



# Annual Report of Monitoring

## Lister Water System

Developed in accordance with the  
*British Columbia Drinking Water Protection Act*

BALFOUR WATER SYSTEM	
Period of Monitoring Covered by this Report:	January 1 - December 31, 2023
Interior Health Permit to Operate Facility Number:	12-098-00372
EOCP Classification:	SWS
IHA Permit:	Drinking Water System 15 - 300 Connections
Location of Water Supply System:	Lister, BC

**Contact Information:**

Regional District of Central Kootenay  
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Trihalomethanes and  
Volatile Organic Compounds Monitoring Results

## 1. Introduction

Lister is a community located 16 km southeast of Creston within RDCK Electoral Area B. This system was first developed in 1929 and underwent significant upgrades in the 60s, 70s, and 80s. It was converted to a RDCK service in 1982 and services 196 active connections. A new groundwater well and reservoir was commissioned in 2013.

As part of the British Columbia Provincial *Drinking Water Protection Act (2001)* and *Drinking Water Protection Regulation (2003)* an annual water system report to water users is required. This annual report summarizes information collected and recorded throughout the reporting period, and details additional relevant information to the water system.

## 2. Water Treatment Objectives

The provincial technical document *Drinking Water Treatment Objectives (Microbiological) for Ground Water Supplies in British Columbia (2015)* provides guidelines on determination of ground water at risk of containing pathogens. If a ground water well is determined to be at risk, disinfection must be provided. Microbiological treatment objectives for Groundwater at Risk of Containing Pathogens (GARP) – Virus Only are as followings:

- 4-log reduction (99.99%) reduction of viruses
- Turbidity less than 1 NTU (Nephelometric Turbidity Unit)
- Zero total and fecal coliforms (E. coli)

Prior to release of the provincial technical document, a new well and reservoir were commissioned in Lister. Early bacteriological monitoring indicated the reoccurring presence of coliforms in water sample testing results, which suggested the well could be at risk of containing pathogens. As a result, sodium hypochlorite disinfection was implemented.

The Lister water treatment plant provides biologically safe drinking water and the Regional District continues to monitor water quality.

## 3. Water System Overview

Lister Water System's water source is a groundwater well. A reservoir commissioned in late 2013 combined with chlorine disinfection continues to be effective for improved water quality in the Lister system.

## 4. Monitoring

The Lister water system includes monitoring for bacteriological testing (total/fecal coliforms), turbidity, chlorine residual (free), consumption, and chemical constituents.

## 4.1 Bacteriological

Sampling is done from various locations within the distribution system. Tests for total and fecal coliforms are performed in accordance with the methods outlined in the Standard Methods for the Examination of Water and Wastewater (2005). Colony forming units (cfu) per 100 ml are determined for each sample. There were no adverse sample results in 2023 which indicates that the Lister water system consistently met guidelines for bacteriological parameters.

## 4.2 Turbidity

Turbidity is measured at the reservoir and two locations within the distribution system using handheld turbidity meters. The Regional District targets a turbidity level post reservoir below 1 NTU. Figure 1 outlines reservoir water turbidity levels. Turbidity levels exceeded 1 NTU on Sept 18<sup>th</sup> and Nov 14<sup>th</sup>. Residuals in the reservoir remained above 0.7 mg/L on those dates.

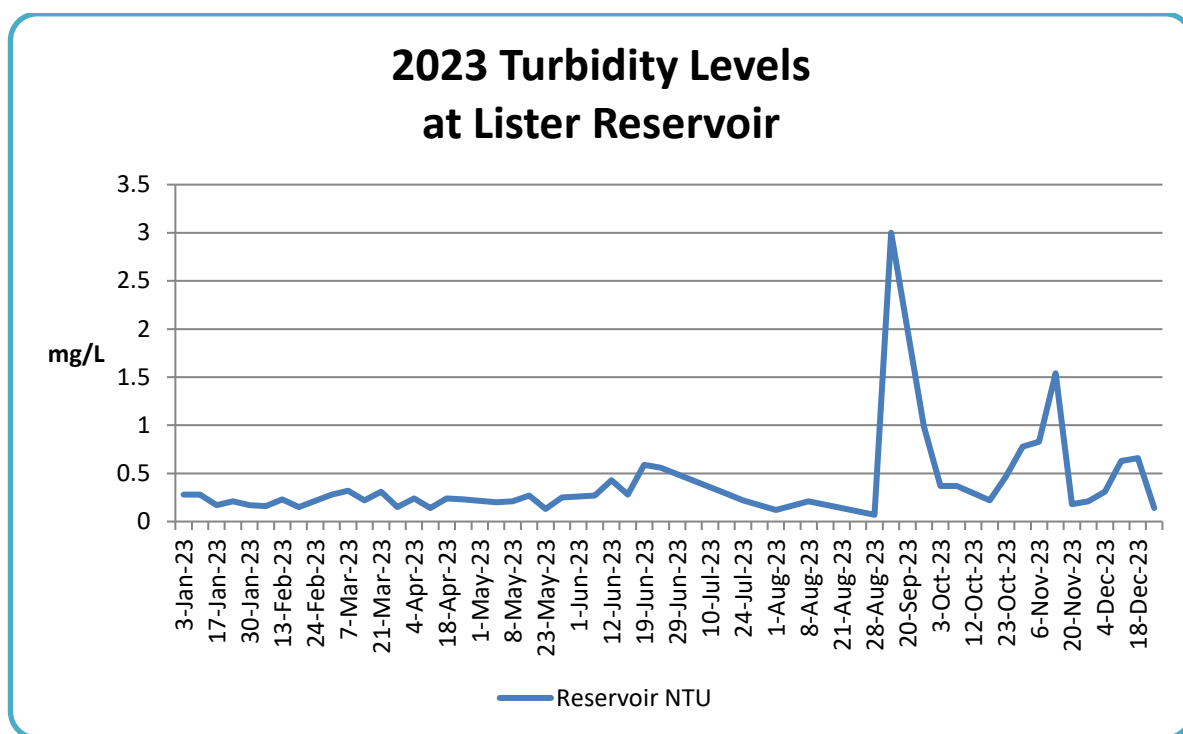


Figure 1 – Reservoir Turbidity Levels for Reporting Period

## 4.3 Chlorine Residual

The Lister treatment system measures free chlorine residual at the reservoir using an online chlorine analyser. The Regional District targets a minimum chlorine residual of 0.5 mg/L post-reservoir to meet the required concentration for disinfection. Figure 1 shows the chlorine residual levels at the Lister Reservoir. Chlorine residuals were below target on 2 days in 2023. Operators immediately addressed the low residual and ensured that the minimum

required chlorine concentration of 0.20 mg/l at the end of the distribution system was met on these days.

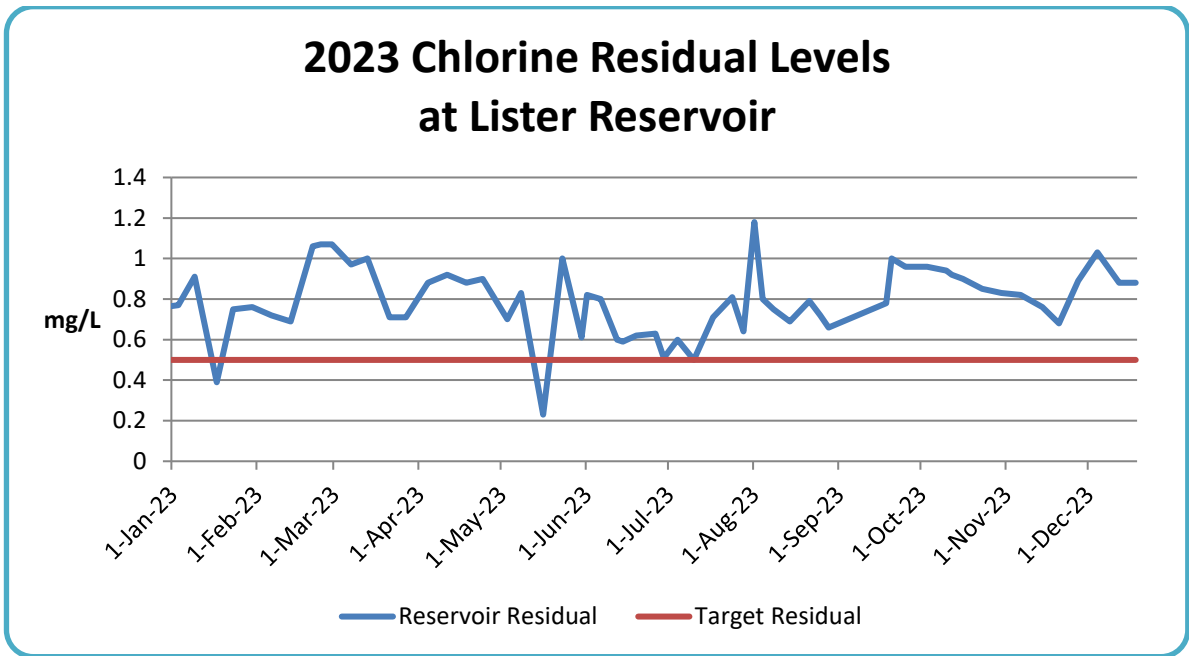


Figure 2 – Free Chlorine Residual Levels for Reporting Period

#### 4.4 Consumption

Flow rates are measured at the Lister well in cubic meters. The total flow recorded for the reporting period was 201,539 cubic meters. The average monthly flow was 16,878 cubic meters. Figure 3 shows the monthly flow at the Lister well.

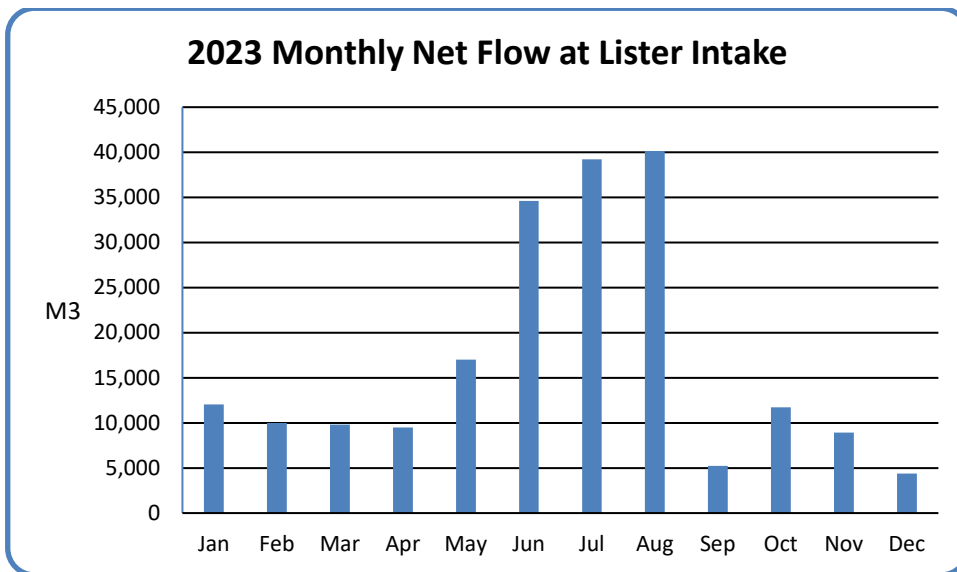


Figure 3 – Treated Water Volumes for Reporting Period

## 4.5 Chemistry

A comprehensive chemical analysis of a sample from the reservoir was completed on January 24<sup>th</sup>, 2023. These test results can be found in Appendix A. The results in Appendix A show that chemical parameters are below the Maximum Acceptable Concentration (MAC) as detailed in Health Canada’s *Guidelines for Canadian Drinking Water Quality – Summary Table (2024)*.

The RDCK also tested for the chemical disinfection by-products Trihalomethanes and Volatile Organic Compounds in February at the reservoir and a point in the distribution system. These results are presented in Appendix A. The results show that levels are below the MAC as outlined in the *Guidelines*.

## 5. Advisories Issued

The following table describes the Notices and Advisories issued for the reporting period.

Table 1 – Notices and Advisories Issued

Notice/Advisory Type	Dates in Effect	Reason
Boil Water Notice - Localized	June 29 – July 7, 2023	Water main repair
Boil Water Notice - Localized	August 23 – 24, 2023	Water main repair
Boil Water Notice	August 31 – September 7, 2023	Failed well pump
Maintenance	October 17, 2023	Annual distribution system maintenance

Each Notice/Advisory was issued a Rescind Notice to notify the public once action was completed and water quality sampling results demonstrated good water quality.

## 6. Capital Projects and Operations & Maintenance

There were no capital projects in 2023. The following operation and maintenance items were completed in 2023:

- Annual flushing and valve exercising
- Well rehabilitation and disinfection
- Well pump inspection
- Six leak repairs and 1 service installation
- Reclassification as a large water system
- Contractor removed dead and leaning trees along the Lister Well House Service Road

## 7. Water Conservation

Mandatory Stage 1 water conservation measures are in place from June 1 to September 30 every year. Stage 1 measures permit the watering of lawns, gardens, trees and shrubs only from 7pm to 10am daily. Watering using drip irrigation, a watering can or a hand held hose is permitted

anytime.

The RDCK implemented Stage 2 Water Conservation Measures on the Lister water system on July 19<sup>th</sup>, 2023. Stage 2 measures permit watering of lawns, gardens, trees and shrubs ONLY between 6:00am-10:00am and 8:00pm-10:00pm. Watering using drip irrigation, a watering can or a hand held hose is permitted anytime.

The RDCK implemented Stage 3 Water Conservation Measures on the Lister water system on August 31, 2023. These measures remained in place until October 5, 2023 when all conservations measures were rescinded. Stage 3 measures permit watering of NEW lawns, gardens, trees and shrubs ONLY between 6:00am-10:00am and 8:00pm-10:00pm. Watering of lawns is prohibited. Watering using drip irrigation, a watering can or a hand held hose is permitted anytime.

## **8. Planned Improvements**

### ***8.1 Improvements Required by Operating Permit or Drinking Water Officer***

The Lister water system was reclassified as a large water system in 2023. Interior Health placed a number of conditions on the Permit to Operate under Section 8 of the BC Drinking Water Protection Act. The conditions are as follows:

- Submit monthly water quality reports
- Update operations and maintenance plan
- Submit asset management plan
- Update source protection planning for groundwater well
- Complete a GARP assessment

### ***8.2 Future Improvements***

There is currently a backlog of approximately \$3.2 million in water line replacements identified in asset management planning. An assessment study was completed in 2019 to determine long term asset replacement and an upgrade schedule. A complementary Long Term Infrastructure Capacity Assessment was also undertaken, with the purpose of obtaining a greater understanding into the possibility of expanding the Lister Water System to include adjacent properties and community water systems. Studies are available on the RDCK Water Systems webpage under the Lister Water System tab (<https://rdck.ca/EN/main/services/water/rdck-water-systems/lister-water-system/lister-water-system-studies.html>).

The RDCK plans to complete the following in 2024:

- Distribution system pipe replacements
- Water main upgrade on Crestview Rd



- Generator procurement and installation
- Variable Frequency Drive well pump motor
- Additional water line replacements

## 9. Training and Certification

Table 2 – Operator Certification

OPERATOR	ACTIVE EOCP LEVELS
Allan K. Richardson	WD-II, WT-II, WWC-II, MWWT-I, CH
Cody Peck	WT-II, WD-II, CH
Evan Bjarnason	WT-II, WD-II, CH
Evan Salmon	WT-I
James Croft	SWS
Kalen Luck	WT-I

## 10. Emergency Response and Contingency Plan

The Emergency Response and Contingency Plan (ERCP) for the Lister water system is updated annually. The ERCP includes emergency contact information, a communications plan, and detailed procedures for the following types of incidents:

- broken water main;
- source contamination;
- elevated turbidity levels in treated water;
- fire in a building;
- flood conditions;
- loss of source;
- presence of coliforms or E. coli;
- pump failure;
- power failure; and
- low chlorine residuals.

The *Drinking Water Protection Regulation (2003)*, under Section 13, requires that water suppliers provide an ERCP to address any potential emergencies that may impact the delivery of water and health of those being supplied by the water system. The ERCP must be made accessible to the staff of the water supplier and a copy submitted to the local Environmental Health Officer. The RDCK has fulfilled these requirements for the Lister Water System.

## Appendix A: Comprehensive Chemistry Analysis Results



## CERTIFICATE OF ANALYSIS

<b>REPORTED TO</b>	Regional District of Central Kootenay - Nelson Box 590 - 202 Lakeside Drive Nelson, BC V1L 5R4		<b>WORK ORDER</b>	23A2524
<b>ATTENTION</b>	RDCK- Nelson	<b>RECEIVED / TEMP REPORTED</b>	2023-01-25 16:30 / 5.6°C 2023-02-02 10:43	
<b>PO NUMBER</b>	RDCK- Nelson	<b>COC NUMBER</b>	B37921	
<b>PROJECT</b>	General Potability			
<b>PROJECT INFO</b>	Lister Water Source			

**Introduction:**

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO/IEC 17025:2017 for specific tests listed in the scope of accreditation approved by CALA.

*Big Picture Sidekicks*



You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

*We've Got Chemistry*



It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

*Ahead of the Curve*



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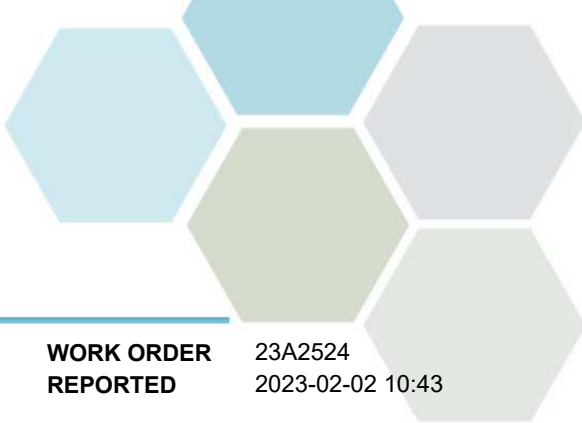
If you have any questions or concerns, please contact me at [bwhitehead@caro.ca](mailto:bwhitehead@caro.ca)

**Authorized By:**

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# TEST RESULTS

**REPORTED TO PROJECT** Regional District of Central Kootenay - Nelson  
General Potability

**WORK ORDER REPORTED** 23A2524  
2023-02-02 10:43

Analyte	Result	Guideline	RL Units	Analyzed	Qualifier
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**Lister Well House (23A2524-01) | Matrix: Water | Sampled: 2023-01-24 09:30**

**Anions**

Chloride	1.22	AO ≤ 250	0.10 mg/L	2023-01-26	
Fluoride	< 0.10	MAC = 1.5	0.10 mg/L	2023-01-26	
Nitrate (as N)	0.206	MAC = 10	0.010 mg/L	2023-01-26	
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	2023-01-26	
Sulfate	10.5	AO ≤ 500	1.0 mg/L	2023-01-26	

**Calculated Parameters**

Total Trihalomethanes	< 0.00400	MAC = 0.1	0.00400 mg/L	N/A	
Hardness, Total (as CaCO3)	58.8	None Required	0.500 mg/L	N/A	
Solids, Total Dissolved	74.9	AO ≤ 500	1.00 mg/L	N/A	

**General Parameters**

Alkalinity, Total (as CaCO3)	58.7	N/A	1.0 mg/L	2023-01-28	
Alkalinity, Phenolphthalein (as CaCO3)	< 1.0	N/A	1.0 mg/L	2023-01-28	
Alkalinity, Bicarbonate (as CaCO3)	58.7	N/A	1.0 mg/L	2023-01-28	
Alkalinity, Carbonate (as CaCO3)	< 1.0	N/A	1.0 mg/L	2023-01-28	
Alkalinity, Hydroxide (as CaCO3)	< 1.0	N/A	1.0 mg/L	2023-01-28	
Conductivity (EC)	130	N/A	2.0 µS/cm	2023-01-28	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020 mg/L	2023-01-31	
pH	6.98	7.0-10.5	0.10 pH units	2023-01-28	HT2
Turbidity	< 0.10	OG < 1	0.10 NTU	2023-01-27	

**Haloacetic Acids**

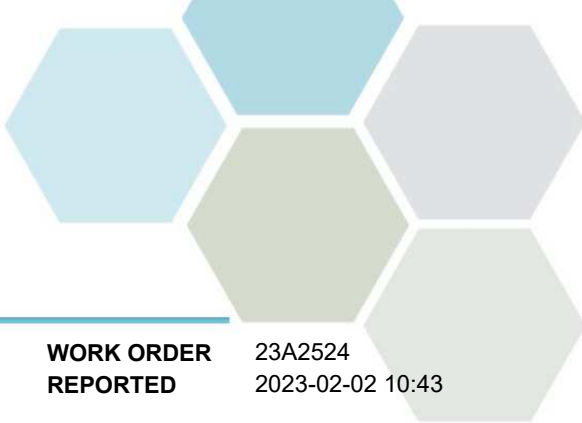
Monochloroacetic Acid	< 0.0020	N/A	0.0020 mg/L	2023-02-02	
Monobromoacetic Acid	< 0.0020	N/A	0.0020 mg/L	2023-02-02	
Dichloroacetic Acid	< 0.0020	N/A	0.0020 mg/L	2023-02-02	
Trichloroacetic Acid	< 0.0020	N/A	0.0020 mg/L	2023-02-02	
Dibromoacetic Acid	< 0.0020	N/A	0.0020 mg/L	2023-02-02	
Total Haloacetic Acids (HAA5)	< 0.00200	MAC = 0.08	0.00200 mg/L	N/A	
Surrogate: 2-Bromopropionic Acid	107		70-130 %	2023-02-02	

**Microbiological Parameters**

Coliforms, Total (Q-Tray)	< 1	MAC = 0	1 MPN/100 mL	2023-01-25	
E. coli (Q-Tray)	< 1	MAC = 0	1 MPN/100 mL	2023-01-25	

**Total Metals**

Aluminum, total	0.0050	OG < 0.1	0.0050 mg/L	2023-01-29	
Antimony, total	< 0.00020	MAC = 0.006	0.00020 mg/L	2023-01-29	
Arsenic, total	0.00687	MAC = 0.01	0.00050 mg/L	2023-01-29	
Barium, total	< 0.0050	MAC = 2	0.0050 mg/L	2023-01-29	
Boron, total	< 0.0500	MAC = 5	0.0500 mg/L	2023-01-29	
Cadmium, total	< 0.000010	MAC = 0.007	0.000010 mg/L	2023-01-29	
Calcium, total	20.4	None Required	0.20 mg/L	2023-01-29	
Chromium, total	0.00156	MAC = 0.05	0.00050 mg/L	2023-01-29	
Copper, total	0.00411	MAC = 2	0.00040 mg/L	2023-01-29	



# TEST RESULTS

**REPORTED TO PROJECT** Regional District of Central Kootenay - Nelson  
General Potability

**WORK ORDER REPORTED** 23A2524  
2023-02-02 10:43

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
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**Lister Well House (23A2524-01) | Matrix: Water | Sampled: 2023-01-24 09:30, Continued**

**Total Metals, Continued**

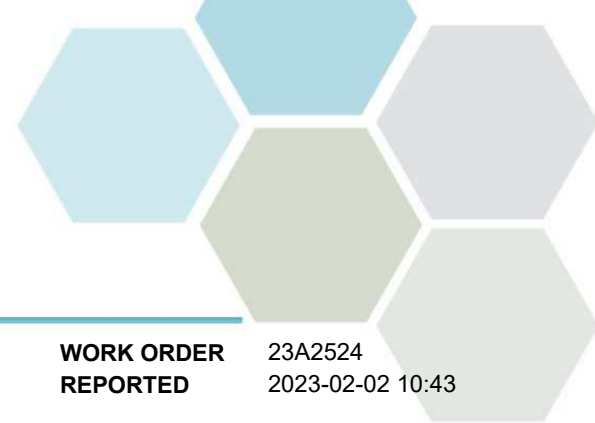
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2023-01-29	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2023-01-29	
Magnesium, total	<b>1.86</b>	None Required	0.010	mg/L	2023-01-29	
Manganese, total	< 0.00020	MAC = 0.12	0.00020	mg/L	2023-01-29	
Potassium, total	<b>1.36</b>	N/A	0.10	mg/L	2023-01-29	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2023-01-29	
Sodium, total	<b>2.80</b>	AO ≤ 200	0.10	mg/L	2023-01-29	
Strontium, total	<b>0.0554</b>	MAC = 7	0.0010	mg/L	2023-01-29	
Uranium, total	<b>0.00103</b>	MAC = 0.02	0.000020	mg/L	2023-01-29	
Zinc, total	<b>0.0078</b>	AO ≤ 5	0.0040	mg/L	2023-01-29	

**Volatile Organic Compounds (VOC)**

Bromodichloromethane	< 0.0010	N/A	0.0010	mg/L	2023-01-31	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2023-01-31	
Chloroform	<b>0.0011</b>	N/A	0.0010	mg/L	2023-01-31	
Dibromochloromethane	< 0.0010	N/A	0.0010	mg/L	2023-01-31	
Surrogate: Toluene-d8	124		70-130	%	2023-01-31	
Surrogate: 4-Bromofluorobenzene	127		70-130	%	2023-01-31	

**Sample Qualifiers:**

HT2 The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.



## APPENDIX 1: SUPPORTING INFORMATION

**REPORTED TO PROJECT** Regional District of Central Kootenay - Nelson  
General Potability

**WORK ORDER REPORTED** 23A2524  
2023-02-02 10:43

Analysis Description	Method Ref.	Technique	Accredited	Location
Alkalinity in Water	SM 2320 B* (2021)	Titration with H2SO4	✓	Kelowna
Anions in Water	SM 4110 B (2020)	Ion Chromatography	✓	Kelowna
Coliforms, Total in Water	NA / SM 9223 (2016)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Conductivity in Water	SM 2510 B (2021)	Conductivity Meter	✓	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection with In-Line UV Digestion and Amperometry	✓	Kelowna
E. coli in Water	NA / SM 9223 (2016)	Quanti-Tray / Enzyme Substrate Endo Agar	✓	Kelowna
Haloacetic Acids in Water	EPA 552.3*	Liquid-Liquid Microextraction, Derivatization and GC-ECD	✓	Richmond
Hardness in Water	SM 2340 B* (2021)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	✓	N/A
pH in Water	SM 4500-H+ B (2021)	Electrometry	✓	Kelowna
Solids, Total Dissolved in Water	SM 1030 E (2021)	SM 1030 E		N/A
Total Metals in Water	EPA 200.2 / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	✓	Richmond
Trihalomethanes in Water	EPA 5030B / EPA 8260D	Purge&Trap / GC-MSD (SIM)	✓	Richmond
Turbidity in Water	SM 2130 B (2020)	Nephelometry	✓	Kelowna

*Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method*

### Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
MPN/100 mL	Most Probable Number per 100 millilitres
NTU	Nephelometric Turbidity Units
OG	Operational Guideline (treated water)
pH units	pH < 7 = acidic, pH > 7 = basic
µS/cm	Microsiemens per centimetre
ASTM	ASTM International Test Methods
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association



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**REPORTED TO PROJECT** Regional District of Central Kootenay - Nelson  
General Potability

**WORK ORDER REPORTED** 23A2524  
2023-02-02 10:43

**General Comments:**

The results in this report apply to the received samples analyzed in accordance with the Chain of Custody document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued or once samples expire, whichever comes first. Longer hold is possible if agreed to in writing. The quality control (QC) data is available upon request

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted **red**. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager: [bwhitehead@caro.ca](mailto:bwhitehead@caro.ca)

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