CARO
ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

REPORTED TO	Lacombe County RR 3 Lacombe, AB T4L 2N3		
ATTENTION	Darren Dempsey	**WORK ORDER**	0081373
PO NUMBER		**RECEIVED / TEMP**	2020-08-14 09:15 / 12°C
PROJECT	Lacombe County Water Samples	**REPORTED**	2020-08-20 13:34
PROJECT INFO	HWY 12/21 Total Metals	**COC NUMBER**	12212020

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/IEC 17025:2017 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 sgulenchyn@caro.ca

Authorized By:

Sara Gulenchyn, B.Sc, P.Chem.
Client Service Manager

Sara Gulenchyn

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TEST RESULTS

REPORTED TO	Lacombe County	**WORK ORDER**	0081373
PROJECT	Lacombe County Water Samples	**REPORTED**	2020-08-20 13:34

Analyte	Result	Guideline	RL	Units	Analyzed	Qualifier
Total Metals (0081373-01) | Matrix: Water | Sampled: 2020-08-13 08:30						
Calculated Parameters						
Hardness, Total (as CaCO3)	**198**	None Required	0.500	mg/L	N/A	
Total Metals						
Aluminum, total	**0.0485**	OG < 0.1	0.0050	mg/L	2020-08-19	
Antimony, total	< 0.00020	MAC = 0.006	0.00020	mg/L	2020-08-19	
Arsenic, total	< 0.00050	MAC = 0.01	0.00050	mg/L	2020-08-19	
Barium, total	**0.108**	MAC = 2	0.0050	mg/L	2020-08-19	
Beryllium, total	< 0.00010	N/A	0.00010	mg/L	2020-08-19	
Bismuth, total	< 0.00010	N/A	0.00010	mg/L	2020-08-19	
Boron, total	< 0.0500	MAC = 5	0.0500	mg/L	2020-08-19	
Cadmium, total	< 0.000010	MAC = 0.005	0.000010	mg/L	2020-08-19	
Calcium, total	**52.6**	None Required	0.20	mg/L	2020-08-19	
Chromium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2020-08-19	
Cobalt, total	< 0.00010	N/A	0.00010	mg/L	2020-08-19	
Copper, total	**0.00106**	MAC = 2	0.00040	mg/L	2020-08-19	
Iron, total	< 0.010	AO ≤ 0.3	0.010	mg/L	2020-08-19	
Lead, total	< 0.00020	MAC = 0.005	0.00020	mg/L	2020-08-19	
Lithium, total	**0.00700**	N/A	0.00010	mg/L	2020-08-19	
Magnesium, total	**16.2**	None Required	0.010	mg/L	2020-08-19	
Manganese, total	**0.00405**	MAC = 0.12	0.00020	mg/L	2020-08-19	
Molybdenum, total	**0.00101**	N/A	0.00010	mg/L	2020-08-19	
Nickel, total	**0.00074**	N/A	0.00040	mg/L	2020-08-19	
Phosphorus, total	< 0.050	N/A	0.050	mg/L	2020-08-19	
Potassium, total	**2.18**	N/A	0.10	mg/L	2020-08-19	
Selenium, total	< 0.00050	MAC = 0.05	0.00050	mg/L	2020-08-19	
Silicon, total	**2.5**	N/A	1.0	mg/L	2020-08-19	
Silver, total	< 0.000050	None Required	0.000050	mg/L	2020-08-19	
Sodium, total	**24.1**	AO ≤ 200	0.10	mg/L	2020-08-19	
Strontium, total	**0.377**	7	0.0010	mg/L	2020-08-19	
Sulfur, total	**31.3**	N/A	3.0	mg/L	2020-08-19	
Tellurium, total	< 0.00050	N/A	0.00050	mg/L	2020-08-19	
Thallium, total	< 0.000020	N/A	0.000020	mg/L	2020-08-19	
Thorium, total	< 0.00010	N/A	0.00010	mg/L	2020-08-19	
Tin, total	< 0.00020	N/A	0.00020	mg/L	2020-08-19	
Titanium, total	< 0.0050	N/A	0.0050	mg/L	2020-08-19	
Tungsten, total	< 0.0010	N/A	0.0010	mg/L	2020-08-19	
Uranium, total	**0.000159**	MAC = 0.02	0.000020	mg/L	2020-08-19	
Vanadium, total	< 0.0010	N/A	0.0010	mg/L	2020-08-19	
Zinc, total	< 0.0040	AO ≤ 5	0.0040	mg/L	2020-08-19	
Zirconium, total	< 0.00010	N/A	0.00010	mg/L	2020-08-19	

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APPENDIX 1: SUPPORTING INFORMATION

REPORTED TO	Lacombe County	**WORK ORDER**	0081373
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Analysis Description	Method Ref.	Technique	Accredited	Location
Hardness in Water	SM 2340 B* (2017)	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

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, June 2019)

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.

Results in **Bold** indicate values that are above CARO's method reporting limits. Any results that are above regulatory limits are highlighted red. Please note that results will only be highlighted red if the regulatory limits are included on the CARO report. Any Bold and/or highlighted results do not take into account method uncertainty. If you would like method uncertainty or regulatory limits to be included on your report, please contact your Account Manager:sgulenchyn@caro.ca

Please note any regulatory guidelines applied to this report are added as a convenience to the client, at their request, to help provide some initial context to analytical results obtained. Although CARO makes every effort to ensure accuracy of the associated regulatory guideline(s) applied, the guidelines applied cannot be assumed to be correct due to a variety of factors and as such CARO Analytical Services assumes no liability or responsibility for the use of those guidelines to make any decisions. The original source of the regulation should be verified and a review of the guideline (s) should be validated as correct in order to make any decisions arising from the comparison of the analytical data obtained to the relevant regulatory guideline for one's particular circumstances. Further, CARO Analytical Services assumes no liability or responsibility for any loss attributed from the use of these guidelines in any way.

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APPENDIX 2: QUALITY CONTROL RESULTS

REPORTED TO	Lacombe County	**WORK ORDER**	0081373
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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 B0H1476										
Blank (B0H1476-BLK1)				Prepared: 2020-08-18, Analyzed: 2020-08-19						
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	< 0.0500	0.0500	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							
Zinc, total	< 0.0040	0.0040	mg/L							

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Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B0H1476, Continued										
Blank (B0H1476-BLK1), Continued				Prepared: 2020-08-18, Analyzed: 2020-08-19						
Zirconium, total	< 0.00010	0.00010	mg/L							
LCS (B0H1476-BS1)				Prepared: 2020-08-18, Analyzed: 2020-08-19						
Aluminum, total	0.0230	0.0050	mg/L	0.0199		116	80-120			
Antimony, total	0.0239	0.00020	mg/L	0.0200		120	80-120			
Arsenic, total	0.0237	0.00050	mg/L	0.0200		119	80-120			
Barium, total	0.0200	0.0050	mg/L	0.0198		101	80-120			
Beryllium, total	0.0209	0.00010	mg/L	0.0198		106	80-120			
Bismuth, total	0.0206	0.00010	mg/L	0.0200		103	80-120			
Boron, total	< 0.0500	0.0500	mg/L	0.0200		113	80-120			
Cadmium, total	0.0204	0.000010	mg/L	0.0199		103	80-120			
Calcium, total	2.23	0.20	mg/L	2.02		111	80-120			
Chromium, total	0.0232	0.00050	mg/L	0.0198		117	80-120			
Cobalt, total	0.0203	0.00010	mg/L	0.0199		102	80-120			
Copper, total	0.0205	0.00040	mg/L	0.0200		102	80-120			
Iron, total	2.03	0.010	mg/L	2.02		101	80-120			
Lead, total	0.0195	0.00020	mg/L	0.0199		98	80-120			
Lithium, total	0.0212	0.00010	mg/L	0.0200		106	80-120			
Magnesium, total	2.01	0.010	mg/L	2.02		100	80-120			
Manganese, total	0.0207	0.00020	mg/L	0.0199		104	80-120			
Molybdenum, total	0.0208	0.00010	mg/L	0.0200		104	80-120			
Nickel, total	0.0206	0.00040	mg/L	0.0200		103	80-120			
Phosphorus, total	2.13	0.050	mg/L	2.00		106	80-120			
Potassium, total	2.18	0.10	mg/L	2.02		108	80-120			
Selenium, total	0.0213	0.00050	mg/L	0.0200		106	80-120			
Silicon, total	2.2	1.0	mg/L	2.00		110	80-120			
Silver, total	0.0216	0.000050	mg/L	0.0200		108	80-120			
Sodium, total	2.01	0.10	mg/L	2.02		100	80-120			
Strontium, total	0.0229	0.0010	mg/L	0.0200		114	80-120			
Tellurium, total	0.0222	0.00050	mg/L	0.0200		111	80-120			
Thallium, total	0.0204	0.000020	mg/L	0.0199		102	80-120			
Thorium, total	0.0199	0.00010	mg/L	0.0200		100	80-120			
Tin, total	0.0214	0.00020	mg/L	0.0200		107	80-120			
Titanium, total	0.0233	0.0050	mg/L	0.0200		116	80-120			
Tungsten, total	0.0210	0.0010	mg/L	0.0200		105	80-120			
Uranium, total	0.0208	0.000020	mg/L	0.0200		104	80-120			
Vanadium, total	0.0232	0.0010	mg/L	0.0200		116	80-120			
Zinc, total	0.0227	0.0040	mg/L	0.0200		114	80-120			
Zirconium, total	0.0210	0.00010	mg/L	0.0200		105	80-120			
Reference (B0H1476-SRM1)				Prepared: 2020-08-18, Analyzed: 2020-08-19						
Aluminum, total	0.341	0.0050	mg/L	0.299		114	70-130			
Antimony, total	0.0585	0.00020	mg/L	0.0517		113	70-130			
Arsenic, total	0.145	0.00050	mg/L	0.119		122	70-130			
Barium, total	0.810	0.0050	mg/L	0.801		101	70-130			
Beryllium, total	0.0564	0.00010	mg/L	0.0501		113	70-130			
Boron, total	3.91	0.0500	mg/L	4.11		95	70-130			
Cadmium, total	0.0520	0.000010	mg/L	0.0503		103	70-130			
Calcium, total	10.9	0.20	mg/L	10.7		102	70-130			
Chromium, total	0.295	0.00050	mg/L	0.250		118	70-130			
Cobalt, total	0.0401	0.00010	mg/L	0.0384		104	70-130			
Copper, total	0.520	0.00040	mg/L	0.487		107	70-130			
Iron, total	0.510	0.010	mg/L	0.504		101	70-130			
Lead, total	0.284	0.00020	mg/L	0.278		102	70-130			
Lithium, total	0.462	0.00010	mg/L	0.398		116	70-130			
Magnesium, total	3.85	0.010	mg/L	3.59		107	70-130			
Manganese, total	0.121	0.00020	mg/L	0.111		109	70-130			

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Analyte	Result	RL	Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
Total Metals, Batch B0H1476, Continued										
Reference (B0H1476-SRM1), Continued				Prepared: 2020-08-18, Analyzed: 2020-08-19						
Molybdenum, total	0.204	0.00010	mg/L	0.196		104	70-130			
Nickel, total	0.260	0.00040	mg/L	0.248		105	70-130			
Phosphorus, total	0.272	0.050	mg/L	0.213		128	70-130			
Potassium, total	6.83	0.10	mg/L	5.89		116	70-130			
Selenium, total	0.136	0.00050	mg/L	0.120		114	70-130			
Sodium, total	9.30	0.10	mg/L	8.71		107	70-130			
Strontium, total	0.460	0.0010	mg/L	0.393		117	70-130			
Thallium, total	0.0838	0.000020	mg/L	0.0787		106	70-130			
Uranium, total	0.0346	0.000020	mg/L	0.0344		101	70-130			
Vanadium, total	0.463	0.0010	mg/L	0.391		118	70-130			
Zinc, total	2.75	0.0040	mg/L	2.50		110	70-130			