Mount Nansen February 2016
Groundwater Monitoring and Sampling

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March 2016

HEMMERA

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1.0 INTRODUCTION

This Work was performed in accordance with Contract C00028455 between Hemmera Envirochem Inc. ("Hemmera") and Government of Yukon ("Client"), dated May 11, 2015 ("Contract"). In performing this Work, Hemmera has relied in good faith on information provided by others, and has assumed that the information provided by those individuals is both complete and accurate. This Work was performed to current industry standard practice for similar environmental work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the Report was produced. The conclusions and recommendations contained in this Report are based upon the applicable guidelines, regulations, and legislation existing at the time the Report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

Hemmera Envirochem Inc. and Ecological Logistics & Research Ltd. (Hemmera/ELR) were retained by the Government of Yukon (GY), Assessment and Abandoned Mines (AAM) to conduct a groundwater monitoring and sampling program at the Mount Nansen Site (the Site) in February, 2016. Hemmera/ELR's scope of work included the monitoring of groundwater wells and collection of groundwater samples from a series of existing groundwater wells at the Site. This report summarizes the monitoring and sampling activities, a description of methodologies and field conditions encountered, a summary of field *in-situ* and laboratory analytical results including a comparison to applicable guidelines, a description of any observations and/or occurrences that may have influenced program results, and recommendations relating to sample procedures and monitoring well conditions. This report does not provide an interpretation of the results, nor does it provide recommendations relating to groundwater quality at the Site.

1.1 SITE LOCATION

The Mount Nansen site is located approximately 45 kilometres (km) west of the Town of Carmacks (70 km by road). This Type II abandoned mine site consists of three (3) primary areas of existing infrastructure: the Brown McDade Pit, a Mill Complex, and a Tailings Facility (**Figure 1-1**). Groundwater monitoring wells exist throughout the Site, a subset of which were sampled during the February 2016 groundwater monitoring and sampling program. The groundwater monitoring locations included in this program are described in **Sections 1.2** and **1.3**.

1.2 SCOPE OF WORK

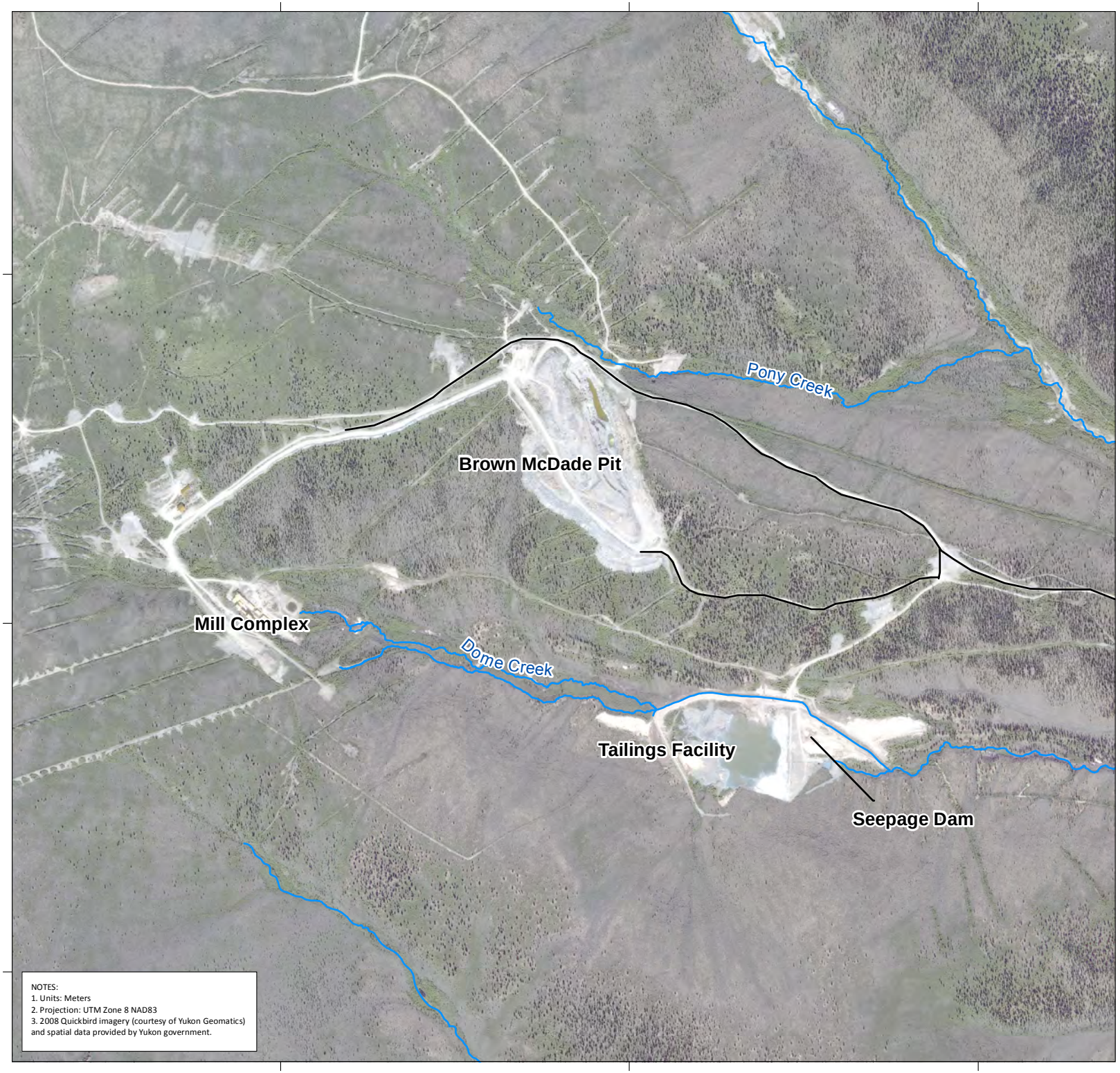
The scope of work for this program included the coordination and execution of the February 2016 groundwater monitoring and sampling, analysis of samples, and the presentation of results in a report.

Groundwater sampling at the Site was conducted over a four (4) day period, between February 1 and February 4, 2016. Sampling was conducted by a team of four (4) qualified field staff from Hemmera/ELR (Justin Hains, Aaron Nicholson, Glenn Rudman, and Dave Clegg). A total of 65 groundwater wells were included in the February 2016 sampling event (**Table 1-1**). It was not possible to sample four (4) of the groundwater wells listed in the scope of work as they had been destroyed; two (2) had been previously destroyed (MP09-01 and GSI-PC-01-B) and two (2) that appeared to have been destroyed during placer mining operations in the summer of 2015 (GSI-PC-02-B and MP09-02; Hemmera, 2015a). One (1) of the remaining 61 groundwater wells assessed was known to be damaged (CH-P-13-02/10), but sampling and monitoring was still attempted during the February 2016 program.

At each well (sampling station) headspace gas concentrations were measured, well and water level parameters were measured (depth to water, depth to bottom, well diameter, and well stick-up height), the well was purged, and then prescribed *in-situ* groundwater quality parameters were measured. Lastly, groundwater samples were collected for laboratory analysis. A detailed description of the sampling methods and measured groundwater quality parameters is provided in **Section 2**.

1.3 SAMPLE SITES

The groundwater wells included in the February 2016 monitoring and sampling event were grouped into six (6) main areas of the Mount Nansen Site (**Table 1-1**). The majority of groundwater wells were located around existing infrastructure including the tailings facility and seepage dam (25 wells), the Brown McDade Pit (13 wells) and the Mill Complex (9 wells). Additional wells (primarily drive-point piezometer installations) were sampled in the vicinity of Dome Creek (9 wells) and Pony Creek (9 wells). **Table 1-1** provides the location, status, and sample recovery for groundwater wells included in the February 2016 sampling program. The well locations are also illustrated in **Figures 1-2** and **1-3**. Photographs of each sample site visited in February 2016 are included in **Appendix A**.



Mount Nansen Site - February 2016
Groundwater Monitoring Program

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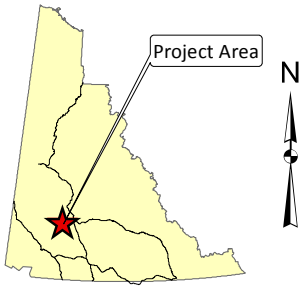
Legend

Watercourses



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250 125 0 250
Meters

March 23, 2016

Hemerra Project: 1343-005.14
ELR Project: 15-200.3

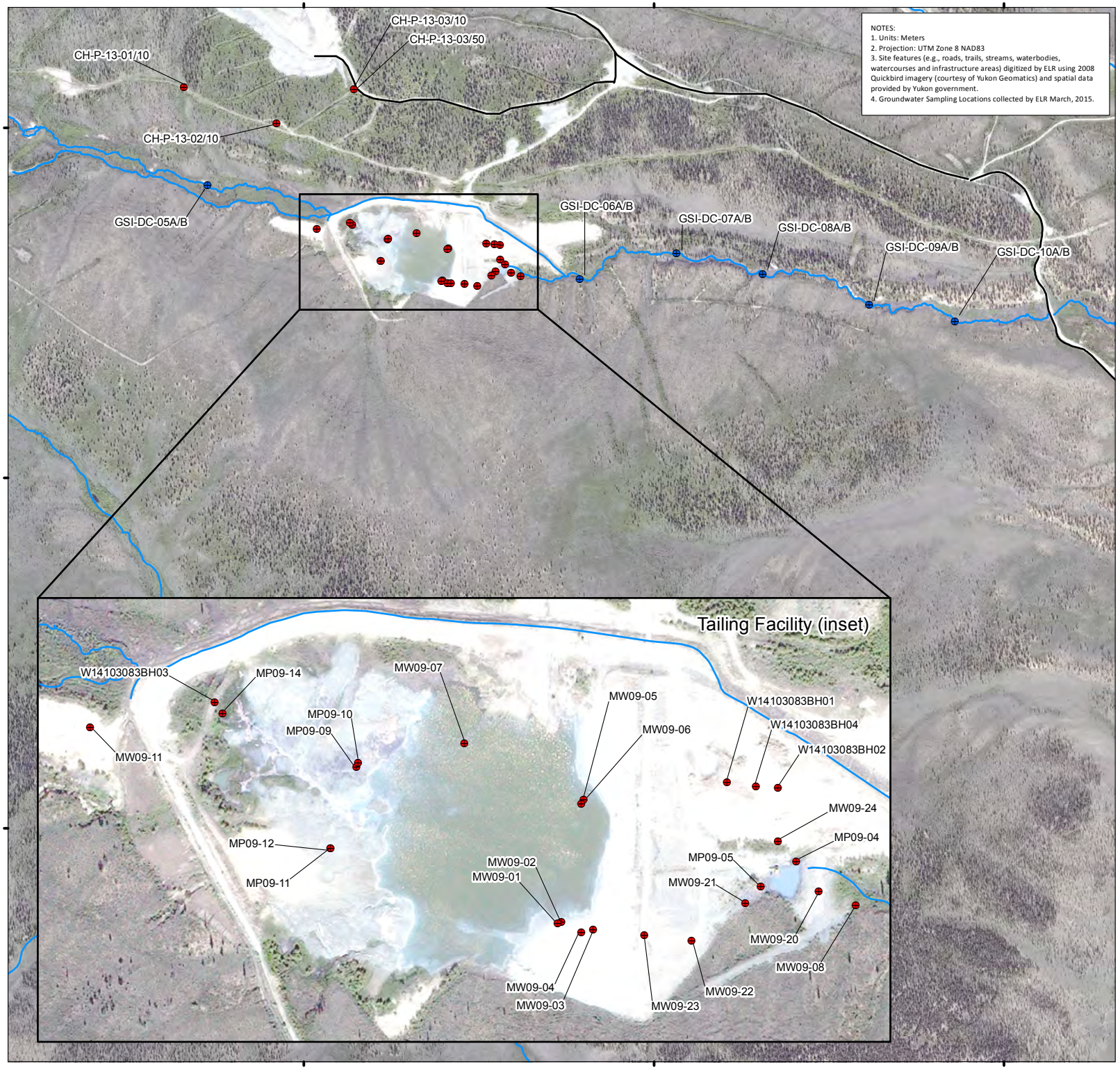
FIGURE 1-1
Site Location - Mount Nansen Site

Table 1-1 Summary of Groundwater Well Locations and Samples Collected

Area	Well Name	UTM (Zone 08N)		Status[1,2]	Sample Collected	QA/QC Sample Collected
		Easting	Northing			
Dome Creek	GSI-DC-01B	387675	6881124	Frozen	-	-
	GSI-DC-02B	387879	6881129	Direct Sampled [1]	✓	-
	GSI-DC-03B	388107	6881079	Frozen	-	-
	GSI-DC-05B	388725	6880836	Frozen [2]	-	-
	GSI-DC-06B	389788	6880567	Frozen	-	-
	GSI-DC-07B	390065	6880641	Frozen [2]	-	-
	GSI-DC-08-B	390311	6880583	Frozen [2]	-	-
	GSI-DC-09-B	390614	6880494	Frozen	-	-
	GSI-DC-10-B	390859	6880447	Frozen	-	-
Mill Complex	GSI-HA-01A	387842	6881132	Direct Sampled [1]	✓	-
	GSI-HA-02A	387861	6881135	Frozen	-	-
	GSI-HA-03A	387878	6881131	Frozen	-	-
	GSI-HA-04A	387916	6881130	Direct Sampled [1]	✓	-
	GSI-HA-05A	387898	6881125	Frozen	-	-
	MW09-16	387992	6881094	Frozen	-	-
	MW09-17	388075	6880970	Frozen	-	-
	MW09-18	388054	6880986	Good	✓	Duplicate, Field Blank
	MW09-19	388051	6881016	Good	✓	-
Brown McDade Pit	CH-P-13-01/10	388657	6881116	Frozen	-	-
	CH-P-13-03/10	389145	6881105	Frozen	-	-
	CH-P-13-03/50	389143	6881110	Direct Sampled [1]	✓	Field Blank
	CH-P-13-04/10	389138	6881472	Frozen	-	-
	CH-P-13-04/35	389138	6881472	Frozen	-	-
	CH-P-13-05/50	388954	6881466	Not Accessible [3]	-	-
	GLL07-01	388851	6881783	Frozen	-	-
	GLL07-02	389069	6881703	Dry	-	-
	GLL07-03	388959	6881477	Not Accessible [3]	-	-
	MW09-13	389006	6881664	Frozen	-	-
	MW09-14	389008	6881669	Direct Sampled [1]	✓	-
	MW09-15	388920	6881727	Insufficient Volume	-	-
	CH-P-13-02/10	388924	6881014	Damaged	-	-

Area	Well Name	UTM (Zone 08N)		Status[1,2]	Sample Collected	QA/QC Sample Collected
		Easting	Northing			
Pony Creek	GSI-PC-01-B	N/A	N/A	Destroyed [4]	-	-
	GSI-PC-02-B	388907	6881786	Destroyed [4]	-	-
	GSI-PC-03-B	389256	6881706	Frozen [2]	-	-
	GSI-PC-04-B	389586	6881656	Frozen	-	-
	GSI-PC-05-B	389713	6881661	Frozen	-	-
	MP09-01	N/A	N/A	Destroyed [4]	-	-
	MP09-02	388867	6881816	Destroyed [4]	-	-
	MP09-03	388956	6881739	Frozen	-	-
	MP09-08	389160	6881718	Frozen	-	-
Seepage Dam	W14103083BH01	389522	6880669	Frozen	-	-
	W14103083BH02	389561	6880665	Frozen	-	-
	W14103083BH04	389544	6880666	Frozen	-	-
Tailings Facility	MP09-04	389575	6880609	Frozen	-	-
	MP09-05	389548	6880590	Frozen	-	-
	MP09-09	389240	6880681	Direct Sampled [1]	✓	-
	MP09-10	389241	6880684	Direct Sampled [1]	✓	-
	MP09-11	389220	6880619	Frozen	-	-
	MP09-12	389220	6880619	Frozen	-	-
	MP09-14	389138	6880722	Frozen	-	-
	MW09-01	389396	6880563	Direct Sampled [1]	✓	-
	MW09-02	389393	6880562	Direct Sampled [1]	✓	-
	MW09-03	389411	6880555	Good	✓	-
	MW09-04	389420	6880557	Good	✓	Duplicate
	MW09-05	389413	6880656	Frozen	-	-
	MW09-06	389411	6880653	Good	✓	-
	MW09-07	389322	6880699	Frozen	-	-
	MW09-08	389620	6880576	Frozen	-	-
	MW09-11	389037	6880711	Frozen	-	-
	MW09-20	389592	6880586	Frozen	-	-
	MW09-21	389536	6880577	Frozen	-	-
	MW09-22	389495	6880549	Direct Sampled [1]	✓	-
	MW09-23	389459	6880553	Good	✓	-
	MW09-24	389561	6880624	Good	✓	-
	W14103083BH03	389132	6880730	Frozen	-	-

Notes: [1]Direct sampling was completed at sample stations where insufficient volume had been encountered during the event, which limited standard purging and sampling methodologies.
[2] Groundwater well was found buried beneath ice and could therefore not be monitored.
[3] Monitoring wells CH-P-13-05/50 and GLL07-03 were not visited during the February 2016 field event due to pit wall stability safety concerns.
[4] Destroyed wells are included in the scope of work and are therefore listed above in the summary table.



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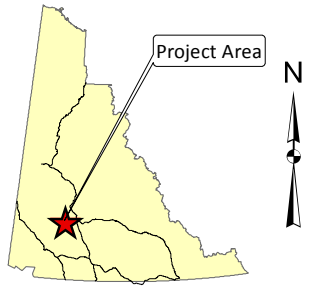
Legend

- Drive Point
- Monitoring Well
- Watercourses



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Meters

March 23, 2016

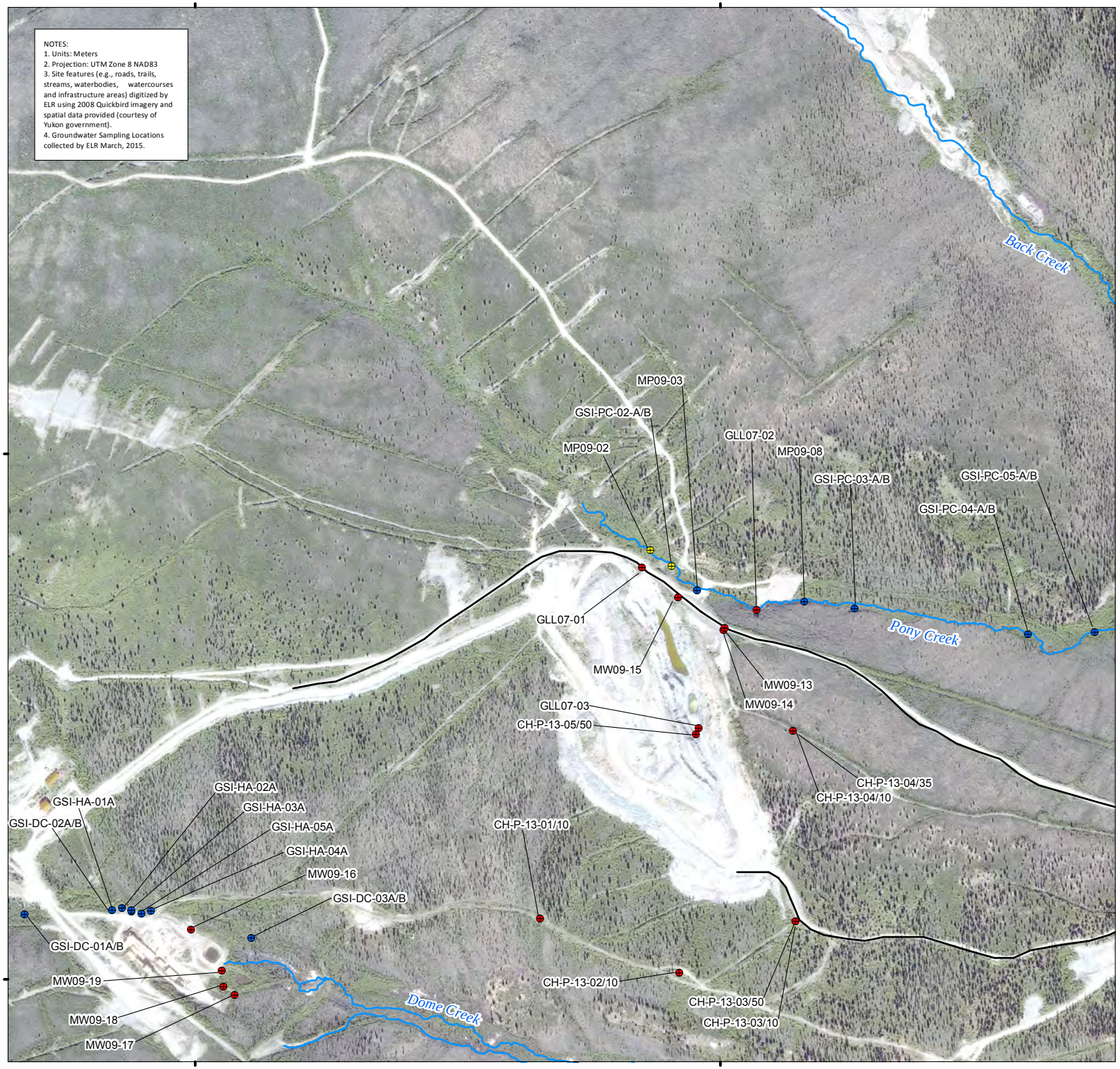
Hemmera Project: 1343-005.14

ELR Project: 15-200.3

FIGURE 1-2

Groundwater Sampling Locations

Dome Creek and Tailings Facility



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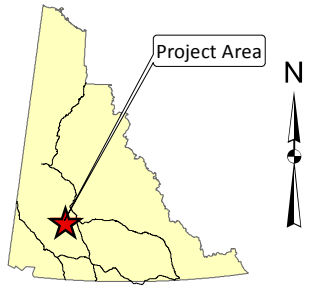
Assessment and Abandoned Mines

Legend

- Drive Point
- Monitoring Well
- Destroyed
- Watercourses



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Meters

March 23, 2016

Hemmera Project: 1343-005.14
ELR Project: 15-200.3

FIGURE 1-3

Groundwater Sampling Locations
Mill Complex and Brown McDade Pit

2.0 METHODOLOGY

2.1 PROTOCOLS

Groundwater purging, monitoring and sampling conducted by Hemmera/ELR were completed in accordance with the Groundwater Sampling Standard Operating Procedures included in the document *Scope of Work: Groundwater Sampling Program – Mount Nansen Site 2015*. These procedures were consistent with Environment Yukon's *Protocol for the Contaminated Sites Regulation #7 - Sampling and Decommissioning* (Environment Yukon, 2011). Methods used were also consistent with the ASTM D4448-01 *Standard Guide for Sampling Groundwater Monitoring Wells* (ASTM, 2013), and the D6452-99 *Guide for Purging Methods for Wells used for Groundwater Quality Investigations* (ASTM, 2012).

2.2 WELL MEASUREMENTS AND PURGING

Upon arriving at each sample station, headspace gases were measured prior to any other well measurements. Oxygen (%), carbon dioxide (ppm), and methane (%LEL) were measured using an RKI Eagle 2 Gas Sample Drawing Monitor.

The well structure and casing were inspected for damage, closure, and general conditions. Depth to water (DTW; m), depth to bottom (DTB; m), well diameter (cm), and well stick-up height (m) were then recorded at each well.

DTB and DTW were measured using either a Solinst - Model 102 Water Level Meter (for 2.54 cm diameter wells) or a Solinst – Model 122 Interface Meter (for wells with diameter greater than 2.54 cm). DTB and DTW were measured from (in order of preference): 1) a black mark drawn on the top of the well; 2) the bottom of the most significant notch found on the top of the PVC if a mark was not present; or 3) a line that was drawn on the highest point of the well if no distinguishable point of measure was present. Stick-up height was measured from the lowest point on the bottom of the well casing to the highest point (or distinguishing mark) on the well. Water level meters were cleaned between each sample site using Alconox low-foaming phosphate-free detergent solution and deionized water.

Following initial inspection and measurements, groundwater wells were purged and sampled using dedicated equipment. Groundwater wells were purged and sampled using one of three (3) techniques: 1) manual purging using high density polyethylene (HDPE) Waterra tubing and a footvalve, 2) GeoPump peristaltic pump with HDPE tubing, or 3) manual purging using disposable polyethylene bailers. The purging technique chosen for each well was that which would produce the most representative groundwater sample.

Groundwater wells were determined to be sufficiently purged when either three (3) successive field parameter measurements were recorded to be within an allowable tolerance level (as summarized in **Table 2-1**, below) or when a volume of water equivalent to three (3) standing well volumes of water had been purged.

Groundwater turbidity measured in Nephelometric Turbidity Units (NTU) or Attenuation Units (AU) was also measured prior to sampling (described below in **Section 2.4**) and was used as an indication of sample quality. Where possible, samples were not collected until turbidity was less than 50 NTU. Purge volumes and purge rates were measured using a graduated container and stop watch. All well measurements, purging details, and additional field notes were recorded on customized field forms in order to minimize the potential for field errors.

Table 2-1 Groundwater Sampling – Field Parameter Purging Criteria

Field Parameter	Allowable Variance
Temperature (°C)	± 3%
pH	± 0.1
Conductivity (µS/cm)	± 3%
Specific Conductivity (µS/cm)	± 3%

2.3 DIRECT SAMPLING

During previous events a select number of groundwater wells were found to have an insufficient volume of groundwater to sample using conventional methods, limiting the number of wells that were sampled during the event. An alternate sampling strategy was established by AAM's consultant (AMEC) in order to obtain samples from low producing wells, which was followed during the February 2016 sampling event. At wells identified as having insufficient volume of water, Hemmera/ELR direct sampled (analytical samples collected prior to purging or collecting field parameter measurements), after which time field parameter measurements were collected if possible. Additionally, a priority ranking order for analytical sample collection previously established by AAM's consultant (AMEC) was used when collecting samples at direct sampled wells (as summarized in **Table 2-2**). This ranking system was used to ensure that samples for higher priority parameters were collected at each well if limited recharge or volume was encountered. Where sample collection was limited, Hemmera/ELR also re-visited wells, where feasible, in an attempt to collect a more thorough sample set.

In addition to the priority ranking order, Hemmera/ELR also considered the minimum sample volumes required for laboratory procedures (provided to Hemmera/ELR by ALS Laboratories). Where well volume was limited, minimum volumes were collected to maximize the number of program parameters collected.

2.4 FIELD PARAMETERS

Hemmera/ELR measured *in-situ* water quality parameters using YSI Professional Plus multi-parameter field meters, Lamotte 2020we turbidity meters, and Hach DR 890 Portable Colorimeters. Flow-through cells were used with the YSI meters to minimize field parameter variability; flow-through cells improve the precision of field measurements by limiting sample water contact with air, and by continuously moving sample water across the field meter sensors. In cases where ambient air temperature was too low to effectively use a flow-through cell without freeze-up, a graduated container was used. The *in-situ* groundwater quality parameters recorded at each sample station included water temperature (^{o}C), specific conductivity (µs/cm), conductivity (µs/cm), oxidation/reduction potential (ORP; mv), pH (pH units), sulphide (mg/l), dissolved oxygen (mg/l and percent saturation), and turbidity (NTU).

During purging, field parameters were monitored at 5 minute intervals, or at volume related intervals (e.g., every 500 mL) in the case of wells with slow recharge. The final set of in situ measurements were recorded at the conclusion of purging.

2.5 GROUNDWATER SAMPLING

Groundwater quality samples were collected and preserved in accordance with laboratory directions, and using techniques consistent with *Standard Methods for the Examination of Water and Wastewater* (Rice et al., 2012). ALS Global was the analytical laboratory chosen for this project, and a summary of the sample bottle set (including parameters analysed and preservation techniques) is provided in **Table 2-2**.

Table 2-2 Groundwater Sampling Parameter Priority, Preservation, and Intended Analysis

Priority	Bottle Type	Parameters Analyzed	Minimum Volume	Sample Treatment	Preservative Added
1a	120 ml (plastic)	Dissolved Metals	100 ml	Field Filtered and Preserved	HNO_3
1b	40 ml (glass)	Dissolved Mercury	15 mL	Field Filtered and Preserved	HCl
2	1 L (plastic)	General Chemistry	200 ml	-	-
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	120 ml	Preserved	NaOH
4	250 ml (glass amber)	Ammonia (NH3)	120 ml	Preserved	H_2SO_4
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	Preserved	HNO_3
6	120 ml (plastic)	Sulphide	100 ml	Preserved	Zinc Acetate, and NaOH
7	250 ml (glass amber)	Total Inorganic Carbon (TIC)	100 ml	-	-

2.6 DATA ANALYSIS

Groundwater analytical field and laboratory results were tabulated and reviewed using Hemmera/ELR's EQWin Data Manager water quality database. Data was tabulated for the report and compared to the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (FAL; CCME, 2014) standards using the database application. All relevant CCME FAL guidelines are presented in **Table A**.

2.7 QUALITY ASSURANCE AND QUALITY CONTROL

2.7.1 Field QA/QC

Several controls were used by Hemmera/ELR staff while in the field to ensure that sample integrity was maintained and that data were recorded completely and accurately. All equipment used during the sampling process was dedicated to individual wells, including HDPE tubing and Waterra footvalves, laboratory provided pre-cleaned sample bottles, disposable filters, disposable syringes, and disposable polyethylene bailers. Field staff used dedicated disposable nitrile gloves for all measurements, purging, and sampling. Water level meters were cleaned between well locations using Alconox low-foaming phosphate-free detergent and deionized water, and field instruments (YSI field meters, turbidity meters, and portable colorimeters) were checked and calibrated before the site visit to ensure the parameters recorded were as accurate as possible.

Project-specific field data sheets were created for the sampling event to help ensure that all required measurements were taken, and that information was recorded correctly. Field data sheets have been included as **Appendix B** of this report.

2.7.2 Analytical QA/QC

Analytical QA/QC measures were included in the February 2016 sampling program as outlined in the scope of work and as per standard industry practice. This included the collection of field duplicates and field blanks, and the use of travel blanks. Duplicate samples were collected at a ratio of 10% of the regular samples (1 duplicate was collected for every 10 samples), and one (1) field blank was prepared during the program. Two travel blanks accompanied the analytical supplies and samples from the laboratory to the field, and back to the laboratory again (1 for each shipment).

The variation between sample and duplicate values was calculated as relative percent difference (RPD). RPD provides a measure of the relative difference between two values in comparison to their mean value, and is calculated as the difference between a sample and its field duplicate over the average of two values. RPD values greater than 20% indicate a greater than expected variation in data that could

potentially have affected the precision of sampling or analysis. RPD was calculated according to the following formula:

$$\%RPD = \left(\frac{\chi_1 - \chi_2}{\left(\frac{\chi_1 + \chi_2}{2}\right)} \right) x\ 100$$

RPD is not calculated if either the sample or the field duplicate concentration is less than five times the detection limit.

The analytical results for field and travel blanks were reviewed to determine whether any of the parameters tested were detected (i.e., result exceeding the detection limit). In such cases, the parameter or element in question and its concentration were reviewed to determine potential sources of contamination or error.

3.0 RESULTS

A summary of laboratory analytical results is presented in **Table A** of this report, including a comparison of results to CCME FAL guidelines. A summary of the QA/QC sampling results is presented in **Table B**, including analytical data for duplicates, field blanks, and travel blanks. Laboratory analytical reports are appended to this report (**Appendix C**).

3.1 GROUNDWATER SAMPLING SUMMARY

Groundwater sampling was completed between February 1 and February 4, 2016. Weather conditions varied throughout the time of sampling with ambient air temperature ranging from -10 to -19°C. Periods of light snow and heavy to light wind occurred throughout the sampling event.

Of the sixty-five (65) wells specified for the February 2016 sampling event, fifty-five (55) were located and assessed during the program. As noted in **Section 1.2**, four (4) groundwater wells listed in the scope of work had previously been reported as destroyed (GSI-PC-01-B, MP09-01, GSI-PC-02-B and MP09-02), two (2) were not accessible due to safety concerns (GLL07-03 and CH-P-13-05/50), and four (4) were covered in ice and could not be monitored (GSI-DC-05-B, GSI-DC-07-B, GSI-DC-08-B, and GSI-PC-03-B). Further details concerning these wells are provided in **Section 3.2**.

Of the fifty-five (55) wells located, seventeen (17) wells were sampled; seven (7) using purging and sample methods as per the program protocols, and ten (10) direct sampled without purging according to the sample priority ranking (**Table 2-2**). In four (4) of the ten (10) direct sampled wells, volumes were insufficient to collect a full sample set. **Table 3-1** provides a summary of limited sample set collection.

Of the remaining thirty-eight (38) of the fifty-five (55) wells that were assessed but not sampled during the program, thirty-five (35) wells were frozen, one (1) well was dry, one (1) well had insufficient volume for sampling, and one (1) well was damaged and could not be sampled. Despite not collecting water quality samples, these wells were still assessed and water/ice depth, well depth, and headspace gas measurements were collected to the extent possible. A summary of the overall condition (status) and sampling result for groundwater wells is provided in **Table 1-1**, and a summary of all well measurements, purge details, and *in-situ* parameter results is provided in **Table 3-2**.

Table 3-1 Summary of Direct Samples Collected During February 2016 Sampling Program

Well Name	Dissolved Metals	Dissolved Mercury	Physical Parameters	Anions/ Nutrients	Cyanide	Ammonia	Thiocyanate	Sulphide	Total Inorganic Carbon
Priority	**1a**	**1b**	**2**	**2**	**3**	**4**	**5**	**6**	**7**
GSI-DC-02B	✓	✓	✓	✓	✓	✓	✓	✓	-
GSI-HA-01A [1]	-	✓	-	-	-	-	-	-	-
GSI-HA-04A	✓	✓	-	-	-	-	-	-	-
CH-P-13-03/50	✓	✓	✓	✓	✓	✓	✓	✓	✓
MW09-14	✓	✓	✓	✓	✓	✓	✓	✓	✓
MP09-09	✓	✓	✓	✓	✓	✓	✓	✓	✓
MP09-10	✓	✓	✓	-	-	-	-	-	-
MW09-01	✓	✓	✓	✓	✓	✓	✓	✓	✓
MW09-02	✓	✓	✓	✓	✓	✓	✓	✓	✓
MW09-22	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: Refer to **Section 2.2** for details concerning direct sampling methodologies, including minimum volume collection. Samples were collected based on field priority ranking as specified in **Table 2-2**.
[1] Insufficient volumes available to collect a full dissolved metals sample, only a dissolved mercury sample was collected.

Table 3-2 Groundwater Field Parameters and Well Measurements for February 2016 Sampling Program

Area	Location ID	Sample Date	Status	Stick up Height (m)	Depth To Water (m)	Depth to Bottom (m)	Standing Water Volume (L)	Volume Purged (L)	Purge Start Time	Purge End Time	Elapsed Purge Time	Purge Rate (l/min)	Criteria[1] (3WV/PS/DS)	Draw Down (m)	pH	Temperature (ºC)	Conductivity (µS/cm)	Specific Conductivity (µS/cm)	ORP (mV)	Dissolved Oxygen (mg/L)	Field Sulphide (mg/L)	Methane (%LEL)	Oxygen (%)	Carbon Dioxide (ppm)	Field Turbidity (NTU)	Method Used	Well Diameter (cm)
Dome Creek	GSI-DC-01A	01/02/2016	Frozen	0.64	0.795	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18.9	350	-	-	2.54
	GSI-DC-01B	01/02/2016	Frozen	0.67	1.456	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	19.1	325	-	-	2.54
	GSI-DC-02A	01/02/2016	Frozen	0.94	1.815	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	17.7	720	-	-	2.54
	GSI-DC-02B [2]	01/02/2016	Direct Sample	0.81	2.300	3.717	0.9	-	-	-	-	-	DS	-	-	-	-	-	-	-	-	0	17.7	1700	-	peristaltic	2.54
	GSI-DC-03A	01/02/2016	Frozen	0.68	0.978	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	0	-	-	2.54
	GSI-DC-03B	01/02/2016	Frozen	0.66	0.945	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	275	-	-	2.54
	GSI-DC-05A [3]	02/02/2016	Frozen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GSI-DC-05B [3]	02/02/2016	Frozen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GSI-DC-06A	02/02/2016	Frozen	0.81	0.841	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	25	-	-	2.54
	GSI-DC-06B	02/02/2016	Frozen	0.41	0.534	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	75	-	-	2.54
	GSI-DC-07A [3]	02/02/2016	Frozen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GSI-DC-07B [3]	02/02/2016	Frozen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GSI-DC-08A [3]	02/02/2016	Frozen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GSI-DC-08B [3]	02/02/2016	Frozen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GSI-DC-09A	02/02/2016	Frozen	0.21	1.055	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	25	-	-	2.54
	GSI-DC-09B	02/02/2016	Frozen	0.21	1.026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	0	-	-	2.54
	GSI-DC-10A	02/02/2016	Frozen	0.85	1.032	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	0	-	-	2.54
	GSI-DC-10B	02/02/2016	Frozen	0.77	0.951	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	0	-	-	2.54
Mill Complex	GSI-HA-01A [2]	01/02/2016	Direct Sample	1.1	2.500	2.785	0.2	-	-	-	-	-	DS	-	-	-	-	-	-	-	-	0	18	320	-	peristaltic	2.54
	GSI-HA-02A	01/02/2016	Frozen	1.46	2.114	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18.0	340	-	-	2.54
	GSI-HA-03A	01/02/2016	Frozen	0.94	0.985	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	200	-	-	2.54
	GSI-HA-04A [2]	01/02/2016	Direct Sample	0.51	1.816	2.11	0.3	-	-	-	-	-	DS	-	-	-	-	-	-	-	-	0	20.9	160	-	peristaltic	2.54
	GSI-HA-05A	01/02/2016	Frozen	0.68	0.400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	0	-	-	2.54
	MW09-16	01/02/2016	Frozen	1.29	1.855	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	525	-	-	5.08
	MW09-17	01/02/2016	Frozen	0.97	5.609	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	9.3	>10000*	-	-	5.08
	MW09-18	01/02/2016	Good	0.86	5.104	7.696	5.2	5.0	13:00	13:07	0:07	0.7	PS	0.001	6.76	-0.1	1356	2608	127.5	2.16	0.00	0	20.9	125	34.1	disp. bailer	5.08
	MW09-19	01/02/2016	Good	0.99	3.040	5.797	5.5	1.6	11:51	12:08	0:17	0.1	PS	0.240	6.68	-0.3	1116	2157	-77.8	0.52	0.12	0	20.9	50	2.9	disp. bailer	5.08

Area	Location ID	Sample Date	Status	Stick up Height (m)	Depth To Water (m)	Depth to Bottom (m)	Standing Water Volume (L)	Volume Purged (L)	Purge Start Time	Purge End Time	Elapsed Purge Time	Purge Rate (l/min)	Criteria[1] (3WV/PS/DS)	Draw Down (m)	pH	Temperature (ºC)	Conductivity (µS/cm)	Specific Conductivity (µS/cm)	ORP (mV)	Dissolved Oxygen (mg/L)	Field Sulphide (mg/L)	Methane (%LEL)	Oxygen (%)	Carbon Dioxide (ppm)	Field Turbidity (NTU)	Method Used	Well Diameter (cm)
Brown McDade Pit	CH-P-13-01/10	02/02/2016	Frozen	0.49	6.678	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	50	-	-	5.08
	CH-P-13-03/10	02/02/2016	Frozen	0.59	4.922	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	5125	-	-	3.81
	CH-P-13-03/50 [2]	02/02/2016	Direct Sample	0.54	48.985	50.555	0.8	-	-	-	-	-	DS	-	-	-	-	-	-	-	0.8	0	20.3	2750	1146 (AU)**	disp. bailer	2.54
	CH-P-13-04/10	03/02/2016	Frozen	0.54	6.045	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	0	-	-	3.81
	CH-P-13-04/35	03/02/2016	Frozen	0.61	6.408	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	25	-	-	2.54
	CH-P-13-05/50 [4]	-	Not Accessible	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GLL07-01	03/02/2016	Frozen	0.79	13.745	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	10.5	>10000*	-	-	5.08
	GLL07-02	03/02/2016	Dry	1.34	7.100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18.5	8350	-	-	15.24
	GLL07-03 [4]	-	Not Accessible	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MW09-13	03/02/2016	Frozen	0.73	8.920	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	1200	-	-	5.08
	MW09-14 [2]	03/02/2016	Direct Sample	0.74	5.114	7.618	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	525	-	disp. bailer	5.08
	MW09-15	03/02/2016	Insufficient Volume	0.89	13.989	14.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.7	650	-	-	5.08
	CH-P-13-02/10	02/02/2016	Damaged	0.84	8.238	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	19.1	>10000*	-	-	5.08
Pony Creek	GSI-PC-01A [5]	-	Destroyed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GSI-PC-01B [5]	-	Destroyed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GSI-PC-02A [5]	-	Destroyed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GSI-PC-02B [5]	-	Destroyed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GSI-PC-03A [3]	03/02/2016	Frozen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GSI-PC-03B [3]	03/02/2016	Frozen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GSI-PC-04A	03/02/2016	Frozen	0.68	0.817	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	25	-	-	2.54
	GSI-PC-04B	03/02/2016	Frozen	0.77	1.419	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	53	-	-	2.54
	GSI-PC-05A	03/02/2016	Frozen	0.73	0.838	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	9.0	>10000*	-	-	2.54
	GSI-PC-05B	03/02/2016	Frozen	0.75	0.839	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	15.0	>10000*	-	-	2.54
	MP09-01 [5]	-	Destroyed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MP09-02 [5]	-	Destroyed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MP09-03	03/02/2016	Frozen	0.54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	21.0	25	-	-	2.54
	MP09-08	03/02/2016	Frozen	0.82	0.360	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	0	-	-	2.54
Seepage Dam	W14103083BH01	02/02/2016	Frozen	0.62	6.450	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18.3	320	-	-	5.08
	W14103083BH02	02/02/2016	Frozen	0.77	6.690	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18.4	300	-	-	5.08
	W14103083BH04	02/02/2016	Frozen	0.77	6.500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18.3	320	-	-	5.08

Area	Location ID	Sample Date	Status	Stick up Height (m)	Depth To Water (m)	Depth to Bottom (m)	Standing Water Volume (L)	Volume Purged (L)	Purge Start Time	Purge End Time	Elapsed Purge Time	Purge Rate (l/min)	Criteria[1] (3WV/PS/DS)	Draw Down (m)	pH	Temperature (ºC)	Conductivity (µS/cm)	Specific Conductivity (µS/cm)	ORP (mV)	Dissolved Oxygen (mg/L)	Field Sulphide (mg/L)	Methane (%LEL)	Oxygen (%)	Carbon Dioxide (ppm)	Field Turbidity (NTU)	Method Used	Well Diameter (cm)
Tailings Facility	MP09-04	02/02/2016	Frozen	1.23	1.814	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18.4	700	-	-	3.81
	MP09-05	02/02/2016	Frozen	1.05	1.343	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18.5	260	-	-	5.08
	MP09-09 [2]	04/02/2016	Direct Sample	2.46	3.890	5.56	1.8	-	-	-	-	-	DS	-	-	-	-	-	-	-	-	4	18	260	-	peristaltic	3.81
	MP09-10 [2]	04/02/2016	Direct Sample	2.2	3.655	4.39	1	-	-	-	-	-	DS	-	-	-	-	-	-	-	-	0	18.1	380	-	disp. bailer	3.81
	MP09-11	04/02/2016	Frozen	1.89	7.900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	17.7	460	-	-	3.81
	MP09-12	04/02/2016	Frozen	1.84	2.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18.0	340	-	-	3.81
	MP09-14	04/02/2016	Frozen	0.92	0.864	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	21.0	0	-	-	2.54
	MW09-01 [2]	03/02/2016	Direct Sample	0.73	7.170	9.18	4	-	-	-	-	-	DS	-	-	-	-	-	-	-	-	0	18.4	1700	-	Waterra	5.08
	MW09-02	02/02/2016	Direct Sample	0.74	3.612	4.72	2.2	1	16:52	16:55	0:03	-	DS	0.508	7.28	0.1	1463	2790	-69.3	2.68	0.04	0	18.4	520	18.8	peristaltic	5.08
	MW09-03	03/02/2016	Good	0.23	6.754	9.953	6.4	5	12:17	12:54	0:37	0.1	PS	0.236	7.45	0.4	1431	2703	112	3.36	-	0	18	380	0.6	peristaltic	5.08
	MW09-04	03/02/2016	Good	0.08	4.738	7.68	5.8	4	10:00	10:40	0:40	0.1	PS	0.732	8.37	0.3	1467	2766	191.5	3.78	0.03	0	18	440	3.4	peristaltic	5.08
	MW09-05	03/02/2016	Frozen	1.11	7.480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	375	-	-	5.08
	MW09-06	03/02/2016	Good	2.07	4.454	5.95	3	3.9	16:33	16:49	0:16	0.3	PS	1.306	7.29	1.6	678	1209	159.9	2.53	0.05	0	14.1	3350	16.6	disp. bailer	5.08
	MW09-07	04/02/2016	Frozen	1.37	3.316	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	0	-	-	5.08
	MW09-08	02/02/2016	Frozen	1.11	1.240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18.8	340	-	-	5.08
	MW09-11	04/02/2016	Frozen	0.82	4.845	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20.9	1125	-	-	5.08
	MW09-20	02/02/2016	Frozen	0.92	3.700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18.7	1500	-	-	5.08
	MW09-21	02/02/2016	Frozen	0.40	1.030	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18.6	260	-	-	5.08
	MW09-22 [2]	03/02/2016	Direct Sample	0.83	4.587	5.298	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	17.3	5000	-	disp. bailer	5.08
	MW09-23	03/02/2016	Good	0.11	12.600	15.85	6.5	25	15:20	15:32	0:12	2.1	3WV	0.2	7.21	0	716	1372	-79.7	3.3	0.29	0	18	320	49.1	Waterra	5.08
	MW09-24	02/02/2016	Good	0.67	9.440	11.24	3.6	15	13:39	14:50	1:11	0.2	PS	0.01	7.23	0.2	446	847	224.2	8.06	0.17	0	24.3	4500	37.6	disp. bailer	5.08
	W14103083BH03	04/02/2016	Frozen	0.74	1.425	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	21.0	0	-	-	5.08

Notes: To maximize the sample return for analytical analysis, field parameters were not collected at all direct sampled wells. Shaded rows indicate monitoring stations where analytical samples were collected.
[1] 3WV = Three well volumes purged prior to sample collection, PS = field parameters stabilized prior to sample collection, and DS = sample collected directly without purging.
[2]Due to low well volumes (direct sampling), field parameters were not measured.
[3]Well found frozen beneath ice and therefore could not be monitored.
[4]Well was not accessible during the sampling event due to health and safety concerns.
[5]Well has been destroyed by placer mining activity.
[*]Field measurements over range of instrument.
[**]AU (Attenuation Unit)

3.2 ANALYTICAL RESULTS

Analytical results are provided below, including a brief summary of CCME FAL guideline exceedances and a description of factors that may have influenced the data. Details regarding well status, including a description of damaged or underperforming wells, are also provided.

In several instances, laboratory reportable detection limits (RDL) for parameters exceeded applicable CCME FAL standards (lightly shaded values in **Table A**). In these cases, samples having elevated levels of certain parameters required laboratory dilution in order to perform the required analyses, thereby resulting in an elevated RDL. For the purpose of this report, samples where the reported RDL is greater than the applicable guideline have not been reported as CCME FAL exceedances.

3.2.1 Dome Creek

Groundwater wells along Dome Creek were monitored between February 1 and February 2, 2016. Samples were obtained from one (1) of the nine (9) drive-point piezometers located in this area. Eight (8) of the drive-point piezometers located in this area were found frozen during the time of sampling (GSI-DC-01B, GSI-DC-03B, GSI-DC-05B, GSI-DC-06B, GSI-DC-07B, GSI-DC-08B, GSI-DC-09B, GSI-DC-10B), the remaining well (GSI-DC-02B) was sampled directly without purging. Of the eight (8) wells reported to be frozen, three (3) were completely buried beneath ice and could not be inspected/monitored during the February 2016 monitoring program. A summary of field measurements, including headspace gases, is provided in **Table 3-2**.

No CCME FAL guideline exceedances were reported from the Dome Creek area during the February 2016 sampling event. Laboratory analytical results and provided in **Appendix C**.

Groundwater turbidity was not measured at site GSI-DC-02B due to insufficient well volumes (**Table 3-2**).

Table 3-3 Summary of CCME FAL Guideline Exceedances for February 2016 Sampling Program

Area	Sample ID	Date Sampled	Parameter	Field Dissolved Oxygen	Ammonia, Total (as N)	Ammonia CCME-FAL [2]	Fluoride (F)	Nitrite (as N)	Cyanide, Free	Dissolved Arsenic (As)	Dissolved Copper (Cu)	Copper CCME-FAL [2]	Dissolved Iron (Fe)	Dissolved Mercury (Hg)	Dissolved Selenium (Se)	Dissolved Silver (Ag)	Dissolved Uranium (U)	Dissolved Zinc (Zn)
			Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			CCME-FAL [1]	9.5	Varies [2]	-	0.12	0.06	0.005	0.005	Varies [10]	-	0.3	0.000026	0.001	0.0001	0.015	0.03
Mill Complex	GSI-HA-04A	01/02/2016	Direct Sample	-	-	-	-	-	-	0.0421	-	-	8.26	-	-	-	-	-
	MW09-18	01/02/2016	Good	2.16	-	-	<0.20	-	-	0.0519	-	-	-	-	-	-	-	-
	MW09-19	01/02/2016	Good	0.52	-	-	-	-	-	0.0224	-	-	3.00	-	-	-	-	-
Brown McDade Pit	CH-P-13-03/50	02/02/2016	Direct Sample	-	-	-	<0.20	-	-	-	-	-	-	-	0.00733	-	-	-
	MW09-14	03/02/2016	Direct Sample	-	-	-	-	-	-	0.0134	-	-	7.25	-	-	-	0.0193	-
Tailings Facility	MP09-09	04/02/2016	Direct Sample	-	-	-	1.71	-	0.532	17.0	0.578	*0.004*	-	0.0000328	0.00103	0.0193	-	-
	MP09-10	04/02/2016	Direct Sample	-	-	-	0.924	0.805	-	6.26	0.0469	*0.004*	-	0.0000881	0.00156	0.00272	-	-
	MW09-01 [3]	03/02/2016	Direct Sample	-	-	-	<0.20	-	-	0.0989	0.00870	*0.004*	-	-	-	-	-	0.968
	MW09-02	02/02/2016	Direct Sample	2.68	-	-	0.47	-	-	15.0	-	-	24.9	-	-	-	-	0.239
	MW09-03	03/02/2016	Good	3.36	-	-	0.22	0.071	-	1.66	-	-	-	-	-	-	-	-
	MW09-04	03/02/2016	Good	3.78	7.38	*0.9788*	0.33	-	-	3.84	-	-	-	-	-	-	-	0.0931
	MW09-06 [4]	04/02/2016	Good	2.53	-	-	0.19	-	-	0.211	0.00761	*0.004*	-	-	-	-	-	0.0879
	MW09-22	03/02/2016	Direct Sample	-	-	-	-	-	<0.010	-	-	-	4.09	-	-	-	-	-
	MW09-23	03/02/2016	Good	3.30	-	-	-	-	-	0.0284	-	-	13.1	-	-	-	-	0.0916
	MW09-24	02/02/2016	Good	8.06	-	-	-	-	-	-	0.00519	*0.004*	-	-	-	-	-	-

Notes:
[1] CCME guideline exceedances shaded with grey. Green shading denotes reportable detection limit in exceedance of CCME guideline.
[2] Calculated CCME guidelines, refer to **Table A** for details.
[3] Due to slow recharge and low well volumes, samples were collected from MW09-01 between February 2 and 3, 2016. Dissolved metals were collected on February 2, 2016. All other parameters were collected on February 3, 2016.
[4] Due to slow recharge and low well volumes, field parameters were measured for well MW09-06 on February 3, 2016. Laboratory analyzed samples were collected on February 4, 2016.
"–" indicates either no exceedance was observed or no analysis was conducted. Refer to **Table A** for full analytical report.

3.2.2 Mill Complex

Groundwater in the Mill Complex Area was sampled on February 1, 2016. Samples were obtained from four (4) of the nine (9) wells identified in this area. Five (5) of the wells located in this area were found frozen during the time of sampling (GSI-HA-02A, GSI-HA-03A, GSI-HA-05A, MW09-16, and MW09-17). Drive-points GSI-HA-01A and GSI-HA-04A were sampled directly without purging, all other wells were sampled according program protocols (MW09-18 and MW09-19). A summary of the samples collected is provided in **Table 3-1**, and analytical results are provide in **Table A**.

CCME FAL guideline exceedances were observed at three (3) of the four (4) sites sampled in the Mill Complex area, including exceedances of dissolved arsenic (three sites) and dissolved iron (two sites). Where measured (three sites), field dissolved oxygen concentrations were below the minimum CCME FAL guideline. A summary of CCME FAL guideline exceedances is provided in **Table 3-3**.

Where measured, groundwater turbidity of all samples collected within this area was less than 50 NTU (**Table 3-2**).

3.2.3 Brown McDade Pit

Groundwater wells in the Brown McDade Pit area were sampled between February 2 and February 3, 2016. Samples were obtained from two (2) of the thirteen (13) sites identified in this area (CH-P-13-03/50 and MW09-14). All samples collected in the Brown McDade area were direct sampled without purging. Six (6) wells were frozen during the Site visit (CH-P-13-01/10, CH-P-13-03/10, CH-P-13-04/10, CH-P-13-04/35, GLL07-01, and MW09-13), one (1) well was dry (GLL07-02), one (1) well was damaged (CH-P-13-02/10), and one (1) well had insufficient volume to collect a sample (MW09-15). Two (2) wells located within the Brown McDade Pit (CH-P-13-05/50 and GLL07-03) were not accessible during the time of sampling due to safety concerns regarding instability of the pit walls. Access to the Brown McDade Pit was restricted by AAM and Denison Environmental Services (DES) during the Site visit. A summary of the samples collected is provided in **Table 3-1**, and analytical results are provide in **Table A**.

CCME FAL guideline exceedances were observed at the two (2) sites sampled in the Brown McDade Pit area, including exceedances of dissolved arsenic (one site), dissolved iron (one site), dissolved selenium (one site), and dissolved uranium (one site). A summary of CCME FAL guideline exceedances is provided in **Table 3-3**.

Groundwater at sample location CH-P-13-03/50 was extremely turbid (1146 AU; Attenuation Units) during the time of sampling. Due to limited well volumes, groundwater turbidity was not measured at the other sampled location (MW09-14) within the Brown McDade Pit area (**Table 3-2**).

Similar to previous sampling events, CH-P-13-02/10 was damaged during the time of sampling. The well status had been previously listed as damaged as bentonite was present at the bottom of the well (Hemmera, 2015a). Well repairs and re-development of this location will be again recommended for the summer of 2016, but are limited by the lack of water in the well (i.e., bentonite clay is in solid form).

3.2.4 Pony Creek

Groundwater wells along Pony Creek were monitored on February 3, 2016. Five (5) of the nine (9) groundwater wells identified in the Pony Creek area were frozen during the time of sampling (GSI-PC-03B, GSI-PC-04B, GSI-PC-05B, MP09-03, and MP09-08). The four (4) remaining wells identified in this area were previously destroyed by placer mining activity (GSI-PC-01B, GSI-PC-02B, MP09-01, and MP09-02) and therefore could not be monitored. Of the five (5) wells reported to be frozen, one (1) was completely buried beneath ice and could not be inspected/monitored during the February 2016 monitoring program. A summary of field measurements collected for each site is provided **Table 3-2**.

3.2.5 Seepage Dam

Groundwater wells in the Seepage Dam area were monitored on February 2, 2016. All three (3) of the groundwater wells identified in the Seepage Dam area were frozen during the time of sampling. A summary of field measurements collected for each site is provided **Table 3-2**.

3.2.6 Tailings Facility

Groundwater wells in the Tailings Facility area were sampled between February 2 and February 4, 2016. Samples were obtained from ten (10) of the twenty-two (22) sample sites located in this area. Twelve (12) of the twenty-two (22) groundwater wells identified in the Tailings Facility area were frozen at the time of sampling (MP09-04, MP09-05, MP09-11, MP09-12, MP09-14, MW09-05, MW09-07, MW09-08, MW09-11, MW09-20, MW09-21, and W14103083BH03). Of the ten (10) samples collected in the Tailings Facility area, five (5) were collected directly without purging (MP09-09, MP09-10, MW09-01, MW09-02, and MW09-22). All other wells were purged prior to sampling (MW09-03, MW09-04, MW09-06, MW09-23, and MW09-24). A summary of the samples collected is provided in **Table 3-1**, and analytical results are provide in **Table A**.

CCME FAL guideline exceedances were observed at all ten (10) sites sampled in the Tailings Facility area, including exceedances of total ammonia (one site), fluoride (six sites), nitrite (two sites), free cyanide (one site), dissolved arsenic (eight sites), dissolved copper (five sites), dissolved iron (three sites), dissolved mercury (two sites), dissolved selenium (two sites), dissolved silver (two sites), and dissolved zinc (five sites). Field dissolved oxygen concentrations were below the minimum CCME FAL guideline level at five (5) of the sampled sites. A summary of CCME FAL guideline exceedances is provided in **Table 3-3**.

Where measured, groundwater turbidity at sampled locations in the Tailings Facility area was less than 50 NTU at the time of sample (**Table 3-2**). Although turbidity was not measured for samples collected directly without purging, field notes indicate that groundwater wells MP09-09 and MW09-01 were extremely turbid at the time of sample collection (visual observation).

3.3 QUALITY ASSURANCE AND QUALITY CONTROL RESULTS

Two (2) duplicate groundwater samples were collected during the February 2016 sampling event. Two (2) travel blanks were provided by the laboratory and accompanied the samples throughout the sampling program, and one (2) field blanks were prepared on site during the sampling program. Detailed results of QA/QC sampling are provided in **Table B**, including RPD values for all duplicate and sample pairs.

3.3.1 Field and Travel Blanks

All travel blank analytical results were reported as less than the RDL with the exception of total ammonia (0.0056 mg/L) which was reported in the travel blank included with the second shipment (**Table B**). The program analytical laboratory (ALS Global) indicated that the detection of low levels of ammonia should not be considered an indication of contamination as low concentrations of ammonia are occasionally detected in travel blanks that are prepared too early in advance of the field program. All other analytical results in both travel blanks were reported below RDL (**Table B**).

All field blank analytical results were reported as less than the RDL (**Table B**).

3.3.2 Field Duplicates

3.3.2.1 MW09-18 and MW16-100

Duplicate and duplicate pair analytical results show that RPD values for nitrate (86.55%), total organic carbon (46.85%), and dissolved cadmium (42.55%) were reported above the acceptable range of variability (i.e. 20%). Field notes/measurements do not identify a potential source of contamination or suggest variability in groundwater quality during the purging process (**Table 3-2**).

All other duplicate and duplicate pair analytical results show that RPD values for samples MW09-18 and MW16-100 were below the 20% RPD threshold limit (**Table B**).

3.3.2.2 MW09-04 and MW16-200

All duplicate and duplicate pair analytical results show that RPD values for samples MW09-04 and MW16-200 were below the 20% RPD threshold limit (**Table B**).

3.3.3 Quality Assurance and Quality Control Summary

Results for the QA/QC analytical program show minimal evidence of sampling variation during the field collection process, and no evidence of contamination during sample collection or transportation.

Travel blank analytical results suggest no external sources of contamination during the transportation process. Although low levels of total ammonia were detected in one of the travel blanks, ALS has indicated that these results do not suggest an external source of contamination.

Overall, across two (2) field blanks, all analytical results were reported as less than the RDL (**Table B**).This suggests that on site sources of contamination have had minimal influence on the program analytical results.

Duplicate and duplicate pair analytical results show some variability in nitrate, total organic carbon, and dissolved cadmium concentrations. Overall, variation of three parameters was observed in only one (1) of two (2) sample duplicate pairs (at Station MW09-18). The most notable variation was observed between nitrate concentrations, resulting in 86.55% RPD between samples MW09-18 and MW16-100. All other parameters were below the 20% RPD threshold limit. Field notes/measurements do not identify a potential source of contamination or suggest variability in groundwater quality during the purging process, and therefore a systematic or site-specific bias is not believed to have occurred (**Table 3-2**). The variation in results observed is considered to be most likely the result of small variations in groundwater quality during sampling, in particular because this site was sampled using disposable bailers, and turbidity at the site was observed to be moderately high (34.1 NTU). Therefore, settling of sediments in the bailer during the sampling process could have contributed to variation in two of the variable parameters that were not field filtered.

4.0 RECOMMENDATIONS

Hemmera/ELR have prepared the following recommendations based on the observations and results of the February 2016 groundwater sampling program.

1. Damaged or degraded wells should be repaired, if possible.

   CH-P-13-02/10, CH-P-13-03/10, and MW09-01 were noted as damaged during the February 2016 and September 2015 sampling events.

   CH-P-13-02/10 was reported as damaged during the time of sampling. Bentonite is present at the bottom of this well and therefore the well status had been listed as damaged. Camera footage obtained at this sample site in July 2015 (Hemmera, 2015b) confirmed the presence of bentonite and filter pack (filter sand) at the bottom of well. Bentonite was also observed seeping in the top portion of the well screen (Hemmera, 2015b). The camera footage from July 2015 suggested that the issue may be the result of improper well installation. Attempts made during the September 2015 event (Hemmera, 2015a) to remove the bentonite plug were unsuccessful. Waterra tubing was lowered into the well to attempt to force the bentonite into the tubing to remove it, however the bentonite was frozen in the well. It is recommended that this method be re-attempted in the late spring or summer of 2016. It should be noted that if bentonite is seeping into the top portion of the well screen, removal of the blockage may only provide a temporary solution.

   Although suspected as frozen during the February 2016 sampling event, sample location CH-P-13-03/10 was dry during previous sampling programs. During a 2014 sampling event, the upper PVC stick-up of this well became detached from the well casing, allowing sand/filter pack material to enter the well. Camera footage obtained in July 2015 (Hemmera, 2015b) from the sample site confirmed the presence of sand at the bottom of the well. Hemmera/ELR recommends that the well be re-developed to remove the sand when conditions allow. The following methods should be considered: 1) Injecting water into the well and using air lift method to clear the well (using air compressor). Well logs should be reviewed prior to implementing this method to assess the hydraulic conductivity of the surrounding formation. A low hydraulic conductivity is required in order to saturate the sand and mobilize using an air compressor. This method may require a substantial volume of water. 2) Use a vacuum truck to remove sand. Vacuum head would need to be small enough to fit in the casing.

   MW09-01 could not be sampled during previous events due to an excessive quantity of tailings present in the groundwater. Although samples were obtained from well MW09-01 during the February 2016 sampling event, groundwater at this location is extremely turbid. The well has a large gash/opening at the top of PVC. Tailings likely enter the well through this opening during periods of high water. The opening at the top of PVC was temporarily sealed during the September 2015 site visit (Hemmera, 2015a) using nitrile gloves and electrical tape. A more permanent fix should be established for this location (such as replacement of the top portion of the PVC well casing). This would require cutting the existing well and adding a coupler, PVC extension, and proper seal or j-plug. This well should also be re-developed to clear debris from the well screen. Due to low volumes and slow recharge it may be necessary to add water to this well in order to suspend the tailing material during the re-development process. Repairs and re-development of this well is recommended for the summer of 2016.

5.0 CLOSURE

We have appreciated the opportunity of working with you on this project and trust that this report is satisfactory to your requirements. Please feel free to contact the undersigned regarding any questions or further information that you may require.

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6.0 REFERENCES

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TABLES

Table A: Groundwater Sampling Analytical Results and CCME Guideline Exceedances for 2015 September Sampling Program

		Site Location	Dome Creek									Mill Complex						
		Sample ID	GSI-DC-01B	GSI-DC-02B [13]	GSI-DC-03B	GSI-DC-05B	GSI-DC-06B	GSI-DC-07B	GSI-DC-08B	GSI-DC-09B	GSI-DC-10B	GSI-HA-01A	GSI-HA-02A	GSI-HA-03A	GSI-HA-04A	GSI-HA-05A	MW09-16	MW09-17
		Date Sampled	01/02/2016	01/02/2016	01/02/2016	02/02/2016	02/02/2016	02/02/2016	02/02/2016	02/02/2016	02/02/2016	01/02/2016	01/02/2016	01/02/2016	01/02/2016	01/02/2016	01/02/2016	01/02/2016
		ALS Work Number	-	L1730670	-	-	-	-	-	-	-	L1730670	-	-	L1730670	-	-	-
		Station Status	Frozen	Direct Sample	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Direct Sample	Frozen	Frozen	Direct Sample	Frozen	Frozen	Frozen
Parameter	Units	CCME-FAL [1,2,3,4]																
Physical Tests																		
Lab pH	pH units	6.5-9.0 [5]	-	8.06	-	-	-	-	-	-	-	-	-	-	7.96	-	-	-
Field pH	pH units	6.5-9.0 [5]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Temperature	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lab Conductivity	uS/cm	-	-	988	-	-	-	-	-	-	-	-	-	-	1170	-	-	-
Field Conductivity	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Specific Conductivity	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Hardness (as CaCO3)	mg/L	-	-	613	-	-	-	-	-	-	-	-	-	-	712	-	-	-
Field Dissolved Oxygen	mg/L	9.5 [6]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Oxidation - Redox Potent	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anions and Nutrients																		
Alkalinity, Total (CaCO3)	mg/L	-	-	291	-	-	-	-	-	-	-	-	-	-	254	-	-	-
Alkalinity, Total (CaCO3, filtered)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	Varies [7]	-	0.149	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia CCME-FAL [7]	*mg/L*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride (Cl)	mg/L	-	-	<1.0	-	-	-	-	-	-	-	-	-	-	<1.0	-	-	-
Fluoride (F)	mg/L	0.12	-	0.061	-	-	-	-	-	-	-	-	-	-	0.061	-	-	-
Nitrate (as N)	mg/L	13	-	0.466	-	-	-	-	-	-	-	-	-	-	<0.010	-	-	-
Nitrite (as N)	mg/L	0.06	-	0.0103	-	-	-	-	-	-	-	-	-	-	0.0031	-	-	-
Total Kjeldahl Nitrogen	mg/L	-	-	1.17	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate (SO4)	mg/L	-	-	300	-	-	-	-	-	-	-	-	-	-	453	-	-	-
Sulphide as S	mg/L	-	-	<0.020	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Sulphide	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anion Sum	meq/L	-	-	12.1	-	-	-	-	-	-	-	-	-	-	14.5	-	-	-
Cation Sum	meq/L	-	-	12.7	-	-	-	-	-	-	-	-	-	-	15.0	-	-	-
Cation - Anion Balance	%	-	-	2.3	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-
Cyanides																		
Cyanide, Total	mg/L	-	-	<0.0050	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide, Free	mg/L	0.005	-	<0.0050	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide, Weak Acid Diss	mg/L	-	-	<0.0050	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thiocyanate (SCN)	mg/L	-	-	<0.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Organic/Inorganic Carbon																		
Total Inorganic Carbon	mg/L	-	-	68.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Organic Carbon	mg/L	-	-	15.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table A: Groundwater Sampling Analytical Results and CCME Guideline Exceedances for 2015 September Sampling Program

		Site Location	Mill Complex		Brown McDade Pit												
		Sample ID	MW09-18	MW09-19	CH-P-13-01/10	CH-P-13-03/10	CH-P-13-03/50	CH-P-13-04/10	CH-P-13-04/35	CH-P-13-05/50	GLL07-01	GLL07-02	GLL07-03	MW09-13	MW09-14	MW09-15	CH-P-13-02/10
		Date Sampled	01/02/2016	01/02/2016	02/02/2016	02/02/2016	02/02/2016	03/02/2016	03/02/2016	-	03/02/2016	03/02/2016	-	03/02/2016	03/02/2016	03/02/2016	02/02/2016
		ALS Work Number	L1730670	L1730670	-	-	L1730670	-	-	-	-	-	-	-	L1731464	-	-
		Station Status	Good	Good	Frozen	Frozen	Direct Sample	Frozen	Frozen	No Access	Frozen	Dry	No Access	Frozen	Direct Sample	Insufficient Volume	Damaged
Parameter	Units	CCME-FAL [1,2,3,4]															
Physical Tests																	
Lab pH	pH units	6.5-9.0 [5]	7.15	7.15	-	-	7.06	-	-	-	-	-	-	-	7.84	-	-
Field pH	pH units	6.5-9.0 [5]	6.76	6.68	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Temperature	C	-	-0.1	-0.3	-	-	-	-	-	-	-	-	-	-	-	-	-
Lab Conductivity	uS/cm	-	2700	1530	-	-	2640	-	-	-	-	-	-	-	1390	-	-
Field Conductivity	uS/cm	-	1356	1116	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Specific Conductivity	uS/cm	-	2608	2157	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Hardness (as CaCO3)	mg/L	-	1940	962	-	-	1780	-	-	-	-	-	-	-	999	-	-
Field Dissolved Oxygen	mg/L	9.5 [6]	2.16	0.52	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Oxidation - Redox Potent	mV	-	127.5	-77.8	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Turbidity	NTU	-	34.1	2.9	-	-	1146.0	-	-	-	-	-	-	-	-	-	-
Anions and Nutrients																	
Alkalinity, Total (CaCO3)	mg/L	-	476	314	-	-	347	-	-	-	-	-	-	-	381	-	-
Alkalinity, Total (CaCO3, filtered)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	Varies [7]	0.0189	2.71	-	-	0.131	-	-	-	-	-	-	-	0.0614	-	-
Ammonia CCME-FAL [7]	*mg/L*	-	*40.46*	*49.47*	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride (Cl)	mg/L	-	<5.0	<2.5	-	-	<5.0	-	-	-	-	-	-	-	3.6	-	-
Fluoride (F)	mg/L	0.12	<0.20	<0.10	-	-	<0.20	-	-	-	-	-	-	-	0.059	-	-
Nitrate (as N)	mg/L	13	0.197	0.743	-	-	2.49	-	-	-	-	-	-	-	1.74	-	-
Nitrite (as N)	mg/L	0.06	<0.010	0.0077	-	-	0.060	-	-	-	-	-	-	-	0.0075	-	-
Total Kjeldahl Nitrogen	mg/L	-	0.229	3.35	-	-	1.36	-	-	-	-	-	-	-	0.635	-	-
Sulfate (SO4)	mg/L	-	1440	630	-	-	1500	-	-	-	-	-	-	-	448	-	-
Sulphide as S	mg/L	-	<0.020	0.042	-	-	<0.020	-	-	-	-	-	-	-	0.032	-	-
Field Sulphide	mg/L	-	0.00	0.12	-	-	0.80	-	-	-	-	-	-	-	-	-	-
Anion Sum	meq/L	-	39.5	19.4	-	-	38.4	-	-	-	-	-	-	-	17.2	-	-
Cation Sum	meq/L	-	39.6	20.4	-	-	37.4	-	-	-	-	-	-	-	22.7	-	-
Cation - Anion Balance	%	-	0.1	2.4	-	-	-1.3	-	-	-	-	-	-	-	13.8	-	-
Cyanides																	
Cyanide, Total	mg/L	-	<0.0050	<0.0050	-	-	<0.0050	-	-	-	-	-	-	-	<0.0050	-	-
Cyanide, Free	mg/L	0.005	<0.0050	<0.0050	-	-	<0.0050	-	-	-	-	-	-	-	<0.0050	-	-
Cyanide, Weak Acid Diss	mg/L	-	<0.0050	<0.0050	-	-	<0.0050	-	-	-	-	-	-	-	<0.0050	-	-
Thiocyanate (SCN)	mg/L	-	<0.50	<0.50	-	-	<0.50	-	-	-	-	-	-	-	<0.50	-	-
Organic/Inorganic Carbon																	
Total Inorganic Carbon	mg/L	-	113	70.2	-	-	91	-	-	-	-	-	-	-	114	-	-
Total Organic Carbon	mg/L	-	6.27	15.3	-	-	18.3	-	-	-	-	-	-	-	8.59	-	-

Table A: Groundwater Sampling Analytical Results and CCME Guideline Exceedances for 2015 September Sampling Program

		Site Location	Pony Creek										Seepage Dam			Tailings Facility			
		Sample ID	GSI-PC-02B	GSI-PC-02B	GSI-PC-03B	GSI-PC-04B	GSI-PC-05B	MP09-01	MP09-02	MP09-02	MP09-03	MP09-08	W14103083BH01	W14103083BH02	W14103083BH04	MP09-04	MP09-05	MP09-09	MP09-10
		Date Sampled	-	-	03/02/2016	03/02/2016	03/02/2016	-	-	03/02/2016	03/02/2016	03/02/2016	02/02/2016	02/02/2016	02/02/2016	02/02/2016	02/02/2016	04/02/2016	04/02/2016
		ALS Work Number	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L1731464	L1731464
		Station Status	Destroyed	Destroyed	Frozen	Frozen	Frozen	Destroyed	Destroyed	Destroyed	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Direct Sample	Direct Sample
Parameter	Units	CCME-FAL[1,2,3,4]																	
Physical Tests																			
Lab pH	pH units	6.5-9.0 [5]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.81	7.78
Field pH	pH units	6.5-9.0 [5]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Temperature	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lab Conductivity	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	702	822
Field Conductivity	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Specific Conductivity	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Hardness (as CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	313	408
Field Dissolved Oxygen	mg/L	9.5 [6]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Oxidation - Redox Potent	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anions and Nutrients																			
Alkalinity, Total (CaCO3)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	79.2	61.9
Alkalinity, Total (CaCO3, filtered)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	Varies [7]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.67	-
Ammonia CCME-FAL [7]	*mg/L*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride (Cl)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.97	2.48
Fluoride (F)	mg/L	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.71	0.924
Nitrate (as N)	mg/L	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0215	0.0632
Nitrite (as N)	mg/L	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0033	0.805
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.81	-
Sulfate (SO4)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	255	341
Sulphide as S	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.020	-
Field Sulphide	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anion Sum	meq/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.07	8.52
Cation Sum	meq/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.17	9.71
Cation - Anion Balance	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	6.6
Cyanides																			
Cyanide, Total	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.10	-
Cyanide, Free	mg/L	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.532	-
Cyanide, Weak Acid Diss	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.604	-
Thiocyanate (SCN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.15	-
Organic/Inorganic Carbon																			
Total Inorganic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.4	-
Total Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	45.2	-

Table A: Groundwater Sampling Analytical Results and CCME Guideline Exceedances for 2015 September Sampling Program

		Site Location	Tailings Facility																	
		Sample ID	MP09-11	MP09-12	MP09-14	MW09-01 [15]	MW09-02	MW09-03	MW09-04	MW09-05	MW09-06 [16]	MW09-07	MW09-08	MW09-11	MW09-20	MW09-21	MW09-22	MW09-23	MW09-24	W14103083BH03
		Date Sampled	04/02/2016	04/02/2016	04/02/2016	03/02/2016	02/02/2016	03/02/2016	03/02/2016	03/02/2016	04/02/2016	04/02/2016	02/02/2016	04/02/2016	02/02/2016	02/02/2016	03/02/2016	03/02/2016	02/02/2016	04/02/2016
		ALS Work Number	-	-	-	L1731464	L1730670	L1731464	L1731464	-	L1731464	-	-	-	-	-	L1731464	L1731464	L1730670	-
		Station Status	Frozen	Frozen	Frozen	Direct Sample	Direct Sample	Good	Good	Frozen	Good	Frozen	Frozen	Frozen	Frozen	Frozen	Direct Sample	Good	Good	Frozen
Parameter	Units	CCME-FAL [1,2,3,4]																		
Physical Tests																				
Lab pH	pH units	6.5-9.0 [5]	-	-	-	7.36	6.78	7.60	8.08	-	7.77	-	-	-	-	-	6.85	7.22	7.46	-
Field pH	pH units	6.5-9.0 [5]	-	-	-	-	7.28	7.45	8.37	-	7.29	-	-	-	-	-	-	7.21	7.23	-
Field Temperature	C	-	-	-	-	-	0.1	0.4	0.3	-	1.6	-	-	-	-	-	-	0.0	0.2	-
Lab Conductivity	uS/cm	-	-	-	-	3000	2660	2650	2680	-	1900	-	-	-	-	-	519	1360	838	-
Field Conductivity	uS/cm	-	-	-	-	-	1463	1431	1467	-	678	-	-	-	-	-	-	716	446	-
Field Specific Conductivity	uS/cm	-	-	-	-	-	2790	2703	2766	-	1209	-	-	-	-	-	-	1372	847	-
Total Hardness (as CaCO3)	mg/L	-	-	-	-	1550	1530	1650	1700	-	1100	-	-	-	-	-	246	788	529	-
Field Dissolved Oxygen	mg/L	9.5 [6]	-	-	-	-	2.68	3.36	3.78	-	2.53	-	-	-	-	-	-	3.30	8.06	-
Field Oxidation - Redox Potent	mV	-	-	-	-	-	-69.3	112.0	191.5	-	159.9	-	-	-	-	-	-	-79.7	224.2	-
Field Turbidity	NTU	-	-	-	-	-	18.8	0.6	3.4	-	16.6	-	-	-	-	-	-	49.1	37.6	-
Anions and Nutrients																				
Alkalinity, Total (CaCO3)	mg/L	-	-	-	-	510	63.4	167	108	-	98.4	-	-	-	-	-	178	319	161	-
Alkalinity, Total (CaCO3, filtered)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	Varies [7]	-	-	-	16.3	10.2	3.43	7.38	-	0.483	-	-	-	-	-	1.15	3.24	0.0083	-
Ammonia CCME-FAL [7]	*mg/L*	-	-	-	-	-	*12.03*	*7.936*	*0.9788*	-	*10.37*	-	-	-	-	-	-	*14.25*	*13.38*	-
Chloride (Cl)	mg/L	-	-	-	-	<5.0	<5.0	<5.0	<5.0	-	<2.5	-	-	-	-	-	<0.50	<1.0	<0.50	-
Fluoride (F)	mg/L	0.12	-	-	-	<0.20	0.47	0.22	0.33	-	0.19	-	-	-	-	-	0.040	0.076	0.029	-
Nitrate (as N)	mg/L	13	-	-	-	<0.050	0.068	0.051	<0.050	-	0.121	-	-	-	-	-	3.79	0.017	2.83	-
Nitrite (as N)	mg/L	0.06	-	-	-	<0.010	<0.010	0.071	<0.010	-	<0.0050	-	-	-	-	-	0.0470	0.0049	<0.0010	-
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	22.5	10.2	3.99	8.10	-	1.03	-	-	-	-	-	13.2	4.00	0.415	-
Sulfate (SO4)	mg/L	-	-	-	-	1220	1720	1640	1740	-	1110	-	-	-	-	-	79.7	503	288	-
Sulphide as S	mg/L	-	-	-	-	<0.020	<0.020	<0.020	<0.020	-	<0.020	-	-	-	-	-	<0.020	0.053	<0.020	-
Field Sulphide	mg/L	-	-	-	-	-	0.04	-	0.03	-	0.05	-	-	-	-	-	-	0.29	0.17	-
Anion Sum	meq/L	-	-	-	-	-	37.1	37.4	38.4	-	25.0	-	-	-	-	-	5.50	16.8	9.42	-
Cation Sum	meq/L	-	-	-	-	-	36.4	36.4	37.3	-	23.5	-	-	-	-	-	6.09	18.5	11.0	-
Cation - Anion Balance	%	-	-	-	-	-	-1.0	-1.4	-1.4	-	-3.3	-	-	-	-	-	5.1	4.7	7.9	-
Cyanides																				
Cyanide, Total	mg/L	-	-	-	-	0.207	0.0207	0.0190	<0.0050	-	<0.0050	-	-	-	-	-	0.021	0.289	0.0077	-
Cyanide, Free	mg/L	0.005	-	-	-	<0.0050	<0.0050	<0.0050	<0.0050	-	<0.0050	-	-	-	-	-	<0.010	<0.0050	<0.0050	-
Cyanide, Weak Acid Diss	mg/L	-	-	-	-	<0.0050	0.0088	<0.0050	<0.0050	-	<0.0050	-	-	-	-	-	<0.010	<0.0050	<0.0050	-
Thiocyanate (SCN)	mg/L	-	-	-	-	23.7	0.62	<0.50	<0.50	-	<0.50	-	-	-	-	-	<0.50	<0.50	<0.50	-
Organic/Inorganic Carbon																				
Total Inorganic Carbon	mg/L	-	-	-	-	130	7.60	41.0	19.8	-	21.5	-	-	-	-	-	47.7	82.2	37.4	-
Total Organic Carbon	mg/L	-	-	-	-	59.8	6.25	6.34	6.00	-	8.18	-	-	-	-	-	266	19.4	6.18	-

Table A: Groundwater Sampling Analytical Results and CCME Guideline Exceedances for 2015 September Sampling Program

	Site Location	Dome Creek									Mill Complex						
	Sample ID	GSI-DC-01B	GSI-DC-02B [13]	GSI-DC-03B	GSI-DC-05B	GSI-DC-06B	GSI-DC-07B	GSI-DC-08B	GSI-DC-09B	GSI-DC-10B	GSI-HA-01A	GSI-HA-02A	GSI-HA-03A	GSI-HA-04A	GSI-HA-05A	MW09-16	MW09-17
	Date Sampled	01/02/2016	01/02/2016	01/02/2016	02/02/2016	02/02/2016	02/02/2016	02/02/2016	02/02/2016	02/02/2016	01/02/2016	01/02/2016	01/02/2016	01/02/2016	01/02/2016	01/02/2016	01/02/2016
	ALS Work Number	-	L1730670	-	-	-	-	-	-	-	L1730670	-	-	L1730670	-	-	-
	Station Status	Frozen	Direct Sample	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Direct Sample	Frozen	Frozen	Direct Sample	Frozen	Frozen	Frozen
Parameter	Units	CCME-FAL [1,2,3,4]															
Dissolved Metals																	
Aluminum (Al)	mg/L	Varies [8]	-	0.0015	-	-	-	-	-	-	-	-	-	0.0100	-	-	-
Aluminum CCME-FAL [8]	*mg/L*	-	-	*0.1*	-	-	-	-	-	-	-	-	-	*0.1*	-	-	-
Antimony (Sb)	mg/L	-	-	0.00057	-	-	-	-	-	-	-	-	-	0.00032	-	-	-
Arsenic (As)	mg/L	0.005	-	0.00325	-	-	-	-	-	-	-	-	-	0.0421	-	-	-
Barium (Ba)	mg/L	-	-	0.119	-	-	-	-	-	-	-	-	-	0.158	-	-	-
Beryllium (Be)	mg/L	-	-	<0.000020	-	-	-	-	-	-	-	-	-	<0.000020	-	-	-
Bismuth (Bi)	mg/L	-	-	<0.000050	-	-	-	-	-	-	-	-	-	<0.000050	-	-	-
Boron (B)	mg/L	1.5	-	0.010	-	-	-	-	-	-	-	-	-	<0.010	-	-	-
Cadmium (Cd)	mg/L	Varies [9]	-	0.0000586	-	-	-	-	-	-	-	-	-	0.0000050	-	-	-
Cadmium CCME-FAL [9]	*mg/L*	-	-	*0.00037*	-	-	-	-	-	-	-	-	-	*0.00037*	-	-	-
Calcium (Ca)	mg/L	-	-	158	-	-	-	-	-	-	-	-	-	180	-	-	-
Chromium (Cr)	mg/L	-	-	0.00022	-	-	-	-	-	-	-	-	-	0.00034	-	-	-
Cobalt (Co)	mg/L	-	-	0.00146	-	-	-	-	-	-	-	-	-	0.00021	-	-	-
Copper (Cu)	mg/L	Varies [10]	-	0.00295	-	-	-	-	-	-	-	-	-	0.00030	-	-	-
Copper CCME-FAL [10]	*mg/L*	-	-	*0.004*	-	-	-	-	-	-	-	-	-	*0.004*	-	-	-
Iron (Fe)	mg/L	0.3	-	0.131	-	-	-	-	-	-	-	-	-	8.26	-	-	-
Lead (Pb)	mg/L	Varies [11]	-	0.000095	-	-	-	-	-	-	-	-	-	0.000256	-	-	-
Lead CCME-FAL [11]	*mg/L*	-	-	*0.007*	-	-	-	-	-	-	-	-	-	*0.007*	-	-	-
Lithium (Li)	mg/L	-	-	0.0019	-	-	-	-	-	-	-	-	-	0.0026	-	-	-
Magnesium (Mg)	mg/L	-	-	53.1	-	-	-	-	-	-	-	-	-	63.6	-	-	-
Manganese (Mn)	mg/L	-	-	2.51	-	-	-	-	-	-	-	-	-	1.77	-	-	-
Mercury (Hg)	mg/L	0.000026	-	<0.0000050	-	-	-	-	-	-	<0.0000050	-	-	<0.0000050	-	-	-
Molybdenum (Mo)	mg/L	0.073	-	0.00333	-	-	-	-	-	-	-	-	-	0.000279	-	-	-
Nickel (Ni)	mg/L	Varies [12]	-	0.0147	-	-	-	-	-	-	-	-	-	0.00071	-	-	-
Nickel CCME-FAL [12]	*mg/L*	-	-	*0.15*	-	-	-	-	-	-	-	-	-	*0.15*	-	-	-
Phosphorus (P)	mg/L	-	-	<0.050	-	-	-	-	-	-	-	-	-	<0.050	-	-	-
Potassium (K)	mg/L	-	-	3.70	-	-	-	-	-	-	-	-	-	2.67	-	-	-
Selenium (Se)	mg/L	0.001	-	0.000054	-	-	-	-	-	-	-	-	-	0.000074	-	-	-
Silicon (Si)	mg/L	-	-	7.81	-	-	-	-	-	-	-	-	-	6.54	-	-	-
Silver (Ag)	mg/L	0.0001	-	<0.000010	-	-	-	-	-	-	-	-	-	<0.000010	-	-	-
Sodium (Na)	mg/L	-	-	5.18	-	-	-	-	-	-	-	-	-	5.15	-	-	-
Strontium (Sr)	mg/L	-	-	0.352	-	-	-	-	-	-	-	-	-	0.507	-	-	-
Sulfur (S)	mg/L	-	-	102	-	-	-	-	-	-	-	-	-	148	-	-	-
Thallium (Tl)	mg/L	0.0008	-	<0.000010	-	-	-	-	-	-	-	-	-	<0.000010	-	-	-
Tin (Sn)	mg/L	-	-	0.00012	-	-	-	-	-	-	-	-	-	0.00077	-	-	-
Titanium (Ti)	mg/L	-	-	<0.00030	-	-	-	-	-	-	-	-	-	0.00072	-	-	-
Uranium (U)	mg/L	0.015	-	0.000562	-	-	-	-	-	-	-	-	-	0.000943	-	-	-
Vanadium (V)	mg/L	-	-	<0.00050	-	-	-	-	-	-	-	-	-	0.00063	-	-	-
Zinc (Zn)	mg/L	0.03	-	0.0111	-	-	-	-	-	-	-	-	-	0.0024	-	-	-
Zirconium (Zr)	mg/L	-	-	<0.00030	-	-	-	-	-	-	-	-	-	<0.00030	-	-	-

Table A: Groundwater Sampling Analytical Results and CCME Guideline Exceedances for 2015 September Sampling Program

		Site Location	Mill Complex		Brown McDade Pit												
		Sample ID	MW09-18	MW09-19	CH-P-13-01/10	CH-P-13-03/10	CH-P-13-03/50	CH-P-13-04/10	CH-P-13-04/35	CH-P-13-05/50	GLL07-01	GLL07-02	GLL07-03	MW09-13	MW09-14	MW09-15	CH-P-13-02/10
		Date Sampled	01/02/2016	01/02/2016	02/02/2016	02/02/2016	02/02/2016	03/02/2016	03/02/2016	-	03/02/2016	03/02/2016	-	03/02/2016	03/02/2016	03/02/2016	02/02/2016
		ALS Work Number	L1730670	L1730670	-	-	L1730670	-	-	-	-	-	-	-	L1731464	-	-
		Station Status	Good	Good	Frozen	Frozen	Direct Sample	Frozen	Frozen	No Access	Frozen	Dry	No Access	Frozen	Direct Sample	Insufficient Volume	Damaged
Parameter	Units	CCME-FAL [1,2,3,4]															
Dissolved Metals																	
Aluminum (Al)	mg/L	Varies [8]	<0.0020	0.0037	-	-	0.0044	-	-	-	-	-	-	-	0.0021	-	-
Aluminum CCME-FAL [8]	*mg/L*	-	*0.1*	*0.1*	-	-	*0.1*	-	-	-	-	-	-	-	*0.1*	-	-
Antimony (Sb)	mg/L	-	0.00043	0.00042	-	-	0.00026	-	-	-	-	-	-	-	0.00020	-	-
Arsenic (As)	mg/L	0.005	0.0519	0.0224	-	-	0.00040	-	-	-	-	-	-	-	0.0134	-	-
Barium (Ba)	mg/L	-	0.00889	0.0305	-	-	0.0390	-	-	-	-	-	-	-	0.0364	-	-
Beryllium (Be)	mg/L	-	<0.000040	<0.000020	-	-	<0.000040	-	-	-	-	-	-	-	<0.000020	-	-
Bismuth (Bi)	mg/L	-	<0.00010	<0.000050	-	-	<0.00010	-	-	-	-	-	-	-	<0.000050	-	-
Boron (B)	mg/L	1.5	<0.020	0.112	-	-	<0.020	-	-	-	-	-	-	-	0.011	-	-
Cadmium (Cd)	mg/L	Varies [9]	0.000057	0.0000435	-	-	0.000181	-	-	-	-	-	-	-	0.0000251	-	-
Cadmium CCME-FAL [9]	*mg/L*	-	*0.00037*	*0.00037*	-	-	*0.00037*	-	-	-	-	-	-	-	*0.00037*	-	-
Calcium (Ca)	mg/L	-	359	217	-	-	450	-	-	-	-	-	-	-	180	-	-
Chromium (Cr)	mg/L	-	<0.00020	0.00033	-	-	<0.00020	-	-	-	-	-	-	-	0.00019	-	-
Cobalt (Co)	mg/L	-	0.00023	0.00194	-	-	0.00071	-	-	-	-	-	-	-	0.00156	-	-
Copper (Cu)	mg/L	Varies [10]	<0.00040	0.00093	-	-	0.00250	-	-	-	-	-	-	-	0.00060	-	-
Copper CCME-FAL [10]	*mg/L*	-	*0.004*	*0.004*	-	-	*0.004*	-	-	-	-	-	-	-	*0.004*	-	-
Iron (Fe)	mg/L	0.3	0.016	3.00	-	-	0.023	-	-	-	-	-	-	-	7.25	-	-
Lead (Pb)	mg/L	Varies [11]	<0.00010	0.000622	-	-	<0.00010	-	-	-	-	-	-	-	0.000130	-	-
Lead CCME-FAL [11]	*mg/L*	-	*0.007*	*0.007*	-	-	*0.007*	-	-	-	-	-	-	-	*0.007*	-	-
Lithium (Li)	mg/L	-	0.0224	0.0076	-	-	0.0032	-	-	-	-	-	-	-	0.0115	-	-
Magnesium (Mg)	mg/L	-	254	102	-	-	158	-	-	-	-	-	-	-	133	-	-
Manganese (Mn)	mg/L	-	0.576	4.75	-	-	0.230	-	-	-	-	-	-	-	1.26	-	-
Mercury (Hg)	mg/L	0.000026	<0.0000050	<0.0000050	-	-	<0.0000050	-	-	-	-	-	-	-	<0.0000050	-	-
Molybdenum (Mo)	mg/L	0.073	<0.00010	0.000270	-	-	0.00047	-	-	-	-	-	-	-	0.000758	-	-
Nickel (Ni)	mg/L	Varies [12]	<0.0010	0.00267	-	-	0.0195	-	-	-	-	-	-	-	0.00248	-	-
Nickel CCME-FAL [12]	*mg/L*	-	*0.15*	*0.15*	-	-	*0.15*	-	-	-	-	-	-	-	*0.15*	-	-
Phosphorus (P)	mg/L	-	<0.050	<0.050	-	-	<0.050	-	-	-	-	-	-	-	0.091	-	-
Potassium (K)	mg/L	-	7.34	6.52	-	-	8.27	-	-	-	-	-	-	-	4.85	-	-
Selenium (Se)	mg/L	0.001	0.00015	0.000166	-	-	0.00733	-	-	-	-	-	-	-	0.000084	-	-
Silicon (Si)	mg/L	-	5.23	6.98	-	-	7.06	-	-	-	-	-	-	-	6.87	-	-
Silver (Ag)	mg/L	0.0001	<0.000020	<0.000010	-	-	<0.000020	-	-	-	-	-	-	-	<0.000010	-	-
Sodium (Na)	mg/L	-	12.2	11.1	-	-	38.3	-	-	-	-	-	-	-	49.5	-	-
Strontium (Sr)	mg/L	-	1.05	0.714	-	-	1.13	-	-	-	-	-	-	-	1.35	-	-
Sulfur (S)	mg/L	-	477	214	-	-	478	-	-	-	-	-	-	-	193	-	-
Thallium (Tl)	mg/L	0.0008	0.000285	<0.000010	-	-	0.000062	-	-	-	-	-	-	-	<0.000010	-	-
Tin (Sn)	mg/L	-	<0.00020	0.00555	-	-	0.00026	-	-	-	-	-	-	-	0.00386	-	-
Titanium (Ti)	mg/L	-	<0.00060	0.00033	-	-	<0.00060	-	-	-	-	-	-	-	<0.00030	-	-
Uranium (U)	mg/L	0.015	0.00802	0.000557	-	-	0.0106	-	-	-	-	-	-	-	0.0193	-	-
Vanadium (V)	mg/L	-	<0.0010	<0.00050	-	-	<0.0010	-	-	-	-	-	-	-	0.00067	-	-
Zinc (Zn)	mg/L	0.03	0.0034	0.0126	-	-	0.0237	-	-	-	-	-	-	-	0.0026	-	-
Zirconium (Zr)	mg/L	-	<0.00060	<0.00030	-	-	<0.00060	-	-	-	-	-	-	-	0.00073	-	-

Table A: Groundwater Sampling Analytical Results and CCME Guideline Exceedances for 2015 September Sampling Program

		Site Location	Pony Creek										Seepage Dam			Tailings Facility			
		Sample ID	GSI-PC-02B	GSI-PC-02B	GSI-PC-03B	GSI-PC-04B	GSI-PC-05B	MP09-01	MP09-02	MP09-02	MP09-03	MP09-08	W14103083BH01	W14103083BH02	W14103083BH04	MP09-04	MP09-05	MP09-09	MP09-10
		Date Sampled	-	-	03/02/2016	03/02/2016	03/02/2016	-	-	03/02/2016	03/02/2016	03/02/2016	02/02/2016	02/02/2016	02/02/2016	02/02/2016	02/02/2016	04/02/2016	04/02/2016
		ALS Work Number	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L1731464	L1731464
		Station Status	Destroyed	Destroyed	Frozen	Frozen	Frozen	Destroyed	Destroyed	Destroyed	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Direct Sample	Direct Sample
Parameter	Units	CCME-FAL [1,2,3,4]																	
Dissolved Metals																			
Aluminum (Al)	mg/L	Varies [8]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0039	0.0024
Aluminum CCME-FAL [8]	*mg/L*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*0.1*	*0.1*
Antimony (Sb)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0941	0.0890
Arsenic (As)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17.0	6.26
Barium (Ba)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00103	0.0101
Beryllium (Be)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000040	<0.000020
Bismuth (Bi)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.000050
Boron (B)	mg/L	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.163	0.188
Cadmium (Cd)	mg/L	Varies [9]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000179	0.000688
Cadmium CCME-FAL [9]	*mg/L*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*0.00037*	*0.00037*
Calcium (Ca)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	124	161
Chromium (Cr)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00020	<0.00010
Cobalt (Co)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0534	0.0328
Copper (Cu)	mg/L	Varies [10]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.578	0.0469
Copper CCME-FAL [10]	*mg/L*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*0.004*	*0.004*
Iron (Fe)	mg/L	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.192	0.057
Lead (Pb)	mg/L	Varies [11]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00076	0.000603
Lead CCME-FAL [11]	*mg/L*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*0.007*	*0.007*
Lithium (Li)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0020	0.0011
Magnesium (Mg)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.86	1.57
Manganese (Mn)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0182	0.190
Mercury (Hg)	mg/L	0.000026	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0000328	0.0000881
Molybdenum (Mo)	mg/L	0.073	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0216	0.0180
Nickel (Ni)	mg/L	Varies [12]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0276	0.00889
Nickel CCME-FAL [12]	*mg/L*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*0.15*	*0.15*
Phosphorus (P)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.333	0.255
Potassium (K)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.0	11.2
Selenium (Se)	mg/L	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00103	0.00156
Silicon (Si)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.81	6.31
Silver (Ag)	mg/L	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0193	0.00272
Sodium (Na)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28.6	28.9
Strontium (Sr)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.189	0.269
Sulfur (S)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	92.4	125
Thallium (Tl)	mg/L	0.0008	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000053	0.000118
Tin (Sn)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00020	0.00016
Titanium (Ti)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00060	<0.00030
Uranium (U)	mg/L	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00134	0.00142
Vanadium (V)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0010	<0.00050
Zinc (Zn)	mg/L	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0020	0.0094
Zirconium (Zr)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00060	<0.00030

Table A: Groundwater Sampling Analytical Results and CCME Guideline Exceedances for 2015 September Sampling Program

		Site Location	Tailings Facility																	
		Sample ID	MP09-11	MP09-12	MP09-14	MW09-01 [15]	MW09-02	MW09-03	MW09-04	MW09-05	MW09-06 [16]	MW09-07	MW09-08	MW09-11	MW09-20	MW09-21	MW09-22	MW09-23	MW09-24	W14103083BH03
		Date Sampled	04/02/2016	04/02/2016	04/02/2016	03/02/2016	02/02/2016	03/02/2016	03/02/2016	03/02/2016	04/02/2016	04/02/2016	02/02/2016	04/02/2016	02/02/2016	02/02/2016	03/02/2016	03/02/2016	02/02/2016	04/02/2016
		ALS Work Number	-	-	-	L1731464	L1730670	L1731464	L1731464	-	L1731464	-	-	-	-	-	L1731464	L1731464	L1730670	-
		Station Status	Frozen	Frozen	Frozen	Direct Sample	Direct Sample	Good	Good	Frozen	Good	Frozen	Frozen	Frozen	Frozen	Frozen	Direct Sample	Good	Good	Frozen
Parameter	Units	CCME-FAL [1,2,3,4]																		
Dissolved Metals																				
Aluminum (Al)	mg/L	Varies [8]	-	-	-	0.0151	0.0020	0.0061	<0.0020	-	0.0023	-	-	-	-	-	0.0307	0.0357	0.0029	-
Aluminum CCME-FAL [8]	*mg/L*	-	-	-	-	*0.1*	*0.1*	*0.1*	*0.1*	-	*0.1*	-	-	-	-	-	*0.1*	*0.1*	*0.1*	-
Antimony (Sb)	mg/L	-	-	-	-	0.0219	0.00396	0.521	0.273	-	0.250	-	-	-	-	-	0.00026	0.00023	0.00018	-
Arsenic (As)	mg/L	0.005	-	-	-	0.0989	15.0	1.66	3.84	-	0.211	-	-	-	-	-	0.00326	0.0284	0.00134	-
Barium (Ba)	mg/L	-	-	-	-	0.0319	0.00625	0.0291	0.00977	-	0.00968	-	-	-	-	-	0.0493	0.0419	0.176	-
Beryllium (Be)	mg/L	-	-	-	-	0.000072	<0.000040	<0.00010	<0.000040	-	<0.000040	-	-	-	-	-	<0.000020	0.000042	<0.000020	-
Bismuth (Bi)	mg/L	-	-	-	-	<0.00010	<0.00010	<0.00025	<0.00010	-	<0.00010	-	-	-	-	-	<0.000050	<0.00010	<0.000050	-
Boron (B)	mg/L	1.5	-	-	-	0.126	0.075	0.185	0.270	-	0.101	-	-	-	-	-	0.032	0.105	0.012	-
Cadmium (Cd)	mg/L	Varies [9]	-	-	-	0.0122	0.000446	0.00121	0.000026	-	0.00513	-	-	-	-	-	0.0000246	0.000045	0.0000535	-
Cadmium CCME-FAL [9]	*mg/L*	-	-	-	-	*0.00037*	*0.00037*	*0.00037*	*0.00037*	-	*0.00037*	-	-	-	-	-	*0.00033*	*0.00037*	*0.00037*	-
Calcium (Ca)	mg/L	-	-	-	-	530	480	520	484	-	358	-	-	-	-	-	85.5	198	153	-
Chromium (Cr)	mg/L	-	-	-	-	0.00020	<0.00020	<0.00050	<0.00020	-	0.00036	-	-	-	-	-	0.00058	0.00045	0.00027	-
Cobalt (Co)	mg/L	-	-	-	-	0.0279	0.0106	0.00307	0.00101	-	0.00165	-	-	-	-	-	0.00412	0.0151	0.00030	-
Copper (Cu)	mg/L	Varies [10]	-	-	-	0.00870	<0.00040	0.0010	<0.00040	-	0.00761	-	-	-	-	-	0.00287	<0.00040	0.00519	-
Copper CCME-FAL [10]	*mg/L*	-	-	-	-	*0.004*	*0.004*	*0.004*	*0.004*	-	*0.004*	-	-	-	-	-	*0.004*	*0.004*	*0.004*	-
Iron (Fe)	mg/L	0.3	-	-	-	0.016	24.9	0.057	<0.010	-	<0.010	-	-	-	-	-	4.09	13.1	<0.010	-
Lead (Pb)	mg/L	Varies [11]	-	-	-	0.00516	0.00021	<0.00025	0.00029	-	0.00058	-	-	-	-	-	0.000078	<0.00010	<0.000050	-
Lead CCME-FAL [11]	*mg/L*	-	-	-	-	*0.007*	*0.007*	*0.007*	*0.007*	-	*0.007*	-	-	-	-	-	*0.007*	*0.007*	*0.007*	-
Lithium (Li)	mg/L	-	-	-	-	0.0032	0.0158	<0.0050	0.0102	-	0.0087	-	-	-	-	-	<0.0010	<0.0020	<0.0010	-
Magnesium (Mg)	mg/L	-	-	-	-	55.9	81.4	86.4	120	-	50.5	-	-	-	-	-	7.81	71.5	36.0	-
Manganese (Mn)	mg/L	-	-	-	-	13.7	21.3	32.9	7.01	-	5.33	-	-	-	-	-	1.89	15.9	0.00060	-
Mercury (Hg)	mg/L	0.000026	-	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050	-	<0.0000050	-	-	-	-	-	0.0000067	<0.0000050	<0.0000050	-
Molybdenum (Mo)	mg/L	0.073	-	-	-	0.00234	0.00623	0.00435	0.00589	-	0.00513	-	-	-	-	-	0.000180	0.00242	0.000292	-
Nickel (Ni)	mg/L	Varies [12]	-	-	-	0.0071	0.0030	<0.0025	<0.0010	-	0.0014	-	-	-	-	-	0.00063	<0.0010	<0.00050	-
Nickel CCME-FAL [12]	*mg/L*	-	-	-	-	*0.15*	*0.15*	*0.15*	*0.15*	-	*0.15*	-	-	-	-	-	*0.15*	*0.15*	*0.15*	-
Phosphorus (P)	mg/L	-	-	-	-	<0.050	<0.050	0.053	0.096	-	<0.050	-	-	-	-	-	<0.050	<0.050	<0.050	-
Potassium (K)	mg/L	-	-	-	-	15.5	43.6	22.6	43.3	-	18.1	-	-	-	-	-	3.00	7.79	1.74	-
Selenium (Se)	mg/L	0.001	-	-	-	0.00018	<0.00010	<0.00025	<0.00010	-	<0.00010	-	-	-	-	-	0.000121	<0.00010	0.000841	-
Silicon (Si)	mg/L	-	-	-	-	6.95	7.07	13.6	14.5	-	6.59	-	-	-	-	-	4.46	6.37	6.94	-
Silver (Ag)	mg/L	0.0001	-	-	-	0.000068	<0.000020	<0.000050	<0.000020	-	0.000062	-	-	-	-	-	0.000046	<0.000020	<0.000010	-
Sodium (Na)	mg/L	-	-	-	-	156	40.0	29.6	32.6	-	17.5	-	-	-	-	-	16.8	23.7	9.51	-
Strontium (Sr)	mg/L	-	-	-	-	1.23	0.950	1.38	1.36	-	0.716	-	-	-	-	-	0.266	0.530	0.555	-
Sulfur (S)	mg/L	-	-	-	-	523	551	535	547	-	339	-	-	-	-	-	26.1	173	114	-
Thallium (Tl)	mg/L	0.0008	-	-	-	0.000791	0.000161	0.000077	0.000138	-	0.000397	-	-	-	-	-	<0.000010	<0.000020	<0.000010	-
Tin (Sn)	mg/L	-	-	-	-	<0.00020	<0.00020	<0.00050	<0.00020	-	0.00071	-	-	-	-	-	<0.00010	<0.00020	<0.00010	-
Titanium (Ti)	mg/L	-	-	-	-	<0.00060	<0.00060	<0.0015	<0.00060	-	<0.00060	-	-	-	-	-	<0.0015	0.00135	<0.00030	-
Uranium (U)	mg/L	0.015	-	-	-	0.00273	0.000866	0.00219	0.000297	-	0.00117	-	-	-	-	-	0.000259	0.00189	0.00170	-
Vanadium (V)	mg/L	-	-	-	-	<0.0010	<0.0010	<0.0025	<0.0010	-	<0.0010	-	-	-	-	-	0.00077	0.0024	<0.00050	-
Zinc (Zn)	mg/L	0.03	-	-	-	0.968	0.239	0.0061	0.0931	-	0.0879	-	-	-	-	-	0.0126	0.0916	0.0027	-
Zirconium (Zr)	mg/L	-	-	-	-	<0.00060	<0.00060	<0.0015	<0.00060	-	<0.00060	-	-	-	-	-	0.00038	0.00069	<0.00030	-

Table B: QA/QC Analytical Data

		Site Location	MW09-18			MW09-04			Field Blanks		Travel Blanks	
		Sample ID	MW16-100	MW09-18		MW16-200	MW09-04		FB16-100	FB16-200	TRAVEL_BLANK	TRAVEL_BLANK
		Date Sampled	01/02/2016	01/02/2016		03/02/2016	03/02/2016		01/02/2016	02/02/2016	02/02/2016	04/02/2016
		ALS Work Number	L1730670	L1730670		L1731464	L1731464		L1730670	L1730670	L1730670	L1731464
		Sample Type	Duplicate	Monitoring	RPD (%) [14]	Duplicate	Monitoring	RPD (%) [14]	Field Blank	Field Blank	Travel Blank	Travel Blank
		Station Status	Good	Good		Good	Good		-	-	-	-
Parameter	Units	CCME-FAL [1, 2, 3, 4]										
Physical Tests												
Lab pH	pH units	6.5-9.0 [5]	7.10	7.15	0.70	8.09	8.08	0.12	5.46	5.39	5.41	5.39
Field pH	pH units	6.5-9.0 [5]	6.76	6.76	-	8.37	8.37	-	-	-	-	-
Field Temperature	C	-	-0.1	-0.1	-	0.3	0.3	-	-	-	-	-
Lab Conductivity	uS/cm	-	2780	2700	2.92	2710	2680	1.11	<2.0	<2.0	<2.0	<2.0
Field Conductivity	uS/cm	-	1356	1356	-	1467	1467	-	-	-	-	-
Field Specific Conductivity	uS/cm	-	2608	2608	-	2766	2766	-	-	-	-	-
Total Hardness (as CaCO3)	mg/L	-	1930	1940	0.52	1710	1700	0.59	<0.50	<0.50	<0.50	<0.50
Field Dissolved Oxygen	mg/L	9.5 [6]	2.16	2.16	-	3.78	3.78	-	-	-	-	-
Field Oxidation - Redox Potent	mV	-	127.5	127.5	-	191.5	191.5	-	-	-	-	-
Field Turbidity	NTU	-	34.1	34.1	-	3.4	3.4	-	-	-	-	-
Anions and Nutrients												
Alkalinity, Total (CaCO3)	mg/L	-	498	476	4.52	106	108	1.87	<1.0	<1.0	<1.0	<1.0
Alkalinity, Total (CaCO3, filtered)	mg/L	-	-	-	-	-	-	-	-	-	-	-
Ammonia, Total (as N)	mg/L	Varies [7]	0.0225	0.0189	17.39	7.38	7.38	0.00	<0.0050	<0.0050	<0.0050	**0.0056**
Ammonia CCME-FAL [7]	*mg/L*	-	*40.46*	*40.46*	-	*0.9788*	*0.9788*	-	-	-	-	-
Chloride (Cl)	mg/L	-	<5.0	<5.0	nc	<5.0	<5.0	nc	<0.50	<0.50	<0.50	<0.50
Fluoride (F)	mg/L	0.12	<0.20	<0.20	nc	0.30	0.33	9.52	<0.020	<0.020	<0.020	<0.020
Nitrate (as N)	mg/L	13	0.078	0.197	***86.55***	<0.050	<0.050	nc	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	mg/L	0.06	<0.010	<0.010	nc	<0.010	<0.010	nc	<0.0010	<0.0010	<0.0010	<0.0010
Total Kjeldahl Nitrogen	mg/L	-	0.189	0.229	19.14	7.93	8.10	2.12	<0.050	<0.050	<0.050	<0.050
Sulfate (SO4)	mg/L	-	1450	1440	0.69	1720	1740	1.16	<0.30	<0.30	<0.30	<0.30
Sulphide as S	mg/L	-	<0.020	<0.020	nc	<0.020	<0.020	nc	<0.020	<0.020	<0.020	<0.020
Field Sulphide	mg/L	-	0.00	0.00	-	0.03	0.03	-	-	-	-	-
Anion Sum	meq/L	-	40.0	39.5	1.26	37.9	38.4	1.31	<0.10	<0.10	<0.10	<0.10
Cation Sum	meq/L	-	39.2	39.6	1.02	37.3	37.3	0.00	<0.10	<0.10	<0.10	<0.10
Cation - Anion Balance	%	-	-1.0	0.1	-	-0.8	-1.4	-	0.0	0.0	0.0	0.0
Cyanides												
Cyanide, Total	mg/L	-	<0.0050	<0.0050	nc	<0.0050	<0.0050	nc	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide, Free	mg/L	0.005	<0.0050	<0.0050	nc	<0.0050	<0.0050	nc	<0.0050	<0.0050	<0.0050	<0.0050
Cyanide, Weak Acid Diss	mg/L	-	<0.0050	<0.0050	nc	<0.0050	<0.0050	nc	<0.0050	<0.0050	<0.0050	<0.0050
Thiocyanate (SCN)	mg/L	-	<0.50	<0.50	nc	<0.50	<0.50	nc	<0.50	<0.50	<0.50	<0.50
Organic/Inorganic Carbon												
Total Inorganic Carbon	mg/L	-	108	113	4.52	21.3	19.8	7.30	<0.50	<0.50	<0.50	<0.50
Total Organic Carbon	mg/L	-	3.89	6.27	***46.85***	5.96	6.00	0.67	<0.50	<0.50	<0.50	<0.50

Table B: QA/QC Analytical Data

		Site Location	MW09-18			MW09-04			Field Blanks		Travel Blanks	
		Sample ID	MW16-100	MW09-18		MW16-200	MW09-04		FB16-100	FB16-200	TRAVEL_BLANK	TRAVEL_BLANK
		Date Sampled	01/02/2016	01/02/2016		03/02/2016	03/02/2016		01/02/2016	02/02/2016	02/02/2016	04/02/2016
		ALS Work Number	L1730670	L1730670		L1731464	L1731464		L1730670	L1730670	L1730670	L1731464
		Sample Type	Duplicate	Monitoring	RPD (%) [14]	Duplicate	Monitoring	RPD (%) [14]	Field Blank	Field Blank	Travel Blank	Travel Blank
		Station Status	Good	Good		Good	Good		-	-	-	-
Parameter	Units	CCME-FAL [1, 2, 3, 4]										
Dissolved Metals												
Aluminum (Al)	mg/L	Varies [8]	<0.0020	<0.0020	nc	<0.0020	<0.0020	nc	<0.0010	<0.0010	-	-
Aluminum CCME-FAL [8]	*mg/L*	-	*0.1*	*0.1*	-	*0.1*	*0.1*	-	-	-	-	-
Antimony (Sb)	mg/L	-	0.00041	0.00043	4.76	0.269	0.273	1.48	<0.00010	<0.00010	-	-
Arsenic (As)	mg/L	0.005	0.0501	0.0519	3.53	3.88	3.84	1.04	<0.00010	<0.00010	-	-
Barium (Ba)	mg/L	-	0.00894	0.00889	0.56	0.0101	0.00977	3.32	<0.000050	<0.000050	-	-
Beryllium (Be)	mg/L	-	<0.000040	<0.000040	nc	<0.000040	<0.000040	nc	<0.000020	<0.000020	-	-
Bismuth (Bi)	mg/L	-	<0.00010	<0.00010	nc	<0.00010	<0.00010	nc	<0.000050	<0.000050	-	-
Boron (B)	mg/L	1.5	<0.020	<0.020	nc	0.267	0.270	1.12	<0.010	<0.010	-	-
Cadmium (Cd)	mg/L	Varies [9]	0.000037	0.000057	***42.55***	0.000029	0.000026	10.91	<0.0000050	<0.0000050	-	-
Cadmium CCME-FAL [9]	*mg/L*	-	*0.00037*	*0.00037*	-	*0.00037*	*0.00037*	-	-	-	-	-
Calcium (Ca)	mg/L	-	359	359	0.00	486	484	0.41	<0.050	<0.050	-	-
Chromium (Cr)	mg/L	-	<0.00020	<0.00020	nc	<0.00020	<0.00020	nc	<0.00010	<0.00010	-	-
Cobalt (Co)	mg/L	-	0.00024	0.00023	4.26	0.00101	0.00101	0.00	<0.00010	<0.00010	-	-
Copper (Cu)	mg/L	Varies [10]	<0.00040	<0.00040	nc	<0.00040	<0.00040	nc	<0.00020	<0.00020	-	-
Copper CCME-FAL [10]	*mg/L*	-	*0.004*	*0.004*	-	*0.004*	*0.004*	-	-	-	-	-
Iron (Fe)	mg/L	0.3	0.019	0.016	17.14	<0.010	<0.010	nc	<0.010	<0.010	-	-
Lead (Pb)	mg/L	Varies [11]	<0.00010	<0.00010	nc	0.00028	0.00029	3.51	<0.000050	<0.000050	-	-
Lead CCME-FAL [11]	*mg/L*	-	*0.007*	*0.007*	-	*0.007*	*0.007*	-	-	-	-	-
Lithium (Li)	mg/L	-	0.0224	0.0224	0.00	0.0105	0.0102	2.90	<0.0010	<0.0010	-	-
Magnesium (Mg)	mg/L	-	250	254	1.59	119	120	0.84	<0.10	<0.10	-	-
Manganese (Mn)	mg/L	-	0.577	0.576	0.17	6.89	7.01	1.73	<0.00010	<0.00010	-	-
Mercury (Hg)	mg/L	0.000026	<0.0000050	<0.0000050	nc	<0.0000050	<0.0000050	nc	<0.0000050	<0.0000050	-	-
Molybdenum (Mo)	mg/L	0.073	<0.00010	<0.00010	nc	0.00563	0.00589	4.51	<0.000050	<0.000050	-	-
Nickel (Ni)	mg/L	Varies [12]	<0.0010	<0.0010	nc	<0.0010	<0.0010	nc	<0.00050	<0.00050	-	-
Nickel CCME-FAL [12]	*mg/L*	-	*0.15*	*0.15*	-	*0.15*	*0.15*	-	-	-	-	-
Phosphorus (P)	mg/L	-	<0.050	<0.050	nc	0.090	0.096	6.45	<0.050	<0.050	-	-
Potassium (K)	mg/L	-	7.37	7.34	0.41	41.3	43.3	4.73	<0.10	<0.10	-	-
Selenium (Se)	mg/L	0.001	0.00014	0.00015	6.90	<0.00010	<0.00010	nc	<0.000050	<0.000050	-	-
Silicon (Si)	mg/L	-	5.30	5.23	1.33	14.4	14.5	0.69	<0.050	<0.050	-	-
Silver (Ag)	mg/L	0.0001	<0.000020	<0.000020	nc	<0.000020	<0.000020	nc	<0.000010	<0.000010	-	-
Sodium (Na)	mg/L	-	12.4	12.2	1.63	31.9	32.6	2.17	<0.050	<0.050	-	-
Strontium (Sr)	mg/L	-	1.05	1.05	0.00	1.35	1.36	0.74	<0.00020	<0.00020	-	-
Sulfur (S)	mg/L	-	474	477	0.63	546	547	0.18	<0.50	<0.50	-	-
Thallium (Tl)	mg/L	0.0008	0.000269	0.000285	5.78	0.000127	0.000138	8.30	<0.000010	<0.000010	-	-
Tin (Sn)	mg/L	-	0.00021	<0.00020	nc	<0.00020	<0.00020	nc	<0.00010	<0.00010	-	-
Titanium (Ti)	mg/L	-	<0.00060	<0.00060	nc	<0.00060	<0.00060	nc	<0.00030	<0.00030	-	-
Uranium (U)	mg/L	0.015	0.00789	0.00802	1.63	0.000287	0.000297	3.42	<0.000010	<0.000010	-	-
Vanadium (V)	mg/L	-	<0.0010	<0.0010	nc	<0.0010	<0.0010	nc	<0.00050	<0.00050	-	-
Zinc (Zn)	mg/L	0.03	0.0032	0.0034	6.06	0.0943	0.0931	1.28	<0.0010	<0.0010	-	-
Zirconium (Zr)	mg/L	-	<0.00060	<0.00060	nc	<0.00060	<0.00060	nc	<0.00030	<0.00030	-	-

Table B: QA/QC Analytical Data

		Site Location	MW09-18			MW09-04			Field Blanks		Travel Blanks	
		Sample ID	MW16-100	MW09-18		MW16-200	MW09-04		FB16-100	FB16-200	TRAVEL_BLANK	TRAVEL_BLANK
		Date Sampled	01/02/2016	01/02/2016		03/02/2016	03/02/2016		01/02/2016	02/02/2016	02/02/2016	04/02/2016
		ALS Work Number	L1730670	L1730670		L1731464	L1731464		L1730670	L1730670	L1730670	L1731464
		Sample Type	Duplicate	Monitoring	RPD (%) [14]	Duplicate	Monitoring	RPD (%) [14]	Field Blank	Field Blank	Travel Blank	Travel Blank
		Station Status	Good	Good		Good	Good		-	-	-	-
Parameter	Units	CCME-FAL [1, 2, 3, 4]										
Total Metals												
Aluminum (Al)	mg/L	Varies [8]	-	-	-	-	-	-	-	-	<0.0030	<0.0030
Aluminum CCME-FAL [8]	*mg/L*	-	-	-	-	-	-	-	-	-	-	-
Antimony (Sb)	mg/L	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Arsenic (As)	mg/L	0.005	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Barium (Ba)	mg/L	-	-	-	-	-	-	-	-	-	<0.000050	<0.000050
Beryllium (Be)	mg/L	-	-	-	-	-	-	-	-	-	<0.000020	<0.000020
Bismuth (Bi)	mg/L	-	-	-	-	-	-	-	-	-	<0.000050	<0.000050
Boron (B)	mg/L	1.5	-	-	-	-	-	-	-	-	<0.010	<0.010
Cadmium (Cd)	mg/L	Varies [9]	-	-	-	-	-	-	-	-	<0.0000050	<0.0000050
Cadmium CCME-FAL [9]	*mg/L*	-	-	-	-	-	-	-	-	-	-	-
Calcium (Ca)	mg/L	-	-	-	-	-	-	-	-	-	<0.050	<0.050
Chromium (Cr)	mg/L	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Cobalt (Co)	mg/L	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Copper (Cu)	mg/L	Varies [10]	-	-	-	-	-	-	-	-	<0.00050	<0.00050
Copper CCME-FAL [10]	*mg/L*	-	-	-	-	-	-	-	-	-	-	-
Lead (Pb)	mg/L	Varies [11]	-	-	-	-	-	-	-	-	<0.000050	<0.000050
Lead CCME-FAL [11]	*mg/L*	-	-	-	-	-	-	-	-	-	-	-
Lithium (Li)	mg/L	-	-	-	-	-	-	-	-	-	<0.0010	<0.0010
Magnesium (Mg)	mg/L	-	-	-	-	-	-	-	-	-	<0.10	<0.10
Manganese (Mn)	mg/L	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Mercury (Hg)	mg/L	0.000026	-	-	-	-	-	-	-	-	<0.0000050	<0.0000050
Molybdenum (Mo)	mg/L	0.073	-	-	-	-	-	-	-	-	<0.000050	<0.000050
Nickel (Ni)	mg/L	Varies [12]	-	-	-	-	-	-	-	-	<0.00050	<0.00050
Nickel CCME-FAL [12]	*mg/L*	-	-	-	-	-	-	-	-	-	-	-
Phosphorus (P)	mg/L	-	-	-	-	-	-	-	-	-	<0.050	<0.050
Potassium (K)	mg/L	-	-	-	-	-	-	-	-	-	<0.10	<0.10
Selenium (Se)	mg/L	0.001	-	-	-	-	-	-	-	-	<0.000050	<0.000050
Silicon (Si)	mg/L	-	-	-	-	-	-	-	-	-	<0.050	<0.050
Silver (Ag)	mg/L	0.0001	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Sodium (Na)	mg/L	-	-	-	-	-	-	-	-	-	<0.050	<0.050
Strontium (Sr)	mg/L	-	-	-	-	-	-	-	-	-	<0.00020	<0.00020
Thallium (Tl)	mg/L	0.0008	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Tin (Sn)	mg/L	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Titanium (Ti)	mg/L	-	-	-	-	-	-	-	-	-	<0.00030	<0.00030
Uranium (U)	mg/L	0.015	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Vanadium (V)	mg/L	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050
Zinc (Zn)	mg/L	0.03	-	-	-	-	-	-	-	-	<0.0030	<0.0030
Zirconium (Zr)	mg/L	-	-	-	-	-	-	-	-	-	<0.00030	<0.00030

Notes

(1) CCME guideline exceedences shaded with dark grey. Light grey shading denotes reportable detection limit in exceedance of CCME Guideline. Where guideline value is dependent on hardness or pH, reported values have been compared against a guideline value calculated for each site based on the relevant value, and the guideline value has been noted as "varies".

(2) - = No standard or not analyzed

(3) CCME = Canadian Council of Ministers of the Environment, Canadian Environmental Quality Guidelines, 1999, updated to November 2014

(4) CCME FAL = Chapter 4, Canadian Water Quality Guidelines for the Protection of Aquatic Life, Freshwater, updated to November 2014

(5) CCME FAL stipulates pH not < 6.5 and not > 9

(6) Guideline note: Lowest acceptable dissolved oxygen concentration for cold-water biota, early life stages

(7) Ammonia varies with pH and temperature for CCME FAL; see the CCME ammonia fact sheet for details regarding the applicable criteria, ammonia-NH3 versus total ammonia-N,and other usage guidelines. CCME values listed in the table are expressed as ammonia (N) When field pH is not available, lab pH is used. When field and lab pH are both not available, the most stringent guideline has been used. If field temperature is not available ammonia standards can not be calculated.

(8) Aluminum varies with pH as follows for CCME FAL:

0.005	if	pH<6.5
0.1	if	pH>=6.5

when field pH is not available, lab pH is used. When field and lab pH are both not available, the most stringent guideline has been used.

(9) Cadmium varies with Hardness in mg/L as follows for CCME FAL:

0.00	if	H<17
0.00004 - 0.00037	if	H>=17 and H<=280 as follows; CWQG (µg/L) = 10{0.83(log[hardness]) – 2.46 }
0.00	if	H>280

(10) Copper varies with Hardness in mg/L as follows for CCME FAL:

0.002	if	H<82
0.002 - 0.004	if	H>=82 and H<=180 as follows; CWQG (µg/L) = 0.2 * e{0.8545[ln(hardness)]-1.465}
0.004	if	H>180

(11) Lead varies with Hardness in mg/L as follows for CCME FAL:

0.001	if	H<60
.001 - 0.00	if	H>=60 and H<=180 as follows; CWQG (µg/L)= e{1.273[ln(hardness)]-4.705}
0.007	if	H>180

(12) Nickel varies with Hardness in mg/L as follows for CCME FAL:

0.025	if	H<60
025 - 0.15	if	H>=60 and H<=180 as follows; CWQG (µg/L) = e{0.76[ln(hardness)]+1.06}
0.15	if	H>180

(13) Due to slow recharge and low well volumes, samples were collected from GSI-DC-02B between February 1 - February 2, 2016. Thiocyanate, TIC, and sulphide were collected on February 2, 2016. All other parameters were collected on February 1, 2016.

(14) RPD = Relative Percent Difference. The difference between a sample and its field duplicate over the average of two values. *nc* = not calculated. RPD is not calculated if either the sample or the field duplicate concentration is less than five times the detection limit.

(15) Due to slow recharge and low well volumes, samples were collected from MW09-01 between February 2 - February 3, 2016. Total hardness and dissolved metals were collected on February 2, 2016. All other parameters were collected on February 3, 2016.

(16) Due to slow recharge and low well volumes, field parameters were measured for well MW09-06 on February 3, 2016. All laboratory samples were collected on February 4, 2016.

Bold and underlined indicates values above RDL in Field Blank or Travel Blank

Bold and Italic Indicates QAQC values exceed expected results (i.e. RDP values exceed 20%).

APPENDIX A
Site Photographs

Photo 1: View of drive point wells GSI-DC-01A and GSI-DC-01B. Photo taken on February 1, 2016.

Photo 2: View of drive point wells GSI-DC-02A and GSI-DC-02B. Photo taken on February 1, 2016.

Photo 3: View of drive point wells GSI-DC-03A and GSI-DC-03B. Photo taken on February 1, 2016.

Photo 4: General location of drive point wells GSI-DC-05A and GSI-DC-05B. Photo taken on February 2, 2016.

Photo 5: View of drive point wells GSI-DC-06A and GSI-DC-06B. Photo taken on February 2, 2016.

Photo 6: General location of drive point wells GSI-DC-07A and GSI-DC-07B. Photo taken on February 2, 2016.

Photo 7: General location of drive point wells GSI-DC-08A and GSI-DC-08B. Photo taken on February 2, 2016.

Photo 8: View of drive point wells GSI-DC-09A and GSI-DC-09B. Photo taken on February 2, 2016.

Photo 9: View of drive point wells GSI-DC-10A and GSI-DC-10B. Photo taken on February 2, 2016.

Photo 10: View of drive point well GSI-HA-01A. Photo taken on February 1, 2016.

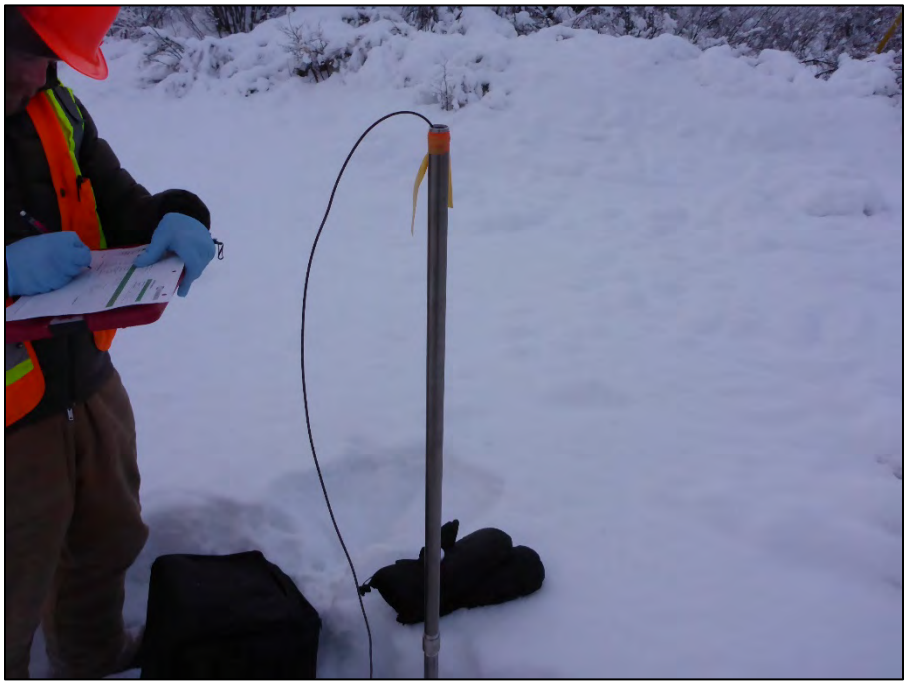

Photo 11: View of drive point well GSI-HA-02A. Photo taken on February 1, 2016.

Photo 12: View of drive point well GSI-HA-03A. Photo taken on February 1, 2016.

Photo 13: View of drive point well GSI-HA-04A. Photo taken on February 1, 2016.

Photo 14: View of drive point well GSI-HA-05A. Photo taken on February 1, 2016.

Photo 15: View of well MW09-15. Photo taken on February 1, 2016.

Photo 16: View of well MW09-16. Photo taken on February 1, 2016.

Photo 17: View of well MW09-17. Photo taken on February 1, 2016.

Photo 18: View of well MW09-18. Photo taken on February 1, 2016.

Photo 19: View of well MW09-19. Photo taken on February 1, 2016.

Photo 20: View of well CH-P-13-01/10. Photo taken on February 2, 2016.

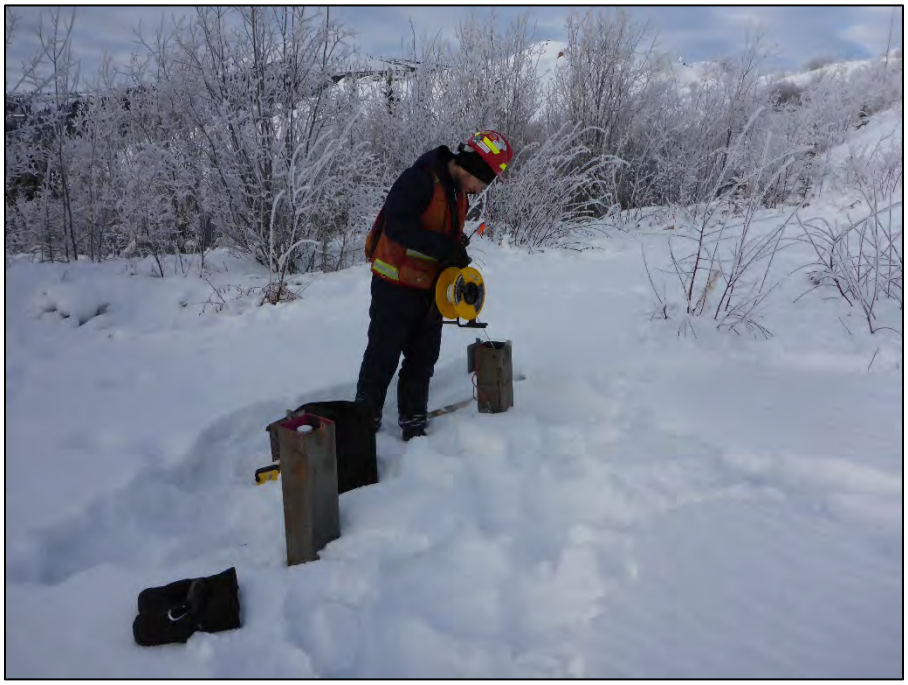

Photo 21: View of wells CH-P-13-03/50 and CH-P-13-03/10. Photo taken on February 2, 2016.

Photo 22: View of wells CH-P-13-04/10 and CH-P-13-04/35. Photo taken on February 3, 2016.

Photo 23: View of well GLL07-01. Photo taken on February 3, 2016.

Photo 24: View of well GLL07-02. Photo taken on February 3, 2016.

Photo 25: View of wells MW09-13 and MW09-14. Photo taken on February 3, 2016.

Photo 26: General location of well GSI-PC-03A and GSI-PC-03B. Photo taken on February 3, 2016.

Photo 27: View of drive point wells GSI-PC-04A and GSI-PC-04B. Photo taken on February 3, 2016.

Photo 28: View of drive point wells GSI-PC-05A and GSI-PC-05B. Photo taken on February 3, 2016.

Photo 29: View of drive point well MP09-03. Photo taken on February 3, 2016.

Photo 30: View of drive point well MP09-08. Photo taken on February 3, 2016.

Photo 31: View of well W14103083BH01. Photo taken on February 2, 2016.

Photo 32: View of well W14103083BH02. Photo taken on February 2, 2016.

Photo 33: View of well W14103083BH04. Photo taken on February 2, 2016.

Photo 34: View of well MP09-04. Photo taken on February 2, 2016.

Photo 35: View of well MP09-05. Photo taken on February 2, 2016.

Photo 36: View of wells MP09-09 and MP09-10. Photo taken on February 4, 2016.

Photo 37: View of wells MP09-11 and MP09-12. Photo taken on February 4, 2016.

Photo 38: View of drive point well MP09-14. Photo taken on February 4, 2016.

Photo 39: View of well MW09-01. Photo taken on February 2, 2016.

Photo 40: View of well MW09-02. Photo taken on February 2, 2016.

Photo 41: View of wells MW09-03 and MW09-04. Photo taken on February 3, 2016.

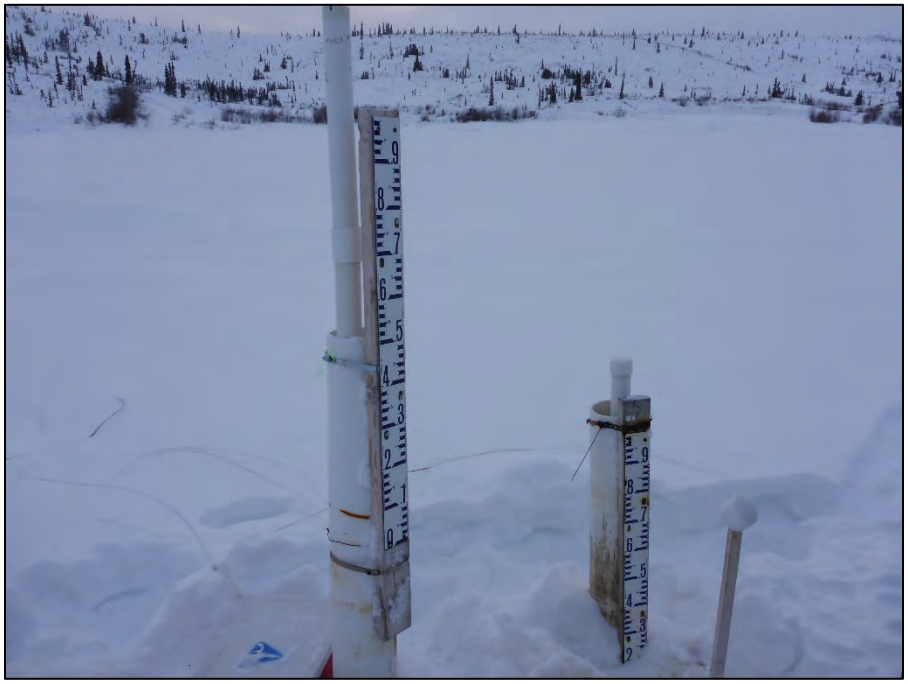

Photo 42: View of wells MW09-05 and MW09-06. Photo taken on February 3, 2016.

Photo 43: View of well MW09-07. Photo taken on February 4, 2016.

Photo 44: View of well MW09-08. Photo taken on February 2, 2016.

Photo 45: View of well MW09-11. Photo taken on February 4, 2016.

Photo 46: View of well MW09-20. Photo taken on February 2, 2016.

Photo 47: View of well MW09-21. Photo taken on February 2, 2016.

Photo 48: View of wells MW09-22. Photo taken on February 3, 2016.

Photo 49: View of well MW09-23. Photo taken on February 3, 2016.

Photo 50: View of well MW09-24. Photo taken on February 2, 2016.

Photo 51: View of well W14103083BH03. Photo taken on February 4, 2016.

Photo 52: View of well CH-P-13-02/10. Photo taken on February 2, 2016.

APPENDIX B
Field Forms

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	CH-P-13-~~[illegible]~~01/10	**Project Number**	1343-005.14	**Date**	FEB 2 2016
Piezometer Diameter	2" PVC	**Client**	GY - AAM	**Samplers**	GR / JH
UTM Location	Z: 08V E: 0388656 N: 6881117	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -11°c
Waypoint	GPS: ECR Name: —			**Recovery**	☐ Good ☐ Bad /
Photos	Cam: LUMIX Nos: 263 - 265	**Purge Method**			
Duplicate Collected	☐ Yes Name: /	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name: /				

Initial Depth to Water (m)	6.678 FROZEN?	**Purge Start Time:**		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit			
Depth to Bottom (m)	—	**Purge Interval Time (____) min / Vol. (____) L**								
Submerged Tubing Depth (m)	~~0.49~~	**Depth to water (m)**	FROZEN							
Well Stick-up Height (m)	0.49	**Temperature (°C) 3%**								
Estimated Water Volume (L)	—	**pH (pH Units) ±0.1**								
		Cond. (µs/cm) 3%								
		Specific Cond. (µs/cm) 3%								
		Redox (mV) 10%								
		DO (mg/L) 10%								
		DO (%) 10%								
		Appearance & Odour (Clear, Silty, HC odours, etc.)								
		Only for final readings: Sulphide (mg/L)								
		Only for final readings: Turbidity (NTU)								
		Interval Purge Volume (L)								
		Cumulative Purge Volume (L):								

(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		Waterra	Peristaltic	Disp. Bailer	Other
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): CH-P-13-01/10

Sample Date (Con't): FEB 2 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	50

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

FROZEN

General Notes and Observations:

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	CH-P-13-02/10	**Project Number**	1343-005.14	**Date**	FEB 2 2016
Piezometer Diameter	2" PVC.	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z:08V E:0388924 N:6881012	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -11°C
Waypoint	GPS: ELR Name: —			**Recovery**	☐ Good ☐ Bad
Photos	Cam: Nos: 260-262	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	DRY/FROZEN/BLOCKED. 8.238.	**Purge Start Time:**		**Purge End Time:**				**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit				
Depth to Bottom (m)	—	**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)	—	**Depth to water (m)**											
Well Stick-up Height (m)	0.64.	**Temperature (°C) 3%**											
Estimated Water Volume (L)	—	**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr²)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

DRY / BLOCKED.

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)					
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): CH-P-13-02/10

Sample Date (Con't): FEB 2 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	19.1
Carbon Dioxide (C02)	PPM	>10,000 ALARM OVER RANGE.

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)	~~DRY~~	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)	DRY / BLOCKED	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

CLAY / BENTONITE ON BOTTOM OF LIKELY WATER LEVEL TAPE, ~~POSSIBLY~~ WELL HAS ~~FOR~~ CLOGGED UP WITH BENTONITE (~ 1-8m)

Consumables Used:

54

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	CH-P-13-03/10	**Project Number**	1343-005.14	**Date**	FEB 2 2016
Piezometer Diameter	1.5" PVC	**Client**	GY - AAM	**Samplers**	GR + JH.
UTM Location	Z: 08V E: 0389145 N: 6881109	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -12°C
Waypoint	GPS: ELR Name: /			**Recovery**	☐ Good ☐ Bad
Photos	Cam: LUMIX Nos: 269-272	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	4.922 FROZEN	**Purge Start Time:**		**Purge End Time:**			**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit			
Depth to Bottom (m)	/	**Purge Interval Time (____) min / Vol. (____) L**									
Submerged Tubing Depth (m)	0.59	**Depth to water (m)**									
Well Stick-up Height (m)		**Temperature (°C) 3%**									
Estimated Water Volume (L)		**pH (pH Units) ±0.1**									
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**									
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**									
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**									
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**									
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**									
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**									
		Only for final readings	**Sulphide (mg/L)**								
			Turbidity (NTU)								
		Interval Purge Volume (L)									
		Cumulative Purge Volume (L):									

FROZEN

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)					
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): CH-P-13-03/10

Sample Date (Con't): FEB 2 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	5125

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		FROZEN
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	CH-P-13-03/50	**Project Number**	1343-005.14	**Date**	Feb 2, 2016
Piezometer Diameter	1" PVC	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z:08V E:0389145 N: 6881109	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Cloudy, -13°C
Waypoint	GPS: ELR Name: —			**Recovery**	☐ Good ☐ Bad
Photos	Cam: LUMIX Nos: 269-272	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☒ Yes Name: FB16-200				

Initial Depth to Water (m)	48.985	**Purge Start Time:**		**Purge End Time:**						**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit				
Depth to Bottom (m)	50.555	**Purge Interval Time (____) min / Vol. (____) L**													
Submerged Tubing Depth (m)	—	**Depth to water (m)**													
Well Stick-up Height (m)	0.54	**Temperature (°C) 3%**			Direct										
Estimated Water Volume (L)	0.785	**pH (pH Units) ±0.1**													
(DTB – DTW) x (πr²)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**			Sample										
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**													
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**													
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**													
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**													
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**													
		Only for final readings	**Sulphide (mg/L)**	0.80											
			Turbidity (NTU)	1146 AU											
		Interval Purge Volume (L)													
		Cumulative Purge Volume (L):													

YSI ID	X	**Sample Method:**			
Logged Field Parameters	☐ Yes ☒ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)	X				
Sample Time (24hr)	14:30			1" X	

HEMMERA

Sample Site (Con't): CH-P-13-03/50

Sample Date (Con't): FEB 2 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	Ø
Oxygen (O2)	%	20.3
Carbon Dioxide (C02)	PPM	2750

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☒ Field Filtered	☒ HNO_3 (Nitric)	100	
1b	40 ml (glass)	Dissolved Mercury	15 mL	☒ Field Filtered	☒ HCL (Hydrochloric)	30	
2	500 ml (plastic)	General Chemistry	100 ml	-	-	100	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☒ NaOH (Sodium Hydroxide)	100	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☒ H_2SO_4 (Sulfuric)	60	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☒ HNO_3 (Nitric)	60	
6	120 ml (plastic)	Sulphide	60 ml	-	☒ Zinc Acetate, then NaOH	60	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	50	

General Notes and Observations:

TURBID WATER

WATER GENERALLY BECAME MORE TURBID WITH EACH BAILER. GOT MINIMUM VOLUMES AS WEREN'T SURE HOW WELL THE SAMPLING WOULD GO.

Consumables Used:

1° bailer
1 roll of twine

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	CH-P-13-04/10	**Project Number**	1343-005.14	**Date**	FEB 3 2016
Piezometer Diameter	1.5" PVC.	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z: E: N:	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -12°C
Waypoint	GPS: Name:			**Recovery**	☐ Good ☐ Bad
Photos	Cam: Nos:	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	6.045 ICE/ BLOCKAGE.	**Purge Start Time:**		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit										
Depth to Bottom (m)		**Purge Interval Time (____) min / Vol. (____) L**															
Submerged Tubing Depth (m)		**Depth to water (m)**															
Well Stick-up Height (m)	0.54	**Temperature (°C) 3%**															
Estimated Water Volume (L)		**pH (pH Units) ±0.1**															
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**															
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**															
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**															
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**															
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**															
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**															
		Only for final readings	**Sulphide (mg/L)**														
			Turbidity (NTU)														
		Interval Purge Volume (L)															
		Cumulative Purge Volume (L):															

FROZEN / BLOCKED.

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)					
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): CH-P-13-04/10

Sample Date (Con't): FEB 3 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: NOT TIGHT

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	Ø
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	Ø

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	CH-P-13-04/35	**Project Number**	1343-005.14	**Date**	FEB 3 2016
Piezometer Diameter	1" PVC	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z: 08V E: 0389135 N: 6881472	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -12°C
Waypoint	GPS: ELR Name: —			**Recovery**	☐ Good ☐ Bad
Photos	Cam: CANON Nos: 273-276	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	6.408 FROZEN BLOCKAGE	**Purge Start Time:**		**Purge End Time:**				**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit						
Depth to Bottom (m)	—	**Purge Interval Time (____) min / Vol. (____) L**													
Submerged Tubing Depth (m)		**Depth to water (m)**													
Well Stick-up Height (m)	0.61	**Temperature (°C) 3%**													
Estimated Water Volume (L)		**pH (pH Units) ±0.1**													
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**													
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**													
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**													
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**													
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**													
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**													
		Only for final readings	**Sulphide (mg/L)**												
			Turbidity (NTU)												
		Interval Purge Volume (L)													
		Cumulative Purge Volume (L):													

FROZEN / BLOCKED

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): CH-P-13-04/35

Sample Date (Con't): _____

WRONG CAP ~~CAP~~ ON WELL

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☒ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: NOT TIGHT.

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	ϕ
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	25

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

FROZEN

General Notes and Observations:

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GLC07-01	**Project Number**	1343-005.14	**Date**	FEB 3 2016
Piezometer Diameter	2" PVC.	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z:08V E:0388853 N: 6881780	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -12°C OVERCAST
Waypoint	GPS: GLR Name: —			**Recovery**	☐ Good ☐ Bad
Photos	Cam: LUMIX Nos: 307 – 309	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	~~TD~~ 13.745 TO ICE	**Purge Start Time:**		**Purge End Time:**				**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit				
Depth to Bottom (m)	—	**Purge Interval** Time (____) min / Vol. (____) L											
Submerged Tubing Depth (m)		**Depth to water (m)**											
Well Stick-up Height (m)	0.79	**Temperature (°C) 3%**											
Estimated Water Volume (L)		**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

FROZEN

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): GLC07-01

Sample Date (Con't): FEB 3 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	Ø
Oxygen (O2)	%	10.5
Carbon Dioxide (C02)	PPM	10,000 OVER RANGE

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochlonc)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfunc)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitnc)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

5/8" LATERAL FROZEN IN WELL.

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GLL-07-02	Project Number	1343-005.14	Date	FEB 3 2016
Piezometer Diameter	6" STEEL	Client	GY - AAM	Samplers	GR + JH
UTM Location	Z: 08V E: 0389070 N: 6881705	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	~ -12°C
Waypoint	GPS: ELR Name: /			Recovery	☐ Good ☐ Bad
Photos	Cam: LUMIX Nos: 289-291	Purge Method			
Duplicate Collected	☐ Yes Name:	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	7.100 TO BLOCKAGE/ FROZEN	Purge Start Time:		Purge End Time:		Pen or YSI:	☐ YSI Pro Plus ☐ Pen Unit
Depth to Bottom (m)		Purge Interval Time (___) min / Vol. (___) L					
Submerged Tubing Depth (m)		Depth to water (m)					
Well Stick-up Height (m)	1.34	Temperature (°C) 3%					
Estimated Water Volume (L)		pH (pH Units) ±0.1	FROZEN/ DRY.				
		Cond. (µs/cm) 3%					
		Specific Cond. (µs/cm) 3%					
		Redox (mV) 10%					
		DO (mg/L) 10%					
		DO (%) 10%					
		Appearance & Odour (Clear, Silty, HC odours, etc.)					
		Only for final readings: Sulphide (mg/L)					
		Only for final readings: Turbidity (NTU)					
		Interval Purge Volume (L)					
		Cumulative Purge Volume (L):					

(DTB – DTW) x (πr²)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

YSI ID		Sample Method:			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		Waterra	Peristaltic	Disp. Bailer	Other
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): GL07-02

Sample Date (Con't): FEB 3 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☒ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other LEFT AS IS

Well properly sealed for gas monitoring: ☐ Yes ☒ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.5
Carbon Dioxide (C02)	PPM	~~7500~~ 8350

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-DC-01A	Project Number	1343-005.14	Date	FEBRUARY 1, 2016
Piezometer Diameter	1"	Client	GY - AAM	Samplers	DC JH
UTM Location	Z: 08 E: 0387674 N: 6881127	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	Broken clouds, -16
Waypoint	GPS: HEM Name: GSI-DC-01A *			Recovery	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 006 - 008	Purge Method			
Duplicate Collected	☐ Yes Name: X	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name: X				

FROZEN AT Initial Depth to Water (m)	0.795 m	Purge Start Time: X	Purge End Time: X	Pen or YSI:	☒ YSI Pro Plus ☐ Pen Unit		
Depth to Bottom (m)	N/A	Purge Interval Time (____) min / Vol. (____) L					
Submerged Tubing Depth (m)	N/A	Depth to water (m)					
Well Stick-up Height (m)	0.64 m	Temperature (°C) 3%					
Estimated Water Volume (L)	—	pH (pH Units) ±0.1					
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		Cond. (µs/cm) 3%					
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		Specific Cond. (µs/cm) 3%					
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		Redox (mV) 10%					
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		DO (mg/L) 10%					
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		DO (%) 10%					
Calculations: N/A		Appearance & Odour (Clear, Silty, HC odours, etc.)					
		Only for final readings: Sulphide (mg/L)					
		Only for final readings: Turbidity (NTU)					
		Interval Purge Volume (L)					
		Cumulative Purge Volume (L):					

Not Sampled
Monitor only

YSI ID		Sample Method:			
Logged Field Parameters	☐ Yes ☐ No	Waterra	Peristaltic	Disp. Bailer	Other
Time logged on YSI (24hr)					
Sample Time (24hr)	Not Sampled				

HEMMERA

Sample Site (Con't): GS1-DC-01A

Sample Date (Con't): ~~FEBRUARY 1, 2016~~ Not sampled

Well Head Seal: ☐ J-Plug ☒ PVC Cap (THREADED) ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0% LEL
Oxygen (O2)	%	18.9 %
Carbon Dioxide (C02)	PPM	350 ppm

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

- Monitor only
- 20cm of snow
- Had to cut plastic well cap off. It is still usable.

Consumables Used:

None

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI – DC-01B	Project Number	1343-005.14	Date	FEBRUARY 1, 2016
Piezometer Diameter	1"	Client	GY - AAM	Samplers	DC JH
UTM Location	Z: 08 E: 0387675 N: 6881128	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	Broken clouds, -16
Waypoint	GPS: HEM Name: GSI-DC-01B*			Recovery	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 009-011	Purge Method			
Duplicate Collected	☐ Yes Name:	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name:		X		

Initial Depth to ~~Water~~ Ice (m)	1.456	Purge Start Time:	X	Purge End Time:	X	Pen or YSI:	~~☐ YSI Pro Plus~~ ☑ Pen Unit
Depth to Bottom (m)	–	Purge Interval Time (___) min / Vol. (___) L					
Submerged Tubing Depth (m)	–	Depth to water (m)	Well Frozen				
Well Stick-up Height (m)	0.67	Temperature (°C) 3%					
Estimated Water Volume (L)	–	pH (pH Units) ±0.1					
		Cond. (µs/cm) 3%					
		Specific Cond. (µs/cm) 3%					
		Redox (mV) 10%					
		DO (mg/L) 10%					
		DO (%) 10%					
		Appearance & Odour (Clear, Silty, HC odours, etc.)					
		Only for final readings: Sulphide (mg/L)					
		Only for final readings: Turbidity (NTU)					
		Interval Purge Volume (L)					
		Cumulative Purge Volume (L):					

(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

N/A

YSI ID	~~X~~	Sample Method:			
Logged Field Parameters	~~☐ Yes ☐ No~~				
Time logged on YSI (24hr)	~~X~~	Waterra	Peristaltic	Disp. Bailer	Other
Sample Time (24hr)	Not sampled		X		

HEMMERA

Sample Site (Con't): GSI-DC-01-B

Sample Date (Con't): Feb 1, 2016 Not sampled

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	19.1
Carbon Dioxide (C02)	PPM	325

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

- Well Frozen
- ~20cm of snow on ground
- Had to cut Pvc cap off. It is still usable

Consumables Used:

None

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-DC-02B	Project Number	1343-005.14	Date	Feb. 1/2016.
Piezometer Diameter	~~[illegible]~~ 1"	Client	GY - AAM	Samplers	AN, GR.
UTM Location	Z:08V E:0387836 N: 6881129	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	Overcast ~ -10°C
Waypoint	GPS: ELR Name: /			Recovery	☐ Good ☒ Bad
Photos	Cam: Nos: 0228 – 0231	Purge Method			
Duplicate Collected	☐ Yes Name: ~~—~~	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	~~☐ Yes Name:~~		X		

	(B)	(A)
Initial Depth to Water (m)	2.300	1.815
Depth to Bottom (m)	~~2.090~~ 3.717	~~POSSIBLY ICE~~ 1.864
Submerged Tubing Depth (m)	~3.7	
Well Stick-up Height (m)	0.805	0.940
Estimated Water Volume (L)	0.85	—

(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations: ~

Purge Start Time:		Purge End Time:		Pen or YSI:	☐ YSI Pro Plus ☐ Pen Unit

Purge Interval Time (___) min / Vol. (___) L									
Depth to water (m)									
Temperature (°C) 3%									
pH (pH Units) ±0.1									
Cond. (µs/cm) 3%		DIRECT							
Specific Cond. (µs/cm) 3%									
Redox (mV) 10%		SAMPLE							
DO (mg/L) 10%									
DO (%) 10%									
Appearance & Odour (Clear, Silty, HC odours, etc.)									
Only for final readings: Sulphide (mg/L)									
Only for final readings: Turbidity (NTU)									
Interval Purge Volume (L)									
Cumulative Purge Volume (L):									

YSI ID	/
Logged Field Parameters	/ ☐ Yes ☐ No
Time logged on YSI (24hr)	/
Sample Time (24hr)	/ 15-30

Sample Method:			
Waterra	Peristaltic	Disp. Bailer	Other
	X		

HEMMERA

Sample Site (Con't): GS1-DC-02

Sample Date (Con't): Feb.1/2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values A	Values B
Methane (CH4)	%LEL	0	0
Oxygen (O2)	%	17.7	17.7
Carbon Dioxide (C02)	PPM	720	1700

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☒ Field Filtered	☒ HNO_3 (Nitric)	120	Feb 1
1b	40 ml (glass)	Dissolved Mercury	15 mL	☒ Field Filtered	☒ HCL (Hydrochloric)	~~40~~ ~~30~~ 140	Feb 1 + 2
2	500 ml (plastic)	General Chemistry	100 ml	-	-	100	Feb 1
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☒ NaOH (Sodium Hydroxide)	100	Feb 1
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☒ H_2SO_4 (Sulfuric)	60	Feb 1 16
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☒ HNO_3 (Nitric)	50	Feb 2 @ 16:00
6	120 ml (plastic)	Sulphide	60 ml	-	☑ Zinc Acetate, then NaOH	60	Feb 2 @ 16:00
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	~~40~~ 38	Feb 2 @ 16:00

General Notes and Observations:

Initially hit ice in drive point but ~~tore~~ broke through with tubing. New readings taken

~~FEB~~ 'B' CO2 READING ROSE QUICKLY THEN ~~REDUCED~~ DECREASED QUICKLY.

-Returned to site Feb 2 to collect remaining samples (Gen chem, SCN, sulphide, TIC)

Consumables Used:

2 m waterra (breaking ice)

6" silicon tubing.

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-DC-03A	**Project Number**	1343-005.14	**Date**	FEB 1 2016
Piezometer Diameter	1"	**Client**	GY - AAM	**Samplers**	DC, SH
UTM Location	Z: 08 E: 0388098 N: 6881075	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	BROKEN CLOUD -11
Waypoint	GPS: HEM Name: GSI-DC-03A*			**Recovery**	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 21 - 23	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to ICE Water (m)	0.978	**Purge Start Time:**	—	**Purge End Time:**	—	**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit						
Depth to Bottom (m)	N/A	**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**											
Well Stick-up Height (m)	0.68	**Temperature (°C) 3%**											
Estimated Water Volume (L)	—	**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

FROZEN

NOT SAMPLED

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)					
Sample Time (24hr)	NOT SAMPLED				

HEMMERA

Sample Site (Con't): GS1-DC-03A

Sample Date (Con't): FEB 1, 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☐ Not Sealed ☒ Other PLASTIC BAG

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☒ Other PLASTIC BAG

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	0

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

SNOW DEPTH 25 cm

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-DC-03B	Project Number	1343-005.14	Date	FEB 1 2016
Piezometer Diameter	1"	Client	GY - AAM	Samplers	DC JH
UTM Location	Z: 08 E: 0388104 N: 6881075	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	Broken Clouds -11°C
Waypoint	GPS: HEM Name: GSI-DC-03B*			Recovery	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 24-26	Purge Method			
Duplicate Collected	☐ Yes Name: ✗	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name: ✗	–	–	–	–

Initial Depth to Water (m)	0.945	Purge Start Time:	✗	Purge End Time:	✗	Pen or YSI:	~~☐ YSI Pro Plus ☐ Pen Unit~~
Depth to Bottom (m)	N/A	Purge Interval Time (___) min / Vol. (___) L					
Submerged Tubing Depth (m)	N/A	Depth to water (m)					
Well Stick-up Height (m)	0.66	Temperature (°C) 3%					
Estimated Water Volume (L)	N/A	pH (pH Units) ±0.1					
		Cond. (µs/cm) 3%					
		Specific Cond. (µs/cm) 3%					
		Redox (mV) 10%					
		DO (mg/L) 10%					
		DO (%) 10%					
		Appearance & Odour (Clear, Silty, HC odours, etc.)					
		Only for final readings: Sulphide (mg/L)					
		Only for final readings: Turbidity (NTU)					
		Interval Purge Volume (L)					
		Cumulative Purge Volume (L):					

(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

N/A

FROZEN NOT SAMPLED

YSI ID	✗	Sample Method:			
Logged Field Parameters	☐ Yes ☐ No	Waterra	Peristaltic	Disp. Bailer	Other
Time logged on YSI (24hr)	✗				
Sample Time (24hr)	NOT SAMPLED				

HEMMERA

Sample Site (Con't): GSI-DC-03B

Sample Date (Con't): FEB 1, 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☒ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	275

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

SNOW DEPTH 25 cm

- CAP NEEDED TO BE CUT TO ACCESS WELL BUT STILL USABLE

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI - DC - 05 A/B.	**Project Number**	1343-005.14	**Date**	FEB 2 2016
Piezometer Diameter	1" STEEL O/D.	**Client**	GY - AAM	**Samplers**	GR / JH
UTM Location	Z: 08V E: 0388722 N: 6880828	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -11°C
Waypoint	GPS: ELR Name: /			**Recovery**	☐ Good ☐ Bad
Photos	Cam: CANON Nos: 266 - 268	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name: /				

Initial Depth to Water (m)	GLACIATED AREA. DRIVE POINTS NOT LOCATED.	**Purge Start Time:**		**Purge End Time:**					**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit			
Depth to Bottom (m)		**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)		**Depth to water (m)**											
Well Stick-up Height (m)		**Temperature (°C) 3%**											
Estimated Water Volume (L)		**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

AREA GLACIATED OVER.

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)					
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): GS1-DC-05 A/B

Sample Date (Con't): FEB 2 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	
Oxygen (O2)	%	
Carbon Dioxide (C02)	PPM	

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-	GLACIATED	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)	OVER	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

DRIVEPOINTS NOT LOCATED GLACIATION!

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GS1 - DC - 06 A/B	**Project Number**	1343-005.14	**Date**	FEB 2 2017
Piezometer Diameter	1" steel OD.	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z: 08V E: 0389788 N: 6880569.	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -15°C
Waypoint	GPS: ELR Name: /			**Recovery**	☐ Good ☐ Bad ?
Photos	Cam: Lumix Nos: 256 - 259	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	A TO ICE 0.841	B TO ICE 0.534	**Purge Start Time:**		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit				
Depth to Bottom (m)	FROZEN		**Purge Interval Time (____) min / Vol. (____) L**									
Submerged Tubing Depth (m)	/		**Depth to water (m)**									
Well Stick-up Height (m)	0.81	0.410	**Temperature (°C) 3%**									
Estimated Water Volume (L)	/		**pH (pH Units) ±0.1**									
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume			**Cond. (µs/cm) 3%**									
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume			**Specific Cond. (µs/cm) 3%**									
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume			**Redox (mV) 10%**									
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume			**DO (mg/L) 10%**									
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume			**DO (%) 10%**									
Calculations:			**Appearance & Odour (Clear, Silty, HC odours, etc.)**									
			Only for final readings	**Sulphide (mg/L)**								
				Turbidity (NTU)								
			Interval Purge Volume (L)									
			Cumulative Purge Volume (L):									

FROZEN

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): GS1-DC-011/B.

Sample Date (Con't): FEB 2 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____ (B)

A - HAD GLOVE CAP - REPLACED W/ 1" CAP.

Seal Replaced: ☐ J-Plug ☒ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☐ No Details: _____

FOR A.

Head Space Gas Measurements

	Units	Values A	Values B
Methane (CH4)	%LEL	Ø	Ø
Oxygen (O2)	%	20.9	20.9
Carbon Dioxide (C02)	PPM	75	75

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Consumables Used:

1 x 1" CAP.

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-DC-07A/B	**Project Number**	1343-005.14	**Date**	FEB 2 2016
Piezometer Diameter	1" OD.	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z: 08V E: 0390062 N: 6880639	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Cloudy -16°C
Waypoint	GPS: ELR Name: /			**Recovery**	☐ Good ☐ Bad
Photos	Cam: Lumix Nos: 252 - 255	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)		**Purge Start Time:**		**Purge End Time:**			**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit			
Depth to Bottom (m)		**Purge Interval Time (____) min / Vol. (____) L**									
Submerged Tubing Depth (m)		**Depth to water (m)**									
Well Stick-up Height (m)		**Temperature (°C) 3%**									
Estimated Water Volume (L)		**pH (pH Units) ±0.1**									
(DTB – DTW) x ($\pi r^{2)}$*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**									
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**									
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**									
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**									
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**									
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**									
		Only for final readings	**Sulphide (mg/L)**								
			Turbidity (NTU)								
		Interval Purge Volume (L)									
		Cumulative Purge Volume (L):									

FROZEN
GLACIATED

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): GSI-DC-07 N/B

Sample Date (Con't): FEB 2 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	
Oxygen (O2)	%	
Carbon Dioxide (C02)	PPM	

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

GLACIATED OVER

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-DC-08A/B	Project Number	1343-005.14	Date	FEB 2 2016
Piezometer Diameter	1" OD	Client	GY - AAM	Samplers	GR + JH
UTM Location	Z: 08V E: 0390311 N: 6880582	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	~ -15°C
Waypoint	GPS: GLR Name: —			Recovery	☐ Good ☐ Bad ?
Photos	Cam: Lumix Nos: 246 - 249	Purge Method			
Duplicate Collected	☐ Yes Name: /				
Field Blank Collected	☐ Yes Name: /				

Purge Method: Waterra	Peristaltic	Disp. Bailer	Other

Initial Depth to Water (m)	
Depth to Bottom (m)	
Submerged Tubing Depth (m)	
Well Stick-up Height (m)	
Estimated Water Volume (L)	

(DTB – DTW) x (πr²)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

Purge Start Time: | Purge End Time: | Pen or YSI: ☐ YSI Pro Plus ☐ Pen Unit

Purge Interval Time (___) min / Vol. (___) L								
Depth to water (m)								
Temperature (°C) 3%			FROZEN					
pH (pH Units) ±0.1								
Cond. (µs/cm) 3%								
Specific Cond. (µs/cm) 3%								
Redox (mV) 10%								
DO (mg/L) 10%			GLACIATED					
DO (%) 10%								
Appearance & Odour (Clear, Silty, HC odours, etc.)			OVER					
Only for final readings: Sulphide (mg/L)								
Only for final readings: Turbidity (NTU)								
Interval Purge Volume (L)								
Cumulative Purge Volume (L):								

YSI ID	
Logged Field Parameters	☐ Yes ☐ No
Time logged on YSI (24hr)	
Sample Time (24hr)	

Sample Method:

Waterra	Peristaltic	Disp. Bailer	Other

HEMMERA

Sample Site (Con't): GSI-DC-08A/B

Sample Date (Con't): FEB 2 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	
Oxygen (O2)	%	
Carbon Dioxide (C02)	PPM	

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

GLACIATED OVER

General Notes and Observations:

GUIDE FLAGGING LOCATED BUT DRIVEPOINTS GLACIATED OVER AND NOT ACTUALLY OBSERVED

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI - DC - 09 A/B	**Project Number**	1343-005.14	**Date**	FEB 2 2016
Piezometer Diameter	1" OD	**Client**	GY - AAM	**Samplers**	GR / JH
UTM Location	Z:08V E: 0390612 N: 6880493	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	-15°C APPROX
Waypoint	GPS: EUR Name: /			**Recovery**	☐ Good ☐ Bad ?
Photos	Cam: LUMIX Nos: 242 - 245.	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	(A) FROZEN 1.055	(B) 1.026	**Purge Start Time:**		**Purge End Time:**			**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit		
Depth to Bottom (m)	/		**Purge Interval Time (____) min / Vol. (____) L**								
Submerged Tubing Depth (m)			**Depth to water (m)**								
Well Stick-up Height (m)	GLACIATED	GLACIATED.	**Temperature (°C) 3%**								
Estimated Water Volume (L)			**pH (pH Units) ±0.1**								
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume			**Cond. (µs/cm) 3%**								
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume			**Specific Cond. (µs/cm) 3%**								
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume			**Redox (mV) 10%**								
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume			**DO (mg/L) 10%**								
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume			**DO (%) 10%**								
Calculations:	A 0.210	B 0.210	**Appearance & Odour (Clear, Silty, HC odours, etc.)**								
ICE TO TOP OF 1" TUBE (NOT CAP)			**Only for final readings**	**Sulphide (mg/L)**							
				Turbidity (NTU)							
			Interval Purge Volume (L)								
			Cumulative Purge Volume (L):								

FROZEN

YSI ID		**Sample Method:**			
Logged Field Parameters	☒ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)					
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): GS1-DC-09 A/B

Sample Date (Con't): FEB 2 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other A. BAG - SEALED

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☐ No Details: B HAD PVC CAP.

Head Space Gas Measurements

	Units	Values	
Methane (CH4)	%LEL	(A) Ø	(B) 0
Oxygen (O2)	%	20.9	20.9
Carbon Dioxide (C02)	PPM	25	Ø

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-	FROZEN	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Consumables Used:

NEW 1" CAP FOR A.

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-DC-10 A/B	**Project Number**	1343-005.14	**Date**	FEB 2 2016
Piezometer Diameter	1" OD.	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z:08V E:0390859 N:6880447	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~
Waypoint	GPS: ELR. Name: /			**Recovery**	☐ Good ☐ Bad ?
Photos	Cam: LUMIX Nos: 238 - 241	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	(A) 1.032 FROZEN	(B) 0.951	**Purge Start Time:**		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit			
Depth to Bottom (m)	FROZEN	FROZEN	**Purge Interval** Time (____) min / Vol. (____) L								
Submerged Tubing Depth (m)	/	/	**Depth to water (m)**								
Well Stick-up Height (m)	0.850	0.770	**Temperature (°C) 3%**								
Estimated Water Volume (L)	/	/	**pH (pH Units) ±0.1**								
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume			**Cond. (µs/cm) 3%**								
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume			**Specific Cond. (µs/cm) 3%**								
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume			**Redox (mV) 10%**								
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume			**DO (mg/L) 10%**								
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume			**DO (%) 10%**								
Calculations:			**Appearance & Odour (Clear, Silty, HC odours, etc.)**								
			Only for final readings	**Sulphide (mg/L)**							
				Turbidity (NTU)							
			Interval Purge Volume (L)								
			Cumulative Purge Volume (L):								

FROZEN

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): GS1-DC-10A/B

Sample Date (Con't): FEB 2 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other GLOVE + PLASTIC BAG (B) (A)

Seal Replaced: ☐ J-Plug ☒ IPEX PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values A	Values B
Methane (CH4)	%LEL	0	0
Oxygen (O2)	%	20.9	20.9
Carbon Dioxide (C02)	PPM	ø	ø

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

FROZEN

General Notes and Observations:

BOTH CAPS REPLACED.

Consumables Used:

2 x 1" IPEX SCREW CAPS

STICK-UPS ARE 1" OD

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI - HA - 01A	Project Number	1343-005.14	Date	FEB 1 2016
Piezometer Diameter	1"	Client	GY - AAM	Samplers	GR + AN
UTM Location	Z08V E: 0387842 N: 6881129	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	~ -11°C
Waypoint	GPS: ELR Name: /			Recovery	☐ Good ☒ Bad
Photos	Cam: LUMIX Nos: 232 – 234	Purge Method			
Duplicate Collected	☐ Yes Name:	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name:		DIRECT - SAMPLE		

Initial Depth to Water (m)	~ 2.500
Depth to Bottom (m)	2.785
Submerged Tubing Depth (m)	2.78
Well Stick-up Height (m)	1.18
Estimated Water Volume (L)	0.182

(DTB – DTW) x (πr²)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

~ 182 ml

Purge Start Time:		Purge End Time:		Pen or YSI:	☐ YSI Pro Plus ☐ Pen Unit

Purge Interval Time (____) min / Vol. (____) L							
Depth to water (m)							
Temperature (°C) 3%							
pH (pH Units) ±0.1	DIRECT SAMPLE.						
Cond. (µs/cm) 3%							
Specific Cond. (µs/cm) 3%							
Redox (mV) 10%							
DO (mg/L) 10%							
DO (%) 10%							
Appearance & Odour (Clear, Silty, HC odours, etc.)							
Only for final readings: Sulphide (mg/L)							
Only for final readings: Turbidity (NTU)							
Interval Purge Volume (L)							
Cumulative Purge Volume (L):							

YSI ID	/
Logged Field Parameters	/ ☐ Yes ☐ No
Time logged on YSI (24hr)	/
Sample Time (24hr)	– 1635

Sample Method:			
Waterra	Peristaltic	Disp. Bailer	Other
	✓		

HEMMERA

Sample Site (Con't): GSI-HA-01A

Sample Date (Con't): FEB 1 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

NO B

	Units	A Values	B
Methane (CH4)	%LEL	0	
Oxygen (O2)	%	18.0	
Carbon Dioxide (C02)	PPM	320	

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☒ Field Filtered	☐ HCL (Hydrochloric)	40 ml	ALL WE COULD GET.
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

ALTHOUGH ABOUT 180 ML AVAILABLE, COULD ONLY DRAW OUT ABOUT 50 ml OF TURBID WATER— ENOUGH TO GET ONE DISS. MERCURY SAMPLE.

Consumables Used:

PERI TUBING 3.5 m

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-HA-02A	**Project Number**	1343-005.14	**Date**	FEB 1 2016
Piezometer Diameter	1" OD	**Client**	GY - AAM	**Samplers**	AN, GR.
UTM Location	Z: 8 E: 0387861 N: 6881131	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	overcast ~-15°C
Waypoint	GPS: Name:			**Recovery**	☐ Good ☐ Bad ?
Photos	Cam: ELR. Nos: 235-237	**Purge Method**			
Duplicate Collected	☐ Yes Name: —	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name: —				

Initial Depth to Water (m)	2.114 (ICE/BLOCK)	**Purge Start Time:**		**Purge End Time:**				**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit			
Depth to Bottom (m)	FROZEN	**Purge Interval** Time (____) min / Vol. (____) L										
Submerged Tubing Depth (m)		**Depth to water (m)**										
Well Stick-up Height (m)	1.46	**Temperature (°C) 3%**										
Estimated Water Volume (L)		**pH (pH Units) ±0.1**										
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**										
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**										
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**										
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**										
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**										
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**										
		Only for final readings	**Sulphide (mg/L)**									
			Turbidity (NTU)									
		Interval Purge Volume (L)										
		Cumulative Purge Volume (L):										

FROZEN

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): GS1-HA-02A

Sample Date (Con't): FEB 1 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18
Carbon Dioxide (C02)	PPM	340

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)	FROZEN	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Tubing frozen in well (peri-tubing). Could not remove. Depth to ice at blockage recorded @ 2.114 m. Used slowing level meter to measure. Meter tip may have been getting stuck on drive point connection tip.

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-HA-03A	**Project Number**	1343-005.14	**Date**	FEB 1, 2016
Piezometer Diameter	1"	**Client**	GY - AAM	**Samplers**	DC JM
UTM Location	Z: 08 E: 0387881 N: 6881133	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	BROKEN CLOUD -13
Waypoint	GPS: HEM1 Name: GSI-HA-03A			**Recovery**	☐ Good ☐ Bad
Photos	Cam: HEM1 Nos:	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:	X		X	

Initial Depth to Water (m)	0.985	**Purge Start Time:**		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit								
Depth to Bottom (m)	N/A	**Purge Interval Time (____) min / Vol. (____) L**													
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**													
Well Stick-up Height (m)	0.94	**Temperature (°C) 3%**													
Estimated Water Volume (L)	N/A	**pH (pH Units) ±0.1**													
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**													
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**													
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**													
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**													
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**													
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**													
		Only for final readings	**Sulphide (mg/L)**												
			Turbidity (NTU)												
		Interval Purge Volume (L)													
		Cumulative Purge Volume (L):													

FROZEN NOT SAMPLED

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)		X		X	X
Sample Time (24hr)	NOT SAMPLED				

HEMMERA

Sample Site (Con't): GSI-HA-034

Sample Date (Con't): FEB / 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap (THREADED) ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☒ PVC Cap (THREADED) ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	200

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

CAP NEEDED TO BE CUT TO ACCESS STILL USABLE

35 cm OF SNOW OVER

Consumables Used:

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-HA-04A	**Project Number**	1343-005.14	**Date**	FEB 1, 2016
Piezometer Diameter	1"	**Client**	GY - AAM	**Samplers**	DC TSH
UTM Location	Z: 08 E: 0387915 N: 6881131	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	BROKEN CLOUD, -14
Waypoint	GPS: HEM Name: GSI-HA-04A~~X~~			**Recovery**	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 037-039				
Duplicate Collected	☐ Yes Name:				
Field Blank Collected	☐ Yes Name:				

Purge Method			
Waterra	**Peristaltic**	**Disp. Bailer**	**Other**

Initial Depth to Water (m)	1.816	**Purge Start Time:**	X	**Purge End Time:**	X	**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit						
Depth to Bottom (m)	2.110	**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)	1.91	**Depth to water (m)**											
Well Stick-up Height (m)	0.51	**Temperature (°C) 3%**											
Estimated Water Volume (L)	0.294	**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations: ½ 2.110 − 1.816 = 0.294		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings — **Sulphide (mg/L)**											
		Only for final readings — **Turbidity (NTU)**											
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

DIRECT SAMPLE

YSI ID	X	**Sample Method:**			
Logged Field Parameters	☐ Yes ☒ No				
Time logged on YSI (24hr)	X	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)	17:15		X		

HEMMERA

Sample Site (Con't): GS1-MA-04A

Sample Date (Con't): FEB 1, 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap (THREADED) ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☒ PVC Cap (THREADED) ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	160

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☒ Field Filtered	☒ HNO_3 (Nitric)	100mL	Feb 1
1b	40 ml (glass)	Dissolved Mercury	15 mL	☒ Field Filtered	☒ HCL (Hydrochloric)	15mL	Feb 1
2	500 ml (plastic)	General Chemistry	100 ml	-	-	~~25mL~~ 80mL	Feb 1 + Feb 2
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

15 cm of SPONGE/FOAM THREADED CAP NEEDED TO BE CUT TO ACCESS, RELEASED

-Returned to location Feb 2 to retrieve filling Gen Chem bottle.

Consumables Used:

~~5m~~ 6m 1/4 tubing

1.5' Silicone

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-HA-05A	**Project Number**	1343-005.14	**Date**	FEB 1, 2016
Piezometer Diameter	1"	**Client**	GY - AAM	**Samplers**	DC + JH
UTM Location	Z: 08 E: 0387898 N: 6881122	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	BROKEN CLOUD, -11
Waypoint	GPS: HEM Name: GSI-HA-05A			**Recovery**	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 30-32	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:	X	X	X	X

Initial Depth to Water (m)	0.400	**Purge Start Time:**	X	**Purge End Time:**	X	**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit				
Depth to Bottom (m)	N/A	**Purge Interval** Time (____) min / Vol. (____) L									
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**									
Well Stick-up Height (m)	0.675	**Temperature (°C) 3%**									
Estimated Water Volume (L)	—	**pH (pH Units) ±0.1**									
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**									
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**	FROZEN								
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**									
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**									
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**									
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**	NOT SAMPLED								
		Only for final readings — **Sulphide (mg/L)**									
		Only for final readings — **Turbidity (NTU)**									
		Interval Purge Volume (L)									
		Cumulative Purge Volume (L):									

YSI ID	X	**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)		X	X	X	X
Sample Time (24hr)	NOT SAMPLED				

HEMMERA

Sample Site (Con't): GS1-HA-05A

Sample Date (Con't): FEB 1, 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap (TRIMMED) ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☒ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	0

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

- THERMOS CAP WAS CUT TO ACCESS WELL STILL FUNCTIONAL
- AT AT SURFACE

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MP09-02 + GSI-PC-02A/B	**Project Number**	1343-005.14	**Date**	Feb 3, 2016
Piezometer Diameter		**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z: E: N:	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Cloudy, -13°C
Waypoint	GPS: Name:			**Recovery**	☐ Good ☐ Bad
Photos	Cam: Lumix Nos: 281-285	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)		**Purge Start Time:**		**Purge End Time:**				**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit				
Depth to Bottom (m)		**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)		**Depth to water (m)**											
Well Stick-up Height (m)		**Temperature (°C) 3%**											
Estimated Water Volume (L)		**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

Wells Destroyed
- MP09-02
- GSI-PC-02A/B

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): MP09-02 + GSI-PC-02A/B

Sample Date (Con't): Feb 3, 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	
Oxygen (O2)	%	
Carbon Dioxide (C02)	PPM	

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Wells have been destroyed by placer mining activities at upper part of Pony Creek. We confirmed this visually with the use of GPS coordinates, the presence of mining equipment, and observations of active mining during the Sept 2015 sampling event.

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-PC-03 A/B.	**Project Number**	1343-005.14	**Date**	FEB 3 2016
Piezometer Diameter	–	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z: 08V E: 0389254 N: 68[illegible]81707	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -12°C
Waypoint	GPS: ELR Name: –			**Recovery**	☐ Good ☐ Bad
Photos	Cam: Lumix Nos: 295 – 298.	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	
Depth to Bottom (m)	
Submerged Tubing Depth (m)	
Well Stick-up Height (m)	
Estimated Water Volume (L)	

(DTB – DTW) x (πr²)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

Purge Start Time:		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit

Purge Interval Time (___) min / Vol. (___) L								
Depth to water (m)								
Temperature (°C) 3%								
pH (pH Units) ±0.1								
Cond. (μs/cm) 3%								
Specific Cond. (μs/cm) 3%								
Redox (mV) 10%								
DO (mg/L) 10%								
DO (%) 10%								
Appearance & Odour (Clear, Silty, HC odours, etc.)								
Only for final readings – **Sulphide (mg/L)**								
Only for final readings – **Turbidity (NTU)**								
Interval Purge Volume (L)								
Cumulative Purge Volume (L):								

NOT FOUND. GLACIATED

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)					
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): GS1-PE-03 A/B

Sample Date (Con't): FEB 3 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	
Oxygen (O2)	%	
Carbon Dioxide (C02)	PPM	

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		CALCULATED OVER
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI-PC-04 A/B	**Project Number**	1343-005.14	**Date**	FEB 3 2016
Piezometer Diameter	1" STEEL	**Client**	GY - AAM	**Samplers**	GR + JM
UTM Location	Z:08V E:0389586 N: 6881660	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -12°C OVERCAST
Waypoint	GPS: ELR Name: —			**Recovery**	☐ Good ☐ Bad
Photos	Cam: Lumix Nos: 299 - 302	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

	A	B										
Initial Depth to Water (m)	0.817 FROZEN	1.419 TO ICE	**Purge Start Time:**		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit				
Depth to Bottom (m)			**Purge Interval Time (____) min / Vol. (____) L**									
Submerged Tubing Depth (m)			**Depth to water (m)**									
Well Stick-up Height (m)	0.68 TO ICE	0.77 TO ICE	**Temperature (°C) 3%**									
Estimated Water Volume (L)			**pH (pH Units) ±0.1**									
			Cond. (µs/cm) 3%									
			Specific Cond. (µs/cm) 3%									
			Redox (mV) 10%									
			DO (mg/L) 10%									
			DO (%) 10%									
			Appearance & Odour (Clear, Silty, HC odours, etc.)									
			Only for final readings	**Sulphide (mg/L)**								
				Turbidity (NTU)								
			Interval Purge Volume (L)									
			Cumulative Purge Volume (L):									

FROZEN

(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)					
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): GS1 - PC - 04 A/B

Sample Date (Con't): FEB 3 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other BAG ON A. CAP ON B.

Seal Replaced: ☐ J-Plug ☒ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

ON A

Head Space Gas Measurements

	Units	Values A	Values B
Methane (CH4)	%LEL	0	0
Oxygen (O2)	%	20.9	20.9
Carbon Dioxide (C02)	PPM	25	525

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Consumables Used:

1" CAP PUT ON A

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	GSI - PC - 05 A/B	**Project Number**	1343-005.14	**Date**	FEB 3 2016
Piezometer Diameter	1" STEEL	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z: 08V E: 0389709 N: 6881661	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -12°C OVERCAST
Waypoint	GPS: ELR Name: —			**Recovery**	☐ Good ☐ Bad
Photos	Cam: LUMIX Nos: 303 - 306	**Purge Method**			
Duplicate Collected	☐ Yes Name: —	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name: —				

	A	B
Initial Depth to Water (m)	0.838 TO ~~0.73~~ ICE	0.839 TO ~~0.75~~ ICE
Depth to Bottom (m)	—	—
Submerged Tubing Depth (m)		
Well Stick-up Height (m)	0.73 TO ICE	0.75 TO ICE
Estimated Water Volume (L)		

(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

Purge Start Time:		**Purge End Time:**			**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit			
Purge Interval Time (____) min / Vol. (____) L									
Depth to water (m)									
Temperature (°C) 3%									
pH (pH Units) ±0.1									
Cond. (µs/cm) 3%									
Specific Cond. (µs/cm) 3%									
Redox (mV) 10%									
DO (mg/L) 10%									
DO (%) 10%									
Appearance & Odour (Clear, Silty, HC odours, etc.)									
Only for final readings **Sulphide (mg/L)**									
Only for final readings **Turbidity (NTU)**									
Interval Purge Volume (L)									
Cumulative Purge Volume (L):									

FROZEN

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): GSI-PC-05 A/B

Sample Date (Con't): FEB 3 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other B HAS CAP A HAS PLASTIC BAG.

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☒ Other * A NEEDS CAP.

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details:

Head Space Gas Measurements

	Units	Values A	Values B
Methane (CH4)	%LEL	Ø	Ø
Oxygen (O2)	%	9.0	15.0
Carbon Dioxide (C02)	PPM	10,000 OVER RANGE →	10,000

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

FROZEN

General Notes and Observations:

* A NEEDS 1" CAP. WE RAN OUT OF PLASTIC CAPS. PLASTIC BAG TIED BACK ON A.

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MP09-03	**Project Number**	1343-005.14	**Date**	FEB 3 2016
Piezometer Diameter	~~1" STEEL~~ 3/4" INSIDE 1" STEEL	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z: 08V E: 0388958 N: 6881744	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ 12°C LIGHT SNOW
Waypoint	GPS: ELR Name: —			**Recovery**	☐ Good ☐ Bad
Photos	Cam: LUMIX Nos: 286 - 288.	**Purge Method**			
Duplicate Collected	☐ Yes Name: /	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name: /				

Initial Depth to Water (m)	COULD NOT GET TAPE PASS THE FROZEN PERI TUBING. TUBING FROZEN IN PLACE.	**Purge Start Time:**		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit						
Depth to Bottom (m)		**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)		**Depth to water (m)**											
Well Stick-up Height (m)	0.54	**Temperature (°C) 3%**											
Estimated Water Volume (L)		**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume (DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume (DTB – DTW) x 2 (for 2" well diameter) = 1 well volume (DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume (DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
		Specific Cond. (µs/cm) 3%											
		Redox (mV) 10%											
		DO (mg/L) 10%											
		DO (%) 10%											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

FROZEN

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): MP09-03

Sample Date (Con't): Feb 3, 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☒ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☒ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	Ø
Oxygen (O2)	%	~~20~~ 21.0
Carbon Dioxide (C02)	PPM	25

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MP09-04	**Project Number**	1343-005.14	**Date**	FEB 2, 2016
Piezometer Diameter	1.5"	**Client**	GY - AAM	**Samplers**	AN DC
UTM Location	Z: 08 E: 0389577 N: 6880610	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	OVERCAST -19°C
Waypoint	GPS: HEM Name: MP09-04			**Recovery**	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 49-51	**Purge Method**			
Duplicate Collected	☐ Yes Name: X	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name: X	X	X	X	X

Initial Depth to Water (m)	1.814	**Purge Start Time:**	X	**Purge End Time:**	X				**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit			
Depth to Bottom (m)	N/A	**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**											
Well Stick-up Height (m)	1.225	**Temperature (°C) 3%**											
Estimated Water Volume (L)	N/A	**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr²)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**			FROZEN								
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**			NOT SAMPLED								
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)	NOT SAMPLED	X	X	X	X

HEMMERA

Sample Site (Con't): MP09-04

Sample Date (Con't): FEB 2, 2016

Well Head Seal: ☒ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☒ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.4
Carbon Dioxide (C02)	PPM	700

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

WELL HAS LOTS OF TUBING HAD TO USE SMALL DIA. TAP

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MP09-05	**Project Number**	1343-005.14	**Date**	Feb. 2 / 2016
Piezometer Diameter	2"	**Client**	GY - AAM	**Samplers**	AN, DC
UTM Location	Z: 08 E: 0389549 N: 6880589	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Overcast ~ -19°C
Waypoint	GPS: HEM Name: MP09-05			**Recovery**	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 61-63	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	1.343	**Purge Start Time:**		**Purge End Time:**						**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit		
Depth to Bottom (m)	N/A	**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**											
Well Stick-up Height (m)	1.050	**Temperature (°C) 3%**											
Estimated Water Volume (L)	N/A	**pH (pH Units) ±0.1**											
(DTB – DTW) x ($\pi r^{2)}$*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

FROZEN ONLY

MONITOR

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)	NOT SAMPLED				

HEMMERA

Sample Site (Con't): MP09-05

Sample Date (Con't): Feb. 2/2016

Well Head Seal: ☒ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☒ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.5
Carbon Dioxide (C02)	PPM	260

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

- FROZEN TUBING IN WELL SMALL DIA REQUIRED
- 70 cm SNOW COVER

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MP09 - 08	**Project Number**	1343-005.14	**Date**	FEB 3 2016
Piezometer Diameter	WATERRA (5/8") INSIDE 1" STEEL	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z: 08V E: 0389160 N: 6881719	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -12°C OVERCAST.
Waypoint	GPS: ELR Name: —			**Recovery**	☐ Good ☐ Bad
Photos	Cam: LUMIX Nos: 292 - 294				
Duplicate Collected	☐ Yes Name: /				
Field Blank Collected	☐ Yes Name:				

Purge Method

Waterra	Peristaltic	Disp. Bailer	Other

Initial Depth to Water (m)	* DEPTH TO ICE 0.36 m
Depth to Bottom (m)	
Submerged Tubing Depth (m)	
Well Stick-up Height (m)	0.82
Estimated Water Volume (L)	

(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

* MEASURED USING FREE TUBE HITTING ICE.

Purge Start Time:		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit			
Purge Interval Time (___) min / Vol. (___) L								
Depth to water (m)								
Temperature (°C) 3%								
pH (pH Units) ±0.1								
Cond. (µs/cm) 3%			FROZEN					
Specific Cond. (µs/cm) 3%								
Redox (mV) 10%								
DO (mg/L) 10%								
DO (%) 10%								
Appearance & Odour (Clear, Silty, HC odours, etc.)								
Only for final readings – **Sulphide (mg/L)**								
Only for final readings – **Turbidity (NTU)**								
Interval Purge Volume (L)								
Cumulative Purge Volume (L):								

YSI ID	
Logged Field Parameters	☐ Yes ☐ No
Time logged on YSI (24hr)	
Sample Time (24hr)	

Sample Method:

Waterra	Peristaltic	Disp. Bailer	Other

HEMMERA

Sample Site (Con't): MP09-08

Sample Date (Con't): FEB 3 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☒ Not Sealed ☐ Other NO CAP

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other PERI TUBING STUCK IN WELL

Well properly sealed for gas monitoring: ☐ Yes ☒ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	Ø
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	Ø

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MP09-09	**Project Number**	1343-005.14	**Date**	FEB 4 2016
Piezometer Diameter	1.5"	**Client**	GY - AAM	**Samplers**	AN DC
UTM Location	Z: 08 E: 0389241 N: 6880682	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	P CLOUDY -12°C
Waypoint	GPS: HEM Name: MP09-09			**Recovery**	☒ Good ☐ Bad
Photos	Cam: HEM Nos: 94-96				
Duplicate Collected	☐ Yes Name:				
Field Blank Collected	☐ Yes Name:				

Purge Method

Waterra	Peristaltic	Disp. Bailer	Other
		X	

Initial Depth to Water (m)	3.890	**Purge Start Time:**		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit
Depth to Bottom (m)	5.560						
Submerged Tubing Depth (m)	N/A						
Well Stick-up Height (m)	2.46						
Estimated Water Volume (L)	1.75						

(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

5.560
3.890
1.670

Purge Interval Time (____) min / Vol. (____) L											
Depth to water (m)											
Temperature (°C) 3%											
pH (pH Units) ±0.1											
Cond. (µs/cm) 3%											
Specific Cond. (µs/cm) 3%											
Redox (mV) 10%											
DO (mg/L) 10%											
DO (%) 10%											
Appearance & Odour (Clear, Silty, HC odours, etc.)											
Only for final readings	**Sulphide (mg/L)**										
	Turbidity (NTU)									100 SILTY	
Interval Purge Volume (L)											
Cumulative Purge Volume (L):											

DUP 1

SAMPLE

YSI ID	
Logged Field Parameters	☐ Yes ☐ No
Time logged on YSI (24hr)	
Sample Time (24hr)	10.00

Sample Method:

Waterra	Peristaltic	Disp. Bailer	Other
	X		

HEMMERA

Sample Site (Con't): MP09-09

Sample Date (Con't): FEB 4, 2016

Well Head Seal: ☒ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☒ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	4
Oxygen (O2)	%	18.0
Carbon Dioxide (C02)	PPM	260

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☑ Field Filtered	☑ HNO_3 (Nitric)	120	
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☑ HCL (Hydrochloric)	40	
2	500 ml (plastic)	General Chemistry	100 ml	-	-	500	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☑ NaOH (Sodium Hydroxide)	145	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☑ H_2SO_4 (Sulfuric)	120	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)	120	
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH	120	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	120	

General Notes and Observations:

10 cm of snow cover

Consumables Used:

1" bailer

1 inline filter

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MP09-10	**Project Number**	1343-005.14	**Date**	FEB 4, 2018
Piezometer Diameter	1.5"	**Client**	GY - AAM	**Samplers**	AM DC
UTM Location	Z:08 E: 6389241 N: 6880681	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	P CLOUDY -12°C
Waypoint	GPS: HEM Name: MP09-10			**Recovery**	☐ Good ☒ Bad
Photos	Cam: HEM Nos: 91-93	**Purge Method**			
Duplicate Collected	☐ Yes Name: X	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:			X	

Initial Depth to Water (m)	3.655	**Purge Start Time:**	X	**Purge End Time:**	X	**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit						
Depth to Bottom (m)	4.390	**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**											
Well Stick-up Height (m)	2.20	**Temperature (°C) 3%**											
Estimated Water Volume (L)	1	**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations: 4.390 − 3.655 = 0.735		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

Direct sample

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)	1030			X	

HEMMERA

Sample Site (Con't): MP09-15

Sample Date (Con't): FEB 4, 2016

Well Head Seal: ☒ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☒ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.1
Carbon Dioxide (C02)	PPM	380

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☑ Field Filtered	☑ HNO_3 (Nitric)	100	
1b	40 ml (glass)	Dissolved Mercury	15 mL	☑ Field Filtered	☑ HCL (Hydrochloric)	30	
2	500 ml (plastic)	General Chemistry	100 ml	-	-	200	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)	Ø	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)	Ø	Not enough sample
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)	Ø	
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH	Ø	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	Ø	

General Notes and Observations:

10cm of snow cover

Consumables Used:

1" bailer

1 inline filter

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MP09-11	**Project Number**	1343-005.14	**Date**	FEB 4, 2016
Piezometer Diameter	1.5"	**Client**	GY - AAM	**Samplers**	AN DC
UTM Location	Z: 08 E: 0389219 N: 6880614	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	PARTLY CLOUDY -12°C
Waypoint	GPS: ME/1 Name: MP09-11			**Recovery**	☐ Good ☐ Bad
Photos	Cam: HSM Nos: 85-87	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m) ICE	7.900	**Purge Start Time:**		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit						
Depth to Bottom (m)	N/A	**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**											
Well Stick-up Height (m)	1.89	**Temperature (°C) 3%**											
Estimated Water Volume (L)	N/A	**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr²)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

FROZEN

MONITOR ONLY

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)	NOT SAMPLED				

HEMMERA

Sample Site (Con't): MP09-11

Sample Date (Con't): FEB 4 2016

Well Head Seal: ☒ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☒ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	17.7
Carbon Dioxide (C02)	PPM	460

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

10 cm of snow cover

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MP09-12	**Project Number**	1343-005.14	**Date**	FEB 4, 2011
Piezometer Diameter	1.5"	**Client**	GY - AAM	**Samplers**	AN DC
UTM Location	Z: 08 E: 0389219 N: 6880613	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	P CLOUDY -12°C
Waypoint	GPS: NFM Name: MP09-12 X			**Recovery**	☐ Good ☒ Bad
Photos	Cam: NFM Nos: 89-90	**Purge Method**			
Duplicate Collected	☐ Yes Name: X	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name: X				

Initial Depth to Water (m)	2.000	**Purge Start Time:**		**Purge End Time:**				**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit				
Depth to Bottom (m)	N/A	**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**											
Well Stick-up Height (m)	1.84	**Temperature (°C) 3%**											
Estimated Water Volume (L)	N/A	**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations: /		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

FROZEN / MONITOR ONLY

YSI ID	X	**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)	X				
Sample Time (24hr)	NOT SAMPLED				

HEMMERA

Sample Site (Con't): MP09-12

Sample Date (Con't): FEB 9, 2016

Well Head Seal: ☒ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☒ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.0
Carbon Dioxide (C02)	PPM	340

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

10cm of snow cover

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MP09-14	**Project Number**	1343-005.14	**Date**	FEB 4, 2016
Piezometer Diameter	5/8" WATERRA INSIDE 1" STEEL	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	ZONE E:0389141 N: 6880720	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -11°C OVERCAST
Waypoint	GPS: ELR Name: ✓			**Recovery**	☐ Good ☐ Bad
Photos	Cam: LUMIX Nos: 329-331	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	0.864 TO ICE/ BLOCKAGE	**Purge Start Time:**		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit						
Depth to Bottom (m)		**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)		**Depth to water (m)**											
Well Stick-up Height (m)	0.92	**Temperature (°C) 3%**											
Estimated Water Volume (L)		**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

FROZEN

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): MP09 - 14

Sample Date (Con't): FEB 4, 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☐ Not Sealed ☒ Other GLOVE + PLASTIC BAG.

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other ABOVE METHOD IS PROBABLY THE BEST.

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details:

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	Ø
Oxygen (O2)	%	21.0
Carbon Dioxide (C02)	PPM	Ø

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

FROZEN

General Notes and Observations:

Consumables Used:

(Peri. DS.)

0.74cm MW09-2 Photo 70-72

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-01	Project Number	1343-005.14	Date	FEB 3, 2016
Piezometer Diameter	2"	Client	GY - AAM	Samplers	DC AN
UTM Location	Z: 08 E: 0389393 N: 6880559	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	-19 BROKEN CLOUD
Waypoint	GPS: HEM Name: MW09-01X			Recovery	☐ Good ☒ Bad
Photos	Cam: HEM Nos: 67-69	Purge Method			
Duplicate Collected	☐ Yes Name: X	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name:	X AVAIL DRY			

Initial Depth to Water (m)	7.170	Purge Start Time:		Purge End Time:		Pen or YSI:	☐ YSI Pro Plus ☐ Pen Unit				
Depth to Bottom (m)	9.180	Purge Interval Time (____) min / Vol. (____) L									
Submerged Tubing Depth (m)	N/A	Depth to water (m)									
Well Stick-up Height (m)	0.73	Temperature (°C) 3%									
Estimated Water Volume (L)	4.00	pH (pH Units) ±0.1									
		Cond. (µs/cm) 3%	DIRECT SAMPLE								
		Specific Cond. (µs/cm) 3%									
		Redox (mV) 10%									
		DO (mg/L) 10%									
		DO (%) 10%									
		Appearance & Odour (Clear, Silty, HC odours, etc.)									
		Only for final readings: Sulphide (mg/L)									
		Only for final readings: Turbidity (NTU)									
		Interval Purge Volume (L)									
		Cumulative Purge Volume (L):									

(DTB – DTW) x (πr²)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

9.18
7.17
2.01

YSI ID		Sample Method:			
Logged Field Parameters	☐ Yes ☐ No	Waterra	Peristaltic	Disp. Bailer	Other
Time logged on YSI (24hr)					
Sample Time (24hr)	14:45				

SEE ...

HEMMERA

Sample Site (Con't): MW09-01

Sample Date (Con't): FEB 3, 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☒ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.4
Carbon Dioxide (C02)	PPM	1700

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)	120	DECANT OFF FEB2 @ 17:15
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)	90	DECANT OFF FEB2
2	500 ml (plastic)	General Chemistry	100 ml	-	-	500	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☒ NaOH (Sodium Hydroxide)	145	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☒ H_2SO_4 (Sulfuric)	120	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☒ HNO_3 (Nitric)	120	
6	120 ml (plastic)	Sulphide	60 ml	-	☒ Zinc Acetate, then NaOH	120	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	120	

General Notes and Observations:

Feb 2 PURGE INTO 1 LITRE BOTTLE

50cm SNOW COVER Purge dry

Due to the amount of sediment in the sample, we collected the Feb 2 purge water from the last portion of pumping, and allowed the sediment to settle. We then used this water to filter for our D. Metals - D. Mercury Samples.

Feb 3

The remaining sample bottles were filled with recharged well water, although they are extremely turbid/silty

Consumables Used:

1" bailer

1" silicon

60 ft. ¼" tubing. per

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-02	Project Number	1343-005.14	Date	FEB 2, 2016
Piezometer Diameter	2"	Client	GY - AAM	Samplers	AN DC
UTM Location	Z: 08 E: 0389395 N: 6880558	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	HIGH CLOUD −19°C
Waypoint	GPS: MM Name: MW09-02			Recovery	☒ Good ☐ Bad
Photos	Cam: MM Nos:	Purge Method			
Duplicate Collected	☐ Yes Name:	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name:		X		

Initial Depth to Water (m)	3.612
Depth to Bottom (m)	4.720
Submerged Tubing Depth (m)	~ 4.5
Well Stick-up Height (m)	0.74
Estimated Water Volume (L)	~ 2.2

(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

Purge Start Time:	16:52	Purge End Time:	16:55	Pen or YSI:	☒ YSI Pro Plus ☐ Pen Unit							
Purge Interval Time (3) min / Vol. (____) L	16:55											
Depth to water (m)	4.12											
Temperature (°C) 3%	0.1											
pH (pH Units) ±0.1	7.28											
Cond. (µs/cm) 3%	1463											
Specific Cond. (µs/cm) 3%	2790											
Redox (mV) 10%	-69.3											
DO (mg/L) 10%	1.268											
DO (%) 10%	18.6											
Appearance & Odour (Clear, Silty, HC odours, etc.)	clear – Yellow brown tinge											
Only for final readings: Sulphide (mg/L)	0.04											
Only for final readings: Turbidity (NTU)	18.8											
Interval Purge Volume (L)	1.0											
Cumulative Purge Volume (L):	1.0											

Direct Sample

YSI ID	MW09-02
Logged Field Parameters	☒ Yes ☐ No
Time logged on YSI (24hr)	16:57
Sample Time (24hr)	17:00

Sample Method:			
Waterra	Peristaltic	Disp. Bailer	Other
	X		

HEMMERA

Sample Site (Con't): MW09-02

Sample Date (Con't): FEB 2, 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☒ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.4
Carbon Dioxide (C02)	PPM	520

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☒ Field Filtered	☒ HNO_3 (Nitric)	1	
1b	40 ml (glass)	Dissolved Mercury	15 mL	☒ Field Filtered	☒ HCL (Hydrochloric)	1	
2	500 ml (plastic)	General Chemistry	100 ml	-	-	1	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☒ NaOH (Sodium Hydroxide)	1	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☒ H_2SO_4 (Sulfuric)	1	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☒ HNO_3 (Nitric)	1	
6	120 ml (plastic)	Sulphide	60 ml	-	☒ Zinc Acetate, then NaOH	1	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	1	

General Notes and Observations:

Previous notes indicated proper purge. DTW dropped after purge start, therefore switched to "direct sample".
DTW seemed to stabilize, recommend proper purge next winter.

Consumables Used:

~5 m peri. tubing.
6" silicon

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-03	Project Number	1343-005.14	Date	FEB 3, 2016
Piezometer Diameter	2"	Client	GY - AAM	Samplers	AN DC
UTM Location	Z:08 E: 0389420 N: 6880557	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	HIGH CLOUD -19°C
Waypoint	GPS: HEM Name: MW09-03			Recovery	☒ Good ☐ Bad
Photos	Cam: HEM Nos: 76-78	Purge Method			
Duplicate Collected	☐ Yes Name:	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name:		X		

Initial Depth to Water (m)	6.754
Depth to Bottom (m)	9.953
Submerged Tubing Depth (m)	9.2
Well Stick-up Height (m)	0.23
Estimated Water Volume (L)	6.4

(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

9.953
6.754
3.200

Purge Start Time:	1217	Purge End Time:	12:54	Pen or YSI:	☒ YSI Pro Plus ☐ Pen Unit				
Purge Interval Time (____) min / Vol. (1) L	1224	1230	1238	1246	1254				
Depth to water (m)	6.95	6.99	6.98	6.98	6.99				
Temperature (°C) 3%	0.5	0.3	0.4	0.4	0.4				
pH (pH Units) ±0.1	8.37	8.06	7.62	7.52	7.45				
Cond. (µs/cm) 3%	1447	1436	1428	1431	1431				
Specific Cond. (µs/cm) 3%	2719	2718	2702	2702	2703				
Redox (mV) 10%	133.7	120.2	115.1	116.1	112.0				
DO (mg/L) 10%	2.85	3.04	3.23	3.46	3.36				
DO (%) 10%	20.2	20.9	22.8	24.0	23.4				
Appearance & Odour (Clear, Silty, HC odours, etc.)	Clear	Clear	Clear	Clear	Clear				
Only for final readings: Sulphide (mg/L)	—	—	—	—	—				
Only for final readings: Turbidity (NTU)	—	—	—	—	0.59				
Interval Purge Volume (L)	1.0	1.0	1.0	1.0	1.0				
Cumulative Purge Volume (L):	1.0	2.0	3.0	4.0	5.0				

YSI ID	
Logged Field Parameters	☐ Yes ☒ No
Time logged on YSI (24hr)	
Sample Time (24hr)	13:00

Sample Method:			
Waterra	Peristaltic	Disp. Bailer	Other
	X		

HEMMERA

Sample Site (Con't): MW09-03

Sample Date (Con't): FEB 3, 2016

Well Head Seal: ☒ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☒ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.0
Carbon Dioxide (C02)	PPM	380

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)	120	
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)	40	
2	500 ml (plastic)	General Chemistry	100 ml	-	-	500	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)	145	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)	120	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)	120	
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH	120	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	120	

General Notes and Observations:

- BURIED UNDER SNOW COVER (0.80m)

Consumables Used:

1" SILICONE

25' 1½" HDPE

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-04	Project Number	1343-005.14	Date	FEB 3, 2016
Piezometer Diameter	2"	Client	GY - AAM	Samplers	AN DC
UTM Location	Z: 08 E: 0389420 N: 6880558	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	HIGH CLOUD -19°C
Waypoint	GPS HEM Name: MW09-04 X			Recovery	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 73-75	Purge Method			
Duplicate Collected	☒ Yes Name: MW16-200	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name:		X		

Initial Depth to Water (m)	4.738
Depth to Bottom (m)	7.680
Submerged Tubing Depth (m)	7.0
Well Stick-up Height (m)	.04
Estimated Water Volume (L)	5.8

(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

7.680
4.738
7.942

Purge Start Time:	10:00	Purge End Time:	10:40	Pen or YSI:	☐ YSI Pro Plus ☐ Pen Unit

Purge Interval Time (7m) min / Vol. (1) L		10:04	10:15	10:25	10:39					
Depth to water (m)		5.03	5.38	5.45	5.47					
Temperature (°C) 3%		0.5	0.5	0.4	0.3					
pH (pH Units) ±0.1		8.26	8.28	8.29	8.37					
Cond. (µs/cm) 3%		1460	1454	1464	1467					
Specific Cond. (µs/cm) 3%		2737	2732	2766	2766					
Redox (mV) 10%		143.1	137.0	138.3	141.5					
DO (mg/L) 10%		3.16	3.34	9.04	5.78					
DO (%) 10%		22.9	23.8	28.1	26.2					
Appearance & Odour (Clear, Silty, HC odours, etc.)		Clear	Clear	Clear	Clear					
Only for final readings	Sulphide (mg/L)	—	—	—	0.03					
	Turbidity (NTU)	—	—	—	3.40*					
Interval Purge Volume (L)		1.0	1.0	1.0	1.0					
Cumulative Purge Volume (L):		1.0	2.0	3.0	4.0					

YSI ID	ELR
Logged Field Parameters	☐ Yes ☐ No
Time logged on YSI (24hr)	
Sample Time (24hr)	10:30

Sample Method:			
Waterra	Peristaltic	Disp. Bailer	Other
	X		

* some ice/slush floating in sample. Results for turbidity may not be accurate.

HEMMERA

Sample Site (Con't): MW09-04

Sample Date (Con't): FEB 3, 2016

Well Head Seal: ☒ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☒ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.0
Carbon Dioxide (C02)	PPM	440

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)	120	
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)	40	
2	500 ml (plastic)	General Chemistry	100 ml	-	-	500	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)	145	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)	120	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)	120	
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH	120	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	120	

General Notes and Observations:

- TRANSDUCER IN WELL
- SLIGHTLY UNDER SNOW (10 cm)

Consumables Used:

1" SILICONE

25' 1/4 HOSE

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-05	**Project Number**	1343-005.14	**Date**	FEB 3 2016
Piezometer Diameter	2" PVC	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z:08V E:0389412 N:6880656	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	-12 WIND LIGHT SNOW
Waypoint	GPS: GR Name: /			**Recovery**	☐ Good ☐ Bad
Photos	Cam: LUMIX Nos:	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	~~7.48~~ 7.480 DRY	**Purge Start Time:**		**Purge End Time:**			**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit					
Depth to Bottom (m)		**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)		**Depth to water (m)**											
Well Stick-up Height (m)	1.11	**Temperature (°C) 3%**											
Estimated Water Volume (L)		**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

DRY

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): MW09-05

Sample Date (Con't): FEB 3 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	Ø
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	375

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Consumables Used:

2545

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-06	**Project Number**	1343-005.14	**Date**	FEB 3 2016
Piezometer Diameter	2" PVC	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z: 05V E: 0389412 N: 6880656	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	-12 LIGHT SNOW
Waypoint	GPS: ELR Name: -			**Recovery**	☐ Good ☒ Bad
Photos	Cam: ELR Nos: 313-316	**Purge Method**			
Duplicate Collected	☐ Yes Name: X	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name: X			✓	

Initial Depth to Water (m)	4.454
Depth to Bottom (m)	5.950
Submerged Tubing Depth (m)	-
Well Stick-up Height (m)	2.07
Estimated Water Volume (L)	~ 3

(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

1.450 X 2

~3L

Purge Start Time:	16:33	**Purge End Time:**		1649		**Pen or YSI:**	☒ YSI Pro Plus ☐ Pen Unit		
Purge Interval Time (____) min / Vol. (1) L	~~1E~~	~~2E~~	~~3E~~	~~1645~~	1649				
Depth to water (m)		5.200	5.520	5.760	·				
Temperature (°C) 3%	1.3	2.0	2.2	2.3	1.6				
pH (pH Units) ±0.1	6.06	6.41	6.86	7.2	7.29				
Cond. (µs/cm) 3%	970	1066	1110	772	678				
Specific Cond. (µs/cm) 3%	1774	1890	1975	1360	1209				
Redox (mV) 10%	210.4	189.8	174.9	162.3	159.9				
DO (mg/L) 10%	2.53	2.79	3.01	1.78	2.53				
DO (%) 10%	18.7	~~19.8~~ 20.6	21.5	13.2	17.9				
Appearance & Odour (Clear, Silty, HC odours, etc.)	SLIGHTLY TURBID	→	TURBID	→	→				
Only for final readings — **Sulphide (mg/L)**	-	-	-	-		0.05 (FEB 4)			
Only for final readings — **Turbidity (NTU)**	-	-	-	-		16.6 (FEB 4)			
Interval Purge Volume (L)	1	1	1	0.5	0.4				
Cumulative Purge Volume (L):	1	2	3	3.5	3.9				

YSI ID	Pine	**Sample Method:**			
Logged Field Parameters	☐ Yes ☒ No				
Time logged on YSI (24hr)	-	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)	09:15 (Feb 4)			X	

HEMMERA

Sample Site (Con't): MW09-06

Sample Date (Con't): FEB 3 2016 (Purge) / Feb 4 (Sampled)

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	14.1
Carbon Dioxide (C02)	PPM	3350

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☒ Field Filtered	☒ HNO_3 (Nitric)	FULL	
1b	40 ml (glass)	Dissolved Mercury	15 mL	☒ Field Filtered	☒ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☒ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☒ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☒ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☒ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

- Purged 3.9L on Feb 2, purged well dry + allow overnight recharge.
- Feb 4, Sampled right away to minimize sediment in samples.
- Otw prior to sampling is: DIPPED ON FEB 4. 4.450 m

Consumables Used:

1x2" bailer

7m of twine

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-07	**Project Number**	1343-005.14	**Date**	Feb 4, 2016
Piezometer Diameter	2" PVC	**Client**	GY - AAM	**Samplers**	JH · GR
UTM Location	Z:08V E: 0389324 N: 6880699	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Clear -13°C
Waypoint	GPS: ELR Name:			**Recovery**	☐ Good ☐ Bad
Photos	Cam: ELR Nos: 317-319	**Purge Method**			
Duplicate Collected	☐ Yes Name: X	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	3.316 TO ICE/ BLOCKAGE	**Purge Start Time:**		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit								
Depth to Bottom (m)		**Purge Interval Time (____) min / Vol. (____) L**													
Submerged Tubing Depth (m)		**Depth to water (m)**													
Well Stick-up Height (m)	1.37	**Temperature (°C) 3%**													
Estimated Water Volume (L)		**pH (pH Units) ±0.1**													
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**													
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**													
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**													
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**													
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**													
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**													
		Only for final readings	**Sulphide (mg/L)**												
			Turbidity (NTU)												
		Interval Purge Volume (L)													
		Cumulative Purge Volume (L):													

FROZEN / DRY

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)					
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): MW09-07

Sample Date (Con't): FEB 4 2016

Well Head Seal: ☒ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	Ø
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	Ø

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

FROZEN/DRY

General Notes and Observations:

DURING OPENING OF WELL TOP OF CASING CRACKED. TAPED UP WITH ELECTRICAL TAPE TO ~~GAIN~~ KEEP SEAL.

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-08	**Project Number**	1343-005.14	**Date**	Feb. 2/2016
Piezometer Diameter	2"	**Client**	GY - AAM	**Samplers**	AN, DC.
UTM Location	Z: 08 E: 0389818 N: 6880576	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Overcast ~ -19°C
Waypoint	GPS: MEM Name: MW09-08			**Recovery**	☐ Good ☐ Bad
Photos	Cam: MEM Nos: 55-57	**Purge Method**			
Duplicate Collected	☐ Yes Name: X	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name: X	X	X	X	X

Initial Depth to ICE Water (m)	1.240	**Purge Start Time:**	X	**Purge End Time:**	X	**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit						
Depth to Bottom (m)	N/A	**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**											
Well Stick-up Height (m)	1.112	**Temperature (°C) 3%**											
Estimated Water Volume (L)	N/A	**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

FROZEN

NOT MONITORED

ONLY

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No X				
Time logged on YSI (24hr)	X	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)	NOT SAMPLED	X	X	X	X

HEMMERA

Sample Site (Con't): MW09-08

Sample Date (Con't): Feb 2 / 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☒ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.8
Carbon Dioxide (C02)	PPM	340

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

TUBING FROZEN IN WELL

TOC'S SAME COLOR

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09 -11	**Project Number**	1343-005.14	**Date**	FEB 4 2016
Piezometer Diameter	2" PVC	**Client**	GY - AAM	**Samplers**	GR + JM
UTM Location	Z: 08V E: 0389040 N: 6880711	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -11°C
Waypoint	GPS: Name:			**Recovery**	☐ Good ☐ Bad
Photos	Cam: Nos: 323-325	**Purge Method**			
Duplicate Collected	☐ Yes Name:	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	4.845 FROZEN/ DRY	**Purge Start Time:**		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit						
Depth to Bottom (m)	–	**Purge Interval** Time (____) min / Vol. (____) L											
Submerged Tubing Depth (m)		**Depth to water (m)**											
Well Stick-up Height (m)	0.82	**Temperature (°C) 3%**											
Estimated Water Volume (L)		**pH (pH Units) ±0.1**	FROZEN/ DRY										
		Cond. (µs/cm) 3%											
		Specific Cond. (µs/cm) 3%											
		Redox (mV) 10%											
		DO (mg/L) 10%											
		DO (%) 10%											
		Appearance & Odour (Clear, Silty, HC odours, etc.)											
		Only for final readings — **Sulphide (mg/L)**											
		Only for final readings — **Turbidity (NTU)**											
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	Waterra	Peristaltic	Disp. Bailer	Other
Time logged on YSI (24hr)					
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): MW09-11

Sample Date (Con't): FEB 4 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	Ø
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	1125

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-	FROZEN / DRY	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-14 & MW09-13	**Project Number**	1343-005.14	**Date**	FEB 3 2016
Piezometer Diameter	2" PVC	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z:08V E:0389006 N:6881169	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~12°C CLOUDY
Waypoint	GPS: ELR Name: —			**Recovery**	☐ Good ☒ Bad ?
Photos	Cam: LUMIX Nos: 277 – 280.	**Purge Method**			
Duplicate Collected	☐ Yes Name:	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name:				

	(13)	(14)
Initial Depth to Water (m)	FROZEN 8.920 BLOCKED	5.114
Depth to Bottom (m)	—	7.618
Submerged Tubing Depth (m)	—	—
Well Stick-up Height (m)	0.73	0.74
Estimated Water Volume (L)	~~5.00~~	5.0

(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

~ 5L

Purge Start Time:		**Purge End Time:**		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit

Purge Interval Time (____) min / Vol. (____) L								
Depth to water (m)								
Temperature (°C) 3%								
pH (pH Units) ±0.1								
Cond. (µs/cm) 3%								
Specific Cond. (µs/cm) 3%								
Redox (mV) 10%								
DO (mg/L) 10%								
DO (%) 10%								
Appearance & Odour (Clear, Silty, HC odours, etc.)								
Only for final readings – **Sulphide (mg/L)**								
Only for final readings – **Turbidity (NTU)**								
Interval Purge Volume (L)								
Cumulative Purge Volume (L):								

MW09-14 DIRECT SAMPLED WITH BAILER.

* MW09-13 was not sampled

YSI ID	
Logged Field Parameters	☐ Yes ☐ No
Time logged on YSI (24hr)	
Sample Time (24hr)	10:15

Sample Method:

Waterra	Peristaltic	Disp. Bailer	Other
		(14) BAILER.	

HEMMERA

Sample Site (Con't): MW09-13 & MW09-14

Sample Date (Con't): FEB 3 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other ON BOTH

Seal Replaced: ☐ J-Plug ☒ PVC Cap ☒ Not required ☐ Other FOR BOTH

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: FOR BOTH.

SAMPLED 14 ONLY.

Head Space Gas Measurements

	Units	Values 13	14
Methane (CH4)	%LEL	Ø	Ø
Oxygen (O2)	%	20.9	20.9
Carbon Dioxide (C02)	PPM	1200	~~4753~~ 25

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☒ Field Filtered	☒ HNO_3 (Nitric)	100	
1b	40 ml (glass)	Dissolved Mercury	15 mL	☒ Field Filtered	☒ HCL (Hydrochloric)	20	
2	500 ml (plastic)	General Chemistry	100 ml	-	-	~ 200	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☒ NaOH (Sodium Hydroxide)	100	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☒ H_2SO_4 (Sulfuric)	60	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☒ HNO_3 (Nitric)	50	
6	120 ml (plastic)	Sulphide	60 ml	-	☒ Zinc Acetate, then NaOH	50	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	50	

General Notes and Observations:

ONLY SAMPLED (14) LIKELY MELTWATER ABOVE AN ICE PLUG. TRIED PERISTALTIC PUMP BUT ~~HEM~~ TUBING ICE UP. USE 1" BAILER TO COLLECT WATER. BALL FREEZING IN BAILER - GOT MIN VOLUMES.

Consumables Used:

1" bailer

5m ¼" tubing

6" silicone

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09 -15	Project Number	1343-005.14	Date	FEB 3 2016
Piezometer Diameter	2" PVC	Client	GY - AAM	Samplers	GR + JH
UTM Location	Z:08V E:0388921 N:6881723	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	-12°C LIGHT SNOW.
Waypoint	GPS: ELR Name: —			Recovery	☐ Good ☐ Bad
Photos	Cam: LUMIX Nos: 310 – 312	Purge Method			
Duplicate Collected	☐ Yes Name:	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	13.989
Depth to Bottom (m)	14.025
Submerged Tubing Depth (m)	
Well Stick-up Height (m)	0.89
Estimated Water Volume (L)	

(DTB – DTW) x (πr²)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

0.072 L
(72 mL)

Purge Start Time:		Purge End Time:		Pen or YSI:	☐ YSI Pro Plus ☐ Pen Unit			
Purge Interval Time (___) min / Vol. (___) L								
Depth to water (m)								
Temperature (°C) 3%								
pH (pH Units) ±0.1								
Cond. (µs/cm) 3%								
Specific Cond. (µs/cm) 3%								
Redox (mV) 10%								
DO (mg/L) 10%								
DO (%) 10%								
Appearance & Odour (Clear, Silty, HC odours, etc.)								
Only for final readings: Sulphide (mg/L)								
Only for final readings: Turbidity (NTU)								
Interval Purge Volume (L)								
Cumulative Purge Volume (L):								

INSUFFICIENT VOLUME

YSI ID	
Logged Field Parameters	☐ Yes ☐ No
Time logged on YSI (24hr)	
Sample Time (24hr)	

Sample Method:			
Waterra	Peristaltic	Disp. Bailer	Other

HEMMERA

Sample Site (Con't): MW09-15

Sample Date (Con't): FEB 3, 2016

Well Head Seal: ☒ J-Plug ☐ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	Ø
Oxygen (O2)	%	20.7
Carbon Dioxide (C02)	PPM	650

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

INSTRUMENTATION IN WELL. TRANSDUCER?

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-16	Project Number	1343-005.14	Date	Feb 1, 2016
Piezometer Diameter	2" PVC	Client	GY - AAM	Samplers	JH + DC
UTM Location	Z: 08 E: 0387990 N: 6881096	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	Broken clouds, -11°C
Waypoint	GPS: Hem Name: MW09-16 X			Recovery	☐ Good ☐ Bad
Photos	Cam: Hem Nos: 27-29	Purge Method			
Duplicate Collected	☐ Yes Name: X	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name: X	/	/	/	/

Initial Depth to Water (m)	1.855	Purge Start Time:	X	Purge End Time:	X	Pen or YSI: ☐ YSI Pro Plus ☐ Pen Unit
Depth to Bottom (m)	N/A	Purge Interval Time (___) min / Vol. (___) L				
Submerged Tubing Depth (m)	N/A	Depth to water (m)				
Well Stick-up Height (m)	1.29	Temperature (°C) 3%				
Estimated Water Volume (L)	N/A	pH (pH Units) ±0.1				
		Cond. (µs/cm) 3%	NOT SAMPLED			
		Specific Cond. (µs/cm) 3%				
		Redox (mV) 10%				
		DO (mg/L) 10%				
		DO (%) 10%				
		Appearance & Odour (Clear, Silty, HC odours, etc.)	FROZEN			
		Only for final readings: Sulphide (mg/L)				
		Only for final readings: Turbidity (NTU)				
		Interval Purge Volume (L)				
		Cumulative Purge Volume (L):				

(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

YSI ID	X	Sample Method:				
Logged Field Parameters	☐ Yes ☐ No					
Time logged on YSI (24hr)		Waterra	Peristaltic	Disp. Bailer	Other	
Sample Time (24hr)	NOT SAMPLED	X	—	X	X	

HEMMERA

Sample Site (Con't): MW09-16

Sample Date (Con't): FEB 1 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☒ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	525

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

2 cm of snow

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-17	**Project Number**	1343-005.14	**Date**	Feb 1, 2016
Piezometer Diameter	2" PVC	**Client**	GY - AAM	**Samplers**	JH + DC
UTM Location	Z: 08 E: 0388078 N6880972	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Broken cloud, -16°C
Waypoint	GPS: Hem Name: MW09-17*			**Recovery**	☐ Good ☐ Bad
Photos	Cam: Hem Nos: 015-017	**Purge Method**			
Duplicate Collected	☐ Yes Name:	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☐ Yes Name:				

Initial Depth to ~~Water~~ Ice (m)	5.609
Depth to Bottom (m)	—
Submerged Tubing Depth (m)	—
Well Stick-up Height (m)	0.97
Estimated Water Volume (L)	—

(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

N/A

Purge Start Time:	X	**Purge End Time:**	X	**Pen or YSI:**	☐ YSI Pro Plus ☑ Pen Unit
Purge Interval Time (____) min / Vol. (____) L	Well frozen or dry				
Depth to water (m)					
Temperature (°C) 3%					
pH (pH Units) ±0.1					
Cond. (µs/cm) 3%					
Specific Cond. (µs/cm) 3%					
Redox (mV) 10%					
DO (mg/L) 10%					
DO (%) 10%					
Appearance & Odour (Clear, Silty, HC odours, etc.)					
Only for final readings – **Sulphide (mg/L)**					
Only for final readings – **Turbidity (NTU)**					
Interval Purge Volume (L)					
Cumulative Purge Volume (L):					

YSI ID	
Logged Field Parameters	☐ Yes ☐ No
Time logged on YSI (24hr)	
Sample Time (24hr)	Not sampled

Sample Method:

Waterra	Peristaltic	Disp. Bailer	Other

HEMMERA

Sample Site (Con't): MW89-17

Sample Date (Con't): Feb 1, 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	9.3
Carbon Dioxide (C02)	PPM	10000 + (over range)

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

- well frozen or dry. Silt observed on water level probe
- Not sampled
- ~30 cm of snow on ground

Consumables Used:

None

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-18	Project Number	1343-005.14	Date	Feb 1, 2016
Piezometer Diameter	2" PVC	Client	GY - AAM	Samplers	JH · DC
UTM Location	Z:08 E:0388055 N:6880984	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	Broken Cloud, -16°C
Waypoint	GPS: Hem Name: MW09-18			Recovery	☒ Good ☐ Bad
Photos	Cam: Hem Nos: 012 - 014	Purge Method			
Duplicate Collected	☒ Yes Name: MW16-100	Waterra	Peristaltic	Disp. Bailer	Other
Field Blank Collected	☒ Yes Name: FB16-100			X	

Initial Depth to Water (m)	5.104
Depth to Bottom (m)	7.696
Submerged Tubing Depth (m)	7.45
Well Stick-up Height (m)	0.86
Estimated Water Volume (L)	5.2 L

(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

7.696
- 5.104
2.592 x2 = 5.184 L

Purge Start Time:	13:00	Purge End Time:	13:07	Pen or YSI:	☒ YSI Pro Plus ☐ Pen Unit					
Purge Interval Time (____) min / Vol. (__1__) L	13:00	13:03	13:05	13:06	13:07					
Depth to water (m)	5.105	5.105	5.105	5.105	5.105					
Temperature (°C) 3%	-0.1	-0.1	-0.1	-0.1	-0.1					
pH (pH Units) ±0.1	6.55	6.71	6.74	6.75	6.76					
Cond. (µs/cm) 3%	1285	1303	1329	1330	1356					
Specific Cond. (µs/cm) 3%	2465	2505	2556	2559	2608					
Redox (mV) 10%	160.8	139.0	133.8	130.5	127.5					
DO (mg/L) 10%	4.06	2.56	2.59	2.28	2.16					
DO (%) 10%	28.4	17.7	17.9	15.6	14.4					
Appearance & Odour (Clear, Silty, HC odours, etc.)	clear	clear	clear	clear	clear					
Only for final readings: Sulphide (mg/L)	–	–	–	–	0.0 (Feb 4)					
Only for final readings: Turbidity (NTU)	–	–	–	–	34.1					
Interval Purge Volume (L)	1.0	1.0	1.0	1.0	1.0					
Cumulative Purge Volume (L):	1.0	2.0	3.0	4.0	5.0					

YSI ID	Pink
Logged Field Parameters	☐ Yes ☒ No
Time logged on YSI (24hr)	–
Sample Time (24hr)	13:10

Sample Method:			
Waterra	Peristaltic	Disp. Bailer	Other
		X	

HEMMERA

Sample Site (Con't): MW09-18

Sample Date (Con't): Feb 1, 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	125

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☒ Field Filtered	☒ HNO_3 (Nitric)	100mL	each
1b	40 ml (glass)	Dissolved Mercury	15 mL	☒ Field Filtered	☒ HCL (Hydrochloric)	15mL	
2	500 ml (plastic)	General Chemistry	100 ml	-	-	100mL	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☒ NaOH (Sodium Hydroxide)	100mL	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☒ H_2SO_4 (Sulfuric)	60mL	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☒ HNO_3 (Nitric)	50mL	
6	120 ml (plastic)	Sulphide	60 ml	-	☒ Zinc Acetate, then NaOH	60mL	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	50mL	√

General Notes and Observations:

~30cm of snow on ground

- Returned Feb 4 @ 11:00 to collect in-field sulphides

Consumables Used:

1 bailer

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-19	Project Number	1343-005.14	Date	Feb 1, 2016
Piezometer Diameter	2" PVC	Client	GY - AAM	Samplers	JH . DC
UTM Location	Z:08 E:0388051 N:6881014	Project Name	Mount Nansen 2016 GW Sampling Program	Weather/Temperature	Broken Cloud -
Waypoint	GPS: Hem Name: MW09-19*			Recovery	☒ Good ☐ Bad
Photos	Cam: Hem Nos: 018-020				
Duplicate Collected	☐ Yes Name:				
Field Blank Collected	☐ Yes Name:				

Purge Method	Waterra	Peristaltic	Disp. Bailer	Other
		X		

Initial Depth to Water (m)	3.040
Depth to Bottom (m)	5.797
Submerged Tubing Depth (m)	5.6
Well Stick-up Height (m)	0.99
Estimated Water Volume (L)	5.5 L

(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

5.797
- 3.040
2.757 x 2 = 5.514 L

Purge Start Time:	11:51	Purge End Time:	12:08	Pen or YSI:	☒ YSI Pro Plus ☐ Pen Unit

Purge Interval Time (3) min / Vol. (____) L	11:53	11:56	11:59	12:02	12:08			
Depth to water (m)	3.30	3.387	3.452	3.463	3.280			
Temperature (°C) 3%	0.1	0.0	0.0	0.0	-0.3			
pH (pH Units) ±0.1	6.08	6.42	6.53	6.61	6.68			
Cond. (µs/cm) 3%	1148	1133	1127	1123	1116			
Specific Cond. (µs/cm) 3%	2193	2164	2154	2151	2157			
Redox (mV) 10%	-34.9	-62.4	-70.8	-77.7	-77.8			
DO (mg/L) 10%	2.96	2.22	1.23	0.80	0.52			
DO (%) 10%	20.4	15.7	8.7	5.5	3.5			
Appearance & Odour (Clear, Silty, HC odours, etc.)	sulfur odour clear	clear, slight sulfur odour	clear sulfur odour	clear sulfur odour	clear silty odour			
Only for final readings: Sulphide (mg/L)	–	–	–	–	0.12			
Only for final readings: Turbidity (NTU)	–	–	–	–	2.87			
Interval Purge Volume (L)	.350	.450	.350	.300	.150			
Cumulative Purge Volume (L):	.350	.800	1.150	1.450	1.600			

YSI ID	Pine
Logged Field Parameters	☐ Yes ☒ No
Time logged on YSI (24hr)	—
Sample Time (24hr)	12:10

Sample Method:	Waterra	Peristaltic	Disp. Bailer	Other
			X	

20.4 15.7
2.96 2.22

HEMMERA

Sample Site (Con't): MW09-19

Sample Date (Con't): Feb 1, 2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other ________

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other ________

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: ________

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	20.9
Carbon Dioxide (C02)	PPM	50

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☒ Field Filtered	☒ HNO_3 (Nitric)	100mL	
1b	40 ml (glass)	Dissolved Mercury	15 mL	☒ Field Filtered	☒ HCL (Hydrochloric)	15mL	
2	500 ml (plastic)	General Chemistry	100 ml	-	-	100mL	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☒ NaOH (Sodium Hydroxide)	100mL	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☒ H_2SO_4 (Sulfuric)	60mL	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☒ HNO_3 (Nitric)	50mL	
6	120 ml (plastic)	Sulphide	60 ml	-	☒ Zinc Acetate, then NaOH	60mL	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	50mL	

General Notes and Observations:

- 25cm of snow on ground
- Water freezing in tube replaced tubing froze [illegible] & bailer for sampling up @ several times [illegible]

Consumables Used:

40' ¼ HDPE
1' silicone
1x bailer
20' twine

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-20	**Project Number**	1343-005.14	**Date**	Feb. 2/2016
Piezometer Diameter	2"	**Client**	GY - AAM	**Samplers**	AN, DC.
UTM Location	Z: 08 E: 0389592 N: 6880587	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Overcast ~ -19°C
Waypoint	GPS: HEM Name: MW09-20			**Recovery**	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 52-54	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:	X	X	X	X

Initial Depth to ~~Water~~ ICE (m)	3.700	**Purge Start Time:**	X	**Purge End Time:**	X	**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit							
Depth to Bottom (m)	N/A	**Purge Interval Time (____) min / Vol. (____) L**												
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**												
Well Stick-up Height (m)	0.92	**Temperature (°C) 3%**												
Estimated Water Volume (L)	N/A	**pH (pH Units) ±0.1**												
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**												
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**			FROZEN									
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**												
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**												
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**			NOT SAMPLED									
Calculations: /		**Appearance & Odour (Clear, Silty, HC odours, etc.)**												
		Only for final readings — **Sulphide (mg/L)**												
		Only for final readings — **Turbidity (NTU)**												
		Interval Purge Volume (L)												
		Cumulative Purge Volume (L):												

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)		X	X	X	X
Sample Time (24hr)	NOT SAMPLED				

HEMMERA

Sample Site (Con't): MW09-20

Sample Date (Con't): Feb.2/2016.

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☒ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.7
Carbon Dioxide (C02)	PPM	1500

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

10 cm snow cover

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-21	**Project Number**	1343-005.14	**Date**	Feb. 2/2016
Piezometer Diameter	2"	**Client**	GY - AAM	**Samplers**	AN, DC.
UTM Location	Z: 08 E: 0389536 N: 6880576	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Overcast ~ -19°C.
Waypoint	GPS: HEM Name: MW09-21			**Recovery**	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 58 - 60	**Purge Method**			
Duplicate Collected	☐ Yes Name: X	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name: X	X	X	X	X

Initial Depth to Water (m)	1.030	**Purge Start Time:**	X	**Purge End Time:**	X				**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit	
Depth to Bottom (m)	N/A	**Purge Interval Time (____) min / Vol. (____) L**									
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**									
Well Stick-up Height (m)	0.40	**Temperature (°C) 3%**									
Estimated Water Volume (L)	N/A	**pH (pH Units) ±0.1**									
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**									
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**									
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**									
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**									
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**									
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**									
		Only for final readings — **Sulphide (mg/L)**									
		Only for final readings — **Turbidity (NTU)**									
		Interval Purge Volume (L)									
		Cumulative Purge Volume (L):									

FROZEN

MONITOR ONLY

YSI ID	X	**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)		X	X	X	X
Sample Time (24hr)	NOT SAMPLED				

HEMMERA

Sample Site (Con't): MW09-21

Sample Date (Con't): Feb. 2 /2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☒ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.6
Carbon Dioxide (C02)	PPM	260

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

- TUBING FROZEN IN WELL
- LEVEL WAS ICE SEEP AT TOP

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-22	**Project Number**	1343-005.14	**Date**	Feb. 3/2016
Piezometer Diameter	2"	**Client**	GY - AAM	**Samplers**	AN, DC.
UTM Location	Z:08 E: 0389497 N: 6880551	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Snowing ~-18°C.
Waypoint	GPS: HEM Name: MW09-22*			**Recovery**	☐ Good ☒ Bad
Photos	Cam: HEM Nos: 82-84	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:			X	

Initial Depth to Water (m)	4.587	**Purge Start Time:**		**Purge End Time:**				**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit				
Depth to Bottom (m)	5.298	**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)	—	**Depth to water (m)**											
Well Stick-up Height (m)	0.83	**Temperature (°C) 3%**											
Estimated Water Volume (L)	~1.8	**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**											
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

Direct Sample - No Vol.

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☒ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)					
Sample Time (24hr)	16:40			X	

HEMMERA

Sample Site (Con't): MW09-22

Sample Date (Con't): Feb. 3/2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	17.3
Carbon Dioxide (C02)	PPM	5000*

* PPM OVER.

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☒ Field Filtered	☒ HNO_3 (Nitric)	100	
1b	40 ml (glass)	Dissolved Mercury	15 mL	☒ Field Filtered	☒ HCL (Hydrochloric)	15	
2	500 ml (plastic)	General Chemistry	100 ml	-	-	100	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☒ NaOH (Sodium Hydroxide)	100	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☒ H_2SO_4 (Sulfuric)	60	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☒ HNO_3 (Nitric)	50	
6	120 ml (plastic)	Sulphide	60 ml	-	☒ Zinc Acetate, then NaOH	60	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	50	

General Notes and Observations:

30cm SNOW COVER.

Consumables Used:

1" bailer + twine

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-23	**Project Number**	1343-005.14	**Date**	Feb. 3/2016
Piezometer Diameter	2"	**Client**	GY - AAM	**Samplers**	AN, DC
UTM Location	Z: 8 E: 0389458 N: 6880555	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Overcast ~ -15°C Very Windy
Waypoint	GPS: HEM. Name: MW09-23			**Recovery**	☒ Good ☐ Bad
Photos	Cam: HEM. Nos: 79-81				
Duplicate Collected	☐ Yes Name: X				
Field Blank Collected	☐ Yes Name: X				

Purge Method

Waterra	Peristaltic	Disp. Bailer	Other
manual X			

Initial Depth to Water (m)	12.600
Depth to Bottom (m)	15.850
Submerged Tubing Depth (m)	~13.8
Well Stick-up Height (m)	0.11
Estimated Water Volume (L)	~6.5

(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:

Purge Start Time: 15:20 **Purge End Time:** 15:32 **Pen or YSI:** ☒ YSI Pro Plus ☐ Pen Unit

Purge Interval Time (____) min / Vol. (____) L		15:23	15:27	15:31					
Depth to water (m)		12.80	12.8	12.8					
Temperature (°C) 3%		0	0	0.0					
pH (pH Units) ±0.1		7.24	7.19	7.21					
Cond. (µs/cm) 3%		668	705	716					
Specific Cond. (µs/cm) 3%		1277	1351	1372					
Redox (mV) 10%		-68.8	-83.0	-79.7					
DO (mg/L) 10%		2.66	3.34	3.30					
DO (%) 10%		18.0	22.9	21.4					
Appearance & Odour (Clear, Silty, HC odours, etc.)		Grey turbid	Same	Same					
Only for final readings	**Sulphide (mg/L)**	-	-	0.29*					
	Turbidity (NTU)	-	-	49.1*					
Interval Purge Volume (L)		9	9	7					
Cumulative Purge Volume (L):		9	18	25					

YSI ID	ELR
Logged Field Parameters	☒ Yes ☐ No
Time logged on YSI (24hr)	15:35
Sample Time (24hr)	15:40

Sample Method:

Waterra	Peristaltic	Disp. Bailer	Other
X			

* sample freezing. Ice/slush may affect sulphide + turbidity results. reagents also freezing.

HEMMERA

Sample Site (Con't): MW09-23

Sample Date (Con't): feb. 3/2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☒ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.0
Carbon Dioxide (C02)	PPM	320

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☒ Field Filtered	☒ HNO_3 (Nitric)	120	
1b	40 ml (glass)	Dissolved Mercury	15 mL	☒ Field Filtered	☒ HCL (Hydrochloric)	46	
2	500 ml (plastic)	General Chemistry	100 ml	-	-	500	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☒ NaOH (Sodium Hydroxide)	145	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☒ H_2SO_4 (Sulfuric)	120	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☒ HNO_3 (Nitric)	120	
6	120 ml (plastic)	Sulphide	60 ml	-	☒ Zinc Acetate, then NaOH	120	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	120	

General Notes and Observations:

Consumables Used:

~18 m waterra tubing
+ footvalve

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	MW09-24	**Project Number**	1343-005.14	**Date**	Feb. 2/2016
Piezometer Diameter	2"	**Client**	GY - AAM	**Samplers**	AN, DC.
UTM Location	Z: 08 E: 0389561 N: 6880622	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Overcast ~-19°C
Waypoint	GPS: HEM Name: MW09-24			**Recovery**	☒ Good ☐ Bad
Photos	Cam: HEM Nos: 64-66	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:	X		X	

Initial Depth to Water (m)	9.440
Depth to Bottom (m)	11.240
Submerged Tubing Depth (m)	N/A
Well Stick-up Height (m)	0.67
Estimated Water Volume (L)	3.6 L

(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume

Calculations:
11.240
9.440
1.800

Purge Start Time:		**Purge End Time:**			**Pen or YSI:**	☒ YSI Pro Plus ☐ Pen Unit			
Purge Interval Time (____) min / Vol. (____) L	13:39	13:42	Stopped purge to locate bailer.	14:39	14:44	14:50			
Depth to water (m)	9.95								
Temperature (°C) 3%	0.1	0.0		0.0	0.2	0.2			
pH (pH Units) ±0.1	7.42	7.44		7.32	7.33	723			
Cond. (µs/cm) 3%	501	398.9		377.3	431.7	445.8			
Specific Cond. (µs/cm) 3%	954	763.2		722.1	818.9	846.8			
Redox (mV) 10%	220.7	226.9		203.6	~~430.7~~	224.2			
DO (mg/L) 10%	10.52	9.69		10.00	8.96	8.06			
DO (%) 10%	72.3	65.8		68.0	61.3	55.2			
Appearance & Odour (Clear, Silty, HC odours, etc.)	Brown turbid	Same.		Clear.	Clear.	Clear.			
Only for final readings Sulphide (mg/L)	—	—		—	—	0.17			
Only for final readings Turbidity (NTU)	—	—		—	—	37.6			
Interval Purge Volume (L)	1	1		4	4	2			
Cumulative Purge Volume (L):	1	2		6	12	14			

YSI ID	MW09-24
Logged Field Parameters	☒ Yes ☐ No
Time logged on YSI (24hr)	14:51
Sample Time (24hr)	13:30*

Sample Method:

Waterra	**Peristaltic**	**Disp. Bailer**	**Other**
		X	

* labeled sample bottles prior to purge. Account for time discrepancy.

HEMMERA

Sample Site (Con't): MW09-24

Sample Date (Con't): Feb. 2/2016

Well Head Seal: ☐ J-Plug ☒ PVC Cap ☐ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☒ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☒ Yes ☐ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	24.3
Carbon Dioxide (C02)	PPM	4500

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☒ Field Filtered	☒ HNO_3 (Nitric)	1	
1b	40 ml (glass)	Dissolved Mercury	15 mL	☒ Field Filtered	☒ HCL (Hydrochloric)	1	
2	500 ml (plastic)	General Chemistry	100 ml	-	-	1	
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☒ NaOH (Sodium Hydroxide)	1	
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☒ H_2SO_4 (Sulfuric)	1	
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☒ HNO_3 (Nitric)	1	
6	120 ml (plastic)	Sulphide	60 ml	-	☒ Zinc Acetate, then NaOH	1	
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-	1	

General Notes and Observations:

Did not have bailer in truck. Had to stop and purge to find bailer. Bailer used due to turbidity/sand at bottom of well. Clogged foot valve and could not manual purge to waterra

Consumables Used:

1 bailer + twine.
1 inline filter.

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	W14103083BH01	**Project Number**	1343-005.14	**Date**	Feb.2/2016
Piezometer Diameter	2"	**Client**	GY - AAM	**Samplers**	AN, DC.
UTM Location	Z: 08 E: 0389523 N: 6880669	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Overcast ~ -19°C
Waypoint	GPS: HEM Name: BH01*			**Recovery**	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 46-48	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:	X	X	X	X

Initial Depth to Water (m) FROZEN	6.450	**Purge Start Time:**	X		**Purge End Time:**	X		**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit						
Depth to Bottom (m)	N/A	**Purge Interval** Time (____) min / Vol. (____) L													
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**													
Well Stick-up Height (m)	0.62	**Temperature (°C) 3%**													
Estimated Water Volume (L)	N/A	**pH (pH Units) ±0.1**													
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**													
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**													
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**													
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**													
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**													
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**													
		Only for final readings **Sulphide (mg/L)**													
		Only for final readings **Turbidity (NTU)**													
		Interval Purge Volume (L)													
		Cumulative Purge Volume (L):													

FROZEN

NOT MONITORED

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)	NOT SAMPLED	X	X	X	X

HEMMERA

Sample Site (Con't): W1410306 3BH01

Sample Date (Con't): FEB 2, 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☒ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☒ No Details: OPEN

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.3
Carbon Dioxide (C02)	PPM	320

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

20 cm OF SNOW COVER

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	W14103083BH02	**Project Number**	1343-005.14	**Date**	Feb. 2/2016
Piezometer Diameter	2"	**Client**	GY - AAM	**Samplers**	AM, DR.
UTM Location	Z: 08 E: 0389558 N: 6880665	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Overcast ~-19°C
Waypoint	GPS: HEM Name: BH02X			**Recovery**	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 40-42	**Purge Method**			
Duplicate Collected	☐ Yes Name: X	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name: X	X	X	X	X

Initial Depth to Water (m)	6.690	**Purge Start Time:**		**Purge End Time:**				**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit				
Depth to Bottom (m)	N/A	**Purge Interval Time (____) min / Vol. (____) L**											
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**											
Well Stick-up Height (m)	0.77	**Temperature (°C) 3%**											
Estimated Water Volume (L)	N/A	**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**											
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**			FROZEN								
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**			NOT SAMPLED								
		Only for final readings	**Sulphide (mg/L)**										
			Turbidity (NTU)										
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)	NOT SAMPLED	X	X	X	X

HEMMERA

Sample Site (Con't): W14103OB3BH07

Sample Date (Con't): FEB 2, 2018

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☒ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☒ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.4
Carbon Dioxide (C02)	PPM	300

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

20 cm OF SNOW COVER

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	W14 03083 BH03	**Project Number**	1343-005.14	**Date**	FEB 4 2016
Piezometer Diameter	2" PVC.	**Client**	GY - AAM	**Samplers**	GR + JH
UTM Location	Z: 08V E: 0389134 N: 6880732	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	~ -10°C
Waypoint	GPS: ELR Name: —			**Recovery**	☐ Good ☐ Bad
Photos	Cam: WMK Nos: 326 - 328	**Purge Method**			
Duplicate Collected	☐ Yes Name:	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:				

Initial Depth to Water (m)	1-425 TO ICE?	**Purge Start Time:**		**Purge End Time:**				**Pen or YSI:**		☐ YSI Pro Plus ☐ Pen Unit					
Depth to Bottom (m)		**Purge Interval Time (____) min / Vol. (____) L**													
Submerged Tubing Depth (m)		**Depth to water (m)**													
Well Stick-up Height (m)	0.74	**Temperature (°C) 3%**													
Estimated Water Volume (L)		**pH (pH Units) ±0.1**													
(DTB – DTW) x (πr^{2})*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**													
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**													
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**													
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**													
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**													
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**													
		Only for final readings	**Sulphide (mg/L)**												
			Turbidity (NTU)												
		Interval Purge Volume (L)													
		Cumulative Purge Volume (L):													

FROZEN / DRY

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No				
Time logged on YSI (24hr)		**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Sample Time (24hr)					

HEMMERA

Sample Site (Con't): W14103083 BH03

Sample Date (Con't): FEB 4 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☒ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other NO CAPS

Well properly sealed for gas monitoring: ☐ Yes ☒ No Details: _____

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	Ø
Oxygen (O2)	%	21.0
Carbon Dioxide (C02)	PPM	Ø

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

NEEDS 2" SCREW CAP. THINNER THAN SCHED 40.

Consumables Used:

HEMMERA

GROUNDWATER SAMPLE COLLECTION SHEET

Sample Site	W1410308 3BH04	**Project Number**	1343-005.14	**Date**	Feb. 2 / 2016
Piezometer Diameter	2"	**Client**	GY - AAM	**Samplers**	AN, DC.
UTM Location	Z: 08 E: 0389543 N: 6880668	**Project Name**	Mount Nansen 2016 GW Sampling Program	**Weather/Temperature**	Overcast ~-19°C
Waypoint	GPS: HEM Name: BH04X			**Recovery**	☐ Good ☐ Bad
Photos	Cam: HEM Nos: 43-45	**Purge Method**			
Duplicate Collected	☐ Yes Name: X	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Field Blank Collected	☐ Yes Name:	X	X	X	X

Initial Depth to Water (m) FROZEN	6.500	**Purge Start Time:**	X	**Purge End Time:**	X	**Pen or YSI:**	☐ YSI Pro Plus ☐ Pen Unit						
Depth to Bottom (m)	N/A	**Purge Interval** Time (____) min / Vol. (____) L											
Submerged Tubing Depth (m)	N/A	**Depth to water (m)**											
Well Stick-up Height (m)	0.77	**Temperature (°C) 3%**											
Estimated Water Volume (L)	N/A	**pH (pH Units) ±0.1**											
(DTB – DTW) x (πr^2)*1000 (for well diameter) = 1 well volume		**Cond. (µs/cm) 3%**		NOT		MONITORED							
(DTB – DTW) x 8.1 (for 4" well diameter) = 1 well volume		**Specific Cond. (µs/cm) 3%**											
(DTB – DTW) x 2 (for 2" well diameter) = 1 well volume		**Redox (mV) 10%**											
(DTB-DTW) x 1.1 (for 1.5" diameter) = 1 well volume		**DO (mg/L) 10%**											
(DTB-DTW) x 0.5 (for 1" diameter) = 1 well volume		**DO (%) 10%**											
Calculations:		**Appearance & Odour (Clear, Silty, HC odours, etc.)**				FROZEN							
		Only for final readings **Sulphide (mg/L)**											
		Only for final readings **Turbidity (NTU)**											
		Interval Purge Volume (L)											
		Cumulative Purge Volume (L):											

YSI ID		**Sample Method:**			
Logged Field Parameters	☐ Yes ☐ No	**Waterra**	**Peristaltic**	**Disp. Bailer**	**Other**
Time logged on YSI (24hr)		X	X	X	X
Sample Time (24hr)	NOT SAMPLED				

HEMMERA

Sample Site (Con't): W1410308 3 B1104

Sample Date (Con't): FEB 2, 2016

Well Head Seal: ☐ J-Plug ☐ PVC Cap ☒ Not Sealed ☐ Other _____

Seal Replaced: ☐ J-Plug ☐ PVC Cap ☐ Not required ☐ Other _____

Well properly sealed for gas monitoring: ☐ Yes ☒ No Details: OPEN

Head Space Gas Measurements

	Units	Values
Methane (CH4)	%LEL	0
Oxygen (O2)	%	18.3
Carbon Dioxide (C02)	PPM	320

Priority	Bottle Type	Parameters Analyzed	Min. Volume	Treatment ☒	Preservative Added ☒	Vol. Collected (ml)	Comments
1a	120 ml (plastic)	Dissolved Metals	100 ml	☐ Field Filtered	☐ HNO_3 (Nitric)		
1b	40 ml (glass)	Dissolved Mercury	15 mL	☐ Field Filtered	☐ HCL (Hydrochloric)		
2	500 ml (plastic)	General Chemistry	100 ml	-	-		
3	145 ml (plastic)	Cyanide (total, free, weak acid dissociable)	100 ml	-	☐ NaOH (Sodium Hydroxide)		
4	120 ml (glass)	Ammonia (NH3)	60 ml	-	☐ H_2SO_4 (Sulfuric)		
5	120 ml (plastic)	Thiocyanate (SCN)	50 ml	-	☐ HNO_3 (Nitric)		
6	120 ml (plastic)	Sulphide	60 ml	-	☐ Zinc Acetate, then NaOH		
7	120 ml (glass amber)	Total Inorganic Carbon (TIC)	50 ml	-	-		

General Notes and Observations:

20 cm OF SNOW COVER

Consumables Used:

APPENDIX C
Laboratory Reports

HEMMERA ENVIROCHEM INC.
ATTN: Natasha Sandys
230 - 2237 2nd Avenue
Whitehorse YK Y1A 0K7

Date Received: 03-FEB-16
Report Date: 16-FEB-16 15:36 (MT)
Version: FINAL

Client Phone: 867-456-4865

Certificate of Analysis

Lab Work Order #: L1730670

Project P.O. #: NOT SUBMITTED
Job Reference: 1343-005.14
C of C Numbers: 1-1343-005.14
Legal Site Desc:

[redacted]
Brent Mack, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1730670-1	L1730670-2	L1730670-3	L1730670-4	L1730670-5
Description	Water	Water	Water	Water	Water
Sampled Date	01-FEB-16	01-FEB-16	01-FEB-16	01-FEB-16	01-FEB-16
Sampled Time	16:35	13:10	13:10	13:10	12:10
Client ID	GSI-HA-01A	MW09-18	MW16-100	FB16-100	MW09-19
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)		2700	2780	<2.0	1530
Hardness (as CaCO3) (mg/L)		1940	1930	<0.50	962
pH (pH)		7.15	7.10	5.46	7.15
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)		476	498	<1.0	314
Ammonia, Total (as N) (mg/L)		0.0189	0.0225	<0.0050	2.71
Chloride (Cl) (mg/L)		<5.0 DLA	<5.0 DLA	<0.50	<2.5 DLA
Fluoride (F) (mg/L)		<0.20 DLA	<0.20 DLA	<0.020	<0.10 DLA
Nitrate (as N) (mg/L)		0.197	0.078	<0.0050	0.743
Nitrite (as N) (mg/L)		<0.010 DLA	<0.010 DLA	<0.0010	0.0077
Total Kjeldahl Nitrogen (mg/L)		0.229	0.189	<0.050	3.35
Sulfate (SO4) (mg/L)		1440	1450	<0.30	630
Sulphide as S (mg/L)		<0.020	<0.020	<0.020	0.042
Anion Sum (meq/L)		39.5	40.0	<0.10	19.4
Cation Sum (meq/L)		39.6	39.2	<0.10	20.4
Cation - Anion Balance (%)		0.1	-1.0	0.0	2.4
Cyanides Cyanide, Weak Acid Diss (mg/L)		<0.0050	<0.0050	<0.0050	<0.0050
Cyanide, Total (mg/L)		<0.0050	<0.0050	<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	<0.0050
Organic / Inorganic Carbon Total Inorganic Carbon (mg/L)		113	108	<0.50	70.2
Total Organic Carbon (mg/L)		6.27	3.89	<0.50	15.3
Total Metals 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)					

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1730670-6	L1730670-7	L1730670-8	L1730670-9	L1730670-10
Description	Water	Water	Water	Water	Water
Sampled Date	01-FEB-16	01-FEB-16	02-FEB-16	02-FEB-16	02-FEB-16
Sampled Time	17:15	15:30	16:00	14:30	17:00
Client ID	GSI-HA-04A	GSI-DC-2B	GSI-DC-2B	CH-P-13-03/50	MW09-02
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)	1170	988		2640	2660
Hardness (as CaCO3) (mg/L)	712	613		1780	1530
pH (pH)	7.96	8.06		7.06	6.78
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	254	291		347	63.4
Ammonia, Total (as N) (mg/L)		0.149		0.131	10.2
Chloride (Cl) (mg/L)	<1.0 DLA	<1.0 DLA		<5.0 DLA	<5.0 DLA
Fluoride (F) (mg/L)	0.061	0.061		<0.20 DLA	0.47
Nitrate (as N) (mg/L)	<0.010 DLA	0.466		2.49	0.068
Nitrite (as N) (mg/L)	0.0031	0.0103		0.060	<0.010 DLA
Total Kjeldahl Nitrogen (mg/L)		1.17		1.36	10.2
Sulfate (SO4) (mg/L)	453	300		1500	1720
Sulphide as S (mg/L)			<0.020	<0.020	<0.020
Anion Sum (meq/L)	14.5	12.1		38.4	37.1
Cation Sum (meq/L)	15.0	12.7		37.4	36.4
Cation - Anion Balance (%)	1.7	2.3		-1.3	-1.0
Cyanides Cyanide, Weak Acid Diss (mg/L)		<0.0050		<0.0050	0.0088
Cyanide, Total (mg/L)		<0.0050		<0.0050	0.0207
Thiocyanate (SCN) (mg/L)			<0.50	<0.50	0.62
Cyanide, Free (mg/L)		<0.0050		<0.0050	<0.0050
Organic / Inorganic Carbon Total Inorganic Carbon (mg/L)			68.4	91	7.60
Total Organic Carbon (mg/L)		15.6		18.3	6.25
Total Metals 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)					

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1730670-11	L1730670-12	L1730670-13		
Description	Water	Water	Water		
Sampled Date	02-FEB-16	02-FEB-16	02-FEB-16		
Sampled Time	13:30		14:30		
Client ID	MW09-24	TRIP BLANK	FB16-200		
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)	838	<2.0	<2.0		
Hardness (as CaCO3) (mg/L)	529	<0.50	<0.50		
pH (pH)	7.46	5.41	5.39		
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	161	<1.0	<1.0		
Ammonia, Total (as N) (mg/L)	0.0083	<0.0050	<0.0050		
Chloride (Cl) (mg/L)	<0.50	<0.50	<0.50		
Fluoride (F) (mg/L)	0.029	<0.020	<0.020		
Nitrate (as N) (mg/L)	2.83	<0.0050	<0.0050		
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010		
Total Kjeldahl Nitrogen (mg/L)	0.415	<0.050	<0.050		
Sulfate (SO4) (mg/L)	288	<0.30	<0.30		
Sulphide as S (mg/L)	<0.020	<0.020	<0.020		
Anion Sum (meq/L)	9.42	<0.10	<0.10		
Cation Sum (meq/L)	11.0	<0.10	<0.10		
Cation - Anion Balance (%)	7.9	0.0	0.0		
Cyanides Cyanide, Weak Acid Diss (mg/L)	<0.0050	<0.0050	<0.0050		
Cyanide, Total (mg/L)	0.0077	<0.0050	<0.0050		
Thiocyanate (SCN) (mg/L)	<0.50	<0.50	<0.50		
Cyanide, Free (mg/L)	<0.0050	<0.0050	<0.0050		
Organic / Inorganic Carbon Total Inorganic Carbon (mg/L)	37.4	<0.50	<0.50		
Total Organic Carbon (mg/L)	6.18	<0.50	<0.50		
Total Metals 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			

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1730670-1 Water 01-FEB-16 16:35 GSI-HA-01A	L1730670-2 Water 01-FEB-16 13:10 MW09-18	L1730670-3 Water 01-FEB-16 13:10 MW16-100	L1730670-4 Water 01-FEB-16 13:10 FB16-100	L1730670-5 Water 01-FEB-16 12:10 MW09-19
WATER						
Total Metals	Magnesium (Mg)-Total (mg/L)					
	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)					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)		<0.0020 DLA	<0.0020 DLA	<0.0010	0.0037
	Antimony (Sb)-Dissolved (mg/L)		0.00043	0.00041	<0.00010	0.00042
	Arsenic (As)-Dissolved (mg/L)		0.0519	0.0501	<0.00010	0.0224
	Barium (Ba)-Dissolved (mg/L)		0.00889	0.00894	<0.000050	0.0305
	Beryllium (Be)-Dissolved (mg/L)		<0.000040 DLA	<0.000040 DLA	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)		<0.00010 DLA	<0.00010 DLA	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)		<0.020 DLA	<0.020 DLA	<0.010	0.112
	Cadmium (Cd)-Dissolved (mg/L)		0.000057	0.000037	<0.0000050	0.0000435
	Calcium (Ca)-Dissolved (mg/L)		359	359	<0.050	217
	Chromium (Cr)-Dissolved (mg/L)		<0.00020 DLA	<0.00020 DLA	<0.00010	0.00033
	Cobalt (Co)-Dissolved (mg/L)		0.00023	0.00024	<0.00010	0.00194
	Copper (Cu)-Dissolved (mg/L)		<0.00040 DLA	<0.00040 DLA	<0.00020	0.00093
	Iron (Fe)-Dissolved (mg/L)		0.016	0.019	<0.010	3.00
	Lead (Pb)-Dissolved (mg/L)		<0.00010 DLA	<0.00010 DLA	<0.000050	0.000622
	Lithium (Li)-Dissolved (mg/L)		0.0224	0.0224	<0.0010	0.0076

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1730670-6 Water 01-FEB-16 17:15 GSI-HA-04A	L1730670-7 Water 01-FEB-16 15:30 GSI-DC-2B	L1730670-8 Water 02-FEB-16 16:00 GSI-DC-2B	L1730670-9 Water 02-FEB-16 14:30 CH-P-13-03/50	L1730670-10 Water 02-FEB-16 17:00 MW09-02
WATER						
Total Metals	Magnesium (Mg)-Total (mg/L)					
	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)					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD		FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD		FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0100	0.0015		0.0044	0.0020
	Antimony (Sb)-Dissolved (mg/L)	0.00032	0.00057		0.00026	0.00396
	Arsenic (As)-Dissolved (mg/L)	0.0421	0.00325		0.00040	15.0
	Barium (Ba)-Dissolved (mg/L)	0.158	0.119		0.0390	0.00625
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020		<0.000040 DLA	<0.000040 DLA
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050		<0.00010 DLA	<0.00010 DLA
	Boron (B)-Dissolved (mg/L)	<0.010	0.010		<0.020 DLA	0.075
	Cadmium (Cd)-Dissolved (mg/L)	0.0000050	0.0000586		0.000181	0.000446
	Calcium (Ca)-Dissolved (mg/L)	180	158		450	480
	Chromium (Cr)-Dissolved (mg/L)	0.00034	0.00022		<0.00020 DLA	<0.00020 DLA
	Cobalt (Co)-Dissolved (mg/L)	0.00021	0.00146		0.00071	0.0106
	Copper (Cu)-Dissolved (mg/L)	0.00030	0.00295		0.00250	<0.00040 DLA
	Iron (Fe)-Dissolved (mg/L)	8.26	0.131		0.023	24.9
	Lead (Pb)-Dissolved (mg/L)	0.000256	0.000095		<0.00010 DLA	0.00021
	Lithium (Li)-Dissolved (mg/L)	0.0026	0.0019		0.0032	0.0158

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1730670-11	L1730670-12	L1730670-13		
Description	Water	Water	Water		
Sampled Date	02-FEB-16	02-FEB-16	02-FEB-16		
Sampled Time	13:30		14:30		
Client ID	MW09-24	TRIP BLANK	FB16-200		
Grouping / **Analyte**					
WATER					
Total Metals					
Magnesium (Mg)-Total (mg/L)		<0.10			
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			
Dissolved Metals					
Dissolved Mercury Filtration Location	FIELD		FIELD		
Dissolved Metals Filtration Location	FIELD		FIELD		
Aluminum (Al)-Dissolved (mg/L)	0.0029		<0.0010		
Antimony (Sb)-Dissolved (mg/L)	0.00018		<0.00010		
Arsenic (As)-Dissolved (mg/L)	0.00134		<0.00010		
Barium (Ba)-Dissolved (mg/L)	0.176		<0.000050		
Beryllium (Be)-Dissolved (mg/L)	<0.000020		<0.000020		
Bismuth (Bi)-Dissolved (mg/L)	<0.000050		<0.000050		
Boron (B)-Dissolved (mg/L)	0.012		<0.010		
Cadmium (Cd)-Dissolved (mg/L)	0.0000535		<0.0000050		
Calcium (Ca)-Dissolved (mg/L)	153		<0.050		
Chromium (Cr)-Dissolved (mg/L)	0.00027		<0.00010		
Cobalt (Co)-Dissolved (mg/L)	0.00030		<0.00010		
Copper (Cu)-Dissolved (mg/L)	0.00519		<0.00020		
Iron (Fe)-Dissolved (mg/L)	<0.010		<0.010		
Lead (Pb)-Dissolved (mg/L)	<0.000050		<0.000050		
Lithium (Li)-Dissolved (mg/L)	<0.0010		<0.0010		

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1730670-1	L1730670-2	L1730670-3	L1730670-4	L1730670-5
Description	Water	Water	Water	Water	Water
Sampled Date	01-FEB-16	01-FEB-16	01-FEB-16	01-FEB-16	01-FEB-16
Sampled Time	16:35	13:10	13:10	13:10	12:10
Client ID	GSI-HA-01A	MW09-18	MW16-100	FB16-100	MW09-19
Grouping / **Analyte**					
WATER					
Dissolved Metals Magnesium (Mg)-Dissolved (mg/L)		254	250	<0.10	102
Manganese (Mn)-Dissolved (mg/L)		0.576	0.577	<0.00010	4.75
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050 DLA	<0.0000050 DLA	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)		<0.00010	<0.00010	<0.000050	0.000270
Nickel (Ni)-Dissolved (mg/L)		<0.0010 DLA	<0.0010 DLA	<0.00050	0.00267
Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved (mg/L)		7.34	7.37	<0.10	6.52
Selenium (Se)-Dissolved (mg/L)		0.00015	0.00014	<0.000050	0.000166
Silicon (Si)-Dissolved (mg/L)		5.23	5.30	<0.050	6.98
Silver (Ag)-Dissolved (mg/L)		<0.000020 DLA	<0.000020 DLA	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)		12.2	12.4	<0.050	11.1
Strontium (Sr)-Dissolved (mg/L)		1.05	1.05	<0.00020	0.714
Sulfur (S)-Dissolved (mg/L)		477	474	<0.50	214
Thallium (Tl)-Dissolved (mg/L)		0.000285	0.000269	<0.000010	<0.000010
Tin (Sn)-Dissolved (mg/L)		<0.00020 DLA	0.00021 DLA	<0.00010	0.00555
Titanium (Ti)-Dissolved (mg/L)		<0.00060	<0.00060	<0.00030	0.00033
Uranium (U)-Dissolved (mg/L)		0.00802	0.00789	<0.000010	0.000557
Vanadium (V)-Dissolved (mg/L)		<0.0010 DLA	<0.0010 DLA	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)		0.0034	0.0032	<0.0010	0.0126
Zirconium (Zr)-Dissolved (mg/L)		<0.00060 DLA	<0.00060 DLA	<0.00030	<0.00030

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1730670-6 Water 01-FEB-16 17:15 GSI-HA-04A	L1730670-7 Water 01-FEB-16 15:30 GSI-DC-2B	L1730670-8 Water 02-FEB-16 16:00 GSI-DC-2B	L1730670-9 Water 02-FEB-16 14:30 CH-P-13-03/50	L1730670-10 Water 02-FEB-16 17:00 MW09-02
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	63.6	53.1		158	81.4
	Manganese (Mn)-Dissolved (mg/L)	1.77	2.51		0.230	21.3
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050		<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000279	0.00333		0.00047	0.00623
	Nickel (Ni)-Dissolved (mg/L)	0.00071	0.0147		0.0195	0.0030
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050		<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	2.67	3.70		8.27	43.6
	Selenium (Se)-Dissolved (mg/L)	0.000074	0.000054		0.00733	<0.00010 DLA
	Silicon (Si)-Dissolved (mg/L)	6.54	7.81		7.06	7.07
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010		<0.000020 DLA	<0.000020 DLA
	Sodium (Na)-Dissolved (mg/L)	5.15	5.18		38.3	40.0
	Strontium (Sr)-Dissolved (mg/L)	0.507	0.352		1.13	0.950
	Sulfur (S)-Dissolved (mg/L)	148	102		478	551
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010		0.000062	0.000161
	Tin (Sn)-Dissolved (mg/L)	0.00077	0.00012		0.00026 DLA	<0.00020 DLA
	Titanium (Ti)-Dissolved (mg/L)	0.00072	<0.00030		<0.00060 DLA	<0.00060 DLA
	Uranium (U)-Dissolved (mg/L)	0.000943	0.000562		0.0106	0.000866
	Vanadium (V)-Dissolved (mg/L)	0.00063	<0.00050		<0.0010 DLA	<0.0010 DLA
	Zinc (Zn)-Dissolved (mg/L)	0.0024	0.0111		0.0237	0.239
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030		<0.00060 DLA	<0.00060 DLA

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1730670-11	L1730670-12	L1730670-13		
Description	Water	Water	Water		
Sampled Date	02-FEB-16	02-FEB-16	02-FEB-16		
Sampled Time	13:30		14:30		
Client ID	MW09-24	TRIP BLANK	FB16-200		
Grouping / **Analyte**					
WATER					
Dissolved Metals Magnesium (Mg)-Dissolved (mg/L)	36.0		<0.10		
Manganese (Mn)-Dissolved (mg/L)	0.00060		<0.00010		
Mercury (Hg)-Dissolved (mg/L)	<0.0000050		<0.0000050		
Molybdenum (Mo)-Dissolved (mg/L)	0.000292		<0.000050		
Nickel (Ni)-Dissolved (mg/L)	<0.00050		<0.00050		
Phosphorus (P)-Dissolved (mg/L)	<0.050		<0.050		
Potassium (K)-Dissolved (mg/L)	1.74		<0.10		
Selenium (Se)-Dissolved (mg/L)	0.000841		<0.000050		
Silicon (Si)-Dissolved (mg/L)	6.94		<0.050		
Silver (Ag)-Dissolved (mg/L)	<0.000010		<0.000010		
Sodium (Na)-Dissolved (mg/L)	9.51		<0.050		
Strontium (Sr)-Dissolved (mg/L)	0.555		<0.00020		
Sulfur (S)-Dissolved (mg/L)	114		<0.50		
Thallium (Tl)-Dissolved (mg/L)	<0.000010		<0.000010		
Tin (Sn)-Dissolved (mg/L)	<0.00010		<0.00010		
Titanium (Ti)-Dissolved (mg/L)	<0.00030		<0.00030		
Uranium (U)-Dissolved (mg/L)	0.00170		<0.000010		
Vanadium (V)-Dissolved (mg/L)	<0.00050		<0.00050		
Zinc (Zn)-Dissolved (mg/L)	0.0027		<0.0010		
Zirconium (Zr)-Dissolved (mg/L)	<0.00030		<0.00030		

* 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	Alkalinity, Total (as CaCO3)	B	L1730670-10, -11, -12, -13, -2, -3, -4, -5, -6, -7, -9
Method Blank	Alkalinity, Total (as CaCO3)	B	L1730670-10, -11, -12, -13, -2, -3, -4, -5, -6, -7, -9
Method Blank	Alkalinity, Total (as CaCO3)	B	L1730670-10, -11, -12, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Aluminum (Al)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Bismuth (Bi)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Cadmium (Cd)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Chromium (Cr)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Cobalt (Co)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Copper (Cu)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Nickel (Ni)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Selenium (Se)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Silver (Ag)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Tin (Sn)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Titanium (Ti)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Vanadium (V)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Zirconium (Zr)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Beryllium (Be)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Aluminum (Al)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Bismuth (Bi)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Chromium (Cr)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Copper (Cu)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Silver (Ag)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Tin (Sn)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Titanium (Ti)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Vanadium (V)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Duplicate	Zirconium (Zr)-Dissolved	DLA	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Sulfate (SO4)	MS-B	L1730670-10, -11, -12, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Sulfate (SO4)	MS-B	L1730670-10, -11, -12, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Sulfate (SO4)	MS-B	L1730670-10, -11, -12, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Potassium (K)-Dissolved	MS-B	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1730670-10, -11, -13, -2, -3, -4, -5, -6, -7, -9
Matrix Spike	Total Inorganic Carbon	MS-B	L1730670-10, -3, -9
Matrix Spike	Total Kjeldahl Nitrogen	MSTN	L1730670-10, -11, -12, -13, -2, -3, -4, -5, -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
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
MSTN	TKN Matrix Spike recovery was low due to interference from high nitrate, which causes negative bias on TKN.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

Reference Information

ALK-TITR-VA 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.

BE-D-L-CCMS-VA 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.

BE-T-L-CCMS-VA 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.

CARBONS-TIC-VA Water Total inorganic carbon by CO2 purge APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CARBONS-TOC-VA 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)".

CL-IC-N-WR Water Chloride in Water by IC EPA 300.1 (mod)

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

CN-FREE-CFA-VA 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.

CN-SCN-VA 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.

CN-T-CFA-VA 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.

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-PCT-VA 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.

F-IC-N-WR Water Fluoride in Water by IC EPA 300.1 (mod)

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

HARDNESS-CALC-VA Water 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-D-CVAA-VA 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.

HG-T-CVAA-VA 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.

IONBALANCE-VA 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:

Reference Information

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA 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.

MET-DIS-LOW-ICP-VA 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).

MET-T-CCMS-VA 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.

MET-TOT-LOW-ICP-VA 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).

NH3-F-VA Water Ammonia in Water by Fluorescence APHA 4500 NH3-NITROGEN (AMMONIA)

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

Reference Information

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.

S2-T-COL-VA	Water	Total Sulphide by Colorimetric	APHA 4500-S2 Sulphide

This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methlyene blue colourimetric method.

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.

** 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:

1-1343-005.14

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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1730670-COFC

COC Number: 1 - 1343-005.14

Page 1 of 2

Report To		Report Format	
Company:	Hemmera Environchem Inc.	Select Report Format:	☑PDF ☑EXCEL ☑EDD (DIGITAL)
Contact:	Natasha Sandys	Quality Control (QC) Report with Report	☑ Yes ☐ No
Address:	230 - 2237 2nd Avenue Whitehorse, YT	☐Criteria on Report - provide details below if box checked	
Phone:	867-456-4865	Select Distribution:	☑EMAIL ☐MAIL ☐FAX
		Email 1 or Fax	nsandys@hemmera.com, jhains@hemmera.com
		Email 2	chris@elr.ca

Invoice To		Invoice Distribution	
	Same as Report To ☑ Yes ☐ No	Select Invoice Distribution:	☑EMAIL ☑MAIL ☐FAX
	Copy of Invoice with Report ☐ Yes ☑ No	Email 1 or Fax	nsandys@hemmera.com
Company:	Hemmera Environchem Inc.	Email 2	chris@elr.ca
Contact:	Natasha Sandys		

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q50588	Approver ID:	Cost Center:
Job #:	1343-005.14	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler: RM, JC, AN, MM

Turnaround Time (TAT) (Rush TAT is not available for all tests)

- R ☑Regular (Standard TAT if received by 3 pm - business days)
- P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
- E ☐Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
- E2 ☐Same day or weekend emergency - contact ALS to confirm TAT and surcharge

Specify Date Required for E2,E or P:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	F/P Dissolved Metals, Hardness	F/P Dissolved Mercury	Nitrate, Nitrite, Total Kjeldahl N (TKN)	Cl, Fl, Sulfate, conductivity, pH, alkalinity	Anion Sum, Cation Sum,Cation/Anion Bala	P Cyanide - Weak Acid Diss., Total, Free	P Ammonia N (total), Total Organic Carbon	P Thiocyanate (SCN)	P Sulphide as S	Total Inorganic Carbon	Number of Containers
	GSI-HA-01A	01-Feb-16	16:35	Water		R									1
	MW09-18	01-Feb-16	13:10	Water	R	R	R	R	R	R	R	R	R	R	8
	MW16-100	01-Feb-16	13:10	Water	R	R	R	R	R	R	R	R	R	R	8
	FB16-100	01-Feb-16	13:10	Water	R	R	R	R	R	R	R	R	R	R	8
	MW09-19	01-Feb-16	12:10	Water	R	R	R	R	R	R	R	R	R	R	8
	GSI-HA-04A	01-Feb-16	17:15	Water	R	R	R	R	R						3
	GSI-DC-02B	01-Feb-16	15:30	Water	R	R	R	R	R	R	R				5
	GSI-DC-02B	02-Feb-16	16:00	Water								R	R	R	3
	CH-P-13-03/50	02-Feb-16	14:30	Water	R	R	R	R	R	R	R	R	R	R	8
	MW09-02	02-Feb-16	17:00	Water	R	R	R	R	R	R	R	R	R	R	8
	MW09-24	02-Feb-16	13:30	Water	R	R	R	R	R	R	R	R	R	R	8
	Trip Blank	02-Feb-16	-	Water	R	R	R	R	R	R	R	R	R	R	8

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ Yes ☑ No

Are samples for human drinking water use? ☐ Yes ☑ No

Special Instructions / Specify Criteria to add on report (client Use)

- See attached parameter sheet for list of full parameters and metals required. -GSI-HA-04A Gen Chem has limited quantities
GSI-DC-02B TIC has limited quantities

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☑	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
5.5	5.0				

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)		
Released by: Jessica Haines	Date: Feb 3, 2016	Time: 09:45	Received by:	Date: 3-Feb-16	Time: 8:30

FINAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

ALS FM-0328 v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

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Canada Toll Free: 1 800 668 9878

L1730670-COFC

COC Number: 1 - 1343-005.14

Report To		Report Format / Distribution		(Rush Turnaround Time (TAT) is not available for all tests)
Company:	Hemmera Environchem Inc.	Select Report Format:	☑PDF ☑EXCEL ☑EDD (DIGITAL)	R ☑Regular (Standard TAT if received by 3 pm - business days)
Contact:	Natasha Sandys	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	230 - 2237 2nd Avenue Whitehorse, YT	☐Criteria on Report - provide details below if box checked		E ☐Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	867-456-4865	Select Distribution:	☑EMAIL ☐MAIL ☐FAX	E2 ☐Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 1 or Fax	nsandys@hemmera.com, jhains@hemmera.com	Specify Date Required for E2,E or P:
		Email 2	chris@elr.ca	

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution		
	Copy of Invoice with Report ☐ Yes ☑ No	Select Invoice Distribution:	☑EMAIL ☑MAIL ☐FAX	
Company:	Hemmera Environchem Inc.	Email 1 or Fax	nsandys@hemmera.com	
Contact:	Natasha Sandys	Email 2	chris@elr.ca	

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q50588	Approver ID:	Cost Center:
Job #:	1343-005.14	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only)		ALS Contact:	Sampler: RM, JC, AN, MM

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	F/P Dissolved Metals, Hardness	F/P Dissolved Mercury	Nitrate, Nitrite, Total Kjeldahl N (TKN)	Cl, Fl, Sulfate, conductivity, pH, alkalinity	Anion Sum, Cation Sum, Cation/Anion Bala	P Cyanide - Weak Acid Diss., Total, Free	P Ammonia N (total), Total Organic Carbon	P Thiocyanate (SCN)	P Sulphide as S	Total Inorganic Carbon	Number of Containers
	FB16-200	02-Feb-16	14:30	Water	R	R	R	R	R	R	R	R	R	R	8

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No Are samples for human drinking water use? ☐ Yes ☑ No	- See attached parameter sheet for list of full parameters and metals required.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐	
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Justin Hains	Date: Feb 3, 2016	Time: 08:45	Received by:	Date:	Time:	Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

ALS-FM-0326e v09 Front/04 January 2014

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

HEMMERA ENVIROCHEM INC.
ATTN: Natasha Sandys
230 - 2237 2nd Avenue
Whitehorse YK Y1A 0K7

Date Received: 05-FEB-16
Report Date: 16-FEB-16 17:13 (MT)
Version: FINAL

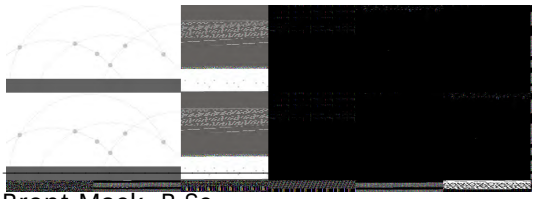
Client Phone: 867-456-4865

Certificate of Analysis

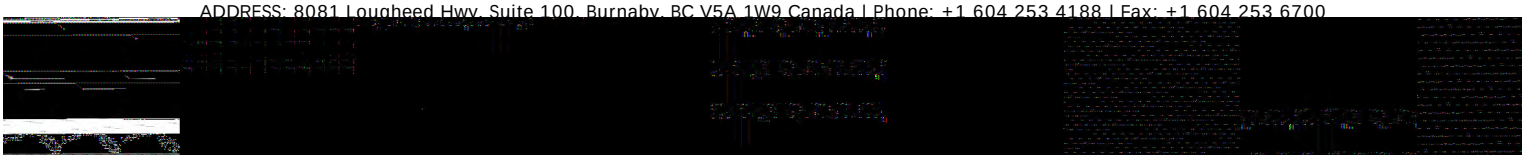
Lab Work Order #: L1731464

Project P.O. #: NOT SUBMITTED
Job Reference: 1343-005.14
C of C Numbers: 1
Legal Site Desc:

Comments:



Brent Mack, B.Sc.
Account Manager



ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1731464-1	L1731464-2	L1731464-3	L1731464-4	L1731464-5
Description	Water	Water	Water	Water	Water
Sampled Date	03-FEB-16	03-FEB-16	02-FEB-16	03-FEB-16	03-FEB-16
Sampled Time	16:40	16:45	17:00	15:40	10:30
Client ID	MW09-22	MW09-01	MW09-01	MW09-23	MW09-04
Grouping / **Analyte**					
WATER					
Physical Tests Conductivity (uS/cm)	519	3000		1360	2680
Hardness (as CaCO3) (mg/L)	246		1550	788	1700
pH (pH)	6.85	7.36		7.22	8.08
Anions and Nutrients Alkalinity, Total (as CaCO3) (mg/L)	178	510		319	108
Ammonia, Total (as N) (mg/L)	1.15	16.3		3.24	7.38
Chloride (Cl) (mg/L)	<0.50	<5.0 DLA		<1.0 DLA	<5.0 DLA
Fluoride (F) (mg/L)	0.040	<0.20 DLA		0.076	0.33
Nitrate (as N) (mg/L)	3.79	<0.050 DLA		0.017	<0.050 DLA
Nitrite (as N) (mg/L)	0.0470	<0.010 DLA		0.0049	<0.010 DLA
Total Kjeldahl Nitrogen (mg/L)	13.2	22.5		4.00	8.10
Sulfate (SO4) (mg/L)	79.7	1220		503	1740
Sulphide as S (mg/L)	<0.020	<0.020		0.053	<0.020
Anion Sum (meq/L)	5.50			16.8	38.4
Cation Sum (meq/L)	6.09			18.5	37.3
Cation - Anion Balance (%)	5.1			4.7	-1.4
Cyanides Cyanide, Weak Acid Diss (mg/L)	<0.010 DLM	<0.0050		<0.0050	<0.0050
Cyanide, Total (mg/L)	0.021	0.207		0.289	<0.0050
Thiocyanate (SCN) (mg/L)	<0.50	23.7		<0.50	<0.50
Cyanide, Free (mg/L)	<0.010 DLM	<0.0050		<0.0050	<0.0050
Organic / Inorganic Carbon Total Inorganic Carbon (mg/L)	47.7	130		82.2	19.8
Total Organic Carbon (mg/L)	266	59.8		19.4	6.00
Total Metals 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)					

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1731464-6 Water 03-FEB-16 10:30 MW16-200	L1731464-7 Water 03-FEB-16 13:00 MW09-03	L1731464-8 Water 03-FEB-16 10:15 MW09-14	L1731464-9 Water 04-FEB-16 10:00 MP09-09	L1731464-10 Water 04-FEB-16 10:30 MP09-10
WATER						
Physical Tests	Conductivity (uS/cm)	2710	2650	1390	702	822
	Hardness (as CaCO3) (mg/L)	1710	1650	999	313	408
	pH (pH)	8.09	7.60	7.84	8.81	7.78
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	106	167	381	79.2	61.9
	Ammonia, Total (as N) (mg/L)	7.38	3.43	0.0614	4.67	
	Chloride (Cl) (mg/L)	<5.0 DLA	<5.0 DLA	3.6	2.97	2.48
	Fluoride (F) (mg/L)	0.30	0.22	0.059	1.71	0.924
	Nitrate (as N) (mg/L)	<0.050 DLA	0.051	1.74	0.0215	0.0632
	Nitrite (as N) (mg/L)	<0.010 DLA	0.071	0.0075	0.0033	0.805
	Total Kjeldahl Nitrogen (mg/L)	7.93	3.99	0.635	6.81	
	Sulfate (SO4) (mg/L)	1720	1640	448	255	341
	Sulphide as S (mg/L)	<0.020	<0.020	0.032	<0.020	
	Anion Sum (meq/L)	37.9	37.4	17.2	7.07	8.52
	Cation Sum (meq/L)	37.3	36.4	22.7	8.17	9.71
	Cation - Anion Balance (%)	-0.8	-1.4	13.8	7.2	6.6
Cyanides	Cyanide, Weak Acid Diss (mg/L)	<0.0050	<0.0050	<0.0050	0.604	
	Cyanide, Total (mg/L)	<0.0050	0.0190	<0.0050	4.10	
	Thiocyanate (SCN) (mg/L)	<0.50	<0.50	<0.50	1.15	
	Cyanide, Free (mg/L)	<0.0050	<0.0050	<0.0050	0.532	
Organic / Inorganic Carbon	Total Inorganic Carbon (mg/L)	21.3	41.0	114	12.4	
	Total Organic Carbon (mg/L)	5.96	6.34	8.59	45.2	
Total Metals	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)					

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1731464-11	L1731464-12			
	Description	Water	Water			
	Sampled Date	04-FEB-16	04-FEB-16			
	Sampled Time	09:15				
	Client ID	MW09-06	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	1900	<2.0			
	Hardness (as CaCO3) (mg/L)	1100	<0.50			
	pH (pH)	7.77	5.39			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	98.4	<1.0			
	Ammonia, Total (as N) (mg/L)	0.483	0.0056 RRV			
	Chloride (Cl) (mg/L)	<2.5 DLA	<0.50			
	Fluoride (F) (mg/L)	0.19	<0.020			
	Nitrate (as N) (mg/L)	0.121	<0.0050			
	Nitrite (as N) (mg/L)	<0.0050 DLA	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	1.03	<0.050			
	Sulfate (SO4) (mg/L)	1110	<0.30			
	Sulphide as S (mg/L)	<0.020	<0.020			
	Anion Sum (meq/L)	25.0	<0.10			
	Cation Sum (meq/L)	23.5	<0.10			
	Cation - Anion Balance (%)	-3.3	0.0			
Cyanides	Cyanide, Weak Acid Diss (mg/L)	<0.0050	<0.0050			
	Cyanide, Total (mg/L)	<0.0050	<0.0050			
	Thiocyanate (SCN) (mg/L)	<0.50	<0.50			
	Cyanide, Free (mg/L)	<0.0050	<0.0050			
Organic / Inorganic Carbon	Total Inorganic Carbon (mg/L)	21.5	<0.50			
	Total Organic Carbon (mg/L)	8.18	<0.50			
Total Metals	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			

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1731464-1 Water 03-FEB-16 16:40 MW09-22	L1731464-2 Water 03-FEB-16 16:45 MW09-01	L1731464-3 Water 02-FEB-16 17:00 MW09-01	L1731464-4 Water 03-FEB-16 15:40 MW09-23	L1731464-5 Water 03-FEB-16 10:30 MW09-04
WATER						
Total Metals	Magnesium (Mg)-Total (mg/L)					
	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)					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD		FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD		FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0307		0.0151	0.0357	<0.0020 DLA
	Antimony (Sb)-Dissolved (mg/L)	0.00026		0.0219	0.00023	0.273
	Arsenic (As)-Dissolved (mg/L)	0.00326		0.0989	0.0284	3.84
	Barium (Ba)-Dissolved (mg/L)	0.0493		0.0319	0.0419	0.00977
	Beryllium (Be)-Dissolved (mg/L)	<0.000020		0.000072	0.000042	<0.000040 DLA
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050		<0.00010 DLA	<0.00010 DLA	<0.00010 DLA
	Boron (B)-Dissolved (mg/L)	0.032		0.126	0.105	0.270
	Cadmium (Cd)-Dissolved (mg/L)	0.0000246		0.0122	0.000045	0.000026
	Calcium (Ca)-Dissolved (mg/L)	85.5		530	198	484
	Chromium (Cr)-Dissolved (mg/L)	0.00058		0.00020	0.00045	<0.00020 DLA
	Cobalt (Co)-Dissolved (mg/L)	0.00412		0.0279	0.0151	0.00101
	Copper (Cu)-Dissolved (mg/L)	0.00287		0.00870	<0.00040 DLA	<0.00040 DLA
	Iron (Fe)-Dissolved (mg/L)	4.09		0.016	13.1	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000078		0.00516	<0.00010 DLA	0.00029
	Lithium (Li)-Dissolved (mg/L)	<0.0010		0.0032	<0.0020 DLA	0.0102

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1731464-6 Water 03-FEB-16 10:30 MW16-200	L1731464-7 Water 03-FEB-16 13:00 MW09-03	L1731464-8 Water 03-FEB-16 10:15 MW09-14	L1731464-9 Water 04-FEB-16 10:00 MP09-09	L1731464-10 Water 04-FEB-16 10:30 MP09-10
WATER						
Total Metals	Magnesium (Mg)-Total (mg/L)					
	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)					
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0020 DLA	0.0061	0.0021	0.0039	0.0024
	Antimony (Sb)-Dissolved (mg/L)	0.269	0.521	0.00020	0.0941	0.0890
	Arsenic (As)-Dissolved (mg/L)	3.88	1.66	0.0134	17.0	6.26
	Barium (Ba)-Dissolved (mg/L)	0.0101	0.0291	0.0364	0.00103	0.0101
	Beryllium (Be)-Dissolved (mg/L)	<0.000040 DLA	<0.00010 DLA	<0.000020	<0.000040 DLA	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.00010 DLA	<0.00025 DLA	<0.000050	<0.00010 DLA	<0.000050
	Boron (B)-Dissolved (mg/L)	0.267	0.185	0.011	0.163	0.188
	Cadmium (Cd)-Dissolved (mg/L)	0.000029	0.00121	0.0000251	0.000179	0.000688
	Calcium (Ca)-Dissolved (mg/L)	486	520	180	124	161
	Chromium (Cr)-Dissolved (mg/L)	<0.00020 DLA	<0.00050 DLA	0.00019	<0.00020 DLA	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	0.00101	0.00307	0.00156	0.0534	0.0328
	Copper (Cu)-Dissolved (mg/L)	<0.00040 DLA	0.0010	0.00060	0.578	0.0469
	Iron (Fe)-Dissolved (mg/L)	<0.010	0.057	7.25	0.192	0.057
	Lead (Pb)-Dissolved (mg/L)	0.00028	<0.00025 DLA	0.000130	0.00076	0.000603
	Lithium (Li)-Dissolved (mg/L)	0.0105	<0.0050 DLA	0.0115	<0.0020 DLA	0.0011

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1731464-11	L1731464-12			
	Description	Water	Water			
	Sampled Date	04-FEB-16	04-FEB-16			
	Sampled Time	09:15				
	Client ID	MW09-06	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Total Metals	Magnesium (Mg)-Total (mg/L)		<0.10			
	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			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0023				
	Antimony (Sb)-Dissolved (mg/L)	0.250				
	Arsenic (As)-Dissolved (mg/L)	0.211				
	Barium (Ba)-Dissolved (mg/L)	0.00968				
	Beryllium (Be)-Dissolved (mg/L)	<0.000040 DLA				
	Bismuth (Bi)-Dissolved (mg/L)	<0.00010 DLA				
	Boron (B)-Dissolved (mg/L)	0.101				
	Cadmium (Cd)-Dissolved (mg/L)	0.00513				
	Calcium (Ca)-Dissolved (mg/L)	358				
	Chromium (Cr)-Dissolved (mg/L)	0.00036				
	Cobalt (Co)-Dissolved (mg/L)	0.00165				
	Copper (Cu)-Dissolved (mg/L)	0.00761				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	0.00058				
	Lithium (Li)-Dissolved (mg/L)	0.0087				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L1731464-1	L1731464-2	L1731464-3	L1731464-4	L1731464-5
Description	Water	Water	Water	Water	Water
Sampled Date	03-FEB-16	03-FEB-16	02-FEB-16	03-FEB-16	03-FEB-16
Sampled Time	16:40	16:45	17:00	15:40	10:30
Client ID	MW09-22	MW09-01	MW09-01	MW09-23	MW09-04
Grouping / **Analyte**					
WATER					
Dissolved Metals Magnesium (Mg)-Dissolved (mg/L)	7.81		55.9	71.5	120
Manganese (Mn)-Dissolved (mg/L)	1.89		13.7	15.9	7.01
Mercury (Hg)-Dissolved (mg/L)	0.0000067		<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved (mg/L)	0.000180		0.00234	0.00242	0.00589
Nickel (Ni)-Dissolved (mg/L)	0.00063		0.0071	<0.0010 DLA	<0.0010 DLA
Phosphorus (P)-Dissolved (mg/L)	<0.050		<0.050	<0.050	0.096
Potassium (K)-Dissolved (mg/L)	3.00		15.5	7.79	43.3
Selenium (Se)-Dissolved (mg/L)	0.000121		0.00018	<0.00010 DLA	<0.00010 DLA
Silicon (Si)-Dissolved (mg/L)	4.46		6.95	6.37	14.5
Silver (Ag)-Dissolved (mg/L)	0.000046		0.000068	<0.000020 DLA	<0.000020 DLA
Sodium (Na)-Dissolved (mg/L)	16.8		156	23.7	32.6
Strontium (Sr)-Dissolved (mg/L)	0.266		1.23	0.530	1.36
Sulfur (S)-Dissolved (mg/L)	26.1		523	173	547
Thallium (Tl)-Dissolved (mg/L)	<0.000010		0.000791	<0.000020 DLA	0.000138
Tin (Sn)-Dissolved (mg/L)	<0.00010		<0.00020 DLA	<0.00020 DLA	<0.00020 DLA
Titanium (Ti)-Dissolved (mg/L)	<0.0015 DLM		<0.00060 DLA	0.00135	<0.00060 DLA
Uranium (U)-Dissolved (mg/L)	0.000259		0.00273	0.00189	0.000297
Vanadium (V)-Dissolved (mg/L)	0.00077		<0.0010 DLA	0.0024	<0.0010 DLA
Zinc (Zn)-Dissolved (mg/L)	0.0126		0.968	0.0916	0.0931
Zirconium (Zr)-Dissolved (mg/L)	0.00038		<0.00060 DLA	0.00069	<0.00060 DLA

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L1731464-6 Water 03-FEB-16 10:30 MW16-200	L1731464-7 Water 03-FEB-16 13:00 MW09-03	L1731464-8 Water 03-FEB-16 10:15 MW09-14	L1731464-9 Water 04-FEB-16 10:00 MP09-09	L1731464-10 Water 04-FEB-16 10:30 MP09-10
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	119	86.4	133	0.86	1.57
	Manganese (Mn)-Dissolved (mg/L)	6.89	32.9	1.26	0.0182	0.190
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	0.0000328	0.0000881
	Molybdenum (Mo)-Dissolved (mg/L)	0.00563	0.00435	0.000758	0.0216	0.0180
	Nickel (Ni)-Dissolved (mg/L)	<0.0010 DLA	<0.0025 DLA	0.00248	0.0276	0.00889
	Phosphorus (P)-Dissolved (mg/L)	0.090	0.053	0.091	0.333	0.255
	Potassium (K)-Dissolved (mg/L)	41.3	22.6	4.85	12.0	11.2
	Selenium (Se)-Dissolved (mg/L)	<0.00010 DLA	<0.00025 DLA	0.000084	0.00103	0.00156
	Silicon (Si)-Dissolved (mg/L)	14.4	13.6	6.87	6.81	6.31
	Silver (Ag)-Dissolved (mg/L)	<0.000020 DLA	<0.000050 DLA	<0.000010	0.0193	0.00272
	Sodium (Na)-Dissolved (mg/L)	31.9	29.6	49.5	28.6	28.9
	Strontium (Sr)-Dissolved (mg/L)	1.35	1.38	1.35	0.189	0.269
	Sulfur (S)-Dissolved (mg/L)	546	535	193	92.4	125
	Thallium (Tl)-Dissolved (mg/L)	0.000127	0.000077	<0.000010	0.000053	0.000118
	Tin (Sn)-Dissolved (mg/L)	<0.00020 DLA	<0.00050 DLA	0.00386	<0.00020 DLA	0.00016
	Titanium (Ti)-Dissolved (mg/L)	<0.00060 DLA	<0.0015 DLA	<0.00030	<0.00060 DLA	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000287	0.00219	0.0193	0.00134	0.00142
	Vanadium (V)-Dissolved (mg/L)	<0.0010 DLA	<0.0025 DLA	0.00067	<0.0010 DLA	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0943	0.0061	0.0026	<0.0020 DLA	0.0094
	Zirconium (Zr)-Dissolved (mg/L)	<0.00060 DLA	<0.0015 DLA	0.00073	<0.00060 DLA	<0.00030

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L1731464-11	L1731464-12			
	Description	Water	Water			
	Sampled Date	04-FEB-16	04-FEB-16			
	Sampled Time	09:15				
	Client ID	MW09-06	TRIP BLANK			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Magnesium (Mg)-Dissolved (mg/L)	50.5				
	Manganese (Mn)-Dissolved (mg/L)	5.33				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.00513				
	Nickel (Ni)-Dissolved (mg/L)	0.0014				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	18.1				
	Selenium (Se)-Dissolved (mg/L)	<0.00010 DLA				
	Silicon (Si)-Dissolved (mg/L)	6.59				
	Silver (Ag)-Dissolved (mg/L)	0.000062				
	Sodium (Na)-Dissolved (mg/L)	17.5				
	Strontium (Sr)-Dissolved (mg/L)	0.716				
	Sulfur (S)-Dissolved (mg/L)	339				
	Thallium (Tl)-Dissolved (mg/L)	0.000397				
	Tin (Sn)-Dissolved (mg/L)	0.00071				
	Titanium (Ti)-Dissolved (mg/L)	<0.00060 DLA				
	Uranium (U)-Dissolved (mg/L)	0.00117				
	Vanadium (V)-Dissolved (mg/L)	<0.0010 DLA				
	Zinc (Zn)-Dissolved (mg/L)	0.0879				
	Zirconium (Zr)-Dissolved (mg/L)	<0.00060 DLA				

* 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	Alkalinity, Total (as CaCO3)	B	L1731464-1, -10, -11, -12, -2, -4, -5, -6, -7, -8, -9
Method Blank	Alkalinity, Total (as CaCO3)	B	L1731464-1, -10, -11, -12, -2, -4, -5, -6, -7, -8, -9
Method Blank	Alkalinity, Total (as CaCO3)	B	L1731464-1, -10, -11, -12, -2, -4, -5, -6, -7, -8, -9
Method Blank	Barium (Ba)-Total	MB-LOR	L1731464-12
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L1731464-1, -10, -11, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L1731464-1, -10, -11, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Silicon (Si)-Dissolved	MS-B	L1731464-1, -10, -11, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L1731464-1, -10, -11, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Nitrite (as N)	MS-B	L1731464-1, -10, -11, -12, -2, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulfate (SO4)	MS-B	L1731464-1, -10, -11, -12, -2, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulfate (SO4)	MS-B	L1731464-1, -10, -11, -12, -2, -4, -5, -6, -7, -8, -9
Matrix Spike	Sulfate (SO4)	MS-B	L1731464-1, -10, -11, -12, -2, -4, -5, -6, -7, -8, -9
Matrix Spike	Barium (Ba)-Total	MS-B	L1731464-12
Matrix Spike	Selenium (Se)-Total	MS-B	L1731464-12
Matrix Spike	Strontium (Sr)-Total	MS-B	L1731464-12
Matrix Spike	Uranium (U)-Total	MS-B	L1731464-12
Matrix Spike	Total Inorganic Carbon	MS-B	L1731464-2, -8, -9
Matrix Spike	Total Organic Carbon	MS-B	L1731464-1, -4
Matrix Spike	Total Kjeldahl Nitrogen	MSTN	L1731464-1, -11, -12, -2, -4, -5, -6, -7, -8, -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
DLM	Detection Limit Adjusted due to sample matrix effects.
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.
MSTN	TKN Matrix Spike recovery was low due to interference from high nitrate, which causes negative bias on TKN.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	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.

BE-D-L-CCMS-VA 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.

BE-T-L-CCMS-VA 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.

CARBONS-TIC-VA Water Total inorganic carbon by CO2 purge APHA 5310B TOTAL ORGANIC CARBON (TOC)

This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".

CARBONS-TOC-VA 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)".

CL-IC-N-WR 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

CN-FREE-CFA-VA	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.

CN-SCN-VA	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.

CN-T-CFA-VA	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.

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-PCT-VA	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.

F-IC-N-WR	Water	Fluoride in Water by IC	EPA 300.1 (mod)

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

HARDNESS-CALC-VA	Water	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-D-CVAA-VA	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.

HG-T-CVAA-VA	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.

IONBALANCE-VA	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]

MET-D-CCMS-VA	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.

MET-DIS-LOW-ICP-VA	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).

MET-T-CCMS-VA	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.

MET-TOT-LOW-ICP-VA	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).

NH3-F-VA	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.

S2-T-COL-VA	Water	Total Sulphide by Colorimetric	APHA 4500-S2 Sulphide

This analysis is carried out using procedures adapted from APHA Method 4500-S2 "Sulphide". Sulphide is determined using the methlyene blue colourimetric method.

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.

** 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

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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L1731464-COFC

COC Number: 2 - 1343-005.14

Page 1 of 1

Report To		Report Format /
Company:	Hemmera Environchem Inc.	Select Report Format: ☑PDF ☐EXCEL (DIGITAL)
Contact:	Natasha Sandys	Quality Control (QC) Report with Report ☑ Yes ☐ No
Address:	230 - 2237 2nd Avenue Whitehorse, YT	☐Criteria on Report - provide details below if box checked
Phone:	867-456-4865	Select Distribution: ☑EMAIL ☐MAIL ☐FAX
		Email 1 or Fax nsandys@hemmera.com, jhains@hemmera.com
		Email 2 chris@elr.ca

Invoice To	Same as Report To ☑ Yes ☐ No	Invoice Distribution
	Copy of Invoice with Report ☐ Yes ☑ No	Select Invoice Distribution: ☑EMAIL ☑MAIL ☐FAX
Company:	Hemmera Environchem Inc.	Email 1 or Fax nsandys@hemmera.com
Contact:	Natasha Sandys	Email 2 chris@elr.ca

Project Information		Oil and Gas Required Fields (client use)	
ALS Quote #:	Q50588	Approver ID:	Cost Center:
Job #:	1343-005.14	GL Account:	Routing Code:
PO / AFE:		Activity Code:	
LSD:		Location:	

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler: JH, DC, GR, AN

.ow (Rush Turnaround Time (TAT) is not available for all tests)

R ☑Regular (Standard TAT if received by 3 pm - business days)

P ☐Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT

E ☐Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT

E2 ☐Same day or weekend emergency - contact ALS to confirm TAT and surcharge

Specify Date Required for E2,E or P:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	F/P Dissolved Metals, Hardness	F/P Dissolved Mercury	Nitrate, Nitrite, Total Kjeldahl N (TKN)	Cl, Fl, Sulfate, conductivity, pH, alkalinity	Anion Sum, Cation Sum, Cation/Anion Bala	P Cyanide - Weak Acid Diss., Total, Free	P Ammonia N (total), Total Organic Carbon	P Thiocyanate (SCN)	P Sulphide as S	Total Inorganic Carbon	Total Metals, Hardness	Total Mercury		Number of Containers
	MW09-22	03-Feb-16	16:40	WATER	R	R	R	R	R	R	R	R	R	R				8
	MW09-01	03-Feb-16	14:45	WATER			R	R	R	R	R	R	R	R				6
	MW09-01	02-Feb-16	17:00	WATER	R	R												2
	MW09-23	03-Feb-16	15:40	WATER	R	R	R	R	R	R	R	R	R	R				8
	MW09-04	03-Feb-16	10:30	WATER	R	R	R	R	R	R	R	R	R	R				8
	MW16-200	03-Feb-16	10:30	WATER	R	R	R	R	R	R	R	R	R	R				8
	MW09-03	03-Feb-16	13:00	WATER	R	R	R	R	R	R	R	R	R	R				8
	MW09-14	03-Feb-16	10:15	WATER	R	R	R	R	R	R	R	R	R	R				8
	MP09-09	04-Feb-16	10:00	WATER	R	R	R	R	R	R	R	R	R	R				8
	MP09-10	04-Feb-16	10:30	WATER	R	R	R	R	R									3
	MW09-06	04-Feb-16	9:15	WATER	R	R	R	R	R	R	R	R	R	R				8
	TRIP BLANK	04-Feb-16	-	WATER			R	R	R	R	R	R	R	R	R	R		8

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report (client Use)
Are samples taken from a Regulated DW System? ☐ Yes ☑ No	- See attached parameter sheet for list of full parameters and metals required.
Are samples for human drinking water use? ☐ Yes ☑ No	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐		SIF Observations	Yes ☐	No ☐
Ice packs	Yes ☐	No ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
3.3°C			7.4	6.9	4.0/6.1°C

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Justin Hains	Date: Feb 4, 2016	Time: 12:07	Received by:	Date: Feb 05, 2016	Time: 10:40AM	Received by: Lady	Date: Feb 6	Time: 11:30am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

APPENDIX D
Response to Client Comments

Response to Comments from Draft Report Version (as Received January, 2016)

Comment No.	Page	Comment	Response
1	1	Just to note to Hemmera that this report will likely be distributed by AAM to other parties (i.e. either public or private) and that those parties may use the data/finding in this report.	Sentence removed.
2	8	Was the electric hydrolift method not possible?	It was not possible to use the hydrolift during the February 2016 sampling event due to site conditions. The primary wells on which the hydrolift is generally used are in the pit area, which was inaccessible due to safety concerns.
3	15	This note does not make sense (i.e. related to destroyed well)	The note has been removed and other notes checked.
4	19	No note? I think this may be a formatting/editing error.	Correct notes have been added for these sites.
5	19	Not light grey; more like teal colour. Change colour or change description.	This was the result of a formatting change, and the description has now been updated.
6	20	Why AU? I thought measurements would all be in NTU?	The turbidity meters automatically switch from NTU to AU at approximately 1,000 NTU. This represents a change from measurements taken at 90 degrees to the light source to 180 degrees to the source, which provides a more accurate reading at higher turbidity levels. AUs are supposed to be comparable to NTU, but reflect only the difference in measurement technique. A reference to AU has also been added in the methods section.