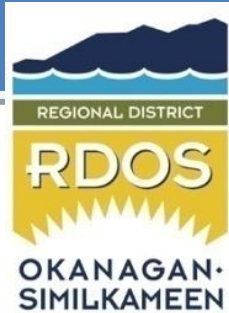
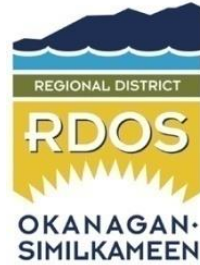


2021

ANNUAL WATER QUALITY MONITORING REPORT MISSEZULA WATER SYSTEM





**2021 ANNUAL WATER QUALITY MONITORING REPORT
MISSEZULA WATER SYSTEM
MISSEZULA, B.C.**

Copy prepared for:
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1. Introduction

As the owner and operator of the Missezula Lake water system, the Regional District Okanagan-Similkameen is responsible for the following Annual Report summarizing the results from the 2021 *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 Missezula Lake water system ownership was transferred from the Missezula Lake Improvement District to the RDOS in the fall of 2019. The Missezula Lake community is a remote community that is located within Electoral Area H approximately 50 kilometers north of Princeton. The Missezula Lake system draws water from Missezula Lake to supply domestic water to approximately 190 connections consisting of both permanent residents and seasonal use homes. The water from Missezula Lake is chlorinated prior to entering the distribution system.

Interior Health Authority has mandated requirements for the Missezula Lake water system to meet the Provincial 4-3-2-1-0 Treatment Standards. Upgrades to the system will be required to fulfill this requirement.

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 Missezula Lake system remained classified as a *Small Water System (SWS)* in 2021.

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 2021

4. Annual Water Usage

The annual pumping volumes extracted from the Missezula Lake from 2007 to 20121 is presented below in Figure 1. In 2021, a total of 144,027 m³ of water was pumped from the Missezula Lake up from 131,078 m³ in 2020.

4.1. Consumption Records

	Cubic Meters (m ³)	US Gallons	
Annual Total Usage	144,027	38,047,908	Date
Minimum Daily Flow	170	44,909	April 20, 2021
Maximum Daily Flow	946	249,907	July 02, 2021

Table 2: Missezula Annual Water Consumption 2021

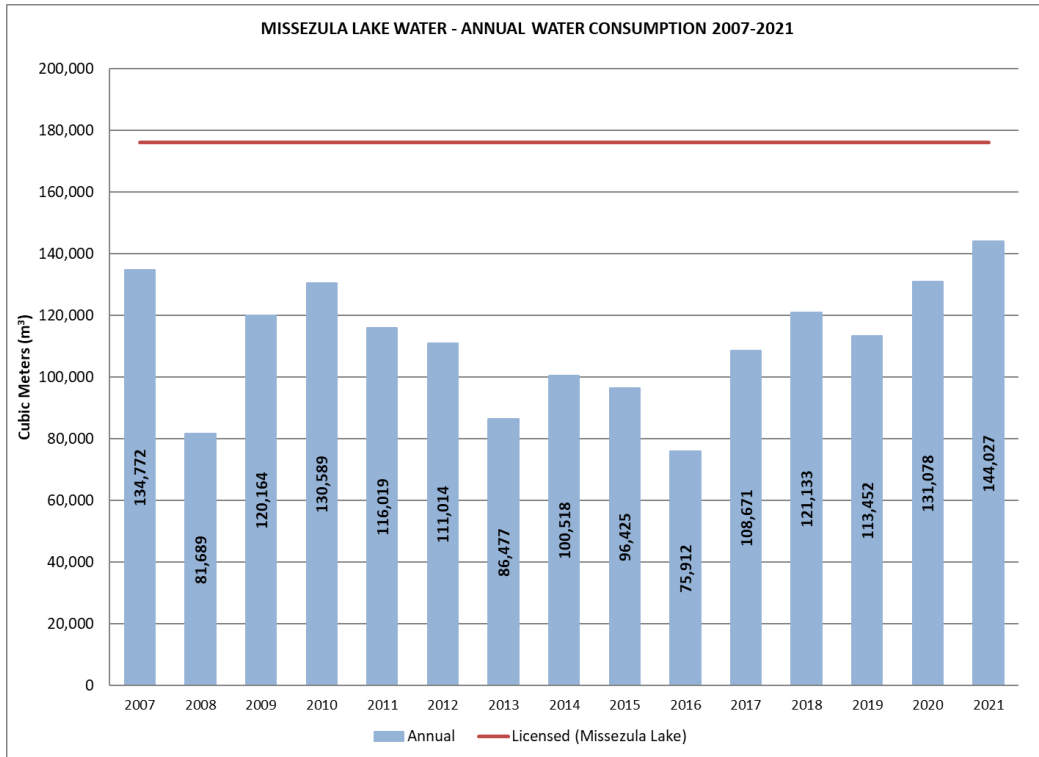


Figure 1: Annual Water Consumption 2007 to 2021

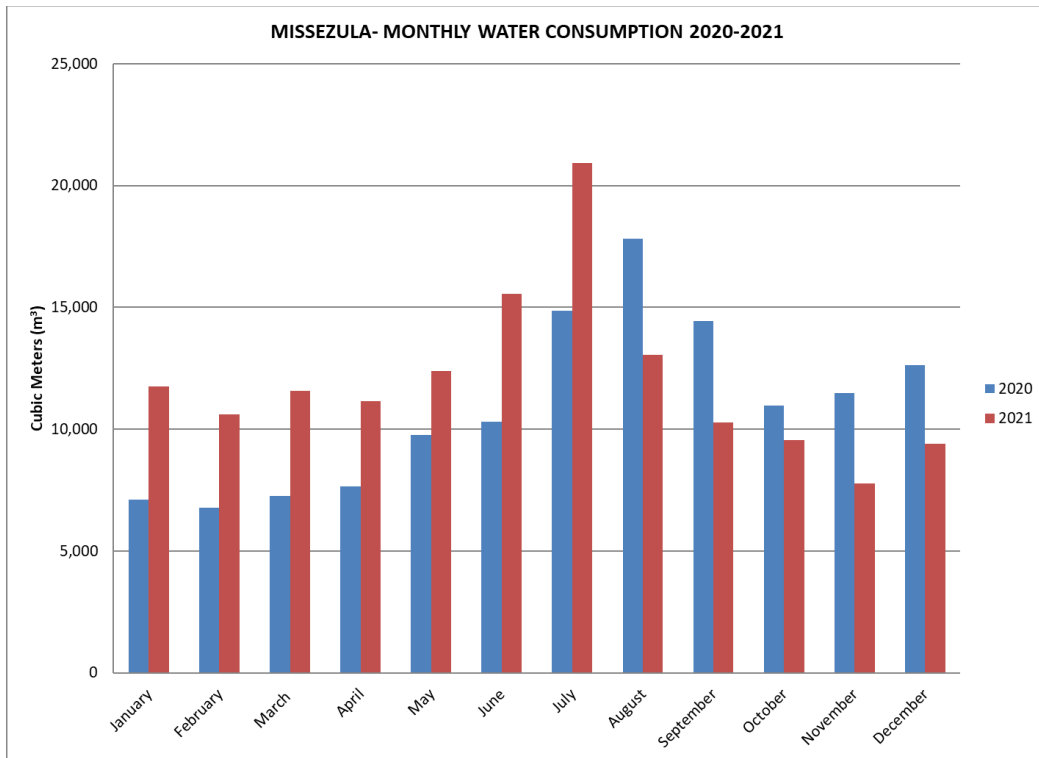


Figure 2: Monthly Water Consumption 2020 to 2021

4.2. Water Conservation

The Missezula Lake water system started under Stage “Normal” water restrictions in 2021. By the third week of July 2021, the Missezula system was placed under Stage 3 water restrictions. This was in response to an earlier than average decrease in water levels in Missezula Lake. The Province regulates the discharge rate from the Missezula Lake which is required to meet the requirements of water licences on Summers Creek. The discharge coupled with low levels of precipitation in 2021 resulted in an increased rate of decline in the lake level. During this time the RDOS started investigating potential responses in the event that the level were to drop to a point where pumping from the Lake would not be sustainable. The Stage 3 Restrictions remained in effect for the remainder of 2021 and no issues with the pumping of water from the lake were encountered.

Stage 3 watering restrictions allows hand-held watering of shrubs, vegetables and flowers once per week, but all lawn watering is not permitted. All other outdoor watering or cleaning is also not permitted. Topping up or refilling of pools, hot tubs, ponds, or water features requires prior approval.

5. 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 2021 were performed by Caro Analytical Services (Kelowna, B.C.)

5.1. Source Water Bi-Weekly Monitoring

Bi-weekly monitoring of the Missezula Lake includes grab samples for bacteriological testing and general water potability parameters and field measured parameters using field kits. Samples from Missezula Lake were analyzed for Total Coliforms and *Escherichia coli (E.coli)*, Alkalinity, Total Organic Carbon, Colour, Hardness, Total Suspended Solids and UV Transmittance at 254 nm. The table below summarizes the laboratory results and the field measured parameters from the Missezula Lake.

Analyte	Unit	Average	Minimum	Maximum	Number of Results	Number of Results with Exceedances
Field Results						
Conductivity	µS/cm	385	327	490	14	0
pH		7.72	7.30	8.11	13	0
Total dissolved solids	mg/L	273	232	347	14	0
Temperature	°C	6.2	3.4	9.6	14	0
Turbidity	NTU	1.1	0.5	2.07	14	0
General						
Alkalinity (total, as CaCO ₃)	mg/L	158	137	166	16	0
Total organic carbon	mg/L	5.22	4.46	8.83	16	0
Colour	CU	7.5	<5.0	13	16	0
Hardness (as CaCO ₃), from total Ca/Mg	mg/L	152	141	170	16	0
Total suspended solids	mg/L	1.4	<2.0	<4.0	16	0
UV transmittance at 254 nm - filtered	%	79.3	69.4	80.8	15	0
UV transmittance at 254 nm - unfiltered	%	78.2	67.8	79.5	16	0
Total Metals						
Calcium (total)	mg/L	41.1	38.3	45.7	16	0
Magnesium (total)	mg/L	12	10.8	13.6	16	0
Microbiological						
E. coli (MPN)	MPN/100 mL	<1	<1	<1	15	0
Total coliforms (MPN)	MPN/100 mL	5	<1	28	15	0

Table 3: Missezula Lake Bi-Weekly Monitoring 2021 Summary

6. 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 2021 were performed by Caro Analytical Services (Kelowna, B.C.)

6.1. Distribution System Bacteriological Results

The Missezula Lake Pumpouse discharge and two distribution system sample stations were sampled bi-weekly. A third distribution sample station was sampled periodically. Samples from the Pumpouse discharge and 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

In 2021, all distribution samples had no detections for Total Coliforms and *E.coli*. The following is a summary of the laboratory bacteriological results from the treated water distribution system.

Analyte	Sampling Location	Unit	Average	Minimum	Maximum	Number of Results	Number of Results with Exceedances
Lab Results: Microbiological							
Background bacteria	Phase 1	CFU/1	<1	<1	<1	5	0
	Pump House	CFU/1	<1	<1	1	23	0
	The Gate	CFU/1	<1	<1	<1	24	0
	Tower	CFU/1	31	<1	390	22	0
E. coli (counts)	Phase 1	CFU/1	<1	<1	<1	6	0
	Pump House	CFU/1	<1	<1	<1	27	0
	The Gate	CFU/1	<1	<1	<1	27	0
	Tower	CFU/1	<1	<1	<1	24	0
Total coliforms (counts)	Phase 1	CFU/1	<1	<1	<1	6	0
	Pump House	CFU/1	<1	<1	<1	27	0
	The Gate	CFU/1	<1	<1	<1	27	0
	Tower	CFU/1	<1	<1	<1	24	0

Table 4: Distribution Water Bacteriological Testing 2021 Summary

6.2. Distribution System Free Chlorine Residuals

The following is a summary of the free chlorine residual measurements from the pump house discharge and the distribution system. Free chlorine is measured with bacteriological samples. Free chlorine residuals are required to be maintained between 0.2 mg/L and 2.0 mg/L of free chlorine.

Analyte	Sampling Location	Unit	Average	Minimum	Maximum	Number of Results
Field Results						
Chlorine (free)	Pump House Discharge	mg/L	0.80	0.50	1.19	27
	Phase 1	mg/L	0.16	0.02	0.52	6
	The Gate	mg/L	0.58	0.29	0.91	27
	Tower	mg/L	0.39	0.02	0.92	24

Table 5: Distribution System Free Chlorine Residuals 2021 Summary

6.3. Distribution System Water Quality Field Parameters

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

Analyte	Unit	Average	Minimum	Maximum	Number of Results	Number of Numerical Results
Field Results						
Conductivity	µS/cm	350	324	374	45	45
pH		7.89	7.53	8.27	43	43
Total dissolved solids	mg/L	248	229	265	45	45
Temperature	°C	7.5	2.8	13.3	45	45
Turbidity	NTU	0.41	0.16	0.67	54	54

Table 6: Distribution System Field Measured Parameters 2021 Summary

6.4. Water Quality Complaints

None to report for 2021.

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

7.1. 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 in 2021.

7.2. 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 December 2, 2021 a BWN was issued in response to a chlorination failure due to a faulty fuse in power supply to the PLC. This BWN was rescinded December 13, 2021.

7.3. 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 2021.

7.4. 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 2021.

8. Program Updates and Status

8.1. Cross Connection Control Program

The RDOS continued work in 2021 towards implementing an official Cross Connection Control program and bylaw. The Public Works Department addresses specific cross connection control issues with the current water system bylaw as they arise.

8.2. Capital Works / System Additions

None of note in 2021.

8.3. Emergency Response Plan

The *Emergency Response Plan* is scheduled to be updated in 2022.

8.4. Future System Upgrades

As mandated by the Interior Health Authority, the Missezula Lake water system is required to meet the Provincial 4-3-2-1-0 Treatment Standards if it is to continue using Missezula Lake as a water source. The Regional District applied for Federal/Provincial grant funding in 2020 and was notified in late 2021 that the grant application was successful. The RDOS will initiate the source water upgrade project for the Missezula Lake water system in 2022.

In anticipation of the upgrades Larratt Aquatic (Kelowna, B.C.) was contracted in 2020 to begin an assessment of the Missezula Lake Intake. This report was completed in early 2022.

8.5. Supervisory Control and Data Acquisition (SCADA System)

A SCADA system is an integral part of a modern water system. It is comprised of sensors, programmable controllers, communications and network devices installed at pump stations and treatment facilities. The SCADA system controls equipment such as pumps and monitors system operations while storing important data such as intake turbidity levels, pumping flow rates, and storage reservoir levels. The system also provides for efficiencies in operation and the response to system failures. This is achieved by the ability to monitor and view the system remotely through a software package along with the generation of alarms that will notify the system Operators when there is a problem or failure within a system.

In 2020 the RDOS had a consultant develop a SCADA Master Plan. This plan will assist with upgrades to the existing SCADA network along with providing a detailed plan on how to move forward into the future in an efficient manner.

In 2021 the RDOS implemented a new SCADA software package. This include new graphics that conformed to the specifications outlined in the Master Plan along with enhanced security for remote access and improved data trending capabilities.

8.6. System Maintenance/Upgrades

None of note in 2021.

8.7. Water Quality Monitoring Program

The *Water Quality Monitoring Program* is scheduled to be updated in 2022.

9. Summary

All tested water parameters from the Missezula Lake water system met applicable criteria in 2021. A Boil Water Notice was issued in December due to a chlorination system failure. The operation of the Missezula Lake water system by a team of RDOS *EOCP* certified Operators resulted in the supply of the highest quality water possible to the community of Missezula Lake. The RDOS continues to work on reviewing and upgrading the various programs that support facilitating the highest quality of water possible. In addition, the RDOS will begin work on the Missezula Lake Upgrade Project in 2022 to meet the Provincial 4-3-2-1-0 Treatment Standards.