



EDI ENVIRONMENTAL DYNAMICS INC.  
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Date Received: 11-MAY-16  
Report Date: 24-MAY-16 14:27 (MT)  
Version: FINAL

Client Phone: 867-393-4882

## Certificate of Analysis

Lab Work Order #: L1767406  
Project P.O. #: NOT SUBMITTED  
Job Reference: MOUNT NANSEN 16-Y-0089  
C of C Numbers: 1  
Legal Site Desc:

Can Dang  
Senior Account Manager

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## ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID	Description	Sampled Date	Sampled Time	Client ID
		L1767406-1	WATER	11-MAY-16	10:30	WQ-PW
<b>WATER</b>						
<b>Physical Tests</b>	Colour, True (CU)					<5.0
	Conductivity (uS/cm)					386
	Hardness (as CaCO3) (mg/L)					203
	pH (pH)					8.19
	Total Dissolved Solids (mg/L)					212
	Turbidity (NTU)					<0.10
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO3) (mg/L)					171
	Chloride (Cl) (mg/L)					<0.50
	Fluoride (F) (mg/L)					0.104
	Nitrate (as N) (mg/L)					0.115
	Nitrite (as N) (mg/L)					<0.0010
	Sulfate (SO4) (mg/L)					35.3
	Anion Sum (meq/L)					4.16
	Cation Sum (meq/L)					4.30
	Cation - Anion Balance (%)					1.7
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)					<0.010
	Antimony (Sb)-Total (mg/L)					<0.00050
	Arsenic (As)-Total (mg/L)					0.00039
	Barium (Ba)-Total (mg/L)					0.090
	Boron (B)-Total (mg/L)					<0.10
	Cadmium (Cd)-Total (mg/L)					<0.00020
	Calcium (Ca)-Total (mg/L)					47.5
	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)					0.00056
	Magnesium (Mg)-Total (mg/L)					20.5
	Manganese (Mn)-Total (mg/L)					<0.0020
	Mercury (Hg)-Total (mg/L)					<0.00020
	Potassium (K)-Total (mg/L)					0.94
	Selenium (Se)-Total (mg/L)					<0.0010
	Sodium (Na)-Total (mg/L)					5.0
	Uranium (U)-Total (mg/L)					0.00189
	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)
Matrix Spike	Sulfate (SO4)	MS-B	L1767406-1
Matrix Spike	Sulfate (SO4)	MS-B	L1767406-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L1767406-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L1767406-1
Matrix Spike	Selenium (Se)-Total	MS-B	L1767406-1
Matrix Spike	Uranium (U)-Total	MS-B	L1767406-1

### 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**
<b>ALK-TITR-VA</b>	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
<p>This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.</p>			
<b>CL-IC-N-WR</b>	Water	Chloride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
<b>COLOUR-TRUE-VA</b>	Water	Colour (True) by Spectrometer	BCMOE Colour Single Wavelength
<p>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.</p> <p>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.</p>			
<b>EC-PCT-VA</b>	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
<p>This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.</p>			
<b>F-IC-N-WR</b>	Water	Fluoride in Water by IC	EPA 300.1 (mod)
<p>Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</p>			
<b>HARDNESS-CALC-VA</b>	Water	Hardness	APHA 2340B
<p>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.</p>			
<b>HG-TOT-CVAFS-VA</b>	Water	Total Hg in Water by CVAFS LOR=50ppt	EPA 1631E (mod)
<p>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).</p>			
<b>IONBALANCE-VA</b>	Water	Ion Balance Calculation	APHA 1030E
<p>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.</p> <p>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:</p> <p>Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]</p>			
<b>MET-T-CCMS-VA</b>	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
<p>Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.</p> <p>Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.</p>			
<b>MET-TOT-ICP-VA</b>	Water	Total Metals in Water by ICPOES	EPA SW-846 3005A/6010B
<p>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</p>			

## Reference Information

6010B).

**NO2-L-IC-N-WR** 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.

**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-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.

**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:*

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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.*

