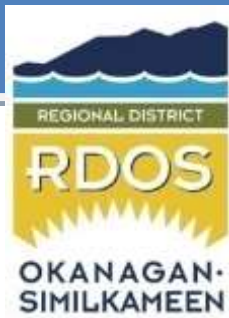


2022

ANNUAL WATER QUALITY MONITORING REPORT SUN VALLEY WATER SYSTEM



Sun Valley Pump Station and Reservoir

Regional District of Okanagan-Similkameen

February, 2024



**2022 ANNUAL WATER QUALITY MONITORING REPORT
SUN VALLEY WATER SYSTEM
SUN VALLEY, B.C.**

Copy prepared for:
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Table of Contents

1. Introduction	1
2. System Description	1
3. System Classification and Operator Certifications	1
3.1. System Classification	1
3.2. Operator Certification	1
4. Annual Water Usage	2
4.1. Consumption Records	2
4.2. Water Conservation	3
5. Aquifer Monitoring	3
6. Source Water Quality	3
6.1. Source Water Bi-Weekly Monitoring	5
6.2. Source Water Comprehensive Potable Water Results	5
6.2.1. Source Water General Potability Parameters 2020 to 2022	6
6.2.2. Guideline Notes for General Potability Parameters	7
6.2.3. Source Water Total Metals 2020 to 2022	8
6.2.4. Guideline Notes for Total Metals Potability	9
7. Distribution System Water Quality	10
7.1. Distribution System Bacteriological Results	10
7.2. Distribution Water Quality Field Parameters	12
7.3. Reservoir Supply Bi-Weekly Monitoring	13
7.4. Water Quality Complaints	13
8. Water System Notifications	13
8.1. Water Quality Advisory (WQA)	13
8.2. Boil Water Notice (BWN)	14
8.3. Do Not Consume (DNC)	14
8.4. Do Not Use (DNU)	14
9. Program Updates and Status	14
9.1. Cross Connection Control Program	14
9.2. Capital Works / System Additions	14
9.3. Emergency Response Plan	15
9.4. Future Systems Upgrades	15
9.5. Supervisory Control and Data Acquisition (SCADA) System	15
9.6. System Maintenance/Upgrades	15
9.7. Water Quality Monitoring Program	15
10. Summary	15

TABLES

Table 1: RDOS Operator Certifications 2022.....	1
Table 2: Annual Water Consumption 2022.....	2
Table 3: Sun Valley Well Bi-Weekly Testing 2022 Summary.....	5
Table 4: Sun Valley Well General Potability Parameters 2020 to 2022.....	6
Table 5: Sun Valley Well Total Metals Potability Parameters 2020 to 2022	8
Table 6: Distribution Water Bacteriological 2022 Summary	11
Table 7: Distribution Field Measured Parameters 2022 Summary.....	12
Table 8: Sun Valley Reservoir Supply Bi-Weekly Testing 2022 Summary	13
Table 9: Sun Valley Water System Boil Water Notices 2022 Dates	14

FIGURES

Figure 1: Annual Water Consumption 2018 to 2022	2
Figure 2: Monthly Water Consumption 2020 to 2022.....	3

1. Introduction

As the owner and operator of the Sun Valley water system, the Regional District Okanagan-Similkameen is responsible for the following Annual Report summarizing the results from the 2022 *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 Sun Valley water system is located within Electoral Area D southeast of Okanagan Falls. The Sun Valley water system consists of a deep groundwater well, a reservoir, distribution pumps and a distribution system. They system supplies water to approximately 28 services which include domestic, irrigation and commercial uses. The system also supports fire protection in the community of Sun Valley.

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 Sun Valley water system remained classified as a *Small Water System (SWS)* in 2022.

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 (4) 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
8761		X						X
9322		X						X

Table 1: RDOS Operator Certifications 2022

4. Annual Water Usage

The RDOS started trending the monthly and annual pumping volumes extracted from the Sun Valley well in 2019 with the installation of a flow meter. In 2022, a total of 142,205 m³ of water was pumped from the Sun Valley well down from 172,420 m³ in 2021.

4.1. Consumption Records

	Cubic Meters (m ³)	US Gallons	Date
Annual Total Usage	142,205	37,566,587	
Minimum Daily Flow	4	1057	February 16, 2022
Maximum Daily Flow	1,713	452,527	July 30, 2022

Table 2: Annual Water Consumption 2022

Both annual and monthly water consumption has been trended as shown in the following two graphs.

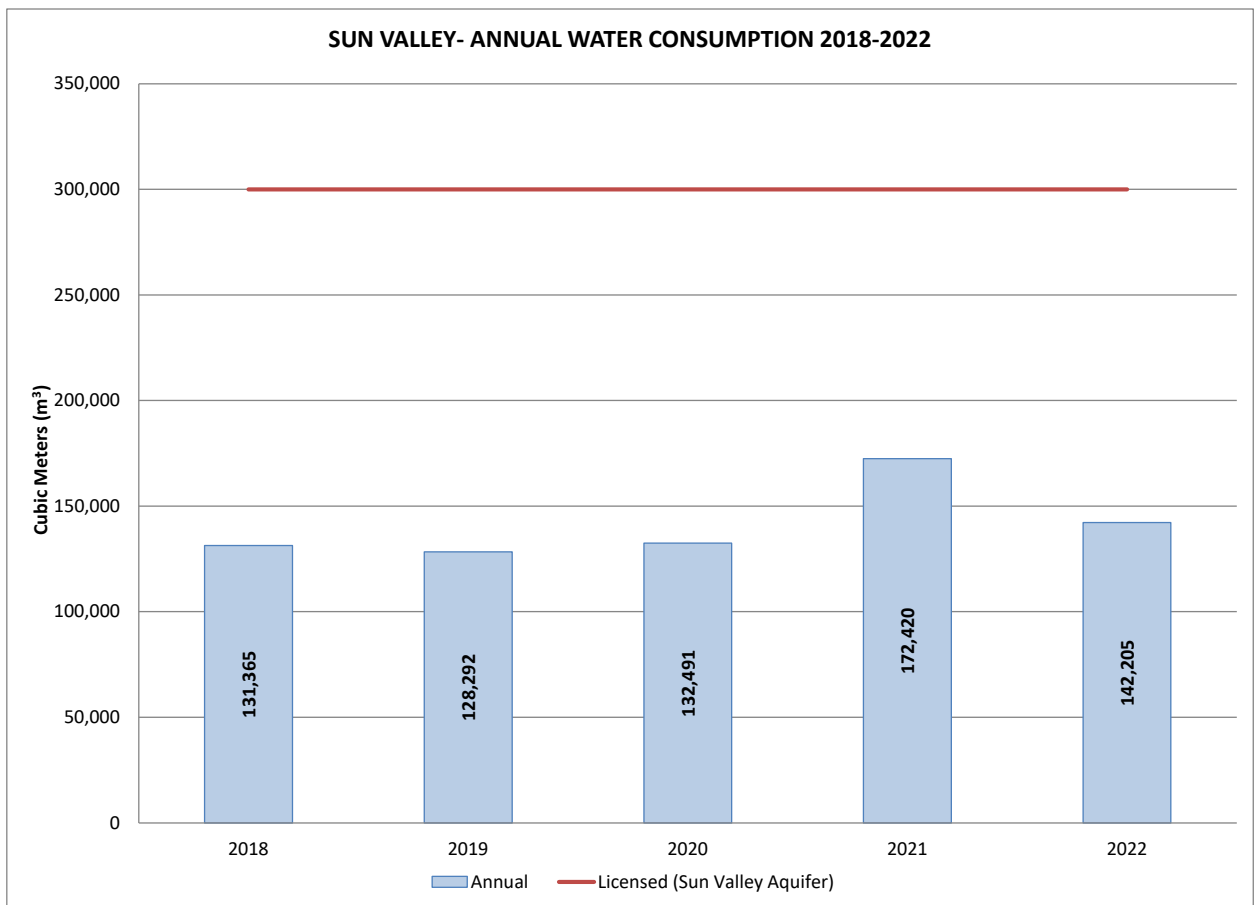


Figure 1: Annual Water Consumption 2018 to 2022

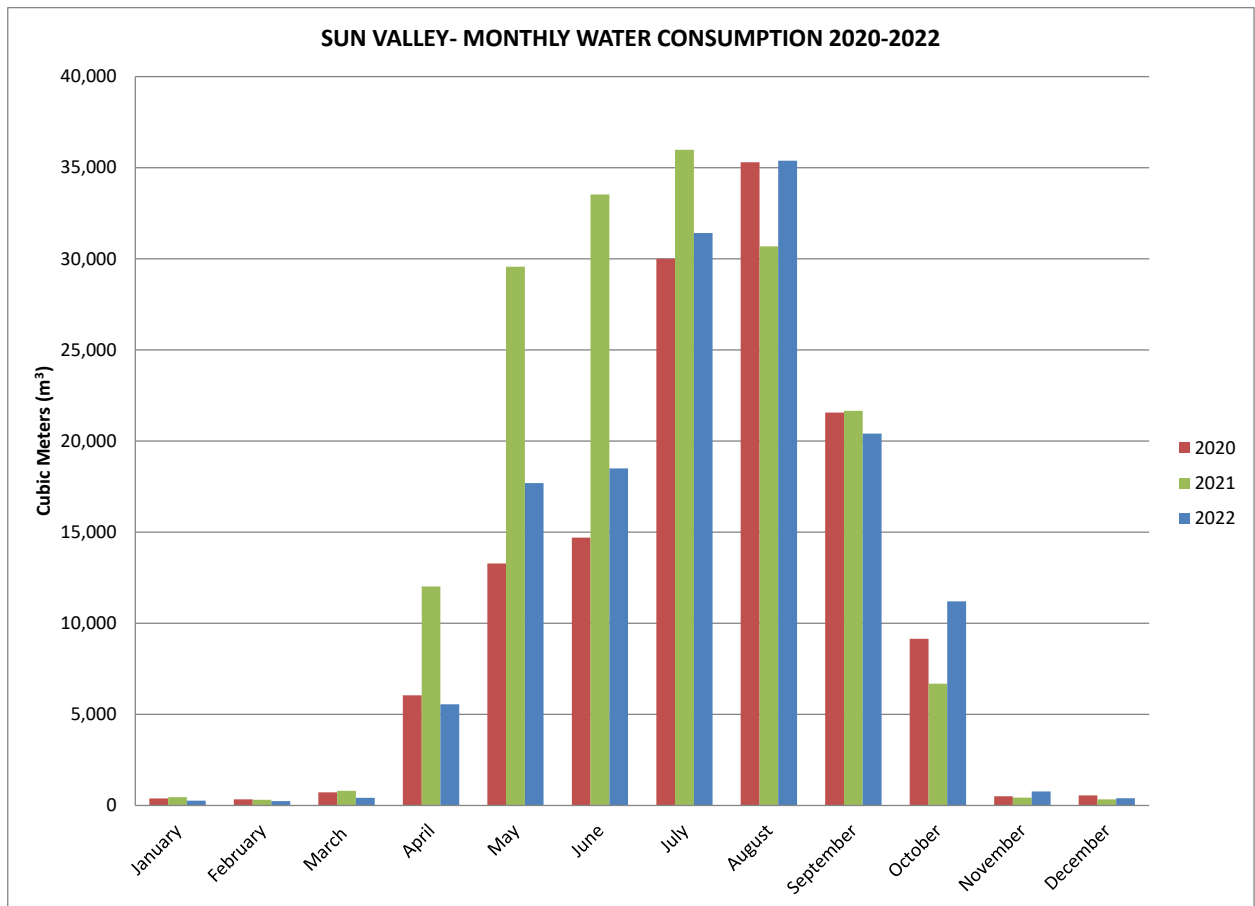


Figure 2: Monthly Water Consumption 2020 to 2022

4.2. Water Conservation

The Sun Valley water system remained under Stage “Normal” water restrictions in 2022.

5. Aquifer Monitoring

The RDOS began monitoring the aquifer level in the Sun Valley well in 2019. Unfortunately, due to a technical issue, the well level monitoring equipment failed in 2021. A new well level sensor and updated electronics (PLC) was installed in the first quarter of 2023.

6. Source Water Quality

All untreated source water quality parameters are compared to the applicable criteria set out in the *British Columbia Drinking Water Protection Act and Regulation (DWPA)*, the *Guidelines for Canadian Drinking Water Quality (GCDWQ)*, Interior Health Authority programs and Operational Guidelines (OG). The *DWPA* and *GCDWQ* define these parameters and set Aesthetic Objectives (AO) and Maximum Acceptable Concentrations (MAC).

Iron and manganese are present in the Sun Valley well water with concentrations that currently meet the criteria set in *The Guidelines for Canadian Drinking Water Quality*. However, iron and manganese continue to create problems within the Sun Valley distribution system.

It is believed that when the iron and manganese in the well water comes in contact with oxygen in the storage reservoir, oxidation of these metals occurs. This results in precipitates of iron and manganese forming reddish/brown sediments. The precipitates settle out in the distribution system piping and form a layer which becomes a medium where bacterial growth can occur. It is suspected that the Total Coliform bacteria that has been reported in a number of samples over the past years are a result of regrowth of bacteria in these sediments. In addition, discolored water and clogging of home filtration systems occurs when these sediments are disturbed and become suspended in the water.

The RDOS continues to closely monitoring the bacteriological quality of the water in the distribution system and responds accordingly with flushing of the system with high velocity water to scour the pipe walls to remove the buildup of iron and manganese precipitates.

In 2020 the RDOS started to investigate options for sequestering the iron and manganese in a small bench scale test. Sequestering is achieved by the use of a chemical additive to keep the iron and manganese in solution and prevent it from precipitating. The bench scale testing conducted to-date has not provided conclusive results and the RDOS will continue its investigation. Public consultation will occur before moving forward with any implementation plan for treatment.

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

6.1. Source Water Bi-Weekly Monitoring

Bi-weekly monitoring of the Sun Valley well includes bacteriological grab samples and field measured parameters using field kits. Samples from the well were analyzed for Total Coliforms and *Escherichia coli* (*E.coli*). A Total Coliform of 1 was reported twice in 2022 in the source well water samples collected bi-weekly. The table below summarizes the bacteriological laboratory results and the field measured parameters from the Sun Valley groundwater well.

Analyte	Unit	Avg	Min	Max	Number of Results	Number of Results with Exceedances
Field Results						
Conductivity	µS/cm	487	447	504	21	0
pH		7.78	7.60	7.93	21	0
Total dissolved solids	mg/L	346	317	358	21	0
Temperature	°C	10.8	8.8	13.3	21	0
Turbidity	NTU	0.17	0.07	0.67	25	0
Lab Results: Microbiological						
Background bacteria	CFU/100 mL	<1	<1	<1	25	0
E. coli (counts)	CFU/100 mL	<1	<1	<1	26	0
Total coliforms (counts)	CFU/100 mL	<1	<1	1	26	0

Table 3: Sun Valley Well Bi-Weekly Testing 2022 Summary

6.2. Source Water Comprehensive Potable Water Results

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 Allowable Concentration (MAC), Interim Maximum Allowable Concentrations (IMAC) and Aesthetic Objectives (AO) for parameters if applicable. In 2022, there were no exceedances of the guidelines in the Sun Valley groundwater well annual sample.

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 tests.

All tested source water parameters met the applicable guidelines in 2022 with no notable increasing or decreasing trends.

6.2.1. Source Water General Potability Parameters 2020 to 2022

Analyte	Unit	Guideline		Sun Valley Well	Sun Valley Well	Sun Valley Well
		GCDWQ MAC	GCDWQ AO	14-Sep-20	13-Sep-21	26-Sep-22
Lab Results: General						
Alkalinity (total, as CaCO ₃)	mg/L	NG	NG	158	224	240
Total organic carbon	mg/L	NG	NG	0.95	0.74	<0.50
Chloride	mg/L	NG	250	6.02	6.06	6.58
Colour	CU	NG	15	<5.0	<5.0	<5.0
Conductivity	µS/cm	NG	NG	468	471	465
Total cyanide	mg/L	0.2 ^{1.1}	NG	<0.0020	<0.0020	<0.0020
Fluoride	mg/L	1.5	NG	0.40	0.33	0.37
Hardness (as CaCO ₃), from total Ca/Mg	mg/L	NG	NG	239	226	225
Langelier Index		NG	NG	0.7	1.0	0.8
pH		NG	7.0 - 10.5 ^{2.1}	8.09	8.20	8.11
Total dissolved solids (computed)	mg/L	NG	500	248	285	296
Sulphate	mg/L	NG	500 ^{2.2}	45.2	46.5	48.2
Sulphide (total, as S)	mg/L	NG	0.047 ^{2.3}	<0.020	<0.020	<0.020
Turbidity	NTU	N ^{1.2}	NG	1.33	1.26	1.69
UV transmittance at 254 nm - filtered	%	NG	NG	98.6	98.6	99.1
Nutrients						
Ammonia (total, as N)	mg/L	NG	NG	0.088	<0.050	<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
Potassium (total)	mg/L	NG	NG	3.34	3.24	3.26

See Guideline Notes in Section 6.2.2

Table 4: Sun Valley Well General Potability Parameters 2020 to 2022

6.2.2. Guideline 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 H₂S) is 0.05 mg/L. This is equivalent to 0.047 mg/L sulphide (as S).

6.2.3. Source Water Total Metals 2020 to 2022

Analyte	Unit	Guideline		Sun Valley Well	Sun Valley Well	Sun Valley Well
		GCDWQ MAC	GCDWQ AO	14-Sep-20	13-Sep-21	26-Sep-22
Lab Results: Total Metals						
Aluminum (total)	mg/L	2.9 ^{1.1}	0.100 ^{2.1}	<0.0050	0.0067	<0.0050
Antimony (total)	mg/L	0.006	NG	<0.00020	<0.00020	<0.00020
Arsenic (total)	mg/L	0.010 ^{1.2}	NG	0.00119	0.00111	0.0011
Barium (total)	mg/L	2.0 ^{1.3}	NG	0.109	0.105	0.106
Boron (total)	mg/L	5	NG	<0.0500	<0.0500	<0.0500
Cadmium (total)	mg/L	0.007 ^{1.4}	NG	<0.000010	<0.000010	<0.000010
Calcium (total)	mg/L	NG	NG	74	69.6	69.9
Chromium (total)	mg/L	0.05	NG	<0.00050	0.00066	<0.00050
Cobalt (total)	mg/L	NG	NG	<0.00010	<0.00010	<0.00010
Copper (total)	mg/L	2 ^{1.5}	1	<0.00040	0.00079	0.00044
Iron (total)	mg/L	NG	0.3	0.227	0.207	0.199
Lead (total)	mg/L	0.005 ^{1.6}	NG	0.00027	0.00025	<0.00020
Magnesium (total)	mg/L	NG	NG	13.1	12.6	12.2
Manganese (total)	mg/L	0.12 ^{1.7}	0.02 ^{2.2}	0.0603	0.0589	0.0576
Mercury (total)	mg/L	0.001	NG	<0.000010	<0.000010	<0.000010
Molybdenum (total)	mg/L	NG	NG	0.00224	0.00232	0.00215
Nickel (total)	mg/L	NG	NG	<0.00040	0.00074	0.00041
Selenium (total)	mg/L	0.05	NG	<0.00050	<0.00050	<0.00050
Sodium (total)	mg/L	NG	200	10.1	10.1	9.52
Strontium (total)	mg/L	7.0 ^{1.8}	NG	0.588	0.528	0.626
Uranium (total)	mg/L	0.02	NG	0.00409	0.00362	0.00311
Zinc (total)	mg/L	NG	5.0	0.0219	0.0299	0.0203

See Guideline Notes in Section 6.2.4

Table 5: Sun Valley Well Total Metals Potability Parameters 2020 to 2022

6.2.4. Guideline 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. **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 Allowable Concentrations (MAC).

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

7.1. **Distribution System Bacteriological Results**

The Sun Valley distribution system has two dedicated sample stations that are alternated between bi-weekly. Samples from the distribution system were analyzed for Total Coliforms and *Escherichia coli (E.coli)*.

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

As discussed above under source water, oxidized iron and manganese are forming reddish/brown sediments within the distribution system. The precipitates settle out in the distribution system piping and forms a layer which becomes a medium where bacterial growth can occur. It is suspected that the Total Coliform bacteria that has been reported in a number of samples over the past years are a result of regrowth of bacteria in these sediments. In addition, discolored water and clogging of home filtration systems occurs when these sediments are disturbed and become suspended in the water.

The RDOS continues to closely monitoring the bacteriological quality of the water in the distribution system and responds accordingly with flushing of the system with high velocity water to scour the pipe walls to remove the buildup of iron and manganese precipitates.

In 2022, Pinewinds Place sampling location had one report for Total Coliforms. All distribution sample had no detections for *E.coli*. The following is a summary of the bacteriological laboratory results from the distribution system.

Analyte	Sampling Location	Unit	Average	Min	Max	Number of Results	Number of Results with Exceedances
Lab Results: Microbiological							
Background bacteria	Pinewinds Pl.	CFU/100 mL	4	<1	32	18	0
	Sun Valley Way	CFU/100 mL	<1	<1	1	20	0
E. coli (counts)	Pinewinds Pl.	CFU/100 mL	<1	<1	<1	18	0
	Sun Valley Way	CFU/100 mL	<1	<1	<1	20	0
Total coliforms (counts)	Pinewinds Pl.	CFU/100 mL	<1	<1	3	18	1
	Sun Valley Way	CFU/100 mL	<1	<1	<1	20	0

Table 6: Distribution Water Bacteriological 2022 Summary

7.2. Distribution 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	Min	Max	Number of Results	Number of Results with Exceedances
Field Results							
Conductivity	Pinewinds Pl.	µS/cm	489	471	499	15	0
	Sun Valley Way	µS/cm	493	472	557	17	0
pH	Pinewinds Pl.		7.72	7.39	7.99	15	0
	Sun Valley Way		7.83	7.57	8.05	17	0
Total dissolved solids	Pinewinds Pl.	mg/L	347	334	355	15	0
	Sun Valley Way	mg/L	350	332	395	17	0
Temperature	Pinewinds Pl.	°C	13.5	6.8	18.8	15	0
	Sun Valley Way	°C	11.8	5.3	18.0	17	0
Turbidity	Pinewinds Pl.	NTU	1.2	0.35	2.42	18	0
	Sun Valley Way	NTU	1.37	0.27	2.47	20	0

Table 7: Distribution Field Measured Parameters 2022 Summary

7.3. Reservoir Supply Bi-Weekly Monitoring

Bi-weekly monitoring of the Sun Valley Reservoir includes bacteriological grab samples and field measured parameters using field kits. Samples from the Reservoir 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 Sun Valley Reservoir.

Analyte	Unit	Average	Minimum	Maximum	Number of Results	Number of Results with Exceedances
Field Results						
Conductivity	µS/cm	489	420	586	23	0
pH		7.83	7.51	8.10	24	0
Total dissolved solids	mg/L	349	334	415	23	0
Temperature	°C	10.3	5.1	14.2	24	0
Turbidity	NTU	1.62	0.42	2.70	27	0
Lab Results: Microbiological						
Background bacteria	CFU/100 mL	2	<1	36	28	0
E. coli (counts)	CFU/100 mL	<1	<1	<1	28	0
Total coliforms (counts)	CFU/100 mL	<1	<1	<1	28	0

Table 8: Sun Valley Reservoir Supply Bi-Weekly Testing 2022 Summary

7.4. Water Quality Complaints

No water quality complaints were received in 2022.

8. 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.

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.

No WQAs issued for 2022.

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.

In 2022 three BWNs were issued; two for power outages that resulted in portions of the water system losing water pressure and one when the reservoir was taken off-line to be clean and distribution lines flushed. The Boil Water Notices were in effect between 7 and 8 days. The reason for the BWN, dates they were issued and rescinded have been tabulated below.

Reason for BWN	Date BWN Issued	Date BWN Rescinded
Power Outage	April 8, 2022	April 14, 2022
Reservoir Cleaning and System Flushing	April 19, 2022	April 25, 2022
Power Outage	August 16, 2022	August 23, 2022

Table 9: Sun Valley Water System Boil Water Notices 2022 Dates

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

The RDOS continued work in 2022 towards implementing an official Cross Connection Control program and bylaw. In 2021, the RDOS adopted Bylaw No 2851, 2020 Cross Connection Control. Bylaw 2851 is a Regional bylaw that will be applicable to all RDOS owned and operated water systems.

9.2. Capital Works / System Additions

No items of note in 2022.

9.3. Emergency Response Plan

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

9.4. Future Systems Upgrades

The RDOS will continue to investigate potential options for treatment of the iron and manganese in the Sun Valley water system.

9.5. Supervisory Control and Data Acquisition (SCADA) System

No items of note in 2022.

9.6. System Maintenance/Upgrades

A leak on home owner's side of the service connection increased system flows on November 26th and 27th, 2022.

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 Sun Valley groundwater well met the applicable criteria in 2022. All tested distribution water parameters with the exception of turbidity met the applicable criteria in 2022. Three *Boil Water Notices* were issued in 2022; two in response to a loss of system pressure resulting from utility power outages and the other one from a scheduled Reservoir cleaning and system flushing. The operation of the Sun Valley system by a team of RDOS *EOCP* certified Operators resulted in the supply of the highest quality water possible to the community of Sun Valley. The RDOS continues to work on reviewing and upgrading the various programs that support facilitating the highest quality of water possible.