ECOLOGICAL LOGISTICS & RESEARCH LTD.
ATTN: Chris Jastrebski
204 - 105 Titanium Way
Whitehorse YT Y1A 0E7

Date Received: 13-SEP-15
Report Date: 23-SEP-15 11:41 (MT)
Version: FINAL

Client Phone: 867-668-6386

Certificate of Analysis

Lab Work Order #: L1672207

Project P.O. #: NOT SUBMITTED
Job Reference: 15-210
C of C Numbers: 1
Legal Site Desc:

Jamie Lo, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1672207-1 Water 08-SEP-15 10:30 HLB	L1672207-2 Water 08-SEP-15 09:35 CC1	L1672207-3 Water 08-SEP-15 09:09 CC2	L1672207-4 Water 08-SEP-15 08:59 CC3	L1672207-5 Water 08-SEP-15 08:28 WC
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	277	278	391	428	344
	pH (pH)	7.81	8.01	7.90	7.94	8.03
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	4.0	9.3
Total Metals	Aluminum (Al)-Total (mg/L)	0.115	0.0924	0.0961	0.145	0.221
	Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	0.00051	0.00054
	Arsenic (As)-Total (mg/L)	0.00091	0.00085	0.00117	0.00138	0.00108
	Barium (Ba)-Total (mg/L)	0.061	0.060	0.057	0.062	0.059
	Beryllium (Be)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Boron (B)-Total (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Total (mg/L)	0.0000478	0.0000424	0.0000532	0.0000488	0.0000247
	Calcium (Ca)-Total (mg/L)	60.2	60.5	74.4	78.0	62.1
	Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	0.0012	0.0012	0.0013
	Cobalt (Co)-Total (mg/L)	0.00047	0.00040	0.00066	0.00074	0.00038
	Copper (Cu)-Total (mg/L)	0.0034	0.0030	0.0027	0.0025	0.0024
	Iron (Fe)-Total (mg/L)	0.351	0.336	0.436	0.558	0.590
	Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Lithium (Li)-Total (mg/L)	0.0034	0.0033	0.0080	0.0080	0.0040
	Magnesium (Mg)-Total (mg/L)	30.7	30.9	49.7	56.7	45.9
	Manganese (Mn)-Total (mg/L)	0.207	0.157	0.153	0.144	0.0993
	Mercury (Hg)-Total (mg/L)	0.0000067	0.0000072	0.0000076	0.0000058	0.0000054
	Molybdenum (Mo)-Total (mg/L)	0.0012	0.0012	0.0015	0.0016	0.0012
	Nickel (Ni)-Total (mg/L)	0.0049	0.0050	0.0125	0.0136	0.0072
	Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
	Selenium (Se)-Total (mg/L)	0.00141	0.00135	0.00145	0.00137	0.00109
	Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Sodium (Na)-Total (mg/L)	2.7	2.7	3.7	4.4	4.1
	Thallium (Tl)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010	<0.010	<0.010	0.010
	Uranium (U)-Total (mg/L)	0.00175	0.00171	0.00197	0.00238	0.00268
	Vanadium (V)-Total (mg/L)	0.00104	0.00094	0.00099	0.00124	0.00154
	Zinc (Zn)-Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Aluminum (Al)-Total	DLA	L1672207-1, -2, -3, -4, -5
Duplicate	Antimony (Sb)-Total	DLA	L1672207-1, -2, -3, -4, -5
Duplicate	Beryllium (Be)-Total	DLA	L1672207-1, -2, -3, -4, -5
Duplicate	Chromium (Cr)-Total	DLA	L1672207-1, -2, -3, -4, -5
Duplicate	Lead (Pb)-Total	DLA	L1672207-1, -2, -3, -4, -5
Duplicate	Silver (Ag)-Total	DLA	L1672207-1, -2, -3, -4, -5
Duplicate	Thallium (Tl)-Total	DLA	L1672207-1, -2, -3, -4, -5
Duplicate	Tin (Sn)-Total	DLA	L1672207-1, -2, -3, -4, -5
Duplicate	Vanadium (V)-Total	DLA	L1672207-1, -2, -3, -4, -5
Duplicate	Cadmium (Cd)-Total	DLM	L1672207-1, -2, -3, -4, -5
Matrix Spike	Calcium (Ca)-Total	MS-B	L1672207-1, -2, -3, -4, -5
Matrix Spike	Iron (Fe)-Total	MS-B	L1672207-1, -2, -3, -4, -5
Matrix Spike	Sodium (Na)-Total	MS-B	L1672207-1, -2, -3, -4, -5
Matrix Spike	Manganese (Mn)-Total	MS-B	L1672207-1, -2, -3, -4, -5
Matrix Spike	Molybdenum (Mo)-Total	MS-B	L1672207-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-TOT-ICP-VA	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

PH-MAN-WR	Water	pH by Meter	APHA 4500-H+

pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 – 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.

TSS-MAN-WR	Water	Total Suspended Solids by Gravimetric	APHA 2540 D

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids are determined by filtering a sample through a glass fibre filter and drying the filter at 104 degrees celsius.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1672207-COFC

COC Number: 14 -

Report To	
Company:	Ecological Logistics & Research Ltd.
Contact:	Chris Jastrebski
Address:	204-105 Titanium Way Whitehorse, YT Y1A 0E7
Phone:	867.668.6386

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ Yes ☐ No
☐ Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	chris@elr.ca , patricia.randell@gov.yk.ca
Email 2	kmartens@minnow.ca

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)	
R	☑ Regular (Standard TAT if received by 3 pm - business days)
P	☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
E	☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
E2	☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Specify Date Required for E2,E or P:	

Invoice To		
	Same as Report To	☑ Yes ☐ No
	Copy of Invoice with Report	☐ Yes ☑ No
Company:	Ecological Logistics & Research Ltd.	
Contact:	Chris Jastrebski	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	chris@elr.ca
Email 2	

Project Information	
ALS Quote #:	Q52337
Job #:	15-210
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
Approver ID:	Cost Center:
GL Account:	Routing Code:
Activity Code:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	TSS	Total Metals and Mercury (P)	Asbestos	#	Number of Containers
	HL B	08-Sep-15	10:30	Water	R	R	X	R	
	CC1	↓	9:35	Water	R	R	X	R	
	CC2	↓	9:09	Water	R	R	X	R	
	CC3	↓	8:59	Water	R	R	X	R	
	WC	08 Sep 15	8:28	Water	R	R	X	R	

Asbestos: No

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

SAMPLE CONDITION AS RECEIVED (lab use only)				
Frozen ☐		SIF Observations	Yes ☐	No ☐
Ice packs	Yes ☐ No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated ☐				
INITIAL COOLER TEMPERATURES °C	1.0	FINAL COOLER TEMPERATURES °C	6 6	6

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Wayne Tamery	Date: Sept 13	Time: 11:00	Received by: [signature]	Date: 13 Sept 15	Time: 1100	Received by: [signature]	Date: Sept. 16	Time: 1345

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

Chris Jastrebski Sept 14 11:00 Air Ferry To Air North