

PUBLIC WATER SYSTEM ANNUAL REPORT

-2017-

Name of the Public Water System: Municipality of Souris-Glenwood Water Treatment Plant

Name of the legal owner: Municipality of Souris-Glenwood

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Water system's emergency number: (204)483-0705

Name of Operator: Don Bodin, Senior Plant Operator

Phone during business hours: (204) 483-5209

Emergency number: (204) 483-0705

Date prepared; March 17, 2017

Charlotte Parham
Chief Administrative Officer
Municipality of Souris-Glenwood

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Introduction:

The 2017 Annual Report for the Municipality of Souris-Glenwood summarizes the Water Utility's ability to produce safe potable water and meet provincial regulations.

1. Description of the Water System:

The Municipality of Souris-Glenwood Public Water System provides potable drinking water to a population of 1837 residents. Treated water produced at the water treatment plant meets all health and aesthetic objectives as stated in the Guidelines for Canadian Drinking Water Quality.

1.1. Water supply source

The Souris Water Treatment Plant receives groundwater from two wells located 16 kilometers northeast of Souris. Both wells were drilled to a depth of approximately 130 feet with the pumps drawing at 80 feet. Raw water is pumped from the wells into a 200mm pipeline where it flows to the water treatment plant.

As water flows through the ground it dissolves metals and minerals. In the case of Souris's raw water, it has come into contact with a few metals with the major concerns being iron, manganese, calcium carbonate (hardness causing mineral) and a conventional parameter known as ammonia. All of these items do not pose health concerns, rather they are known as aesthetic water quality parameters, with the exception being ammonia as there is no upper detection limit in the Guidelines for Canadian Drinking Water Quality. (See Appendix A- Raw Water Analyses)

1.2. Water treatment process

Iron and manganese are metals that cause laundry and plumbing fixture staining problems. In addition, these materials can build up in the distribution pipes and cause reduced flow. Calcium carbonate causes hardness in water which diminishes the ability of the water to react with soap and form lather. Hardness also forms scale deposits in hot water devices reducing the life expectancy of these appliances.

Ammonia does not pose a health concern but rather it does cause other problems in the treatment process.

The current water treatment process is designed to remove iron, manganese and ammonia down to acceptable limits and soften the water down to a total hardness of 80 to 100 mg/L. With regards to hardness individuals have their own preference with the ability to install their own water softeners.

The Souris water treatment process consists of iron and manganese removal followed by reverse osmosis, ph adjustment, disinfection and fluoridation. (See Appendix B-Treatment Process). The treatment process also contains the addition of approximately 20% of blended raw water. The town chose this as to make the water less aggressive before it enters the distribution system.

Iron and manganese is removed from the raw water by adding potassium permanganate. The water then flows into a contact tank with a retention time of approximately 90 minutes. Potassium permanganate is added to cause the iron and manganese to come out of solution (precipitate). The precipitated iron and manganese is then removed from the water by flowing through three manganese greensand filters. This treatment process is the blended water.

In addition to iron and manganese removal, hardness and ammonia is removed by reverse osmosis (R.O.). The R.O. consists of a two stage unit with 80 membranes. After R.O., the ph is then adjusted, followed by chlorination and fluoridation. Treated water is then stored in the treated water reservoir located beneath the plant.

1.3. Distribution system

Treated water from the reservoir is pumped throughout the towns distribution system via two duty pumps. The main pump is 15 h.p. with the backup pump being 25 h.p. The backup pump is set to start if pressure in the distribution drops below 70 p.s.i. Piping in the distribution consists of approximately 80% cast iron and 20% PVC.

1.4. Storage reservoirs

Name: Water Plant Reservoir	Capacity: 178,000 imp. gals
Name: North Reservoir	Capacity: 50,000 imp. gals
Name: Pumphouse Reservoir	Capacity: 130,000 imp. gals

1.5. Number of connections, population served and types of water users

The Souris distribution system is comprised of 882 service connections, serving a population of 1837 people. All service connections are metered. Types of water users are domestic, commercial and agricultural. Agricultural water is provided by an automatic bulk water station located at the water treatment plant.

1.6. Classification and Certification

The Municipality of Souris-Glenwood Water Treatment Plant consists of only two operators.

- Class 3 Water Treatment Facility Classification
- Certification level of operators:
 - Don Bodin, Level 3
 - Darcy Dunbar, Level 2

2. Disinfection System in Use

The final step in the treatment of safe potable water is disinfection. Disinfection is the destruction or inactivation of potential disease causing organisms in water. As per the Drinking Water Safety Act the Souris Public Water System must ensure that a disinfection residual of at least:

- 0.5 mg of free chlorine per litre of water is detectable at the point where water enters the distribution system, after a minimum contact time of 20 minutes.
- 0.1 mg of free chlorine per litre of water is detectable at all times in the distribution system.

Because the Souris raw water has elevated concentrations of ammonia, it has interfered in maintaining a 0.5 mg/l of free chlorine. After an increase in the feed rate of approximately 60 % we achieved breakpoint chlorination and were able to maintain the required residual of at least 0.50 mg/l , 99 % of the time at the water treatment plant.

2.1. Type of disinfection system used

The Municipality of Souris-Glenwood disinfects using chlorine gas by ejecting it into the treated water before it enters the reservoirs.

2.2. Equipment redundancy and monitoring requirements

As required by the Drinking Water Safety Act the Souris PWS ensures continuous disinfection is maintained at the plant by keeping in stock all spare parts required for the chlorinator. A complete spare chlorinator is also kept at the plant.

Disinfectant residuals are monitored daily at the plant and bi-weekly in the distribution system and recorded on the appropriate monitoring forms. Monthly chlorination report forms are sent to the regional Drinking Water Officer at the end of each month .The public water system has also met its regulatory requirement for 2017 with regard to weekly monitoring of free ammonia 96% of the time, missing a test in July and one in August.

2.3 Disinfection residual overall performance/ results

For 2017, the Souris Public Water System has met the regulatory requirements in regards to monitoring and reporting disinfection residuals leaving the water treatment plant 100% of the time. In the distribution system we met the standards 100% of the time in regards to monitoring and reporting.

3. List of Water Quality Standards:

The Province of Manitoba has adopted a number of water quality standards from the Guidelines for Canadian Drinking Water Quality, developed by Health Canada. The parameters are health-based and they express the maximum acceptable concentrations for a groundwater source. Concentration values in excess require corrective actions. The 2017 results for the Souris Public Water System are summarized in the following table:

Source	Parameter	Standard	Performance Objectives	Frequency	Test Results	
Groundwater	TC & EC*	No TC or EC		Bi-weekly	100% passed	
	Report Submissions			Monthly	100%	
	Disinfectant (Free Chlorine)	WTP (>0.50 mg/L)			Daily	99%
		Distribution (>0.10 mg/L)			Bi-weekly	100%
	Total Dissolved Solids		500	Every three years. * * Results from Dec 1, 2015. To be tested in 2018.	213 mg/L	
	Iron		0.3		<0.010 mg/L	
	Manganese		0.05		0.00106 mg/L	
	Arsenic	<= 0.01 mg/L			0.00098 mg/L	
	Benzene	<= 0.005 mg/L			<0.00050 mg/L	
	Fluoride	<= 1.5 mg/L			See Appendix C	
	Lead	<= 0.01 mg/L			0.000090 mg/L	
	Nitrate	<= 45mg/L as nitrate, 10mg/L as nitrogen			0.0141mg/L as N	
	Trichloroethylene	<= 0.005mg/L			<0.50 mg/L	
	Tetrachloroethylene	<= 0.03mg/L			<0.50 mg/L	
Uranium	<= 0.02 mg/L		0.00020 mg/L			

Bacteriological Monitoring and Reporting.

	Regulatory Requirement	PWS Performance
Number of Raw/ incoming water samples	26	26
Number of treated water samples	26	26
Number of distribution water samples	26	52
Frequency of Testing	Bi-weekly	100%
Total Coliform present in samples	0 TC per 100ml	100%
E. Coli present on samples	0 EC per 100ml	100%

Treated water leaving the Souris Public Water System is below all aesthetic limits as established in the Guidelines for Canadian Drinking Water Quality and does not pose a health concern. * Bacterial testing: We test the raw water (untreated), the treated water and the water in the distribution system bi-weekly for the presence of Total Coliform (TC) and E. Coli (EC) bacteria. If these bacteria are present in the water it is an indication that disease causing organisms may also be present.

4. Water System Incidents and Corrective Actions

The Souris Public Water system was in compliance 99% of the time when using the free chlorine method of disinfection at the water treatment plant. The plant experienced mechanical problems on April 21 & 22 where the free residual was below the 0.50 mg/l guideline at the treatment plant. Corrective Action forms were filed with Manitoba Water Stewardship. The free residual was in compliance 100% of the time in the distribution system. We were in compliance 100 % of the time in regards to the bi-weekly sample monitoring. In regards to weekly testing for free ammonia, we missed a test in July and in August being in compliance 96% of the time.

5. Additional records required

The Souris Public Water System takes part in Manitoba Health's fluoridation program. Water samples are collected on a daily basis from the treated water reservoir and tested on site. Daily fluoride results are recorded and a 14 day composite sample is submitted bi-weekly to ALS Labs in Winnipeg for analysis. (See Appendix C – 2017 Fluoridation Results). The Souris Public Water System strives to maintain a 0.70 mg/L fluoride level. The operating range for fluoride, as identified by Manitoba Health, is 0.50- 0.90 mg/L. Manitoba Health dropped the optimum level from 1.00 mg/L down to 0.70 mg/L as of March 26, 2011.

6. Drinking Water Safety Orders on your System and Actions Taken in Response

In 2017, no drinking water safety orders were issued.

7. Boil Water Advisories Issued and Actions Taken in Response

In 2017, there were 7 boil water advisories issued. Jan.18 to Jan.23, Mar.6 to Mar.15, May 22 to May 23, May 24 to May 31, Aug.25 to Aug.30, Aug.31 to Sept.8 and Nov.7 to Nov.10 all due to watermain breaks and water line depressurization.

8. Warnings Issued or Charges Laid on the System in Accordance with The Drinking Water Safety Act

In 2017, no Warnings were Issued or Charges Laid against the Souris Public Water System.

9. Major Expenses Incurred

On May 8 2017, all 80 membranes were changed in the R.O. unit at a total cost of \$76,995.85.

10. Future System Expansion and/or Increased Production

In 2018, the Municipality of Souris-Glenwood does not anticipate any system expansion or increased production.

Municipality of Souris-Glenwood Appendix A

Results of Raw & Treated Water Analyses



ANALYTICAL REPORT

Physical Tests (WATER)

Analyte	Unit	Guide Limit		ALS ID	L1708928-1	L1708928-2
		#1	#2	Sampled Date	01-DEC-15	01-DEC-15
				Sampled Time	11:00	11:00
				Sample ID	SOURIS 1 - RAW	SOURIS 2 - TREATED
Colour, True	CU	15	-		10.1	<5.0
Conductivity	umhos/cm	-	-		1230	364
Hardness (as CaCO3)	mg/L	-	-		374	86.4
Langelier Index (4 C)	No Unit	-	-		0.34	-0.64
Langelier Index (60 C)	No Unit	-	-		1.1	0.13
pH	pH units	6.5-8.5	-		7.59	7.63
Total Dissolved Solids	mg/L	500	-		776	213
Transmittance, UV (254 nm)	% T	-	-		78.0	94.2
Turbidity	NTU	-	-		31.4	<0.10

Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Anions and Nutrients (WATER)

Analyte	Unit	Guide Limit		ALS ID	L1708928-1	L1708928-2
		#1	#2	Sampled Date	01-DEC-15	01-DEC-15
				Sampled Time	11:00	11:00
				Sample ID	SOURIS 1 - RAW	SOURIS 2 - TREATED
Alkalinity, Total (as CaCO3)	mg/L	-	-		370	112
Ammonia, Total (as N)	mg/L	-	-		1.24	<0.010
Bicarbonate (HCO3)	mg/L	-	-		452	137
Bromide (Br)	mg/L	-	-		0.21	<0.10
Carbonate (CO3)	mg/L	-	-		<0.60	<0.60
Chloride (Cl)	mg/L	250	-		28.6	10.4
Fluoride (F)	mg/L	-	1.5		0.278	0.594
Hydroxide (OH)	mg/L	-	-		<0.34	<0.34
Nitrate (as N)	mg/L	-	10		<0.0050	0.0141
Nitrite (as N)	mg/L	-	1		<0.0010	<0.0010
Sulfate (SO4)	mg/L	500	-		314	71.9

Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Organic / Inorganic Carbon (WATER)

Analyte	Unit	Guide Limit		ALS ID	L1708928-1	L1708928-2
		#1	#2	Sampled Date	01-DEC-15	01-DEC-15
				Sampled Time	11:00	11:00
				Sample ID	SOURIS 1 - RAW	SOURIS 2 - TREATED
Dissolved Organic Carbon	mg/L	-	-		4.44	1.44
Total Organic Carbon	mg/L	-	-		3.87	0.72

Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.



ANALYTICAL REPORT

Total Metals (WATER)

		ALS ID		L1708928-1	L1708928-2
		Sampled Date		01-DEC-15	01-DEC-15
		Sampled Time		11:00	11:00
		Sample ID		SOURIS 1 - RAW	SOURIS 2 - TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Aluminum (Al)-Total	mg/L	0.1	-	<0.0050	<0.0050
Antimony (Sb)-Total	mg/L	-	0.006	<0.00020	<0.00020
Arsenic (As)-Total	mg/L	-	0.01	0.00279	0.00098
Barium (Ba)-Total	mg/L	-	1	0.0274	0.00245
Beryllium (Be)-Total	mg/L	-	-	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L	-	-	<0.00020	<0.00020
Boron (B)-Total	mg/L	-	5	0.363	0.277
Cadmium (Cd)-Total	mg/L	-	0.005	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	-	-	92.0	21.3
Cesium (Cs)-Total	mg/L	-	-	<0.00010	<0.00010
Chromium (Cr)-Total	mg/L	-	0.05	<0.0010	<0.0010
Cobalt (Co)-Total	mg/L	-	-	<0.00020	<0.00020
Copper (Cu)-Total	mg/L	1	-	0.00027	0.0381
Iron (Fe)-Total	mg/L	0.3	-	2.67	<0.010
Lead (Pb)-Total	mg/L	-	0.01	<0.000090	<0.000090
Lithium (Li)-Total	mg/L	-	-	0.114	0.0281
Magnesium (Mg)-Total	mg/L	-	-	34.9	8.05
Manganese (Mn)-Total	mg/L	0.05	-	0.106	0.00106
Molybdenum (Mo)-Total	mg/L	-	-	0.00319	0.00063
Nickel (Ni)-Total	mg/L	-	-	<0.0020	<0.0020
Phosphorus (P)-Total	mg/L	-	-	<0.10	0.31
Potassium (K)-Total	mg/L	-	-	6.63	1.70
Rubidium (Rb)-Total	mg/L	-	-	0.00322	0.00082
Selenium (Se)-Total	mg/L	-	0.05	<0.0010	<0.0010
Silicon (Si)-Total	mg/L	-	-	12.9	3.02
Silver (Ag)-Total	mg/L	-	-	<0.00010	<0.00010
Sodium (Na)-Total	mg/L	200	-	150	49.6
Strontium (Sr)-Total	mg/L	-	-	0.893	0.194
Tellurium (Te)-Total	mg/L	-	-	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	-	-	<0.00010	<0.00010
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.00020	<0.00020
Titanium (Ti)-Total	mg/L	-	-	<0.00050	<0.00050

Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

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ANALYTICAL REPORT

Total Metals (WATER)

		ALS ID		L1708928-1	L1708928-2
		Sampled Date		01-DEC-15	01-DEC-15
		Sampled Time		11:00	11:00
		Sample ID		SOURIS 1 - RAW	SOURIS 2 - TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Tungsten (W)-Total	mg/L	-	-	<0.00010	<0.00010
Uranium (U)-Total	mg/L	-	0.02	0.00070	0.00016
Vanadium (V)-Total	mg/L	-	-	<0.00020	<0.00020
Zinc (Zn)-Total	mg/L	5	-	0.0024	0.0032
Zirconium (Zr)-Total	mg/L	-	-	<0.00040	<0.00040

Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Volatile Organic Compounds (WATER)

		ALS ID		L1708928-1
		Sampled Date		01-DEC-15
		Sampled Time		11:00
		Sample ID		SOURIS 1 - RAW
Analyte	Unit	Guide Limit #1	Guide Limit #2	
Benzene	mg/L	-	0.005	<0.00050
1,1-dichloroethene	mg/L	-	0.014	<0.00050
Dichloromethane	mg/L	-	0.05	<0.0010 ^{DLCL}
Ethylbenzene	mg/L	0.0016	0.14	<0.00050
MTBE	mg/L	0.015	-	<0.00050
Tetrachloroethene	mg/L	-	0.01	<0.00050
Toluene	mg/L	0.024	0.06	<0.00050
Trichloroethene	mg/L	-	0.005	<0.00050
o-Xylene	mg/L	-	-	<0.00050
m+p-Xylenes	mg/L	-	-	<0.00050
Xylenes (Total)	mg/L	0.02	0.09	<0.0015
Surrogate: 4-Bromofluorobenzene (SS)	%	-	-	95.4
Surrogate: 1,4-Difluorobenzene (SS) %		-	-	99.2

Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)

#1: GCDWQ - Aesthetic Objective

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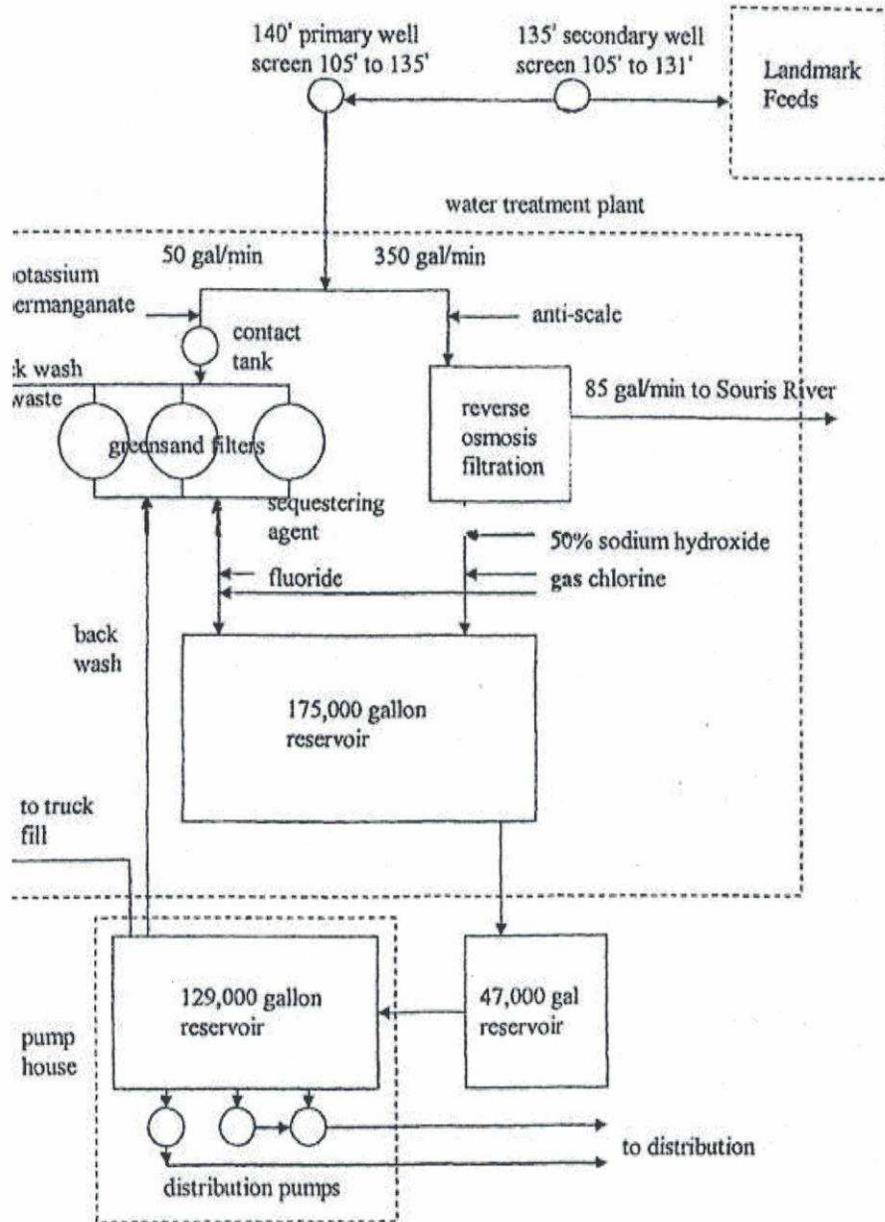
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Souris Water Treatment Plant

Appendix B



Fluoridation Results 2017 Appendix C

<i>Date</i>	<i>Readings</i>
1. Dec.24/16 - Jan 6/17	0.46 mg/l
2. Jan 7 - Jan 20	0.71 mg/l
3. Jan 21 - Feb 3	0.49 mg/l
4. Feb 4 - Feb 17	0.60 mg/l
5. Feb 18 - March 3	0.63 mg/l
6. March 4 - March 17	0.60 mg/l
7. March 18 - March 31	0.57 mg/l
8. April 1 - April 14	0.66 mg/l
9. April 15 - April 28	0.63 mg/l
10. April 29 - May 12	0.70 mg/l
11. May 13 - May 26	0.52 mg/l
12. May 27 - June 9	0.62 mg/l
13. June 10 - June 23	0.70 mg/l
14. June 24 - July 7	0.63 mg/l
15. July 8 - July 21	0.61 mg/l
16. July 22 - Aug 4	0.57 mg/l
17. Aug 5 - Aug 18	0.48 mg/l
18. Aug 19 - Sept 1	0.65 mg/l
19. Sept 2 - Sept 15	0.68 mg/l
20. Sept 16 - Sept 29	0.70 mg/l
21. Sept 30 - Oct 13	0.68 mg/l
22. Oct 14 - Oct 27	0.67 mg/l
23. Oct 28 - Nov 10	0.64 mg/l
24. Nov 11 - Nov 24	0.55 mg/l
25. Nov 25 - Dec 8	0.52 mg/l
26. Dec 9 - Dec 22	0.49 mg/l

Total Metals (WATER)

		ALS ID		L1708928-1	L1708928-2
		Sampled Date		01-DEC-15	01-DEC-15
		Sampled Time		11:00	11:00
		Sample ID		SOURIS 1 - RAW	SOURIS 2 - TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Aluminum (Al)-Total	mg/L	0.1	-	<0.0050	<0.0050
Antimony (Sb)-Total	mg/L	-	0.006	<0.00020	<0.00020
Arsenic (As)-Total	mg/L	-	0.01	0.00279	0.00098
Barium (Ba)-Total	mg/L	-	1	0.0274	0.00245
Beryllium (Be)-Total	mg/L	-	-	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L	-	-	<0.00020	<0.00020
Boron (B)-Total	mg/L	-	5	0.363	0.277
Cadmium (Cd)-Total	mg/L	-	0.005	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	-	-	92.0	21.3
Cesium (Cs)-Total	mg/L	-	-	<0.00010	<0.00010
Chromium (Cr)-Total	mg/L	-	0.05	<0.0010	<0.0010
Cobalt (Co)-Total	mg/L	-	-	<0.00020	<0.00020
Copper (Cu)-Total	mg/L	1	-	0.00027	0.0381
Iron (Fe)-Total	mg/L	0.3	-	2.67	<0.010
Lead (Pb)-Total	mg/L	-	0.01	<0.000090	<0.000090
Lithium (Li)-Total	mg/L	-	-	0.114	0.0281
Magnesium (Mg)-Total	mg/L	-	-	34.9	8.05
Manganese (Mn)-Total	mg/L	0.05	-	0.106	0.00106
Molybdenum (Mo)-Total	mg/L	-	-	0.00319	0.00063
Nickel (Ni)-Total	mg/L	-	-	<0.0020	<0.0020
Phosphorus (P)-Total	mg/L	-	-	<0.10	0.31
Potassium (K)-Total	mg/L	-	-	6.63	1.70
Rubidium (Rb)-Total	mg/L	-	-	0.00322	0.00082
Selenium (Se)-Total	mg/L	-	0.05	<0.0010	<0.0010
Silicon (Si)-Total	mg/L	-	-	12.9	3.02
Silver (Ag)-Total	mg/L	-	-	<0.00010	<0.00010
Sodium (Na)-Total	mg/L	200	-	150	49.6
Strontium (Sr)-Total	mg/L	-	-	0.893	0.194
Tellurium (Te)-Total	mg/L	-	-	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	-	-	<0.00010	<0.00010
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.00020	<0.00020
Titanium (Ti)-Total	mg/L	-	-	<0.00050	<0.00050

Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

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ANALYTICAL REPORT

Total Metals (WATER)

		ALS ID		L1708928-1	L1708928-2
		Sampled Date		01-DEC-15	01-DEC-15
		Sampled Time		11:00	11:00
		Sample ID		SOURIS 1 - RAW	SOURIS 2 - TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Aluminum (Al)-Total	mg/L	0.1	-	<0.0050	<0.0050
Antimony (Sb)-Total	mg/L	-	0.006	<0.00020	<0.00020
Arsenic (As)-Total	mg/L	-	0.01	0.00279	0.00098
Barium (Ba)-Total	mg/L	-	1	0.0274	0.00245
Beryllium (Be)-Total	mg/L	-	-	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L	-	-	<0.00020	<0.00020
Boron (B)-Total	mg/L	-	5	0.363	0.277
Cadmium (Cd)-Total	mg/L	-	0.005	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	-	-	92.0	21.3
Cesium (Cs)-Total	mg/L	-	-	<0.00010	<0.00010
Chromium (Cr)-Total	mg/L	-	0.05	<0.0010	<0.0010
Cobalt (Co)-Total	mg/L	-	-	<0.00020	<0.00020
Copper (Cu)-Total	mg/L	1	-	0.00027	0.0381
Iron (Fe)-Total	mg/L	0.3	-	2.67	<0.010
Lead (Pb)-Total	mg/L	-	0.01	<0.000090	<0.000090
Lithium (Li)-Total	mg/L	-	-	0.114	0.0281
Magnesium (Mg)-Total	mg/L	-	-	34.9	8.05
Manganese (Mn)-Total	mg/L	0.05	-	0.106	0.00106
Molybdenum (Mo)-Total	mg/L	-	-	0.00319	0.00063
Nickel (Ni)-Total	mg/L	-	-	<0.0020	<0.0020
Phosphorus (P)-Total	mg/L	-	-	<0.10	0.31
Potassium (K)-Total	mg/L	-	-	6.63	1.70
Rubidium (Rb)-Total	mg/L	-	-	0.00322	0.00082
Selenium (Se)-Total	mg/L	-	0.05	<0.0010	<0.0010
Silicon (Si)-Total	mg/L	-	-	12.9	3.02
Silver (Ag)-Total	mg/L	-	-	<0.00010	<0.00010
Sodium (Na)-Total	mg/L	200	-	150	49.6
Strontium (Sr)-Total	mg/L	-	-	0.893	0.194
Tellurium (Te)-Total	mg/L	-	-	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	-	-	<0.00010	<0.00010
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.00020	<0.00020
Titanium (Ti)-Total	mg/L	-	-	<0.00050	<0.00050

Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.



ANALYTICAL REPORT

Total Metals (WATER)

		ALS ID		L1708928-1	L1708928-2
		Sampled Date		01-DEC-15	01-DEC-15
		Sampled Time		11:00	11:00
		Sample ID		SOURIS 1 - RAW	SOURIS 2 - TREATED
Analyte	Unit	Guide Limit #1	Guide Limit #2		
Aluminum (Al)-Total	mg/L	0.1	-	<0.0050	<0.0050
Antimony (Sb)-Total	mg/L	-	0.006	<0.00020	<0.00020
Arsenic (As)-Total	mg/L	-	0.01	0.00279	0.00098
Barium (Ba)-Total	mg/L	-	1	0.0274	0.00245
Beryllium (Be)-Total	mg/L	-	-	<0.00020	<0.00020
Bismuth (Bi)-Total	mg/L	-	-	<0.00020	<0.00020
Boron (B)-Total	mg/L	-	5	0.363	0.277
Cadmium (Cd)-Total	mg/L	-	0.005	<0.000010	<0.000010
Calcium (Ca)-Total	mg/L	-	-	92.0	21.3
Cesium (Cs)-Total	mg/L	-	-	<0.00010	<0.00010
Chromium (Cr)-Total	mg/L	-	0.05	<0.0010	<0.0010
Cobalt (Co)-Total	mg/L	-	-	<0.00020	<0.00020
Copper (Cu)-Total	mg/L	1	-	0.00027	0.0381
Iron (Fe)-Total	mg/L	0.3	-	2.67	<0.010
Lead (Pb)-Total	mg/L	-	0.01	<0.000090	<0.000090
Lithium (Li)-Total	mg/L	-	-	0.114	0.0281
Magnesium (Mg)-Total	mg/L	-	-	34.9	8.05
Manganese (Mn)-Total	mg/L	0.05	-	0.106	0.00106
Molybdenum (Mo)-Total	mg/L	-	-	0.00319	0.00063
Nickel (Ni)-Total	mg/L	-	-	<0.0020	<0.0020
Phosphorus (P)-Total	mg/L	-	-	<0.10	0.31
Potassium (K)-Total	mg/L	-	-	6.63	1.70
Rubidium (Rb)-Total	mg/L	-	-	0.00322	0.00082
Selenium (Se)-Total	mg/L	-	0.05	<0.0010	<0.0010
Silicon (Si)-Total	mg/L	-	-	12.9	3.02
Silver (Ag)-Total	mg/L	-	-	<0.00010	<0.00010
Sodium (Na)-Total	mg/L	200	-	150	49.6
Strontium (Sr)-Total	mg/L	-	-	0.893	0.194
Tellurium (Te)-Total	mg/L	-	-	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	-	-	<0.00010	<0.00010
Thorium (Th)-Total	mg/L	-	-	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	-	<0.00020	<0.00020
Titanium (Ti)-Total	mg/L	-	-	<0.00050	<0.00050

Federal Guidelines for Canadian Drinking Water Quality (MAR, 2015)

#1: GCDWQ - Aesthetic Objective

#2: GCDWQ - Maximum Acceptable Concentrations (MACs)

Detection Limit for result exceeds Guide Limit. Assessment against Guide Limit cannot be made.

Analytical result for this parameter exceeds Guide Limit listed on this report.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Validation Results 2017 Appendix C

<i>Date</i>	<i>Readings</i>
1. Dec.24/16 - Jan 6/17	0.46 mg/l
2. Jan 7 - Jan 20	0.71 mg/l
3. Jan 21 – Feb 3	0.49 mg/l
4. Feb 4 – Feb 17	0.60 mg/l
5. Feb 18 – March 3	0.63 mg/l
6. March 4 – March 17	0.60 mg/l
7. March 18 – March 31	0.57 mg/l
8. April 1 – April 14	0.66 mg/l
9. April 15 – April 28	0.63 mg/l
10. April 29 – May 12	0.70 mg/l
11. May 13 – May 26	0.52 mg/l
12. May 27 – June 9	0.62 mg/l
13. June 10 – June 23	0.70 mg/l
14. June 24 – July 7	0.63 mg/l
15. July 8 – July 21	0.61 mg/l
16. July 22 - Aug 4	0.57 mg/l
17. Aug 5 – Aug 18	0.48 mg/l
18. Aug 19 – Sept 1	0.65 mg/l
19. Sept 2 – Sept 15	0.68 mg/l
20. Sept 16 – Sept 29	0.70 mg/l
21. Sept 30 – Oct 13	0.68 mg/l
22. Oct 14 – Oct 27	0.67 mg/l
23. Oct 28 – Nov 10	0.64 mg/l
24. Nov 11 – Nov 24	0.55 mg/l
25. Nov 25 – Dec 8	0.52 mg/l
26. Dec 9 - Dec 22	0.49 mg/l