RAYLEIGH WATERWORKS DISTRICT

2022
Annual Water Quality Report

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1. INTRODUCTION

Under the British Columbia Drinking Water Protection Act (DWPA) all water purveyors are required to provide customers (the public) with an annual report on the quality of drinking water.

This report describes where your water comes from, how it is distributed, and how we ensure it is safe to drink.

This report covers the period of January 1, 2022, to December 31, 2022.

2. ANNUAL CONSUMPTION

Total consumption in 2022 was 503,610 Cubic Meters, with an 8% reduction from 2021. The average per capita water usage in Rayleigh was 707 liters per day (Figure 2), and the average daily water production for 2022 was 1496 cubic meters (Figure 3).

Figure 1: Ten Year Consumption Comparison – Cubic Meters

Month											Year to Year Comparison		
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Average	Minimum	Maximum
January	12,447	13,387	12,863	14,472	13,858	11,743	11,484	13,091	12,491	11,627	12,746	11,484	14,472
February	11,185	11,849	11,758	13,536	12,361	10,398	10,723	11,652	11,148	9,890	11,450	9,890	13,536
March	13,974	13,268	15,750	16,945	14,015	11,813	12,053	13,558	13,251	11,393	13,602	11,393	16,945
April	27,207	20,736	35,946	44,666	18,491	20,791	21,054	29,648	36,716	24,932	28,019	18,491	44,666
May	67,006	43,512	83,730	63,370	45,793	80,717	66,681	62,172	71,427	48,615	63,302	43,512	83,730
June	64,265	72,372	91,111	77,279	97,182	79,455	85,515	46,458	103,146	56,643	77,343	46,458	103,146
July	120,848	118,352	103,766	77,706	121,664	99,599	79,777	70,389	129,036	99,760	102,090	70,389	129,036
August	105,009	84,800	86,828	93,481	102,423	85,980	90,202	93,118	83,093	105,541	93,047	83,093	105,541
September	49,765	44,068	42,176	34,345	59,343	30,873	34,150	64,398	42,226	70,524	47,187	30,873	70,524
October	21,804	21,641	21,619	18,889	17,740	15,693	14,498	20,507	18,527	34,439	20,536	14,498	34,439
November	13,609	13,593	14,087	16,827	11,234	11,657	12,125	12,406	12,450	14,676	13,266	11,234	16,827
December	14,260	14,770	15,755	17,937	11,939	12,302	12,698	12,758	12,372	15,572	14,036	11,939	17,937
Total	521,378	472,347	535,388	489,452	526,044	471,021	450,961	450,154	545,884	503,610	496,624	450,154	545,884
Daily Peak	4,567	5,339	4,497	3,892	4,738	4,467	4,091	3,738	5,076	4,411	4,482	3,738	5,339
Peak Date	24-Jul	16-Jul	28-Jun	30-Jun	09-Jul	19-Jul	07-Aug	03-Aug	28-Jun	28-Jul			
Daily Low	352	299	361	302	281	319	294	257	293	223	298	223	361
Low Date	06-Mar	01-Feb	17-Feb	07-Nov	23-Mar	28-Oct	31-Jan	08-Nov	18-Nov	05-Dec			

Figure 2: Average Daily Consumption Per Capita

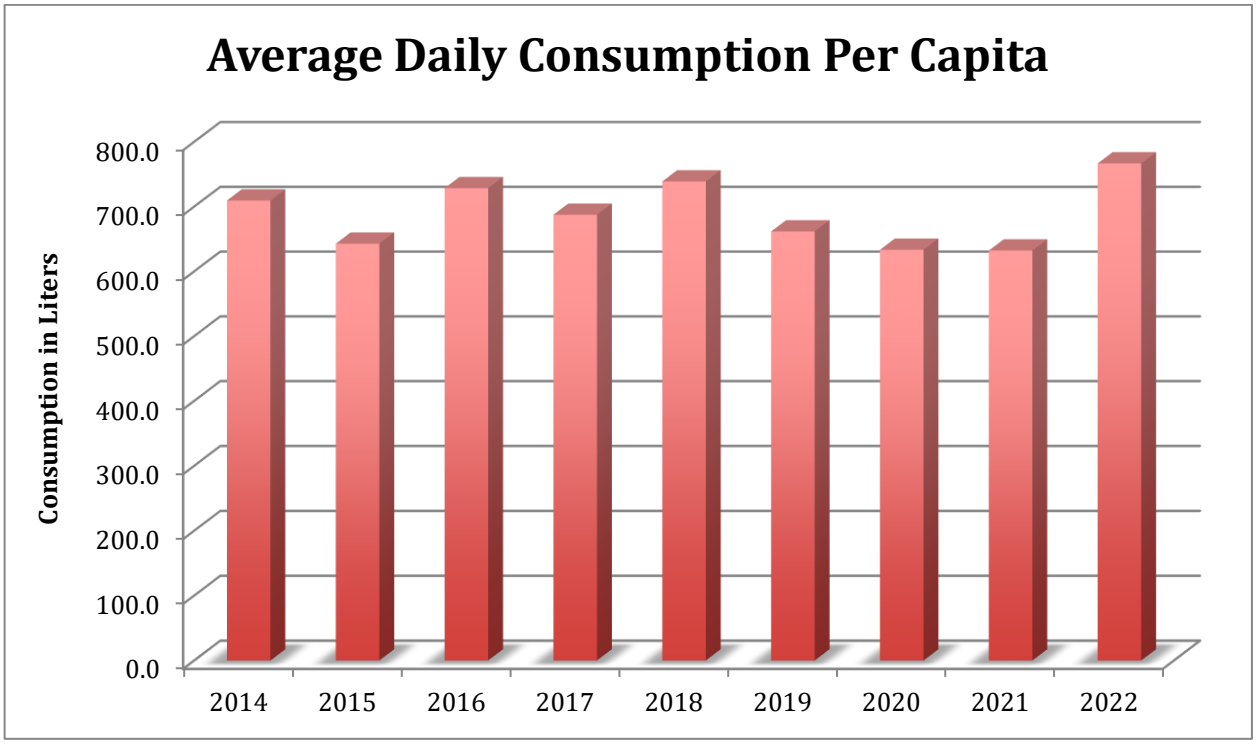
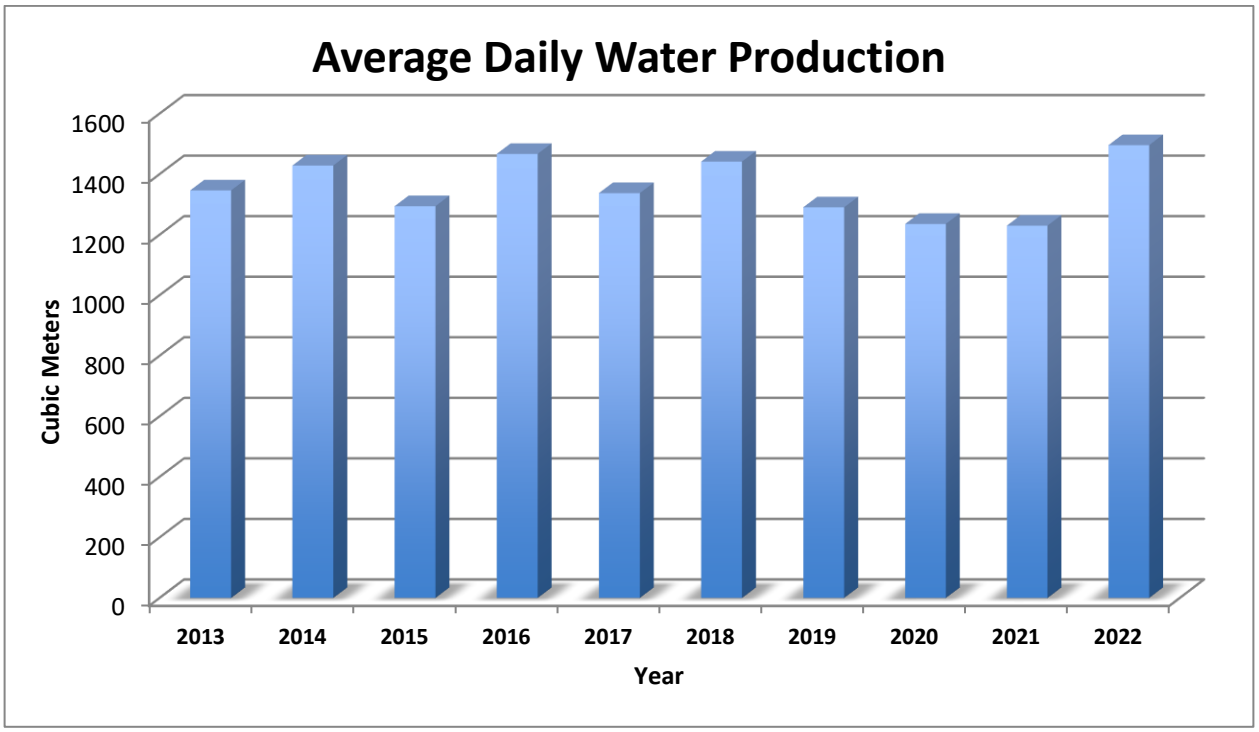


Figure 3: Average Daily Water Production



3. SYSTEM OVERVIEW

Rayleigh Waterworks District services approximately 704 connections with an estimated population of 2300 residents within its boundaries.

Source Water

The district's water supply comes from the North Thompson River. The North Thompson River originates west of the community of Valemount and joins the South Thompson in Kamloops. The Thompson River is the largest tributary of the Fraser River.

Treatment Plant

The treatment plant is a package plant from Siemens Water Technologies Corporation (now Evoqua). The plant is a conventional sand filtration, multi-barrier water treatment system.

As water is pumped from the North Thompson River it enters the Clemons Centrifugal Sand Separator, where 98 percent of 200 mesh (0.074 mm) or larger sand, grit, and other solids heavier than water are removed. The remaining particles comprised of suspended and dissolved solids are separated from the water in three different stages through the treatment plant.

Before entering the water treatment plant, raw water is injected with coagulant, rapidly mixed to attract and bind together solids into a settleable floc. The first portion of the treatment system (tube clarifier) removes these settleable solids. The second section of the treatment plant (adsorption clarifier) further reduces contaminants by removing non-settling solids. The final stage of the solid's removal process is a mixed media filter. The mixed media consists of anthracite, silica sand and garnet. As the water passes through these media particles the remaining fine solids left in the water are removed. The treated water then flows through ultraviolet (UV) reactors where UV light energy provides the first level of disinfection by inactivating any pathogens such as giardia and cryptosporidium that may remain. The second level of disinfection is provided by chlorination, ensuring safety of the water and to maintain a residual amount of chlorine throughout the distribution system as it is pumped to the residents and the reservoirs.

Distribution System

Rayleigh Waterworks Distribution system consists of approximately 18 km of a mixture of Asbestos Cement, PVC, and a small amount of ductile iron pipe (100m). Figure 4 outlines the water main material, size, and length.

Figure 4: Length of Water Main (in meters) by Material and Size

SIZE	Asbestos Cement (m)	PVC (m)
50 mm		143
100 mm	3023	109
150 mm	8596	2787
200 mm	52	4911
250 mm	634	1188
300 mm	277	1009
350 mm		4
400 mm		58
TOTAL	**12582**	**6670**

Water Storage

There are two concrete cast reservoirs with a combined capacity of 870 cubic meters. The smaller reservoir, 113 m^3 was constructed in 1967 and the larger reservoir, 757 m^3 was constructed in 1975. The Infrastructure Condition Assessment completed in October 2018 by TRU Engineering states a storage of 1900 cubic meters based on MMCD is required, (Master Municipal Construction Documents) design criteria.

4. REGULATORY REQUIREMENTS

The Province through Interior Health Authority (IHA) is the regulatory agency for water suppliers. The Drinking Water Protection Act is the legislation governing safe drinking water in the province. This legislation requires the water supplier to monitor the drinking water at source and within the distribution system to ensure compliance with the *Drinking Water Protection Regulation* and report all results to IHA.

Interior Health Authority's 4-3-2-1-0 Drinking Water Objective provides a performance target for all water suppliers to provide consumers with microbiological safe drinking water. The drinking water objective is:

- 4 log (99.99%) inactivation of viruses
- 3 log (99.9%) removal or inactivation of Giardia Lamblia and Cryptosporidium
- 2 refers to two treatment processes for all surface drinking water systems.
- 1 for less than 1 NTU of turbidity with a target of 0.1 NTU
- 0 total and fecal coliforms and E. Coli.

The following definitions apply to Rayleigh Waterworks

4 Log inactivation of viruses
Viruses are easily inactivated by using chlorine. Maintaining 0.5 mg/L of free chlorine for 20 minutes is adequate in most cases.

3 Log removal or inactivation of Giardia Lamblia and Cryptosporidium
Giardia may be inactivated by large doses of free chlorine, ultraviolet light, or removed by filtration. Systems with optimized conventional rapid sand filtration can achieve 3 log removal of Cryptosporidium. Ultraviolet disinfection is given a credit of 3.0 logs if the dose is a minimum of 40 mJ/cm^2.

2 Treatment Barriers
2 treatment barriers are a minimum for all surface water sources. The main risk to water quality is from microbiological agents. It is recognized that effective treatment for all microbial risks by a single treatment barrier is not effective. A minimum dual barrier of treatment is required for all surface water to reduce the risk of microbial or health threats to drinking water. Water filtration and disinfection meet the 2 treatment barriers.

<1 NTU of turbidity (less than)
The guidelines for the Canadian Drinking Water Quality currently specify that the filtered treated water from conventional filtration have turbidity ≤ 0.3 NTU in at least 95% of measurements either per filter cycle or per month; never to exceed 1.0 NTU. Filtration systems should be designed to reduce turbidity levels as low as reasonably achievable and strive to achieve a treated water turbidity target of less than 0.1 NTU.

0 Fecal coliform or E. coli bacteria
The Drinking Water Protection Act requires water suppliers to provide water with zero E. coli sample results. Coliform bacteria are easily controlled with chlorine, UV light and can be reduced by filtration.

5. WATER QUALITY MONITORING

Water samples are taken daily at source and after treatment and analyzed to confirm compliance with applicable requirements. Figure 5 summarizes the monthly averages of both source and treated water. Weekly bacteriological samples are taken from a rotating location within the distribution system and submitted to ALS Environmental Laboratories for independent analysis. These weekly samples are also analyzed in house for free and total chlorine and turbidity. Figure 6 summarizes these results.

RWWD personnel also sample the treated water daily for bacteriological analysis using IDEXX Colilert Test. Colilert simultaneously detects total coliforms and *e. coli* in water. All daily water samples taken using the Colilert test are analyzed to ensure that they pass, meaning they test negative for total coliform and *e. coli.*

pH

The pH of water is a measurement of how acidic or basic it is. The pH scale runs from 0 (most acidic) to 14 (most basic) and 7 being neutral. Natural waters usually have a pH of between 6.5 and 8.5.

Turbidity

Turbidity is the cloudy appearance of water caused by the presence of suspended and colloidal matter. A turbidity measurement is used to indicate the clarity of water. The measurement unit is called a Nephelometric Turbidity Unit (NTU). The turbidimeter measures the intensity of light scattered at 90 degrees as a beam of light passes through a water sample.

Aluminum

We use an aluminum-based coagulant in the treatment process and by monitoring the amount in our treated water we can ensure that the coagulant is not being overdosed and entering our drinking water at elevated levels. For treatment plants using aluminum-based coagulants, GCDWQ has an operational guideline of 0.1 mg/L on water leaving a plant.

Iron

Iron is naturally occurring through the erosion of rocks and minerals. No evidence exists of dietary iron toxicity in the public. The aesthetic objective outlined in the GCDWQ is ≤ 0.3 mg/L.

Free & Total Chlorine

Chlorine levels are important in water treatment to ensure that water is safe all the way through the distribution system to each home. Sodium hypochlorite is the form of chlorine used in our treatment system. Free chlorine measures the amount of hypochlorite in our water, while total chlorine measures the free chlorine plus any combined chlorine disinfectants such as chloramines.

UV Transmittance (UVT)

UVT is related to the quantity of organics, colloidal solids and other material in the water which absorb and scatter the UV light as it passes through the water. In a UV disinfection system, if the UVT of the water is too low, then the UV light is not able to penetrate the water as efficiently, thereby reducing the effective UV dose delivered.

Background Bacterial Monitoring

Background bacteria monitoring is done through what is called a heterotrophic plate count (HPC). Heterotrophic bacteria are a group of bacteria that use carbon as a food source and can be found in a variety of water sources. Most bacteria found in water are heterotrophic. In general, these bacteria are not pathogenic, and the HPC test will not tell you whether the water is safe to drink. Because of this, there is no maximum acceptable concentration (MAC), as stated in the GCDWQ. This test tells us if there are conditions within the system that bacteria can regrow or thrive in.

Coliform Bacteria Monitoring

Coliform bacteria represent a large group of bacteria found in water and soil, on vegetation, and in the feces of mammals. Most of these bacteria are not harmful to humans but, because of the ease of testing of these bacteria, it makes for a great indicator of contamination.
In water treatment systems, there is a zero-threshold allowance for coliforms within water samples. If a sample shows positive for coliforms, the site is immediately resampled and, if coliforms are found again, a boil water advisory is put in place while working closely with the local health authority.

E. Coli Bacterial Monitoring

E. coli bacteria are a subsection of coliform bacteria. These bacteria may not be harmful to human health, but specific strains can cause serious health issues and even death in some instances. These bacteria are also found almost exclusively in the feces of mammals; therefore, they are a definite sign of contamination. Any positive counts for coliforms or E. coli result in an immediate boil water advisory, resampling, and cleaning of the affected area. The results for the 2020 distribution system can be seen in Figure 6.

Figure 3: Water Quality Monthly Average

2022

SOURCE & TREATED WATER QUALITY MONTHLY AVERAGE

	RIVER				TREATED EFFLUENT						
Date:	Turbidity	Temperature	pH	Iron	Turbidity	Temperature	pH	Res. Chlorine	Iron	Aluminum	UV Transmittance
	NTU	°C		mg/L	NTU	°C		ppm	mg/L	mg/L	%
JANUARY	2.87	1.05	7.02	0.06	0.040	1.54	7.01	0.66	0.02	0.011	97%
FEBRUARY	2.35	0.93	7.07	0.07	0.040	1.77	7.12	0.64	0.07	0.011	97%
MARCH	4.80	3.22	7.04	0.12	0.038	3.33	7.30	0.62	0.02	0.011	97%
APRIL	5.42	6.93	7.40	0.11	0.040	8.27	7.31	0.57	0.02	0.011	96%
MAY	12.1	8.5	7.19	0.14	0.037	10.2	7.14	0.59	0.02	0.011	95%
JUNE	18.65	10.7	7.10	0.14	0.040	11.7	7.08	0.64	0.04	0.009	97%
JULY	14.54	14.6	7.12	0.02	0.040	16.1	7.18	0.64	0.01	0.002	98%
AUGUST	20.9	18.0	7.29	0.03	0.042	19.9	7.18	0.65	0.01	0.017	98%
SEPTEMBER	13.99	15.0	7.38	0.01	0.044	17.6	7.13	0.63	0.00	0.002	99%
OCTOBER	7.57	11.25	7.19	0.01	0.046	13.63	7.23	0.60	0.00	0.002	99%
NOVEMBER	3.64	3.31	7.11	0.01	0.044	4.42	7.09	0.59	0.001	0.002	99%
DECEMBER	2.71	1.77	7.22	0.01	0.048	2.03	6.97	0.61	0.00	0.001	98%

* ND Not Detectable

Figure: 6 Weekly Distribution Samples

RAYLEIGH WATERWORKS DISTRICT
DISTRIBUTION SAMPLES
2022

DATE	SAMPLE LOCATION	RESIDUAL mg/L FREE	RESIDUAL mg/L TOTAL	TURBIDITY NTU	ALS ENVIRONMENTAL * MPN/100 mL **CFU/100mL E. coli	COLIFORM BACTERIA TOTAL	COLIFORM TOTAL BACKGROUND	CERTIFICATE OF ANALYSIS
04-Jan	Yellowhead South	0.22	0.24	0.29	* <1	* <1	** <1	KS2200010-001
11-Jan	Yellowhead North	0.54	0.55	0.20	* <1	* <1		KS2200068-001
18-Jan	Hyas Place	0.60	0.63	0.35	* <1	* <1	** <1	KS2200147-001
25-Jan	Reighmount Place	0.34	0.36	0.65	* <1	* <1		KS2200210-001
01-Feb	Hyas Place	0.46	0.49	0.09	* <1	* <1		KS2200301-001
09-Feb	Reighmount Place	0.59	0.68	0.26	** <1	** <1	** <1	KS220380-001
15-Feb	Reighmount Drive	0.53	0.57	0.34	** <1	** <1	** <1	KS2200509-001
23-Feb	Strawberry Lane	0.36	0.36	0.09	** <1	** <1	** <1	KS2200542-001
01-Mar	Pinantan Place	0.55	0.58	0.30	** <1	** <1	** <1	KS2200657-001
09-Mar	Yellowhead North	0.38	0.43	0.19	** <1	** <1	** <1	KS2200765-001
15-Mar	Hyas Place	0.51	0.59	0.2	** <1	** <1	1	KS2200828-001
22-Mar	Reighmount Place	0.55	0.61	0.61	** <1	** <1	** <1	KS2200925-001
29-Mar	Reighmount Drive	0.47	0.53	0.23	** <1	** <1	** <1	KS2201031-001
05-Apr	Rayleigh Elementary School	0.51	0.57	0.19	** <1	** <1	** <1	KS2201117-001
12-Apr	Hyas Place	0.48	0.52	0.14	** <1	** <1	** <1	KS2201208-001
19-Apr	Davie Road	0.44	0.55	0.33	** <1	** <1	** <1	KS2201286-001
24-Apr	Strawberry Lane	0.53	0.60	0.26	** <1	** <1	** <1	KS2201362-001
05-May	Pinantan Pl	0.43	0.49	0.23	** <1	** <1	** <1	KS2201531-001
10-May	Yellowhead South	0.27	0.32	0.33	** <1	** <1	** <1	KS2201581-001
17-May	Yellowhead North	0.37	0.41	0.15	** <1	** <1	** <1	KS2201683-001
24-May	Hyas Place	0.51	0.51	0.20	** <1	** <1	** <1	KS2201766-001
31-May	Reighmount Place	0.59	0.62	0.34	** <1	** <1	** <1	KS2201887-001
07-Jun	Reighmount Drive	0.62	0.66	0.22	** <1	** <1	** <1	KS2201990-001
14-Jun	Rayleigh Elementary	0.54	0.57	0.35	** <1	** <1	** <1	KS2202129-001
21-Jun	3990 Davie Road	0.46	0.48	0.15	** <1	** <1	** <1	KS2202222-001
28-Jun	Strawberry Lane	0.41	0.44	0.13	** <1	** <1	** <1	KS2202342-001
28-Jun	Reighmount Place	0.70	0.71	0.24	** <1	** <1	** <1	KS2102040-001
04-Jul	Pinantan Place	0.43	0.44	0.96	**<1	** <1	** <1	KS2202401-001
12-Jul	Yellowhead South	0.23	0.26	0.55	**<1	** <1	** <1	KS2202512-001
19-Jul	Yellowhead North	0.32	0.35	0.32	**<1	** <1	** <1	KS2202595-001
27-Jul	Hyas Pl	0.73	0.75	0.16	**<1	** <1	** <1	KS2202726-001
04-Aug	Reighmount Pl	0.53	0.55	0.09	**<1	** <1	** <1	KS2202842-001
09-Aug	Reighmount Dr.	0.54	0.66	1.8	**<1	** <1	** <1	KS2202903-001
15-Aug	Davie Rd.	0.36	0.37	0.22	**<1	** <1	** <1	KS2202980-001
24-Aug	Strawberry Lane	0.33	0.38	0.39	**<1	** <1	** <1	KS2202909-001
30-Aug	Pinantan Place	0.59	0.65	0.47	**<1	** <1	** <1	KS2203115-001
06-Sep	Yellowhead South	0.38	0.39	0.35	**<1	** <1	** <1	KS2203299-001
12-Sep	Yellowhead North	0.41	0.42	0.47	**<1	** <1	** <1	KS2203402-001
19-Sep	Hyas Place	0.51	0.54	0.28	**<1	** <1	** <1	KS2203499-001
27-Sep	Reighmount Place	0.44	0.53	0.67	**<1	** <1	** <1	KS2203651-001
04-Oct	Reighmount Drive	0.55	0.59	0.33	**<1	** <1	** <1	KS2203753-001
11-Oct	Rayleigh Elementary	0.6	0.69	0.12	**<1	** <1	** <1	KS2203865-001
18-Oct	Davie Rd.	0.43	0.46	0.18	**<1	** <1	** <1	KS2203980-001
25-Oct	Strawberry Lane	0.48	0.51	0.46	**<1	** <1	** <1	KS2204076-001
01-Nov	Pinantan Place	0.51	0.55	0.74	**<1	** <1	** <1	KS2204189-001
08-Nov	Yellowhead South	0.29	0.38	0.18	** <1	** <1	** <1	KS2204269-001
17-Nov	Yellowhead North	0.42	0.46	0.34	**<1	** <1	** <1	KS2204389-001
22-Nov	Hyas Place	0.37	0.43	0.21	**<1	** <1	** <1	KS2204427-001
28-Nov	Reighmount Drive	0.58	0.59	1.76	** <1	** <1	** <1	KS2204516-001
06-Dec	Reighmount Drive	0.53	0.6	0.16	**<1	** <1	** <1	KS2204590-001
13-Dec	Rayleigh Elementary	0.4	0.58	0.32	**<1	** <1	** <1	KS2204696-001
20-Dec	Strawberry Lane	0.47	0.58	0.44	** <1	** <1	** <1	KS2204793-001
28-Dec	Pinantan Place	0.48	0.56	0.25	** <1	** <1	** <1	KS2204834-001

MPN/100 mL Most Probable Number per 100 mL
CFU/100 mL Colony Forming Units per 100 mL

Potable Water Disinfection By-Products

Interior Health Authority requested that RWWD sample the distribution system quarterly for Trihalomethanes (THM's), Haloacetic Acids (HAA's) and Total Organic Carbon (TOC). These analyses are performed by ALS Environmental. The results are presented in figure 7.

Trihalomethanes are formed as a by-product predominantly when chlorine is used to disinfect water for drinking. They represent one group of chemicals generally referred to as disinfection by-products. THM's result from the reaction of chlorine and/or bromine with organic matter present in the water being treated.

Haloacetic acids are a type of chlorination disinfection by-product that are formed when the chlorine used to disinfect drinking water reacts with naturally occurring organic matter (NOM) in water. Haloacetic Acids five (HAA5) refers to the five haloacetic acids most found in drinking water. HAA5 consists of monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid. HAA5 are more likely to be found at higher levels in water supplies with surface water sources such as rivers since soil and rock act as filters to reduce organic matter found in groundwater.

Trihalomethane and Haloacetic Acid results are below GCDWQ Maximum Allowable Concentration.

Test Description	2022 - Results				Units of Measure	BCDWQG MAC	GCDWQ MAC
	22-Feb	10-May	09-Aug	01-Nov			
Organic / Inorganic Carbon							
Total Organic Carbon	1.05	2.04	0.81	0.85	mg/L	**4 mg/L**	
Trihalomethanes							
Bromodichloromethane	<0.0010	<0.0010	<0.0010	0.0011	mg/L		
Bromoform	<0.0010	<0.0010	<0.0010	<0.0010	mg/L		
Dibromochloromethane	<0.0010	<0.0010	<0.0010	0.0186	mg/L		
Chloroform	0.0226	0.0300	0.0159	<0.0010	mg/L		
Total Trihalomethanes	0.0226	0.0300	0.0159	0.0197	mg/L	**0.1 mg/L**	**0.1 mg/L**
Haloacetic Acids							
Bromochloroacetic acid	<1.00	<1.00	<1.00	<1.00	µg/L		
Monochloroacetic Acid	<1.00	<1.00	<1.00	<1.00	µg/L		
Dichloroacetic Acid	7.35	10.5	2.75	3.23	µg/L		
Trichloroacetic Acid	9.34	9.15	<1.00	<1.00	µg/L		
Monobromoacetic Acid	<1.00	<1.00	<1.00	<1.00	µg/L		
Dibromoacetic Acid	<1.00	<1.00	6.16	5.45	µg/L		
Total Haloecetic Acids 5	16.7	19.6	8.91	8.68	µg/L	**80 µg/L**	**80 µg/L**

BCDWQG = British Columbia Drinking Water Quality Guidelines (Jan. 2022)
GCDWQ = Guidelines for Canadian Drinking Water Quality (Mar, 2022)
MAC - Maximum Acceptable Concentration

Source Water Analysis

The results of an extensive water quality analysis on the source water are presented in Figure 8. These analyses were performed by ALS Environmental Laboratories, a Provincially accredited lab.

Figure 8: Source Water - Physical and Chemical Properties

Test Description	2022 - Results		Unit of Measure
	Date	Date	
Physical Tests	18-May	12-Sep	
conductivity	85.5	91.3	µS/cm
colour, true	21.4	7.8	CU
hardness (as CaCO3), dissolved	38.3	41.6	mg/L
hardness (as CaCO3), from total Ca/Mg	40.8	43.3	mg/L
pH	7.74	7.78	pH units
solids, total dissolved [TDS]	61	67	mg/L
solids, total suspended [TSS]	12.5	6.4	mg/L
turbidity	7.98	4.94	NTU
Anions and Nutrients			
bromide	<0.050	<0.050	mg/L
Chloride (Cl)	<0.50	<0.50	mg/L
Flouride (F)	0.05	0.042	mg/L
Nitrate (as N)	0.138	0.0707	mg/L
Nitrite (as N)	<0.0010	<0.0010	mg/L
Sulfate (SO4)	4.80	8.6	mg/L
Organic / Inorganic Carbon			
Total Organic Carbon	5.91	1.3	mg/L
Total Metals			
aluminum, total	0.49	0.295	mg/L
antimony, total	<0.00010	<0.00010	mg/L
arsenic, total	0.00021	0.0001	mg/L
barium, total	0.0114	0.00954	mg/L
beryllium, total	<0.000100	<0.000100	mg/L
bismuth, total	<0.000050	<0.000050	mg/L
boron, total	<0.010	<0.010	mg/L
cadmium, total	0.0000065	0.0000077	mg/L
calcium, total	12.5	13.6	mg/L
cesium, total	0.000107	0.000102	mg/L
chromium, total	0.00102	0.00061	mg/L
cobalt, total	0.00043	0.00028	mg/L
copper, total	0.00462	0.0016	mg/L
iron, total	0.712	0.434	mg/L
lead, total	0.000397	0.00022	mg/L
lithium, total	0.0015	0.0022	mg/L
magnesium, total	2.32	2.27	mg/L
manganese, total	0.0183	0.0123	mg/L
mercury, total	<0.0000050	<0.0000050	mg/L
molybdenum, total	0.00122	0.000528	mg/L
nickel, total	0.00239	0.00171	mg/L
phosphorus, total	<0.050	<0.050	mg/L
potassium, total	0.939	0.98	mg/L
rubidium, total	0.00228	0.00286	mg/L
selenium, total	0.00012	0.000063	mg/L
silicon, total	4.34	2.46	mg/L
silver, total	<0.000010	<0.000010	mg/L
sodium, total	1.52	1.22	mg/L
strontium, total	0.0735	0.0904	mg/L
sulfur, total	1.74	3.15	mg/L
tellurium, total	<0.00020	<0.00020	mg/L
thallium, total	<0.000010	0.000012	mg/L
thorium, total	<0.00010	<0.00010	mg/L
tin, total	<0.00010	<0.00010	mg/L
titanium, total	0.0327	0.0273	mg/L
tungsten, total	<0.00010	<0.00010	mg/L
uranium, total	0.000405	0.000316	mg/L
vanadium, total	0.00128	0.00097	mg/L
zinc, total	0.0061	0.0034	mg/L
zirconium, total	<0.00020	<0.00020	mg/L

Figure 8: Source Water - Physical and Chemical Properties continued

Test Description	2022 - Results		Unit of Measure
	Date	Date	
Dissolved Metals	18-May	12-Sep	
aluminum, dissolved	0.0433	0.0227	mg/L
antimony, dissolved	<0.00010	<0.00010	mg/L
arsenic, dissolved	0.00013	0.0001	mg/L
barium, dissolved	0.00724	0.00723	mg/L
beryllium, dissolved	<0.000100	<0.000100	mg/L
bismuth, dissolved	<0.000050	<0.000050	mg/L
boron, dissolved	<0.010	<0.010	mg/L
cadmium, dissolved	0.0000062	<0.0000050	mg/L
calcium, dissolved	11.6	13.3	mg/L
cesium, dissolved	<0.000010	0.000015	mg/L
chromium, dissolved	<0.00050	<0.00050	mg/L
cobalt, dissolved	<0.00010	<0.00010	mg/L
copper, dissolved	0.00203	0.00103	mg/L
iron, dissolved	0.05	0.033	mg/L
lead, dissolved	0.000076	<0.000050	mg/L
lithium, dissolved	<0.0010	0.0011	mg/L
magnesium, dissolved	2.26	2.04	mg/L
manganese, dissolved	0.00309	0.00472	mg/L
mercury, dissolved	<0.0000050	<0.0000050	mg/L
molybdenum, dissolved	0.00128	0.000511	mg/L
nickel, dissolved	0.00093	0.00098	mg/L
phosphorus, dissolved	<0.050	<0.050	mg/L
potassium, dissolved	0.84	0.853	mg/L
rubidium, dissolved	0.00116	0.00187	mg/L
selenium, dissolved	0.000118	<0.000050	mg/L
silicon, dissolved	3.63	1.96	mg/L
silver, dissolved	<0.000010	<0.000010	mg/L
sodium, dissolved	1.56	1.140	mg/L
strontium, dissolved	0.0698	0.082	mg/L
sulfur, dissolved	1.42	3.11	mg/L
tellurium, dissolved	<0.00020	<0.00020	mg/L
thallium, dissolved	<0.000010	<0.000010	mg/L
thorium, dissolved	<0.00010	<0.00010	mg/L
tin, dissolved	<0.00010	<0.00010	mg/L
titanium, dissolved	0.00082	0.00056	mg/L
tungsten, dissolved	<0.00010	<0.00010	mg/L
uranium, dissolved	0.000309	0.000263	mg/L
vanadium, dissolved	<0.00050	<0.00050	mg/L
zinc, dissolved	0.002	0.0023	mg/L
zirconium, dissolved	<0.00020	<0.00020	mg/L
dissolved mercury filtration location	Field	Field	
dissolved metals filtration location	Laboratory	Field	

DLB = Detection Limit Raised. Analyte detected at comparable level in Method Blank
- A blank entry designates no known limit

Unit	Description
-	No Unit
µS/cm	Microsiemens per centimetre
CU	colour units (1CU = 1 mg/L Pt)
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units

6. WATER QUALITY CONCERNS

Rayleigh Waterworks received and responded to two water pressure concerns and no water quality complaints in 2022. Operators assessed both incidents which led to one resident situated at the very end of road at a dead-end distribution line that is not looped into the rest of the grid. The resident has been aware of the situation since the original service installation 40 + years ago. Due to the limitations of tie-in access of easements and existing railroad location there was no way to alleviate the issue. The second resident had issues with original plumbing water service tie-in design issue from a ¾ inch service down to a ½ inch into the residence.

7. CROSS CONNECTION CONTROL PROGRAM

Cross connection refers to an actual or potential connection between a potable water supply and an industrial, commercial, or residential source of contamination.

To prevent cross connection from occurring a backflow prevention device is installed on the customer's water piping at the source of potential contamination and/or on the water service line on the customer's property.

Currently RWWD bylaws are in place that require any new connections that are over 1" to install an approved backflow preventer. Commercial accounts within the district's boundaries are currently required to have these devices installed and have them tested annually and provide certification to RWWD.

All residential, commercial, or other designated customer piping serving irrigation purposes must have a back flow prevention assembly installed at the take-off point and all such points if multiple take offs are used.

All back flow prevention assemblies shall be of a type acceptable to RWWD.
Before any person shall connect to any standpipe or fire hydrant within the district, they must fill out a usage permit and obtain written approval. A meter wagon and backflow preventer supplied by the district are required to be connected to the district's access point for the duration of the permit. The user must also provide proof of liability insurance coverage prior to approval of the permit.

All residential properties that are located on the East Side of Highway 5 are required to install a booster pump and back flow prevention assembly at their own cost. Upon installation of the booster pump and back flow preventer the customer is required to notify RWWD of completion and an operator from the district will inspect and confirm installation.

8. EMERGENCY RESPONSE PLAN

RWWD has an Emergency Response Plan pertaining to the water system. The emergency response plan identifies several potential emergencies that can occur and provides a systematic approach on how the district will deal with the emergency.

9. 2022 Challenges and Successes

RWWD still continues to deal with peak water demands during the irrigational season requirements and excessive water consumption, to meet minimum fire protection reservoir storage levels. This was achieved by RWWD operations by efficiently optimizing process control and daily visual checks throughout the community to capture any Water Restriction violators. Ongoing challenges with high costs of hauling solids from our waste tank from the water plant.

The valve exercise program was completed in May of 2022 on all of our water main isolation valves within the Rayleigh Improvement District distribution system.

10. 2022 Projects:

The SCADA software system for the water plant was upgraded by Exceed Engineering Inc. Annual recertification of online instrumentation and back flow prevention devices for RWWD Utilities were completed. Another River Pump was rebuilt as per O&M requirements. The valve exercise program was completed in May of 2022 on all of our water main isolation valves within the Rayleigh Improvement District distribution system.

11. Planned 2023 Projects

Continuation of annual valve exercise program on distribution system. Initiate a plan with existing staff to conduct the uni-directional flushing program on the distribution system. Source out capital costs for a stand-alone dewatering system for the waste tanks at the water plant to eliminate high-cost solids disposal.

12. STAFF CERTIFICATION

In accordance with Interior Health Authority's Condition of Permit and the Environmental Operators Certification Program (E.O.C.P), all operators employed by the Rayleigh Waterworks District must be certified and complete a specific schedule of training to retain certification. The following certifications have been achieved to date:

Water Treatment Operator Level I
Water Treatment Operator Level MUII
Water Treatment Operator Level III
Water Distribution Operator Level II
Water Distribution Operator Level MUI
Wastewater Treatment Operator Level MUII
Wastewater Treatment Operator Level III
Wastewater Collection Operator Level I