

## CERTIFICATE OF ANALYSIS

<b>REPORTED TO</b>	Yukon Government - Department of Education 1000 Lewes Blvd. Whitehorse, YT Y1A 6N2	<b>WORK ORDER</b>	8080454
<b>ATTENTION</b>	Miles Hume	<b>RECEIVED / TEMP REPORTED</b>	2018-08-04 09:00 / 13°C 2018-08-21 11:27
<b>PO NUMBER</b>		<b>COC NUMBER</b>	B65351
<b>PROJECT</b>	Department of Education 2018 Water Testing Program		
<b>PROJECT INFO</b>	Contract No. C00044694 - Nelnah		

### 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.

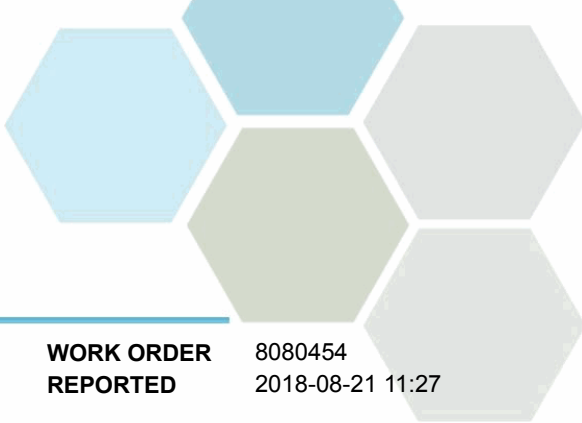
If you have any questions or concerns, please contact me at [machan@caro.ca](mailto:machan@caro.ca)

### Authorized By:

Maggie Chan, DipT  
Client Service Representative

1-888-311-8846 | [www.caro.ca](http://www.caro.ca)

#110 4011 Viking Way Richmond, BC V6V 2K9 | #102 3677 Highway 97N Kelowna, BC V1X 5C3 | 17225 109 Avenue Edmonton, AB T5S 1H7

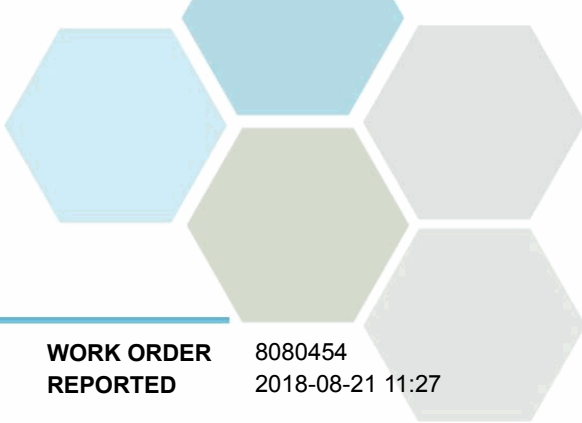


## TEST RESULTS

**REPORTED TO PROJECT** Yukon Government - Department of Education  
Department of Education 2018 Water Testing Program

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Analyte	Result	RL	Units	Analyzed	Qualifier
<b>BS1 (8080454-01)   Matrix: Water   Sampled: 2018-07-31 08:00</b>					
<i>Total Metals</i>					
Lead, total	7.95	0.20	µg/L	2018-08-11	
<b>BS2 (8080454-02)   Matrix: Water   Sampled: 2018-07-31 08:00</b>					
<i>Total Metals</i>					
Lead, total	7.37	0.20	µg/L	2018-08-11	
<b>BS3 (8080454-03)   Matrix: Water   Sampled: 2018-07-31 08:00</b>					
<i>Total Metals</i>					
Lead, total	5.19	0.20	µg/L	2018-08-11	
<b>BS4 (8080454-04)   Matrix: Water   Sampled: 2018-07-31 08:00</b>					
<i>Total Metals</i>					
Lead, total	14.1	0.20	µg/L	2018-08-11	
<b>BS5 (8080454-05)   Matrix: Water   Sampled: 2018-07-31 08:00</b>					
<i>Total Metals</i>					
Lead, total	13.6	0.20	µg/L	2018-08-11	
<b>KS1 (8080454-06)   Matrix: Water   Sampled: 2018-07-31 08:00</b>					
<i>Total Metals</i>					
Lead, total	14.0	0.20	µg/L	2018-08-11	
<b>KS2 (8080454-07)   Matrix: Water   Sampled: 2018-07-31 08:00</b>					
<i>Total Metals</i>					
Lead, total	2.83	0.20	µg/L	2018-08-11	
<b>DF1 (8080454-08)   Matrix: Water   Sampled: 2018-07-31 08:00</b>					
<i>Total Metals</i>					
Lead, total	22.2	0.20	µg/L	2018-08-11	
<b>BS6 (8080454-09)   Matrix: Water   Sampled: 2018-07-31 08:00</b>					
<i>Total Metals</i>					

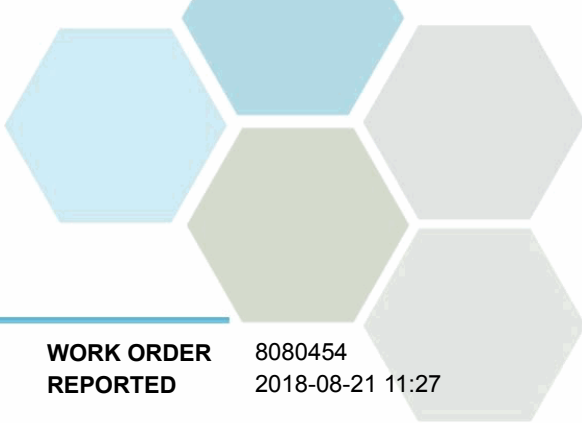


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Analyte	Result	RL	Units	Analyzed	Qualifier
<b>BS6 (8080454-09)   Matrix: Water   Sampled: 2018-07-31 08:00, Continued</b>					
<i>Total Metals, Continued</i>					
Lead, total	19.5	0.20	µg/L	2018-08-11	
<b>KS3 (8080454-10)   Matrix: Water   Sampled: 2018-07-31 08:00</b>					
<i>Total Metals</i>					
Lead, total	16.0	0.20	µg/L	2018-08-11	
<b>NBJ (8080454-11)   Matrix: Water   Sampled: 2018-07-31 08:00</b>					
<i>Calculated Parameters</i>					
Hardness, Total (as CaCO3)	169	0.500	mg/L	N/A	
<i>Total Metals</i>					
Aluminum, total	7.3	5.0	µg/L	2018-08-11	
Antimony, total	< 0.20	0.20	µg/L	2018-08-11	
Arsenic, total	< 0.50	0.50	µg/L	2018-08-11	
Barium, total	28.6	5.0	µg/L	2018-08-11	
Boron, total	22.4	5.0	µg/L	2018-08-11	
Cadmium, total	0.054	0.010	µg/L	2018-08-11	
Calcium, total	53100	200	µg/L	2018-08-11	
Chromium, total	1.29	0.50	µg/L	2018-08-11	
Copper, total	246	0.40	µg/L	2018-08-11	
Iron, total	674	10	µg/L	2018-08-11	
Lead, total	9.18	0.20	µg/L	2018-08-11	
Magnesium, total	8850	10	µg/L	2018-08-11	
Manganese, total	10.0	0.20	µg/L	2018-08-11	
Mercury, total	< 0.010	0.010	µg/L	2018-08-09	
Potassium, total	1320	100	µg/L	2018-08-11	
Selenium, total	< 0.50	0.50	µg/L	2018-08-11	
Sodium, total	3690	100	µg/L	2018-08-11	
Uranium, total	0.546	0.020	µg/L	2018-08-11	
Zinc, total	349	4.0	µg/L	2018-08-11	



## APPENDIX 1: SUPPORTING INFORMATION

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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
Mercury, total in Water	EPA 245.7*	BrCl <sub>2</sub> Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond
Total Metals in Water	EPA 200.2* / EPA 6020B	HNO <sub>3</sub> +HCl Hot Block Digestion / Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS)	Richmond

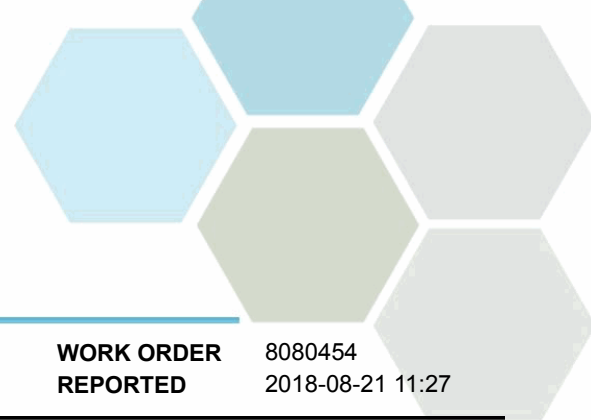
*Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method*

### 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
mg/L	Milligrams per litre
µg/L	Micrograms per litre
EPA	United States Environmental Protection Agency Test Methods
SM	Standard Methods for the Examination of Water and Wastewater, American Public Health Association

### 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

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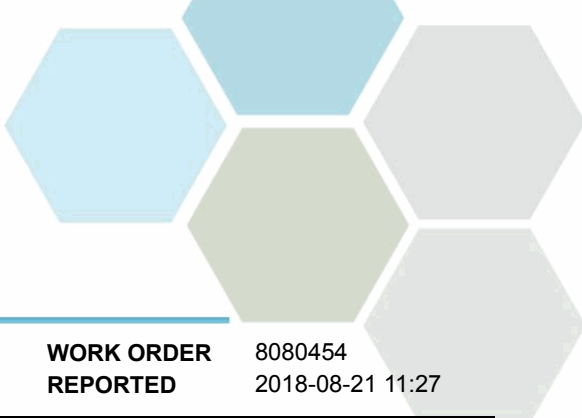
The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **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
<b>Total Metals, Batch B8H0397</b>									
<b>Blank (B8H0397-BLK1)</b>			Prepared: 2018-08-07, Analyzed: 2018-08-09						
Mercury, total	< 0.010	0.010 µg/L							
<b>Blank (B8H0397-BLK2)</b>			Prepared: 2018-08-07, Analyzed: 2018-08-09						
Mercury, total	< 0.010	0.010 µg/L							
<b>Reference (B8H0397-SRM1)</b>			Prepared: 2018-08-07, Analyzed: 2018-08-09						
Mercury, total	4.70	0.010 µg/L	4.89		96	80-120			
<b>Reference (B8H0397-SRM2)</b>			Prepared: 2018-08-07, Analyzed: 2018-08-09						
Mercury, total	4.69	0.010 µg/L	4.89		96	80-120			
<b>Total Metals, Batch B8H0526</b>									
<b>Blank (B8H0526-BLK1)</b>			Prepared: 2018-08-08, Analyzed: 2018-08-11						
Lead, total	< 0.20	0.20 µg/L							
<b>Blank (B8H0526-BLK2)</b>			Prepared: 2018-08-08, Analyzed: 2018-08-11						
Lead, total	< 0.20	0.20 µg/L							
<b>LCS (B8H0526-BS1)</b>			Prepared: 2018-08-08, Analyzed: 2018-08-11						
Lead, total	20.3	0.20 µg/L	20.0		101	80-120			
<b>LCS (B8H0526-BS2)</b>			Prepared: 2018-08-08, Analyzed: 2018-08-11						
Lead, total	20.5	0.20 µg/L	20.0		102	80-120			
<b>Duplicate (B8H0526-DUP2)</b>			<b>Source: 8080454-01</b> Prepared: 2018-08-08, Analyzed: 2018-08-11						
Lead, total	7.99	0.20 µg/L		7.95			< 1	20	
<b>Reference (B8H0526-SRM1)</b>			Prepared: 2018-08-08, Analyzed: 2018-08-11						
Lead, total	203	0.20 µg/L	204		100	90-110			
<b>Reference (B8H0526-SRM2)</b>			Prepared: 2018-08-08, Analyzed: 2018-08-11						
Lead, total	207	0.20 µg/L	204		101	90-110			

**Total Metals, Batch B8H0779**

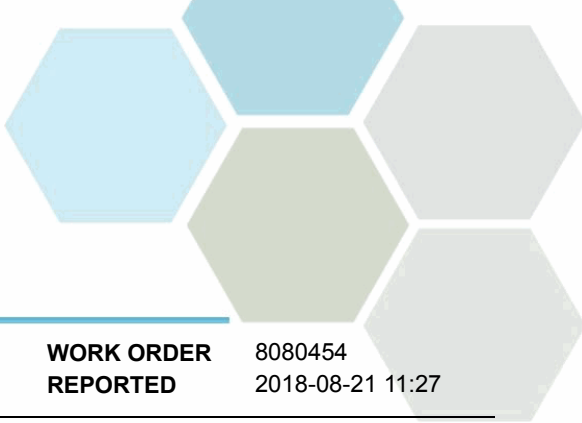


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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
<b>Total Metals, Batch B8H0779, Continued</b>									
<b>Blank (B8H0779-BLK1)</b>					Prepared: 2018-08-10, Analyzed: 2018-08-11				
Aluminum, total	< 5.0	5.0 µg/L							
Antimony, total	< 0.20	0.20 µg/L							
Arsenic, total	< 0.50	0.50 µg/L							
Barium, total	< 5.0	5.0 µg/L							
Boron, total	< 5.0	5.0 µg/L							
Cadmium, total	< 0.010	0.010 µg/L							
Calcium, total	< 200	200 µg/L							
Chromium, total	< 0.50	0.50 µg/L							
Copper, total	< 0.40	0.40 µg/L							
Iron, total	< 10	10 µg/L							
Lead, total	< 0.20	0.20 µg/L							
Magnesium, total	< 10	10 µg/L							
Manganese, total	< 0.20	0.20 µg/L							
Potassium, total	< 100	100 µg/L							
Selenium, total	< 0.50	0.50 µg/L							
Sodium, total	< 100	100 µg/L							
Uranium, total	< 0.020	0.020 µg/L							
Zinc, total	< 4.0	4.0 µg/L							
<b>LCS (B8H0779-BS1)</b>					Prepared: 2018-08-10, Analyzed: 2018-08-11				
Aluminum, total	20.3	5.0 µg/L	20.0		102	80-120			
Antimony, total	21.9	0.20 µg/L	20.0		109	80-120			
Arsenic, total	20.2	0.50 µg/L	20.0		101	80-120			
Barium, total	22.4	5.0 µg/L	20.0		112	80-120			
Boron, total	19.3	5.0 µg/L	20.0		96	80-120			
Cadmium, total	22.2	0.010 µg/L	20.0		111	80-120			
Calcium, total	2040	200 µg/L	2000		102	80-120			
Chromium, total	19.0	0.50 µg/L	20.0		95	80-120			
Copper, total	19.8	0.40 µg/L	20.0		99	80-120			
Iron, total	1900	10 µg/L	2000		95	80-120			
Lead, total	22.6	0.20 µg/L	20.0		113	80-120			
Magnesium, total	1920	10 µg/L	2000		96	80-120			
Manganese, total	20.4	0.20 µg/L	20.0		102	80-120			
Potassium, total	1790	100 µg/L	2000		90	80-120			
Selenium, total	20.6	0.50 µg/L	20.0		103	80-120			
Sodium, total	1880	100 µg/L	2000		94	80-120			
Uranium, total	22.4	0.020 µg/L	20.0		112	80-120			
Zinc, total	21.4	4.0 µg/L	20.0		107	80-120			
<b>Reference (B8H0779-SRM1)</b>					Prepared: 2018-08-10, Analyzed: 2018-08-11				
Aluminum, total	312	5.0 µg/L	303		103	82-114			
Antimony, total	51.8	0.20 µg/L	51.1		101	88-115			
Arsenic, total	121	0.50 µg/L	118		102	88-111			
Barium, total	870	5.0 µg/L	823		106	83-110			
Boron, total	3260	5.0 µg/L	3450		94	80-118			
Cadmium, total	53.4	0.010 µg/L	49.5		108	90-110			
Calcium, total	10200	200 µg/L	11600		88	85-113			
Chromium, total	236	0.50 µg/L	250		94	88-111			
Copper, total	499	0.40 µg/L	486		103	90-117			
Iron, total	456	10 µg/L	488		93	90-116			
Lead, total	217	0.20 µg/L	204		107	90-110			
Magnesium, total	3600	10 µg/L	3790		95	88-116			
Manganese, total	109	0.20 µg/L	109		100	88-108			
Potassium, total	6680	100 µg/L	7210		93	87-116			
Selenium, total	127	0.50 µg/L	121		105	90-122			
Sodium, total	7000	100 µg/L	7540		93	86-118			



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Analyte	Result	RL Units	Spike Level	Source Result	% REC	REC Limit	% RPD	RPD Limit	Qualifier
<i>Total Metals, Batch B8H0779, Continued</i>									
<b>Reference (B8H0779-SRM1), Continued</b>					Prepared: 2018-08-10, Analyzed: 2018-08-11				
Uranium, total	33.6	0.020 µg/L	30.6		110	88-112			
Zinc, total	2490	4.0 µg/L	2490		100	90-113			