CERTIFICATE OF ANALYSIS

REPORTED TO	Highway 12/21 Regional Water Services Commission RR3 Lacombe, AB T4L 2N3		
ATTENTION	Darren Dempsey	**WORK ORDER**	8021928
PO NUMBER		**RECEIVED / TEMP**	2018-02-28 09:35 / 10°C
PROJECT	Water Sample	**REPORTED**	2018-03-07 10:11
PROJECT INFO	12/21 Annual	**COC NUMBER**	No Number

Introduction:

CARO Analytical Services is a testing laboratory full of smart, engaged scientists driven to make the world a safer and healthier place. Through our clients' projects we become an essential element for a better world. We employ methods conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts. CARO is accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

Big Picture Sidekicks

You know that the sample you collected after snowshoeing to site, digging 5 meters, and racing to get it on a plane so you can submit it to the lab for time sensitive results needed to make important and expensive decisions (whew) is VERY important. We know that too.

We've Got Chemistry

It's simple. We figure the more you enjoy working with our fun and engaged team members; the more likely you are to give us continued opportunities to support you.

Ahead of the Curve

Through research, regulation knowledge, and instrumentation, we are your analytical centre for the technical knowledge you need, BEFORE you need it, so you can stay up to date and in the know.

If you have any questions or concerns, please contact me at jshanko@caro.ca

Authorized By:

Jennifer Shanko, A.Sc.T.
Account Manager

CARO ANALYTICAL SERVICES

TEST RESULTS

REPORTED TO	Highway 12/21 Regional Water Services Commission	**WORK ORDER**	8021928
PROJECT	Water Sample	**REPORTED**	2018-03-07 10:11

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12/21 #1 (8021928-01) | Matrix: Water | Sampled: 2018-02-27 08:20						
Calculated Parameters						
Hardness, Total (as CaCO3)	**271**	None Required	0.500	mg/L	N/A	
Total Metals						
Aluminum, total	**0.0156**	OG < 0.1	0.0050	mg/L	2018-03-02	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2018-03-02	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2018-03-02	
Barium, total	**0.0921**	MAC = 1	0.0050	mg/L	2018-03-02	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2018-03-02	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2018-03-02	
Boron, total	**0.0250**	MAC = 5	0.0050	mg/L	2018-03-02	
Cadmium, total	< 0.000010	MAC = 0.005	0.000010	mg/L	2018-03-02	
Calcium, total	**70.7**	None Required	0.20	mg/L	2018-03-02	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2018-03-02	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2018-03-02	
Copper, total	**0.00342**	AO ≤ 1	0.00040	mg/L	2018-03-02	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2018-03-02	
Lead, total	< 0.00020	MAC = 0.01	0.00020	mg/L	2018-03-02	
Lithium, total	**0.00695**	N/A	0.00010	mg/L	2018-03-02	
Magnesium, total	**23.0**	None Required	0.010	mg/L	2018-03-02	
Manganese, total	**0.00081**	AO ≤ 0.05	0.00020	mg/L	2018-03-02	
Molybdenum, total	**0.00131**	N/A	0.00010	mg/L	2018-03-02	
Nickel, total	**0.00055**	N/A	0.00040	mg/L	2018-03-02	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2018-03-02	
Potassium, total	**1.74**	N/A	0.10	mg/L	2018-03-02	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2018-03-02	
Silicon, total	**2.9**	N/A	1.0	mg/L	2018-03-02	
Silver, total	< 0.000050	None Required	0.000050	mg/L	2018-03-02	
Sodium, total	**18.7**	AO ≤ 200	0.10	mg/L	2018-03-02	
Strontium, total	**0.421**	N/A	0.0010	mg/L	2018-03-02	
Sulfur, total	**24.9**	N/A	3.0	mg/L	2018-03-02	
Tellurium, total	< 0.00050	N/A	0.00050	mg/L	2018-03-02	
Thallium, total	< 0.000020	N/A	0.000020	mg/L	2018-03-02	
Thorium, total	< 0.00010	N/A	0.00010	mg/L	2018-03-02	
Tin, total	< 0.00020	N/A	0.00020	mg/L	2018-03-02	
Titanium, total	< 0.0050	N/A	0.0050	mg/L	2018-03-02	
Tungsten, total	**0.0012**	N/A	0.0010	mg/L	2018-03-02	
Uranium, total	**0.000796**	MAC = 0.02	0.000020	mg/L	2018-03-02	
Vanadium, total	< 0.0010	N/A	0.0010	mg/L	2018-03-02	
Zinc, total	**0.0053**	AO ≤ 5	0.0040	mg/L	2018-03-02	
Zirconium, total	< 0.00010	N/A	0.00010	mg/L	2018-03-02	
12/21 #2 (8021928-02) | Matrix: Water | Sampled: 2018-02-27 08:20						

TEST RESULTS

REPORTED TO Highway 12/21 Regional Water Services Commission
PROJECT Water Sample

WORK ORDER 8021928
REPORTED 2018-03-07 10:11

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
12/21 #2 (8021928-02) | Matrix: Water | Sampled: 2018-02-27 08:20, Continued						
Calculated Parameters						
Total Trihalomethanes	**0.0200**	MAC = 0.1	0.00400	mg/L	N/A	
Volatile Organic Compounds (VOC)						CT8
Bromodichloromethane	**0.0024**	N/A	0.0010	mg/L	2018-03-01	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2018-03-01	
Chloroform	**0.0176**	0.0018	0.0010	mg/L	2018-03-01	
Dibromochloromethane	< 0.0010	0.19	0.0010	mg/L	2018-03-01	
Surrogate: Toluene-d8	*114*		*70-130*	%	*2018-03-01*	
Surrogate: 4-Bromofluorobenzene	*100*		*70-130*	%	*2018-03-01*	
12/21 #3 (8021928-03) | Matrix: Water | Sampled: 2018-02-27 08:20						
Calculated Parameters						
Total Trihalomethanes	**0.0196**	MAC = 0.1	0.00400	mg/L	N/A	
Volatile Organic Compounds (VOC)						
Bromodichloromethane	**0.0024**	N/A	0.0010	mg/L	2018-03-01	
Bromoform	< 0.0010	N/A	0.0010	mg/L	2018-03-01	
Chloroform	**0.0172**	0.0018	0.0010	mg/L	2018-03-01	
Dibromochloromethane	< 0.0010	0.19	0.0010	mg/L	2018-03-01	
Surrogate: Toluene-d8	*112*		*70-130*	%	*2018-03-01*	
Surrogate: 4-Bromofluorobenzene	*98*		*70-130*	%	*2018-03-01*	

Sample Qualifiers:

CT8 Headspace in sample container is greater than 5% volume - VOC results may be compromised

APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Highway 12/21 Regional Water Services Commission	**WORK ORDER**	8021928
PROJECT	Water Sample	**REPORTED**	2018-03-07 10:11

Analysis Description	Method Ref.	Technique	Location
Hardness in Water	SM 2340 B* (2011)	Calculation: 2.497 [total Ca] + 4.118 [total Mg] (Est)	N/A
Total Metals in Water	EPA 200.2* / EPA 6020B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	Richmond
Trihalomethanes in Water	EPA 5030B / EPA 8260D	Purge&Trap / GC-MSD (SIM)	Richmond

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

Glossary of Terms:

RL	Reporting Limit (default)
<	Less than the specified Reporting Limit (RL) - the actual RL may be higher than the default RL due to various factors
AO	Aesthetic Objective
MAC	Maximum Acceptable Concentration (health based)
mg/L	Milligrams per litre
OG	Operational Guideline (treated water)
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

Guidelines Referenced in this Report:

AB Tier 1 Commercial (Feb 2016)
Guidelines for Canadian Drinking Water Quality (Health Canada, Feb 2017)

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

General Comments:

The results in this report apply to the samples analyzed in accordance with the Chain of Custody 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.

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Highway 12/21 Regional Water Services Commission	**WORK ORDER**	8021928
PROJECT	Water Sample	**REPORTED**	2018-03-07 10:11

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk)**: A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- **Duplicate (Dup)**: An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- **Blank Spike (BS)**: A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.
- **Matrix Spike (MS)**: A second aliquot of sample is fortified with with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- **Reference Material (SRM)**: A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B8C0124										
Blank (B8C0124-BLK1)				Prepared: 2018-03-02, Analyzed: 2018-03-02						
Aluminum, total	< 0.0050	0.0050	mg/L							
Antimony, total	< 0.00020	0.00020	mg/L							
Arsenic, total	< 0.00050	0.00050	mg/L							
Barium, total	< 0.0050	0.0050	mg/L							
Beryllium, total	< 0.00010	0.00010	mg/L							
Bismuth, total	< 0.00010	0.00010	mg/L							
Boron, total	< 0.0050	0.0050	mg/L							
Cadmium, total	< 0.000010	0.000010	mg/L							
Calcium, total	< 0.20	0.20	mg/L							
Chromium, total	< 0.00050	0.00050	mg/L							
Cobalt, total	< 0.00010	0.00010	mg/L							
Copper, total	< 0.00040	0.00040	mg/L							
Iron, total	< 0.010	0.010	mg/L							
Lead, total	< 0.00020	0.00020	mg/L							
Lithium, total	< 0.00010	0.00010	mg/L							
Magnesium, total	< 0.010	0.010	mg/L							
Manganese, total	< 0.00020	0.00020	mg/L							
Molybdenum, total	< 0.00010	0.00010	mg/L							
Nickel, total	< 0.00040	0.00040	mg/L							
Phosphorus, total	< 0.050	0.050	mg/L							
Potassium, total	< 0.10	0.10	mg/L							
Selenium, total	< 0.00050	0.00050	mg/L							
Silicon, total	< 1.0	1.0	mg/L							
Silver, total	< 0.000050	0.000050	mg/L							
Sodium, total	< 0.10	0.10	mg/L							
Strontium, total	< 0.0010	0.0010	mg/L							
Sulfur, total	< 3.0	3.0	mg/L							
Tellurium, total	< 0.00050	0.00050	mg/L							
Thallium, total	< 0.000020	0.000020	mg/L							
Thorium, total	< 0.00010	0.00010	mg/L							
Tin, total	< 0.00020	0.00020	mg/L							
Titanium, total	< 0.0050	0.0050	mg/L							
Tungsten, total	< 0.0010	0.0010	mg/L							
Uranium, total	< 0.000020	0.000020	mg/L							
Vanadium, total	< 0.0010	0.0010	mg/L							

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Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B8C0124, Continued										
Blank (B8C0124-BLK1), Continued				Prepared: 2018-03-02, Analyzed: 2018-03-02						
Zinc, total	< 0.0040	0.0040	mg/L							
Zirconium, total	< 0.00010	0.00010	mg/L							
LCS (B8C0124-BS1)				Prepared: 2018-03-02, Analyzed: 2018-03-02						
Aluminum, total	0.0225	0.0050	mg/L	0.0200		113	80-120			
Antimony, total	0.0212	0.00020	mg/L	0.0200		106	80-120			
Arsenic, total	0.0207	0.00050	mg/L	0.0200		103	80-120			
Barium, total	0.0190	0.0050	mg/L	0.0200		95	80-120			
Beryllium, total	0.0220	0.00010	mg/L	0.0200		110	80-120			
Bismuth, total	0.0225	0.00010	mg/L	0.0200		113	80-120			
Boron, total	0.0226	0.0050	mg/L	0.0200		113	80-120			
Cadmium, total	0.0205	0.000010	mg/L	0.0200		103	80-120			
Calcium, total	2.25	0.20	mg/L	2.00		112	80-120			
Chromium, total	0.0209	0.00050	mg/L	0.0200		104	80-120			
Cobalt, total	0.0211	0.00010	mg/L	0.0200		105	80-120			
Copper, total	0.0223	0.00040	mg/L	0.0200		112	80-120			
Iron, total	2.09	0.010	mg/L	2.00		104	80-120			
Lead, total	0.0224	0.00020	mg/L	0.0200		112	80-120			
Lithium, total	0.0213	0.00010	mg/L	0.0200		106	80-120			
Magnesium, total	2.27	0.010	mg/L	2.00		114	80-120			
Manganese, total	0.0200	0.00020	mg/L	0.0200		100	80-120			
Molybdenum, total	0.0205	0.00010	mg/L	0.0200		103	80-120			
Nickel, total	0.0218	0.00040	mg/L	0.0200		109	80-120			
Phosphorus, total	1.99	0.050	mg/L	2.00		100	80-120			
Potassium, total	2.12	0.10	mg/L	2.00		106	80-120			
Selenium, total	0.0235	0.00050	mg/L	0.0200		118	80-120			
Silicon, total	2.1	1.0	mg/L	2.00		106	80-120			
Silver, total	0.0209	0.000050	mg/L	0.0200		105	80-120			
Sodium, total	2.27	0.10	mg/L	2.00		113	80-120			
Strontium, total	0.0192	0.0010	mg/L	0.0200		96	80-120			
Sulfur, total	4.6	3.0	mg/L	5.00		92	80-120			
Tellurium, total	0.0192	0.00050	mg/L	0.0200		96	80-120			
Thallium, total	0.0222	0.000020	mg/L	0.0200		111	80-120			
Thorium, total	0.0207	0.00010	mg/L	0.0200		104	80-120			
Tin, total	0.0210	0.00020	mg/L	0.0200		105	80-120			
Titanium, total	0.0215	0.0050	mg/L	0.0200		108	80-120			
Tungsten, total	0.0185	0.0010	mg/L	0.0200		92	80-120			
Uranium, total	0.0236	0.000020	mg/L	0.0200		118	80-120			
Vanadium, total	0.0202	0.0010	mg/L	0.0200		101	80-120			
Zinc, total	0.0217	0.0040	mg/L	0.0200		108	80-120			
Zirconium, total	0.0208	0.00010	mg/L	0.0200		104	80-120			
Reference (B8C0124-SRM1)				Prepared: 2018-03-02, Analyzed: 2018-03-02						
Aluminum, total	0.309	0.0050	mg/L	0.303		102	82-114			
Antimony, total	0.0523	0.00020	mg/L	0.0511		102	88-115			
Arsenic, total	0.123	0.00050	mg/L	0.118		104	88-111			
Barium, total	0.759	0.0050	mg/L	0.823		92	83-110			
Beryllium, total	0.0541	0.00010	mg/L	0.0496		109	80-119			
Boron, total	3.56	0.0050	mg/L	3.45		103	80-118			
Cadmium, total	0.0501	0.000010	mg/L	0.0495		101	90-110			
Calcium, total	12.5	0.20	mg/L	11.6		107	85-113			
Chromium, total	0.269	0.00050	mg/L	0.250		108	88-111			
Cobalt, total	0.0409	0.00010	mg/L	0.0377		109	90-114			
Copper, total	0.547	0.00040	mg/L	0.486		113	90-117			
Iron, total	0.523	0.010	mg/L	0.488		107	90-116			
Lead, total	0.224	0.00020	mg/L	0.204		110	90-110			

APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Highway 12/21 Regional Water Services Commission	**WORK ORDER**	8021928
PROJECT	Water Sample	**REPORTED**	2018-03-07 10:11

Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B8C0124, Continued										
Reference (B8C0124-SRM1), Continued				Prepared: 2018-03-02, Analyzed: 2018-03-02						
Lithium, total	0.416	0.00010	mg/L	0.403		103	79-118			
Magnesium, total	4.22	0.010	mg/L	3.79		111	88-116			
Manganese, total	0.109	0.00020	mg/L	0.109		100	88-108			
Molybdenum, total	0.207	0.00010	mg/L	0.198		104	88-110			
Nickel, total	0.267	0.00040	mg/L	0.249		107	90-112			
Phosphorus, total	0.208	0.050	mg/L	0.227		91	72-118			
Potassium, total	7.75	0.10	mg/L	7.21		107	87-116			
Selenium, total	0.143	0.00050	mg/L	0.121		118	90-122			
Sodium, total	8.44	0.10	mg/L	7.54		112	86-118			
Strontium, total	0.364	0.0010	mg/L	0.375		97	86-110			
Thallium, total	0.0899	0.000020	mg/L	0.0805		112	90-113			
Uranium, total	0.0319	0.000020	mg/L	0.0306		104	88-112			
Vanadium, total	0.398	0.0010	mg/L	0.386		103	87-110			
Zinc, total	2.72	0.0040	mg/L	2.49		109	90-113			
Volatile Organic Compounds (VOC), Batch B8C0050										
Blank (B8C0050-BLK1)				Prepared: 2018-03-01, Analyzed: 2018-03-01						
Bromodichloromethane	< 0.0010	0.0010	mg/L							
Bromoform	< 0.0010	0.0010	mg/L							
Chloroform	< 0.0010	0.0010	mg/L							
Dibromochloromethane	< 0.0010	0.0010	mg/L							
Surrogate: Toluene-d8	*0.0278*		*mg/L*	0.0246		*113*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0252*		*mg/L*	0.0250		*101*	*70-130*			
LCS (B8C0050-BS1)				Prepared: 2018-03-01, Analyzed: 2018-03-01						
Bromodichloromethane	0.0210	0.0010	mg/L	0.0200		105	70-130			
Bromoform	0.0201	0.0010	mg/L	0.0202		100	70-130			
Chloroform	0.0210	0.0010	mg/L	0.0202		104	70-130			
Dibromochloromethane	0.0204	0.0010	mg/L	0.0201		102	70-130			
Surrogate: Toluene-d8	*0.0281*		*mg/L*	0.0246		*114*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*0.0271*		*mg/L*	0.0250		*108*	*70-130*			