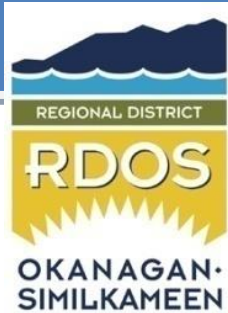
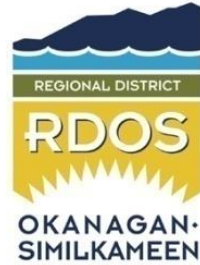


# 2023

## ANNUAL WATER QUALITY MONITORING REPORT FAULDER WATER SYSTEM



Faulder Uranium Treatment System



**2023 ANNUAL WATER QUALITY MONITORING REPORT  
FAULDER WATER SYSTEM  
FAULDER, B.C.**

Copy prepared for:  
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## 1. Introduction

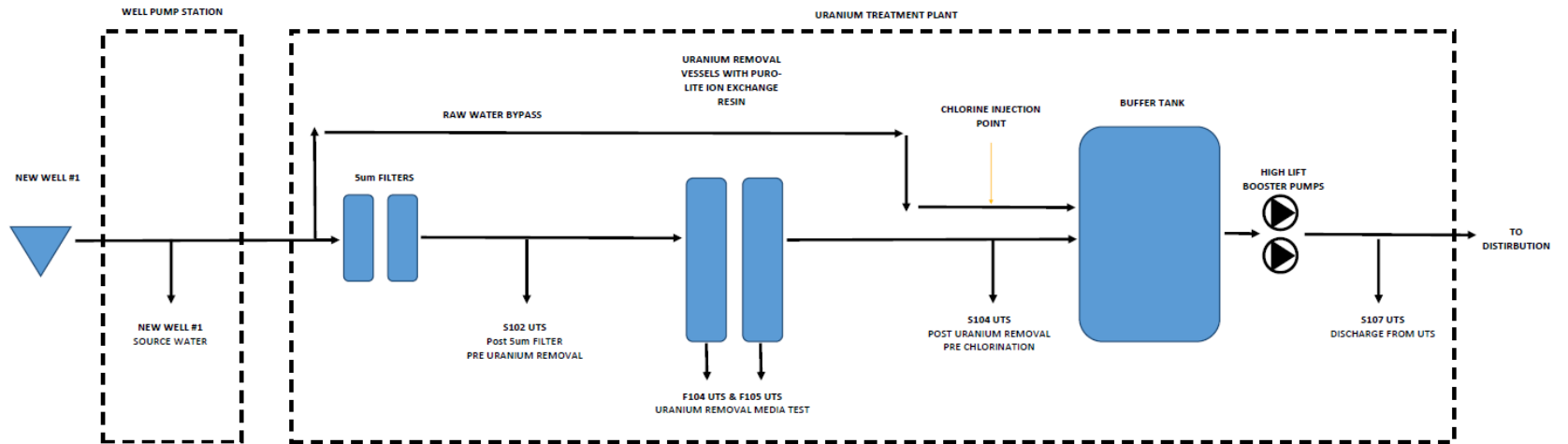
As the owner and operator of the Faulder water system, the Regional District Okanagan-Similkameen is responsible for the following Annual Report summarizing the results from the 2023 *Water Quality Monitoring Program*. The report is a conditional requirement of the *Permit to Operate* issued by the Interior Health Authority (IHA) and the *BC Drinking Water Protection Act and Regulation*.

## 2. System Description

The Faulder water system is located within Electoral Area F, approximately ten kilometers west of Summerland. The water system consists of a primary and a backup deep groundwater wells, a Uranium Treatment Plant, storage reservoir and a distribution system. The system supplies domestic water to approximately 80 connections, however, it does not support fire protection. A portion of the well water (approximately 80%) is pumped through a uranium treatment system and blended with an untreated portion (approximately 20%) to achieve a uranium concentration below the Maximum Acceptable Concentration (MAC) of 0.02 mg/L total uranium. Water is then pumped into the distribution system and to an elevated storage reservoir. There is one Booster Zone in the system supplying water to the Upper Zone, a small subdivision at an elevation higher than the Reservoir.

The Uranium Treatment System (UTS) uses an ion exchange resin (Purolite A300e) to remove uranium from a portion of the raw groundwater. This treated water is then blended with untreated groundwater to produce a product water that is below the MAC for uranium. The ion exchange media is not regenerated, instead it is disposed of when a set volume of water passes through the media resulting in uranium content that doesn't move the media into a "dangerous goods" designation allowing for safe transport for appropriate disposal.

### Uranium Treatment System – Process Diagram and Sampling Locations



In early 2023 the two vessels that were online were determined to have exceeded the pre-set volume and were due for removal/disposal. The RDOS sent two new vessels to a contractor specializing in water treatment to have the vessels filled with new Purolite A300e. As the Purolite media is hydrostatic it is understood that the media was wetted to fill the new vessels. The filled vessels were returned from BI Pure to the RDOS on March 1, 2023 and installed into the Faulder UTS on April 14, 2023. On April 27<sup>th</sup> the results were received from Caro for the April 24<sup>th</sup> routine bacteriological samples as follows:

- UTS Discharge (UTS S-107)
  - TC – Overgrown, with TC detected
  - Background – Overgrown
  - E. coli – Overgrown, without visible E.coli.
- 176 Fish Lake Rd (distribution)
  - TC - <1
  - Background – 1300 CFU/100ml
  - E. coli - <1

The system was resampled on April 27<sup>th</sup> with a report of background counts of 1900 CFU/100ml at S-107 and 4800 CFU/100ml at 176 Fish Lake Rd. Temporary chlorination was implemented on April 27<sup>th</sup>. A water quality complaint of foul smelling water was received from a resident on Fish Lake Rd on April 27<sup>th</sup>. A site visit was conducted the same day, with the plan to take a bacteriological sample, however, chlorine was already present at the time of investigation.

The RDOS suspected that the Purolite media was contaminated either when the new vessels were filled or upon installation of the vessels into the UTS Plant. This same scenario occurred in 2016 when the system was being commissioned and during this time, two vessels of media were removed and replaced due to high bacteriological counts.

Enhanced bacteriological monitoring continued in May and showed background counts throughout the UTS piping network. This resulted in a *Water Quality Advisory* for uranium being issued to allow for the disinfection of the UTS piping network with the uranium vessels removed from service as the media cannot handle any chlorine. On May 24<sup>th</sup> the UTS piping network was disinfected to AWWA standards, however, post disinfection bacteriological testing continue to report low level background bacteria, with the uranium vessels remaining offline. On June 1<sup>st</sup>, the UTS piping network was again disinfected to AWWA standards.

With significant consultation with Purolite a plan was developed to clean, disinfect and regenerate the suspected contaminated Purolite A300e media. On June 12<sup>th</sup>, the temporary chlorination was suspended in preparation of cleaning one resin vessel (F-104) as a large supply of unchlorinated water was required for the cleaning and disinfection procedure to avoid any negative effects from hypochlorite on the A300e media. The cleaning, disinfection and regeneration of the media was conducted on June 14<sup>th</sup> and 15<sup>th</sup>. The bacteriological samples taken on June 15<sup>th</sup> reported <1 background counts from vessel F-104 and all UTS network locations with the exception of UTS

discharge S-107 that reported 2 CFU/100ml. Subsequent sampling results were low in background counts with an increasing trend from F-104 and UTS piping network. On June 22<sup>nd</sup> temporary chlorination was restarted as low levels of background bacteria were periodically being detected in the UTS piping system, however, total coliforms and *E. coli* levels remained non-detect. The uranium removal media remained offline for the remainder of June.

In July the uranium removal vessels remained offline with continued enhanced bacteriological monitoring with background bacteria counts continuing to be reported. Modifications were made to the UTS piping network to remove any stagnant sections of piping with no discernable results. Flushing of the uranium removal vessels commenced in anticipation of bringing the vessels back online.

On August 4<sup>th</sup> the uranium vessels (x2) were brought back online and on August 30<sup>th</sup> the WQA for uranium was rescinded.

Background bacteria continued to be reported until mid-October when levels started to drop significantly. Background levels were intermittent and at low levels (below 30 CFU/100ml). Enhanced bacteriological monitoring will continue in 2024 and the RDOS plans to investigate typing the background bacteria as it did back in 2016 which resulted in the following species being reported:

- *Ochrobactrum anthropic*
- *Pseudomonas fluorescens*
- *Burkholderia cepacia*

### 3. System Classification and Operator Certifications

#### 3.1. System Classification

The *British Columbia Environmental Operators Certification Program (BC EOCP)* is responsible for the classification of potable water systems in BC. The Faulder water system remained classified as a *Small Water System (SWS)* in 2023.

#### 3.2. Operator Certification

The *British Columbia Environmental Operators Certification Program (BC EOCP)* is also responsible for certification of all water system operators. Operators may hold certification(s) in the disciplines of *Water Distribution* and/or *Water Treatment* with four levels of certification achievable within each discipline. RDOS Operators annually attend courses, seminars and complete online training required to maintain their levels of certification. In addition, all operators annually continue to work on augmenting and furthering their levels of certification. All RDOS Operators are certified through the *BC EOCP* as indicated in the table below.



OPERATOR EOCP CERTIFICATION No.	WATER DISTRIBUTION CERTIFICATION LEVELS				WATER TREATMENT CERTIFICATION LEVELS			
	IV	III	II	I	IV	III	II	I
1162	X						X	
4194			X					
4840			X				X	
4839		X						X
6926		X						X
8761		X						X
9322		X						X

**Table 1: RDOS Operator Certifications 2023**

**4. Annual Water Usage**

The source water for the Faulder water system is a deep groundwater well. In 2023, a total of 51,766 m<sup>3</sup> of water was pumped from the Faulder well, up from 42,930 m<sup>3</sup> in 2022.

**4.1. Annual Water Usage**

	Cubic Meters (m <sup>3</sup> )	US Gallons	
<b>Annual Total Usage</b>	51,766	13,675,130	
<b>Minimum Daily Flow</b>	35	9,246	December 14, 2023
<b>Maximum Daily Flow</b>	718	189,676	August 1, 2023

**Table 2: Annual Water Consumption 2023**

Both annual and monthly water consumption are trended in the following two graphs.

Regional District of Okanagan-Similkameen  
 Faulder Annual Water Quality Report – 2023

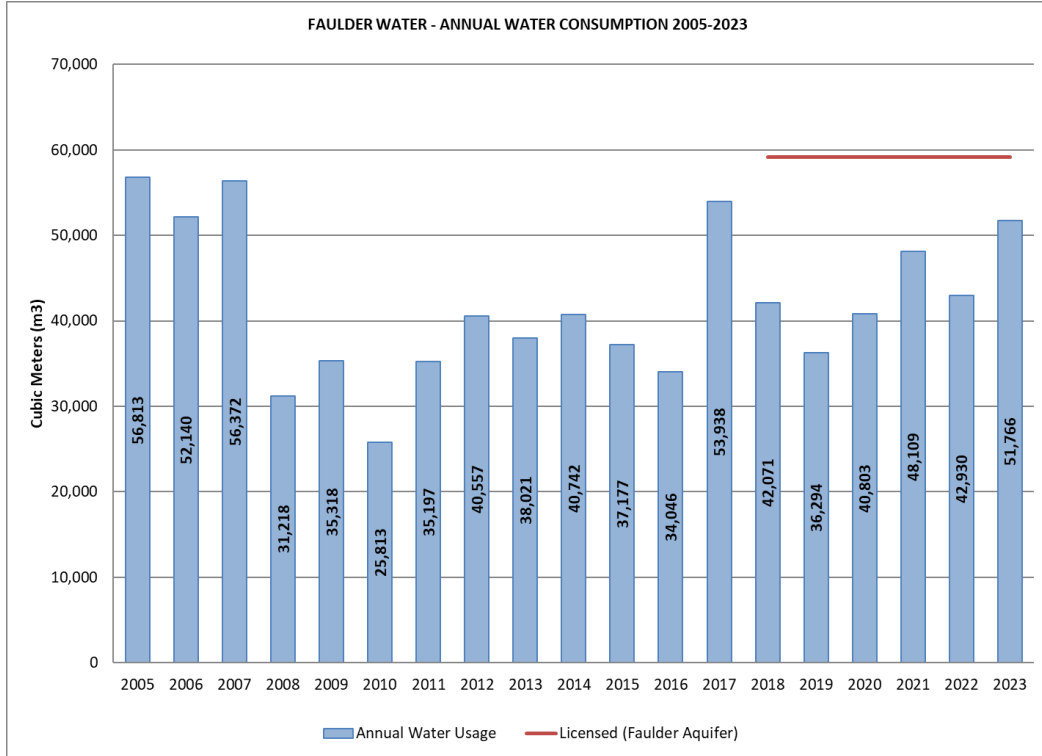


Figure 1: Annual Water Consumption 2005 to 2023

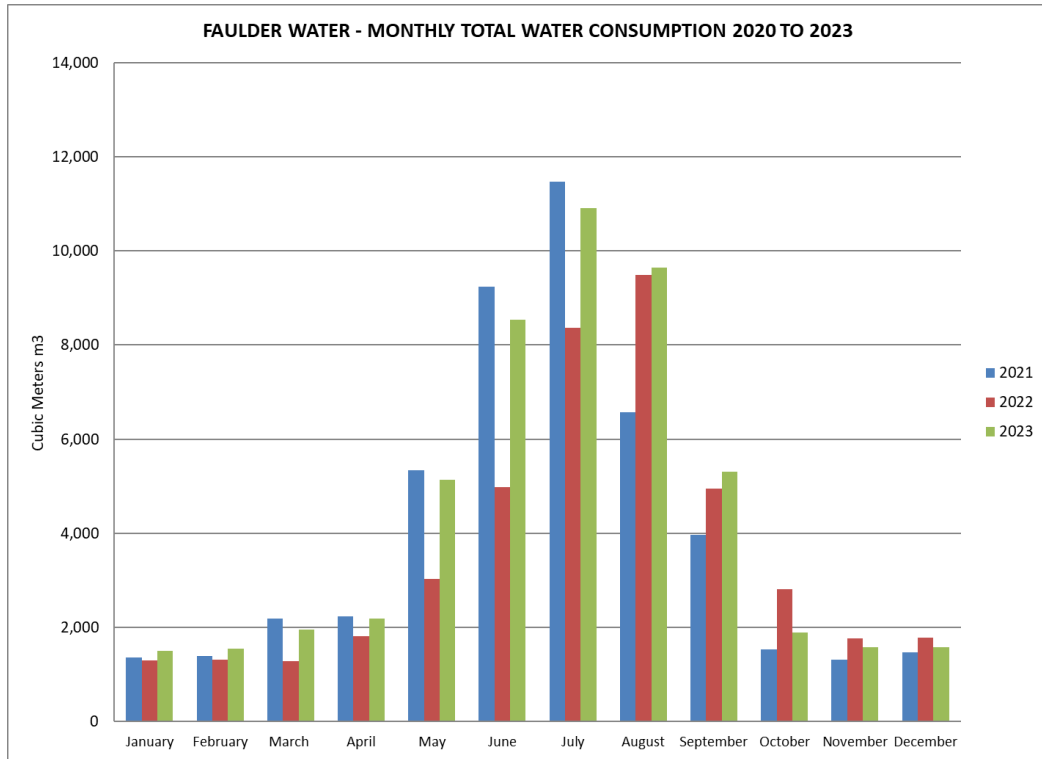


Figure 2: Monthly Water Consumption 2021 to 2023

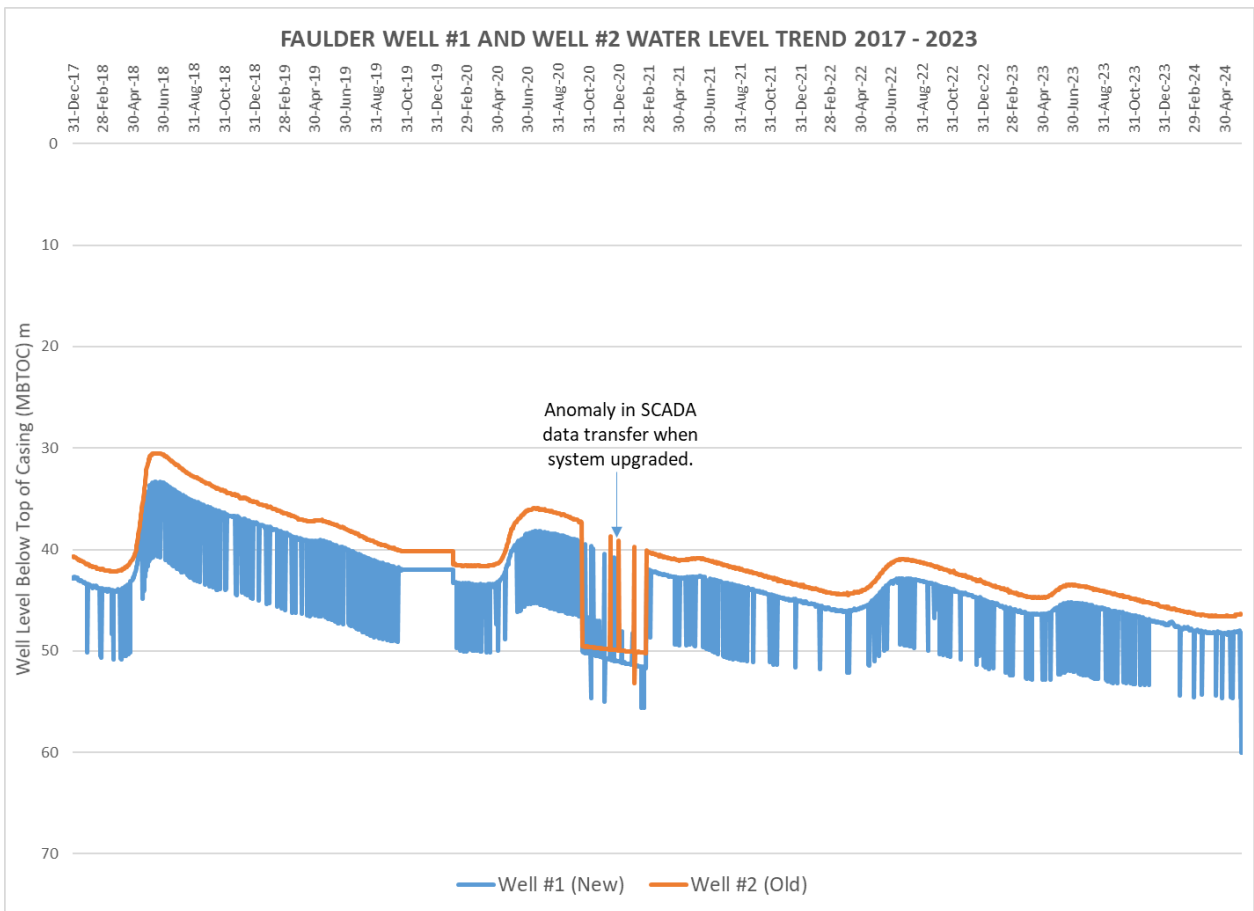
**4.2. Water Conservation**

On July 13, 2023 the Faulder water system moved from Stage “Normal” to Stage 1 water restrictions. Stage 1 restrictions are intended to reduce total and peak use by 10%. On July 21, 2023 the Faulder restrictions were further elevated from Stage 1 to Stage 2. Stage 2 restrictions are intended to reduce total and peak use by 20%. On October 16<sup>th</sup> the RDOS returned all systems to Stage “Normal”.

**5. Aquifer Monitoring**

The Faulder wells draw water from the Meadow Valley aquifer. Recharge into the Faulder section of the aquifer declined annually in 2019 through 2023 compared to 2018 which saw substantial recharge. The static water level has declined approximately 15 meters over the past 5 years.

The measured recharge into the Faulder aquifer was minimal in 2023.



**Figure 3: Faulder Aquifer Level 2017 to 2023 Trend**

## 6. Source Water Quality

All untreated source water quality parameters are compared to the *British Columbia Drinking Water Protection Act and Regulation (DWPA)* and the *Guidelines for Canadian Drinking Water Quality (GCDWQ)* unless otherwise noted, which could be indicated as an Operational Guideline (OG). The *DWPA* and *GCDWQ* define these parameters and set Aesthetic Objectives (AO) and Maximum Acceptable Concentrations (MAC).

All accredited laboratory tests in 2023 were performed by Caro Analytical Services (Kelowna, B.C.).

### 6.1. Source Water Bacteriological Results

Typically, bacteriological samples are only collected annually from Faulder’s untreated groundwater well. In 2023 the sampling frequency increased in response to the background bacteria counts. Monitoring of the Faulder well includes bacteriological grab samples and field measured parameters using field test kits. Samples from the well were analyzed for Total Coliforms and *Escherichia coli (E.coli)*. The table below summarizes the bacteriological laboratory results and the field measured parameters from the Faulder groundwater well.

Analyte	Unit	Average	Minimum	Maximum	Number of Results	Number of Results with Exceedances
<b>Field Results</b>						
Conductivity	µS/cm	399	380	448	34	0
pH		7.34	6.9	7.68	34	0
Total dissolved solids	mg/L	282	269	314	34	0
Temperature	°C	10.6	9.4	12.8	34	0
Turbidity	NTU	0.15	0.04	0.81	33	0
<b>Lab Results</b>						
<b>Microbiological</b>						
Background bacteria	CFU/100 mL	1	1	6	36	0
Total coliforms (counts)	CFU/100 mL				36	0
E. coli (counts)	CFU/100 mL				36	0

**Table 3: Faulder Well Bacteriological Testing 2023 Summary**

## **6.2. Source Water Potable Water Testing**

Annually, the RDOS submits a sample of the untreated well water to an accredited lab for comprehensive potable water testing. The results of these test are compared against the *Guidelines for Canadian Drinking Water Quality*. The *GCDWQ* establishes Maximum Acceptable Concentration (MAC), Interim Maximum Acceptable Concentrations (IMAC) and Aesthetic Objectives (AO) for parameters if applicable.

This comprehensive test includes physical parameters (e.g. color, turbidity, temperature, ultraviolet transmittance), chemical parameters (e.g. hardness, total metals and nutrients). Changes in these parameters may result in the need for water notifications for customers (i.e. Boil Water Notice or Water Quality Advisory) or the requirement for treatment processes to be implemented. The following tables display the results for the respective comprehensive potable water test.

All tested source water parameters with the exception of uranium, met the applicable guidelines in 2023 with no notable increasing or decreasing trends.

### 6.2.1. Source Water General Potability Parameters

Analyte	Unit	Guideline		Well 1 (New Well) 14- Sep-21	Well 1 (New Well) 26- Sep-22	Well 1 (New Well) 18- Sep-23
		GCDW Q MAC	GCDWQ AO			
<b>Lab Results</b>						
<b>General</b>						
Alkalinity (total, as CaCO <sub>3</sub> )	mg/L	NG	NG	180	192	183
Total organic carbon	mg/L	NG	NG	1.64	0.69	1.73
Chloride	mg/L	NG	250	10.7	13	14.1
Colour	CU	NG	15	<5.0	<5.0	<5.0
Conductivity	µS/cm	NG	NG	338	370	394
Total cyanide	mg/L	0.2 <sup>1.1</sup>	NG	<0.002 0	<0.002 0	<0.002 0
Fluoride	mg/L	1.5	NG	0.24	0.14	0.12
Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg	mg/L	NG	NG	201	165	184
Langelier Index		NG	NG	<-5.0	0.3	0.1
pH		NG	7.0 - 10.5 <sup>2.1</sup>	7.92	7.93	7.72
Total dissolved solids (computed)	mg/L	NG	500	225	221	223
Sulphate	mg/L	NG	500 <sup>2.2</sup>	15.6	16.9	15.1
Sulphide (total, as S)	mg/L	NG	0.047 <sup>2.3</sup>	<0.020	<0.020	<0.020
Turbidity	NTU	N <sup>1.2</sup>	NG	0.1	<0.10	0.3
UV transmittance at 254 nm - filtered	%	NG	NG	97.6	97.6	86.5
<b>Nutrients</b>						
Ammonia (total, as N)	mg/L	NG	NG	<0.050	<0.050	<0.050
Nitrate (as N)	mg/L	10	NG	0.347	0.309	0.241
Nitrite (as N)	mg/L	1	NG	<0.010	<0.010	<0.010
Potassium (total)	mg/L	NG	NG	3.16	3.17	3.32

See Guideline Notes in Section 6.2.2

**Table 4: Faulder Well General Potability Parameters 2023 Summary**

## 6.2.2. Guidelines Notes for General Potability Parameters

### 1. Notes for Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations (GCDWQ MAC)

#### **Note 1.1 for Total cyanide:**

The MAC for free cyanide is 0.2 mg/L. A maximum of 0.2 mg/L was used, in this report, to identify exceedances for total cyanide as a means for determining the potential for exceeding the free cyanide guideline.

#### **Note 1.2 for Turbidity:**

"Waterworks systems that use a surface water source or a groundwater source under the direct influence of surface water should filter the source water to meet health-based turbidity limits, as defined for specific treatment technologies. Where possible, filtration systems should be designed and operated to reduce turbidity levels as low as possible, with a treated water turbidity target of less than 0.1 NTU at all times. Where this is not achievable, the treated water turbidity levels from individual filters should meet the requirements described in GCDWQ.

For systems that use groundwater that is not under the direct influence of surface water, which are considered less vulnerable to faecal contamination, turbidity should generally be below 1.0 NTU.

For effective operation of the distribution system, it is good practice to ensure that water entering the distribution system has turbidity levels below 1.0 NTU."

### 2. Notes for Guidelines for Canadian Drinking Water Quality - Aesthetic Objectives (GCDWQ AO)

#### **Note 2.1 for pH:**

The operational guideline for pH is a range of 7.0 to 10.5 in finished drinking water.

#### **Note 2.2 for Sulphate:**

There may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L. Health authorities should be notified of drinking water sources containing above 500 mg/L.

#### **Note 2.3 for Sulphide (total, as S):**

The aesthetic objective for sulphide (as H<sub>2</sub>S) is 0.05 mg/L. This is equivalent to 0.047 mg/L sulphide (as S).

### 6.2.3. Source Water Total Metals

Analyte	Unit	Guideline		Sampling Location		
		GCDWQ MAC	GCDWQ AO	Well 1 (New Well)	Well 1 (New Well)	Well 1 (New Well)
				14-Sep-21	26-Sep-22	18-Sep-23
<b>Lab Results</b>						
<b>Total Metals</b>						
Aluminum (total)	mg/L	2.9 <sup>1.1</sup>	0.100 <sup>2.1</sup>	0.0114	<0.0050	<0.0050
Antimony (total)	mg/L	0.006	NG	<0.00020	<0.00020	<0.00020
Arsenic (total)	mg/L	0.010 <sup>1.2</sup>	NG	<0.00050	<0.00050	<0.00050
Barium (total)	mg/L	2.0 <sup>1.3</sup>	NG	0.103	0.1	0.109
Boron (total)	mg/L	5	NG	<0.0500	<0.0500	<0.0500
Cadmium (total)	mg/L	0.007 <sup>1.4</sup>	NG	0.00001	<0.000010	<0.000010
Calcium (total)	mg/L	NG	NG	58.8	45.6	51.9
Chromium (total)	mg/L	0.05	NG	<0.00050	0.0016	<0.00050
Cobalt (total)	mg/L	NG	NG	<0.00010	<0.00010	<0.00010
Copper (total)	mg/L	2 <sup>1.5</sup>	1	0.00346	0.00245	0.00183
Iron (total)	mg/L	NG	0.3	<0.010	<0.010	<0.010
Lead (total)	mg/L	0.005 <sup>1.6</sup>	NG	<0.00020	0.00021	0.00078
Magnesium (total)	mg/L	NG	NG	13.1	12.5	13.2
Manganese (total)	mg/L	0.12 <sup>1.7</sup>	0.02 <sup>2.2</sup>	0.00025	<0.00020	<0.00020
Mercury (total)	mg/L	0.001	NG	<0.000010	<0.000010	<0.000010
Molybdenum (total)	mg/L	NG	NG	0.0235	0.0215	0.0208
Nickel (total)	mg/L	NG	NG	<0.00040	0.00052	0.00275
Selenium (total)	mg/L	0.05	NG	<0.00050	<0.00050	<0.00050
Sodium (total)	mg/L	NG	200	13.1	11.5	13
Strontium (total)	mg/L	7.0 <sup>1.8</sup>	NG	0.677	0.725	
Uranium (total)	mg/L	0.02	NG	0.0237	0.0212	0.0254
Zinc (total)	mg/L	NG	5.0	0.0046	0.0046	0.0067

See Guideline Notes in Section 6.2.4

**Table 5: Faulder Well Total Metals Potability 2023 Summary**



#### 6.2.4. Guidelines Notes for Total Metals Potability

##### 1. Notes for Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations (GCDWQ MAC)

**Note 1.1 for Aluminum (total):** The maximum acceptable concentration (MAC) for total aluminum in drinking water is 2.9 mg/L (2 900 µg/L) based on a locational running annual average of a minimum of quarterly samples taken in the distribution system. (Update March 5, 2021)

**Note 1.2 for Arsenic (total):** Every effort should be made to maintain arsenic levels in drinking water as low as reasonably achievable.

**Note 1.3 for Barium (total):** Update January 24, 2020. The MAC was revised from 1.0 mg/L to 2.0 mg/L.

**Note 1.4 for Cadmium (total):** A maximum acceptable concentration (MAC) of 0.007 mg/L (7 µg/L) is established for total cadmium in drinking water, based on a sample of water taken at the tap. (Update July 14, 2020).

**Note 1.5 for Copper (total):** A maximum acceptable concentration (MAC) of 2 mg/L is established for total copper in drinking water, based on a sample of water taken at the tap. Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on Copper, June 2019.

**Note 1.6 for Lead (total):** The maximum acceptable concentration (MAC) for total lead in drinking water is 0.005 mg/L (5 µg/L), based on a sample of water taken at the tap and using the appropriate protocol for the type of building being sampled. Every effort should be made to maintain lead levels in drinking water as low as reasonably achievable (or ALARA). (GCDWQ: Guideline Technical Document; March, 2019)

**Note 1.7 for Manganese (total):** Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on manganese, May 2019.

**Note 1.8 for Strontium (total):** Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on strontium, May 2019.

2. **Notes for Guidelines for Canadian Drinking Water Quality - Aesthetic Objectives (GCDWQ AO)**

**Note 2.1 for Aluminum (total):** The operational guidance (OG) value for total aluminum in drinking water is 0.100 mg/L (100 µg/L) to optimize water treatment and distribution system operations. This value is based on a locational running annual average. The sampling frequency required to calculate the locational running annual average will vary based on the type of treatment facility and the sampling location. (Update March 5, 2021)

**Note 2.2 for Manganese (total):** Guidelines for Canadian Drinking Water Quality - Guideline Technical Document on manganese, May 2019.

## 7. Uranium Treatment System Water Quality

### 7.1. Treatment System Bacteriological Results

The following is a summary of the enhanced bacteriological testing that was conducted on the Uranium Treatment System (UTS) in 2023.

Analyte	Sampling Location	Unit	Average	Minimum	Maximum	Number of Results	Number of Results with Exceedances
<b>Field Results</b>							
Conductivity	S102 UTS	µS/cm	382	242	400	18	0
	S104 UTS	µS/cm	387	242	421	29	0
	S107 UTS Discharge	µS/cm	396	284	458	49	0
pH	S102 UTS		7.42	6.78	7.75	18	0
	S104 UTS		7.41	6.78	7.77	29	0
	S107 UTS Discharge		7.39	6.74	7.94	49	0
Total dissolved solids	S102 UTS	mg/L	281	243	373	18	0
	S104 UTS	mg/L	281	242	372	29	0
	S107 UTS Discharge	mg/L	280	201	328	49	0
Temperature	S102 UTS	°C	10.2	9.5	11.4	18	0
	S104 UTS	°C	10.3	9.6	12	29	0
	S107 UTS Discharge	°C	10.6	8.1	12.2	49	0
Turbidity	S102 UTS	NTU	0.17	0.03	0.62	12	0
	S104 UTS	NTU	0.12	0.03	0.43	23	0
	S107 UTS Discharge	NTU	0.13	0.04	0.4	46	0

Analyte	Sampling Location	Unit	Average	Minimum	Maximum	Number of Results	Number of Results with Exceedances
<b>Lab Results</b>							
<b>Microbiological</b>							
Background bacteria	S102 UTS	CFU/100 mL	3	1	34	31	0
	S104 UTS	CFU/100 mL	554	1	>20000	43	0
	S107 UTS Discharge	CFU/100 mL	432	1	>20000	52	0
Total coliforms (counts)	S102 UTS	CFU/100 mL	1	1	1	31	0
	S104 UTS	CFU/100 mL				44	0
	S107 UTS Discharge	CFU/100 mL	1	1	1	52	2
Total coliforms (MPN)	S102 UTS	MPN/100 mL				0	0
	S104 UTS	MPN/100 mL				0	0
	S107 UTS Discharge	MPN/100 mL				0	0
E. coli (counts)	S102 UTS	CFU/100 mL				31	0
	S104 UTS	CFU/100 mL				44	0
	S107 UTS Discharge	CFU/100 mL				52	1
E. coli (MPN)	S102 UTS	MPN/100 mL				0	0
	S104 UTS	MPN/100 mL				0	0
	S107 UTS Discharge	MPN/100 mL				0	0

Table 6: Faulder UTS Bacteriological Testing 2023 Summary

The following is a summary of the enhanced bacteriological testing that was conducted on the Purolite A300e media in 2023.

Sampling Location	Date Sampled	Client Sample ID	Client Sample Comment	Lab Results				
				Microbiological				
				Background bacteria	Total coliforms (counts)	Total coliforms (MPN)	E. coli (counts)	E. coli (MPN)
				CFU/100 mL	CFU/100 mL	MPN/100 mL	CFU/100 mL	MPN/100 mL
UTS Media Test	24-May-23	F-104 UTS Media Test	UTS Vessels taken offline and piping disinfected and being flushed to drain with unchlorinated well water when well runs	OG	OG		OG	
UTS Media Test	24-May-23	F-105 UTS Media Test	UTS Vessels taken offline and piping disinfected and being flushed to drain with unchlorinated well water when well runs	OG	OG		OG	

Sampling Location	Date Sampled	Client Sample ID	Client Sample Comment	Lab Results				
				Microbiological				
				Background bacteria	Total coliforms (counts)	Total coliforms (MPN)	E. coli (counts)	E. coli (MPN)
				CFU/100 mL	CFU/100 mL	MPN/100 mL	CFU/100 mL	MPN/100 mL
UTS Media Test	15-Jun-23	F104 Media Test	Resin F104 cleaned with 0.1% peracetic acid June 14 and rinsed. Regenerated with 10% NaCl and soaked overnight. Rinsed June 15th and sampled. YSI for field parameters	<1	<1		<1	
UTS Media Test	16-Jun-23	F104 Media Test	YSI field parameters	2	<1		<1	
UTS Media Test	20-Jun-23	F014 Media Test		220	1		<1	
UTS Media Test	22-Jun-23	F104 Media Test	No field data	50	<1		<1	
UTS Media Test	4-Jul-23	F-104 UTS	No field data	OG	OG		OG	
UTS Media Test	10-Jul-23	F014 Media Test		>20000	>=1		<1	

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Sampling Location	Date Sampled	Client Sample ID	Client Sample Comment	Lab Results				
				Microbiological				
				Background bacteria	Total coliforms (counts)	Total coliforms (MPN)	E. coli (counts)	E. coli (MPN)
				CFU/100 mL	CFU/100 mL	MPN/100 mL	CFU/100 mL	MPN/100 mL
UTS Media Test	12-Jul-23	F014 Media Test		2000	<1		<1	
UTS Media Test	31-Jul-23	F104 Media Test		1700		<1		<1
UTS Media Test	31-Jul-23	F105 Media Test		3		<1		<1
UTS Media Test	2-Aug-23	F104 Media Test		3400	<1	<1	<1	<1
UTS Media Test	2-Aug-23	F105 Media Test		<1	<1	<1	<1	<1
UTS Media Test	8-Aug-23	F104 Media Test		1300	<1	<1	<1	<1
UTS Media Test	8-Aug-23	F105 Media Test		130	<1	<1	<1	<1
UTS Media Test	10-Aug-23	F104 Media Test		2200	<1	<1	<1	<1
UTS Media Test	10-Aug-23	F105 Media Test		3	<1	<1	<1	<1
UTS Media Test	15-Aug-23	F104 Media Test	No field data	950	<1		<1	
UTS Media Test	15-Aug-23	F105 Media Test	No field data	9	<1		<1	

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Sampling Location	Date Sampled	Client Sample ID	Client Sample Comment	Lab Results				
				Microbiological				
				Background bacteria	Total coliforms (counts)	Total coliforms (MPN)	E. coli (counts)	E. coli (MPN)
				CFU/100 mL	CFU/100 mL	MPN/100 mL	CFU/100 mL	MPN/100 mL
UTS Media Test	17-Aug-23	F104 Media Test		1700	<1	<1	<1	<1
UTS Media Test	17-Aug-23	F105 Media Test		620	<1	<1	<1	<1
UTS Media Test	21-Aug-23	F104 Media Test		310	<1	<1	<1	<1
UTS Media Test	21-Aug-23	F105 Media Test		1	<1	<1	<1	<1
UTS Media Test	23-Aug-23	F104 Media Test	No field data	2	<1	<1	<1	<1
UTS Media Test	23-Aug-23	F105 Media Test	No field data	<1	<1	<1	<1	<1
UTS Media Test	28-Aug-23	F104 Media Test	No field data	<1	<1	<1	<1	<1
UTS Media Test	28-Aug-23	F105 Media Test	No field data	<1	<1	<1	<1	<1
UTS Media Test	5-Sep-23	F104 Media Test	No field data	<1	<1	<1	<1	<1
UTS Media Test	5-Sep-23	F105 Media Test	No field data	<1	<1	<1	<1	<1
UTS Media Test	11-Sep-23	F104 Media Test	No field data	OG	OG		OG	



Sampling Location	Date Sampled	Client Sample ID	Client Sample Comment	Lab Results				
				Microbiological				
				Background bacteria	Total coliforms (counts)	Total coliforms (MPN)	E. coli (counts)	E. coli (MPN)
				CFU/100 mL	CFU/100 mL	MPN/100 mL	CFU/100 mL	MPN/100 mL
UTS Media Test	11-Sep-23	F105 Media Test	No field data	<1	<1		<1	
UTS Media Test	18-Sep-23	F104 Media Test		5	<1	<1	<1	<1
UTS Media Test	18-Sep-23	F105 Media Test		6	<1	<1	<1	<1
UTS Media Test	25-Sep-23	F104 Media Test		63	<1		<1	
UTS Media Test	25-Sep-23	F105 Media Test		3	<1		<1	
UTS Media Test	4-Oct-23	F104 Media Test		43	<1	<1	<1	<1
UTS Media Test	4-Oct-23	F105 Media Test		<1	<1	<1	<1	<1
UTS Media Test	7-Nov-23	F104 Media Test		<1	<1	<1	<1	<1
UTS Media Test	7-Nov-23	F105 Media Test		<1	<1	<1	<1	<1
UTS Media Test	21-Nov-23	F104 Media Test		<1	<1	<1	<1	<1
UTS Media Test	21-Nov-23	F105 Media Test		<1	<1	<1	<1	<1

Sampling Location	Date Sampled	Client Sample ID	Client Sample Comment	Lab Results				
				Microbiological				
				Background bacteria	Total coliforms (counts)	Total coliforms (MPN)	E. coli (counts)	E. coli (MPN)
				CFU/100 mL	CFU/100 mL	MPN/100 mL	CFU/100 mL	MPN/100 mL
UTS Media Test	27-Nov-23	F104 Media Test		<1	<1	<1	<1	<1
UTS Media Test	27-Nov-23	F105 Media Test		<1	<1	<1	<1	<1
UTS Media Test	4-Dec-23	F104 Media Test		<1	<1	<1	<1	<1
UTS Media Test	4-Dec-23	F105 Media Test		<1	<1	<1	<1	<1
UTS Media Test	11-Dec-23	F104 Media Test		2	<1	<1	<1	<1
UTS Media Test	11-Dec-23	F105 Media Test		<1	<1	<1	<1	<1
UTS Media Test	18-Dec-23	UTS F-104		<1	<1	<1	<1	<1
UTS Media Test	18-Dec-23	UTS F-105		<1	<1	<1	<1	<1
GCDWQ MAC				NG	0 <sup>1.3</sup>	0 <sup>1.4</sup>	0 <sup>1.1</sup>	0 <sup>1.2</sup>

**Table 7:** Faulder Purolite A300e Uranium Removal Media Bacteriological Testing 2023 Summary

**8. Distribution System Water Quality**

All treated distribution system water quality parameters are compared to the *British Columbia Drinking Water Protection Act and Regulation (DWPA)* and the *Guidelines for Canadian Drinking Water Quality (GCDWQ)* unless otherwise noted, which could be indicated as an operational guideline (OG). The *DWPA* and *GCDWQ* define these parameters and set Aesthetic Objectives (AO) and Maximum Acceptable Concentrations (MAC).

All accredited laboratory tests in 2022 were performed by Caro Analytical Services (Kelowna, B.C.)

**8.1. Distribution System Bacteriological Results**

Samples from the distribution system were analyzed for Total Coliforms and *Escherichia coli (E.coli)*. Schedule A of the *BC Drinking Water Protection Regulation* provides bacteriological testing criteria as given below.

**Schedule A**  
**Water Quality Standards for Potable Water**  
*(sections 2 and 9)*

Parameter:	Standard:
Fecal coliform bacteria	No detectable fecal coliform bacteria per 100 ml
<i>Escherichia coli</i>	No detectable <i>Escherichia coli</i> per 100 ml
Total coliform bacteria	
(a) 1 sample in a 30 day period	No detectable total coliform bacteria per 100 ml
(b) more than 1 sample in a 30 day period	At least 90% of samples have no detectable total coliform bacteria per 100 ml and no sample has more than 10 total coliform bacteria per 100 ml

The Faulder distribution system has two dedicated sample stations:

- The two sampling locations, 176 Fish Lake Road (Lower Zone) and Mountain View Road (Upper Zone), are sampling locations within the distribution system.

The following is a summary of the bacteriological laboratory results which are collected bi-weekly from the Faulder Water System. Samples were analyzed for Total Coliforms and *Escherichia coli (E.coli)* and neither were detected in any of the distribution samples.

Analyte	Sampling Location	Unit	Avg	Min	Max	Number of Results	Number of Results with Exceedances
<b>Lab Results</b>							
<b>Microbiological</b>							
Background bacteria	176 Fish Lake Rd	CFU/100 mL	339	1	4800	18	0
	Mountain View Rd	CFU/100 mL				11	0
Total coliforms (counts)	176 Fish Lake Rd	CFU/100 mL				19	0
	Mountain View Rd	CFU/100 mL				13	0
E. coli (counts)	176 Fish Lake Rd	CFU/100 mL				19	0
	Mountain View Rd	CFU/100 mL				13	0

**Table 8: Post Uranium Treatment and Distribution Water Bacteriological Testing 2023 Summary**

In addition to the bacteriological samples which are collected bi-weekly, field parameters of pH, temperature, conductivity, total dissolved solids (TDS) and turbidity are also recorded using portable probes or test kits by Operations staff.

**8.2. Distribution System Water Quality Field Parameters**

The following is a summary of the field parameters that are measured routinely in the distribution system.

Analyte	Sampling Location	Unit	Average	Minimum	Maximum	Number of Results
<b>Field Results</b>						
Chlorine (free)	176 Fish Lake Rd	mg/L	0.74	0.05	1.28	12
	Mountain View Rd	mg/L	0.62	0.43	1.15	9
Conductivity	176 Fish Lake Rd	µS/cm	392	376	429	14
	Mountain View Rd	µS/cm	407	378	505	12
pH	176 Fish Lake Rd		7.4	7.18	7.78	15
	Mountain View Rd		7.49	7.09	8.07	12
Total dissolved solids	176 Fish Lake Rd	mg/L	279	267	303	14
	Mountain View Rd	mg/L	290	270	365	12
Temperature	176 Fish Lake Rd	°C	9.3	3.8	14.7	15
	Mountain View Rd	°C	11.2	4	20.1	12
Turbidity	176 Fish Lake Rd	NTU	0.13	0.05	0.31	15
	Mountain View Rd	NTU	0.14	0.04	0.32	12

**Table 7: Distribution System Field Measured Parameters 2023 Summary**

**8.3. Total Uranium Results**

A monthly sample is collected for total uranium from the sample location (S107 UTS Discharge) post uranium treatment after the treated well water and untreated well water have been blended before the water enters the distribution system. In 2022, all water samples were below *The Guidelines for Canadian Drinking Water Quality* Maximum Acceptable Concentration (MAC) of 0.02 mg/L for total uranium prior to entering the distribution system. Note: the two exceedances for uranium in August were due to improper valving arrangements in the UTS. These exceedances occurred while a *Water Quality Advisory* for uranium was in effect.

Analyte	Unit	Average	Minimum	Maximum	Number of Results	Number of Results with Exceedances
<b>Lab Results</b>						
<b>Total Metals</b>						
Uranium (total)	mg/L	0.0174	0.0154	0.0237	14	2

**Table 8: Faulder Water System Total Uranium 2023 Summary**

#### **8.4. Water Quality Complaints**

A water quality complaint of foul smelling water was received from a resident on Fish Lake Rd on April 27<sup>th</sup>. A site visit was conducted the same day, with the plan to take a bacteriological sample, however, the temporary chlorination was already present at the time of investigation.

After the implementation of the temporary chlorination there were numerous complaints from residents for the taste and odour of chlorine.

### **9. Water System Notifications**

The Interior Health Authority's team of drinking water officers are responsible for providing the oversight to ensure compliance and drinking water safety. The IHA is responsible for issuing *Permits to Operate* to drinking water systems. The Interior Health Authority has four types of water notifications to inform users of negative impacts to water quality.

On April 28, 2023 the RDOS implemented temporary chlorination of the Faulder water system in response to the elevated background bacteria. On May 3, 2023 and Information Release was issued. The temporary chlorination of the system remained in effect for the remainder of the year.

#### **9.1. Water Quality Advisory (WQA)**

There is some level of risk associated with consuming the drinking water but a Boil Water Notice is not needed. The risk is elevated for people with weakened immune systems, the elderly and infants and young children.

May 23, 2023 – A *Water Quality Advisory* for uranium was issued in response to removal of the uranium removal media due to high background bacteria results.

#### **9.2. Boil Water Notice (BWN)**

There are organisms in the water that can make you sick. To safely consume (swallow) the water, you must bring it to a rolling boil for at least 60 seconds, or use a safe alternate source of water. In 2022, there were two (2) *Boil Water Notices* issued, as tabulated below, for the Upper Zone because of loss of system pressure when the emergency generator failed during a utility power outage.

No BWNs issued in 2023.

### **9.3. Do Not Consume (DNC)**

There are harmful chemicals or other bad things in the water that can make you sick. You cannot make the water safe by boiling. The water can make you sick if you consume (swallow) it. You cannot use the water for drinking, brushing teeth, washing/preparing/cooking food or pet's drinking water. You can bath, shower and water plants and gardens with the water.

No DNCs issued in 2023.

### **9.4. Do Not Use (DNU)**

There are known microbial, chemical or radiological contaminants in the water and that any contact with the water with the skin, lungs or eyes can be dangerous. Do not turn on your tap for any reason and do not use your water. You CANNOT make the water safe by boiling it.

No DNUs issued in 2023.

## **10. Program Updates and Status**

### **10.1. Cross Connection Control Program**

A cross connection is any actual or potential connection between the drinking water (potable) system and a non-potable substance (contaminant). Backflow is when the flow of water in a pipe reverses from the normal direction. When a cross connection and backflow occur simultaneously often the result is a contaminant entering the drinking water system.

Cross connection in plumbing systems require backflow preventers corresponding to the degree of hazard as indicated by the CSA B64.10, "Manual for the Selection and Installation of Backflow Preventers", as referenced in the BC Plumbing Code, or as determined by a CCC hazard assessment survey.

The RDOS adopted a Regional CCC Bylaw, No.2851, in 2020 to address cross connection and backflow prevention applicable to all agricultural, industrial, commercial and institutional properties. These property uses are required to have a suitable backflow protection device installed.

In February, 2023 the RDOS started implementation of its Regional Cross Connection Control program with MTS Inc. (Vernon, B.C.) contracted as the program administrator.

#### **10.2. Capital Works / System Additions**

No items of note in 2022.

#### **10.3. Emergency Response Plan**

The *Emergency Response Plan* is scheduled to be updated in 2024.

#### **10.4. Future System Upgrades**

A Water Capital Master Plan was completed in 2023. This will include an assessment of the current water system and an upgrade plan for the Faulder water system infrastructure with a focus on asset management and meeting future climate conditions and water demands.

#### **10.5. Supervisory Control and Data Acquisition (SCADA System) Upgrades**

No items of note in 2023.

#### **10.6. System Maintenance/Upgrades**

No items of note in 2023.

#### **10.7. Water Quality Monitoring Program**

The Water Quality Monitoring Program is scheduled to be updated in 2024.

### **11. Summary**

All tested source water parameters from the Faulder groundwater well met the applicable criteria in 2023 with the exception of uranium exceeding the Maximum Acceptable Concentration (MAC) of 0.02 mg/L as set by the *Guidelines for Canadian Drinking Water Quality*. The operation of a uranium treatment system reduces the uranium concentration to an acceptable level. Elevated background bacteria in the distribution system in April resulted in the immediate implementation of temporary chlorination of the system which remained in effect for the remainder of 2023. With the suspected source of the background bacteria being the contamination of the uranium removal resin, a *Water Quality Advisory* for uranium was in effect for approximately 4 months to accommodate the removal of the uranium removal resin for cleaning and disinfection purposes. An extensive investigation and monitoring program was initiated and remains in place to determine the source of the background bacteria in the UTS and how to best mitigate the source of bacteria in the future. The RDOS continues to work on reviewing and upgrading the various programs that support facilitating the highest quality of water possible.