



SABINA GOLD & SILVER CORP.
ATTN: Merle Keefe
Suite 1800 - 555 Burrard St.
Box 220
Vancouver BC V7X 1M7

Date Received: 10-MAY-19
Report Date: 16-MAY-19 15:50 (MT)
Version: FINAL

Client Phone: 604-240-6619

Certificate of Analysis

Lab Work Order #: **L2270964**
Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers:
Legal Site Desc:



Oliver Gregg
Account Manager

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ADDRESS: 314 Old Airport Road, Unit 116, Yellowknife, NT X1A 3T3 Canada | Phone: +1 867 873 5593 |
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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2270964-1	L2270964-2		
		Description	SEAWATER	SEAWATER		
		Sampled Date	09-MAY-19	09-MAY-19		
		Sampled Time	13:15	13:00		
		Client ID	DESAL INTAKE	DESAL DISCHARGE		
Grouping	Analyte					
SEAWATER						
Physical Tests	Conductivity (uS/cm)		34300	34500		
	Hardness (as CaCO3) (mg/L)		4220	4510		
	pH (pH)		7.80	7.83		
	Salinity (psu)		21.2	21.4		
	Total Suspended Solids (mg/L)		7.1	<2.0		
	Total Dissolved Solids (mg/L)		25000	25000		
	TDS (Calculated) (mg/L)		21600	20300		
	Turbidity (NTU)		1.50	0.27		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)		93.4	94.1		
	Alkalinity, Carbonate (as CaCO3) (mg/L)		<1.0	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)		<1.0	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)		93.4	94.1		
	Ammonia, Total (as N) (mg/L)		0.0108	0.0065		
	Chloride (Cl) (mg/L)		12100	10600		
	Fluoride (F) (mg/L)		<1.0	<1.0		
	Nitrate and Nitrite (as N) (mg/L)		<0.051	<0.051		
	Nitrate (as N) (mg/L)		<0.050	<0.050		
	Nitrite (as N) (mg/L)		0.011	0.017		
	Phosphorus (P)-Total (mg/L)		0.0252	0.0203		
	Sulfate (SO4) (mg/L)		1660	1430		
	Anion Sum (meq/L)		376	330		
	Cation Sum (meq/L)		372	393		
	Cation - Anion Balance (%)		-0.6	8.7		
Cyanides	Cyanide, Total (mg/L)		0.0035	<0.0030		
	Cyanide, Free (mg/L)		<0.0030	<0.0030		
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)		2.64	2.48		
Total Metals	Arsenic (As)-Total (mg/L)		0.00105	0.00100		
	Cadmium (Cd)-Total (mg/L)		0.000057	0.000051		
	Chromium (Cr)-Total (mg/L)		0.00053	<0.00050		
	Cobalt (Co)-Total (mg/L)		0.000104	0.000071		
	Copper (Cu)-Total (mg/L)		0.00920	0.00125		
	Iron (Fe)-Total (mg/L)		0.068	0.012		
	Lead (Pb)-Total (mg/L)		0.000104	<0.000050		
	Manganese (Mn)-Total (mg/L)		0.00534	0.00392		
	Mercury (Hg)-Total (mg/L)		<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)		0.00710	0.00739		

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID				
	L2270964-1 SEAWATER 09-MAY-19 13:15 DESAL INTAKE	L2270964-2 SEAWATER 09-MAY-19 13:00 DESAL DISCHARGE			
Grouping	Analyte				
SEAWATER					
Total Metals	Nickel (Ni)-Total (mg/L)	0.00134	0.00112		
	Selenium (Se)-Total (mg/L)	<0.00050	<0.00050		
	Uranium (U)-Total (mg/L)	0.00204	0.00197		
	Zinc (Zn)-Total (mg/L)	0.0236	<0.0030		
Dissolved Metals	Dissolved Mercury Filtration Location	LAB	LAB		
	Dissolved Metals Filtration Location	LAB	LAB		
	Arsenic (As)-Dissolved (mg/L)	0.00097	0.00106		
	Cadmium (Cd)-Dissolved (mg/L)	0.000049	0.000055		
	Chromium (Cr)-Dissolved (mg/L)	0.00107	0.00069		
	Cobalt (Co)-Dissolved (mg/L)	0.000075	0.000072		
	Copper (Cu)-Dissolved (mg/L)	0.00477	0.00114		
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010		
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050		
	Manganese (Mn)-Dissolved (mg/L)	0.00393	0.00362		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	0.00731	0.00718		
	Nickel (Ni)-Dissolved (mg/L)	0.00118	0.00111		
	Selenium (Se)-Dissolved (mg/L)	<0.00050	<0.00050		
	Silicon (Si)-Dissolved (mg/L)	<1.0	<1.0		
	Sodium (Na)-Dissolved (mg/L)	6450	6790		
	Uranium (U)-Dissolved (mg/L)	0.00202	0.00197		
	Zinc (Zn)-Dissolved (mg/L)	0.0168	0.0015		

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2270964-1 SEAWATER 09-MAY-19 13:15 DESAL INTAKE	L2270964-2 SEAWATER 09-MAY-19 13:00 DESAL DISCHARGE		
Grouping	Analyte				
WATER					
Cyanides	Cyanide, Weak Acid Diss (mg/L)	<0.0050	<0.0050		
Aggregate Organics	Oil and Grease (mg/L)	<5.0	<5.0		

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Seawater	Alkalinity Spec by Titration (Seawater)	APHA 2320 Alkalinity
		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.	
ANIONS-C-CL-IC-VA	Seawater	Chloride by IC (seawater)	EPA 300.1 (mod)
		This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".	
ANIONS-C-F-IC-VA	Seawater	Fluoride by IC (seawater)	EPA 300.1 (mod)
		This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".	
ANIONS-C-SO4-IC-VA	Seawater	Sulfate by IC (seawater)	EPA 300.1 (mod)
		This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".	
CARBONS-C-DOC-VA	Seawater	DOC by combustion (seawater)	APHA 5310B TOTAL ORGANIC CARBON (TOC)
		This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)". Dissolved carbon (DOC) fractions are determined by filtering the sample through a 0.45 micron membrane filter prior to analysis.	
CN-FREE-L-CFA-VA	Seawater	Free Cyanide (Low) in Seawater by CFA	ASTM 7237
		This analysis is carried out using procedures adapted from ASTM Method 7237 "Free Cyanide with Flow Injection Analysis (FIA) Utilizing Gas Diffusion Separation and Amperometric Detection". Free cyanide is determined by in-line gas diffusion at pH 6 with final determination by colourimetric analysis.	
CN-T-L-CFA-VA	Seawater	Total Cyanide (Low) in Seawater by CFA	ISO 14403:2002
		This analysis is carried out using procedures adapted from ISO Method 14403:2002 "Determination of Total Cyanide using Flow Analysis (FIA and CFA)". Total or strong acid dissociable (SAD) cyanide is determined by in-line UV digestion along with sample distillation and final determination by colourimetric analysis. Method Limitation: This method is susceptible to interference from thiocyanate (SCN). If SCN is present in the sample, there could be a positive interference with this method, but it would be less than 1% and could be as low as zero.	
CN-WAD-CFA-VA	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN CYANIDE
		This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.	
EC-C-PCT-VA	Seawater	Conductivity (Automated) (seawater)	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	Seawater	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-DIS-C-CVAFS-VA	Seawater	Diss. Mercury in Seawater by CVAFS	PUGET SOUND PROTOCOLS, EPA 245.7
		This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater 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-C-CVAFS-VA	Seawater	Total Mercury in Seawater by CVAFS	PUGET SOUND PROTOCOLS, EPA 245.7
		This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater 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).	
IONBALANCE-VA	Seawater	Ion Balance Calculation (seawater)	APHA 1030E
MET-D-F-HMI-CCMS-VA	Seawater	Diss. Metals in Seawater by CRC ICPMS	APHA 3030B/EPA 6020B (mod)
		Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS (HMI Mode).	
MET-T-HB-F-HMI-MS-VA	Seawater	Tot Metals in Seawater by CRC ICPMS (BC)	EPA 200.2/6020B (mod)
		Seawater samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS (HMI Mode). This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.	
NA-D-CCMS-VA	Seawater	Diss. Sodium in Seawater by CRC ICPMS	APHA 3030B/EPA 6020B (mod)
		Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
NH3-F-VA	Seawater	Ammonia in Seawater by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
		This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.	

Reference Information

NO2+NO3-CALC-VA	Seawater	Nitrite & Nitrate in Seawater (Calc)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
NO2-L-IC-N-VA	Seawater	Nitrite in Seawater 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-VA	Seawater	Nitrate in Seawater by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
OGG-SF-VA	Water	Oil & Grease by Gravimetric	BCMOE (2010), EPA1664A
The procedure involves an extraction of the entire water sample with hexane. This extract is then evaporated to dryness, and the residue weighed to determine Oil and Grease.			
P-T-PRES-COL-VA	Seawater	Total P in Seawater by Colour	APHA 4500-P Phosphorus
This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.			
PH-C-PCT-VA	Seawater	pH by Meter (Automated) (seawater)	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.			
SALINITY-CALC-VA	Seawater	Salinity by conductivity meter	APHA 2520B
Salinity is determined by the APHA 2520B Electrical Conductivity Method. Salinity is a unitless parameter that is roughly equivalent to grams per Litre. ALS applies the unit of psu (practical salinity unit) to indicate that salinity values are derived from the Practical Salinity Scale.			
SI-D-CCMS-VA	Seawater	Diss. Silicon in Seawater by CRC ICPMS	APHA 3030B/EPA 6020B (mod)
Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
TDS-CALC-VA	Seawater	TDS (Calculated)	APHA 1030E (20TH EDITION)
This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses". The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.			
TDS-VA	Seawater	Total Dissolved Solids by Gravimetric	APHA 2540 Gravimetric
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.			
TSS-C-VA	Seawater	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 (TSS) is determined by filtering a sample through a glass fibre filter. TSS is determined by drying the filter at 104 degrees celsius.			
TURBIDITY-C-VA	Seawater	Turbidity by Meter in Seawater	APHA 2130 Turbidity
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

** 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

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.



Quality Control Report

Workorder: L2270964

Report Date: 16-MAY-19

Page 1 of 10

Client: SABINA GOLD & SILVER CORP.
 Suite 1800 - 555 Burrard St. Box 220
 Vancouver BC V7X 1M7

Contact: Merle Keefe

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-WAD-CFA-VA		Water						
Batch	R4632787							
WG3048168-2	LCS							
Cyanide, Weak Acid Diss			111.7		%		80-120	13-MAY-19
WG3048168-1	MB							
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	13-MAY-19
OGG-SF-VA		Water						
Batch	R4636586							
WG3050206-2	LCS							
Oil and Grease			98.6		%		70-130	15-MAY-19
WG3050206-1	MB							
Oil and Grease			<5.0		mg/L		5	15-MAY-19
ALK-TITR-VA		Seawater						
Batch	R4634618							
WG3047360-3	CRM	VA-ALK-TITR-CONTROL						
Alkalinity, Total (as CaCO3)			101.0		%		85-115	14-MAY-19
WG3047360-1	MB							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	14-MAY-19
ANIONS-C-CL-IC-VA		Seawater						
Batch	R4634661							
WG3047678-3	DUP	L2270964-2						
Chloride (Cl)		10600	10800		mg/L	1.9	20	13-MAY-19
WG3047678-2	LCS							
Chloride (Cl)			100.2		%		90-110	13-MAY-19
WG3047678-1	MB							
Chloride (Cl)			<50		mg/L		50	13-MAY-19
ANIONS-C-F-IC-VA		Seawater						
Batch	R4634661							
WG3047678-3	DUP	L2270964-2						
Fluoride (F)		<1.0	<1.0	RPD-NA	mg/L	N/A	20	13-MAY-19
WG3047678-2	LCS							
Fluoride (F)			100.4		%		90-110	13-MAY-19
WG3047678-1	MB							
Fluoride (F)			<1.0		mg/L		1	13-MAY-19
ANIONS-C-SO4-IC-VA		Seawater						
Batch	R4634661							
WG3047678-3	DUP	L2270964-2						
Sulfate (SO4)		1430	1470		mg/L	2.3	20	13-MAY-19
WG3047678-2	LCS							

Quality Control Report

Workorder: L2270964

Report Date: 16-MAY-19

Page 2 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-C-SO4-IC-VA Seawater								
Batch	R4634661							
WG3047678-2	LCS							
Sulfate (SO4)			100.8		%		90-110	13-MAY-19
WG3047678-1	MB							
Sulfate (SO4)			<30		mg/L		30	13-MAY-19
CARBONS-C-DOC-VA Seawater								
Batch	R4633893							
WG3047898-3	DUP	L2270964-1						
Dissolved Organic Carbon		2.64	2.48		mg/L	6.2	20	13-MAY-19
WG3047898-2	LCS							
Dissolved Organic Carbon			103.1		%		80-120	13-MAY-19
WG3047898-1	MB							
Dissolved Organic Carbon			<0.50		mg/L		0.5	13-MAY-19
WG3047898-4	MS	L2270964-2						
Dissolved Organic Carbon			105.8		%		70-130	13-MAY-19
CN-FREE-L-CFA-VA Seawater								
Batch	R4632787							
WG3048168-2	LCS							
Cyanide, Free			105.2		%		80-120	13-MAY-19
WG3048168-1	MB							
Cyanide, Free			<0.0030		mg/L		0.003	13-MAY-19
CN-T-L-CFA-VA Seawater								
Batch	R4632787							
WG3048168-2	LCS							
Cyanide, Total			100.8		%		80-120	13-MAY-19
WG3048168-1	MB							
Cyanide, Total			<0.0030		mg/L		0.003	13-MAY-19
EC-C-PCT-VA Seawater								
Batch	R4634618							
WG3047360-4	CRM	VA-EC-PCT-CONTROL						
Conductivity			103.5		%		90-110	14-MAY-19
WG3047360-1	MB							
Conductivity			<2.0		uS/cm		2	14-MAY-19
HG-DIS-C-CVAFS-VA Seawater								
Batch	R4634047							
WG3049085-3	DUP	L2270964-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	14-MAY-19
WG3049085-2	LCS							

Quality Control Report

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Page 3 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-DIS-C-CVAFS-VA		Seawater						
Batch	R4634047							
WG3049085-2	LCS							
Mercury (Hg)-Dissolved			99.6		%		80-120	14-MAY-19
WG3049085-1	MB	LF						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	14-MAY-19
WG3049085-4	MS	L2270964-2						
Mercury (Hg)-Dissolved			94.9		%		70-130	14-MAY-19
HG-TOT-C-CVAFS-VA		Seawater						
Batch	R4634047							
WG3048711-2	LCS							
Mercury (Hg)-Total			101.5		%		80-120	14-MAY-19
WG3048711-1	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	14-MAY-19
MET-D-F-HMI-CCMS-VA		Seawater						
Batch	R4634462							
WG3048552-3	DUP	L2270964-1						
Arsenic (As)-Dissolved		0.00097	0.00100		mg/L	2.7	20	13-MAY-19
Cadmium (Cd)-Dissolved		0.000049	0.000054		mg/L	10	20	13-MAY-19
Chromium (Cr)-Dissolved		0.00107	0.00104		mg/L	2.7	20	13-MAY-19
Cobalt (Co)-Dissolved		0.000075	0.000074		mg/L	0.8	20	13-MAY-19
Copper (Cu)-Dissolved		0.00477	0.00488		mg/L	2.3	20	13-MAY-19
Iron (Fe)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	13-MAY-19
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	13-MAY-19
Manganese (Mn)-Dissolved		0.00393	0.00416		mg/L	5.6	20	13-MAY-19
Molybdenum (Mo)-Dissolved		0.00731	0.00697		mg/L	4.7	20	13-MAY-19
Nickel (Ni)-Dissolved		0.00118	0.00127		mg/L	7.4	20	13-MAY-19
Selenium (Se)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-MAY-19
Uranium (U)-Dissolved		0.00202	0.00195		mg/L	3.3	20	13-MAY-19
Zinc (Zn)-Dissolved		0.0168	0.0177		mg/L	4.9	20	13-MAY-19
WG3048552-2	LCS							
Arsenic (As)-Dissolved			103.6		%		80-120	13-MAY-19
Cadmium (Cd)-Dissolved			98.5		%		80-120	13-MAY-19
Chromium (Cr)-Dissolved			98.5		%		80-120	13-MAY-19
Cobalt (Co)-Dissolved			100.7		%		80-120	13-MAY-19
Copper (Cu)-Dissolved			105.1		%		80-120	13-MAY-19
Iron (Fe)-Dissolved			90.5		%		80-120	13-MAY-19
Lead (Pb)-Dissolved			98.0		%		80-120	13-MAY-19



Quality Control Report

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Page 4 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-F-HMI-CCMS-VA								
	Seawater							
Batch	R4634462							
WG3048552-2	LCS							
Manganese (Mn)-Dissolved			100.1		%		80-120	13-MAY-19
Molybdenum (Mo)-Dissolved			92.2		%		80-120	13-MAY-19
Nickel (Ni)-Dissolved			103.7		%		80-120	13-MAY-19
Selenium (Se)-Dissolved			108.2		%		80-120	13-MAY-19
Uranium (U)-Dissolved			94.9		%		80-120	13-MAY-19
Zinc (Zn)-Dissolved			107.1		%		80-120	13-MAY-19
WG3048552-1	MB	NP						
Arsenic (As)-Dissolved			<0.00040		mg/L		0.0004	13-MAY-19
Cadmium (Cd)-Dissolved			<0.000010		mg/L		0.00001	13-MAY-19
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	13-MAY-19
Cobalt (Co)-Dissolved			<0.000050		mg/L		0.00005	13-MAY-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	13-MAY-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	13-MAY-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	13-MAY-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	13-MAY-19
Molybdenum (Mo)-Dissolved			<0.00010		mg/L		0.0001	13-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	13-MAY-19
Selenium (Se)-Dissolved			<0.00050		mg/L		0.0005	13-MAY-19
Uranium (U)-Dissolved			<0.000050		mg/L		0.00005	13-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	13-MAY-19
WG3048552-4	MS	L2270964-2						
Arsenic (As)-Dissolved			96.8		%		70-130	13-MAY-19
Cadmium (Cd)-Dissolved			86.0		%		70-130	13-MAY-19
Chromium (Cr)-Dissolved			105.9		%		70-130	13-MAY-19
Cobalt (Co)-Dissolved			98.0		%		70-130	13-MAY-19
Copper (Cu)-Dissolved			91.4		%		70-130	13-MAY-19
Iron (Fe)-Dissolved			101.4		%		70-130	13-MAY-19
Lead (Pb)-Dissolved			84.5		%		70-130	13-MAY-19
Manganese (Mn)-Dissolved			105.2		%		70-130	13-MAY-19
Molybdenum (Mo)-Dissolved			102.1		%		70-130	13-MAY-19
Nickel (Ni)-Dissolved			94.4		%		70-130	13-MAY-19
Selenium (Se)-Dissolved			91.9		%		70-130	13-MAY-19
Uranium (U)-Dissolved			88.6		%		70-130	13-MAY-19
Zinc (Zn)-Dissolved			88.9		%		70-130	13-MAY-19
MET-T-HB-F-HMI-MS-VA								
	Seawater							

Quality Control Report

Workorder: L2270964

Report Date: 16-MAY-19

Page 5 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-HB-F-HMI-MS-VA		Seawater						
Batch	R4634462							
WG3048357-3	DUP	L2270964-1						
Arsenic (As)-Total		0.00105	0.00108		mg/L	2.4	20	13-MAY-19
Cadmium (Cd)-Total		0.000057	0.000059		mg/L	3.7	20	13-MAY-19
Chromium (Cr)-Total		0.00053	0.00050		mg/L	4.7	20	13-MAY-19
Cobalt (Co)-Total		0.000104	0.000102		mg/L	2.0	20	13-MAY-19
Copper (Cu)-Total		0.00920	0.00960		mg/L	4.3	20	13-MAY-19
Iron (Fe)-Total		0.068	0.072		mg/L	5.4	20	13-MAY-19
Lead (Pb)-Total		0.000104	0.000109		mg/L	4.5	20	13-MAY-19
Manganese (Mn)-Total		0.00534	0.00569		mg/L	6.4	20	13-MAY-19
Molybdenum (Mo)-Total		0.00710	0.00715		mg/L	0.7	20	13-MAY-19
Nickel (Ni)-Total		0.00134	0.00131		mg/L	2.1	20	13-MAY-19
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	13-MAY-19
Uranium (U)-Total		0.00204	0.00205		mg/L	0.5	20	13-MAY-19
Zinc (Zn)-Total		0.0236	0.0251		mg/L	6.3	20	13-MAY-19
WG3048357-2	LCS							
Arsenic (As)-Total			105.5		%		80-120	13-MAY-19
Cadmium (Cd)-Total			107.9		%		80-120	13-MAY-19
Chromium (Cr)-Total			100.6		%		80-120	13-MAY-19
Cobalt (Co)-Total			102.3		%		80-120	13-MAY-19
Copper (Cu)-Total			105.8		%		80-120	13-MAY-19
Iron (Fe)-Total			95.0		%		80-120	13-MAY-19
Lead (Pb)-Total			100.8		%		80-120	13-MAY-19
Manganese (Mn)-Total			101.5		%		80-120	13-MAY-19
Molybdenum (Mo)-Total			94.9		%		80-120	13-MAY-19
Nickel (Ni)-Total			103.9		%		80-120	13-MAY-19
Selenium (Se)-Total			111.8		%		80-120	13-MAY-19
Uranium (U)-Total			97.6		%		80-120	13-MAY-19
Zinc (Zn)-Total			112.1		%		80-120	13-MAY-19
WG3048357-1	MB							
Arsenic (As)-Total			<0.00040		mg/L		0.0004	13-MAY-19
Cadmium (Cd)-Total			<0.000010		mg/L		0.00001	13-MAY-19
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	13-MAY-19
Cobalt (Co)-Total			<0.000050		mg/L		0.00005	13-MAY-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	13-MAY-19
Iron (Fe)-Total			<0.010		mg/L		0.01	13-MAY-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	13-MAY-19

Quality Control Report

Workorder: L2270964

Report Date: 16-MAY-19

Page 6 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-HB-F-HMI-MS-VA								
	Seawater							
Batch	R4634462							
WG3048357-1	MB							
Manganese (Mn)-Total			<0.00020		mg/L		0.0002	13-MAY-19
Molybdenum (Mo)-Total			<0.00010		mg/L		0.0001	13-MAY-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	13-MAY-19
Selenium (Se)-Total			<0.00050		mg/L		0.0005	13-MAY-19
Uranium (U)-Total			<0.000050		mg/L		0.00005	13-MAY-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-MAY-19
WG3048357-4	MS	L2270964-2						
Arsenic (As)-Total			97.6		%		70-130	13-MAY-19
Cadmium (Cd)-Total			89.1		%		70-130	13-MAY-19
Chromium (Cr)-Total			107.5		%		70-130	13-MAY-19
Cobalt (Co)-Total			98.4		%		70-130	13-MAY-19
Copper (Cu)-Total			91.5		%		70-130	13-MAY-19
Iron (Fe)-Total			95.5		%		70-130	13-MAY-19
Lead (Pb)-Total			81.0		%		70-130	13-MAY-19
Manganese (Mn)-Total			107.2		%		70-130	13-MAY-19
Molybdenum (Mo)-Total			96.6		%		70-130	13-MAY-19
Nickel (Ni)-Total			94.4		%		70-130	13-MAY-19
Selenium (Se)-Total			93.2		%		70-130	13-MAY-19
Uranium (U)-Total			85.4		%		70-130	13-MAY-19
Zinc (Zn)-Total			91.0		%		70-130	13-MAY-19
NA-D-CCMS-VA								
	Seawater							
Batch	R4635420							
WG3050586-2	LCS							
Sodium (Na)-Dissolved			92.3		%		80-120	15-MAY-19
WG3050586-1	MB	LF						
Sodium (Na)-Dissolved			<2.5		mg/L		2.5	15-MAY-19
NH3-F-VA								
	Seawater							
Batch	R4634725							
WG3047935-3	DUP	L2270964-1						
Ammonia, Total (as N)		0.0108	0.0109		mg/L	1.7	20	14-MAY-19
WG3047935-2	LCS							
Ammonia, Total (as N)			102.3		%		85-115	14-MAY-19
WG3047935-1	MB							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	14-MAY-19
WG3047935-4	MS	L2270964-2						

Quality Control Report

Workorder: L2270964

Report Date: 16-MAY-19

Page 7 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-F-VA								
Seawater								
Batch	R4634725							
WG3047935-4	MS	L2270964-2						
Ammonia, Total (as N)			93.6		%		75-125	14-MAY-19
NO2-L-IC-N-VA								
Seawater								
Batch	R4634661							
WG3047678-3	DUP	L2270964-2						
Nitrite (as N)		0.017	<0.010	RPD-NA	mg/L	N/A	20	13-MAY-19
WG3047678-2	LCS							
Nitrite (as N)			99.2		%		90-110	13-MAY-19
WG3047678-1	MB							
Nitrite (as N)			<0.010		mg/L		0.01	13-MAY-19
NO3-L-IC-N-VA								
Seawater								
Batch	R4634661							
WG3047678-3	DUP	L2270964-2						
Nitrate (as N)		<0.050	<0.050	RPD-NA	mg/L	N/A	20	13-MAY-19
WG3047678-2	LCS							
Nitrate (as N)			101.6		%		90-110	13-MAY-19
WG3047678-1	MB							
Nitrate (as N)			<0.050		mg/L		0.05	13-MAY-19
P-T-PRES-COL-VA								
Seawater								
Batch	R4634550							
WG3047888-2	CRM	VA-ERA-PO4						
Phosphorus (P)-Total			105.7		%		80-120	14-MAY-19
WG3047888-3	DUP	L2270964-1						
Phosphorus (P)-Total		0.0252	0.0229		mg/L	9.5	20	14-MAY-19
WG3047888-1	MB							
Phosphorus (P)-Total			<0.0040		mg/L		0.004	14-MAY-19
PH-C-PCT-VA								
Seawater								
Batch	R4636161							
WG3050406-2	CRM	VA-PH7-BUF						
pH			6.98		pH		6.9-7.1	15-MAY-19
WG3050406-5	DUP	L2270964-1						
pH		7.80	7.82	J	pH	0.02	0.3	15-MAY-19
SI-D-CCMS-VA								
Seawater								



Quality Control Report

Workorder: L2270964

Report Date: 16-MAY-19

Page 8 of 10

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SI-D-CCMS-VA		Seawater						
Batch	R4635420							
WG3050586-2	LCS							
Silicon (Si)-Dissolved			95.4		%		80-120	15-MAY-19
Batch	R4636318							
WG3050586-1	MB	LF						
Silicon (Si)-Dissolved			<1.0		mg/L		1	15-MAY-19
TDS-VA		Seawater						
Batch	R4634514							
WG3048020-3	DUP	L2270964-1						
Total Dissolved Solids		25000	25100		mg/L	0.0	20	13-MAY-19
WG3048020-2	LCS							
Total Dissolved Solids			100.5		%		85-115	13-MAY-19
WG3048020-1	MB							
Total Dissolved Solids			<10		mg/L		10	13-MAY-19
TSS-C-VA		Seawater						
Batch	R4634394							
WG3048024-2	LCS							
Total Suspended Solids			100.7		%		85-115	13-MAY-19
WG3048024-1	MB							
Total Suspended Solids			<2.0		mg/L		2	13-MAY-19
TURBIDITY-C-VA		Seawater						
Batch	R4632276							
WG3047566-2	CRM	VA-FORM-40						
Turbidity			107.3		%		85-115	12-MAY-19
WG3047566-3	DUP	L2270964-1						
Turbidity		1.50	1.45		NTU	3.4	15	12-MAY-19
WG3047566-1	MB							
Turbidity			<0.10		NTU		0.1	12-MAY-19

Quality Control Report

Workorder: L2270964

Report Date: 16-MAY-19

Page 9 of 10

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Workorder: L2270964

Report Date: 16-MAY-19

Page 10 of 10

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter (Automated) (seawater)							
	1	09-MAY-19 13:15	15-MAY-19 09:26	0.25	140	hours	EHTR-FM
	2	09-MAY-19 13:00	15-MAY-19 09:26	0.25	140	hours	EHTR-FM
Anions and Nutrients							
Nitrate in Seawater by IC (Low Level)							
	1	09-MAY-19 13:15	13-MAY-19 10:49	3	4	days	EHT
	2	09-MAY-19 13:00	13-MAY-19 10:49	3	4	days	EHT
Nitrite in Seawater by IC (Low Level)							
	1	09-MAY-19 13:15	13-MAY-19 10:49	3	4	days	EHT
	2	09-MAY-19 13:00	13-MAY-19 10:49	3	4	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.

Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2270964 were received on 10-MAY-19 09:40.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

