SUMMIT ENVIRONMENTAL CONSULTANTS INC.
ATTN: Nicole Jacques
301 - 4109 4th Avenue
Whitehorse YT Y1A 1H6

Date Received: 17-MAY-13
Report Date: 29-MAY-13 18:42 (MT)
Version: FINAL

Client Phone: 867-456-2711

Certificate of Analysis

Lab Work Order #: L1303472

Project P.O. #:	NOT SUBMITTED
Job Reference:	2013-2333.300.323
C of C Numbers:	1
Legal Site Desc:	

Dean Watt
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1303472-1	L1303472-2			
	Description	Groundwater	Groundwater			
	Sampled Date	16-MAY-13	16-MAY-13			
	Sampled Time	12:00	12:00			
	Client ID	MW09-02	MW09-24			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	3040	889			
	Hardness (as CaCO3) (mg/L)	1670	504			
	pH (pH)	6.91	7.76			
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	53.3	6.6			
	Alkalinity, Total (as CaCO3) (mg/L)	46.3	167			
	Chloride (Cl) (mg/L)	<10 DLA	<2.5 DLA			
	Fluoride (F) (mg/L)	0.56	<0.10 DLA			
	Nitrate (as N) (mg/L)	<0.10 DLA	1.55			
	Nitrite (as N) (mg/L)	<0.020 DLA	<0.0050 DLA			
	Total Kjeldahl Nitrogen (mg/L)	18.3	0.285			
	Sulfate (SO4) (mg/L)	2010	358			
Total Metals	Aluminum (Al)-Total (mg/L)	0.407	9.34			
	Antimony (Sb)-Total (mg/L)	0.0393	0.00250			
	Arsenic (As)-Total (mg/L)	21.0	0.0868			
	Barium (Ba)-Total (mg/L)	0.021	0.450			
	Beryllium (Be)-Total (mg/L)	<0.0010 DLA	<0.0010			
	Boron (B)-Total (mg/L)	<0.10	<0.10			
	Cadmium (Cd)-Total (mg/L)	0.00746	0.000607			
	Calcium (Ca)-Total (mg/L)	426	141			
	Chromium (Cr)-Total (mg/L)	<0.0010 DLA	0.0230			
	Cobalt (Co)-Total (mg/L)	0.0130	0.00896			
	Copper (Cu)-Total (mg/L)	0.0179	0.103			
	Iron (Fe)-Total (mg/L)	36.9	21.9			
	Lead (Pb)-Total (mg/L)	0.178	0.0159			
	Lithium (Li)-Total (mg/L)	0.0205	0.0073			
	Magnesium (Mg)-Total (mg/L)	157	38.4			
	Manganese (Mn)-Total (mg/L)	35.5	0.684			
	Mercury (Hg)-Total (mg/L)	0.000020	0.000013			
	Molybdenum (Mo)-Total (mg/L)	0.0059	0.0018			
	Nickel (Ni)-Total (mg/L)	<0.0050 DLA	0.0132			
	Potassium (K)-Total (mg/L)	80.3	4.1			
	Selenium (Se)-Total (mg/L)	<0.0010 DLA	0.00051			
	Silver (Ag)-Total (mg/L)	0.00274	0.000811			
	Sodium (Na)-Total (mg/L)	87.5	11.0			
	Thallium (Tl)-Total (mg/L)	0.00076	<0.00020			
	Tin (Sn)-Total (mg/L)	0.0010	0.00143			
	Titanium (Ti)-Total (mg/L)	0.014	0.614			

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1303472-1	L1303472-2			
	Description	Groundwater	Groundwater			
	Sampled Date	16-MAY-13	16-MAY-13			
	Sampled Time	12:00	12:00			
	Client ID	MW09-02	MW09-24			
Grouping	**Analyte**					
WATER						
Total Metals	Uranium (U)-Total (mg/L)	0.00065	0.00402			
	Vanadium (V)-Total (mg/L)	<0.010 DLA	0.0420			
	Zinc (Zn)-Total (mg/L)	0.877	0.0602			
Dissolved Metals	Dissolved Metals Filtration Location	LAB	LAB			
	Aluminum (Al)-Dissolved (mg/L)	<0.010 DLA	0.0076			
	Antimony (Sb)-Dissolved (mg/L)	0.0028	<0.00050			
	Arsenic (As)-Dissolved (mg/L)	10.4	0.00162			
	Barium (Ba)-Dissolved (mg/L)	<0.020	0.139			
	Beryllium (Be)-Dissolved (mg/L)	<0.0010 DLA	<0.0010			
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10			
	Cadmium (Cd)-Dissolved (mg/L)	<0.00010 DLA	0.000200			
	Calcium (Ca)-Dissolved (mg/L)	422	144			
	Chromium (Cr)-Dissolved (mg/L)	<0.0010 DLA	<0.0010			
	Cobalt (Co)-Dissolved (mg/L)	0.0127	0.00038			
	Copper (Cu)-Dissolved (mg/L)	<0.0020 DLA	0.0094			
	Iron (Fe)-Dissolved (mg/L)	16.8	<0.030			
	Lead (Pb)-Dissolved (mg/L)	<0.00050 DLA	<0.00050			
	Lithium (Li)-Dissolved (mg/L)	0.0186	<0.0050			
	Magnesium (Mg)-Dissolved (mg/L)	151	35.3			
	Manganese (Mn)-Dissolved (mg/L)	34.3	0.0204			
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010			
	Molybdenum (Mo)-Dissolved (mg/L)	0.0051	<0.0010			
	Nickel (Ni)-Dissolved (mg/L)	<0.0050 DLA	<0.0010			
	Potassium (K)-Dissolved (mg/L)	74.2	2.0			
	Selenium (Se)-Dissolved (mg/L)	<0.0010 DLA	0.00034			
	Silver (Ag)-Dissolved (mg/L)	<0.00010 DLA	<0.000020			
	Sodium (Na)-Dissolved (mg/L)	83.0	10.7			
	Thallium (Tl)-Dissolved (mg/L)	0.00030	<0.00020			
	Tin (Sn)-Dissolved (mg/L)	<0.0010 DLA	<0.00050			
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010			
	Uranium (U)-Dissolved (mg/L)	0.00040	0.00343			
	Vanadium (V)-Dissolved (mg/L)	<0.010 DLA	<0.0010			
	Zinc (Zn)-Dissolved (mg/L)	0.422	0.0054			

* 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)
Method Blank	Aluminum (Al)-Dissolved	MB-LOR	L1303472-1, -2
Matrix Spike	Sulfate (SO4)	MS-B	L1303472-1, -2
Matrix Spike	Sulfate (SO4)	MS-B	L1303472-1, -2
Matrix Spike	Fluoride (F)	MS-B	L1303472-1, -2
Matrix Spike	Sulfate (SO4)	MS-B	L1303472-1, -2
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1303472-1, -2
Matrix Spike	Antimony (Sb)-Dissolved	MS-B	L1303472-1, -2
Matrix Spike	Arsenic (As)-Dissolved	MS-B	L1303472-1, -2
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1303472-1, -2
Duplicate	Total Kjeldahl Nitrogen	TKND	L1303472-1, -2
Duplicate	Total Kjeldahl Nitrogen	TKND	L1303472-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit Adjusted For required dilution
MB-LOR	Method Blank exceeds ALS DQO. LORs adjusted for samples with positive hits below 5 times blank level.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
TKND	TKN duplication was poor due to interference from high nitrate, which causes negative bias on TKN.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 "Acidity"

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-COL-VA	Water	Alkalinity by Colourimetric (Automated)	EPA 310.2

This analysis is carried out using procedures adapted from EPA Method 310.2 "Alkalinity". Total Alkalinity is determined using the methyl orange colourimetric method.

ANIONS-CL-IC-WR	Water	Chloride by Ion Chromatography	EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.

ANIONS-F-IC-WR	Water	Fluoride by Ion Chromatography	EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.

ANIONS-NO2-IC-WR	Water	Nitrite Nitrogen by Ion Chromatography	EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003. Nitrate is detected by UV absorbance.

ANIONS-NO3-IC-WR	Water	Nitrate Nitrogen by Ion Chromatography	EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003. Nitrate is detected by UV absorbance.

ANIONS-SO4-IC-WR	Water	Sulphate by Ion Chromatography	EPA 300.1

This analysis is carried out using procedures adapted from EPA Method 300.1, "Determination of Inorganic Anions by Ion Chromatography", Revision 1.0, April 1999 and from "Determination of Inorganic Anions in Environmental Waters Using a Hydroxide-Selective Column", Application Note 154 v.19, Dionex 2003.

EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

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.

Reference Information

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-DIS-LOW-CVAFS-VA Water Dissolved Mercury in Water by CVAFS(Low) EPA SW-846 3005A & EPA 245.7

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 filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

HG-TOT-LOW-CVAFS-VA Water Total Mercury in Water by CVAFS(Low) EPA 245.7

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 procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry (EPA Method 245.7).

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030 B&E / EPA SW-846 6020A

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 hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

MET-DIS-ICP-VA Water Dissolved 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 procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS APHA 3030 B&E / EPA SW-846 6020A

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 hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

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.

TKN-F-VA Water TKN in Water by Fluorescence APHA 4500-NORG D.

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

** 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
WR	ALS ENVIRONMENTAL - WHITEHORSE, YUKON, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

1

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 Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Report To		Report Format / Distribution	Service Requested (Rush for routine analysis subject to availability)
Company:	Summit Environmental Consultants Inc.	☐ Standard ☐ Other	◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Nicole Jacques	☑ PDF ☑ Excel ☐ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	301 - 4109 4th Avenue	Email 1: nrj@summit-environmental.com	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
	Whitehorse, YT, Y1A iH6	Email 2:	○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	867 - 456 - 2711 Fax: 604 - 291 - 6163	Email 3:	
Invoice To	Same as Report ? ☑ Yes ☐ No	Client / Project Information	
Hardcopy of Invoice with Report?	☐ Yes ☑ No	Job #: 2013-2333.300.323	
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #: Summit Environmental - General Price List	
Lab Work Order # (lab use only)		ALS Contact:	Sampler: NJ and SG

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Analysis Request: Please indicate below Filtered, Preserved or both (F, P, F/P)											Number of Containers
					F/P	P	P									
					Metals - Dissolved	Metals - Total	Total Kinetic Nitrogen	General								
	MW09-02	16-Mar-13	-	Groundwater	X	X	X	X								4
	MW09-24	16-Mar-13	-	Groundwater	X	X	X	X								4

L1303472-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

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 provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
				17-May-13	1:40	9.8 °C				