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

Date Received: 13-AUG-15
Report Date: 27-AUG-15 11:09 (MT)
Version: FINAL

Client Phone: 867-668-6386

Certificate of Analysis

Lab Work Order #: L1657162

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

Comments: Please note ALS identified samples L1657162-1 to -3 was sublet to ALS Cincinnati for Asbestos in water testing.

Jamie Lo, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1657162-1	L1657162-2	L1657162-3	L1657162-4	L1657162-5
Description	Water	Water	Water	Water	Water
Sampled Date	10-AUG-15	10-AUG-15	10-AUG-15	10-AUG-15	10-AUG-15
Sampled Time	09:37	09:09	08:26	08:00	08:10
Client ID	HL	CC1	CC2	CC3	WC
Grouping / **Analyte**					
WATER					
Physical Tests Hardness (as CaCO3) (mg/L)	278	281	412	407	384
pH (pH)	8.12	8.23	8.09	8.11	8.19
Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
Total Metals Aluminum (Al)-Total (mg/L)	0.0451	0.0388	0.0263	0.0385	0.104
Antimony (Sb)-Total (mg/L)	<0.00050	<0.00050	0.00050	0.00057	0.00079
Arsenic (As)-Total (mg/L)	0.00084	0.00090	0.00125	0.00128	0.00116
Barium (Ba)-Total (mg/L)	0.055	0.053	0.050	0.052	0.060
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)	0.0000397	0.0000293	0.0000567	0.0000473	0.0000255
Calcium (Ca)-Total (mg/L)	61.1	61.4	78.7	76.2	68.8
Chromium (Cr)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	0.0011
Cobalt (Co)-Total (mg/L)	0.00036	<0.00030	0.00070	0.00060	<0.00030
Copper (Cu)-Total (mg/L)	0.0030	0.0028	0.0022	0.0021	0.0023
Iron (Fe)-Total (mg/L)	0.224	0.181	0.301	0.299	0.397
Lead (Pb)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Lithium (Li)-Total (mg/L)	0.0033	0.0034	0.0087	0.0079	0.0045
Magnesium (Mg)-Total (mg/L)	30.6	30.9	52.4	52.7	51.6
Manganese (Mn)-Total (mg/L)	0.120	0.0695	0.106	0.0960	0.0702
Mercury (Hg)-Total (mg/L)	0.0000107	0.0000109	0.0000079	0.0000080	0.0000104
Molybdenum (Mo)-Total (mg/L)	0.0015	0.0015	0.0019	0.0018	0.0014
Nickel (Ni)-Total (mg/L)	0.0043	0.0062	0.0163	0.0152	0.0093
Potassium (K)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	<2.0
Selenium (Se)-Total (mg/L)	0.00130	0.00120	0.00121	0.00115	0.00103
Silver (Ag)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Sodium (Na)-Total (mg/L)	2.7	2.7	4.3	4.3	4.3
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)	0.00209	0.00202	0.00218	0.00236	0.00345
Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00086
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)
Matrix Spike	Calcium (Ca)-Total	MS-B	L1657162-1, -2, -3, -4, -5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1657162-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
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-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

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.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Submitted To: Reporting
ALS Whitehorse
12-151 Industrial Rd
Whitehorse, YT Y1A2V3

REFERENCE DATA

Asbestos in Water by TEM

Sample Type:	Drinking Water
Method Reference:	EPA Method 100.2
Client Sample No.:	L1657162-1/HL through L1657162-3/CC2
Sample Location:	L1657162; ELR: Clinton Creek
PO No.:	L1657162
ALS Work Order No.:	1508549
ALS Sample No.:	1508549-01 through 1508549-03

The samples indicated in this report were analyzed by Transmission Electron Microscopy (TEM) for asbestos using EPA Method 100.2 "Detection of Asbestos Structures >10μm in Length in Drinking Water" dated June 1994. Sample collection is performed outside the laboratory and is the responsibility of the client. If sample collection or submission deviates from any method requirement, interpretation of the results under strict EPA guidelines cannot be made.

Upon arrival at the laboratory, each sample was ultrasonically treated in its original container for 15 minutes to suspend the solids. Aliquots of this suspension were filtered onto 0.22μm pore size MCE filters. Whenever possible, a sufficient volume of sample is filtered to yield a reporting limit (RL) of <0.20 MFL equivalent to counting of one confirmed asbestos fiber. However, the actual volumes filtered are based on the clarity of the sample. Portions of the filtered sample are coated with carbon and mounted on TEM grids for examination.

Analysis is performed on an FEI Tecnai Spirit G2 Twin TEM with EDAX Genesis System. Results apply only to portions of samples analyzed and are tabulated on the following page(s). Samples are disposed after sufficient filtration. Filtered portions are disposed after 1 year, and grids are archived for a minimum of 3 years.

Pamela Johnson
Analyst

Shawn Smythe
Project Manager

NELAC accredited through New York ELAP (LAB #11371)

CLIENT: ALS Whitehorse
SAMPLE LOCATION: L1657162; ELR: Clinton Creek

SAMPLE PREP DATA

Date Received:	8/18/2015
Date Filtered:	8/18/2015
Time Filtered:	10:30
Filter Type:	MCE, 0.22 µm
Filter Size:	47 mm
Collection Area:	1075 mm^2

ANALYSIS DATA

Date and Time Analyzed:	8/25/2015 & 14:00
Magnification:	13,500x
Calibration Constant:	1 cm = 0.74 µm
EDXA Resolution:	<170.0 eV
Accelerating Voltage:	100 keV
Camera Constant:	129.25 mm-Å

SAMPLE IDENTIFICATION			
Client Sample No.:	L1657162-1/HL	L1657162-2/CC1	L1657162-3/CC2
ALS Sample No.:	1508549-01	1508549-02	1508549-03
Date Sampled:	8/10/2015	8/10/2015	8/10/2015
Time Sampled:	9:37	9:09	8:26
Volume Filtered (L):	0.050	0.050	0.050
No. Grid Openings Analyzed:	10	4	4
Average Grid Opening Area:	0.0108	0.0108	0.0108
RL (MFL):	0.20	0.50	0.50
Asbestos Fibers ≥10 microns			
Chrysotile:	7	19	12
Amosite:	0	0	0
Crocidolite:	0	0	0
Act-Tremolite†:	0	0	0
Anthophyllite:	0	0	0
Total Asbestos ≥10 microns			
Count:	**7**	**19**	**12**
Concentration (MFL):	**1.39**	**9.46**	**5.97**

†Act-Tremolite concentrations include: Actinolite, as well as the Libby Amphiboles; Tremolite, Winchite, and Richterite.
RL= Reporting Limit MFL= Millions of Fibers per Liter

NOTE: All samples were received past the 48 hour hold time and contained many Chrysotile asbestos fibers that were too short to be counted by this method.

Pamela Johnson
Analyst

Shawn Smythe
Project Manager

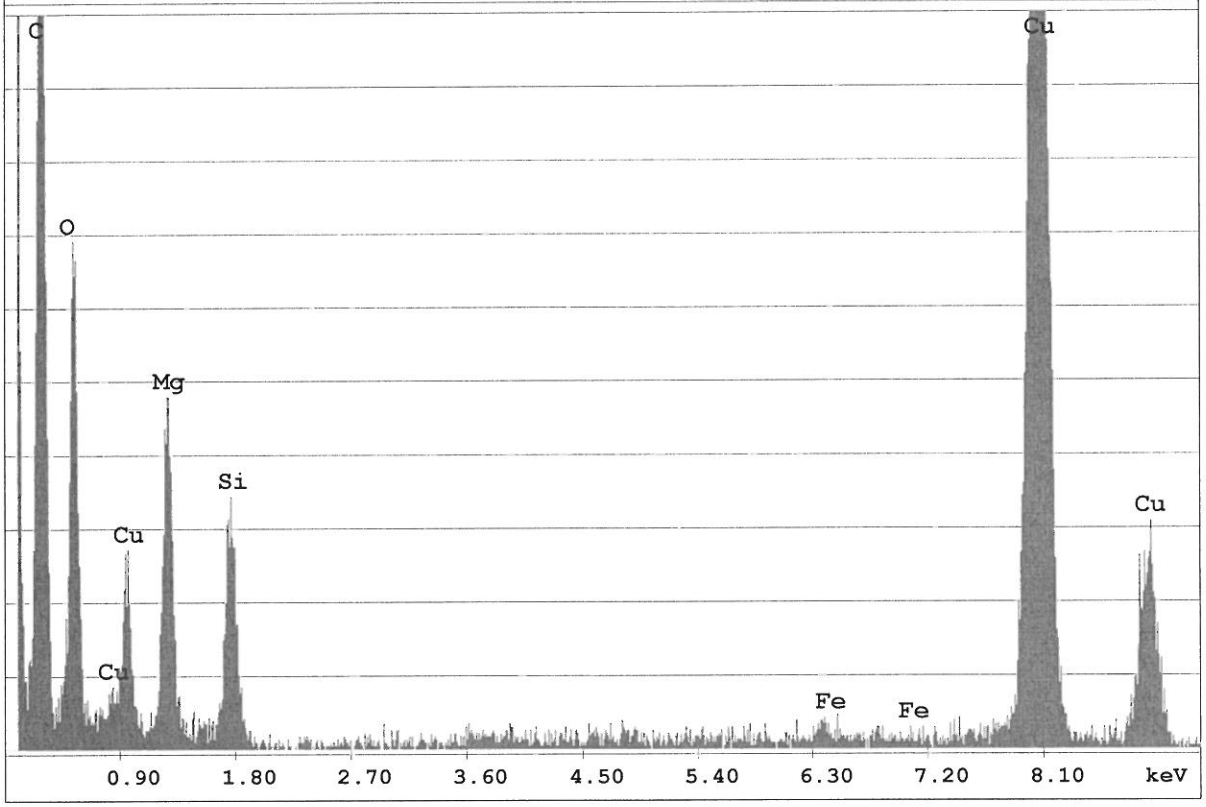
NELAC accredited through New York ELAP (LAB #11371)

Z:\TEM\EDXA SPECTRA\2015 Sample Data\WATER\1508549 ALS Yukon\1508549 01 Chrysotile.spc

Label:1508549 01 a1 Chrysotile

kV:100.0 X Tilt:13.0 Y Tilt:0.0 Det: STD

Res:134 Amp.T:51.20 FS:235 Lsec:14 25-Aug-2015 14:24:06



c:\edax32\genesis\genspc.spc

Label:1508549 02 a1 Chrysotile

kV:100.0 X Tilt:13.0 Y Tilt:0.0 Det: STD

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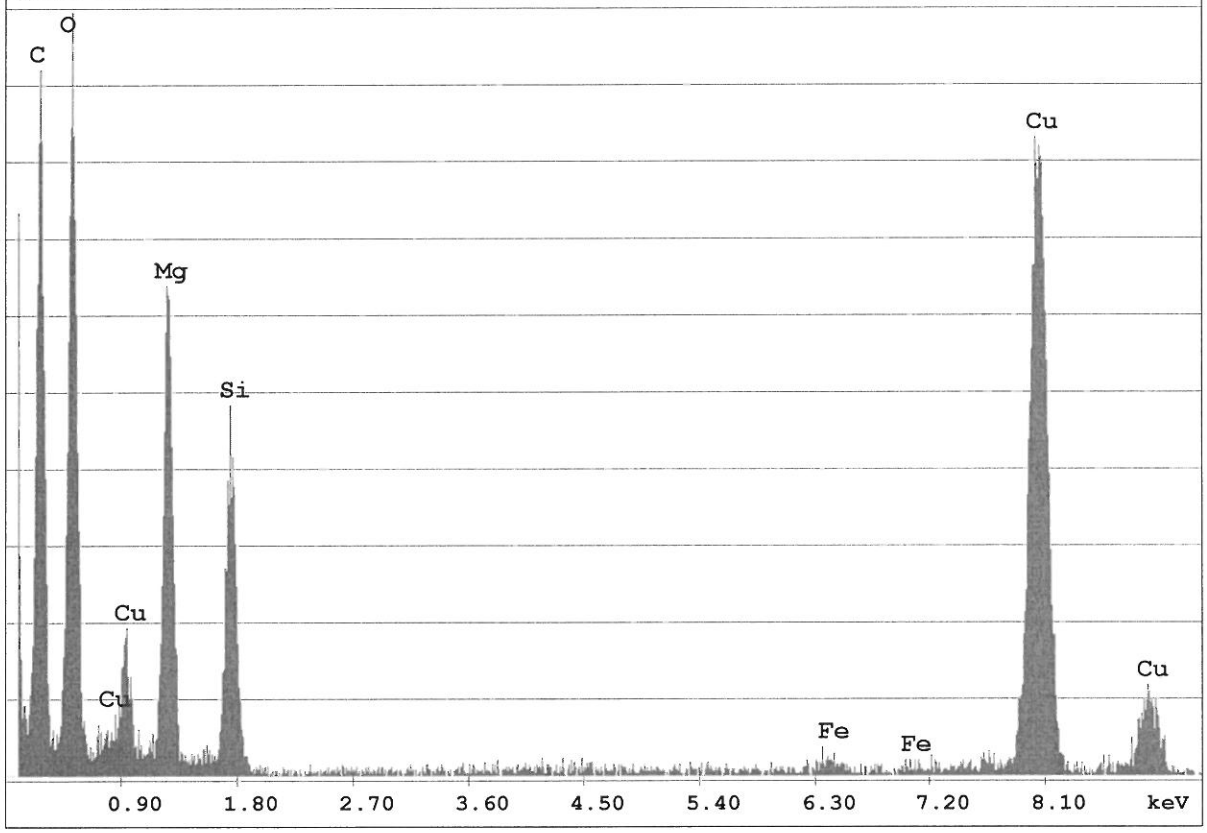

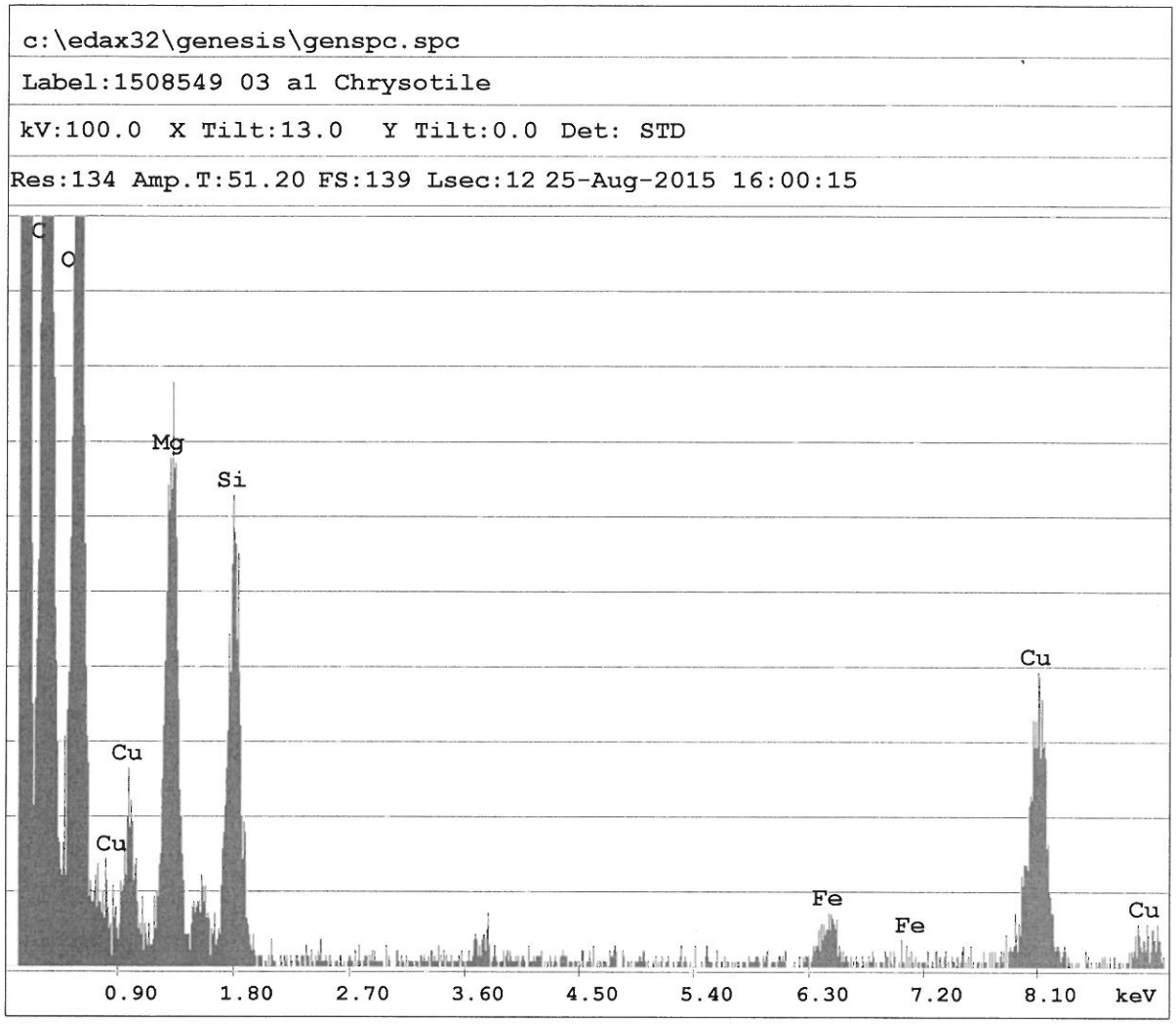
c:\edax32\genesis\genspc.spc
Label:1508549 03 a1 Chrysotile
kV:100.0 X Tilt:13.0 Y Tilt:0.0 Det: STD
Res:134 Amp.T:51.20 FS:139 Lsec:12 25-Aug-2015 16:00:15
C
O
Mg
Si
Cu
Cu
Fe
Fe
Cu
Cu
0.90
1.80
2.70
3.60
4.50
5.40
6.30
7.20
8.10
keV

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1657162-COFC

COC Number: 14 -

Page 1 of 1

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	Ecological Logistics & Research Ltd.	Select Report Format:	☑PDF ☑EXCEL ☑EDD (DIGITAL)	R ☑Regular (Standard TAT if received by 3 pm - business days)
Contact:	Chris Jastrebski	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	204-105 Titanium Way Whitehorse, YT Y1A 0E7	☐Criteria on Report - provide details below if box checked Select Distribution:	☑EMAIL ☐MAIL ☐FAX	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
Phone:	867.668.6386	Email 1 or Fax	chris@elr.ca	Specify Date Required for E2,E or P:
		Email 2	kmartens@minnow.ca	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution	
	Copy of Invoice with Report ☐ Yes ☑ No	Select Invoice Distribution:	☑EMAIL ☐MAIL ☐FAX
Company:	Ecological Logistics & Research Ltd.	Email 1 or Fax	chris@elr.ca
Contact:	Chris Jastrebski	Email 2	Patricia.Randell@gov.yk.ca

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q52337	Approver ID:	Cost Center:
Job #:	15-210	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		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	pH	Number of Containers
	HL	10-Aug-15	9:37	Water	R	R	R	R	4
	CC1	10-Aug-15	9:09	Water	R	R	R	R	4
	CC2	10-Aug-15	8:26	Water	R	R	R	R	4
	CC3	10-Aug-15	8:00	Water	R	R		R	3
	WC	10-Aug-15	8:10	Water	R	R		R	3

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No Are samples for human drinking water use? ☐ Yes ☑ No	

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			FINAL COOLER TEMPERATURES °C		
4.5					

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	Aug 13/15	9:30		13 Aug 15	09:40			

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

NA-FM-0326e v09 Front/04 January 2014

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.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.