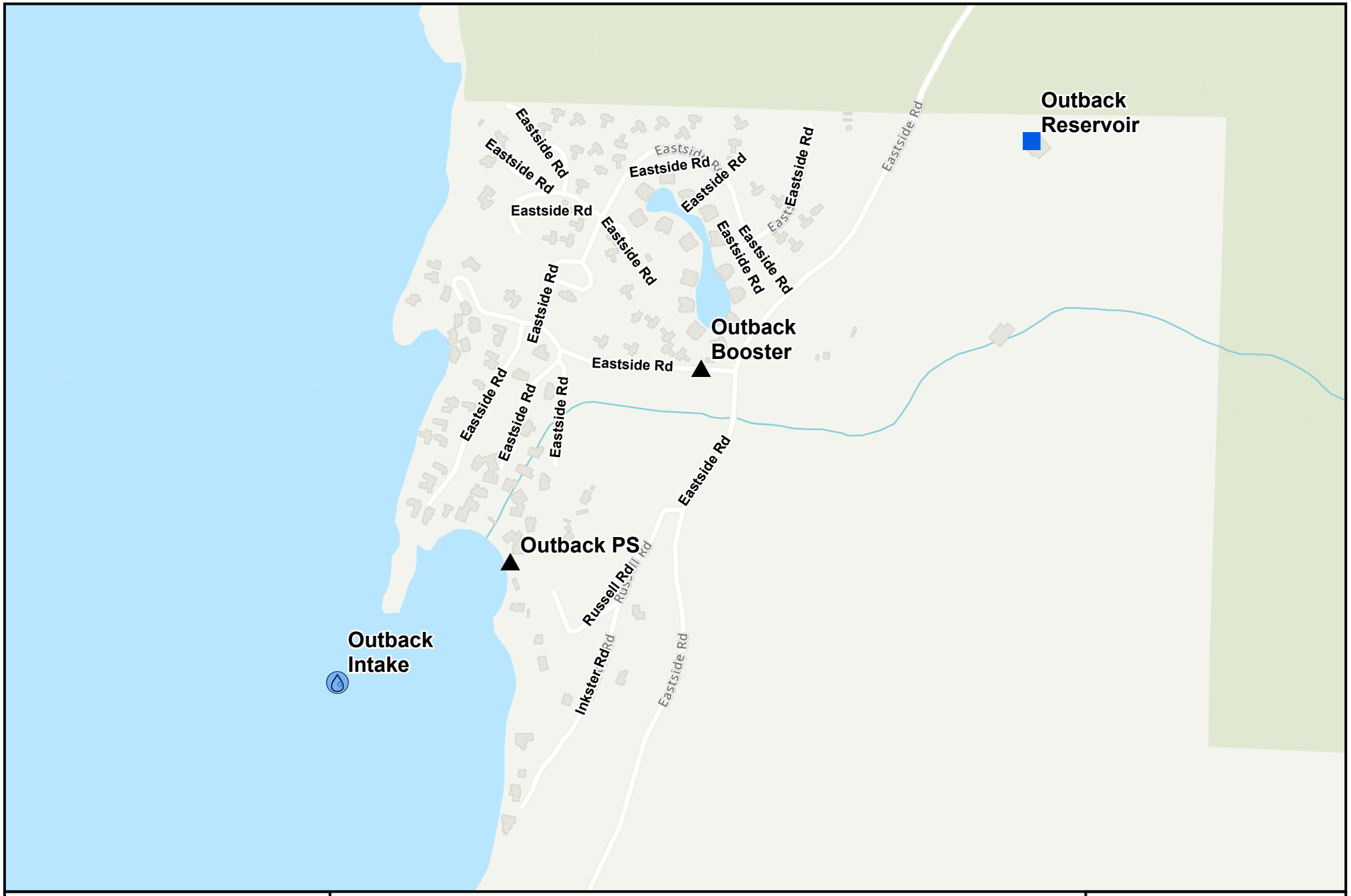
APPENDIX A

WATER SYSTEM MAP



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Outback

REGIONAL DISTRICT NORTH OKANAGAN

N

Date: Jun 02, 2025

Scale: 1:6,446
Size: 11" x 8.5"

0 160 320 640 Meters

Folder: \\nord\rdno\Maps\GIS\ArcGIS_Pro\Aprx_MasterMaps\Utilities\Master_WQ\

APPENDIX B

OPERATING PERMIT

PERMIT VALIDATION

Interior Health

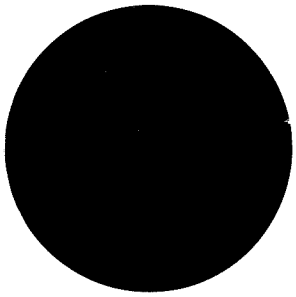
ACCOUNTS RECEIVABLE
12-945 Columbia St W, Kamloops, BC V2C 1L5
Toll Free: 1-844-868-5200 ext. 10365 – Local Calls: 778-362-6810 ext. 10365
Email: hp.billing@interiorhealth.ca

TO VALIDATE your operating permit, immediately affix this decal in the designated location on the permit. The Health Act Fees Regulation states that an operation permit is valid only if it bears an unexpired decal.

Regional District of North Okanagan
Outback Water Treatment Plant
9848 Aberdeen Rd
Vernon BC V1B 2K9
Canada

Permit Number:	**005250**
Issue Date:	06-Mar-2024
Expiry Date:	31-Mar-2025
Facility Number:	13-098-00577
Facility Name:	Outback Water Treatment Plant

Drinking Water System 15 - 300 Connections



APPENDIX C

2024 SAMPLING PROGRAM AND SCHEDULES

RDNO Operator Schedule 2024		
Week	**RDNO Water Quality Sampling (Monday)**	**RDNO Operator Sampling (Tuesday)**
Jan 1 - 5		Outback Reservoir SS, Delcliffe Road SS
Jan 8 - 12		Outback Reservoir SS, Delcliffe Hill PS
Jan 15 - 19		Outback Reservoir SS, Delcliffe Road SS
Jan 22 - 26	Outback Intake, Delcliffe Intake	Outback Reservoir SS, Delcliffe Hill PS
Jan 29 - Feb 2		Outback Reservoir SS, Delcliffe Road SS
Feb 5 - 9		Outback Reservoir SS, Delcliffe Hill PS
Feb 12 - 16		Outback Reservoir SS, Delcliffe Road SS
Feb 19 - 23		Outback Reservoir SS, Delcliffe Hill PS
Feb 26 - Mar 1	Outback Intake, Delcliffe Intake	Outback Reservoir SS, Delcliffe Road SS
Mar 4 - 8		Outback Reservoir SS, Delcliffe Hill PS
Mar 11 - 15		Outback Reservoir SS, Delcliffe Road SS
Mar 18 - 22		Outback Reservoir SS, Delcliffe Hill PS
Mar 25 - 29	Outback Reservoir, Outback Intake, Delcliffe Intake	Outback Reservoir SS, Delcliffe Road SS
Apr 1 - 5		Outback Reservoir SS, Delcliffe Hill PS
Apr 8 - 12		Outback Reservoir SS, Delcliffe Road SS
Apr 15 - 19		Outback Reservoir SS, Delcliffe Hill PS
Apr 22 - 26	Outback Intake, Delcliffe Intake	Outback Reservoir SS, Delcliffe Road SS
Apr 29 - May 3		Outback Reservoir SS, Delcliffe Hill PS
May 6 - 10		Outback Reservoir SS, Delcliffe Road SS
May 13 - 17		Outback Reservoir SS, Delcliffe Hill PS
May 20 - 24		Outback Reservoir SS, Delcliffe Road SS
May 27 - 31	Outback Intake, Delcliffe Intake	Outback Reservoir SS, Delcliffe Hill PS
Jun 3 - 7		Outback Reservoir SS, Delcliffe Road SS
Jun 10 - 14		Outback Reservoir SS, Delcliffe Hill PS
Jun 17 - 21		Outback Reservoir SS, Delcliffe Road SS
Jun 24 - 28	Outback Reservoir, Outback Intake, Delcliffe Intake	Outback Reservoir SS, Delcliffe Hill PS
Jul 1 - 5		Outback Reservoir SS, Delcliffe Road SS
Jul 8 - 12		Outback Reservoir SS, Delcliffe Hill PS
Jul 15 - 19		Outback Reservoir SS, Delcliffe Road SS
Jul 22 - 26	Outback Intake, Delcliffe Intake	Outback Reservoir SS, Delcliffe Hill PS

RDNO Operator Schedule 2024		
Week	**RDNO Water Quality Sampling (Monday)**	**RDNO Operator Sampling (Tuesday)**
Jul 29 - Aug 2		Outback Reservoir SS, Delcliffe Road SS
Aug 5 - 9		Outback Reservoir SS, Delcliffe Hill PS
Aug 12 - 16		Outback Reservoir SS, Delcliffe Road SS
Aug 19 - 23		Outback Reservoir SS, Delcliffe Hill PS
Aug 26 - 30	Outback Intake, Delcliffe Intake	Outback Reservoir SS, Delcliffe Road SS
Sep 2 - 6		Outback Reservoir SS, Delcliffe Hill PS
Sep 9 - 13		Outback Reservoir SS, Delcliffe Road SS
Sep 16 - 20		Outback Reservoir SS, Delcliffe Hill PS
Sep 23 - 27	Outback Reservoir, Outback Intake, Delcliffe Intake	Outback Reservoir SS, Delcliffe Road SS
Sep 30 - Oct 4		Outback Reservoir SS, Delcliffe Hill PS
Oct 7 - 11		Outback Reservoir SS, Delcliffe Road SS
Oct 14 - 18		Outback Reservoir SS, Delcliffe Hill PS
Oct 21 - 25	Outback Intake, Delcliffe Intake	Outback Reservoir SS, Delcliffe Road SS
Oct 28 - Nov 1		Outback Reservoir SS, Delcliffe Hill PS
Nov 4 - 8		Outback Reservoir SS, Delcliffe Road SS
Nov 11 - 15		Outback Reservoir SS, Delcliffe Hill PS
Nov 18 - 22		Outback Reservoir SS, Delcliffe Road SS
Nov 25 - 29	Outback Intake, Delcliffe Intake	Outback Reservoir SS, Delcliffe Hill PS
Dec 2 - 6		Outback Reservoir SS, Delcliffe Road SS
Dec 9 - 13		Outback Reservoir SS, Delcliffe Hill PS
Dec 16 - 20	Outback Reservoir, Outback Intake, Delcliffe Intake	Outback Reservoir SS, Delcliffe Road SS
Dec 23 - 27		Outback Reservoir SS, Delcliffe Hill PS

July and August - Pump runs frequently so meeting is not required

OUTBACK - BOTTLES AND PARAMETERS

Weekly Sampling by RDNO Operators

Sample Site	Bottles	Parameters
Outback Reservoir SS	1 - Caro Bacterial	Total Coliform, E.Coli

Monthly Sampling

Sample Site	Bottles	Parameters
Outback Intake	1 - Caro Bacterial	Total Coliform, E.Coli
	1 - Caro Bacterial	SRB (sulfur reducing bacteria), IRB (iron related bacteria)
	1 - 200 mL PA Bacterial	Bacterial (Most Probable Number)
	1 - TOC Caro	TOC
	1 - 1 L in house	Algae Density (May to November)
	1 - 4 L Caro	Chlorophyll a (May to November)

Quarterly Sampling - March, June, September, December

Sample Site	Bottles	Parameters
Outback Intake	1 - Caro Bacterial	Total Coliform, E.Coli
	1 - Caro Bacterial	SRB (sulfur reducing bacteria), IRB (iron related bacteria)
	1 - 200 mL PA Bacterial	Bacterial (Most Probable Number)
	1 - TOC Caro	TOC
	1 - 125 mL Caro (yellow lid)	TP
	1 - 250 ml Caro	TN
	1 - 500 mL in house	Sulfate, Apparent Colour, Total Alkalinity, Total Hardness
	1 - 1 L in house	Algae Density (May to November)
	1 - 4 L Caro	Chlorophyll a (May to November)

Quarterly Sampling - March, June, September, December

Outback Reservoir SS	1 - 200 mL PA Bacterial	Bacterial (Most Probable Number)
	2 - THM Bottles	THM's
	2 - HAA bottles	HAA's

Annual Sampling (July)

Sample Site	Bottles	Parameters
Outback Intake	1 - Caro Bacterial	Total Coliform, E.Coli
	1 - 200 mL PA Bacterial	Bacterial (Most Probable Number)
	1 - 125 mL Metals Caro	
	1 - 40 mL mercury glass metals	
	1 - 125 mL Caro (yellow lid)	TP
	1 - Cyanide	Cyanide
	1 - TOC	TOC
	1 - 1 L Caro	
	1 - 1 L in house	Algae Density
	1 - 4 L Caro	Chlorophyll a

APPENDIX D

2024 SOURCE WATER COMPREHENSIVE ANALYSIS

Outback Intake Water Quality 2024

Water System: Greater Vernon Water
Source: Okanagan Lake

Sampling Point: Outback Intake
Date of Sample: July 22, 2024

Parameter	Result	Guideline	Unit
ALKALINITY (BICARBONATE, AS CACO3)	118	N/A	mg/L
ALKALINITY (CARBONATE, AS CACO3)	<1.0	N/A	mg/L
ALKALINITY (HYDROXIDE, AS CACO3)	<1.0	N/A	mg/L
ALKALINITY (PHENOLPHTHALEIN, AS CACO3)	<1.0	N/A	mg/L
ALKALINITY (TOTAL, AS CACO3)	118	N/A	mg/L
ALUMINUM (TOTAL)	<0.005	OG < 0.1, MAC = 2.9	mg/L
ANTIMONY (TOTAL)	<0.0002	MAC = 0.006	mg/L
ARSENIC (TOTAL)	<0.0005	MAC = 0.01	mg/L
BARIUM (TOTAL)	0.0239	MAC = 2	mg/L
BERYLLIUM (TOTAL)	<0.0001	N/A	mg/L
BISMUTH (TOTAL)	<0.0001	N/A	mg/L
BORON (TOTAL)	<0.05	MAC = 5	mg/L
CADMIUM (TOTAL)	<0.00001	MAC = 0.007	mg/L
CALCIUM (TOTAL)	35.9	N/A	mg/L
CHLORIDE	5.88	N/A	mg/L
CHLOROPHYLL A	<1.0	N/A	µg/L
CHROMIUM (TOTAL)	<0.0005	MAC = 0.05	mg/L
COBALT (TOTAL)	<0.0001	N/A	mg/L
COLOUR (TRUE)	<5.0	AO ≤ 15	TCU
CONDUCTIVITY	301	N/A	µS/cm
COPPER (TOTAL)	0.0014	MAC = 2	mg/L
CYANIDE (TOTAL)	<0.002	MAC = 0.2	mg/L
DISSOLVED ORGANIC CARBON	4.12	N/A	mg/L
FLUORIDE	0.22	MAC=1.5	mg/L
HARDNESS (TOTAL, AS CACO3)	130	N/A	mg/L
IRON (TOTAL)	0.019	AO ≤ 0.3	mg/L
LEAD (TOTAL)	<0.0002	MAC = 0.005	mg/L
LITHIUM (TOTAL)	0.00317	N/A	mg/L
MAGNESIUM (TOTAL)	9.82	N/A	mg/L
MANGANESE (TOTAL)	0.00071	MAC = 0.12	mg/L
MERCURY (TOTAL)	<0.00001	MAC = 0.001	mg/L
MOLYBDENUM (TOTAL)	0.00336	N/A	mg/L
NICKEL (TOTAL)	0.00076	N/A	mg/L
NITRATE + NITRITE	0.0941	N/A	mg N/L
NITRATE	0.094	N/A	mg N/L
NITRITE	<0.01	N/A	mg N/L
NITROGEN (TOTAL)	0.294	N/A	mg/L
PHOSPHORUS (TOTAL DISSOLVED)	<0.005	N/A	mg/L
PHOSPHORUS (TOTAL)	<0.05	N/A	mg/L
PH	7.1	OG = 7.0-10.5	pH units
POTASSIUM (TOTAL)	2.5	N/A	mg/L
SELENIUM (TOTAL)	<0.0005	MAC = 0.05	mg/L
SILICON (TOTAL, AS SI)	3.6	N/A	mg/L
SILVER (TOTAL)	<0.00005	N/A	mg/L
SODIUM (TOTAL)	12.1	AO ≤ 200	mg/L

STRONTIUM (TOTAL)	0.282	MAC = 7	mg/L
SULFUR (TOTAL)	10.8	N/A	mg/L
SULPHATE	30.8	N/A	mg/L
TELLURIUM (TOTAL)	<0.0005	N/A	mg/L
THALLIUM (TOTAL)	<0.00002	N/A	mg/L
THORIUM (TOTAL)	<0.0001	N/A	mg/L
TIN (TOTAL)	<0.0002	N/A	mg/L
TITANIUM (TOTAL)	<0.005	N/A	mg/L
TOTAL DISSOLVED SOLIDS	164	AO ≤ 500	mg/L
TOTAL KJELDAHL NITROGEN	0.2	N/A	mg/L
TOTAL ORGANIC CARBON	4.57	N/A	mg/L
TUNGSTEN (TOTAL)	<0.001	N/A	mg/L
TURBIDITY	0.24	OG < 1	NTU
URANIUM (TOTAL)	0.00225	MAC = 0.02	mg/L
UV TRANSMITTANCE (FILTERED)	87.4	N/A	% T
VANADIUM (TOTAL)	<0.005	N/A	mg/L
ZINC (TOTAL)	0.004	AO ≤ 5	mg/L
ZIRCONIUM (TOTAL)	<0.0001	N/A	mg/L

"<" = Less than the detection limit shown

N/A = No current guideline

OG = Operational Guideline

MAC = Maximum Acceptable Concentration Guideline

AO = Aesthetic Objective Guideline

Guidelines are for treated drinking water - these samples are untreated water