2024 ANNUAL DRINKING WATER REPORT

Columbia Ridge Waterworks

Small Water System

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Introduction

Columbia Ridge is located approximately 10 km south of Fairmont Hot Springs Resort, British Columbia.

Bluestem Utilities ULC. owns and operates the utility infrastructure associated with Columbia Ridge Waterwork. Specifically, the water treatment plant, water distribution network and fire hydrants. The distribution network serves approximately 160 residential connections with 35 fire hydrants.

Columbia Ridge Waterworks water treatment plant is classified as Small Water System facility by the EOCP (Environmental Operators Certification Program). Bluestem Utilities has one chief operator and three part-time operators for water treatment and distribution system and fire hydrants maintenance. This ensures that at least one operator is on site or available to provide twenty-four-hour emergency on-call coverage.

Providing clean, potable, and aesthetically pleasing drinking water to its customers is at the forefront of our responsibilities. This is accomplished by maintaining a regular monitoring, sampling, and maintenance schedule.

System Overview

Water Source

Columbia Ridge Waterworks has two water sources. The primary source is Beardsley Spring which is used year-round. The second source is Columbia Lake which is used during the summer months, from May until October. During the summer season the two sources are blended.

Beardsley Spring

Columbia Lake

Treatment

The water source from Beardsley Spring is gravity fed year-round and the Columbia Lake source is pumped to the reservoir during the summer months.

There is continuous online monitoring system of turbidity and chlorine residual. The Bluestem Utilities operator administers a dosage of 12% Sodium Hypochlorite via a pump when the reservoir is being filled. The level of chlorine leaving the treatment plant is usually around 1.00 mg/L. This creates a very efficient disinfection process by inactivating many microorganisms.

Turbidity Meter

Chlorine Analyzer

Sodium Hypochlorite

Reservoir

There are two reservoirs with a total capacity of 910 cubic meters. Each reservoir is equipped with a mixer. The reservoirs fill up via a level sensor. When the level decreases from 2.80 meter (maximum level) to 2.70 meter the Beardsley Creek source will start to fill up the reservoir. If the reservoir decreases to 2.50 meter due to consumption demand, the Columbia Lake pump turns on filling the reservoir at the same time as the spring.

New Reservoir

Distribution system

The distribution system works on pressure. There are three pumps. One pump operates continuously to maintain a pressure of 73psi. If water demand increases, and the pressure decreases, the second pump will run to maintain the pressure. The third pump is used for supplemental fire flow.

Pumps

Distribution

Water Quality

Full Potability Analysis Beardsley Spring

A full water potability test was completed on October 02, 2024, for Beardsley Spring. This testing is completed prior to any treatment; therefore, it provides a very accurate representation of the water quality coming from Beardsley Spring.

Physical Test		Method/lab/Accreditation	LOR	Unit	Result
Absorbance, UV (@ 254nm)	----	E404/CG	0.0050	AU/cm	0.0100
Alkalinity, bicarbonate (as CaCO3)	----	E290/CG	1.0	mg/L	234
Alkalinity, carbonate (as CaCO3)	----	E290/CG	1.0	mg/L	<1.0
Alkalinity, hydroxide (as CaCO3)	----	E290/CG	1.0	mg/L	<1.0
Alkalinity, total (as CaCO3)	----	E290/CG	1.0	mg/L	234
Colour, true	----	E329/CG	5.0	CU	<5.0
Conductivity	----	E100/CG	2.0	µS/cm	425
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/CG	0.50	mg/L	229
Langelier index (@ 4°C)	----	EC105A/CG	0.010	-	0.499
pH	----	E108/CG	0.10	pH units	8.19
Solids, total dissolved [TDS]	----	E162/CG	10	mg/L	270
Solids, total suspended [TSS]	----	E160-L/CG	1.0	mg/L	6.8 DLIS
Temperature, sample	----	E218/CG	0.10	°C	20.3
Turbidity	----	E121/CG	0.10	NTU	5.94
Transmittance, UV (@ 254nm)	----	E404/CG	1.0	% T/cm	97.7
Anions and Nutrients					
Ammonia, total (as N)	7664-41-7	E298/CG	0.0050	mg/L	0.0160
Chloride	16887-00-6	E235.Cl-L/CG	0.10	mg/L	0.38
Fluoride	16984-48-8	E235.F/CG	0.020	mg/L	0.052
Nitrite (as N)	14797-65-0	E235.NO2-L/CG	0.0010	mg/L	<0.0010
Nitrogen, total organic	----	EC363/CG	0.050	mg/L	<0.056
Phosphorus, total	7723-14-0	E372-U/CG	0.0020	mg/L	<0.0020
Sulfate (as SO4)	14808-79-8	E235.SO4-L/CG	0.050	mg/L	10.7
Nitrate (as N)	14797-55-8	E235.NO3-L/CG	0.0050	mg/L	0.123
Kjeldahl nitrogen, total [TKN]	----	E318/CG	0.050	mg/L	<0.050
Nitrogen, total	7727-37-9	EC368/CG	0.050	mg/L	0.123
Cyanides					
Cyanide, strong acid dissociable (Total)		E333/WT	0.0020	mg/L	<0.0020

Organic / Inorganic Carbon		Method/lab/Accreditation	LOR	Unit	Result
Carbon, total organic [TOC]		E355-L/CG	0.50	mg/L	<0.50
Microbiological Test					
Coliforms, total	----	E010/CG	1	MPN/100 mL	53
Heterotrophic plate count [HPC]	----	E010.HPC/CG	1	MPN/100 mL	387
Bacteria, iron related, population estimate	----	E030.IRB/CG	1	CFU/mL	9000
Coliforms, Escherichia coli [E. coli]	----	E010/CG	1	MPN/100 mL	<1
Bacteria, dominant	----	E030.IRB/CG	-	-	IRB
Aggressivity	----	E030.IRB/CG	-	-	Aggressive
Total Metals					
Aluminum, total	7429-90-5	E420/CG	0.0030	mg/L	0.0237
Antimony, total	7440-36-0	E420/CG	0.00010	mg/L	<0.00010
Arsenic, total	7440-38-2	E420/CG	0.00010	mg/L	0.00017
Barium, total	7440-39-3	E420/CG	0.00010	mg/L	0.170
Boron, total	7440-42-8	E420/CG	0.010	mg/L	<0.010
Cadmium, total	7440-43-9	E420/CG	0.0000050	mg/L	<0.0000050
Calcium, total	7440-70-2	E420/CG	0.050	mg/L	40.3
Chromium, total	7440-47-3	E420/CG	0.00050	mg/L	<0.00050
Copper, total	7440-50-8	E420/CG	0.00050	mg/L	0.00273
Iron, total	7439-89-6	E420/CG	0.010	mg/L	0.013
Lead, total	7439-92-1	E420/CG	0.000050	mg/L	0.000477
Magnesium, total	7439-95-4	E420/CG	0.0050	mg/L	31.1
Manganese, total	7439-96-5	E420/CG	0.00010	mg/L	0.00064
Mercury, total	7439-97-6	E508/CG	0.0000050	mg/L	<0.0000050
Molybdenum, total	7439-98-7	E420/CG	0.000050	mg/L	0.00166
Potassium, total	7440-09-7	E420/CG	0.050	mg/L	0.786
Selenium, total	7782-49-2	E420/CG	0.000050	mg/L	0.000198
Sodium, total	7440-23-5	E420/CG	0.050	mg/L	4.76
Strontium, total	7440-24-6	E420/CG	0.00020	mg/L	0.117
Uranium, total	7440-61-1	E420/CG	0.000010	mg/L	0.00210
Zinc, total	7440-66-6	E420/CG	0.0030	mg/L	0.0100

Full potability analysis Columbia Lake

A full water potability test was completed on November 06, 2024, for Columbia Lake. This testing is completed prior to any treatment; therefore, it provides a very accurate representation of the water quality coming from Columbia Lake.

Physical Tests		Method/lab/Accreditation	LOR	UNIT	Result
Absorbance, UV (@ 254nm)	----	E404/CG	0.0050	AU/cm	0.0250
Alkalinity, bicarbonate (as CaCO3)	----	E290/CG	1.0	mg/L	148
Alkalinity, carbonate (as CaCO3)	----	E290/CG	1.0	mg/L	<1.0
Alkalinity, hydroxide (as CaCO3)	----	E290/CG	1.0	mg/L	<1.0
Alkalinity, total (as CaCO3)	----	E290/CG	1.0	mg/L	148
Colour, true	----	E329/CG	5.0	CU	<5.0
Conductivity	----	E100/CG	2.0	µS/cm	320
Hardness (as CaCO3), from total Ca/Mg	----	EC100A/CG	0.50	mg/L	163
Langelier index (@ 4°C)	----	EC105A/CG	0.010	-	0.214
pH	----	E108/CG	0.10	pH units	8.21
Solids, total dissolved [TDS]	----	E162/CG	10	mg/L	192
Solids, total suspended [TSS]	----	E160-L/CG	1.0	mg/L	<1.5 DLS
Temperature, sample	----	E218/CG	0.10	°C	20.3
Turbidity	----	E121/CG	0.10	NTU	0.43
Transmittance, UV (@ 254nm)	----	E404/CG	1.0	% T/cm	94.4
Anions and Nutrients					
Ammonia, total (as N)	7664-41-7	E298/CG	0.0050	mg/L	0.0164
Chloride	16887-00-6	E235.Cl-L/CG	0.10	mg/L	6.30
Fluoride	16984-48-8	E235.F/CG	0.020	mg/L	0.065
Nitrite (as N)	14797-65-0	E235.NO2-L/CG	0.0010	mg/L	0.0010
Nitrogen, total organic	----	EC363/CG	0.050	mg/L	0.130
Phosphorus, total	7723-14-0	E372-U/CG	0.0020	mg/L	0.0085
Sulfate (as SO4)	14808-79-8	E235.SO4-L/CG	0.050	mg/L	32.3
Nitrate (as N)	14797-55-8	E235.NO3-L/CG	0.0050	mg/L	0.0098
Kjeldahl nitrogen, total [TKN]	----	E318/CG	0.050	mg/L	0.146
Nitrogen, total	7727-37-9	EC368/CG	0.050	mg/L	0.157
Cyanides					
Cyanide, strong acid dissociable (Total)	----	E333/WT	0.0020	mg/L	<0.0020

Organic / Inorganic Carbon		Method/lab/Accreditation	LOR	unit	Result
Carbon, total organic [TOC]	----	E355-L/CG	0.50	mg/L	2.05
Microbiological Tests					
Coliforms, total	----	E010/CG	1	MPN/100 mL	<1
Heterotrophic plate count [HPC]	----	E010.HPC/CG	1	MPN/100 mL	172
Coliforms, Escherichia coli [E. coli]	----	E010/CG	1	MPN/100 mL	<1
Aggressivity	----	E030.IRB/CG	-	-	Moderate
Bacteria, dominant	----	E030.IRB/CG	-	-	IRB
Bacteria, iron related, population estimate	----	E030.IRB/CG	1	CFU/mL	2200
Total Metals					
Aluminum, total	7429-90-5	E420/CG	0.0030	mg/L	0.0040
Antimony, total	7440-36-0	E420/CG	0.00010	mg/L	<0.00010
Arsenic, total	7440-38-2	E420/CG	0.00010	mg/L	0.00100
Barium, total	7440-39-3	E420/CG	0.00010	mg/L	0.0760
Boron, total	7440-42-8	E420/CG	0.010	mg/L	<0.010
Cadmium, total	7440-43-9	E420/CG	0.0000050	mg/L	<0.0000050
Calcium, total	7440-70-2	E420/CG	0.050	mg/L	29.8
Chromium, total	7440-47-3	E420/CG	0.00050	mg/L	<0.00050
Copper, total	7440-50-8	E420/CG	0.00050	mg/L	<0.00050
Iron, total	7439-89-6	E420/CG	0.010	mg/L	0.022
Lead, total	7439-92-1	E420/CG	0.000050	mg/L	<0.000050
Magnesium, total	7439-95-4	E420/CG	0.0050	mg/L	21.5
Manganese, total	7439-96-5	E420/CG	0.00010	mg/L	0.00429
Mercury, total	7439-97-6	E508/CG	0.0000050	mg/L	<0.0000050
Molybdenum, total	7439-98-7	E420/CG	0.000050	mg/L	0.000600
Potassium, total	7440-09-7	E420/CG	0.050	mg/L	0.869
Selenium, total	7782-49-2	E420/CG	0.000050	mg/L	<0.000050
Sodium, total	7440-23-5	E420/CG	0.050	mg/L	6.67
Strontium, total	7440-24-6	E420/CG	0.00020	mg/L	0.221
Uranium, total	7440-61-1	E420/CG	0.000010	mg/L	0.000909
Zinc, total	7440-66-6	E420/CG	0.0030	mg/L	<0.0030

Water Distribution

In 2024 we have treated and distributed approximately 66,848 cubic meters of water (66,848,000L). Chart 1 below illustrates the amount of water that was treated daily from January to December 2024. Note that Columbia Ridge area is a seasonal destination with few full-time residents. Higher flows can be expected through the summer months (June – Oct) due to higher occupancy rates. Summer irrigation also factors into a higher demand during these months.

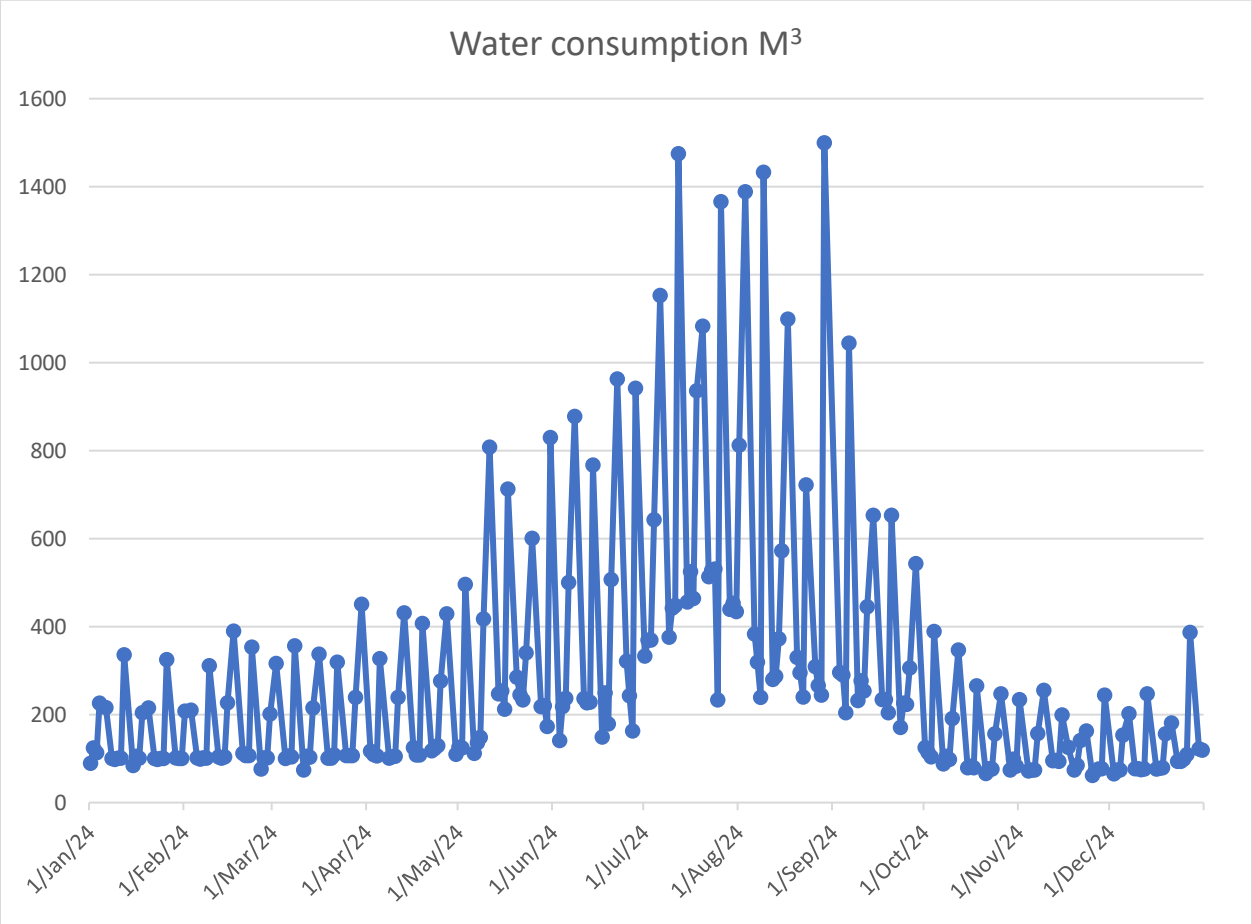

Chart 1: water consumption 2024.

Monitoring the Small Water System

Five times per week, Bluestem Utilities operators perform a set of daily rounds consisting of operational checks of the Beardsley Spring, Columbia Lake station, the water system and the distribution of water throughout the area. Chlorine residual and turbidity checks are also completed on the same frequency by an operator with portable instruments. By completing these checks, this ensures an adequate chlorine residual and turbidity level throughout the entire system.

Chlorine residual concentrations usually range from 0.30 to 2.0 mg/L in many Canadian drinking water distribution systems. Bluestem Utilities operators try to maintain the residual around 1.00 mg/L in the reservoir to ensure proper disinfection while minimizing the taste of chlorine for the customer.

Turbidity is one of the most important measurements of water quality. Turbidity is a measurement of the clarity of the water and gives an indication on the number of particles in the water that can't be seen by the naked eye. A rise in turbidity can help alert an operator of changes in raw water quality. Higher turbidity (more particles) can harbor microorganisms, shielding them from disinfection. The turbidity levels should never exceed 1.0 NTU. As noted below, the highest turbidity level recorded in 2024 at the Columbia Ridge reservoir was 0.65 NTU.

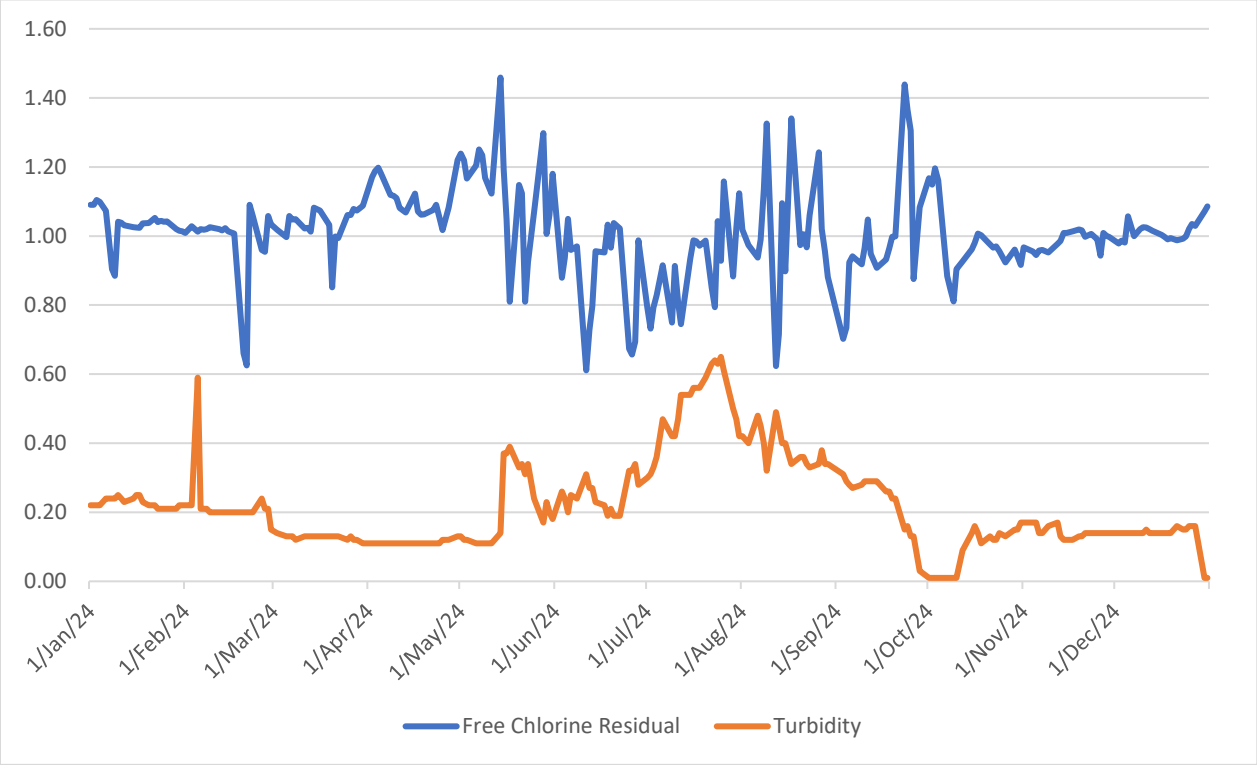

Chart 2: Chlorine & Turbidity 2024

Microbiological Test

Bacteriological test

Bacteriological sampling is done semi-monthly at two locations. Location one is the reservoir, location two is Spirits Reach. These samples are sent to Interior Health Authority to test for E. Coli bacteria and total coliforms. Bluestem Utilities has received zero reports of any positive test results for the year 2024.

Columbia Ridge Waterworks

Bacteria Test Result

Date	Reservoir E. coli	Reservoir Total Coliform	# 6 Spirits Reach E. coli	# 6 Spirits Reach Total Coliform
Jan 08/2024	<1	<1	<1	<1
Jan 22/2024	<1	<1	<1	<1
Feb 05/2024	<1	<1	<1	<1
Feb 20/2024	<1	<1	<1	<1
March 06/2024	<1	<1	<1	<1
March 20/2024	<1	<1	<1	<1
April 03/2024	<1	<1	<1	<1
May 01/2024	<1	<1	<1	<1
May 15/2024	<1	<1	<1	<1
May 29/2024	<1	<1	<1	<1
June 12/2024	<1	<1	<1	<1
June 26/2024	<1	<1	<1	<1
July 10/2024	<1	<1	<1	<1
July 22/2024	<1	<1	<1	<1
Aug 06/2024	<1	<1	<1	<1
Aug 20/2024	<1	<1	<1	<1
Sept 04/2024	<1	<1	<1	<1
Sept 18/2024	<1	<1	<1	<1
Oct 02/2024	<1	<1	<1	<1
Oct 16/2024	<1	<1	<1	<1
Oct 30/2024	<1	<1	<1	<1
Nov 13/2024	<1	<1	<1	<1
Nov 27/2024	<1	<1	<1	<1
Dec 11/2024	<1	<1	<1	<1

THM, HAA tests

Trihalomethane (THM) and Halo Acetic Acids (HAA) are a byproduct of the water treatment process. They are formed when natural organic material, such as the decaying vegetation commonly found in lakes and reservoirs, reacts with chlorine used to treat the water. This reaction produces disinfection byproduct the most common of which are THMs and HAAs. THM and HAA tests are performed quarterly. These samples are sent to ALS Laboratory in Calgary.

					Client sampling date / time	24-Jan-2024 14:30
Analyte	*CAS Number*	*Method/Lab*	*LOR*	*Unit*	**CG2400942-001**	
					Result	
Volatile Organic Compounds (THMs)						
Bromodichloromethane	75-27-4	E611B/CG	1.0	µg/L	<1.0	
Bromoform	75-25-2	E611B/CG	1.0	µg/L	<1.0	
Chloroform	67-66-3	E611B/CG	1.0	µg/L	1.5	
Dibromochloromethane	124-48-1	E611B/CG	1.0	µg/L	<1.0	
Trihalomethanes [THMs], total	----	E611B/CG	2.0	µg/L	<2.0	
Volatile Organic Compounds (THMs) Surrogates						
Bromo fluorobenzene, 4-	460-00-4	E611B/CG	1.0	%	96.3	
difluoro benzene, 1,4-	540-36-3	E611B/CG	1.0	%	92.0	
Halo acetic Acids						
Bromo chloroacetic acid	5589-96-8	E750/WT	1.00	µg/L	<1.00	
dibromo acetic acid	631-64-1	E750/WT	1.00	µg/L	<1.00	
Dichloroacetic acid	79-43-6	E750/WT	1.00	µg/L	1.43	
Mono bromoacetic acid	79-08-3	E750/WT	1.00	µg/L	<1.00	
Monochloroacetic acid	79-11-8	E750/WT	1.00	µg/L	<1.00	
Trichloroacetic acid	76-03-9	E750/WT	1.00	µg/L	<1.20 DLM	
Halo acetic acids, total [HAA5]	n/a	E750/WT	5.00	µg/L	<5.00	

					Client sampling date / time	17-Apr-2024 10:25
Analyte	*CAS Number*	*Method/Lab*	*LOR*	*Unit*	**CG2404808-001**	
					Result	
Volatile Organic Compounds (THMs)						
Bromodichloromethane	75-27-4	E611B/CG	1.0	µg/L	1.4	
Bromoform	75-25-2	E611B/CG	1.0	µg/L	<1.0	
Chloroform	67-66-3	E611B/CG	1.0	µg/L	2.9	
Dibromochloromethane	124-48-1	E611B/CG	1.0	µg/L	<1.0	
Trihalomethanes [THMs], total	----	E611B/CG	2.0	µg/L	4.3	
Volatile Organic Compounds (THMs) Surrogates						
Bromo fluorobenzene, 4-	460-00-4	E611B/CG	1.0	%	71.9	
difluoro benzene, 1,4-	540-36-3	E611B/CG	1.0	%	101	
Halo acetic Acids						
Bromo chloroacetic acid	5589-96-8	E750/WT	1.00	µg/L	<1.00	
dibromo acetic acid	631-64-1	E750/WT	1.00	µg/L	<1.00	
Dichloroacetic acid	79-43-6	E750/WT	1.00	µg/L	1.33	

Mono bromoacetic acid	79-08-3	E750/WT	1.00	µg/L	<1.00
Monochloroacetic acid	79-11-8	E750/WT	1.00	µg/L	<1.00
Trichloroacetic acid	76-03-9	E750/WT	1.00	µg/L	1.44
halo acetic acids, total [HAA5]	n/a	E750/WT	5.00	µg/L	<5.00

		Client sampling date / time			17-Jul-2024 13:00
Analyte	*CAS Number*	*Method/Lab*	*LOR*	*Unit*	**CG2410017-001**
					Result
Volatile Organic Compounds (THMs)					
Bromodichloromethane	75-27-4	E611B/CG	1.0	µg/L	2.0
Bromoform	75-25-2	E611B/CG	1.0	µg/L	<1.0
Chloroform	67-66-3	E611B/CG	1.0	µg/L	21.8
Dibromochloromethane	124-48-1	E611B/CG	1.0	µg/L	<1.0
Trihalomethanes [THMs], total	----	E611B/CG	2.0	µg/L	23.8
Volatile Organic Compounds (THMs) Surrogates					
Bromo fluorobenzene, 4-	460-00-4	E611B/CG	1.0	%	93.6
Difluoro benzene, 1,4-	540-36-3	E611B/CG	1.0	%	101
Halo acetic Acids					
Bromo chloroacetic acid	5589-96-8	E750/WT	1.00	µg/L	1.37
Dibromo acetic acid	631-64-1	E750/WT	1.00	µg/L	<1.00
Dichloroacetic acid	79-43-6	E750/WT	1.00	µg/L	17.0
Mon bromoacetic acid	79-08-3	E750/WT	1.00	µg/L	<1.00
Monochloroacetic acid	79-11-8	E750/WT	1.00	µg/L	1.90
Trichloroacetic acid	76-03-9	E750/WT	1.00	µg/L	14.6
Halo acetic acids, total [HAA5]	n/a	E750/WT	5	µg/L	33.5

		Client sampling date / time			16-Oct-2024 10:10
Analyte	*CAS Number*	*Method/Lab/Accreditation*	*LOR*	*Unit*	**CG2415274-001**
					Result
Volatile Organic Compounds (THMs)					
Bromodichloromethane	75-27-4	E611B/CG	1.0	µg/L	1.8
Bromoform	75-25-2	E611B/CG	1.0	µg/L	<1.0
Chloroform	67-66-3	E611B/CG	1.0	µg/L	4.8
Dibromochloromethane	124-48-1	E611B/CG	1.0	µg/L	1.0
Trihalomethanes [THMs], total	----	E611B/CG	2.0	µg/L	7.6
Volatile Organic Compounds (THMs) Surrogates					

Bromo fluorobenzene, 4-	460-00-4	E611B/CG	1.0	%	70.8
Difluoro benzene, 1,4-	540-36-3	E611B/CG	1.0	%	96.3
Halo acetic Acids					
Bromo chloroacetic acid	5589-96-8	E750/WT	1.00	µg/L	<5.00 DLM
Dibromo acetic acid	631-64-1	E750/WT	1.00	µg/L	<5.00 DLM
Dichloroacetic acid	79-43-6	E750/WT	1.00	µg/L	<5.00 DLM
Mono bromoacetic acid	79-08-3	E750/WT	1.00	µg/L	<5.00 DLM
Monochloroacetic acid	79-11-8	E750/WT	1.00	µg/L	<5.00 DLM
Trichloroacetic acid	76-03-9	E750/WT	1.00	µg/L	<5.00 DLM
Halo acetic acids, total [HAA5]	n/a	E750/WT	5.00	µg/L	<11.2

System Maintenance

Bluestem Utilities operator has performed general maintenance of the water system including.

- Maintenance and calibration of equipment at the water treatment plant,
- Inspection and exercising (close/open) of main water valves,
- Check pressures, flows and exercise isolation valves on fire hydrants,
- Flush the distribution system.