



HEMMERA ENVIROCHEM INC.  
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Date Received: 30-MAY-16  
Report Date: 12-JUL-16 12:13 (MT)  
Version: FINAL REV. 2

Client Phone: 867-456-4865

## Certificate of Analysis

Lab Work Order #: L1775300  
Project P.O. #: NOT SUBMITTED  
Job Reference: 1343-005.27  
C of C Numbers: 1  
Legal Site Desc:

Comments:

12-JUL-2016 This report replaces the previous version and contains an updated Sampling Date.

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Brent Mack, B.Sc.  
Account Manager

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## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1775300-1 Water 27-MAY-16 12:20 GSI-PC-03B	L1775300-2 Water 26-MAY-16 12:45 MP09-14	L1775300-3 Water 27-MAY-16 11:50 MP09-08	L1775300-4 Water 25-MAY-16 14:10 GSI-HA-04A	L1775300-5 Water 27-MAY-16 08:10 GSI-HA-04A	
Grouping	Analyte					
<b>WATER</b>						
<b>Physical Tests</b>	Conductivity (uS/cm)	3920		726	347	
	Hardness (as CaCO3) (mg/L)	2790	144	413	262	
	pH (pH)	8.12		7.53	7.59	
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO3) (mg/L)	900		225	136	
	Ammonia, Total (as N) (mg/L)			0.0318		
	Chloride (Cl) (mg/L)	<10 <sup>DLDS</sup>		<0.50	<0.50	
	Fluoride (F) (mg/L)	<0.40 <sup>DLDS</sup>		0.077	0.097	
	Nitrate (as N) (mg/L)	<0.10 <sup>DLDS</sup>		<0.0050	0.0059	
	Nitrite (as N) (mg/L)	<0.020 <sup>DLDS</sup>		<0.0010	<0.0010	
	Total Kjeldahl Nitrogen (mg/L)			0.233		
	Sulfate (SO4) (mg/L)	2030		172	68.3	
	Anion Sum (meq/L)	60.3		8.08		
	Cation Sum (meq/L)	62.0		8.65		
	Cation - Anion Balance (%)	1.3		3.4		
	<b>Cyanides</b>	Cyanide, Weak Acid Diss (mg/L)	<0.0050		<0.0050	<0.0050
		Cyanide, Total (mg/L)	<0.0050		<0.0050	<0.0050
Thiocyanate (SCN) (mg/L)				<0.50		
Cyanide, Free (mg/L)		<0.0050		<0.0050	<0.0050	
<b>Organic / Inorganic Carbon</b>	Total Inorganic Carbon (mg/L)			60.4		
	Total Organic Carbon (mg/L)			5.99		
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1775300-6 Water 27-MAY-16 16:10 GSI-HA-04A	L1775300-7 Water 27-MAY-16 10:10 MW09-22	L1775300-8 Water 27-MAY-16 16:25 MW09-22	L1775300-9 Water 27-MAY-16 12:50 DUP-3	L1775300-10 Water 27-MAY-16 10:10 FB-4
Grouping	Analyte					
<b>WATER</b>						
<b>Physical Tests</b>	Conductivity (uS/cm)			937	728	<2.0
	Hardness (as CaCO3) (mg/L)		471		414	<0.50
	pH (pH)			7.03	7.45	5.41
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO3) (mg/L)			165	225	<1.0
	Ammonia, Total (as N) (mg/L)	0.0641	0.702		0.0345	<0.0050
	Chloride (Cl) (mg/L)			<1.0 <sup>DLDS</sup>	0.75	<0.50
	Fluoride (F) (mg/L)			0.046	0.088	<0.020
	Nitrate (as N) (mg/L)			0.330	<0.0050	<0.0050
	Nitrite (as N) (mg/L)			0.0188	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	1.38	2.45		0.265	<0.050
	Sulfate (SO4) (mg/L)			343	172	<0.30
	Anion Sum (meq/L)				8.10	<0.10
	Cation Sum (meq/L)				8.66	<0.10
	Cation - Anion Balance (%)				3.3	0.0
<b>Cyanides</b>	Cyanide, Weak Acid Diss (mg/L)		<0.0050		<0.0050	<0.0050
	Cyanide, Total (mg/L)		0.0177		<0.0050	<0.0050
	Thiocyanate (SCN) (mg/L)	<0.50	<0.50		<0.50	<0.50
	Cyanide, Free (mg/L)		<0.0050		<0.0050	<0.0050
<b>Organic / Inorganic Carbon</b>	Total Inorganic Carbon (mg/L)	30.8		59.2	61.3	<0.50
	Total Organic Carbon (mg/L)	18.0	18.5		6.18	<0.50
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)					
	Antimony (Sb)-Total (mg/L)					
	Arsenic (As)-Total (mg/L)					
	Barium (Ba)-Total (mg/L)					
	Beryllium (Be)-Total (mg/L)					
	Bismuth (Bi)-Total (mg/L)					
	Boron (B)-Total (mg/L)					
	Cadmium (Cd)-Total (mg/L)					
	Calcium (Ca)-Total (mg/L)					
	Chromium (Cr)-Total (mg/L)					
	Cobalt (Co)-Total (mg/L)					
	Copper (Cu)-Total (mg/L)					
	Iron (Fe)-Total (mg/L)					
	Lead (Pb)-Total (mg/L)					
	Lithium (Li)-Total (mg/L)					
	Magnesium (Mg)-Total (mg/L)					

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L1775300-11			
		Water			
		27-MAY-16			
		TRAVEL BLANK			
Grouping	Analyte				
<b>WATER</b>					
<b>Physical Tests</b>	Conductivity (uS/cm)	<2.0			
	Hardness (as CaCO3) (mg/L)	<0.50			
	pH (pH)	5.47			
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO3) (mg/L)	<1.0			
	Ammonia, Total (as N) (mg/L)	<0.0050			
	Chloride (Cl) (mg/L)	<0.50			
	Fluoride (F) (mg/L)	<0.020			
	Nitrate (as N) (mg/L)	<0.0050			
	Nitrite (as N) (mg/L)	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	0.059			
	Sulfate (SO4) (mg/L)	<0.30			
	Anion Sum (meq/L)	<0.10			
	Cation Sum (meq/L)	<0.10			
	Cation - Anion Balance (%)	0.0			
	<b>Cyanides</b>	Cyanide, Weak Acid Diss (mg/L)	<0.0050		
Cyanide, Total (mg/L)		<0.0050			
Thiocyanate (SCN) (mg/L)		<0.50			
Cyanide, Free (mg/L)		<0.0050			
<b>Organic / Inorganic Carbon</b>	Total Inorganic Carbon (mg/L)	<0.50			
	Total Organic Carbon (mg/L)	<0.50			
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	<0.0030			
	Antimony (Sb)-Total (mg/L)	<0.00010			
	Arsenic (As)-Total (mg/L)	<0.00010			
	Barium (Ba)-Total (mg/L)	<0.000050			
	Beryllium (Be)-Total (mg/L)	<0.000020			
	Bismuth (Bi)-Total (mg/L)	<0.000050			
	Boron (B)-Total (mg/L)	<0.010			
	Cadmium (Cd)-Total (mg/L)	<0.0000050			
	Calcium (Ca)-Total (mg/L)	<0.050			
	Chromium (Cr)-Total (mg/L)	<0.00010			
	Cobalt (Co)-Total (mg/L)	<0.00010			
	Copper (Cu)-Total (mg/L)	<0.00050			
	Iron (Fe)-Total (mg/L)	<0.010			
	Lead (Pb)-Total (mg/L)	<0.000050			
	Lithium (Li)-Total (mg/L)	<0.0010			
	Magnesium (Mg)-Total (mg/L)	<0.10			

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# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1775300-1 Water 27-MAY-16 12:20 GSI-PC-03B	L1775300-2 Water 26-MAY-16 12:45 MP09-14	L1775300-3 Water 27-MAY-16 11:50 MP09-08	L1775300-4 Water 25-MAY-16 14:10 GSI-HA-04A	L1775300-5 Water 27-MAY-16 08:10 GSI-HA-04A
Grouping	Analyte					
<b>WATER</b>						
<b>Total Metals</b>	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					
	Phosphorus (P)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silicon (Si)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Strontium (Sr)-Total (mg/L)					
	Sulfur (S)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
	Zirconium (Zr)-Total (mg/L)					
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location	FIELD		FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0315	0.0021	0.0046	0.0232	
	Antimony (Sb)-Dissolved (mg/L)	0.00296	0.00481	<0.00010	0.00090	
	Arsenic (As)-Dissolved (mg/L)	0.0874	0.809	0.0148	0.0249	
	Barium (Ba)-Dissolved (mg/L)	0.126	0.0237	0.0446	0.0531	
	Beryllium (Be)-Dissolved (mg/L)	<0.000040 <sup>DLA</sup>	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.00010 <sup>DLA</sup>	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	0.036	0.020	<0.010	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)	0.000135	0.0000467	<0.0000050	0.0000330	
	Calcium (Ca)-Dissolved (mg/L)	125	44.7	114	67.0	
	Chromium (Cr)-Dissolved (mg/L)	0.0290	0.00015	<0.00010	0.00114	
	Cobalt (Co)-Dissolved (mg/L)	0.00579	0.00040	0.00065	0.00025	
	Copper (Cu)-Dissolved (mg/L)	0.00541	0.00043	<0.00020	0.00164	
	Iron (Fe)-Dissolved (mg/L)	7.28	0.600	1.11	1.80	
	Lead (Pb)-Dissolved (mg/L)	0.00080	0.000650	<0.000050	0.000315	
	Lithium (Li)-Dissolved (mg/L)	0.0469	0.0022	0.0036	0.0020	
	Magnesium (Mg)-Dissolved (mg/L)	603	7.83	30.9	23.1	

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# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1775300-6 Water 27-MAY-16 16:10 GSI-HA-04A	L1775300-7 Water 27-MAY-16 10:10 MW09-22	L1775300-8 Water 27-MAY-16 16:25 MW09-22	L1775300-9 Water 27-MAY-16 12:50 DUP-3	L1775300-10 Water 27-MAY-16 10:10 FB-4
Grouping	Analyte					
<b>WATER</b>						
<b>Total Metals</b>	Manganese (Mn)-Total (mg/L)					
	Mercury (Hg)-Total (mg/L)					
	Molybdenum (Mo)-Total (mg/L)					
	Nickel (Ni)-Total (mg/L)					
	Phosphorus (P)-Total (mg/L)					
	Potassium (K)-Total (mg/L)					
	Selenium (Se)-Total (mg/L)					
	Silicon (Si)-Total (mg/L)					
	Silver (Ag)-Total (mg/L)					
	Sodium (Na)-Total (mg/L)					
	Strontium (Sr)-Total (mg/L)					
	Sulfur (S)-Total (mg/L)					
	Thallium (Tl)-Total (mg/L)					
	Tin (Sn)-Total (mg/L)					
	Titanium (Ti)-Total (mg/L)					
	Uranium (U)-Total (mg/L)					
	Vanadium (V)-Total (mg/L)					
	Zinc (Zn)-Total (mg/L)					
	Zirconium (Zr)-Total (mg/L)					
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location		FIELD		FIELD	FIELD
	Dissolved Metals Filtration Location		FIELD		FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)		0.0275		0.0051	<0.0010
	Antimony (Sb)-Dissolved (mg/L)		0.00031		<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)		0.00206		0.0152	<0.00010
	Barium (Ba)-Dissolved (mg/L)		0.0829		0.0434	<0.000050
	Beryllium (Be)-Dissolved (mg/L)		<0.000020		<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050		<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)		0.029		<0.010	<0.010
	Cadmium (Cd)-Dissolved (mg/L)		0.0000550		<0.0000050	<0.0000050
	Calcium (Ca)-Dissolved (mg/L)		167		115	<0.050
	Chromium (Cr)-Dissolved (mg/L)		0.00047		<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)		0.00884		0.00066	<0.00010
	Copper (Cu)-Dissolved (mg/L)		0.00348		<0.00020	<0.00020
	Iron (Fe)-Dissolved (mg/L)		0.936		1.11	<0.010
	Lead (Pb)-Dissolved (mg/L)		0.000081		<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)		<0.0010		0.0034	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)		13.0		30.9	<0.10

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# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L1775300-11 Water 27-MAY-16  TRAVEL BLANK			
Grouping	Analyte				
<b>WATER</b>					
<b>Total Metals</b>	Manganese (Mn)-Total (mg/L)	<0.00010			
	Mercury (Hg)-Total (mg/L)	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	<0.000050			
	Nickel (Ni)-Total (mg/L)	<0.00050			
	Phosphorus (P)-Total (mg/L)	<0.050			
	Potassium (K)-Total (mg/L)	<0.10			
	Selenium (Se)-Total (mg/L)	<0.000050			
	Silicon (Si)-Total (mg/L)	<0.050			
	Silver (Ag)-Total (mg/L)	<0.000010			
	Sodium (Na)-Total (mg/L)	<0.050			
	Strontium (Sr)-Total (mg/L)	<0.00020			
	Sulfur (S)-Total (mg/L)	<0.50			
	Thallium (Tl)-Total (mg/L)	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030			
	Uranium (U)-Total (mg/L)	<0.000010			
	Vanadium (V)-Total (mg/L)	<0.00050			
	Zinc (Zn)-Total (mg/L)	<0.0030			
	Zirconium (Zr)-Total (mg/L)	<0.00030			
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location				
	Dissolved Metals Filtration Location				
	Aluminum (Al)-Dissolved (mg/L)				
	Antimony (Sb)-Dissolved (mg/L)				
	Arsenic (As)-Dissolved (mg/L)				
	Barium (Ba)-Dissolved (mg/L)				
	Beryllium (Be)-Dissolved (mg/L)				
	Bismuth (Bi)-Dissolved (mg/L)				
	Boron (B)-Dissolved (mg/L)				
	Cadmium (Cd)-Dissolved (mg/L)				
	Calcium (Ca)-Dissolved (mg/L)				
	Chromium (Cr)-Dissolved (mg/L)				
	Cobalt (Co)-Dissolved (mg/L)				
	Copper (Cu)-Dissolved (mg/L)				
	Iron (Fe)-Dissolved (mg/L)				
	Lead (Pb)-Dissolved (mg/L)				
	Lithium (Li)-Dissolved (mg/L)				
	Magnesium (Mg)-Dissolved (mg/L)				

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	Description	Sampled Date	Sampled Time	Client ID	L1775300-1	L1775300-2	L1775300-3	L1775300-4	L1775300-5
					Water	Water	Water	Water	Water
		27-MAY-16	12:20	GSI-PC-03B	27-MAY-16	26-MAY-16	27-MAY-16	25-MAY-16	27-MAY-16
					12:20	12:45	11:50	14:10	08:10
					GSI-PC-03B	MP09-14	MP09-08	GSI-HA-04A	GSI-HA-04A
Grouping	Analyte								
<b>WATER</b>									
<b>Dissolved Metals</b>	Manganese (Mn)-Dissolved (mg/L)	2.10	0.115	0.804	1.24				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050		<0.0000050	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.0153	0.000727	0.000406	0.000770				
	Nickel (Ni)-Dissolved (mg/L)	0.0743	0.00523	<0.00050	0.00172				
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050				
	Potassium (K)-Dissolved (mg/L)	24.6	9.49	1.12	2.24				
	Selenium (Se)-Dissolved (mg/L)	0.00039	<0.000050	0.000100	0.000061				
	Silicon (Si)-Dissolved (mg/L)	8.84	0.932	7.39	4.66				
	Silver (Ag)-Dissolved (mg/L)	<0.000020 <sup>DLA</sup>	<0.000010	<0.000010	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	117	4.80	6.32	2.79				
	Strontium (Sr)-Dissolved (mg/L)	2.18	0.158	1.15	0.165				
	Sulfur (S)-Dissolved (mg/L)	629	31.4	59.6	38.9				
	Thallium (Tl)-Dissolved (mg/L)	<0.000020 <sup>DLA</sup>	<0.000010	<0.000010	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	0.00025	<0.00010	<0.00010	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	0.00336	<0.00030	<0.00030	0.00095				
	Uranium (U)-Dissolved (mg/L)	0.0239	0.000129	0.00246	0.000367				
	Vanadium (V)-Dissolved (mg/L)	0.0033	<0.00050	<0.00050	0.00084				
	Zinc (Zn)-Dissolved (mg/L)	0.0376	0.0059	0.0026	0.0037				
	Zirconium (Zr)-Dissolved (mg/L)	0.00114	<0.00030	<0.00030	<0.00030				

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## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1775300-6	L1775300-7	L1775300-8	L1775300-9	L1775300-10
		Description	Water	Water	Water	Water	Water
		Sampled Date	27-MAY-16	27-MAY-16	27-MAY-16	27-MAY-16	27-MAY-16
		Sampled Time	16:10	10:10	16:25	12:50	10:10
		Client ID	GSI-HA-04A	MW09-22	MW09-22	DUP-3	FB-4
Grouping	Analyte						
<b>WATER</b>							
<b>Dissolved Metals</b>	Manganese (Mn)-Dissolved (mg/L)			3.49		0.810	<0.00010
	Mercury (Hg)-Dissolved (mg/L)			<0.0000050		<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)			0.000195		0.000382	<0.000050
	Nickel (Ni)-Dissolved (mg/L)			0.00127		<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)			<0.050		<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)			3.01		1.14	<0.10
	Selenium (Se)-Dissolved (mg/L)			0.000148		0.000084	<0.000050
	Silicon (Si)-Dissolved (mg/L)			4.35		7.40	<0.050
	Silver (Ag)-Dissolved (mg/L)			0.000019		<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)			22.5		6.31	<0.050
	Strontium (Sr)-Dissolved (mg/L)			0.448		1.12	<0.00020
	Sulfur (S)-Dissolved (mg/L)			108		59.7	<0.50
	Thallium (Tl)-Dissolved (mg/L)			<0.000010		<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)			<0.00010		<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)			0.00069		<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)			0.000684		0.00241	<0.000010
	Vanadium (V)-Dissolved (mg/L)			0.00053		<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)			0.0020		<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)			0.00031		<0.00030	<0.00030

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>				
	L1775300-11 Water 27-MAY-16 TRAVEL BLANK				
Grouping	Analyte				
<b>WATER</b>					
<b>Dissolved Metals</b>	Manganese (Mn)-Dissolved (mg/L) Mercury (Hg)-Dissolved (mg/L) Molybdenum (Mo)-Dissolved (mg/L) Nickel (Ni)-Dissolved (mg/L) Phosphorus (P)-Dissolved (mg/L) Potassium (K)-Dissolved (mg/L) Selenium (Se)-Dissolved (mg/L) Silicon (Si)-Dissolved (mg/L) Silver (Ag)-Dissolved (mg/L) Sodium (Na)-Dissolved (mg/L) Strontium (Sr)-Dissolved (mg/L) Sulfur (S)-Dissolved (mg/L) Thallium (Tl)-Dissolved (mg/L) Tin (Sn)-Dissolved (mg/L) Titanium (Ti)-Dissolved (mg/L) Uranium (U)-Dissolved (mg/L) Vanadium (V)-Dissolved (mg/L) Zinc (Zn)-Dissolved (mg/L) Zirconium (Zr)-Dissolved (mg/L)				

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

## Reference Information

## QC Samples with Qualifiers &amp; Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Alkalinity, Total (as CaCO <sub>3</sub> )	B	L1775300-1, -10, -11, -3, -5, -8, -9
Method Blank	Alkalinity, Total (as CaCO <sub>3</sub> )	B	L1775300-1, -10, -11, -3, -5, -8, -9
Method Blank	Chromium (Cr)-Total	MB-LOR	L1775300-11
Matrix Spike	Total Inorganic Carbon	MS-B	L1775300-3, -6, -8, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Total Inorganic Carbon	MS-B	L1775300-10, -11
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1775300-1, -10, -2, -3, -4, -7, -9

## Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
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-TITR-VA</b>	Water	Alkalinity Species by Titration	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.			
<b>BE-D-L-CCMS-VA</b>	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
<b>BE-T-L-CCMS-VA</b>	Water	Total Be (Low) 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>CARBONS-TIC-VA</b>	Water	Total inorganic carbon by CO <sub>2</sub> purge	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
<b>CARBONS-TOC-VA</b>	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
<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.			

## Reference Information

<b>CN-FREE-CFA-VA</b>	Water	Free Cyanide in water 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.			
<b>CN-SCN-VA</b>	Water	Thiocyanate by Colour	APHA 4500-CN CYANIDE
This analysis is carried out using procedures adapted from APHA Method 4500-CN- M "Thiocyanate" Thiocyanate is determined by the ferric nitrate colourimetric method.			
<b>CN-T-CFA-VA</b>	Water	Total Cyanide in water 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.			
<b>CN-WAD-CFA-VA</b>	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.			
<b>EC-PCT-VA</b>	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.			
<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-D-CVAA-VA</b>	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
<b>HG-T-CVAA-VA</b>	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
<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-D-CCMS-VA</b>	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
<b>MET-DIS-LOW-ICP-VA</b>	Water	Dissolved Metals in Water by ICPOES	EPA 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).			
<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-LOW-ICP-VA</b>	Water	Total Metals in Water by ICPOES	EPA 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>NH3-F-VA</b>	Water	Ammonia in Water by Fluorescence	APHA 4500 NH3-NITROGEN (AMMONIA)

## Reference Information

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.

**NH3-F-VA**                      Water              Ammonia in Water 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.

**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.

**S-DIS-ICP-VA**                      Water              Dissolved Sulfur 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, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.

**S-TOT-ICP-VA**                      Water              Total Sulfur 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, or filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

Method Limitation: This method will not give total sulfur results for all samples. Sulfide or other volatile forms of sulfur that may be present in submitted samples, is often lost during the sampling, preservation and analysis process. The data reported as total and/or dissolved sulfur represents all non-volatile forms of sulfur present in a particular sample.

**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.

**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.

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

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**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.*



L1775300-COFC

<b>Report To</b>		<b>Report Form:</b>		below (Rush Turnaround Time (TAT) is not available for all tests)																							
Company: Hemmera Environchem Inc.		Select Report Format: <input checked="" type="checkbox"/> PDF <input type="checkbox"/> ORIGINAL		R <input checked="" type="checkbox"/> Regular (Standard TAT if received by 3 pm - business days)																							
Contact: Natasha Sandys		Quality Control (QC) Report with Report <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		P <input type="checkbox"/> Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT																							
Address: 230 - 2237 2nd Avenue Whitehorse, YT		<input type="checkbox"/> Criteria on Report - provide details below if box checked		E <input type="checkbox"/> Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT																							
Phone: 867-456-4865		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		E2 <input type="checkbox"/> Same day or weekend emergency - contact ALS to confirm TAT and surcharge																							
Email 1 or Fax nsandys@hemmera.com		Email 1 or Fax nsandys@hemmera.com		Specify Date Required for E2,E or P:																							
Email 2 chris@elr.ca		Email 2 chris@elr.ca		<b>Analysis Request</b>																							
<b>Invoice To</b> Same as Report To <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<b>Invoice Distribution</b>		Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																							
Copy of Invoice with Report <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input checked="" type="checkbox"/> MAIL <input type="checkbox"/> FAX		F/P		F/P				P		P		P													
Company: Hemmera Environchem Inc.		Email 1 or Fax nsandys@hemmera.com		Dissolved Metals, Hardness		Dissolved Mercury		Nitrate, Nitrite, Total Kjeldahl N (TKN)		Cl, F, Sulfate, conductivity, pH, alkalinity		Anion Sum, Cation Sum, Cation/Anion Balance		Cyanide - Weak Acid Diss., Total, Free		Ammonia N (total), Total Organic Carbon		Thiocyanate (SCN)		Total Inorganic Carbon		Number of Containers					
Contact: Natasha Sandys		Email 2 chris@elr.ca																									
<b>Project Information</b>		<b>Oil and Gas Required Fields (client use)</b>																									
ALS Quote #: Q56042		Approver ID: [REDACTED] Cost Center: [REDACTED]																									
Job #: 1343-005.27		GL Account: [REDACTED] Routing Code: [REDACTED]																									
PO / AFE:		Activity Code: [REDACTED]																									
LSD:		Location: [REDACTED]																									
ALS Lab Work Order # (lab use only)		ALS Contact:		Sampler: JC,MM,NB,KB																							
<b>ALS Sample # (lab use only)</b>	<b>Sample Identification and/or Coordinates (This description will appear on the report)</b>			<b>Date (dd-mmm-yy)</b>	<b>Time (hh:mm)</b>	<b>Sample Type</b>																					
	GSI-PC-03B			27-May-16	12:20	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	7						
	MP09-14			26-May-16	12:45	Water	R														1						
	MP09-08			27-May-16	11:50	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	7						
	GSI-HA-04A			25-May-16	14:10	Water	R	R													2						
	GSI-HA-04A			27-May-16	8:10	Water			R	R	R	R									2						
	GSI-HA-04A			27-May-16	16:10	Water								R	R	R					3						
	MW09-22			27-May-16	10:10	Water	R	R					R	R	R						5						
	MW09-22			27-May-16	16:25	Water			R	R	R						R				2						
	Dup-3			27-May-16	12:50	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	7						
	FB-4			27-May-16	10:10	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	7						
	Travel Blank			27-May-16		Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	7						
<b>Drinking Water (DW) Samples<sup>1</sup> (client use)</b>				<b>Special Instructions / Specify Criteria to add on report (client use)</b>				<b>SAMPLE CONDITION AS RECEIVED (lab use only)</b>																			
Are samples taken from a Regulated DW System? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				Please send ELR EQWin EDD file with regular results report.				Frozen <input type="checkbox"/>		SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>		Ice packs Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>		Cooling Initiated <input checked="" type="checkbox"/>											
Are samples for human drinking water use? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No								INITIAL COOLER TEMPERATURES °C		FINAL COOLER TEMPERATURES °C																	
2.4				8/9/2016																							
<b>SHIPMENT RELEASE (client use)</b>				<b>INITIAL SHIPMENT RECEPTION (lab use only)</b>				<b>FINAL SHIPMENT RECEPTION (lab use only)</b>																			
Released by: [Signature]		Date: May 30 2016	Time: 9:15	Received by: [Signature]		Date: May 30 2016	Time: 9:30	Received by: [Signature]		Date: May 31	Time: 4pm																