WESTBAY FLUID PRESSURE MONITORING AND GROUNDWATER SAMPLING IN IGNACE BOREHOLES

2023 Annual Report

APM-REP-01332-0472 **December 2024**

Geofirma Engineering Ltd.

nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

This report has been prepared under contract to NWMO. The report has been reviewed by NWMO, but the views and conclusions are those of the authors and do not necessarily represent those of the NWMO.

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Westbay Fluid Pressure Monitoring and Groundwater Sampling in Ignace Boreholes

2023 Annual Report

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Revision Tracking Table

Revision	Revision Release Date	Description of Modifications/Edits
R0A	June 28, 2024	Initial draft release
R0B	August 12, 2024	Second draft release
R0C	October 30, 2024	Third draft release
R0	December 6, 2024	Final Release

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1 INTRODUCTION

Geofirma Engineering Ltd. has been retained by the Nuclear Waste Management Organization (NWMO) to complete long-term monitoring of Westbay multilevel systems that are installed in deep bedrock boreholes near Ignace, Ontario.

The purpose of this project is to measure groundwater pressures and temperatures and to collect groundwater samples for geochemical analysis. Measuring fluid pressures in each of the intervals of a single Westbay multilevel system is referred to as pressure profiling. Data obtained from this project will be used to evaluate the groundwater system at the Revell site.

The scope of work includes pressure profiling, groundwater sampling, and laboratory analysis of water samples for four Westbay multilevel systems installed in the boreholes at the Revell Site: IG_BH01, IG_BH03, IG_BH05 and IG_BH06. Pressure measurements are taken at each sampling port quarterly and selected intervals are targeted for groundwater sampling. Specific intervals targeted for groundwater sampling are selected by NWMO based on the interval's hydraulic properties and the likelihood of collecting a groundwater sample that is representative for the target bedrock interval.

An annual technical report, prepared by Geofirma, describes all work activities completed during each calendar year, including all pressure profiling, groundwater sampling, and laboratory analyses. This 2023 Annual Report is the fourth annual report prepared by Geofirma. The report describes the field activities, procedures, and results from the quarterly monitoring events completed in 2023. Table 1 summarizes the fieldwork completed to date as part of the program that started in 2020.

Work described in this technical report was carried out in accordance with Geofirma's project specific Test Plan, Project Quality Plan, and Health, Safety, and Environment Plan.

Table 1 Summary of Completed Fieldwork as of December 2023.

Year /Quarter		IG_BH01		IG_BH03		IG_BH05		IG_BH06	
		PP	Sampling	PP	Sampling	PP	Sampling	PP	Sampling
2020	Q4	✓	✓ INT_009 (I)	✓	-	-	-	-	-
2021	Q1	✓	✓ INT_009 (F)	✓	-	-	-	-	-
	Q2	✓	-	✓	-	-	-	-	-
	Q3	✓	✓ INT_007 (I)	✓	✓ INT_002 (I)	-	-	-	-
	Q4	✓	✓ INT_007 (F)	✓	✓ INT_002 (I)	-	-	-	-
2022	Q1	✓	✓ INT_004 (I)	✓	✓ INT_002 (I)	✓	✓ INT_007 (I)	-	-
	Q2	✓	✓ INT_004 (F)	✓	✓ INT_002 (I)	✓	✓ INT_007 (I)	-	-
	Q3	✓	✓ INT_002 (I)	✓	✓ INT_002 (F)	✓	✓ INT_007 (F)	✓	-
	Q4	✓	✓ INT_002 (I) INT_007 (NG/R)	✓	✓ INT_021 (A)	✓	✓ INT_005 (I)	✓	✓ INT_008 (A)
2023	Q1	No field work completed during Q1 2023							
	Q2	✓	✓ INT_002 (F) INT_017 (F)	✓	-	✓	-	✓	-
	Q3a	-	✓ INT_004 (NG/R)	-	✓ INT_002 (NG/R)	-	-	-	-
	Q3	✓	✓ INT_020 (F) INT_017 (NG/R) INT_002 (NG/R) INT_007 (NG/R) INT_009 (NG/R)	✓	✓ INT_021 (F)	✓	-	-	-
	Q4	✓	✓ INT_002 (NG/R) INT_004 (NG/R) INT_009 (I/R) INT_019 (I)	✓	✓ INT_002 (NG/R)	✓	-	-	-

(I) = interim sample collected
(F) = final sample collected
(R) = re-sample collected
(A) = archive sample collected
(NG) = noble gas only sample collected

2 BACKGROUND

2.1 NWMO APM Program

The NWMO is implementing their Adaptive Phased Management ("APM") plan for the long-term management of Canada's used nuclear fuel. APM includes the emplacement of the used nuclear fuel in an underground deep geological repository (DGR). The initial borehole drilling and testing project at the Revell Site in northwestern Ontario is part of the Phase 2 geoscientific preliminary field investigations in the NWMO's APM site selection process.

Phase 2 Preliminary Assessments involve, among other, the drilling and testing of six deep boreholes in a potential repository area (PRA) located within the northwestern portion of the Revell Batholith, approximately 50 km northwest of Ignace, Ontario. The Revell Site is located approximately 250 km northwest of Thunder Bay along the Trans-Canada Highway (HWY 17). Figure 1 shows the locations of all six boreholes drilled and tested as part of the APM Phase 2 geoscientific preliminary assessments. All fieldwork described in this report was completed by Geofirma at boreholes IG_BH01, IG_BH03, IG_BH05, and IG_BH06.

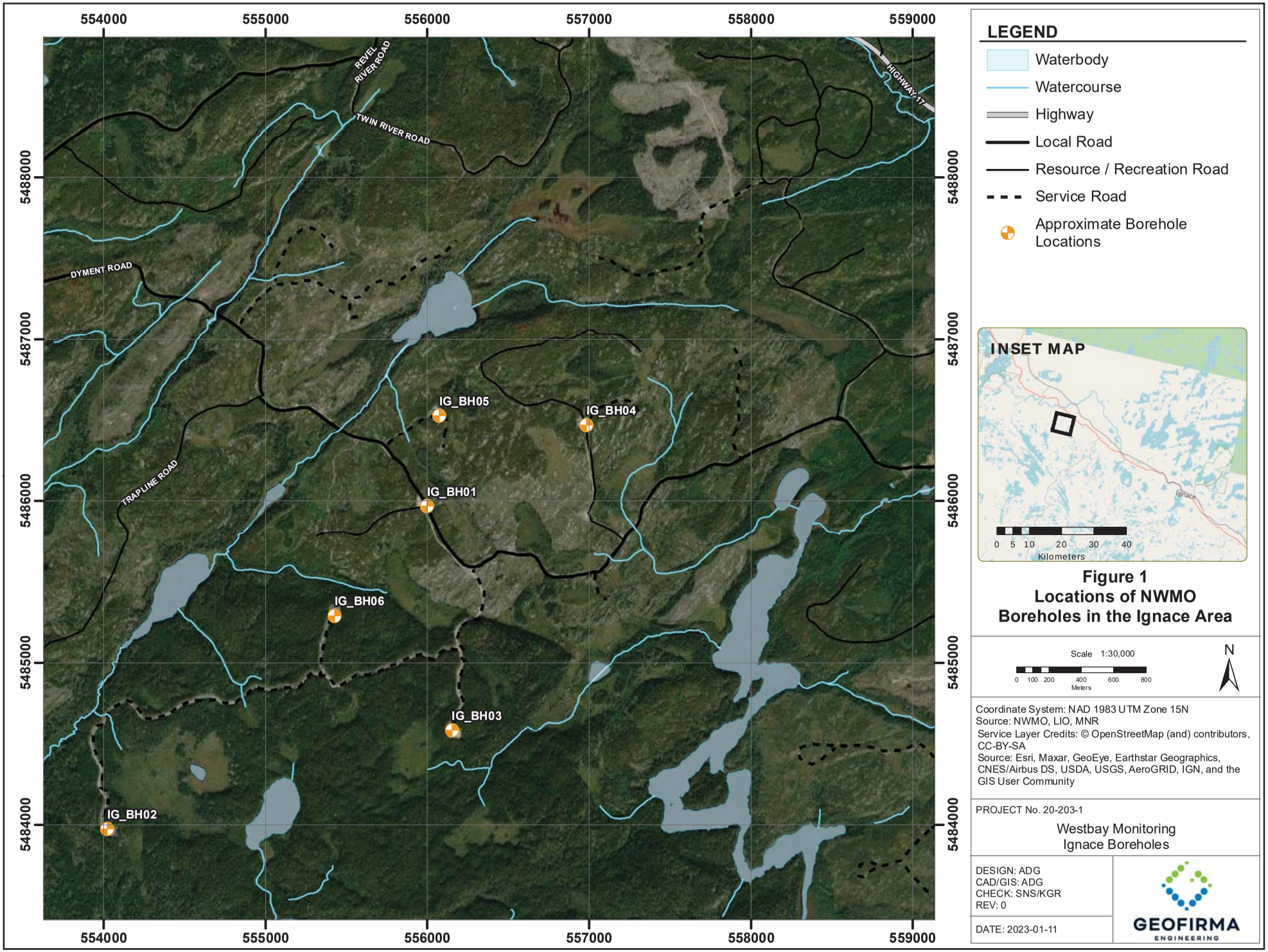
All boreholes were previously drilled using HQ3 wireline coring equipment that produces a 96 mm nominal diameter borehole to depths of approximately 1000m along borehole length. The first borehole, IG_BH01, was drilled vertically; the remaining five boreholes were drilled at an inclined angle of 70° from horizontal. The inclination of some boreholes varied during drilling, resulting in borehole true vertical depths ranging from approximately 883 to 1,000 metres below ground surface (m BGS).

Westbay multilevel monitoring systems, completed with MP38 casing (Multiport casing with inside diameter of 38 mm), have been installed in four of the six boreholes: IG_BH01, IG_BH03, IG_BH05, and IG_BH06. Boreholes IG_BH02 and IG_BH04 have been temporarily sealed using bridge plug-style packers to minimize vertical borehole fluid cross connections.

In September 2023, the NWMO installed a string of dedicated Westbay MOSDAX pressure transducers into the MP38 casing at borehole IG_BH06. The probes were installed in select intervals to allow for continuous long-term data logging of in-situ groundwater pressures. The installation of these probes does not allow pressure profiling or groundwater sampling to be completed and therefore quarterly monitoring at IG_BH06 was suspended after Q2 2023.

2.2 Geological Setting

The approximately 2.7-billion-year-old Revell batholith is located in the western part of the Wabigoon Sub province of the Archean Superior Province. The batholith is roughly elliptical in shape trending northwest, and is approximately 40 km in length, 15 km in width, and covers an area of approximately 455 km^2. Based on recent geophysical modelling, the batholith has a relatively flat base that extends to depths of nearly 4 km in some regions (Sanders Geophysics Limited [SGL], 2020). The batholith is surrounded by supracrustal rocks of the Raleigh Lake (to the north and east) and Bending Lake (to the southwest) greenstone belts (Figure 2).



LEGEND

- Waterbody
- Watercourse
- Highway
- Local Road
- Resource / Recreation Road
- Service Road
- Approximate Borehole Locations

Figure 1
Locations of NWMO Boreholes in the Ignace Area

Scale 1:30,000

0 100 200 400 600 800
Meters

N

Coordinate System: NAD 1983 UTM Zone 15N
Source: NWMO, LIO, MNR
Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

PROJECT No. 20-203-1

Westbay Monitoring
Ignace Boreholes

DESIGN: ADG
CAD/GIS: ADG
CHECK: SNS/KGR
REV: 0

DATE: 2023-01-11

GEOFIRMA ENGINEERING

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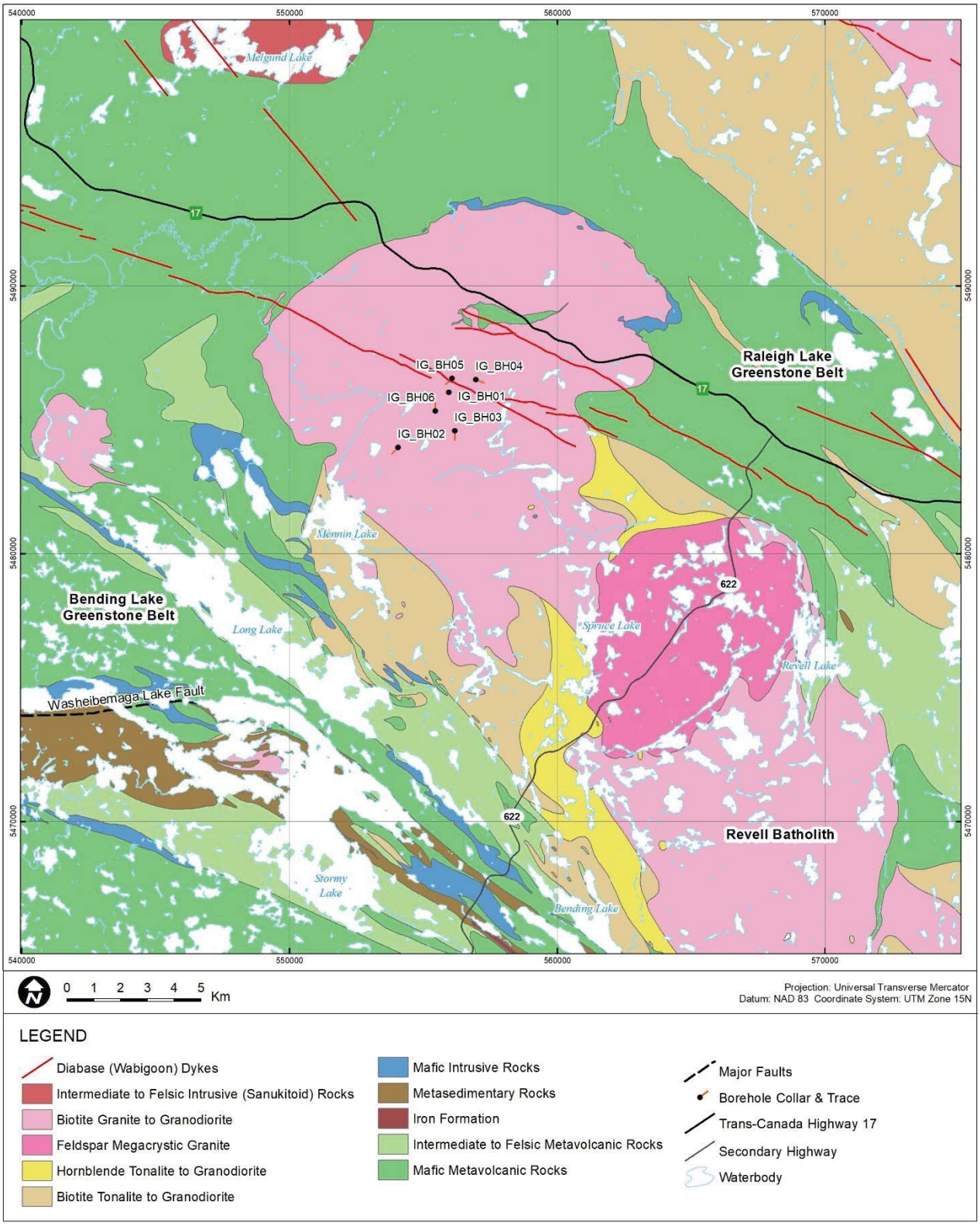

Figure 2 Bedrock Geology of the Revell Site and Surrounding Area

3 DESCRIPTION OF ACTIVITIES

The following section provides a summary of the field and laboratory activities that were completed for each quarterly monitoring event in 2023. All field measurements and equipment calibrations that were completed as part of water sampling activities were recorded in a excel-format Data Quality Confirmation (DQC) workbook and delivered to the NWMO.

Geofirma completed three full monitoring and sampling events in June (Q2), September (Q3) and December (Q4) 2023, as well as an additional sampling event for the collection of noble gas samples from select intervals in August (Q3a) 2023. Throughout 2023, there was a focus on sampling and re-sampling intervals for noble gas analyses, with the goal of improving sampling methodology to collect high quality samples. The Q1 2023 monitoring event was cancelled by the NWMO, while improvements to the sampling methodology were being developed.

3.1 Quarterly Monitoring Events

Details of the work activities completed in 2023 for each quarterly monitoring event are summarized in Table 2.

Table 2 Summary of 2023 Field Activities for Westbay Monitoring at Revell Site

Monitoring Event	Field Work Dates	Work Activities Completed
Q1	No Quarterly Monitoring	
Q2	Jun 13 – 27 2023	• Pressure/temperature profiling at IG_BH01 • Pressure/temperature profiling at IG_BH03 • Pressure/temperature profiling at IG_BH05 • Pressure/temperature profiling at IG_BH06 • Purging and sampling from IG_BH01_T_INT_017 • Purging and sampling from IG_BH01_T_INT_002
Q3a	Aug 5 – Aug 07 2023	• Purging and noble gas re-sampling from IG_BH01_T_INT_004 • Purging and noble gas re-sampling from IG_BH03_T_INT_002
Q3	Sep 27 – Oct 17 2023	• Pressure/temperature profiling at IG_BH01 • Pressure/temperature profiling at IG_BH03 • Pressure/temperature profiling at IG_BH05 • Purging and sampling from IG_BH01_T_INT_020 • Purging and noble gas re-sampling from IG_BH01_T_INT_002 • Purging and noble gas re-sampling from IG_BH01_T_INT_017 • Purging and noble gas re-sampling from IG_BH01_T_INT_007 • Purging and noble gas re-sampling from IG_BH01_T_INT_009 • Purging and sampling from IG_BH03_T_INT_021

Q4	Nov 29 – Dec 10 2023	• Pressure/temperature profiling at IG_BH01 • Pressure/temperature profiling at IG_BH03 • Pressure/temperature profiling at IG_BH05 • Purging and re-sampling from IG_BH01_T_INT_009 • Purging and sampling from IG_BH01_T_INT_019 • Purging and noble gas re-sampling from IG_BH01_T_INT_002 • Purging and noble gas re-sampling from IG_BH01_T_INT_004 • Purging and noble gas re-sampling from IG_BH03_T_INT_002

3.2 Fluid Pressure and Temperature Profiling

Fluid pressure and temperature profiling was completed in the Westbay multilevel systems according to the methodology outlined in Geofirma's Test Plan. All fluid pressure and temperature measurements from the systems were collected using NWMO-owned Westbay equipment (MOSDAX, MAGI, etc.).

Prior to the start of pressure profiling, Geofirma field staff completed measurements and quality checks to confirm the quality of the data collected using the MOSDAX probe during pressure profiling activities. A barometric logger (Solinst Barologger) was installed at ground surface within 100 meters of the wellhead to record barometric (atmospheric) pressure at a frequency of 60 seconds throughout the profiling event. Before lowering the MOSDAX probe into the well, surface inspections and function checks were completed. Manual water level measurements from within the MP38 casing were also recorded, these measurements were used to assess the calibration of the MOSDAX probe when the probe was submerged to a known depth.

Pressure and temperature profiling was completed from the deepest to the shallowest sampling ports at each borehole (bottom to top), unless otherwise stated. At each sampling port, the following measurements were collected: start profile time, landed pressure inside of the MP38 casing, interval pressure and temperature, pressure inside the MP38 casing, and end profile time.

All field measurements and records of Westbay equipment operation during pressure and temperature profiling were recorded on purpose-built field data sheets within the DQC workbook.

Quality checks of pressure/temperature data were performed during field work at each sampling port by ensuring that values were acceptable when compared to data from previous monitoring round(s). Anomalous values were noted in the DQC workbook and confirmed by collecting a second pressure measurement at the same interval.

3.3 Groundwater Purging

3.3.1 Westbay Interval Selection for Groundwater Purging and Sampling

Westbay intervals targeted for purging and groundwater sampling during each quarterly monitoring event were identified by NWMO prior to Geofirma mobilization. Geofirma performed a 24-hr purge (including recovery) prior to sampling each of the targeted Westbay intervals, however, due to the low hydraulic conductivities of the bedrock, NWMO personnel also completed frequent purging activities between Geofirma's quarterly monitoring events. Concentration of fluorescein tracer is the primary criteria used to

assess drill water concentrations in groundwater samples. Fluorescein concentration in the drill water during borehole drilling was maintained at a targeted range of approximately 100 µg/L (100 ppb). A groundwater sample with a drill water concentration of less than 5% (i.e., fluorescein < 5 ppb) was considered representative of formation chemistry and designated as a final sample.

Table 3 below summarizes the top depth, bottom depth, and sampling port depth of the Westbay intervals for which Geofirma completed purging and groundwater sampling for during 2023, listed in meters below ground surface (m BGS).

Table 3 Details on Westbay MP38 Intervals Purged and Sampled During 2023

Westbay Interval ID	Top of Interval (m BGS)	Bottom of Interval (m BGS)	Sampling Port Depth (m BGS)
Q2 (June) 2023			
IG_BH01_T_INT_002	885.19	972.71	888.49
IG_BH01_T_INT_017	195.87	226.97	199.17
Q3a (August) 2023			
IG_BH01_T_INT_004*	765.77	799.95	769.06
IG_BH03_T_INT_002*	865.35	884.86	868.28
Q3 (September) 2023			
IG_BH01_T_INT_020	65.89	124.28	69.09
IG_BH01_T_INT_017	195.87	226.97	199.17
IG_BH01_T_INT_002*	885.19	972.71	888.49
IG_BH01_T_INT_007*	624.94	645.42	628.23
IG_BH01_T_INT_009*	536.87	570.16	540.07
IG_BH03_T_INT_021	65.09	150.15	68.16
Q4 (December) 2023			
IG_BH01_T_INT_002*	885.19	972.71	888.49
IG_BH01_T_INT_004*	765.77	799.95	769.06
IG_BH01_T_INT_009*	536.87	570.16	540.07
IG_BH01_T_INT_019	125.18	144.78	128.48
IG_BH03_T_INT_002*	865.35	884.86	868.28

*Interval was previously purged and sampled, Geofirma completed re-sampling.

3.3.2 Westbay MP38 Interval Purging

Operation of the Westbay equipment for purging activities was completed by Geofirma staff according to procedures outlined in the Test Plan. A minimum 24-hour purge, including recovery time, was performed for each interval selected for groundwater sampling. Select chemical parameters (pH, temperature, electrical conductivity, dissolved oxygen, oxidation-reduction potential, turbidity and fluorescein) were measured in the field, during purging activities, using a Horiba U52 multiparameter probe and Turner Designs AquaFluor fluorometer and recorded in the DQC workbook.

Purging was completed using a double valve pump (Solinst model 408) provided by Geofirma. The pump was set within the Westbay MP38 casing at a depth of approximately 85 meters below top of casing. As described in the Test Plan, two methods were used for purging, dependant on the status of the selected interval. A brief description of the two methods is provided below:

1) Open Pumping Port Method: The pumping port of the interval remains open, and the double valve pump is lowered to into the MP38 casing to complete the purging. This purging method was used for Westbay intervals that were selected for interim sampling, when purging by NWMO is expected to continue after Geofirma completes the current sample collection activity.

2) Flow-through Sampling Port Method: The Westbay MOSDAX probe was lowered and attached to the selected interval's sampling port and the valve is opened. The double valve pump was then lowered into the MP38 casing to complete the purging. This purging method was used for Westbay intervals that were selected for "final" sampling or on intervals with low to moderate formation hydraulic conductivity (K). The pumping port remained closed during purging (or was closed prior to the final 24-hr purge immediately prior to collecting a "final" sample).

Details for each purging event are described in the subsections below and are summarized in Table 4. All water generated during purging was collected in 20 L plastic buckets and removed from site for disposal by NWMO personnel at the Ignace landfill in accordance with applicable regulations.

Many of the intervals selected for purging and sampling in 2023 had previously been fully purged and pumping ports remained closed, Geofirma still completed a 24-hr purge on these intervals prior to sampling using the flow-through sampling port method described above. Following purging, Geofirma measured field parameters to confirm the sample met the criteria for final sampling.

No purging was completed by Geofirma during Q3a (August) 2023, as requested by NWMO, a confirmatory fluorescein sample was collected prior to sampling.

All water generated during purging was collected in 20 L plastic buckets and removed from site for disposal by NWMO personnel at the Ignace landfill in accordance with applicable regulations.

Table 4 Details of Purging Activities for Selected Intervals in 2023

Westbay Interval ID	Volume Purged Prior to Event (L)	Final Date purged by NWMO	Date Purged by Geofirma	Volume Purged by Geofirma (L)	Total Purged Volume (L)	Purging method used
Q2 (June) 2023						
IG_BH01_T_INT_002	4371	2023-03-19	2023-06-14	50	4421	Flow-through Sampling Port
IG_BH01_T_INT_017	802	2023-05-15	2023-06-17	30	650	Flow-through Sampling Port
Q3a (August) 2023						
IG_BH01_T_INT_004*	2852	2023-08-01	N/A	N/A	2852	N/A
IG_BH03_T_INT_002*	1209	2023-08-01	N/A	N/A	1209	N/A
Q3 (September) 2023						

IG_BH01_T_INT_020	349	2023-09-16	2023-10-10	65	387	Flow-through Sampling Port
IG_BH01_T_INT_017	803	2023-05-15	2023-10-07	30	833	Flow-through Sampling Port
IG_BH01_T_INT_002*	4421	2023-08-01	2023-10-08	60	4481	Flow-through Sampling Port
IG_BH01_T_INT_007*	2688	2022-11-22	2023-10-06	60	2748	Flow-through Sampling Port
IG_BH01_T_INT_009*	5692	2021-03-12	2023-10-12/13	60	5752	Flow-through Sampling Port
IG_BH03_T_INT_021	1800	2023-05-15	2023-10-01	11	1811	Flow-through Sampling Port
Q4 (December) 2023						
IG_BH01_T_INT_002*	4481	2023-08-01	2023-12-04	16	4497	Flow-through Sampling Port
IG_BH01_T_INT_004*	2852	2023-08-01	2023-12-05	24	2876	Flow-through Sampling Port
IG_BH01_T_INT_009*	5752	2021-03-12	2023-12-06	14	5766	Flow-through Sampling Port
IG_BH01_T_INT_019	1351	2023-07-31	2023-12-07	15	1366	Flow-through Sampling Port
IG_BH03_T_INT_002*	1209	2023-08-01	2023-12-01	15	1224	Flow-through Sampling Port

*Interval was previously purged and sampled, Geofirma completed re-sampling.

3.4 Test Plan Groundwater Sampling

Groundwater sampling was performed by Geofirma staff using a NWMO-owned Westbay MOSDAX sampler probe and accessories. All sampling was completed in accordance with the Test Plan. A summary of the field procedures for groundwater sampling is provided in the following section.

3.4.1 Equipment Decontamination

Prior to sample collection, all sampling equipment (MOSDAX probe, stainless steel sample cannisters, fittings) was decontaminated by Geofirma field staff. Equipment decontamination was recorded in the DQC workbook and followed the procedure described below:

1. Put on new, powder-free nitrile gloves. Remove potential clothing that may contaminate field equipment.
2. Wipe off visible loose contamination (e.g., dirt) using a brush or paper towel.
3. Wash equipment with solution made of laboratory grade non-phosphate, non-perfumed detergent (e.g., Alconox) and water. Use a brush to apply detergent. For internal mechanisms or items that cannot be washed using a brush, flush two system volumes of the cleaning solution though the system.

4. Rinse the equipment using distilled water and allow the equipment to air dry. Try to place equipment in a location that minimizes potential of airborne contamination (e.g., dust) during drying.
5. Purge rinse water from MOSDAX sampling probe using high purity (alphagaz^{TM}, >99.999%) compressed nitrogen. Compressed nitrogen is applied to the inlet port using sampling tubing and flushed through the open port at the bottom of the tool.
6. Contain all water generated during decontamination procedures and dispose of it.
7. If a duplicate sample is being collected, collect a rinsate sample after decontamination is complete by running distilled water through the Westbay MOSDAX sampler probe.

Rinsate water and water containing laboratory standards and solutions was contained in a plastic bucket and transported offsite by Geofirma for offsite disposal.

3.4.2 Groundwater Sample Collection

Sample collection was completed using NWMO-owned Westbay MOSDAX sampling equipment. Four stainless steel sample cannisters (0.25 L each) were connected in series and attached to the bottom of the MOSDAX sampler probe. Prior to lowering the sample cannisters into the borehole, the four containers were flushed with high-purity nitrogen (N_2) and then evacuated using a vacuum pump to less than 35 kilopascals (kPa), or as low as possible (<5 kPa) for noble gas samples.

Once lowered, the sampler probe was connected to the sampling port or lowered to 2 m above the pumping port (if the pumping port was left open), the valve on the MOSDAX sampler was opened so that groundwater could fill the vacated stainless-steel containers. The pressure in the MOSDAX sampler probe was monitored during sampling to ensure that the sample containers were filled (taking approximately 1-15 minutes). A successful sample collection is verified by Geofirma observing a drop in formation pressure once the valve of the MOSDAX has been opened, followed by formation pressure typically returning to within 10-15 kPa of the initial formation pressure reading once the cannisters are filled. Once the cannisters were filled, the valve on the MOSDAX sampler was closed, and the probe and all the cannisters were retrieved to surface. This process is referred to as a sampling “run”, multiple runs are required to collect sufficient sample water for analysis.

3.4.3 Field Parameter Measurements and Transfer of Water to Laboratory Bottles

Sample water collected with the MOSDAX sampler probe was used to fill laboratory bottles, complete field parameter measurements, and field analytical testing as outlined in Table 5. Calibration of the measurement equipment and measurement of field parameters (e.g., alkalinity) was completed following procedures outlined in the Test Plan.

To minimize exposure to the atmosphere, sample water used for field parameter measurements remained in the Westbay sample cannisters and only the quantity required to perform each field test was extracted. Polyethylene tubing was used to transfer the water directly from the Westbay stainless-steel sample cannisters into the Horiba flow-through cell, eliminating the exposure to the atmosphere. When required, high purity compressed nitrogen was used to pressurize the stainless steel cannisters to assist with water flow.

Water collected for laboratory analysis was decanted from the stainless-steel sample cannisters into laboratory provided bottles. All bottles were placed in coolers on ice and shipped/delivered to the analytical laboratories under chain of custody (COC) procedures.

An archive sample was collected as a part of every sample suite following the same procedures. The archive samples were kept on ice or refrigerated until they were hand-delivered to the NWMO office in Ignace, ON.

Table 5 Field Parameter Measurement and Testing Methods

Parameter	Volume Required	Field-Measurement Method
Fluorescein	25 mL	Handheld Fluorometer (Turner Designs Aquafluor™)
Turbidity	500 mL	In sealed flow-through cell (i.e., Horiba Flow Chamber) with inserted water quality multi-probe (Horiba-U52/U50)
Dissolved Oxygen (DO)		
Electrical Conductivity		
Temperature		
Oxidation-Reduction Potential (ORP)		
pH		
Fluid Density		HACH™ Hydrometer (SG > 1.0)
Dissolved Total Sulphide [S^{2-}_{Total}]	25 mL	Dissolved total sulphide by methylene blue method (Hach Method No. 8131) and colorimeter (Hach DR900Multiparameter Colorimeter)
Ferrous Iron [Fe^{2+}]	35 mL	1-10 Phenanthroline Method (Hach Method No. 8146) using portable colorimeter (Hach DR900 Multiparameter Colorimeter)
Dissolved Oxygen	50 mL	Indigo Carmine method (Hach Method No. 8316) using portable colorimeter (Hach DR900) for concentrations < 1mg/L and Horiba-U52/50 for concentrations > 1 mg/L
Alkalinity	100 mL	Hach™ Alkalinity Test Kit, digital titration method using sulphuric acid (H_2SO_4), phenolphthalein indicator, and bromocresol green-methyl red indicator; hydroxide, carbonate and bicarbonate alkalinities can be determined (Hach Method No. 8203)

3.4.4 Sampling Procedure for Noble Gas Samples

The noble gas sampling procedure was updated twice during 2023 following multiple discussions with NWMO and in consultation with the University of Oxford to attempt to collect highest quality samples by completing a methods development study using variable cannister materials and configurations. The changes made were captured in the test plan and in two memorandums provided to the NWMO dated June 7, 2023 and January 22, 2024. The generalized procedure is outlined below.

Water samples for noble gases analysis were collected using lab-provided 3/8” tubing connected to the Westbay MOSDAX sampler. A train of two or three tubes (~0.3 m long each) were connected in series below the MOSDAX sampler with a 250 mL stainless-steel Westbay sample cannister between the probe and the tubes (Figure 3a). The sample train followed the same sampling procedure as outlined in section 3.4.2.

Upon retrieval to the surface, lab-provided clamps were used to seal off both ends of each of the tubing segments. By sealing each segment, triplicates were collected for each sample (Figure 3b). After clamping, the noble gas samples were wrapped in bubble wrap and placed in a rigid-sided cooler for transport.

Some notable changes to procedures in 2023 include:

- The addition of nitrogen and trip blank samples (see section 3.4.5)
- In Q2 and Q3a 2023 sampling rounds, both lab-provided Cu tubes (with clamps) and NWMO provided stainless-steel tubes (with Swagelok He-grade valves) were used to collect noble gas samples. The goal was to identify any benefit on sample quality using stainless steel versus copper tubing.
- Following the testing of the samples from Q2 and Q3a, it was concluded that the copper tubing and lab-designed clamps yielded higher quality results, only these supplies were used for the remainder of the 2023 quarterly sampling events (Q3 and Q4).

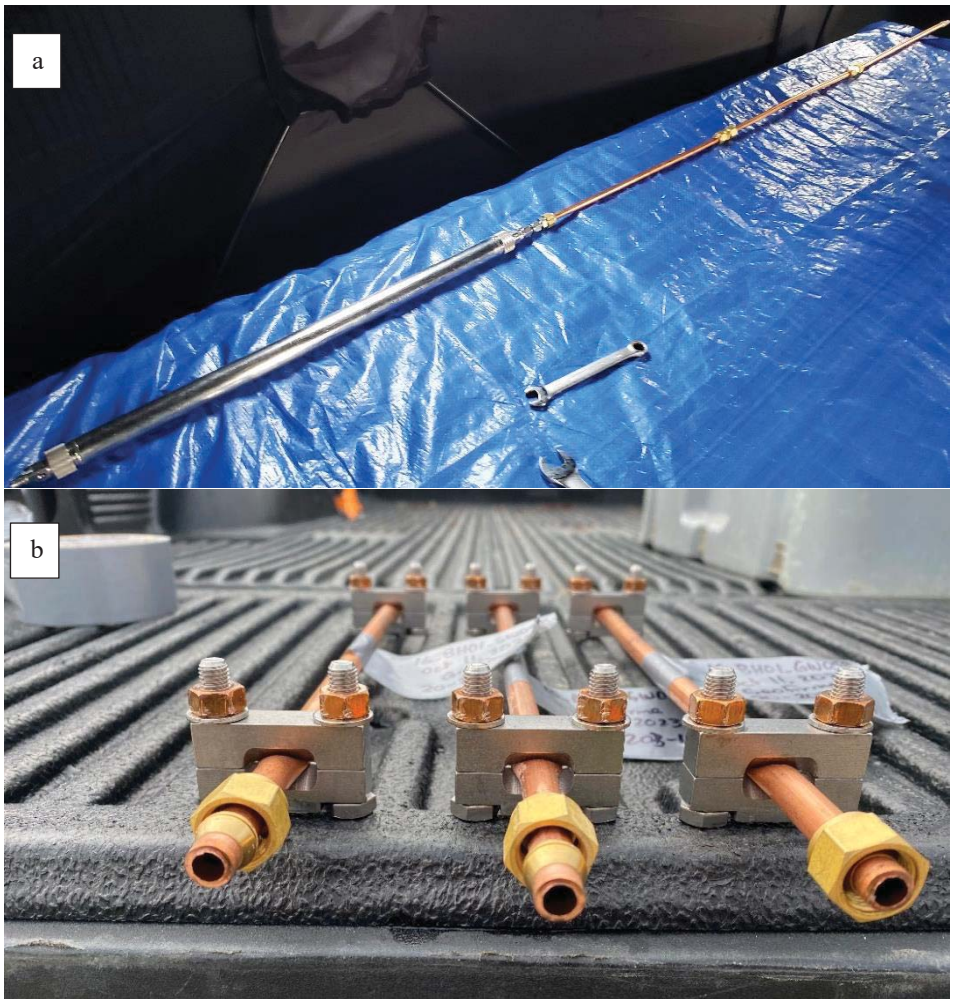

Figure 3 Example photos of noble gas sampling. a) photo of the sample train with Westbay cannister and three Cu tubes, prior to sending it downhole. b) photo of sample tubes after being clamped and labelled.

3.4.5 Collection of QA/QC Samples

QA/QC samples were collected as part of each monitoring event in 2023. Three types of QA/QC samples were collected, including:

- *Rinsate blank* - to test the sampling equipment after decontamination for contamination, one sample collected per quarterly event.
- *Field blank* - tritium-free blanks to assess atmospheric contamination during sample collection and transport, one sample collected per quarterly event.
- *Duplicate samples* – complete set of duplicate samples, collected to assess the consistency of the laboratory analyses. Duplicate samples are collected from intervals that have met the criteria for final sampling or otherwise requested by NWMO.

The rinsate blank was collected by running distilled water through the Westbay MOSDAX sampler probe and sampler containers following the completion of decontamination activities and prior to sample

collection. Sufficient water was run through the sampling equipment to fill laboratory-provided sample bottles for major elements and metals, trace elements, and anions.

A tritium-free "field" blank was collected to assess atmospheric contamination of groundwater samples. Tritium-free water is provided in bottles by the University of Ottawa. These bottles were stored on-site and left exposed to the atmosphere for the same duration as the tritium and ^{14}C-DIC samples. During sampling, the tritium-free water was decanted into sample bottles identical to the ones used for tritium and ^{14}C-DIC analyses. The field blank was analyzed for tritium and ^{14}C-DIC at the same time as the corresponding groundwater sample.

A full suite of duplicates was collected during the Q2, Q3 and Q4 monitoring events in 2023 to assess the variability of results provided by laboratory analysis. Duplicate samples were collected at the same time as the primary/original sample, on a bottle-by-bottle basis. For example, both the original and duplicate tritium bottles were filled before filling the next bottle type.

Additional QA/QC samples were also introduced to better assess the representativeness of sample results to in-situ formation groundwater, these included:

- *Nitrogen (N_2) Blank (noble gas)* – nitrogen blank is collected to assess the background concentration of noble gases in the N_2 gas (alphagaz^{TM}) used to flush the noble gas sampling tubes. One sample was collected for every new gas tank used.
- *Trip blank (noble gas)* – collected to assess atmospheric contamination during noble gas sample collection and transport, one sample collected per quarterly event.
- *Half Trip blank (noble gas)* – collected to assess atmospheric contamination during noble gas sample preparation procedures and transport, one sample collected per quarterly event, as requested.

The N_2 blank sample was collected during Q2 2023 when a new tank of N_2 was purchased. It was collected by attaching the N_2 supply line to the top of the noble gas sample tube, the tube(s) was flushed and then pressurized with N_2 at 15 pounds per square inch (psi) and sealed.

A trip blank sample was collected during each monitoring event in 2023. The sample tube(s) was flushed with N_2 then vacated to <1 kPa (as read on field MAGI), then sent downhole to the selected interval and waited the same length of time it took the primary samples to fill without collecting any sample water. The tubes were then returned to surface and sealed.

One half trip blank sample collected during Q2 and Q3a 2023 sampling. The sample underwent the same preparations as all other noble gas samples: flushed with N_2 then vacated. The sample was then sealed.

3.4.6 Samples Collected in 2023

A total of 6 full set groundwater samples, 6 QA/QC samples, and 16 noble gas samples (including noble gas blanks) were collected in 2023.

Unless otherwise specified, approximately 5 litres (L) of groundwater was required to meet the sampling objectives with an additional 1-2 L required to complete field parameter measurements for each selected interval. This requires between 6-7 sample runs to collect sufficient volume for sampling. Approximately

double the amount of volume and runs were required on Westbay intervals that were selected for duplicate samples.

As described above and following the Test Plan, sample collection is completed by either of these two methods:

1) Within the MP38 casing: Samples collected by this method were from Westbay intervals that were continuing to be purged; therefore, the pumping port remains open during sampling. The samples are collected by lowering the MOSDAX sample probe to approximately 2 m above the pumping port, then opening the valve for collection. They are therefore not sampled directly from the formation but from the water column in the MP38 casing. These samples are considered interim samples, with estimated drill fluid proportions above 5%.

2) Sampling port: Samples collected by this method were from Westbay intervals that were deemed as final with estimated drill fluid proportions below 5%. The samples are collected from the formation, with the MOSDAX sample probe attached to the sampling port.

A summary of samples collected in 2023 with details on collection method used is provided in Appendix A. The following noteworthy changes to the routine planned sampling program were implemented:

Q2 2023 (June)

In Q2 2023, Geofirma collected final samples from intervals IG_BH01_T_INT_017 and IG_BH01_T_INT_002, as well as additional noble gas samples, as described in section 3.4.4, as part of a methods development assessment. Additionally, during this quarter, interval IG_BH05_T_INT_005 was selected for sampling, however, after multiple attempts by Geofirma to collect the sample, and discussions with NWMO, the sampling of this interval was cancelled due to issues with the sampling and measuring ports.

Q3a 2023 (August)

Based on conversations with NWMO, Geofirma and University of Oxford related to methods development for noble gas sampling, Geofirma completed an additional round of sampling in August 2023 (Q3a) for noble gas samples only from intervals IG_BH01_T_INT_004 and IG_BH03_T_INT_002. Geofirma did not complete any purging prior to sampling, however a confirmatory fluorescein measurement was collected.

Q3 2023 (September)

During Q3 (September) 2023, interval IG_BH01_T_INT_009 was selected for re-sampling for noble gas analyses. This interval had previously been fully purged and sampled in 2021 and expected to meet the requirements for a final sample (<5% drill fluid), as the fluorescein concentration of the sample collected in 2021 was 4.39 ppb. However, Geofirma's field measurements unexpectedly confirmed high fluorescein concentrations (~14 ppb). The sample was still collected and sent to the lab, the decision to run the sample will be decided by the NWMO.

Q4 2023 (December)

Interval IG_BH01_T_INT_009 was targeted for final re-sampling for all analyses again in Q4 following troubleshooting and the re-closing of some pumping ports in IG_BH01 between Q3 and Q4 by NWMO. Similar to Q3, Geofirma's field measurements for this interval showed elevated fluorescein concentrations (~13 ppb), it was therefore decided to collect an interim sample from this interval and forgo the planned collection of a duplicate.

3.5 Laboratory Analyses

Samples collected during the monitoring events were shipped/delivered to select analytical laboratories under chain of custody procedures. All samples were transported in rigid-sided coolers with bubble wrap to prevent damage during transport. Except for the noble gas samples, all samples were transported on ice to maintain a temperature below 10 degrees C during transport. Noble gas samples were transported in coolers protected with bubble wrap.

Laboratory analysis of groundwater samples was completed by Bureau Veritas, Isotope Tracer Technologies (IT2), the University of Ottawa, and Oxford University. Archive samples were also collected and delivered to NWMO. A complete list of analytes analyzed by laboratories as part of the monitoring program is provided in Table 6.

Bureau Veritas completed laboratory analyses of the non-isotopic parameters listed, which included listed major elements and metals, trace elements, anions, and nutrients.

Isotope Tracer Technologies Inc. (IT2), of Waterloo, Ontario completed all the listed stable and radioactive isotope analyses, excluding ^{36}Cl and ^{129}I analyses which were sent to be completed at the University of Ottawa (UofO). While the UofO was the primary analytical lab, the ^{36}Cl analysis was subcontracted out to be completed by *Eidgenössische Technische Hochschule* (ETH) Zurich.

The noble gas samples were shipped to the University of Oxford for analysis. Samples were collected and shipped by Geofirma, but the contract for testing is managed by the NWMO and therefore the results are not presented or discussed in this report.

Table 6 Completed Laboratory Analyses, by Analytical Lab

Analytes	Analytical Lab or Storage
Major and Trace Elements and Metals (Na, K, Ca, Mg, Sr, Li, Si, Al, B, Cu, Ni, Zn, Pb, Cd, As, Se, Bi, U, Cs, Rb, Ba, Cr, Co, Th, Zr)	Bureau Veritas
Total Dissolved Sulphur, Total Dissolved Iron	
Ruthenium (Ru)	
Reactive Silica (SiO_2)	
Sulphide (S^{2-}) (by zinc acetate ppt)	
Anions (Br, Cl, SO_4, PO_4, I, NO_2, NO_3)	
pH	
Total Alkalinity as $CaCO_3$	
Fluoride (F)	
Total Inorganic Carbon (TIC)	
Carbonate, Bicarbonate (CO_3, HCO_3)	
Total Ammonia (NH_4+NH_3)	
Total Nitrogen	
Total Organic Carbon (TOC)	
Total Phosphorus	
Dissolved Organic Carbon (DOC)	
$\delta^{18}O$, $\delta^{2}H$, ^{3}H (enriched, saline sample)	Isotope Tracer Tech. (IT2)
$^{87}Sr/^{86}Sr$	
$\delta^{37}Cl$	
$\delta^{13}C$-DIC	
^{14}C-DIC	
^{129}I, ^{36}Cl	University of Ottawa (*with subcontract to ETH Zurich)*
Noble Gases (^{3}He, ^{4}He, ^{20}Ne, ^{21}Ne, ^{22}Ne, ^{36}Ar, ^{40}Ar, Kr $_{Total}$, Xe $_{Total}$)	Oxford University
Archive	NWMO Ignace Office

4 RESULTS

Analyses of field data and results from the 2023 quarterly monitoring events are presented in the following sections. Groundwater pressures and calculation of hydraulic heads are presented in Section 4.1 and 4.2. Chemistry results from groundwater sampling are presented in Section 4.3.

4.1 Pressure Profile Analysis

4.1.1 Conversion of Absolute Pressure Fluid Profile

The Westbay MOSDAX pressure probe measures absolute pressure in the packer-isolated borehole intervals outside the MP38 casing, which is considered the formation pressure (P_f). Pressures measured by this equipment are total/absolute pressures, expressed in metric (SI) units of kilopascal (kPa), which include the combined pressure of the water column and the atmospheric pressure (P_a). The effect of atmospheric pressure (P_a) was addressed by measuring the P_a at ground surface and subtracting the P_a from the formation pressure. For pressure data presented in this report, the averaged P_a measured at the start and end of a given pressure profile was used to correct all measurements collected during the profile. A separate P_a was used for each quarterly pressure profile at each borehole.

4.1.2 Calculation of Equivalent Freshwater and Environmental Hydraulic Heads

Formation fluid pressures measured in variable-density groundwater systems are commonly expressed as freshwater hydraulic heads and environmental hydraulic heads. Equivalent freshwater hydraulic heads assume a constant fluid density with depth across the entire length of the measured profile, whereas environmental hydraulic heads are determined using a reference formation fluid density profile. Equivalent freshwater hydraulic heads were calculated assuming a fluid density of 1000 kg/m^3, corresponding to the density of freshwater at ambient temperatures. The data required to complete these calculations are depth/elevations of MP38 measurement ports, measured formation fluid pressures, and the reference formation fluid density profile. Hydraulic head (H) is the sum of the elevation head (Z) and the pressure head (ψ).

Equivalent freshwater hydraulic heads are calculated from measured formation pressures and MP system measurement port elevations as:

$$H_f = Z + \psi = Z + \frac{P_f - P_a}{\rho_f g} \qquad [1]$$

Where: H_f = equivalent freshwater hydraulic head [m ASL];

Z = elevation of MP pressure measurement port [m ASL];

P_f = formation pressure measured in MP measurement port [Pa or kg/ms^2];

P_a = averaged atmospheric pressure measured at ground surface [Pa or kg/ms^2];

ρ_f = density of freshwater [1000 kg/m^3 at ambient temperatures]; and

g = gravitational acceleration [9.807 m/s^2].

Note: for head calculations, ground surface elevations were assumed to be 430.562 m ASL (IG_BH01), 441.403 m ASL (IG_BH03), 432.29 m ASL (IG_BH05), and 417.74 m ASL (IG_BH06)

Environmental hydraulic heads are determined from calculated freshwater heads and a reference formation fluid density profile as:

$$H_e = H_f - \left(\frac{\rho_f - \rho_a}{\rho_f} \right) (Z - Z_r) \quad [2]$$

Where: H_e = environmental hydraulic head [m ASL]

Z_r = elevation of reference point below which an average fluid density is determined [i.e., top of the groundwater system as represented by ground surface]; and

ρ_a = average density of water between Z and Z_r defined as:

$$\rho_a = \frac{1}{Z_r - Z} \int_Z^{Z_r} \rho(z) dz \quad [3]$$

Fluid density profile functions ($\rho(z)$) can be determined from compilations of measured fluid densities of porewater and groundwater samples from different depths at a given site.

4.1.3 Calculated Hydraulic Head and Vertical Depth Profiles

Calculated equivalent freshwater hydraulic heads from the 2023 monitoring event are plotted in meters above mean sea level (m ASL) with true vertical depths (TVD) below ground surface in Figure 4. Figure 4 also shows the average (arithmetic mean) values corresponding to reliable 2022 pressure profile data for comparison.

Appendix B provides tables showing the measured formation pressures and calculated equivalent freshwater hydraulic heads from pressure profiling in IG_BH01, IG_BH03, IG_BH05, and IG_BH06. Borehole IG_BH06 was only included in the scope for pressure profiling during the Q2 2023 monitoring event. Calculation of environmental heads were not performed in this annual report as fluid density profiles for IG_BH01, IG_BH03, IG_BH05, and IG_BH06 have not yet been finalized.

Head profiles in boreholes IG_BH01 and IG_BH06 were generally consistent throughout the 2023 monitoring events and were comparable to profiles measured by Geofirma in previous years (2021 and 2022). These profiles show relatively uniform pressures above 700 m BGS with slightly increasing pressures below this depth. The relatively low-pressure, anomalous measurements and associated freshwater heads observed at select intervals of the profiles in IG_BH01 and IG_BH06 were expected due to ongoing purging, sampling, or post-sampling recovery of selected intervals. The head profiles for IG_BH03 were more inconsistent than expected throughout 2023 compared to previous years, suggesting lower confidence in the data. The freshwater heads in IG_BH05 generally illustrated a similar profile for each quarter increasing with depth, but with slight shifts in magnitude between quarters, with pressure heads from Q3 2023 plotting above the 2022 average and pressure heads from Q4 2023 plotting below.

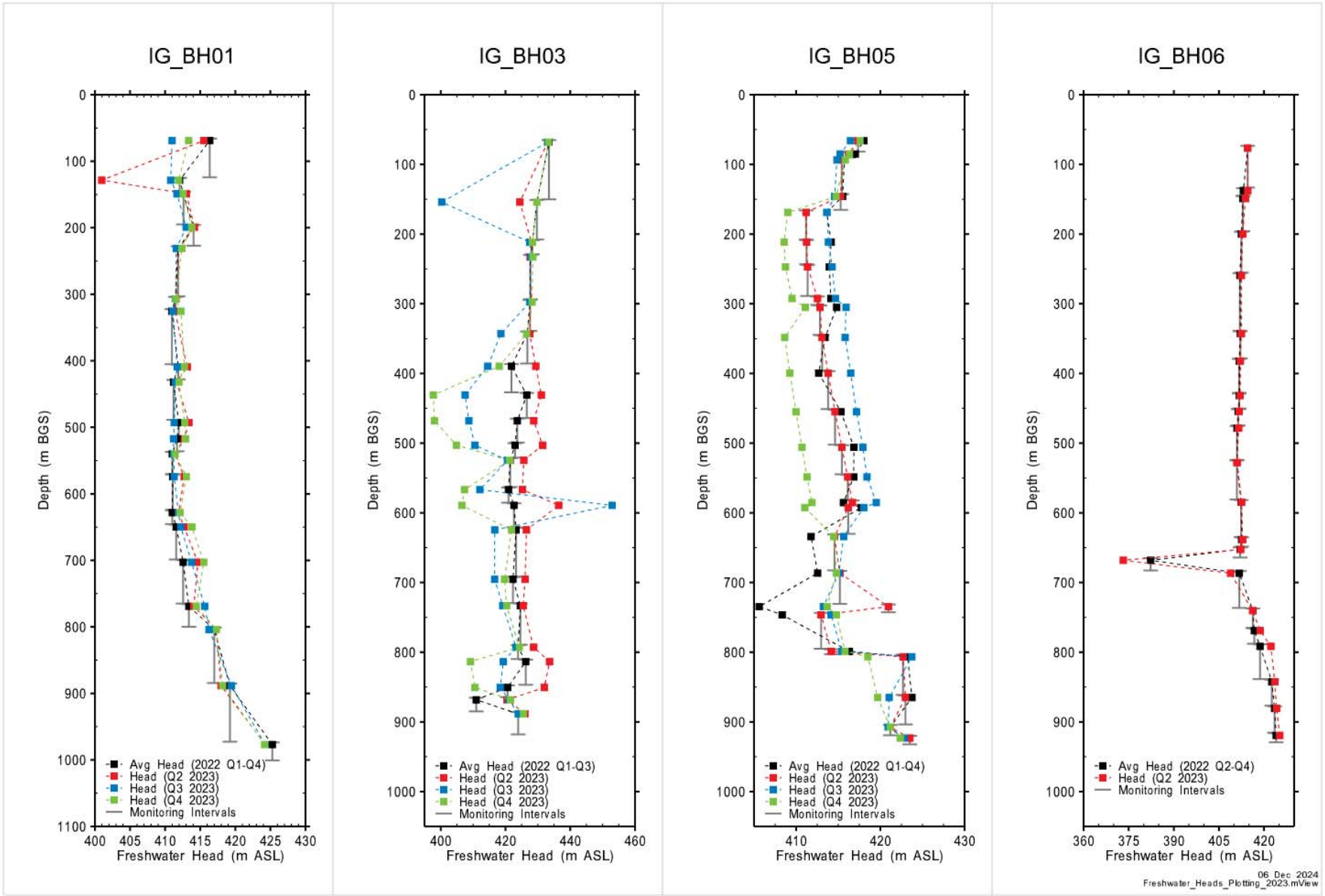

Figure 4 Vertical Depth Profiles of Equivalent Freshwater Hydraulic Heads

4.2 Freshwater Heads in Deep Bedrock Boreholes

The following sections summarize the profiles for each borehole and discuss any notable observations. For each notable observation described, the data are categorized as outlined below:

- Category 1: Data are deemed representative.
- Category 2: Data are deemed not representative for a known reason.
- Category 3: Data are deemed not representative for an unknown reason.

Based on Geofirma's review, unless otherwise noted in the following sections, the pressure measurements are considered acceptable and therefore representative of in-situ conditions (i.e., category 1).

4.2.1 IG_BH01

Freshwater hydraulic head profiles for IG_BH01 were consistent for all 2023 monitoring events (Figure 4). The relatively low head and pressures observed in IG_BH01 from intervals 18 (148.98 m BGS) to 20 (69.09 m BGS) in Q2 2023 is likely caused by drawdown from the purging of intervals 17, 19 and 20 in preparation for sampling and is considered category 2.

4.2.2 IG_BH03

Freshwater hydraulic head profiles for IG_BH03 were more scattered throughout 2023 (Figure 4). Previously (in Q4 2022), Geofirma experienced several challenges when completing a pressure profile at this borehole due to issues with Westbay equipment / multilevel system. NWMO began troubleshooting the Westbay MP38 multilevel system in early 2023 in an attempt to remediate some of the issues encountered. The unresolved equipment and multilevel system issues in this borehole likely influenced the variability observed in the profiles. The results from all quarters in 2023 were compared to reliable data from the previous year (Q1 -Q3 2022), and some notable outliers include:

- The high (Q2 2023) to low (Q4 2023) pressure heads observed in intervals 3 (850.53 m BGS) and 4 (813.57 m BGS). This may have resulted from the slow stabilization of these intervals following the closing of interval 2's pumping port and/or the unresolved equipment issues. The data collected for intervals 3 and 4 in all quarters in 2023 are considered category 3.
- Interval 9 (589.28 m BGS) had significantly higher pressure heads in Q2 and Q3 2023 and a lower pressure head in Q4 2023. As there is no record of any pumping port being opened or purging of this interval, these values are considered anomalous and are considered category 3 for all quarterly monitoring rounds during 2023.
- Similarly, intervals 6 (733.26 m BGS), 7 (695.28 m BGS) and 8 (624.5 m BGS) showed consistently decreasing pressure heads between quarters throughout 2023 with no record of any pumping port being opened or purging of these intervals, therefore they are also considered to be category 3.
- Interval 10 (566.78 m BGS) also shows variable pressure heads throughout 2023 but instead of consistent decrease in pressure follows a similar pattern to intervals 3 and 4 discussed above. As these variations are not understood, they are considered anomalous and therefore category 3.
- Low pressure heads were also observed from intervals 12 (502.91 m BGS) to 15 (389.63 m BGS) of IG_BH03 during the Q3 and Q4 monitoring events. As there is no record of any opening/closing of

pumping ports or purging for these intervals, these measurements have been flagged as anomalous and considered category 3.

- The low head and pressures observed in interval 20 (154.03 m BGS) in Q3 2023 may have been influenced by the purging of interval 21 in preparation for sampling during that quarter and is considered category 2.

During each quarter, Geofirma's field staff noted that the appropriate pressure responses were observed and re-measured the anomalous measurements to confirm the values.

4.2.3 IG_BH05

Freshwater hydraulic head profiles for IG_BH05 generally followed a similar profile for each quarter, but with a slight magnitude shift between quarters, most notably between intervals 10 (592.48 m BGS) and 21 (168.82 m BGS) (Figure 4). NWMO began troubleshooting this borehole in 2023 as there was suspected issues with Westbay port operation; these unresolved issues likely contributed to the variability observed between quarters. The data collected for intervals 10 to 21 are considered category 3.

The relatively low head and pressures observed in IG_BH05 in intervals 4 (806.50 m BGS) to 7 (734.54 m BGS) was likely due to the previous purging, sampling, and slow recovery of interval 7, as well as the ongoing purging of interval 5 in anticipation of sampling in 2023. These data are considered category 2. Due to issues encountered with the multilevel system, this interval was not sampled.

4.2.4 IG_BH06

Geofirma completed only one freshwater hydraulic head profile in IG_BH06 during Q2 2023 (Figure 4). A string of dedicated Westbay MOSDAX pressure transducers were installed in the MP38 casing in September 2023, removing the need for further quarterly monitoring and sampling of this borehole. Ongoing monitoring and downloading of MOSDAX data was not part of Geofirma's scope and therefore is not included in this report. The freshwater head profile from Q2 2023 was consistent with previous profiles collected by Geofirma in 2022. The relatively low head and pressures observed in IG_BH06 interval 8 (668.15 m BGS) is likely due to the ongoing purging of this interval in preparation for sampling.

4.3 Groundwater Chemistry

As discussed in Section 3, Geofirma only measured field parameters and collected groundwater samples from targeted intervals in IG_BH01 and IG_BH03 during 2023. Geofirma staff completed a review of all laboratory-reported water chemistry results (excluding noble gas results) for samples collected in 2023 (Appendix A). Unless otherwise noted in the following sections, the water chemistry results are considered acceptable based on Geofirma's review.

Geofirma completed collection of groundwater samples targeted for lab testing of noble gases and shipped them to the University of Oxford for analysis. The results of these analyses are to be delivered directly to the NWMO and are therefore not included in this report.

Results that are presented in this report include field measurements and laboratory reported values that have not been corrected for drill water contamination/impacts. Correction for drill water contamination is outside of the project's scope of work. Samples collected during the 2023 monitoring events have levels

of drill water contamination ranging from approximately 1% to 32%, based on field-measured fluorescein concentrations. These should be considered when evaluating the data presented in this report. Estimated drill fluid concentrations for each sample is reported in the sample summary table (Appendix A).

Appendix C provides complete tables with all water chemistry results from the 2023 groundwater sampling events and all laboratory reports are found in Appendix E.

4.3.1 Field Measurements

Field parameter measurements were collected by Geofirma field staff as part of groundwater sampling activities during each quarter. A complete table of field parameters and measurements are provided in Appendix C. The field measurements discussed below are for full suite samples (i.e., excludes noble gas-only samples).

The pH field measurements from all samples collected in IG_BH01 ranged from 7.25 to 8.18, with no notable trends with depth. The pH value from the one sample collected from IG_BH03 was recorded to be 9.37.

The electrical conductivity (EC) measurements for the IG_BH01 samples ranged from 0.062 to 37.6 mS/cm and increased with depth. Samples with EC measurements <1.0 mS/cm were collected from shallow intervals (< 200 m BGS). Sample IG_BH03_GW022 had an EC measurement of 0.143 mS/cm, this measurement is consistent with expected values for shallow freshwater groundwater, however the measurement confidence is low due to a failed calibration of the EC probe prior to the collection of this measurement.

The total dissolved solids (TDS) measurements recorded by the multiparameter probe are a conversion of the measured EC value, and therefore follow the same trend. The TDS values ranged from 0.04 to 22.9 g/L for samples collected from IG_BH01 and increased with depth and measured 0.093 g/L for the one sample collected IG_BH03. Samples IG_BH01_GW046 (199.17 m BGS), IG_BH01_GW056 (69.09 m BGS), IG_BH01_GW075 (128.48 m BGS) and IG_BH03_GW022 (68.16 m BGS) with TDS values between 0-1 g/L are categorized as freshwater, sample IG_BH01_GW074 (540.07 m BGS) with a TDS value of 4.05 g/L is categorized as brackish, and sample IG_BH01_GW044 (888.49 m BGS) with a TDS value of 22.9 g/L is categorized as saline groundwater (Freeze & Cherry, 1979).

Colorimetric dissolved oxygen (DO) measurements from all samples were below 1 mg/L and are consistent with the zero or near zero readings from the multiparameter probe. In general, readings from the multiparameter probe are more accurate than the colorimeter readings, as the sample water for the multiparameter probe is analyzed in a flow-through cell with less potential for atmospheric exposure.

Dissolved ferrous iron (Fe^{2+}) measurements from all samples in both IG_BH01 and IG_BH03 were measured to be between 0.02 and 2.1 mg/L. The highest concentrations of 2.1 mg/L and 1.1 mg/L were measured in samples IG_BH01_GW056 (69.09 m BGS) and IG_BH01_GW074 (540.07 m BGS), respectively.

Concentrations of dissolved sulphide (S^{2-}) measured in all samples were recorded to be <0.15 mg/L, with the lowest concentrations being observed in samples from the three shallowest intervals:

IG_BH01_GW056 (69.09 m BGS), IG_BH01_GW075 (128.48 m BGS), and IG_BH03_GW022 (68.16 m BGS). The two highest concentrations of 0.13 mg/L and 0.10 mg/L were measured in samples IG_BH01_GW044 (888.49 m BGS) and IG_BH01_GW046 (199.17 m BGS), respectively.

Select field parameters were measured for intervals where only noble gas analysis was targeted; these results are presented in Table C.2. in Appendix C. These measurements were collected from sample water collected in the one (250-mL) Westbay sample container placed on top on the noble gas sample train. The sample water was then pushed through the multimeter flow through cell, using gravity and pressurized nitrogen. For most samples, excluding IG_BH01_GW067 and IG_BH01_GW069, there was insufficient sample water collected (<400 mL) in a single run to fill the flow through cell and therefore the sample water was exposed to the atmosphere, making the DO and ORP measurements unreliable. For samples IG_BH01_GW067 and IG_BH01_GW069, additional sample water was collected in a second run and the two Westbay containers bottles were attached together following the second run (with all valves closed during connection/disconnection, minimizing air exposure), then the multimeter parameters were collected. This method resulted in more reliable DO and ORP readings, however pressurized N_2 was required to fill the flow through cell, which may affect these results.

4.3.2 General Chemistry

Groundwater general chemistry results are summarized in Appendix C, with the associated laboratory report from Bureau Veritas (BV) provided in Appendix E. Discussion of QA sample results, including rinsate and duplicate samples is provided in Section 5.3.1.

The major ion concentrations were converted to milliequivalents, then converted to relative concentrations and plotted on ternary plots to produce Piper diagrams. The Piper diagrams for the samples from boreholes IG_BH01 and IG_BH03 are shown in Figure 5. For samples with results below the detection limits, a value of 0.5 x the detection limit value was used.

Samples from the three shallow intervals of IG_BH01 (<200 m BGS) are classified as Ca-HCO_3 type waters with low Mg^{2+} and SO_4^{2-} concentrations. Sample IG_BH01_GW075 (128.48 m BGS) shows slightly higher concentrations of Cl^- and can could be considered Na-Cl type. The two samples from the deeper intervals of IG_BH01 are classified as Ca-Cl type with relatively low concentrations of Mg^{2+} and HCO_3. Sample IG_BH03_GW022 (68.16 m BGS) is classified as Na- HCO_3 type with low concentrations of Mg^{2+} and SO_4^{2-}.

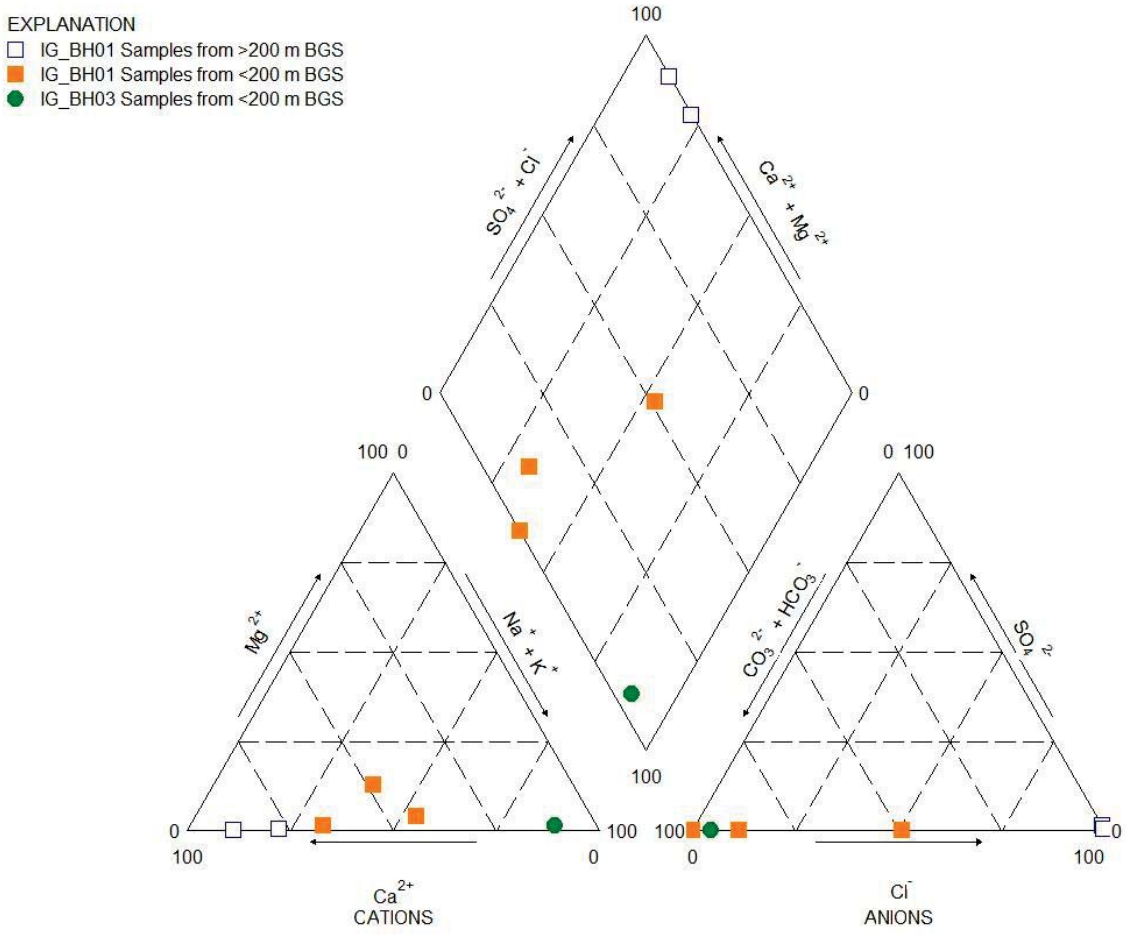

Figure 5 Piper Plot for Groundwater Samples collected in 2023.

4.3.3 Isotopes

Isotope results are summarized in Appendix C and shown in Figure 6, with the associated laboratory reports from the University of Ottawa and IT2 provided in Appendix E. Discussion of QA sample results, including field blank samples and duplicates is provided in section 5.3.2.

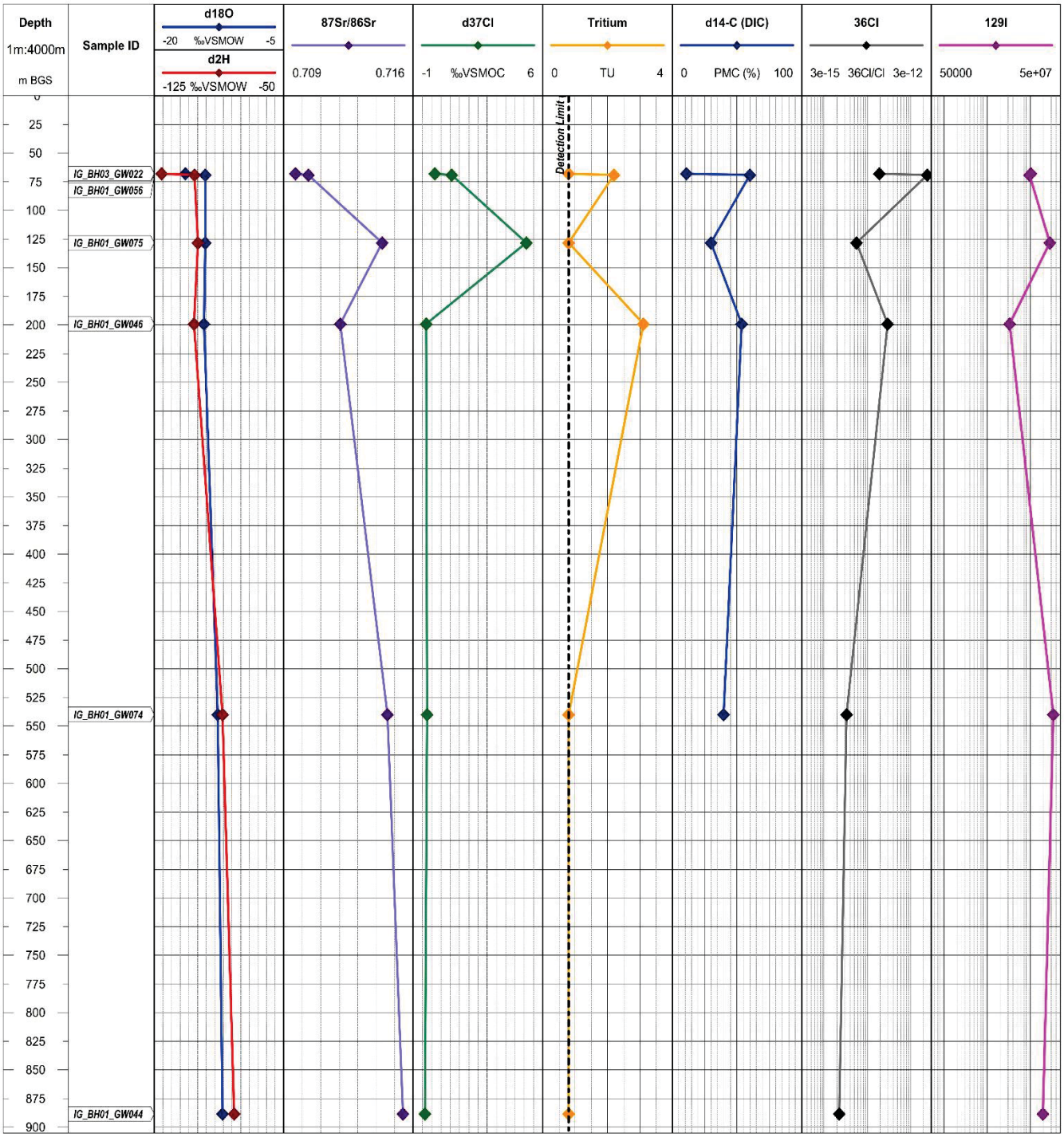

Figure 6 Isotopic (δ^2H, $\delta^{18}O$, $^{87}Sr/^{86}Sr$, $\delta^{37}Cl$, Tritium (^3H),^{14}C,^{36}Cl, and ^{129}I) Concentration Depth Profile for 2023 Groundwater Samples.

Stable isotope data ($\delta^{18}O$ and $\delta^{2}H$) are summarized in Appendix C and presented in Figure 6 and Figure 7. Results show that most samples collected have deuterium excess compared to the global meteoric water level (GMWL), with the equation of $\delta^{2}H = 8\ \delta^{18}O + 10‰$ (Clark, 2015), excluding samples IG_BH01_GW056 (69.09 m BGS) and IG_BH03_GW022 (68.16 m BGS) which fall along the GWML line, these two samples were collected from the shallowest intervals in IG_BH01 and IG_BH03.

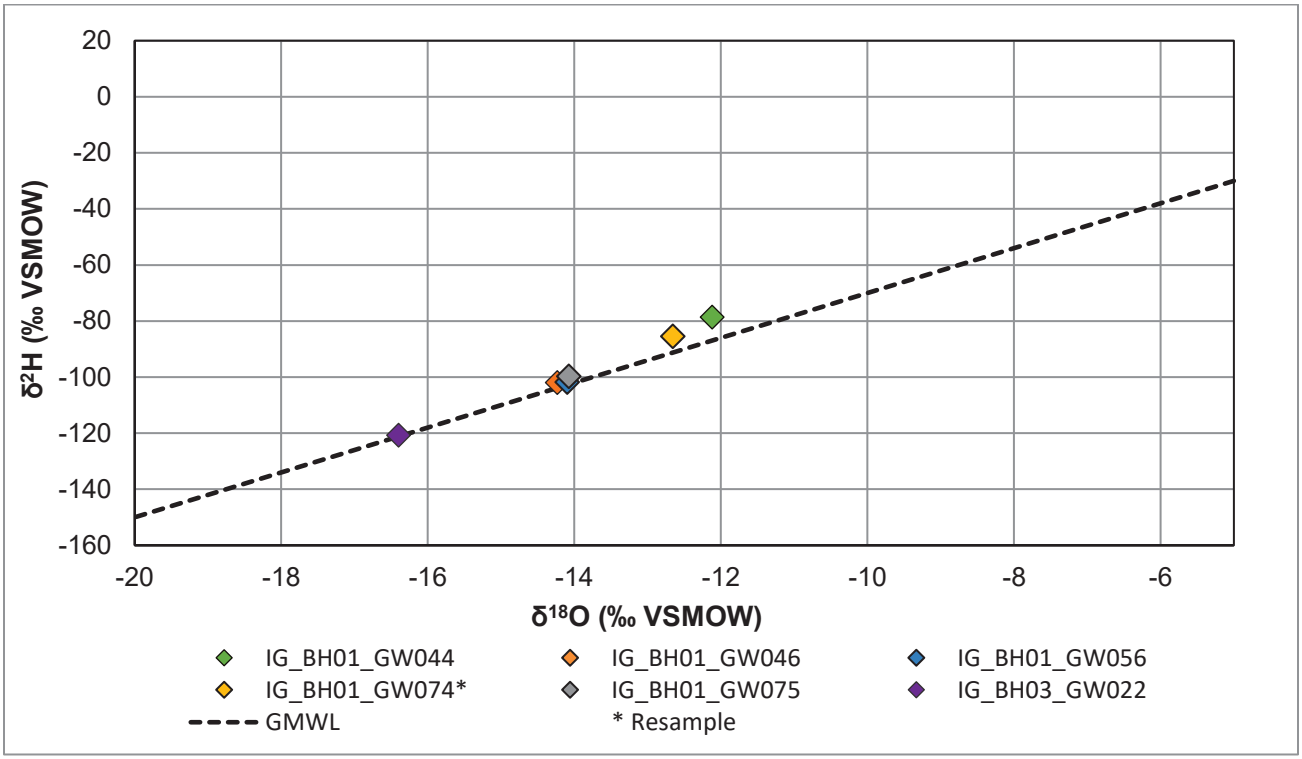

Figure 7 2023 $\delta^{18}O$ and $\delta^{2}H$ sample results plotted along GMWL. GMWL is the global meteoric water level line, $\delta^{2}H = 8\ \delta^{18}O + 10‰$ (Clark, 2015).

Tritium results for IG_BH01 and IG_BH03 samples from each monitoring event are shown in Figure 6, with reported values below the detection limit (<0.8 TU) plotted at 0.8 TU. There are no significant trends observed, samples IG_BH01_GW044 (888.49 m BGS), IG_BH01_GW074 (540.07 m BGS), IG_BH01_GW075 (128.48 m BGS), and IG_BH03_GW022 (68.16 m BGS) all reported tritium concentrations below the detection limit of <0.8 TU. Samples IG_BH01_GW046 (199.17 m BGS) and IG_BH01_GW056 (69.09) measured relatively higher tritium concentrations of 3.1 TU and 2.2 TU, respectively.

Radiocarbon results are presented in Figure 6, the results are shown as percent modern carbon (pmC). ^{14}C results from IG_BH01 ranged from 29.94 pmC to 59.85 pmC, with no significant trends with depth observed. Sample IG_BH01_GW044 (888.49 m BGS) did not produce enough gas to run the ^{14}C analysis. The ^{14}C result from sample IG_BH03_GW022 (68.16 m BGS) was 10.89 pmC. ^{14}C results will need to be corrected for drill water impacts and interpreted. This interpretation is outside the scope of this report and will be completed by the NWMO.

The strontium isotopic ratios ($^{87}Sr/^{86}Sr$) in the groundwater samples collected during 2023 are presented in Figure 6. The isotopic ratios for strontium in all samples fall within the range of 0.710 to 0.716. In

general, the samples show the isotopic signature becoming more radiogenic with depth, excluding sample IG_BH01_GW075 (128.48 m BGS), with a strontium ratio of 0.71432.

Results for $\delta^{37}Cl$ (Figure 6) for most of the groundwater samples collected during 2023 monitoring events were between -0.3‰ to +1.1 ‰ SMOC (Standard Mean Ocean Chloride). These results are consistent with results from previous studies of fluids sourced from crystalline rocks in the Canadian Shield (Stotler, Frape, & Shouakar-Stash, 2010). Sample IG_BH01_GW075 (128.48 m BGS) had a $\delta^{37}Cl$ result of +5.11‰ SMOC.

The measured ^{36}Cl (Figure 6) abundance ratios ($^{36}Cl/Cl$) for all groundwater sampled collected in 2023 range from 5.6 x 10^{-14} to 1.90 x 10^{-13} and show no notable trends. Sample IG_BH01_GW056 (69.09 m BGS) had a measured Cl concentration below the detection limit (1 mg/L), therefore the measured $^{36}Cl/Cl$ ratio was normalized to the maximum concentration of 1 mg/L to yield a minimum ^{36}Cl abundance ratio of 2.46 x 10-^{12}.

The ^{129}I isotope (Figure 6) results for all samples collected in 2023 ranged from 3.3 million to 33.7 million atoms per kilogram. The three shallow intervals (<200 m BGS) have the lowest concentrations of 10.1 million atoms/kg or below, no other significant trends are noted.

5 DATA QUALITY

Overall quality management of the activities performed at each quarterly monitoring event, and represented in this report, are consistent with the Test Plan and the Project Quality Plan.

5.1 In-Field Data Quality Assurance

5.1.1 Field Data Quality Confirmation

Each quarterly monitoring event has a designated DQC workbook. The DQC workbook was completed by field staff each day throughout the monitoring event to ensure quality of data collected, following the data deliverable verification procedures outlined in the Test Plan. The DQC excel workbook has been submitted to the NWMO separately, as a part of the data deliverable package, a PDF version has been included in Appendix F.

5.1.2 QA Checks During Pressure Profiling

Pressures recorded during each pressure profile are compared to the those recorded during the previous field event. For a given interval, measured formation pressures within 50 kPa of the previous records are considered representative and acceptable. If the value was observed to be out of this acceptable range, Geofirma staff remeasured the interval to confirm the reading and recorded it in the DQC, along with any noteworthy comments.

5.2 Field Data Chemistry

Following field activities each quarter, Geofirma staff reviewed the in-field data parameters and measurements. Most field parameter measurements and field-testing results from the 2023 sampling events were within the anticipated ranges and are comparable to laboratory provided results, where available (e.g. pH and alkalinity). A few minor discrepancies were observed by Geofirma and are summarized below:

- The pH measurements collected in field from samples IG_BH01_GW044 (7.71) and IG_BH01_GW074 (7.25), were slightly above the measurements reported by the laboratory of 6.79 and 6.74, respectively. Similarly for IG_BH03_GW022, with field pH measurement of 9.37, and laboratory measurement of 8.80. These slight discrepancies are likely due to the samples being measured under different conditions. The pH can change due changes in temperature or degassing of CO_2 (Clark, 2015), and therefore the field readings are considered the most representative of in-situ groundwater conditions.
- For most of the noble gas-only samples, excluding IG_BH01_GW067 and IG_BH01_GW069, there was insufficient sample water collected (<400 mL) in a single run to fill the flow through cell and therefore the sample water was exposed to air, making the DO and ORP measurements unreliable. This does not affect the quality of the noble gas samples, as the noble gas tubes are sealed off from the Westbay container, prior to this testing.

5.3 Laboratory Data Quality

As discussed in Section 3.4.5, three types of QA/QC samples, including rinsate blanks, field blanks, and duplicate samples, were collected as part of the groundwater sampling event for laboratory quality assurance (Appendix D).

Pairs of duplicate samples were compared to assess the consistency of analytical results by relative percent difference (RPD) for each analyte where the primary and duplicate sample had reported values above method detection limits. RPD was calculated by the equation below:

- Equation 1: $RPD = \frac{|x_1 - x_2|}{\bar{x}} \times 100\%$

Where:
x_1 = concentration of original sample
x_2 = concentration of duplicate sample
$\bar{x}$ = average concentration of original and duplicate sample

RPD values for homogeneous water samples are generally considered acceptable for laboratory QA if the RPD is less than 30% (MECP, 2004). However, since the uncertainty associated with a value increases as the result approaches the method detection limit (MDL), the MECP recommends using a duplicate result in RPD calculations only if the average of the two duplicates is greater than five times the MDL (5x MDL) (MECP, 2004). All calculated RPD values can be found in Appendix D.

Geofirma also calculated the charge balance error (CBE) for the general chemistry results from each groundwater sample to assess the accuracy of the geochemical analysis. The charge balance is the comparison of the sum of anions in meq/L with the sum of cations in meq/L in the solution and is expressed as a percentage (Equation 2). A charge balance error of less than ±5% is considered to be acceptable for the purpose of this study (Hounslow, 1995).

- Equation 2: $CBE\ (\%) = \frac{(\Sigma C - \Sigma A)}{(\Sigma C + \Sigma A)} \times 100$

Where:
$\sum C$ = the sum of cations
$\sum A$= the sum of anions

5.3.1 General Chemistry

5.3.1.1 *Q2 (June) 2023 – General Chemistry Results*

Geofirma compared the BV laboratory results for the primary sample (IG_BH01_GW044) and the duplicate sample (IG_BH01_GW045) collected in Q2. The comparison shows consistent results between each analyte and all RPD values were within the acceptable range of below 30% (Appendix D), demonstrating the reliability of these results.

A duplicate sample was also collected for IG_BH01_T_INT_017. Geofirma compared the BV Laboratory results for the primary sample (IG_BH01_GW046) and the duplicate sample (IG_BH01_GW047). The results are generally acceptable, showing consistent values for most analytes, excluding iron (Fe), calcium (Ca), and strontium (Sr) values, which had RPD values above the acceptable rage of 30% (Appendix D). These inconsistencies were noted by Geofirma during a review of the laboratory results. These samples were collected one after another and variation was not expected. Geofirma requested

that Bureau Veritas review and re-analyze if possible. The lab confirmed the original results, the results have been flagged as possible bottle contamination of the bottle that underwent metal analysis, as abnormal results were only observed in the metal analysis of this particular sample.

The calculated charge-balance error for general chemistry analyses results provided by BV were -4.06%, 1.06%, 33.74%, and -0.79% for IG_BH01_GW044, IG_BH01_GW045, IG_BH01_GW046, and IG_BH01_GW047, respectively. All samples, excluding sample IG_BH01_GW046 are within an acceptable range (<±5%).

The high charge balance error for sample IG_BH01_GW046 is due to the high concentrations of flagged metal analysis (Ca, Fe and Sr) and considered unreliable.

Results for the rinsate blank sample IG_BH01_GW042 collected prior to sampling showed all non-detects, except for a low concentration of Calcium (Ca) of 0.56 mg/L. Laboratory reported concentrations of calcium on all primary samples collected during this quarter were at least one to two orders of magnitudes higher, demonstrating that the decontamination procedure and sampling equipment had negligible impact on the associated primary groundwater samples.

5.3.1.2 *Q3 (September) 2023 – General Chemistry Results*

Geofirma's comparison of the BV laboratory results for the primary sample (IG_BH01_GW056) and the duplicate sample (IG_BH01_GW057) collected in Q3 showed consistent results between the samples for all analytes, with all available RPD values within the acceptable range of 30% (Appendix D), demonstrating the reliability of these results.

A duplicate sample was also collected for IG_BH03_T_INT_021. Geofirma compared the BV Laboratory results for the primary sample (IG_BH03_GW022) and the duplicate sample (IG_BH01_GW023), sample results were consistent for all analytes, with all RPD values within the acceptable range of 30% (Appendix D), demonstrating that these results are reliable.

The calculated charge-balance error for general chemistry analyses results provided by BV were 2.26%, 2.26%, 1.46% and 1.79% for IG_BH01_GW056, IG_BH01_GW057, IG_BH03_GW022, and IG_BH01_GW023, respectively, all within the acceptable range (<±5%).

Results for the rinsate blank sample (IG_BH01_GW054) collected prior to sampling reported all concentrations below laboratory detection limits, demonstrating that the decontamination procedure and sampling equipment had negligible impact on the associated primary groundwater samples.

5.3.1.3 *Q4 (December) 2023 – General Chemistry Results*

There were no duplicate samples collected by Geofirma during this sampling round. There were two primary samples run, IG_BH01_GW074 and IG_BH01_GW075, both were considered interim samples, meaning that more purging is required to get a representative sample of the groundwater.

The calculated charge-balance error for general chemistry analyses results provided by BV were 3.32% for IG_BH01_GW074, and 3.19% for IG_BH01_GW075, both within the acceptable range (<±5%).

Results for the rinsate blank sample (IG_BH01_GW072) collected prior to sampling reported all concentrations below laboratory detection limits, demonstrating that the decontamination procedure and sampling equipment had negligible impact on the associated primary groundwater samples.

5.3.2 Isotopes

Geofirma reviewed the results from IT2 and the University of Ottawa Radiohalide laboratory, compared duplicate samples, and evaluated them against the field blanks where applicable. The methodologies, standards and blanks used by the laboratories are included in each report (Appendix E).

Results from the Q2 and Q3 sampling rounds generally showed consistent values between the primary and the duplicate samples. The duplicate sample (IG_BH01_GW057) collected in Q3 2023, had a slightly higher and inconsistent isotopic concentration of $\delta^{37}Cl$ (1.07 σ 0.2). The lab noted the inconsistency and ran the sample multiple times, confirming the same result, this result is noted to be anomalous. Since no duplicate samples were collected during the Q4 2023 sampling round, further assessment of the isotope results was limited.

Field blank samples from Q2 (IG_BH01_GW043) and Q4 (BH01_GW073) had tritium concentrations below laboratory detection limits (0.8 TU) and the field blank sample from Q3 (IG_BH01_GW055) had a very low tritium concentration of 1.0 NTU (± 1σ 0.7). Carbon-14 as percent modern carbon is reported to be at ~40% for all three samples. The reported values for tritium and ^{14}C are consistent and within the expected range of ≤ 5.0 NTU and <100 pmC (atmospheric concentrations) for the tritium free field blank samples (Clark, 2015) . This thereby indicates there was no atmospheric contamination during sampling, transport, and laboratory analysis.

6 DATA DELIVERY

6.1 Data Deliverables

As part of the data delivery schedule prescribed in the project Test Plan, Geofirma provided NWMO with the following items (as applicable) for each quarterly monitoring event:

- Barometric Pressure Data
- Data Quality Confirmation (DQC) Workbook
- Photographs of field activities
- Laboratory data and chain of custody forms
- Completed import templates for data entry into acQuire by NWMO:
    - IMP-15 – BV Groundwater Chemistry Results
    - IMP-15 – IT2 Groundwater Chemistry Results
    - IMP-15 – UofO Groundwater Chemistry Results
    - IMP-22 – Port Pressure Measurements for IG_BH01
    - IMP-22 – Port Pressure Measurements for IG_BH03
    - IMP-22 – Port Pressure Measurements for IG_BH05
    - IMP-22 – Port Pressure Measurements for IG_BH06
    - IMP-DE07 – Groundwater Field Parameter Measurements

The quarterly data deliveries were split into two deliveries to speed up data processing time, as requested by the NWMO. One delivery for pressure profiling (PP) activities and results, and a second delivery for groundwater (GW) sampling activities and results. Table 7 provides a summary of data deliveries submitted to the NWMO by quarterly monitoring event.

Table 7 Data Delivery, by Quarterly Monitoring Event

Monitoring Event	Data Delivery Date	Comments
Q2	26-Mar-2024	R0 – Finalized data delivery (PP)
	22-May-2024	R0 – Finalized data delivery (GW)
Q3a	24-Aug-2023	R0 – Finalized data delivery (GW): noble gas only sampling activities
Q3	26-Mar-2024	R0 – Finalized data delivery (PP)
	08-Aug-2024	R0 – Finalized data delivery (GW)
Q4	26-Mar-2024	R0 – Finalized data delivery (PP)
	08-Aug-2024	R0 – Finalized data delivery (GW)

7 CONCLUSIONS

Geofirma completed four monitoring events of Westbay multilevel systems installed in NWMO boreholes (IG_BH01, IG_BH03, IG_BH05, and IG_BH06) located in Ignace, Ontario during 2023. A summary of the work completed during 2023:

- No field monitoring was completed by Geofirma during Q1 2023 while improvements to the sampling methodology were being completed.
- The Q2 monitoring event was completed by Geofirma between June 13 - 27, 2023, including pressure/temperature profiling at IG_BH01, IG_BH03, IG_BH05 and IG_BH06, and collection of full suite water samples from IG_BH01_T_INT_017 and IG_BH01_T_INT_002.
- An additional monitoring event (Q3a) was completed by Geofirma between August 5 - 7, 2023, including noble gas re-sampling from IG_BH01_T_INT_004, and IG_BH03_INT_002. This monitoring event was incorporated in between Q2 and Q3 monitoring events to focus on methods development for noble gas sampling.
- The Q3 monitoring event was completed by Geofirma between September 27 – October 17, 2023, including pressure profiling at IG_BH01, and IG_BH03, and IG_BH05, collection of final (full suite) groundwater samples from IG_BH01_T_INT_020 and IG_BH03_T_INT_021, and re-sampling for noble gas only at IG_BH01_T_INT_017, IG_BH01_T_INT_009, IG_BH01_T_INT_007, and IG_BH01_T_INT_002.
- The Q4 monitoring event was completed by Geofirma between November 29 - December 10, 2023, including pressure profiling at IG_BH01, and IG_BH03, and IG_BH05, collection of interim full suite water samples from IG_BH01_T_INT_009 (resampled) and IG_BH01_T_INT_019, and noble gas only sampling of IG_BH01_T_INT_002, IG_BH01_T_INT_004, and IG_BH03_T_INT_002.

Measured formation pressures and calculated equivalent freshwater heads from IG_BH01 and IG_BH06 were generally consistent throughout the year and comparable with previous years. Boreholes IG_BH03 and IG_BH05 had greater variability and inconsistencies in their profiles compared to previous years, notable outliers include:

- IG_BH03 interval 3 (850.53 m BGS) and interval 4 (813.57 m BGS) show high (Q2) and low (Q4) pressure heads.
- IG_BH03 interval 9 (589.28 m BGS) had significantly higher pressure heads in Q2 and Q3 2023 and a lower pressure head in Q4 2023.
- IG_BH03 intervals 6 (733.26 m BGS), 7 (695.28 m BGS) and 8 (624.5 m BGS) showed consistently decreasing pressure heads between quarters throughout 2023.
- IG_BH03 interval 10 (566.78 m BGS) also showed variable pressure heads throughout 2023.
- IG_BH03 between intervals 12 (502.91 m BGS) and 15 (389.63 m BGS) show low pressure heads observed during the Q3 and Q4 monitoring events. There is no record of any opening/closing of pumping ports or purging for these intervals, these measurements have been flagged as anomalous.
- IG_BH05 between intervals 10 (592.48 m BGS) and 21 (168.82 m BGS) show fluctuations in head

profiles that generally follow similar profiles with a magnitude shift.

These inconsistencies are considered nonrepresentative of the formation pressures and are believed to be due to unresolved issues with the multilevel system equipment.

All other formation pressures that were outside of their typical range were associated with drawdown from ongoing interval purging in preparation for groundwater sampling. Calculation of environmental heads was not completed as fluid density profiles have not been provided to Geofirma by NWMO.

Full suite groundwater water samples collected in each quarter underwent field measurements and were analyzed for a suite of conventional laboratory analyses at Bureau Veritas Laboratories. Isotope analyses were completed at the University of Ottawa and Isotope Tracer Technologies (IT2).

Geofirma completed collection of additional groundwater samples for noble gas analysis only as part of a methods development scope to better understand and improve the quality of noble gas analysis. The collection procedure was adjusted throughout the year in consultation with the NWMO and the University of Oxford in an attempt to collect the highest quality of samples possible, as discussed in section 3.4.4. Noble gas samples were collected by Geofirma and shipped to the University of Oxford for analysis, the results were sent directly to the NWMO and are not included in this report.

Groundwater chemistry results were reviewed by Geofirma to ensure that concentrations were reported within an acceptable range and that any quality issues were flagged. In general, the water analyses were within expected ranges. Some data concerns were identified as discussed in Sections 5.2 and 5.3. These concerns were discussed with the responsible laboratory to investigate causes, request re-analysis where warranted, and plan potential solutions to mitigate similar issues moving forward. A brief summary of these flagged items include:

- Slight discrepancies between pH measurements collected in field and in the laboratory. Field readings are considered the most representative of in-situ groundwater conditions as pH can change due to temperature differences and degassing of CO_2.
- In-field measurements collected for the noble gas only samples, excluding samples IG_BH01_GW067 and IG_BH01_GW069, had insufficient amount of sample water to flow through the multiparameter probe flow-through cell, allowing for atmospheric exposure. This affected the DO and ORP readings of these samples, making them unreliable. In-field DO and ORP concerns are not pertinent to the final laboratory results.
- Metals analysis of sample IG_BH01_GW046 were flagged as anomalous, re-analysis of the sample confirmed the same results, leading to the conclusion that the laboratory bottles the sample was collected in was likely contaminated. No other analyses for this sample were affected. Therefore, metals (Ca, Fe and Sr) results from IG_BH01_GW046 are flagged as unreliable.

Most samples collected in 2023 were from IG_BH01, the groundwater chemistry results from these samples showed that groundwaters collected from above 200 m BGS are generally classified as Ca-HCO_3 type waters with low Mg^{2+} and SO_4^{2-} concentrations, except for sample IG_BH01_GW075 (128.48 m BGS) which had slightly higher concentrations of Cl^- and can could be considered Na-Cl type. The two samples from the deeper intervals of IG_BH01 are classified as Ca-Cl type with relatively low

concentrations of Mg^{2+} and HCO_3. No significant trends were observed in the isotope chemistry results of these samples.

The chemistry data collected to date are limited and further sampling is required to get a better understanding of site conditions.

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Appendix A

2023 Sample Collection Summary

	Sample ID	Sample Type	Interval ID	Interval Depth (m BGS)	Interval Purge Status	Estimated Proportion of Drill Fluid[1] (%)	Sample Method	Comments
Q1	No quarterly monitoring							
Q2	IG_BH01_GW037	N_2 Blank - NG	--	--	--	--	--	Noble gas blank sample. Sample tubing (1xSS tube and 1xCu tube) flushed with nitrogen then clamped.
	IG_BH01_GW038							
	IG_BH01_GW039	Trip Blank - NG	IG_BH01_T_INT_002	--	--	--	--	Noble gas blank sample. Sample tubing (1xSS tube and 1xCu tube) is flushed and vacated, then lowered to the port interval then retrieved and clamped (no water collected).
	IG_BH01_GW040							
	IG_BH01_GW041	Half Trip Blank - NG	--	--	--	--	--	Noble gas blank sample. Sample tubing (1xCu tube) is flushed and vacated, then clamped (no water collected)
	IG_BH01_GW042	Rinsate	--	--	--	--	--	
	IG_BH01_GW043	Field blank	--	--	--	--	--	
	IG_BH01_GW044	Primary	IG_BH01_T_INT_002	885.19 - 972.71	Final Sample	3%	Sampling port (from formation)	
	IG_BH01_GW045	Duplicate						
	IG_BH01_GW046	Primary	IG_BH01_T_INT_017	195.87 - 226-97	Final Sample	1%	Sampling port (from formation)	
	IG_BH01_GW047	Duplicate						
Q3a	IG_BH01_GW048	Trip Blank - NG	--	--	--	--	--	Noble gas blank sample. Sample tubing (1xSS tube and 1xCu tube) is flushed and vacated, then lowered to the port interval then retrieved and clamped (no water collected).
	IG_BH01_GW049							
	IG_BH01_GW050	Half Trip Blank - NG	--	--	--	--	--	Noble gas blank sample. Sample tubing (1xCu tube) is flushed and vacated, then clamped (no water collected)
	IG_BH01_GW051							
	IG_BH01_GW052	Primary - NG	IG_BH01_T_INT_004*	765.77 - 799.95	Final Sample	4%	Sampling port (from formation)	Re-sample for noble gas only.
	IG_BH01_GW053	Duplicate - NG						
	IG_BH03_GW020	Primary - NG	IG_BH03_T_INT_002*	865.35 - 884.86	Final Sample	3%	Sampling port (from formation)	Re-sample for noble gas only.
	IG_BH03_GW021	Duplicate - NG						
Q3	IG_BH01_GW054	Rinsate	--	--	--	--	--	
	IG_BH01_GW055	Field blank	--	--	--	--	--	
	IG_BH01_GW056	Primary	IG_BH01_T_INT_020	65.89 - 124.28	Final Sample	1%	Sampling port (from formation)	
	IG_BH01_GW057	Duplicate						
	IG_BH01_GW058	Primary - NG	IG_BH01_T_INT_017*	195.87 - 226.97	Final Sample*	1%	Sampling port (from formation)	Re-sample for noble gas only.
	IG_BH01_GW059	Duplicate - NG						
	IG_BH01_GW060	Primary - NG	IG_BH01_T_INT_002*	885.19 - 972.71	Final Sample*	4%	Sampling port (from formation)	Re-sample for noble gas only. Samples were collected but **not submitted to the lab for analysis.**
	IG_BH01_GW061	Duplicate - NG						
	IG_BH01_GW062	Primary - NG	IG_BH01_T_INT_007*	624.94 - 645.42	Final Sample*	4%	Sampling port (from formation)	Re-sample for noble gas only.
	IG_BH01_GW063	Duplicate - NG						
	IG_BH01_GW064	Trip Blank - NG	IG_BH01_T_INT_007	--	--	--	--	Noble gas blank sample. Sample tubing (1xSS tube and 1xCu tube) is flushed and vacated, then lowered to the port interval then retrieved and clamped (no water collected).
	IG_BH01_GW065	Primary - NG	IG_BH01_T_INT_009*	536.87 - 570.16	Final Sample*	14%	Sampling port (from formation)	Re-sample for noble gas only. Note that this interval was expected to have <5% proportion of drill fluid remaining, however ~14% was measured during sampling.
	IG_BH01_GW066	Duplicate - NG						
	IG_BH03_GW022	Primary	IG_BH03_T_INT_021	65.09 - 150.15	Final Sample	2%	Sampling port (from formation)	
	IG_BH03_GW023	Duplicate						
Q4	IG_BH01_GW067	Primary - NG	IG_BH01_T_INT_002*	885.19 - 972.71	Final Sample*	4%	Sampling port (from formation)	Re-sample for noble gas only.
	IG_BH01_GW068	Duplicate - NG						
	IG_BH01_GW069	Primary - NG	IG_BH01_T_INT_004*	765.77 - 799.95	Final Sample	3%	Sampling port (from formation)	Re-sample for noble gas only.
	IG_BH01_GW070	Duplicate - NG						
	IG_BH01_GW071	Trip Blank - NG	IG_BH01_T_INT_004	--	--	--	--	Noble gas blank sample. Sample tubing (1xSS tube and 1xCu tube) is flushed and vacated, then lowered to the port interval then retrieved and clamped (no water collected).
	IG_BH01_GW072	Rinsate	--	--	--	--	--	
	IG_BH01_GW073	Field blank	--	--	--	--	--	
	IG_BH01_GW074	Primary	IG_BH01_T_INT_009*	536.87 - 570.16	Ongoing purging	13%	Sampling port (from formation)	Re-sample for all analyses as an interim sample.
	IG_BH01_GW075	Primary	IG_BH01_T_INT_019	125.18 - 144.78	Ongoing purging	32%	Sampling port (from formation)	
	IG_BH03_GW024	Primary - NG	IG_BH03_T_INT_002*	865.35 - 884.86	Final Sample*	3%	Sampling port (from formation)	Re-sample for noble gas only.
	IG_BH03_GW025	Duplicate - NG						

**Interval was previously purged and sampled, Geofirma completed re-sampling.*

[1]Estimated proportion of drill fluid (%) is based on in-field fluorescein measurements of collected groundwater sample, and assuming the pre-purging drill fluid concentration was at 100% (i.e, 100 ppb fluorescein)

-- = no value measured or information not relevant to sample

- NG = sample collected for noble gas analyses only

Appendix B

Fluid Pressures, Calculated Pressure Heads, and Calculated Freshwater Heads

Table B.1: Fluid Pressure, Calculated Pressure Head(Ψ)and Calculated Freshwater Head (H*f*) for IG_BH01

			Q2 2023				Q3 2023				Q4 2023			
Port No.	Port Depth (m BGS)	Q1 2023	Fluid Pressure (kPa)	Ψ (m)	Water Level (m BGS)	H*f* (m)	Fluid Pressure (kPa)	Ψ (m)	Water Level (m BGS)	H*f* (m)	Fluid Pressure (kPa)	Ψ (m)	Water Level (m BGS)	H*f* (m)
1	976.91	No quarterly monitoring	9612.16	970.61	6.30	424.26	9613.73	970.60	6.31	424.25	9611.72	970.53	6.38	424.19
2	888.49		8683.33	875.89	12.59	417.97	8699.47	877.37	11.11	419.45	8685.89	876.13	12.36	418.20
3	804.14		7849.35	790.86	13.29	417.27	7841.1	789.85	14.30	416.26	7849.95	790.89	13.26	417.31
4	769.06		7474.13	752.59	16.47	414.09	7490.98	754.14	14.92	415.64	7477.74	752.93	16.13	414.43
5	702.90		6830.91	687.01	15.89	414.67	6823.76	686.11	16.79	413.78	6839.42	687.85	15.05	415.51
6	649.62		6289.13	631.76	17.86	412.70	6286.12	631.29	18.33	412.23	6300.23	632.87	16.76	413.81
7	628.23		6071.62	609.58	18.65	411.91	6073.12	609.57	18.66	411.90	6074.11	609.81	18.42	412.14
8	574.26		5550.25	556.42	17.84	412.72	5537.81	554.98	19.27	411.29	5553.41	556.71	17.54	413.02
9	540.07		5201.39	520.85	19.22	411.34	5201.73	520.71	19.36	411.20	5202.39	520.92	19.15	411.41
10	517.28		4991.67	499.46	17.82	412.74	4978.14	497.92	19.37	411.20	4993.63	499.63	17.65	412.92
11	492.89		4758.76	475.71	17.18	413.39	4739.99	473.63	19.26	411.30	4753.27	475.13	17.76	412.80
12	432.01		4144.59	413.09	18.92	411.64	4144.56	412.92	19.10	411.47	4148.09	413.42	18.60	411.97
13	409.22		3935.88	391.81	17.41	413.15	3923.51	390.38	18.84	411.72	3932.28	391.41	17.81	412.75
14	325.54		3098.12	306.38	19.16	411.40	3096.91	306.09	19.45	411.11	3106.83	307.24	18.30	412.26
15	307.25		2920.32	288.25	19.00	411.57	2920.99	288.15	19.10	411.47	2920.05	288.20	19.05	411.51
16	231.17		2178.11	212.57	18.59	411.97	2176.1	212.20	18.97	411.59	2182.58	213.00	18.17	412.39
17	199.17		1885.97	182.78	16.39	414.17	1876.1	181.61	17.56	413.00	1882.57	182.41	16.76	413.80
18	148.98		1382.5	131.44	17.54	**413.03**	1371.11	130.11	18.87	**411.70**	1378.27	130.98	18.00	**412.57**
19	128.48		1063.41	98.91	29.58	**400.99**	1161.24	108.71	19.77	**410.79**	1170.96	109.85	18.64	**411.92**
20	69.09		623.35	54.03	15.06	**415.51**	580.65	49.51	19.58	**410.98**	602.54	51.88	17.21	**413.36**

Notes for Calculation:	Q2 2023	Q3 2023	Q4 2022
P_{atm} (average), kPa	93.44	95.09	93.71
Ground Surface Elevation, mASL	430.562		

Table B.2: Fluid Pressure, Calculated Pressure Head(Ψ)and Calculated Freshwater Head (H*f*) for IG_BH03

			Q2 2023				Q3 2023				Q4 2023			
Port No.	True Port Depth (m BGS)	Q1 2023	Fluid Pressure (kPa)	Ψ (m)	Water Level (m BGS)	H*f* (m)	Fluid Pressure (kPa)	Ψ (m)	Water Level (m BGS)	H*f* (m)	Fluid Pressure (kPa)	Ψ (m)	Water Level (m BGS)	H*f* (m)
1	888.57	No quarterly monitoring	8658.11	873.14	15.43	425.97	8637.57	871.10	17.47	423.94	8652.17	872.75	15.82	425.58
2	868.28		8405.46	847.38	20.90	**420.50**	8410.62	847.96	20.32	**421.08**	8413.72	848.43	19.85	**421.56**
3	850.53		8344.15	841.13	9.40	**432.00**	8210.2	827.53	23.00	**418.40**	8132.15	819.72	30.81	**410.60**
4	813.57		7997.62	805.79	7.78	**433.62**	7856.9	791.50	22.07	**419.33**	7755.97	781.37	32.20	**409.20**
5	792.89		7746.4	780.18	12.71	428.69	7692.73	774.76	18.13	423.27	7700.85	775.74	17.15	424.26
6	733.26		7129.94	717.32	15.94	**425.46**	7067.72	711.03	22.23	**419.17**	7077.71	712.20	21.06	**420.35**
7	695.28		6763.12	679.91	15.37	**426.04**	6670.6	670.54	24.74	**416.66**	6699	673.59	21.69	**419.71**
8	624.5		6073.44	609.59	14.91	**426.49**	5976.64	599.77	24.73	**416.68**	6026.33	605.00	19.50	**421.90**
9	589.28		5825.61	584.32	4.96	**436.44**	5986.84	600.81	-11.53	**452.94**	5530.37	554.43	34.85	**406.55**
10	566.78		5495.1	550.61	16.17	**425.24**	5365.75	537.48	29.30	**412.11**	5317.55	532.72	34.06	**407.35**
11	524.65		5086.1	508.91	15.74	425.66	5036.14	503.87	20.78	420.63	5041.5	504.58	20.07	421.33
12	502.91		4929.99	492.99	9.92	431.48	4724.57	472.10	30.81	**410.60**	4666.65	466.35	36.56	**404.85**
13	467.93		4559.83	455.25	12.68	428.72	4362.99	435.23	32.70	**408.71**	4257.2	424.60	43.33	**398.08**
14	430.9		4219.63	420.56	10.34	431.06	3988.5	397.05	33.85	**407.55**	3890.61	387.22	43.68	**397.73**
15	389.63		3798.25	377.59	12.04	429.36	3652.3	362.77	26.86	**414.54**	3685.34	366.29	23.34	**418.06**
16	342.83		3320.5	328.88	13.95	427.45	3233.29	320.04	22.79	418.61	3309.69	327.99	14.84	426.56
17	297.42		2879.8	283.94	13.48	427.92	2876.11	283.62	13.80	427.60	2880.38	284.21	13.21	428.19
18	232.9		2244.38	219.15	13.75	427.65	2246.17	219.39	13.51	427.89	2250.06	219.94	12.96	428.44
19	211.75		2041	198.41	13.34	428.06	2034.99	197.85	13.90	427.50	2041.45	198.67	13.08	428.32
20	154.03		1439.56	137.08	16.95	424.45	1202.51	112.97	41.06	**400.34**	1488.99	142.33	11.70	429.71
21	68.16		681.43	59.77	8.39	433.02	681.24	59.81	8.35	433.06	682.19	60.07	8.09	433.31

Notes for Calculation:	Q2 2023	Q3 2023	Q4 2022
P_{atm} (average), kPa	95.22	94.66	93.12
Ground Surface Elevation, mASL	441.403		

Measurement Flagged : Category 2 - Data are deemed not representative for a known reason
Measurement Flagged : Category 3 - Data are deemed not representative for an unknown reason

Table B.4: Fluid Pressure, Calculated Pressure Head(Ψ)and Calculated Freshwater Head (*Hf*) for IG_BH05

			Q2 2023				Q3 2023				Q4 2023			
Port No.	True Port Depth (m BGS)	Q1 2023	Fluid Pressure (kPa)	Ψ (m)	Water Level (m BGS)	*Hf* (m)	Fluid Pressure (kPa)	Ψ (m)	Water Level (m BGS)	*Hf* (m)	Fluid Pressure (kPa)	Ψ (m)	Water Level (m BGS)	*Hf* (m)
1	923.15	No quarterly monitoring	9063.22	914.36	8.79	423.50	9053.19	913.66	9.49	422.80	9048.65	913.23	9.92	422.37
2	907.47		8886.74	896.37	11.10	421.19	8881.03	896.11	11.36	420.93	8882.94	896.33	11.14	421.15
3	865.06		8488.38	855.75	9.31	422.98	8466.24	853.81	11.25	421.04	8452.61	852.45	12.61	419.68
4	806.50		7911.32	796.90	9.60	**422.69**	7918.36	797.95	8.55	**423.74**	7866.85	792.72	13.78	**418.51**
5	798.79		7752.1	780.67	18.12	**414.17**	7761.31	781.93	16.86	**415.43**	7764.71	782.31	16.48	**415.81**
6	746.43		7226.83	727.11	19.32	**412.97**	7235.25	728.29	18.14	**414.15**	7241.00	728.91	17.52	**414.77**
7	734.54		7188.54	723.20	11.34	**420.95**	7109.62	715.48	19.06	**413.23**	7113.75	715.93	18.61	**413.68**
8	686.45		6660.33	669.34	17.11	415.18	6656.08	669.23	17.22	415.07	6652.89	668.94	17.51	414.78
9	634.09		6140.6	616.35	17.74	414.55	6148.1	617.44	16.65	415.64	6136.20	616.25	17.84	414.45
10	592.48		5748.62	576.38	16.10	**416.19**	5763.55	578.22	14.26	**418.03**	5694.59	571.22	21.26	**411.03**
11	585.33		5683.26	569.71	15.62	**416.67**	5707.87	572.55	12.78	**419.51**	5632.79	564.92	20.41	**411.88**
12	548.51		5316.75	532.34	16.17	**416.12**	5336.01	534.63	13.88	**418.41**	5265.95	527.51	21.00	**411.29**
13	505.99		4893	489.13	16.86	**415.43**	4914.29	491.63	14.36	**417.93**	4843.10	484.40	21.59	**410.70**
14	454.95		4384.48	437.28	17.67	**414.62**	4406.27	439.83	15.12	**417.17**	4335.53	432.64	22.31	**409.98**
15	399.56		3833.14	381.06	18.50	**413.79**	3856.3	383.75	15.81	**416.48**	3785.24	376.53	23.03	**409.26**
16	348.37		3324.19	329.16	19.21	**413.08**	3347.84	331.90	16.47	**415.82**	3277.20	324.73	23.64	**408.65**
17	305.20		2898.31	285.74	19.46	**412.83**	2925.5	288.83	16.37	**415.92**	2877.79	284.00	21.20	**411.09**
18	292.42		2770.18	272.67	19.75	**412.54**	2787.78	274.79	17.63	**414.66**	2737.00	269.64	22.78	**409.51**
19	246.98		2312.95	226.05	20.93	**411.36**	2338.31	228.96	18.02	**414.27**	2283.71	223.42	23.56	**408.73**
20	211.41		1962.88	190.35	21.06	**411.23**	1985.15	192.95	18.46	**413.83**	1933.28	187.69	23.72	**408.57**
21	168.82		1544.75	147.72	21.10	**411.19**	1565.84	150.19	18.63	**413.66**	1519.97	145.54	23.28	**409.01**
22	145.94		1360.6	128.94	17.00	415.29	1350.29	128.21	17.73	414.56	1351.80	128.40	17.54	414.75
23	93.69		849.41	76.82	16.87	415.42	840.66	76.25	17.44	414.85	850.03	77.23	16.46	415.83
24	85.09		773.02	69.03	16.06	416.23	759.99	68.02	17.07	415.22	770.59	69.13	15.96	416.33
25	66.00		596.84	51.06	14.94	417.35	584.81	50.16	15.84	416.45	595.70	51.30	14.70	417.59

Notes for Calculation:	Q2 2023	Q3 2023	Q4 2022
P_{atm} (average), kPa	96.08	92.90	92.62
Ground Surface Elevation, mASL		432.29	

Table B.4: Fluid Pressure, Calculated Pressure Head(Ψ)and Calculated Freshwater Head (*Hf*) for IG_BH06

			Q2 2023				Q1 2023	Q1 2023
Port No.	True Port Depth (m BGS)	Q1 2023	Fluid Pressure (kPa)	Ψ (m)	Water Level (m BGS)	*Hf* (m)		
1	919.41	No quarterly monitoring	9185.51	926.89	-7.48	425.22	No pressure profile completed	No pressure profile completed
2	880.65		8794.83	887.05	-6.40	424.14		
3	842.46		8414.55	848.28	-5.82	423.56		
4	791.6		7903.32	796.15	-4.55	422.29		
5	769.09		7647.32	770.05	-0.96	418.70		
6	740.28		7340.08	738.72	1.56	416.18		
7	686.61		6742.11	677.74	8.87	408.87		
8	668.15		6211.21	623.61	44.54	373.20		
9	652.47		6440.27	646.96	5.51	412.23		
10	638.37		6308.38	633.52	4.85	412.89		
11	584.64		5777.92	579.43	5.21	412.53		
12	528		5208.17	521.33	6.67	411.07		
13	478.5		4727.4	472.31	6.19	411.55		
14	454.44		4493.4	448.45	5.99	411.75		
15	431.77		4274.05	426.08	5.69	412.05		
16	382.27		3789.4	376.66	5.61	412.13		
17	342.64		3403.86	337.35	5.29	412.45		
18	259.3		2586.87	254.04	5.26	412.48		
19	199.93		2008.97	195.11	4.82	412.92		
20	148.98		1517.75	145.03	3.95	413.79		
21	137.63		1414.45	134.49	3.14	414.60		
22	76.73		817.09	73.58	3.15	414.59		

Notes for Calculation:	Q2 2022
P_{atm} (average), kPa	95.49
Ground Surface Elevation, mASL	417.74

Measurement Flagged : Category 2 - Data are deemed not representative for a known reason

Measurement Flagged : Category 3 - Data are deemed not representative for an unknown reason

Appendix C

Groundwater Chemistry Results

Borehole ID			IG_BH01					IG_BH03
Sample ID			IG_BH01_GW044	IG_BH01_GW046	IG_BH01_GW056	IG_BH01_GW074	IG_BH01_GW075	IG_BH03_GW022
Interval ID (Port Depth m BGS)			IG_BH01_T_INT_002 (888.49)	IG_BH01_T_INT_017 (199.17)	IG_BH01_T_INT_020 (69.09)	IG_BH01_T_INT_009* (540.07)	IG_BH01_T_INT_019 (128.48)	IG_BH03_T_INT_021 (68.16)
	Reportable Detection Limit[1] / Range	Units	Q2 2023	Q2 2023	Q3 2023	Q4 2023	Q4 2023	Q3 2023
Field Measurements								
Field Multimeter pH	--	–	7.71	8.18	7.32	7.25	7.95	9.37
Field Multimeter Temperature	-10 to 55	Degrees C	25.60	22.79	9.65	17.09	8.62	27.28
Field Multimeter EC	100	mS/cm	37.6	0.319	0.062	6.440	0.271	**0.143**
Field Multimeter ORP	± 2000	mV	-30	-107	-98	-95	56	-44
Field Multimeter DO	50	mg/L	0.88	0.81	0.00	0.00	0.00	0.00
Field Multimeter Turbidity	800	NTU	0.0	3.4	0.4	0.0	0.0	3.1
Field Multimeter TDS	100	g/L	22.90	0.21	0.04	4.050	0.176	0.09
Field Fluorescein	0.4	ppb	2.625	0.756	0.52	13.44	32.28	1.746
Field Alkalinity	10 to 4000	mg/L CaCO3	8.1	88	69	7	97	160
Field Density	--	SG	1.025	0.998	1.01	1.010	1.000	1.000
Field Analy. DO	1..100	mg/L	0.342	0.570	0.531	0.353	0.710	0.9
Field Analy. Ferrous	3.00	mg/L	0.74	0.47	2.1	1.14	0.07	0.02
Field Analy. Sulphide	0.70	mg/L	0.13	0.1	0.03	0.04	0.01	0.02
Laboratory Measurements - Physiochemical Parameter, Major Anions and Nutrients								
pH	--	–	6.79	7.98	7.55	6.74	8.1	8.80
Alkalinity-Bicarbonate	1.0	mg/L	5.4	83	63	8.2	89.0	170
Alkalinity-Carbonate	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	9.9
Alkalinity-Hydroxide	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Alkalinity-Total	1.0	mg/L	5.4	84	63	8.2	90.0	180
Total Ammonia as N (NH4+NH3)	0.05	mg/L	0.14	<0.050	<0.050	0.13	<0.050	0.1
Dissolved Bromide (Br)	1.0	mg/L	290	<1.0	<1.0	76	1.1	<1.0
Dissolved Chloride (Cl)	1.0	mg/L	19000	8.2	<1.0	3800	72.0	6
Fluoride (F)	0.1	mg/L	0.65	0.39	0.17	0.48	0.8	5.9
Dissolved Iodide (I)	0.1	mg/L	<10	<0.10	<0.10	<10	<0.10	<0.10
Nitrate (NO3)	0.1	mg/L	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrite (NO2)	0.0	mg/L	<0.10	<0.010	0.013	<0.010	<0.010	<0.010
Nitrate + Nitrite	0.1	mg/L	<1.0	<0.10	<0.10	<0.10	<0.10	<0.10
Total Kjeldahl Nitrogen (TKN)	1.0	mg/L	6.3	<2.0	<0.10	<1.0	0.2	0.2
Total Nitrogen (N)	2.0	mg/L	6.3	<2.0	<0.10	<1.0	0.2	0.2
OrthoPhosphate (P)	0.01	mg/L	<0.010	0.027	<0.010	<0.010	0.0	0.0
Total Phosphorus (P_{tot})	0.0	mg/L	<0.020	0.05	0.019	0.03	0.1	0.0
Dissolved Sulphate (SO4)	10.0	mg/L	350	<1.0	<1.0	16	<1.0	<1.0
Sulphide as S	0.02	mg/L	<0.020	0.021	<0.020	<0.020	0.0	<0.020
Dissolved Organic Carbon (DOC)	1.0	mg/L	2.4	1.7	1	1.3	1.9	10.0
Total Organic Carbon (TOC)	1.0	mg/L	1	19	15	1.3	2.3	39.0
Total Inorganic Carbon (C)	1.0	mg/L	1.2	1	0.9	2.0	20.0	9.4
Reactive Silica (SiO2)	0.25	mg/L	20	20	23	11	12.0	9
Laboratory Measurements - Metals								
Dissolved Aluminum (Al)	0.0049	mg/L	0.011	<0.0049	<0.0049	<0.0049	<0.0049	0.2
Dissolved Arsenic (As)	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Barium (Ba)	0.002	mg/L	0.28	0.01	0.0083	0.3	0.0	0.0
Dissolved Bismuth (Bi)	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dissolved Boron (B)	0.01	mg/L	0.43	0.078	0.021	0.25	0.1	0.24
Dissolved Cadmium (Cd)	0.00009	mg/L	0.00013	<0.00009	<0.00009	<0.00009	<0.00009	<0.00009
Dissolved Calcium (Ca)	1.0	mg/L	8900	**51**	12	1800	35.0	8
Dissolved Cesium (Cs)	0.0002	mg/L	0.0012	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Dissolved Chromium (Cr)	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dissolved Cobalt (Co)	0.0005	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Dissolved Copper (Cu)	0.0009	mg/L	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009
Dissolved Iron (Fe)	0.02	mg/L	0.48	**0.12**	3.5	1.1	0.2	0.0
Dissolved Lead (Pb)	0.0005	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Dissolved Lithium (Li)	0.005	mg/L	0.075	0.033	0.028	0.044	0.0	0.1
Dissolved Magnesium (Mg)	0.05	mg/L	5.5	0.68	1.9	3	2.0	0.7
Dissolved Nickel (Ni)	0.001	mg/L	0.0022	<0.001	0.001	0.0012	<0.001	0.0
Dissolved Potassium (K)	0.2	mg/L	18	2.5	1.7	13	5.9	1
Dissolved Rubidium (Rb)	0.0002	mg/L	0.038	0.0014	0.0011	0.014	0.0	0.0
Total Ruthenium (Ru)	0.002	mg/L	<0.0020	<0.0032	<0.0020	<0.0020	<0.0020	<0.0020
Dissolved Selenium (Se)	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Dissolved Silicon (Si)	0.05	mg/L	3.1	8.7	11	3.9	6.0	4.0
Dissolved Sodium (Na)	0.1	mg/L	1300	27	10	580	47.0	81.0
Dissolved Strontium (Sr)	0.001	mg/L	120	**0.61**	0.08	20	0.3	0.1
Dissolved Sulphur (S)	0.5	mg/L	130	0.8	<0.5	5.5	<0.5	<0.5
Dissolved Thorium (Th)	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Dissolved Uranium (U)	0.0001	mg/L	0.00012	0.0006	0.0018	<0.0001	0.0	0.0
Dissolved Zirconium (Zr)	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Laboratory Measurements - Isotopes and Radiohalides								
Oxygen-18 of water ($\delta^{18}O$)	--	‰ VSMOW	-12.1	-14.2	-14.1	-12.7	-14.1	-16.4
Deuterium of water ($\delta^{2}H$)	--	‰ VSMOW	-78.7	-102	-101.8	-85.5	-99.8	-120.8
Tritium (^{3}H)	0.8	TU	< 0.8	3.1	2.2	<0.8	< 0.8	< 0.8
Carbon-13 of DIC ($\delta^{13}C$-DIC)	--	‰ VPDB	-15.3	-18.3	-20.2	-10.7	-18.2	-13.9
Carbon-14 of DIC (^{14}C-DIC)	0.53	pmC (%)	--	0.5361	0.5985	39.70%	29.94%	0.1089
Chlorine-37 ($\delta^{37}Cl$)	--	‰ VSMOC	-0.37	-0.31	1.07	-0.25	5.11	0.16
Chlorine-36 ($^{36}Cl/Cl$)	--	–	2.24E-14	2.94E-13	>2.46E-12	3.28E-14	5.61E-14	1.90E-13
Iodine-129 (^{129}I)	--	atoms/kg	1.93E+07	3.33E+06	9.62E+06	3.37E+07	2.80E+07	1.01E+07
Strontium isotope ratio ($^{87}Sr/^{86}Sr$)	--	–	0.71543	0.71206	0.71034	0.71459	0.71432	0.70964

Table does not include samples that were collected for noble gas analysis only - these samples were shipped to the University of Oxford for analysis, results are to be delivered directly to the NWMO.

-- = Not reported or no value measured

*Interval was previously purged and sampled, Geofirma completed re-sampling.

Measurement flagged as anomolous

Table C.2: In-field geochemistry measuremenst for samples collected for noble gas analysis only in 2023

		Borehole ID	IG_BH01							IG_BH03	
		Sample ID	IG_BH01_GW052	IG_BH01_GW058	IG_BH01_GW060	IG_BH01_GW062	IG_BH01_GW065	IG_BH01_GW067	IG_BH01_GW069	IG_BH03_GW020	IG_BH03_GW024
		Interval ID	IG_BH01_T_INT_004*	IG_BH01_T_INT_017*	IG_BH01_T_INT_002*	IG_BH01_T_INT_007*	IG_BH01_T_INT_009*	IG_BH01_T_INT_002*	IG_BH01_T_INT_004*	IG_BH03_T_INT_002*	IG_BH03_T_INT_002*
	Reportable Detection Limit[1] / Range	Units	Q3a 2023	Q3 2023	Q3 2023	Q3 2023	Q3 2023	Q4 2023	Q4 2023	Q3a 2023	Q4 2023
Field Measurements											
Field Multimeter pH	--	--	7.65	6.93	6.68	7.17	8.09	6.74	7.90	8.37	8.51
Field Multimeter Temperature	-10 to 55	Degrees C	21.64	8.21	8.03	8.96	9.28	12.41	11.90	27.94	5.55
Field Multimeter EC	100	mS/cm	26.7	0.112	46.4	17.6	10.8	38.1	21.8	33.2	51.5
Field Multimeter ORP	± 2000	mV	-34	-13	-73	-61	-162	55	158	-165	-150
Field Multimeter DO	50	mg/L	**1.90**	**6.46**	**7.86**	**7.35**	**9.64**	0.00	0.00	**1.41**	**4.38**
Field Multimeter Turbidity	800	NTU	0	14.3	9.1	15.6	16.4	80.1	10.8	0.0	4.4
Field Multimeter TDS	100	g/L	16.60	0.07	28.30	10.90	6.68	23.30	13.5	20.3	30.90
Field Fluorescein	0.4	ppb	4.175	0.748	3.553	3.576	14.87	3.523	3.360	3.278	3.247
Field Density	--	SG	1.02	1.007	1.034	1.018	1.012	--	1.015	1.020	1.030

Table does not include noble gas analysis results - these samples were shipped to the University of Oxford for testing, results are to be delivered directly to the NWMO.

-- = Not reported or no value measured

*Interval was previously purged and sampled, Geofirma completed re-sampling.

Measurement flagged as anomolous

Appendix D

QA/QC Results and Calculations

Table D.1: Relative Percent Difference (RPD) Calculation

Parameter	Units	Q2 2023							Q3 2023							
		RDL	IG_BH01_GW044	IG_BH01_GW046	Difference	Average	5 X RDL	RPD %	RDL	IG_BH01_GW046	IG_BH01_GW047	Difference	Average	5 X RDL	RPD %
Laboratory Measurements - Physiochemical Parameter, Major Anions and Nutrients																
Alkalinity-Bicarbonate	mg/L	1.00	5.4	4.8	0.6	5.1	5	12	1.00	83.0	84	1	83.5	5	1
Alkalinity-Carbonate	mg/L	1.00	<1.0	<1.0	--	--	5	--	1.00	<1.0	<1.0	--	--	5	--
Alkalinity-Hydroxide	mg/L	1.00	<1.0	<1.0	--	--	5	--	1.00	<1.0	<1.0	--	--	5	--
Alkalinity-Total	mg/L	1.00	5.4	4.8	0.6	5.1	5	12	1.00	84.00	85	1	84.5	5	1
Total Ammonia as N (NH4+NH3)	mg/L	0.05	0.14	0.14	0	*0.14*	0.25	--	0.05	<0.050	<0.050	--	--	0.25	--
Dissolved Bromide (Br)	mg/L	100.00	290	310	20	*301*	500	--	1.00	<1.0	<1.0	--	--	5	--
Dissolved Chloride (Cl)	mg/L	100.00	19000	19000	0	19,000	500	0	1.00	8	9	1	9	5	7
Fluoride (F)	mg/L	0.10	0.65	0.66	0.01	0.655	0.5	2	0.10	0.390	0.4	0.01	*0.395*	0.5	--
Dissolved Iodide (I)	mg/L	10.00	<10	<10	--	--	50	--	0.10	<0.10	<0.10	--	--	0.5	--
Nitrate (NO3)	mg/L	0.10	<1.0	<0.50	--	--	0.5	--	0.10	<0.10	<0.10	--	--	0.5	--
Nitrite (NO2)	mg/L	0.01	<0.10	<0.050	--	--	0.05	--	0.01	<0.010	<0.010	--	--	0.05	--
Nitrate + Nitrite	mg/L	0.10	<1.0	<0.50	--	--	0.5	--	0.10	<0.10	<0.10	--	--	0.5	--
Total Kjeldahl Nitrogen (TKN)	mg/L	2.00	6.3	6.7	0.4	*6.5*	10	6	2.00	<2.0	<2.0	--	--	10	--
Total Nitrogen (N)	mg/L	2.00	6.3	6.7	0.4	*6.5*	10	6	2.00	<2.0	<2.0	--	--	10	--
OrthoPhosphate (P)	mg/L	0.01	<0.010	<0.010	--	--	0.05	--	0.01	0.027	0.027	0	0.027	0.05	0
Total Phosphorus (Ptot)	mg/L	0.02	<0.020	<0.020	--	--	0.1	--	0.02	0.05	0.059	0.009	0.0545	0.1	17
Dissolved Sulphate (SO4)	mg/L	100.00	350	360	10	*355*	500	3	1.00	<1.0	1.2	--	--	5	--
Sulphide as S	mg/L	0.02	<0.020	<0.020	--	--	0.1	--	0.02	0.021	0.025	0.004	0.023	0.1	17
Dissolved Organic Carbon (DOC)	mg/L	0.40	2.4	1.5	0.9	*1.95*	2	--	0.40	1.7	1.3	0.4	1.5	2	27
Total Organic Carbon (TOC)	mg/L	0.40	1.2	0.98	0.22	*1.09*	2	--	0.40	19	20	1	19.5	2	5
Total Inorganic Carbon (C)	mg/L	1.00	1	1	0	*1*	5	0	1.00	1	1.3	0.3	1.15	5	26
Reactive Silica (SiO2)	mg/L	0.55	20	16	4	18	2.75	22	0.55	20	19	1	19.5	2.75	5
Laboratory Measurements - Metals																
Dissolved Aluminum (Al)	mg/L	0.0049	0.011	0.011	0	0.011	0.02	0	0.0049	<0.0049	0.0084	--	--	0.0245	--
Dissolved Arsenic (As)	mg/L	0.001	<0.001	<0.001	--	--	0.005	--	0.001	<0.001	<0.001	--	--	0.005	--
Dissolved Barium (Ba)	mg/L	0.002	0.28	0.27	0.01	0.275	0.01	4	0.002	0.01	0.011	0.001	0.0105	0.01	10
Dissolved Bismuth (Bi)	mg/L	0.001	<0.001	<0.001	--	--	0.005	--	0.001	<0.001	<0.001	--	--	0.005	--
Dissolved Boron (B)	mg/L	0.01	0.43	0.42	0.01	0.425	0.05	2	0.01	0.078	0.078	0	0.078	0.05	0
Dissolved Cadmium (Cd)	mg/L	0.00009	0.00013	0.00019	--	--	0.00045	--	0.00009	<0.00009	<0.00009	--	--	0.00045	--
Dissolved Calcium (Ca)	mg/L	1.0	8900	10000	1100	9450	5	12	1.0	**51**	17	34	34	5	100
Dissolved Cesium (Cs)	mg/L	0.0002	0.0012	0.0011	--	--	0.001	--	0.0002	<0.0002	<0.0002	--	--	0.001	--
Dissolved Chromium (Cr)	mg/L	0.005	<0.005	<0.005	--	--	0.025	--	0.005	<0.005	<0.005	--	--	0.025	--
Dissolved Cobalt (Co)	mg/L	0.0005	<0.0005	<0.0005	--	--	0.0025	--	0.0005	<0.0005	<0.0005	--	--	0.0025	--
Dissolved Copper (Cu)	mg/L	0.0009	<0.0009	<0.0009	--	--	0.0045	--	0.0009	<0.0009	<0.0009	--	--	0.0045	--
Dissolved Iron (Fe)	mg/L	0.02	0.48	0.47	0.01	0.475	0.1	--	0.02	**0.12**	0.67	0.55	0.395	0.1	139
Dissolved Lead (Pb)	mg/L	0.0005	<0.0005	<0.0005	--	--	0.0025	--	0.0005	<0.0005	<0.0005	--	--	0.0025	--
Dissolved Lithium (Li)	mg/L	0.005	0.075	0.07	0.005	0.0725	0.025	7	0.005	0.033	0.033	0	0.033	0.025	0
Dissolved Magnesium (Mg)	mg/L	0.05	5.5	5	0.5	5.25	0.25	10	0.05	0.68	0.85	0.03	0.665	0.25	5
Dissolved Nickel (Ni)	mg/L	0.001	0.0022	0.0023	1E-04	*0.0225*	0.005	--	0.001	<0.001	<0.001	--	--	0.005	--
Dissolved Potassium (K)	mg/L	0.2	18	17	1	17.5	1	6	0.2	2.5	2.2	0.3	2.35	1	13
Dissolved Rubidium (Rb)	mg/L	0.0002	0.038	0.038	0	0.038	0.001	0	0.0002	0.0014	0.0013	0.0001	0.00135	0.001	7
Total Ruthenium (Ru)	mg/L	0.002	<0.0020	<0.0020	--	--	0.01	--	0.002	<0.0032	<0.0032	--	--	0.01	--
Dissolved Selenium (Se)	mg/L	0.002	<0.002	<0.002	--	--	0.01	--	0.002	<0.002	<0.002	--	--	0.01	--
Dissolved Silicon (Si)	mg/L	0.05	3.1	3.1	0	3.1	0.25	0	0.05	8.7	8.9	0.2	8.8	0.25	2
Dissolved Sodium (Na)	mg/L	0.1	1300	1300	0	1300	0.5	0	0.1	27	22	5	24.5	0.5	20
Dissolved Strontium (Sr)	mg/L	0.001	120	120	0	120	0.005	0	0.001	**0.61**	0.16	0.45	0.385	0.005	117
Dissolved Sulphur (S)	mg/L	0.5	130	130	0	130	2.5	0	0.5	0.8	<0.5	--	--	2.5	--
Dissolved Thorium (Th)	mg/L	0.002	<0.002	<0.002	--	--	0.01	--	0.002	<0.002	<0.002	--	--	0.01	--
Dissolved Uranium (U)	mg/L	0.0001	0.00012	0.00014	0.00002	*0.00013*	0.0005	--	0.0001	0.0006	0.00061	--	--	0.0005	--
Dissolved Zirconium (Zr)	mg/L	0.001	<0.001	<0.001	--	--	0.005	--	0.001	<0.001	<0.001	--	--	0.005	--

Q3 2023															
RDL	IG_BH01_GW056	IG_BH01_GW057	Difference	Average	5 X RDL	RPD %	RDL	IG_BH03_GW022	IG_BH03_GW023	Difference	Average	5 X RDL	RPD %
1.00	63.0	63	0	63	5	0	1.00	170.0	170	0	170	5	0
1.00	<1.0	<1.0	--	--	5	--	1.00	9.9	11	1.1	10.45	5	11
1.00	<1.0	<1.0	--	--	5	--	1.00	<1.0	<1.0	--	--	5	--
1.00	63.00	63	0	63	5	0	1.00	180.00	180	0	180	5	0
0.05	<0.050	<0.050	--	--	0.25	--	0.05	0.06	0.056	0.005	*0.0585*	0.25	--
1.00	<1.0	<1.0	--	--	5	--	1.00	<1.0	<1.0	--	--	5	--
1.00	<1.0	<1.0	--	--	5	--	1.00	6	6	0	6	5	3
0.10	0.170	0.16	0.01	0.165	0.5	6	0.10	5.900	5.9	0	5.9	0.5	--
0.10	<0.10	<0.10	--	--	0.5	--	0.10	<0.10	<0.10	--	--	0.5	--
0.10	<0.10	<0.10	--	--	0.5	--	0.10	<0.10	<0.10	--	--	0.5	--
0.01	0.01	0.01	0	0.013	0.05	0	0.01	<0.010	<0.010	--	--	0.05	--
0.10	<0.10	<0.10	--	--	0.5	--	0.10	<0.10	<0.10	--	--	0.5	--
0.10	<0.10	<0.10	--	--	0.5	--	0.10	0.2	0.24	0.04	*0.22*	0.5	--
0.10	<0.10	<0.10	--	--	0.5	--	0.10	0.2	0.24	0.04	*0.22*	0.5	--
0.01	<0.010	<0.010	--	--	0.05	--	0.01	0.013	0.012	--	--	0.05	--
0.02	0.019	0.019	0	*0.019*	0.1	--	0.02	0.027	0.026	0.001	*0.0265*	0.1	--
1.00	<1.0	<1.0	--	--	5	--	1.00	<1.0	<1.0	--	--	5	--
0.02	<0.020	<0.020	--	--	0.1	--	0.02	<0.020	<0.020	--	--	0.1	--
0.40	1	1.2	0.2	1.1	2	18	0.40	10	10	0	10	2	0
0.40	15	15	0	15	2	0	0.40	39	39	0	39	2	0
1.00	0.9	0.97	0.07	0.935	5	7	1.00	9.4	9.3	0.1	9.35	5	1
0.55	23	23	0	23	2.75	0	0.55	8.7	8.9	0.2	8.8	2.75	2
0.0049	<0.0049	<0.0049	--	--	0.0245	--	0.0049	0.15	0.15	0	0.15	0.0245	0
0.001	<0.001	<0.001	--	--	0.005	--	0.001	<0.001	<0.001	--	--	0.005	--
0.002	0.0083	0.0085	0.0002	0.0084	0.01	2	0.002	0.0083	0.0085	0.0002	*0.0084*	0.01	--
0.001	<0.001	<0.001	--	--	0.005	--	0.001	<0.001	<0.001	--	--	0.005	--
0.01	0.021	0.019	0.002	0.02	0.05	10	0.01	0.24	0.25	0.01	0.245	0.05	4
0.00009	<0.00009	<0.00009	--	--	0.00045	--	0.00009	<0.00009	<0.00009	--	--	0.00045	--
1.0	12	12	0	12	5	0	1	8	7.7	0.3	7.85	5	4
0.0002	<0.0002	<0.0002	--	--	0.001	--	0.0002	<0.0002	<0.0002	--	--	0.001	--
0.005	<0.005	<0.005	--	--	0.025	--	0.005	<0.005	<0.005	--	--	0.025	--
0.0005	<0.0005	<0.0005	--	--	0.0025	--	0.0005	<0.0005	<0.0005	--	--	0.0025	--
0.0009	<0.0009	<0.0009	--	--	0.0045	--	0.0009	<0.0009	<0.0009	--	--	0.0045	--
0.02	3.5	3.6	0.1	3.55	0.1	3	0.02	0.04	0.04	0	*0.04*	0.1	--
0.0005	<0.0005	<0.0005	--	--	0.0025	--	0.0005	<0.0005	<0.0005	--	--	0.0025	--
0.005	0.028	0.028	0	0.028	0.025	0	0.005	0.059	0.06	0.001	0.0595	0.025	2
0.05	1.9	1.9	0	1.9	0.25	0	0.05	0.68	0.72	0.04	0.7	0.25	6
0.001	0.001	<0.001	--	--	0.005	--	0.001	0.0037	0.0037	0	0.0037	0.005	0
0.2	1.7	1.7	0	1.7	1	0	0.2	1.2	1.2	0	1.2	1	0
0.0002	0.0011	0.0011	0	0.0011	0.001	0	0.0002	0.0023	0.0023	0	0.0023	0.001	0
0.002	<0.0020	<0.0020	--	--	0.01	--	0.002	<0.0020	<0.002	--	--	0.01	--
0.002	<0.002	<0.002	--	--	0.01	--	0.002	<0.002	<0.002	--	--	0.01	--
0.05	11	11	0	11	0.25	0	0.05	4	4	0	4	0.25	0
0.1	10	9.9	0.1	9.95	0.5	1	0.1	81	82	1	81.5	0.5	1
0.001	0.08	0.08	0	0.08	0.005	0	0.001	0.086	0.086	0	0.086	0.005	0
0.5	<0.5	<0.5	--	--	2.5	--	0.5	<0.5	<0.5	--	--	2.5	--
0.002	<0.002	<0.002	--	--	0.01	--	0.002	<0.002	<0.002	--	--	0.01	--
0.0001	0.0018	0.0018	0	0.0018	0.0005	0	0.0001	0.0035	0.0035	0	0.0035	0.0005	0
0.001	<0.001	<0.001	--	--	0.005	--	0.001	<0.001	<0.001	--	--	0.005	--

Measurement flagged as anomolous

Legend	
Sample concentration(s) below detection limit so RPD cannot be calculated, or average value below 5X detection limit, or RPD cannot be calculated.	--
Average Value below 5X detection limit	*XX*
Calculated RPD exceeds 30%	**XX**
Reported Detection Limit	RDL

Table D.2: Rinsate and Field Blank Sample Results

	Reportable Detection Limit[1] / Range	Units	Q2 2023	Q3 2023	Q4 2023
Rinsate Sample ID			IG_BH01_GW042	IG_BH01_GW054	IG_BH01_GW072
Laboratory Measurements - Physiochemical Parameter, Major Anions and Nutrients					
Dissolved Bromide (Br)	1.0	mg/L	<1.0	<1.0	<1.0
Dissolved Chloride (Cl)	1.0	mg/L	<1.0	<1.0	<1.0
Fluoride (F)	0.1	mg/L	<0.10	<0.10	<0.10
Dissolved Iodide (I)	0.1	mg/L	<0.10	<0.10	<0.10
Nitrate (NO3)	0.1	mg/L	<0.10	<0.10	<0.10
Nitrite (NO2)	0.01	mg/L	<0.010	<0.010	<0.010
Nitrate + Nitrite	0.1	mg/L	<0.10	<0.10	<0.10
OrthoPhosphate (P)	0.01	mg/L	<0.010	<0.010	<0.010
Dissolved Sulphate (SO4)	1.0	mg/L	<1.0	<1.0	<1.0
Laboratory Measurements - Metals					
Dissolved Aluminum (Al)	0.0049	mg/L	<0.0049	<0.0049	<0.0049
Dissolved Arsenic (As)	0.001	mg/L	<0.001	<0.001	<0.001
Dissolved Barium (Ba)	0.002	mg/L	<0.002	<0.002	<0.002
Dissolved Bismuth (Bi)	0.001	mg/L	<0.001	<0.001	<0.001
Dissolved Boron (B)	0.01	mg/L	<0.010	<0.010	<0.010
Dissolved Cadmium (Cd)	0.00009	mg/L	<0.00009	<0.00009	<0.00009
Dissolved Calcium (Ca)	0.2	mg/L	0.56	<0.200	<0.200
Dissolved Cesium (Cs)	0.0002	mg/L	<0.0002	<0.0002	<0.0002
Dissolved Chromium (Cr)	0.005	mg/L	<0.005	<0.005	<0.005
Dissolved Cobalt (Co)	0.0005	mg/L	<0.0005	<0.0005	<0.0005
Dissolved Copper (Cu)	0.0009	mg/L	<0.0009	<0.0009	<0.0009
Dissolved Iron (Fe)	0.02	mg/L	<0.02	<0.02	<0.02
Dissolved Lead (Pb)	0.0005	mg/L	<0.0005	<0.0005	<0.0005
Dissolved Lithium (Li)	0.005	mg/L	<0.0050	<0.0050	<0.0050
Dissolved Magnesium (Mg)	0.05	mg/L	<0.050	<0.050	<0.050
Dissolved Nickel (Ni)	0.001	mg/L	<0.001	<0.001	<0.001
Dissolved Potassium (K)	0.2	mg/L	<0.200	<0.200	<0.200
Dissolved Rubidium (Rb)	0.0002	mg/L	<0.0002	<0.0002	<0.0002
Dissolved Selenium (Se)	0.002	mg/L	<0.002	<0.002	<0.002
Dissolved Silicon (Si)	0.05	mg/L	<0.050	<0.050	<0.050
Dissolved Sodium (Na)	0.1	mg/L	<0.100	<0.100	<0.100
Dissolved Strontium (Sr)	0.001	mg/L	0.0048	<0.0010	<0.0010
Dissolved Sulphur (S)	0.5	mg/L	<0.5	<0.5	<0.5
Dissolved Thorium (Th)	0.002	mg/L	<0.002	<0.002	<0.002
Dissolved Uranium (U)	0.0001	mg/L	<0.0001	<0.0001	<0.0001
Dissolved Zirconium (Zr)	0.001	mg/L	<0.001	<0.001	<0.001
Field Blank Sample ID			IG_BH01_GW043	IG_BH01_GW055	IG_BH01_GW073
Laboratory Measurements - Isotopes and Radiohalides					
Tritium (^{3}H)	0.8	TU	< 0.8	1	< 0.8
Carbon-13 of DIC (δ^{13}C-DIC)	--	‰ VPDB	-10.1	-12	-10.2
Carbon-14 of DIC (^{14}C-DIC)	0.53	pmC (%)	39.79%	39.05%	39.85%

-- = Not reported or no value measured

[1] Reportable detection limit most commonly used is listed, there are cases where the detection limits were raised due to matrix interference or sample dilution.

Appendix E

Laboratory Reports

2023 Lab Reports:
Bureau Veritas

GEOFIRMA ENGINEERING

Your P.O. #: 202031-004
Your Project #: 20-203-1
Site Location: IGNACE, ON
Your C.O.C. #: n/a

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2023/08/04
Report #: R7750718
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3I6341
Received: 2023/06/23, 09:40

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	1	N/A	2023/06/29	CAM SOP-00448	SM 23 2320 B m
Alkalinity	1	N/A	2023/07/07	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	2	N/A	2023/06/29	CAM SOP-00102	APHA 4500-CO2 D
Anions	1	N/A	2023/06/28	CAM SOP-00435	SM 23 4110 B m
Anions	1	N/A	2023/07/07	CAM SOP-00435	SM 23 4110 B m
Dissolved Organic Carbon (DOC) (3)	2	N/A	2023/06/28	CAM SOP-00446	SM 23 5310 B m
Fluoride	2	2023/06/28	2023/06/29	CAM SOP-00449	SM 23 4500-F C m
Dissolved Metals Analysis by ICP	2	2023/06/27	2023/07/04	CAM SOP-00408	EPA 6010D m
Dissolved Metals by ICPMS	1	N/A	2023/06/29	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS	1	N/A	2023/07/10	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICP	2	2023/06/29	2023/06/29	CAM SOP-00408	EPA 6010D m
Iodide, Thiosulphate, Thiocyanate (1)	2	N/A	2023/07/07	CAL SOP-00057	Dionex #034035 R09 m
Total Extractable Lanthanides-waters (2, 4)	2	2023/06/29	2023/06/30	STL SOP-00071	MA.200–Mét. 1.2 R5 m
Silica (Reactive) (1)	2	N/A	2023/07/06	AB SOP-00011	EPA370.1 R1978 m
Ammonium as NH4+	2	N/A	2023/08/01		
Total Ammonia-N	1	N/A	2023/06/28	CAM SOP-00441	USGS I-2522-90 m
Total Ammonia-N	1	N/A	2023/06/29	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (5)	2	N/A	2023/06/27	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Organic Nitrogen	2	N/A	2023/08/01	Auto Calc.	
pH	2	2023/06/28	2023/06/29	CAM SOP-00413	SM 4500H+ B m
Field Measured pH (6)	2	N/A	2023/08/01		Field pH Meter
Orthophosphate	2	N/A	2023/06/28	CAM SOP-00461	SM 23 4500-P E m
Sulphide	2	N/A	2023/06/27	CAM SOP-00455	SM 23 4500-S G m
Field Temperature (6)	2	N/A	2023/08/01		Field Thermometer
Total Inorganic Carbon (TIC)	2	N/A	2023/06/29	CAM SOP-00433	SM 23 5310 m
Total Kjeldahl Nitrogen in Water	2	2023/06/27	2023/06/28	CAM SOP-00938	OMOE E3516 m
Total Nitrogen (calculated)	2	N/A	2023/06/29	Auto Calc.	
Total Organic Carbon (TOC) (7)	2	N/A	2023/06/28	CAM SOP-00446	SM 23 5310B m
Total Phosphorus (Colourimetric)	2	2023/06/27	2023/06/29	CAM SOP-00407	SM 23 4500-P I

Your P.O. #: 202031-004
Your Project #: 20-203-1
Site Location: IGNACE, ON
Your C.O.C. #: n/a

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2023/08/04
Report #: R7750718
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3I6341
Received: 2023/06/23, 09:40

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

(1) This test was performed by Bureau Veritas Calgary (19th), 4000 19th Street NE , Calgary, AB, T2E 6P8
(2) This test was performed by Bureau Veritas Montreal., 889 Montée de Liesse , Ville St-Laurent, QC, H4T 1P5
(3) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(4) Non-accredited test method
(5) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(6) This is a field test, therefore, the results relate to items that were not analysed at Bureau Veritas.
(7) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Your P.O. #: 202031-004
Your Project #: 20-203-1
Site Location: IGNACE, ON
Your C.O.C. #: n/a

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2023/08/04
Report #: R7750718
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3I6341
Received: 2023/06/23, 09:40

Encryption Key

Katherine Szozda
Project Manager
04 Aug 2023 15:02:45

Please direct all questions regarding this Certificate of Analysis to:
Katherine Szozda, Project Manager
Email: Katherine.Szozda@bureauveritas.com
Phone# (613)274-0573 Ext:7063633

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Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas Job #: C3I6341
Report Date: 2023/08/04

Geofirma Engineering Ltd
Client Project #: 20-203-1
Site Location: IGNACE, ON
Your P.O. #: 202031-004
Sampler Initials: AC

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		WFB936			WFB936			WFB937		
Sampling Date		2023/06/20			2023/06/20			2023/06/21		
COC Number		n/a			n/a			n/a		
	UNITS	**IG_BH01_GW046**	**RDL**	**QC Batch**	**IG_BH01_GW046 Lab-Dup**	**RDL**	**QC Batch**	**IG_BH01_GW047**	**RDL**	**QC Batch**
Calculated Parameters										
Ammonium (NH4)	mg/L	<0.013	0.013	8825936				<0.05	0.05	8825936
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	83	1.0	8752229				84	1.0	8752229
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	8752229				<1.0	1.0	8752229
Hydrox. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	8752229				<1.0	1.0	8752229
Total Nitrogen (N)	mg/L	<2.0	2.0	8752825				<2.0	2.0	8752825
Total Organic Nitrogen	mg/L	<0.10	0.10	8825937				<0.10	0.10	8825937
Field Measurements										
Field Temperature	Celsius	23.76	N/A	ONSITE				23.76	N/A	ONSITE
Field Measured pH	pH	8.70		ONSITE				8.70		ONSITE
Inorganics										
Total Ammonia-N	mg/L	<0.050	0.050	8755304				<0.050	0.050	8755156
Fluoride (F-)	mg/L	0.39	0.10	8758491				0.40	0.10	8758491
Total Inorganic Carbon (C)	mg/L	19	1	8757488	19	1	8757488	20	1	8757488
Dissolved Iodide	mg/L	<0.10	0.10	8776552				<0.10	0.10	8776552
Total Kjeldahl Nitrogen (TKN)	mg/L	<2.0 (1)	2.0	8755171				<2.0 (1)	2.0	8755171
Dissolved Organic Carbon	mg/L	1.7	0.40	8751278				1.3	0.40	8751278
Total Organic Carbon (TOC)	mg/L	1.0	0.40	8755191				1.3	0.40	8755191
Orthophosphate (P)	mg/L	0.027	0.010	8755307				0.027	0.010	8755307
pH	pH	7.98		8758497				7.97		8758497
Total Phosphorus	mg/L	0.050	0.020	8755202				0.059	0.020	8755202
Reactive Silica (SiO2)	mg/L	20	0.25	8774912	21	0.25	8774912	19	0.25	8775461
Sulphide	mg/L	0.021	0.020	8754316				0.025	0.020	8754316
Alkalinity (Total as CaCO3)	mg/L	84	1.0	8772781				85	1.0	8758508
Nitrite (N)	mg/L	<0.010	0.010	8755225				<0.010	0.010	8755225
Dissolved Chloride (Cl-)	mg/L	8.2	1.0	8773451				8.8	1.0	8756960
Nitrate (N)	mg/L	<0.10	0.10	8755225				<0.10	0.10	8755225
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	8755225				<0.10	0.10	8755225
Dissolved Bromide (Br-)	mg/L	<1.0	1.0	8773451				<1.0	1.0	8756960
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	8773451				1.2	1.0	8756960
Metals										
Total Ruthenium (Ru)	ug/L	<3.2	3.2	8792818				<3.2	3.2	8792818

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) TKN: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C3I6341
Report Date: 2023/08/04

Geofirma Engineering Ltd
Client Project #: 20-203-1
Site Location: IGNACE, ON
Your P.O. #: 202031-004
Sampler Initials: AC

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		WFB937		
Sampling Date		2023/06/21		
COC Number		n/a		
	UNITS	**IG_BH01_GW047 Lab-Dup**	**RDL**	**QC Batch**
Inorganics				
Dissolved Iodide	mg/L	<0.10	0.10	8776552

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Bureau Veritas Job #: C3I6341
Report Date: 2023/08/04

Geofirma Engineering Ltd
Client Project #: 20-203-1
Site Location: IGNACE, ON
Your P.O. #: 202031-004
Sampler Initials: AC

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		WFB936			WFB936			WFB937		
Sampling Date		2023/06/20			2023/06/20			2023/06/21		
COC Number		n/a			n/a			n/a		
	UNITS	**IG_BH01_GW046**	**RDL**	**QC Batch**	**IG_BH01_GW046 Lab-Dup**	**RDL**	**QC Batch**	**IG_BH01_GW047**	**RDL**	**QC Batch**
Metals										
Dissolved Iron (Fe)	mg/L	0.12	0.02	8831303	0.11	0.02	8831303	0.67	0.02	8755377
Total Iron (Fe)	mg/L	0.77	0.02	8759522				0.86	0.02	8759522
Dissolved Sulphur (S)	mg/L	0.8	0.5	8755377				<0.5	0.5	8755377
Total Sulphur (S)	mg/L	<0.5	0.5	8759522				<0.5	0.5	8759522
Dissolved Aluminum (Al)	ug/L	<4.9	4.9	8774640	<4.9	4.9	8774640	8.4	4.9	8756874
Dissolved Arsenic (As)	ug/L	<1.0	1.0	8774640	<1.0	1.0	8774640	<1.0	1.0	8756874
Dissolved Barium (Ba)	ug/L	10	2.0	8774640	10	2.0	8774640	11	2.0	8756874
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	8774640	<1.0	1.0	8774640	<1.0	1.0	8756874
Dissolved Boron (B)	ug/L	78	10	8774640	78	10	8774640	78	10	8756874
Dissolved Cadmium (Cd)	ug/L	<0.090	0.090	8774640	<0.090	0.090	8774640	<0.090	0.090	8756874
Dissolved Calcium (Ca)	ug/L	51000	200	8831304				17000	200	8756874
Dissolved Cesium (Cs)	ug/L	<0.20	0.20	8774640	<0.20	0.20	8774640	<0.20	0.20	8756874
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	8774640	<5.0	5.0	8774640	<5.0	5.0	8756874
Dissolved Cobalt (Co)	ug/L	<0.50	0.50	8774640	<0.50	0.50	8774640	<0.50	0.50	8756874
Dissolved Copper (Cu)	ug/L	<0.90	0.90	8774640	<0.90	0.90	8774640	<0.90	0.90	8756874
Dissolved Lead (Pb)	ug/L	<0.50	0.50	8774640	<0.50	0.50	8774640	<0.50	0.50	8756874
Dissolved Lithium (Li)	ug/L	33	5.0	8774640	33	5.0	8774640	33	5.0	8756874
Dissolved Magnesium (Mg)	ug/L	680	50	8774640	660	50	8774640	650	50	8756874
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	8774640	<1.0	1.0	8774640	<1.0	1.0	8756874
Dissolved Potassium (K)	ug/L	2500	200	8774640	2400	200	8774640	2200	200	8756874
Dissolved Rubidium (Rb)	ug/L	1.4	0.20	8774640	1.4	0.20	8774640	1.3	0.20	8756874
Dissolved Selenium (Se)	ug/L	<2.0	2.0	8774640	<2.0	2.0	8774640	<2.0	2.0	8756874
Dissolved Silicon (Si)	ug/L	8700	50	8774640	8900	50	8774640	8900	50	8756874
Dissolved Sodium (Na)	ug/L	27000	100	8774640	27000	100	8774640	22000	100	8756874
Dissolved Strontium (Sr)	ug/L	610	1.0	8831304				160	1.0	8756874
Dissolved Thorium (Th)	ug/L	<2.0	2.0	8774640	<2.0	2.0	8774640	<2.0	2.0	8756874
Dissolved Uranium (U)	ug/L	0.60	0.10	8774640	0.60	0.10	8774640	0.61	0.10	8756874
Dissolved Zirconium (Zr)	ug/L	<1.0	1.0	8774640	<1.0	1.0	8774640	<1.0	1.0	8756874

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Bureau Veritas Job #: C3I6341
Report Date: 2023/08/04

Geofirma Engineering Ltd
Client Project #: 20-203-1
Site Location: IGNACE, ON
Your P.O. #: 202031-004
Sampler Initials: AC

TEST SUMMARY

Bureau Veritas ID: WFB936
Sample ID: IG_BH01_GW046
Matrix: Water

Collected: 2023/06/20
Shipped:
Received: 2023/06/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8772781	N/A	2023/07/07	Kien Tran
Carbonate, Bicarbonate and Hydroxide	CALC	8752229	N/A	2023/06/29	Automated Statchk
Anions	IC	8773451	N/A	2023/07/07	Lusine Khachatryan
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8751278	N/A	2023/06/28	Nimarta Singh
Fluoride	ISE	8758491	2023/06/28	2023/06/29	Kien Tran
Dissolved Metals Analysis by ICP	ICP	8831303	2023/08/03	2023/08/03	Suban Kanapathippllai
Dissolved Metals by ICPMS	ICP/MS	8774640	N/A	2023/07/10	Thuy Linh Nguyen
Total Metals Analysis by ICP	ICP	8759522	2023/06/29	2023/06/29	Suban Kanapathippllai
Iodide, Thiosulphate, Thiocyanate	IC/EC	8776552	N/A	2023/07/07	Kanwardeep Brar
Total Extractable Lanthanides-waters	ICP/MSMS	8792818	2023/06/29	2023/06/30	Darya Mitrofanova
Silica (Reactive)	KONE	8774912	N/A	2023/07/06	Shanna McKort
Ammonium as NH4+	CALC/NH3	8825936	N/A	2023/08/01	Automated Statchk
Total Ammonia-N	LACH/NH4	8755304	N/A	2023/06/29	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8755225	N/A	2023/06/27	Chandra Nandlal
Organic Nitrogen	CALC	8825937	N/A	2023/08/01	Automated Statchk
pH	AT	8758497	2023/06/28	2023/06/29	Kien Tran
Field Measured pH	PH	ONSITE	N/A	2023/08/01	Katherine Szozda
Orthophosphate	KONE	8755307	N/A	2023/06/28	Alina Dobreanu
Sulphide	ISE/S	8754316	N/A	2023/06/27	Taslima Aktar
Field Measured pH	PH	ONSITE	N/A	2023/08/01	Katherine Szozda
Total Inorganic Carbon (TIC)	TOCV/NDIR	8757488	N/A	2023/06/29	Nimarta Singh
Total Kjeldahl Nitrogen in Water	SKAL	8755171	2023/06/27	2023/06/28	Kruti Jitesh Patel
Total Nitrogen (calculated)	CALC	8752825	N/A	2023/06/29	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	8755191	N/A	2023/06/28	Nimarta Singh
Total Phosphorus (Colourimetric)	SKAL/P	8755202	2023/06/27	2023/06/29	Sachi Patel

Bureau Veritas ID: WFB936 Dup
Sample ID: IG_BH01_GW046
Matrix: Water

Collected: 2023/06/20
Shipped:
Received: 2023/06/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals Analysis by ICP	ICP	8831303	2023/08/03	2023/08/03	Suban Kanapathippllai
Dissolved Metals by ICPMS	ICP/MS	8774640	N/A	2023/07/10	Thuy Linh Nguyen
Silica (Reactive)	KONE	8774912	N/A	2023/07/06	Shanna McKort
Total Inorganic Carbon (TIC)	TOCV/NDIR	8757488	N/A	2023/06/29	Nimarta Singh

Bureau Veritas ID: WFB937
Sample ID: IG_BH01_GW047
Matrix: Water

Collected: 2023/06/21
Shipped:
Received: 2023/06/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8758508	N/A	2023/06/29	Kien Tran
Carbonate, Bicarbonate and Hydroxide	CALC	8752229	N/A	2023/06/29	Automated Statchk

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Bureau Veritas Job #: C3I6341
Report Date: 2023/08/04

Geofirma Engineering Ltd
Client Project #: 20-203-1
Site Location: IGNACE, ON
Your P.O. #: 202031-004
Sampler Initials: AC

TEST SUMMARY

Bureau Veritas ID: WFB937
Sample ID: IG_BH01_GW047
Matrix: Water

Collected: 2023/06/21
Shipped:
Received: 2023/06/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Anions	IC	8756960	N/A	2023/06/28	Lusine Khachatryan
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8751278	N/A	2023/06/28	Nimarta Singh
Fluoride	ISE	8758491	2023/06/28	2023/06/29	Kien Tran
Dissolved Metals Analysis by ICP	ICP	8755377	2023/06/27	2023/07/04	Thuy Linh Nguyen
Dissolved Metals by ICPMS	ICP/MS	8756874	N/A	2023/06/29	Azita Fazaeli
Total Metals Analysis by ICP	ICP	8759522	2023/06/29	2023/06/29	Suban Kanapathippllai
Iodide, Thiosulphate, Thiocyanate	IC/EC	8776552	N/A	2023/07/07	Kanwardeep Brar
Total Extractable Lanthanides-waters	ICP/MSMS	8792818	2023/06/29	2023/06/30	Darya Mitrofanova
Silica (Reactive)	KONE	8775461	N/A	2023/07/06	Shanna McKort
Ammonium as NH4+	CALC/NH3	8825936	N/A	2023/08/01	Automated Statchk
Total Ammonia-N	LACH/NH4	8755156	N/A	2023/06/28	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8755225	N/A	2023/06/27	Chandra Nandlal
Organic Nitrogen	CALC	8825937	N/A	2023/08/01	Automated Statchk
pH	AT	8758497	2023/06/28	2023/06/29	Kien Tran
Field Measured pH	PH	ONSITE	N/A	2023/08/01	Katherine Szozda
Orthophosphate	KONE	8755307	N/A	2023/06/28	Alina Dobreanu
Sulphide	ISE/S	8754316	N/A	2023/06/27	Taslima Aktar
Field Measured pH	PH	ONSITE	N/A	2023/08/01	Katherine Szozda
Total Inorganic Carbon (TIC)	TOCV/NDIR	8757488	N/A	2023/06/29	Nimarta Singh
Total Kjeldahl Nitrogen in Water	SKAL	8755171	2023/06/27	2023/06/28	Kruti Jitesh Patel
Total Nitrogen (calculated)	CALC	8752825	N/A	2023/06/29	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	8755191	N/A	2023/06/28	Nimarta Singh
Total Phosphorus (Colourimetric)	SKAL/P	8755202	2023/06/27	2023/06/29	Sachi Patel

Bureau Veritas ID: WFB937 Dup
Sample ID: IG_BH01_GW047
Matrix: Water

Collected: 2023/06/21
Shipped:
Received: 2023/06/23

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Iodide, Thiosulphate, Thiocyanate	IC/EC	8776552	N/A	2023/07/07	Kanwardeep Brar

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	0.7°C

Revised Report [2023/08/04]: Dissolved metals reworked for Ca, Sr, and Fe per client request
Revised Report [2023/08/01]: Ammonium and Total Organic Nitrogen added per client request

Sample WFB936 [IG_BH01_GW046] : TOC< DOC: Both values fall within the method uncertainty for duplicates and are likely equivalent. TOC < DOC: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Sample WFB937 [IG_BH01_GW047] : Sulphur < Sulphide: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Sample WFB936, Dissolved Metals Analysis by ICP: Test repeated.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8751278	NS3	Matrix Spike	Dissolved Organic Carbon	2023/06/28		95	%	80 - 120
8751278	NS3	Spiked Blank	Dissolved Organic Carbon	2023/06/28		94	%	80 - 120
8751278	NS3	Method Blank	Dissolved Organic Carbon	2023/06/28	<0.40		mg/L	
8751278	NS3	RPD	Dissolved Organic Carbon	2023/06/28	11		%	20
8754316	TAK	Matrix Spike	Sulphide	2023/06/27		85	%	80 - 120
8754316	TAK	Spiked Blank	Sulphide	2023/06/27		92	%	80 - 120
8754316	TAK	Method Blank	Sulphide	2023/06/27	<0.020		mg/L	
8754316	TAK	RPD	Sulphide	2023/06/27	NC		%	20
8755156	KPJ	Matrix Spike	Total Ammonia-N	2023/06/28		102	%	75 - 125
8755156	KPJ	Spiked Blank	Total Ammonia-N	2023/06/28		103	%	80 - 120
8755156	KPJ	Method Blank	Total Ammonia-N	2023/06/28	<0.050		mg/L	
8755156	KPJ	RPD	Total Ammonia-N	2023/06/28	19		%	20
8755171	KJP	Matrix Spike	Total Kjeldahl Nitrogen (TKN)	2023/06/28		98	%	80 - 120
8755171	KJP	QC Standard	Total Kjeldahl Nitrogen (TKN)	2023/06/28		100	%	80 - 120
8755171	KJP	Spiked Blank	Total Kjeldahl Nitrogen (TKN)	2023/06/28		102	%	80 - 120
8755171	KJP	Method Blank	Total Kjeldahl Nitrogen (TKN)	2023/06/28	<0.10		mg/L	
8755171	KJP	RPD	Total Kjeldahl Nitrogen (TKN)	2023/06/28	17		%	20
8755191	NS3	Matrix Spike	Total Organic Carbon (TOC)	2023/06/28		92	%	80 - 120
8755191	NS3	Spiked Blank	Total Organic Carbon (TOC)	2023/06/28		96	%	80 - 120
8755191	NS3	Method Blank	Total Organic Carbon (TOC)	2023/06/28	<0.40		mg/L	
8755191	NS3	RPD	Total Organic Carbon (TOC)	2023/06/28	2.8		%	20
8755202	SPC	Matrix Spike	Total Phosphorus	2023/06/28		99	%	80 - 120
8755202	SPC	QC Standard	Total Phosphorus	2023/06/28		111	%	80 - 120
8755202	SPC	Spiked Blank	Total Phosphorus	2023/06/28		103	%	80 - 120
8755202	SPC	Method Blank	Total Phosphorus	2023/06/28	<0.020		mg/L	
8755202	SPC	RPD	Total Phosphorus	2023/06/28	2.4		%	20
8755225	C_N	Matrix Spike	Nitrite (N)	2023/06/27		NC	%	80 - 120
			Nitrate (N)	2023/06/27		90	%	80 - 120
8755225	C_N	Spiked Blank	Nitrite (N)	2023/06/27		105	%	80 - 120
			Nitrate (N)	2023/06/27		93	%	80 - 120
8755225	C_N	Method Blank	Nitrite (N)	2023/06/27	<0.010		mg/L	
			Nitrate (N)	2023/06/27	<0.10		mg/L	
8755225	C_N	RPD	Nitrite (N)	2023/06/27	2.6		%	20
			Nitrate (N)	2023/06/27	NC		%	20
8755304	KPJ	Matrix Spike	Total Ammonia-N	2023/06/29		102	%	75 - 125
8755304	KPJ	Spiked Blank	Total Ammonia-N	2023/06/29		105	%	80 - 120
8755304	KPJ	Method Blank	Total Ammonia-N	2023/06/29	<0.050		mg/L	
8755304	KPJ	RPD	Total Ammonia-N	2023/06/29	9.4		%	20
8755307	ADB	Matrix Spike	Orthophosphate (P)	2023/06/28		88	%	75 - 125
8755307	ADB	Spiked Blank	Orthophosphate (P)	2023/06/28		91	%	80 - 120
8755307	ADB	Method Blank	Orthophosphate (P)	2023/06/28	<0.010		mg/L	
8755307	ADB	RPD	Orthophosphate (P)	2023/06/28	NC		%	20
8755377	TLG	Matrix Spike	Dissolved Iron (Fe)	2023/07/04		98	%	80 - 120
			Dissolved Sulphur (S)	2023/07/04		NC	%	80 - 120
8755377	TLG	Spiked Blank	Dissolved Iron (Fe)	2023/07/04		99	%	80 - 120
			Dissolved Sulphur (S)	2023/07/04		100	%	80 - 120
8755377	TLG	Method Blank	Dissolved Iron (Fe)	2023/07/04	<0.02		mg/L	
			Dissolved Sulphur (S)	2023/07/04	<0.5		mg/L	
8756874	AFZ	Matrix Spike	Dissolved Aluminum (Al)	2023/06/29		102	%	80 - 120
			Dissolved Arsenic (As)	2023/06/29		100	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Barium (Ba)	2023/06/29		99	%	80 - 120
			Dissolved Bismuth (Bi)	2023/06/29		100	%	80 - 120
			Dissolved Boron (B)	2023/06/29		107	%	80 - 120
			Dissolved Cadmium (Cd)	2023/06/29		100	%	80 - 120
			Dissolved Calcium (Ca)	2023/06/29		101	%	80 - 120
			Dissolved Cesium (Cs)	2023/06/29		99	%	80 - 120
			Dissolved Chromium (Cr)	2023/06/29		98	%	80 - 120
			Dissolved Cobalt (Co)	2023/06/29		96	%	80 - 120
			Dissolved Copper (Cu)	2023/06/29		98	%	80 - 120
			Dissolved Lead (Pb)	2023/06/29		95	%	80 - 120
			Dissolved Lithium (Li)	2023/06/29		99	%	80 - 120
			Dissolved Magnesium (Mg)	2023/06/29		98	%	80 - 120
			Dissolved Nickel (Ni)	2023/06/29		97	%	80 - 120
			Dissolved Potassium (K)	2023/06/29		100	%	80 - 120
			Dissolved Rubidium (Rb)	2023/06/29		101	%	80 - 120
			Dissolved Selenium (Se)	2023/06/29		100	%	80 - 120
			Dissolved Silicon (Si)	2023/06/29		103	%	80 - 120
			Dissolved Sodium (Na)	2023/06/29		98	%	80 - 120
			Dissolved Strontium (Sr)	2023/06/29		100	%	80 - 120
			Dissolved Thorium (Th)	2023/06/29		99	%	80 - 120
			Dissolved Uranium (U)	2023/06/29		102	%	80 - 120
			Dissolved Zirconium (Zr)	2023/06/29		103	%	80 - 120
8756874	AFZ	Spiked Blank	Dissolved Aluminum (Al)	2023/06/29		102	%	80 - 120
			Dissolved Arsenic (As)	2023/06/29		96	%	80 - 120
			Dissolved Barium (Ba)	2023/06/29		99	%	80 - 120
			Dissolved Bismuth (Bi)	2023/06/29		98	%	80 - 120
			Dissolved Boron (B)	2023/06/29		103	%	80 - 120
			Dissolved Cadmium (Cd)	2023/06/29		97	%	80 - 120
			Dissolved Calcium (Ca)	2023/06/29		101	%	80 - 120
			Dissolved Cesium (Cs)	2023/06/29		97	%	80 - 120
			Dissolved Chromium (Cr)	2023/06/29		95	%	80 - 120
			Dissolved Cobalt (Co)	2023/06/29		94	%	80 - 120
			Dissolved Copper (Cu)	2023/06/29		95	%	80 - 120
			Dissolved Lead (Pb)	2023/06/29		92	%	80 - 120
			Dissolved Lithium (Li)	2023/06/29		95	%	80 - 120
			Dissolved Magnesium (Mg)	2023/06/29		96	%	80 - 120
			Dissolved Nickel (Ni)	2023/06/29		94	%	80 - 120
			Dissolved Potassium (K)	2023/06/29		97	%	80 - 120
			Dissolved Rubidium (Rb)	2023/06/29		96	%	80 - 120
			Dissolved Selenium (Se)	2023/06/29		97	%	80 - 120
			Dissolved Silicon (Si)	2023/06/29		102	%	80 - 120
			Dissolved Sodium (Na)	2023/06/29		96	%	80 - 120
			Dissolved Strontium (Sr)	2023/06/29		98	%	80 - 120
			Dissolved Thorium (Th)	2023/06/29		96	%	80 - 120
			Dissolved Uranium (U)	2023/06/29		99	%	80 - 120
			Dissolved Zirconium (Zr)	2023/06/29		100	%	80 - 120
8756874	AFZ	Method Blank	Dissolved Aluminum (Al)	2023/06/29	<4.9		ug/L	
			Dissolved Arsenic (As)	2023/06/29	<1.0		ug/L	
			Dissolved Barium (Ba)	2023/06/29	<2.0		ug/L	
			Dissolved Bismuth (Bi)	2023/06/29	<1.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Boron (B)	2023/06/29	<10		ug/L	
			Dissolved Cadmium (Cd)	2023/06/29	<0.090		ug/L	
			Dissolved Calcium (Ca)	2023/06/29	<200		ug/L	
			Dissolved Cesium (Cs)	2023/06/29	<0.20		ug/L	
			Dissolved Chromium (Cr)	2023/06/29	<5.0		ug/L	
			Dissolved Cobalt (Co)	2023/06/29	<0.50		ug/L	
			Dissolved Copper (Cu)	2023/06/29	<0.90		ug/L	
			Dissolved Lead (Pb)	2023/06/29	<0.50		ug/L	
			Dissolved Lithium (Li)	2023/06/29	<5.0		ug/L	
			Dissolved Magnesium (Mg)	2023/06/29	<50		ug/L	
			Dissolved Nickel (Ni)	2023/06/29	<1.0		ug/L	
			Dissolved Potassium (K)	2023/06/29	<200		ug/L	
			Dissolved Rubidium (Rb)	2023/06/29	<0.20		ug/L	
			Dissolved Selenium (Se)	2023/06/29	<2.0		ug/L	
			Dissolved Silicon (Si)	2023/06/29	<50		ug/L	
			Dissolved Sodium (Na)	2023/06/29	<100		ug/L	
			Dissolved Strontium (Sr)	2023/06/29	<1.0		ug/L	
			Dissolved Thorium (Th)	2023/06/29	<2.0		ug/L	
			Dissolved Uranium (U)	2023/06/29	<0.10		ug/L	
			Dissolved Zirconium (Zr)	2023/06/29	<1.0		ug/L	
8756874	AFZ	RPD	Dissolved Aluminum (Al)	2023/06/29	1.1		%	20
			Dissolved Arsenic (As)	2023/06/29	NC		%	20
			Dissolved Barium (Ba)	2023/06/29	0.52		%	20
			Dissolved Bismuth (Bi)	2023/06/29	NC		%	20
			Dissolved Boron (B)	2023/06/29	NC		%	20
			Dissolved Cadmium (Cd)	2023/06/29	NC		%	20
			Dissolved Calcium (Ca)	2023/06/29	2.1		%	20
			Dissolved Chromium (Cr)	2023/06/29	NC		%	20
			Dissolved Cobalt (Co)	2023/06/29	NC		%	20
			Dissolved Copper (Cu)	2023/06/29	3.0		%	20
			Dissolved Lead (Pb)	2023/06/29	NC		%	20
			Dissolved Lithium (Li)	2023/06/29	NC		%	20
			Dissolved Magnesium (Mg)	2023/06/29	0.029		%	20
			Dissolved Nickel (Ni)	2023/06/29	NC		%	20
			Dissolved Potassium (K)	2023/06/29	0.39		%	20
			Dissolved Selenium (Se)	2023/06/29	NC		%	20
			Dissolved Silicon (Si)	2023/06/29	1.9		%	20
			Dissolved Sodium (Na)	2023/06/29	0.48		%	20
			Dissolved Strontium (Sr)	2023/06/29	1.4		%	20
			Dissolved Uranium (U)	2023/06/29	NC		%	20
			Dissolved Zirconium (Zr)	2023/06/29	NC		%	20
8756960	LKH	Matrix Spike [WFB936-01]	Dissolved Chloride (Cl-)	2023/06/28		99	%	80 - 120
			Dissolved Bromide (Br-)	2023/06/28		103	%	80 - 120
			Dissolved Sulphate (SO4)	2023/06/28		97	%	80 - 120
8756960	LKH	Spiked Blank	Dissolved Chloride (Cl-)	2023/06/28		98	%	70 - 130
			Dissolved Bromide (Br-)	2023/06/28		102	%	80 - 120
			Dissolved Sulphate (SO4)	2023/06/28		96	%	80 - 120
8756960	LKH	Method Blank	Dissolved Chloride (Cl-)	2023/06/28	<1.0		mg/L	
			Dissolved Bromide (Br-)	2023/06/28	<1.0		mg/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Sulphate (SO4)	2023/06/28	<1.0		mg/L	
8757488	NS3	Matrix Spike [WFB936-01]	Total Inorganic Carbon (C)	2023/06/29		98	%	80 - 120
8757488	NS3	Spiked Blank	Total Inorganic Carbon (C)	2023/06/29		99	%	80 - 120
8757488	NS3	Method Blank	Total Inorganic Carbon (C)	2023/06/29	<1		mg/L	
8757488	NS3	RPD [WFB936-01]	Total Inorganic Carbon (C)	2023/06/29	0.21		%	20
8758491	KIT	Matrix Spike	Fluoride (F-)	2023/06/28		104	%	80 - 120
8758491	KIT	Spiked Blank	Fluoride (F-)	2023/06/28		108	%	80 - 120
8758491	KIT	Method Blank	Fluoride (F-)	2023/06/28	<0.10		mg/L	
8758491	KIT	RPD	Fluoride (F-)	2023/06/28	3.3		%	20
8758497	KIT	Spiked Blank	pH	2023/06/28		102	%	98 - 103
8758497	KIT	RPD	pH	2023/06/28	0.13		%	N/A
8758508	KIT	Spiked Blank	Alkalinity (Total as CaCO3)	2023/06/28		95	%	85 - 115
8758508	KIT	Method Blank	Alkalinity (Total as CaCO3)	2023/06/28	<1.0		mg/L	
8758508	KIT	RPD	Alkalinity (Total as CaCO3)	2023/06/28	0.77		%	20
8759522	SUK	Matrix Spike	Total Iron (Fe)	2023/06/29		96	%	80 - 120
			Total Sulphur (S)	2023/06/29		NC	%	80 - 120
8759522	SUK	Spiked Blank	Total Iron (Fe)	2023/06/29		102	%	80 - 120
			Total Sulphur (S)	2023/06/29		100	%	80 - 120
8759522	SUK	Method Blank	Total Iron (Fe)	2023/06/29	<0.02		mg/L	
			Total Sulphur (S)	2023/06/29	<0.5		mg/L	
8772781	KIT	Spiked Blank	Alkalinity (Total as CaCO3)	2023/07/06		95	%	85 - 115
8772781	KIT	Method Blank	Alkalinity (Total as CaCO3)	2023/07/06	<1.0		mg/L	
8772781	KIT	RPD	Alkalinity (Total as CaCO3)	2023/07/06	2.4		%	20
8773451	LKH	Matrix Spike	Dissolved Chloride (Cl-)	2023/07/07		90	%	80 - 120
			Dissolved Bromide (Br-)	2023/07/07		93	%	80 - 120
			Dissolved Sulphate (SO4)	2023/07/07		87	%	80 - 120
8773451	LKH	Spiked Blank	Dissolved Chloride (Cl-)	2023/07/07		98	%	70 - 130
			Dissolved Bromide (Br-)	2023/07/07		101	%	80 - 120
			Dissolved Sulphate (SO4)	2023/07/07		95	%	80 - 120
8773451	LKH	Method Blank	Dissolved Chloride (Cl-)	2023/07/07	<1.0		mg/L	
			Dissolved Bromide (Br-)	2023/07/07	<1.0		mg/L	
			Dissolved Sulphate (SO4)	2023/07/07	<1.0		mg/L	
8773451	LKH	RPD	Dissolved Bromide (Br-)	2023/07/07	NC		%	20
8774640	TLG	Matrix Spike [WFB936-04]	Dissolved Aluminum (Al)	2023/07/10		105	%	80 - 120
			Dissolved Arsenic (As)	2023/07/10		103	%	80 - 120
			Dissolved Barium (Ba)	2023/07/10		102	%	80 - 120
			Dissolved Bismuth (Bi)	2023/07/10		104	%	80 - 120
			Dissolved Boron (B)	2023/07/10		107	%	80 - 120
			Dissolved Cadmium (Cd)	2023/07/10		102	%	80 - 120
			Dissolved Cesium (Cs)	2023/07/10		102	%	80 - 120
			Dissolved Chromium (Cr)	2023/07/10		100	%	80 - 120
			Dissolved Cobalt (Co)	2023/07/10		99	%	80 - 120
			Dissolved Copper (Cu)	2023/07/10		102	%	80 - 120
			Dissolved Lead (Pb)	2023/07/10		98	%	80 - 120
			Dissolved Lithium (Li)	2023/07/10		102	%	80 - 120
			Dissolved Magnesium (Mg)	2023/07/10		103	%	80 - 120
			Dissolved Nickel (Ni)	2023/07/10		100	%	80 - 120
			Dissolved Potassium (K)	2023/07/10		104	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Rubidium (Rb)	2023/07/10		103	%	80 - 120
			Dissolved Selenium (Se)	2023/07/10		104	%	80 - 120
			Dissolved Silicon (Si)	2023/07/10		108	%	80 - 120
			Dissolved Sodium (Na)	2023/07/10		NC	%	80 - 120
			Dissolved Thorium (Th)	2023/07/10		101	%	80 - 120
			Dissolved Uranium (U)	2023/07/10		107	%	80 - 120
			Dissolved Zirconium (Zr)	2023/07/10		107	%	80 - 120
8774640	TLG	Spiked Blank	Dissolved Aluminum (Al)	2023/07/10		101	%	80 - 120
			Dissolved Arsenic (As)	2023/07/10		97	%	80 - 120
			Dissolved Barium (Ba)	2023/07/10		97	%	80 - 120
			Dissolved Bismuth (Bi)	2023/07/10		102	%	80 - 120
			Dissolved Boron (B)	2023/07/10		102	%	80 - 120
			Dissolved Cadmium (Cd)	2023/07/10		97	%	80 - 120
			Dissolved Cesium (Cs)	2023/07/10		98	%	80 - 120
			Dissolved Chromium (Cr)	2023/07/10		96	%	80 - 120
			Dissolved Cobalt (Co)	2023/07/10		95	%	80 - 120
			Dissolved Copper (Cu)	2023/07/10		98	%	80 - 120
			Dissolved Lead (Pb)	2023/07/10		96	%	80 - 120
			Dissolved Lithium (Li)	2023/07/10		100	%	80 - 120
			Dissolved Magnesium (Mg)	2023/07/10		98	%	80 - 120
			Dissolved Nickel (Ni)	2023/07/10		96	%	80 - 120
			Dissolved Potassium (K)	2023/07/10		100	%	80 - 120
			Dissolved Rubidium (Rb)	2023/07/10		97	%	80 - 120
			Dissolved Selenium (Se)	2023/07/10		100	%	80 - 120
			Dissolved Silicon (Si)	2023/07/10		105	%	80 - 120
			Dissolved Sodium (Na)	2023/07/10		99	%	80 - 120
			Dissolved Thorium (Th)	2023/07/10		99	%	80 - 120
			Dissolved Uranium (U)	2023/07/10		104	%	80 - 120
			Dissolved Zirconium (Zr)	2023/07/10		101	%	80 - 120
8774640	TLG	Method Blank	Dissolved Aluminum (Al)	2023/07/10	<4.9		ug/L	
			Dissolved Arsenic (As)	2023/07/10	<1.0		ug/L	
			Dissolved Barium (Ba)	2023/07/10	<2.0		ug/L	
			Dissolved Bismuth (Bi)	2023/07/10	<1.0		ug/L	
			Dissolved Boron (B)	2023/07/10	<10		ug/L	
			Dissolved Cadmium (Cd)	2023/07/10	<0.090		ug/L	
			Dissolved Cesium (Cs)	2023/07/10	<0.20		ug/L	
			Dissolved Chromium (Cr)	2023/07/10	<5.0		ug/L	
			Dissolved Cobalt (Co)	2023/07/10	<0.50		ug/L	
			Dissolved Copper (Cu)	2023/07/10	<0.90		ug/L	
			Dissolved Lead (Pb)	2023/07/10	<0.50		ug/L	
			Dissolved Lithium (Li)	2023/07/10	<5.0		ug/L	
			Dissolved Magnesium (Mg)	2023/07/10	<50		ug/L	
			Dissolved Nickel (Ni)	2023/07/10	<1.0		ug/L	
			Dissolved Potassium (K)	2023/07/10	<200		ug/L	
			Dissolved Rubidium (Rb)	2023/07/10	<0.20		ug/L	
			Dissolved Selenium (Se)	2023/07/10	<2.0		ug/L	
			Dissolved Silicon (Si)	2023/07/10	<50		ug/L	
			Dissolved Sodium (Na)	2023/07/10	<100		ug/L	
			Dissolved Thorium (Th)	2023/07/10	<2.0		ug/L	
			Dissolved Uranium (U)	2023/07/10	<0.10		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Zirconium (Zr)	2023/07/10	<1.0		ug/L	
8774640	TLG	RPD [WFB936-04]	Dissolved Aluminum (Al)	2023/07/10	NC		%	20
			Dissolved Arsenic (As)	2023/07/10	NC		%	20
			Dissolved Barium (Ba)	2023/07/10	0.82		%	20
			Dissolved Bismuth (Bi)	2023/07/10	NC		%	20
			Dissolved Boron (B)	2023/07/10	0.15		%	20
			Dissolved Cadmium (Cd)	2023/07/10	NC		%	20
			Dissolved Cesium (Cs)	2023/07/10	NC		%	20
			Dissolved Chromium (Cr)	2023/07/10	NC		%	20
			Dissolved Cobalt (Co)	2023/07/10	NC		%	20
			Dissolved Copper (Cu)	2023/07/10	NC		%	20
			Dissolved Lead (Pb)	2023/07/10	NC		%	20
			Dissolved Lithium (Li)	2023/07/10	0.32		%	20
			Dissolved Magnesium (Mg)	2023/07/10	3.3		%	20
			Dissolved Nickel (Ni)	2023/07/10	NC		%	20
			Dissolved Potassium (K)	2023/07/10	1.3		%	20
			Dissolved Rubidium (Rb)	2023/07/10	2.6		%	20
			Dissolved Selenium (Se)	2023/07/10	NC		%	20
			Dissolved Silicon (Si)	2023/07/10	1.8		%	20
			Dissolved Sodium (Na)	2023/07/10	0.63		%	20
			Dissolved Thorium (Th)	2023/07/10	NC		%	20
			Dissolved Uranium (U)	2023/07/10	0.83		%	20
			Dissolved Zirconium (Zr)	2023/07/10	NC		%	20
8774912	éH2	Matrix Spike [WFB936-02]	Reactive Silica (SiO2)	2023/07/06		NC	%	80 - 120
8774912	éH2	Spiked Blank	Reactive Silica (SiO2)	2023/07/06		104	%	80 - 120
8774912	éH2	Method Blank	Reactive Silica (SiO2)	2023/07/06	<0.050		mg/L	
8774912	éH2	RPD [WFB936-02]	Reactive Silica (SiO2)	2023/07/06	4.5		%	20
8775461	éH2	Matrix Spike	Reactive Silica (SiO2)	2023/07/06		95	%	80 - 120
8775461	éH2	Spiked Blank	Reactive Silica (SiO2)	2023/07/06		106	%	80 - 120
8775461	éH2	Method Blank	Reactive Silica (SiO2)	2023/07/06	<0.050		mg/L	
8775461	éH2	RPD	Reactive Silica (SiO2)	2023/07/06	1.7		%	20
8776552	KDB	Matrix Spike	Dissolved Iodide	2023/07/07		96	%	80 - 120
8776552	KDB	Spiked Blank	Dissolved Iodide	2023/07/07		100	%	80 - 120
8776552	KDB	Method Blank	Dissolved Iodide	2023/07/07	<0.10		mg/L	
8776552	KDB	RPD [WFB937-02]	Dissolved Iodide	2023/07/07	NC		%	20
8792818	DMI	Spiked Blank	Total Ruthenium (Ru)	2023/06/30		100	%	80 - 120
8792818	DMI	Method Blank	Total Ruthenium (Ru)	2023/06/30	<2.0		ug/L	
8831303	SUK	Matrix Spike [WFB936-04]	Dissolved Iron (Fe)	2023/08/03		95	%	80 - 120
8831303	SUK	Spiked Blank	Dissolved Iron (Fe)	2023/08/03		100	%	80 - 120
8831303	SUK	Method Blank	Dissolved Iron (Fe)	2023/08/03	<0.02		mg/L	
8831303	SUK	RPD [WFB936-04]	Dissolved Iron (Fe)	2023/08/03	9.4		%	25
8831304	TLG	Matrix Spike	Dissolved Calcium (Ca)	2023/08/03		111	%	80 - 120
			Dissolved Strontium (Sr)	2023/08/03		NC	%	80 - 120
8831304	TLG	Spiked Blank	Dissolved Calcium (Ca)	2023/08/03		100	%	80 - 120
			Dissolved Strontium (Sr)	2023/08/03		96	%	80 - 120
8831304	TLG	Method Blank	Dissolved Calcium (Ca)	2023/08/03	<200		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Strontium (Sr)	2023/08/03	<1.0		ug/L	

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Bureau Veritas Job #: C3I6341
Report Date: 2023/08/04

Geofirma Engineering Ltd
Client Project #: 20-203-1
Site Location: IGNACE, ON
Your P.O. #: 202031-004
Sampler Initials: AC

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

CHIMISTE Mira El Masri 2021-087 QUÉBEC

Mira El Masri, M.Sc. Chemist, Montréal, Analyst II

Katherine Szozda

Katherine Szozda, Project Manager

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

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Your Project #: 202031
Your C.O.C. #: 935463-01-01

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2023/07/28
Report #: R7739398
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3J1206
Received: 2023/06/28, 10:10

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	2	N/A	2023/07/04	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	2	N/A	2023/07/04	CAM SOP-00102	APHA 4500-CO2 D
Anions	3	N/A	2023/07/04	CAM SOP-00435	SM 23 4110 B m
Dissolved Organic Carbon (DOC) (3)	1	N/A	2023/07/12	CAM SOP-00446	SM 23 5310 B m
Dissolved Organic Carbon (DOC) (3)	1	N/A	2023/07/05	CAM SOP-00446	SM 23 5310 B m
Fluoride	2	2023/06/30	2023/07/04	CAM SOP-00449	SM 23 4500-F C m
Fluoride	1	2023/07/05	2023/07/05	CAM SOP-00449	SM 23 4500-F C m
Dissolved Metals Analysis by ICP	3	2023/07/01	2023/07/06	CAM SOP-00408	EPA 6010D m
Dissolved Metals by ICPMS	2	N/A	2023/07/04	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS	1	N/A	2023/07/09	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICP	2	2023/07/04	2023/07/05	CAM SOP-00408	EPA 6010D m
Iodide, Thiosulphate, Thiocyanate (1)	3	N/A	2023/07/11	CAL SOP-00057	Dionex #034035 R09 m
Total Extractable Lanthanides-waters (2, 4)	2	2023/07/10	2023/07/11	STL SOP-00071	MA.200–Mét. 1.2 R5 m
Silica (Reactive) (1)	2	N/A	2023/07/06	AB SOP-00011	EPA370.1 R1978 m
Ammonium as NH4+	2	N/A	2023/07/28		
Total Ammonia-N	2	N/A	2023/07/04	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (5)	2	N/A	2023/07/04	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Nitrate & Nitrite as Nitrogen in Water (5)	1	N/A	2023/07/05	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Organic Nitrogen	2	N/A	2023/07/06	Auto Calc.	
pH	2	2023/06/30	2023/07/04	CAM SOP-00413	SM 4500H+ B m
Field Measured pH (6)	2	N/A	2023/07/28		Field pH Meter
Orthophosphate	2	N/A	2023/07/04	CAM SOP-00461	SM 23 4500-P E m
Orthophosphate	1	N/A	2023/07/05	CAM SOP-00461	SM 23 4500-P E m
Sulphide	2	N/A	2023/06/30	CAM SOP-00455	SM 23 4500-S G m
Field Temperature (6)	2	N/A	2023/07/28		Field Thermometer
Total Inorganic Carbon (TIC)	2	N/A	2023/07/05	CAM SOP-00433	SM 23 5310 m
Total Kjeldahl Nitrogen in Water	2	2023/07/04	2023/07/05	CAM SOP-00938	OMOE E3516 m
Total Nitrogen (calculated)	2	N/A	2023/07/06	Auto Calc.	
Total Organic Carbon (TOC) (7)	1	N/A	2023/07/12	CAM SOP-00446	SM 23 5310B m
Total Organic Carbon (TOC) (7)	1	N/A	2023/07/05	CAM SOP-00446	SM 23 5310B m

Your Project #: 202031
Your C.O.C. #: 935463-01-01

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2023/07/28
Report #: R7739398
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3J1206
Received: 2023/06/28, 10:10

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Total Phosphorus (Colourimetric)	1	2023/07/04	2023/07/05	CAM SOP-00407	SM 23 4500-P I
Total Phosphorus (Colourimetric)	1	2023/07/04	2023/07/06	CAM SOP-00407	SM 23 4500-P I

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
(1) This test was performed by Bureau Veritas Calgary (19th), 4000 19th Street NE , Calgary, AB, T2E 6P8
(2) This test was performed by Bureau Veritas Montreal., 889 Montée de Liesse , Ville St-Laurent, QC, H4T 1P5
(3) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(4) Non-accredited test method
(5) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(6) This is a field test, therefore, the results relate to items that were not analysed at Bureau Veritas.
(7) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Your Project #: 202031
Your C.O.C. #: 935463-01-01

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2023/07/28
Report #: R7739398
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3J1206
Received: 2023/06/28, 10:10

Encryption Key

Bureau Veritas
28 Jul 2023 11:24:46

Please direct all questions regarding this Certificate of Analysis to:
Katherine Szozda, Project Manager
Email: Katherine.Szozda@bureauveritas.com
Phone# (613)274-0573 Ext:7063633
==========
This report has been generated and distributed using a secure automated process.
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RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		WGC099			WGC100		
Sampling Date		2023/06/20 10:30			2023/06/21 16:00		
COC Number		935463-01-01			935463-01-01		
	UNITS	**IG_BH01_GW042**	**RDL**	**QC Batch**	**IG_BH01_GW044**	**RDL**	**QC Batch**
Calculated Parameters							
Ammonium (NH4)	mg/L				0.17	0.05	8763053
Bicarb. Alkalinity (calc. as CaCO3)	mg/L				5.4	1.0	8763050
Carb. Alkalinity (calc. as CaCO3)	mg/L				<1.0	1.0	8763050
Hydrox. Alkalinity (calc. as CaCO3)	mg/L				<1.0	1.0	8763050
Total Nitrogen (N)	mg/L				6.3	2.0	8763055
Total Organic Nitrogen	mg/L				6.2	0.10	8763054
Field Measurements							
Field Temperature	Celsius				21.46	N/A	ONSITE
Field Measured pH	pH				8.12		ONSITE
Inorganics							
Total Ammonia-N	mg/L				0.14	0.050	8764063
Fluoride (F-)	mg/L	<0.10	0.10	8769893	0.65	0.10	8764062
Total Inorganic Carbon (C)	mg/L				1	1	8765112
Dissolved Iodide	mg/L	<0.10 (1)	0.10	8776552	<10 (1)	10	8776552
Total Kjeldahl Nitrogen (TKN)	mg/L				6.3	2.0	8766865
Dissolved Organic Carbon	mg/L				2.4	0.40	8784250
Total Organic Carbon (TOC)	mg/L				1.2	0.40	8783728
Orthophosphate (P)	mg/L	<0.010	0.010	8768964	<0.010	0.010	8764938
pH	pH				6.79		8764070
Total Phosphorus	mg/L				<0.020	0.020	8766805
Reactive Silica (SiO2)	mg/L				20	0.55	8775493
Sulphide	mg/L				<0.020	0.020	8762834
Alkalinity (Total as CaCO3)	mg/L				5.4	1.0	8764066
Nitrite (N)	mg/L	<0.010	0.010	8767414	<0.10	0.10	8764094
Dissolved Chloride (Cl-)	mg/L	<1.0	1.0	8763884	19000	100	8763884
Nitrate (N)	mg/L	<0.10	0.10	8767414	<1.0	1.0	8764094
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	8767414	<1.0	1.0	8764094
Dissolved Bromide (Br-)	mg/L	<1.0	1.0	8763884	290 (2)	100	8763884
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	8763884	350 (2)	100	8763884
Metals							
Total Ruthenium (Ru)	ug/L				<2.0	2.0	8794997

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Detection limits raised due to matrix interference.
(2) Due to high concentrations of the target analyte (Cl), sample required dilution. Detection limits were adjusted accordingly.

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RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		WGC101			WGC101		
Sampling Date		2023/06/21 16:00			2023/06/21 16:00		
COC Number		935463-01-01			935463-01-01		
	UNITS	**IG_BH01_GW045**	**RDL**	**QC Batch**	**IG_BH01_GW045 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters							
Ammonium (NH4)	mg/L	0.17	0.05	8763053			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	4.8	1.0	8763050			
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	8763050			
Hydrox. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	8763050			
Total Nitrogen (N)	mg/L	6.7	2.0	8763055			
Total Organic Nitrogen	mg/L	6.5	0.10	8763054			
Field Measurements							
Field Temperature	Celsius	21.46	N/A	ONSITE			
Field Measured pH	pH	8.12		ONSITE			
Inorganics							
Total Ammonia-N	mg/L	0.14	0.050	8764063			
Fluoride (F-)	mg/L	0.66	0.10	8764062			
Total Inorganic Carbon (C)	mg/L	1	1	8765112	1	1	8765112
Dissolved Iodide	mg/L	<10 (1)	10	8776552			
Total Kjeldahl Nitrogen (TKN)	mg/L	6.7	2.0	8766865			
Dissolved Organic Carbon	mg/L	1.5	0.40	8763652			
Total Organic Carbon (TOC)	mg/L	0.98	0.40	8768867			
Orthophosphate (P)	mg/L	<0.010	0.010	8764938			
pH	pH	7.07		8764070			
Total Phosphorus	mg/L	<0.020	0.020	8766805			
Reactive Silica (SiO2)	mg/L	16	0.55	8775493			
Sulphide	mg/L	<0.020	0.020	8762834			
Alkalinity (Total as CaCO3)	mg/L	4.8	1.0	8764066			
Nitrite (N)	mg/L	<0.050	0.050	8763931			
Dissolved Chloride (Cl-)	mg/L	19000	100	8763884			
Nitrate (N)	mg/L	<0.50	0.50	8763931			
Nitrate + Nitrite (N)	mg/L	<0.50	0.50	8763931			
Dissolved Bromide (Br-)	mg/L	310 (2)	100	8763884			
Dissolved Sulphate (SO4)	mg/L	360 (2)	100	8763884			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Detection limits raised due to matrix interference.
(2) Due to high concentrations of the target analyte (Cl), sample required dilution. Detection limits were adjusted accordingly.

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RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		WGC101			WGC101		
Sampling Date		2023/06/21 16:00			2023/06/21 16:00		
COC Number		935463-01-01			935463-01-01		
	UNITS	**IG_BH01_GW045**	**RDL**	**QC Batch**	**IG_BH01_GW045 Lab-Dup**	**RDL**	**QC Batch**
Metals							
Total Ruthenium (Ru)	ug/L	<2.0	2.0	8794997			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		WGC099			WGC099			WGC100		
Sampling Date		2023/06/20 10:30			2023/06/20 10:30			2023/06/21 16:00		
COC Number		935463-01-01			935463-01-01			935463-01-01		
	UNITS	**IG_BH01_GW042**	**RDL**	**QC Batch**	**IG_BH01_GW042 Lab-Dup**	**RDL**	**QC Batch**	**IG_BH01_GW044**	**RDL**	**QC Batch**
Metals										
Dissolved Iron (Fe)	mg/L	<0.02	0.02	8765052				0.48	0.02	8765052
Total Iron (Fe)	mg/L							1.9	0.02	8767169
Dissolved Sulphur (S)	mg/L	<0.5	0.5	8765052				130	0.5	8765052
Total Sulphur (S)	mg/L							130	0.5	8767169
Dissolved Aluminum (Al)	ug/L	<4.9	4.9	8774794	<4.9	4.9	8774794	11	4.9	8764868
Dissolved Arsenic (As)	ug/L	<1.0	1.0	8774794	<1.0	1.0	8774794	<1.0	1.0	8764868
Dissolved Barium (Ba)	ug/L	<2.0	2.0	8774794	<2.0	2.0	8774794	280	2.0	8764868
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	8774794	<1.0	1.0	8774794	<1.0	1.0	8764868
Dissolved Boron (B)	ug/L	<10	10	8774794	<10	10	8774794	430	10	8764868
Dissolved Cadmium (Cd)	ug/L	<0.090	0.090	8774794	<0.090	0.090	8774794	0.13	0.090	8764868
Dissolved Calcium (Ca)	ug/L	560	200	8774794	550	200	8774794	8900000	10000	8764868
Dissolved Cesium (Cs)	ug/L	<0.20	0.20	8774794	<0.20	0.20	8774794	1.2	0.20	8764868
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	8774794	<5.0	5.0	8774794	<5.0	5.0	8764868
Dissolved Cobalt (Co)	ug/L	<0.50	0.50	8774794	<0.50	0.50	8774794	<0.50	0.50	8764868
Dissolved Copper (Cu)	ug/L	<0.90	0.90	8774794	<0.90	0.90	8774794	<0.90	0.90	8764868
Dissolved Lead (Pb)	ug/L	<0.50	0.50	8774794	<0.50	0.50	8774794	<0.50	0.50	8764868
Dissolved Lithium (Li)	ug/L	<5.0	5.0	8774794	<5.0	5.0	8774794	75	5.0	8764868
Dissolved Magnesium (Mg)	ug/L	<50	50	8774794	<50	50	8774794	5500	50	8764868
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	8774794	<1.0	1.0	8774794	2.2	1.0	8764868
Dissolved Potassium (K)	ug/L	<200	200	8774794	<200	200	8774794	18000	200	8764868
Dissolved Rubidium (Rb)	ug/L	<0.20	0.20	8774794	<0.20	0.20	8774794	38	0.20	8764868
Dissolved Selenium (Se)	ug/L	<2.0	2.0	8774794	<2.0	2.0	8774794	<2.0	2.0	8764868
Dissolved Silicon (Si)	ug/L	<50	50	8774794	<50	50	8774794	3100	50	8764868
Dissolved Sodium (Na)	ug/L	<100	100	8774794	<100	100	8774794	1300000	500	8764868
Dissolved Strontium (Sr)	ug/L	4.8	1.0	8774794	4.6	1.0	8774794	120000	5.0	8764868
Dissolved Thorium (Th)	ug/L	<2.0	2.0	8774794	<2.0	2.0	8774794	<2.0	2.0	8764868
Dissolved Uranium (U)	ug/L	<0.10	0.10	8774794	<0.10	0.10	8774794	0.12	0.10	8764868
Dissolved Zirconium (Zr)	ug/L	<1.0	1.0	8774794	<1.0	1.0	8774794	<1.0	1.0	8764868

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		WGC100			WGC101		
Sampling Date		2023/06/21 16:00			2023/06/21 16:00		
COC Number		935463-01-01			935463-01-01		
	UNITS	**IG_BH01_GW044 Lab-Dup**	**RDL**	**QC Batch**	**IG_BH01_GW045**	**RDL**	**QC Batch**
Metals							
Dissolved Iron (Fe)	mg/L	0.45	0.02	8765052	0.47	0.02	8765052
Total Iron (Fe)	mg/L				1.6	0.02	8767169
Dissolved Sulphur (S)	mg/L	130	0.5	8765052	130	0.5	8765052
Total Sulphur (S)	mg/L				130	0.5	8767169
Dissolved Aluminum (Al)	ug/L				11	4.9	8764868
Dissolved Arsenic (As)	ug/L				<1.0	1.0	8764868
Dissolved Barium (Ba)	ug/L				270	2.0	8764868
Dissolved Bismuth (Bi)	ug/L				<1.0	1.0	8764868
Dissolved Boron (B)	ug/L				420	10	8764868
Dissolved Cadmium (Cd)	ug/L				0.19	0.090	8764868
Dissolved Calcium (Ca)	ug/L				10000000	10000	8764868
Dissolved Cesium (Cs)	ug/L				1.1	0.20	8764868
Dissolved Chromium (Cr)	ug/L				<5.0	5.0	8764868
Dissolved Cobalt (Co)	ug/L				<0.50	0.50	8764868
Dissolved Copper (Cu)	ug/L				<0.90	0.90	8764868
Dissolved Lead (Pb)	ug/L				<0.50	0.50	8764868
Dissolved Lithium (Li)	ug/L				70	5.0	8764868
Dissolved Magnesium (Mg)	ug/L				5000	50	8764868
Dissolved Nickel (Ni)	ug/L				2.3	1.0	8764868
Dissolved Potassium (K)	ug/L				17000	200	8764868
Dissolved Rubidium (Rb)	ug/L				38	0.20	8764868
Dissolved Selenium (Se)	ug/L				<2.0	2.0	8764868
Dissolved Silicon (Si)	ug/L				3100	50	8764868
Dissolved Sodium (Na)	ug/L				1300000	500	8764868
Dissolved Strontium (Sr)	ug/L				120000	5.0	8764868
Dissolved Thorium (Th)	ug/L				<2.0	2.0	8764868
Dissolved Uranium (U)	ug/L				0.14	0.10	8764868
Dissolved Zirconium (Zr)	ug/L				<1.0	1.0	8764868

RDL = Reportable Detection Limit
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Lab-Dup = Laboratory Initiated Duplicate

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TEST SUMMARY

Bureau Veritas ID: WGC099
Sample ID: IG_BH01_GW042
Matrix: Water

Collected: 2023/06/20
Shipped:
Received: 2023/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Anions	IC	8763884	N/A	2023/07/04	Lusine Khachatryan
Fluoride	ISE	8769893	2023/07/05	2023/07/05	Kien Tran
Dissolved Metals Analysis by ICP	ICP	8765052	2023/07/01	2023/07/06	Thuy Linh Nguyen
Dissolved Metals by ICPMS	ICP/MS	8774794	N/A	2023/07/09	Azita Fazaeli
Iodide, Thiosulphate, Thiocyanate	IC/EC	8776552	N/A	2023/07/11	Kanwardeep Brar
Nitrate & Nitrite as Nitrogen in Water	LACH	8767414	N/A	2023/07/05	Chandra Nandlal
Orthophosphate	KONE	8768964	N/A	2023/07/05	Massarat Jan

Bureau Veritas ID: WGC099 Dup
Sample ID: IG_BH01_GW042
Matrix: Water

Collected: 2023/06/20
Shipped:
Received: 2023/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals by ICPMS	ICP/MS	8774794	N/A	2023/07/09	Azita Fazaeli

Bureau Veritas ID: WGC100
Sample ID: IG_BH01_GW044
Matrix: Water

Collected: 2023/06/21
Shipped:
Received: 2023/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8764066	N/A	2023/07/04	Kien Tran
Carbonate, Bicarbonate and Hydroxide	CALC	8763050	N/A	2023/07/04	Automated Statchk
Anions	IC	8763884	N/A	2023/07/04	Lusine Khachatryan
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8784250	N/A	2023/07/12	Gyulshen Idriz
Fluoride	ISE	8764062	2023/06/30	2023/07/04	Kien Tran
Dissolved Metals Analysis by ICP	ICP	8765052	2023/07/01	2023/07/06	Thuy Linh Nguyen
Dissolved Metals by ICPMS	ICP/MS	8764868	N/A	2023/07/04	Prempal Bhatti
Total Metals Analysis by ICP	ICP	8767169	2023/07/04	2023/07/05	Thuy Linh Nguyen
Iodide, Thiosulphate, Thiocyanate	IC/EC	8776552	N/A	2023/07/11	Kanwardeep Brar
Total Extractable Lanthanides-waters	ICP/MSMS	8794997	2023/07/10	2023/07/11	Darya Mitrofanova
Silica (Reactive)	KONE	8775493	N/A	2023/07/06	Shanna McKort
Ammonium as NH4+	CALC/NH3	8763053	N/A	2023/07/28	Automated Statchk
Total Ammonia-N	LACH/NH4	8764063	N/A	2023/07/04	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8764094	N/A	2023/07/04	Chandra Nandlal
Organic Nitrogen	CALC	8763054	N/A	2023/07/06	Automated Statchk
pH	AT	8764070	2023/06/30	2023/07/04	Kien Tran
Field Measured pH	PH	ONSITE	N/A	2023/07/28	Katherine Szozda
Orthophosphate	KONE	8764938	N/A	2023/07/04	Massarat Jan
Sulphide	ISE/S	8762834	N/A	2023/06/30	Taslima Aktar
Field Measured pH	PH	ONSITE	N/A	2023/07/28	Katherine Szozda
Total Inorganic Carbon (TIC)	TOCV/NDIR	8765112	N/A	2023/07/05	Gyulshen Idriz
Total Kjeldahl Nitrogen in Water	SKAL	8766865	2023/07/04	2023/07/05	Rajni Tyagi
Total Nitrogen (calculated)	CALC	8763055	N/A	2023/07/06	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	8783728	N/A	2023/07/12	Gyulshen Idriz
Total Phosphorus (Colourimetric)	SKAL/P	8766805	2023/07/04	2023/07/06	Sachi Patel

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TEST SUMMARY

Bureau Veritas ID: WGC100 Dup
Sample ID: IG_BH01_GW044
Matrix: Water

Collected: 2023/06/21
Shipped:
Received: 2023/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals Analysis by ICP	ICP	8765052	2023/07/01	2023/07/06	Thuy Linh Nguyen

Bureau Veritas ID: WGC101
Sample ID: IG_BH01_GW045
Matrix: Water

Collected: 2023/06/21
Shipped:
Received: 2023/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8764066	N/A	2023/07/04	Kien Tran
Carbonate, Bicarbonate and Hydroxide	CALC	8763050	N/A	2023/07/04	Automated Statchk
Anions	IC	8763884	N/A	2023/07/04	Lusine Khachatryan
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8763652	N/A	2023/07/05	Gyulshen Idriz
Fluoride	ISE	8764062	2023/06/30	2023/07/04	Kien Tran
Dissolved Metals Analysis by ICP	ICP	8765052	2023/07/01	2023/07/06	Thuy Linh Nguyen
Dissolved Metals by ICPMS	ICP/MS	8764868	N/A	2023/07/04	Prempal Bhatti
Total Metals Analysis by ICP	ICP	8767169	2023/07/04	2023/07/05	Thuy Linh Nguyen
Iodide, Thiosulphate, Thiocyanate	IC/EC	8776552	N/A	2023/07/11	Kanwardeep Brar
Total Extractable Lanthanides-waters	ICP/MSMS	8794997	2023/07/10	2023/07/11	Darya Mitrofanova
Silica (Reactive)	KONE	8775493	N/A	2023/07/06	Shanna McKort
Ammonium as NH4+	CALC/NH3	8763053	N/A	2023/07/28	Automated Statchk
Total Ammonia-N	LACH/NH4	8764063	N/A	2023/07/04	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8763931	N/A	2023/07/04	Chandra Nandlal
Organic Nitrogen	CALC	8763054	N/A	2023/07/06	Automated Statchk
pH	AT	8764070	2023/06/30	2023/07/04	Kien Tran
Field Measured pH	PH	ONSITE	N/A	2023/07/28	Katherine Szozda
Orthophosphate	KONE	8764938	N/A	2023/07/04	Massarat Jan
Sulphide	ISE/S	8762834	N/A	2023/06/30	Taslima Aktar
Field Measured pH	PH	ONSITE	N/A	2023/07/28	Katherine Szozda
Total Inorganic Carbon (TIC)	TOCV/NDIR	8765112	N/A	2023/07/05	Gyulshen Idriz
Total Kjeldahl Nitrogen in Water	SKAL	8766865	2023/07/04	2023/07/05	Rajni Tyagi
Total Nitrogen (calculated)	CALC	8763055	N/A	2023/07/06	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	8768867	N/A	2023/07/05	Gyulshen Idriz
Total Phosphorus (Colourimetric)	SKAL/P	8766805	2023/07/04	2023/07/05	Sachi Patel

Bureau Veritas ID: WGC101 Dup
Sample ID: IG_BH01_GW045
Matrix: Water

Collected: 2023/06/21
Shipped:
Received: 2023/06/28

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Inorganic Carbon (TIC)	TOCV/NDIR	8765112	N/A	2023/07/05	Gyulshen Idriz

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	2.0°C

Sample WGC100 [IG_BH01_GW044] : Nitrite/Nitrate: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.
DOC>TOD: Results have been confirmed by reanalysis.

Sample WGC101 [IG_BH01_GW045] : Nitrite/Nitrate: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.
TOC < DOC: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8762834	TAK	Matrix Spike	Sulphide	2023/06/30		83	%	80 - 120
8762834	TAK	Spiked Blank	Sulphide	2023/06/30		96	%	80 - 120
8762834	TAK	Method Blank	Sulphide	2023/06/30	<0.020		mg/L	
8762834	TAK	RPD	Sulphide	2023/06/30	NC		%	20
8763652	GID	Matrix Spike [WGC100-06]	Dissolved Organic Carbon	2023/07/05		94	%	80 - 120
8763652	GID	Spiked Blank	Dissolved Organic Carbon	2023/07/04		98	%	80 - 120
8763652	GID	Method Blank	Dissolved Organic Carbon	2023/07/04	<0.40		mg/L	
8763884	LKH	Matrix Spike	Dissolved Chloride (Cl-)	2023/07/04		100	%	80 - 120
			Dissolved Bromide (Br-)	2023/07/04		104	%	80 - 120
			Dissolved Sulphate (SO4)	2023/07/04		97	%	80 - 120
8763884	LKH	Spiked Blank	Dissolved Chloride (Cl-)	2023/07/04		100	%	70 - 130
			Dissolved Bromide (Br-)	2023/07/04		104	%	80 - 120
			Dissolved Sulphate (SO4)	2023/07/04		97	%	80 - 120
8763884	LKH	Method Blank	Dissolved Chloride (Cl-)	2023/07/04	<1.0		mg/L	
			Dissolved Bromide (Br-)	2023/07/04	<1.0		mg/L	
			Dissolved Sulphate (SO4)	2023/07/04	<1.0		mg/L	
8763884	LKH	RPD	Dissolved Bromide (Br-)	2023/07/04	NC		%	20
8763931	C_N	Matrix Spike	Nitrite (N)	2023/07/04		102	%	80 - 120
			Nitrate (N)	2023/07/04		98	%	80 - 120
8763931	C_N	Spiked Blank	Nitrite (N)	2023/07/04		106	%	80 - 120
			Nitrate (N)	2023/07/04		96	%	80 - 120
8763931	C_N	Method Blank	Nitrite (N)	2023/07/04	<0.010		mg/L	
			Nitrate (N)	2023/07/04	<0.10		mg/L	
8763931	C_N	RPD	Nitrite (N)	2023/07/04	NC		%	20
			Nitrate (N)	2023/07/04	NC		%	20
8764062	KIT	Matrix Spike	Fluoride (F-)	2023/07/04		91	%	80 - 120
8764062	KIT	Spiked Blank	Fluoride (F-)	2023/07/04		98	%	80 - 120
8764062	KIT	Method Blank	Fluoride (F-)	2023/07/04	<0.10		mg/L	
8764062	KIT	RPD	Fluoride (F-)	2023/07/04	1.8		%	20
8764063	KPJ	Matrix Spike	Total Ammonia-N	2023/07/04		102	%	75 - 125
8764063	KPJ	Spiked Blank	Total Ammonia-N	2023/07/04		100	%	80 - 120
8764063	KPJ	Method Blank	Total Ammonia-N	2023/07/04	<0.050		mg/L	
8764063	KPJ	RPD	Total Ammonia-N	2023/07/04	0.29		%	20
8764066	KIT	Spiked Blank	Alkalinity (Total as CaCO3)	2023/07/04		95	%	85 - 115
8764066	KIT	Method Blank	Alkalinity (Total as CaCO3)	2023/07/04	<1.0		mg/L	
8764066	KIT	RPD	Alkalinity (Total as CaCO3)	2023/07/04	1.2		%	20
8764070	KIT	Spiked Blank	pH	2023/07/04		102	%	98 - 103
8764070	KIT	RPD	pH	2023/07/04	1.6		%	N/A
8764094	C_N	Matrix Spike	Nitrite (N)	2023/07/04		104	%	80 - 120
			Nitrate (N)	2023/07/04		100	%	80 - 120
8764094	C_N	Spiked Blank	Nitrite (N)	2023/07/04		105	%	80 - 120
			Nitrate (N)	2023/07/04		101	%	80 - 120
8764094	C_N	Method Blank	Nitrite (N)	2023/07/04	<0.010		mg/L	
			Nitrate (N)	2023/07/04	<0.10		mg/L	
8764094	C_N	RPD	Nitrite (N)	2023/07/04	NC		%	20
			Nitrate (N)	2023/07/04	NC		%	20
8764868	PBA	Matrix Spike	Dissolved Aluminum (Al)	2023/07/01		106	%	80 - 120
			Dissolved Arsenic (As)	2023/07/01		103	%	80 - 120
			Dissolved Barium (Ba)	2023/07/01		103	%	80 - 120
			Dissolved Bismuth (Bi)	2023/07/01		96	%	80 - 120
			Dissolved Boron (B)	2023/07/01		101	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Cadmium (Cd)	2023/07/01		103	%	80 - 120
			Dissolved Calcium (Ca)	2023/07/01		NC	%	80 - 120
			Dissolved Cesium (Cs)	2023/07/01		104	%	80 - 120
			Dissolved Chromium (Cr)	2023/07/01		103	%	80 - 120
			Dissolved Cobalt (Co)	2023/07/01		100	%	80 - 120
			Dissolved Copper (Cu)	2023/07/01		107	%	80 - 120
			Dissolved Lead (Pb)	2023/07/01		100	%	80 - 120
			Dissolved Lithium (Li)	2023/07/01		107	%	80 - 120
			Dissolved Magnesium (Mg)	2023/07/01		NC	%	80 - 120
			Dissolved Nickel (Ni)	2023/07/01		98	%	80 - 120
			Dissolved Potassium (K)	2023/07/01		106	%	80 - 120
			Dissolved Rubidium (Rb)	2023/07/01		103	%	80 - 120
			Dissolved Selenium (Se)	2023/07/01		103	%	80 - 120
			Dissolved Silicon (Si)	2023/07/01		105	%	80 - 120
			Dissolved Sodium (Na)	2023/07/01		NC	%	80 - 120
			Dissolved Strontium (Sr)	2023/07/01		NC	%	80 - 120
			Dissolved Thorium (Th)	2023/07/01		100	%	80 - 120
			Dissolved Uranium (U)	2023/07/01		101	%	80 - 120
			Dissolved Zirconium (Zr)	2023/07/01		113	%	80 - 120
8764868	PBA	Spiked Blank	Dissolved Aluminum (Al)	2023/07/01		103	%	80 - 120
			Dissolved Arsenic (As)	2023/07/01		99	%	80 - 120
			Dissolved Barium (Ba)	2023/07/01		102	%	80 - 120
			Dissolved Bismuth (Bi)	2023/07/01		93	%	80 - 120
			Dissolved Boron (B)	2023/07/01		96	%	80 - 120
			Dissolved Cadmium (Cd)	2023/07/01		98	%	80 - 120
			Dissolved Calcium (Ca)	2023/07/01		104	%	80 - 120
			Dissolved Cesium (Cs)	2023/07/01		103	%	80 - 120
			Dissolved Chromium (Cr)	2023/07/01		100	%	80 - 120
			Dissolved Cobalt (Co)	2023/07/01		98	%	80 - 120
			Dissolved Copper (Cu)	2023/07/01		102	%	80 - 120
			Dissolved Lead (Pb)	2023/07/01		97	%	80 - 120
			Dissolved Lithium (Li)	2023/07/01		104	%	80 - 120
			Dissolved Magnesium (Mg)	2023/07/01		106	%	80 - 120
			Dissolved Nickel (Ni)	2023/07/01		97	%	80 - 120
			Dissolved Potassium (K)	2023/07/01		108	%	80 - 120
			Dissolved Rubidium (Rb)	2023/07/01		99	%	80 - 120
			Dissolved Selenium (Se)	2023/07/01		99	%	80 - 120
			Dissolved Silicon (Si)	2023/07/01		103	%	80 - 120
			Dissolved Sodium (Na)	2023/07/01		107	%	80 - 120
			Dissolved Strontium (Sr)	2023/07/01		98	%	80 - 120
			Dissolved Thorium (Th)	2023/07/01		96	%	80 - 120
			Dissolved Uranium (U)	2023/07/01		97	%	80 - 120
			Dissolved Zirconium (Zr)	2023/07/01		107	%	80 - 120
8764868	PBA	Method Blank	Dissolved Aluminum (Al)	2023/07/01	<4.9		ug/L	
			Dissolved Arsenic (As)	2023/07/01	<1.0		ug/L	
			Dissolved Barium (Ba)	2023/07/01	<2.0		ug/L	
			Dissolved Bismuth (Bi)	2023/07/01	<1.0		ug/L	
			Dissolved Boron (B)	2023/07/01	<10		ug/L	
			Dissolved Cadmium (Cd)	2023/07/01	<0.090		ug/L	
			Dissolved Calcium (Ca)	2023/07/01	<200		ug/L	
			Dissolved Cesium (Cs)	2023/07/01	<0.20		ug/L	
			Dissolved Chromium (Cr)	2023/07/01	<5.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Cobalt (Co)	2023/07/01	<0.50		ug/L	
			Dissolved Copper (Cu)	2023/07/01	<0.90		ug/L	
			Dissolved Lead (Pb)	2023/07/01	<0.50		ug/L	
			Dissolved Lithium (Li)	2023/07/01	<5.0		ug/L	
			Dissolved Magnesium (Mg)	2023/07/01	<50		ug/L	
			Dissolved Nickel (Ni)	2023/07/01	<1.0		ug/L	
			Dissolved Potassium (K)	2023/07/01	<200		ug/L	
			Dissolved Rubidium (Rb)	2023/07/01	<0.20		ug/L	
			Dissolved Selenium (Se)	2023/07/01	<2.0		ug/L	
			Dissolved Silicon (Si)	2023/07/01	<50		ug/L	
			Dissolved Sodium (Na)	2023/07/01	130, RDL=100		ug/L	
			Dissolved Strontium (Sr)	2023/07/01	<1.0		ug/L	
			Dissolved Thorium (Th)	2023/07/01	<2.0		ug/L	
			Dissolved Uranium (U)	2023/07/01	<0.10		ug/L	
			Dissolved Zirconium (Zr)	2023/07/01	<1.0		ug/L	
8764868	PBA	RPD	Dissolved Arsenic (As)	2023/07/01	2.9		%	20
			Dissolved Barium (Ba)	2023/07/01	0.19		%	20
			Dissolved Boron (B)	2023/07/01	0.74		%	20
			Dissolved Cadmium (Cd)	2023/07/01	NC		%	20
			Dissolved Chromium (Cr)	2023/07/01	NC		%	20
			Dissolved Cobalt (Co)	2023/07/01	NC		%	20
			Dissolved Copper (Cu)	2023/07/01	0.11		%	20
			Dissolved Lead (Pb)	2023/07/01	NC		%	20
			Dissolved Nickel (Ni)	2023/07/01	NC		%	20
			Dissolved Selenium (Se)	2023/07/01	NC		%	20
			Dissolved Sodium (Na)	2023/07/01	1.7		%	20
			Dissolved Uranium (U)	2023/07/01	2.1		%	20
8764938	MJ1	Matrix Spike	Orthophosphate (P)	2023/07/04		91	%	75 - 125
8764938	MJ1	Spiked Blank	Orthophosphate (P)	2023/07/04		92	%	80 - 120
8764938	MJ1	Method Blank	Orthophosphate (P)	2023/07/04	<0.010		mg/L	
8764938	MJ1	RPD	Orthophosphate (P)	2023/07/04	NC		%	20
8765052	TLG	Matrix Spike [WGC100-08]	Dissolved Iron (Fe)	2023/07/06		95	%	80 - 120
			Dissolved Sulphur (S)	2023/07/06		NC	%	80 - 120
8765052	TLG	Spiked Blank	Dissolved Iron (Fe)	2023/07/06		103	%	80 - 120
			Dissolved Sulphur (S)	2023/07/06		99	%	80 - 120
8765052	TLG	Method Blank	Dissolved Iron (Fe)	2023/07/06	<0.02		mg/L	
			Dissolved Sulphur (S)	2023/07/06	<0.5		mg/L	
8765052	TLG	RPD [WGC100-08]	Dissolved Iron (Fe)	2023/07/06	6.0		%	25
			Dissolved Sulphur (S)	2023/07/06	0.47		%	25
8765112	GID	Matrix Spike [WGC101-01]	Total Inorganic Carbon (C)	2023/07/05		77 (1)	%	80 - 120
8765112	GID	Spiked Blank	Total Inorganic Carbon (C)	2023/07/05		101	%	80 - 120
8765112	GID	Method Blank	Total Inorganic Carbon (C)	2023/07/05	<1		mg/L	
8765112	GID	RPD [WGC101-01]	Total Inorganic Carbon (C)	2023/07/05	4.3		%	20
8766805	SPC	Matrix Spike	Total Phosphorus	2023/07/05		108	%	80 - 120
8766805	SPC	QC Standard	Total Phosphorus	2023/07/05		105	%	80 - 120
8766805	SPC	Spiked Blank	Total Phosphorus	2023/07/05		99	%	80 - 120
8766805	SPC	Method Blank	Total Phosphorus	2023/07/05	<0.020		mg/L	
8766805	SPC	RPD	Total Phosphorus	2023/07/05	1.5		%	20
8766865	RTY	Matrix Spike	Total Kjeldahl Nitrogen (TKN)	2023/07/06		107	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8766865	RTY	QC Standard	Total Kjeldahl Nitrogen (TKN)	2023/07/05		112	%	80 - 120
8766865	RTY	Spiked Blank	Total Kjeldahl Nitrogen (TKN)	2023/07/05		103	%	80 - 120
8766865	RTY	Method Blank	Total Kjeldahl Nitrogen (TKN)	2023/07/05	<0.10		mg/L	
8766865	RTY	RPD	Total Kjeldahl Nitrogen (TKN)	2023/07/06	14		%	20
8767169	TLG	Matrix Spike	Total Iron (Fe)	2023/07/05		NC	%	80 - 120
			Total Sulphur (S)	2023/07/05		NC	%	80 - 120
8767169	TLG	Spiked Blank	Total Iron (Fe)	2023/07/05		99	%	80 - 120
			Total Sulphur (S)	2023/07/05		101	%	80 - 120
8767169	TLG	Method Blank	Total Iron (Fe)	2023/07/05	<0.02		mg/L	
			Total Sulphur (S)	2023/07/05	<0.5		mg/L	
8767414	C_N	Matrix Spike	Nitrite (N)	2023/07/05		108	%	80 - 120
			Nitrate (N)	2023/07/05		105	%	80 - 120
8767414	C_N	Spiked Blank	Nitrite (N)	2023/07/05		105	%	80 - 120
			Nitrate (N)	2023/07/05		102	%	80 - 120
8767414	C_N	Method Blank	Nitrite (N)	2023/07/05	<0.010		mg/L	
			Nitrate (N)	2023/07/05	<0.10		mg/L	
8767414	C_N	RPD	Nitrite (N)	2023/07/05	NC		%	20
			Nitrate (N)	2023/07/05	NC		%	20
8768867	GID	Matrix Spike	Total Organic Carbon (TOC)	2023/07/05		95	%	80 - 120
8768867	GID	Spiked Blank	Total Organic Carbon (TOC)	2023/07/05		98	%	80 - 120
8768867	GID	Method Blank	Total Organic Carbon (TOC)	2023/07/05	<0.40		mg/L	
8768867	GID	RPD	Total Organic Carbon (TOC)	2023/07/05	1.1		%	20
8768964	MJ1	Matrix Spike	Orthophosphate (P)	2023/07/05		NC	%	75 - 125
8768964	MJ1	Spiked Blank	Orthophosphate (P)	2023/07/05		93	%	80 - 120
8768964	MJ1	Method Blank	Orthophosphate (P)	2023/07/05	<0.010		mg/L	
8768964	MJ1	RPD	Orthophosphate (P)	2023/07/05	0.060		%	20
8769893	KIT	Matrix Spike	Fluoride (F-)	2023/07/05		91	%	80 - 120
8769893	KIT	Spiked Blank	Fluoride (F-)	2023/07/05		95	%	80 - 120
8769893	KIT	Method Blank	Fluoride (F-)	2023/07/05	<0.10		mg/L	
8769893	KIT	RPD	Fluoride (F-)	2023/07/05	6.4		%	20
8774794	AFZ	Matrix Spike [WGC099-02]	Dissolved Aluminum (Al)	2023/07/09		108	%	80 - 120
			Dissolved Arsenic (As)	2023/07/09		103	%	80 - 120
			Dissolved Barium (Ba)	2023/07/09		101	%	80 - 120
			Dissolved Bismuth (Bi)	2023/07/09		104	%	80 - 120
			Dissolved Boron (B)	2023/07/09		107	%	80 - 120
			Dissolved Cadmium (Cd)	2023/07/09		101	%	80 - 120
			Dissolved Calcium (Ca)	2023/07/09		105	%	80 - 120
			Dissolved Cesium (Cs)	2023/07/09		100	%	80 - 120
			Dissolved Chromium (Cr)	2023/07/09		101	%	80 - 120
			Dissolved Cobalt (Co)	2023/07/09		100	%	80 - 120
			Dissolved Copper (Cu)	2023/07/09		103	%	80 - 120
			Dissolved Lead (Pb)	2023/07/09		98	%	80 - 120
			Dissolved Lithium (Li)	2023/07/09		105	%	80 - 120
			Dissolved Magnesium (Mg)	2023/07/09		100	%	80 - 120
			Dissolved Nickel (Ni)	2023/07/09		100	%	80 - 120
			Dissolved Potassium (K)	2023/07/09		101	%	80 - 120
			Dissolved Rubidium (Rb)	2023/07/09		102	%	80 - 120
			Dissolved Selenium (Se)	2023/07/09		107	%	80 - 120
			Dissolved Silicon (Si)	2023/07/09		105	%	80 - 120
			Dissolved Sodium (Na)	2023/07/09		100	%	80 - 120
			Dissolved Strontium (Sr)	2023/07/09		101	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Thorium (Th)	2023/07/09		100	%	80 - 120
			Dissolved Uranium (U)	2023/07/09		105	%	80 - 120
			Dissolved Zirconium (Zr)	2023/07/09		104	%	80 - 120
8774794	AFZ	Spiked Blank	Dissolved Aluminum (Al)	2023/07/09		105	%	80 - 120
			Dissolved Arsenic (As)	2023/07/09		98	%	80 - 120
			Dissolved Barium (Ba)	2023/07/09		99	%	80 - 120
			Dissolved Bismuth (Bi)	2023/07/09		101	%	80 - 120
			Dissolved Boron (B)	2023/07/09		102	%	80 - 120
			Dissolved Cadmium (Cd)	2023/07/09		97	%	80 - 120
			Dissolved Calcium (Ca)	2023/07/09		104	%	80 - 120
			Dissolved Cesium (Cs)	2023/07/09		99	%	80 - 120
			Dissolved Chromium (Cr)	2023/07/09		98	%	80 - 120
			Dissolved Cobalt (Co)	2023/07/09		96	%	80 - 120
			Dissolved Copper (Cu)	2023/07/09		99	%	80 - 120
			Dissolved Lead (Pb)	2023/07/09		95	%	80 - 120
			Dissolved Lithium (Li)	2023/07/09		99	%	80 - 120
			Dissolved Magnesium (Mg)	2023/07/09		97	%	80 - 120
			Dissolved Nickel (Ni)	2023/07/09		96	%	80 - 120
			Dissolved Potassium (K)	2023/07/09		98	%	80 - 120
			Dissolved Rubidium (Rb)	2023/07/09		97	%	80 - 120
			Dissolved Selenium (Se)	2023/07/09		102	%	80 - 120
			Dissolved Silicon (Si)	2023/07/09		103	%	80 - 120
			Dissolved Sodium (Na)	2023/07/09		97	%	80 - 120
			Dissolved Strontium (Sr)	2023/07/09		98	%	80 - 120
			Dissolved Thorium (Th)	2023/07/09		99	%	80 - 120
			Dissolved Uranium (U)	2023/07/09		102	%	80 - 120
			Dissolved Zirconium (Zr)	2023/07/09		102	%	80 - 120
8774794	AFZ	Method Blank	Dissolved Aluminum (Al)	2023/07/09	<4.9		ug/L	
			Dissolved Arsenic (As)	2023/07/09	<1.0		ug/L	
			Dissolved Barium (Ba)	2023/07/09	<2.0		ug/L	
			Dissolved Bismuth (Bi)	2023/07/09	<1.0		ug/L	
			Dissolved Boron (B)	2023/07/09	<10		ug/L	
			Dissolved Cadmium (Cd)	2023/07/09	<0.090		ug/L	
			Dissolved Calcium (Ca)	2023/07/09	<200		ug/L	
			Dissolved Cesium (Cs)	2023/07/09	<0.20		ug/L	
			Dissolved Chromium (Cr)	2023/07/09	<5.0		ug/L	
			Dissolved Cobalt (Co)	2023/07/09	<0.50		ug/L	
			Dissolved Copper (Cu)	2023/07/09	<0.90		ug/L	
			Dissolved Lead (Pb)	2023/07/09	<0.50		ug/L	
			Dissolved Lithium (Li)	2023/07/09	<5.0		ug/L	
			Dissolved Magnesium (Mg)	2023/07/09	<50		ug/L	
			Dissolved Nickel (Ni)	2023/07/09	<1.0		ug/L	
			Dissolved Potassium (K)	2023/07/09	<200		ug/L	
			Dissolved Rubidium (Rb)	2023/07/09	<0.20		ug/L	
			Dissolved Selenium (Se)	2023/07/09	<2.0		ug/L	
			Dissolved Silicon (Si)	2023/07/09	<50		ug/L	
			Dissolved Sodium (Na)	2023/07/09	<100		ug/L	
			Dissolved Strontium (Sr)	2023/07/09	<1.0		ug/L	
			Dissolved Thorium (Th)	2023/07/09	<2.0		ug/L	
			Dissolved Uranium (U)	2023/07/09	<0.10		ug/L	
			Dissolved Zirconium (Zr)	2023/07/09	<1.0		ug/L	
8774794	AFZ	RPD [WGC099-02]	Dissolved Aluminum (Al)	2023/07/09	NC		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Arsenic (As)	2023/07/09	NC		%	20
			Dissolved Barium (Ba)	2023/07/09	NC		%	20
			Dissolved Bismuth (Bi)	2023/07/09	NC		%	20
			Dissolved Boron (B)	2023/07/09	NC		%	20
			Dissolved Cadmium (Cd)	2023/07/09	NC		%	20
			Dissolved Calcium (Ca)	2023/07/09	2.3		%	20
			Dissolved Cesium (Cs)	2023/07/09	NC		%	20
			Dissolved Chromium (Cr)	2023/07/09	NC		%	20
			Dissolved Cobalt (Co)	2023/07/09	NC		%	20
			Dissolved Copper (Cu)	2023/07/09	NC		%	20
			Dissolved Lead (Pb)	2023/07/09	NC		%	20
			Dissolved Lithium (Li)	2023/07/09	NC		%	20
			Dissolved Magnesium (Mg)	2023/07/09	NC		%	20
			Dissolved Nickel (Ni)	2023/07/09	NC		%	20
			Dissolved Potassium (K)	2023/07/09	NC		%	20
			Dissolved Rubidium (Rb)	2023/07/09	NC		%	20
			Dissolved Selenium (Se)	2023/07/09	NC		%	20
			Dissolved Silicon (Si)	2023/07/09	NC		%	20
			Dissolved Sodium (Na)	2023/07/09	NC		%	20
			Dissolved Strontium (Sr)	2023/07/09	3.2		%	20
			Dissolved Thorium (Th)	2023/07/09	NC		%	20
			Dissolved Uranium (U)	2023/07/09	NC		%	20
			Dissolved Zirconium (Zr)	2023/07/09	NC		%	20
8775493	éH2	Matrix Spike	Reactive Silica (SiO2)	2023/07/06		98	%	80 - 120
8775493	éH2	Spiked Blank	Reactive Silica (SiO2)	2023/07/06		105	%	80 - 120
8775493	éH2	Method Blank	Reactive Silica (SiO2)	2023/07/06	<0.050		mg/L	
8776552	KDB	Matrix Spike	Dissolved Iodide	2023/07/07		96	%	80 - 120
8776552	KDB	Spiked Blank	Dissolved Iodide	2023/07/07		100	%	80 - 120
8776552	KDB	Method Blank	Dissolved Iodide	2023/07/07	<0.10		mg/L	
8776552	KDB	RPD	Dissolved Iodide	2023/07/07	NC		%	20
8783728	GID	Matrix Spike	Total Organic Carbon (TOC)	2023/07/12		96	%	80 - 120
8783728	GID	Spiked Blank	Total Organic Carbon (TOC)	2023/07/12		98	%	80 - 120
8783728	GID	Method Blank	Total Organic Carbon (TOC)	2023/07/12	<0.40		mg/L	
8783728	GID	RPD	Total Organic Carbon (TOC)	2023/07/12	NC		%	20
8784250	GID	Matrix Spike	Dissolved Organic Carbon	2023/07/12		96	%	80 - 120
8784250	GID	Spiked Blank	Dissolved Organic Carbon	2023/07/12		99	%	80 - 120
8784250	GID	Method Blank	Dissolved Organic Carbon	2023/07/12	<0.40		mg/L	
8784250	GID	RPD	Dissolved Organic Carbon	2023/07/12	0.97		%	20
8794997	DMI	Spiked Blank	Total Ruthenium (Ru)	2023/07/11		88	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8794997	DMI	Method Blank	Total Ruthenium (Ru)	2023/07/11	<2.0		ug/L	

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Cristina Carriere, Senior Scientific Specialist

Frederic Arnau, B.Sc., Chemist, Scientific Service Specialist

Katherine Szozda, Project Manager

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

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Your Project #: 202031
Your C.O.C. #: 955525-01-01

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2023/11/14
Report #: R7911715
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3U9856
Received: 2023/10/03, 11:21

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	2	N/A	2023/10/13	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	2	N/A	2023/10/14	CAM SOP-00102	APHA 4500-CO2 D
Anions	1	N/A	2023/10/13	CAM SOP-00435	SM 23 4110 B m
Anions	2	N/A	2023/11/10	CAM SOP-00435	SM 23 4110 B m
Dissolved Organic Carbon (DOC) (3)	2	N/A	2023/10/20	CAM SOP-00446	SM 23 5310 B m
Fluoride	1	2023/10/11	2023/10/13	CAM SOP-00449	SM 23 4500-F C m
Fluoride	2	2023/11/09	2023/11/10	CAM SOP-00449	SM 23 4500-F C m
Dissolved Metals Analysis by ICP	3	2023/11/01	2023/11/03	CAM SOP-00408	EPA 6010D m
Dissolved Metals by ICPMS	3	N/A	2023/10/16	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICP	2	2023/10/15	2023/10/17	CAM SOP-00408	EPA 6010D m
Iodide, Thiosulphate, Thiocyanate (1)	3	N/A	2023/10/14	CAL SOP-00057	Dionex #034035 R09 m
Total Extractable Lanthanides-waters (2, 4)	2	2023/10/19	2023/10/20	STL SOP-00071	MA. 200-Met 1.2 R7 m
Silica (Reactive) (1)	2	N/A	2023/10/15	AB SOP-00011	EPA 370.1 R1978 m
Ammonium as NH4+	2	N/A	2023/11/06		
Total Ammonia-N	2	N/A	2023/10/16	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (5)	1	N/A	2023/10/14	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Nitrate & Nitrite as Nitrogen in Water (5)	2	N/A	2023/11/14	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Organic Nitrogen	2	N/A	2023/11/08	Auto Calc.	
pH	2	2023/10/11	2023/10/13	CAM SOP-00413	SM 4500H+ B m
Field Measured pH (6)	2	N/A	2023/11/06		Field pH Meter
Orthophosphate	1	N/A	2023/10/12	CAM SOP-00461	SM 23 4500-P E m
Orthophosphate	2	N/A	2023/11/10	CAM SOP-00461	SM 23 4500-P E m
Sulphide	2	N/A	2023/10/11	CAM SOP-00455	SM 23 4500-S G m
Field Temperature (6)	2	N/A	2023/11/06		Field Thermometer
Total Inorganic Carbon (TIC)	2	N/A	2023/10/12	CAM SOP-00433	SM 23 5310 m
Total Kjeldahl Nitrogen in Water	2	2023/10/11	2023/10/16	CAM SOP-00938	OMOE E3516 m
Total Nitrogen (calculated)	2	N/A	2023/10/17	Auto Calc.	
Total Organic Carbon (TOC) (7)	2	N/A	2023/10/19	CAM SOP-00446	SM 23 5310B m
Total Phosphorus (Colourimetric)	2	2023/10/12	2023/10/17	CAM SOP-00407	SM 23 4500-P I

Your Project #: 202031
Your C.O.C. #: 955525-01-01

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2023/11/14
Report #: R7911715
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3U9856
Received: 2023/10/03, 11:21

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

(1) This test was performed by Bureau Veritas Calgary (19th), 4000 19th Street NE , Calgary, AB, T2E 6P8
(2) This test was performed by Bureau Veritas Montreal., 889 Montée de Liesse , Ville St-Laurent, QC, H4T 1P5
(3) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(4) Non-accredited test method
(5) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(6) This is a field test, therefore, the results relate to items that were not analysed at Bureau Veritas.
(7) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Your Project #: 202031
Your C.O.C. #: 955525-01-01

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2023/11/14
Report #: R7911715
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3U9856
Received: 2023/10/03, 11:21

Encryption Key

Katherine Szozda
Project Manager
14 Nov 2023 18:05:23

Please direct all questions regarding this Certificate of Analysis to:
Katherine Szozda, Project Manager
Email: Katherine.Szozda@bureauveritas.com
Phone# (613)274-0573 Ext:7063633

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Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas Job #: C3U9856
Report Date: 2023/11/14

Geofirma Engineering Ltd
Client Project #: 202031
Sampler Initials: AC

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XFA620			XFA620			XFA621		
Sampling Date		2023/10/02 09:10			2023/10/02 09:10			2023/10/02 11:00		
COC Number		955525-01-01			955525-01-01			955525-01-01		
	UNITS	**IG_BH01_GW054**	**RDL**	**QC Batch**	**IG_BH01_GW054 Lab-Dup**	**RDL**	**QC Batch**	**IG_BH03_GW022**	**RDL**	**QC Batch**
Calculated Parameters										
Ammonium (NH4)	mg/L							<0.05	0.05	9020537
Bicarb. Alkalinity (calc. as CaCO3)	mg/L							170	1.0	8972318
Carb. Alkalinity (calc. as CaCO3)	mg/L							9.9	1.0	8972318
Hydrox. Alkalinity (calc. as CaCO3)	mg/L							<1.0	1.0	8972318
Total Nitrogen (N)	mg/L							0.20	0.10	8973164
Total Organic Nitrogen	mg/L							0.14	0.10	9030501
Field Measurements										
Field Temperature	Celsius							27.28	N/A	ONSITE
Field Measured pH	pH							9.37		ONSITE
Inorganics										
Total Ammonia-N	mg/L							0.061	0.050	8980162
Fluoride (F-)	mg/L	<0.10	0.10	8974396				5.9	0.10	9040245
Total Inorganic Carbon (C)	mg/L							39	1	8974675
Dissolved Iodide	mg/L	<0.10	0.10	9001127				<0.10	0.10	9001127
Total Kjeldahl Nitrogen (TKN)	mg/L							0.20	0.10	8973307
Dissolved Organic Carbon	mg/L							10	0.40	8987163
Total Organic Carbon (TOC)	mg/L							9.4	0.40	8990270
Orthophosphate (P)	mg/L	<0.010	0.010	8973475				0.013	0.010	9038152
pH	pH							8.80		8974448
Total Phosphorus	mg/L							0.027	0.004	8976345
Reactive Silica (SiO2)	mg/L							8.7	0.050	8987986
Sulphide	mg/L							<0.020	0.020	8972418
Alkalinity (Total as CaCO3)	mg/L							180	1.0	8974441
Nitrite (N)	mg/L	<0.010	0.010	8973752				<0.010	0.010	9040059
Dissolved Chloride (Cl-)	mg/L	<1.0	1.0	8974493	<1.0	1.0	8974493	6.0	1.0	9040260
Nitrate (N)	mg/L	<0.10	0.10	8973752				<0.10	0.10	9040059
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	8973752				<0.10	0.10	9040059
Dissolved Bromide (Br-)	mg/L	<1.0	1.0	8974493	<1.0	1.0	8974493	<1.0	1.0	9040260
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	8974493	<1.0	1.0	8974493	<1.0	1.0	9040260
Metals										
Total Ruthenium (Ru)	ug/L							<2.0	2.0	9015159

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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Bureau Veritas Job #: C3U9856
Report Date: 2023/11/14

Geofirma Engineering Ltd
Client Project #: 202031
Sampler Initials: AC

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XFA621			XFA622		
Sampling Date		2023/10/02 11:00			2023/10/02 17:50		
COC Number		955525-01-01			955525-01-01		
	UNITS	**IG_BH03_GW022 Lab-Dup**	**RDL**	**QC Batch**	**IG_BH03_GW023**	**RDL**	**QC Batch**
Calculated Parameters							
Ammonium (NH4)	mg/L				<0.05	0.05	9020537
Bicarb. Alkalinity (calc. as CaCO3)	mg/L				170	1.0	8972318
Carb. Alkalinity (calc. as CaCO3)	mg/L				11	1.0	8972318
Hydrox. Alkalinity (calc. as CaCO3)	mg/L				<1.0	1.0	8972318
Total Nitrogen (N)	mg/L				0.24	0.10	8973164
Total Organic Nitrogen	mg/L				0.18	0.10	9030501
Field Measurements							
Field Temperature	Celsius				27.28	N/A	ONSITE
Field Measured pH	pH				9.37		ONSITE
Inorganics							
Total Ammonia-N	mg/L				0.056	0.050	8980162
Fluoride (F-)	mg/L	5.9	0.10	9040245	5.9	0.10	9040245
Total Inorganic Carbon (C)	mg/L				39	1	8974675
Dissolved Iodide	mg/L				<0.10	0.10	9001127
Total Kjeldahl Nitrogen (TKN)	mg/L				0.24	0.10	8973307
Dissolved Organic Carbon	mg/L				10	0.40	8987163
Total Organic Carbon (TOC)	mg/L				9.3	0.40	8990270
Orthophosphate (P)	mg/L				0.012	0.010	9038152
pH	pH				8.86		8974448
Total Phosphorus	mg/L				0.026	0.004	8976345
Reactive Silica (SiO2)	mg/L				8.9	0.050	8987986
Sulphide	mg/L				<0.020	0.020	8972418
Alkalinity (Total as CaCO3)	mg/L				180	1.0	8974441
Nitrite (N)	mg/L				<0.010	0.010	9040059
Dissolved Chloride (Cl-)	mg/L				6.2	1.0	9040260
Nitrate (N)	mg/L				<0.10	0.10	9040059
Nitrate + Nitrite (N)	mg/L				<0.10	0.10	9040059
Dissolved Bromide (Br-)	mg/L				<1.0	1.0	9040260
Dissolved Sulphate (SO4)	mg/L				<1.0	1.0	9040260
Metals							
Total Ruthenium (Ru)	ug/L				<2.0	2.0	9015159

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		XFA620			XFA621	XFA622		
Sampling Date		2023/10/02 09:10			2023/10/02 11:00	2023/10/02 17:50		
COC Number		955525-01-01			955525-01-01	955525-01-01		
	UNITS	**IG_BH01_GW054**	**RDL**	**QC Batch**	**IG_BH03_GW022**	**IG_BH03_GW023**	**RDL**	**QC Batch**
Metals								
Dissolved Iron (Fe)	mg/L	<0.02	0.02	9021972	0.04	0.04	0.02	9021972
Total Iron (Fe)	mg/L				0.11	0.14	0.02	8982373
Dissolved Sulphur (S)	mg/L	<0.5	0.5	9021972	<0.5	<0.5	0.5	9021972
Total Sulphur (S)	mg/L				<0.5	<0.5	0.5	8982373
Dissolved Aluminum (Al)	ug/L	<4.9	4.9	8975257	150	150	4.9	8975257
Dissolved Arsenic (As)	ug/L	<1.0	1.0	8975257	<1.0	<1.0	1.0	8975257
Dissolved Barium (Ba)	ug/L	<2.0	2.0	8975257	8.3	8.5	2.0	8975257
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	8975257	<1.0	<1.0	1.0	8975257
Dissolved Boron (B)	ug/L	<10	10	8975257	240	250	10	8975257
Dissolved Cadmium (Cd)	ug/L	<0.090	0.090	8975257	<0.090	<0.090	0.090	8975257
Dissolved Calcium (Ca)	ug/L	<200	200	8975257	8000	7700	200	8975257
Dissolved Cesium (Cs)	ug/L	<0.20	0.20	8975257	<0.20	<0.20	0.20	8975257
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	8975257	<5.0	<5.0	5.0	8975257
Dissolved Cobalt (Co)	ug/L	<0.50	0.50	8975257	<0.50	<0.50	0.50	8975257
Dissolved Copper (Cu)	ug/L	<0.90	0.90	8975257	<0.90	<0.90	0.90	8975257
Dissolved Iron (Fe)	ug/L	<100	100	8975257	<100	<100	100	8975257
Dissolved Lead (Pb)	ug/L	<0.50	0.50	8975257	<0.50	<0.50	0.50	8975257
Dissolved Lithium (Li)	ug/L	<5.0	5.0	8975257	59	60	5.0	8975257
Dissolved Magnesium (Mg)	ug/L	<50	50	8975257	680	720	50	8975257
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	8975257	3.7	3.7	1.0	8975257
Dissolved Potassium (K)	ug/L	<200	200	8975257	1200	1200	200	8975257
Dissolved Rubidium (Rb)	ug/L	<0.20	0.20	8975257	2.3	2.3	0.20	8975257
Dissolved Selenium (Se)	ug/L	<2.0	2.0	8975257	<2.0	<2.0	2.0	8975257
Dissolved Silicon (Si)	ug/L	<50	50	8975257	4000	4000	50	8975257
Dissolved Sodium (Na)	ug/L	<100	100	8975257	81000	82000	100	8975257
Dissolved Strontium (Sr)	ug/L	<1.0	1.0	8975257	86	86	1.0	8975257
Dissolved Thorium (Th)	ug/L	<2.0	2.0	8975257	<2.0	<2.0	2.0	8975257
Dissolved Uranium (U)	ug/L	<0.10	0.10	8975257	3.5	3.5	0.10	8975257
Dissolved Zirconium (Zr)	ug/L	<1.0	1.0	8975257	<1.0	<1.0	1.0	8975257

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		XFA622		
Sampling Date		2023/10/02 17:50		
COC Number		955525-01-01		
	UNITS	**IG_BH03_GW023 Lab-Dup**	**RDL**	**QC Batch**
Metals				
Dissolved Iron (Fe)	mg/L	0.03	0.02	9021972
Dissolved Sulphur (S)	mg/L	<0.5	0.5	9021972

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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TEST SUMMARY

Bureau Veritas ID: XFA620
Sample ID: IG_BH01_GW054
Matrix: Water

Collected: 2023/10/02
Shipped:
Received: 2023/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Anions	IC	8974493	N/A	2023/10/13	Lusine Khachatryan
Fluoride	ISE	8974396	2023/10/11	2023/10/13	Surinder Rai
Dissolved Metals Analysis by ICP	ICP	9021972	2023/11/01	2023/11/03	Suban Kanapathippllai
Dissolved Metals by ICPMS	ICP/MS	8975257	N/A	2023/10/16	Arefa Dabhad
Iodide, Thiosulphate, Thiocyanate	IC/EC	9001127	N/A	2023/10/14	Karen Graham
Nitrate & Nitrite as Nitrogen in Water	LACH	8973752	N/A	2023/10/14	Chandra Nandlal
Orthophosphate	KONE	8973475	N/A	2023/10/12	Alina Dobreanu

Bureau Veritas ID: XFA620 Dup
Sample ID: IG_BH01_GW054
Matrix: Water

Collected: 2023/10/02
Shipped:
Received: 2023/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Anions	IC	8974493	N/A	2023/10/13	Lusine Khachatryan

Bureau Veritas ID: XFA621
Sample ID: IG_BH03_GW022
Matrix: Water

Collected: 2023/10/02
Shipped:
Received: 2023/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8974441	N/A	2023/10/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	8972318	N/A	2023/10/14	Automated Statchk
Anions	IC	9040260	N/A	2023/11/10	Lusine Khachatryan
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8987163	N/A	2023/10/20	Gyulshen Idriz
Fluoride	ISE	9040245	2023/11/09	2023/11/10	Surinder Rai
Dissolved Metals Analysis by ICP	ICP	9021972	2023/11/01	2023/11/03	Suban Kanapathippllai
Dissolved Metals by ICPMS	ICP/MS	8975257	N/A	2023/10/16	Arefa Dabhad
Total Metals Analysis by ICP	ICP	8982373	2023/10/15	2023/10/17	Suban Kanapathippllai
Iodide, Thiosulphate, Thiocyanate	IC/EC	9001127	N/A	2023/10/14	Karen Graham
Total Extractable Lanthanides-waters	ICP/MSMS	9015159	2023/10/19	2023/10/20	Darya Mitrofanova
Silica (Reactive)	KONE	8987986	N/A	2023/10/15	Shanna McKort
Ammonium as NH4+	CALC/NH3	9020537	N/A	2023/11/06	Automated Statchk
Total Ammonia-N	LACH/NH4	8980162	N/A	2023/10/16	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	9040059	N/A	2023/11/14	Chandra Nandlal
Organic Nitrogen	CALC	9030501	N/A	2023/11/08	Automated Statchk
pH	AT	8974448	2023/10/11	2023/10/13	Surinder Rai
Field Measured pH	PH	ONSITE	N/A	2023/11/06	Katherine Szozda
Orthophosphate	KONE	9038152	N/A	2023/11/10	Massarat Jan
Sulphide	ISE/S	8972418	N/A	2023/10/11	Gurparteek KAUR
Field Measured pH	PH	ONSITE	N/A	2023/11/06	Katherine Szozda
Total Inorganic Carbon (TIC)	TOCV/NDIR	8974675	N/A	2023/10/12	Gyulshen Idriz
Total Kjeldahl Nitrogen in Water	SKAL	8973307	2023/10/11	2023/10/16	Kruti Jitesh Patel
Total Nitrogen (calculated)	CALC	8973164	N/A	2023/10/17	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	8990270	N/A	2023/10/19	Gyulshen Idriz
Total Phosphorus (Colourimetric)	SKAL/P	8976345	2023/10/12	2023/10/17	Shivani Shivani

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TEST SUMMARY

Bureau Veritas ID: XFA621 Dup
Sample ID: IG_BH03_GW022
Matrix: Water

Collected: 2023/10/02
Shipped:
Received: 2023/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Fluoride	ISE	9040245	2023/11/09	2023/11/10	Surinder Rai

Bureau Veritas ID: XFA622
Sample ID: IG_BH03_GW023
Matrix: Water

Collected: 2023/10/02
Shipped:
Received: 2023/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8974441	N/A	2023/10/13	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	8972318	N/A	2023/10/14	Automated Statchk
Anions	IC	9040260	N/A	2023/11/10	Lusine Khachatryan
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8987163	N/A	2023/10/20	Gyulshen Idriz
Fluoride	ISE	9040245	2023/11/09	2023/11/10	Surinder Rai
Dissolved Metals Analysis by ICP	ICP	9021972	2023/11/01	2023/11/03	Suban Kanapathippllai
Dissolved Metals by ICPMS	ICP/MS	8975257	N/A	2023/10/16	Arefa Dabhad
Total Metals Analysis by ICP	ICP	8982373	2023/10/15	2023/10/17	Suban Kanapathippllai
Iodide, Thiosulphate, Thiocyanate	IC/EC	9001127	N/A	2023/10/14	Karen Graham
Total Extractable Lanthanides-waters	ICP/MSMS	9015159	2023/10/19	2023/10/20	Darya Mitrofanova
Silica (Reactive)	KONE	8987986	N/A	2023/10/15	Shanna McKort
Ammonium as NH4+	CALC/NH3	9020537	N/A	2023/11/06	Automated Statchk
Total Ammonia-N	LACH/NH4	8980162	N/A	2023/10/16	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	9040059	N/A	2023/11/14	Chandra Nandlal
Organic Nitrogen	CALC	9030501	N/A	2023/11/08	Automated Statchk
pH	AT	8974448	2023/10/11	2023/10/13	Surinder Rai
Field Measured pH	PH	ONSITE	N/A	2023/11/06	Katherine Szozda
Orthophosphate	KONE	9038152	N/A	2023/11/10	Massarat Jan
Sulphide	ISE/S	8972418	N/A	2023/10/11	Gurparteek KAUR
Field Measured pH	PH	ONSITE	N/A	2023/11/06	Katherine Szozda
Total Inorganic Carbon (TIC)	TOCV/NDIR	8974675	N/A	2023/10/12	Gyulshen Idriz
Total Kjeldahl Nitrogen in Water	SKAL	8973307	2023/10/11	2023/10/16	Kruti Jitesh Patel
Total Nitrogen (calculated)	CALC	8973164	N/A	2023/10/17	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	8990270	N/A	2023/10/19	Gyulshen Idriz
Total Phosphorus (Colourimetric)	SKAL/P	8976345	2023/10/12	2023/10/17	Shivani Shivani

Bureau Veritas ID: XFA622 Dup
Sample ID: IG_BH03_GW023
Matrix: Water

Collected: 2023/10/02
Shipped:
Received: 2023/10/03

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals Analysis by ICP	ICP	9021972	2023/11/01	2023/11/03	Suban Kanapathippllai

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.3°C

Revised Report [2023/11/14]: Requested additional analysis for metals added to all three sample as per client. Anion tests reanalyzed per client request for samples IG_BH03_GW022 and IG_BH03_GW023 past holding time with client consent.

Sample XFA621 [IG_BH03_GW022] : TOC< DOC: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Sample XFA622 [IG_BH03_GW023] : TOC< DOC: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8972418	GTK	Matrix Spike	Sulphide	2023/10/11		92	%	80 - 120
8972418	GTK	Spiked Blank	Sulphide	2023/10/11		95	%	80 - 120
8972418	GTK	Method Blank	Sulphide	2023/10/11	<0.020		mg/L	
8972418	GTK	RPD	Sulphide	2023/10/11	NC		%	20
8973307	KJP	Matrix Spike	Total Kjeldahl Nitrogen (TKN)	2023/10/16		NC	%	80 - 120
8973307	KJP	QC Standard	Total Kjeldahl Nitrogen (TKN)	2023/10/16		100	%	80 - 120
8973307	KJP	Spiked Blank	Total Kjeldahl Nitrogen (TKN)	2023/10/16		101	%	80 - 120
8973307	KJP	Method Blank	Total Kjeldahl Nitrogen (TKN)	2023/10/16	<0.10		mg/L	
8973307	KJP	RPD	Total Kjeldahl Nitrogen (TKN)	2023/10/16	1.6		%	20
8973475	ADB	Matrix Spike	Orthophosphate (P)	2023/10/12		NC	%	75 - 125
8973475	ADB	Spiked Blank	Orthophosphate (P)	2023/10/12		94	%	80 - 120
8973475	ADB	Method Blank	Orthophosphate (P)	2023/10/12	<0.010		mg/L	
8973475	ADB	RPD	Orthophosphate (P)	2023/10/12	0.050		%	20
8973752	C_N	Matrix Spike	Nitrite (N)	2023/10/14		96	%	80 - 120
			Nitrate (N)	2023/10/14		88	%	80 - 120
8973752	C_N	Spiked Blank	Nitrite (N)	2023/10/14		102	%	80 - 120
			Nitrate (N)	2023/10/14		94	%	80 - 120
8973752	C_N	Method Blank	Nitrite (N)	2023/10/14	<0.010		mg/L	
			Nitrate (N)	2023/10/14	<0.10		mg/L	
8973752	C_N	RPD	Nitrite (N)	2023/10/14	NC		%	20
			Nitrate (N)	2023/10/14	NC		%	20
8974396	SAU	Matrix Spike	Fluoride (F-)	2023/10/13		89	%	80 - 120
8974396	SAU	Spiked Blank	Fluoride (F-)	2023/10/13		97	%	80 - 120
8974396	SAU	Method Blank	Fluoride (F-)	2023/10/13	<0.10		mg/L	
8974396	SAU	RPD	Fluoride (F-)	2023/10/13	2.4		%	20
8974441	SAU	Spiked Blank	Alkalinity (Total as CaCO3)	2023/10/13		100	%	85 - 115
8974441	SAU	Method Blank	Alkalinity (Total as CaCO3)	2023/10/13	<1.0		mg/L	
8974441	SAU	RPD	Alkalinity (Total as CaCO3)	2023/10/13	1.4		%	20
8974448	SAU	Spiked Blank	pH	2023/10/13		102	%	98 - 103
8974448	SAU	RPD	pH	2023/10/13	0.60		%	N/A
8974493	LKH	Matrix Spike [XFA620-01]	Dissolved Chloride (Cl-)	2023/10/13		98	%	80 - 120
			Dissolved Bromide (Br-)	2023/10/13		98	%	80 - 120
			Dissolved Sulphate (SO4)	2023/10/13		97	%	80 - 120
8974493	LKH	Spiked Blank	Dissolved Chloride (Cl-)	2023/10/13		98	%	70 - 130
			Dissolved Bromide (Br-)	2023/10/13		99	%	80 - 120
			Dissolved Sulphate (SO4)	2023/10/13		97	%	80 - 120
8974493	LKH	Method Blank	Dissolved Chloride (Cl-)	2023/10/13	<1.0		mg/L	
			Dissolved Bromide (Br-)	2023/10/13	<1.0		mg/L	
			Dissolved Sulphate (SO4)	2023/10/13	<1.0		mg/L	
8974493	LKH	RPD [XFA620-01]	Dissolved Chloride (Cl-)	2023/10/13	NC		%	20
			Dissolved Bromide (Br-)	2023/10/13	NC		%	20
			Dissolved Sulphate (SO4)	2023/10/13	NC		%	20
8974675	GID	Matrix Spike	Total Inorganic Carbon (C)	2023/10/12		97	%	80 - 120
8974675	GID	Spiked Blank	Total Inorganic Carbon (C)	2023/10/12		100	%	80 - 120
8974675	GID	Method Blank	Total Inorganic Carbon (C)	2023/10/12	<1		mg/L	
8974675	GID	RPD	Total Inorganic Carbon (C)	2023/10/12	0.12		%	20
8975257	ADA	Matrix Spike	Dissolved Aluminum (Al)	2023/10/16		97	%	80 - 120
			Dissolved Arsenic (As)	2023/10/16		101	%	80 - 120
			Dissolved Barium (Ba)	2023/10/16		98	%	80 - 120
			Dissolved Bismuth (Bi)	2023/10/16		98	%	80 - 120
			Dissolved Boron (B)	2023/10/16		NC	%	80 - 120
			Dissolved Cadmium (Cd)	2023/10/16		100	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Calcium (Ca)	2023/10/16		NC	%	80 - 120
			Dissolved Cesium (Cs)	2023/10/16		100	%	80 - 120
			Dissolved Chromium (Cr)	2023/10/16		99	%	80 - 120
			Dissolved Cobalt (Co)	2023/10/16		100	%	80 - 120
			Dissolved Copper (Cu)	2023/10/16		96	%	80 - 120
			Dissolved Iron (Fe)	2023/10/16		102	%	80 - 120
			Dissolved Lead (Pb)	2023/10/16		94	%	80 - 120
			Dissolved Lithium (Li)	2023/10/16		96	%	80 - 120
			Dissolved Magnesium (Mg)	2023/10/16		NC	%	80 - 120
			Dissolved Nickel (Ni)	2023/10/16		97	%	80 - 120
			Dissolved Potassium (K)	2023/10/16		105	%	80 - 120
			Dissolved Rubidium (Rb)	2023/10/16		102	%	80 - 120
			Dissolved Selenium (Se)	2023/10/16		96	%	80 - 120
			Dissolved Silicon (Si)	2023/10/16		92	%	80 - 120
			Dissolved Sodium (Na)	2023/10/16		NC	%	80 - 120
			Dissolved Strontium (Sr)	2023/10/16		102	%	80 - 120
			Dissolved Thorium (Th)	2023/10/16		96	%	80 - 120
			Dissolved Uranium (U)	2023/10/16		97	%	80 - 120
			Dissolved Zirconium (Zr)	2023/10/16		106	%	80 - 120
8975257	ADA	Spiked Blank	Dissolved Aluminum (Al)	2023/10/16		100	%	80 - 120
			Dissolved Arsenic (As)	2023/10/16		101	%	80 - 120
			Dissolved Barium (Ba)	2023/10/16		99	%	80 - 120
			Dissolved Bismuth (Bi)	2023/10/16		98	%	80 - 120
			Dissolved Boron (B)	2023/10/16		96	%	80 - 120
			Dissolved Cadmium (Cd)	2023/10/16		99	%	80 - 120
			Dissolved Calcium (Ca)	2023/10/16		104	%	80 - 120
			Dissolved Cesium (Cs)	2023/10/16		103	%	80 - 120
			Dissolved Chromium (Cr)	2023/10/16		98	%	80 - 120
			Dissolved Cobalt (Co)	2023/10/16		100	%	80 - 120
			Dissolved Copper (Cu)	2023/10/16		96	%	80 - 120
			Dissolved Iron (Fe)	2023/10/16		100	%	80 - 120
			Dissolved Lead (Pb)	2023/10/16		95	%	80 - 120
			Dissolved Lithium (Li)	2023/10/16		96	%	80 - 120
			Dissolved Magnesium (Mg)	2023/10/16		103	%	80 - 120
			Dissolved Nickel (Ni)	2023/10/16		98	%	80 - 120
			Dissolved Potassium (K)	2023/10/16		104	%	80 - 120
			Dissolved Rubidium (Rb)	2023/10/16		100	%	80 - 120
			Dissolved Selenium (Se)	2023/10/16		98	%	80 - 120
			Dissolved Silicon (Si)	2023/10/16		101	%	80 - 120
			Dissolved Sodium (Na)	2023/10/16		102	%	80 - 120
			Dissolved Strontium (Sr)	2023/10/16		102	%	80 - 120
			Dissolved Thorium (Th)	2023/10/16		96	%	80 - 120
			Dissolved Uranium (U)	2023/10/16		98	%	80 - 120
			Dissolved Zirconium (Zr)	2023/10/16		104	%	80 - 120
8975257	ADA	Method Blank	Dissolved Aluminum (Al)	2023/10/16	<4.9		ug/L	
			Dissolved Arsenic (As)	2023/10/16	<1.0		ug/L	
			Dissolved Barium (Ba)	2023/10/16	<2.0		ug/L	
			Dissolved Bismuth (Bi)	2023/10/16	<1.0		ug/L	
			Dissolved Boron (B)	2023/10/16	<10		ug/L	
			Dissolved Cadmium (Cd)	2023/10/16	<0.090		ug/L	
			Dissolved Calcium (Ca)	2023/10/16	<200		ug/L	
			Dissolved Cesium (Cs)	2023/10/16	<0.20		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Chromium (Cr)	2023/10/16	<5.0		ug/L	
			Dissolved Cobalt (Co)	2023/10/16	<0.50		ug/L	
			Dissolved Copper (Cu)	2023/10/16	<0.90		ug/L	
			Dissolved Iron (Fe)	2023/10/16	<100		ug/L	
			Dissolved Lead (Pb)	2023/10/16	<0.50		ug/L	
			Dissolved Lithium (Li)	2023/10/16	<5.0		ug/L	
			Dissolved Magnesium (Mg)	2023/10/16	<50		ug/L	
			Dissolved Nickel (Ni)	2023/10/16	<1.0		ug/L	
			Dissolved Potassium (K)	2023/10/16	<200		ug/L	
			Dissolved Rubidium (Rb)	2023/10/16	<0.20		ug/L	
			Dissolved Selenium (Se)	2023/10/16	<2.0		ug/L	
			Dissolved Silicon (Si)	2023/10/16	<50		ug/L	
			Dissolved Sodium (Na)	2023/10/16	<100		ug/L	
			Dissolved Strontium (Sr)	2023/10/16	<1.0		ug/L	
			Dissolved Thorium (Th)	2023/10/16	<2.0		ug/L	
			Dissolved Uranium (U)	2023/10/16	<0.10		ug/L	
			Dissolved Zirconium (Zr)	2023/10/16	<1.0		ug/L	
8975257	ADA	RPD	Dissolved Arsenic (As)	2023/10/16	NC		%	20
			Dissolved Barium (Ba)	2023/10/16	0.86		%	20
			Dissolved Boron (B)	2023/10/16	2.4		%	20
			Dissolved Cadmium (Cd)	2023/10/16	NC		%	20
			Dissolved Calcium (Ca)	2023/10/16	1.7		%	20
			Dissolved Chromium (Cr)	2023/10/16	NC		%	20
			Dissolved Copper (Cu)	2023/10/16	2.5		%	20
			Dissolved Iron (Fe)	2023/10/16	NC		%	20
			Dissolved Lead (Pb)	2023/10/16	NC		%	20
			Dissolved Magnesium (Mg)	2023/10/16	1.7		%	20
			Dissolved Potassium (K)	2023/10/16	2.3		%	20
			Dissolved Sodium (Na)	2023/10/16	0.17		%	20
8976345	SSV	Matrix Spike	Total Phosphorus	2023/10/17		93	%	80 - 120
8976345	SSV	QC Standard	Total Phosphorus	2023/10/17		100	%	80 - 120
8976345	SSV	Spiked Blank	Total Phosphorus	2023/10/17		101	%	80 - 120
8976345	SSV	Method Blank	Total Phosphorus	2023/10/17	<0.004		mg/L	
8976345	SSV	RPD	Total Phosphorus	2023/10/17	7.2		%	20
8980162	KPJ	Matrix Spike	Total Ammonia-N	2023/10/16		102	%	75 - 125
8980162	KPJ	Spiked Blank	Total Ammonia-N	2023/10/16		104	%	80 - 120
8980162	KPJ	Method Blank	Total Ammonia-N	2023/10/16	<0.050		mg/L	
8980162	KPJ	RPD	Total Ammonia-N	2023/10/16	NC		%	20
8982373	SUK	Matrix Spike	Total Iron (Fe)	2023/10/17		95	%	80 - 120
			Total Sulphur (S)	2023/10/17		98	%	80 - 120
8982373	SUK	Spiked Blank	Total Iron (Fe)	2023/10/17		96	%	80 - 120
			Total Sulphur (S)	2023/10/17		94	%	80 - 120
8982373	SUK	Method Blank	Total Iron (Fe)	2023/10/17	<0.02		mg/L	
			Total Sulphur (S)	2023/10/17	<0.5		mg/L	
8987163	GID	Matrix Spike	Dissolved Organic Carbon	2023/10/20		92	%	80 - 120
8987163	GID	Spiked Blank	Dissolved Organic Carbon	2023/10/20		94	%	80 - 120
8987163	GID	Method Blank	Dissolved Organic Carbon	2023/10/20	<0.40		mg/L	
8987163	GID	RPD	Dissolved Organic Carbon	2023/10/20	3.0		%	20
8987986	éH2	Matrix Spike	Reactive Silica (SiO2)	2023/10/15		104	%	80 - 120
8987986	éH2	Spiked Blank	Reactive Silica (SiO2)	2023/10/15		105	%	80 - 120
8987986	éH2	Method Blank	Reactive Silica (SiO2)	2023/10/15	<0.050		mg/L	
8990270	GID	Matrix Spike	Total Organic Carbon (TOC)	2023/10/19		95	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8990270	GID	Spiked Blank	Total Organic Carbon (TOC)	2023/10/19		98	%	80 - 120
8990270	GID	Method Blank	Total Organic Carbon (TOC)	2023/10/19	<0.40		mg/L	
8990270	GID	RPD	Total Organic Carbon (TOC)	2023/10/19	16		%	20
9001127	KGR	Matrix Spike	Dissolved Iodide	2023/10/14		92	%	80 - 120
9001127	KGR	Spiked Blank	Dissolved Iodide	2023/10/14		97	%	80 - 120
9001127	KGR	Method Blank	Dissolved Iodide	2023/10/14	<0.10		mg/L	
9015159	DMI	Spiked Blank	Total Ruthenium (Ru)	2023/10/20		98	%	80 - 120
9015159	DMI	Method Blank	Total Ruthenium (Ru)	2023/10/20	<2.0		ug/L	
9021972	SUK	Matrix Spike [XFA622-05]	Dissolved Iron (Fe)	2023/11/03		100	%	80 - 120
			Dissolved Sulphur (S)	2023/11/03		99	%	80 - 120
9021972	SUK	Spiked Blank	Dissolved Iron (Fe)	2023/11/03		104	%	80 - 120
			Dissolved Sulphur (S)	2023/11/03		100	%	80 - 120
9021972	SUK	Method Blank	Dissolved Iron (Fe)	2023/11/08	<0.02		mg/L	
			Dissolved Sulphur (S)	2023/11/08	<0.5		mg/L	
9021972	SUK	RPD [XFA622-05]	Dissolved Iron (Fe)	2023/11/03	10		%	25
			Dissolved Sulphur (S)	2023/11/03	NC		%	25
9038152	MJ1	Matrix Spike	Orthophosphate (P)	2023/11/10		90	%	75 - 125
9038152	MJ1	Spiked Blank	Orthophosphate (P)	2023/11/10		95	%	80 - 120
9038152	MJ1	Method Blank	Orthophosphate (P)	2023/11/10	<0.010		mg/L	
9038152	MJ1	RPD	Orthophosphate (P)	2023/11/10	NC		%	20
9040059	C_N	Matrix Spike	Nitrite (N)	2023/11/14		101	%	80 - 120
			Nitrate (N)	2023/11/14		NC	%	80 - 120
9040059	C_N	Spiked Blank	Nitrite (N)	2023/11/14		105	%	80 - 120
			Nitrate (N)	2023/11/14		94	%	80 - 120
9040059	C_N	Method Blank	Nitrite (N)	2023/11/14	<0.010		mg/L	
			Nitrate (N)	2023/11/14	<0.10		mg/L	
9040059	C_N	RPD	Nitrite (N)	2023/11/14	0.79		%	20
			Nitrate (N)	2023/11/14	0.36		%	20
9040245	SAU	Matrix Spike [XFA621-01]	Fluoride (F-)	2023/11/10		NC	%	80 - 120
9040245	SAU	Spiked Blank	Fluoride (F-)	2023/11/10		98	%	80 - 120
9040245	SAU	Method Blank	Fluoride (F-)	2023/11/10	<0.10		mg/L	
9040245	SAU	RPD [XFA621-01]	Fluoride (F-)	2023/11/10	0.47		%	20
9040260	LKH	Matrix Spike	Dissolved Chloride (Cl-)	2023/11/10		100	%	80 - 120
			Dissolved Bromide (Br-)	2023/11/10		99	%	80 - 120
			Dissolved Sulphate (SO4)	2023/11/10		96	%	80 - 120
9040260	LKH	Spiked Blank	Dissolved Chloride (Cl-)	2023/11/10		98	%	70 - 130
			Dissolved Bromide (Br-)	2023/11/10		99	%	80 - 120
			Dissolved Sulphate (SO4)	2023/11/10		96	%	80 - 120
9040260	LKH	Method Blank	Dissolved Chloride (Cl-)	2023/11/10	<1.0		mg/L	
			Dissolved Bromide (Br-)	2023/11/10	<1.0		mg/L	
			Dissolved Sulphate (SO4)	2023/11/10	<1.0		mg/L	
9040260	LKH	RPD	Dissolved Chloride (Cl-)	2023/11/10	1.0		%	20
			Dissolved Bromide (Br-)	2023/11/10	NC		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Sulphate (SO4)	2023/11/10	4.7		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

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Jonathan Fauvel, B.Sc, Chimiste, Scientific Specialist

Katherine Szozda, Project Manager

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

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Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Your P.O. #: 202031-004
Your Project #: 20-203-1
Site#: IGNACE, ON

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2023/11/15
Report #: R7912795
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3W6006
Received: 2023/10/18, 10:15

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	2	N/A	2023/10/23	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	2	N/A	2023/10/24	CAM SOP-00102	APHA 4500-CO2 D
Anions	2	N/A	2023/11/10	CAM SOP-00435	SM 23 4110 B m
Dissolved Organic Carbon (DOC) (3)	2	N/A	2023/10/25	CAM SOP-00446	SM 23 5310 B m
Fluoride	2	2023/11/09	2023/11/10	CAM SOP-00449	SM 23 4500-F C m
Dissolved Metals Analysis by ICP	2	2023/11/06	2023/11/08	CAM SOP-00408	EPA 6010D m
Dissolved Metals by ICPMS	2	N/A	2023/10/26	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICP	2	2023/10/24	2023/10/25	CAM SOP-00408	EPA 6010D m
Iodide, Thiosulphate, Thiocyanate (1)	2	N/A	2023/10/28	CAL SOP-00057	Dionex #034035 R09 m
Total Extractable Lanthanides-waters (2, 4)	2	2023/10/26	2023/10/28	STL SOP-00071	MA. 200-Met 1.2 R7 m
Silica (Reactive) (1)	2	N/A	2023/10/26	AB SOP-00011	EPA 370.1 R1978 m
Ammonium as NH4+	2	N/A	2023/11/06		
Total Ammonia-N	2	N/A	2023/10/26	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (5)	2	N/A	2023/11/14	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Organic Nitrogen	2	N/A	2023/11/08	Auto Calc.	
pH	2	2023/10/21	2023/10/23	CAM SOP-00413	SM 4500H+ B m
Field Measured pH (6)	2	N/A	2023/11/06		Field pH Meter
Orthophosphate	2	N/A	2023/11/10	CAM SOP-00461	SM 23 4500-P E m
Sulphide	2	N/A	2023/10/23	CAM SOP-00455	SM 23 4500-S G m
Field Temperature (6)	2	N/A	2023/11/06		Field Thermometer
Total Inorganic Carbon (TIC)	2	N/A	2023/10/24	CAM SOP-00433	SM 23 5310 m
Total Kjeldahl Nitrogen in Water	2	2023/10/24	2023/10/25	CAM SOP-00938	OMOE E3516 m
Total Nitrogen (calculated)	2	N/A	2023/10/25	Auto Calc.	
Total Organic Carbon (TOC) (7)	2	N/A	2023/10/25	CAM SOP-00446	SM 23 5310B m
Total Phosphorus (Colourimetric)	2	2023/10/24	2023/10/25	CAM SOP-00407	SM 23 4500-P I

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

Your P.O. #: 202031-004
Your Project #: 20-203-1
Site#: IGNACE, ON

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2023/11/15
Report #: R7912795
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C3W6006
Received: 2023/10/18, 10:15

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

(1) This test was performed by Bureau Veritas Calgary (19th), 4000 19th Street NE , Calgary, AB, T2E 6P8
(2) This test was performed by Bureau Veritas Montreal., 889 Montée de Liesse , Ville St-Laurent, QC, H4T 1P5
(3) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(4) Non-accredited test method
(5) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(6) This is a field test, therefore, the results relate to items that were not analysed at Bureau Veritas.
(7) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Encryption Key

Katherine Szozda
Project Manager
15 Nov 2023 14:59:14

Please direct all questions regarding this Certificate of Analysis to:
Katherine Szozda, Project Manager
Email: Katherine.Szozda@bureauveritas.com
Phone# (613)274-0573 Ext:7063633

==========

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Bureau Veritas Job #: C3W6006
Report Date: 2023/11/15

Geofirma Engineering Ltd
Client Project #: 20-203-1
Your P.O. #: 202031-004
Sampler Initials: MD

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XIN853			XIN853		
Sampling Date		2023/10/11			2023/10/11		
	UNITS	**IG_BH01_GW056**	**RDL**	**QC Batch**	**IG_BH01_GW056 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters							
Ammonium (NH4)	mg/L	<0.00061	0.00061	9030494			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	63	1.0	8997464			
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	8997464			
Hydrox. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	8997464			
Total Nitrogen (N)	mg/L	<0.10	0.10	8997463			
Total Organic Nitrogen	mg/L	<0.10	0.10	9030501			
Field Measurements							
Field Temperature	Celsius	9.65	N/A	ONSITE			
Field Measured pH	pH	7.32		ONSITE			
Inorganics							
Total Ammonia-N	mg/L	<0.050	0.050	9002322			
Fluoride (F-)	mg/L	0.17	0.10	9040245			
Total Inorganic Carbon (C)	mg/L	15	1	9000913	15	1	9000913
Dissolved Iodide	mg/L	<0.10	0.10	9018238			
Total Kjeldahl Nitrogen (TKN)	mg/L	<0.10	0.10	9002601			
Dissolved Organic Carbon	mg/L	1.0	0.40	8999651			
Total Organic Carbon (TOC)	mg/L	0.90	0.40	9002449			
Orthophosphate (P)	mg/L	<0.010	0.010	9038152			
pH	pH	7.55		8998044			
Total Phosphorus	mg/L	0.019	0.004	9002457			
Reactive Silica (SiO2)	mg/L	23	0.25	9016228			
Sulphide	mg/L	<0.020	0.020	8998759			
Alkalinity (Total as CaCO3)	mg/L	63	1.0	8998041			
Nitrite (N)	mg/L	0.013	0.010	9040183			
Dissolved Chloride (Cl-)	mg/L	<1.0	1.0	9040260			
Nitrate (N)	mg/L	<0.10	0.10	9040183			
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	9040183			
Dissolved Bromide (Br-)	mg/L	<1.0	1.0	9040260			
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	9040260			
Metals							
Total Ruthenium (Ru)	ug/L	<2.0	2.0	9035617			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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Bureau Veritas Job #: C3W6006
Report Date: 2023/11/15

Geofirma Engineering Ltd
Client Project #: 20-203-1
Your P.O. #: 202031-004
Sampler Initials: MD

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XIN854			XIN854		
Sampling Date		2023/10/17			2023/10/17		
	UNITS	**IG_BH01_GW057**	**RDL**	**QC Batch**	**IG_BH01_GW057 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters							
Ammonium (NH4)	mg/L	<0.00061	0.00061	9030494			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	63	1.0	8997464			
Carb. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	8997464			
Hydrox. Alkalinity (calc. as CaCO3)	mg/L	<1.0	1.0	8997464			
Total Nitrogen (N)	mg/L	<0.10	0.10	8997463			
Total Organic Nitrogen	mg/L	<0.10	0.10	9030501			
Field Measurements							
Field Temperature	Celsius	9.65	N/A	ONSITE			
Field Measured pH	pH	7.32		ONSITE			
Inorganics							
Total Ammonia-N	mg/L	<0.050	0.050	9002322			
Fluoride (F-)	mg/L	0.16	0.10	9040245			
Total Inorganic Carbon (C)	mg/L	15	1	9000913			
Dissolved Iodide	mg/L	<0.10	0.10	9018238			
Total Kjeldahl Nitrogen (TKN)	mg/L	<0.10	0.10	9002601	<0.10	0.10	9002601
Dissolved Organic Carbon	mg/L	1.2	0.40	8999659			
Total Organic Carbon (TOC)	mg/L	0.97	0.40	9002449			
Orthophosphate (P)	mg/L	<0.010	0.010	9038152			
pH	pH	7.55		8998044			
Total Phosphorus	mg/L	0.019	0.004	9002457			
Reactive Silica (SiO2)	mg/L	23	0.25	9016228			
Sulphide	mg/L	<0.020	0.020	8998759			
Alkalinity (Total as CaCO3)	mg/L	63	1.0	8998041			
Nitrite (N)	mg/L	0.013	0.010	9040183			
Dissolved Chloride (Cl-)	mg/L	<1.0	1.0	9040260			
Nitrate (N)	mg/L	<0.10	0.10	9040183			
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	9040183			
Dissolved Bromide (Br-)	mg/L	<1.0	1.0	9040260			
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	9040260			
Metals							
Total Ruthenium (Ru)	ug/L	<2.0	2.0	9035617			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		XIN853	XIN854		
Sampling Date		2023/10/11	2023/10/17		
	UNITS	**IG_BH01_GW056**	**IG_BH01_GW057**	**RDL**	**QC Batch**
Metals					
Dissolved Iron (Fe)	mg/L	3.5	3.6	0.02	9030935
Total Iron (Fe)	mg/L	3.7	3.8	0.02	9002042
Dissolved Sulphur (S)	mg/L	<0.5	<0.5	0.5	9030935
Total Sulphur (S)	mg/L	<0.5	<0.5	0.5	9002042
Dissolved Aluminum (Al)	ug/L	<4.9	<4.9	4.9	8998874
Dissolved Arsenic (As)	ug/L	<1.0	<1.0	1.0	8998874
Dissolved Barium (Ba)	ug/L	8.3	8.5	2.0	8998874
Dissolved Bismuth (Bi)	ug/L	<1.0	<1.0	1.0	8998874
Dissolved Boron (B)	ug/L	21	19	10	8998874
Dissolved Cadmium (Cd)	ug/L	<0.090	<0.090	0.090	8998874
Dissolved Calcium (Ca)	ug/L	12000	12000	200	8998874
Dissolved Cesium (Cs)	ug/L	<0.20	<0.20	0.20	8998874
Dissolved Chromium (Cr)	ug/L	<5.0	<5.0	5.0	8998874
Dissolved Cobalt (Co)	ug/L	<0.50	<0.50	0.50	8998874
Dissolved Copper (Cu)	ug/L	<0.90	<0.90	0.90	8998874
Dissolved Lead (Pb)	ug/L	<0.50	<0.50	0.50	8998874
Dissolved Lithium (Li)	ug/L	28	28	5.0	8998874
Dissolved Magnesium (Mg)	ug/L	1900	1900	50	8998874
Dissolved Nickel (Ni)	ug/L	1.0	<1.0	1.0	8998874
Dissolved Potassium (K)	ug/L	1700	1700	200	8998874
Dissolved Rubidium (Rb)	ug/L	1.1	1.1	0.20	8998874
Dissolved Selenium (Se)	ug/L	<2.0	<2.0	2.0	8998874
Dissolved Silicon (Si)	ug/L	11000	11000	50	8998874
Dissolved Sodium (Na)	ug/L	10000	9900	100	8998874
Dissolved Strontium (Sr)	ug/L	80	80	1.0	8998874
Dissolved Thorium (Th)	ug/L	<2.0	<2.0	2.0	8998874
Dissolved Uranium (U)	ug/L	1.8	1.8	0.10	8998874
Dissolved Zirconium (Zr)	ug/L	<1.0	<1.0	1.0	8998874

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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TEST SUMMARY

Bureau Veritas ID: XIN853
Sample ID: IG_BH01_GW056
Matrix: Water

Collected: 2023/10/11
Shipped:
Received: 2023/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998041	N/A	2023/10/23	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	8997464	N/A	2023/10/24	Automated Statchk
Anions	IC	9040260	N/A	2023/11/10	Lusine Khachatryan
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999651	N/A	2023/10/25	Gyulshen Idriz
Fluoride	ISE	9040245	2023/11/09	2023/11/10	Surinder Rai
Dissolved Metals Analysis by ICP	ICP	9030935	2023/11/06	2023/11/08	Suban Kanapathippllai
Dissolved Metals by ICPMS	ICP/MS	8998874	N/A	2023/10/26	Thuy Linh Nguyen
Total Metals Analysis by ICP	ICP	9002042	2023/10/24	2023/10/25	Suban Kanapathippllai
Iodide, Thiosulphate, Thiocyanate	IC/EC	9018238	N/A	2023/10/28	Karen Graham
Total Extractable Lanthanides-waters	ICP/MSMS	9035617	2023/10/26	2023/10/28	Darya Mitrofanova
Silica (Reactive)	KONE	9016228	N/A	2023/10/26	Adam Fishleigh
Ammonium as NH4+	CALC/NH3	9030494	N/A	2023/11/06	Automated Statchk
Total Ammonia-N	LACH/NH4	9002322	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	9040183	N/A	2023/11/14	Chandra Nandlal
Organic Nitrogen	CALC	9030501	N/A	2023/11/08	Automated Statchk
pH	AT	8998044	2023/10/21	2023/10/23	Surinder Rai
Field Measured pH	PH	ONSITE	N/A	2023/11/06	Katherine Szozda
Orthophosphate	KONE	9038152	N/A	2023/11/10	Massarat Jan
Sulphide	ISE/S	8998759	N/A	2023/10/23	Gurparteek KAUR
Field Measured pH	PH	ONSITE	N/A	2023/11/06	Katherine Szozda
Total Inorganic Carbon (TIC)	TOCV/NDIR	9000913	N/A	2023/10/24	Gyulshen Idriz
Total Kjeldahl Nitrogen in Water	SKAL	9002601	2023/10/24	2023/10/25	Kruti Jitesh Patel
Total Nitrogen (calculated)	CALC	8997463	N/A	2023/10/25	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	9002449	N/A	2023/10/25	Gyulshen Idriz
Total Phosphorus (Colourimetric)	SKAL/P	9002457	2023/10/24	2023/10/25	Sachi Patel

Bureau Veritas ID: XIN853 Dup
Sample ID: IG_BH01_GW056
Matrix: Water

Collected: 2023/10/11
Shipped:
Received: 2023/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Inorganic Carbon (TIC)	TOCV/NDIR	9000913	N/A	2023/10/24	Gyulshen Idriz

Bureau Veritas ID: XIN854
Sample ID: IG_BH01_GW057
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998041	N/A	2023/10/23	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	8997464	N/A	2023/10/24	Automated Statchk
Anions	IC	9040260	N/A	2023/11/10	Lusine Khachatryan
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999659	N/A	2023/10/25	Gyulshen Idriz
Fluoride	ISE	9040245	2023/11/09	2023/11/10	Surinder Rai
Dissolved Metals Analysis by ICP	ICP	9030935	2023/11/06	2023/11/08	Suban Kanapathippllai

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Bureau Veritas Job #: C3W6006
Report Date: 2023/11/15

Geofirma Engineering Ltd
Client Project #: 20-203-1
Your P.O. #: 202031-004
Sampler Initials: MD

TEST SUMMARY

Bureau Veritas ID: XIN854
Sample ID: IG_BH01_GW057
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals by ICPMS	ICP/MS	8998874	N/A	2023/10/26	Thuy Linh Nguyen
Total Metals Analysis by ICP	ICP	9002042	2023/10/24	2023/10/25	Suban Kanapathippllai
Iodide, Thiosulphate, Thiocyanate	IC/EC	9018238	N/A	2023/10/28	Karen Graham
Total Extractable Lanthanides-waters	ICP/MSMS	9035617	2023/10/26	2023/10/28	Darya Mitrofanova
Silica (Reactive)	KONE	9016228	N/A	2023/10/26	Adam Fishleigh
Ammonium as NH4+	CALC/NH3	9030494	N/A	2023/11/06	Automated Statchk
Total Ammonia-N	LACH/NH4	9002322	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	9040183	N/A	2023/11/14	Chandra Nandlal
Organic Nitrogen	CALC	9030501	N/A	2023/11/08	Automated Statchk
pH	AT	8998044	2023/10/21	2023/10/23	Surinder Rai
Field Measured pH	PH	ONSITE	N/A	2023/11/06	Katherine Szozda
Orthophosphate	KONE	9038152	N/A	2023/11/10	Massarat Jan
Sulphide	ISE/S	8998759	N/A	2023/10/23	Gurparteek KAUR
Field Measured pH	PH	ONSITE	N/A	2023/11/06	Katherine Szozda
Total Inorganic Carbon (TIC)	TOCV/NDIR	9000913	N/A	2023/10/24	Gyulshen Idriz
Total Kjeldahl Nitrogen in Water	SKAL	9002601	2023/10/24	2023/10/25	Kruti Jitesh Patel
Total Nitrogen (calculated)	CALC	8997463	N/A	2023/10/25	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	9002449	N/A	2023/10/25	Gyulshen Idriz
Total Phosphorus (Colourimetric)	SKAL/P	9002457	2023/10/24	2023/10/25	Sachi Patel

Bureau Veritas ID: XIN854 Dup
Sample ID: IG_BH01_GW057
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Kjeldahl Nitrogen in Water	SKAL	9002601	2023/10/24	2023/10/25	Kruti Jitesh Patel

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.0°C

Revised Report [2023/11/15]: Sample IDs amended and reworks for anion testing per client request. Reworks ran past holding time with client consent.
Revised Report [2023/11/08]: Requested additional analysis for dissolved metals is added to both samples as per client.

Sample XIN853 [IG_BH01_GW056] : TOC< DOC: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Sample XIN854 [IG_BH01_GW057] : TOC< DOC: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8998041	SAU	Spiked Blank	Alkalinity (Total as CaCO3)	2023/10/23		97	%	85 - 115
8998041	SAU	Method Blank	Alkalinity (Total as CaCO3)	2023/10/23	<1.0		mg/L	
8998041	SAU	RPD	Alkalinity (Total as CaCO3)	2023/10/23	0.17		%	20
8998044	SAU	Spiked Blank	pH	2023/10/23		102	%	98 - 103
8998044	SAU	RPD	pH	2023/10/23	2.0		%	N/A
8998759	GTK	Matrix Spike	Sulphide	2023/10/23		92	%	80 - 120
8998759	GTK	Spiked Blank	Sulphide	2023/10/23		92	%	80 - 120
8998759	GTK	Method Blank	Sulphide	2023/10/23	<0.020		mg/L	
8998759	GTK	RPD	Sulphide	2023/10/23	0		%	20
8998874	TLG	Matrix Spike	Dissolved Aluminum (Al)	2023/10/26		104	%	80 - 120
			Dissolved Arsenic (As)	2023/10/26		98	%	80 - 120
			Dissolved Barium (Ba)	2023/10/26		102	%	80 - 120
			Dissolved Bismuth (Bi)	2023/10/26		95	%	80 - 120
			Dissolved Boron (B)	2023/10/26		101	%	80 - 120
			Dissolved Cadmium (Cd)	2023/10/26		99	%	80 - 120
			Dissolved Calcium (Ca)	2023/10/26		NC	%	80 - 120
			Dissolved Cesium (Cs)	2023/10/26		101	%	80 - 120
			Dissolved Chromium (Cr)	2023/10/26		95	%	80 - 120
			Dissolved Cobalt (Co)	2023/10/26		96	%	80 - 120
			Dissolved Copper (Cu)	2023/10/26		99	%	80 - 120
			Dissolved Lead (Pb)	2023/10/26		94	%	80 - 120
			Dissolved Lithium (Li)	2023/10/26		96	%	80 - 120
			Dissolved Magnesium (Mg)	2023/10/26		100	%	80 - 120
			Dissolved Nickel (Ni)	2023/10/26		95	%	80 - 120
			Dissolved Potassium (K)	2023/10/26		94	%	80 - 120
			Dissolved Rubidium (Rb)	2023/10/26		98	%	80 - 120
			Dissolved Selenium (Se)	2023/10/26		100	%	80 - 120
			Dissolved Silicon (Si)	2023/10/26		104	%	80 - 120
			Dissolved Sodium (Na)	2023/10/26		NC	%	80 - 120
			Dissolved Strontium (Sr)	2023/10/26		95	%	80 - 120
			Dissolved Thorium (Th)	2023/10/26		96	%	80 - 120
			Dissolved Uranium (U)	2023/10/26		97	%	80 - 120
			Dissolved Zirconium (Zr)	2023/10/26		106	%	80 - 120
8998874	TLG	Spiked Blank	Dissolved Aluminum (Al)	2023/10/26		102	%	80 - 120
			Dissolved Arsenic (As)	2023/10/26		98	%	80 - 120
			Dissolved Barium (Ba)	2023/10/26		101	%	80 - 120
			Dissolved Bismuth (Bi)	2023/10/26		96	%	80 - 120
			Dissolved Boron (B)	2023/10/26		96	%	80 - 120
			Dissolved Cadmium (Cd)	2023/10/26		98	%	80 - 120
			Dissolved Calcium (Ca)	2023/10/26		106	%	80 - 120
			Dissolved Cesium (Cs)	2023/10/26		101	%	80 - 120
			Dissolved Chromium (Cr)	2023/10/26		94	%	80 - 120
			Dissolved Cobalt (Co)	2023/10/26		97	%	80 - 120
			Dissolved Copper (Cu)	2023/10/26		95	%	80 - 120
			Dissolved Lead (Pb)	2023/10/26		94	%	80 - 120
			Dissolved Lithium (Li)	2023/10/26		103	%	80 - 120
			Dissolved Magnesium (Mg)	2023/10/26		96	%	80 - 120
			Dissolved Nickel (Ni)	2023/10/26		96	%	80 - 120
			Dissolved Potassium (K)	2023/10/26		100	%	80 - 120
			Dissolved Rubidium (Rb)	2023/10/26		98	%	80 - 120
			Dissolved Selenium (Se)	2023/10/26		100	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Silicon (Si)	2023/10/26		102	%	80 - 120
			Dissolved Sodium (Na)	2023/10/26		99	%	80 - 120
			Dissolved Strontium (Sr)	2023/10/26		97	%	80 - 120
			Dissolved Thorium (Th)	2023/10/26		93	%	80 - 120
			Dissolved Uranium (U)	2023/10/26		98	%	80 - 120
			Dissolved Zirconium (Zr)	2023/10/26		103	%	80 - 120
8998874	TLG	Method Blank	Dissolved Aluminum (Al)	2023/10/26	<4.9		ug/L	
			Dissolved Arsenic (As)	2023/10/26	<1.0		ug/L	
			Dissolved Barium (Ba)	2023/10/26	<2.0		ug/L	
			Dissolved Bismuth (Bi)	2023/10/26	<1.0		ug/L	
			Dissolved Boron (B)	2023/10/26	<10		ug/L	
			Dissolved Cadmium (Cd)	2023/10/26	<0.090		ug/L	
			Dissolved Calcium (Ca)	2023/10/26	<200		ug/L	
			Dissolved Cesium (Cs)	2023/10/26	<0.20		ug/L	
			Dissolved Chromium (Cr)	2023/10/26	<5.0		ug/L	
			Dissolved Cobalt (Co)	2023/10/26	<0.50		ug/L	
			Dissolved Copper (Cu)	2023/10/26	<0.90		ug/L	
			Dissolved Lead (Pb)	2023/10/26	<0.50		ug/L	
			Dissolved Lithium (Li)	2023/10/26	<5.0		ug/L	
			Dissolved Magnesium (Mg)	2023/10/26	<50		ug/L	
			Dissolved Nickel (Ni)	2023/10/26	<1.0		ug/L	
			Dissolved Potassium (K)	2023/10/26	<200		ug/L	
			Dissolved Rubidium (Rb)	2023/10/26	<0.20		ug/L	
			Dissolved Selenium (Se)	2023/10/26	<2.0		ug/L	
			Dissolved Silicon (Si)	2023/10/26	<50		ug/L	
			Dissolved Sodium (Na)	2023/10/26	<100		ug/L	
			Dissolved Strontium (Sr)	2023/10/26	<1.0		ug/L	
			Dissolved Thorium (Th)	2023/10/26	<2.0		ug/L	
			Dissolved Uranium (U)	2023/10/26	<0.10		ug/L	
			Dissolved Zirconium (Zr)	2023/10/26	<1.0		ug/L	
8998874	TLG	RPD	Dissolved Aluminum (Al)	2023/10/26	8.9		%	20
			Dissolved Arsenic (As)	2023/10/26	NC		%	20
			Dissolved Barium (Ba)	2023/10/26	0.15		%	20
			Dissolved Bismuth (Bi)	2023/10/26	NC		%	20
			Dissolved Boron (B)	2023/10/26	2.4		%	20
			Dissolved Cadmium (Cd)	2023/10/26	NC		%	20
			Dissolved Calcium (Ca)	2023/10/26	3.1		%	20
			Dissolved Chromium (Cr)	2023/10/26	NC		%	20
			Dissolved Cobalt (Co)	2023/10/26	NC		%	20
			Dissolved Copper (Cu)	2023/10/26	2.5		%	20
			Dissolved Lead (Pb)	2023/10/26	NC		%	20
			Dissolved Lithium (Li)	2023/10/26	NC		%	20
			Dissolved Magnesium (Mg)	2023/10/26	2.1		%	20
			Dissolved Nickel (Ni)	2023/10/26	0.41		%	20
			Dissolved Potassium (K)	2023/10/26	1.5		%	20
			Dissolved Selenium (Se)	2023/10/26	NC		%	20
			Dissolved Silicon (Si)	2023/10/26	2.8		%	20
			Dissolved Sodium (Na)	2023/10/26	4.0		%	20
			Dissolved Strontium (Sr)	2023/10/26	0.44		%	20
			Dissolved Uranium (U)	2023/10/26	1.2		%	20
			Dissolved Zirconium (Zr)	2023/10/26	NC		%	20

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8999651	GID	Matrix Spike	Dissolved Organic Carbon	2023/10/24		95	%	80 - 120
8999651	GID	Spiked Blank	Dissolved Organic Carbon	2023/10/24		97	%	80 - 120
8999651	GID	Method Blank	Dissolved Organic Carbon	2023/10/24	<0.40		mg/L	
8999651	GID	RPD	Dissolved Organic Carbon	2023/10/24	0.063		%	20
8999659	GID	Matrix Spike	Dissolved Organic Carbon	2023/10/25		95	%	80 - 120
8999659	GID	Spiked Blank	Dissolved Organic Carbon	2023/10/25		98	%	80 - 120
8999659	GID	Method Blank	Dissolved Organic Carbon	2023/10/25	<0.40		mg/L	
8999659	GID	RPD	Dissolved Organic Carbon	2023/10/25	2.2		%	20
9000913	GID	Matrix Spike [XIN853-02]	Total Inorganic Carbon (C)	2023/10/24		93	%	80 - 120
9000913	GID	Spiked Blank	Total Inorganic Carbon (C)	2023/10/24		98	%	80 - 120
9000913	GID	Method Blank	Total Inorganic Carbon (C)	2023/10/24	<1		mg/L	
9000913	GID	RPD [XIN853-02]	Total Inorganic Carbon (C)	2023/10/24	1.0		%	20
9002042	SUK	Matrix Spike	Total Iron (Fe)	2023/10/25		100	%	80 - 120
			Total Sulphur (S)	2023/10/25		NC	%	80 - 120
9002042	SUK	Spiked Blank	Total Iron (Fe)	2023/10/25		97	%	80 - 120
			Total Sulphur (S)	2023/10/25		95	%	80 - 120
9002042	SUK	Method Blank	Total Iron (Fe)	2023/10/25	<0.02		mg/L	
			Total Sulphur (S)	2023/10/25	<0.5		mg/L	
9002042	SUK	RPD	Total Iron (Fe)	2023/10/25	2.3		%	25
9002322	KPJ	Matrix Spike	Total Ammonia-N	2023/10/26		NC	%	75 - 125
9002322	KPJ	Spiked Blank	Total Ammonia-N	2023/10/26		102	%	80 - 120
9002322	KPJ	Method Blank	Total Ammonia-N	2023/10/26	<0.050		mg/L	
9002322	KPJ	RPD	Total Ammonia-N	2023/10/26	3.9		%	20
9002449	GID	Matrix Spike	Total Organic Carbon (TOC)	2023/10/25		93	%	80 - 120
9002449	GID	Spiked Blank	Total Organic Carbon (TOC)	2023/10/25		98	%	80 - 120
9002449	GID	Method Blank	Total Organic Carbon (TOC)	2023/10/25	<0.40		mg/L	
9002449	GID	RPD	Total Organic Carbon (TOC)	2023/10/25	0.73		%	20
9002457	SPC	Matrix Spike	Total Phosphorus	2023/10/25		91	%	80 - 120
9002457	SPC	QC Standard	Total Phosphorus	2023/10/25		99	%	80 - 120
9002457	SPC	Spiked Blank	Total Phosphorus	2023/10/25		94	%	80 - 120
9002457	SPC	Method Blank	Total Phosphorus	2023/10/25	<0.004		mg/L	
9002457	SPC	RPD	Total Phosphorus	2023/10/25	19		%	20
9002601	KJP	Matrix Spike [XIN854-04]	Total Kjeldahl Nitrogen (TKN)	2023/10/25		107	%	80 - 120
9002601	KJP	QC Standard	Total Kjeldahl Nitrogen (TKN)	2023/10/25		98	%	80 - 120
9002601	KJP	Spiked Blank	Total Kjeldahl Nitrogen (TKN)	2023/10/25		99	%	80 - 120
9002601	KJP	Method Blank	Total Kjeldahl Nitrogen (TKN)	2023/10/25	<0.10		mg/L	
9002601	KJP	RPD [XIN854-04]	Total Kjeldahl Nitrogen (TKN)	2023/10/25	NC		%	20
9016228	éKS	Matrix Spike	Reactive Silica (SiO2)	2023/10/26		97	%	80 - 120
9016228	éKS	Spiked Blank	Reactive Silica (SiO2)	2023/10/26		99	%	80 - 120
9016228	éKS	Method Blank	Reactive Silica (SiO2)	2023/10/26	<0.050		mg/L	
9018238	KGR	Matrix Spike	Dissolved Iodide	2023/10/28		85	%	80 - 120
9018238	KGR	Spiked Blank	Dissolved Iodide	2023/10/28		90	%	80 - 120
9018238	KGR	Method Blank	Dissolved Iodide	2023/10/28	<0.10		mg/L	
9030935	SUK	Matrix Spike	Dissolved Iron (Fe)	2023/11/08		92	%	80 - 120
			Dissolved Sulphur (S)	2023/11/08		NC	%	80 - 120
9030935	SUK	Spiked Blank	Dissolved Iron (Fe)	2023/11/08		97	%	80 - 120
			Dissolved Sulphur (S)	2023/11/08		95	%	80 - 120
9030935	SUK	Method Blank	Dissolved Iron (Fe)	2023/11/08	<0.02		mg/L	
			Dissolved Sulphur (S)	2023/11/08	<0.5		mg/L	
9030935	SUK	RPD	Dissolved Sulphur (S)	2023/11/08	0.38		%	25
9035617	DMI	Spiked Blank	Total Ruthenium (Ru)	2023/10/28		94	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9035617	DMI	Method Blank	Total Ruthenium (Ru)	2023/10/28	<2.0		ug/L	
9038152	MJ1	Matrix Spike	Orthophosphate (P)	2023/11/10		90	%	75 - 125
9038152	MJ1	Spiked Blank	Orthophosphate (P)	2023/11/10		95	%	80 - 120
9038152	MJ1	Method Blank	Orthophosphate (P)	2023/11/10	<0.010		mg/L	
9038152	MJ1	RPD	Orthophosphate (P)	2023/11/10	NC		%	20
9040183	C_N	Matrix Spike	Nitrite (N)	2023/11/14		NC	%	80 - 120
			Nitrate (N)	2023/11/14		103	%	80 - 120
9040183	C_N	Spiked Blank	Nitrite (N)	2023/11/14		106	%	80 - 120
			Nitrate (N)	2023/11/14		106	%	80 - 120
9040183	C_N	Method Blank	Nitrite (N)	2023/11/14	<0.010		mg/L	
			Nitrate (N)	2023/11/14	<0.10		mg/L	
9040183	C_N	RPD	Nitrite (N)	2023/11/14	0.52		%	20
			Nitrate (N)	2023/11/14	1.1		%	20
9040245	SAU	Matrix Spike	Fluoride (F-)	2023/11/10		NC	%	80 - 120
9040245	SAU	Spiked Blank	Fluoride (F-)	2023/11/10		98	%	80 - 120
9040245	SAU	Method Blank	Fluoride (F-)	2023/11/10	<0.10		mg/L	
9040245	SAU	RPD	Fluoride (F-)	2023/11/10	0.47		%	20
9040260	LKH	Matrix Spike	Dissolved Chloride (Cl-)	2023/11/10		100	%	80 - 120
			Dissolved Bromide (Br-)	2023/11/10		99	%	80 - 120
			Dissolved Sulphate (SO4)	2023/11/10		96	%	80 - 120
9040260	LKH	Spiked Blank	Dissolved Chloride (Cl-)	2023/11/10		98	%	70 - 130
			Dissolved Bromide (Br-)	2023/11/10		99	%	80 - 120
			Dissolved Sulphate (SO4)	2023/11/10		96	%	80 - 120
9040260	LKH	Method Blank	Dissolved Chloride (Cl-)	2023/11/10	<1.0		mg/L	
			Dissolved Bromide (Br-)	2023/11/10	<1.0		mg/L	
			Dissolved Sulphate (SO4)	2023/11/10	<1.0		mg/L	
9040260	LKH	RPD	Dissolved Chloride (Cl-)	2023/11/10	1.0		%	20
			Dissolved Bromide (Br-)	2023/11/10	NC		%	20
			Dissolved Sulphate (SO4)	2023/11/10	4.7		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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Bureau Veritas Job #: C3W6006
Report Date: 2023/11/15

Geofirma Engineering Ltd
Client Project #: 20-203-1
Your P.O. #: 202031-004
Sampler Initials: MD

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

Cristina Carriere, Senior Scientific Specialist

CHIMISTE Mira El Masri 2021-087 QUÉBEC

Mira El Masri, M.Sc. Chemist, Montréal, Analyst II

Katherine Szozda, Project Manager

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

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Your Project #: 202031
Your C.O.C. #: 965042-01-01

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2024/01/02
Report #: R7974550
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3BE209
Received: 2023/12/11, 14:00

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	2	N/A	2023/12/16	CAM SOP-00448	SM 24 2320 B m
Carbonate, Bicarbonate and Hydroxide	2	N/A	2023/12/16	CAM SOP-00102	APHA 4500-CO2 D
Anions	3	N/A	2023/12/18	CAM SOP-00435	SM 23 4110 B m
Dissolved Organic Carbon (DOC) (3)	2	N/A	2023/12/15	CAM SOP-00446	SM 24 5310 B m
Fluoride	3	2023/12/15	2023/12/16	CAM SOP-00449	SM 24 4500-F C m
Dissolved Metals Analysis by ICP	3	2023/12/18	2023/12/20	CAM SOP-00408	EPA 6010D m
Dissolved Metals by ICPMS	2	N/A	2023/12/18	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS	1	N/A	2023/12/19	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICP	2	2023/12/18	2023/12/19	CAM SOP-00408	EPA 6010D m
Iodide, Thiosulphate, Thiocyanate (1)	3	N/A	2023/12/27	CAL SOP-00057	Dionex #034035 R09 m
Total Extractable Lanthanides-waters (2, 4)	2	2023/12/20	2023/12/20	STL SOP-00071	MA. 200-Met 1.2 R7 m
Silica (Reactive) (1)	2	N/A	2023/12/22	AB SOP-00011	EPA 370.1 R1978 m
Ammonium as NH4+	2	N/A	2024/01/02		
Total Ammonia-N	2	N/A	2023/12/15	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (5)	3	N/A	2023/12/18	CAM SOP-00440	SM 24 4500-NO3I/NO2B
Organic Nitrogen	2	N/A	2023/12/18	Auto Calc.	
pH	2	2023/12/15	2023/12/16	CAM SOP-00413	SM 24th - 4500H+ B
Field Measured pH (6)	2	N/A	2024/01/02		Field pH Meter
Orthophosphate	3	N/A	2023/12/18	CAM SOP-00461	SM 24 4500-P E
Sulphide	2	N/A	2023/12/18	CAM SOP-00455	SM 24 4500-S G m
Field Temperature (6)	2	N/A	2024/01/02		Field Thermometer
Total Inorganic Carbon (TIC)	2	N/A	2023/12/15	CAM SOP-00433	SM 24 5310 B m
Total Kjeldahl Nitrogen in Water	2	2023/12/15	2023/12/18	CAM SOP-00938	OMOE E3516 m
Total Nitrogen (calculated)	2	N/A	2023/12/18	Auto Calc.	
Total Organic Carbon (TOC) (7)	2	N/A	2023/12/15	CAM SOP-00446	SM 24 5310B m
Total Phosphorus (Colourimetric)	2	2023/12/15	2023/12/18	CAM SOP-00407	SM 24 4500-P I
Turbidity	2	N/A	2023/12/18	CAM SOP-00417	SM 24 2130 B

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau

Your Project #: 202031
Your C.O.C. #: 965042-01-01

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2024/01/02
Report #: R7974550
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3BE209
Received: 2023/12/11, 14:00

Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
(1) This test was performed by Bureau Veritas Calgary (19th), 4000 19th Street NE , Calgary, AB, T2E 6P8
(2) This test was performed by Bureau Veritas Montreal., 889 Montée de Liesse , Ville St-Laurent, QC, H4T 1P5
(3) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(4) Non-accredited test method
(5) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.
(6) This is a field test, therefore, the results relate to items that were not analysed at Bureau Veritas.
(7) Total Organic Carbon (TOC) present in the sample should be considered as non-purgeable TOC.

Your Project #: 202031
Your C.O.C. #: 965042-01-01

Attention: Amy Cartier

Geofirma Engineering Ltd
1 Raymond St
Suite 200
Ottawa, ON
CANADA K1R 1A2

Report Date: 2024/01/02
Report #: R7974550
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3BE209
Received: 2023/12/11, 14:00

Encryption Key

Bureau Veritas
02 Jan 2024 09:28:17

Please direct all questions regarding this Certificate of Analysis to:
Katherine Szozda, Project Manager
Email: Katherine.Szozda@bureauveritas.com
Phone# (613)274-0573 Ext:7063633
==========
This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas Job #: C3BE209
Report Date: 2024/01/02

Geofirma Engineering Ltd
Client Project #: 202031
Sampler Initials: AC

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XWG399			XWG399			XWG400		
Sampling Date		2023/12/09 16:30			2023/12/09 16:30			2023/12/09 16:00		
COC Number		965042-01-01			965042-01-01			965042-01-01		
	UNITS	**IG_BH01_GW072**	**RDL**	**QC Batch**	**IG_BH01_GW072 Lab-Dup**	**RDL**	**QC Batch**	**IG_BH01_GW074**	**RDL**	**QC Batch**
Calculated Parameters										
Ammonium (NH4)	mg/L							0.17	0.05	9115824
Bicarb. Alkalinity (calc. as CaCO3)	mg/L							8.2	1.0	9114090
Carb. Alkalinity (calc. as CaCO3)	mg/L							<1.0	1.0	9114090
Hydrox. Alkalinity (calc. as CaCO3)	mg/L							<1.0	1.0	9114090
Total Nitrogen (N)	mg/L							<1.0	1.0	9115823
Total Organic Nitrogen	mg/L							<0.10	0.10	9115825
Field Measurements										
Field Temperature	Celsius							17.09	N/A	ONSITE
Field Measured pH	pH							7.25		ONSITE
Inorganics										
Total Ammonia-N	mg/L							0.13	0.050	9115944
Fluoride (F-)	mg/L	<0.10	0.10	9115087				0.48	0.10	9116193
Total Inorganic Carbon (C)	mg/L							2	1	9116074
Dissolved Iodide	mg/L	<0.10	0.10	9133648	<0.10	0.10	9133648	<10	10	9133648
Total Kjeldahl Nitrogen (TKN)	mg/L							<1.0 (1)	1.0	9115752
Dissolved Organic Carbon	mg/L							1.3	0.40	9116143
Total Organic Carbon (TOC)	mg/L							1.3	0.40	9115952
Orthophosphate (P)	mg/L	<0.010	0.010	9116237				<0.010	0.010	9116237
pH	pH							6.74		9116194
Total Phosphorus	mg/L							0.028	0.004	9115831
Reactive Silica (SiO2)	mg/L							11	0.25	9133649
Sulphide	mg/L							<0.020	0.020	9117984
Turbidity	NTU							3.4	0.1	9116999
Alkalinity (Total as CaCO3)	mg/L							8.2	1.0	9116191
Nitrite (N)	mg/L	<0.010	0.010	9116019				<0.010	0.010	9116019
Dissolved Chloride (Cl-)	mg/L	<1.0	1.0	9110700				3800	50	9110700
Nitrate (N)	mg/L	<0.10	0.10	9116019				<0.10	0.10	9116019
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	9116019				<0.10	0.10	9116019
Dissolved Bromide (Br-)	mg/L	<1.0	1.0	9110700				76	1.0	9110700
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	9110700				16	1.0	9110700
Metals										
Total Ruthenium (Ru)	ug/L							<2.0	2.0	9127626

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable
(1) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly.

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Bureau Veritas Job #: C3BE209
Report Date: 2024/01/02

Geofirma Engineering Ltd
Client Project #: 202031
Sampler Initials: AC

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XWG400			XWG401			XWG401		
Sampling Date		2023/12/09 16:00			2023/12/10 12:45			2023/12/10 12:45		
COC Number		965042-01-01			965042-01-01			965042-01-01		
	UNITS	**IG_BH01_GW074 Lab-Dup**	**RDL**	**QC Batch**	**IG_BH01_GW075**	**RDL**	**QC Batch**	**IG_BH01_GW075 Lab-Dup**	**RDL**	**QC Batch**
Calculated Parameters										
Ammonium (NH4)	mg/L				<0.05	0.05	9115824			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L				89	1.0	9114090			
Carb. Alkalinity (calc. as CaCO3)	mg/L				<1.0	1.0	9114090			
Hydrox. Alkalinity (calc. as CaCO3)	mg/L				<1.0	1.0	9114090			
Total Nitrogen (N)	mg/L				0.17	0.10	9115823			
Total Organic Nitrogen	mg/L				0.17	0.10	9115825			
Field Measurements										
Field Temperature	Celsius				8.62	N/A	ONSITE			
Field Measured pH	pH				7.95		ONSITE			
Inorganics										
Total Ammonia-N	mg/L	0.13	0.050	9115944	<0.050	0.050	9115944			
Fluoride (F-)	mg/L				0.79	0.10	9116193	0.71	0.10	9116193
Total Inorganic Carbon (C)	mg/L	2	1	9116074	20	1	9116074			
Dissolved Iodide	mg/L				<0.10	0.10	9133648			
Total Kjeldahl Nitrogen (TKN)	mg/L				0.17	0.10	9115752			
Dissolved Organic Carbon	mg/L	1.1	0.40	9116143	1.9	0.40	9116143			
Total Organic Carbon (TOC)	mg/L	1.2	0.40	9115952	2.3	0.40	9115952			
Orthophosphate (P)	mg/L				0.047	0.010	9116237			
pH	pH				8.07		9116194	8.20		9116194
Total Phosphorus	mg/L				0.075	0.004	9115831			
Reactive Silica (SiO2)	mg/L				12	0.25	9133649			
Sulphide	mg/L				0.020	0.020	9117984			
Turbidity	NTU	3.4	0.1	9116999	2.3	0.1	9116999			
Alkalinity (Total as CaCO3)	mg/L				90	1.0	9116191	91	1.0	9116191
Nitrite (N)	mg/L				<0.010	0.010	9116019			
Dissolved Chloride (Cl-)	mg/L				72	1.0	9110700			
Nitrate (N)	mg/L				<0.10	0.10	9116019			
Nitrate + Nitrite (N)	mg/L				<0.10	0.10	9116019			
Dissolved Bromide (Br-)	mg/L				1.1	1.0	9110700			
Dissolved Sulphate (SO4)	mg/L				<1.0	1.0	9110700			
Metals										
Total Ruthenium (Ru)	ug/L				<2.0	2.0	9127626			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		XWG399			XWG400			XWG400		
Sampling Date		2023/12/09 16:30			2023/12/09 16:00			2023/12/09 16:00		
COC Number		965042-01-01			965042-01-01			965042-01-01		
	UNITS	**IG_BH01_GW072**	**RDL**	**QC Batch**	**IG_BH01_GW074**	**RDL**	**QC Batch**	**IG_BH01_GW074 Lab-Dup**	**RDL**	**QC Batch**
Metals										
Dissolved Iron (Fe)	mg/L	<0.02	0.02	9118575	1.1	0.02	9118575	1.2	0.02	9118575
Total Iron (Fe)	mg/L				1.1	0.02	9117855			
Dissolved Sulphur (S)	mg/L	<0.5	0.5	9118575	5.5	0.5	9118575	5.5	0.5	9118575
Total Sulphur (S)	mg/L				5.4	0.5	9117855			
Dissolved Aluminum (Al)	ug/L	<4.9	4.9	9118578	<4.9	4.9	9118578			
Dissolved Arsenic (As)	ug/L	<1.0	1.0	9118578	<1.0	1.0	9118578			
Dissolved Barium (Ba)	ug/L	<2.0	2.0	9118578	300	2.0	9118578			
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	9118578	<1.0	1.0	9118578			
Dissolved Boron (B)	ug/L	<10	10	9118578	250	10	9118578			
Dissolved Cadmium (Cd)	ug/L	<0.090	0.090	9118578	<0.090	0.090	9118578			
Dissolved Calcium (Ca)	ug/L	<200	200	9118578	1800000	1000	9118578			
Dissolved Cesium (Cs)	ug/L	<0.20	0.20	9118578	<0.20	0.20	9118578			
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	9118578	<5.0	5.0	9118578			
Dissolved Cobalt (Co)	ug/L	<0.50	0.50	9118578	<0.50	0.50	9118578			
Dissolved Copper (Cu)	ug/L	<0.90	0.90	9118578	<0.90	0.90	9118578			
Dissolved Lead (Pb)	ug/L	<0.50	0.50	9118578	<0.50	0.50	9118578			
Dissolved Lithium (Li)	ug/L	<5.0	5.0	9118578	44	5.0	9118578			
Dissolved Magnesium (Mg)	ug/L	<50	50	9118578	3000	50	9118578			
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	9118578	1.2	1.0	9118578			
Dissolved Potassium (K)	ug/L	<200	200	9118578	13000	200	9118578			
Dissolved Rubidium (Rb)	ug/L	<0.20	0.20	9118578	14	0.20	9118578			
Dissolved Selenium (Se)	ug/L	<2.0	2.0	9118578	<2.0	2.0	9118578			
Dissolved Silicon (Si)	ug/L	<50	50	9118578	3900	50	9118578			
Dissolved Sodium (Na)	ug/L	<100	100	9118578	580000	100	9118578			
Dissolved Strontium (Sr)	ug/L	<1.0	1.0	9118578	20000	1.0	9118578			
Dissolved Thorium (Th)	ug/L	<2.0	2.0	9118578	<2.0	2.0	9118578			
Dissolved Uranium (U)	ug/L	<0.10	0.10	9118578	<0.10	0.10	9118578			
Dissolved Zirconium (Zr)	ug/L	<1.0	1.0	9118578	<1.0	1.0	9118578			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		XWG401		
Sampling Date		2023/12/10 12:45		
COC Number		965042-01-01		
	UNITS	**IG_BH01_GW075**	**RDL**	**QC Batch**
Metals				
Dissolved Iron (Fe)	mg/L	0.21	0.02	9118575
Total Iron (Fe)	mg/L	0.27	0.02	9117855
Dissolved Sulphur (S)	mg/L	<0.5	0.5	9118575
Total Sulphur (S)	mg/L	<0.5	0.5	9117855
Dissolved Aluminum (Al)	ug/L	<4.9	4.9	9118578
Dissolved Arsenic (As)	ug/L	<1.0	1.0	9118578
Dissolved Barium (Ba)	ug/L	25	2.0	9118578
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	9118578
Dissolved Boron (B)	ug/L	110	10	9118578
Dissolved Cadmium (Cd)	ug/L	<0.090	0.090	9118578
Dissolved Calcium (Ca)	ug/L	35000	200	9118578
Dissolved Cesium (Cs)	ug/L	<0.20	0.20	9118578
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	9118578
Dissolved Cobalt (Co)	ug/L	<0.50	0.50	9118578
Dissolved Copper (Cu)	ug/L	<0.90	0.90	9118578
Dissolved Lead (Pb)	ug/L	<0.50	0.50	9118578
Dissolved Lithium (Li)	ug/L	35	5.0	9118578
Dissolved Magnesium (Mg)	ug/L	2000	50	9118578
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	9118578
Dissolved Potassium (K)	ug/L	5900	200	9118578
Dissolved Rubidium (Rb)	ug/L	3.4	0.20	9118578
Dissolved Selenium (Se)	ug/L	<2.0	2.0	9118578
Dissolved Silicon (Si)	ug/L	6000	50	9118578
Dissolved Sodium (Na)	ug/L	47000	100	9118578
Dissolved Strontium (Sr)	ug/L	300	1.0	9118578
Dissolved Thorium (Th)	ug/L	<2.0	2.0	9118578
Dissolved Uranium (U)	ug/L	17	0.10	9118578
Dissolved Zirconium (Zr)	ug/L	<1.0	1.0	9118578

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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TEST SUMMARY

Bureau Veritas ID: XWG399
Sample ID: IG_BH01_GW072
Matrix: Water

Collected: 2023/12/09
Shipped:
Received: 2023/12/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Anions	IC	9110700	N/A	2023/12/18	Lusine Khachatryan
Fluoride	ISE	9115087	2023/12/15	2023/12/16	Nachiketa Gohil
Dissolved Metals Analysis by ICP	ICP	9118575	2023/12/18	2023/12/20	Suban Kanapathippllai
Dissolved Metals by ICPMS	ICP/MS	9118578	N/A	2023/12/18	Prempal Bhatti
Iodide, Thiosulphate, Thiocyanate	IC/EC	9133648	N/A	2023/12/27	Kanwardeep Brar
Nitrate & Nitrite as Nitrogen in Water	LACH	9116019	N/A	2023/12/18	Chandra Nandlal
Orthophosphate	KONE	9116237	N/A	2023/12/18	Alina Dobreanu

Bureau Veritas ID: XWG399 Dup
Sample ID: IG_BH01_GW072
Matrix: Water

Collected: 2023/12/09
Shipped:
Received: 2023/12/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Iodide, Thiosulphate, Thiocyanate	IC/EC	9133648	N/A	2023/12/27	Kanwardeep Brar

Bureau Veritas ID: XWG400
Sample ID: IG_BH01_GW074
Matrix: Water

Collected: 2023/12/09
Shipped:
Received: 2023/12/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	9116191	N/A	2023/12/16	Nachiketa Gohil
Carbonate, Bicarbonate and Hydroxide	CALC	9114090	N/A	2023/12/16	Automated Statchk
Anions	IC	9110700	N/A	2023/12/18	Lusine Khachatryan
Dissolved Organic Carbon (DOC)	TOCV/NDIR	9116143	N/A	2023/12/15	Gyulshen Idriz
Fluoride	ISE	9116193	2023/12/15	2023/12/16	Nachiketa Gohil
Dissolved Metals Analysis by ICP	ICP	9118575	2023/12/18	2023/12/20	Suban Kanapathippllai
Dissolved Metals by ICPMS	ICP/MS	9118578	N/A	2023/12/19	Prempal Bhatti
Total Metals Analysis by ICP	ICP	9117855	2023/12/18	2023/12/19	Suban Kanapathippllai
Iodide, Thiosulphate, Thiocyanate	IC/EC	9133648	N/A	2023/12/27	Kanwardeep Brar
Total Extractable Lanthanides-waters	ICP/MSMS	9127626	2023/12/20	2023/12/20	Zineb El Ouali
Silica (Reactive)	KONE	9133649	N/A	2023/12/22	Marjolen Busslinger
Ammonium as NH4+	CALC/NH3	9115824	N/A	2024/01/02	Automated Statchk
Total Ammonia-N	LACH/NH4	9115944	N/A	2023/12/15	Shivani Shivani
Nitrate & Nitrite as Nitrogen in Water	LACH	9116019	N/A	2023/12/18	Chandra Nandlal
Organic Nitrogen	CALC	9115825	N/A	2023/12/18	Automated Statchk
pH	AT	9116194	2023/12/15	2023/12/16	Nachiketa Gohil
Field Measured pH	PH	ONSITE	N/A	2024/01/02	Katherine Szozda
Orthophosphate	KONE	9116237	N/A	2023/12/18	Alina Dobreanu
Sulphide	ISE/S	9117984	N/A	2023/12/18	Surinder Rai
Field Measured pH	PH	ONSITE	N/A	2024/01/02	Katherine Szozda
Total Inorganic Carbon (TIC)	TOCV/NDIR	9116074	N/A	2023/12/15	Gyulshen Idriz
Total Kjeldahl Nitrogen in Water	SKAL	9115752	2023/12/15	2023/12/18	Rajni Tyagi
Total Nitrogen (calculated)	CALC	9115823	N/A	2023/12/18	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	9115952	N/A	2023/12/15	Gyulshen Idriz
Total Phosphorus (Colourimetric)	SKAL/P	9115831	2023/12/15	2023/12/18	Sachi Patel

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TEST SUMMARY

Bureau Veritas ID: XWG400
Sample ID: IG_BH01_GW074
Matrix: Water

Collected: 2023/12/09
Shipped:
Received: 2023/12/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Turbidity	AT	9116999	N/A	2023/12/18	Kien Tran

Bureau Veritas ID: XWG400 Dup
Sample ID: IG_BH01_GW074
Matrix: Water

Collected: 2023/12/09
Shipped:
Received: 2023/12/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Organic Carbon (DOC)	TOCV/NDIR	9116143	N/A	2023/12/15	Gyulshen Idriz
Dissolved Metals Analysis by ICP	ICP	9118575	2023/12/18	2023/12/20	Suban Kanapathippllai
Total Ammonia-N	LACH/NH4	9115944	N/A	2023/12/15	Shivani Shivani
Total Inorganic Carbon (TIC)	TOCV/NDIR	9116074	N/A	2023/12/15	Gyulshen Idriz
Total Organic Carbon (TOC)	TOCV/NDIR	9115952	N/A	2023/12/15	Gyulshen Idriz
Turbidity	AT	9116999	N/A	2023/12/18	Kien Tran

Bureau Veritas ID: XWG401
Sample ID: IG_BH01_GW075
Matrix: Water

Collected: 2023/12/10
Shipped:
Received: 2023/12/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	9116191	N/A	2023/12/16	Nachiketa Gohil
Carbonate, Bicarbonate and Hydroxide	CALC	9114090	N/A	2023/12/16	Automated Statchk
Anions	IC	9110700	N/A	2023/12/18	Lusine Khachatryan
Dissolved Organic Carbon (DOC)	TOCV/NDIR	9116143	N/A	2023/12/15	Gyulshen Idriz
Fluoride	ISE	9116193	2023/12/15	2023/12/16	Nachiketa Gohil
Dissolved Metals Analysis by ICP	ICP	9118575	2023/12/18	2023/12/20	Suban Kanapathippllai
Dissolved Metals by ICPMS	ICP/MS	9118578	N/A	2023/12/18	Prempal Bhatti
Total Metals Analysis by ICP	ICP	9117855	2023/12/18	2023/12/19	Suban Kanapathippllai
Iodide, Thiosulphate, Thiocyanate	IC/EC	9133648	N/A	2023/12/27	Kanwardeep Brar
Total Extractable Lanthanides-waters	ICP/MSMS	9127626	2023/12/20	2023/12/20	Zineb El Ouali
Silica (Reactive)	KONE	9133649	N/A	2023/12/22	Marjolen Busslinger
Ammonium as NH4+	CALC/NH3	9115824	N/A	2024/01/02	Automated Statchk
Total Ammonia-N	LACH/NH4	9115944	N/A	2023/12/15	Shivani Shivani
Nitrate & Nitrite as Nitrogen in Water	LACH	9116019	N/A	2023/12/18	Chandra Nandlal
Organic Nitrogen	CALC	9115825	N/A	2023/12/18	Automated Statchk
pH	AT	9116194	2023/12/15	2023/12/16	Nachiketa Gohil
Field Measured pH	PH	ONSITE	N/A	2024/01/02	Katherine Szozda
Orthophosphate	KONE	9116237	N/A	2023/12/18	Alina Dobreanu
Sulphide	ISE/S	9117984	N/A	2023/12/18	Surinder Rai
Field Measured pH	PH	ONSITE	N/A	2024/01/02	Katherine Szozda
Total Inorganic Carbon (TIC)	TOCV/NDIR	9116074	N/A	2023/12/15	Gyulshen Idriz
Total Kjeldahl Nitrogen in Water	SKAL	9115752	2023/12/15	2023/12/18	Rajni Tyagi
Total Nitrogen (calculated)	CALC	9115823	N/A	2023/12/18	Automated Statchk
Total Organic Carbon (TOC)	TOCV/NDIR	9115952	N/A	2023/12/15	Gyulshen Idriz
Total Phosphorus (Colourimetric)	SKAL/P	9115831	2023/12/15	2023/12/18	Sachi Patel
Turbidity	AT	9116999	N/A	2023/12/18	Kien Tran

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Bureau Veritas Job #: C3BE209
Report Date: 2024/01/02

Geofirma Engineering Ltd
Client Project #: 202031
Sampler Initials: AC

TEST SUMMARY

Bureau Veritas ID: XWG401 Dup
Sample ID: IG_BH01_GW075
Matrix: Water

Collected: 2023/12/10
Shipped:
Received: 2023/12/11

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	9116191	N/A	2023/12/16	Nachiketa Gohil
Fluoride	ISE	9116193	2023/12/15	2023/12/16	Nachiketa Gohil
pH	AT	9116194	2023/12/15	2023/12/16	Nachiketa Gohil

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	5.0°C

RESULTS OF ANALYSES OF WATER

Sample XWG400 [IG_BH01_GW074] Iodide, Thiosulphate, Thiocyanate: Detection limits raised due to matrix interference.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9110700	LKH	Matrix Spike	Dissolved Chloride (Cl-)	2023/12/18		99	%	80 - 120
			Dissolved Bromide (Br-)	2023/12/18		99	%	80 - 120
			Dissolved Sulphate (SO4)	2023/12/18		97	%	80 - 120
9110700	LKH	Spiked Blank	Dissolved Chloride (Cl-)	2023/12/18		97	%	70 - 130
			Dissolved Bromide (Br-)	2023/12/18		99	%	80 - 120
			Dissolved Sulphate (SO4)	2023/12/18		96	%	80 - 120
9110700	LKH	Method Blank	Dissolved Chloride (Cl-)	2023/12/18	<1.0		mg/L	
			Dissolved Bromide (Br-)	2023/12/18	<1.0		mg/L	
			Dissolved Sulphate (SO4)	2023/12/18	<1.0		mg/L	
9110700	LKH	RPD	Dissolved Chloride (Cl-)	2023/12/18	0.57		%	20
			Dissolved Bromide (Br-)	2023/12/18	NC		%	20
			Dissolved Sulphate (SO4)	2023/12/18	NC		%	20
9115087	NGI	Matrix Spike	Fluoride (F-)	2023/12/16		100	%	80 - 120
9115087	NGI	Spiked Blank	Fluoride (F-)	2023/12/16		104	%	80 - 120
9115087	NGI	Method Blank	Fluoride (F-)	2023/12/16	<0.10		mg/L	
9115087	NGI	RPD	Fluoride (F-)	2023/12/16	6.4		%	20
9115752	RTY	Matrix Spike	Total Kjeldahl Nitrogen (TKN)	2023/12/18		104	%	80 - 120
9115752	RTY	QC Standard	Total Kjeldahl Nitrogen (TKN)	2023/12/18		103	%	80 - 120
9115752	RTY	Spiked Blank	Total Kjeldahl Nitrogen (TKN)	2023/12/18		105	%	80 - 120
9115752	RTY	Method Blank	Total Kjeldahl Nitrogen (TKN)	2023/12/18	<0.10		mg/L	
9115752	RTY	RPD	Total Kjeldahl Nitrogen (TKN)	2023/12/18	15		%	20
9115831	SPC	Matrix Spike	Total Phosphorus	2023/12/18		93	%	80 - 120
9115831	SPC	QC Standard	Total Phosphorus	2023/12/18		103	%	80 - 120
9115831	SPC	Spiked Blank	Total Phosphorus	2023/12/18		98	%	80 - 120
9115831	SPC	Method Blank	Total Phosphorus	2023/12/18	<0.004		mg/L	
9115831	SPC	RPD	Total Phosphorus	2023/12/18	0.61		%	20
9115944	SSV	Matrix Spike [XWG400-06]	Total Ammonia-N	2023/12/15		97	%	75 - 125
9115944	SSV	Spiked Blank	Total Ammonia-N	2023/12/15		99	%	80 - 120
9115944	SSV	Method Blank	Total Ammonia-N	2023/12/15	<0.050		mg/L	
9115944	SSV	RPD [XWG400-06]	Total Ammonia-N	2023/12/15	4.2		%	20
9115952	GID	Matrix Spike [XWG400-06]	Total Organic Carbon (TOC)	2023/12/15		89	%	80 - 120
9115952	GID	Spiked Blank	Total Organic Carbon (TOC)	2023/12/15		92	%	80 - 120
9115952	GID	Method Blank	Total Organic Carbon (TOC)	2023/12/15	<0.40		mg/L	
9115952	GID	RPD [XWG400-06]	Total Organic Carbon (TOC)	2023/12/15	6.2		%	20
9116019	C_N	Matrix Spike	Nitrite (N)	2023/12/18		102	%	80 - 120
			Nitrate (N)	2023/12/18		NC	%	80 - 120
9116019	C_N	Spiked Blank	Nitrite (N)	2023/12/18		104	%	80 - 120
			Nitrate (N)	2023/12/18		99	%	80 - 120
9116019	C_N	Method Blank	Nitrite (N)	2023/12/18	<0.010		mg/L	
			Nitrate (N)	2023/12/18	<0.10		mg/L	
9116019	C_N	RPD	Nitrite (N)	2023/12/18	4.9		%	20
			Nitrate (N)	2023/12/18	0.095		%	20
9116074	GID	Matrix Spike [XWG400-01]	Total Inorganic Carbon (C)	2023/12/15		61 (1)	%	80 - 120
9116074	GID	Spiked Blank	Total Inorganic Carbon (C)	2023/12/15		96	%	80 - 120
9116074	GID	Method Blank	Total Inorganic Carbon (C)	2023/12/15	<1		mg/L	
9116074	GID	RPD [XWG400-01]	Total Inorganic Carbon (C)	2023/12/15	4.8		%	20
9116143	GID	Matrix Spike [XWG400-03]	Dissolved Organic Carbon	2023/12/15		88	%	80 - 120
9116143	GID	Spiked Blank	Dissolved Organic Carbon	2023/12/15		95	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9116143	GID	Method Blank	Dissolved Organic Carbon	2023/12/15	<0.40		mg/L	
9116143	GID	RPD [XWG400-03]	Dissolved Organic Carbon	2023/12/15	12		%	20
9116191	NGI	Spiked Blank	Alkalinity (Total as CaCO3)	2023/12/16		96	%	85 - 115
9116191	NGI	Method Blank	Alkalinity (Total as CaCO3)	2023/12/16	<1.0		mg/L	
9116191	NGI	RPD [XWG401-01]	Alkalinity (Total as CaCO3)	2023/12/16	0.62		%	20
9116193	NGI	Matrix Spike [XWG401-01]	Fluoride (F-)	2023/12/16		97	%	80 - 120
9116193	NGI	Spiked Blank	Fluoride (F-)	2023/12/16		100	%	80 - 120
9116193	NGI	Method Blank	Fluoride (F-)	2023/12/16	<0.10		mg/L	
9116193	NGI	RPD [XWG401-01]	Fluoride (F-)	2023/12/16	11		%	20
9116194	NGI	Spiked Blank	pH	2023/12/16		102	%	98 - 103
9116194	NGI	RPD [XWG401-01]	pH	2023/12/16	1.6		%	N/A
9116237	ADB	Matrix Spike	Orthophosphate (P)	2023/12/18		90	%	75 - 125
9116237	ADB	Spiked Blank	Orthophosphate (P)	2023/12/18		94	%	80 - 120
9116237	ADB	Method Blank	Orthophosphate (P)	2023/12/18	<0.010		mg/L	
9116237	ADB	RPD	Orthophosphate (P)	2023/12/18	NC		%	20
9116999	KIT	Spiked Blank	Turbidity	2023/12/18		100	%	80 - 120
9116999	KIT	Method Blank	Turbidity	2023/12/18	<0.1		NTU	
9116999	KIT	RPD [XWG400-01]	Turbidity	2023/12/18	0		%	20
9117855	SUK	Matrix Spike	Total Iron (Fe)	2023/12/19		NC	%	80 - 120
			Total Sulphur (S)	2023/12/19		97	%	80 - 120
9117855	SUK	Spiked Blank	Total Iron (Fe)	2023/12/19		101	%	80 - 120
			Total Sulphur (S)	2023/12/19		98	%	80 - 120
9117855	SUK	Method Blank	Total Iron (Fe)	2023/12/19	<0.02		mg/L	
			Total Sulphur (S)	2023/12/19	<0.5		mg/L	
9117984	SAU	Matrix Spike	Sulphide	2023/12/18		93	%	80 - 120
9117984	SAU	Spiked Blank	Sulphide	2023/12/18		97	%	80 - 120
9117984	SAU	Method Blank	Sulphide	2023/12/18	<0.020		mg/L	
9117984	SAU	RPD	Sulphide	2023/12/18	NC		%	20
9118575	SUK	Matrix Spike [XWG400-04]	Dissolved Iron (Fe)	2023/12/20		92	%	80 - 120
			Dissolved Sulphur (S)	2023/12/20		NC	%	80 - 120
9118575	SUK	Spiked Blank	Dissolved Iron (Fe)	2023/12/20		100	%	80 - 120
			Dissolved Sulphur (S)	2023/12/20		96	%	80 - 120
9118575	SUK	Method Blank	Dissolved Iron (Fe)	2023/12/20	<0.02		mg/L	
			Dissolved Sulphur (S)	2023/12/20	<0.5		mg/L	
9118575	SUK	RPD [XWG400-04]	Dissolved Iron (Fe)	2023/12/20	0.78		%	25
			Dissolved Sulphur (S)	2023/12/20	0.71		%	25
9118578	PBA	Matrix Spike	Dissolved Aluminum (Al)	2023/12/18		104	%	80 - 120
			Dissolved Arsenic (As)	2023/12/18		101	%	80 - 120
			Dissolved Barium (Ba)	2023/12/18		107	%	80 - 120
			Dissolved Bismuth (Bi)	2023/12/18		98	%	80 - 120
			Dissolved Boron (B)	2023/12/18		102	%	80 - 120
			Dissolved Cadmium (Cd)	2023/12/18		103	%	80 - 120
			Dissolved Calcium (Ca)	2023/12/18		NC	%	80 - 120
			Dissolved Cesium (Cs)	2023/12/18		112	%	80 - 120
			Dissolved Chromium (Cr)	2023/12/18		100	%	80 - 120
			Dissolved Cobalt (Co)	2023/12/18		100	%	80 - 120
			Dissolved Copper (Cu)	2023/12/18		107	%	80 - 120
			Dissolved Lead (Pb)	2023/12/18		101	%	80 - 120
			Dissolved Lithium (Li)	2023/12/18		107	%	80 - 120
			Dissolved Magnesium (Mg)	2023/12/18		NC	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Nickel (Ni)	2023/12/18		96	%	80 - 120
			Dissolved Potassium (K)	2023/12/18		NC	%	80 - 120
			Dissolved Rubidium (Rb)	2023/12/18		101	%	80 - 120
			Dissolved Selenium (Se)	2023/12/18		99	%	80 - 120
			Dissolved Silicon (Si)	2023/12/18		110	%	80 - 120
			Dissolved Sodium (Na)	2023/12/18		NC	%	80 - 120
			Dissolved Strontium (Sr)	2023/12/18		NC	%	80 - 120
			Dissolved Thorium (Th)	2023/12/18		103	%	80 - 120
			Dissolved Uranium (U)	2023/12/18		104	%	80 - 120
			Dissolved Zirconium (Zr)	2023/12/18		116	%	80 - 120
9118578	PBA	Spiked Blank	Dissolved Aluminum (Al)	2023/12/18		101	%	80 - 120
			Dissolved Arsenic (As)	2023/12/18		99	%	80 - 120
			Dissolved Barium (Ba)	2023/12/18		104	%	80 - 120
			Dissolved Bismuth (Bi)	2023/12/18		97	%	80 - 120
			Dissolved Boron (B)	2023/12/18		100	%	80 - 120
			Dissolved Cadmium (Cd)	2023/12/18		100	%	80 - 120
			Dissolved Calcium (Ca)	2023/12/18		105	%	80 - 120
			Dissolved Cesium (Cs)	2023/12/18		108	%	80 - 120
			Dissolved Chromium (Cr)	2023/12/18		100	%	80 - 120
			Dissolved Cobalt (Co)	2023/12/18		100	%	80 - 120
			Dissolved Copper (Cu)	2023/12/18		102	%	80 - 120
			Dissolved Lead (Pb)	2023/12/18		99	%	80 - 120
			Dissolved Lithium (Li)	2023/12/18		104	%	80 - 120
			Dissolved Magnesium (Mg)	2023/12/18		102	%	80 - 120
			Dissolved Nickel (Ni)	2023/12/18		98	%	80 - 120
			Dissolved Potassium (K)	2023/12/18		105	%	80 - 120
			Dissolved Rubidium (Rb)	2023/12/18		101	%	80 - 120
			Dissolved Selenium (Se)	2023/12/18		98	%	80 - 120
			Dissolved Silicon (Si)	2023/12/18		107	%	80 - 120
			Dissolved Sodium (Na)	2023/12/18		101	%	80 - 120
			Dissolved Strontium (Sr)	2023/12/18		103	%	80 - 120
			Dissolved Thorium (Th)	2023/12/18		99	%	80 - 120
			Dissolved Uranium (U)	2023/12/18		100	%	80 - 120
			Dissolved Zirconium (Zr)	2023/12/18		108	%	80 - 120
9118578	PBA	Method Blank	Dissolved Aluminum (Al)	2023/12/18	<4.9		ug/L	
			Dissolved Arsenic (As)	2023/12/18	<1.0		ug/L	
			Dissolved Barium (Ba)	2023/12/18	<2.0		ug/L	
			Dissolved Bismuth (Bi)	2023/12/18	<1.0		ug/L	
			Dissolved Boron (B)	2023/12/18	<10		ug/L	
			Dissolved Cadmium (Cd)	2023/12/18	<0.090		ug/L	
			Dissolved Calcium (Ca)	2023/12/18	<200		ug/L	
			Dissolved Cesium (Cs)	2023/12/18	<0.20		ug/L	
			Dissolved Chromium (Cr)	2023/12/18	<5.0		ug/L	
			Dissolved Cobalt (Co)	2023/12/18	<0.50		ug/L	
			Dissolved Copper (Cu)	2023/12/18	<0.90		ug/L	
			Dissolved Lead (Pb)	2023/12/18	<0.50		ug/L	
			Dissolved Lithium (Li)	2023/12/18	<5.0		ug/L	
			Dissolved Magnesium (Mg)	2023/12/18	<50		ug/L	
			Dissolved Nickel (Ni)	2023/12/18	<1.0		ug/L	
			Dissolved Potassium (K)	2023/12/18	<200		ug/L	
			Dissolved Rubidium (Rb)	2023/12/18	<0.20		ug/L	
			Dissolved Selenium (Se)	2023/12/18	<2.0		ug/L	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Dissolved Silicon (Si)	2023/12/18	<50		ug/L	
			Dissolved Sodium (Na)	2023/12/18	<100		ug/L	
			Dissolved Strontium (Sr)	2023/12/18	<1.0		ug/L	
			Dissolved Thorium (Th)	2023/12/18	<2.0		ug/L	
			Dissolved Uranium (U)	2023/12/18	<0.10		ug/L	
			Dissolved Zirconium (Zr)	2023/12/18	<1.0		ug/L	
9118578	PBA	RPD	Dissolved Arsenic (As)	2023/12/18	NC		%	20
			Dissolved Barium (Ba)	2023/12/18	0.95		%	20
			Dissolved Boron (B)	2023/12/18	0.31		%	20
			Dissolved Cadmium (Cd)	2023/12/18	NC		%	20
			Dissolved Chromium (Cr)	2023/12/18	NC		%	20
			Dissolved Cobalt (Co)	2023/12/18	NC		%	20
			Dissolved Copper (Cu)	2023/12/18	NC		%	20
			Dissolved Lead (Pb)	2023/12/18	NC		%	20
			Dissolved Nickel (Ni)	2023/12/18	NC		%	20
			Dissolved Selenium (Se)	2023/12/18	NC		%	20
			Dissolved Sodium (Na)	2023/12/18	1.4		%	20
			Dissolved Uranium (U)	2023/12/18	1.1		%	20
9127626	ZEO	Spiked Blank	Total Ruthenium (Ru)	2023/12/20		97	%	80 - 120
9127626	ZEO	Method Blank	Total Ruthenium (Ru)	2023/12/20	<2.0		ug/L	
9133648	KDB	Matrix Spike	Dissolved Iodide	2023/12/27		97	%	80 - 120
9133648	KDB	Spiked Blank	Dissolved Iodide	2023/12/27		102	%	80 - 120
9133648	KDB	Method Blank	Dissolved Iodide	2023/12/27	<0.10		mg/L	
9133648	KDB	RPD [XWG399-01]	Dissolved Iodide	2023/12/27	NC		%	20
9133649	éE2	Matrix Spike	Reactive Silica (SiO2)	2023/12/22		NC	%	80 - 120
9133649	éE2	Spiked Blank	Reactive Silica (SiO2)	2023/12/22		103	%	80 - 120
9133649	éE2	Method Blank	Reactive Silica (SiO2)	2023/12/22	<0.050		mg/L	

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

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Cristina Carriere, Senior Scientific Specialist

Jonathan Fauvel, B.Sc, Chimiste, Scientific Specialist

Katherine Szozda, Project Manager

Suwan (Sze Yeung) Fock, B.Sc., Scientific Specialist

Bureau Veritas Proprietary Software
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Automated Statchk

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2023 Lab Reports:
Isotope Tracer Technologies (IT^2)

GEOFIRMA ENGINEERING

ISOTOPE TRACER TECHNOLOGIES INC

Isotope Analyses for: Geofirma Engineering LTD

IT^2 FILE # 230250

2024-01-08

Approved by:

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File Number: **230250**
Project Number: **20-203-1**

#	Client ID	Sample #	Sampling		E^3H	Result	± 1σ	$\delta^{18}O$	Aver	Stdv	δ^2H	Aver	Stdv
			Date	Time	Enriched	T.U.		H_2O	VSMOW		H_2O	VSMOW	
1	IG_BH01_GW043	135865	2023-06-19	14:10	X	< 0.8	0.8						
2	IG_BH01_GW044	135866	2023-06-19/20	various	X	< 0.8	0.8	X	-12.12	0.07	X	-78.7	0.3
3	IG_BH01_GW045	135867	2023-06-19/20	various	X	< 0.8	0.8	X	-12.20	0.05	X	-78.8	0.2
4	IG_BH01_GW046	135868	2023-06-20/21	various	X	3.1	1.6	X	-14.23	0.07	X	-102.0	0.2
5	IG_BH01_GW047	135869	2023-06-20/21	various	X	1.1	0.8	X	-14.34	0.05	X	-102.5	0.2

#	Client ID	Sample #	Sampling		$^{87}Sr/^{86}Sr$	Result	StdErr (abs)	StdDev (abs)	Result	StdErr (abs)	StdDev (abs)
			Date	Time							
1	IG_BH01_GW043	135865	2023-06-19	14:10							
2	IG_BH01_GW044	135866	2023-06-19/20	various	X	0.71543	6.20E-06	8.54E-05	0.715557	6.19E-06	8.54E-05
3	IG_BH01_GW045	135867	2023-06-19/20	various	X	0.71542	5.78E-06	8.01E-05			
4	IG_BH01_GW046	135868	2023-06-20/21	various	X	0.71206	4.22E-06	5.82E-05			
5	IG_BH01_GW047	135869	2023-06-20/21	various	X	0.71203	7.54E-06	1.05E-04			

#	Client ID	Sample #	Sampling		$\delta^{37}Cl$	Result	Stdv	Result	Stdv	Date	
			Date	Time							
1	IG_BH01_GW043	135865	2023-06-19	14:10							Revised Jan. 08, 2024
2	IG_BH01_GW044	135866	2023-06-19/20	various	X	-0.20	0.13	-0.37	0.02	2023-11-25	
3	IG_BH01_GW045	135867	2023-06-19/20	various	X	0.18	0.14	-0.24	0.09	2023-11-25	
4	IG_BH01_GW046	135868	2023-06-20/21	various	X	0.20	0.13	-0.31	0.11	2023-11-25	
5	IG_BH01_GW047	135869	2023-06-20/21	various	X	-0.31	0.07	-0.22	0.09	2023-12-02	

#	Client ID	Sample #	Sampling		$\delta^{13}C$	Result	Repeat	^{14}C	Result			
			Date	Time	DIC	PDB		DIC	14C yr BP	±	F14C	±
1	IG_BH01_GW043	135865	2023-06-19	14:10	X	-10.1	-10.0	X	7403	16	0.3979	0.0008
2	IG_BH01_GW044	135866	2023-06-19/20	various	X	-15.3	-15.3	X	No Gas			
3	IG_BH01_GW045	135867	2023-06-19/20	various	X	-17.6		X	No Gas			
4	IG_BH01_GW046	135868	2023-06-20/21	various	X	-18.3		X	5008	17	0.5361	0.0011
5	IG_BH01_GW047	135869	2023-06-20/21	various	X	-18.8	-18.8	X	5026	18	0.5349	0.0012

Approved by:

Orfan S-Stash

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Attn.: Chris Morgan/Amy Cartier
E-mail: cmorgan@geofirma.com
E-mail: acartier@geofirma.com

File Number: 230250
Project Number: 20-203-1

E^3H ANALYSES

Tritium is reported in Tritium Units.
1TU = 3.221 Picocurries/L per IAEA, 2000 Report.
1TU = 0.11919 Becquerels/L per IAEA, 2000 Report.

^{18}O & ^{2}H (CRDS)

Instrument Used: Cavity Ring Down Spectroscopy (CRDS)
CRDS (Model L2130-i) (Picarro, California, USA).
Standard Used: IT2-11C / IT2-12D / IT2-13C Calibrated with IAEA Standards (V-SMOW, SLAP, and GISP)
Typical Standard deviation: (18O ±0.1‰) (2H ± 1‰)

$^{87}Sr/^{86}Sr$ ANALYSES

Instrument Used:
Thermal Ionization Mass Spectrometry (TIMS), TI-Box, spectromat, Germany
Standard Used: NIST-987
Typical Standard deviation: ±0.0001

^{37}Cl ANALYSES

Instrument Used:
Isotope Ratio Mass Spectrometry (IRMS) - MAT 253, Thermo Scientific, Germany
Coupled with an Agilent 6890 Gas Chromatograph (GC)
Standard Used: SMOC
Typical Standard deviation: ± 0.15‰

^{13}C DIC Analyses

Instrument Used:
Finnigan MAT, Delta^{Plus} XL IRMS, Germany.
Standard Used: IT2-27/IT2-34/NBS-18/NBS-19
Typical Standard deviation: ± 0.2 ‰

^{14}C DIC Analyses

Instrument Used: AMS (Accelerator Mass Spectrometry)
Standard Used: OX1: 1.05 x e-10/OX2: 1.35 x e-10/C6: 1.5 x e-10/C7: 0.5 x e-10
Typical Standard deviation: 5 to 10% of Standard values listed above
Reporting of Data: In this analysis report, we have followed the conventions recommended by Millard (2014).
Radiocarbon Analysis
Radiocarbon analyses are performed on a 3MV tandem accelerator mass spectrometer built by High Voltage Engineering (HVE). 12,13,14C+3 ions are measured at 2.5 MV terminal voltage with Ar stripping. The fraction modern carbon, F14C, is calculated according to Reimer et al. (2004) as the ratio of the sample 14C/12C ratio to the standard 14C/12C ratio (in our case Ox-II) measured in the same data block. Both 14C/12C ratios are background-corrected and the result is corrected for spectrometer and preparation fractionation using the AMS measured 13C/12C ratio and is normalized to δ13C (PDB). Radiocarbon ages are calculated as -8033ln(F14C) and reported in 14C yr BP (BP=AD 1950) as described by Stuiver and Polach (1977). The errors on 14C ages (1σ) are based on counting statistics and 14C/12C and 13C/12C variation between data blocks. We do not report δ13C as it is measured on the AMS and contains machine fractionation.
D14C (defined as per mil Depletion or Enrichment Relative to Standard Normalized for Isotope Fractionation) are calculated as $(F14C - 1) \cdot 1000$.
Δ14C (defined as age corrected D14C) are calculated as $(F14C \cdot e^{(1950-y)/8267} - 1) \cdot 1000$, where y = year of measurement.

Approved by:

Orfan S-Stash

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ISOTOPE TRACER TECHNOLOGIES INC

CHAIN OF CUSTODY / ANALYTICAL SERVICES REQUEST FORM

Page 1_ of 1_

Note: all TAT Quoted material is in business days which exclude statutory holidays and weekends.

Specify date required

Service Requested

(regular)

(Rush)

COMPANY NAME	Geofirma Engineering Ltd
OFFICE ADDRESS	1 Raymond St, Suite 200 Ottawa, ON K1R 1A2
PROJECT MANAGER: Amy Cartier/Chris Morgan	
PROJECT # 20-203-1	
PHONE 514-730-0961/613-402	FAX
	PO # 202031

REPORT FORMAT/DISTRIBUTION

EMAIL _X____ FAX _____ BOTH _____
SELECT: PDF _____ DIGITAL _____ BOTH _X_
EMAIL 1 _acartier@geofirma.com_____
EMAIL 2 _cmorgan@geofirma.com_____

SAMPLING INFORMATION

Sample Date/Time		TYPE		MATRIX				ANALYSIS REQUEST												PLEASE INDICATE FILTERED, PRESERVED OR BOTH <----- (F, P, F/P)	
Date (YYYY-MM-DD)	Time (24hr) (hh:mm)	COMP	GRAB	WATER	SOIL	OTHER	SAMPLE DESCRIPTION TO APPEAR ON REPORT	NUMBER OF CONTAINERS	3H, 2H, D18O	14C-DIC	d13C-dic	37-Cl	87Sr/86/Sr	3H Only						COMMENTS	LAB ID
2023-06-19	14:10			X			IG_BH01_GW043	2		X				X							
2023-06-19/20	Various			X			IG_BH01_GW044	6	X	X	X	X	X								
2023-06-19/20	Various			X			IG_BH01_GW045	7	X	X	X	X	X	X							
2023-06-20/21	Various			X			IG_BH01_GW046	6	X	X	X	X	X	X							
2023-06-20/21	Various			X			IG_BH01_GW047	6	X	X	X	X	X	X							
																				Shipped on ice <10	

SUBMISSION #:

ENTERED BY:

DATE/TIME ENTERED:

BIN #:

SPECIAL INSTRUCTIONS/COMMENTS

COC ID#: GFIM_IT2_0008

THE QUESTIONS BELOW MUST BE ANSWERED FORWATER SAMPLES (CHECK Yes OR No)

Are any samples taken from a regulated DW System? Yes ___ No _X_
If yes, an authorized drinking water COC MUST be used for this submission.
Is the water sampled intended to be potable for human consumption? Yes ___ No _X_

SAMPLE CONDITION

___ FROZEN
___ COLD
___ COOLING INITIATED
___ AMBIENT

SAMPLED BY: Amy Cartier	DATE & TIME 2023-06-21	RECEIVED BY:	DATE & TIME	Observations
RELINQUISHED BY: Chris Morgan	DATE & TIME 2023-06-28	RECEIVED AT LAB BY: Nour A.	DATE & TIME 2023-06-29	

1. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs.

2. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

ISOTOPE TRACER TECHNOLOGIES INC

Isotope Analyses for: Geofirma Engineering Ltd.

IT^2 FILE # 231066

2024-01-18

Approved by:

Orfan Shouakar-Stash, PhD
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Website: www.it2isotopes.com

ISOTOPE TRACER TECHNOLOGIES INC

Client: Geofirma Engineering Ltd.
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K1R 1A2
Att.: Chris Morgan/Amy Cartier
E-mail: cmorgan@geofirma.com
E-mail: acartier@goefirma.com
Phone: 613-402-1701/ 514730-0961

File Number: 231066
Project #: 20-203-1
PO: 202031

#	Sample ID	Sample Collection		Sample #	$\delta^{18}O$	Aver	Stdv	$\delta^{2}H$	Aver	Stdv	$E^{3}H$	Result	± 1σ
		Date	Time		H_2O	VSMOW		H_2O	VSMOW		Enriched	TU	
1	IG_BH03_GW022	2023-10-02/03	Various	159134	X	-16.41	0.06	X	-120.8	0.3	X	< 0.8	0.7
2	IG_BH03_GW023	2023-10-02/03	Various	159135	X	-16.55	0.03	X	-122.1	0.3	X	< 0.8	0.8
3	IG_BH01_GW056	2023-10-11/12	Various	159136	X	-14.15	0.09	X	-101.8	0.4	X	2.2	0.8
4	IG_BH01_GW057	2023-10-11/12	Various	159137	X	-14.06	0.07	X	-101.1	0.2	X	2.5	0.8
5	IG_BH01_GW055	2023-10-03	11:15	159138							X	1.0	0.7

#	Sample ID	Sample Collection		Sample #	$\delta^{13}C$	Result	Repeat	^{14}C	Result			
		Date	Time		DIC	VPDB		DIC	14C yr BP	±	F14C	±
1	IG_BH03_GW022	2023-10-02/03	Various	159134	X	-13.9		X	17850	50	0.1089	0.0007
2	IG_BH03_GW023	2023-10-02/03	Various	159135	X	-16.3		X	18200	55	0.1040	0.0007
3	IG_BH01_GW056	2023-10-11/12	Various	159136	X	-20.2		X	4130	20	0.5985	0.0015
4	IG_BH01_GW057	2023-10-11/12	Various	159137	X	-20.2	-19.9	X	4080	25	0.6025	0.0016
5	IG_BH01_GW055	2023-10-03	11:15	159138	X	-12.0		X	7560	25	0.3905	0.0011

#	Sample ID	Sample Collection		Sample #	$\delta^{37}Cl$	Result	Stdv
		Date	Time			SMOC	
1	IG_BH03_GW022	2023-10-02/03	Various	159134	X	0.16	0.12
2	IG_BH03_GW023	2023-10-02/03	Various	159135	X	0.16	0.01
3	IG_BH01_GW056	2023-10-11/12	Various	159136	X	0.58	0.11
4	IG_BH01_GW057	2023-10-11/12	Various	159137	X	1.07	0.20
5	IG_BH01_GW055	2023-10-03	11:15	159138			

						Average		Third Run		Second Run		First Run	
#	Sample ID	Sample Collection		Sample #	$\delta^{37}Cl$	Result	Stdv	Result	Stdv	Result	Stdv	Result	Stdv
		Date	Time			SMOC		SMOC		SMOC		SMOC	
4	IG_BH01_GW057	2023-10-11/12	Various	159137	X	1.07	0.20	1.04	0.26	0.82	0.30	1.35	0.28

#	Sample ID	Sample Collection		Sample #	$^{87}Sr/^{86}Sr$	Result	StdErr (abs)	StdDev (abs)	Repeat	StdErr (abs)	StdDev (abs)
		Date	Time			NIST-987					
1	IG_BH03_GW022	2023-10-02/03	Various	159134	X	0.70964	5.57E-06	7.70E-05	0.70969	6.95E-06	9.68E-05
2	IG_BH03_GW023	2023-10-02/03	Various	159135	X	0.70978	8.47E-06	1.16E-04			
3	IG_BH01_GW056	2023-10-11/12	Various	159136	X	0.71034	6.43E-06	8.77E-05			
4	IG_BH01_GW057	2023-10-11/12	Various	159137	X	0.71012	5.56E-06	7.71E-05			
5	IG_BH01_GW055	2023-10-03	11:15	159138							

Approved by:

Orfan S-Stash

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E-mail: acartier@goefirma.com
Phone: 613-402-1701/ 514730-0961

File Number: 231066
Project #: 20-203-1
PO: 202031

^{18}O & ^{2}H (CRDS)

Instrument Used: Cavity Ring Down Spectroscopy (CRDS)
CRDS (Model L2130-i) (Picarro, California, USA).
Standard Used:
IT2-12D / IT2-13C / IT2-14C Calibrated with IAEA Standards (V-SMOW, SLAP, and GISP)
Typical Standard deviation:
(^{18}O ±0.1‰) (^{2}H ± 1‰)

E^{3}H ANALYSES

Tritium is reported in Tritium Units.
1TU = 3.221 Picocurries/L per IAEA, 2000 Report.
1TU = 0.11919 Becquerels/L per IAEA, 2000 Report.

^{13}C DIC Analyses

Instrument Used:
Finnigan MAT, Delta^{Plus} XL IRMS, Germany.
Standard Used: IT2-27/ IT2-34/ NBS-18/ NBS-19
Typical Standard deviation: ± 0.2 ‰

^{14}C DIC Analyses

Instrument Used: AMS (Accelerator Mass Spectrometry)
Standard Used: OX1: 1.05 x e-10/OX2: 1.35 x e-10/C6: 1.5 x e-10/C7: 0.5 x e-10
Typical Standard deviation: 5 to 10% of Standard values listed above
Reporting of Data: In this analysis report, we have followed the conventions recommended by Millard (2014).
Radiocarbon Analysis
Radiocarbon analyses are performed on a 3MV tandem accelerator mass spectrometer built by High Voltage Engineering (HVE). 12,13,14C+3 ions are measured at 2.5 MV terminal voltage with Ar stripping. The fraction modern carbon, F14C, is calculated according to Reimer et al. (2004) as the ratio of the sample 14C/12C ratio to the standard 14C/12C ratio (in our case Ox-II) measured in the same data block. Both 14C/12C ratios are background-corrected and the result is corrected for spectrometer and preparation fractionation using the AMS measured 13C/12C ratio and is normalized to δ13C (PDB). Radiocarbon ages are calculated as -8033ln(F14C) and reported in 14C yr BP (BP=AD 1950) as described by Stuiver and Polach (1977). The errors on 14C ages (1σ) are based on counting statistics and 14C/12C and 13C/12C variation between data blocks. We do not report δ13C as it is measured on the AMS and contains machine fractionation.
D14C (defined as per mil Depletion or Enrichment Relative to Standard Normalized for Isotope Fractionation) are calculated as $(F14C - 1) \cdot 1000$.
Δ14C (defined as age corrected D14C) are calculated as $(F14C \cdot e^{(1950-y)/8267} - 1) \cdot 1000$, where y = year of measurement.

Approved by:

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ISOTOPE TRACER TECHNOLOGIES INC

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E-mail: acartier@goefirma.com
Phone: 613-402-1701/ 514730-0961

File Number: 231066
Project #: 20-203-1
PO: 202031

^{37}Cl ANALYSES

Instrument Used:
Isotope Ratio Mass Spectrometry (IRMS) - MAT 253, Thermo Scientific, Germany
Coupled with an Agilent 6890 Gas Chromatograph (GC)
Standard Used:
SMOC
Typical Standard deviation:
± 0.15‰

^{87}Sr/^{86}Sr ANALYSES

Instrument Used:
Thermal Ionization Mass Spectrometry (TIMS), TI-Box, spectromat, Germany
Standard Used:
NIST-987
Typical Standard deviation:
±0.0001

Approved by:

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ISOTOPE TRACER TECHNOLOGIES INC

CHAIN OF CUSTODY / ANALYTICAL SERVICES REQUEST FORM

Page 1 of 1

Note: all TAT Quoted material is in business days which exclude statutory holidays and weekends.

Specify date required	Service Requested		
	(regular)	X	Regular
	(Rush)		

COMPANY NAME	Geofirma Engineering Ltd.
OFFICE ADDRESS	1 Raymond St., Suite 200 Ottawa ON K1R 1A2
PROJECT MANAGER: Chris Morgan/Amy Cartier	
PROJECT # 20 203-1	
PHONE: 613-402-1701/ 514-730-0961	FAX
	PO # 202031

REPORT FORMAT/DISTRIBUTION

EMAIL __X____ FAX _____ BOTH _____
SELECT: PDF _____ DIGITAL _____ BOTH __X__
EMAIL 1 ___cmorgan@geofirma.com_____
EMAIL 2 ___acartier@geofirma.com_____

SAMPLING INFORMATION

Sample Date/Time		TYPE		MATRIX				NUMBER OF CONTAINERS	ANALYSIS REQUEST										
Date (YYYY-MM-DD)	Time (24hr) (hh:mm)	COMP	GRAB	WATER	SOIL	OTHER	SAMPLE DESCRIPTION TO APPEAR ON REPORT		3H, 2H, D18O	14C-DIC	d13C-DIC	37-Cl	87Sr/86Sr	3H only					
2023-10-02/03	Various			X			IG_BH03_GW022	2		X				X					
2023-10-02/03	Various			X			IG-BH03-GW023	6	X	X	X	X	X	X					
2023-10-11/12/13	Various			X			IG-BH01-GW056	6	X	X	X	X	X	X					
2023-10-11/12	Various			X			IG-BH01-GW057	6	X	X	X	X	X	X					
2023-10-3	11:15			X			IG_BH01_GW055	6	X	X	X	X	X	X					

SUBMISSION #:	
ENTERED BY:	
DATE/TIME ENTERED:	
BIN #:	

PLEASE INDICATE FILTERED, PRESERVED OR BOTH
<----- (F, P, F/P)

COMMENTS / LAB ID

Shipped on Ice (<10°C)

SPECIAL INSTRUCTIONS/COMMENTS

COC ID#: GFIM-IT2-0010

THE QUESTIONS BELOW MUST BE ANSWERED FORWATER SAMPLES (CHECK Yes OR No)

Are any samples taken from a regulated DW System? Yes ___ No _X_
If yes, an authorized drinking water COC MUST be used for this submission.
Is the water sampled intended to be potable for human consumption? Yes ___ No _X_

SAMPLE CONDITION

___ FROZEN
___ COLD
___ COOLING INITIATED
___ AMBIENT

Observations

SAMPLED BY: Morgan deKroon	DATE & TIME Various	RECEIVED BY: Nour. A.	DATE & TIME		
RELINQUISHED BY: Morgan deKroon	DATE & TIME 2023-Oct-19 09:00	RECEIVED AT LAB BY: Nour	DATE & TIME 2023-Oct-19		

1. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs.

2. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

ISOTOPE TRACER TECHNOLOGIES INC

Isotope Analyses for: Geofirma Engineering Ltd.

IT^2 FILE # 231159

2024-04-08

Approved by:

Orfan Shouakar-Stash, PhD
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E-mail: acartier@geofirma.com
Phone: 613-402-1701/ 514-730-0961

File Number: 231159
Project #: 20-203-1
PO: 202031

#	Sample ID	Sample Collection		Sample #	E3H	Result	± 1σ
		Date	Time		Enriched	TU	
1	IG_BH01_GW073	2023-12-10	n/a	162494	X	< 0.8	0.3
2	IG_BH01_GW074	2023-12-09	n/a	162495	X	< 0.8	0.5
3	IG_BH01_GW075	2023-12-10	n/a	162496	X	< 0.8	0.5

#	Sample ID	Sample Collection		Sample #	$\delta^{13}C$	Result	Repeat
		Date	Time		DIC	VPDB	
1	IG_BH01_GW073	2023-12-10	n/a	162494	X	-10.2	-10.2
2	IG_BH01_GW074	2023-12-09	n/a	162495	X	-10.7	
3	IG_BH01_GW075	2023-12-10	n/a	162496	X	-18.2	

#	Sample ID	Sample Collection		Sample #	^{14}C	Result			
		Date	Time		DIC	14C yr BP	±	F14C	±
1	IG_BH01_GW073	2023-12-10	n/a	162494	X	7400	45	0.3985	0.0021
2	IG_BH01_GW074	2023-12-09	n/a	162495	X	7430	50	0.3970	0.0023
3	IG_BH01_GW075	2023-12-10	n/a	162496	X	9690	55	0.2994	0.0020

#	Sample ID	Sample Collection		Sample #	$\delta^{18}O$	Aver	Stdv	$\delta^{2}H$	Aver	Stdv
		Date	Time		H_2O	VSMOW		H_2O	VSMOW	
1	IG_BH01_GW073	2023-12-10	n/a	162494						
2	IG_BH01_GW074	2023-12-09	n/a	162495	X	-12.66	0.04	X	-85.5	0.3
3	IG_BH01_GW075	2023-12-10	n/a	162496	X	-14.08	0.02	X	-99.8	0.3

#	Sample ID	Sample Collection		Sample #	$^{87}Sr/^{86}Sr$	Result	StdErr (abs)	StdDev (abs)	Result	StdErr (abs)	StdDev (abs)
		Date	Time			NIST-987					
1	IG_BH01_GW073	2023-12-10	n/a	162494							
2	IG_BH01_GW074	2023-12-09	n/a	162495	X	0.71459	6.40E-06	8.32E-05	0.71462	8.19E-06	1.10E-04
3	IG_BH01_GW075	2023-12-10	n/a	162496	X	0.71432	8.28E-06	1.10E-04			

#	Sample ID	Sample Collection		Sample #	$\delta^{37}Cl$	Result	Stdv
		Date	Time			SMOC	
1	IG_BH01_GW073	2023-12-10	n/a	162494			
2	IG_BH01_GW074	2023-12-09	n/a	162495	X	-0.25	0.15
3	IG_BH01_GW075	2023-12-10	n/a	162496	X	5.11	0.23

Canada Post: 1Z59V8W30493706931
Client: Geofirma Engineering Ltd.
Address: 1 Raymond St., Suite 200
Ottawa, ON 1KR 1A2
Att.: Chris Morgan / Amy Cartier
E-mail: cmorgan@geofirma.com
E-mail: acartier@geofirma.com
Phone: 613-402-1701/ 514-730-0961

File Number: 231159
Project #: 20-203-1
PO: 202031

E^3H ANALYSES

Tritium is reported in Tritium Units.
1TU = 3.221 Picocurries/L per IAEA, 2000 Report.
1TU = 0.11919 Becquerels/L per IAEA, 2000 Report.

^{14}C DIC Analyses

Instrument Used:
AMS (Accelerator Mass Spectrometry)
Standard Used:
OX1: 1.05 x e-10
OX2: 1.35 x e-10
C6: 1.5 x e-10
C7: 0.5 x e-10
Typical Standard deviation:
5 to 10% of Standard values listed above

^{13}C DIC Analyses

Instrument Used:
Finnigan MAT, Delta^{Plus} XL IRMS, Germany.
Standard Used:
IT^2-27
IT^2-34
NBS-18
NBS-19
Typical Standard deviation:
± 0.2 ‰

Reporting of Data

In this analysis report, we have followed the conventions recommended by Millard (2014).

Radiocarbon Analysis

Radiocarbon analyses are performed on a 3MV tandem accelerator mass spectrometer built by High Voltage Engineering (HVE). 12,13,14C+3 ions are measured at 2.5 MV terminal voltage with Ar stripping. The fraction modern carbon, F14C, is calculated according to Reimer et al. (2004) as the ratio of the sample 14C/12C ratio to the standard 14C/12C ratio (in our case Ox-II) measured in the same data block. Both 14C/12C ratios are background-corrected and the result is corrected for spectrometer and preparation fractionation using the AMS measured 13C/12C ratio and is normalized to δ13C (PDB). Radiocarbon ages are calculated as -8033ln(F14C) and reported in 14C yr BP (BP=AD 1950) as described by Stuiver and Polach (1977). The errors on 14C ages (1σ) are based on counting statistics and 14C/12C and 13C/12C variation between data blocks. We do not report δ13C as it is measured on the AMS and contains machine fractionation.
D14C (defined as per mil Depletion or Enrichment Relative to Standard Normalized for Isotope Fractionation) are calculated as $(F14C - 1) \cdot 1000$.
Δ14C (defined as age corrected D14C) are calculated as $(F14C \cdot e(1950-y)/8267) - 1) \cdot 1000$, where y = year of measurement.

Approved by:

Orfan Shouakar-Stash, PhD
Director
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Address: 1 Raymond St., Suite 200
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Att.: Chris Morgan / Amy Cartier
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E-mail: acartier@geofirma.com
Phone: 613-402-1701/ 514-730-0961

File Number: 231159
Project #: 20-203-1
PO: 202031

^{18}O & ^{2}H (CRDS)

Instrument Used: Cavity Ring Down Spectroscopy (CRDS)
CRDS (Model L2130-i) (Picarro, California, USA).
Standard Used:
IT2-11C / IT2-12D / IT2-13C Calibrated with IAEA Standards (V-SMOW, SLAP, and GISP)
Typical Standard deviation:
(^{18}O ±0.1‰) (^{2}H ± 1‰)

$^{87}Sr/^{86}Sr$ ANALYSES

Instrument Used:
Thermal Ionization Mass Spectrometry (TIMS), TI-Box, spectromat, Germany
Standard Used:
NIST-987
Typical Standard deviation:
±0.0001

^{37}Cl ANALYSES

Instrument Used:
Isotope Ratio Mass Spectrometry (IRMS) - MAT 253, Thermo Scientific, Germany
Coupled with an Agilent 6890 Gas Chromatograph (GC)
Standard Used:
SMOC
Typical Standard deviation:
± 0.15‰

Approved by:

Orfan S-Stahs

Orfan Shouakar-Stash, PhD
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ISOTOPE TRACER TECHNOLOGIES INC

CHAIN OF CUSTODY / ANALYTICAL SERVICES REQUEST FORM

Page __ of __

Note: all TAT Quoted material is in business days which exclude statutory holidays and weekends.

Specify date required

Service Requested (regular) [ ] Regular

(Rush) [ ]

COMPANY NAME	Geofirma Engineering Ltd.
OFFICE ADDRESS	1 Raymond St., Suite 200 Ottawa ON K1R 1A2
PROJECT MANAGER: Chris Morgan/Amy Cartier	
PROJECT # 20 203-1	
PHONE: 613-402-1701/ 514-730-0961	FAX
	PO # 202031

REPORT FORMAT/DISTRIBUTION

EMAIL __X____ FAX _____ BOTH _____
SELECT: PDF _____ DIGITAL _____ BOTH __X__
EMAIL 1 ___cmorgan@geofirma.com_____
EMAIL 2 ___acartier@geofirma.com_____

ANALYSIS REQUEST

PLEASE INDICATE FILTERED, PRESERVED OR BOTH <----- (F, P, F/P)

SUBMISSION #:

ENTERED BY:

DATE/TIME ENTERED:

BIN #:

SAMPLING INFORMATION

Sample Date/Time		TYPE		MATRIX				NUMBER OF CONTAINERS	3H, 2H, D18O	14C-DIC	d13C-DIC	37-Cl	87Sr/86Sr	3H only						COMMENTS	LAB ID
Date (YYYY-MM-DD)	Time (24hr) (hh:mm)	COMP	GRAB	WATER	SOIL	OTHER	SAMPLE DESCRIPTION TO APPEAR ON REPORT														
2023-12-10				X			IG_BH01_GW073	2		X				X							
2023-12-09				X			IG_BH01_GW074	6	X	X	X	X	X								
2023-12-10				X			IG_BH01_GW075	6	X	X	X	X	X								

SPECIAL INSTRUCTIONS/COMMENTS

COC ID#: GFIM_IT2_0010

THE QUESTIONS BELOW MUST BE ANSWERED FORWATER SAMPLES (CHECK Yes OR No)

Are any samples taken from a regulated DW System? Yes ___ No _X_
If yes, an authorized drinking water COC MUST be used for this submission.
Is the water sampled intended to be potable for human consumption? Yes ___ No _X_

SAMPLE CONDITION

___FROZEN
X COLD
___ COOLING INITIATED
___ AMBIENT

Observations

SAMPLED BY: AMSC / MEOR	DATE & TIME 23-12-11 7:00	RECEIVED BY:	DATE & TIME
RELINQUISHED BY:	DATE & TIME	RECEIVED AT LAB BY:	DATE & TIME 23-12-12

1. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs.

2. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

2023 Lab Reports:
University of Ottawa

GEOFIRMA ENGINEERING

Hydrogeochemistry Laboratory
Analytical Report - Clark group
University of Ottawa
25 Templeton Street
Ottawa, ON K1N 6N5

Analytical report for:
Geofirma Engineering Ltd. 1 Raymond Street #200 Ottawa, ON K1R 1A2

Sample description	
Site	Ignace
Type	Water
Container	Nalgene
Volume	1L

Analysis	
Analyte	^{129}I
Method	^{129}I extraction to AgI and AMS analysis
Facility	Hydrogeochemistry Laboratory, University of Ottawa
Report Approved by	 Ian Clark, P.Geo.

Timeline		
Samples received	Analyses completed	Report date
July 2023	^{129}I	January 8, 2024

Sample	Date Sampled	Sample Weight (*g*)	^{127}I Concentration Measured (ppb)	Mass of Iodide Carrier Added (mg)	$^{129}I/^{127}I$ Ratio Measured ($x10^{-14}$) *		^{129}I Concentration ($x10^{6}$ *atoms/g*)		Original Ratio ($x10^{-09}$) **	
					Ratio	Standard Deviation	Concentration	Standard Deviation	OR	Standard Deviation
IG_BH01_GW044	2023-06-19	225.18	932	1.63	4.99E+01	1.04E+01	1.93E-02	4.02E-03	4.37E-03	9.34E-04
IG_BH01_GW045	2023-06-19	250.65	932	1.58	6.20E+01	1.37E+01	2.13E-02	4.72E-03	4.83E-03	1.09E-03
IG_BH01_GW046	2023-06-20	234.46	< LOD***	1.47	1.12E+01	2.58E+00	3.33E-03	7.69E-04	> 3.9***	
IG_BH01_GW047	2023-06-20	240.23	< LOD***	1.54	1.09E+01	2.25E+00	3.32E-03	6.81E-04	> 3.9***	

Note: ** $^{129}I/^{127}I$ Ratio Measured includes both sample and carrier added.*

Note 2: *** $^{129}I/^{127}I$ Ratio calculated before added the carrier.*

Note 3 *: *** The LOD obtained by ICP-MS measurements is 0.181 ppb. OR lower limit was determined with LOD as upper limit.*

AMS Measurements

The ^{129}I analysis are performed on a 3MV accelerator mass spectrometer (AMS) built by High Voltage Engineering (HVE). $^{129}I^{+3}$ ions are measured at 2.5 MV terminal voltage Ar stripping. The errors represent 68.3% confidence limits, based on 1 measurement each. These measurements were normalized with respect to ISO-6II in-house reference material for which $^{129}I/^{127}I = (5.71 \pm 0.01)x10^{-12}$, by calibration with the NIST 3230 I and II standard reference material.

The AMS system background was monitored with our standard NaI blank material and found to be normal.

No background corrections were applied to these data. A NaI blank measured on October 18, 2023 set of samples yielded a $^{129}I/^{127}I$ ratio of $(4.38 \pm 2.8)\ x10^{-15}$.

Hydrogeochemistry Laboratory
Analytical Report - Clark group
University of Ottawa
25 Templeton Street
Ottawa, ON K1N 6N5

Analytical report for:
Geofirma Engineering Ltd. 1 Raymond Street #200 Ottawa, ON K1R 1A2

Sample description	
Site	Ignace
Type	Water
Container	Nalgene
Volume	1L

Analysis	
Analyte	^{129}I
Method	^{129}I extraction to AgI and AMS analysis
Facility	Hydrogeochemistry Laboratory, University of Ottawa
Report Approved by	 Ian Clark, P.Geo.

Timeline		
Samples received	Analyses completed	Report date
2023 Q3, 2023 Q4	^{129}I	May 21, 2024

Sample	Date Sampled	Sample Weight (*g*)	^{127}I Concentration Measured (ppb)	Mass of Iodide Carrier Added (mg)	$^{129}I/^{127}I$ Ratio Measured ($x10^{-14}$) *		^{129}I Concentration ($x10^{6}$ *atoms/g*)		Original Ratio ($x10^{-09}$) **	
					Ratio	Standard Deviation	Concentration	Standard Deviation	OR	Standard Deviation
IG_BH03_GW022	2023-10-03	201.25	3.64	1.97	2.18E+01	1.29E+00	1.01E-02	6.00E-04	5.86E-01	1.69E-02
IG_BH03_GW023	2023-10-03	202.08	3.53	1.97	2.58E+01	2.22E+00	1.19E-02	1.03E-03	7.11E-01	2.57E-02
IG_BH01_GW056	2023-10-11	200.61	0.83	1.97	2.07E+01	1.59E+00	9.62E-03	7.41E-04	2.44E+00	1.90E-02
IG_BH01_GW057	2023-10-11	201.51	0.82	1.88	1.95E+01	9.58E-01	8.61E-03	4.24E-04	2.22E+00	1.37E-02
IG_BH01_GW074	2023-12-09	200.13	5.98	1.97	7.22E+01	1.62E+00	3.37E-02	7.57E-04	1.19E+00	3.96E-02
IG_BH01_GW075	2023-12-10	201.51	305.46	1.97	5.85E+01	1.42E+00	2.80E-02	6.79E-04	1.93E-02	3.25E-02

Note: ** $^{129}I/^{127}I$ Ratio Measured includes both sample and carrier added.*

Note 2: *** $^{129}I/^{127}I$ Ratio calculated before added the carrier.*

Hydrogeochemistry Laboratory
Analytical Report - Clark group
University of Ottawa
25 Templeton Street
Ottawa, ON K1N 6N5

Analytical report for:
Geofirma Engineering Ltd. 1 Raymond Street #200 Ottawa, ON K1R 1A2

Sample description	
Site	Ignace
Type	Water
Container	Nalgene
Volume	1 L

Analysis	
Analyte	^{36}Cl in dissolved Cl
Method	AMS
Facility	Hydrogeochemistry Laboratory, University of Ottawa
Report Approved by	Ian Clark, P.Geo.

Timeline		
Samples received	Analyses completed	Report date
2023 Q2(4), 2023 Q3(4), 2023 Q4(2)	36Cl	April 17, 2024

Notes
Samples were collected in the field by Geofirma staff. Bottles were received sealed and in good condition. Samples were extracted as Cl^- from solution on an anion exchange column, eluted and precipitated as AgCl target material. AMS analysis was undertaken on a 6 MV tandem accelerator mass spectrometer at PRIME Lab, Purdue.

Sample		Lab ID	Comment	Cl (mg/L)	$^{36}Cl/Cl$ final (10^{-15})	±	^{36}Cl atoms/L (10^{6})	±
Q2	IG_BH01_GW044	PRIME	prepared at uOttawa	19000	22.4	1.5	7221	491
	IG_BH01_GW045	PRIME	prepared at uOttawa	19000	18.9	1.3	6091	432
	IG_BH01_GW046	PRIME	prepared at uOttawa	8.2	294.3	7.8	41	1
	IG_BH01_GW047	PRIME	prepared at uOttawa	8.8	307.9	8.9	46	1
Q3	IG_BH03_GW022	PRIME	prepared at uOttawa	6	190.0	8.3	19	1
	IG_BH03_GW023	PRIME	prepared at uOttawa	6.2	183.5	17.8	19	2
	IG_BH01_GW056	PRIME	prepared at uOttawa	<1	>2455.8		42	1
	IG_BH01_GW057	PRIME	prepared at uOttawa	<1	>2453.4		42	1
Q4	IG_BH01_GW074	PRIME	prepared at uOttawa	3800	32.8	2.3	2113	150
	IG_BH01_GW075	PRIME	prepared at uOttawa	72	56.1	2.4	69	3

Note: IG BH01 GW56 and GW57 have less than 1 mg/L Cl^-. The measured $^{36}Cl/Cl$ ratio was then normalized to the minimum concentration of 1 mg/L Cl^- to yield a minimum (greater than) $^{36}Cl/Cl$ ratio for the sample

Appendix F

Data Quality Confirmation Workbooks

2023 Q2
(June)

GEOFIRMA
ENGINEERING

Borehole ID:	BH01, BH03, BH05, BH06	Comments:
Date:	June 13 - 27 2023	
Completed by:	AMSC, MdK, CAM, MEOR	
Sampling Interval:	[IG_BH01_T_INT_002] [IG_BH01_T_INT_017] [IG_BH05_T_INT_005]	

Equipment	Date/Time	Decontamination Required (Y/N)	Location (BH)	PPE	Decontamination Procedure					Staff initial	Comments
					Loose Contamination Removed	Detergent Wash *(record type of detergent used)*	Dionized Water Rinse	Air Dried (Minimize Dust)	Rinsate Sample Collected (Y/N)		
Electronic Water Level Tape	2023-06-13 10:15	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	MdK	
MOSDAX sampler probe EMS 5523	2023-06-13 10:25	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	MdK	
Westbay sample bottles (x4)	2023-06-13 13:45	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	AMSC	
Noble Gas tubes (4x SS, 4xCu)	2023-06-14 11:30	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	AMSC	
Bladder Pump	2023-06-14 13:30	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	AMSC	
MOSDAX sampler probe EMS 4960	2023-06-15 8:30	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	MdK	
Westbay sample bottles (x4)	2023-06-16 15:00	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	AMSC	
Westbay sample bottles (x4)	2023-06-17 13:00	N	IG_BH01	Y	Y	N	Y	Y	Y	AMSC	Rinsate sample collected: IG_BH01_GW042 Bottles were decontaminated the previous day and not used, bottles were rinsed with DI prior to collecting the sample.
Noble Gas tubes (3x SS, 6xCu)	2023-06 18 10:30	N	IG_BH01	Y	Y	N	Y	Y	N	AMSC	Prevously decontaminated. all tubes were rinsed with DI prior to sampling.
Westbay sample bottles (x6)	2023-06-19 8:00	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	AMSC	
Westbay sample bottles (x6)	2023-06-20 10:45	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	AMSC	
Electronic Water Level Tape	2023-06-21 11:15	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	MEOR	
MOSDAX sampler probe EMS 4960	2023-06-21 11:15	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	MEOR	
Bladder Pump	2023-06-22 10:00	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	MEOR	
Westbay sample bottles (x4)	2023-06-23 11:25	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	CAM	
MOSDAX sampler probe EMS 4960	2023-06-23 15:30	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	MEOR	
MOSDAX sampler probe EMS 5230	2023-06-25 8:10	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	MEOR	
MOSDAX sampler probe EMS 4960	2023-06-25 11:30	Y	IG_BH06	Y	Y	N	Y	Y	N	MEOR	Rinsed with DI and wiped using shop towels
Electronic Water Level Tape	2023-06-25 11:30	Y	IG_BH06	Y	Y	N	Y	Y	N	MEOR	Rinsed with DI and wiped using shop towels
MOSDAX sampler probe EMS 4960	2023-06-25 14:40	Y	IG_BH03	Y	Y	N	Y	Y	N	MEOR	Rinsed with DI and wiped using shop towels
Electronic Water Level Tape	2023-06-25 14:40	Y	IG_BH03	Y	Y	N	Y	Y	N	MEOR	Rinsed with DI and wiped using shop towels
Electronic Water Level Tape	2023-06-26 9:10	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	MEOR	
MOSDAX sampler probe EMS 4960	2023-06-26 9:50	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	MEOR	
Westbay sample bottles (x4)	2023-06-26 9:50	Y	IG_BH01	Y	Y	Alconox	Y	Y	Y	CAM	Rinsate sample re-collected: IG_BH01_GW042. Original sample had shipping delays that meant that it did not meet laboratory-specified holding times.
MOSDAX sampler probe EMS 4960	2023-06-26 16:50	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	MEOR	
Westbay sample bottles (x4)	2023-06-26 16:50	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	CAM	
Electronic Water Level Tape	2023-06-27 7:25	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	MEOR	
MOSDAX sampler probe EMS 4960	2023-06-27 9:25	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	MEOR	Decontaminated after sampling at Int 024
Westbay sample bottles (x4)	2023-06-27 9:25	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	CAM	Decontaminated after sampling at Int 024
MOSDAX sampler probe EMS 4960	2023-06-27 11:15	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	MEOR	Decontaminated after sampling at Int 011
Westbay sample bottles (x1)	2023-06-27 11:15	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	CAM	Decontaminated after sampling at Int 011
MOSDAX sampler probe EMS 4960	2023-06-27 14:30	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	MEOR	Decontaminated after sampling at Int 002. Probe decontaminated prior return it to NWMO
Westbay sample bottles (x4)	2023-06-27 14:30	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	CAM	Decontaminated after sampling at Int 002. Bottles decontaminated for storage

Date	Time	Personnel	Equipment Type	Serial Number	Calibration Check			Calibration Performed			Comments
					Check Method & Standard(s) Used	Equipment Reading(s)	Calibration Required (Y/N)	Calibration Method & Standard(s) Used	Equipment Reading(s)	Calibration Completed (Y/N)	
13-Jun-23	11:40	AMSC	MOSDAX Probe	EMS 5523	Manual WL/P vs. Probe P	Manual P (anticipated) = 344.46 kPa Probe P (measured) = 356.97 kPa	N	--	--	--	
13-Jun-23	6:30	AMSC	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.728 100.2	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
13-Jun-23	6:40	AMSC	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 3.98, 7.02, 10.00	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.99 pH 4.50 mS/cm 0.0 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
14-Jun-23	6:30	MdK	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.839 100.1	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
14-Jun-23	6:45	MdK	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.00, 7.00, 10.00	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	4.00 pH 4.49 mS/cm 0.0 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
15-Jun-23	6:30	MdK	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.753 100.2	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
15-Jun-23	6:45	MdK	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 3.99, 7.00, 10.01	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.99 pH 4.49 mS/cm 0.0 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
15-Jun-23	10:00	AMSC	DR900	200660001027	Absorbance Std Test Kit **520nm:** Blank: 0.00 Std 1: 0.597 ± 0.05 Std 2: 1.257 ± 0.10 Std 3: 1.890 ± 0.15	**520nm:** Blank: 0.000 Std 1: 0.605 Std 2: 1.281 Std 3: 1.890	N	--	--	--	Cal checked using DR900 absorbance check kit (LOT# A2294)
					Absorbance Std Test Kit **610nm:** Blank: 0.00 Std 1: 0.556 ± 0.05 Std 2: 1.173 ± 0.10 Std 3: 1.764 ± 0.15	**610nm:** Blank: 0.000 Std 1: 0.575 Std 2: 1.213 Std 3: 1.810	N	--	--	--	
16-Jun-23	6:40	AMSC	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.761 100.2	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
16-Jun-23	6:45	AMSC	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 3.98 7.02 10.02	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.99 pH 4.49 mS/cm 0.2 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
16-Jun-23	8:45	AMSC	DR900	200660001027	Absorbance Std Test Kit **520nm:** Blank: 0.00 Std 1: 0.597 ± 0.05 Std 2: 1.257 ± 0.10 Std 3: 1.890 ± 0.15	**520nm:** Blank: 0.000 Std 1: 0.610 Std 2: 1.275 Std 3: 1.914	N	--	--	--	Cal checked using DR900 absorbance check kit (LOT# A2294)
					Absorbance Std Test Kit **610nm:** Blank: 0.00 Std 1: 0.556 ± 0.05 Std 2: 1.173 ± 0.10 Std 3: 1.764 ± 0.15	**610nm:** Blank: 0.000 Std 1: 0.579 Std 2: 1.210 Std 3: 1.803	N	--	--	--	
17-Jun-23	7:15	AMSC	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.837 100.1	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
17-Jun-23	7:15	MdK	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.00 7.01 10.01	--	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	4.00 pH 4.49 mS/cm 0.0 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)

17-Jun-23	14:15	AMSC	DR900	200660001027	Absorbance Std Test Kit	**520nm:** Blank: 0.00 Std 1: 0.597 ± 0.05 Std 2: 1.257 ± 0.10 Std 3: 1.890 ± 0.15	**520nm:** Blank: 0.000 Std 1: 0.602 Std 2: 1.267 Std 3: 1.898	N	--	--	--	Cal checked using DR900 absorbance check kit (LOT# A2294)
						610nm: Blank: 0.00 Std 1: 0.556 ± 0.05 Std 2: 1.173 ± 0.10 Std 3: 1.764 ± 0.15	**610nm:** Blank: 0.000 Std 1: 0.562 Std 2: 1.196 Std 3: 1.788	N	--	--	--	
18-Jun-23	6:40	MdK	Fluorometer	807511	--		--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.875 100.1	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
18-Jun-23	6:45	MdK	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00		pH check: 4.00 7.00 10.01	--	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	4.00 pH 4.49 mS/cm 0.0 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
19-Jun-23	6:40	MdK	Fluorometer	807511	--		--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.738 100.3	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
19-Jun-23	6:45	MdK	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00		pH check: 3.99 7.00 10.02	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.99 pH 4.49 mS/cm 0.0 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
20-Jun-23	5:45	MdK	Fluorometer	807511	--		--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.790 100.2	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
20-Jun-23	5:45	MdK	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00		pH check: 4.00 7.00 10.01	--	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	4.00 pH 4.49 mS/cm 0.0 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
20-Jun-23	11:20	AMSC	DR900	200660001027	Absorbance Std Test Kit	**520nm:** Blank: 0.00 Std 1: 0.597 ± 0.05 Std 2: 1.257 ± 0.10 Std 3: 1.890 ± 0.15	**520nm:** Blank: 0.000 Std 1: 0.598 Std 2: 1.254 Std 3: 1.890	N	--	--	--	Cal checked using DR900 absorbance check kit (LOT# A2294)
						610nm: Blank: 0.00 Std 1: 0.556 ± 0.05 Std 2: 1.173 ± 0.10 Std 3: 1.764 ± 0.15	**610nm:** Blank: 0.000 Std 1: 0.573 Std 2: 1.197 Std 3: 1.791	N	--	--	--	
21-Jun-23	5:45	MdK	Fluorometer	807511	--		--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.698 100.2	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
21-Jun-23	5:45	MdK	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00		pH check: 4.00 7.00 10.00	--	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	4.00 pH 4.49 mS/cm 0.2 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
22-Jun-23	6:10	CAM	Fluorometer	807511	--		--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.783 100.2	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
22-Jun-23	6:10	CAM	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00		pH check: 4.00 7.00 10.00	--	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	4.00 pH 4.50 mS/cm 0.1 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
23-Jun-23	6:30	CAM	Fluorometer	807511	--		--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.691 100.33	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024

23-Jun-23	6:37	CAM	HoribaU52	SRGWN2Y6		Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.00 7.00 10.00	--	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.99 pH 4.52 mS/cm 0.0 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
24-Jun-23	6:40	MEOR	Fluorometer	807511		--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.704 100.2	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
24-Jun-23	6:50	MEOR	HoribaU52	SRGWN2Y6		Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.00 7.00 10.00	--	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	4.01 pH 4.48 mS/cm 0.0 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
25-Jun-23	6:45	MEOR	Fluorometer	807511		--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.625 100.3	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
25-Jun-23	6:50	MEOR	HoribaU52	SRGWN2Y6		Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.00 7.00 10.00	--	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.99 pH 4.48 mS/cm 0.1 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
26-Jun-23	7:05	MEOR	Fluorometer	807511		--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.765 100.3	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
27-Jun-23	7:45	MEOR	Fluorometer	807511		--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.781 100.1	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
27-Jun-23	7:50	MEOR	HoribaU52	SRGWN2Y6		Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.00 7.00 10.00	--	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.99 pH 4.49 mS/cm 0.2 NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#2GK364, exp. Nov/23), pH 10.0 (LOT#1GI516, exp. Sep/23), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
27-Jun-23	7:45	CAM	DR900	200660001027	Absorbance Std Test Kit	**520nm:** Blank: 0.00 Std 1: 0.597 ± 0.05 Std 2: 1.257 ± 0.10 Std 3: 1.890 ± 0.15	**520nm:** Blank: 0.000 Std 1: 0.600 Std 2: 1.282 Std 3: 1.924	N	--	--	--	Cal checked using DR900 absorbance check kit (LOT# A2294)
						610nm: Blank: 0.00 Std 1: 0.556 ± 0.05 Std 2: 1.173 ± 0.10 Std 3: 1.764 ± 0.15	**610nm:** Blank: 0.000 Std 1: 0.575 Std 2: 1.201 Std 3: 1.823	N	--	--	--	

Completed by:	CAM / MEOR	Verified by:	AMSC
Date:	27-Jun-23	Date:	04-Jul-23

20-203-1: Westbay Pressure/Temperature Profiling - IG_BH01

Well ID	IG_BH01				**Pre Profile**			**Post Profile**			Weather: 26 °C
Datum:	Ground Level		Probe Type:	MOSDAX	P_{atm}	93.92	kPa	P_{atm}	92.95	kPa	Sunny - morning
Elev. G.S.:	430.562	m	Serial No.:	EMS5523	Temp.	26.93	°C	Temp.	7.87	°C	Hazy/Smoke - afternoon
Height of Westbay above G.S.:	0.32	m AGS	Probe Range:	2000psi	Date/Time	2023-06-13 10:50		Date/Time	2023-06-13 18:55		
Elev. Top of Westbay Casing:	430.88	m	Westbay Casing Type:	MP38	MP38 Water Level	43.87	mBTOC	MP38 Water Level	44.36	mBTOC	Specific Weight 9.807 kN/m3
Reference Elevation:	430.562	mASL	Sampler Valve Position:	Closed							Gravitational Acceleration 9.8065 m/s2
Borehole angle:	-90°										P_{atm} 93.44

Notes: Intervals sampled during Q2 2023: IG_BH01_INT_T_002 & IG_BH01_T_INT_017

				Fluid Pressure Readings													
Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m BGS)	Start Profile Time	Inside Casing (P1-Landed Pressure) (kPa)	Shoe Out	#Rotation	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Shoe In	#Rotation	Inside Casing (P1) (kPa)	Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Z: Elev of pressure measurement port (mASL)	Freshwater Head (mASL)	Comments
1	977.30		976.91	12:17:00	9460.73	x	15	9612.16	12:18:00	13.56	x	15	9460.69	970.61	6.30	-546.35	424.26	
2	888.80		888.49	12:28:00	8564.02	x	15	8683.33	12:33:00	13.28	x	15	8564.06	875.89	12.59	-457.92	417.97	Re-checked (P2=8683.37 kPa), interval recently purged
3	804.40		804.14	12:42:00	7709.25	x	15	7849.35	12:43:00	12.65	x	15	7709.60	790.86	13.29	-373.58	417.27	
4	769.30		769.06	12:55:00	7353.88	x	15	7474.13	12:56:00	12.05	x	15	7353.91	752.59	16.47	-338.50	414.09	
5	703.10		702.90	13:03:00	6684.85	x	15	6830.91	13:04:00	11.50	x	15	6685.26	687.01	15.89	-272.33	414.67	Verified by MdK
6	649.80		649.62	13:11:00	6145.05	x	15	6289.13	13:12:00	10.90	x	15	6145.07	631.76	17.86	-219.06	412.70	
7	628.40		628.23	13:15:00	5928.34	x	15	6071.62	13:16:00	10.60	x	15	5928.36	609.58	18.65	-197.67	411.91	
8	574.40		574.26	13:26:00	5382.33	x	15	5550.25	13:28:00	9.81	x	15	5382.33	556.42	17.84	-143.70	412.72	Re-checked (P2=5550.53 kPa)
9	540.20		540.07	13:32:00	5035.79	x	15	5201.39	13:33:00	9.59	x	15	5035.81	520.85	19.22	-109.51	411.34	Re-checked (P2=5201.89 kPa)
10	517.40		517.28	13:38:00	4804.39	x	15	4991.67	13:39:00	9.29	x	15	4804.40	499.46	17.82	-86.72	412.74	
11	493.00		492.89	13:44:00	4557.68	x	15	4758.76	13:46:00	9.07	x	15	4557.70	475.71	17.18	-62.33	413.39	
12	432.10		432.01	14:02:00	3943.29	x	15	4144.59	14:03:00	8.57	x	15	3943.31	413.09	18.92	-1.45	411.64	
13	409.30		409.22	14:07:00	3717.43	x	15	3935.88	14:08:00	8.29	x	15	3717.45	391.81	17.41	21.34	413.15	
14	325.60		325.54	14:15:00	2889.99	x	15	3098.12	14:16:00	7.61	x	15	2890.01	306.38	19.16	105.02	411.40	
15	307.30		307.25	14:19:00	2709.62	x	15	2920.32	14:20:00	7.32	x	15	2709.64	288.25	19.00	123.31	411.57	
16	231.20		231.17	14:29:00	1957.17	x	15	2178.11	14:30:00	6.35	x	15	1957.18	212.57	18.59	199.40	411.97	
17	199.20		199.17	14:35:00	1640.86	x	15	1885.97	14:38:00	6.01	x	15	1640.87	182.78	16.39	231.39	414.17	
18	149.00		148.98	14:50:00	1144.26	x	15	1382.50	14:51:00	5.58	x	15	1144.27	131.44	17.54	281.58	413.03	
19	128.50		128.48	14:56:00	942.28	x	15	1063.41	14:57:00	5.41	x	15	942.28	98.91	29.58	302.08	400.99	Lower than expected, Relanded and rechecked (P2 = 1063.81 kPa)
20	69.10		69.09	15:04:00	355.17	x	15	623.35	15:05:00	5.29	x	15	355.18	54.03	15.06	361.47	415.51	

Completed by:	AMSC/MdK	Verified by:	CAM / MdK
Date:	13-Jun-23	Date:	17-Jul-23 / 21-Feb-24

20-203-1: Westbay Pressure/Temperature Profiling - IG_BH03

Well ID	IG_BH03			**Pre Profile**			**Post Profile**			Weather:	18 °C
Datum:	Ground Level	Probe Type:	MOSDAX	P_{atm}	94.65	kPa	P_{atm}	95.79	kPa		Rainy
Elev. G.S.:	441.403 m	Serial No.:	EMS4960	Temp.	15.21	°C	Temp.	5.58	°C		
Height of Westbay above G.S.:	1.299 m AGS	Probe Range:	2000psi	Date/Time	2023-06-25 15:10		Date/Time	2023-06-25 18:50			
Elev. Top of Westbay Casing:	442.702 m	Westbay Casing Type:	MP38	MP38 Water Level	21.55	mBTOC	MP38 Water Level	21.77	mBTOC	Specific Weight	9.807 kN/m3
Reference Elevation:	441.403 mASL	Sampler Valve Position:	Closed							Gravitational Acceleratic	9.8065 m/s2
Borehole angle:	-70°									P_{atm}	95.22

Notes:

Pressure profiling/tool; operation run and recorded with Westbay's Mprofile. Recording time is off by one (1) hour. Most zone pressures seems to be slowly increasing after shoe-out, approx. 0.2 to 0.3 kPa after approx. 5 minutes

				Fluid Pressure Readings														
Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m BGS)	Start Profile Time	Inside Casing (P1-Landed Pressure) (kPa)	Shoe Out	# rottions	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Shoe In	# rottions	Inside Casing (P1) (kPa)	Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Z: Elev of pressure measurement port (mASL)	Freshwater Head (mASL)	Comments
1	966.81		888.57	15:50:00	8862.71	x	13	8658.11	15:58:00	13.12	x	13	8862.93	873.14	15.43	-447.17	425.97	P2 slowly climbing from 8651 kPa after shoe-out
2	943.91		868.28	16:03:00	8656.80	x	13	8405.46	16:04:00	13.05	x	13	8656.97	847.38	20.90	-426.88	420.50	P2 re-confirmed after second shoe-out 8405.72 kPa
3	924.01		850.53	16:10:00	8478.12	x	13	8344.15	16:12:00	12.86	x	13	8477.94	841.13	9.40	-409.13	432.00	P2 re-confirmed after second shoe-out 8343.94kPa
4	882.81		813.57	16:22:00	8103.80	x	13	7997.62	16:23:00	12.52	x	13	8103.60	805.79	7.78	-372.17	433.62	P2 re-confirmed after second shoe-out 7997.84kPa
5	859.91		792.89	16:26:00	7892.61	x	13	7746.40	16:28:00	12.36	x	13	7892.63	780.18	12.71	-351.49	428.69	P2 re-confirmed after second shoe-out 7746.80kPa
6	794.31		733.26	16:34:00	7289.00	x	13	7129.94	16:36:00	11.76	x	13	7289.01	717.32	15.94	-291.86	425.46	P2 re-confirmed after second shoe-out 7130.23kPa
7	752.81		695.28	16:41:00	6904.00	x	13	6763.12	16:44:00	11.34	x	13	6903.96	679.91	15.37	-253.88	426.04	P2 re-confirmed after second shoe-out 6763.35kPa
8	676.01		624.50	16:53:00	6186.85	x	13	6073.44	16:58:00	10.72	x	13	6186.80	609.59	14.91	-183.10	426.49	P2 re-confirmed after second shoe-out 6073.50kPa
9	637.81		589.28	17:01:00	5830.47	x	13	5825.61	17:06:00	10.27	x	13	5830.67	584.32	4.96	-147.88	436.44	P2 re-confirmed after second shoe-out 5825.57kPa
10	613.41		566.78	17:10:00	5602.55	x	13	5495.10	17:16:00	10.00	x	13	5602.53	550.61	16.17	-125.38	425.24	P2 re-confirmed after second shoe-out 5495.43kPa
11	567.71		524.65	15:22:00	5175.52	x	13	5086.10	17:26:00	9.66	x	13	5175.59	508.91	15.74	-83.25	425.66	P2 re-confirmed after second shoe-out 5086.37kPa
12	544.11		502.91	17:30:00	4955.90	x	13	4929.99	17:33:00	9.29	x	13	4955.71	492.99	9.92	-61.51	431.48	P2 re-confirmed after second shoe-out 4930.51kPa
13	506.11		467.93	17:39:00	4601.24	x	13	4559.83	17:42:00	8.96	x	13	4601.55	455.25	12.68	-26.53	428.72	P2 re-confirmed after second shoe-out 4559.91kPa
14	465.91		430.90	17:47:00	4226.21	x	13	4219.63	17:50:00	8.62	x	13	4226.14	420.56	10.34	10.50	431.06	P2 re-confirmed after second shoe-out 4219.73kPa
15	421.11		389.63	17:54:00	3808.67	x	13	3798.25	17:58:00	8.20	x	13	3809.06	377.59	12.04	51.77	429.36	P2 re-confirmed after second shoe-out 3798.28kPa
16	370.31		342.83	18:03:00	3334.42	x	13	3320.50	18:05:00	7.79	x	13	3334.64	328.88	13.95	98.57	427.45	P2 re-confirmed after second shoe-out 3320.44kPa
17	321.01		297.42	18:11:00	2875.73	x	13	2879.80	18:14:00	7.28	x	13	2875.47	283.94	13.48	143.98	427.92	P2 re-confirmed after second shoe-out 2879.80kPa
18	251.01		232.90	18:18:00	2223.48	x	13	2244.38	18:20:00	6.77	x	13	2223.61	219.15	13.75	208.50	427.65	
19	228.11		211.75	18:23:00	2011.03	x	13	2041.00	18:24:00	6.50	x	13	2011.10	198.41	13.34	229.65	428.06	
20	165.71		154.03	18:28:00	1435.64	x	13	1439.56	18:31:00	6.06	x	13	1435.67	137.08	16.95	287.37	424.45	P2 re-confirmed after second shoe-out 1439.58kPa
21	73.01		68.16	18:37:00	584.41	x	13	681.43	18:38:00	5.48	x	13	584.35	59.77	8.39	373.24	433.02	

Completed by:	CAM/MEOR	Verified by:	AMSC
Date:	25-Jun-23	Date:	04-Jul-23 / 21-Feb-24

20-203-1: Westbay Pressure/Temperature Profiling - IG_BH05

Well ID	IG_BH05			Pre Profile			Post Profile			Weather:	28 °C
Datum:	Ground Level	Probe Type:	MOSDAX	P_{atm}	96.31	kPa	P_{atm}	95.84	kPa		Sunny
Elev. G.S.:	432.29 m	Serial No.:	EMS4960	Temp.	22.57	°C	Temp.	6.08	°C		
Height of Westbay above G.S.:	1.31 m AGS	Probe Range:	2000psi	Date/Time	2023-06-21 11:30		Date/Time	2023-06-21 16:30			
Elev. Top of Westbay Casing:	433.60 m	Westbay Casing Type:	MP38	MP38 Water Level	27.61	mBTOC	MP38 Water Level	28.14	mBTOC	Specific Weight	9.807 kN/m3
Reference Elevation:	432.29 mASL	Sampler Valve Position:	Closed							Gravitational Acceleratic	9.8065 m/s2
Borehole angle:	-70°									P_{atm}	96.08

Notes: Sample interval for Q2 2023 was supposed to be IG_BH05_INT_T_005. Due to several issues (pressures, port status, port operation etc.) sampling of this interval during Q2 was cancelled by NWMO.
Profile was completed from bottom up from interval 1 - 6, then method switched to top down due to poor borehole conditions for the remainder of the borehole.

				Fluid Pressure Readings													
Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m BGS)	Start Profile Time	Inside Casing (P1-Landed Pressure) (kPa)	Shoe Out	Rotations	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Shoe In	Rotations	Inside Casing (P1) (kPa)	Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Z: Elev of pressure measurement port (mASL)	Freshwater Head (mASL)	Comments
1	991.20		923.15	12:09:00	9073.85	X	13	9063.22	12:10:00	12.99	X	13	9073.96	914.36	8.79	-490.86	423.50	
2	974.30		907.47	12:14:00	8916.69	X	13	8886.74	12:15:00	13.28	X	13	8916.50	896.37	11.10	-475.18	421.19	
3	928.60		865.06	12:19:00	8490.75	X	13	8488.38	12:21:00	13.10	X	13	8490.26	855.75	9.31	-432.77	422.98	
4	865.50		806.50	12:25:00	7901.69	X	13	7911.32	12:27:00	12.59	X	13	7901.82	796.90	9.60	-374.21	422.69	
5	857.20		798.79	12:29:00	7824.27	x	13	7752.10	12:30:00	12.42	x	13	7824.51	780.67	18.12	-366.50	414.17	Re-checked (P2=7751.90 kPa)
6	800.80		746.43	12:35:00	7299.66	x	13	7226.83	12:42:00	11.75	x	13	7299.77	727.11	19.32	-314.14	412.97	
7	788.00		734.54	15:32:00	7178.72	x	12	7188.54	16:00:00	11.50	x	12	7178.93	723.20	11.34	-302.25	420.95	@12:50: unable to shoe out correctly. Brought probe back to surface and cleaned out shoe/ replaced plunger seal @16:00: (P2 = 7630 kPa at 15:35) sat on port for 25mins, pressure continued to slowly decrease. P2 Initial spike was observed, then slow decrease, no stabilization.
8	736.20		686.45	15:27:00	6695.97	x	13	6660.33	15:29:00	10.61	x	13	6695.99	669.34	17.11	-254.16	415.18	
9	679.80		634.09	15:22:00	6171.49	x	12	6140.60	15:24:00	10.19	x	12	6171.32	616.35	17.74	-201.80	414.55	
10	635.00		592.48	15:17:00	5754.69	x	14	5748.62	15:19:00	9.82	x	14	5754.50	576.38	16.10	-160.19	416.19	Saw pressure spike then stabilize.
11	627.30		585.33	15:11:00	5683.45	x	14	5683.26	15:14:00	9.63	x	14	5682.97	569.71	15.62	-153.04	416.67	Saw pressure spike then stabilize.
12	587.70		548.51	15:07:00	5315.61	x	14	5316.75	15:09:00	9.18	x	14	5315.69	532.34	16.17	-116.22	416.12	Saw pressure spike then stabilize.
13	542.00		505.99	15:01:00	4891.92	X	14	4893.00	15:02:00	8.65	X	14	4891.98	489.13	16.86	-73.70	415.43	Re-checked (P2=4893.36 kPa) Saw pressure spike then stabilize
14	487.20		454.95	14:56:00	4383.72	X	14	4384.48	14:58:00	8.15	X	14	4383.97	437.28	17.67	-22.66	414.62	Verified by MdK. 'Saw pressure spike then stabilize.
15	427.80		399.56	14:50:00	3832.00	X	14	3833.14	14:52:00	7.62	X	14	3832.12	381.06	18.50	32.73	413.79	Saw pressure spike then stabilize.
16	372.90		348.37	14:43:00	3322.55	X	14	3324.19	14:44:00	7.11	X	14	3322.34	329.16	19.21	83.92	413.08	Saw pressure spike then stabilize.
17	326.60		305.20	14:37:00	2892.70	X	14	2898.31	14:39:00	6.72	X	14	2892.18	285.74	19.46	127.09	412.83	Saw pressure spike then stabilize.
18	312.90		292.42	14:34:00	2765.46	X	14	2770.18	14:36:00	6.49	X	14	2765.33	272.67	19.75	139.87	412.54	Saw pressure spike then stabilize.
19	264.20		246.98	14:28:00	2312.12	X	14	2312.95	14:31:00	6.18	X	14	2312.48	226.05	20.93	185.31	411.36	Saw pressure spike then stabilize.
20	226.10		211.41	14:18:00	1959.00	X	14	1962.88	14:25:00	5.97	X	14	1958.40	190.35	21.06	220.88	411.23	Saw pressure spike then stabilize.
21	180.5		168.82	14:13:00	1534.77	X	14	1544.75	14:15:00	5.56	X	14	1535.19	147.72	21.10	263.47	411.19	
22	156.0		145.94	14:09:00	1307.59	X	14	1360.60	14:10:00	5.46	X	14	1307.16	128.94	17.00	286.35	415.29	
23	100.1		93.69	14:04:00	786.79	X	14	849.41	14:05:00	5.61	X	14	786.76	76.82	16.87	338.60	415.42	
24	90.9		85.09	14:01:00	700.88	X	14	773.02	14:02:00	6.02	X	14	700.79	69.03	16.06	347.20	416.23	
25	70.5		66.00	13:56:00	510.36	X	14	596.84	13:57:00	7.36	X	14	510.54	51.06	14.94	366.29	417.35	

Completed by:	AMSC	Verified by:	CAM / MdK
Date:	21-Jun-23	Date:	17-Jul-23 / 21-Feb-24

20-203-1: Westbay Pressure/Temperature Profiling - IG_BH06

Well ID	IG_BH06			**Pre Profile**			**Post Profile**			Weather:	17 °C
Datum:	Ground Level	Probe Type:	MOSDAX	P_{atm}	95.61	kPa	P_{atm}	95.36	kPa		Rainy
Elev. G.S.:	417.74 m	Serial No.:	EMS4960	Temp.	17.63	°C	Temp.	5.14	°C		
Height of Westbay above G.S.:	0.91 m AGS	Probe Range:	2000psi	Date/Time	2023-06-25 11:35		Date/Time	2023-06-25 14:05			
Elev. Top of Westbay Casing:	418.65 m	Westbay Casing Type:	MP38	MP38 Water Level	56.74	mBTOC	MP38 Water Level	56.84	mBTOC	Specific Weight	9.807
Reference Elevation:	417.74 mASL	Sampler Valve Position:	Closed							Gravitational Acceleratic	9.8065 kN/m3
Borehole angle:	-70°									P_{atm}	95.49 m/s2

Notes:

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m BGS)	Fluid Pressure Readings: Start Profile Time	Inside Casing (P1-Landed Pressure) (kPa)	Shoe Out	Rotations	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Shoe In	Rotations	Inside Casing (P1) (kPa)	Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Z: Elev of pressure measurement port (mASL)	Freshwater Head (mASL)	Comments
1	990.20		919.41	12:24:00	8710.37	x	14	9185.51	12:26:00	13.24	x	14	8710.17	926.89	-7.48	-501.67	425.22	
2	948.40		880.65	12:34:00	8324.05	x	14	8794.83	12:35:00	13.17	x	14	8324.65	887.05	-6.40	-462.91	424.14	
3	907.20		842.46	12:40:00	7944.36	x	14	8414.55	12:41:00	12.95	x	14	7944.45	848.28	-5.82	-424.72	423.56	
4	852.30		791.60	12:44:00	7437.87	x	14	7903.32	12:45:00	12.53	x	14	7438.60	796.15	-4.55	-373.86	422.29	
5	828.00		769.09	12:48:00	7214.30	x	14	7647.32	12:49:00	12.20	x	14	7214.06	770.05	-0.96	-351.35	418.70	
6	796.90		740.28	12:51:00	6928.09	x	14	7340.08	12:52:00	11.93	x	14	6927.82	738.72	1.56	-322.54	416.18	
7	739.00		686.61	12:56:00	6394.60	x	14	6742.11	12:57:00	11.43	x	14	6394.45	677.74	8.87	-268.87	408.87	
8	719.10		668.15	13:00:00	6211.40	x	14	6211.21	13:01:00	11.05	x	14	6211.04	623.61	44.54	-250.41	373.20	Re-confirmed P2 6211.18 kPa: 13:03 Interval is currently drawing down for purging
9	702.20		652.47	13:04:00	6055.80	x	14	6440.27	13:05:00	10.86	x	14	6055.66	646.96	5.51	-234.73	412.23	
10	687.00		638.37	13:06:00	5915.62	x	14	6308.38	13:07:00	10.74	x	14	5915.51	633.52	4.85	-220.63	412.89	
11	629.10		584.64	13:11:00	5382.59	x	14	5777.92	13:12:00	10.30	x	14	5382.34	579.43	5.21	-166.90	412.53	
12	568.10		528.00	13:15:00	4820.32	x	14	5208.17	13:16:00	9.77	x	14	4819.89	521.33	6.67	-110.26	411.07	
13	514.80		478.50	13:19:00	4328.17	x	14	4727.40	13:20:00	9.29	x	14	4328.30	472.31	6.19	-60.76	411.55	
14	488.90		454.44	13:22:00	4089.55	x	14	4493.40	13:23:00	8.97	x	14	4089.77	448.45	5.99	-36.70	411.75	
15	464.50		431.77	13:25:00	3865.03	x	14	4274.05	13:26:00	8.71	x	14	3864.78	426.08	5.69	-14.03	412.05	
16	411.20		382.27	13:28:00	3375.31	x	14	3789.40	13:29:00	8.28	x	14	3375.61	376.66	5.61	35.47	412.13	
17	368.50		342.64	13:37:00	2983.56	x	14	3403.86	13:38:00	7.52	x	14	2983.98	337.35	5.29	75.10	412.45	
18	278.70		259.30	13:41:00	2157.89	x	14	2586.87	13:42:00	7.06	x	14	2158.00	254.04	5.26	158.44	412.48	
19	214.80		199.93	13:46:00	1568.79	x	14	2008.97	13:47:00	6.41	x	14	1568.39	195.11	4.82	217.81	412.92	
20	160.00		148.98	13:50:00	1063.39	x	14	1517.75	13:50:00	5.86	x	14	1063.31	145.03	3.95	268.76	413.79	
21	147.8		137.63	13:53:00	950.74	x	14	1414.45	13:54:00	5.59	x	14	950.72	134.49	3.14	280.11	414.60	
22	82.4		76.73	13:57:00	347.35	x	14	817.09	13:58:00	5.23	x	14	347.31	73.58	3.15	341.01	414.59	

Completed by:	CAM/MEOR	Verified by:	AMSC
Date:	25-Jun-23	Date:	04-Jul-23 / 21-Feb-24

20-203-1: Field Parameter Measurement/Testing - Field Data Sheet

Ignace Fluid Pressure Profiling and Sampling

Well ID:	IG_BH01	Multiparameter Probe:	Horiba U52 (SN.SRGWN2Y6)	Other Notes/Comments	**IG_BH01_GW044** - Primary Sample INT002 (Primary ID for NG = Cu tubes) **IG_BH01_GW045** - Duplicate Sample INT002 (Duplicate ID for NG = SS tubes) **IG_BH01_GW042** - Rinsate Sample **IG_BH01_GW043** - Field Blank Sample **IG_BH01_GW037** - N2 Blank Sample - SS **IG_BH01_GW038** - N2 Blank Sample - Cu **IG_BH01_GW039** - Trip Blank Sample - SS **IG_BH01_GW040** - Trip Blank Sample - Cu **IG_BH01_GW041** - Half Trip Blank Sample - Cu **IG_BH01_GW046** - Primary Sample INT017 **IG_BH01_GW047** - Duplicate Sample INT017
Date(s):	June 14-21 2023, June 26 2023	Fluorometer:	AquaFluor (SN.807511)		
Operator(s):	AMSC, MdK, CAM, MEOR	Colorimeter:	DR900 (SN. 200660001027)		

Port ID	Cumulative Purge/Sampled Volume (L)	Measurement Date and Time	Multiparameter Probe								Fluorometer		Hydrometer	Colorimetric				Alkalinity		Sample Collected (Y/N)	Collected by (Initial)	Comments (sampling run #, sample ID, water colour or odour, etc.)
			Calibrated	pH	Temp (°C)	EC (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	TDS (g/L)	Calibrated	Fluorescein (ppb)	Specific Gravity	Calibrated	Dissolved Oxygen (mg/L)	Dissolved Ferrous Iron Fe^{2+} (mg/L)	Total Dissolved Sulphide S^{2-} (mg/L)	Phenol. (mg/L)	Total as $CaCO_3$ (mg/L)			
IG_BH01_T_INT_002	8	2023-06-14 14:25	Y	8.29	11.56	1.1	55	4.93	10.7	0.686	Y	29.00	1.000	--	--	--	--	--	--	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC. Formation pressure before pumping = 8684.58 kPa
IG_BH01_T_INT_002	12	2023-06-14 15:20	Y	8.25	10.97	0.591	61	2.22	21.1	0.378	Y	29.53	1.000	--	--	--	--	--	--	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH01_T_INT_002	22	2023-06-14 16:25	Y	8.43	11.85	0.470	43	1.69	X	0.305	Y	29.90	1.000	--	--	--	--	--	--	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH01_T_INT_002	30	2023-06-14 17:25	Y	8.49	11.77	0.432	37	1.55	47.0	0.281	Y	30.20	0.999	--	--	--	--	--	--	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC. Formation pressure after pump off = 8534.45 kPa
IG_BH01_T_INT_002	35	2023-06-15 10:30	Y	7.97	13.23	0.567	130	2.89	16.3	0.363	Y	29.04	-	-	-	-	-	-	-	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC. Formation P before pumping =8681.09 kPa
IG_BH01_T_INT_002	42	2023-06-15 11:30	Y	8.23	16.23	0.445	34	1.07	17.4	0.289	Y	28.20	1.000	-	-	-	-	-	-	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH01_T_INT_002	50	2023-06-15 12:30	Y	8.14	16.16	0.419	37	0.97	17.80	0.272	Y	28.130	0.999	-	-	-	-	-	-	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH01_T_INT_002	-	2023-06-15 15:45	-	-	-	-	-	-	-	-	Y	2.957	-	-	-	-	-	-	-	N	AMSC	Collected during run #1 of sampling.Sample collected from interval - WB probe attached to the sampling port (pumping port closed). Attempted to collect horiba measurements but not enough water was collected to get measurements.
IG_BH01_T_INT_002	-	2023-06-17 15:15	Y	8.12	21.46	34.2	-98	0.39	0.0	20.9	Y	2.625	1.025	Y	0.342	0.74	0.13	0	8.1	Y	AMSC	Collecting during sampling, run #4. Sample collected from interval - WB probe attached to the sampling port (pumping port closed). Horiba measurements collected while sample flowing through the flow through cell.
IG_BH01_T_INT_002	-	2023-06-17 16:00	Y	7.43	23.86	15.5	124	0.96	14.3	9.63	-	-	-	-	-	-	-	-	-	-	AMSC	Horiba measurements collected after sample water sat in flow through cell for ~45mins
IG_BH01_T_INT_002	-	2023-06-20 10:30	Y	7.96	23.07	35.1	84	4.10	0.0	21.4	Y	3.223	-	-	-	-	-	-	-	Y	AMSC	Collecting during sampling, run #17. Sample collected from interval - WB probe attached to the sampling port (pumping port closed). Horiba measurements collected while sample flowing through the flow through cell.
IG_BH01_T_INT_002	-	2023-06-20 10:45	Y	7.71	25.60	37.6	-30	0.88	0.0	22.9	-	-	-	-	-	-	-	-	-	-	AMSC	Horiba measurements collected after sample water sat in flow through cell for ~15mins
IG_BH01_T_INT_017	1	2023-06-16 11:20	Y	8.31	17.50	0.403	-175	0.24	4.9	0.262	Y	0.858	0.998	-	-	-	-	-	-	N	AMSC	Collected prior to purging from during a test sampling run, sample collected from sampling port. Parameters collected from horiba flow through cell.
IG_BH01_T_INT_017	8	2023-06-16 14:30	Y	8.35	18.29	0.436	29	5.52	10.5	0.284	Y	25.26	1.000	-	-	-	-	-	-	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH01_T_INT_017	12	2023-06-16 15:30	Y	8.25	19.73	0.426	7	3.74	4.4	0.277	Y	25.74	1.000	-	-	-	-	-	-	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC.

IG_BH01_T_INT_017	16	2023-06-16 16:30	Y	8.46	20.52	0.423	-14	2.57	6.3	0.275	Y	25.70	0.999	-	-	-	-	-	-	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH01_T_INT_017	20	2023-06-16 17:30	Y	8.36	18.89	0.452	-9	2.21	12.1	0.293	Y	26.32	1.000	-	-	-	-	-	-	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH01_T_INT_017	23	2023-06-17 10:15	Y	8.16	19.47	0.461	53	0.49	16.4	0.300	Y	27.07	1.000	-	-	-	-	-	-	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH01_T_INT_017	27	2023-06-17 11:15	Y	8.19	19.53	0.460	15	0.48	10.5	0.299	Y	26.41	0.999	-	-	-	-	-	-	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH01_T_INT_017	30	2023-06-17 12:15	Y	8.35	23.20	0.470	-3	0.41	15.4	0.305	Y	25.690	1.000	-	-	-	-	-	-	N	AMSC	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH01_T_INT_017	-	2023-06-20 11:35	Y	8.70	23.76	0.500	-165	1.97	0.0	0.320	Y	0.756	0.998	Y	0.570	0.47	0.10	0	88	Y	AMSC	Collecting during sampling, run #1. Sample collected from interval - WB probe attached to the sampling port (pumping port closed). Horiba measurements collected while sample flowing through the flow through cell.
IG_BH01_T_INT_017	-	2023-06-20 12:10	Y	8.19	24.08	0.294	-157	4.23	0.0	0.191	-	-	-	-	-	-	-	-	-	-	AMSC	Horiba measurements collected after sample water sat in flow through cell for ~35mins
IG_BH01_T_INT_017	-	2023-06-21 9:45	Y	8.74	21.12	0.358	-134	1.39	2.2	0.233	Y	0.741	-	-	-	-	-	-	-	-	AMSC	Collecting during sampling, run #10. Sample collected from interval - WB probe attached to the sampling port (pumping port closed). Horiba measurements collected while sample flowing through the flow through cell.
IG_BH01_T_INT_017	-	2023-06-21 10:00		8.18	22.79	0.319	-107	0.81	3.4	0.2	-	-	-	-	-	-	-	-	-	-	AMSC	Horiba measurements collected after sample water sat in flow through cell for ~15mins.
IG_BH01_T_INT_002	-	2023-06-26 13:30	-	-	-	-	-	-	-	-	Y	2.461	-	-	-	-	-	-	-	Y	CAM	Collected during run #18 of sampling INT002. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
IG_BH01_T_INT_002	-	2023-06-26 16:00	-	-	-	-	-	-	-	-	Y	2.988	-	-	-	-	-	-	-	Y	CAM	Collected during run #20 of sampling INT002. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)

Completed by:	AMSC, MEOR	Verified by:	CAM
Date:	6/21/2023, 6/26/2023	Date:	17-Jul-23

20-203-1: Groundwater Sampling Form

Ignace Fluid Pressure Profiling and Sampling

Well ID:	IG_BH01		**Start Time**	8:20 (16-Jun-23), 10:50 (26-Jun-23)
MP38 Water Level Before Sampling:	49.85 (16-Jun-23), 29.58 (26-Jun-23)	m BTOC	**Starting Ambient Pressure**	95.60 (16-Jun-23), 93.91 (26-Jun-23) kPa
MP38 Water Level After Sampling:	64.17 (21-Jun-23), 30.21 (26-Jun-23)	m BTOC	**End Sampling Time**	10:30 (21-Jun-23), 16:00 (21-Jun-23)
Probe Serial #/Range	EMS 4960 (2000psi)	kPa	**Ending Ambient Pressure**	96.20 (21-Jun-23), 96.30 (26-Jun-23) kPa
Date:	June 15 - 21 2023, June 26 2023			

Other Notes/Comments:

IG_BH01_GW044 - Primary Sample INT002 (Primary ID for NG = Cu tubes). BV samples re-collected
IG_BH01_GW045 - Duplicate Sample INT002 (Duplicate ID for NG = SS tubes). BV samples re-collected
IG_BH01_GW042 - Rinsate Sample. Sample re-collected
IG_BH01_GW043 - Field Blank Sample
IG_BH01_GW037 - N2 Blank Sample - SS
IG_BH01_GW038 - N2 Blank Sample - Cu
IG_BH01_GW039 - Trip Blank Sample - SS
IG_BH01_GW040 - Trip Blank Sample - Cu
IG_BH01_GW041 - Half Trip Blank Sample - Cu

IG_BH01_GW046 - Primary Sample INT017
IG_BH01_GW047 - Duplicate Sample INT017

Sampling Run Start Date/Time	Port #	Run #	Function Tests/Preparation						Landed Port	Sampling Sequence									Sampling Run End Time	Comments (volume recovered, parameters measured, samples collected, etc)
			Shoe-Out	Close Valve	Vaccum Check	Open Valve	Evacuate Bottles (~35 kPa)	Close Valve		Landed Westbay MP38 Pressure (pre-sample, kPa)	Shoe-Out	Zone Pressure (pre-sample, kPa)	Open-Valve	Stablization Time (sec)	Zone Pressure (post-sample kPa)	Close Valve	Shoe-In	Landed Westbay MP38 Pressure (post-sample, kPa)		
2023-06-15 14:00	INT 002	1	X	X	X	X	0.5	X	X	8533.57	X	8652.27	X	300	8650.3	X	X	8533.44	15:30	Sample collected from interval - WB probe attached to the sampling port (pumping port closed). **Only ~150mL collected from run**, collected in horiba flow-through cell, not enough to fill and get measurements. Unfilled bottles may be due to faulty connection nut (13). Swapped Westbay bottle nut.
2023-06-15 16:00	INT 002	2	X	X	X	X	0.2	X	X	8533.08	X	8666.35	X	300	8666.07	X	x	8532.96		Sample collected from interval - WB probe attached to the sampling port (pumping port closed). Only ~3 kPa drop when valve opened, and took about 90sec to re-stabilize to formation pressure. Remained on port with valve open for 5 mins, Relanded: P1 =8532.84 kPa, P2=8666.49 kPa, opened valve and no change in pressure (indication that bottles are full?). **No water was collected.**
2023-06-15 17:40	INT 020	N/A	X	X	X	X	2.8	X	X	310.90	X	629.56	X	1680	597.32	X	X	311.76	18:25	**Test Run** Used this run to as a check given that the last two runs to INT002 did not collect any water. Took 25 minutes for pressure to come back up to - run was successful in collecting a full1L. Water collected was discarded.
2023-06-16 8:20	INT002	3	X	X	X	X	8.5	X	X	8531.81	X	8680.89	X	900	8680.43	X	X	8531.72		Sample collected from interval - WB probe attached to the sampling port (pumping port closed). Pressure initially dropped ~10kPa and re-stabilized within 90s. Stayed on port for 5mins, no change in pressure. Relanded and opened valve, no change in pressure. Remained on port for another 10mins, still no change. **No water was collected.**
2023-06-16 10:25	INT017	N/A	X	X	X	X	8.8	X	X	1595.38	X	1885.62	X	1800	1851.46	X	X	1595.44		**Test run.** Successful run, collected 1L. Used sample to take measurements, the rest was discarded.
2023-06-16 11:30	INT002	N/A	X	X	X	X	7.8	X	N/A	8551.71	N/A	N/A	X	0	N/A	X	X	8551.00		**Test run** Attempted to collect a sample from within the MP38 casing without connecting to the port (~888 m). Minimal change in pressure (~2kPa) when valve was opened.
2023-06-16 13:15	INT002	4	X	X	X	X	8.4	X	X	8403.85	X	8682.32	X	780	8668.48	X	X	8403.52	15:10	Run #4 used to collect parameters and in field measurements as well as the Ru samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-16 15:20	INT002	5	X	X	X	X	4.8	X	X	8403.64	X	8680.66	X	600	8664.30	X	X	8403.15	16:55	Run #5 used to collect archive, metals and ammonia samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-16 17:05	INT002	6	X	X	X	X	2	X	X	8403.03	X	8679.28	X	600	8663.09	X	X	8402.76	18:45	Run #6 used to collect silica, DOC, sulphide and nutrients samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-18 8:15	INT002	7	X	X	X	X	0.25	X	X	8402.38	X	8683.03	X	480	8665.27	X	X	8402.00	9:45	Run #7 used to collect general chemistry samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-18 9:55	INT002	8	X	X	X	X	0.25	X	X	8401.81	X	8680.40	X	480	8662.12	X	X	8401.03	11:25	Run #8 used to collect ^{37}Cl samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-18 11:35	INT002	9	X	X	X	X	0.25	X	X	8391.48	X	8679.28	X	360	8673.57	X	X	8391.27	14:10	Run #9 was Noble Gas Run #1. (SS-Cu-SS) &13-C samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-18 14:30	INT002	10	X	X	X	X	0.25	X	X	8390.45	X	8680.52	X	420	8675.21	X	X	8389.70	16:20	Run #10 was Noble Gas Run #2. (Cu-Cu-Cu). Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-18 16:40	INT002	11	X	X	X	X	0.25	X	X	8389.42	X	8681.24	N/A	420	N/A	N/A	X	8389.62	18:50	Run #11 was used to collect the noble gs trip blanks. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)

2023-06-18 19:00	INT002	11b	X	X	X	X	0.25	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	19:05	"Run" #11b used to collect the noble gas half trip blank. WB probe was landed on the port but no water collected for this blank.
2023-06-19 8:50	INT002	12	X	X	X	X	5	X	X	8398.47	X	8683.71	X	480	8665..50	X	X	8398.12	10:10	Run #12 used to collect $^{129}I/^{36}Cl$. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-19 10:30	INT002	13	X	X	X	X	5	X	X	8397.96	X	8681.26	X	600	8665.81	X	X	8397.57	12:00	Run #13 used to collect $^{129}I/^{36}Cl$. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-19 12:10	INT002	14	X	X	X	X	5	X	X	8397.60	X	8679.55	X	480	8661.63	X	X	8397.15	13:35	Run #14 used to collect ^{14}C samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-19 13:45	INT002	15	X	X	X	X	5	X	X	8399.23	X	8678.38	X	540	8659.44	X	X	8399.70	15:20	Run #15 used to collect $^{87}Sr/^{86}Sr$ samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-20 7:20	INT002	16	X	X	X	X	5	X	X	8399.81	X	8684.31	X	600	8663.45	X	X	8399.33	8:55	Run #16 used to collect $^{2}H/^{1}H/^{18}O$ and FL measurements. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-20 9:10	INT002	17	X	X	X	X	5	X	X	8398.33	X	8680.38	X	420	8657.40	X	X	8398.72	10:30	Run #17 used to collect $^{2}H/^{1}H/^{18}O$ and horiba measurements. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-20 10:45	INT017	1	X	X	X	X	5	X	X	1461.46	X	1882.92	X	1500	1802.85	X	X	1462.60	11:30	Run #1 used to collect in field measurements and parameters, ammonia and nutirients. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-20 11:45	INT017	2	X	X	X	X	5	X	X	1461.33	X	1866.57	X	1020	1675.70	X	X	1462.15	12:25	Run #2 used to collect $^{129}I/^{36}Cl$ and SiO_2. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-20 12:35	INT017	3	X	X	X	X	7	X	X	1460.87	X	1853.52	X	1000	1650.23	X	X	1462.15	13:10	Run #3 used to collect $^{129}I/^{36}Cl$ and $SiO2_2$. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-20 13:25	INT017	4	X	X	X	X	7	X	X	1461.03	X	1853.43	X	1200	1677.88	X	X	1462.16	14:00	Run #4 used to collect $^{2}H/^{3}H/^{18}O$ and metals. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-20 14:15	INT017	5	X	X	X	X	6	X	X	1460.81	X	1849.55	X	1200	1691.75	X	X	1461.71	14:55	Run #5 used to collect $^{2}H/^{3}H/^{18}O$ and metals. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-20 15:05	INT017	6	X	X	X	X	7.5	X	X	1459.89	X	1843.77	X	1200	1684.36	X	X	1461.71	15:40	Run #6 used to collect ^{14}C samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-21 7:25	INT017	7	X	X	X	X	6.8	X	X	1460.15	X	1882.10	X	1200	1704.75	X	X	1462.14	8:05	Run #7 used to collect $^{87}Sr/^{86}Sr$ and Ru samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-21 8:15	INT017	8	X	X	X	X	7	X	X	1461.44	X	1859.02	X	1200	1681.79	X	X	1461.72	8:50	Run #8 used to collect Archive, Sulphide, and 13-C samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-21 9:00	INT017	9	X	X	X	X	7	X	X	1460.47	X	1851.46	X	1200	1672.67	X	X	1461.29	9:45	Run #9 used to collect ^{37}Cl samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-21 9:55	INT017	10	X	X	X	X	7	X	X	1459.96	X	1843.92	X	1200	1653.14	X	X	1461.28	10:30	Run #10 used to collect general chemistry samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-26 12:30	INT002	18	X	X	X	X	3.7	X	X	8696.53	X	8689.06	X	270	8686.76	X	X	8691.06	13:30	Run #18 used to re-collect silica, Ru, nutrient and ammonia samples. FL = 2.461 ppb. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-26 13:40	INT002	19	X	X	X	X	3.1	X	X	8692.80	X	8691.76	X	240	8685.75	X	X	8689.71	14:45	Run #19 used to re-collect metals, sulphide, DOC samples. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)
2023-06-26 15:00	INT002	20	X	X	X	X	3.2	X	X	8691.92	X	8690.04	X	240	8685.00	X	X	8689.01	16:00	Run #20 used to re-collect general chemistry samples. FL = 2.988 ppb. Sample collected from interval - WB probe attached to the sampling port (pumping port closed)

Note: Record field parameter measurements on *20-203-01: Field Parameter Measurement/Testing - Field Data Sheet*

Completed by:	MdK, CAM	Verified by:	AMSC
Date:	21-Jun-23 26-Jun-23	Date:	04-Jul-23

Well ID:	IG_BH05	Multiparameter Probe:	Horiba U52 (SN.SRGWN2Y6)	Other Notes/Comments	~~IG_BH05_GW014 - Primary Sample~~
Date(s):	6/22/2023, 6/23/2023	Fluorometer:	AquaFluor (SN.807511)		~~IG_BH05_GW015 - Duplicate Sample~~
Operator(s):	CAM, MEOR	Colorimeter:	DR900 (SN. 200660001027)		Sampling of this interval was cancelled at NWMO's request due to issues with unknown status of measurment/pumping ports, and closure of measurment port for IG_BH05_T_INT005 when "opening valve".

Port ID	Cumulative Purge/Sampled Volume (L)	Measurement Date and Time	Multiparameter Probe								Fluorometer		Hydrometer	Colorimetric				Alkalinity		Sample Collected (Y/N)	Collected by (Initial)	Comments (sampling run #, sample ID, water colour or odour, etc.)
			Calibrated	pH	Temp (°C)	EC (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	TDS (g/L)	Calibrated	Fluorescein (ppb)	Specific Gravity	Calibrated	Dissolved Oxygen (mg/L)	Dissolved Ferrous Iron Fe^{2+} (mg/L)	Total Dissolved Sulphide S^{2-} (mg/L)	Phenol. (mg/L)	Total as $CaCO_3$ (mg/L)			
IG_BH05_T_INT_005	20	2023-06-22 14:45	Y	7.80	18.69	8.34	-114	1.60	12.1	5.25	Y	27.00	1.020	--	--	--	--	--	--	N	CAM	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH05_T_INT_005	30	2023-06-22 15:32	Y	7.78	17.76	8.29	-115	1.47	30.7	5.22	Y	--	1.020	--	--	--	--	--	--	N	CAM	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH05_T_INT_005	40	2023-06-22 16:40	Y	7.76	15.8	8.85	-118	1.53	8.0	5.57	Y	28.10	1.020	--	--	--	--	--	--	N	CAM	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH05_T_INT_005	50	2023-06-22 17:10	Y	7.77	14.40	9.08	-118	1.60	15.1	5.71	Y	29.00	1.015	--	--	--	--	--	--	N	CAM	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH05_T_INT_005	55	2023-06-23 10:58	Y	7.8	12.3	8.43	-95	1.54	77.0	5.3	Y	26.270	1.020	--	--	--	--	--	--	N	CAM	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH05_T_INT_005	60	2023-06-23 11:16	Y	7.82	12.28	8.58	-111	1.40	70.6	5.37	Y	28.040	1.020	--	--	--	--	--	--	N	CAM	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH05_T_INT_005	65	2023-06-23 11:34	Y	7.84	12.89	8.57	-121	1.33	27.7	5.39	Y	28.57	1.020	--	--	--	--	--	--	N	CAM	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH05_T_INT_005	70	2023-06-23 12:20	Y	7.82	13.85	8.61	-131	1.07	31.0	5.45	Y	28.31	1.020	--	--	--	--	--	--	N	CAM	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH05_T_INT_005	80	2023-06-23 13:35	Y	7.73	16.27	8.47	-140	1.03	1.0	5.32	Y	27.700	1.020	--	--	--	--	--	--	N	CAM	Parameters collected while purging with bladder pump placed at ~85 m BTOC.
IG_BH05_T_INT_005	90	2023-06-23 14:25	Y	7.68	17.90	8.46	-138	0.95	8.3	5.34	Y	26.72	1.02	--	--	--	--	--	--	N	CAM	Parameters collected while purging with bladder pump placed at ~85 m BTOC.

Completed by:	MEOR, CAM	Verified by:	AMSC
Date:	23-Jun-23	Date:	04-Jul-27

20-203-1: Groundwater Sampling Form

Ignace Fluid Pressure Profiling and Sampling

Well ID:	IG_BH05		**Start Time**	15:55, 8:40, 8:25, 7:40	
MP38 Water Level Before Sampling:	64.23, 46.34, 35.85, 27.72	m BTOC	**Starting Ambient Pressure**	94.50, 95.03, 96.54, 94.22	kPa
MP38 Water Level After Sampling:	63.01, 44.21, 36.25, 28.38	m BTOC	**End Sampling Time**	17:35, 16:55, 10:15, 13:00	
Probe Serial #/Range	EMS 4960- 2000 psi, EMS 5230 (25-Jun-23)		**Ending Ambient Pressure**	94.8, 94.58, 96.12, 96,42	kPa
Date:	23-Jun-23, 24-Jun-23, 25-Jun-23, 27-Jun-23				

Other Notes/Comments: ~~**IG_BH05_GW014** - Primary Sample~~

~~**IG_BH05_GW015** - Duplicate Sample~~

Sampling of this interval was cancelled at NWMO's request due to issues with unknown status of measurment/pumping ports, and closure of measurment port for IG_BH05_T_INT005 when "opening valve".

Sampling Run Start Date/Time	Port #	Run #	Function Tests/Preparation						Landed Port	Sampling Sequence									Sampling Run End Time	Comments (volume recovered, parameters measured, samples collected, etc)
			Shoe-Out	Close Valve	Vaccum Check	Open Valve	Evacuate Bottles (<35 kPa)	Close Valve		Landed Westbay MP38 Pressure (pre-sample, kPa)	Shoe-Out	Zone Pressure (pre-sample, kPa)	Open-Valve	Stablization Time (sec)	Zone Pressure (post-sample kPa)	Close Valve	Shoe-In	Landed Westbay MP38 Pressure (post-sample, kPa)		
2023-06-23 15:55	INT 005	1	X	X	X	X	2.5	X	X	7491.10	X	7637.28	X	2280	--	X	X	--	17:35	No water from run #1. Suspect plundger plugged. No significant change after open valve. Closed valve afterwards and MP38 pressure remain below 40 kPa.
2023-06-24 11:50	INT 005	2	X	X	X	X	2.46	X	X	7668.00	NA	NA	X	300	NA	X	NA	7660.00	13:20	1L of water collected from MP38. FI= 2.875 ppb. Same pressure behaviour as Run#1 when probe was coupled with port.
2023-06-24 14:10	INT 005	3	X	X	X	X	1.58	X	X	7683.00	NA	NA	X	300	NA	X	NA	7675.00	15:35	1L of water collected from MP38. FI= 3.334 ppb. Same pressure behaviour as Run#1 when probe was coupled with port.
2023-06-24 15:50	INT 005	4	X	X	X	X	NA	X	X	7656.43	NA	NA	X	300	NA	X	NA	7648.00	16:55	1L of water collected from MP38. FI= 3.091 ppb. No vacuum applied to test suction of probe against the port.
2023-06-25 8:25	INT 005	5	X	X	X	X	4.3	X	X	7735.00	NA	NA	X	240	NA	X	NA	7727.00	10:10	Probe EMS5230 used for sampling. Samples collected 3m above the sampling port. 1L of water collected from MP38. FI= 3.374 ppb. Same pressure behaviour as Run#1 when probe was coupled with port.
2023-06-27 7:40	INT 024	N/A	X	X	X	X	3.2	X	X	7834.76	X	7733.4	X	300	NA	X	NA	7833.90	9:15	**Test run.** Problems to sample remain at Int 005. Most likely to be a port issue than a probe issue. Sampling at INT024 to test probe. Sampling successful. FL: 77.27 ppb.
2023-06-27 9:30	INT 011	N/A	X	X	X	X	4.1	X	X	7824.27	X	7734.33	X	NA	NA	X	NA	--	10:55	Running down hole with one (1) bottle. Same pressure behaviour as previous runs. Collecting sample from INT011 to confirm fluorescein levels. FL 1.840 ppb.
2023-06-27 11:25	INT 002	N/A	X	X	X	X	2.83	X	X	7831.23	X	7734.67	X	NA	NA	X	NA	--	13:00	Running down hole after cleaning and re-greased the actuator nut as requested by NWMO. Same pressure behaviour as previous runs. Collecting sample from INT002 to confirm fluorescein levels. FL 101.7 ppb. Final run.

*Note: Record field parameter measurements on *20-203-01: Field Parameter Measurement/Testing - Field Data Sheet*

Completed by:	CAM/MEOR	Verified by:	AMSC
Date:	27-Jun-23	Date:	04-Jul-23

COC Number/ID	Sample ID(s)	Shipping Information						Receiving Information				Comments
		Shipped Date	Shipped Time	Temp. Shipped (deg C)	COC Signed by Geofirma (Y/N)	Shipping Address	Shipping Method	Received Date	Received Time	Temp Received (deg C)	COC Signed By Receiving Lab (Y/N)	
GFIM_BVL_0014	IG_BH01_GW042 IG_BH01_GW044 IG_BH01_GW045	19-Jun-23	7:00	3	Y	Bureau Veritas Labs 946 Cobalt Crescent Thunder Bay, ON	Courier	21-Jun-23	13:33	20,20,20	Y	**Not analyzed** - samples comprimised due to late delivery.
GFIM_BVL_0015	IG_BH01_GW046 IG_BH01_GW047	23-Jun-23	10:30	3	Y	Bureau Veritas Labs 946 Cobalt Crescent Thunder Bay, ON	Hand delivered	23-Jun-23	9:40	0,0,2	Y	
GFIM_BVL_0016	IG_BH01_GW042 IG_BH01_GW044 IG_BH01_GW045	27-Jun-23	10:30	3	Y	Bureau Veritas Labs 946 Cobalt Crescent Thunder Bay, ON	Courier	28-Jun-23	10:20	2,2,2	Y	Re-sampled as the previous ones were delayed due to courier missing pickup .
GFIM_NWMO_0008	IG_BH01_GW044 IG_BH01_GW045 IG_BH01_GW046 IG_BH01_GW047	27-Jun-23	18:00	3	Y	NWMO Office - Ignace 304 Main St Ignace ON P0T 1T0	Hand delivered	27-Jun-23	18:00	N/A	Y	
GFIM_IT2_0008	IG_BH01_GW043 IG_BH01_GW044 IG_BH01_GW045 IG_BH01_GW046 IG_BH01_GW047	28-Jun-23	11:00	3	Y	Isotope Tracer Technologies 608 Weber St. N Unit3, Waterloo, ON N2V 1K4	Courier	29-Jun-23	N/A	N/A	Y	Reviewed by CAM. Provided email to IT2 clarifying requested analyses on July 6, 2023
GFIM_UofO_0008	IG_BH01_GW044 IG_BH01_GW045 IG_BH01_GW046 IG_BH01_GW047	04-Jul-23	9:00	<10 (on ice)	Y	University of Ottawa 25 Templeton St., Ottawa ON K1N 6N5	Hand delivered	04-Jul-23	9:30	N/A	Y	
GFIM_UofOxford_0001	IG_BH01_GW037 IG_BH01_GW038 IG_BH01_GW039 IG_BH01_GW040 IG_BH01_GW041 IG_BH01_GW044 IG_BH01_GW045	23-Jun-23	7:00	n/a	Y	Univeristy of Oxford Department of Earth Science South Parks Road Oxford UK OX1 3AN	Courier	28-Jun-23	18:08	n/a	Y	Noble gas samples

Completed by:	AMSC	Verified by:	CAM
Date:	04-Jul-23	Date:	17-Aug-23

Laboratory Report Date	2023-07-17 & 2023-07-28
Laboratory Name	**Bureau Veritas**
Laboratory Report ID (If applicable)	C3I6341 & C3J1206
Analyses Completed	Major and Trace Elements and Metals; Total dissolved sulphur; Total dissolved iron; Reactive silica; Sulphide; Anions; pH; Alkalinity; Fluoride; TIC; TOC; DOC; TKN; Total Phosphorus; Total Ammonia; Total Nitrogen; Carbonate, Bicarbonate and Hydroxide

Associated COC #(s)	GFIM_BVL_0015 & GFIM_BVL_0016

Samples Included in Laboratory Report

IG_BH01_GW042
IG_BH01_GW044
IG_BH01_GW045
IG_BH01_GW046
IG_BH01_GW047

Quality Check and Verification	Verified By (Initials)	Comments
Results received from laboratory	AMSC	
All samples were tested or accounted for. Justification provided for any untested samples (e.g. spare sample)	AMSC	
Laboratory data report provided with results	AMSC	
Laboratory testing methods/techniques included in data report	AMSC	
Laboratory QA procedures and equipment calibration included in data report	AMSC	
Laboratory results are within reasonable/expected range	AMSC	See notes below

Other Comments/Notes:

[2023-08-01] : Geofirma flagged some analytes for samples IG_BH01_GW046 and IG_BH01_GW047 that had descrepencies and asked the lab to review and re-anlyze if feasible. Including:
-- Fe, Ca and Sr values between the two samples are inconsistent
-- IG_BH01_GW046 has a charge balance error of ~40%. (Requested re-analysis of metals for GW046)
[2023-08-07] Lab re-analyzed dissolved metals for sample IG_BH01_GW046, and all original values were confirmed. Due charge balance error, results for IG_BH01_GW046 will be flagged in future data deliveries and reports.

Note: A copy of this form is to be complete for each laboratory data report that is received by Geofirma

Completed by:	AMSC	Verified by:	CAM
Date:	01-Aug-23	Date:	17-Aug-23

Laboratory Report Date	2023-09-14
Laboratory Name	**Isotope Tracer Technologies (IT^2)**
Laboratory Report ID (If applicable)	**230250**
Analyses Completed	$\delta^{18}O$, $\delta^{2}H$, Trtrium (^{3}H), $^{87}Sr/^{86}Sr$, $\delta^{37}Cl$, $\delta^{13}C$, ^{14}C

Associated COC #(s)	GFIM_IT2_0008

Samples Included in Laboratory Report

IG_BH01_GW043
IG_BH01_GW044
IG_BH01_GW045
IG_BH01_GW046
IG_BH01_GW047

Quality Check and Verification	Verified By (Initials)	Comments
Results received from laboratory	AMSC	
All samples were tested or accounted for. Justification provided for any untested samples (e.g. spare sample)	AMSC	
Laboratory data report provided with results	AMSC	
Laboratory testing methods/techniques included in data report	AMSC	
Laboratory QA procedures and equipment calibration included in data report	AMSC	
Laboratory results are within reasonable/expected range	AMSC	see notes below

Other Comments/Notes:

[2023-11-14]: Asked lab to confirm correct reporting of δ37Cl results, as the primary and duplicate sample results do not seem to match up as well as other analyses.
[2024-01-08]: Received updated lab report with results of the re-run δ37Cl results.

Note: A copy of this form is to be complete for each laboratory data report that is received by Geofirma

Completed by:	AMSC	Verified by:	MdK
Date:	14-Nov-23 / 08-Jan-24	Date:	10-Jan-24

Laboratory Report Date	2024-01-08 & 2024-04-17
Laboratory Name	**University of Ottawa**
Laboratory Report ID (If applicable)	N/A
Analyses Completed	^{129}I & ^{36}Cl

Associated COC #(s)	GFIM_UofO_0008

0
IG_BH01_GW044 IG_BH01_GW045 IG_BH01_GW046 IG_BH01_GW047

Quality Check and Verification	Verified By (Initials)	Comments
Results received from laboratory	AMSC	
All samples were tested or accounted for. Justification provided for any untested samples (e.g. spare sample)	AMSC	
Laboratory data report provided with results	AMSC	
Laboratory testing methods/techniques included in data report	AMSC	
Laboratory QA procedures and equipment calibration included in data report	AMSC	
Laboratory results are within reasonable/expected range	AMSC	

Other Comments/Notes:
[2024-01-08]: Received 129I results, still awaiting 36Cl results. [2024-04-19]: Received 36Cl results.

Note: A copy of this form is to be complete for each laboratory data report that is received by Geofirma

Completed by:	AMSC	Verified by:	MdK / MEOR
Date:	10-Jan-24 / 22-Apr-24	Date:	10-Jan-24 / 24-Apr-24

2023 Q3
(September)

GEOFIRMA
ENGINEERING

Borehole ID:	BH01, BH03 & BH05
Date:	Sept 27 - Oct 17 2023
Completed by:	AMSC, LIM, MdK, KBT
Sampling Interval:	[IG_BH01_T_INT_020] [IG_BH03_T_INT_021] & NG sampling

Comments:

Equipment	Date/Time	Decontamination Required (Y/N)	Location (BH)	PPE	Decontamination Procedure					Staff initial	Comments
					Loose Contamination Removed	Detergent Wash *(record type of detergent used)*	Dionized Water Rinse	Air Dried (Minimize Dust)	Rinsate Sample Collected (Y/N)		
Electronic Water Level Tape	2023-09-27 8:15	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	AMSC	
MOSDAX sampler probe EMS 5523	2023-09-27 8:15	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	LIM	
Solinst Pump	2023-09-27 12:30	Y	IG_BH01	Y	Y	N/A	Y	Y	N	AMSC	
Electronic Water Level Tape	2023-09-30 8:00	Y	IG_BH03	Y	Y	Alconox	Y	Y	N	AMSC	
MOSDAX sampler probe EMS 5523	2023-09-30 8:00	Y	IG_BH03	Y	Y	Alconox	Y	Y	N	LIM	
Westbay sample bottles (x6)	2023-09-30 15:30	Y	IG_BH03	Y	Y	Alconox	Y	Y	N	LIM	
Solinst Pump	2023-10-01 8:15	Y	IG_BH03	Y	Y	N/A	Y	Y	N	AMSC	
Westbay sample bottles (x6)	2023-10-02 9:10	Y	IG_BH03	Y	Y	Alconox	Y	Y	Y	LIM	Rinsate sample collected: IG_BH01_GW054
Cu tubes (x6)	2023-10-04 8:30	Y	IG_BH03	Y	Y	DI	Y	Y	N	AMSC	
Electronic Water Level Tape	2023-10-04 14:30	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	AMSC	
MOSDAX sampler probe EMS 5523	2023-10-04 14:30	Y	IG_BH05	Y	Y	Alconox	Y	Y	N	LIM	
Electronic Water Level Tape	2023-10-06 8:15	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	MdK	
Solinst Pump	2023-10-06 8:15	Y	IG_BH01	Y	Y	N/A	Y	Y	N	MdK	
MOSDAX sampler probe EMS 5523	2023-10-06 12:30	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	MdK	
Westbay sample bottles (x1)	2023-10-09 7:30	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	MdK	
Cu tubes (x8)	2023-10-09 7:30	Y	IG_BH01	Y	Y	DI	Y	Y	N	MdK	
Westbay sample bottles (x1)	2023-10-09 14:30	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	MdK	
Cu tubes (x6)	2023-10-09 7:30	Y	IG_BH01	Y	Y	DI	Y	Y	N	MdK	
Westbay sample bottles (x1)	2023-10-11 8:15	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	MdK	
Cu tubes (x6)	2023-10-11 8:15	Y	IG_BH01	Y	Y	DI	Y	Y	N	MdK	
Westbay sample bottles (x4)	2023-10-11 11:00	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	MdK	
Cu tubes (x6)	2023-10-11 11:00	Y	IG_BH01	Y	Y	DI	Y	Y	N	MdK	
Westbay sample bottles (x1)	2023-10-13 12:00	Y	IG_BH01	Y	Y	Alconox	Y	Y	N	MdK	
Cu tubes (x5)	2023-10-13 12:00	Y	IG_BH01	Y	Y	DI	Y	Y	N	MdK	

Date	Time	Personnel	Equipment Type	Serial Number	Calibration Check			Calibration Performed			Comments
					Check Method & Standard(s) Used	Equipment Reading(s)	Calibration Required (Y/N)	Calibration Method & Standard(s) Used	Equipment Reading(s)	Calibration Completed (Y/N)	
27-Sep-23	11:30	AMSC, LIM	MOSDAX Probe	EMS 5523	Manual WL/P vs. Probe P	Manual P (anticipated) = 2444.27 kP Probe P (measured) = 2461.43 kPa	N	--	--	--	
28-Sep-23	11:30	AMSC	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000ppb, 9.595ppb, 100.6ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
28-Sep-23	11:30	AMSC,	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 3.98, 7.00, 10.00	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	3.98 pH, 4.49mS/cm, 0.0NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
30-Sep-23	16:00	AMSC	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000ppb, 9.529ppb, 100.5ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
01-Oct-23	6:55	AMSC	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 3.98, 7.00, 10.00	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	3.98 pH, 4.48mS/cm, 0.0NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
01-Oct-23	7:00	LIM	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000ppb, 9.603ppb, 100.2ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
02-Oct-23	6:45	AMSC	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.00, 7.02, 10.00	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	4.00 pH, 4.49mS/cm, 0.1NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
02-Oct-23	6:55	AMSC	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000ppb, 9.674ppb, 100.2ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
02-Oct-23	10:45	AMSC	DR900	200660001027	Absorbance Std Test Kit **520nm:** Blank: 0.00 Std 1: 0.597 ± 0.05 Std 2: 1.257 ± 0.10 Std 3: 1.890 ± 0.15	**520nm:** Blank: 0.000 Std 1: 0.610 Std 2: 1.262 Std 3: 1.904		--	--	--	Cal checked using DR900 absorbance check kit (LOT# A2294)
					610nm: Blank: 0.00 Std 1: 0.556 ± 0.05 Std 2: 1.173 ± 0.10 Std 3: 1.764 ± 0.15	**610nm:** Blank: 0.000 Std 1: 0.580 Std 2: 1.203 Std 3: 1.806		--	--	--	
04-Oct-23	6:45	AMSC	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.00, 7.02, 10.00	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	4.01 pH, 1.36mS/cm, 0.0NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24) . EC calibration flagged as low, will bias field readings.
04-Oct-23	6:55	AMSC	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000ppb, 9.607ppb, 100.4ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
06-Oct-23	6:45	MdK	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.00, 6.95, 10.02	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	3.99 pH, 4.50mS/cm, 0.0NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
06-Oct-23	6:45	MdK	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000ppb, 9.642ppb, 100.4ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
07-Oct-23	6:30	MdK	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.02, 7.01, 10.00	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	3.99 pH, 4.49mS/cm, 0.0NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
07-Oct-23	6:30	MdK	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000ppb, 9.579ppb, 100.4ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
08-Oct-23	6:30	MdK	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.01, 7.00, 10.05	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	4.00 pH, 4.49mS/cm, 0.0NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
08-Oct-23	6:45	MdK	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000ppb, 9.817ppb, 100.2ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
09-Oct-23	5:30	MdK	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 3.97, 7.05, 10.00	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	3.99 pH, 4.49mS/cm, 0.8NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
09-Oct-23	5:30	MdK	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000ppb, 9.529ppb, 100.4ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024

10-Oct-23	6:30	MdK	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.05, 7.00, 10.00	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	4.00 pH, 4.49mS/cm, 0.1NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
10-Oct-23	6:30	MdK	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000ppb, 9.650ppb, 100.2ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
11-Oct-23	6:30	MdK	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.06, 7.00, 10.02	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	4.00 pH, 4.49mS/cm, 0.1NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
11-Oct-23	6:30	MdK	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000ppb, 9.503ppb, 100.4ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
11-Oct-23	6:45	MdK	DR900	200660001027	Absorbance Std Test Kit **520nm:** Blank: 0.00 Std 1: 0.597 ± 0.05 Std 2: 1.257 ± 0.10 Std 3: 1.890 ± 0.15	**520nm:** Blank: 0.000 Std 1: 0.606 Std 2: 1.282 Std 3: 1.915	N	--	--	--	Cal checked using DR900 absorbance check kit (LOT# A2294)
					610nm: Blank: 0.00 Std 1: 0.556 ± 0.05 Std 2: 1.173 ± 0.10 Std 3: 1.764 ± 0.15	**610nm:** Blank: 0.000 Std 1: 0.569 Std 2: 1.206 Std 3: 1.802	N	--	--	--	
12-Oct-23	8:30	MdK	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.005ppb, 9.607ppb, 100.5ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
12-Oct-23	9:00	MdK	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.00, 7.00, 10.00	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	3.99 pH, 4.49mS/cm, 0.1NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
13-Oct-23	7:30	MdK	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 4.01, 7.00, 10.00	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	4.00 pH, 4.49mS/cm, 0.1NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)
13-Oct-23	9:10	MdK	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000ppb, 9.560ppb, 100.6ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
17-Oct-23	8:30	MdK	Fluorometer	807511	--	--	Y	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.008ppb, 9.973ppb, 104.7ppb	Y	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
17-Oct-23	8:45	MdK	HoribaU52	YJCSRYK7	Lab provided solutions; 4.00, 7.00, 10.00	pH check: 3.98, 6.99, 10.00	Y	Lab-provided auto calibration solution 4.00 pH, 4.49mS/cm, 0.0NTU	4.00 pH, 4.49mS/cm, 0.0NTU	Y	Calibrated using lab provided solutions: AutoCal (LOT#3GE0924, exp. May/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#2GK014, exp. Nov/24) , pH 4.0 (LOT#2GE006, exp. May/24)

Completed by:	MdK	Verified by:	AMSC
Date:	17-Oct-23	Date:	14-Nov-23

20-203-1: Pumping Port Operation - Field Data Sheet

Well ID:	IG_BH01		
MP38 Water Level Before Port Operations:	19.48 (27-Sep 10:00)/ 19.48 (28-Sep 8:30)/ 28.78 (28-Sep 13:35)	m BTOC	
MP38 Water Level After Port Operations:	N/A	m BTOC	
Probe Serial o (Range)	EMS5523 (2000psi)		

Pumping Port Depth	~~117.7~~ 111.2	m BTOC
Associated Sampling Port	69.1	m BTOC
Date(s):	Sep 27, 28, 29, 2023	
Operator(s):	AMSC, LIM, Peter T. (NWMO), Tony K. (WB)	

Other Notes/Comments:

Geofirma/NWMO attempted port closing operations while training with Westbay (Tony K.), the closure was unsuccesful after two days (Sep 27/ 28) of attempts. Geofirma was notified after day 2 of attempts, that the WB design details provided to Geofirma from NWMO had the incorrect pumping port depth. One more day (Sep. 29) of port closure was attempted by Geofirma, after which NWMO continued attempts for multiple days until completing the closure on Oct. 3, 2023.

Date	Start Time	COMPLETE BEFORE OPENING PUMPING PORT			Suface Preparation/Checks						Pressurize Container				Land on Pumping Port	Open/Close Port Operation									Comments
		Landed Shoe In - MP38 Casing Pressure (kPa)	Landed Shoe Out - Interval Pressure (kPa)	Okay to Open Port (Yes/No)	Open/ Close	Face Plate (A or B)	Pumping Port Plunger	Container Pressure (kPa)	Function Checks Complete	Sample Valve Closed	Depth Lowered (m BTOC)	Open Valve	Container Pressure (kPa)	Close Valve		Westbay MP38 Pressure (pre-operation, kPa)	Shoe-Out	Zone Pressure (pre-operation, kPa)	Open Valve	Operation Duration	Zone Pressure (post-operation, kPa)	Close Valve	Shoe-in	MP38 Pressure (post-operation, kPa)	
27-Sep-23	10:00	N/A	N/A	N/A	Close	B	Y	94.98	x	x	258.73	x	2460.49	x	x	1073.32	x	4202.90	x	1.5 min	2361.34	x	x	1074.29	Attempt #1 using +200psi. Water level continued to rise. **Port not closed.**
28-Sep-23	9:30	N/A	N/A	N/A	Close	B	Y	94.73	x	x	293.22	x	2806.46	x	x	1074.02	x	4820.32	x	1.5 min	2611.29	x	x	1073.69	Attempt #2 using +250psi After 30 min, water level continued to rise. **Port not closed**
28-Sep-23	14:00	N/A	N/A	N/A	Close	B	Y	94.85	x	x	327.47	x	3094.85	x	x	1026.60	x	4392	x	2 min	2922.39	x	x	1028.15	Attempt #3 using +300psi After 30 min, water level continued to rise. **Port not closed**
28-Sep-23	16:12	N/A	N/A	N/A	Close	B	Y	1378	x	x	N/A	N/A	N/A	N/A	X	1059.59	x	4523	x	1.5 min	1269	x	x	1059.21	Attempt #4 using +200psi of N2 Water level continued to rise. **Port not closed**
29-Sep-23	8:30	N/A	N/A	N/A	Close	B	Y	94.92	x	x	250.17	N/A	2379.14	x	x	1009.87	x	1290	x	1.5 min	1590	x	x	1009.92	Attempt #5
29-Sep-23	9:01	N/A	N/A	N/A	Close	B	Y	N/A	N/A	N/A	N/A	N/A	"	N/A	x	1009.93	x	1368	x	1.5 min	1560	x	x	1009.93	Re-landed and re-attempted to close port with same pressurized bottle. Water level continued to rise. **Port not closed**
29-Se-23	9:30	N/A	N/A	N/A	Close	B	Y	2067	x	x	N/A	N/A	N/A	N/A	x	1012.2	x	1372	x	1 min	2034.77	x	x	1012.18	Attempt #6. Bottle pressurized to 300psi
29-Sep-23	9:45	N/A	N/A	N/A	Close	B	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	x	1012.78	x	1401	x	1 min	2031.62	x	x	1011.56	Re-landed and re-attempted to close port with same pressurized bottle. Water level continued to rise. **Port not closed**
29-Sep-23	10:40	N/A	N/A	N/A	Close	B	Y	3100	x	x	N/A	N/A	N/A	N/A	x	1012.84	x	1399	x	1 min	3217.2	x	x	1012.50	Attempt #7. Bottle pressurized to 450 psi Water level continued to rise. **Port not closed**
29-Sep-23	11:45	N/A	N/A	N/A	Close	B	Y	94.47	x	x	363.53	x	3498.84	x	x	1005.01	x	1427	x	1 min	3241.44	x	x	1005.42	Attempt #8a Water level continued to rise. **Port not closed**
29-Sep-23	12:25	N/A	N/A	N/A	Close	B	Y	N/A	N/A	N/A	363.86	x	3500.48	x	x	999.47	x	1415	x	5 min	3313.66	x	x	1000.61	Attempt #8b. Went back down to 'top up' pressurized bottle and re-attempt. Water level continued to rise. **Port not closed**
29-Sep-23	14:05	N/A	N/A	N/A	Close	B	Y	N/A	N/A	N/A	364.15	x	3502.3	x	x	1000.17	x	1431	x	3min	3333.87	x	x	1000.60	Attempt #8c. Went back down to 'top up' pressurized bottle and re-attempt. Water level continued to rise. **Port not closed**
29-Sep-23	15:30	N/A	N/A	N/A	Close	B	Y	94.53	x	x	232.45	x	2193.94	x	x	1003.14	x	1428	x	3 min	09.1 - 2106.	x	x	1003.20	Attempt #9. Water level continued to rise. **Port not closed**

- Pre-Open pressures are to be measured at the sampling port within the same monitoring intverval as the pumping port that is to be opened

Completed by:	AMSC	Verified by:	MdK
Date:	29-Sep-23	Date:	15-Nov-23

20-203-1: Westbay Pressure/Temperature Profiling - IG_BH01

Well ID	IG_BH01									Weather:	15 °C
Datum:	Ground Level		Probe Type:	MOSDAX		Pre Profile		Post Profile			Cloudy
Elev. G.S.:	430.562 m		Serial No.:	EMS5523		P_{atm}	95.22 kPa	P_{atm}	94.95 kPa		
Height of Westbay above G.S.:	0.32 m AGS		Probe Range:	2000psi		Temp.	15.16 °C	Temp.	5.66 °C		
Elev. Top of Westbay Casing:	430.882 m		Westbay Casing Type:	MP38		Date/Time	2023-09-27 13:00	Date/Time	2023-07-27 17:15		
Reference Elevation:	430.562 mASL		ampler Valve Position:	Closed		MP38 Water Level	19.91 mBTOC	MP38 Water Level	20.33 mBTOC	Specific Weight	9.807 kN/m3
Borehole angle:	-90°									Gravitational Acceleratic	9.8065 m/s2
										P_{atm}	95.09

Notes: Sample interval: IG_BH01_INT_T_020
Pressure profile completed by AMSC/LIM during training with Westbay (Tony K.)

				Fluid Pressure Readings													
Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m BGS)	Start Profile Time	Inside Casing (P1-Landed Pressure) (kPa)	Shoe Out	#Rotation	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Shoe In	#Rotation	Inside Casing (P1) (kPa)	Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Z: Elev of pressure measurement port (mASL)	Freshwater Head (mASL)	Comments
1	977.30		976.91	13:58:00	9605.08	x	17	9613.73	14:01:00	14.00	x	17	9603.15	970.60	6.31	-546.35	424.25	observed expected pressure spike
2	888.80		888.49	14:27:00	8702.08	x	16	8699.47	14:30:00	13.20	x	16	8701.75	877.37	11.11	-457.92	419.45	observed expected pressure spike
3	804.40		804.14	14:47:00	7845.97	x	16	7841.10	14:49:00	12.44	x	16	7846.01	789.85	14.30	-373.58	416.26	observed expected pressure spike
4	769.30		769.06	14:55:00	7490.21	x	16	7490.98	14:57:00	12.04	x	16	7490.25	754.14	14.92	-338.50	415.64	observed expected pressure spike
5	703.10		702.90	15:08:00	6824.12	x	16	6823.76	15:10:00	11.39	x	16	6824.14	686.11	16.79	-272.33	413.78	observed expected pressure spike
6	649.80		649.62	15:20:00	6297.36	x	16	6286.12	15:21:00	10.70	x	16	6297.76	631.29	18.33	-219.06	412.23	observed expected pressure spike
7	628.40		628.23	15:26:00	6086.23	x	16	6073.12	15:27:00	10.51	x	16	6086.62	609.57	18.66	-197.67	411.90	observed expected pressure spike
8	574.40		574.26	15:37:00	5554.66	x	16	5537.81	15:38:00	9.96	x	16	5554.68	554.98	19.27	-143.70	411.29	observed expected pressure spike
9	540.20		540.07	15:47:00	5217.84	x	15	5201.73	15:48:00	9.58	x	15	5217.85	520.71	19.36	-109.51	411.20	observed expected pressure spike
10	517.40		517.28	15:54:00	4993.12	x	15	4978.14	15:56:00	9.30	x	15	4993.13	497.92	19.37	-86.72	411.20	observed expected pressure spike
11	493.00		492.89	16:00:00	4753.09	x	15	4739.99	16:02:00	9.08	x	15	4753.48	473.63	19.26	-62.33	411.30	observed expected pressure spike
12	432.10		432.01	16:09:00	4152.75	x	15	4144.56	16:14:00	8.47	x	15	4153.55	412.92	19.10	-1.45	411.47	observed appropriate pressure drop, Verified by AMSC/TK
13	409.30		409.22	16:19:00	3929.12	x	15	3923.51	16:23:00	8.13	x	15	3929.50	390.38	18.84	21.34	411.72	observed appropriate pressure drop
14	325.60		325.54	16:30:00	3103.63	x	15	3096.91	16:31:00	7.63	x	15	3103.66	306.09	19.45	105.02	411.11	observed expected pressure spike
15	307.30		307.25	16:34:00	2923.97	x	15	2920.99	16:35:00	7.27	x	15	2924.74	288.15	19.10	123.31	411.47	observed appropriate pressure drop
16	231.20		231.17	16:47:00	2175.34	x	15	2176.10	16:48:00	6.52	x	15	2175.36	212.20	18.97	199.40	411.59	observed expected pressure spike
17	199.20		199.17	16:51:00	1860.42	x	15	1876.10	16:52:00	6.21	x	15	1860.43	181.61	17.56	231.39	413.00	observed appropriate pressure drop
18	149.00		148.98	16:58:00	1365.51	x	15	1371.11	17:00:00	5.75	x	15	1365.91	130.11	18.87	281.58	411.70	observed appropriate pressure drop
19	128.50		128.48	17:04:00	1164.60	x	15	1161.24	17:05:00	5.54	x	15	1164.98	108.71	19.77	302.08	410.79	
20	69.10		69.09	17:12:00	579.54	x	15	580.65	17:13:00	5.37	x	15	579.91	49.51	19.58	361.47	410.98	

Completed by:	LIM/AMSC	Verified by:	MdK
Date:	27-Sep-23	Date:	15-Nov-23

20-203-1: Westbay Pressure/Temperature Profiling - IG_BH03

Well ID	IG_BH03		Probe Type:	MOSDAX		Pre Profile		Post Profile		Weather:	15 °C
Datum:	Ground Level		Serial No.:	EMS5523		P_{atm}	94.48 kPa	P_{atm}	94.84 kPa		Sunny
Elev. G.S.:	441.403	m	Probe Range:	2000psi		Temp.	13.75 °C	Temp.	9.25 °C		
Height of Westbay above G.S.:	1.299	m AGS	Westbay Casing Type:	MP38		Date/Time	2023-09-30 8:45	Date/Time	2023-09-30 14:50	Specific Weight	9.807 kN/m3
Elev. Top of Westbay Casing:	442.702	m	ampler Valve Position:	Closed		MP38 Water Level	47.74 mBTOC	MP38 Water Level	47.74 mBTOC	Gravitational Accelerati	9.8065 m/s2
Reference Elevation:	441.403	mASL								P_{atm}	94.66
Borehole angle:	-70°										

Notes:
Run and recorded with Westbay's Mprofile.

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m BGS)	Fluid Pressure Readings										Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Z: Elev of pressure measurement port (mASL)	Freshwater Head (mASL)	Comments
				Start Profile Time	Inside Casing (P1-Landed Pressure) (kPa)	Shoe Out	# rottions	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Shoe In	# rottions	Inside Casing (P1) (kPa)					
1	966.81		888.57	09:49:00	8618.02	x	14	8637.57	09:51:00	12.87	x	14	8617.89	871.10	17.47	-447.17	423.94	observed expected pressure spike
2	943.91		868.28	10:02:00	8411.75	x	14	8410.62	10:03:00	12.92	x	14	8412.13	847.96	20.32	-426.88	421.08	observed expected pressure spike; leaky port in this interval? Verified by AMSC
3	924.01		850.53	10:14:00	8233.15	x	14	8210.20	10:15:00	12.79	x	14	8233.15	827.53	23.00	-409.13	418.40	observed expected pressure spike; re-checked P2=8210.21
4	882.81		813.57	10:33:00	7858.76	x	14	7856.90	10:35:00	12.41	x	14	7958.79	791.50	22.07	-372.17	419.33	observed expected pressure spike; relanded and re-checked P2=7857.29 Verified by AMSC
5	859.91		792.89	10:45:00	7848.75	x	14	7692.73	10:46:00	12.20	x	14	7649.14	774.76	18.13	-351.49	423.27	observed expected pressure spike
6	794.31		733.26	10:55:00	7045.90	x	14	7067.72	10:57:00	11.71	x	14	7046.33	711.03	22.23	-291.86	419.17	observed expected pressure spike
7	752.81		695.28	11:06:00	6661.95	x	14	6670.60	11:07:00	11.30	x	14	6661.61	670.54	24.74	-253.88	416.66	observed expected pressure spike
8	676.01		624.50	11:16:00	5945.50	x	14	5976.64	11:17:00	10.72	x	14	5945.43	599.77	24.73	-183.10	416.68	observed expected pressure spike
9	637.81		589.28	11:25:00	5589.83	x	13	5986.84	11:27:00	10.18	x	13	5585.84	600.81	-11.53	-147.88	452.94	observed expected pressure spike; relanded and re-checked P2=5586.85; head of ~453m due to debris/silt?
10	613.41		566.78	11:35:00	5361.62	x	13	5365.75	11:36:00	9.95	x	13	5361.63	537.48	29.30	-125.38	412.11	observed expected pressure spike
11	567.71		524.65	11:42:00	4935.34	x	13	5036.14	11:46:00	9.56	x	13	4935.38	503.87	20.78	-83.25	420.63	observed expected pressure spike
12	544.11		502.91	11:59:00	4716.33	x	13	4724.57	12:00:00	9.34	x	13	4716.34	472.10	30.81	-61.51	410.60	observed expected pressure spike
13	506.11		467.93	12:07:00	4361.86	x	13	4362.99	12:08:00	9.02	x	13	4363.00	435.23	32.70	-26.53	408.71	observed expected pressure spike
14	465.91		430.90	12:15:00	3987.35	x	13	3988.50	12:18:00	8.59	x	13	3987.76	397.05	33.85	10.50	407.55	observed expected pressure spike
15	421.11		389.63	12:25:00	3571.50	x	13	3652.30	12:26:00	8.30	x	13	3571.16	362.77	26.86	51.77	414.54	observed expected pressure spike
16	370.31		342.83	12:32:00	3097.23	x	13	3233.29	12:33:00	7.84	x	13	3097.62	320.04	22.79	98.57	418.61	observed expected pressure spike
17	321.01		297.42	12:38:00	2638.53	x	13	2876.11	12:39:00	7.43	x	13	2638.55	283.62	13.80	143.98	427.60	observed expected pressure spike; brought probe to surface because arm was stuck out after this measurement
18	251.01		232.90	14:06:00	1987.09	x	13	2246.17	14:08:00	7.05	x	13	1987.14	219.39	13.51	208.50	427.89	observed expected pressure spike
19	228.11		211.75	14:12:00	1774.51	x	13	2034.99	14:13:00	6.60	x	13	1774.54	197.85	13.90	229.65	427.50	observed expected pressure spike
20	165.71		154.03	14:19:00	1199.51	x	13	1202.51	14:20:00	6.09	x	13	1199.55	112.97	41.06	287.37	400.34	observed expected pressure spike; re-landed by hand and re-checked P2=1202.54; possible open pumping port? Verified by AMSC
21	73.01		68.16	14:32:00	345.22	x	12	681.24	14:34:00	5.39	x	13	345.98	59.81	8.35	373.24	433.06	observed expected pressure spike

Completed by:	LIM/AMSC	Verified by:	MdK
Date:	30-Sep-23	Date:	15-Nov-23

20-203-1: Westbay Pressure/Temperature Profiling - IG_BH05

Well ID	IG_BH05		Probe Type:	MOSDAX		Pre Profile		Post Profile		Weather:	11 °C
Datum:	Ground Level		Serial No.:	EMS5523		P_{atm}	92.75 kPa	P_{atm}	93.05 kPa		Rainy
Elev. G.S.:	432.29	m	Probe Range:	2000psi		Temp.	14.68 °C	Temp.	5.77 °C		
Height of Westbay above G.S.:	1.31	m AGS	Westbay Casing Type:	MP38		Date/Time	2023-10-04 14:55	Date/Time	2023-10-05 15:00		
Elev. Top of Westbay Casing:	433.60	m	Sampler Valve Position:	Closed		MP38 Water Level	24.49 mBTOC	MP38 Water Level	25.09 mBTOC	Specific Weight	9.807 kN/m3
Reference Elevation:	432.29	mASL								Gravitational Acceleration	9.8065 m/s2
Borehole angle:	-70°									P_{atm}	92.90

Notes: Profile was started on Oct-04 at 14:55, but was unable to be finished until the following day (Oct-05)

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m BGS)	Fluid Pressure Readings										Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Z: Elev of pressure measurement port (mASL)	Freshwater Head (mASL)	Comments
				Start Profile Time	Inside Casing (P1-Landed Pressure) (kPa)	Shoe Out	rotations	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Shoe In		Inside Casing (P1) (kPa)					
1	991.20		923.15	Oct-04 15:53	9091.30	x	14	9053.19	16:02:00	13.49	x	14	9091.61	913.66	9.49	-490.86	422.80	Pressure peaked ok but slow response to stabilize.
2	974.30		907.47	Oct-05 13:18	8931.55	x	14	8881.03	13:20:00	13.01	x	14	8931.44	896.11	11.36	-475.18	420.93	Oct 4: P1= 8933.86kPa. P2 of 10500 kPa after 14 rotations (repeated show in/out) and decreasing slowly for more than 20 min. Oct 5: Pressure spike observed
3	928.60		865.06	Oct-04 16:45	8507.60	x	13	8466.24	16:46:00	13.07	x	13	8507.46	853.81	11.25	-432.77	421.04	Pressure spike observed followed by drop to P2<P1
4	865.50		806.50	Oct-05 13:05	7918.36	x	15	7918.36	01:07:00	12.23	x	15	7918.28	797.95	8.55	-374.21	423.74	Oct 4: Unable to get stable pressure. Attempted multiple times, re-landing, shoeing in and out and still no stable P2 even with 14 rotations. P1=7919.97kPa. Oct 5: A few shoe in/out attempts until small pressure spike observed with pressure drop
5	857.20		798.79	Oct-05 12:56	7840.63	x	14	7761.31	12:57:00	11.85	x	14	7841.37	781.93	16.86	-366.50	415.43	Small pressure spike followed by drop (P2<P1)
6	800.80		746.43	Oct-05 12:48	7316.53	x	14	7235.25	12:49:00	11.46	x	14	7316.50	728.29	18.14	-314.14	414.15	Subtle pressure spike followed by significant drop (P2<<P1)
7	788.00		734.54	Oct-05 12:41	7197.17	x	14	7109.62	12:44:00	11.24	x	14	7197.11	715.48	19.06	-302.25	413.23	Small pressure spike followed by drop (P2<P1)
8	736.20		686.45	Oct-05 13:49	6713.78	x	15	6656.08	14:05:00	11.02	x	15	6713.89	669.23	17.22	-254.16	415.07	12:29 on Oct 5: P1=6714.79kPa. Unable to get stable P2 pressure after 15 shoe out rotations. Attempted multiple times, re-landing, shoeing in and out and still no stable P2. 13:50 on Oct 5: Multiple landings and shoe in/out with 16-17 rotations and a couple at 23 rotations, even when it feels like probe landed properly on port. After many attempts a pressure drop was observed with 15 rotations during the shoe out.
9	679.80		634.09	Oct-05 14:10	6189.33	x	15	6148.10	14:11:00	10.63	x	15	6189.38	617.44	16.65	-201.80	415.64	12:04 on Oct 5: P1=6190.68. Unable to get stable P2 pressure with 15-16 shoe out rotations. Attempted multiple times, re-landing, shoeing in and out; still no stable P2. 14:10 on Oct 5: Landed and observed pressure drop on first shoe out attempt.
10	635.00		592.48	Oct-05 11:57	5774.07	x	14	5763.55	11:59:00	9.81	x	14	5774.01	578.22	14.26	-160.19	418.03	observed expected pressure spike
11	627.30		585.33	Oct-05 11:53	5702.88	x	15	5707.87	11:54:00	9.61	x	15	5702.86	572.55	12.78	-153.04	419.51	observed expected pressure spike
12	587.70		548.51	Oct-05 11:44	5335.69	x	15	5336.01	11:46:00	9.21	x	15	5335.61	534.63	13.88	-116.22	418.41	Shoe in/out looked good but did not see pressure spike. Several previous shoe out attempts had 16-18 or 23 rotations, probe was brought to surface. Actuator nut cleaned and shoe replaced before final measurement.
13	542.00		505.99	Oct-05 09:56	4913.54	x	15	4914.29	09:57:00	8.54	x	15	4913.52	491.63	14.36	-73.70	417.93	observed expected pressure spike
14	487.20		454.95	Oct-05 09:51	4405.90	x	15	4406.27	09:52:00	8.04	x	15	4405.88	439.83	15.12	-22.66	417.17	observed expected pressure spike
15	427.80		399.56	Oct-05 09:44	3854.82	x	15	3856.30	09:46:00	7.63	x	15	3855.17	383.75	15.81	32.73	416.48	observed expected pressure spike
16	372.90		348.37	Oct-05 09:38	3346.36	x	15	3347.84	09:39:00	7.01	x	15	3346.34	331.90	16.47	83.92	415.82	observed expected pressure spike
17	326.60		305.20	Oct-05 09:34	2917.00	x	15	2925.50	09:35:00	6.71	x	15	2916.99	288.83	16.37	127.09	415.92	observed expected pressure spike
18	312.90		292.42	Oct-05 09:29	2790.04	x	15	2787.78	09:31:00	6.48	x	15	2790.01	274.79	17.63	139.87	414.66	observed expected pressure spike
19	264.20		246.98	Oct-05 09:23	2237.48	x	15	2338.31	09:25:00	6.09	x	15	2337.83	228.96	18.02	185.31	414.27	observed expected pressure spike
20	226.10		211.41	Oct-05 09:18	1984.41	x	15	1985.15	09:19:00	5.76	x	15	1984.40	192.95	18.46	220.88	413.83	observed expected pressure spike
21	180.5		168.82	Oct-05 09:12	1560.25	x	15	1565.84	09:14:00	5.57	x	15	1560.51	150.19	18.63	263.47	413.66	observed expected pressure spike
22	156.0		145.94	Oct-05 09:08	1333.14	x	15	1350.29	09:09:00	5.47	x	15	1333.51	128.21	17.73	286.35	414.56	observed expected pressure spike
23	100.1		93.69	Oct-05 09:01	812.71	x	15	840.66	09:02:00	5.66	x	15	812.72	76.25	17.44	338.60	414.85	observed expected pressure spike
24	90.9		85.09	Oct-05 08:56	727.18	x	15	759.99	08:56:00	6.39	x	15	727.25	68.02	17.07	347.20	415.22	observed expected pressure spike
25	70.5		66.00	Oct-05 08:50	537.35	x	15	584.81	08:51:00	8.15	x	15	537.63	50.16	15.84	366.29	416.45	observed expected pressure spike

Completed by:	AMSC	Verified by:	MdK
Date:	05-Oct-23	Date:	15-Nov-23

Well ID:	IG_BH01	Multiparameter Probe:	Horiba U52 (SN.YJCSRYK7)	Other Notes/Comments	**IG_BH01_GW054** - Rinsate Sample **IG_BH01_GW055** - Field Blank Sample **IG_BH01_GW056** - Primary Sample for **INT020** **IG_BH01_GW057** - Duplicate Sample for **INT020** **IG_BH01_GW058** - Primary Sample for **INT017 - NG only** **IG_BH01_GW059** - Duplicate Sample for **INT017 - NG only** **IG_BH01_GW060** - Primary Sample for **INT002 - NG only** **IG_BH01_GW061** - Duplicate Sample for **INT002 - NG only** **IG_BH01_GW062** - Primary Sample for **INT007 - NG only** **IG_BH01_GW063** - Duplicate Sample for **INT007 - NG only** **IG_BH01_GW064** - NG Trip Blank Sample (from INT 007) **IG_BH01_GW065** - Primary Sample for **INT009 - NG only** **IG_BH01_GW066** - Duplicate Sample for **INT009 - NG only**
Date(s):	Sep 28 - Oct 17 2023	Fluorometer:	AquaFluor (SN.807511)		
Operator(s):	AMSC, LIM, MdK, KBT	Colorimeter:	DR900 (SN. 2006600010027)		

Port ID	Cumulative Purge/Sampled Volume (L)	Measurement Date and Time	Multiparameter Probe								Fluorometer		Hydrometer	Colorimetric				Alkalinity		Sample Collected (Y/N)	Collected by (Initial)	Comments (sampling run #, sample ID, water colour or odour, etc.)
			Calibrated	pH	Temp (°C)	EC (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	TDS (g/L)	Calibrated	Fluorescein (ppb)	Specific Gravity	Calibrated	Dissolved Oxygen (mg/L)	Dissolved Ferrous Iron Fe^{2+} (mg/L)	Total Dissolved Sulphide S^{2-} (mg/L)	Phenol. (mg/L)	Total as $CaCO_3$ (mg/L)			
IG_BH01_T_INT_020	13	2023-09-28 12:00	Y	7.97	9.66	0.2	136	0.00	66.1	0.101	Y	1.353	1.000	-	-	-	-	-	-	N	AMSC	Parameters collecting **during purging** with pump set at ~80 m BTOC (pumping port open)
IG_BH01_T_INT_020	30	2023-09-28 13:00	Y	8.09	9.67	0.154	-56	0.00	50.5	0.1	Y	1.251	1.000	-	-	-	-	-	-	N	AMSC	Parameters collecting **during purging** with pump set at ~80 m BTOC (pumping port open)
IG_BH01_T_INT_007	20	2023-10-06 10:00	Y	7.54	7.62	0.154	-121	0.00	35.4	0.098	Y	1.873	1.005	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~80 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not INT007
IG_BH01_T_INT_007	45	2023-10-06 12:00	Y	7.05	7.71	0.151	-122	0.00	24.5	0.098	Y	1.730	1.005	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~80 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not INT007
IG_BH01_T_INT_007	60	2023-10-06 13:00	Y	7.29	7.87	0.151	-140	0.00	21.4	0.098	Y	1.668	1.005	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~80 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not INT007 (14:10: P1 = 6002.06; P2 = 6073.36)
IG_BH01_T_INT_017	5	2023-10-07 14:30	Y	8.43	8.83	0.167	-57	0.00	47.7	0.108	Y	2.345	1.005	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~80 m BTOC Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not the formation(P1 = 1800.81; P2 = 1827.68)
IG_BH01_T_INT_017	20	2023-10-07 15:30	Y	7.95	8.10	0.168	-88	0.00	37.4	0.109	Y	2.200	1.005	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~80 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not the formation (P1 = 1741.10; P2 = 1859.74)
IG_BH01_T_INT_017	30	2023-10-07 16:30	Y	7.48	8.11	0.165	-99	0.00	30.4	0.108	Y	2.090	1.005	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~80 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not the formation (P1 = 1722.07; P2 = 1864.59)
IG_BH01_T_INT_002	15	2023-10-08 10:00	Y	7.11	7.61	0.170	-80	0.00	89.1	0.110	Y	2.080	1.010	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~80 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not the formation (P1 = 8636.30; P2 = 8644.20)
IG_BH01_T_INT_002	35	2023-10-08 12:00	Y	8.06	7.80	0.110	-171	0.00	71.0	0.110	Y	1.920	1.010	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~80 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not the formation (P1 = 8577.59; P2 = 8588)
IG_BH01_T_INT_002	60	2023-10-08 15:00	Y	8.11	8.01	0.177	-200	0.00	5.0	0.115	Y	1.720	1.008	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~80 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not the formation (P1 = 8565.55; P2 = 8576.08)
IG_BH01_T_INT_007	–	2023-10-09 14:45	Y	7.11	8.83	17.6	-48	17.42	15.1	10.9	Y	3.576	1.018	-	-	-	-	-	-	Y	MdK	Parameters taken from interval **during Noble Gas Sampling** (Run #4) Note [2024/04/07] : Horiba parameters were collected from top bottle (250 mL), sample water is likely exposed to air due to insufficient sample collected to flow through the Horiba flow through cell, influencing the high DO readings.
IG_BH01_T_INT_007	–	2023-10-09 14:55	Y	7.17	8.96	17.6	-61	7.35	15.6	10.9	Y	–	–	-	-	-	-	-	-	Y	MdK	Parameters taken from interval **during Noble Gas Sampling** after sitting for 10 mins Note [2024/04/07] : Note [2024/04/07] : Horiba parameters were collected from top bottle (250 mL), sample water is likely exposed to air due to insufficient sample collected to flow through the Horiba flow through cell, influencing the high DO readings.
IG_BH01_T_INT_002	–	2023-10-09 16:25	Y	6.68	8.03	46.4	-73	7.86	9.1	28.3	Y	3.553	1.034	-	-	-	-	-	-	Y	MdK	Parameters taken from interval **during Noble Gas Sampling** (Run #1) Note [2024/04/07] : Horiba parameters were collected from top bottle (250 mL), sample water is likely exposed to air due to insufficient sample collected to flow through the Horiba flow through cell, influencing the high DO readings.
IG_BH01_T_INT_002	–	2023-10-09 16:55	Y	7.07	8.28	46.5	-78	5.12	3.5	28.4	Y	–	–	-	-	-	-	-	-	Y	MdK	Parameters taken from interval **during Noble Gas Sampling** after sitting for 30 mins Note [2024/04/07] : Horiba parameters were collected from top bottle (250 mL), sample water is likely exposed to air due to insufficient sample collected to flow through the Horiba flow through cell, influencing the high DO readings.

IG_BH01_T_INT_020	30	2023-10-10 11:30	Y	7.65	7.13	0.195	-104	0.00	27.8	0.127	Y	1.535	1.005	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~45 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not the formation (P1 = 452.12; P2 = 459.60)
IG_BH01_T_INT_020	50	2023-10-10 13:30	Y	7.65	7.43	0.182	-94	0.00	17.2	0.118	Y	1.364	1.008	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~45 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not the formation (P1 = 445.07; P2 = 452.53)
IG_BH01_T_INT_020	65	2023-10-10 15:00	Y	7.61	7.63	0.177	-111	0.00	9.8	0.114	Y	1.281	1.008	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~45 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not the formation (P1 = 439.86; P2 = 448.06)
IG_BH01_T_INT_017	–	2023-10-11 11:00	Y	6.93	8.21	0.112	-13	6.46	14.3	0.072	Y	0.748	1.007	-	-	-	-	-	-	Y	MdK	Parameters taken from interval **during Noble Gas Sampling** (Run #2) Note [2024/04/07] : Horiba parameters were collected from top bottle (250 mL), sample water is likely exposed to air due to insufficient sample collected to flow through the Horiba flow through cell, influencing the high DO readings.
IG_BH01_T_INT_017	–	2023-10-11 11:25	Y	7.41	8.71	0.111	-119	6.16	2.2	0.072	–	–	–	-	-	-	-	-	-	Y	MdK	Parameters taken from interval **during Noble Gas Sampling** after sitting for 25mins. Note [2024/04/07] : Horiba parameters were collected from top bottle (250 mL), sample water is likely exposed to air due to insufficient sample collected to flow through the Horiba flow through cell, influencing the high DO readings.
IG_BH01_T_INT_020	–	2023-10-11 13:20	Y	7.32	9.65	0.062	-98	0.00	0.4	0.040	Y	0.518	1.010	Y	0.531	2.10	0.03	0	69	Y	MdK	Parameters taken from interval (pumping port closed) **during sampling** (Run #2);
IG_BH01_T_INT_020	–	2023-10-11 13:35	Y	7.22	10.06	0.062	-121	0.00	0.2	0.040	–	–	–	-	-	-	-	-	-	Y	MdK	Parameters taken from interval (pumping port closed) **during sampling** after sitting in Horiba flow through cell for 15 min
IG_BH01_T_INT_009	30	2023-10-12 15:00	Y	8.21	8.44	0.274	-157	0.00	87.0	0.174	Y	1.722	1.010	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~80 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not the formation (P1 =5092.37 ; P2 =5196.91)
IG_BH01_T_INT_009	50	2023-10-13 11:00	Y	8.27	7.26	0.291	-138	0.00	96.3	0.189	Y	1.788	1.012	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~80 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not the formation (P1 =5085.25; P2 =5198.78)
IG_BH01_T_INT_009	60	2023-10-13 12:00	Y	8.06	7.35	0.303	-148	0.00	112	0.197	Y	1.727	1.012	-	-	-	-	-	-	N	MdK	Parameters collecting **during purging** with pump set at ~80 m BTOC; Pumping port closed; Parameters are only representative of water within the MP38 casing at the time of collection, not the formation (P1 = 5067.27; P2 =5189.78)
IG_BH01_T_INT_009	–	2023-10-13 15:30	Y	8.09	9.28	10.8	-162	9.64	16.4	6.7	Y	14.870	1.012	-	-	-	-	-	-	N	MdK	Parameters taken from interval **during Noble Gas Sampling** (Run #2) Note [2024/04/07] : Horiba parameters were collected from top bottle (250 mL), sample water is likely exposed to air due to insufficient sample collected to flow through the Horiba flow through cell, influencing the high DO readings.
IG_BH01_T_INT_009	–	2023-10-13 16:00	Y	8.15	9.57	10.8	-162	6.81	30.1	6.71	Y	-	-	-	-	-	-	-	-	N	MdK	Parameters taken from interval **during Noble Gas Sampling**: Sitting for 30 min. Note [2024/04/07] : Horiba parameters were collected from top bottle (250 mL), sample water is likely exposed to air due to insufficient sample collected to flow through the Horiba flow through cell, influencing the high DO readings.
IG_BH01_T_INT_009	–	2023-10-13 16:30	Y	8.22	9.23	10.9	-147	6.20	6.5	6.78	Y	14.010	1.013	-	-	-	-	-	-	N	MdK	Parameters taken from interval **during Noble Gas Sampling**: Sitting for 60 min Note [2024/04/07] : Note [2024/04/07] : Horiba parameters were collected from top bottle (250 mL), sample water is likely exposed to air due to insufficient sample collected to flow through the Horiba flow through cell, influencing the high DO readings.
IG_BH01_T_INT_020	–	2023-10-17 15:20	Y	7.42	12.68	0.068	-80	0.00	0.0	0.044	Y	0.370	1.011	-	-	-	-	-	-	N	MdK	Parameters taken from interval (pumping port closed) **during sampling** (Run #18)
IG_BH01_T_INT_020	–	2023-10-17 15:40	Y	7.41	13.21	0.067	-115	0.00	0.0	0.044	Y	–	–	-	-	-	-	-	-	N	MdK	Parameters taken from interval (pumping port closed) **during sampling** after sitting in Horiba flow through cell for 20 min

Completed by:	MdK	Verified by:	AMSC
Date:	17-Oct-23	Date:	14-Nov-23

20-203-1: Groundwater Sampling - Field Data Sheet

Well ID:	IG_BH01	**Start Time**	7:30, 8:30, 8:10, 13:00, 09:20
MP38 Water Level Before Sampling:	28.093 ; 28.513 ; 28.192 – ; 29.206 m BTOC	**Starting Ambient Pressure**	93.93 ; 94.92; 94.37; 94.97; 93.10 kPa
MP38 Water Level After Sampling:	29.753 ; 28.952; 29.196; 3.3;64; 29.786 m BTOC	**End Sampling Time**	18:20, 17:00 ; 12:15, 4:20 ; 15:25
Probe Serial #/Range	EMS 552:3 kPa	**Ending Ambient Pressure**	93.73 ; 93.96; 94.6:5; 94.80; 93.78 kPa
Date:	10-Oct-23; 11 -Oct-23; 12 -Oct-23; 13-Oct-23; 17-Oct-23		

Other Notes/Comments:	**IG_BH01_GW004 -** Rinsate Sample **IG_BH01_GW005 -** Field Blank Sample **IG_BH01_GW006 -** Primary Sample for **INT020** **IG_BH01_GW007 -** Duplicate Sample for **INT020** **IG_BH01_GW008 -** Primary Sample for **INT017** - NG only **IG_BH01_GW009 -** Duplicate Sample for **INT017** - NG only **IG_BH01_GW000 -** Primary Sample for **INT002** - NG only **IG_BH01_GW001 -** Duplicate Sample fo r**INT002** - NG only **IG_BH01_GW002 -** Primary Sample for **INT007** - NG only **IG_BH01_GW003 -** Duplicate Sample for **INT007** - NG only **IG_BH01_GW004 -** NG Trip Blank Sample (from INT 007) **IG_BH01_GW005 -** Primary Sample for **INT009** - NG only **IG_BH01_GW006 -** Duplicate Sample for **INT009** - NG only

Sampling Run Start Date/Time	Port #	Run #	Function Tests/Preparation							Sampling Sequence									Sampling Run End Time	Comments (volume recovered, parameters measured, samples collected, etc)
			Shoe-Out	Close Valve	Vaccum Check	Open Valve	Evacuate Bottles (<25 kPa)	Close Valve	Landed Port	Landed Westbay MP38 Pressure (pre-sample, kPa)	Shoe-Out	Zone Pressure (pre-sample, kPa)	Open-Valve	Stabilization Time (sec)	Zone Pressure (post-sample kPa)	Close Valve	Shoe-In	Landed Westbay MP38 Pressure (post-sample, kPa)		
2023-10-09 8:42	INT 007	1	x	x	x	x	0.09	x	x	608.2:6 7	x	607.2:1:5	x	3:53	60:67.95	x	x	6078.83	9:3:5	Collected by landing probe on the sampling port (pumping port closed). Run #1 used to collect noble gas.
2023-10-09 10:45	INT 007	2	x	x	x	x	0:8:7	x	x	607:9.3:0	x	607:1.4:1	x	3:23	60:66.83	x	x	6076.21	11:25	Collected by landing probe on the sampling port (pumping port closed). Run #2 used to collect noble gas and field parameters.
2023-10-09 12:13	INT 007	3	x	x	x	x	0.0:0	x	x	607:7.8:6	x	607:0.7:1	ns	3:30	60:70.60	ns	x	6075.09	13:00	Collected by landing probe on the sampling port (pumping port closed). Run #3 used to collect field blank.
2023-10-09 13:48	INT 007	4	x	x	x	x	0.1	x	x	607:3.2:1	x	607:1.9:6	x	3:60	60:67.93	x	x	6071.68	14:40	Collected by landing probe on the sampling port (pumping port closed). Run #4 used to collect noble gas and field parameters.
2023-10-09 15:27	INT 002	1	x	x	x	x	0.0:8	x	x	870.3:6 2	x	869:9.4:5	x	1:80	8:695. 9 :3	x	x	8699.28	16:20	Collected by landing probe on the sampling port (pumping port closed). Run #1 used to collect noble gas and field parameters.
2023-10-09 17:13	INT 002	2	x	x	x	x	0:1:2	x	x	869:8.1:8	x	869:5.1:5	x	1:50	8:692.:08	x	x	8695.:07	18:10	Collected by landing probe on the sampling port (pumping port closed). Run #2 used to collect noble gas.
2023-10-11 9:05	INT 017	1	x	x	x	x	0:0:1	x	x	179:5.4:4	x	187:4.9:6	x	10:2:0	18:52.:27	x	x	1791.:83	9:3:8	Collected by landing probe on the sampling port (pumping port closed). Run #1 used to collect noble gas and field parameters.
2023-10-11 10:12	INT 017	2	x	x	x	x	0:0:7	x	x	179:3.3:2	x	187:1.6:8	x	11:1:0	18:53.:03	x	x	1789.:60	10:49	Collected by landing probe on the sampling port (pumping port closed). Run #2 used to collect noble gas and field parameters.
2023-10-11 11:4:4	INT 020	1	x	x	x	x	0:2:2	x	x	515.:99	x	593.:90	x	13:8:0	591.:77	x	x	5:10.9:9	12:15	Collected by landing probe on the sampling port (pumping port closed). Run #1 used to collect $^{3}H/^{3}He$.
2023-10-11 12:37	INT 020	2	x	x	x	x	0:0:5	x	x	514.:03	x	590.:44	x	13:2:0	590.:28	x	x	5:10.6:1	13:09	Collected by landing probe on the sampling port (pumping port closed). Run #2 used to collect field parameters.
2023-10-11 13:33	INT 020	3	x	x	x	x	0:2:7	x	x	514.:07	x	590.:10	x	10:2:0	570.:59	x	x	5:10.9:8	13:57	Collected by landing probe on the sampling port (pumping port closed). Run #3 used to collect ^{14}C.
2023-10-11 14:17	INT 020	4	x	x	x	x	0:0:4	x	x	513.:68	x	588.:97	x	8:70	562.:01	x	x	5:10.6:1	14:40	Collected by landing probe on the sampling port (pumping port closed). Run #4 used to collect ^{14}C(^{13}C), Nutrients, and Ammonia.
2023-10-11 14:59	INT 020	5	x	x	x	x	0:2:7	x	x	505.:83	x	588.:21	x	5:10	580.:23	x	x	505.:36	15:15	Collected by landing probe on the sampling port (pumping port closed). Run #5 used to collect noble gas and Reactive Silica.
2023-10-11 15:40	INT 020	6	x	x	x	x	0:2:9	x	x	507.:68	x	590.:11	x	4:80	580.:60	x	x	506.:85	15:54	Collected by landing probe on the sampling port (pumping port closed). Run #6 used to collect noble gas and Reactive Silica.
2023-10-11 16:18	INT 020	7	x	x	x	x	0:0:5	x	x	516.:89	x	590.:75	x	8:70	563.:55	x	x	5:12.8:4	16:43	Collected by landing probe on the sampling port (pumping port closed). Run #7 used to collect $^{87}Sr/^{86}Sr$.
2023-10-12 8:15	INT 020	8	x	x	x	x	0:0:4	x	x	5:22.:69	x	593.:91	x	8:40	566.:45	x	x	5:18.7:7	8:40	Collected by landing probe on the sampling port (pumping port closed). Run #8 used to collect Archive and $\delta^{13}C$-DIC
2023-10-12 8:59	INT 020	9	x	x	x	x	0.1	x	x	5:20.:08	x	590.:15	x	8:10	561.:27	x	x	5:16.9:4	9:18	Collected by landing probe on the sampling port (pumping port closed). Run #9 used to collect ^{14}C.
2023-10-12 9:45	INT 020	10	x	x	x	x	0.7	x	x	5:19.:96	x	590.:07	x	8:10	502.:38	x	x	5:15.8:2	10:05	Collected by landing probe on the sampling port (pumping port closed). Run #10 used to collect Sulfide, DOC, & Metals.
2023-10-12 10:29	INT 020	11	x	x	x	x	0:5:1	x	x	5:17.:89	x	589.:06	x	8:40	562.:02	x	x	5:15.0:8	10:50	Collected by landing probe on the sampling port (pumping port closed). Run #11 used to collect $^{4}He/^{3}He$ and Ruthenium.
2023-10-12 11:11	INT 020	12	x	x	x	x	0:4:8	x	x	5:17.:82	x	588.:25	x	8:10	560.:15	x	x	5:14.7:0	11:30	Collected by landing probe on the sampling port (pumping port closed). Run #12 used to collect $^{4}C/^{14}C$.
2023-10-12 11:48	INT 020	13	x	x	x	x	0:4:1	x	x	5:17.:09	x	587.:82	x	8:40	562.:38	x	x	5:14.3:3	12:05	Collected by landing probe on the sampling port (pumping port closed). Run #13 used to collect General Chemistry
2023-10-13 13:33	INT 009	1	x	x	x	x	0:1:4	x	x	512.:4:1	x	519.:5:1:7	x	9:00	5161.:59	x	x	5128.:72	14:20	Collected by landing probe on the sampling port (pumping port closed). Run #1 used to collect noble gas and field parameters.
2023-10-13 15:1:1	INT 009	2	x	x	x	x	0.3	x	x	515.:8:1:0	x	519.:5:5:5	x	8:70	5162.:08	x	x	5196.:46	16:00	Collected by landing probe on the sampling port (pumping port closed). Run #2 used to collect noble gas and field parameters.
2023-10-17 9:30	INT 020	14	x	x	x	x	0:5:9	x	x	5:11.:69	N/A	N/A	N/A	N/A	N/A	N/A	N/A	505.:7:8	10:03	Testing Pt Value Changes (Vacuum held, no water)
2023-10-17 10:4:2	INT 020	15	x	x	x	x	0:5:6	x	x	507.:82	N/A	N/A	N/A	N/A	N/A	N/A	N/A	503.:9:1	11:05	Testing Pt Value Changes (Vacuum held, no water)
2023-10-17 11:3:5	INT 020	16	x	x	x	x	0:4:9	x	x	506.:31	x	593.:92	x	9:30	571.:33	x	x	503.:1:6	12:10	Collected by landing probe on the sampling port (pumping port closed). Run #16 used to collect nutrients and DOC.
2023-10-17 13:4:5	INT 020	17	x	x	x	x	0:6:4	x	x	506.:45	x	592.:53	x	9:60	572.:46	x	x	503.:5:4	14:20	Collected by landing probe on the sampling port (pumping port closed). Run #17 used to collect Gen Chem and Sulphide.
2023-10-17 14:4:7	INT 020	18	x	x	x	x	0:6:6	x	x	505.:06	x	591.:18	x	11:4:0	578.:40	x	x	502.:4:1	15:10	Collected by landing probe on the sampling port (pumping port closed). Run #18 used to collect field parameters

Note: Record field parameter measurements on *20-203-01: Field Parameter Measurement/Testing - Field Data Sheet*

Completed by:	MsK	Verified by:	AMSC
Date:	17-Oct-2:3	Date:	1:4-Nov-23

20-203-1: Field Parameter Measurement/Testing - Field Data Sheet

NWMO Ignace Westbay Monitoring

Well ID:	IG_BH03	Multiparameter Probe:	Horiba U52 (SN.YJCSRYK7)	Other Notes/Comments	**IG_BH03_GW022** - Primary Sample for **INT021** **IG_BH03_GW023** - Duplicate Sample for **INT021**
Date(s):	Oct 01 - 04, 2023	Fluorometer:	AquaFluor (SN.807511)		
Operator(s):	AMSC, LIM	Colorimeter:	DR900 (SN. 200660001027)		

Port ID	Cumulative Purge/Sampled Volume (L)	Measurement Date and Time	Multiparameter Probe								Fluorometer		Hydrometer	Colorimetric				Alkalinity		Sample Collected (Y/N)	Collected by (Initial)	Comments (sampling run #, sample ID, water colour or odour, etc.)
			Calibrated	pH	Temp (°C)	EC (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	TDS (g/L)	Calibrated	Fluorescein (ppb)	Specific Gravity	Calibrated	Dissolved Oxygen (mg/L)	Dissolved Ferrous Iron Fe^{2+} (mg/L)	Total Dissolved Sulphide S^{2-} (mg/L)	Phenol. (mg/L)	Total as $CaCO_3$ (mg/L)			
IG_BH03_T_INT_021	4	2023-10-01 9:12	Y	9.59	12.06	1.06	110	0.00	10.2	0.680	Y	3.502	1.000	-	-	-	-	-	-	N	AMSC	Parameters collected **while purging**. Pumping port closed; however, INT020 is open at IG_BH03 so readings collected while purging are not accurate representation of targeted interval INT021
IG_BH03_T_INT_021	8	2023-10-01 9:35	Y	9.02	11.60	1.01	84	0.00	10.2	0.651	Y	3.811	1.000	-	-	-	-	-	-	N	LIM	Parameters collected **while purging**. Pumping port closed; however, INT020 is open at IG_BH03 so readings collected while purging are not accurate representation of targeted interval INT021
IG_BH03_T_INT_021	11	2023-10-01 10:05	Y	8.94	12.01	0.944	48	0.00	10.4	0.601	Y	3.828	1.002	-	-	-	-	-	-	N	AMSC	Parameters collected **while purging**. Pumping port closed; however, INT020 is open at IG_BH03 so readings collected while purging are not accurate representation of targeted interval INT021
IG_BH03_T_INT_021	n/a	2023-10-02 11:45	-	-	-	-	-	-	-	-	Y	1.746	1.000	Y	0.921	0.02	0.02	0	160	Y	AMSC	In field measurements collected from Run #1 **during sampling**. Pumping port closed
IG_BH03_T_INT_021	n/a	2023-10-02 12:30	Y	9.76	25.16	0.136	-56	0.00	12.1	0.088	-	-	-	-	-	-	-	-	-	Y	AMSC	Horiba measurements collected from Run #2 **during sampling**, pumping port closed; ~500mL was run into the flow-through cell .
IG_BH03_T_INT_021	n/a	2023-10-02 12:45	Y	9.37	27.28	0.143	-44	0.00	3.1	0.093	-	-	-	-	-	-	-	-	-	Y	AMSC	Horiba measurements collected after sample water sat in horiba flow through cell for 15 mins.
IG_BH03_T_INT_021	n/a	2023-10-04 13:15	Y	7.62	16.80	0.246	100	0.00	2.3	0.16	Y	2.774	-	-	-	-	-	-	-	Y	AMSC	Meaurements taken **during sampling** run #19. Sample water was held in sampling cup with horiba (5 min), **not as reliable**. Horiba calibration for EC was reading below standard values - **EC measurements are therefore likely biased low.**
IG_BH03_T_INT_021	n/a	2023-10-04 13:30	Y	8.3	16.62	0.243	-102	0.00	2.1	0.158	-	-	-	-	-	-	-	-	-	Y	AMSC	Meaurements taken during sampling run #19. Sample water was held in sampling cup with horiba (20 min), **not as reliable**. Horiba calibration for EC was reading below standard values - **EC measurements are therefore likely biased low.**

Completed by:	AMSC	Verified by:	MdK
Date:	04-Oct-23	Date:	15-Nov-23

20-203-1: Groundwater Sampling - Field Data Sheet

Well ID:	IG_BH03	**Start Time**	2023-10-02 11:00
MP38 Water Level Before Sampling:	35.68 (02-Oct-23)/ 34.61 (03-Oct-23)/ 33.56 (04-Oct-23) m BTOC	**Starting Ambient Pressure**	96.75 (02-Oct-23)/ 93.48 (03-Oct-23)/ kPa
MP38 Water Level After Sampling:	35.38 (02-Oct-23)/ 34.71 (03-Oct-23) / 33.41 (04-Oct-23) m BTOC	**End Sampling Time**	2023-10-04 13:00
Probe Serial #/Range	EMS5230 & EMS5523 / 2000psi	**Ending Ambient Pressure**	97.07 (02-Oct-23) / 93.23 (03-Oct-23)/ kPa
Date:	Oct 02 -04 2023		

Other Notes/Comments:
IG_BH03_GW022 - Primary Sample for **INT021**
IG_BH03_GW023 - Duplicate Sample for **INT021**

Sampling Run Start Date/Time	Port #	Run #	Function Tests/Preparation						Landed Port	Sampling Sequence									Sampling Run End Time	Comments (volume recovered, parameters measured, samples collected, etc)
			Shoe-Out	Close Valve	Vaccum Check	Open Valve	Evacuate Bottles (<35 kPa)	Close Valve		Landed Westbay MP38 Pressure (pre-sample, kPa)	Shoe-Out	Zone Pressure (pre-sample, kPa)	Open-Valve	Stablization Time	Zone Pressure (post-sample kPa)	Close Valve	Shoe-In	Landed Westbay MP38 Pressure (post-sample, kPa)		
2023-10-02 11:00	INT 021	1	x	x	x	x	8.66	x	x	474.42	x	613.12	x	5min	316	x	x	473.81	11:35	Collected by landing probe on the sampling port (pumping port closed). Recovered ~600mL. Run#1 used to collect in field measurements and SiO2
2023-10-02 11:55	INT 021	2	x	x	x	x	5.73	x	x	474.58	x	601.80	x	5min	329.81	x	x	474.00	12:30	Collected by landing probe on the sampling port (pumping port closed). Recovered ~500mL. Run #2 used to collect horiba measurements.
2023-10-02 13:30	INT 021	3	x	x	x	x	4.57	x	x	474.07	x	619.02	x	2min	473.34	x	x	474.10	13:50	Collected by landing probe on the sampling port (pumping port closed). Recovered ~250mL. Attempted disassembling probe and cleaning all parts. Run #3 used to collect gen chem.
2023-10-02 14:05	INT 021	4	x	x	x	x	5.53	x	x	474.02	x	617.91	x	2min	381.17	x	x	473.14	14:35	Collected by landing probe on the sampling port (pumping port closed). Recovered ~250mL. Switched out valve and nut at bottom of first bottle. Run #4 used to collect gen chem.
2023-10-02 14:45	INT 021	5	x	x	x	x	5.77	x	x	473.81	x	612.96	x	20min	480	x	x	472.33	15:20	Call with Westbay - removed 'pig tail' coil from top bottle to attempt to retrieve more sample. Recovered ~700mL. Run #5 used for gen chem. Collected by landing probe on the sampling port (pumping port closed)
2023-10-02 15:40	INT 021	6	x	x	x	x	5.61	x	x	466.64	x	605.91	x	25min	570.11	x	x	466.23	16:20	Call with Westbay. Determined that the formation has low transmissivity. **Switched to 2 sample bottles (500ml)** and added 'pig tail' coil back in top bottle. Fewer sample bottles account for lower P1. P2 decreased for 4.5 min and then began increasing. Recovered 500mL. Run #6 used to collect sulphide and DOC samples. Collected by landing probe on the sampling port (pumping port closed).
2023-10-02 16:30	INT 021	7	x	x	x	x	5.83	x	x	466.61	x	608.47	x	15min	528.7	x	x	466.12	17:05	Collected by landing probe on the sampling port (pumping port closed). Recovered 500mL. Run #7 used to collect metals and Ru samples.
2023-10-02 17:20	INT 021	8	x	x	x	x	3.78	x	x	466.47	x	600.35	x	13min	502.91	x	x	466.22	17:45	Collected by landing probe on the sampling port (pumping port closed). Recovered 500mL. Run #8 used to collect nutrients and ammonia samples.
2023-10-03 8:35	INT 021	9	x	x	x	x	2.96	x	x	471.57	x	650.65	x	15min	564.16	x	x	471.41	9:10	Collected by landing probe on the sampling port (pumping port closed). Recovered 450mL Run #9 used to collect 37Cl.
2023-10-03 9:20	INT 021	10	x	x	x	x	3.87	x	x	471.92	x	629.50	x	20min	550.79	x	x	471.45	9:45	Collected by landing probe on the sampling port (pumping port closed). Recovered 450mL. Run #10 used to collect 37Cl.
2023-10-03 10:00	INT 021	11	x	x	x	x	4.58	x	x	477.25	x	624.93	x	35min	571.7	x	x	477.31	10:50	**4 sample bottles** (2 added account for higher P1). Upon opening the valve, P2 decreased slowly for 10 min before coming back up. 920mL recovered. Run #11 used to collect 14C, archive, 13C. Collected by landing probe on the sampling port (pumping port closed)
2023-10-03 11:00	INT 021	12	x	x	x	x	4.87	x	x	477.52	x	619.95	x	35min	562.21	x	x	477.46	11:50	Collected by landing probe on the sampling port (pumping port closed). 950mL recovered. Run #12 used to collect 14C, archive, 13C
2023-10-03 12:00	INT 021	13	x	x	x	x	5.30	x	x	477.53	x	610.74	x	30min	544.12	x	x	477.07	12:45	Collected by landing probe on the sampling port (pumping port closed). 950mL recovered. Run #13 used to collect 129I/36Cl

20-203-1: Groundwater Sampling - Field Data Sheet

Sampling Run Start Date/Time	Port #	Run #	Function Tests/Preparation						Landed Port	Sampling Sequence									Sampling Run End Time	Comments (volume recovered, parameters measured, samples collected, etc)
			Shoe-Out	Close Valve	Vaccum Check	Open Valve	Evacuate Bottles (<35 kPa)	Close Valve		Landed Westbay MP38 Pressure (pre-sample, kPa)	Shoe-Out	Zone Pressure (pre-sample, kPa)	Open-Valve	Stablization Time	Zone Pressure (post-sample kPa)	Close Valve	Shoe-In	Landed Westbay MP38 Pressure (post-sample, kPa)		
2023-10-03 13:00	INT 021	14	x	x	x	x	4.73	x	x	477.66	x	602.20	x	30min	534.32	x	x	476.70	13:45	Collected by landing probe on the sampling port (pumping port closed). 950mL recovered. Run #14 used to collect 129I/36Cl
2023-10-03 13:55	INT 021	15	x	x	x	x	4.59	x	x	479.99	x	600.05	x	37min	529.23	x	x	479.31	14:45	5th bottle added to recover >1L to fill 1L no-head-space sample bottle with water from one run (additional bottle accounts for higher P1). Upon opening the valve, P2 decreased slowly for 12 minutes before coming back up. Recovered 1.15L. Run #15 used to collect 18O/2H/3H. Collected by landing probe on the sampling port (pumping port closed).
2023-10-03 15:00	INT 021	16	x	x	x	x	5.02	x	x	479.92	x	595.15	x	37min	525.64	x	x	479.69	15:50	Collected by landing probe on the sampling port (pumping port closed). Recovered 1.15L. Run #16 used to collect 18O/2H/3H
2023-10-03 16:05	INT 021	17	x	x	x	x	4.55	x	x	479.39	x	590.11	x	38min	528.49	x	x	479.31	16:55	Collected by landing probe on the sampling port (pumping port closed). Recovered 1.15L. Run #16 used to collect 87Sr/86Sr.
2023-10-04 9:00	INT 021	18	x	x	x	x	0.03	x	x	477.95	x	649.39	x	57min	641.36	x	x	478.19	10:10	1 sample bottle and 3 copper tubes for noble gas sampling. Upon opening the valve to the formation, pressure dropped for 2 min before increasing towards formation pressure. Collected by landing probe on the sampling port (pumping port closed)
2023-10-04 11:15	INT 021	19	x	x	x	x	0.19	x	x	478.56	x	648.68	x	57min	640.99	x	x	478.98	12:30	1 sample bottle and 3 copper tubes for noble gas sampling. Collected by landing probe on the sampling port (pumping port closed)

Note: Record field parameter measurements on *20-203-01: Field Parameter Measurement/Testing - Field Data Sheet*

Completed by:	AMSC/LIM	Verified by:	MdK
Date:	04-Oct-23	Date:	15-Nov-23

20-203-1: Chain of Custody Tracking Sheet

COC Number/ID	Sample ID(s)	Shipping Information						Receiving Information				Comments
		Shipped Date	Shipped Time	Temp. Shipped (deg C)	COC Signed by Geofirma (Y/N)	Shipping Address	Shipping Method	Received Date	Received Time	Temp Received (deg C)	COC Signed By Receiving Lab (Y/N)	
GFIM_BVL_0017	IG_BH03_GW022 IG_BH03_GW023 IG_BH01_GW054	03-Oct-23	7:00	<10 deg C (on ice)	Y	Bureau Veritas Labs 946 Cobalt Crescent Thunder Bay, ON	Hand delivery (Peter T. - NWMO)	03-Oct-23	11:21	7,5,4	Y	
GFIM_BVL_0018	IG_BH01_GW056 IG_BH01_GW057	18-Oct-23	9:30	<10 deg C (on ice)	Y	Bureau Veritas Labs 946 Cobalt Crescent Thunder Bay, ON	Hand delivery	18-Oct-23	10:15	4,5,6	Y	
GFIM_NWMO_0009	IG_BH03_GW022 IG_BH03_GW023 IG_BH01_GW056 IG_BH01_GW057	17-Oct-23	17:15	<10 deg C	Y	NWMO Office - Ignace 304 Main St Ignace ON P0T 1T0	Hand delivery	17-Oct-23	17:25	<10 deg C	Y	
GFIM_IT2_0009	IG_BH03_GW022 IG_BH03_GW023 IG_BH01_GW055 IG_BH01_GW056 IG_BH01_GW057	18-Oct-23	9:00	<10 deg C (on ice)	Y	Isotope Tracer Technologies 608 Weber St. N Unit3, Waterloo, ON N2V 1K4	Courrier	19-Oct-23	n/a	n/a	Y	COC filled out incorrectly for samples IG_BH01_GW055 & IG_BH03_GW022. Geofirma followed up via email to correct and clarify.
GFIM_UofO_0009	IG_BH03_GW022 IG_BH03_GW023 IG_BH01_GW056 IG_BH01_GW057	24-Oct-23	9:30	<10 deg C (on ice)	Y	University of Ottawa 25 Templeton St., Ottawa ON K1N 6N5	Hand delivery	24-Oct-23	10:00	n/a	Y	
GFIM_UofOxford_0003	IG_BH03_GW022 IG_BH03_GW023 IG_BH01_GW056 IG_BH01_GW057 IG_BH01_GW058 IG_BH01_GW059 IG_BH01_GW062 IG_BH01_GW063 IG_BH01_GW064 IG_BH01_GW065 IG_BH01_GW066	18-Oct-23	7:00	N/A	Y	Univeristy of Oxford Department of Earth Science South Parks Road Oxford UK OX1 3AN	Courrier	26-Oct-23	n/a	n/a	Y	

Completed by:	AMSC	Verified by:	MdK
Date:	14-Nov-23	Date:	15-Nov-23

20-203-1: Laboratory Data Quality Confirmation Report

Laboratory Report Date	2023-10-30 & 2023-11-09
Laboratory Name	**Bureau Veritas**
Laboratory Report ID (If applicable)	C3U9856 & C3W6006
Analyses Completed	Major and Trace Elements and Metals; Total dissolved sulphur; Total dissolved iron; Reactive silica; Sulphide; Anions; pH; Alkalinity; Fluoride; TIC; TOC; DOC; TKN; Total Phosphorus; Total Ammonia; Total Nitrogen; Carbonate, Bicarbonate and Hydroxide

Associated COC #(s)	GFIM_BVL_0017 & GFIM_BVL_0018

Samples Included in Laboratory Report
IG_BH03_GW022 IG_BH03_GW023 IG_BH01_GW054 IG_BH01_GW056 IG_BH01_GW057

Quality Check and Verification	Verified By (Initials)	Comments
Results received from laboratory	AMSC	
All samples were tested or accounted for. Justification provided for any untested samples (e.g. spare sample)	AMSC	
Laboratory data report provided with results	AMSC	
Laboratory testing methods/techniques included in data report	AMSC	
Laboratory QA procedures and equipment calibration included in data report	AMSC	
Laboratory results are within reasonable/expected range	AMSC	

Other Comments/Notes:
[2023-11-09]: Asked lab to re-run anions for all samples as they were slighlty below expected. Awaiting updated reports. [2023-11-15]: Received updated lab reports, re-run alayses confirmed orginal results.

Note: A copy of this form is to be complete for each laboratory data report that is received by Geofirma

Completed by:	AMSC	Verified by:	MdK
Date:	14-Nov-23	Date:	15-Nov-23

20-203-1: Laboratory Data Quality Confirmation Report

Laboratory Report Date	**2024-01-18**
Laboratory Name	**Isotope Tracer Technologies (IT^2)**
Laboratory Report ID (If applicable)	**231066**
Analyses Completed	$\delta^{18}O$, $\delta^{2}H$, Trtrium (^{3}H), $^{87}Sr/^{86}Sr$, $\delta^{37}Cl$, $\delta^{13}C$, ^{14}C

Associated COC #(s)	GFIM_IT2_0009

Samples Included in Laboratory Report
IG_BH03_GW022 IG_BH03_GW023 IG_BH01_GW055 IG_BH01_GW056 IG_BH01_GW057

Quality Check and Verification	Verified By (Initials)	Comments
Results received from laboratory	AMSC	
All samples were tested or accounted for. Justification provided for any untested samples (e.g. spare sample)	AMSC	
Laboratory data report provided with results	AMSC	
Laboratory testing methods/techniques included in data report	AMSC	
Laboratory QA procedures and equipment calibration included in data report	AMSC	
Laboratory results are within reasonable/expected range	AMSC	

Other Comments/Notes:
Lab noted that sample IG_BH01_GW057 was run multiple times to try and improve results (large stdv). Asked lab to revise report to include all run results.

Note: A copy of this form is to be complete for each laboratory data report that is received by Geofirma

Completed by:	AMSC	Verified by:	MEOR
Date:	20-Jan-24	Date:	24-Apr-24

20-203-1: Laboratory Data Quality Confirmation Report

Laboratory Report Date	2024-04-17; 2024-05-21
Laboratory Name	**University of Ottawa**
Laboratory Report ID (If applicable)	N/A
Analyses Completed	^{129}I & ^{36}Cl

Associated COC #(s)	GFIM_UofO_0009

0
IG_BH03_GW022 IG_BH03_GW023 IG_BH01_GW056 IG_BH01_GW057

Quality Check and Verification	Verified By (Initials)	Comments
Results received from laboratory	AMSC / MdK	
All samples were tested or accounted for. Justification provided for any untested samples (e.g. spare sample)	AMSC / MdK	
Laboratory data report provided with results	AMSC / MdK	
Laboratory testing methods/techniques included in data report	AMSC / MdK	
Laboratory QA procedures and equipment calibration included in data report	AMSC	
Laboratory results are within reasonable/expected range	AMSC	see notes.

Other Comments/Notes:
Note from lab: IG BH01 GW56 and GW57 have less than 1 mg/L Cl–. The measured 36Cl/Cl ratio was then normalized to the minimum concentration of 1 mg/L Cl– to yield a minimum (greater than) 36Cl/Cl ratio for the sample. [2024-04-19]: Received 36Cl results. [2024-05-21]: Received 129I results.

Note: A copy of this form is to be complete for each laboratory data report that is received by Geofirma

Completed by:	AMSC / MdK	Verified by:	MEOR
Date:	2024-04-22 / 2024-05-27	Date:	29-May-24

2023 Q4
(December)

GEOFIRMA
ENGINEERING

Borehole ID:	BH01, BH03 & BH05	Comments:
Date:	Nov 29 - Dec 10 2023	
Completed by:	AMSC, MEOR	
Sampling Interval:	[IG_BH01_T_INT_009] [IG_BH01_T_INT_019] & NG sampling	

Equipment	Date/Time	Decontamination Required (Y/N)	Location (BH)	PPE	Decontamination Procedure					Staff initial	Comments
					Loose Contamination Removed	Detergent Wash *(record type of detergent used)*	Dionized Water Rinse	Air Dried (Minimize Dust)	Rinsate Sample Collected (Y/N)		
Electronic Water Level Tape	2023-11-29 9:15	Y	BH05	Y	Y	Alconox	Y	Y	N	MEOR	
MOSDAX sampler probe EMS 5523	2023-11-29 9:15	Y	BH05	Y	Y	Alconox	Y	Y	N	AMSC	
Electronic Water Level Tape	2023-11-30 8:00	Y	BH03	Y	Y	Alconox	Y	Y	N	MEOR	
MOSDAX sampler probe EMS 5523	2023-11-30 8:00	Y	BH03	Y	Y	Alconox	Y	Y	N	AMSC	
Bladder Pump	2023-12-01 8:45	Y	BH03	Y	Y	Alconox	Y	Y	N	AMSC	
Westbay sample bottles (x1)	2023-11-02 8:00	Y	BH03	Y	Y	Alconox	Y	Y	N	MEOR	
Electronic Water Level Tape	2023-12-03 8:00	Y	BH01	Y	Y	Alconox	Y	Y	N	MEOR	
MOSDAX sampler probe EMS 5523	2023-12-03 8:20	Y	BH01	Y	Y	Alconox	Y	Y	N	AMSC	
Bladder Pump	2023-12-04 8:15	Y	BH01	Y	Y	Alconox	Y	Y	N	AMSC	
Westbay sample bottles (x6)	2023-12-07 10:00	Y	BH01	Y	Y	Alconox	Y	Y	N	AMSC	
Westbay sample bottles (x2)	2023-12-08 8:30	Y	BH01	Y	Y	Alconox	Y	Y	N	AMSC	Deconned the two bottles used for sampling of INT002
Westbay sample bottles (x3)	2023-12-08 13:00	Y	BH01	Y	Y	Alconox	Y	Y	N	AMSC	Deconned the three bottles used for sampling of INT004
Westbay sample bottles (x6)	2023-12-09 16:30	Y	BH01	Y	Y	Alconox	Y	Y	Y	AMSC	Deconned all bottles after used for sampling of INT009. Collected rinsate sample: IG_BH01_GW072

Date	Time	Personnel	Equipment Type	Serial Number	Calibration Check			Calibration Performed			Comments
					Check Method & Standard(s) Used	Equipment Reading(s)	Calibration Required (Y/N)	Calibration Method & Standard(s) Used	Equipment Reading(s)	Calibration Completed (Y/N)	
29-Nov-23	9:40	AMSC	MOSDAX Probe	EMS 5523	Manual WL/P vs. Probe P	Manual P (anticipated) = 455.68 kPa Probe P (measured) = 467.52 kPa	N	--	--	--	
01-Dec-23	6:30	MEOR	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.001 9.525 100.5	--	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
01-Dec-23	6:40	MEOR	HoribaU52	SRGWN2Y6	--	--	--	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	4.00 pH 4.49 mS/cm 0.0 NTU	--	Calibrated using lab provided solutions: AutoCal (LOT#3GH0985, exp. Aug/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#3GH684, exp. Aug/25) , pH 4.0 (LOT#3GE0156, exp. May/24) .Calibration failed due to turbidity probe issues. The probe was therefore cal checked with the provided auto cal solution, all readings were good, the cal checked values are recorded. **Unit was checked by the supplier on arrival and an as-received certificate was issued showing a passing status.**
02-Dec-23	6:40	MEOR	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.001 9.525 100.5	--	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
02-Dec-23	6:30	AMSC	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00	3.97 7.01 10.00	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.97 pH 4.51 mS/cm 0.0 NTU		Calibrated using lab provided solutions: AutoCal (LOT#3GH0985, exp. Aug/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#3GH684, exp. Aug/25) , pH 4.0 (LOT#3GE0156, exp. May/24) .Calibration failed due to turbidity probe issues. The probe was therefore cal checked with the provided auto cal solution, all readings were good, the cal checked values are recorded. **Unit was checked by the supplier on arrival and an as-received certificate was issued showing a passing status.**
04-Dec-23	6:30	MEOR	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.625 100.4	--	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
04-Dec-23	6:30	AMSC	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00	4.00 7.02 10.00	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.94 pH 4.50 mS/cm 0.0 NTU		Calibrated using lab provided solutions: AutoCal (LOT#3GH0985, exp. Aug/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#3GH684, exp. Aug/25) , pH 4.0 (LOT#3GE0156, exp. May/24) .Calibration failed due to turbidity probe issues. The probe was therefore cal checked with the provided auto cal solution, all readings were good, the cal checked values are recorded. **Unit was checked by the supplier on arrival and an as-received certificate was issued showing a passing status.**
05-Dec-23	6:30	MEOR	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.523 100.4	--	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
05-Dec-23	6:30	AMSC	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00	3.98 7.00 10.00	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.98 pH 4.49 mS/cm 0.0 NTU		Calibrated using lab provided solutions: AutoCal (LOT#3GH0985, exp. Aug/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#3GH684, exp. Aug/25) , pH 4.0 (LOT#3GE0156, exp. May/24)
06-Dec-23	6:30	MEOR	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.514 100.4	--	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
06-Dec-23	6:30	AMSC	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00	3.98 7.00 10.00	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.99 pH 4.50mS/cm 0.0 NTU		Calibrated using lab provided solutions: AutoCal (LOT#3GH0985, exp. Aug/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#3GH684, exp. Aug/25) , pH 4.0 (LOT#3GE0156, exp. May/24)
07-Dec-23	6:30	MEOR	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.514 100.4	--	
07-Dec-23	6:30	AMSC	HoribaU52	**P4SYN7B2**	Lab provided solutions; 4.00, 7.00, 10.00	4.00 7.02 10.00	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	4.00 pH 4.48 mS/cm 70.1 NTU		Calibration failed due to turbidity probe issues. The probe was therefore cal checked with the provided auto cal solution, pH and EC readings were good, the cal checked values are recorded. Replacement probe is being used as the cal check readings were better. pH was manually calibrated. Calibrated using lab provided solutions: AutoCal (LOT#3GH0985, exp. Aug/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#3GH684, exp. Aug/25) , pH 4.0 (LOT#3GE0156, exp. May/24) . **Unit was checked by the supplier on arrival and an as-received certificate was issued showing a fail status.**
07-Dec-23	11:30	AMSC	DR900	200660001027	Absorbance Std Test Kit	**520nm:** Blank: 0.00 Std 1: 0.597 ± 0.05 Std 2: 1.257 ± 0.10 Std 3: 1.890 ± 0.15	**520 nm:** Blank: 0.000 Std 1: 0.613 Std 2: 1.277 Std 3: 1.915	N	--	--	--	Cal checked using DR900 absorbance check kit (LOT# A2294)
						610nm: Blank: 0.00 Std 1: 0.556 ± 0.05 Std 2: 1.173 ± 0.10 Std 3: 1.764 ± 0.15	**610 nm:** Blank: 0.000 Std 1: 0.577 Std 2: 1.203 Std 3: 1.803	N	--	--	--	

08-Dec-23	6:30	MEOR	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.660 100.3	--	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
08-Dec-23	6:30	AMSC	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00	4.00 7.00 10.00	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	4.00 pH 4.49 mS/cm 0.0 NTU		Calibrated using lab provided solutions: AutoCal (LOT#3GH0985, exp. Aug/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#3GH684, exp. Aug/25) , pH 4.0 (LOT#3GE0156, exp. May/24) .Calibration failed due to turbidity probe issues. The probe was therefore cal checked with the provided auto cal solution, all readings were good, the cal checked values are recorded. **Unit was checked by the supplier on arrival and an as-received certificate was issued showing a passing status.**
08-Dec-23	6:45	AMSC	DR900	200660001027	Absorbance Std Test Kit **520nm:** Blank: 0.00 Std 1: 0.597 ± 0.05 Std 2: 1.257 ± 0.10 Std 3: 1.890 ± 0.15	**520nm:** Blank: 0.000 Std 1: 0.599 Std 2: 1.266 Std 3: 1.911	N	--	--	--	Cal checked using DR900 absorbance check kit (LOT# A2294)
					Absorbance Std Test Kit **610nm:** Blank: 0.00 Std 1: 0.556 ± 0.05 Std 2: 1.173 ± 0.10 Std 3: 1.764 ± 0.15	**610nm:** Blank: 0.000 Std 1: 0.522 Std 2: 1.182 Std 3: 1.782	N	--	--	--	
09-Dec-23	6:30	MEOR	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.561 100.4	--	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
09-Dec-23	6:30	AMSC	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00	3.99 7.00 10.00	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.99 pH 4.50 mS/cm 0.0 NTU		Calibrated using lab provided solutions: AutoCal (LOT#3GH0985, exp. Aug/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#3GH684, exp. Aug/25) , pH 4.0 (LOT#3GE0156, exp. May/24)
10-Dec-23	6:00	MEOR	Fluorometer	807511	--	--	--	3 pt calibration with standard solution, 0ppb, 10ppb, 100ppb	0.000 9.656 100.4	--	Calibrated using turner design fluorescein standards: 10ppb (LOT# 10F0730), 100ppb (LOT# 1F0732) Exp. Jan 2024
10-Dec-23	6:00	AMSC	HoribaU52	SRGWN2Y6	Lab provided solutions; 4.00, 7.00, 10.00	4.00 7.01 10.00	N	Lab-provided auto caliubration solution 4.0 pH, 4.49mS/cm, 0.0NTU	3.98 pH 4.49 mS/cm 0.0 NTU		Calibrated using lab provided solutions: AutoCal (LOT#3GH0985, exp. Aug/24), pH 10.0 (LOT#2GK001, exp. Nov/24), pH 7.0 (LOT#3GH684, exp. Aug/25) , pH 4.0 (LOT#3GE0156, exp. May/24) .Calibration failed due to turbidity probe issues. The probe was therefore cal checked with the provided auto cal solution, all readings were good, the cal checked values are recorded. **Unit was checked by the supplier on arrival and an as-received certificate was issued showing a passing status.**
10-Dec-23	6:15	AMSC	DR900	200660001027	Absorbance Std Test Kit **520nm:** Blank: 0.00 Std 1: 0.597 ± 0.05 Std 2: 1.257 ± 0.10 Std 3: 1.890 ± 0.15	**520nm:** Blank: 0.000 Std 1: 0.599 Std 2: 1.264 Std 3: 1.905	N	--	--	--	Cal checked using DR900 absorbance check kit (LOT# A2294)
					Absorbance Std Test Kit **610nm:** Blank: 0.00 Std 1: 0.556 ± 0.05 Std 2: 1.173 ± 0.10 Std 3: 1.764 ± 0.15	**610nm:** Blank: 0.000 Std 1: 0.570 Std 2: 1.197 Std 3: 1.801	N	--	--	--	

Additional Notes:

Horiba **SRGWN2Y6** was used for the majority of the field work (excl. Dec-07), the calibration would fail due to the the turbidity probe - however, when checked all values read correctly. The unit was checked by the supplier on arrival, an 'as-received' calibration certificate was issued, and the turbidity sensor **passed**.

Horiba **P4SYN7B2** was received as a backup to SRGWN276, but experienced the same issue with the tubidity sensor. The readings when checked were less reliable, therefore Geofirma staff continued to use SRGWN276. The unit was also checked by supplier on arrival, an 'as-received' calibration certificate was issued, however not the turbidity sensor **failed - the values recoreded by this probe have been flagged.**

Completed by:	AMSC/MEOR	Verified by:	MdK
Date:	10-Dec-23	Date:	09-Jan-24

20-203-1: Westbay Pressure/Temperature Profiling - IG_BH01

Well ID	IG_BH01				**Pre Profile**			**Post Profile**			Weather:	-6	°C
Datum:	Ground Level		Probe Type:	MOSDAX	P_{atm}	93.65	kPa	P_{atm}	93.77	kPa		Overcast	
Elev. G.S.:	430.562	m	Serial No.:	EMS5523	Temp.	9.61	°C	Temp.	5.89	°C			
Height of Westbay above G.S.:	0.32	m AGS	Probe Range:	2000psi	Date/Time	2023-12-03 8:50		Date/Time	2023-12-03 12:24				
Elev. Top of Westbay Casing:	430.88	m	Westbay Casing Type:	MP38	MP38 Water Level	46.14	mBTOC	MP38 Water Level	46.34	mBTOC	Specific Weight	9.807	kN/m3
Reference Elevation:	430.562	mASL	Sampler Valve Position:	Closed							Gravitational Acceleratic	9.8065	m/s2
Borehole angle:	-90										P_{atm}	93.71	

Notes: Completed profile top down
Mprofile used during profile
Sample intervals: IG_BH01_INT_T_009 and IG_BH01_T_INT_019, all ports reported to be closed.

				Fluid Pressure Readings													
Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m BGS)	Start Profile Time	Inside Casing (P1-Landed Pressure) (kPa)	Shoe Out	#Rotation	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Shoe In	#Rotation	Inside Casing (P1) (kPa)	Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Z: Elev of pressure measurement port (mASL)	Freshwater Head (mASL)	Comments
1	977.30		976.91	11:42:00	9478.01	X	14	9611.72	11:43:00	13.58	X	14	9477.87	970.53	6.38	-546.35	424.19	
2	888.80		888.49	11:35:00	8582.05	X	14	8685.89	11:36:00	12.58	X	14	8581.99	876.13	12.36	-457.92	418.20	
3	804.40		804.14	11:23:00	7727.40	X	14	7849.95	11:29:00	12.02	X	14	7727.39	790.89	13.26	-373.58	417.31	Mprofile lost connection, switched to using single probe mode on MAGI
4	769.30		769.06	11:18:00	7373.30	X	15	7477.74	11:18:00	11.34	X	15	7372.51	752.93	16.13	-338.50	414.43	
5	703.10		702.90	11:11:00	6703.90	X	15	6839.42	11:12:00	10.67	X	15	6703.86	687.85	15.05	-272.33	415.51	
6	649.80		649.62	11:06:00	6164.42	X	15	6300.23	11:07:00	10.10	X	15	6164.39	632.87	16.76	-219.06	413.81	
7	628.40		628.23	11:02:00	5948.10	X	15	6074.11	11:03:00	9.73	X	15	5948.06	609.81	18.42	-197.67	412.14	
8	574.40		574.26	10:57:00	5402.75	X	15	5553.41	10:59:00	9.09	X	15	5402.34	556.71	17.54	-143.70	413.02	Verified by MEOR
9	540.20		540.07	10:54:00	5056.66	X	14	5202.39	10:55:00	8.46	X	14	5056.63	520.92	19.15	-109.51	411.41	
10	517.40		517.28	9:41:00	4826.21	X	14	4993.63	9:42:00	8.80	X	14	4826.01	499.63	17.65	-86.72	412.92	Pulling probe out of hole, functions not responding correctly. Cleaned probe (including actuator nut) and resumed profile.
11	493.00		492.89	9:37:00	4579.54	X	14	4753.27	9:38:00	8.39	X	14	4579.15	475.13	17.76	-62.33	412.80	
12	432.10		432.01	9:29:00	3963.27	X	14	4148.09	9:30:00	7.72	X	14	3963.25	413.42	18.60	-1.45	411.97	
13	409.30		409.22	9:26:00	3732.18	X	14	3932.28	9:27:00	7.32	X	14	3732.53	391.41	17.81	21.34	412.75	
14	325.60		325.54	9:21:00	2886.00	X	14	3106.83	9:22:00	6.66	X	14	2885.98	307.24	18.30	105.02	412.26	
15	307.30		307.25	9:18:00	2701.15	X	14	2920.05	9:19:00	6.35	X	14	2701.50	288.20	19.05	123.31	411.51	
16	231.20		231.17	9:13:00	1938.88	X	14	2182.58	9:14:00	5.80	X	14	2938.86	213.00	18.17	199.40	412.39	
17	199.20		199.17	9:10:00	1621.79	X	14	1882.57	9:11:00	5.57	X	14	1622.15	182.41	16.76	231.39	413.80	
18	149.00		148.98	9:05:00	1124.73	X	14	1378.27	9:06:00	5.44	X	14	1124.73	130.98	18.00	281.58	412.57	
19	128.50		128.48	8:59:00	921.96	X	14	1170.96	9:00:00	5.42	X	14	922.33	109.85	18.64	302.08	411.92	
20	69.10		69.09	8:51:00	334.70	X	14	602.54	8:53:00	5.72	X	14	334.74	51.88	17.21	361.47	413.36	

Completed by:	AMSC/MEOR	Verified by:	MdK
Date:	03-Dec-23	Date:	09-Jan-24

20-203-1: Westbay Pressure/Temperature Profiling - IG_BH03

Well ID	IG_BH03			**Pre Profile**			**Post Profile**			Weather:	-8 °C
Datum:	Ground Level	Probe Type:	MOSDAX	P_{atm}	92.81	kPa	P_{atm}	93.43	kPa		cloudy
Elev. G.S.:	441.403 m	Serial No.:	EMS5523	Temp.	8.44	°C	Temp.	5.72	°C		
Height of Westbay above G.S.:	1.299 m AGS	Probe Range:	2000psi	Date/Time	2023-11-30 11:45		Date/Time	2023-11-30 15:20			
Elev. Top of Westbay Casing:	442.702 m	Westbay Casing Type:	MP38	MP38 Water Level	58.79	mBTOC	MP38 Water Level	58.88	mBTOC	Specific Weight	9.807 kN/m3
Reference Elevation:	441.403 mASL	ampler Valve Position:	Closed							Gravitational Acceleratio	9.8065 m/s2
Borehole angle:	-70									P_{atm}	93.12

Notes:
Completed profile top down.
Mprofile used during profiling.

				Fluid Pressure Readings													
Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m BGS)	Start Profile Time	Inside Casing (P1-Landed Pressure) (kPa)	Shoe Out	# rottions	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Shoe In	# rottions	Inside Casing (P1) (kPa)	Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Z: Elev of pressure measurement port (mASL)	Freshwater Head (mASL)	Comments
1	966.81		888.57	14:06:00	8514.07	x	13	8652.17	14:10:00	13.00	x	13	8514.06	872.75	15.82	-447.17	425.58	
2	943.91		868.28	14:02:00	8308.77	x	13	8413.72	14:04:00	12.78	x	13	8308.76	848.43	19.85	-426.88	421.56	
3	924.01		850.53	13:54:00	8129.91	x	13	8132.15	13:57:00	12.47	x	13	8130.22	819.72	30.81	-409.13	410.60	Re-checked (P2=8132.50 kPa). Observed expected spike on both attempts. P1 is equal to P2, possible due to an open or leaking port?
4	882.81		813.57	13:46:00	7755.98	x	13	7755.97	13:49:00	12.14	x	13	7755.90	781.37	32.20	-372.17	409.20	Re-checked (P2=7755.93 kPa). Observed expected spike on both attempts. P1 is equal to P2, possible due to an open or leaking port?
5	859.91		792.89	13:42:00	7547.14	x	13	7700.85	13:43:00	11.72	x	13	7546.73	775.74	17.15	-351.49	424.26	
6	794.31		733.26	13:36:00	6944.03	x	13	7077.71	13:37:00	11.16	x	13	6943.62	712.20	21.06	-291.86	420.35	
7	752.81		695.28	13:31:00	6559.37	x	13	6699.00	13:32:00	10.70	x	13	6559.34	673.59	21.69	-253.88	419.71	
8	676.01		624.50	13:24:00	5842.94	x	14	6026.33	13:26:00	10.20	x	14	5842.92	605.00	19.50	-183.10	421.90	
9	637.81		589.28	13:15:00	5486.89	x	14	5530.37	13:17:00	9.92	x	14	5486.84	554.43	34.85	-147.88	406.55	Re-checked (P2= 5522.08). Observed expected spike on both attempts. Verified by MEOR
10	613.41		566.78	13:10:00	5259.10	x	14	5317.55	13:11:00	9.51	x	14	5259.07	532.72	34.06	-125.38	407.35	
11	567.71		524.65	13:04:00	4833.62	x	14	5041.50	13:05:00	9.12	x	14	4833.23	504.58	20.07	-83.25	421.33	
12	544.11		502.91	12:59:00	4614.61	x	14	4666.65	13:00:00	8.88	x	14	4614.22	466.35	36.56	-61.51	404.85	Observed expected spike, but has lower head than previous profiles.
13	506.11		467.93	12:54:00	4260.20	x	14	4257.20	12:55:00	8.53	x	14	4259.80	424.60	43.33	-26.53	398.08	Observed expected spike, but P1 and P2 are similar and has lower head than previous profiles.
14	465.91		430.90	12:46:00	3886.13	x	14	3890.61	12:48:00	8.12	x	14	3886.10	387.22	43.68	10.50	397.73	Observed expected spike, but P1 and P2 are similar and has lower head than previous profiles.
15	421.11		389.63	12:41:00	3469.59	x	15	3685.34	12:42:00	7.70	x	15	3469.57	366.29	23.34	51.77	418.06	
16	370.31		342.83	12:35:00	2996.51	x	15	3309.69	12:36:00	7.16	x	15	2996.48	327.99	14.84	98.57	426.56	
17	321.01		297.42	12:29:00	2537.86	x	16	2880.38	12:30:00	6.73	x	16	2537.84	284.21	13.21	143.98	428.19	
18	251.01		232.90	12:23:00	1886.54	x	16	2250.06	12:24:00	6.27	x	16	1886.53	219.94	12.96	208.50	428.44	
19	228.11		211.75	12:16:00	1672.82	x	16	2041.45	12:19:00	6.08	x	16	1673.53	198.67	13.08	229.65	428.32	
20	165.71		154.03	12:07:00	1096.74	x	16	1488.99	12:08:00	5.64	x	16	1097.10	142.33	11.70	287.37	429.71	
21	73.0		68.16	11:59:00	242.98	x	16	682.19	12:01:00	6.05	x	16	243.07	60.07	8.09	373.24	433.31	

Completed by:	AMSC/MEOR	Verified by:	MdK
Date:	30-Nov-23	Date:	09-Jan-24

20-203-1: Westbay Pressure/Temperature Profiling - IG_BH05

Well ID	IG_BH05			**Pre Profile**			**Post Profile**			Weather:	-1 °C
Datum:	Ground Level	Probe Type:	MOSDAX	P_{atm}	92.62	kPa	P_{atm}	92.62	kPa		cloudy
Elev. G.S.:	432.29 m	Serial No.:	EMS5523	Temp.	9.22	°C	Temp.	6.05	°C		
Height of Westbay above G.S.:	1.31 m AGS	Probe Range:	2000psi	Date/Time	2023-11-29 9:30		Date/Time	2023-11-29 13:30			
Elev. Top of Westbay Casing:	433.60 m	Westbay Casing Type:	MP38	MP38 Water Level	32.41	mBTOC	MP38 Water Level	32.24	mBTOC	Specific Weight	9.807 kN/m3
Reference Elevation:	432.29 mASL	Sampler Valve Position:	Closed							Gravitational Acceleratic	9.8065 m/s2
Borehole angle:	-70									P_{atm}	92.62

Notes: Completed profile top down

Port No.	Port Position From Log (m)	Port Position From Cable (m)	True Port Depth "Dp" (m BGS)	Fluid Pressure Readings: Start Profile Time	Inside Casing (P1-Landed Pressure) (kPa)	Shoe Out	rotations	Outside Casing (P2) (kPa)	Time (H:M:S)	Probe Temp. (°C)	Shoe In		Inside Casing (P1) (kPa)	Pressure Head Outside Port (m) H=(P2-Patm)/w	Piezo Level Outside Port (m) Dz = Dp-H	Z: Elev of pressure measurement port (mASL)	Freshwater Head (mASL)	Comments
1	991.20		923.15	12:38:00	9019.28	x	13	9048.65	12:48:00	13.50	x	13	9019.28	913.23	9.92	-490.86	422.37	Attempted multiple landings and got the same response: pressure peaked but did not stabilize right away - likely due to some build up on port. Waited on port for 10mins to stabilize, after 10 minutes pressure was still slowly decreasing but relatively stable. There is likely some build up at the bottom of the hole, preventing a good seal onto the port.
2	974.30		907.47	11:57:00	8861.87	x	13	8882.94	11:58:00	12.94	x	13	8861.84	896.33	11.14	-475.18	421.15	Observed expected pressure spike
3	928.60		865.06	11:50:00	8436.08	x	14	8452.61	11:52:00	12.54	x	14	8436.38	852.45	12.61	-432.77	419.68	Observed expected pressure spike
4	865.50		806.50	11:44:00	7848.81	x	13	7866.85	11:45:00	12.06	x	13	7848.80	792.72	13.78	-374.21	418.51	Observed expected pressure spike
5	857.20		798.79	11:37:00	7771.48	x	14	7764.71	11:37:00	11.80	x	14	7771.46	782.31	16.48	-366.50	415.81	Observed small pressure spike
6	800.80		746.43	11:28:00	7247.04	x	14	7241.00	11:31:00	11.44	x	14	7247.01	728.91	17.52	-314.14	414.77	Slight trouble landing initially but second attempt was successful. Observed expected pressure spike
7	788.00		734.54	11:19:00	7127.28	x	14	7113.75	11:24:00	11.19	x	14	7127.27	715.93	18.61	-302.25	413.68	Slight trouble landing initially but second attempt was successful. Observed expected pressure spike
8	736.20		686.45	11:14:00	6645.01	x	14	6652.89	11:15:00	10.51	x	14	6644.99	668.94	17.51	-254.16	414.78	Observed small pressure spike
9	679.80		634.09	11:08:00	6120.54	x	13	6136.20	11:09:00	10.03	x	13	6120.89	616.25	17.84	-201.80	414.45	Observed expected pressure spike
10	635.00		592.48	11:02:00	5703.97	x	14	5694.59	11:03:00	9.22	x	14	5703.96	571.22	21.26	-160.19	411.03	Observed expected pressure spike
11	627.30		585.33	10:58:00	5633.17	x	14	5632.79	10:59:00	9.49	x	14	5632.77	564.92	20.41	-153.04	411.88	Observed expected pressure spike, noted that P2 and P1 have similar values
12	587.70		548.51	10:52:00	5265.58	x	14	5265.95	10:53:00	9.07	x	14	5265.56	527.51	21.00	-116.22	411.29	Observed small pressure spike, noted that P2 and P1 have similar values
13	542.00		505.99	10:44:00	4842.75	x	14	4843.10	10:47:00	8.66	x	14	4842.70	484.40	21.59	-73.70	410.70	Observed small pressure spike, noted that P2 and P1 have similar values
14	487.20		454.95	10:37:00	4334.79	x	14	4335.53	10:39:00	8.02	x	14	4334.76	432.64	22.31	-22.66	409.98	Observed expected pressure spike, noted that P2 and P1 have similar values
15	427.80		399.56	10:31:00	3784.50	x	15	3785.24	10:33:00	7.51	x	15	3784.47	376.53	23.03	32.73	409.26	Observed expected pressure spike, noted that P2 and P1 have similar values
16	372.90		348.37	10:25:00	3276.08	x	15	3277.20	10:26:00	6.97	x	15	3276.44	324.73	23.64	83.92	408.65	Observed expected pressure spike, noted that P2 and P1 have similar values
17	326.60		305.20	10:20:00	2846.78	x	15	2877.79	10:21:00	6.60	x	15	2846.77	284.00	21.20	127.09	411.09	Observed expected pressure spike. verified by AMSC
18	312.90		292.42	10:16:00	2719.82	x	15	2737.00	10:17:00	6.33	x	15	2719.18	269.64	22.78	139.87	409.51	Observed expected pressure spike
19	264.20		246.98	10:12:00	2267.66	x	16	2283.71	10:13:00	6.02	x	16	2268.02	223.42	23.56	185.31	408.73	Observed expected pressure spike
20	226.10		211.41	10:06:00	1914.26	x	16	1933.28	10:08:00	5.77	x	16	1914.61	187.69	23.72	220.88	408.57	Observed expected pressure spike
21	180.5		168.82	10:00:00	1490.50	x	16	1519.97	10:01:00	5.52	x	16	1490.50	145.54	23.28	263.47	409.01	Observed expected pressure spike
22	156.0		145.94	09:54:00	1263.43	x	16	1351.80	09:55:00	5.39	x	16	1263.80	128.40	17.54	286.35	414.75	Observed expected pressure spike
23	100.1		93.69	09:47:00	743.08	x	16	850.03	09:49:00	5.43	x	16	743.46	77.23	16.46	338.60	415.83	Observed expected pressure spike
24	90.9		85.09	09:43:00	657.31	x	16	770.59	09:45:00	5.73	x	16	657.70	69.13	15.96	347.20	416.33	Observed expected pressure spike
25	70.5		66.00	09:39:00	467.52	x	16	595.70	09:41:00	6.34	x	16	467.96	51.30	14.70	366.29	417.59	Observed expected pressure spike

Completed by:	MEOR/AMSC	Verified by:	MdK
Date:	29-Nov-23	Date:	09-Jan-24

Well ID:	IG_BH01	Multiparameter Probe:	Horiba U52 (SN.SRGWN2Y6)	Other Notes/Comments	**IG_BH01_GW067** - Primary Sample for **INT002** - NG only **IG_BH01_GW068** - Duplicate Sample for **INT002** - NG only **IG_BH01_GW069** - Primary Sample for **INT004** - NG only **IG_BH01_GW070** - Duplicate Sample for **INT004** - NG only **IG_BH01_GW071** - NG Trip Blank Sample (from **INT004**) **IG_BH01_GW072** - Rinsate Sample **IG_BH01_GW073** - Field Blank Sample **IG_BH01_GW074** - Primary Sample for **INT009** **IG_BH01_GW075** - Primary Sample for **INT019**
Date(s):	Dec 04 - 10 2023	Fluorometer:	AquaFluor (SN.807511)		
Operator(s):	AMSC, MEOR	Colorimeter:	DR900 (SN. 200660001027)		

Port ID	Cumulative Purge/Sampled Volume (L)	Measurement Date and Time	Multiparameter Probe								Fluorometer		Hydrometer	Colorimetric				Alkalinity		Sample Collected (Y/N)	Collected by (initial)	Comments (sampling run #, sample ID, water colour or odour, etc.)
			Calibrated	pH	Temp (°C)	EC (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	TDS (g/L)	Calibrated	Fluorescein (ppb)	Specific Gravity	Calibrated	Dissolved Oxygen (mg/L)	Dissolved Ferrous Iron Fe^{2+} (mg/L)	Total Dissolved Sulphide S^{2-} (mg/L)	Phenol. (mg/L)	Total as $CaCO_3$ (mg/L)			
IG_BH01_T_INT_002	5	2023-12-04 10:02	Y	9.02	6.44	0.839	102	0.14	186	0.537	Y	2.755	1.005	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. Turbidity reading unreliable as calibration was not successful (note that cal check for the turb was good and as-received calibration passed). MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.** Purging activities for this interval began on 03-Dec by flow-through recharge. No water was pumped, therefore no parameters were collected.
IG_BH01_T_INT_002	8	2023-12-04 10:20	Y	8.54	5.91	0.795	23	0.00	192	0.509	Y	2.766	1.005	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. Turbidity reading unreliable as calibration was not successful (note that cal check for the turb was good and as-received calibration passed). MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_002	12	2023-12-04 11:00	Y	8.49	6.42	0.779	-11	0.00	130	0.490	Y	2.678	1.008	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. Turbidity reading unreliable as calibration was not successful (note that cal check for the turb was good and as-received calibration passed). MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_002	16	2023-12-04 11:30	Y	8.34	6.50	0.765	-12	0.00	130	0.490	Y	2.458	1.010	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. Turbidity reading unreliable as calibration was not successful (note that cal check for the turb was good and as-received calibration passed). MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_004	5	2023-12-04 14:00	Y	8.45	6.39	0.782	8	0.00	177	0.501	Y	2.420	1.005	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. Turbidity reading unreliable as calibration was not successful (note that cal check for the turb was good and as-received calibration passed). MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_004	10	2023-12-04 14:30	Y	8.50	6.38	0.766	-15	0.00	132	0.490	Y	2.356	1.005	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. Turbidity reading unreliable as calibration was not successful (note that cal check for the turb was good and as-received calibration passed). MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_004	15	2023-12-05 10:00	Y	8.42	6.23	0.819	54	3.23	140	0.524	Y	2.395	1.010	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_004	21	2023-12-05 11:00	Y	8.48	6.04	0.819	-31	0.31	68.9	0.524	Y	2.385	1.010	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_004	24	2023-12-05 11:30	Y	8.46	5.89	0.828	-30	0.00	59.5	0.530	Y	2.337	1.008	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_009	3	2023-12-05 13:30	Y	8.48	5.69	0.838	-17	0.00	77.8	0.537	Y	2.344	1.008	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_009	8	2023-12-05 14:20	Y	8.50	5.59	0.839	-26	0.00	69.5	0.537	Y	2.319	1.008	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_009	10	2023-12-06 9:30	Y	8.41	6.94	0.829	116	5.57	125	0.530	Y	2.296	1.005	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_009	14	2023-12-06 10:45	Y	8.45	6.12	0.866	-44	0.36	125	0.555	Y	2.119	1.005	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_019	3	2023-12-06 14:00	Y	8.44	6.21	0.904	-24	0.00	105	0.579	Y	1.913	1.003	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**

IG_BH01_T_INT_019	7	2023-12-06 15:00	Y	8.40	6.33	0.887	-50	0.00	93.7	0.568	Y	1.885	1.005	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_019	10	2023-12-07 9:45	Y	8.32	5.91	1.20	18	0.00	113	0.770	Y	5.727	1.003	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. Turbidity reading unreliable as calibration was not successful (note as-received cal failed, therefore values are flagged). **Used horiba P4SYN7B2.** MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_019	15	2023-12-07 10:45	Y	8.37	5.69	1.21	-3	0.00	86.7	0.778	Y	5.780	1.003	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. Turbidity reading unreliable as calibration was not successful (note as-received cal failed, therefore values are flagged). **Used horiba P4SYN7B2.** MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing at the time of collection, not the formation.**
IG_BH01_T_INT_002	N/A	2023-12-07 14:20	-	-	-	-	-	-	-	-	Y	3.523	-	-	-	-	-	-	-	Y	AMSC	Fluorescein measurement collected from run #1 **Collected by landing probe on the sampling port.**- see comments in sampling sheet.
IG_BH01_T_INT_002	N/A	2023-12-07 15:58	Y	6.58	10.82	42.9	175	0.00	523	26.1	-	-	-	-	-	-	-	-	-	Y	AMSC	Measurements collected after run #2 (**collected by landing probe on the sampling port)** with the combined volume from run #1. Sample was slightly exposed to air for ~30-60s - see comments in sampling sheet. Parameters collected from flow-through cell while sample water was being pushed through. Attempted to take colorimetric DO, but not enough water to flow through cup to get accurate reading. Due to this attempt, not enough water was left over to get the specific gravity measurement. Turbidity reading unreliable as calibration was not successful (note as-received cal failed, therefore values are flagged). **Used horiba P4SYN7B2.**
IG_BH01_T_INT_002	N/A	2023-12-07 16:02	Y	6.74	12.41	38.1	55	0.00	80.1	23.3	-	-	-	-	-	-	-	-	-	Y	AMSC	See previous comment. Parameters collected after sample sat in flow through cell ~5 mins. Turbidity reading unreliable as calibration was not successful (note as-received cal failed, therefore values are flagged). **Used horiba P4SYN7B2.**
IG_BH01_T_INT_002	N/A	2023-12-07 16:13	Y	6.64	13.97	37.2	61	0.00	79.0	22.7	-	-	-	-	-	-	-	-	-	Y	AMSC	See previous comment. Parameters collected after sample sat in flow through cell ~15 mins. Turbidity reading unreliable as calibration was not successful (note as-received cal failed, therefore values are flagged). **Used horiba P4SYN7B2.**
IG_BH01_T_INT_004	N/A	2023-12-08 10:15	Y	-	-	-	-	-	-	-	Y	3.360		-	-	-	-	-	-	Y	AMSC	Fluorescein measurement collected from run #1 - **collected by landing probe on the sampling port.** - see comments in sampling sheet.
IG_BH01_T_INT_004	N/A	2023-12-09 11:39	Y	8.10	11.66	22.7	244	0.00	5.5	14.1	-	-	1.015	-	-	-	-	-	-	Y	AMSC	Measurements collected after run #2 **(collected by landing probe on the sampling port)** with the combined volume from run #1. Sample was slightly exposed to air for ~30-60s - see comments in sampling sheet. Parameters collected from flow-through cell while sample water was being pushed through. Turbidity reading unreliable as calibration was not successful. (note that cal check for the turb was good and as-received calibration passed).
IG_BH01_T_INT_004	N/A	2023-12-08 11:43	Y	7.90	11.90	21.8	158	0.00	10.8	13.5	-	-	-	-	-	-	-	-	-	Y	AMSC	See previous comment. Parameters collected after sample sat in flow through cell ~5 mins. Turbidity reading unreliable as calibration was not successful. (note that cal check for the turb was good and as-received calibration passed).
IG_BH01_T_INT_004	N/A	2023-12-08 11:54	Y	7.78	13.04	21.6	79	0.00	20.9	13.4	-	-	-	-	-	-	-	-	-	Y	AMSC	See previous comment. Parameters collected after sample sat in flow through cell ~15 mins. Turbidity reading unreliable as calibration was not successful.(note that cal check for the turb was good and as-received calibration passed).
IG_BH01_T_INT_009	N/A	2023-12-08 14:45	Y	7.84	13.74	6.76	-27	0.00	79.2	4.26	Y	13.57 13.44	1.010	Y	0.353	1.14	0.04	0	7	Y	AMSC	Measurements collected from run #1,c**ollected by landing probe on the sampling port.** DO collected directly from sample line prior other parameters. Parameters collected from flow-through cell while sample water was being pushed through. Turbidity reading unreliable as calibration was not successful. (note that cal check for the turb was good and as-received calibration passed). Sample water collected in HDPE bottle then used to collect in-field measurements (within ~10mins).Fluorescein measurements were taken twice (2 separate cuvettes) to confirm
IG_BH01_T_INT_009	N/A	2023-12-08 14:48	Y	7.25	17.09	6.44	-95	0.00	0.0	4.05	-	-	-	-	-	-	-	-	-	Y	AMSC	Parameters collected after sample sat in flow through cell ~3 mins. Turbidity reading unreliable as calibration was not successful.(note that cal check for the turb was good and as-received calibration passed).
IG_BH01_T_INT_009	N/A	2023-12-08 14:52	Y	6.93	17.48	6.780	-105	0.00	0.0	4.27	-	-	-	-	-	-	-	-	-	Y	AMSC	Parameters collected after sample sat in flow through cell ~8 mins. Turbidity reading unreliable as calibration was not successful.(note that cal check for the turb was good and as-received calibration passed).
IG_BH01_T_INT_009	N/A	2023-12-08 15:50	Y	-	-	-	-	-	-	-	Y	14.04 13.95 14.11	-	-	-	-	-	-	-	Y	AMSC	Measurements collected from run #2 (**collected by landing probe on the sampling port**) to confirm fluorescein conc.Fluorescein measurements were taken x3 (3 separate cuvettes) to confirm
IG_BH01_T_INT_009	N/A	2023-12-09 13:15	Y	-	-	-	-	-	-	-	Y	14.08	-	-	-	-	-	-	-	Y	AMSC	Measurements collected from run #5 (**collected by landing probe on the sampling port**) to reconfirm fluorescein conc.
IG_BH01_T_INT_019	N/A	2023-12-10 8:54	Y	7.17	7.11	0.300	185	0.00	0.0	0.195		32.28	1.000	Y	0.710	0.07	0.01	0	97	Y	AMSC	Measurements collected from run #1 (**collected by landing probe on the sampling port**). DO collected directly from sample line prior other parameters. Parameters collected from flow-through cell while sample water was being pushed through.Turbidity reading unreliable as calibration was not successful. (note that cal check for the turb was good and as-received calibration passed). Sample water collected in HDPE bottle then used to collect in-field measurements (within ~10mins)
IG_BH01_T_INT_019	N/A	2023-12-10 8:59	Y	7.95	8.62	0.271	56	0.00	0.0	0.176	-	-	-	-	-	-	-	-	-	Y	AMSC	Parameters collected after sample sat in flow through cell ~5 mins. Turbidity reading unreliable as calibration was not successful.(note that cal check for the turb was good and as-received calibration passed).
IG_BH01_T_INT_019	N/A	2023-12-10 9:07	Y	7.90	9.24	0.272	17	0.00	8.7	0.177	-	-	-	-	-	-	-	-	-	Y	AMSC	Parameters collected after sample sat in flow through cell ~13 mins. Turbidity reading unreliable as calibration was not successful.(note that cal check for the turb was good and as-received calibration passed).
IG_BH01_T_INT_019	N/A	2023-12-10 12:44	Y	-	-	-	-	-	-	-	Y	32.56	-	-	-	-	-	-	-	Y	AMSC	Measurements collected from run #6 to reconfirm fluorescein conc.

Completed by:	AMSC/MEOR	Verified by:	MEOR
Date:	10-Dec-23	Date:	25-Jan-24

20-203-1: Groundwater Sampling - Field Data Sheet

Well ID:	IG_BH01		**Start Time**	2023-12-07 12:35	
MP38 Water Level Before Sampling:	45.84 (07-Dec)	m BTOC	**Starting Ambient Pressure**	93.13 (07-Dec)	kPa
MP38 Water Level After Sampling:	46.69 (10-Dec)	m BTOC	**End Sampling Time**	2023-12-10 12:45	
Probe Serial #/Range	EMS5523/ 2000psi	kPa	**Ending Ambient Pressure**	93.63 (10-Dec)	kPa
Date:	Dec 07- 10 2023				

Other Notes/Comments:

IG_BH01_GW067 - Primary Sample for **INT002** - NG only
IG_BH01_GW068 - Duplicate Sample for **INT002** - NG only
IG_BH01_GW069 - Primary Sample for **INT004** - NG only
IG_BH01_GW070 - Duplicate Sample for **INT004** - NG only
IG_BH01_GW071 - NG Trip Blank Sample (from **INT004**)
IG_BH01_GW072 - Rinsate Sample
IG_BH01_GW073 - Field Blank Sample
IG_BH01_GW074 - Primary Sample for **INT009 - interim sample**
IG_BH01_GW075 - Primary Sample for **INT019 - interim sample**

			Function Tests/Preparation							Sampling Sequence										
Sampling Run Start Date/Time	**Port #**	**Run #**	**Shoe-Out**	**Close Valve**	**Vaccum Check**	**Open Valve**	**Evacuate Bottles (<35 kPa)**	**Close Valve**	**Landed Port**	**Landed Westbay MP38 Pressure (pre-sample, kPa)**	**Shoe-Out**	**Zone Pressure (pre-sample, kPa)**	**Open Valve**	**Stablization Time**	**Zone Pressure (post-sample kPa)**	**Close Valve**	**Shoe-In**	**Landed Westbay MP38 Pressure (post-sample, kPa)**	**Sampling Run End Time**	**Comments (volume recovered, parameters measured, samples collected, etc)**
2023-12-07 12:35	INT 002	1	x	x	x	x	0.58	x	x	8595.33	x	8684.85	x	17 min	8681.48	x	x	8594.92	13:55	Run #1 for noble gas sampling. Kept top WB bottle aside for parameters to be taken after the second run. Ended up needing to swap out flow restrictor from this bottle to use for the next run., bottle was therefore depressurized and exposed to air ~30-60s while the exchanging the connection. 13mL of sample was collected during depressurization and used to collect fluorescein measurements. Collected by landing probe on the sampling port.
2023-12-07 14:28	INT 002	2	x	x	x	x	0.09	x	x	8594.28	x	8684.18	x	15 min	8680.74	x	x	8593.80	15:45	Run #2 for noble gas sampling. Top WB bottle was used in combination with the bottle from the previous run to collect horiba measurements. Colected by landing probe on the sampling port.
2023-12-08 8:40	INT004	1	x	x	x	x	0.15	x	x	7382.48	x	7475.99	x	15 min	7470.80	x	x	7382.12	9:55	Run #1 for noble gas sampling. Kept top WB bottle aside for parameters to be taken after the second run. Swapped out flow restrictor from this bottle to use for the next run, bottle was therefore depressurized and exposed to air ~30-60s while the exchanging the connection. 10mL of sample was collected during depressurization and used to collect fluorescein measurements. Collected by landing probe on the sampling port.
2023-12-08 10:10	INT004	2	x	x	x	x	0.34	x	x	7381.84	x	7475.02	x	15 min	7470.01	x	x	7381.33	11:20	Run #2 for noble gas sampling. Top WB bottle was used in combination with the bottle from the previous run to collect horiba measurements. Colected by landing probe on the sampling port.
2023-12-08 11:50	INT004	3	x	x	x	x	0.05	x	x	7380.15	x	7474.83	NA	15 min	7474.92	NA	x	7379.85	13:00	Run #3 used to collect NG trip blank. Collected by landing probe on the sampling port.
2023-12-08 13:20	INT 009	1	x	x	x	x	4.9	x	x	5073.83	x	5198.94	x	30 min	5141.08	x	x	5073.63	14:25	Run #1 used to collect in field measurements and parameters. Fluorescein measurements ~13ppb. Geofirma notified PM and NWMO. Collected by landing probe on the sampling port.
2023-12-08 14:55	INT 009	2	x	x	x	x	4.55	x	x	5073.17	x	5187.78	x	30 min	5141.45	x	x	5072.89	16:25	Run #2 was used to confirm fluorescein measurements, the rest of the sample water was kept in HDPE bottle to be 'archived'. Collected by landing probe on the sampling port.
2023-12-09 8:40	INT 009	3	x	x	x	x	0.26	x	x	5064.67	x	5198.05	x	36 min	5186.77	x	x	5064.64	10:10	Run #3 used to collect noble gases and SIO2. Collected by landing probe on the sampling port.
2023-12-09 10:30	INT 009	4	x	x	x	x	4.4	x	x	5076.28	x	5195.26	x	37.5	5142.20	x	x	5077.01	11:45	Run #4 was used to collect 18O/2H/3H, metals and DOC. Collected by landing probe on the sampling port. Five WB sample bottles in chain used for this run
2023-12-09 12:00	INT 009	5	x	x	x	x	4.5	x	x	5076.91	x	5181.80	x	31	5111.10	x	x	5076.64	13:05	Run #5 was used to collect 14C, 13C, sulfide, nutirents, ammonia, archive and Pi measurements. Colected by landing probe on the sampling port. Five WB sample bottles in chain used for this run
2023-12-09 13:20	INT 009	6	x	x	x	x	4.06	x	x	5076.15	x	5172.42	x	30	5099.48	x	x	5075.89	14:25	Run #6 was used to collect 129I/36Cl, Ru and gen chem. Collected by landing probe on the sampling port. Five WB sample bottles in chain used for this run
2023-12-09 14:45	INT 009	7	x	x	x	x	4.1	x	x	5076.16	x	5167.55	x	30	5093.49	x	x	5075.88	15:50	Run #7 was used to collect 37Cl, 87Sr/86Sr and gen chem. Colected by landing probe on the sampling port. Five WB sample bottles in chain used for this run
2023-12-10 8:10	INT 019	1	x	x	x	x	3.95	x	x	934.95	x	1134.49	x	15 min	1125.08	x	x	935.36	8:45	Run #1 used to collect in field measurements and parameters. Colected by landing probe on the sampling port. Five WB sample bottles in chain used for this run
2023-12-10 9:05	INT 019	2	x	x	x	x	4.22	x	x	934.60	x	1126.20	x	15 min	1117.28	x	x	935.00	9:35	Run#2 used to collect 129I/36Cl, ammonia and nutrients Colected by landing probe on the sampling port. Five WB sample bottles in chain used for this run
2023-12-10 9:50	INT 019	3	x	x	x	x	4.15	x	x	934.56	x	1118.33	x	12 min	1109.07	x	x	934.63	10:15	Run #3 used to collect 37Cl, 87Sr/86Sr and 1/2 gen chem Colected by landing probe on the sampling port. Five WB sample bottles in chain used for this run
2023-12-10 10:30	INT 019	4	x	x	x	x	3.89	x	x	934.11	x	1110.44	x	11 min	1101.24	x	x	934.25	11:00	Run #4 used to collect 18O/2H/3H and 1/2 gen chem. Colected by landing probe on the sampling port. Five WB sample bottles in chain used for this run
2023-12-10 11:20	INT 019	5	x	x	x	x	4.51	x	x	933.85	x	1102.39	x	15 min	1093.77	x	x	934.24	11:50	Run #5 used to collect 14C, 13C, DOC, sulfide, metals and archive. Colected by landing probe on the sampling port. Five WB sample bottles in chain used for this run
2023-12-10 12:10	INT 019	6	x	x	x	x	0.35	x	x	921.87	x	1095.94	x	5 min	1093.39	x	x	921.93	12:35	Run #6 used to collect noble gases and Ru. Collected by landing probe on the sampling port. Five WB sample bottles in chain used for this run

Note: Record field parameter measurements on *20-203-01: Field Parameter Measurement/Testing - Field Data Sheet*

Completed by:	MEOR	Verified by:	AMSC
Date:	10-Dec-23	Date:	19-Jan-24

GEOFIRMA ENGINEERING

20-203-1: Field Parameter Measurement/Testing - Field Data Sheet

NWMO Ignace Westbay Monitoring

Well ID:	IG_BH03	Multiparameter Probe:	Horiba U52 (SN.SRGWN2Y6)	Other Notes/Comments	**IG_BH03_GW024** - Primary Sample for **INT002 - NG Only** **IG_BH03_GW025** - Duplicate Sample for **INT002 - NG only**
Date(s):	Dec 01 - 02 2023	Fluorometer:	AquaFluor (SN.807511)		
Operator(s):	AMSC, MEOR	Colorimeter:	DR900 (SN. 200660001027)		

Port ID	Cumulative Purge/Sampled Volume (L)	Measurement Date and Time	Multiparameter Probe								Fluorometer		Hydrometer	Colorimetric				Alkalinity		Sample Collected (Y/N)	Collected by (Initial)	Comments (sampling run #, sample ID, water colour or odour, etc.)
			Calibrated	pH	Temp (°C)	EC (mS/cm)	ORP (mV)	DO (mg/L)	Turbidity (NTU)	TDS (g/L)	Calibrated	Fluorescein (ppb)	Specific Gravity	Calibrated	Dissolved Oxygen (mg/L)	Dissolved Ferrous Iron Fe^{2+} (mg/L)	Total Dissolved Sulphide S^{2-} (mg/L)	Phenol. (mg/L)	Total as $CaCO_3$ (mg/L)			
INT002	6	2023-12-02 10:35	Y	8.37	5.77	4.67	223	0.34	48.3	2.99	Y	6.530	1.010	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. Turbidity reading unreliable as calibratiion was not successful (note that cal check for the turb was good and as-received calibration passed). MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing, not the formation.**
INT002	12	2023-12-01 11:32	Y	9.79	4.33	4.50	194	0.00	48.7	2.88	Y	6.959	1.010	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. Turbidity reading unreliable as calibratiion was not successful (note that cal check for the turb was good and as-received calibration passed). MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing, not the formation.**
INT002	15	2023-12-01 12:30	Y	10.22	3.99	4.27	184	0.00	45.0	2.73	Y	7.029	1.010	-	-	-	-	-	-	N	AMSC	Parameters collected during purging. Pump set at ~85m. Turbidity reading unreliable as calibratiion was not successful (note that cal check for the turb was good and as-received calibration passed). MOSDAX probe was attached to port but valve remained close, therefore these **parameters are only representative of water within the MP38 casing, not the formation.**
INT002	N/A	2023-12-02 12:00	-	-	-	-	-	-	-	-	Y	3.247	-	-	-	-	-	-	-	Y	MEOR	Measurements collected from Run #1 , **collected by landing probe on the sampling port**. Confirmatory measurements for noble gas sampling. Sample water from run #1 was also placed in the horiba cup, but not enough water collected to get measurements.
INT002	N/A	2023-12-02 14:20	Y	8.51	5.55	51.5	-150	4.38	19.5	30.9	-	-	1.030	-	-	-	-	-	-	Y	MEOR	Measurements collected from Run #2 , **collected by landing probe on the sampling port**. Confirmatory measurements for noble gas sampling. Additional sample water from run #2 was added to the horiba measuring cup to collect field readings. Therefore half of the sample water was exposed to air for ~2hours before readings were taken. Readings taken after sample was in measuring cup for 5 mins, DO and ORP measurement flagged due to air exposure. Turbidity reading unreliable as calibratiion was not successful (note that cal check for the turb was good and as-received calibration passed).

Completed by:	MEOR/AMSC	Verified by:	MEOR
Date:	02-Dec-23	Date:	25-Jan-24

20-203-1: Groundwater Sampling - Field Data Sheet

Well ID:	IG_BH03		**Start Time**	9:25	
MP38 Water Level Before Sampling:	65.38	m BTOC	**Starting Ambient Pressure**	93.48	kPa
MP38 Water Level After Sampling:	65.46	m BTOC	**End Sampling Time**	14:40	
Probe Serial #/Range	EMS5523/ 2000psi		**Ending Ambient Pressure**	93.45	kPa
Date:	02-Dec-23				

Other Notes/Comments: **IG_BH03_GW024** - Primary Sample for **INT002 - NG Only**
IG_BH01_GW025 - Duplicate Sample for **INT002 - NG only**

Sampling Run Start Date/Time	Port #	Run #	Function Tests/Preparation						Landed Port	Sampling Sequence									Sampling Run End Time	Comments (volume recovered, parameters measured, samples collected, etc)
			Shoe-Out	Close Valve	Vaccum Check	Open Valve	Evacuate Bottles (<35 kPa)	Close Valve		Landed Westbay MP38 Pressure (pre-sample, kPa)	Shoe-Out	Zone Pressure (pre-sample, kPa)	Open-Valve	Stablization Time	Zone Pressure (post-sample kPa)	Close Valve	Shoe-In	Landed Westbay MP38 Pressure (post-sample, kPa)		
2023-12-02 9:25	INT002	1	x	x	x	x	0.44	x	x	8254.78	x	8380.71	x	25 min	8355.7	x	x	8253.75	11:47	Noble gas sampling, 3 x Cu tubes in a string below WB stainless steel sample bottle. Full 250ml of pressurized sample water recovered in the top bottle. Run used for primary sample: IG_BH03_GW024. Fluorecein measurement collected. Collected by landing probe on the sampling port.
2023-12-02 12:05	INT002	2	x	x	x	x	0.03	x	x	8254.87	x	8369.18	x	25 min	8345.17	x	x	8253.76	14:10	Noble gas sampling, 3 x Cu tubes in a string below WB stainless steel sample bottle. Full 250ml of pressurized sample water recovered in the top bottle. Run used for dupliacte sample: IG_BH03_GW025. Horiba measurements collected. Collected by landing probe on the sampling port.

Note: Record field parameter measurements on *20-203-01: Field Parameter Measurement/Testing - Field Data Sheet*

Completed by:	MEOR	Verified by:	AMSC
Date:	02-Dec-23	Date:	19-Jan-23

20-203-1: Chain of Custody Tracking Sheet

COC Number/ID	Sample ID(s)	Shipping Information						Receiving Information				Comments
		Shipped Date	Shipped Time	Temp. Shipped (deg C)	COC Signed by Geofirma (Y/N)	Shipping Address	Shipping Method	Received Date	Received Time	Temp Received (deg C)	COC Signed By Receiving Lab (Y/N)	
GFIM_BVL_0019	IG_BH01_GW072 IG_BH01_GW074 IG_BH01_GW075	11-Dec-23	7:00	<10	Y	Bureau Veritas Labs 946 Cobalt Crescent Thunder Bay, ON	Hand Delivered	11-Dec-23	14:00	5,5,5	Y	No ice put in cooler as the cooler was exposed to outdoor temps <0 deg C, and delivered directly to BVL fridge.
GFIM_NWMO_0010	IG_BH01_GW074 IG_BH01_GW075	10-Dec-23	15:00	<10	Y	NWMO Office - Ignace 304 Main St Ignace ON P0T 1T0	Hand Delivered	10-Dec-23	15:25	<10	Y	
GFIM_IT2_0010	IG_BH01_GW073 IG_BH01_GW074 IG_BH01_GW075	11-Dec-23	7:00	<10	Y	Isotope Tracer Technologies 608 Weber St. N Unit3, Waterloo, ON N2V 1K4	Courier	12-Dec-23	n/a	n/a	Y	
GFIM_UofO_0010	IG_BH01_GW074 IG_BH01_GW075	15-Dec-23	10:00	<10	Y	University of Ottawa 25 Templeton St., Ottawa ON K1N 6N5	Hand Delivered	15-Dec-23	10:05	n/a	Y	
GFIM_UofOxford_0004	IG_BH03_GW024 IG_BH03_GW025 IG_BH01_GW067 IG_BH01_GW068 IG_BH01_GW069 IG_BH01_GW070 IG_BH01_GW071 IG_BH01_GW074 IG_BH01_GW075	11-Dec-23	7:00	n/a	Y	Univeristy of Oxford Department of Earth Science South Parks Road Oxford UK OX1 3AN	Hand Delivered	19-Dec-23	15:12	n/a	Y	

Completed by:	AMSC	Verified by:	MEOR
Date:	19-Dec-23	Date:	25-Jan-24

20-203-1: Laboratory Data Quality Confirmation Report

Laboratory Report Date	02-Jan-24
Laboratory Name	**Bureau Veritas**
Laboratory Report ID (If applicable)	C3BE209
Analyses Completed	Major and Trace Elements and Metals; Total dissolved sulphur; Total dissolved iron; Reactive silica; Sulphide; Anions; pH; Alkalinity; Fluoride; TIC; TOC; DOC; TKN; Total Phosphorus; Total Ammonia; Total Nitrogen; Carbonate, Bicarbonate and Hydroxide + Turbidity

Associated COC #(s)	GFIM_BVL_0019

Samples Included in Laboratory Report
IG_BH01_GW072 IG_BH01_GW074 IG_BH01_GW075

Quality Check and Verification	Verified By (Initials)	Comments
Results received from laboratory	AMSC	
All samples were tested or accounted for. Justification provided for any untested samples (e.g. spare sample)	AMSC	
Laboratory data report provided with results	AMSC	
Laboratory testing methods/techniques included in data report	AMSC	
Laboratory QA procedures and equipment calibration included in data report	AMSC	
Laboratory results are within reasonable/expected range	AMSC	

Other Comments/Notes:

Note: A copy of this form is to be complete for each laboratory data report that is received by Geofirma

Completed by:	AMSC	Verified by:	MEOR
Date:	02-Jan-24	Date:	25-Jan-24

20-203-1: Laboratory Data Quality Confirmation Report

Laboratory Report Date	**2024-04-08**
Laboratory Name	**Isotope Tracer Technologies (IT^2)**
Laboratory Report ID (If applicable)	**231159**
Analyses Completed	$\delta^{18}O$, $\delta^{2}H$, Trtrium (^{3}H), $^{87}Sr/^{86}Sr$, $\delta^{37}Cl$, $\delta^{13}C$, ^{14}C

Associated COC #(s)	GFIM_IT2_0010

Samples Included in Laboratory Report
IG_BH01_GW073 IG_BH01_GW074 IG_BH01_GW075

Quality Check and Verification	Verified By (Initials)	Comments
Results received from laboratory	AMSC	
All samples were tested or accounted for. Justification provided for any untested samples (e.g. spare sample)	AMSC	
Laboratory data report provided with results	AMSC	
Laboratory testing methods/techniques included in data report	AMSC	
Laboratory QA procedures and equipment calibration included in data report	AMSC	
Laboratory results are within reasonable/expected range	AMSC	

Other Comments/Notes:
[2024-04-22]: $\delta^{37}Cl$ is above what has been observed previously, requested the lab review and confirm. Awaiting response.

Note: A copy of this form is to be complete for each laboratory data report that is received by Geofirma

Completed by:	AMSC	Verified by:	MEOR
Date:	22-Apr-24	Date:	24-Apr-24

20-203-1: Laboratory Data Quality Confirmation Report

Laboratory Report Date	2024-04-17; 2024-05-21
Laboratory Name	**University of Ottawa**
Laboratory Report ID (If applicable)	N/A
Analyses Completed	^{129}I & ^{36}Cl

Associated COC #(s)	GFIM_UofO_0010

Samples Included in Laboratory Report
IG_BH01_GW074 IG_BH01_GW075

Quality Check and Verification	Verified By (Initials)	Comments
Results received from laboratory	AMSC/MdK	
All samples were tested or accounted for. Justification provided for any untested samples (e.g. spare sample)	AMSC/MdK	
Laboratory data report provided with results	AMSC/MdK	
Laboratory testing methods/techniques included in data report	AMSC/MdK	
Laboratory QA procedures and equipment calibration included in data report	AMSC	
Laboratory results are within reasonable/expected range	AMSC	

Other Comments/Notes:
[2024-04-19]: Received 36Cl results. [2024-05-21]: Received 129I results.

Note: A copy of this form is to be complete for each laboratory data report that is received by Geofirma

Completed by:	AMSC / MdK	Verified by:	MEOR
Date:	2024-04-22 / 2024-05-27	Date:	29-May-24