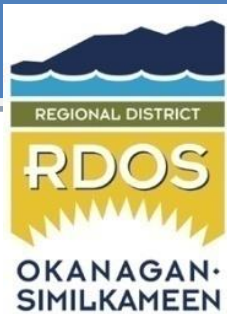


# 2023

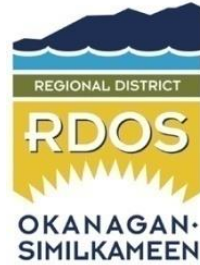
## ANNUAL WATER QUALITY MONITORING REPORT OKANAGAN FALLS WATER SYSTEM



Okanagan Falls Well #6 Pump Station

Regional District of Okanagan-Similkameen

July, 2024



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

Copy prepared for:

**INTERIOR HEALTH AUTHORITY (IHA)**

Interior Health Drink Water Program

505 Doyle Street.

Kelowna, B.C.

V1Y 6V8

Attention: Judi Ekkert, B.Tech, CPHI(C)  
Specialist – Environmental Health Officer  
Drinking Water Program

**Prepared by:**

**Regional District of Okanagan-Similkameen**

101 Martin St.

Penticton, B.C.

V2A 5J9

Author: Rob Palmer, A.Sc.T.

Environmental Supervisor

## Table of Contents

1. Introduction.....	3
2. System Description.....	3
3. System Classification and Operator Certifications.....	3
3.1. System Classification .....	3
3.2. Operator Certification .....	4
4. Annual Water Usage .....	4
4.1. Consumption Records .....	4
4.2. Water Conservation .....	6
5. Aquifer Monitoring.....	6
6. Source Water Quality.....	6
6.1. Source Water Bacteriological Results.....	7
6.2. Source Water Potable Water Testing .....	11
6.2.1. Source Water General Potability Parameters 2023 .....	12
6.2.2. Guidelines Notes for General Potability Parameters.....	18
6.2.3. Source Water Total Metals 2023 .....	19
6.2.4. Guidelines Notes for Total Metals Potability .....	24
6.2.5. Source Water Manganese Testing 2023 .....	25
6.2.6. Source Water Hydrocarbons and Miscellaneous Organic Substance Testing 2023 .....	26
6.2.7. Guideline Notes for Source Water Hydrocarbons and Miscellaneous Organic Substance Testing .....	30
6.3. Distribution System Bacteriological Results.....	31
6.4. Lower Zone Distribution System Free Chlorine Residuals .....	32
6.5. Distribution System Water Quality Field Parameter Testing .....	33
6.6. Water Quality Complaints.....	33
7. Water System Notifications .....	34
8.1. <i>Water Quality Advisory (WQA)</i> .....	34
8.2. <i>Boil Water Notice (BWN)</i> .....	34
8.3. <i>Do Not Consume (DNC)</i> .....	35
8.4. <i>Do Not Use (DNU)</i> .....	35
9. Program Updates and Status .....	35
9.1. Cross Connection Control Program.....	35
9.2. Capital Works / System Additions .....	36
9.3. Emergency Response Plan .....	36
9.4. Future System Upgrades .....	36
9.5. Supervisory Control and Data Acquisition (SCADA) System Upgrades .....	36
9.6. System Maintenance/Upgrades .....	36

**9.7. Water Quality Monitoring Program** ..... 36

**10. Summary**..... 37

**TABLES**

Table 1: RDOS Operator Certifications 2023..... 4

Table 2: Annual Water Consumption 2023..... 4

Table 3: Well #2 Source Water Routine Testing Summary 2023 ..... 7

Table 4: Well #3 Source Water Routine Testing Summary 2023 ..... 8

Table 5: Well #4 Source Water Routine Testing Summary 2023 ..... 9

Table 6: Well #5 Source Water Routine Testing Summary 2023 ..... 10

Table 7: Well #6 Source Water Routine Testing Summary 2023 ..... 11

Table 8: Well #2 Source Water General Potability Parameters 2021-2023..... 12

Table 9: Well #3 Source Water General Potability Parameters 2021-2023..... 13

Table 10: Well #4 Source Water General Potability Parameters 2021-2023..... 14

Table 11: Well #5 Source Water General Potability Parameters 2021-2023..... 15

Table 12: Well #6 Source Water General Potability Parameters 2021-2023..... 17

Table 13: Well #2 Source Water Total Metals Potability 2021-2023..... 19

Table 14: Well #3 Source Water Total Metals Potability 2021-2023..... 20

Table 15: Well #4 Source Water Total Metals Potability 2021-2023..... 21

Table 16: Well #5 Source Water Total Metals Potability 2021-2023..... 22

Table 17: Well #6 Source Water Total Metals Potability 2021-2023..... 23

Table 18: Well #2, #4 and #5 Total Manganese Monitoring Summary 2023 ..... 26

Table 19: Well #4 Hydrocarbon and Misc. Organic Substances Summary 2022-2023 ..... 28

Table 20: Well #5 Hydrocarbon and Misc. Organic Substances Summary 2022-2023 ..... 30

Table 21: Distribution Water Bacteriological Testing Summary for 2023 ..... 31

Table 22: Lower Zone Annual Distribution Free Chlorine Residual Summary for 2023 ..... 32

Table 23: Annual Lower Zone Field Water Quality Parameter Testing Summary for 2023..... 33

Table 24: Annual Upper Zone Field Water Quality Parameter Testing Summary for 2023..... 33

**FIGURES**

Figure 1: Total Annual Water Consumption 2022 to 2023 ..... 5

Figure 2: Source Well Annual Water Consumption 2022 - 2022 ..... 5

Figure 3: Okanagan Fall Wells Level 2020 to 2024 Trend ..... 6

## 1. Introduction

As the owner and operator of the Okanagan Falls water system, the Regional District of Okanagan-Similkameen (RDOS) 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 supporting Regulation*.

## 2. System Description

The Okanagan Falls water system is located within Electoral Area D, 20 kilometers south of Penticton. The RDOS took over the ownership and operation of the water system from the Okanagan Falls Irrigation District in January, 2023. The water system consists of five groundwater source wells and a distribution system. The system supplies water to approximately 1300 domestic connections, 10 irrigation connections and 70 commercial connections and supports fire protection. The system is split into the Lower and Upper Zone. Well #2 and #5 supply the Lower Zone, however, issues with iron and manganese resulted in the removal of Well #2 from service in March of 2023. A requirement for chlorination in the Lower Zone was implemented a number of years ago in response to coliform counts (both Total and *E. coli*) in which the source was not identifiable. The Upper Zone is supplied by Well #3, #4 and #6, and these sources are not chlorinated. Both Zones have associated storage reservoirs at an elevated location in the distribution system.

## 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 Okanagan Falls distribution system remained as a *Level II* Distribution System in 2023.

The Treatment at Well #5 remained classified as a *Level I* Treatment Facility 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 1 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
8266				X				X
8761		X						X
9322		X						X
1000977			X					X

**Table 1: RDOS Operator Certifications 2023**

### 4. Annual Water Usage

There are five wells supplying source water for the Okanagan Falls water system and the consumption data is given in Table 2 below.

#### 4.1. Consumption Records

Zone	Well #	Annual Totals	Daily Minimum		Daily Maximum	
		(m <sup>3</sup> )	(m <sup>3</sup> )	Date	(m <sup>3</sup> )	Date
Lower	2	14,431	35	Jan 27, 2023	507	Feb 13, 2023
	5	371,564	0	Multiple dates	3,461	July 9, 2023
Upper	3	90,429	0	Multiple dates	959	June 24, 2023
	4	69,796	0	Multiple dates	759	Aug 16, 2023
	6	101,655	0	Multiple dates	1,067	May 16, 2023
<b>Total Annual Usage</b>		647,875				

**Table 2: Annual Water Consumption 2023**

Two graphs representing the total system consumption and annual volumes for each well source have been trended as shown in the following graphs.

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

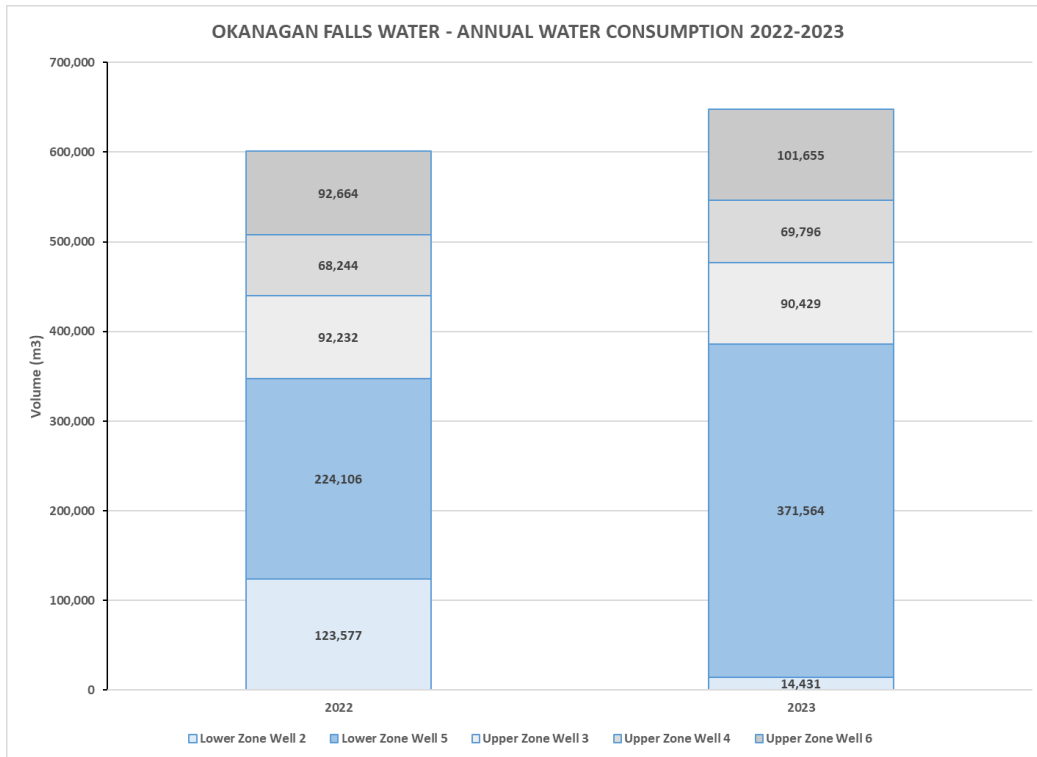


Figure 1: Total Annual Water Consumption 2022 to 2023

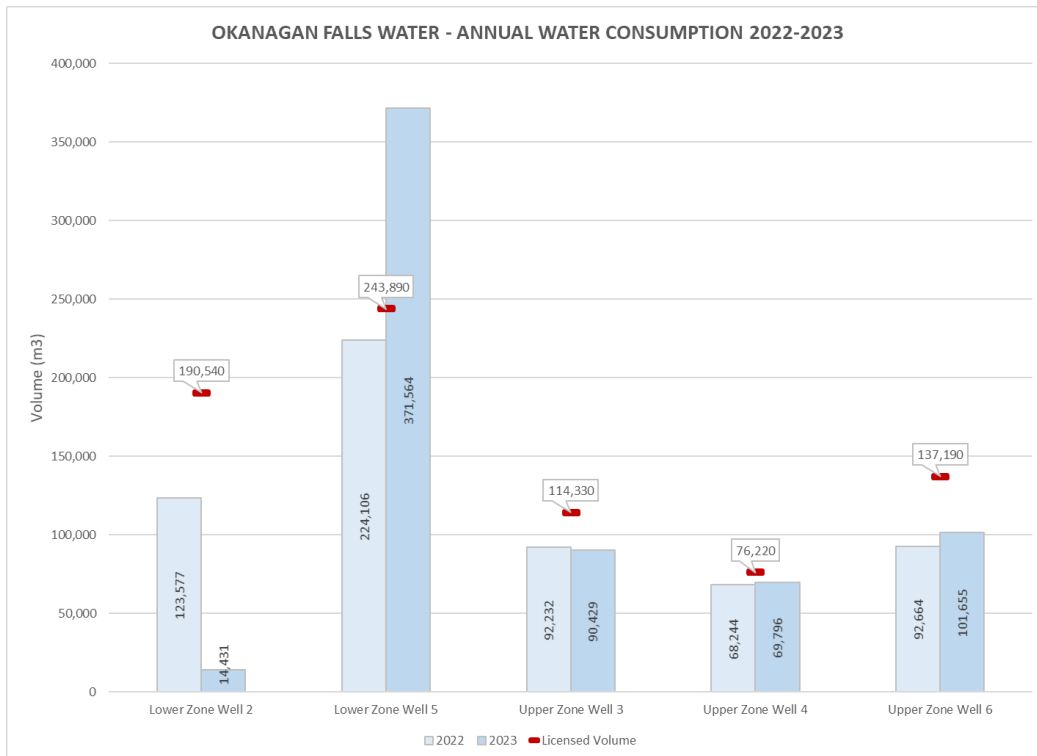


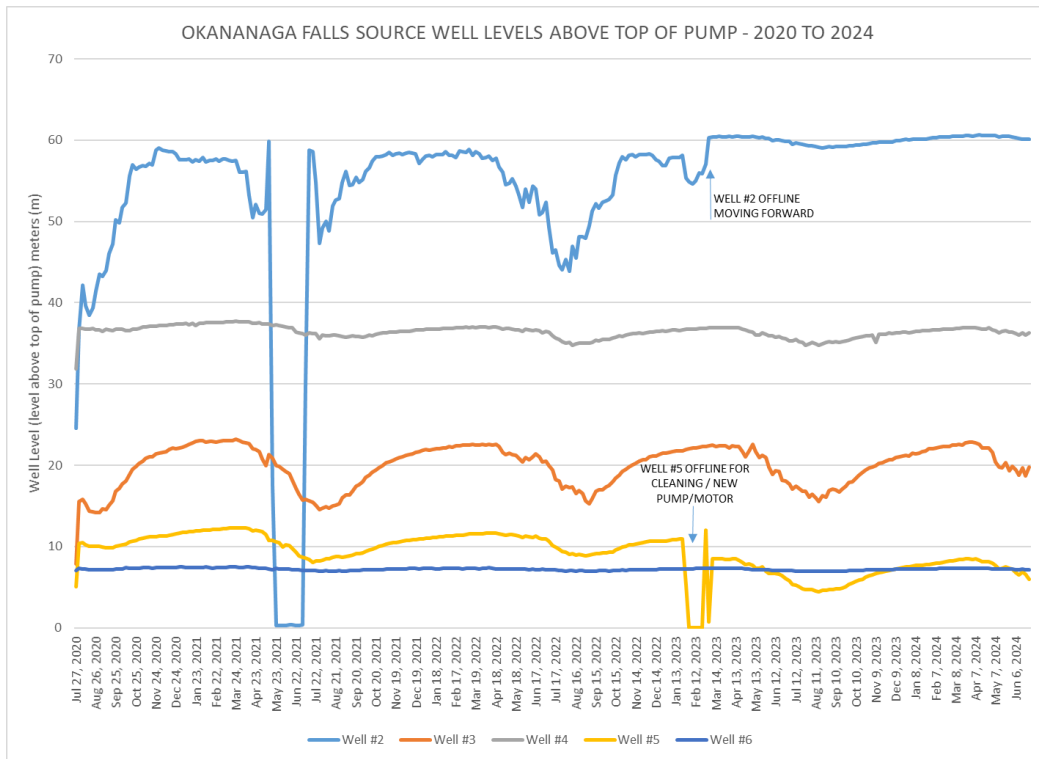
Figure 2: Source Well Annual Water Consumption 2022 - 2023

**4.2. Water Conservation**

On July 13, 2023 the Okanagan Falls water system moved from Stage “Normal” to Stage 1 water restrictions. Stage 1 restrictions are intended to reduce total and peak use by 10%. Stage 2 restrictions, with the goal of a voluntary reduction of 20%, were implemented July 21, 2023. On October 16<sup>th</sup> the RDOS returned all systems to Stage “Normal”.

**5. Aquifer Monitoring**

The Okanagan Falls groundwater wells draw water from Aquifers 254/255. Recharge into the aquifers appears to be consistent over the past four years.



**Figure 3: Okanagan Fall Wells Level 2020 to 2024 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).



**6.1. Source Water Bacteriological Results**

Bacteriological samples are typically collected from the Okanagan Falls groundwater wells either weekly or every three weeks depending on the zone the well supplies. Monitoring of the Okanagan Falls wells includes bacteriological grab samples and field measured parameters using field test kits. Samples from the wells were analyzed for Total Coliforms and *Escherichia coli* (*E.coli*) by an accredited laboratory. The tables below summarize the bacteriological laboratory results and the field measured parameters for the Okanagan Falls groundwater Wells #2, #3, #4, #5 and #6.

After Well#2 was removed from service in March of 2023 regular flushing of the well continued with corresponding bacteriological samples.

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

**Sampling Location:** Well #2

Analyte	Unit	Avg	Min	Max	Number of Results	Number of Results with Exceedances
<b>Field Results</b>						
Conductivity	µS/cm	428	376	448	10	0
pH		7.96	7.44	8.72	10	0
Total dissolved solids	mg/L	303	268	314	10	0
Temperature	°C	10.8	9.5	13.1	10	0
Turbidity	NTU	0.27	0.09	1.38	10	0
<b>Lab Results</b>						
<b>Microbiological</b>						
Background bacteria	CFU/100 mL	<1	<1	<1	6	0
Total coliforms (counts)	CFU/100 mL	<1	<1	<1	15	0
E. coli (counts)	CFU/100 mL	<1	<1	<1	15	0

**Table 3: Well #2 Source Water Routine Testing Summary 2023**

**Sampling Location:** Well #3

Analyte	Unit	Avg	Min	Max	Number of Results	Number of Results with Exceedances
<b>Field Results</b>						
Conductivity	µS/cm	492	432	613	21	0
pH		7.21	6.67	7.51	21	0
Total dissolved solids	mg/L	354	307	526	21	0
Temperature	°C	11.5	9.8	14.1	21	0
Turbidity	NTU	0.20	0.10	0.40	21	0
<b>Lab Results</b>						
<b>Microbiological</b>						
Background bacteria	CFU/100 mL	<1	<1	<1	6	0
Total coliforms (counts)	CFU/100 mL	<1	<1	<1	21	0
E. coli (counts)	CFU/100 mL	<1	<1	<1	21	0

**Table 4:** Well #3 Source Water Routine Testing Summary 2023

**Sampling Location:** Well #4

Analyte	Unit	Avg	Min	Max	Number of Results	Number of Results with Exceedances
<b>Field Results</b>						
Conductivity	µS/cm	539	499	589	19	0
pH		7.37	6.39	8.25	19	0
Total dissolved solids	mg/L	380	344	420	19	0
Temperature	°C	11.3	9.9	12.8	19	0
Turbidity	NTU	0.27	0.08	1.53	21	0
<b>Lab Results</b>						
<b>Microbiological</b>						
Background bacteria	CFU/100 mL	<1	<1	<1	7	0
Total coliforms (counts)	CFU/100 mL	<1	<1	<1	19	0
E. coli (counts)	CFU/100 mL	<1	<1	<1	19	0

**Table 5: Well #4 Source Water Routine Testing Summary 2023**

Sampling Location: Well #5

Analyte	Unit	Avg	Minimum	Maximum	Number of Results	Number of Results with Exceedances
<b>Field Results</b>						
Conductivity	µS/cm	510	469	591	42	0
pH		7.44	6.62	7.81	44	0
Total dissolved solids	mg/L	362	333	420	43	0
Temperature	°C	11.4	9.0	13.9	44	0
Turbidity	NTU	0.20	0.05	0.39	46	0
<b>Lab Results</b>						
<b>Microbiological</b>						
Background bacteria	CFU/100 mL	1	<1	2	19	0
Total coliforms (counts)	CFU/100 mL	<1	<1	<1	47	0
E. coli (counts)	CFU/100 mL	<1	<1	<1	47	0

Table 6: Well #5 Source Water Routine Testing Summary 2023

Sampling Location: Well #6

Analyte	Unit	Avg	Minimum	Maximum	Number of Results	Number of Results with Exceedances
<b>Field Results</b>						
Conductivity	µS/cm	450	430	530	19	0
pH		6.92	6.41	7.21	19	0
Total dissolved solids	mg/L	320	308	374	19	0
Temperature	°C	11.4	7.6	15.9	19	0
Turbidity	NTU	0.28	0.10	1.19	19	0
<b>Lab Results</b>						
<b>Microbiological</b>						
Background bacteria	CFU/100 mL	<1	<1	<1	6	0
Total coliforms (counts)	CFU/100 mL	<1	<1	<1	18	0
E. coli (counts)	CFU/100 mL	<1	<1	<1	18	0

Table 7: Well #6 Source Water Routine Testing Summary 2023

## 6.2. Source Water Potable Water Testing

Annually, the RDOS submits a sample of untreated well water from each of the source wells 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 2023 accredited laboratory tests were performed by Caro Analytical Services (Kelowna, B.C.).

All tested source water parameters met the applicable guidelines in 2023 with the exception of manganese exceeding the MAC at Well #2. Any observed trends are noted with the following results.

### 6.2.1. Source Water General Potability Parameters 2023

#### Well #2 General Parameters

Analyte	Unit	Guideline		Well #2 2-Mar- 21	Well #2 12-Jul- 22	Well #2 22-Aug- 23	Well #2 14-Nov- 23
		GCDWQ MAC	GCDWQ AO				
<b>Lab Results</b>							
<b>General</b>							
Alkalinity (total, as CaCO <sub>3</sub> )	mg/L	NG	NG	202	209		180
Total organic carbon	mg/L	NG	NG				0.94
Chloride	mg/L	NG	250	3.93	3.01		2.83
Colour	CU	NG	15	<5.0	<5.0		<5.0
Conductivity	µS/cm	NG	NG	414	419		400
Total cyanide	mg/L	0.2 <sup>1.1</sup>	NG	<0.0020	<0.0020		<0.0020
Fluoride	mg/L	1.5	NG	0.33	0.34		0.3
Langelier Index		NG	NG	0.6	1		0.4
pH		NG	7.0 - 10.5 <sup>2.1</sup>	8.01	8.19		7.93
Total dissolved solids (computed)	mg/L	NG	500	244	258		236
Sulphate	mg/L	NG	500 <sup>2.2</sup>	33.4	34.2		33.7
Sulphide (total, as S)	mg/L	NG	0.047 <sup>2.3</sup>				<0.020
Turbidity	NTU	N <sup>1.2</sup>	NG	0.22	0.11		0.22
UV transmittance at 254 nm - filtered	%	NG	NG				95.4
UV transmittance at 254 nm - unfiltered	%	NG	NG				95.3
<b>Nutrients</b>							
Ammonia (total, as N)	mg/L	NG	NG				<0.050
Nitrate (as N)	mg/L	10	NG	<0.010	<0.010		<0.010
Nitrite (as N)	mg/L	1	NG	<0.010	<0.010		<0.010
Phosphorus (total, by ICPMS/ICPOES)	mg/L	NG	NG			0.08	
Potassium (total)	mg/L	NG	NG	3.14	2.88	3.02	2.9

See Guideline Notes in Section 6.2.2

**Table 8: Well #2 Source Water General Potability Parameters 2021-2023**

Well #3 General Parameters

Analyte	Unit	Guideline		Well #3	Well #3	Well #3
		GCDW Q MAC	GCDWQ AO	02- Mar-21	26-Jul- 22	11-Oct- 23
				Sampling Location Date Sampled		
<b>Lab Results</b>						
<b>General</b>						
Alkalinity (total, as CaCO <sub>3</sub> )	mg/L	NG	NG	220	225	242
Total organic carbon	mg/L	NG	NG			1.52
Chloride	mg/L	NG	250	10.5	10.6	10.7
Colour	CU	NG	15	<5.0	<5.0	<5.0
Conductivity	µS/cm	NG	NG	421	473	471
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	0.13	0.16	0.17
Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg	mg/L	NG	NG	202	223	230
Langelier Index		NG	NG	0.5	0.8	0.4
pH		NG	7.0 - 10.5 <sup>2.1</sup>	7.84	7.98	7.73
Total dissolved solids (computed)	mg/L	NG	500	267	280	296
Sulphate	mg/L	NG	500 <sup>2.2</sup>	30	31.1	32.8
Sulphide (total, as S)	mg/L	NG	0.047 <sup>2.3</sup>			<0.020
Turbidity	NTU	N <sup>1.2</sup>	NG	0.19	<0.10	<0.10
UV transmittance at 254 nm - filtered	%	NG	NG			98.4
UV transmittance at 254 nm - unfiltered	%	NG	NG			98.5
<b>Nutrients</b>						
Ammonia (total, as N)	mg/L	NG	NG			<0.050
Nitrate (as N)	mg/L	10	NG	0.532	0.618	0.854
Nitrite (as N)	mg/L	1	NG	<0.010	<0.010	<0.010
Potassium (total)	mg/L	NG	NG	3.07	2.98	3

See Guideline Notes in Section 6.2.2

**Table 9: Well #3 Source Water General Potability Parameters 2021-2023**

For Well #3, an upward trend was noted for both alkalinity and total dissolved solids in the tested parameters since 2002, but not for any of the other parameters.

Well #4 General Parameters

Analyte	Unit	Guideline		Well #4 26-Oct- 21	Well #4 19-Jul- 22	Well #4 11-Oct- 23
		GCDW Q MAC	GCDWQ AO			
		Date Sampled				
<b>Lab Results</b>						
<b>General</b>						
Alkalinity (total, as CaCO <sub>3</sub> )	mg/L	NG	NG	295	257	263
Total organic carbon	mg/L	NG	NG			0.9
Chloride	mg/L	NG	250	3.86	3.73	3.78
Colour	CU	NG	15	<5.0	<5.0	<5.0
Conductivity	µS/cm	NG	NG	545	521	503
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	0.16	0.15	0.23
Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg	mg/L	NG	NG	276	256	267
Langelier Index		NG	NG	1	1	0.7
pH		NG	7.0 - 10.5 <sup>2.1</sup>	8.08	8.06	7.9
Total dissolved solids (computed)	mg/L	NG	500	329	298	309
Sulphate	mg/L	NG	500 <sup>2.2</sup>	30	30.3	32.9
Sulphide (total, as S)	mg/L	NG	0.047 <sup>2.3</sup>			<0.020
Turbidity	NTU	N <sup>1.2</sup>	NG	0.15	0.14	0.12
UV transmittance at 254 nm - filtered	%	NG	NG			99.1
UV transmittance at 254 nm - unfiltered	%	NG	NG			99.3
<b>Nutrients</b>						
Ammonia (total, as N)	mg/L	NG	NG			<0.050
Nitrate (as N)	mg/L	10	NG	0.3	0.161	0.449
Nitrite (as N)	mg/L	1	NG	<0.010	<0.010	<0.010
Potassium (total)	mg/L	NG	NG	3.13	2.88	2.99

See Guideline Notes in Section 6.2.2

**Table 10: Well #4 Source Water General Potability Parameters 2021-2023**



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

Well #5 General Parameters

Analyte	Unit	Guideline		Well #5	Well #5	Well #5	Well #5	Well #5
		GCDW Q MAC	GCDWQ AO	9-Mar-21	2-Nov-21	12-Jul-22	28-Feb-23	3-Oct-23
				Date Sampled				
<b>Lab Results</b>								
<b>General</b>								
Alkalinity (total, as CaCO <sub>3</sub> )	mg/L	NG	NG	242	241	250	208	241
Bromide	mg/L	NG	NG				<0.10	
Total organic carbon	mg/L	NG	NG					2.59
Chloride	mg/L	NG	250	9.9	8.9	10.5	10.3	8.31
Colour	CU	NG	15	<5.0	<5.0	<5.0		<5.0
Conductivity	µS/cm	NG	NG	506	487	513	493	461
Total cyanide	mg/L	0.2 <sup>1.1</sup>	NG	<0.002 0	<0.002 0	<0.002 0		<0.002 0
Fluoride	mg/L	1.5	NG	0.18	0.15	0.2	0.18	0.22
Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg	mg/L	NG	NG	240	223	238	247	227
Langelier Index		NG	NG	1	0.9	0.9	0.4	0.7
pH		NG	7.0 - 10.5 <sup>2.1</sup>	8.19	8.08	8.06	7.83	8.04
Total dissolved solids	mg/L	NG	500				284	
Total dissolved solids (computed)	mg/L	NG	500	301	289	303		291
Sulphate	mg/L	NG	500 <sup>2.2</sup>	36	34.8	34.6	37.5	34.2
Sulphide (total, as S)	mg/L	NG	0.047 <sup>2.3</sup>					<0.020
Turbidity	NTU	N <sup>1.2</sup>	NG	0.25	0.38	0.34	0.45	0.35
UV transmittance at 254 nm - filtered	%	NG	NG					97
UV transmittance at 254 nm - unfiltered	%	NG	NG					97
<b>Nutrients</b>								
Ammonia (total, as N)	mg/L	NG	NG					<0.050
Nitrate (as N)	mg/L	10	NG	0.485	0.24	0.469	0.248	0.43
Nitrite (as N)	mg/L	1	NG	<0.010	<0.010	<0.010	<0.010	<0.010
Phosphorus (total, by ICPMS/ICPOES)	mg/L	NG	NG				<0.050	
Potassium (total)	mg/L	NG	NG	3.1	2.81	3.07	3.12	2.9

See Guideline Notes in Section 6.2.2

**Table 11: Well #5 Source Water General Potability Parameters 2021-2023**

At Well #5 an increasing trend was observed with chloride and nitrate. The RDOS obtained historical Well #5 data from the Okanagan Falls Irrigation District for the years 2002 to 2014, and from 2021 to 2022; with a gap in the data between 2014 and 2021. The historical values for chloride from 2002 to 2014 were approximately half of the chloride concentrations since 2021. Similarly, historical nitrate values from 2011 to 2014 are an order of magnitude lower than current nitrate concentrations since 2021. An increase in both chloride and nitrate concentrations could indicate anthropogenic activities from farming and/or sewage are impacting the groundwater source at Well #5.

Well #6 General Parameters

Analyte	Unit	Guideline		Well #6	Well #6	Well #6
		GCDW Q MAC	GCDWQ AO	9-Mar- 21	19-Jul- 22	11-Oct- 23
				Date Sampled		
<b>Lab Results</b>						
<b>General</b>						
Alkalinity (total, as CaCO <sub>3</sub> )	mg/L	NG	NG	182	189	200
Total organic carbon	mg/L	NG	NG			1.08
Chloride	mg/L	NG	250	9.86	9.3	10.4
Colour	CU	NG	15	<5.0	<5.0	<5.0
Conductivity	µS/cm	NG	NG	384	408	426
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	0.15	0.14	0.18
Hardness (as CaCO <sub>3</sub> ), from total Ca/Mg	mg/L	NG	NG	184	192	195
Langelier Index		NG	NG	0.5	0.4	0.2
pH		NG	7.0 - 10.5 <sup>2.1</sup>	8.02	7.77	7.66
Total dissolved solids (computed)	mg/L	NG	500	239	243	257
Sulphate	mg/L	NG	500 <sup>2.2</sup>	29.4	28.3	32.2
Sulphide (total, as S)	mg/L	NG	0.047 <sup>2.3</sup>			<0.020
Turbidity	NTU	N <sup>1.2</sup>	NG	0.22	0.15	0.15
UV transmittance at 254 nm - filtered	%	NG	NG			98.7
UV transmittance at 254 nm - unfiltered	%	NG	NG			99
<b>Nutrients</b>						
Ammonia (total, as N)	mg/L	NG	NG			<0.050
Nitrate (as N)	mg/L	10	NG	1.06	0.906	1.27
Nitrite (as N)	mg/L	1	NG	<0.010	<0.010	<0.010
Potassium (total)	mg/L	NG	NG	2.77	2.55	2.66

See Guideline Notes in Section 6.2.2

**Table 12:** Well #6 Source Water General Potability Parameters 2021-2023

## 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 2023

#### Well #2 Total Metals

Analyte	Unit	Guideline		Well #2 2-Mar-21	Well #2 12-Jul-22	Well #2 22-Aug-23	Well #2 14-Nov-23
		GCDWQ MAC	GCDWQ AO				
<b>Lab Results</b>							
<b>Total Metals</b>							
Aluminum (total)	mg/L	2.9 <sup>1.1</sup>	0.100 <sup>2.1</sup>	<0.0050	<0.0050	<0.0050	<0.0050
Antimony (total)	mg/L	0.006	NG	<0.00020	<0.00020	<0.00020	<0.00020
Arsenic (total)	mg/L	0.010 <sup>1.2</sup>	NG	0.00244	0.00237	0.00624	0.00239
Barium (total)	mg/L	2.0 <sup>1.3</sup>	NG	0.139	0.142	0.181	0.14
Beryllium (total)	mg/L	NG	NG			<0.00010	
Bismuth (total)	mg/L	NG	NG			<0.00010	
Boron (total)	mg/L	5	NG	<0.0500	<0.0500	<0.0500	<0.0500
Cadmium (total)	mg/L	0.007 <sup>1.4</sup>	NG	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (total)	mg/L	NG	NG	59.3	72.5	61.5	67.1
Chromium (total)	mg/L	0.05	NG	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (total)	mg/L	NG	NG	<0.00010	<0.00010	<0.00010	<0.00010
Copper (total)	mg/L	2 <sup>1.5</sup>	1	0.00713	0.00045	0.0037	0.00131
Iron (total)	mg/L	NG	0.3	0.016	0.01	1.52	0.047
Lead (total)	mg/L	0.005 <sup>1.6</sup>	NG	0.00098	0.00035	0.00369	<0.00020
Magnesium (total)	mg/L	NG	NG	10.8	9.72	9.65	9.98
Manganese (total)	mg/L	0.12 <sup>1.7</sup>	0.02 <sup>2.2</sup>	0.163	0.163	0.488	<b>0.232</b>
Mercury (total)	mg/L	0.001	NG	<0.000010	<0.000010		<0.000010
Molybdenum (total)	mg/L	NG	NG	0.00199	0.00197	0.00262	0.00263
Nickel (total)	mg/L	NG	NG	<0.00040	<0.00040	<0.00040	<0.00040
Selenium (total)	mg/L	0.05	NG	<0.00050	<0.00050	<0.00050	<0.00050
Silicon (total, as Si)	mg/L	NG	NG			8.3	
Sodium (total)	mg/L	NG	200	10.7	8.88	9.11	9.01
Strontium (total)	mg/L	7.0 <sup>1.8</sup>	NG	0.544	0.563	0.558	
Sulphur (total)	mg/L	NG	NG			9.1	
Uranium (total)	mg/L	0.02	NG	0.000875	0.000768	0.000444	0.000786
Vanadium (total)	mg/L	NG	NG			<0.0050	
Zinc (total)	mg/L	NG	5.0	0.0121	0.0048	<0.0040	<0.0040

See Guideline Notes in Section 6.2.4

**Table 13: Well #2 Source Water Total Metals Potability 2021-2023**

Total manganese for Well #2 was reported at 0.232 mg/L exceeding the MAC of 0.12 mg/L.

Well #3 Total Metals

Analyte	Unit	Guideline		Well #3	Well #3	Well #3
		GCDWQ MAC	GCDWQ AO	2-Mar-21	26-Jul-22	11-Oct-23
				Sampling Location		Date Sampled
<b>Lab Results</b>						
<b>Total Metals</b>						
Aluminum (total)	mg/L	2.9 <sup>1.1</sup>	0.100 <sup>2.1</sup>	<0.0050	<0.0050	0.0065
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	0.0593	0.0564	0.0608
Boron (total)	mg/L	5	NG	<0.0500	<0.0500	<0.0500
Cadmium (total)	mg/L	0.007 <sup>1.4</sup>	NG	0.000047	0.000047	0.000041
Calcium (total)	mg/L	NG	NG	61.3	71.1	73.9
Chromium (total)	mg/L	0.05	NG	<0.00050	<0.00050	<0.00050
Cobalt (total)	mg/L	NG	NG	<0.00010	<0.00010	<0.00010
Copper (total)	mg/L	2 <sup>1.5</sup>	1	0.00157	0.00165	0.00212
Iron (total)	mg/L	NG	0.3	0.021	<0.010	<0.010
Lead (total)	mg/L	0.005 <sup>1.6</sup>	NG	0.00024	<0.00020	<0.00020
Magnesium (total)	mg/L	NG	NG	11.9	11.1	11
Manganese (total)	mg/L	0.12 <sup>1.7</sup>	0.02 <sup>2.2</sup>	0.00054	0.00432	0.00607
Mercury (total)	mg/L	0.001	NG	<0.000010	<0.000010	<0.000010
Molybdenum (total)	mg/L	NG	NG	0.00092	0.00098	0.00099
Nickel (total)	mg/L	NG	NG	0.00074	0.0005	0.00076
Selenium (total)	mg/L	0.05	NG	0.00193	0.0022	0.00172
Sodium (total)	mg/L	NG	200	13.7	13.4	13.2
Strontium (total)	mg/L	7.0 <sup>1.8</sup>	NG	0.558	0.544	
Uranium (total)	mg/L	0.02	NG	0.00282	0.00306	0.00313
Zinc (total)	mg/L	NG	5.0	0.008	<0.0040	0.0057

See Guideline Notes in Section 6.2.4

**Table 14: Well #3 Source Water Total Metals Potability 2021-2023**

Well #4 Total Metals

Analyte	Unit	Guideline		Well #4	Well #4	Well #4
		GCDWQ MAC	GCDWQ AO	26-Oct-21	19-Jul-22	11-Oct-23
		Sampling Location Date Sampled				
<b>Lab Results</b>						
<b>Total Metals</b>						
Aluminum (total)	mg/L	2.9 <sup>1.1</sup>	0.100 <sup>2.1</sup>	0.0065	<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	0.0007	0.00082
Barium (total)	mg/L	2.0 <sup>1.3</sup>	NG	0.114	0.105	0.104
Boron (total)	mg/L	5	NG	<0.0500	<0.0500	<0.0500
Cadmium (total)	mg/L	0.007 <sup>1.4</sup>	NG	0.000038	0.00005	0.000028
Calcium (total)	mg/L	NG	NG	90.8	85.5	89.2
Chromium (total)	mg/L	0.05	NG	<0.00050	<0.00050	<0.00050
Cobalt (total)	mg/L	NG	NG	<0.00010	<0.00010	<0.00010
Copper (total)	mg/L	2 <sup>1.5</sup>	1	0.00733	0.0147	0.00335
Iron (total)	mg/L	NG	0.3	0.034	<0.010	<0.010
Lead (total)	mg/L	0.005 <sup>1.6</sup>	NG	0.0014	0.00026	0.00026
Magnesium (total)	mg/L	NG	NG	11.9	10.4	10.6
Manganese (total)	mg/L	0.12 <sup>1.7</sup>	0.02 <sup>2.2</sup>	0.0498	0.0413	0.0279
Mercury (total)	mg/L	0.001	NG	<0.000010	<0.000010	<0.000010
Molybdenum (total)	mg/L	NG	NG	0.00111	0.00089	0.00113
Nickel (total)	mg/L	NG	NG	0.00151	0.00063	0.00044
Selenium (total)	mg/L	0.05	NG	0.00107	0.00095	0.00081
Sodium (total)	mg/L	NG	200	8.47	7.47	7.52
Strontium (total)	mg/L	7.0 <sup>1.8</sup>	NG	0.696	0.682	
Uranium (total)	mg/L	0.02	NG	0.00258	0.00231	0.00211
Zinc (total)	mg/L	NG	5.0	0.013	0.0091	0.0073

See Guideline Notes in Section 6.2.4

**Table 15: Well #4 Source Water Total Metals Potability 2021-2023**

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

Well #5 Total Metals

Analyte	Unit	Guideline		Well #5 9-Mar-21	Well #5 2-Nov-21	Well #5 12-Jul-22	Well #5 28-Feb-23	Well #5 3-Oct-23
		GCDWQ MAC	GCDWQ AO					
		Sampling Location Date Sampled						
<b>Lab Results</b>								
<b>Total Metals</b>								
Aluminum (total)	mg/L	2.9 <sup>1.1</sup>	0.100 <sup>2.1</sup>	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Antimony (total)	mg/L	0.006	NG	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Arsenic (total)	mg/L	0.010 <sup>1.2</sup>	NG	0.00071	0.00051	0.0008	0.00071	0.00082
Barium (total)	mg/L	2.0 <sup>1.3</sup>	NG	0.0937	0.0905	0.0968	0.0959	0.09
Boron (total)	mg/L	5	NG	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Cadmium (total)	mg/L	0.007 <sup>1.4</sup>	NG	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Calcium (total)	mg/L	NG	NG	75.1	70.2	75.9	78.1	73.2
Chromium (total)	mg/L	0.05	NG	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (total)	mg/L	NG	NG	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (total)	mg/L	2 <sup>1.5</sup>	1	0.00718	0.0039	0.00511	0.0233	0.00661
Iron (total)	mg/L	NG	0.3	0.074	0.102	0.092	0.074	0.103
Lead (total)	mg/L	0.005 <sup>1.6</sup>	NG	0.00029	<0.00020	<0.00020	0.00075	0.00031
Magnesium (total)	mg/L	NG	NG	12.6	11.5	11.7	12.5	10.8
Manganese (total)	mg/L	0.12 <sup>1.7</sup>	0.02 <sup>2.2</sup>	0.0242	0.0263	0.0251	0.0296	0.0267
Mercury (total)	mg/L	0.001	NG	<0.000010	<0.000010	<0.000010		<0.000010
Molybdenum (total)	mg/L	NG	NG	0.00125	0.00123	0.00122	0.00128	0.00132
Nickel (total)	mg/L	NG	NG	0.0005	0.0008	<0.00040	0.00043	<0.00040
Selenium (total)	mg/L	0.05	NG	0.0007	0.00052	0.0008	0.00096	<0.00050
Sodium (total)	mg/L	NG	200	14.2	13.1	13.4	13.9	12.5
Strontium (total)	mg/L	7.0 <sup>1.8</sup>	NG	0.595	0.538	0.659	0.631	
Sulphur (total)	mg/L	NG	NG				12.4	
Zinc (total)	mg/L	NG	5.0	0.0113	0.0087	0.0051	0.0189	0.0048

See Guideline Notes in Section 6.2.4

**Table 16: Well #5 Source Water Total Metals Potability 2021-2023**



Well #6 Total Metals

Analyte	Unit	Guideline		Well #6	Well #6	Well #6
		GCDWQ MAC	GCDWQ AO	9-Mar-21	19-Jul-22	11-Oct-23
		Sampling Location Date Sampled				
<b>Lab Results</b>						
<b>Total Metals</b>						
Aluminum (total)	mg/L	2.9 <sup>1.1</sup>	0.100 <sup>2.1</sup>	<0.0050	<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	0.0486	0.0507	0.0499
Boron (total)	mg/L	5	NG	<0.0500	<0.0500	<0.0500
Cadmium (total)	mg/L	0.007 <sup>1.4</sup>	NG	<0.000010	0.00001	0.000012
Calcium (total)	mg/L	NG	NG	55.5	60.4	61.1
Chromium (total)	mg/L	0.05	NG	<0.00050	<0.00050	<0.00050
Cobalt (total)	mg/L	NG	NG	<0.00010	<0.00010	<0.00010
Copper (total)	mg/L	2 <sup>1.5</sup>	1	0.0104	0.0115	0.0127
Iron (total)	mg/L	NG	0.3	0.019	<0.010	0.011
Lead (total)	mg/L	0.005 <sup>1.6</sup>	NG	0.00049	0.00042	0.00087
Magnesium (total)	mg/L	NG	NG	11	10	10.2
Manganese (total)	mg/L	0.12 <sup>1.7</sup>	0.02 <sup>2.2</sup>	<0.00020	<0.00020	<0.00020
Mercury (total)	mg/L	0.001	NG	<0.000010	<0.000010	<0.000010
Molybdenum (total)	mg/L	NG	NG	0.00107	0.00095	0.00095
Nickel (total)	mg/L	NG	NG	<0.00040	<0.00040	<0.00040
Selenium (total)	mg/L	0.05	NG	0.00095	0.00096	0.00104
Sodium (total)	mg/L	NG	200	14.7	13	13.4
Strontium (total)	mg/L	7.0 <sup>1.8</sup>	NG	0.49	0.531	
Uranium (total)	mg/L	0.02	NG	0.00347	0.00344	0.00356
Zinc (total)	mg/L	NG	5.0	0.0076	0.0044	0.0212

See Guideline Notes in Section 6.2.4

**Table 17: Well #6 Source Water Total Metals Potability 2021-2023**

#### 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.

### 6.2.5. Source Water Manganese Testing 2023

As like many other groundwater wells in the south Okanagan, iron and manganese are present in the Okanagan Falls source wells with varying concentrations between the source wells, however, the Lower Zone has the highest concentrations. Well #2 is the only source exceeding the Maximum Allowable Concentration (MAC) of 0.12 mg/L of manganese established in the *Guidelines for Canadian Drinking Water Quality*. When iron and manganese in the well water come in contact with oxidants such as oxygen and chlorine, oxidation of these metals occurs. This results in precipitates of iron and manganese forming and resulting in reddish/brown sediments that accumulate in the distribution system. Well #2 was removed from service due to the elevated iron and manganese which resulted in poor water quality in the Lower Zone. Even with manganese levels below the MAC in Well #5, there are still negative impacts to the water quality in the Lower Zone but to a lesser degree than that of Well #2. Well #2 is regularly flushed and manganese level monitored in the event the well had to be returned to service.

Flushing of the distribution system occurs at minimum, annually. Additional flushing of sections of the distribution system are conducted in response to water quality complaints.

Concentrations of iron and manganese are considerably lower in the Upper Zone. In 2021, Well #4 was reporting manganese levels close to the MAC, however, the level dropped in the fall of 2021 close to the Aesthetic Objective of 0.02 mg/L. The cause of this change in concentration has not been determined. Well #4 is periodically tested in order to ensure that the level is not increasing.

The following table is a summary of the manganese monitoring in 2023 for Well #2, #4 and #5.

Analyte	Sampling Location	Unit	Avg	Min	Max	Number of Results
<b>Lab Results</b>						
<b>Total Metals</b>						
Manganese (total)	Well #2	mg/L	0.321	0.196	0.503	7
	Well #4	mg/L	0.0285	0.0279	0.0290	2
	Well #5	mg/L	0.0283	0.0267	0.0296	3

**Table 18: Well #2, #4 and #5 Total Manganese Monitoring Summary 2023**

#### 6.2.6. Source Water Hydrocarbons and Miscellaneous Organic Substance Testing 2023

The Okanagan Falls Irrigation District started monitoring for hydrocarbons at Well #2, #4 and #5 in 2015 and the RDOS continued with testing of Well #4 and #5 in 2023. Well #2 was not tested as it had been removed from regular service in 2023.

All parameters meet the GCDWQ MAC or AO with all hydrocarbon compounds were non-detectable with the exception of toluene at both Well #4 and Well #5.

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

Well #4 Hydrocarbons and Miscellaneous Organic Substances

Analyte	Unit	Guideline		Sampling Location	Well #4	Well #4
		GCDWQ MAC	GCDWQ AO	Date Sampled	19-Jul-22	6-Nov-23
<b>Lab Results</b>						
<b>Chlorinated Hydrocarbons</b>						
1,2-Dichlorobenzene	mg/L	NG	NG		<0.0005	
1,3-Dichlorobenzene	mg/L	NG	NG		<0.0010	
1,4-Dichlorobenzene	mg/L	0.005	0.001		<0.0010	
1,1-Dichloroethane	mg/L	NG	NG		<0.0010	
1,2-Dichloroethane	mg/L	0.005	NG		<0.0010	
1,1-Dichloroethylene	mg/L	0.014	NG		<0.0010	
cis-1,2-Dichloroethylene	mg/L	NG	NG		<0.0010	
trans-1,2-Dichloroethylene	mg/L	NG	NG		<0.0010	
Monochlorobenzene	mg/L	NG	NG		<0.0010	
1,1,1,2-Tetrachloroethane	mg/L	NG	NG		<0.0005	
Tetrachloroethylene	mg/L	0.01	NG		<0.0010	
1,1,1-Trichloroethane	mg/L	NG	NG		<0.0010	
1,1,2-Trichloroethane	mg/L	NG	NG		<0.0010	
Trichloroethylene	mg/L	0.005	NG		<0.0010	
<b>Miscellaneous Organic Substances</b>						
Chloroethane	mg/L	NG	NG		<0.0020	
1,2-Dibromoethane	mg/L	NG	NG		<0.0003	
1,2-Dichloropropane	mg/L	NG	NG		<0.0010	
1,3-Dichloropropene (cis + trans)	mg/L	NG	NG		<0.0010	
HEPHw	mg/L	NG	NG		<0.250	<0.250
LEPHw	mg/L	NG	NG		<0.250	<0.250
Methyl tert-butyl ether (MTBE)	mg/L	NG	0.015		<0.0010	<0.0010
VHw6-10	mg/L	NG	NG		<0.190	<0.100
Vinyl chloride	mg/L	0.002 1.1	NG		<0.0010	
VPHw	mg/L	NG	NG		<0.190	<0.100
<b>Monocyclic Aromatic Hydrocarbons (MAHs)</b>						
Benzene	mg/L	0.005	NG		<0.0005	<0.0005

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

Analyte	Unit	Guideline		Well #4	Well #4
		GCDWQ MAC	GCDWQ AO	Date Sampled	Date Sampled
				19-Jul-22	6-Nov-23
Ethylbenzene	mg/L	0.14	0.0016	<0.0010	<0.0010
Styrene	mg/L	NG	NG	<0.0010	<0.0010
Toluene	mg/L	0.06	0.024	<0.0010	0.0016
Xylenes	mg/L	0.09	0.02	<0.0020	<0.0020
<b>Polycyclic Aromatic Hydrocarbons (PAHs)</b>					
Acenaphthene	mg/L	NG	NG	<0.000050	<0.000050
Acenaphthylene	mg/L	NG	NG	<0.000200	<0.000200
Acridine	mg/L	NG	NG	<0.000050	<0.000050
Anthracene	mg/L	NG	NG	<0.000010	<0.000010
Benz[a]anthracene	mg/L	NG	NG	<0.000010	<0.000010
Benzo[a]pyrene	mg/L	0.00004	NG	<0.000010	<0.000010
Benzo[b]fluoranthene	mg/L	NG	NG		
Benzo[g,h,i]perylene	mg/L	NG	NG	<0.000050	<0.000050
Benzo[k]fluoranthene	mg/L	NG	NG	<0.000050	<0.000050
Chrysene	mg/L	NG	NG	<0.000050	<0.000050
Dibenz[a,h]anthracene	mg/L	NG	NG	<0.000010	<0.000010
Fluoranthene	mg/L	NG	NG	<0.000030	<0.000030
Fluorene	mg/L	NG	NG	<0.000050	<0.000050
Indeno[1,2,3-cd]pyrene	mg/L	NG	NG	<0.000050	<0.000050
Naphthalene	mg/L	NG	NG	<0.000200	<0.000200
Phenanthrene	mg/L	NG	NG	<0.000100	<0.000100
Pyrene	mg/L	NG	NG	<0.000020	<0.000020
Quinoline	mg/L	NG	NG	<0.000050	<0.000050

See Guideline Notes in Section 6.2.7

**Table 19: Well #4 Hydrocarbon and Misc. Organic Substances Summary 2022-2023**

Well #5 Hydrocarbons and Miscellaneous Organic Substances

Analyte	Unit	Guideline		Sampling Location	Well #5	Well #5
		GCDWQ MAC	GCDWQ AO	Date Sampled	12-Jul-22	6-Nov-23
<b>Lab Results</b>						
<b>Chlorinated Hydrocarbons</b>						
1,2-Dichlorobenzene	mg/L	NG	NG		<0.0005	
1,3-Dichlorobenzene	mg/L	NG	NG		<0.0010	
1,4-Dichlorobenzene	mg/L	0.005	0.001		<0.0010	
1,1-Dichloroethane	mg/L	NG	NG		<0.0010	
1,2-Dichloroethane	mg/L	0.005	NG		<0.0010	
1,1-Dichloroethylene	mg/L	0.014	NG		<0.0010	
cis-1,2-Dichloroethylene	mg/L	NG	NG		<0.0010	
trans-1,2-Dichloroethylene	mg/L	NG	NG		<0.0010	
Monochlorobenzene	mg/L	NG	NG		<0.0010	
1,1,2,2-Tetrachloroethane	mg/L	NG	NG		<0.0005	
Tetrachloroethylene	mg/L	0.01	NG		<0.0010	
1,1,1-Trichloroethane	mg/L	NG	NG		<0.0010	
1,1,2-Trichloroethane	mg/L	NG	NG		<0.0010	
Trichloroethylene	mg/L	0.005	NG		<0.0010	
<b>Miscellaneous Organic Substances</b>						
Chloroethane	mg/L	NG	NG		<0.0020	
1,2-Dibromoethane	mg/L	NG	NG		<0.0003	
1,2-Dichloropropane	mg/L	NG	NG		<0.0010	
1,3-Dichloropropene (cis + trans)	mg/L	NG	NG		<0.0010	
HEPHw	mg/L	NG	NG		<0.250	<0.250
LEPHw	mg/L	NG	NG		<0.250	<0.250
Methyl tert-butyl ether (MTBE)	mg/L	NG	0.015		<0.0010	<0.0010
VHw6-10	mg/L	NG	NG		<0.150	<0.100
Vinyl chloride	mg/L	0.002 <sup>1.1</sup>	NG		<0.0010	
VPHw	mg/L	NG	NG		<0.150	<0.100
<b>Monocyclic Aromatic Hydrocarbons (MAHs)</b>						
Benzene	mg/L	0.005	NG		<0.0005	<0.0005

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

Analyte	Unit	Guideline		Well #5	Well #5
		GCDWQ MAC	GCDWQ AO	Date Sampled	Date Sampled
				12-Jul-22	6-Nov-23
Ethylbenzene	mg/L	0.14	0.0016	<0.0010	<0.0010
Styrene	mg/L	NG	NG	<0.0010	<0.0010
Toluene	mg/L	0.06	0.024	<0.0010	0.0015
Xylenes	mg/L	0.09	0.02	<0.0020	<0.0020
<b>Polycyclic Aromatic Hydrocarbons (PAHs)</b>					
Acenaphthene	mg/L	NG	NG	<0.000050	<0.000050
Acenaphthylene	mg/L	NG	NG	<0.000200	<0.000200
Acridine	mg/L	NG	NG	<0.000050	<0.000050
Anthracene	mg/L	NG	NG	<0.000010	<0.000010
Benz[a]anthracene	mg/L	NG	NG	<0.000010	<0.000010
Benzo[a]pyrene	mg/L	0.00004	NG	<0.000010	<0.000010
Benzo[b]fluoranthene	mg/L	NG	NG		
Benzo[g,h,i]perylene	mg/L	NG	NG	<0.000050	<0.000050
Benzo[k]fluoranthene	mg/L	NG	NG	<0.000050	<0.000050
Chrysene	mg/L	NG	NG	<0.000050	<0.000050
Dibenz[a,h]anthracene	mg/L	NG	NG	<0.000010	<0.000010
Fluoranthene	mg/L	NG	NG	<0.000030	<0.000030
Fluorene	mg/L	NG	NG	<0.000050	<0.000050
Indeno[1,2,3-cd]pyrene	mg/L	NG	NG	<0.000050	<0.000050
Naphthalene	mg/L	NG	NG	<0.000200	<0.000200
Phenanthrene	mg/L	NG	NG	<0.000100	<0.000100
Pyrene	mg/L	NG	NG	<0.000020	<0.000020
Quinoline	mg/L	NG	NG	<0.000050	<0.000050

See Guideline Notes in Section 6.2.7

**Table 20: Well #5 Hydrocarbon and Misc. Organic Substances Summary 2022-2023**

**6.2.7. Guideline Notes for Source Water Hydrocarbons and Miscellaneous Organic Substance Testing**

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

**Note 1.1 for Vinyl chloride:** Every effort should be made to maintain vinyl chloride levels in drinking water as low as reasonably achievable.



### 6.3. Distribution System Bacteriological Results

The following is a summary of the bacteriological laboratory results from the treated water distribution system. There are seven (7) regular sampling sites in the Lower Zone and two (2) regular sampling sites in the Upper Zone throughout the distribution system. Weekly distribution bacteriological sampling includes one sample from each zone.

Schedule A of the *B C 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

In 2023, all but three (3) distribution samples had no detections for Total Coliforms and *E.coli*. The three positive samples were from the Upper Zone, with detections for Total Coliforms only. The reported values were between 1 and 5 CFU/100ml. A resample results reported no detection for Total Coliforms. No distribution samples had positive reports for *E.coli*. The following is a summary of the laboratory bacteriological results from the treated water distribution system.

Analyte	Unit	Average	Minimum	Maximum	Number of Results	Number of Results with Exceedances
<b>Lab Results</b>						
<b>Microbiological</b>						
Background bacteria	CFU/100 mL	12	1	500	46	0
Total coliforms (counts)	CFU/100 mL	1	1	5	116	3
E. coli (counts)	CFU/100 mL				116	0

**Table 21:** Distribution Water Bacteriological Testing Summary for 2023

**6.4. Lower Zone Distribution System Free Chlorine Residuals**

In Okanagan Falls only the Lower Zone is chlorinated. The following is a summary of the field free chlorine residual measurements from the Lower Zone distribution system. Free chlorine residuals are required to be maintained between 0.2 mg/L and 2.0 mg/L. There are eight (8) regular sampling sites throughout the distribution system. Typically, one (1) site was monitored on a weekly basis in conjunction with the bacteriological sampling. Flushing of water mains occurred at all locations when measured residual levels were below 0.2 mg/L free chlorine.

Analyte	Sampling Location	Unit	Average	Minimum	Maximum	Number of Results
<b>Field Results</b>						
Chlorine (free)	Ash St.	mg/L	0.62	0.32	0.89	9
	Cedar & 8th	mg/L	0.61	0.51	0.74	7
	Cedar & Thomas	mg/L	0.67	0.49	0.85	5
	Ferguson Pl.	mg/L	0.59	0.49	0.77	7
	Hody Dr.	mg/L	0.62	0.46	0.79	9
	Hwy 97 & 14th	mg/L	0.59	0.47	0.85	6
	McLean & Walnut	mg/L	0.64	0.47	0.75	7
	Sixth Ave.	mg/L	0.6	0.44	0.77	5

**Table 22:** Lower Zone Annual Distribution Free Chlorine Residual Summary for 2023

### 6.5. Distribution System Water Quality Field Parameter Testing

The following are summaries of the field parameters that are measured routinely in the distribution system for the Lower and Upper Zones. There are eight (8) regular sampling sites in the Lower Zone and two (2) in the Upper Zone of the distribution system. Typically, one (1) site from both the Lower and Upper Zone were monitored on a weekly basis in conjunction with the bacteriological sampling.

#### Lower Zone

Analyte	Unit	Average	Median	Minimum	Maximum	Number of Results
<b>Field Results</b>						
Conductivity	µS/cm	503	501	399	665	53
pH		7.57	7.56	6.94	8.7	53
Total dissolved solids	mg/L	357	355	284	481	53
Temperature	°C	11.3	11.8	5.7	18.1	53
Turbidity	NTU	0.3	0.22	0.12	2.64	58

**Table 23: Annual Lower Zone Field Water Quality Parameter Testing Summary for 2023**

#### Upper Zone

Analyte	Unit	Average	Median	Minimum	Maximum	Number of Results
<b>Field Results</b>						
Conductivity	µS/cm	489	484	439	599	52
pH		7.28	7.24	6.55	8.12	53
Total dissolved solids	mg/L	347	345	312	430	52
Temperature	°C	11.7	12.1	7.5	16.3	53
Turbidity	NTU	0.16	0.15	0.07	0.26	58

**Table 24: Annual Upper Zone Field Water Quality Parameter Testing Summary for 2023**

### 6.6. Water Quality Complaints

Approximately ten (10) water quality complaints were received in 2023. The majority of the complaints originated from the Lower Zone in the early months of 2023 before the removal of Well #2 from service and in November following the water service valve failures on Maple St. Complaints were typically of foul smelling water, discolored water and sediments. The typical response to these complaints included field water quality measurements (turbidity and free chlorine) and flushing of the local distribution system.

## 7. 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 purveyors. The Interior Health Authority has four types of public water notifications to inform users of negative impacts to water quality.

### 8.1. 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.

On January 23, 2023 the RDOS issued a *Water Quality Advisory* for manganese in the Lower Zone. This advisory was required to accommodate maintenance work on Well #5 which resulted in Well #2 being the only supply to the Lower Zone during this time. Historically, a WQA was not required as Well #2, which has a manganese concentration above the MAC, was blended with Well #5 water to bring the level below the MAC. The WQA was rescinded on April 18, 2023 at which time Well #2 was removed from service with Well #5 being the sole supply for the Lower Zone.

### 8.2. 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.

On November 17, 2023 a contractor struck a 4 inch (100mm) main on Hody Dr. A *Boil Water Notice* was issued for the entirety of Hody Dr. since the 4 inch main could not be flushed because a mainline valve was broken in the closed position. The BWN was rescinded on November 17, 2023.

A *Boil Water Notice* was issued for the Lower Zone on December 3, 2023 in response to two failed curb stop valves in the 1200 block of Maple St. After repairs were completed, the distribution system in the area was flushed. The BWN was rescinded on December 8, 2023.

On December 8, 2023 a radial split was discovered downstream of the previous repair on the 4 inch (100mm) Hody Dr. water main. This BWN was issued only to four (4) residences that were connected to the 4 inch main. The BWN was rescinded on December 15, 2023.

### **8.3. 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 2022.

### **8.4. 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 2022.

## **9. Program Updates and Status**

### **9.1. 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. One of main focuses of the program in 2023 was to address agricultural properties with a Severe Hazard rating that did not have an approved backflow preventer installed and/or an annual test report submitted. Properties with a Severe Hazard rating are commonly found in the agriculture sector. A common practice that results in an irrigation system being classified as a Severe Hazard is the use of fertigation/chemigation systems. This is where chemicals are injected directly into an irrigation system for application to crops. All other agricultural irrigation systems are typically rated as a Moderate Hazard. Agricultural properties with a Moderate Hazard classification were

encouraged to voluntarily comply with the installation and testing of a backflow preventer in 2023 with mandatory compliance set for 2025.

In 2023 work was also done on following up on commercial properties with known existing backflow preventers along with the surveying of commercial properties that were not part of the CCC database.

**9.2. Capital Works / System Additions**

None to report in 2023.

**9.3. Emergency Response Plan**

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

**9.4. Future System Upgrades**

The RDOS continued worked work in 2023 on planning for significant upgrades to the Okanagan Falls water system. In December of 2023 it was announced that the Okanagan Falls water system would receive an estimated total of \$4.8 million in 2024 and 2025.

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

No items of note in 2023.

**9.6. System Maintenance/Upgrades**

Unidirectional flushing of the distribution system occurred in the spring and fall of 2023. Both the Lower and Upper Zones were flushed in the spring while only the Lower Zone was flushed in the fall.

**9.7. Water Quality Monitoring Program**

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

## 10. Summary

All tested source water parameters from the groundwater wells in Okanagan Falls water system supplying the Okanagan Falls water system met the applicable criteria in 2023 with the exception of manganese from Well #2 which exceeded the MAC of 0.12 mg/L. In response to the poor water quality supplied from Well #2 the decision was made to remove it from service in April of 2023. Well #5 was capable of solely meeting the water demand in the Lower Zone in 2023. Iron and manganese from Well #5 continued to affect water quality in the Lower Zone, however, the impacts were significantly lower than that of Well #2. In 2023, the treated distribution water parameters met the applicable criteria. Low free chlorine residuals or poor water quality (color/sediments) complaints were actioned with flushing to increase residual levels and remove stagnated water. The operation of the Okanagan Falls water system by a team of RDOS *EOCP* certified Operators resulted in the continuous supply of the highest quality water possible to the community of Okanagan Falls. The RDOS continues to work on reviewing and upgrading the various programs that support improving the quality of water along with planning for future system upgrades.