



ENVIRONMENTAL DYNAMICS INC.  
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Date Received: 14-JAN-16  
Report Date: 22-JAN-16 12:33 (MT)  
Version: FINAL

Client Phone: 867-393-4882

## Certificate of Analysis

Lab Work Order #: L1723426  
Project P.O. #: NOT SUBMITTED  
Job Reference: MOUNT NANSEN 15-Y-0146  
C of C Numbers: 1  
Legal Site Desc:

Can Dang  
Senior Account Manager

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ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID Description Sampled Date Sampled Time Client ID				
		L1723426-1 Water 13-JAN-16 11:15 WQ-PW				
<b>WATER</b>						
<b>Physical Tests</b>	Colour, True (CU)		<5.0			
	Conductivity (uS/cm)		324			
	Hardness (as CaCO3) (mg/L)		193			
	pH (pH)		7.63			
	Total Dissolved Solids (mg/L)		199			
	Turbidity (NTU)		0.16			
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO3) (mg/L)		163			
	Chloride (Cl) (mg/L)		<0.50			
	Fluoride (F) (mg/L)		0.088			
	Nitrate (as N) (mg/L)		0.125			
	Nitrite (as N) (mg/L)		<0.0010			
	Sulfate (SO4) (mg/L)		29.6			
	Anion Sum (meq/L)		3.88			
	Cation Sum (meq/L)		4.10			
	Cation - Anion Balance (%)		2.7			
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)		<0.010			
	Antimony (Sb)-Total (mg/L)		<0.00050			
	Arsenic (As)-Total (mg/L)		0.00048			
	Barium (Ba)-Total (mg/L)		0.083			
	Boron (B)-Total (mg/L)		<0.10			
	Cadmium (Cd)-Total (mg/L)		<0.00020			
	Calcium (Ca)-Total (mg/L)		45.3			
	Chromium (Cr)-Total (mg/L)		<0.0020			
	Copper (Cu)-Total (mg/L)		<0.0010			
	Iron (Fe)-Total (mg/L)		<0.030			
	Lead (Pb)-Total (mg/L)		0.00065			
	Magnesium (Mg)-Total (mg/L)		19.4			
	Manganese (Mn)-Total (mg/L)		<0.0020			
	Mercury (Hg)-Total (mg/L)		<0.00020			
	Potassium (K)-Total (mg/L)		0.86			
	Selenium (Se)-Total (mg/L)		<0.0010			
	Sodium (Na)-Total (mg/L)		5.2			
	Uranium (U)-Total (mg/L)		0.00163			
	Zinc (Zn)-Total (mg/L)		<0.050			

\* 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)-Total	MB-LOR	L1723426-1
Matrix Spike	Manganese (Mn)-Total	MS-B	L1723426-1

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
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**
<b>ALK-COL-VA</b>	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.			
<b>CL-IC-N-WR</b>	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>COLOUR-TRUE-VA</b>	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
This analysis is carried out using procedures adapted from British Columbia Environmental Manual "Colour- Single Wavelength." Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method.			
Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.			
<b>EC-MAN-WR</b>	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.			
<b>F-IC-N-WR</b>	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>HARDNESS-CALC-VA</b>	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
<b>HG-TOT-CVAFS-VA</b>	Water	Total Hg in Water by CVAFS LOR=50ppt	EPA 1631E (mod)
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).			
<b>IONBALANCE-VA</b>	Water	Ion Balance Calculation	APHA 1030E
Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.			
Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:			
Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]			
<b>MET-T-CCMS-VA</b>	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.			
<b>MET-TOT-ICP-VA</b>	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).			
<b>NO2-L-IC-N-WR</b>	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

## Reference Information

**NO3-L-IC-N-WR** Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

**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.

**SO4-IC-N-WR** Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

**TDS-CALC-VA** Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".

**TURBIDITY-VA** Water Turbidity by Meter APHA 2130 "Turbidity"

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

**TURBIDITY-VA** Water Turbidity by Meter APHA 2130 Turbidity

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

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\*\* 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
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

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### Chain of Custody Numbers:

1

### 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.*

