

# CITY OF ROSSLAND

## Annual Water Report - 2016

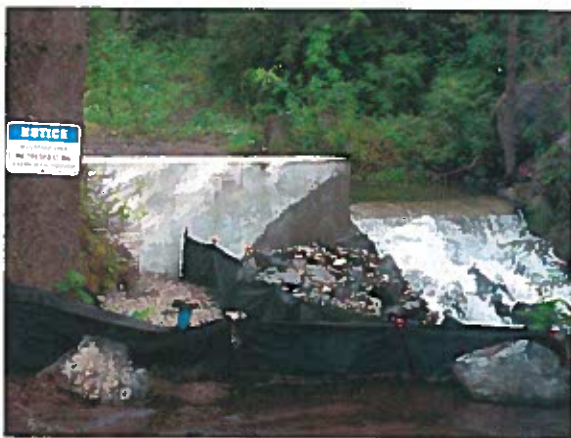


### Introduction

The City of Rossland provides drinking water to users connected to the Rossland Water System. This report is provided to City Council for their information, and in fulfillment of the City's obligations under the Provincial Drinking Water Act and associated regulations, as well as the terms and conditions of the City's Water System Operating Permit. Enforcement of the regulations and issuance of water system permits is the responsibility of the Interior Health Authority's Drinking Water Officer.

### Raw Water

The City's raw water source is entirely surface water in three alpine creek catchments: Topping Creek, Hanna Creek and Murphy Creek, with intakes adjacent to Highway 3B between Red Mountain and Nancy Greene Summit, ranging in elevation from 1200m to 1550m above sea level. A map of the intake locations is provided in Appendix A.



ToppingCreek Raw Water Intake

The City sampled and undertook complete testing of our raw water sources in 2016 and the result of these tests is provided in Appendix B.

Raw water is collected at Hanna and Murphy Creek intakes and transmitted by pipeline ranging in size from 150mm to 250mm to Ophir Reservoir which has a capacity of approximately 165,000 cubic meters. Ophir Reservoir water is piped to Star Gulch Reservoir along with raw water from Topping Creek intake to fill approximately 120,000 cubic meters. During the Spring Freshet, all three creeks, and the reservoir, overflow water for many months as supply exceeds consumption.

The City of Rossland inspects intakes, pipes and areas immediately around the intakes on a monthly basis in summer, while winter and spring access limits inspections to a couple of times by snowshoe or snowmobile. Much of the watershed is used for recreation, with skiing, mountain biking, horse riding and hiking activities common. The City has erected signage near facilities and along hiking trails indicating that the area is part of the City's watershed.

### Hydrant Flushing

The City flushes all fire hydrants annually as a health requirement during the month of May to help maintain water quality with our aging infrastructure. In the fall the City will flush specific hydrants around town where there are minimal flows.

### Valve Replacement

The City has an ongoing program to replace aging valves in the water distribution system for better control of directional flushing as well as less disruption when a water repair is required.



## Treated Water

Immediately south of the Star Gulch Reservoir is the City's Water Treatment Plant located adjacent to Highway 3B. This facility was built and in 1996 and comprises of three main buildings – two slow sand filter buildings and one control and pumping building. There are six slow sand filter bays drawing water directly from Star Gulch Reservoir. These bays are monitored daily and periodic maintenance includes the removal of build up on the surface of the Smutzdecke (active biological layer). Water passes through the filter bays and is then chlorinated using chlorine gas before being stored in the clearwater tank prior to distribution to the City.

Disinfection equipment is capable of providing sufficient dosage to the water at both high and low flow periods to ensure an appropriate, and compliant, level of residual disinfection capability throughout the distribution system. The dual control chlorinators can provide 0-9 kg per day during low water flow periods and 0-22 kg per day during high demand.

The chlorine disinfection system is maintained by City staff trained to operate the system and who provide scheduled maintenance/overhaul services, as well as do



Downtown Rossland

repair work as required. A stock of extra parts and equipment, as well as quick-connect plumbing and electrical connections ensure complete redundancy of the system at all times, to minimize the chance of extended breakdowns.

## Distribution System

The City's distribution system is comprised of a variety of pipe materials, from ductile iron cement lined, mild steel, asbestos cement, copper, PVC and Polyethylene. Replacement of older pipe materials is a slow process, and as opportunities arise through subdivision, building permits, paving work or detected leaks, the City is replacing pipes and service connections.

The City, due to the range of elevations throughout the system, has five pressure zones, these are described below.

### Red Mountain Zone

This zone is pumped from the treatment plant up to a concrete reservoir on Granite Mountain above the development in the base area of Red Mountain. A single pipeline in and out of the Granite reservoir proves to be an operational challenge for maintaining high quality water with low occupancy and slower development contributing to lower consumption rates in the base area. This storage also provides backup supply for the remainder of the City in the event of a power failure or other issues with the treatment plant.

### Upper Rossland Zone

The Upper Rossland Zone is fed by gravity from the Treatment Plant. This zone essentially services properties at elevations at and above the downtown core.



## Kirkup Zone

The Kirkup zone is supplied from a small pump station at the intersection of Kirkup Ave and Plewman Way which is in the Upper Rossland Zone. Water is pumped to a bolted steel reservoir located on Mount Kirkup and feeds residential properties that are located above the minimum pressure zone provided by gravity from the treatment plant.

## Lower Rossland Zone

Two Pressure Reducing Valve (PRV) stations separate the upper and lower Rossland Zones. These are located outside City Hall on Columbia Avenue, and on Park Street above the Pinewood subdivision. This zone encounters operational challenges with older infrastructure and low flows in some sections.

## Redstone Zone

With the completion of the first phase of the Redstone subdivision, residential water services were provided to this area. A PRV station along Esling Drive reduces the pressure from over 230 psi to around 20 psi to ensure that pressures within the subdivision do not exceed 150 psi.

Star Gulch Reservoir



## Water Sampling and Testing Program

Drinking water delivered to users of the City system is subject to a comprehensive and rigorous testing program that ensures quality drinking water. Continuous monitoring of free chlorine residual readings, temperature and pH in the drinking water is accomplished with Hach meters located in the Water Treatment plant (disinfection takes place here). On a daily basis City staff test samples of drinking water from the plant. On a weekly basis City Staff test separate locations for free chlorine residuals (i.e. the presence of chlorine in the water). These tests are conducted with hand-held Hach meters that measure the minute amounts of disinfectant that must be in the drinking water throughout the system to meet regulations. Sample points are located at the start, middle and end of the entire City water distribution system to ensure the effectiveness of the disinfection program. At least 0.2 milligrams of chlorine must be present in every litre of water to meet these standards.

Over six hundred manual chlorine residual tests were conducted by City staff in 2016 at over 10 various locations around town. The lowest residual reading in the distribution system was 0.17 mg/l and the highest reading was 0.80 mg/l. Whenever staff determine that the readings may be trending too low they slightly increase the dosage of disinfectant at the Water Treatment Centre and confirm the results during the next day's tests indicating residual levels have increased.

Water samples are sent, on a weekly basis, to the Caro Environmental Services laboratories to be tested for the presence/absence e-coli and total coliform bacteria. City staff draws these samples and sends them to the Kelowna laboratory. Results are returned to the City within a week.



The standard protocol when a water sample is found to contain the presence of coliforms, however minute, is to resample the water immediately at the same location and resubmit for testing. The provincial Drinking Water Officer will determine if any action by the purveyor is necessary only after a second test also shows the presence of coliforms.

In 2016, the City submitted approximately 100 samples for ecoli and coliform testing and zero came back positive for either ecoli or coliforms.

Turbidity is monitored continuously after filtration with the highest reading at 0.09 and the lowest reading of 0.06 during 2016.

See Appendix C for test results

## Records

The City uses SCADA (System Control and Data Acquisition) to continuously monitor water quality, flow, pressure and storage. This system assists City staff to maintain a safe drinking water supply by advising when dosage or residual disinfectant levels are outside of set parameters (either high or low) for the system. The SCADA system will alert staff by cell phone or computer message to ensure that corrections can be made before water quality can be adversely affected.

This data is stored at the Water Treatment plant. This data is forwarded on a monthly basis and is used to provide information to the provincial Drinking Water Officer, including the completion of this annual report.

Flow records are taken daily to determine the volume of treated water being produced and distributed. Future upgrades of this system would include the installation of further flow meters for raw water and treated water at key points in the distribution system.

## Water Consumption

Water consumption in 2016 was more than last year. The total water consumption was 721,458 cubic meters as compared to 703,462 cubic meters in 2015. Since we started the metering program in 2009, there has been up to a 30% decrease in water usage. See Consumption Report Appendix D.

Consumption at Red Mountain is able to be measured separately as all of the water for this zone is pumped and passes through a flow meter. Typically, the consumption at Red Mountain is lower per unit than in the rest of the City, this is a function of less irrigated landscaping per lot, and lower occupancy levels in the summer.

Minimum daily demands are fairly constant in town throughout the year, ranging between 1,062-2,253 cubic meters per day.

Maximum day demands occur during summer (June-September) and range approximately from 1,571-3,716 cubic meters for irrigation periods.

## New Connections

In 2016, the City received 19 building applications for new dwellings which is up from 14 in 2015.

## Regulatory and Administration

### Water Metering and Conservation Program

The City approved Policy #06-04 "Residential Water Conservation Incentive Program" in May 2009. The Objectives are the City will provide to every existing residential home with a water meter.

There were 1735 water connections in early 2016 and 1692 of those were metered. By the end of 2016 there were 1747 total connections and 1709 were metered.



## Emergency Response Plan and Dam Management

In 2016, as part of the review of the emergency preparedness, the City started to work with Engineers and started a formal geotechnical assessment of Star Gulch reservoir and are in the process of submitting the Emergency Preparedness Plan and the Operation, Maintenance and Surveillance Plan for Star Gulch Dam to the Ministry. The City has completed the dam safety review on Star Gulch in 2016 and the OMS and EPP for Ophir Reservoir.

## Staffing

Trained, certified City staff work to maintain the 24 hour per day supply of safe drinking water to users in Rossland. This is accomplished by ensuring that staff is on call every day of the year and that the previously mentioned surveillance, operating and control system (SCADA) is operating continuously. Water distribution work is also done by staff certified for their tasks: water main replacement, water service installation, fire hydrant and valve maintenance. Special tasks such as reservoir cleaning and leak detection are undertaken by qualified staff with the proper equipment and experience to complete the work.

The City has two Water Treatment – Level 1 and Level 2 Operators, two Water Distribution Level 1, one Water Distribution Level 2, and three operators trained in Chlorine Handling.

## Conclusion

This 2016 City of Rossland Water System Report is presented to the public, by way of posting on the City of Rossland website, as required by the British Columbia Drinking Water Protection Act and Regulations, as well as to meet the terms and conditions of the City's Water System Operating Permit CITYRO 950 issued by the Interior Health Drinking Water Officer.

### Attachments:

Appendix A – Watershed Map

Appendix B – CARO Water Analysis Raw Water Tests 2016

Appendix C – CARO Drinking Water Analysis E.coli and Coliforms 2016

Appendix D – Rossland Water Consumption 2010-2016

Appendix E – Rossland Water Flows Highs & Lows 2005-2016

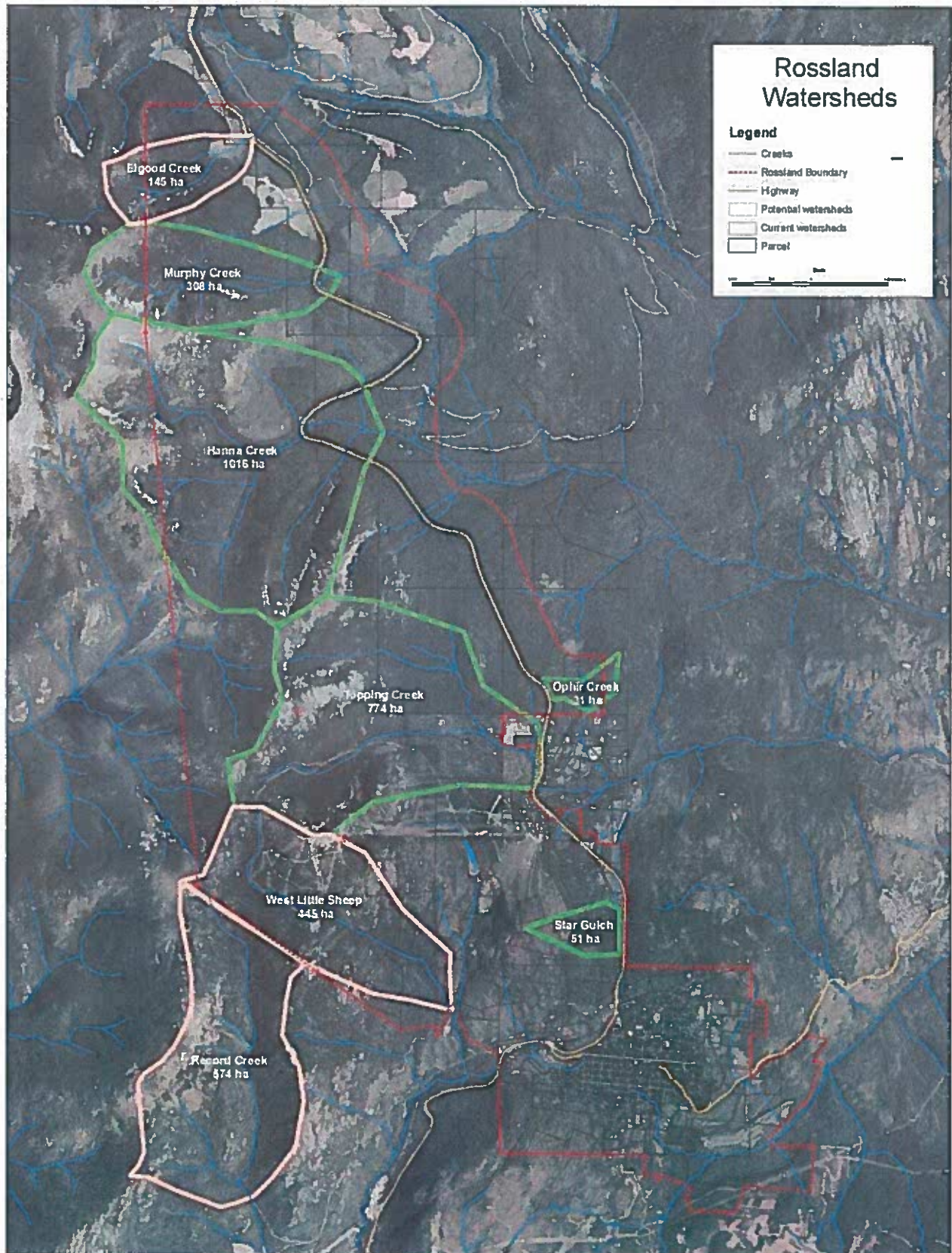
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Manager of Operations  
City of Rossland  
Box 1179 Rossland BC  
V0G1Y0 Canada

darrin@rossland.ca  
250-362-7396 ext 1237





Appendix A - Watershed Map



# APPENDIX B



## CERTIFICATE OF ANALYSIS

<b>REPORTED TO</b>	Rossland, City of 1899 Columbia Ave- PO Box 1179 Rossland, BC V0G 1Y0	<b>TEL</b>	1(250)362-7396
		<b>FAX</b>	(250) 362-9634
<b>ATTENTION</b>	Accounts Payable	<b>WORK ORDER</b>	6101204
<b>PO NUMBER</b>		<b>RECEIVED / TEMP</b>	2016-10-19 08:40 / 9°C
<b>PROJECT</b>	General Potability	<b>REPORTED</b>	2016-11-23
<b>PROJECT INFO</b>	Water Samples	<b>COC NUMBER</b>	No Number

### General Comments:

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

Authorized By: **Ed Hoppe, B.Sc., P.Chem.**  
Division Manager, Kelowna

***If you have any questions or concerns, please contact your Account Manager:  
Kristin McKeown (kmckeown@caro.ca)***

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#102 3677 Highway 97N  
Kelowna, BC V1X 5C3  
Tel: 250-765-9646 Fax: 250-765-3893

17225 109 Avenue  
Edmonton, AB T5S 1H7  
Tel: 780-489-9100 Fax: 780-489-9700

[www.caro.ca](http://www.caro.ca)

**REPORTED TO PROJECT**      Rossland, City of  
General Potability

**WORK ORDER REPORTED**      6101204  
2016-11-23

Analysis Description	Method Reference	Technique	Location
Alkalinity in Water	APHA 2320 B*	Titration with H2SO4	Kelowna
Anions by IC in Water	APHA 4110 B	Ion Chromatography with Chemical Suppression of Eluent Conductivity	Kelowna
Coliforms, Total (MF-Endo) in Water	APHA 9222 B	Membrane Filtration / Incubation on m-Endo Agar	Kelowna
Colour, True in Water	APHA 2120 C	Spectrophotometry (456 nm)	Kelowna
Conductivity in Water	APHA 2510 B	Conductivity Meter	Kelowna
Cyanide, SAD in Water	ASTM D7511-12	Flow Injection Analysis with In-Line Ultraviolet Digestion and Amperometric Detection	Kelowna
E. coli (MF-NA+MUG) in Water	APHA 9222 G	Membrane Filtration / Nutrient Agar with MUG	Kelowna
Hardness (as CaCO3) in Water	APHA 2340 B*	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Estimated)	N/A
Langelier Index in Water	APHA 2330 B	Calculation	N/A
Mercury, total by CVAFS in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond
pH in Water	APHA 4500-H+ B	Electrometry	Kelowna
Solids, Total Dissolved (calc) in Water	APHA 1030 E	Calculation: 100 x ((Cations)-[Anions])/((Cations)+[Anions])	N/A
Temperature (lab) in Water	APHA 2550 B	Thermometer	Kelowna
Total Metals by ICPMS in Water	APHA 3030E* / APHA 3125 B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	Richmond
Turbidity in Water	APHA 2130 B	Nephelometry	Kelowna

*Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method*

**Method Reference Descriptions:**

APHA            Standard Methods for the Examination of Water and Wastewater, 22nd Edition, American Public Health Association/American Water Works Association/Water Environment Federation  
 ASTM            ASTM International Test Methods  
 EPA              United States Environmental Protection Agency Test Methods

**Glossary of Terms:**

MRL            Method Reporting Limit  
 <                Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences  
 AO              Aesthetic objective  
 MAC            Maximum acceptable concentration (health based)  
 OG              Operational guideline (treated water)  
 °C               Degrees Celcius  
 CFU/100 mL    Colony Forming Units per 100 millilitres  
 CU              Colour Units (referenced against a platinum cobalt standard)  
 mg/L            Milligrams per litre  
 NTU             Nephelometric Turbidity Units  
 pH units        pH < 7 = acidic, pH > 7 = basic  
 µS/cm          Microsiemens per centimetre



**REPORTED TO PROJECT**      Rossland, City of  
                                         General Potability

**WORK ORDER**      6101204  
**REPORTED**          2016-11-23

**Standards / Guidelines Referenced in this Report:**

Guidelines for Canadian Drinking Water Quality (Oct 2014)

Website:            [http://www.hc-sc.gc.ca/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/sum\\_guide-res\\_recom-eng.pdf](http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf)

*Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user*

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REPORTED TO PROJECT Rossland, City of  
General Potability

WORK ORDER 6101204  
REPORTED 2016-11-23

Analyte	Result / Recovery	Standard / Guideline	MRL / Units Limits	Prepared	Analyzed	Notes
<b>Sample ID: Topping Creek (6101204-01) [Water] Sampled: 2016-10-18 08:45</b>						
<b>Anions</b>						
Chloride	0.39	AO ≤ 250	0.10 mg/L	N/A	2016-10-21	
Fluoride	< 0.10	MAC = 1.5	0.10 mg/L	N/A	2016-10-21	
Nitrate (as N)	0.020	MAC = 10	0.010 mg/L	N/A	2016-10-21	
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	N/A	2016-10-21	
Sulfate	1.4	AO ≤ 500	1.0 mg/L	N/A	2016-10-21	
<b>General Parameters</b>						
Alkalinity, Total (as CaCO3)	9	N/A	2 mg/L	N/A	2016-10-20	
Alkalinity, Phenolphthalein (as CaCO3)	< 1	N/A	2 mg/L	N/A	2016-10-20	
Alkalinity, Bicarbonate (as CaCO3)	9	N/A	2 mg/L	N/A	2016-10-20	
Alkalinity, Carbonate (as CaCO3)	< 1	N/A	2 mg/L	N/A	2016-10-20	
Alkalinity, Hydroxide (as CaCO3)	< 1	N/A	2 mg/L	N/A	2016-10-20	
Colour, True	22	AO ≤ 15	5 CU	N/A	2016-10-20	
Conductivity (EC)	27	N/A	2 µS/cm	N/A	2016-10-20	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020 mg/L	N/A	2016-10-25	
pH	7.04	6.5-8.5	0.01 pH units	N/A	2016-10-20	HT2
Temperature	21	N/A	°C	N/A	2016-10-20	HT2
Turbidity	0.97	OG < 0.1	0.10 NTU	N/A	2016-10-19	
<b>Calculated Parameters</b>						
Hardness, Total (as CaCO3)	12.0	N/A	4.99 mg/L	N/A	N/A	
Langelier Index	-2.9	N/A	-5.0 -	N/A	2016-10-26	
Solids, Total Dissolved (calc)	14.0	N/A	2.00 mg/L	N/A	N/A	
<b>Total Metals</b>						
Aluminum, total	0.233	OG < 0.1	0.005 mg/L	2016-10-24	2016-10-25	
Antimony, total	< 0.0010	MAC = 0.006	0.0001 mg/L	2016-10-24	2016-10-25	
Arsenic, total	< 0.0050	MAC = 0.01	0.0005 mg/L	2016-10-24	2016-10-25	
Barium, total	< 0.050	MAC = 1	0.005 mg/L	2016-10-24	2016-10-25	
Boron, total	0.245	MAC = 5	0.004 mg/L	2016-10-24	2016-10-25	
Cadmium, total	< 0.00010	MAC = 0.005	0.00001 mg/L	2016-10-24	2016-10-25	
Calcium, total	3.7	N/A	0.2 mg/L	2016-10-24	2016-10-25	
Chromium, total	< 0.0050	MAC = 0.05	0.0005 mg/L	2016-10-24	2016-10-25	
Cobalt, total	< 0.00050	N/A	0.00005 mg/L	2016-10-24	2016-10-25	
Copper, total	< 0.0020	AO ≤ 1	0.0002 mg/L	2016-10-24	2016-10-25	
Iron, total	0.10	AO ≤ 0.3	0.01 mg/L	2016-10-24	2016-10-25	
Lead, total	< 0.0010	MAC = 0.01	0.0001 mg/L	2016-10-24	2016-10-25	
Magnesium, total	0.66	N/A	0.01 mg/L	2016-10-24	2016-10-25	
Manganese, total	0.0034	AO ≤ 0.05	0.0002 mg/L	2016-10-24	2016-10-25	
Mercury, total	< 0.00002	MAC = 0.001	0.00002 mg/L	2016-10-25	2016-10-25	
Molybdenum, total	< 0.0010	N/A	0.0001 mg/L	2016-10-24	2016-10-25	
Nickel, total	< 0.0020	N/A	0.0002 mg/L	2016-10-24	2016-10-25	
Potassium, total	0.62	N/A	0.02 mg/L	2016-10-24	2016-10-25	
Selenium, total	< 0.0050	MAC = 0.05	0.0005 mg/L	2016-10-24	2016-10-25	
Sodium, total	1.45	AO ≤ 200	0.02 mg/L	2016-10-24	2016-10-25	
Uranium, total	0.00024	MAC = 0.02	0.00002 mg/L	2016-10-24	2016-10-25	
Zinc, total	< 0.040	AO ≤ 5	0.004 mg/L	2016-10-24	2016-10-25	

**SAMPLE ANALYTICAL DATA**

REPORTED TO PROJECT Rossland, City of  
General Potability

WORK ORDER REPORTED 6101204  
2016-11-23

Analyte	Result / Recovery	Standard / Guideline	MRL / Units Limits	Prepared	Analyzed	Notes
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Sample ID: Topping Creek (6101204-01) [Water] Sampled: 2016-10-18 08:45, Continued

**Microbiological Parameters**

Coliforms, Total	52	MAC = None Detected	1 CFU/100 mL	N/A	2016-10-19	
Background Colonies	> 200	N/A	200 CFU/100 mL	N/A	2016-10-19	
E. coli	11	MAC = None Detected	1 CFU/100 mL	N/A	2016-10-19	

**Sample / Analysis Qualifiers:**

HT2 The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

<b>REPORTED TO</b>	Rossland, City of 1899 Columbia Ave- PO Box 1179 Rossland, BC V0G 1Y0	<b>TEL</b>	1(250)362-7396
		<b>FAX</b>	(250) 362-9634
<b>ATTENTION</b>	Accounts Payable	<b>WORK ORDER</b>	6111635
<b>PO NUMBER</b>		<b>RECEIVED / TEMP</b>	2016-11-23 08:20 / 3°C
<b>PROJECT</b>	General Potability	<b>REPORTED</b>	2016-11-30
<b>PROJECT INFO</b>	Water Samples	<b>COC NUMBER</b>	no num

**General Comments:**

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Authorized By: **Ed Hoppe, B.Sc., P.Chem.**  
Division Manager, Kelowna

***If you have any questions or concerns, please contact your Account Manager:  
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**REPORTED TO PROJECT**      Rossland, City of  
General Potability

**WORK ORDER REPORTED**      6111635  
2016-11-30

Analysis Description	Method Reference	Technique	Location
Alkalinity in Water	APHA 2320 B*	Titration with H2SO4	Kelowna
Anions by IC in Water	APHA 4110 B	Ion Chromatography with Chemical Suppression of Eluent Conductivity	Kelowna
Coliforms, Total (MF-Endo) in Water	APHA 9222 B	Membrane Filtration / Incubation on m-Endo Agar	Kelowna
Colour, True in Water	APHA 2120 C	Spectrophotometry (456 nm)	Kelowna
Conductivity in Water	APHA 2510 B	Conductivity Meter	Kelowna
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E. coli (MF-NA+MUG) in Water	APHA 9222 G	Membrane Filtration / Nutrient Agar with MUG	Kelowna
Hardness (as CaCO3) in Water	APHA 2340 B*	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Estimated)	N/A
Langelier Index in Water	APHA 2330 B	Calculation	N/A
Mercury, total by CVAFS in Water	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond
pH in Water	APHA 4500-H+ B	Electrometry	Kelowna
Solids, Total Dissolved (calc) in Water	APHA 1030 E	Calculation: 100 x ((Cations)-[Anions])/([Cations]+[Anions])	N/A
Temperature (lab) in Water	APHA 2550 B	Thermometer	Kelowna
Total Metals by ICPMS in Water	APHA 3030E* / APHA 3125 B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	Richmond
Turbidity in Water	APHA 2130 B	Nephelometry	Kelowna

*Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method*

**Method Reference Descriptions:**

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ASTM            ASTM International Test Methods

EPA              United States Environmental Protection Agency Test Methods

**Glossary of Terms:**

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<                Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences

AO              Aesthetic objective

MAC            Maximum acceptable concentration (health based)

OG              Operational guideline (treated water)

°C                Degrees Celcius

CFU/100 mL    Colony Forming Units per 100 millilitres

CU                Colour Units (referenced against a platinum cobalt standard)

mg/L            Milligrams per litre

NTU             Nephelometric Turbidity Units

pH units        pH < 7 = acidic, pH > 7 = basic

µS/cm          Microsiemens per centimetre

**REPORTED TO PROJECT**      Rossland, City of  
                                         General Potability

**WORK ORDER**      6111635  
**REPORTED**          2016-11-30

**Standards / Guidelines Referenced in this Report:**

Guidelines for Canadian Drinking Water Quality (Oct 2014)

Website:            [http://www.hc-sc.gc.ca/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/sum\\_guide-res\\_recom-eng.pdf](http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf)

*Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user*

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REPORTED TO PROJECT Rossland, City of  
General Potability

WORK ORDER REPORTED 6111635  
2016-11-30

Analyte	Result / Recovery	Standard / Guideline	MRL / Units Limits	Prepared	Analyzed	Notes
<b>Sample ID: Murphy Creek (6111635-01) [Water] Sampled: 2016-11-22 08:30</b>						
<b>Anions</b>						
Chloride	0.12	AO ≤ 250	0.10 mg/L	N/A	2016-11-25	
Fluoride	< 0.10	MAC = 1.5	0.10 mg/L	N/A	2016-11-25	
Nitrate (as N)	< 0.010	MAC = 10	0.010 mg/L	N/A	2016-11-25	
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	N/A	2016-11-25	
Sulfate	< 1.0	AO ≤ 500	1.0 mg/L	N/A	2016-11-25	
<b>General Parameters</b>						
Alkalinity, Total (as CaCO <sub>3</sub> )	6	N/A	2 mg/L	N/A	2016-11-24	
Alkalinity, Phenolphthalein (as CaCO <sub>3</sub> )	< 1	N/A	2 mg/L	N/A	2016-11-24	
Alkalinity, Bicarbonate (as CaCO <sub>3</sub> )	6	N/A	2 mg/L	N/A	2016-11-24	
Alkalinity, Carbonate (as CaCO <sub>3</sub> )	< 1	N/A	2 mg/L	N/A	2016-11-24	
Alkalinity, Hydroxide (as CaCO <sub>3</sub> )	< 1	N/A	2 mg/L	N/A	2016-11-24	
Colour, True	9	AO ≤ 15	5 CU	N/A	2016-11-25	
Conductivity (EC)	19	N/A	2 µS/cm	N/A	2016-11-24	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020 mg/L	N/A	2016-11-25	
pH	6.66	6.5-8.5	0.01 pH units	N/A	2016-11-24	HT2
Temperature	23	N/A	°C	N/A	2016-11-24	HT2
Turbidity	0.20	OG < 0.1	0.10 NTU	N/A	2016-11-24	
<b>Calculated Parameters</b>						
Hardness, Total (as CaCO <sub>3</sub> )	8.30	N/A	0.50 mg/L	N/A	N/A	
Langelier Index	-3.6	N/A	-5.0 -	N/A	2016-11-30	
Solids, Total Dissolved (calc)	7.85	N/A	1.00 mg/L	N/A	N/A	
<b>Total Metals</b>						
Aluminum, total	0.075	OG < 0.1	0.005 mg/L	2016-11-25	2016-11-25	
Antimony, total	0.0002	MAC = 0.006	0.0001 mg/L	2016-11-25	2016-11-25	
Arsenic, total	< 0.0005	MAC = 0.01	0.0005 mg/L	2016-11-25	2016-11-25	
Barium, total	0.005	MAC = 1	0.005 mg/L	2016-11-25	2016-11-25	
Boron, total	0.013	MAC = 5	0.004 mg/L	2016-11-25	2016-11-25	
Cadmium, total	0.00001	MAC = 0.005	0.00001 mg/L	2016-11-25	2016-11-25	
Calcium, total	2.6	N/A	0.2 mg/L	2016-11-25	2016-11-25	
Chromium, total	< 0.0005	MAC = 0.05	0.0005 mg/L	2016-11-25	2016-11-25	
Cobalt, total	< 0.00005	N/A	0.00005 mg/L	2016-11-25	2016-11-25	
Copper, total	0.0003	AO ≤ 1	0.0002 mg/L	2016-11-25	2016-11-25	
Iron, total	0.01	AO ≤ 0.3	0.01 mg/L	2016-11-25	2016-11-25	
Lead, total	< 0.0001	MAC = 0.01	0.0001 mg/L	2016-11-25	2016-11-25	
Magnesium, total	0.43	N/A	0.01 mg/L	2016-11-25	2016-11-25	
Manganese, total	0.0006	AO ≤ 0.05	0.0002 mg/L	2016-11-25	2016-11-25	
Mercury, total	< 0.00002	MAC = 0.001	0.00002 mg/L	2016-11-28	2016-11-29	
Molybdenum, total	0.0006	N/A	0.0001 mg/L	2016-11-25	2016-11-25	
Nickel, total	< 0.0002	N/A	0.0002 mg/L	2016-11-25	2016-11-25	
Potassium, total	0.17	N/A	0.02 mg/L	2016-11-25	2016-11-25	
Selenium, total	< 0.0005	MAC = 0.05	0.0005 mg/L	2016-11-25	2016-11-25	
Sodium, total	0.88	AO ≤ 200	0.02 mg/L	2016-11-25	2016-11-25	
Uranium, total	0.00033	MAC = 0.02	0.00002 mg/L	2016-11-25	2016-11-25	
Zinc, total	< 0.004	AO ≤ 5	0.004 mg/L	2016-11-25	2016-11-25	

REPORTED TO PROJECT Rossland, City of  
General Potability

WORK ORDER 6111635  
REPORTED 2016-11-30

Analyte	Result / Recovery	Standard / Guideline	MRL / Units Limits	Prepared	Analyzed	Notes
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**Sample ID: Murphy Creek (6111635-01) [Water] Sampled: 2016-11-22 08:30, Continued**

**Microbiological Parameters**

Coliforms, Total	<b>22</b>	MAC = None Detected	1 CFU/100 mL	N/A	2016-11-23	
E. coli	< 1	MAC = None Detected	1 CFU/100 mL	N/A	2016-11-23	

**Sample ID: Hanna Creek (6111635-02) [Water] Sampled: 2016-11-22 08:45**

**Anions**

Chloride	0.73	AO ≤ 250	0.10 mg/L	N/A	2016-11-25	
Fluoride	< 0.10	MAC = 1.5	0.10 mg/L	N/A	2016-11-25	
Nitrate (as N)	< 0.010	MAC = 10	0.010 mg/L	N/A	2016-11-25	
Nitrite (as N)	< 0.010	MAC = 1	0.010 mg/L	N/A	2016-11-25	
Sulfate	< 1.0	AO ≤ 500	1.0 mg/L	N/A	2016-11-25	

**General Parameters**

Alkalinity, Total (as CaCO <sub>3</sub> )	8	N/A	2 mg/L	N/A	2016-11-24	
Alkalinity, Phenolphthalein (as CaCO <sub>3</sub> )	< 1	N/A	2 mg/L	N/A	2016-11-24	
Alkalinity, Bicarbonate (as CaCO <sub>3</sub> )	8	N/A	2 mg/L	N/A	2016-11-24	
Alkalinity, Carbonate (as CaCO <sub>3</sub> )	< 1	N/A	2 mg/L	N/A	2016-11-24	
Alkalinity, Hydroxide (as CaCO <sub>3</sub> )	< 1	N/A	2 mg/L	N/A	2016-11-24	
Colour, True	11	AO ≤ 15	5 CU	N/A	2016-11-25	
Conductivity (EC)	23	N/A	2 µS/cm	N/A	2016-11-24	
Cyanide, Total	< 0.0020	MAC = 0.2	0.0020 mg/L	N/A	2016-11-25	
pH	6.86	6.5-8.5	0.01 pH units	N/A	2016-11-24	HT2
Temperature	23	N/A	°C	N/A	2016-11-24	HT2
Turbidity	0.33	OG < 0.1	0.10 NTU	N/A	2016-11-24	

**Calculated Parameters**

Hardness, Total (as CaCO <sub>3</sub> )	9.46	N/A	0.50 mg/L	N/A	N/A	
Langelier Index	-3.2	N/A	-5.0 -	N/A	2016-11-30	
Solids, Total Dissolved (calc)	10.5	N/A	1.00 mg/L	N/A	N/A	

**Total Metals**

Aluminum, total	0.073	OG < 0.1	0.005 mg/L	2016-11-25	2016-11-25	
Antimony, total	0.0002	MAC = 0.006	0.0001 mg/L	2016-11-25	2016-11-25	
Arsenic, total	< 0.0005	MAC = 0.01	0.0005 mg/L	2016-11-25	2016-11-25	
Barium, total	0.006	MAC = 1	0.005 mg/L	2016-11-25	2016-11-25	
Boron, total	0.009	MAC = 5	0.004 mg/L	2016-11-25	2016-11-25	
Cadmium, total	0.00001	MAC = 0.005	0.00001 mg/L	2016-11-25	2016-11-25	
Calcium, total	2.7	N/A	0.2 mg/L	2016-11-25	2016-11-25	
Chromium, total	< 0.0005	MAC = 0.05	0.0005 mg/L	2016-11-25	2016-11-25	
Cobalt, total	< 0.00005	N/A	0.00005 mg/L	2016-11-25	2016-11-25	
Copper, total	0.0007	AO ≤ 1	0.0002 mg/L	2016-11-25	2016-11-25	
Iron, total	0.05	AO ≤ 0.3	0.01 mg/L	2016-11-25	2016-11-25	
Lead, total	< 0.0001	MAC = 0.01	0.0001 mg/L	2016-11-25	2016-11-25	
Magnesium, total	0.64	N/A	0.01 mg/L	2016-11-25	2016-11-25	
Manganese, total	0.0023	AO ≤ 0.05	0.0002 mg/L	2016-11-25	2016-11-25	



REPORTED TO PROJECT Rossland, City of  
General Potability

WORK ORDER 6111635  
REPORTED 2016-11-30

Analyte	Result / Recovery	Standard / Guideline	MRL / Units Limits	Prepared	Analyzed	Notes
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Sample ID: Hanna Creek (6111635-02) [Water] Sampled: 2016-11-22 08:45, Continued

**Total Metals, Continued**

Mercury, total	< 0.00002	MAC = 0.001	0.00002 mg/L	2016-11-28	2016-11-29	
Molybdenum, total	0.0003	N/A	0.0001 mg/L	2016-11-25	2016-11-25	
Nickel, total	0.0006	N/A	0.0002 mg/L	2016-11-25	2016-11-25	
Potassium, total	0.27	N/A	0.02 mg/L	2016-11-25	2016-11-25	
Selenium, total	< 0.0005	MAC = 0.05	0.0005 mg/L	2016-11-25	2016-11-25	
Sodium, total	1.37	AO ≤ 200	0.02 mg/L	2016-11-25	2016-11-25	
Uranium, total	0.00021	MAC = 0.02	0.00002 mg/L	2016-11-25	2016-11-25	
Zinc, total	< 0.004	AO ≤ 5	0.004 mg/L	2016-11-25	2016-11-25	

**Microbiological Parameters**

Coliforms, Total	26	MAC = None Detected	1 CFU/100 mL	N/A	2016-11-23	
E. coli	1	MAC = None Detected	1 CFU/100 mL	N/A	2016-11-23	

**Sample / Analysis Qualifiers:**

HT2 The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.

# APPENDIX C



## CERTIFICATE OF ANALYSIS

<b>REPORTED TO</b>	Rossland, City of 1899 Columbia Ave- PO Box 1179 Rossland, BC V0G 1Y0	<b>TEL</b>	1(250)362-7396
		<b>FAX</b>	(250) 362-9634
<b>ATTENTION</b>	Accounts Payable	<b>WORK ORDER</b>	6112125
<b>PO NUMBER</b>		<b>RECEIVED / TEMP</b>	2016-11-30 08:40 / 3°C
<b>PROJECT</b>	Drinking Water	<b>REPORTED</b>	2016-12-01
<b>PROJECT INFO</b>	Water Samples	<b>COC NUMBER</b>	No Number

### General Comments:

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

Authorized By: **Ed Hoppe, B.Sc., P.Chem.**  
Division Manager, Kelowna

***If you have any questions or concerns, please contact your Account Manager:  
Kristin McKeown (kmckeown@caro.ca)***

### Locations:

#110 4011 Viking Way  
Richmond, BC V6V 2K9  
Tel: 604-279-1499 Fax: 604-279-1599

#102 3677 Highway 97N  
Kelowna, BC V1X 5C3  
Tel: 250-765-9646 Fax: 250-765-3893

17225 109 Avenue  
Edmonton, AB T5S 1H7  
Tel: 780-489-9100 Fax: 780-489-9700

[www.caro.ca](http://www.caro.ca)

**REPORTED TO PROJECT**      Rossland, City of  
Drinking Water

**WORK ORDER REPORTED**      6112125  
2016-12-01

Analysis Description	Method Reference	Technique	Location
Coliforms, Total (MF-CCA) in Water	APHA 9222*	Membrane Filtration / Incubation on Chromocult Agar	Kelowna
E. coli (MF-CCA) in Water	APHA 9222*	Membrane Filtration / Incubation on Chromocult Agar	Kelowna

*Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method*

**Method Reference Descriptions:**

APHA      Standard Methods for the Examination of Water and Wastewater, 22nd Edition, American Public Health Association/American Water Works Association/Water Environment Federation

**Glossary of Terms:**

MRL      Method Reporting Limit  
 <      Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences  
 AO      Aesthetic objective  
 MAC      Maximum acceptable concentration (health based)  
 OG      Operational guideline (treated water)  
 CFU/100 mL      Colony Forming Units per 100 millilitres

**Standards / Guidelines Referenced in this Report:**

Guidelines for Canadian Drinking Water Quality (Oct 2014)

Website:      [http://www.hc-sc.gc.ca/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/sum\\_guide-res\\_recom-eng.pdf](http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf)

*Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user*

**SAMPLE ANALYTICAL DATA**

REPORTED TO PROJECT Rossland, City of Drinking Water

WORK ORDER REPORTED 6112125 2016-12-01

Analyte	Result / Recovery	Standard / Guideline	MRL / Units Limits	Prepared	Analyzed	Notes
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**Sample ID: Seven Summits Service (6112125-01) [Water] Sampled: 2016-11-29 09:30**

*Microbiological Parameters*

Coliforms, Total	< 1	MAC = None Detected	1 CFU/100 mL	N/A	2016-11-30	
E. coli	< 1	MAC = None Detected	1 CFU/100 mL	N/A	2016-11-30	

**Sample ID: City Shop (6112125-02) [Water] Sampled: 2016-11-29 09:45**

*Microbiological Parameters*

Coliforms, Total	< 1	MAC = None Detected	1 CFU/100 mL	N/A	2016-11-30	
E. coli	< 1	MAC = None Detected	1 CFU/100 mL	N/A	2016-11-30	

# APPENDIX D

## ROSSLAND WATER CONSUMPTION

2010-2016

	2010	2011	2012	2013	2014	2015	2016
January	68663	56230	50482	53491	50961	49222	58827
February	61362	53097	47482	52612	48253	43970	56669
March	62471	59542	53762	57500	51177	49705	55102
April	62562	54956	50212	50873	46817	51013	50246
May	70886	60844	56926	65888	52037	65600	65675
June	67889	62548	60611	74757	67283	87438	72233
July	114287	89100	78101	99716	92541	92457	82683
August	111783	106997	100793	85315	96203	81345	89220
September	71240	76889	73796	62511	73679	44337	54860
October	60265	51258	58909	56520	49885	44827	46264
November	53475	52883	43911	48823	42134	42837	40025
December	55265	52266	49840	49087	46370	50711	49654
<b>TOTAL</b>	<b>860148</b>	<b>776610</b>	<b>724825</b>	<b>757093</b>	<b>717340</b>	<b>703462</b>	<b>721458</b>
<b>%</b>	<b>-6%</b>	<b>-15%</b>	<b>-21%</b>	<b>-18%</b>	<b>-22%</b>	<b>-30%</b>	<b>-22%</b>

# of connections	1681	1692	1707	1723	1731	1735	1747
# of meters	647	1254	1615	1667	1682	1692	1709

2009 Total 914992

# APPENDIX E

## HIGHEST AND LOWEST WATER FLOW FOR THE YEAR

DATE	YEAR	CUBIC METERS
1-Dec	2005	1331
15-Aug	2005	4840
7-Nov	2006	1364
25-Jul	2006	6215
4-Oct	2007	1507
17-Jul	2007	6776
17-Nov	2008	1584
15-Jul	2008	4862
9-Nov	2009	1584
5-Aug	2009	5390
16-Dec	2010	1276
6-Aug	2010	4950
3-Nov	2011	1331
12-Jul	2011	4950
10-Nov	2012	1100
16-Aug	2012	4330
31-Jan	2013	993
22-Jul	2013	3968
15-Nov	2014	1139
13-Aug	2014	3875
24-Sep	2015	1214
10-Jun	2015	3972
3-Dec	2016	1062
18-Jul	2016	3716