

CITY OF ROSSLAND

Annual Water Report - 2015



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.



Topping Creek Raw Water Intake

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.

The City conducted a comprehensive water test and the result of this test is provided in Appendix B.



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 Rosland 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 Rosland Zone

Two Pressure Reducing Valve (PRV) stations separate the upper and lower Rosland 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 2015 at over 10 various locations around town. The lowest residual reading in the distribution system was 0.22 mg/l and the highest reading was 1.44 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 2015, the City submitted approximately 110 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 0.11 and the lowest reading of 0.06 during 2015.

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 2015 was more than last year. The total water consumption was 703,462 cubic meters as compared to 717,340 cubic meters in 2014. Since we started the metering program in 2009, there has been 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 1,215-1,607 cubic meters per day. Maximum day demands occur during summer (June-September) and range approximately from 1,638-3,972 cubic meters for irrigation periods.

New Connections

In 2015, the City received 14 building applications for new dwellings which is up from 12 in 2014.

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 1731 water connections in early 2015 and 1682 of those were metered. By the end of 2015 there were 1735 total connections and 1692 were metered.



Emergency Response Plan and Dam Management

In 2015, 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 is continuing to work with the Ministry to review and complete the dam safety review on Star Gulch in 2016 and to complete 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 one Water Treatment – Level 2 Operators, two Water Distribution Level 1, one Water Distribution Level 2-3 operator in training, and three operators trained in Chlorine Handling.

Conclusion

This 2015 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 Comprehensive 2015

Appendix C – CARO Drinking Water Analysis E.coli and Coliforms 2015

Appendix D – Rossland Water Consumption 2010-2015

Appendix E – Rossland Water Flows Highs & Lows 2005-2015

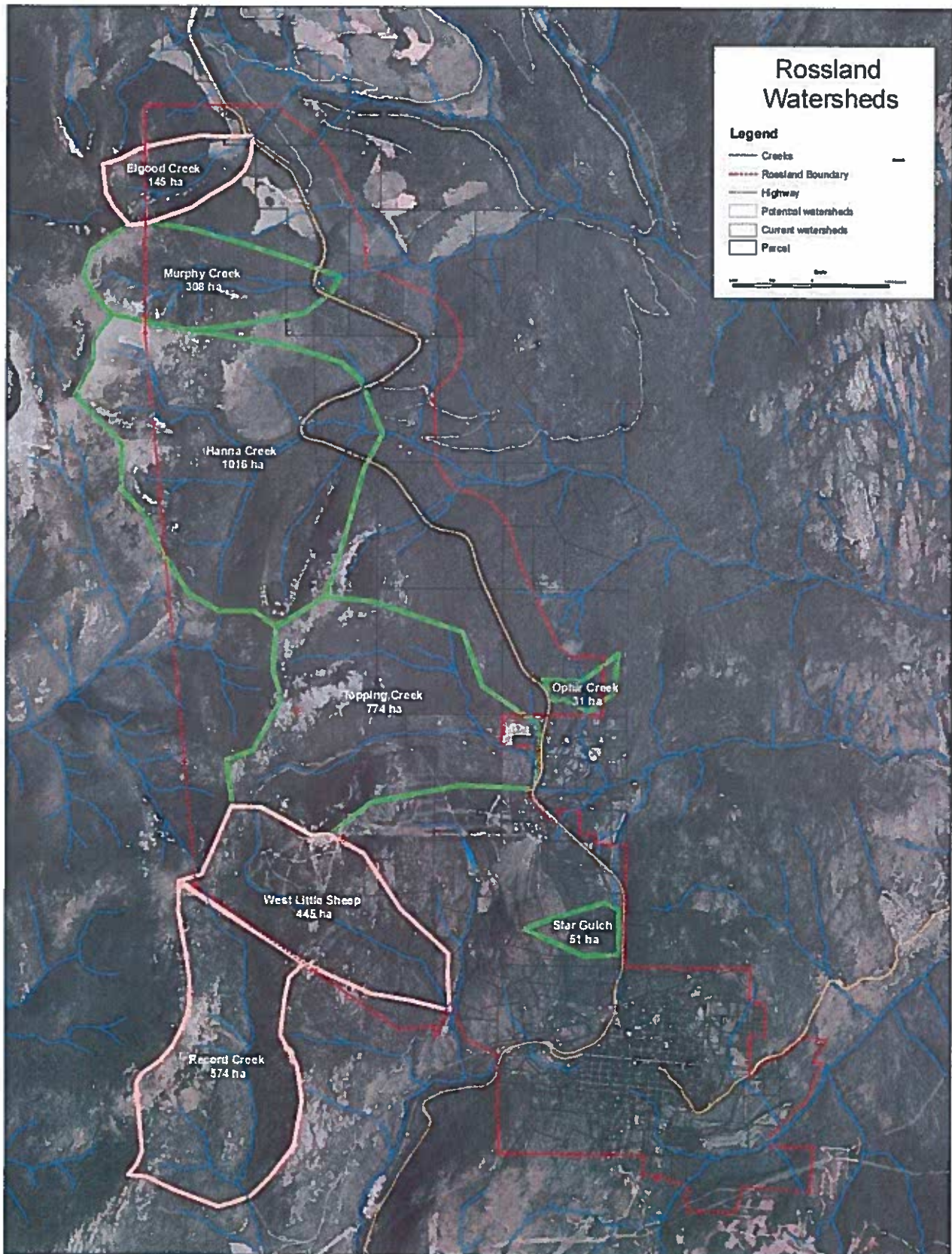
Darrin Albo
Manager of Operations
City of Rossland
Box 1179 Rossland BC
V0G1Y0 Canada

darrin@rossland.ca
250-362-2328





Appendix A - Watershed Map



APPENDIX B



CERTIFICATE OF ANALYSIS

REPORTED TO	Rosland, City of 1899 Columbia Ave- PO Box 1179 Rosland, BC V0G 1Y0	TEL	1-250-368-7283
		FAX	(250) 362-9634
ATTENTION	Darryl Pettitt	WORK ORDER	4121439
PO NUMBER		RECEIVED / TEMP	Dec-30-14 08:55 / 1°C
PROJECT	Comprehensive Analysis	REPORTED	Jan-07-15
PROJECT INFO	Water Samples	COC NUMBER	COC no#

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, BSc, PChem**
Business Manager, Kelowna

Please contact CARO if more information is needed or to provide feedback on our services.

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#110 4011 Viking Way
Richmond, BC V6V 2K9
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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

REPORTED TO PROJECT Rossland, City of
Comprehensive Analysis

WORK ORDER REPORTED 4121439
Jan-07-15

Analysis Description	Method Reference	Technique	Location
Alkalinity (Total)	APHA 2320 B	Titration with H ₂ SO ₄ to pH 4.5	Kelowna
Anions in Water by IC	APHA 4110 B	Ion Chromatography with Chemical Suppression of Eluent Conductivity	Kelowna
Colour, True	APHA 2120 C *	Spectrophotometry (456 nm)	Kelowna
Conductivity in Water	APHA 2510 B	Conductivity Meter	Kelowna
Cyanide, Total in Liquids	APHA 4500-CN- C / APHA 4500-CN- E	Distillation / Colorimetry	Kelowna
E. coli (CCA)	APHA 9222 *	Membrane Filtration / Membrane Filtration	Kelowna
Hardness (as CaCO ₃)	APHA 2340 B	Calculation	N/A
Mercury, total by CVAFS	EPA 245.7 *	BrCl ₂ Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond
pH in Water	APHA 4500-H+ B	Electrometry	Kelowna
Solids, Total Dissolved	APHA 1030 E	Calculation	N/A
Total Coliforms (CCA)	APHA 9222 *	Membrane Filtration / Membrane Filtration	Kelowna
Total Recoverable Metals	APHA 3030E* / APHA 3125 B	HNO ₃ +HCl Hot Block Digestion / Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	Richmond
Transmissivity at 254 nm	APHA 5910 B	Ultraviolet Absorption	Kelowna
Turbidity	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
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)
% T Percent Transmittance
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

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

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
Comprehensive Analysis

WORK ORDER REPORTED 4121439
Jan-07-15

Analyte	Result / Recovery	Standard / Guideline	MRL / Limits	Units	Prepared	Analyzed	Notes
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Sample ID: 2111 2nd Ave (4121439-01) [Water] Sampled: Dec-29-14 09:45

Anions							
Chloride	5.00	AO ≤ 250	0.10	mg/L	N/A	Dec-30-14	
Fluoride	< 0.10	MAC = 1.5	0.10	mg/L	N/A	Dec-30-14	
Nitrate as N	0.034	N/A	0.010	mg/L	N/A	Dec-30-14	
Nitrite as N	< 0.010	N/A	0.010	mg/L	N/A	Dec-30-14	
Sulfate	7.8	AO ≤ 500	1.0	mg/L	N/A	Dec-30-14	
General Parameters							
Alkalinity, Total as CaCO3	14	N/A	1	mg/L	N/A	Dec-30-14	
Colour, True	< 5	AO ≤ 15	5	CU	N/A	Dec-31-14	
Conductivity (EC)	67	N/A	2	µS/cm	N/A	Dec-30-14	
Cyanide, Total	< 0.010	MAC = 0.2	0.010	mg/L	Jan-05-15	Jan-06-15	
pH	7.13	6.5-8.5	0.01	pH units	N/A	Dec-30-14	
Turbidity	< 0.1	OG < 0.1	0.1	NTU	N/A	Dec-30-14	
UV Transmittance @ 254nm	89.3	N/A	0.1	% T	N/A	Dec-30-14	
Calculated Parameters							
Hardness, Total (Total as CaCO3)	22.3	N/A	5.0	mg/L	N/A	N/A	
Solids, Total Dissolved	33.4	AO ≤ 500	2.0	mg/L	N/A	N/A	
Total Recoverable Metals							
Aluminum, total	< 0.05	OG < 0.1	0.05	mg/L	Jan-05-15	Jan-05-15	
Antimony, total	< 0.001	MAC = 0.006	0.001	mg/L	Jan-05-15	Jan-05-15	
Arsenic, total	< 0.005	MAC = 0.01	0.005	mg/L	Jan-05-15	Jan-05-15	
Barium, total	< 0.05	MAC = 1	0.05	mg/L	Jan-05-15	Jan-05-15	
Beryllium, total	< 0.001	N/A	0.001	mg/L	Jan-05-15	Jan-05-15	
Boron, total	< 0.04	MAC = 5	0.04	mg/L	Jan-05-15	Jan-05-15	
Cadmium, total	< 0.0001	MAC = 0.005	0.0001	mg/L	Jan-05-15	Jan-05-15	
Calcium, total	7.0	N/A	2.0	mg/L	Jan-05-15	Jan-05-15	
Chromium, total	< 0.005	MAC = 0.05	0.005	mg/L	Jan-05-15	Jan-05-15	
Cobalt, total	< 0.0005	N/A	0.0005	mg/L	Jan-05-15	Jan-05-15	
Copper, total	0.103	AO ≤ 1	0.002	mg/L	Jan-05-15	Jan-05-15	
Iron, total	< 0.10	AO ≤ 0.3	0.10	mg/L	Jan-05-15	Jan-05-15	
Lead, total	0.001	MAC = 0.01	0.001	mg/L	Jan-05-15	Jan-05-15	
Magnesium, total	1.2	N/A	0.1	mg/L	Jan-05-15	Jan-05-15	
Manganese, total	< 0.002	AO ≤ 0.05	0.002	mg/L	Jan-05-15	Jan-05-15	
Mercury, total	< 0.00002	MAC = 0.001	0.00002	mg/L	Jan-05-15	Jan-06-15	
Molybdenum, total	< 0.001	N/A	0.001	mg/L	Jan-05-15	Jan-05-15	
Nickel, total	< 0.002	N/A	0.002	mg/L	Jan-05-15	Jan-05-15	
Phosphorus, total	< 0.2	N/A	0.2	mg/L	Jan-05-15	Jan-05-15	
Potassium, total	0.6	N/A	0.2	mg/L	Jan-05-15	Jan-05-15	
Selenium, total	< 0.005	MAC = 0.05	0.005	mg/L	Jan-05-15	Jan-05-15	
Silicon, total	< 5	N/A	5	mg/L	Jan-05-15	Jan-05-15	
Silver, total	< 0.0005	N/A	0.0005	mg/L	Jan-05-15	Jan-05-15	
Sodium, total	3.2	AO ≤ 200	0.2	mg/L	Jan-05-15	Jan-05-15	
Uranium, total	< 0.0002	MAC = 0.02	0.0002	mg/L	Jan-05-15	Jan-05-15	
Vanadium, total	< 0.01	N/A	0.01	mg/L	Jan-05-15	Jan-05-15	
Zinc, total	< 0.04	AO ≤ 5	0.04	mg/L	Jan-05-15	Jan-05-15	

SAMPLE ANALYTICAL DATA

REPORTED TO PROJECT Rossland, City of
Comprehensive Analysis

WORK ORDER 4121439
REPORTED Jan-07-15

Analyte	Result / Recovery	Standard / Guideline	MRL / Units Limits	Prepared	Analyzed	Notes
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Sample ID: 2111 2nd Ave (4121439-01) [Water] Sampled: Dec-29-14 09:45, Continued

Microbiological Parameters

Coliforms, Total	< 1	MAC = None Detected	1 CFU/100 mL	Dec-30-14	Dec-31-14	
E. coli	< 1	MAC = None Detected	1 CFU/100 mL	Dec-30-14	Dec-31-14	

APPENDIX C



CERTIFICATE OF ANALYSIS

REPORTED TO	Rosland, City of 1899 Columbia Ave- PO Box 1179 Rosland, BC V0G 1Y0	TEL	1(250)362-7396
		FAX	(250) 362-9634
ATTENTION	Accounts Payable	WORK ORDER	5090601
PO NUMBER		RECEIVED / TEMP	Sep-09-15 09:00 / 9°C
PROJECT	Drinking Water	REPORTED	Sep-16-15
PROJECT INFO	Water Samples	COC NUMBER	COCno#

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:
Karin Miyazaki, B.Sc. (kmiyazaki@caro.ca)

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Tel: 780-489-9100 Fax: 780-489-9700

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REPORTED TO PROJECT Rossland, City of
Drinking Water

WORK ORDER REPORTED 5090601
Sep-16-15

Analysis Description	Method Reference	Technique	Location
E. coli (CCA)	APHA 9222*	Membrane Filtration / Chromocult Agar	Kelowna
Total Coliforms (CCA)	APHA 9222*	Membrane Filtration / 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
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

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 5090601
Sep-16-15

Analyte	Result / Recovery	Standard / Guideline	MRL / Units Limits	Prepared	Analyzed	Notes
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Sample ID: Rossland Mine Museum (5090601-01) [Water] Sampled: Sep-08-15 09:30

Microbiological Parameters

Coliforms, Total	< 1	MAC = None Detected	1 CFU/100 mL	Sep-09-15	Sep-10-15	
E. coli	< 1	MAC = None Detected	1 CFU/100 mL	Sep-09-15	Sep-10-15	

Sample ID: City Shop (5090601-02) [Water] Sampled: Sep-08-15 09:45

Microbiological Parameters

Coliforms, Total	< 1	MAC = None Detected	1 CFU/100 mL	Sep-09-15	Sep-10-15	
E. coli	< 1	MAC = None Detected	1 CFU/100 mL	Sep-09-15	Sep-10-15	

APPENDIX D

ROSSLAND WATER CONSUMPTION 2010-2015

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

# of connector	1681	1692	1707	1723	1731	1735
# of meters	647	1254	1615	1667	1682	1692
 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