

SUMMIT ENVIRONMENTAL CONSULTANTS INC. ATTN: Nicole Jacques # 301 - 4109 4th Avenue Whitehorse YT Y1A 1H6 Date Received:27-MAY-13Report Date:14-JUN-13 11:20 (MT)Version:FINAL REV. 2

Client Phone: 867-456-2711

# **Certificate of Analysis**

### Lab Work Order #:

Project P.O. #: Job Reference: C of C Numbers: Legal Site Desc: L1307027 NOT SUBMITTED 2013-2333.300.323

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Dean Watt Account Manager

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# ALS ENVIRONMENTAL ANALYTICAL REPORT

L1307027 CONTD.... PAGE 2 of 6 14-JUN-13 11:20 (MT) Version: FINAL REV. 2

	Sample ID Description Sampled Date Sampled Time Client ID	L1307027-1 Groundwater 22-MAY-13 12:00 L2	L1307027-2 Surface Water 22-MAY-13 12:00 TAILINGS SAND (HUMIDITY CELL)	L1307027-4 Surface Water 22-MAY-13 12:00 TRENCH ABOVE MILL ROAD 01	L1307027-5 Surface Water 23-MAY-13 12:00 TRENCH ABOVE MILL ROAD 02	L1307027-6 Surface Water 23-MAY-13 12:00 DES-03
Grouping	Analyte					
WATER						
Physical Tests	Conductivity (uS/cm)	296	1320	27.2	24.1	743
	Hardness (as CaCO3) (mg/L)	170	896	14.0	14.7	422
	рН (рН)	7.57	8.47	6.93	5.82	5.84
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	5.0	4.8	4.3	11.3	10.1
	Alkalinity, Total (as CaCO3) (mg/L)	37.2	18.2	10.5	7.6	8.6
	Chloride (Cl) (mg/L)	<0.50	<5.0	<0.50	<0.50	<0.50
	Fluoride (F) (mg/L)	0.188	<0.20	0.020	<0.020	<0.020
	Nitrate (as N) (mg/L)	0.0563	<0.050	0.0217	0.0191	0.874
	Nitrite (as N) (mg/L)	<0.0010	<0.010	<0.0010	<0.0010	<0.0010
	Sulfate (SO4) (mg/L)	133	844	1.91	<0.50	402
Total Metals	Aluminum (AI)-Total (mg/L)	0.302	<0.0050	1.97	0.774	0.477
	Antimony (Sb)-Total (mg/L)	0.00340	0.0465	0.00110	0.00055	<0.00050
	Arsenic (As)-Total (mg/L)	0.0316	0.00117	0.0206	0.00444	0.00307
	Barium (Ba)-Total (mg/L)	<0.020	0.020	0.041	0.045	0.064
	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)	0.00128	0.000408	0.000074	0.000143	0.00912
	Calcium (Ca)-Total (mg/L)	47.0	302	4.94	4.40	103
	Chromium (Cr)-Total (mg/L)	<0.0010	0.0015	0.0019	<0.0010	<0.0010
	Cobalt (Co)-Total (mg/L)	<0.00030	0.00635	0.00119	0.00032	0.00063
	Copper (Cu)-Total (mg/L)	0.0073	0.0024	0.0057	0.0058	0.0039
	Iron (Fe)-Total (mg/L)	0.675	<0.030	2.99	0.501	0.874
	Lead (Pb)-Total (mg/L)	0.0178	<0.00050	0.00229	0.00132	0.00064
	Lithium (Li)-Total (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Magnesium (Mg)-Total (mg/L)	11.5	24.4	1.47	0.90	37.2
	Manganese (Mn)-Total (mg/L)	0.0646	0.0187	0.129	0.0426	0.968
	Mercury (Hg)-Total (mg/L)	<0.000010	<0.000010	0.000015	0.000026	<0.000010
	Molybdenum (Mo)-Total (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Total (mg/L)	<0.0010	0.0019	0.0015	0.0018	0.0052
	Potassium (K)-Total (mg/L)	<2.0	2.9	<2.0	<2.0	2.3
	Selenium (Se)-Total (mg/L)	<0.00010	0.00011	<0.00010	<0.00010	<0.00010
	Silver (Ag)-Total (mg/L)	0.000277	<0.000020	0.000075	0.000060	0.000023
	Sodium (Na)-Total (mg/L)	<2.0	<2.0	<2.0	<2.0	3.0
	Thallium (TI)-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	0.011	0.082	0.012	0.023
	Uranium (U)-Total (mg/L)	0.00022	0.00040	<0.00020	<0.00020	<0.00020

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

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	Sample ID Description Sampled Date Sampled Time Client ID	L1307027-1 Groundwater 22-MAY-13 12:00 L2	L1307027-2 Surface Water 22-MAY-13 12:00 TAILINGS SAND (HUMIDITY CELL)	L1307027-4 Surface Water 22-MAY-13 12:00 TRENCH ABOVE MILL ROAD 01	L1307027-5 Surface Water 23-MAY-13 12:00 TRENCH ABOVE MILL ROAD 02	L1307027-6 Surface Water 23-MAY-13 12:00 DES-03
Grouping	Analyte					
WATER						
Total Metals	Vanadium (V)-Total (mg/L)	0.0011	<0.0010	0.0072	0.0011	0.0017
	Zinc (Zn)-Total (mg/L)	0.0639	0.0082	0.0129	0.0124	3.42
Dissolved Metals	Dissolved Metals Filtration Location	LAB	FIELD	LAB	LAB	LAB
	Aluminum (Al)-Dissolved (mg/L)	0.0434	<0.0050	0.252	0.560	0.130
	Antimony (Sb)-Dissolved (mg/L)	0.00140	0.0491	<0.00050	<0.00050	<0.00050
	Arsenic (As)-Dissolved (mg/L)	0.0211	0.00111	0.00336	0.00267	0.00126
	Barium (Ba)-Dissolved (mg/L)	<0.020	0.021	<0.020	0.043	0.058
	Beryllium (Be)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Boron (B)-Dissolved (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Cadmium (Cd)-Dissolved (mg/L)	0.000626	0.000379	0.000020	0.000138	0.00921
	Calcium (Ca)-Dissolved (mg/L)	48.5	317	4.08	4.44	107
	Chromium (Cr)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Cobalt (Co)-Dissolved (mg/L)	<0.00030	0.00614	<0.00030	<0.00030	0.00052
	Copper (Cu)-Dissolved (mg/L)	0.0025	<0.0010	0.0025	0.0055	0.0017
	Iron (Fe)-Dissolved (mg/L)	0.059	<0.030	0.219	0.297	0.236
	Lead (Pb)-Dissolved (mg/L)	0.00216	<0.00050	<0.00050	0.00061	0.00078
	Lithium (Li)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Magnesium (Mg)-Dissolved (mg/L)	11.8	25.7	0.92	0.88	37.8
	Manganese (Mn)-Dissolved (mg/L)	0.0150	0.0169	0.00724	0.0356	0.995
	Mercury (Hg)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000020	<0.000010
	Molybdenum (Mo)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Nickel (Ni)-Dissolved (mg/L)	<0.0010	0.0016	<0.0010	0.0018	0.0051
	Potassium (K)-Dissolved (mg/L)	<2.0	3.0	<2.0	<2.0	2.3
	Selenium (Se)-Dissolved (mg/L)	<0.00010	0.00011	<0.00010	<0.00010	<0.00010
	Silver (Ag)-Dissolved (mg/L)	0.000033	<0.000020	<0.000020	0.000030	<0.000020
	Sodium (Na)-Dissolved (mg/L)	<2.0	<2.0	<2.0	<2.0	3.1
	Thallium (TI)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Tin (Sn)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Dissolved (mg/L)	<0.010	0.011	<0.010	<0.010	<0.010
	Uranium (U)-Dissolved (mg/L)	0.00021	0.00041	<0.00020	<0.00020	<0.00020
	Vanadium (V)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)-Dissolved (mg/L)	0.0331	0.0070	<0.0050	0.0121	3.51

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

## **Reference Information**

### **QC Samples with Qualifiers & Comments:**

QC Type Des	cription	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate		Antimony (Sb)-Dissolved	DLA	L1307027-1, -4, -5, -6
Duplicate		Arsenic (As)-Dissolved	DLA	L1307027-1, -4, -5, -6
Duplicate		Beryllium (Be)-Dissolved	DLA	L1307027-1, -4, -5, -6
Duplicate		Cobalt (Co)-Dissolved	DLA	L1307027-1, -4, -5, -6
Duplicate		Lead (Pb)-Dissolved	DLA	L1307027-1, -4, -5, -6
Duplicate		Silver (Ag)-Dissolved	DLA	L1307027-1, -4, -5, -6
Duplicate		Thallium (TI)-Dissolved	DLA	L1307027-1, -4, -5, -6
Duplicate		Tin (Sn)-Dissolved	DLA	L1307027-1, -4, -5, -6
Duplicate		Vanadium (V)-Dissolved	DLA	L1307027-1, -4, -5, -6
Matrix Spike		Manganese (Mn)-Dissolved	MS-B	L1307027-2
Matrix Spike		Calcium (Ca)-Dissolved	MS-B	L1307027-2
Matrix Spike		Sodium (Na)-Dissolved	MS-B	L1307027-2
Matrix Spike		Sulfate (SO4)	MS-B	L1307027-1, -2, -4, -5, -6
Matrix Spike		Calcium (Ca)-Dissolved	MS-B	L1307027-1, -4, -5, -6
Matrix Spike		Manganese (Mn)-Dissolved	MS-B	L1307027-1, -4, -5, -6
Matrix Spike		Molybdenum (Mo)-Dissolved	MS-B	L1307027-1, -4, -5, -6
Qualifiers for	r Individual Parameters	Listed:		
Qualifier	Description			
DLA	Detection Limit Adjus	ted For required dilution		
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**						
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 "Acidity"						
This analysis is carried out endpoint.	using proced	ures adapted from APHA Method 2310 "Acidity". Acidit	y is determined by potentiometric titration to a specified						
ACY-PCT-VA	Water	Acidity by Automatic Titration	APHA 2310 Acidity						
This analysis is carried out endpoint.	using proced	ures adapted from APHA Method 2310 "Acidity". Acidit	y is determined by potentiometric titration to a specified						
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 1.0, April 1999 and from "Do Dionex 2003.	using proced etermination	ures adapted from EPA Method 300.1, "Determination of Inorganic Anions in Environmental Waters Using a H	of Inorganic Anions by Ion Chromatography", Revision lydroxide-Selective Column", Application Note 154 v.19,						
ANIONS-F-IC-WR	Water	Fluoride by Ion Chromatography	EPA 300.1						
This analysis is carried out 1.0, April 1999 and from "Do Dionex 2003.	using proced etermination	ures adapted from EPA Method 300.1, "Determination of Inorganic Anions in Environmental Waters Using a H	of Inorganic Anions by Ion Chromatography", Revision lydroxide-Selective Column", Application Note 154 v.19,						
ANIONS-NO2-IC-WR	Water	Nitrite Nitrogen by Ion Chromatography	EPA 300.1						
This analysis is carried out 1.0, April 1999 and from "Do Dionex 2003. Nitrate is dete	using proced etermination ected by UV	ures adapted from EPA Method 300.1, "Determination of Inorganic Anions in Environmental Waters Using a H absorbance.	of Inorganic Anions by Ion Chromatography", Revision lydroxide-Selective Column", Application Note 154 v.19,						
ANIONS-NO3-IC-WR	Water	Nitrate Nitrogen by Ion Chromatography	EPA 300.1						
This analysis is carried out 1.0, April 1999 and from "Do Dionex 2003. Nitrate is dete	using proced etermination ected by UV	ures adapted from EPA Method 300.1, "Determination of Inorganic Anions in Environmental Waters Using a H absorbance.	of Inorganic Anions by Ion Chromatography", Revision Iydroxide-Selective Column", Application Note 154 v.19,						
ANIONS-SO4-IC-WR	Water	Sulphate by Ion Chromatography	EPA 300.1						
This analysis is carried out 1.0, April 1999 and from "Do Dionex 2003.	using proced etermination	ures adapted from EPA Method 300.1, "Determination of Inorganic Anions in Environmental Waters Using a H	of Inorganic Anions by Ion Chromatography", Revision lydroxide-Selective Column", Application Note 154 v.19,						
EC-MAN-WR	Water	Conductivity by Meter	APHA 2510 (B)						

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

### **Reference Information**

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#### HARDNESS-CALC-VA Water Hardness

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-DIS-LOW-CVAFS-VA Water Dissolved Mercury in Water by CVAFS(Low)

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 or atomic absorption spectrophotometry (EPA Method 245.7).

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

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 or atomic absorption spectrophotometry (EPA Method 245.7).

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS

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

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

Total Metals in Water by CRC ICPMS

APHA 3030 B&E / EPA SW-846 6020A

EPA SW-846 3005A/6010B

EPA SW-846 3005A/6010B

APHA 4500-H (B)

APHA 3030 B&E / EPA SW-846 6020A

APHA 2340B

FPA 245 7

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 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

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

"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."

\*\* 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:

### **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.

		Bolessed hv: Date (dd-mmm-vy) Time (hh-mm) Received	Also provided on another revenues in and the second s	by the use of this fact the ALS location	By the use of this form the user ackno	The sample labels for Mill Road Seep 02 should read Trench Above Will Ave		Special In	L1307027-COFC					DES-03	Trench Above Mill Road 02	Trench Above Mill Road 01	ITERICIT Guily (Tread Materia to point around		Tailings Sand (Humitdity Cell)	12 L2	(This description will appear on the report	Sample Identification	(iab use only) The area in the second s	s s (ab Work Order # s	Phone: Fax:	Address:	Contact:	Company:	Hardcopy of Invoice with Report?		Phone: 001 - 400 - 2111 1 1 Voc   No	WHITEHUISE, 11, 17117 Eav: 604-291-6163	Multiphone VT V1A iH6	Address: 301 - 4109 4th Avenue	Contact: Nicole Jacques	Company: Summit Environmental Consultants Inc.	Report To		ALS Environmental		► .	
	27-Mul 13 9:10 9,2	f by: Date: Time: Temperatun	SHIPMENT, RECEPTION((ab use only)	n addresses, phone numbers and sample container / p	owledges and agrees with the Terms and Conditions a	bortions of this form may delay analysis. Please fill in	and no please recommize this change in the lab report.		AE-Freshwater Aquatic Life/BC CSR - Comm					23-May-13 - Surface Wat	23-May-13 - Surface Wat	C1-Way-12	Surface Wat	22-May-13 - Surface Wate	22-May-13 - Surface Wate	22-May-13 - Groundwald		(dd-mmm-vy) (hh:mm) Sample Typ		ALS Dean Watt Sampler: NJ	Quote #: Summit Environmental - General Fluce List					Inh #· 2013-2333.300.323	Client / Project Information	Email 3:	Email 2:	Email 1: nri@summit-environmental.com			C) standard [] Other	Report Format / Distribution		Canada Toli Free, 1 ooo ooo oo oo	Chain of Custody / Analytical Kequest Fulli	At the standard of Analytical Reminest Form
GENF 18.01 Front	oC If Yes add SIF	e: Verified by: Date: Iffe: Observativits.	SHIPMENT VERIFICATION (lab use only)	reservation / holding time table for common analyses.	s provided on a separate Excel tab.	n this form LEGIBLY.			ercial/AB Tier 1 - Natural, etc) / Hazardous Details					er X X X 3		× · · · · · · · · · · · · · · · · · · ·	er X X X 3	er X X X J J J J J J J J J J J J J J J J				Meta Meta Gen Nu	als	- Diss - Tota inetic I	Niti		ers			F/P  P  P	Please indicate below Filtered, Preserved or Doth (F, F, F/F)	Analysis Request		Comp Day or Wookend Emergency - Contact ALS to Confirm TAT	O Emergency (1-2 Bus, Days) - 100% Surcharge - Contact ALS to Confirm TAT	O Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT	Regular (Standard Turnaround Times - Business Days)	Service Requested (Rush for routine analysis subject to availability)		Page <u>1</u> of <u>1</u>		COC #

COC #