



Appendix B.1

Final - Hydrogeological Investigation Report,
Golder Associates



REPORT

Fifteen Mile Stream Gold Project
Hydrogeological Investigation

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1895674-003-Rev2

September 10, 2019



Distribution List

1 PDF Copy - Atlantic Mining NS Corp

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Executive Summary

Atlantic Mining NS Corp (AMNS), a wholly owned subsidiary of St. Barbara Ltd., is planning to develop the Fifteen Mile Stream Gold Project (the Project) located approximately 115 km east of Halifax, in Halifax County, in the province of Nova Scotia.

The objectives of the hydrogeological investigation were to collect baseline data on the local groundwater levels, groundwater quality, and overburden and shallow bedrock hydraulic characteristics including hydraulic conductivities.

A borehole drilling investigation was carried out and consisted of drilling at 14 locations over the site. Total drilling length for this investigation, combining overburden and rock lengths, was 290.22 m. Monitoring wells were installed in each borehole (with the exception of FMS-HG18-02X). Monitoring wells were completed at ground surface with a protective steel monument casing.

Findings of the hydrogeological investigation are summarized below.

Overburden and Bedrock

- The subsurface stratigraphy findings generally consist of a thin, discontinuous layer of topsoil (less than 0.10 m in thickness), followed by a discontinuous layer of fill, up to 1.52 m in thickness. The fill on-site is generally sourced from local materials that have been reworked as part of the historical land use.
- Underlying the discontinuous topsoil and fill is generally a compact to very dense glacial till, typically consisting of silty sand to silty gravel and frequently containing cobbles and/or boulders.
- The depth of the overburden varies across the site, and was observed to range from 1.01 to 6.32 m in the 2018 boreholes, with typical overburden depth ranging from 2 to 4 m.
- The bedrock consisted of slightly weathered to fresh, thinly to medium bedded, grey, medium, and fine grained, medium strong to strong Greywacke-Argillite to Argillite-Greywacke.
- No major features such as faults were observed during the FMS hydrogeological drilling program.

Groundwater Levels

- The groundwater levels measured were shallow, ranging from 0.13 to 4.95 mbgs (103.44 to 160.52 m relative to CGVD28). The groundwater elevations are similar, with less than 2 m difference, when comparing the bedrock (A) and bedrock-soil interface (B) wells at each location. Groundwater elevations at most borehole locations indicate slight downward or nearly neutral gradients.
- The hydrographs for wells generally show consistent groundwater levels over the monitoring period to date. Some fluctuation in groundwater levels is apparent, likely related seasonal variation and related to precipitation events.

Hydraulic Conductivity

The hydraulic conductivity of the subsurface materials at FMS was estimated by packer tests, single well response tests, and grain size analyses. The results are summarized as follows:

- The results of the packer testing program show a wide range of hydraulic conductivity across the area tested, ranging from 7×10^{-8} m/s to 6×10^{-5} m/s.
- The results of the rising head SWRT estimated hydraulic conductivities of the 'A' wells installed into the bedrock ranged from 6×10^{-8} m/s to 1×10^{-5} m/s and estimated hydraulic conductivities of the 'B' wells installed across the overburden-bedrock interface ranged from 1×10^{-7} m/s to 4×10^{-5} m/s.
- Estimates of hydraulic conductivity of select soil samples range from 4×10^{-9} m/s to 4×10^{-6} m/s.

Geochemistry

Bulk metals analyses were conducted on all twelve samples. The results of the bulk metals analyses are summarized as follows:

- Arsenic and bismuth concentrations are observed to be greater than ten times the average crustal abundance in the majority of samples.
- Lead concentrations are observed to be greater than ten times the average crustal abundance in sample FMS-HG18-06A, OS2.
- Antimony concentrations are observed to be greater than five times the average crustal abundance in two samples.
- All other constituents were detected at concentrations less than five times the average crustal abundance in all samples.

Acid Base Accounting (ABA) was completed on six samples. The results are summarized as follows:

- All samples have sulphide and total sulphur contents less than 0.2%, paste pH values above 5.5, and AP values less than 4 t CaCO_3 /1000 t. Sulphide content in all samples is below the 0.4 wt% and 12.51 kg H_2SO_4 /t exemption limits, described in Section 5, Subsection A of the Nova Scotia Sulphide Bearing Material Disposal Regulation (N.S. Reg. 57/95). However, applicability of this data, with respect to the regulation, is dependant upon the actual area and location of overburden to be removed. Low NP values result in NPR values below 2 for some samples; however, based on the low sulphide, sulphur, and AP values, all samples are expected to be non-acid generating.

Short-term leach testing was conducted on six samples and compared to the Canadian Environmental Quality Guidelines (CEQG) for the Protection of Freshwater Aquatic Life. The results are summarized as follows:

- The pH for all samples ranged from 5.2 to 7.3.
- Nitrate was greater than CEQG in three samples.
- Aluminum was greater than CEQG in four samples.
- Arsenic was greater than CEQG in three samples.
- Copper was greater than CEQG in two samples.

- Iron was greater than CEQG in one sample.
- Lead was greater than CEQG in one sample.
- Nickel was greater than CEQG in one sample.
- Zinc was greater than CEQG in three samples.
- All other parameters were below CEQGs.

Groundwater Quality

All groundwater quality results were compared to the Guidelines for Canadian Drinking Water Quality (CDWQ) and the Nova Scotia Environment Pathway Specific Standards for Groundwater (NSE PSS) for groundwater discharging to surface water (0-10 m from a fresh water body). The results of the laboratory analysis are summarized as follows:

- PHC/BTEX, and total and free cyanide were not detected in any of the samples collected.
- Total mercury exceeded the NSE PSS in two wells in September 2018, and total and dissolved mercury exceeded the NSE PSS in one well in November 2018. Total and dissolved mercury did not exceed the CDWQ in any samples collected in September 2018, November 2018, March 2019, or June 2019.
- Metals parameters exceeding the NSE PSS during the monitoring events included total mercury and dissolved aluminum, arsenic, cadmium, cobalt, copper, iron, manganese, mercury, selenium, silver, and zinc. It should be noted that the laboratory detection limit for dissolved cadmium is greater than the NSE PSS. Dissolved arsenic exceeded the CDWQ in seven wells in September 2018. Dissolved arsenic exceeded the CDWQ in six wells in November 2018, all of which also exceeded in September 2018. Dissolved arsenic exceeded the CDWQ in five wells in March 2019, all except one of which also exceeded in the 2018 sampling. Dissolved arsenic exceeded CDWQ in six wells in June 2019, all of which also exceeded in the previous sampling.
- Dissolved manganese exceeded the CDWQ in 13 wells. Health Canada established a guideline for manganese in May 2019. Previous sampling events were not compared to the new Health Canada CDWQ guideline; however, concentrations reported for the June 2019 sampling event are consistent with manganese concentrations from previous sampling events.
- Aluminum, iron, and zinc exceeded aesthetic objectives/operational guidance values in multiple wells during all monitoring events.
- No other metals parameters exceeded CDWQ MAC.

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Groundwater Quality Results

1.0 INTRODUCTION

Atlantic Mining NS Corp (AMNS), a wholly owned subsidiary of St. Barbara Ltd., is planning to develop the Fifteen Mile Stream Gold Project (the Project) located approximately 115 km east of Halifax, in Halifax County, in the province of Nova Scotia (NS) [Figure 1].

This factual report is intended to present the results of the hydrogeological baseline study and field investigation, with the objective of supporting the Environmental Impact Statement (EIS) process necessary to develop the Project.

1.1 Overview of the Fifteen Mile Stream Project

AMNS is planning to construct, operate, and eventually reclaim a new open pit gold mine at the Project site, which is defined by the red boundary noted on Figure 1. The proposed site infrastructure layout is also presented in Figure 1, which may be refined as a result of ongoing consultation and engineering studies. The major proposed Project components are expected to consist of:

- Open pit
- Tailings Management Facility
- Ore Stockpile
- Waste Rock Stockpile
- Till Stockpile
- Plant Site

These facilities will be supported by other infrastructure as required during the construction, operations, and closure of the Project.

1.2 Coordinate, Datum, and Unit Systems

All coordinates given in this report are referenced to North American Datum 1983 (NAD83(CSRS)), Universal Transverse Mercator (UTM) Grid Projection Zone 20. All vertical levels discussed in this report are referenced to Canadian Geodetic Vertical Datum of 1928 (CGVD28).

This report is presented using the International System of Units (SI), where length is described in meters (m), mass in kilograms (kg), and pressure in Pascals (Pa).

2.0 OBJECTIVES

The objectives of the hydrogeological investigation were to collect baseline data on the local groundwater levels, overburden and groundwater quality, and overburden and shallow bedrock hydraulic characteristics, including hydraulic conductivities. The baseline hydrogeological data will inform the creation of three-dimensional groundwater flow, solute transport models, and provide a hydrogeological technical background for the EIS submission for the FMS project.

3.0 BACKGROUND INFORMATION

This section outlines the site background information related to surficial geology, bedrock geology, and groundwater.

3.1 Surficial Geology

The surficial geology at FMS is characterized by stony till plains and/or silty till plains (ground moraine). The topography is flat to rolling, with many exposed boulders and elongated drumlins or oval hills partially covered by till from the Wisconsinan glaciation. The till is a mix of material derived from local bedrock sources, with a stony to silty sand matrix. The till plains and drumlins are generally 2 m to 30 m in thickness (N.S. DNR, 1992).

3.2 Bedrock Geology

The FMS site lies within the Goldenville Formation, comprising sandstone turbidites and slate of Cambrian age.

Gold mineralization at FMS occurs in rocks of the Moose River member of the Goldenville Formation, in the Meguma Terrane, similar to AMNS's Touquoy Gold Project, located approximately 37 km west (Plate 1). The deposits consist of disseminated and vein-hosted gold located within a folded sequence.

The main FMS deposit, Egerton-MacLean, will expose an overturned anticline and a syncline with beds dipping mainly to the north. The south limb is offset by a normal fault referred to as the Seigel fault, which marks a change in the bedding dip from moderately north dipping (north of the fault) to steeply north dipping (south of the fault) (N.S. DNR, 2000).

3.3 Groundwater

The Nova Scotia Well Logs Database (N.S. DNR, 2018) was queried to find well records near the Project. No wells were identified close to the Project, with the nearest wells located approximately 15 km to the north and south.

Provincial scale mapping identifies the FMS area as having a high relative risk of arsenic in groundwater at concentrations exceeding drinking water health guidelines (Kennedy, 2017). The FMS area falls within the area mapped as less likely to have groundwater concentrations of uranium (and related radionuclides) that exceed the drinking water health guidelines (O'Reilly, 2009).

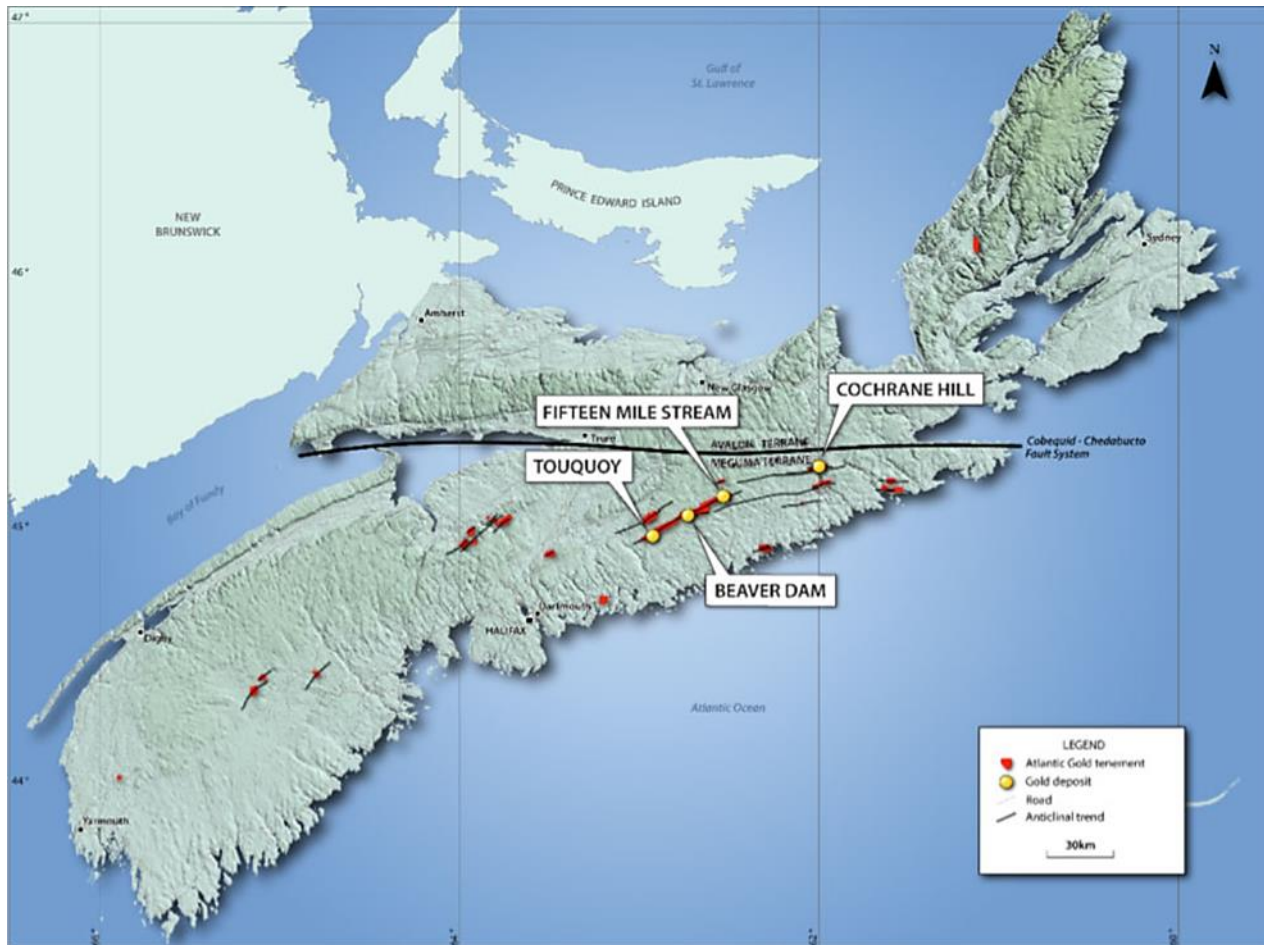


Plate 1: AMNS Deposits and Anticline Trends (AMNS Website)

4.0 INVESTIGATION METHODOLOGY

This section describes the site investigation program, including the number and location of boreholes. Herein is described the methodology for borehole drilling, the installation of monitoring wells, and collecting groundwater levels. Hydraulic conductivity testing is described in Section 4.5 and laboratory testing of overburden and groundwater samples collected during the field investigation is outlined in Section 4.6.

4.1 Borehole Locations

The in-field investigations were carried out at 14 drilling locations over the site. At each drilling location up to two monitoring wells were installed within individual offset boreholes. The completed borehole/monitoring well locations are shown on Figure 1 and listed in Table 1 below. The location surveying was conducted by WSP, with coordinates received on August 29, 2018. Borehole locations are denoted as FMS-HG18-01 through to FMS-HG18-16, with the exception of proposed locations FMS-HG18-01 and FMS-HG18-12, which were removed from the scope during the investigation.

Table 1: Borehole Locations and Elevations

Borehole/ Monitoring Well ID	Coordinates (UTM Zone 20, NAD83(CSRS))		Ground Surface Elevation (m CGVD28)	Drilled Depth (mbgs ¹)
	Northing (m)	Easting (m)		
FMS-HG18-02A	536074.78	5001177.74	135.97	24.24
FMS-HG18-02B	536073.90	5001174.33	135.85	8.22
FMS-HG18-02X	<i>Abandoned borehole located adjacent to FMS-HG18-02A</i>			
FMS-HG18-03A	537293.47	4999550.33	121.58	12.08
FMS-HG18-03B	537290.61	4999550.81	121.77	7.05
FMS-HG18-04A	535801.11	4998824.55	106.66	25.74
FMS-HG18-04B	535800.77	4998822.68	106.67	7.79
FMS-HG18-05A	537263.21	4998507.48	113.53	13.81
FMS-HG18-05B	537262.41	4998509.10	113.68	6.36
FMS-HG18-06A	537513.23	4998697.25	111.97	8.36
FMS-HG18-07A	537889.27	4998795.88	112.98	12.37
FMS-HG18-07B	537883.79	4998796.17	112.78	4.85
FMS-HG18-08A	537612.69	4997771.11	140.03	13.93
FMS-HG18-08B	537611.40	4997771.21	139.98	6.45
FMS-HG18-09A	538367.38	4999479.78	123.58	12.38
FMS-HG18-09B	538367.24	4999477.38	123.62	6.32
FMS-HG18-10A	539251.88	4998600.50	140.31	12.30
FMS-HG18-10B	539248.83	4998600.75	140.19	6.56
FMS-HG18-11A	538575.33	4997758.94	162.38	10.92
FMS-HG18-11B	538573.36	4997760.25	162.41	4.94
FMS-HG18-13A	539918.74	4997839.08	151.29	12.43
FMS-HG18-13B	539918.74	4997839.08	151.33	3.08

Borehole/ Monitoring Well ID	Coordinates (UTM Zone 20, NAD83(CSRS))		Ground Surface Elevation (m CGVD28)	Drilled Depth (mbgs ¹)
	Northing (m)	Easting (m)		
FMS-HG18-14A	536802.34	4998352.85	116.89	13.81
FMS-HG18-14B	536804.30	4998352.73	116.97	7.83
FMS-HG18-15A	536367.44	4998746.87	107.46	10.83
FMS-HG18-15B	536367.09	4998743.63	107.56	4.17
FMS-HG18-16A	540442.99	4999567.69	142.17	11.02
FMS-HG18-16B	540445.43	4999567.50	142.19	5.65

Note:

1. Meters below ground surface (mbgs)

Borehole locations were selected to provide broad coverage of the proposed site facility areas; and due to proximity to key infrastructure such as proposed pit, dam and processing facility locations and existing surface water features.

Borehole locations were constrained by the existing access road network, property access agreements, and offsets from environmentally sensitive areas.

4.2 Borehole Drilling

Borehole drilling for this investigation was carried out between May 29 to June 16, 2018, and July 30 to August 14, 2018. Drilling was performed by Logan Drilling Group (Logan) of Stewiacke, Nova Scotia using CME drill rigs mounted on tracked carriers. One CME-75 type rig was dedicated for the duration of the program, and the second Logan drill team used two rigs (CME-55 and CME-45) based on availability. Logan was contracted to AMNS but was supervised during borehole drilling by Golder staff, who logged the soil and rock samples at the drill rig as they were recovered.

Drilling through the overburden was advanced with a rotary tricone bit with water flush. "HTW" size casing was advanced through the overburden and into the upper bedrock to prevent collapse of the borehole. Standard Penetration Testing (SPT) was carried out at 0.0 m and 0.6 m depth, and then at 0.75 m intervals to collect soil samples for geological and geotechnical characterization. An oversized split spoon was used to sample for chemical characterization, taken over the same depth interval as the standard size split spoon at the corresponding sample number. The oversized split spoon samples were taken for each unique overburden unit encountered at each borehole location. In areas of difficult advance, the overburden was drilled with HQ coring equipment, and SPT samples were collected opportunistically when ground conditions allowed. Often in difficult advance areas, the SPT sample recovery was low, and oversized split spoon samples for chemical characterization were not attempted. The overburden encountered did not meet the criteria for Shelby tube sampling.

Drilling through bedrock was advanced by coring with triple tube HQ3 size equipment. Casing was not advanced past the top of competent bedrock unless unstable or permeable rock was encountered at deeper depths.

Geotechnical logging of the rock core recovered included rock type and description, Total Core Recovery (TCR), Solid Core Recovery (SCR), Rock Quality Designation (RQD), fracture index, feature measurements and characterization, and strength and weathering classification.

The first and deepest borehole (denoted "A") at each location was advanced into bedrock to the depth at which the criteria to terminate the borehole was met. The borehole termination criteria began with minimum Rock Quality Designation (RQD) above 80% for at least the final 3.0 m and was later increased to 4.5 m based on the good quality shallow rock encountered at the beginning of the program. In addition to RQD criteria, the rock mass was judged to be characteristic of the site competent rock, such that weathering, alteration, micro-defect intensity, and strength were not observed to negatively impact the rock mass behaviour. Additionally, the borehole termination criteria specified that a minimum borehole depth of 10 m and a minimum rock depth of 6 m were to be reached. Following completion of drilling, borehole A underwent packer testing (detailed in Section 4.5), and a monitoring well was installed in the bedrock.

The second borehole (denoted "B") at each drilling location was advanced to a target depth for the purpose of installing a second, shallower well screened across the bedrock/overburden interface. Soils were only logged in the first borehole at each location while bedrock was logged in both the first and second boreholes. At the FMS site, no third boreholes (denoted "C") were drilled for overburden well installations because the overburden thickness was less than 10 m at all borehole locations.

During the drilling program, a total of 43.96 m of overburden was logged, with a total of 89.94 m of overburden drilled, including all secondary (B) drillholes advanced at each of the drilling sites. A total of 200.28 m of rock was drilled and logged in full, including primary (A) and secondary (B) drillholes at each of the drilling sites. Total drilling length for this investigation, combining overburden and rock lengths, was 290.22 m.

At location FMS-HG18-02, the first borehole to be drilled had to be abandoned, due to collapsing borehole walls. This borehole was denoted FMS-HG18-02X, and a replacement borehole was then drilled adjacent this location following the procedures for the first borehole. At location FMS-HG18-06, the first borehole encountered an underground mine opening and could not advance beyond the mine opening due to risk of damage to the drilling equipment. No subsequent boreholes were drilled at site FMS-HG18-06, due to the high probability of intersecting more historic mining openings.

4.3 Monitoring Wells

Monitoring wells were installed in each borehole (with the exception of FMS-HG18-02X) with screens at the intervals summarized in Table 2 below. Wells were constructed as standpipe piezometers with nominal 50 mm (2") diameter PVC screen and risers. Except for FMS-HG18-06A, the annulus around the screen intervals were backfilled with graded clean silica sand, and the annulus above the screen interval were sealed with bentonite. Well FMS-HG18-06A was installed into an open void interpreted to be a former mine working; therefore, no sand pack could be installed around the screen and the riser annulus was backfilled with caved-in material and bentonite. Monitoring wells were completed at ground surface with a protective steel monument casing.

After installation of each monitoring well, the well was developed with a Waterra Hydrolift inertial pump system by pumping at least 10 well volumes of water from the well, or until the well was pumped dry. Basic water quality

parameters were measured regularly during well development to monitor for changes as the development progressed.

Table 2: Monitoring Well Screen Intervals

Borehole/Monitoring Well ID	Screen Interval (mbgs)	Screen Interval (m CGVD28)
FMS-HG18-02A	17.36 - 20.41	118.61 - 115.56
FMS-HG18-02B	2.46 - 7.03	133.39 - 128.82
FMS-HG18-03A	8.93 - 11.98	112.65 - 109.60
FMS-HG18-03B	3.84 - 6.89	117.93 - 114.88
FMS-HG18-04A	14.88 - 20.98	91.78 - 85.68
FMS-HG18-04B	4.07 - 7.12	102.60 - 99.55
FMS-HG18-05A	9.17 - 13.70	104.36 - 99.83
FMS-HG18-05B	2.84 - 5.89	110.84 - 107.79
FMS-HG18-06A	3.33 - 6.38	108.64 - 105.59
FMS-HG18-07A	7.68 - 10.73	105.30 - 102.25
FMS-HG18-07B	1.71 - 4.76	111.07 - 108.02
FMS-HG18-08A	10.29 - 13.34	129.74 - 126.69
FMS-HG18-08B	1.39 - 5.96	138.59 - 134.02
FMS-HG18-09A	8.98 - 12.03	114.60 - 111.55
FMS-HG18-09B	3.14 - 6.19	120.48 - 117.43
FMS-HG18-10A	9.22 - 12.27	131.09 - 128.04
FMS-HG18-10B	1.90 - 6.47	138.29 - 133.72
FMS-HG18-11A	7.87 - 10.92	154.51 - 151.46
FMS-HG18-11B	1.85 - 4.90	160.56 - 157.51
FMS-HG18-13A	9.38 - 12.43	141.91 - 138.86
FMS-HG18-13B	2.52 - 5.57	148.81 - 145.76
FMS-HG18-14A	9.55 - 12.60	107.34 - 104.29

Borehole/Monitoring Well ID	Screen Interval (mbgs)	Screen Interval (m CGVD28)
FMS-HG18-14B	1.86 - 6.43	115.11 - 110.54
FMS-HG18-15A	7.73 - 10.78	99.73 - 96.68
FMS-HG18-15B	1.03 - 4.08	106.53 - 103.48
FMS-HG18-16A	7.86 - 10.91	134.31 - 131.26
FMS-HG18-16B	2.42 - 5.47	139.77 - 136.72

Well installations details are provided on the borehole log records in Appendix A.

4.4 Groundwater Levels

Groundwater levels in the FMS monitoring wells are monitored manually, with an electric water level probe. Some wells have also had dataloggers installed to record water levels automatically. Pressure transducer dataloggers have been installed in both A and B wells at locations FMS-HG18-02, -04, -05, -07, -09, and -10. Groundwater levels are measured in the field relative to a surveyed reference point (typically the top of the PVC riser pipe) so they can be converted to equivalent groundwater elevations for comparison across the site.

4.5 Hydraulic Conductivity Testing

Hydraulic Conductivity Testing was conducted in two phases as part of the field investigation. The below sections describe the methodology for packer testing and single well response testing as carried out during the program.

4.5.1 Packer Testing

After completion of drilling at each borehole A, the borehole was flushed with clear water to remove drill cuttings, and packer testing was carried out with a wireline single packer assembly. Due to the ground conditions at FMS-HG18-06A, as previously described, no packer test could be carried out.

The packer assembly was located with a bit stop at the end of the drill rod string and was positioned as close to the top of the bedrock as rock quality would allow. The testing interval was therefore from the bottom of the packer assembly to the bottom of the borehole. Testing consisted of a falling head test (FHT) performed by filling the drill rods with water and monitoring the recovery with manual measurements and dataloggers. If recovery during the FHT was rapid (less than 30 minutes for full recovery) or if additional test data was required, a constant rate injection test (CRI) was carried out. In many cases where bedrock and water levels were shallow, not enough head change could be created and measured due to the dimensions of the packer and testing assembly. In these cases, a CRI was performed in place of the FHT. The interval water pressure was continuously measured by a dedicated datalogger installed below the packer assembly within the testing interval. For monitoring purposes during the testing, a second datalogger with real-time data readout was used. For FHT, the monitoring datalogger was lowered into the water column in the drill rod string and compared with manual water levels taken with an

electric water level probe. For the CRI tests, the monitoring datalogger was connected to the flow manifold and compared against an analogue pressure gauge.

4.5.2 Single Well Response Tests

Rising Head Single Well Response Tests (SWRT) were performed at each monitoring well (with the exception of FMS-HG18-06A) after the wells had recovered from well development. The tests were carried out by lowering one to three plastic bailers (nominal 1-liter volume for each bailer) into the water column and letting them fill with water. Once the bailers were full and the water level had stabilized, the bailers were removed from the well and the subsequent water level recovery was monitored with a water level measuring probe and with a datalogger installed near the bottom of the well.

4.6 Laboratory Testing

This section describes the geotechnical and chemical testing program for overburden samples, as well as the groundwater quality testing program.

4.6.1 Overburden

Geotechnical Testing of Overburden

The geotechnical soil samples that were collected by SPT methods (as described in Section 4.2) were analyzed by Englobe in Dartmouth, Nova Scotia. The samples were tested for the following parameters:

- Moisture content
- Atterberg limits
- Grain size distribution (mechanical sieve and/or hydrometer)

Geochemical Analyses of Overburden

Overburden samples for geochemical analysis were collected by oversized split spoon, at the same depth interval as the corresponding standard split spoon sample number (as further described in Section 4.2). Geochemical analyses on samples of overburden were carried out by SGS Canada Ltd. in Lakefield, Ontario. Testing included the following:

- Trace metals analysis to quantify the elemental composition of the overburden samples.
- Acid base accounting to evaluate the acid rock drainage (ARD) potential of overburden samples.
- Short-term leach testing to evaluate the metal leaching (ML) potential of overburden samples.

4.6.2 Groundwater

Groundwater samples were collected from each monitoring well on-site from September 4 to 6, 2018 (Round 1); November 19 to 20, 2018 (Round 3); March 21 to 22, 2019 (Round 5); and again, June 4 to June 5, 2019 (Round 6). Prior to the collection of samples, each monitoring well was developed by the removal of ten well volumes of water, or by pumping the well dry and allowing it to recover three times. This development process

was carried out using a Waterra Hydrolift inertial pump system. To minimize the influence of suspended sediment on the groundwater quality results, all samples were collected using low-flow sampling methodology with a peristaltic pump. This method involved positioning the pump intake approximately 1 m below the water surface with the pump allowed to run at a flow rate of approximately 1 L/min.

Analytical bottles for each sample were provided by AGAT Laboratories and were filled directly from the peristaltic pump discharge. Groundwater quality samples were submitted under chain of custody to AGAT Laboratories in Dartmouth, NS. Radium-226 analysis was conducted by the Saskatchewan Research Council, as subcontracted by AGAT.

Groundwater quality samples were analyzed for the following parameter suites: Atlantic RBCA Tier 1 Hydrocarbons (including benzene; toluene; ethylbenzene, xylene [BTEX], and petroleum hydrocarbons [PHC]); total and free cyanide; total and dissolved mercury; general chemistry; total and dissolved phosphorous; chemical oxygen demand; dissolved organic carbon; and total suspended solids.

Standard sampling protocols were followed to ensure accuracy and precision of results. This included decontamination procedures, the collection of QA/QC samples, labelling, preserving, completed Chain of Custody forms, and packaging QA/QC procedures in the laboratory.

QA/QC sampling was conducted for approximately 10% of samples that were analyzed. Field QA/QC was addressed by collecting blind field duplicates. The results of the QA/QC sampling were used to evaluate the reliability of the sampling and analysis methods.

5.0 INVESTIGATION RESULTS

This section describes the results of borehole logging, groundwater level measurements, hydraulic conductivity testing, and laboratory testing results.

5.1 Overburden and Bedrock

The record of borehole logs are presented in Appendix A, with photos of the recovered overburden and rock presented in Appendix B.

The subsurface stratigraphy findings generally consist of a thin, discontinuous layer of topsoil (less than 0.10 m in thickness), followed by a discontinuous layer of fill, up to 1.52 m in thickness. The fill on-site is difficult to identify, as it is generally sourced from local materials that have been reworked as part of the historical land use. The unit is logged as loose to very dense silty gravel and sand to silty sand. Organics and cobbles and/or boulders were occasionally encountered in the fill.

Underlying the discontinuous topsoil and fill is compact to very dense glacial till, typically consisting of silty sand to silty gravel and frequently containing cobbles and/or boulders. In FMS-HG18-03A, a very dense silt layer (0.59 m in thickness) was encountered underlying the sandy silty gravel till. In FMS-HG18-10A, a gravel layer of residual soil (0.90 m in thickness) was encountered underlying the sandy silty gravel till.

The depth of the overburden varies across the site and was observed to range from 1.01 to 6.32 m in the 2018 boreholes, with typical overburden depth ranging from 2 to 4 m. FMS-HG18-02X has the least overburden thickness at 1.01 m; FMS-HG18-03A has the greatest overburden thickness at 6.32 m.

Moisture content determinations were performed on three samples of fill, with an average moisture content of 5%. Moisture content determinations on 18 samples of glacial till yielded a minimum value of 3%, a maximum value of 24%, and an average value of 10%. A single moisture content determination on the silt in FMS-HG18-03A resulted in a moisture content of 22%.

Atterberg Limit determinations were carried out on five samples of glacial till; all samples tested “non-plastic”.

Table 3 and Table 4 present the grain size analysis results for the select samples of fill and glacial till, respectively, from the present investigation. The full details of the individual sample results are presented in Appendix C.

Table 3: Summary of Grain Size Analyses of Fill for the 2018 Hydrogeological Program

Subsurface Unit	Grain Size	Average	Standard Deviation	Minimum	Maximum	Test Count
Fill (Silty Gravel and Sand to Silty Sand)	Gravel (%)	44	3	41	47	3
	Sand (%)	37	5	32	41	
	Silt-sized (%)	15	4	11	18	
	Clay-sized (%)	4	3	2	7	

Table 4: Summary of Grain Size Analyses of Glacial Till for the 2018 Hydrogeological Program

Subsurface Unit	Grain Size	Average	Standard Deviation	Minimum	Maximum	Test Count
Glacial Till (Silty Sand to Silty Gravel)	Gravel (%)	35	9	19	52	18
	Sand (%)	36	6	26	47	
	Silt-sized (%)	22	7	11	42	
	Clay-sized (%)	5	4	2	17	

The bedrock consisted of slightly weathered to fresh, thinly to medium bedded, grey, medium and fine grained, medium strong to strong Greywacke-Argillite to Argillite-Greywacke. The thickest continuous greywacke lithological unit observed was 5.35 m thick along the borehole in FMS-HG18-09A. The thickest continuous argillite lithological unit was observed in FMS-HG18-05A at 9.75 m thick along the borehole. In some locations, the weathering increased to moderately weathered near surface. Similarly, the strength varied from weak in some argillite beds to very strong in some greywacke beds. Occasional vugs were observed in the greywacke, and occasional silicification was observed in both lithological units. Borehole FMS-HG18-06A displayed the highest degree of weathering, with deep, continuous iron oxidation and infilling, which may be related to the underlying historic mining opening that was intersected by the borehole. Borehole FMS-HG18-04A was drilled to the deepest depth of 25.74 m due to unusual micro-defect density and alteration. This alteration and elevated micro-defect

intensity is no longer observed below a sharp contact at 19.54 m depth between argillite-greywacke and argillite. No major features such as faults were observed during the FMS hydrogeological drilling program.

The geotechnical logged parameters of the rock core are summarized in Table 5 for the rock core logging program, including all boreholes, totalling 200.38 m of rock core.

Table 5: Summary of Geotechnical Logging Parameters for the 2018 Hydrogeological Rock Core Logging Program

Geotechnical Core Logging Parameter	Average	Standard Deviation	Minimum	Maximum
Total Core Recovery (TCR, %)	99	3.69	78	100
Solid Core Recovery (SCR, %)	54	23.09	0	96
Rock Quality Designation (RQD, %)	83	16.70	30	100
Fracture Count per 0.25 m	2.29	4.53	0	25 (maximum defined value)

5.2 Groundwater Levels

Data from six complete groundwater level monitoring rounds of the wells installed at FMS are presented in Table 6 below. The first two rounds of groundwater level monitoring from August 2018 were taken opportunistically, following well installation and development. The regular groundwater level monitoring program commenced in September 2018 when the first baseline groundwater quality samples were collected from the wells. Groundwater level monitoring was subsequently conducted in October, November, and December of 2018, as well as March and June of 2019. Hydrographs for select wells showing the manual and continuous groundwater levels are presented alongside precipitation records in Appendix D.

The groundwater levels measured were shallow, ranging from 0.13 to 4.95 mbgs. Groundwater elevations ranged from 103.44 to 160.52 m relative to CGVD28. The groundwater elevations are similar, with less than 2 m difference, when comparing the bedrock (A) and bedrock-soil interface (B) wells at each location. Groundwater elevations at most borehole locations indicate slight downward or nearly neutral gradients. Slight upward gradients between A/B well pairs were observed at locations FMS-HG18-04, -07, -10, -15, and -16.

The hydrographs for wells at FMS-HG18-02, -04, -05, -07, -09, and -10 (Appendix D) generally show consistent groundwater levels over the monitoring period to date. Some fluctuation in groundwater levels is apparent, likely related to seasonal variation and precipitation events. The precipitation data shown on the hydrographs is from the Malay Falls weather station, located approximately 18 km from the site (NS DNR, 2018).

Table 6: Groundwater Levels for FMS 2018 Hydrogeological Boreholes

Borehole	Water Level (mbgs), Collected on Aug. 15/18	Water Level (m CGVD28), Collected on Aug. 15/18	Water Level (mbgs), Collected on Aug. 20/18	Water Level (m CGVD28), Collected on Aug. 20/18	Water Level (mbgs), Collected on Sept. 4-6/18	Water Level (m CGVD28), Collected on Sept. 4-6/18	Water Level (mbgs), Collected on Oct. 9/18	Water Level (m CGVD28), Collected on Oct. 9/18	Water Level (mbgs), Collected on Nov. 17-18/18	Water Level (m CGVD28), Collected on Nov. 17-18/18	Water Level (mbgs), Collected on Dec. 11/18	Water Level (m CGVD28), Collected on Dec. 11/18	Water Level (mbgs), Collected on Mar. 21-22/19	Water Level (m CGVD28), Collected on Mar. 21-22/19	Water Level (mbgs), Collected on Jun. 4/19	Water Level (m CGVD28), Collected on Jun. 4/19
FMS-HG18-02A	3.56	132.41	3.60	132.37	3.69	132.28	3.66	132.31	2.77	133.20	2.94	133.03	2.87	133.10	4.22	132.74
FMS-HG18-02B	3.35	132.5	3.34	132.51	3.42	132.43	3.55	132.30	2.59	133.26	2.76	133.09	2.65	133.20	3.95	132.87
FMS-HG18-03A	4.48	117.1	4.68	116.9	4.79	116.79	4.51	117.07	3.33	118.25	3.61	117.97	3.39	118.19	4.95	117.67
FMS-HG18-03B	4.07	117.7	4.68	117.09	4.85	116.92	4.52	117.25	3.44	118.33	3.72	118.05	3.52	118.25	4.89	117.75
FMS-HG18-04A	1.98	104.68	2.07	104.59	2.23	104.43	1.98	104.68	1.40	105.26	1.42	105.23	1.60	105.06	2.53	105.16
FMS-HG18-04B	2.88	103.79	2.04	104.63	3.23	103.44	2.74	103.93	2.20	104.47	2.42	104.24	2.37	104.30	2.96	104.68
FMS-HG18-05A	2.28	111.25	2.12	111.41	2.46	111.07	2.12	111.41	1.85	111.68	2.05	111.48	1.99	111.54	2.82	111.64
FMS-HG18-05B	2.09	111.59	2.00	111.68	2.28	111.40	1.81	111.87	1.22	112.46	1.59	112.09	1.61	112.07	2.30	112.44
FMS-HG18-06A	1.41	110.56	1.46	110.51	1.50	110.47	1.36	110.61	1.22	110.75	1.35	110.62	1.36	110.61	2.19	110.72
FMS-HG18-07A	0.45	112.53	0.41	112.57	0.50	112.48	0.44	112.54	0.28	112.70	0.35	112.63	Frozen, inaccessible.	Frozen, inaccessible.	1.29	112.59
FMS-HG18-07B	0.29	112.49	0.29	112.49	0.32	112.46	0.24	112.54	0.13	112.65	0.21	112.57	Frozen, inaccessible.	Frozen, inaccessible.	1.16	112.60
FMS-HG18-08A	2.60	137.43	2.48	137.55	2.79	137.24	2.46	137.57	2.11	137.92	2.32	137.71	2.24	137.79	3.08	137.83
FMS-HG18-08B	2.17	137.81	2.32	137.66	2.69	137.29	2.26	137.72	1.55	138.43	1.86	138.12	1.61	138.37	2.45	138.38
FMS-HG18-09A	2.16	121.42	2.06	121.52	2.35	121.23	1.93	121.65	1.39	122.19	1.62	121.97	1.49	122.09	2.43	122.10
FMS-HG18-09B	1.59	122.03	1.44	122.18	1.87	121.75	1.36	122.26	0.62	123.00	0.87	122.76	0.68	122.94	1.58	122.96
FMS-HG18-10A	1.60	138.71	1.34	138.97	1.60	138.71	1.27	139.04	0.96	139.35	1.14	139.17	1.07	139.24	2.00	139.25
FMS-HG18-10B	1.34	138.85	1.24	138.95	1.45	138.74	1.20	138.99	0.88	139.31	1.19	138.99	1.09	139.10	2.98	139.23
FMS-HG18-11A	3.90	158.48	4.07	158.31	4.18	158.20	3.74	158.64	3.20	159.18	3.57	158.82	3.28	159.10	4.22	159.05
FMS-HG18-11B	3.33	159.08	3.24	159.17	3.57	158.84	2.97	159.44	1.98	160.43	2.62	159.79	2.30	160.11	2.85	160.52
FMS-HG18-13A	3.67	147.62	3.50	147.79	4.04	147.25	3.50	147.79	2.93	148.36	3.15	148.14	3.06	148.23	3.99	148.27
FMS-HG18-13B	1.79	149.54	1.57	149.76	2.26	149.07	1.50	149.83	0.36	150.97	0.80	150.53	0.54	150.79	1.50	150.88

Borehole	Water Level (mbgs), Collected on Aug. 15/18	Water Level (m CGVD28), Collected on Aug. 15/18	Water Level (mbgs), Collected on Aug. 20/18	Water Level (m CGVD28), Collected on Aug. 20/18	Water Level (mbgs), Collected on Sept. 4-6/18	Water Level (m CGVD28), Collected on Sept. 4-6/18	Water Level (mbgs), Collected on Oct. 9/18	Water Level (m CGVD28), Collected on Oct. 9/18	Water Level (mbgs), Collected on Nov. 17-18/18	Water Level (m CGVD28), Collected on Nov. 17-18/18	Water Level (mbgs), Collected on Dec. 11/18	Water Level (m CGVD28), Collected on Dec. 11/18	Water Level (mbgs), Collected on Mar. 21-22/19	Water Level (m CGVD28), Collected on Mar. 21-22/19	Water Level (mbgs), Collected on Jun. 4/19	Water Level (m CGVD28), Collected on Jun. 4/19
FMS-HG18-14A	4.75	112.14	4.72	112.17	4.83	112.06	4.60	112.29	3.92	112.97	3.14	113.76	4.11	112.78	5.23	112.63
FMS-HG18-14B	4.71	112.26	4.68	112.29	4.80	112.17	4.55	112.42	3.76	113.21	4.00	112.97	3.98	112.99	5.16	112.80
FMS-HG18-15A	0.66	106.8	0.61	106.85	0.82	106.64	0.59	106.87	0.48	106.98	0.56	106.90	Frozen, inaccessible.	Frozen, inaccessible.	1.52	106.94
FMS-HG18-15B	0.92	106.64	0.93	106.63	1.07	106.49	0.87	106.69	0.78	106.78	0.85	106.71	0.80	106.76	1.84	106.75
FMS-HG18-16A	2.79	139.38	2.79	139.38	3.07	139.10	2.86	139.31	0.84	141.33	1.14	141.04	1.51	140.66	2.44	140.61
FMS-HG18-16B	3.39	138.8	3.44	138.75	3.60	138.59	2.45	139.74	0.84	141.35	1.17	141.02	1.58	140.61	2.48	140.59

5.3 Hydraulic Conductivity

The hydraulic conductivity of the subsurface materials at FMS was estimated by packer tests, single well response tests, and grain size analyses. The results are presented in the below sections.

5.3.1 Packer Testing

The results of the packer testing program at FMS are summarized in Table 7. The tests were analysed using the Hvorslev methods for constant and variable head conditions (Hvorslev, 1951). The results show a wide range of hydraulic conductivity across the area tested, ranging from 7×10^{-8} m/s to 6×10^{-5} m/s.

The results of the packer tests are also plotted on Plate 2 showing the intervals tested relative to depth below top of bedrock and the resulting hydraulic conductivity estimate for each test.

Table 7: Packer Testing Results for FMS 2018 Hydrogeological Boreholes

Borehole	Test Number	Test Interval (mbgs)	Test Interval (m CGVD28)	Test Type	Hydraulic Conductivity (m/s)
FMS-HG18-02A	Test 1	6.83 - 24.24	129.14 - 111.73	CRI	7E-08
FMS-HG18-03A	Test 1	9.38 - 12.08	112.20 - 109.50	FHT	2E-07
FMS-HG18-04A	Test 1	19.46 - 25.74	87.20 - 80.92	CRI	2E-07
FMS-HG18-04A	Test 2	7.39 - 25.74	99.27 - 80.92	CRI	7E-08
FMS-HG18-05A	Test 1	6.00 - 13.81	107.53 - 99.72	CRI	6E-06
FMS-HG18-05A	Test 2	8.57 - 13.81	104.96 - 99.72	CRI	6E-06
FMS-HG18-07A	Test 1	4.65 - 12.37	108.33 - 100.61	CRI	4E-07
FMS-HG18-08A	Test 1	4.16 - 13.93	135.87 - 126.10	CRI	1E-05
FMS-HG18-08A	Test 2	7.39 - 13.93	132.64 - 126.10	CRI	2E-06
FMS-HG18-09A	Test 1	6.10 - 12.38	117.48 - 111.20	CRI	5E-07
FMS-HG18-10A	Test 1	5.02 - 12.30	135.29 - 128.01	CRI	1E-05
FMS-HG18-10A	Test 2	7.94 - 12.30	132.37 - 128.01	CRI	1E-06
FMS-HG18-11A	Test 1	3.16 - 10.92	159.22 - 151.46	CRI	3E-06
FMS-HG18-13A	Test 1	8.09 - 12.43	143.20 - 138.86	CRI	1E-06
FMS-HG18-14A	Test 1	4.10 - 13.81	112.79 - 103.08	CRI	6E-05
FMS-HG18-14A	Test 2	6.04 - 13.81	110.85 - 103.08	CRI	2E-06
FMS-HG18-14A	Test 3	11.52 - 13.81	105.37 - 103.08	FHT	1E-06
FMS-HG18-15A	Test 1	5.12 - 10.83	102.34 - 96.63	CRI	2E-07
FMS-HG18-16A	Test 1	7.48 - 11.02	134.69 - 131.15	CRI	3E-07

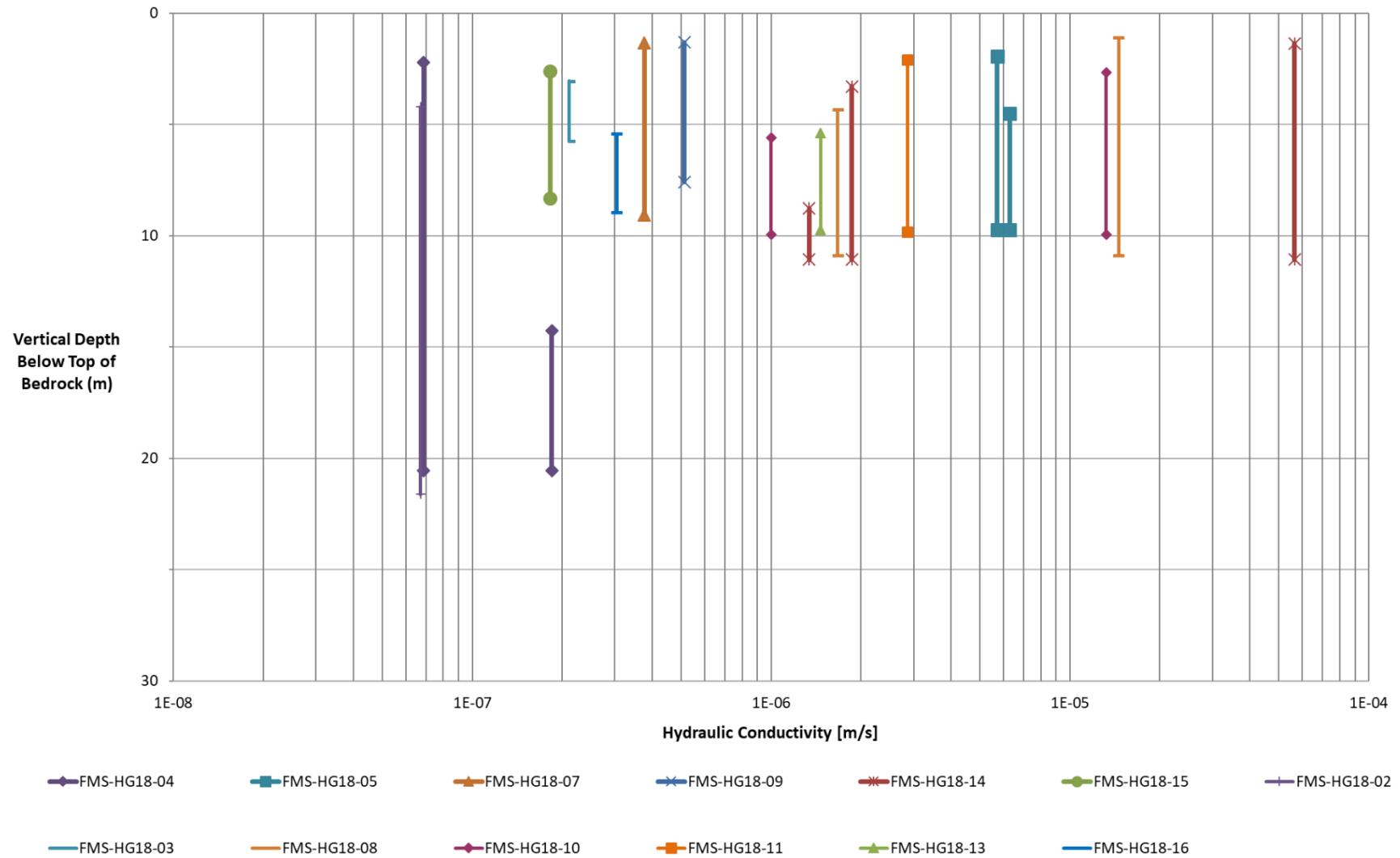


Plate 2: Hydraulic Conductivity Profile for the 2018 Hydrogeological Packer Testing Results

5.3.2 Single Well Response Tests

The results of the rising head SWRT are summarized in Table 8 below, and the analysis sheets are provided in Appendix E. Analyses of the SWRT were carried out using the Hvorslev method (Hvorslev, 1951). The estimated hydraulic conductivities of the 'A' wells installed into the bedrock ranged from 6×10^{-8} m/s to 1×10^{-5} m/s. The estimated hydraulic conductivities of the 'B' wells installed across the overburden-bedrock interface ranged from 1×10^{-7} m/s to 4×10^{-5} m/s.

Table 8: Single Well Response Test Summary

Well ID	Top of Test Interval (mbgs)	Bottom of Test interval (mbgs)	Top of Test Interval (m CGVD28)	Bottom of Test Interval (m CGVD28)	Hydraulic Conductivity (m/s)
FMS-HG18-02A	17.36	20.41	118.61	115.56	6E-08
FMS-HG18-02B	3.36	7.03	132.49	128.82	1E-06
FMS-HG18-03A	8.93	11.98	112.65	109.60	3E-07
FMS-HG18-03B	4.42	6.89	117.35	114.88	2E-06
FMS-HG18-04A	14.88	20.98	91.78	85.68	3E-07
FMS-HG18-04B	4.07	7.12	102.60	99.55	1E-07
FMS-HG18-05A	9.17	13.70	104.36	99.83	1E-05
FMS-HG18-05B	2.84	5.89	110.84	107.79	5E-07
FMS-HG18-07A	7.68	10.73	105.30	102.25	1E-06
FMS-HG18-07B	1.71	4.76	111.07	108.02	5E-06
FMS-HG18-08A	10.29	13.34	129.74	126.69	2E-06
FMS-HG18-08B	2.56	5.96	137.42	134.02	9E-06
FMS-HG18-09A	8.98	12.03	114.60	111.55	4E-07
FMS-HG18-09B	3.14	6.19	120.48	117.43	3E-06
FMS-HG18-10A	9.22	12.27	131.09	128.04	5E-07
FMS-HG18-10B	1.90	6.47	138.29	133.72	4E-06
FMS-HG18-11A	7.87	10.92	154.51	151.46	2E-06
FMS-HG18-11B	3.59	4.90	158.82	157.51	1E-06
FMS-HG18-13A	9.38	12.43	141.91	138.86	2E-06
FMS-HG18-13B	2.52	5.57	148.81	145.76	1E-06
FMS-HG18-14A	9.55	12.60	107.34	104.29	3E-06
FMS-HG18-14B	4.74	6.43	112.23	110.54	3E-06

Well ID	Top of Test Interval (mbgs)	Bottom of Test interval (mbgs)	Top of Test Interval (m CGVD28)	Bottom of Test Interval (m CGVD28)	Hydraulic Conductivity (m/s)
FMS-HG18-15A	7.73	10.78	99.73	96.68	4E-07
FMS-HG18-15B	1.03	4.08	106.53	103.48	7E-07
FMS-HG18-16A	7.86	10.91	134.31	131.26	4E-07
FMS-HG18-16B	3.35	5.47	138.84	136.72	4E-05

Note: Test intervals based on well screens except where the static water level was below the top of the screen in which case the static water level was considered the top of the test interval.

5.3.3 Grain Size Estimates

Estimates of hydraulic conductivity of select soil samples were made based on the grain size analyses using the Hazen approximation. A summary of the results is provided in Table 9. The estimates range from 4×10^{-9} m/s to 4×10^{-6} m/s.

Table 9: Hydraulic Conductivity Estimates Based on Soil Grain Size

Borehole	Sample No.	Representative Sample Depth (mbgs)	Soil Type	D ₁₀ : Grain size at 10% (wt%) passing (mm)	Estimated Hydraulic Conductivity (m/s)
FMS-HG18-02X	SS2	0.70	SILTY SAND and GRAVEL	0.0140	2E-06
FMS-HG18-03A	SS1	0.31	sandy SILTY GRAVEL	0.0110	1E-06
FMS-HG18-03A	SS3	1.09	sandy SILTY GRAVEL	0.0110	1E-06
FMS-HG18-03A	SS7	3.99	SILTY GRAVEL and SAND	0.0120	1E-06
FMS-HG18-03A	SS8	6.23	SILT, some sand, trace gravel	0.0043	2E-07
FMS-HG18-04A	SS3	2.11	sandy GRAVEL and SILT	0.0007	5E-09
FMS-HG18-04A	SS5	3.69	sandy GRAVEL and SILT	0.0006	4E-09
FMS-HG18-05A	SS1B	0.32	sandy SILTY GRAVEL	0.0170	3E-06
FMS-HG18-05A	SS3	1.84	gravelly SILTY SAND	0.0080	6E-07
FMS-HG18-05A	SS5	3.36	gravelly SAND and SILT	0.0064	4E-07

Borehole	Sample No.	Representative Sample Depth (mbgs)	Soil Type	D ₁₀ : Grain size at 10% (wt%) passing (mm)	Estimated Hydraulic Conductivity (m/s)
FMS-HG18-06A	SS3	1.84	SILTY SAND and GRAVEL	0.0090	8E-07
FMS-HG18-07A	SS2	0.92	sandy SILTY GRAVEL	0.0110	1E-06
FMS-HG18-07A	SS4	2.75	gravelly SILTY SAND	0.0090	8E-07
FMS-HG18-08A	SS2	0.80	SILTY GRAVEL and SAND	0.0130	2E-06
FMS-HG18-09A	SS3	1.80	sandy SILTY GRAVEL	0.0080	6E-07
FMS-HG18-09A	SS5	4.32	sandy SILTY GRAVEL	0.0095	9E-07
FMS-HG18-10A	SS2	0.92	sandy SILTY GRAVEL	0.0210	4E-06
FMS-HG18-13A	SS3	1.41	gravelly SILTY SAND	0.0090	8E-07
FMS-HG18-14A	SS2	0.84	SILTY GRAVEL and SAND	0.0080	6E-07
FMS-HG18-14A	SS3	1.86	gravelly SILTY SAND	0.0080	6E-07
FMS-HG18-16A	SS1	0.31	gravelly SILTY SAND	0.0024	6E-08
FMS-HG18-16A	SS3	1.64	SILTY GRAVEL and SAND	0.0040	2E-07

5.4 Analytical Results

The following section provides the analytical results for the overburden geochemistry and groundwater quality sampling conducted at FMS.

5.4.1 Overburden

Overburden samples that were collected from selected boreholes at the Project site were submitted to an accredited laboratory to characterize the geochemical characteristics. The sample selection process included samples from boreholes located on lands proposed for infrastructure construction where overburden may be removed and stockpiled. A total of twelve (12) samples were collected and submitted to SGS Canada Ltd. in Lakefield, Ontario, for analysis (Table 10). All samples were submitted for analysis of metals content, and a subset of six samples from boreholes located in or near areas of anticipated overburden removal and stockpiling were submitted for analysis of acid generating and metal leaching potential via acid base accounting and short-term leach analyses.

Table 10: Samples Selected for Overburden Geochemical Analyses

Borehole ID	Sample ID	Depth (m)	Analytical Series		
			Metals	ABA	SFE
FMS-HG18-03A	SS2/SS4	0.61 – 0.66	X		
FMS-HG18-04A	SS1B	0.05 – 0.61	X		
FMS-HG18-05B	OS1	0.00 – 0.61	X		
FMS-HG18-06A	OS2	0.61 – 1.22	X	X	X
FMS-HG18-07A	OS2	0.61 – 1.22	X		
FMS-HG18-08A	SS1	0.00 – 0.61	X		
FMS-HG18-09A	SS1A/SS1B/SS2	0.00 – 0.65	X	X	X
FMS-HG18-10A	SS3	1.45 – 2.03	X	X	X
FMS-HG18-11A	SS2	0.61 – 0.97	X	X	X
FMS-HG18-13A	OS3	1.22 – 1.60	X	X	X
FMS-HG18-14A	SS1	0.00 – 0.61	X	X	X
FMS-HG18-16A	SS2	0.61 – 1.22	X		

5.4.1.1 Geochemical Test Work Methodology

The geochemical test work completed on the twelve overburden samples included the following:

- Bulk metals (elemental analysis)
- Acid-base accounting (ABA)
- Short-term (de-ionized) leach tests

The following sub-section outlines the details of the testing methods, which are consistent with the recommendations of the following recognized documents:

- MEND (Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials 2009)
- Guidelines for Acid Rock Drainage (GARD) Guide (INAP 2013)
- Price (DRAFT Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia 1997)

5.4.1.1.1 Bulk Metals

Bulk metals analyses were conducted on all samples to quantify the elemental composition of the materials. Bulk metal analysis determines the concentrations of major and trace elements by a multi-acid leach, followed by an inductively coupled plasma mass spectrometry (ICP-MS) analysis to determine the concentrations of the following

elements: Ag, Al, As, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Ti, Tl, U, V, Y, and Zn.

The results of the bulk metal analyses provide a basis for comparison between samples of rock and typical crustal abundances (Price, 1997). Comparison to typical crustal abundances is completed as part of a screening tool to identify materials and site-specific parameters that require further review with respect to environmental significance. It should be noted, however, that high concentrations in the solid-phase does not necessarily identify materials that will be of environmental significance.

5.4.1.1.2 Acid-Base Accounting

ABA measures the bulk quantities of acid generating minerals (e.g., sulphide minerals) and acid neutralizing minerals (e.g., carbonate minerals) to assess whether the materials tested will have sufficient capacity to neutralize the acidity generated through sulphide oxidation or if the materials have the potential to generate acidic effluents. The methodology performed on the samples is a modified Sobek method (Sobek et al., 1978) that includes analysis for paste pH, sulphur species (total sulphur, sulphate content, and sulphide content), acid potential (AP) and neutralization potential (NP), and carbon species (total carbon and carbonate content). Detailed descriptions of the ABA methods are found in MEND (2009).

5.4.1.1.3 Short-term Leach Tests

Short-term leach testing was conducted on all samples to evaluate the metal leaching potential under laboratory conditions. The results of short-term leach tests are commonly used to estimate the potential composition of water that comes into contact with test materials. It is important to note, however, that the results of short-term leach tests do not directly measure the expected effluent chemistry of the test material under ambient conditions due to:

- Relatively small sample size and volume.
- Short duration of the test may not be sufficient to account for representative water-rock interaction times and mineral reaction rates (i.e., sulphide oxidation).
- Enhanced dissolution of some mineral phases due to lab-imposed conditions (i.e., pH, redox, and agitation).

Although there are limitations with the testing, it is a useful indication of the soluble species that can be readily leached from the test materials; as such, it is intended to be used as a screening tool to identify constituents of potential concern.

De-ionized (DI) water leach testing was completed to measure the concentrations of constituents in the sample leachate that are readily soluble in water. The DI water leach method is described in Price (1997) and MEND (2009). Samples are mixed with DI water at a 3:1 liquid to solid ratio in an extraction vessel. The vessel is shaken immediately, and an initial pH is recorded. The slurry is then shaken for 24 hours, after which a final pH is measured and the supernatant is extracted for analysis including the following constituents: conductivity, alkalinity, Cl, NO₃, SO₄, Al, As, Ag, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Li, Mg, Mn, Mo, Na, Ni, Pb, Sb, Se, Si, Sn, Sr, Ti, Tl, U, V, and Zn.

5.4.1.2 Results

The analytical results of the overburden characterization program are included in Appendix F.

5.4.1.2.1 Bulk Metals

Bulk metals analyses were conducted on all twelve samples. Metal concentrations are compared to average crustal abundances, for reference, as recommended by Price (1997). The results of the bulk metals analyses are presented in Appendix F-1 and summarized as follows:

- Arsenic and bismuth concentrations are observed to be greater than 10 times the average crustal abundance in the majority of samples.
- Lead concentrations are observed to be greater than 10 times the average crustal abundance in sample FMS-HG18-06A, OS2.
- Antimony concentrations are observed to be greater than five times the average crustal abundance in two samples.
- All other constituents were detected at concentrations less than five times the average crustal abundance in all samples.

The method detection limit for selenium is greater than ten times the average crustal abundance.

Although the solid-phase concentrations of some metals are greater than the average crustal abundance, such concentrations do not necessarily increase the potential for impacts. However, the parameters identified to have elevated solid-phase concentrations require further consideration.

5.4.1.2.2 Acid-Base Accounting

ABA was completed on six samples. A screening level evaluation of the acid generation potential and neutralization potential was conducted using the interpretation of results of the ABA analysis, which includes determination of the following:

- Paste pH, acid potential (AP), neutralization potential (NP), carbonate NP (CO₃-NP), sulphur species, and carbon species.

Additionally, the potential for acid generation is commonly interpreted according to the ratio of NP to AP (NP/AP), according to the guidelines recommended by MEND (2009) and described in the following table:

Table 11: Acid Generation Potentials Based on NP/AP

Acid Generation Potential	Criteria	Comments
Potentially Acid Generating (PAG)	NP/AP < 1	Potentially acid generating, unless sulphide minerals are non-reactive.
Uncertain	1 ≤ NP/AP ≤ 2	Possibly acid generating if NP is insufficiently reactive or is depleted at a rate faster than sulphides.
Non-Potentially Acid Generating (non-PAG)	NP/AP > 2	Not expected to generate acidity.

Using bulk NP in the NP/AP (NPR) calculation accounts for less reactive silicate minerals, as well as more reactive carbonate minerals. $\text{CO}_3\text{-NP}$ can also be used in the calculations ($\text{CO}_3\text{-NPR} = \text{CO}_3\text{-NP/AP}$) to account for buffering capacity from carbonate minerals only and ignores the neutralizing capacity of other and more slowly reacting minerals. Therefore, $\text{CO}_3\text{-NP/AP}$ ($\text{CO}_3\text{-NPR}$) is also presented and used in assessing acid generation potentials.

The screening criteria (sulphide content <0.3 wt% as S and paste pH <5.5) and acid potential criteria above are used to evaluate the potential for these materials to be acid generating. The results of the ABA testing program of the waste rock samples are presented in Appendix F-2. The results are summarized as follows:

- Sulphide content was less than 0.3 wt% as S in all samples and ranged from <0.02 to 0.12 wt% as S.
- Total sulphur content ranged from <0.005 to 0.169 wt%.
- Paste pH values were above 5.5 in all samples and ranged from 5.7 to 8.2.
- Acid Potential (AP) values ranged from 0.3 to 3.8 t $\text{CaCO}_3/1000$ t (0.6 to 3.7 kg H_2SO_4 / t).
- Neutralization Potential (NP) values ranged from -0.8 to 4.0 t $\text{CaCO}_3/1000$ t, while Carbonate Neutralization Potential ($\text{CO}_3\text{-NP}$) values ranged from 0.1 to 47 t $\text{CaCO}_3/1000$ t.
- Net potential ratios of NPR and $\text{CO}_3\text{-NPR}$ for all samples ranged from -0.4 to 13 and 0.3 to 21, respectively.

All samples have sulphide and total sulphur contents less than 0.2%, paste pH values above 5.5, and AP values less than 4 t $\text{CaCO}_3/1000$ t. Sulphide content in all samples is below the 0.4 wt% and 12.51 kg $\text{H}_2\text{SO}_4/\text{t}$ exemption limits described in Section 5, Subsection A of the Nova Scotia Sulphide Bearing Material Disposal Regulation (N.S. Reg. 57/95). However, applicability of this data with respect to the regulation is dependant upon the actual area and location of overburden to be removed. Low NP values result in NPR values below 2 for some samples; however, based on the low sulphide, sulphur, and AP values, all samples are expected to be non-acid generating.

5.4.1.2.3 Short-term Leach Testing

Short-term leach testing was conducted on six samples. Concentrations of measured parameters and pH values in the leachate were compared to the Canadian Environmental Quality Guidelines (CEQG) for the Protection of Freshwater Aquatic Life (CCME, 2018) for purposes of determining parameters that may need to be further evaluated as part of an overall site water quality prediction. Although the results are compared to regulatory limits and guidelines, it is important to note that these regulatory limits and guidelines do not apply to short-term leach test results, and therefore should not be interpreted within a regulatory context. Rather, these comparisons are conducted herein to qualitatively identify parameters that are leachable from test materials at concentrations that may require further evaluation in the context of the overall water quality effects assessment. The results of the short-term leach test are presented in Appendix F-3 and summarized as follows:

- The pH for all samples ranged from 5.2 to 7.3.
- Nitrate was greater than CEQG (0.05 mg/L) in three samples and ranged from <0.6 to 8.4 mg/L.
- Aluminum was greater than CEQG (pH dependent; 0.005 to 0.1 mg/L) in four samples and ranged from 0.007 to 0.384 mg/L.
- Arsenic was greater than CEQG (0.005 mg/L) in three samples and ranged from 0.0004 to 0.0576 mg/L.
- Copper was greater than CEQG (0.002 mg/L) in two samples and ranged from 0.00050 to 0.00436 mg/L.
- Iron was greater than CEQG (0.3 mg/L) in one sample and ranged from <0.007 to 0.418 mg/L.

- Lead was greater than CEQG (0.001 mg/L) in one sample and ranged from <0.00001 to 0.02091 mg/L.
- Nickel was greater than CEQG (0.025 mg/L) in one sample and ranged from 0.0009 to 0.1640 mg/L.
- Zinc was greater than CEQG (0.007 mg/L) in three samples and ranged from <0.002 to 0.224 mg/L.
- All other parameters were below CEQGs.

5.4.2 Groundwater

All groundwater quality results were compared to the Guidelines for Canadian Drinking Water Quality (CDWQ) and the Nova Scotia Environment Pathway Specific Standards for Groundwater (NSE PSS) for groundwater discharging to surface water (0-10 m from a fresh water body). Groundwater quality results are shown compared to the CDWQ and the NSE PSS in the laboratory results provided in Appendix G. The results of the laboratory analysis are summarized as follows:

- PHC/BTEX and total and free cyanide were not detected in any of the samples collected. Total mercury exceeded the NSE PSS in wells FMS-HG18-06A and FMS-HG18-11B in September 2018, and total and dissolved mercury exceeded the NSE PSS in well FMS-HG18-15A in November 2018. Total and dissolved mercury did not exceed the CDWQ in any samples collected in September 2018, November 2018, March 2019, or June 2019.
- Radium-226 did not exceed the health-related maximum acceptable concentration (MAC) provided in the CDWQ in any of the samples collected in the September 2018, November 2018, March 2019, and June 2019 sampling events.
- Table 12 (below) provides a summary of the groundwater exceedances of the CDWQ MAC for the September 2018, November 2018, March 2019, and June 2019 sampling events:
 - Dissolved arsenic exceeded the CDWQ in seven wells (FMS-HG18-03A, FMS-HG18-04A, FMS-HG18-05A, FMS-HG18-06A, FMS-HG18-07A, FMS-HG18-07B, and FMS-HG18-15A) in September 2018. Dissolved arsenic exceeded the CDWQ in six wells in November 2018, all of which also exceeded in September 2018 (FMS-HG18-03A, FMS-HG18-04A, FMS-HG18-05A, FMS-HG18-07A, FMS-HG18-07B, and FMS-HG18-15A). Dissolved arsenic exceeded the CDWQ in 5 wells (FMS-HG18-02A, FMS-HG18-03A, FMS-HG18-04A, FMS-HG18-05A, and FMS-HG18-06A) in March 2019, all of which exceeded in the 2018 sampling with the exception of FMS-HG18-02A. Dissolved arsenic exceeded CDWQ in six wells (FMS-HG18-02A, FMS-HG18-03A, FMS-HG18-04A, FMS-HG18-05A, FMS-HG18-07A, and FMS-HG18-07B) in June 2019, all of which exceeded in the previous sampling.
 - Dissolved manganese exceeded the CDWQ in 13 wells (FMS-HG18-03A, FMS-HG18-04A, FMS-HG18-04B, FMS-HG18-06A, FMS-HG18-07A, FMS-HG18-07B, FMS-HG18-09A, FMS-HG18-09B, FMS-HG18-11A, FMS-HG18-11B, FMS-HG18-15A, FMS-HG18-15B and FMS-HG18-16A). Health Canada established a guideline for manganese in May 2019. Previous sampling events were not compared to the new Health Canada CDWQ guideline; however, concentrations reported for the June 2019 sampling event are consistent with manganese concentrations from previous sampling events.
 - Aluminum, iron, and zinc exceeded aesthetic objectives/operational guidance value in multiple wells during all monitoring events.

- Health Canada established new CDWQ MAC guidelines in March 2019 (lead) and June 2019 (copper and strontium). Groundwater results were compared to guidelines in effect at the time of sampling and no results for these parameters exceeded CDWQ MAC. Previous sampling events were not compared to the new Health Canada CDWQ guideline; however, lead, copper, and strontium concentrations reported for the March and June 2019 sampling events are consistent with lead, copper, and strontium concentrations from previous sampling events.
- No other metals parameters exceeded CDWQ MAC.
- Parameters exceeding the NSE PSS in groundwater for the September 2018, November 2018, March 2019, and June 2019 sampling events are presented in Table 13. Metals parameters exceeding the NSE PSS included total mercury and dissolved aluminum, arsenic, cadmium, cobalt, copper, iron, manganese, mercury, selenium, silver, and zinc. It should be noted that the laboratory detection limit for dissolved cadmium (0.017 µg/L) is greater than the NSE PSS (0.01 µg/L). Detected concentrations of dissolved cadmium are presented in Table 13.

Table 12: Groundwater Concentrations Exceeding the MAC

Monitoring Well ID	Groundwater Concentrations Exceeding the MAC			
	September 2018	November 2018	March 2019	June 2019
FMS-HG18-02A	None	None	Dissolved arsenic	Dissolved arsenic
FMS-HG18-02B	None	None	None	None
FMS-HG18-03A	Dissolved arsenic	Dissolved arsenic	Dissolved arsenic	Dissolved manganese
FMS-HG18-03B	None	None	None	None
FMS-HG18-04A	Dissolved arsenic	Dissolved arsenic	Dissolved arsenic	Dissolved arsenic and manganese
FMS-HG18-04B	None	None	None	Dissolved manganese
FMS-HG18-05A	Dissolved arsenic	Dissolved arsenic	Dissolved arsenic	Dissolved arsenic
FMS-HG18-05B	None	None	None	None
FMS-HG18-06A	Dissolved arsenic	None	Dissolved arsenic	Dissolved manganese
FMS-HG18-07A	Dissolved arsenic	Dissolved arsenic	Not sampled as well frozen	Dissolved arsenic and manganese
FMS-HG18-07B	Dissolved arsenic	Dissolved arsenic	Not sampled as well frozen	Dissolved arsenic and manganese

Monitoring Well ID	Groundwater Concentrations Exceeding the MAC			
	September 2018	November 2018	March 2019	June 2019
FMS-HG18-08A	None	None	None	None
FMS-HG18-08B	None	None	None	None
FMS-HG18-09A	None	None	None	Dissolved manganese
FMS-HG18-09B	None	None	None	Dissolved manganese
FMS-HG18-10A	None	None	None	None
FMS-HG18-10B	None	None	None	None
FMS-HG18-11A	None	None	None	Dissolved manganese
FMS-HG18-11B	None	None	None	Dissolved manganese
FMS-HG18-13A	None	None	None	None
FMS-HG18-13B	None	None	None	None
FMS-HG18-14A	None	None	None	None
FMS-HG18-14B	None	None	None	None
FMS-HG18-15A	Dissolved arsenic	Dissolved arsenic	Not sampled as well frozen	Dissolved manganese
FMS-HG18-15B	None	None	None	Dissolved manganese
FMS-HG18-16A	None	None	None	Dissolved manganese
FMS-HG18-16B	None	None	None	None

Table 13: Dissolved Groundwater Concentrations Exceeding the NSE PSS

Monitoring Well ID	Dissolved Groundwater Concentrations Exceeding the NSE PSS			
	September 2018	November 2018	March 2019	June 2019
FMS-HG18-02A	Aluminium and arsenic	Aluminium and arsenic	Arsenic and copper	Arsenic and copper
FMS-HG18-02B	Aluminium, iron, and manganese	Aluminium, cadmium, and copper	Aluminum, cadmium, and copper	Aluminum and copper
FMS-HG18-03A	Arsenic	Aluminium and arsenic	Arsenic	Aluminum and arsenic
FMS-HG18-03B	Cadmium, copper, and zinc	Aluminium	Cadmium, copper, and silver	Silver
FMS-HG18-04A	Aluminium, arsenic, and cadmium	Aluminium and arsenic	Arsenic	Aluminum
FMS-HG18-04B	Cadmium, manganese, and zinc	Cadmium, iron, manganese, and zinc	Cadmium, iron, manganese, and zinc	Cadmium and zinc
FMS-HG18-05A	Aluminium, arsenic, and cadmium	Aluminium and arsenic	Arsenic	Aluminum
FMS-HG18-05B	Aluminium, arsenic, and cadmium	Aluminium, cadmium and copper	Aluminum, cadmium, and copper	Aluminum, cadmium, and copper
FMS-HG18-06A	Aluminium, arsenic, iron, manganese, and total mercury	Aluminium and cadmium	Aluminum, arsenic, and iron	Aluminum and cadmium
FMS-HG18-07A	Arsenic	Arsenic	Not sampled as well frozen	Arsenic
FMS-HG18-07B	Aluminium, arsenic, and iron	Aluminium, arsenic, and iron	Not sampled as well frozen	Aluminum, arsenic, and iron
FMS-HG18-08A	None	None	None	None
FMS-HG18-08B	Copper	Aluminium and cadmium	Aluminum	Aluminum, cadmium, and silver

Monitoring Well ID	Dissolved Groundwater Concentrations Exceeding the NSE PSS			
	September 2018	November 2018	March 2019	June 2019
FMS-HG18-09A	None	None	None	None
FMS-HG18-09B	Cadmium, silver, and zinc	Cadmium and copper	Cadmium, copper, and iron	Aluminum, cadmium, copper, and iron
FMS-HG18-10A	Cadmium and zinc	Aluminium	Aluminum	Aluminum
FMS-HG18-10B	Aluminium and cadmium	Aluminium	Aluminum and cadmium	Aluminum
FMS-HG18-11A	Cadmium and manganese	Cadmium and manganese	Cadmium and manganese	Cadmium and manganese
FMS-HG18-11B	Aluminium, cadmium, copper, manganese, and total mercury	Aluminium, cadmium, cobalt, copper, iron, and manganese	Aluminum, cobalt, copper, iron, and manganese	Aluminum, cadmium, cobalt, iron, manganese, and selenium
FMS-HG18-13A	None	Aluminium	Aluminum	None
FMS-HG18-13B	Aluminium, copper, and silver	Aluminium, copper, and silver	Aluminum, cadmium, copper, and silver	Aluminum and silver
FMS-HG18-14A	Arsenic and cadmium	Cadmium	Cadmium	Aluminum
FMS-HG18-14B	Cadmium	Aluminium, cadmium, and copper	Aluminum and cadmium	Aluminum and cadmium
FMS-HG18-15A	Aluminium and arsenic	Aluminium, arsenic, mercury, and total mercury	Not sampled as well frozen	Arsenic
FMS-HG18-15B	None	None	Aluminum	None
FMS-HG18-16A	None	None	Silver	None
FMS-HG18-16B	Aluminium, cadmium, and copper	Aluminium, cadmium, copper, and silver	Aluminum, copper, and silver	Aluminum, cadmium, copper, and silver

6.0 CLOSURE

The information presented in this factual report describes the current understanding of the hydrogeological conditions at the FMS Project site based on existing information and a baseline field investigation, with the objective of supporting the EIS process necessary to develop the Project.

We trust that the above is adequate for your current needs. Should you have any questions, comments, or concerns please do not hesitate to contact the undersigned.

Signature Page

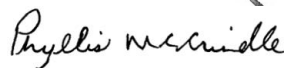
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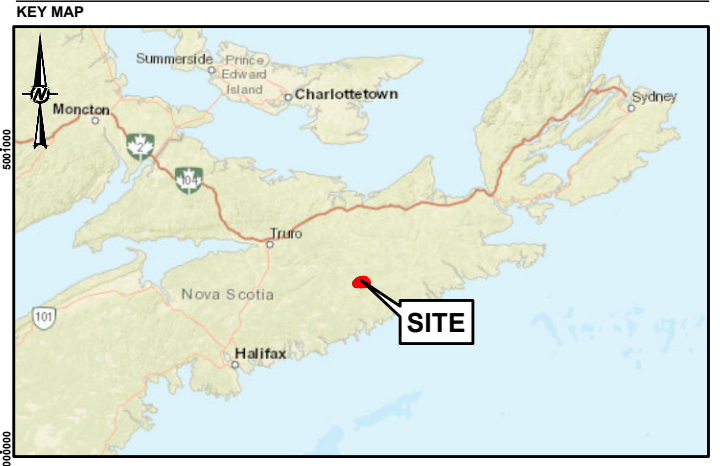
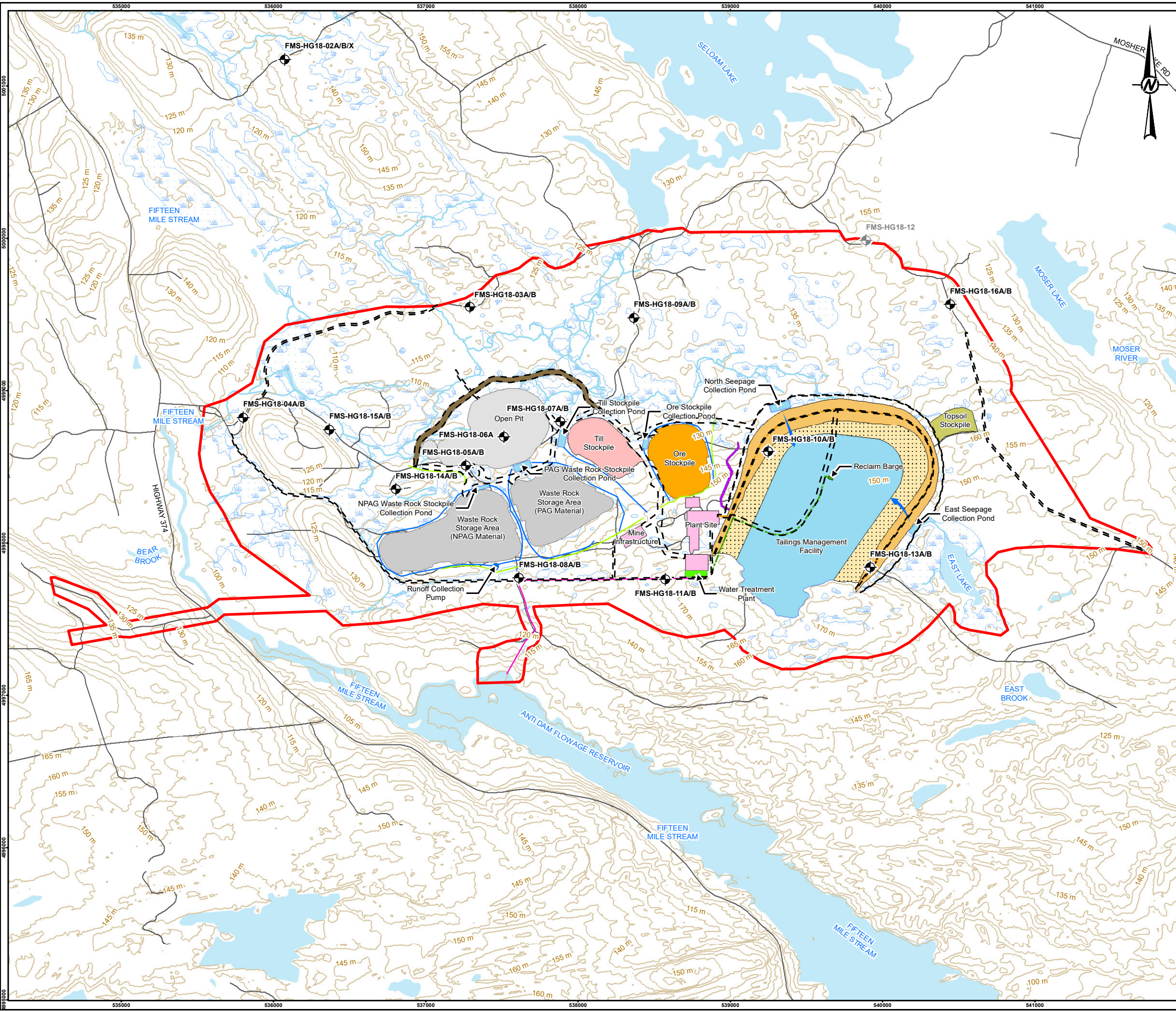
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REFERENCES

- Hazen, A. (1911). Discussion: Dams on Sand Foundations. (pp. 73-199). Transactions, American Society of Civil Engineers.
- Health Canada. (2017). *Guidelines for Canadian Drinking Water Quality Summary Table*.
- Hvorslev, M. (1951). *Time Lag and Soil Permeability in Ground-Water Observations*. Corps. of Engineers, U.S Army.
- Kennedy, G. W. (2017). *An Arsenic in Well Water Risk Map for Nova Scotia based on Observed Patterns of Water Concentrations of Arsenic in Bedrock Aquifers*. Nova Scotia Natural Resources, Geoscience and Mines Branch.
- N.S. DNR. (1992). Surficial Geology of the province of Nova Scotia, Map 92-3. Halifax: Nova Scotia Department of Natural Resources, Mine and Energy Branches, compiled by R.R. Stea, H. Conley, and Y. Brown.
- N.S. DNR. (2000). Geological Map of the province of Nova Scotia, Map ME 2000-1. Halifax: Nova Scotia Department of Natural Resources, Minerals and Energy Branch, compiled by J.D. Keppie.
- N.S. DNR. (2018). Enhanced Georeferenced Nova Scotia Well Logs Database, DP ME 430, Version 3. Halifax: Nova Scotia Department of Natural Resources, compiled by G.W. Kennedy and B.E. Fisher.
- Nova Scotia Environment. (2013). *Remediation Levels Protocol. Table 3, Pathway Specific Standards for Groundwater*.
- O'Reilly, G. A. (2009). *Map Showing Potential for Uranium and Related Radionuclides in Groundwater in Nova Scotia*. Halifax: Nova Scotia Department of Natural Resources, Mineral Resources Branch.



LEGEND

- HYDROGEOLOGICAL DRILLING LOCATION
- REMOVED FROM SCOPE
- FIFTEEN MILE STREAM EIS PROJECT AREA
- EXISTING ROAD
- ACCESS ROAD
- TOPOGRAPHIC CONTOUR, 5 METRE INTERVAL
- WATERCOURSE
- WETLAND
- WATERBODY

PROPOSED SITE INFRASTRUCTURE

- DIVERSION DAM
- EMBANKMENT
- OPEN PIT
- ORE STOCKPILE
- PLANT SITE
- POND; COLLECTION PONDS
- RECLAIM BARGE
- RUNOFF COLLECTION SUMP
- SPILLWAY OUTLET CHANNEL
- TAILINGS
- TILL STOCKPILE
- TOPSOIL STOCKPILE
- WASTE ROCK STORAGE
- WATER TREATMENT PLANT
- TAILINGS PIPELINE
- COLLECTION DITCH
- RECLAIM PIPELINE
- NON-CONTACT WATER DITCH
- WATER TREATMENT PIPELINE

NOTE(S)
 1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
 1. MCCALLUM ENVIRONMENTAL LTD. EIS PROJECT AREA, (VER.190313, RECEIVED 2019-03-18).
 2. MCCALLUM ENVIRONMENTAL LTD. PROPOSED INFRASTRUCTURE, (VER.190620, RECEIVED 2019-06-28).
 3. MOOSE MOUNTAIN. TOPOGRAPHIC CONTOURS, EMAILED JULY 17, 2018.
 4. THE DRILLING LOCATIONS WERE SURVEYED BY WSP, COORDINATES RECEIVED ON AUGUST 29, 2018.
 5. BASE DATA DOWNLOADED FROM NOVA SCOTIA GEOGRAPHIC DATA DIRECTORY, NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES, 2018.
 6. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
 7. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83.
 COORDINATE SYSTEM: UTM ZONE 20, VERTICAL DATUM: CGVD28

0 200 400 800 METRES
 1:25,000

CLIENT
ATLANTIC MINING NS CORP

PROJECT
**HYDROGEOLOGICAL INVESTIGATION REPORT
 FIFTEEN MILE STREAM GOLD PROJECT**

TITLE
DRILLING LOCATIONS AND INFRASTRUCTURE

CONSULTANT
GOLDER

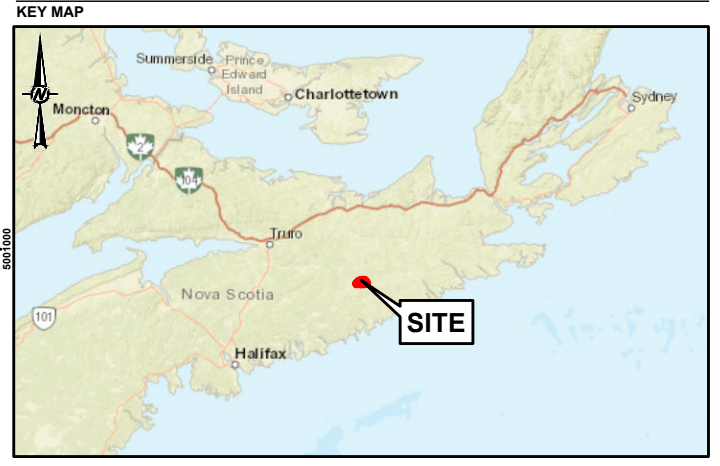
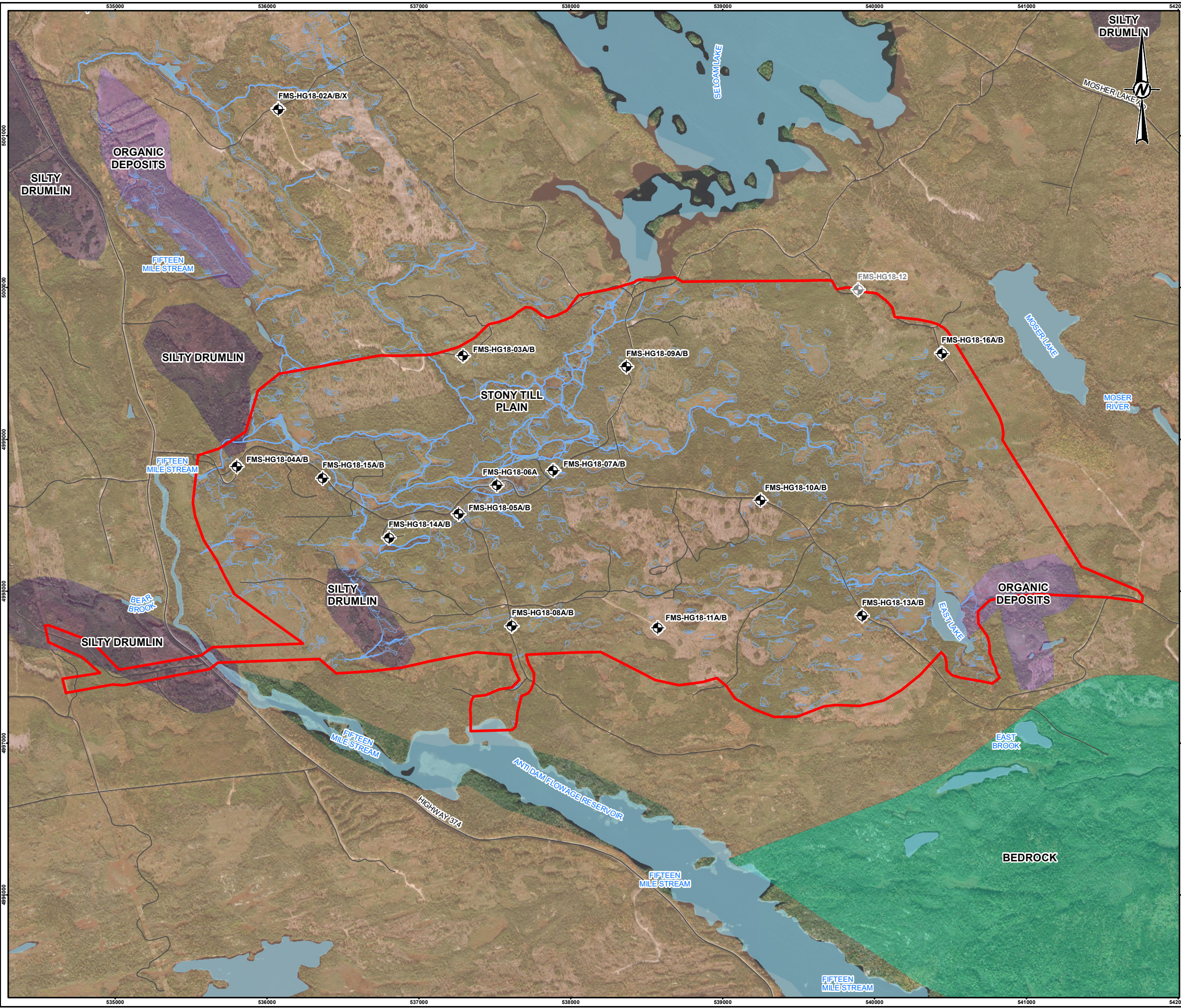
YYYY-MM-DD	2019-09-09
DESIGNED	CM
PREPARED	BR
REVIEWED	SB
APPROVED	PM

PROJECT NO. 1895674 CONTROL 0003 REV. 2

FIGURE 1

Path: N:\Active\Spatial_BA\MapInfo_Mining_NS_Corp\FifteenMileStream_Coherence\HRRD_PROD\1895674_AtlanticGold_Hydrogeology\Studies\40_PROD\000000_CH_FMS_Hydrogeology\1895674_0000.CH\0001.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 28mm



- LEGEND**
- HYDROGEOLOGICAL DRILLING LOCATION
 - REMOVED FROM SCOPE
 - FIFTEEN MILE STREAM EIS PROJECT AREA
 - EXISTING ROAD
 - WATERCOURSE
 - WETLAND
 - WATERBODY
- SURFICIAL GEOLOGY**
- BEDROCK - BEDROCK OF VARIOUS TYPES AND AGES; GLACIALLY SCOURED BASINS AND KNOBS, OVERLAIN BY THIN, DISCONTINUOUS VENEER OF STONY TILL
 - ORGANIC DEPOSITS - SPHAGNUM MOSS, PEAT, GYTTJA, CLAY
 - SILTY DRUMLIN - SILTIER TILL, HIGHER PERCENTAGE OF DISTANT SOURCE MATERIAL INCLUDING RED CLAY
 - STONY TILL PLAIN - STONY, SANDY MATRIX, MATERIAL DERIVED FROM LOCAL BEDROCK SOURCES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. MCCALLUM ENVIRONMENTAL LTD. EIS PROJECT AREA, (VER.190313, RECEIVED 2019-03-18).
2. THE DRILLING LOCATIONS WERE SURVEYED BY WSP, COORDINATES RECEIVED ON AUGUST 29, 2018.
3. DP ME 36, VERSION 2, 2006. DIGITAL VERSION OF NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES MAP ME 1992-3, SURFICIAL GEOLOGY MAP OF THE PROVINCE OF NOVA SCOTIA, SCALE 1:500 000, BY R. R. STEA, H. CONLEY AND Y. BROWN, 1992
4. BASE DATA DOWNLOADED FROM NOVA SCOTIA GEOGRAPHIC DATA DIRECTORY, NOVA SCOTIA DEPARTMENT OF NATURAL RESOURCES, 2018.
5. SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY
6. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 20, VERTICAL DATUM: CGVD28

0 200 400 800
1:25,000 METRES

CLIENT
ATLANTIC MINING NS CORP

PROJECT
**HYDROGEOLOGICAL INVESTIGATION REPORT
FIFTEEN MILE STREAM GOLD PROJECT**

TITLE
SURFICIAL GEOLOGY

CONSULTANT	YYYY-MM-DD	2019-09-09
	DESIGNED	CM
	PREPARED	BR
	REVIEWED	SB
	APPROVED	PM

PROJECT NO. 1895674 CONTROL 0003 REV. 2

GOLDER

FIGURE **2**

Path: N:\Data\Spatial_BVA\Mining_Mining_NS_Corp\EIS\FifteenMileStream_Coherence\H2000_FRO_18\06\F14_AtlanticGold_Hydrogeology\Studies\F14_Hydrogeology\1895674_0003-CH-0002.mxd

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 26mm

APPENDIX A

Record of Borehole Logs

Lithological and Geotechnical Rock Description Terminology

CORE CONDITION

Total Core Recovery (TCR): TCR records the total amount of core recovered over the measured length drilled for each core run.

Solid Core Recovery (SCR): SCR is defined as the length of full axial diameter (full circumference) core recovered in a run. The full diameter is defined as the pieces of core not intersected by any fractures.

Rock Quality Designation (RQD): RQD is based on the total cumulative length of sound core recovered in lengths greater than 10 cm (4 inches) as measured along the center line axis of the core from the mid-point of one natural fracture to the mid-point of the next natural fracture.

Note that the Fracture per 0.25 m refers to the sum of naturally broken fractures logged, excluding mechanical breaks. Note that lost core is counted as 1 fracture per cm of lost core length.

Joint Roughness (Jr): Describes the small-scale geometry of the joint surface (Barton, 1974).

Joint Alteration (Ja): This rating distinguishes between fractures which are filled with alteration minerals such as clay, and those which are not (Barton, 1974).

Joint Condition Rating (Jcon): The Joint Condition Rating is a numeral description used in RMR_{76} (Bieniawski, 1976) ranging from 0 to 25 based on the shape, roughness, and infill character observed in a discontinuity.

Hydraulic Conductivity (K): The hydraulic conductivity is a calculated value based on packer testing (falling head tests and constant rate injections) as well as single well response testing (rising/ falling head tests). The packer testing was carried out at the completion of the borehole, with the single well response testing carried out after the installation of standpipe piezometers.

LEGEND (ISRM, BROWN, 1981)

Strength

R1	Very weak rock
R2	Weak rock
R3	Medium strong rock
R4	Strong rock
R5	Very strong rock

Weathering

W1	Fresh
W2	Slightly Weathered
W3	Moderately Weathered
W4	Highly Weathered
W5	Completely Weathered
W6	Residual Soil

Features



Structure Type

BD	Bedding	CO	Contact
FO	Foliation	HBD	Healed Bedding
HCO	Healed Contact	HVN	Healed Vein
JN	Joint	VN	Vein
SH	Shear Zone		

Shape

CU	Curved	IR	Irregular
PL	Planar	ST	Stepped
UN	Undulating		

Roughness

K	Slickensided	PO	Polished
RO	Rough	SM	Smooth

Infill

-	Clean	CT	Coating < 1 mm
IN	Infilling > 1 mm	SA	Slightly Altered
SO	Staining Only		

Infill Type

Bx	Breccia/ Broken Rock	Ca	Calcite
Chl	Chlorite	Cl	Clay
FeOx	Iron Oxide	Gv	Gravel
Go	Gouge	Gv	Gravel
M	Silt	Py	Pyrite
Sa	Sand		

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-02A

SHEET 1 OF 3

LOCATION: N 536074.781; E 5001177.735

DRILLING DATE: August 6, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 45

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25 m	DIP W.I.T CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2	3	10					20
0		GROUND SURFACE		135.97																
0		Overburden drilled out.		0.00																
0		For soil stratigraphy refer to Record of Borehole FMS-HG18-02X																		
3		Slightly weathered, medium bedded, grey, medium with fine grains, moderately porous, medium strong interbedded GREYWACKE-ARGILLITE - Broken core from 2.86 m to 3.19 m		133.35	2.62	1	JN,UN,SM SA,FeOx BD,UN,RO SA,FeOx	2 2 20 3 2 22						R3	W2					
3					2	BD,UN,SM CT,Chl 1 mm	2 4 16							R3	W2					
3						JN,UN,RO IN,Gv 20 mm	3 5 8													
4		- Broken/lost core from 3.75 m to 4.05 m, lost drill fluid circulation			3	BD,UN,SM SO,FeOx BD,UN,SM CT,Cl 1 mm BD,UN,SM SO,FeOx	2 1 20 2 4 16 2 1 20							R3	W2		3.56 mbgs Aug. 15, 2018			
4						JN,UN,RO SO,FeOx	3 1 25										Bentonite Seal			
4		- Broken core from 4.51 m to 4.83 m																		
5					4	BD,UN,SM CT,FeOx 1 mm BD,UN,SM CT,FeOx 1 mm BD,UN,SM -	2 3 20 2 3 20 2 1 20							R3	W2					
6	Relay Drill HC3 Core																			
7		Fresh, medium bedded, grey, medium grained, faintly to moderately porous, medium strong to very strong interbedded GREYWACKE-ARGILLITE		129.70	6.27	5	JN,UN,SM SA,Chl JN,UN,SM -	2 2 20 2 1 20						R4	W1					
8					6									R3	W1					
8					7	SH,PL,K CT,Chl 1 mm	0.5 4 6							R5	W1					
9		CONTINUED NEXT PAGE																		

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/MA

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-02B

SHEET 1 OF 2

LOCATION: N 536073.896; E 5001174.328

DRILLING DATE: August 10, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 45

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER				
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP W.I.T CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX		
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2	3	10					20	30
0		GROUND SURFACE		135.85																	
0.00		Overburden drilled out. For soil stratigraphy refer to Record of Borehole FMS-HG18-02X		0.00																	
1																					
2	Rotary Drill HTW Casing																				
3																					
4		Slightly to moderately weathered, medium bedded, grey, medium with fine grains, moderately porous, medium strong, interbedded GREYWACKE-ARGILLITE - Broken core from 4.40 m to 4.80 m		131.87 3.98	1	BD,UN,SM	CT,Cl 1 mm	2	4	16											
5					2	BD,UN,SM	SA,Chl	2	2	20											
6	Rotary Drill HQ3 Core				3	BD,UN,RO	-	3	1	25											
7					4	JN,UN,RO	IN,Cl 4 mm	3	8	6											
8					5	BD,UN,SM	CT,M 1 mm	2	4	16											
9					3	BD,UN,RO	IN,Cl 4 mm	3	8	6											
10					4	BD,UN,RO	IN,Cl 4 mm	1.5	8	6											
11					4	BD,UN,RO	SA,Chl	3	2	22											
12					4	BD,UN,SM	CT,Gv 1 mm	2	3	20											
13					4	BD,UN,SM	SA,FeOx	2	2	20											
14					4	JN,UN,RO	CT,Cl 1 mm	3	3	22											
15					4	BD,UN,RO	SO,FeOx	1.5	2	20											
16					4	BD,PL,RO	SA,FeOx	3	3	22											
17					4	JN,IR,RO	CT,Ca 1 mm	3	3	22											
18					5	CO,PL,K	SA,FeOx	0.5	2	6											
19					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
20					5	JN,UN,RO	CT,Ca 1 mm	3	3	22											
21					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
22					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
23					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
24					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
25					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
26					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
27					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
28					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
29					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
30					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
31					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
32					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
33					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
34					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
35					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
36					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
37					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
38					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
39					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
40					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
41					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
42					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
43					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
44					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
45					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
46					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
47					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
48					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
49					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
50					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
51					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
52					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
53					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
54					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
55					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
56					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
57					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
58					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
59					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
60					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
61					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
62					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
63					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
64					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
65					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
66					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
67					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
68					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
69					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
70					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
71					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
72					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
73					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
74					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
75					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
76					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
77					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
78					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
79					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
80					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
81					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
82					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
83					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
84					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
85					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
86					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
87					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
88					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
89					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
90					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
91					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
92					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
93					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
94					5	BD,UN,SM	CT,Ca 1 mm	2	3	20											
95					5	BD,UN,SM	CT,Ca 1 mm	2	3</												

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-02X

SHEET 2 OF 3

LOCATION: N 5363075; E 5001186

DRILLING DATE: August 6-7, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 45

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.25 m	DIP W.I.T. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	Q	U	T	K					10
		BEDROCK SURFACE		1.01																
1		Slightly weathered to fresh, medium bedded, grey, medium with fine grains, moderately to faintly porous, medium strong, interbedded GREYWACKE-ARGILLITE - Lost core from 1.38 m to 1.58 m - Broken core from 1.58 m to 1.85 m, lost drill fluid circulation				BD,IR,SM CT,M 1 mm	2	4	18											
				JN,UN,SM IN,Gv 5 mm	2	5	8													
2						JN,UN,SM IN,Cl 6 mm	2	15	0											
						JN,PL,RO SA,FeOx	1.5	2	20											
3						BD,PL,SM SO,FeOx	1	1	16											
						BD,UN,SM IN,Cl 10 mm	2	15	0											
4						BD,ST,RO -	3	1	25											
						BD,PL,SM SA,FeOx	1	2	16											
5						SH,UN,SM IN,Cl 30 mm	2	15	0											
						JN,UN,RO SA,FeOx	3	2	22											
6						JN,UN,RO SO,FeOx	3	1	25											
						SH,UN,SM IN,Cl 30 mm	2	15	0											
7						CO,UN,SM CT,FeOx 1 mm	2	3	20											
						BD,UN,SM -	2	2	20											
8						BD,UN,SM SA,FeOx	2	2	20											
						JN,PL,RO SA,Py	1.5	2	20											
						BD,UN,SM SA,FeOx	2	2	20											
9						BD,PL,RO SO,FeOx	1.5	1	20											
						BD,PL,RO -	1.5	1	20											
						JN,PL,RO CT,FeOx 1 mm	1.5	3	20											
						JN,UN,SM SA,FeOx	2	2	20											
						JN,UN,SM SA,Py	2	2	20											
						BD,ST,SM CT,Ca 1 mm	2	3	20											
						BD,UN,SM -	2	1	20											
						BD,UN,SM SA,Py	2	2	20											
						BD,PL,RO CT,Ca 1 mm	1.5	3	20											
						BD,UN,SM SA,Ca	2	2	20											
						BD,PL,SM SA,FeOx	2	2	16											
10						JN,UN,SM SA,FeOx	2	2	20											

CONTINUED NEXT PAGE

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/MA

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-02X

SHEET 3 OF 3

LOCATION: N 5363075; E 5001186

DRILLING DATE: August 6-7, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 45

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										ROCK STRENGTH INDEX	WEATHERING INDEX	FEATURES	PIEZOMETER		
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP w.r.t CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY						K, cm/sec	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2	3	10						20
Rotary Drill HQ3 Core		--- CONTINUED FROM PREVIOUS PAGE --- Fresh, medium bedded, grey, medium with fine grains, faintly porous, medium strong to very strong, interbedded GREYWACKE-ARGILLITE																			
10																					
11																					
12																					
13																					
14																					
15																					
16																					
17		End of Drillhole		16.73																	
18		NOTES: 1. Hole lost and abandoned due to squeezing upper rock. 2. Location coordinates approximate (determined by handheld GPS)																			
19																					

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/MA

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MAISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-03B

SHEET 1 OF 1

LOCATION: N 537290.611; E 4999550.812

DRILLING DATE: August 14, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP W/ I CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2	3	K, cm/sec					1
0		GROUND SURFACE		121.77																
0		Overburden drilled out.		0.00																
1		For soil stratigraphy refer to Record of Borehole FMS-HG18-03A																		
2																				
3																				
4	Rotary Drill HC3 Core																			
5		Slightly weathered, medium bedded, grey, medium grained, highly to faintly porous, medium strong to strong GREYWACKE - Broken core from 4.80 m to 5.09 m		116.97 4.80	1															
6																				
7		End of Drillhole		114.72 7.05	2															
8		NOTE: 1. Single well response testing (rising head test) performed from 3.84 m to 6.89 m depth.																		
9																				

Bentonite Seal

3.20 mbgs

Silica Sand

3.84 mbgs

4.07 mbgs

Aug. 15, 2018



50 mm Diam. PVC #10 Slot Screen

6.89 mbgs

FEATURES LEGEND

-  BROKEN CORE
-  FAULT
-  LOST CORE
-  CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

-  PACKER TESTING
-  SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: AKV/MA

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF BOREHOLE: FMS-HG18-04A

SHEET 1 OF 4

LOCATION: N 535801.108 ;E 4998824.548

BORING DATE: June 13-14, 2018

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES					STANDARD PENETRATION RESISTANCE, N VALUE				HYDRAULIC CONDUCTIVITY, k, cm/s				REMARKS, ADDITIONAL LAB. TESTING & GRAIN SIZE DISTRIBUTION (%)	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	REC LENGTH (mm) SA LENGTH (mm)	BLOWS/0.15m	N VALUE	SHEAR STRENGTH				WATER CONTENT PERCENT					
										20	40	60	80	10 ⁻⁵	10 ⁻⁵	10 ⁻⁴			10 ⁻³
0		GROUND SURFACE		106.66													GR SA SI CL		
		TOPSOIL - (PT) Fibrous PEAT; dark brown; non-cohesive, dry, loose		106.05	1A		6												
		FILL - (ML/GM) sandy SILT and GRAVEL; brown, contains organic matter, cobbles and/or boulders; non-cohesive, dry, loose			1B	SS	203 610	3 2 10	5										
		(GM) sandy SILTY GRAVEL; grey, contains cobbles and/or boulders; non-cohesive, wet, dense to very dense		105.85	2-1	SS	0 76	50/0.08	>50										
1				105.81	2	SS	152 229	17 50/0.08	>50										
				105.06	3-1	SS	0 330	16 17 50/0.03	>67										
2		(GM/ML) sandy GRAVEL and SILT; reddish brown, with occasional cobbles and/or boulders (GLACIAL TILL); non-cohesive, moist, compact to very dense - OS3 sampled from 1.81 m to 2.41 m depth		1.60	3	SS	330 610	12 16 20 21	36								33 26 25 16		
3	Rotary Drill HTW Casing				4	SS	356 610	12 12 13 27	25										
4					5	SS	330 610	12 19 24 22	43								31 29 23 17		
5					6	SS	533 610	17 20 17 21	37										
					7	SS	229 229	18 50/0.08	>50										
				101.47															
6		Borehole continued on RECORD OF DRILLHOLE FMS-HG18-04A		5.19															
		NOTE: 1. "OS" denotes oversized split spoon sample (0.08 m outer diameter)																	
7																			
8																			
9																			
10																			

1.98 mbgs
Aug. 15, 2018

Bentonite Seal

MIS-BHS 014 1895674.GPJ GAL-MIS.GDT 4/29/19 ZS

DEPTH SCALE

1 : 50



LOGGED: CM/CDM/KL

CHECKED: SB

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-04A

SHEET 2 OF 4

LOCATION: N 535801.108; E 4998824.548

DRILLING DATE: June 13-14, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.25 m	DIP W.I.I. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	10	0	0	K, cm/sec					10
		BEDROCK SURFACE		101.47																
6		Slightly weathered, thinly bedded, dark grey, fine grained, moderately to slightly porous, medium strong mudstone ARGILLITE		5.19	1	JN,IR,RO IN,Ci 3 mm	3	8	6											
						BD,UN,SM CT,Ci 1 mm	2	4	16											
						JN,PL,SM CT,Ci 1 mm	1	4	12											
						BD,PL,SM CT,Ci 1 mm	1	4	12											
						JN,PL,SM CT,FeOx 1 mm	1	3	16											
						JN,UN,SM -	2	1	20											
						BD,PL,SM IN,Ci 3 mm	2	1	8											
						JN,PL,SM SA,FeOx	1	2	16											
						BD,UN,SM IN,FeOx 3 mm	2	4	6											
						JN,UN,SM SA,FeOx	2	2	20											
						JN,UN,SM CT,M 1 mm	2	4	16											
						BD,PL,SM SA,FeOx	1	2	16											
						BD,PL,SM -	1	1	16											
						BD,PL,SM -	1	1	16											
						BD,PL,SM -	1	1	16											
						BD,UN,SM -	2	1	20											
						BD,UN,SM -	2	1	20											
						BD,PL,SM -	1	1	16											
						BD,UN,SM CT,Bx 1 mm	2	3	20											
						BD,UN,SM -	2	1	20											
						BD,PL,RO -	1.5	1	20											
						BD,UN,SM CT,Chl 1 mm	2	4	16											
						BD,PL,SM -	1	1	16											
						BD,PL,SM -	1	1	16											
						BD,UN,SM -	2	1	20											
						BD,UN,SM -	2	1	20											
						BD,UN,SM -	2	1	20											
						BD,UN,SM -	2	1	20											
						BD,UN,SM -	2	1	20											
						BD,UN,SM CT,M 1 mm	2	4	16											
						JN,UN,RO -	3	1	25											
						JN,UN,RO CT,Bx 1 mm	3	3	22											
						CO,UN,SM IN,M 3 mm	2	4	6											
						BD,PL,SM SA,Ca	1	2	16											
						BD,UN,SM SA,M	2	2	20											
						BD,UN,SM -	2	1	20											
						BD,UN,SM SA,Ca	2	2	20											
						BD,UN,SM -	2	1	20											
						BD,UN,SM CT,M 1 mm	2	4	16											
						JN,UN,RO -	3	1	25											
						JN,UN,RO CT,Bx 1 mm	3	3	22											
						CO,UN,SM IN,M 3 mm	2	4	6											
						BD,PL,SM SA,Ca	1	2	16											
						BD,UN,SM SA,M	2	2	20											
						BD,UN,SM -	2	1	20											
						BD,UN,SM -	2	1	20											
						BD,PL,SM SA,M	1	2	16											
						BD,PL,SM SA,M	1	2	16											

CONTINUED NEXT PAGE

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE
1 : 50



LOGGED: CM/CDM/KL
CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER				
						RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.25 m	DIP W.I. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX		
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2	3	10					20	30
Rotary Drill HQ3 Core		--- CONTINUED FROM PREVIOUS PAGE ---																			
15		Slightly weathered, thinly to medium bedded, grey-green, fine and medium grained, slightly to moderately porous, weak to medium strong, interbedded silicified ARGILLITE-GREYWACKE - Broken core from 14.35 m to 15.25 m		89.23 17.43	7																
16					8																
17		- Broken core from 15.78 m to 16.22 m			9																
18		Fresh, thinly bedded, grey to dark grey, fine with medium grains, slightly to faintly porous, weak to medium strong, interbedded ARGILLITE-GREYWACKE			10																
19					11																
20		Fresh, medium bedded, green-grey, medium grained, moderately to slightly porous, medium to very strong, silicified GREYWACKE		87.12 19.54	12																
21		- Broken core from 20.91 m to 21.07 m			13																
22					14																
23					15																

CONTINUED NEXT PAGE

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-04A

SHEET 4 OF 4

LOCATION: N 535801.108; E 4998824.548

DRILLING DATE: June 13-14, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER				
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25 m	DIP W.I.I CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX		
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2	3	10					20	30
		--- CONTINUED FROM PREVIOUS PAGE ---																			
24	Rotary Drill HC3 Core	Fresh, medium bedded, green-grey, medium grained, moderately to slightly porous, medium to very strong, silicified GREYWACKE		15						JN,UN,RO SO,Py	3	1	25								
										JN,UN,RO SO,Py	3	1	25								
					16						VN,UN,SM CT,Chl 1 mm	2	4	16							
					82.24						HCO,-,-	4	0.75	25							
25		Fresh, thinly bedded, dark grey and green, fine grained, faintly porous, medium strong, interbedded siltstone and mudstone ARGILLITE		24.42						BD,UN,SM SO,Ca	2	1	20								
										BD,UN,SM SO,Ca	2	1	20								
										BD,PL,SM -	1	1	16								
										BD,PL,SM -	1	1	16								
										BD,PL,SM -	1	1	16								
26		End of Drillhole		80.92																	
				25.74																	
27		NOTES: 1. Packer testing (falling head test, constant rate injection) performed from 19.46 m to 25.74 m and 7.39 m to 25.74 m depth 2. Single well response testing (rising head test) performed from 14.88 m to 20.98 m depth.																			

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/CDM/KL

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-04B

SHEET 1 OF 1

LOCATION: N 535800.771; E 4998822.675

DRILLING DATE: June 16, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP W.I.T CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2	3	K, cm/sec					1
0		GROUND SURFACE		106.67																
0.00		Overburden drilled out. For soil stratigraphy refer to Record of Borehole FMS-HG18-04A		0.00																
1																				
2	Rotary Drill HWT Casing																			
3																				
4																				
4.07																				
5		Slightly weathered, thinly bedded, grey, fine grained, slightly porous, medium strong ARGILLITE		102.13	1															
4.54				4.54																
6					2															
6	Rotary Drill HQ3 Core																			
7					3															
7.12																				
7.79				98.88																
7.79		End of Drillhole		7.79																
8		NOTE: 1. Single well response testing (rising head test) performed from 4.07 m to 7.12 m depth.																		
9																				

Bentonite Seal

2.88 mbgs
Aug. 15, 2018

3.35 mbgs

Silica Sand

4.07 mbgs

50 mm Diam. PVC #10 Slot Screen

7.12 mbgs

Silica Sand

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: KL

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF BOREHOLE: FMS-HG18-05A

SHEET 1 OF 3

LOCATION: N 537263.208 ;E 4998507.475

BORING DATE: May 29-30, 2018

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				STANDARD PENETRATION RESISTANCE, N VALUE				HYDRAULIC CONDUCTIVITY, k, cm/s				REMARKS, ADDITIONAL LAB. TESTING & GRAIN SIZE DISTRIBUTION (%)	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	REC LENGTH (mm) SA LENGTH (mm)	BLOWS/0.15m	N VALUE	SHEAR STRENGTH				WATER CONTENT PERCENT					
										20	40	60	80	nat V. + rem V. Φ	Q - U -			10 ⁻⁵	10 ⁻⁵
0		GROUND SURFACE		113.53													GR SA SI CL		
		TOPSOIL - (SM) SILTY SAND; brown; non-cohesive, dry, very loose		0.89	1A		1												
		(GM) sandy SILTY GRAVEL; brown (GLACIAL TILL); non-cohesive, dry, compact to very dense			1B	SS	279 610	3 7 21	10									51 35 11 3	
					2	SS	229 279	21	>50										
1		(SM/ML) gravelly SILTY SAND to gravelly SAND and SILT; brown, contains cobbles and/or boulders (GLACIAL TILL); non-cohesive, wet, very dense		112.64			50/0.13												
				0.89															
					3	SS	381 610	29 38 40	67									34 41 21 4	
					4	SS	229 381	28 28	>78										
					5	SS	431 610	19 35 31 45	66									19 35 42 4	
					6	SS	254 254	35	>50										
4		(GM) sandy SILTY GRAVEL; grey (GLACIAL TILL); non-cohesive, wet, very dense		109.72															
				3.81															
				109.47															
				4.06															
		Borehole continued on RECORD OF DRILLHOLE FMS-HG18-05A																	

2.28 mbgs
Aug. 15, 2018

Bentonite Seal

MIS-BHS 014 1895674.GPJ_GAL-MIS.GDT 4/29/19_ZS



DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER	
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP W.I.T CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY K, cm/sec	ROCK STRENGTH INDEX			WEATHERING INDEX
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2					
		BEDROCK SURFACE		109.47														
		Moderately to slightly weathered, very thinly to thinly bedded, fine to medium grained, faintly porous, medium strong to strong, interbedded ARGILLITE (siltstone and mudstone) - Broken core from 4.06 m to 4.24 m - Broken core from 4.52 m to 4.60 m		4.06	1					JN,UN,SM CT,Cl 1 mm JN,IR,SM CT,Cl 1 mm JN,PL,SM SO,FeOx	2 4 16 2 4 16 1 1 16		R3	W3				
					2					BD,UN,RO SA,FeOx JN,PL,SM SO,FeOx JN,UN,SM CT,M 1 mm	3 2 22 1 2 16 2 4 16		R3	W3				
					3					JN,PL,RO SO,FeOx JN,UN,RO SO,FeOx JN,UN,RO SO,FeOx	1.5 1 20 3 1 25 3 1 25		R3	W2				
					4					JN,PL,RO SO,FeOx JN,PL,RO SA,Py JN,UN,RO SO,FeOx JN,PL,RO - JN,UN,RO -	1.5 1 20 1.5 2 30 3 1 25 1.5 1 20 3 1 25					Bentonite Seal		
					5					JN,UN,RO SO,FeOx JN,PL,SM - JN,UN,SM IN,Bx 5 mm BD,UN,RO SO,FeOx HCO,UN, -	3 1 25 1 1 16 2 5 8 3 1 25 4 0.75 25		R4	W2				
					5					BD,UN,SM CT,FeOx 1 mm JN,CU,RO CT,FeOx 1 mm JN,PL,SM -	2 3 20 3 3 22 1 1 16		R4	W2	8.23 mbgs	Silica Sand		
		- Broken core from 9.10 m to 9.22 m		104.22						JN,UN,SM SA,FeOx BD,IR,RO SA,FeOx BD,UN,SM -	2 2 20 3 2 22 2 1 20				9.17 mbgs			
		Slightly weathered, very thinly to thickly bedded, grey, fine grained, faintly porous, strong banded ARGILLITE siltstone (with mudstone folded banding/foliation)		9.31	6					BD,UN,SM SO,FeOx BD,UN,RO - BD,UN,SM SO,FeOx BD,UN,RO SO,Py JN,IR,RO SO,FeOx JN,PL,SM SA,FeOx	1.5 1 20 1.5 1 20 3 1 25 3 1 25 1 2 16		R3	W2				
					7					JN,UN,SM SO,Py BD,IR,SM SA,FeOx JN,PL,RO SA,FeOx	2 2 20 2 2 20 1.5 2 20					50 mm Diam. PVC #10 Slot Screen		
					8					JN,PL,RO SA,FeOx JN,PL,RO SO,Py VN,UN,RO CT,Cl 1 mm JN,CU,RO SO,FeOx JN,UN,RO SA,FeOx	1.5 2 20 1.5 1 20 3 4 20 3 1 25 3 2 22		R4	W2				

CONTINUED NEXT PAGE

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-07A

SHEET 2 OF 3

LOCATION: N 537889.273; E 4998795.88

DRILLING DATE: June 3, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER	
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25 m	DIP W.I.T CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY K, cm/sec	ROCK STRENGTH INDEX			WEATHERING INDEX
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	SL	LS					
		BEDROCK SURFACE		109.68														
4		Slightly weathered to fresh, thinly to very thinly bedded, dark grey, faintly porous, medium strong, banded ARGILLITE (mudstone and siltstone)		3.30	1													
					2													
5					3													
6					4													
7		Fresh, medium bedded, green grey and dark grey, fine grained, faintly porous, weak mudstone and medium strong siltstone banded ARGILLITE		106.43														
					5													
8		- Broken core from 7.93 m to 8.01 m			6													
9					7													
10		Fresh, medium bedded, light grey, medium grained, faintly porous, strong GREYWÄCKE		103.37														
					8													

CONTINUED NEXT PAGE

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/KL

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-07B

SHEET 1 OF 1

LOCATION: N 537883.789; E 4998796.171

DRILLING DATE: June 5, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP W.I.T. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	U	L	W	K					cm/sec
0		GROUND SURFACE		112.78																
0.00		Overburden drilled out. For soil stratigraphy refer to Record of Borehole FMS-HG18-07B		0.00														Bentonite Seal 0.29 mbgs Aug. 15, 2018		
1																		0.91 mbgs		
2	Rotary Drill H Casing																	Silica Sand		
3																		1.71 mbgs		
4	Rotary Drill HC3 Core	Slightly weathered, medium bedded, grey, medium grained, faintly porous, medium strong ARGILLITE - Broken core from 3.39 m to 3.66 m, drill flush return colour changed to brown, no change in volume		109.52 3.26	1											R3	W2			
4.76					2											R3	W2			
5		End of Drillhole NOTE: 1. Single well response testing (rising head test) performed from 1.71 m to 4.76 m depth.		107.93 4.85														50 mm Diam. PVC #10 Slot Screen		
5																		4.78 mbgs		
6																				
7																				
8																				
9																				

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/KL

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-08A

SHEET 2 OF 3

LOCATION: N 537612.69; E 4997771.114

DRILLING DATE: July 30-31, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER				
						RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.25 m	DIP W.I.T. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX		
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2	3	10					20	30
		BEDROCK SURFACE		136.98																	
		Slightly weathered to fresh, medium bedded, grey, medium with fine grains, faintly to slightly porous, medium strong, interbedded GREYWACKE-ARGILLITE		3.05	1																
		- Broken core from 3.66 m to 3.78 m																			
4		- 4.35 m bedding with clay and aperture, lost drill flush circulation			2																
5					3																
		- Broken core from 5.79 m to 5.97 m																			
6		- Broken core from 6.15 m to 6.40 m																			
7					4																
8		Fresh, medium to thinly bedded, grey-green, fine with medium grains, faintly porous, medium strong, interbedded ARGILLITE-GREYWACKE		132.03	5																
		- Broken core from 8.37 m to 8.45 m		8.00																	
9																					
10					6																
11					7																
12																					

CONTINUED NEXT PAGE

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/KL

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-08A

SHEET 3 OF 3

LOCATION: N 537612.69; E 4997771.114

DRILLING DATE: July 30-31, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP W.I.I CORE AXIS	DISCONTINUITY DATA				HYDRAULIC CONDUCTIVITY			ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	S	L	U	T					K, cm/sec
		--- CONTINUED FROM PREVIOUS PAGE ---																		
13	Rotary Drill HCS Core	Fresh, medium to thinly bedded, grey-green, fine with medium grains, faintly porous, medium strong, interbedded ARGILLITE-GREYWACKE		126.10 13.93	7	100	100	100	0	0								50 mm Diam. PVC #10 Slot Screen		
					8	100	100	100	0	0								13.34 mbgs		
14		End of Drillhole																Silica Sand		
15		NOTES: 1. Packer testing (falling head test, constant rate injection) performed from 4.16 m to 13.93 m and 7.39 m to 13.93 m depth. 2. Single well response testing (rising head test) performed from 10.29 m to 13.34 m depth.																		

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/KL

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-08B

SHEET 1 OF 1

LOCATION: N 537611.398; E 4997771.205

DRILLING DATE: August 1, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP W.I.T CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	J	S	U	K, cm/sec					10
0		GROUND SURFACE		139.98																
0.00		Overburden drilled out. For soil stratigraphy refer to Record of Borehole FMS-HG18-08A		0.00																
1	Rotary Drill HW Casing																Bentonite Seal			
1.39																	0.91 mbgs			
2																	1.39 mbgs			
2.17																	2.17 mbgs Aug. 15, 2018			
3				136.78																
3.20		Moderately weathered, medium bedded, grey, medium with fine grains, slightly to moderately porous, medium strong to weak, interbedded GREYWACKE-ARGILLITE		3.20	1															
4		- Broken core from 3.90 m to 4.55 m			2												50 mm Diam. PVC #10 Slot Screen			
5	Rotary Drill HQ3 Core																			
6		- Clay seam from 5.63 m to 5.76 m - Broken core from 5.76 m to 6.09 m			3												5.96 mbgs			
6.45				133.53													1.39 mbgs			
6.45		End of Drillhole		6.45																
7		NOTE: 1. Single well response testing (rising head test) performed from 1.39 m to 5.96 m depth.																		
8																				
9																				

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/KL

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-09A

SHEET 3 OF 3

LOCATION: N 538367.381; E 4999479.784

DRILLING DATE: June 5-6, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.25 m	DIP W.I.I. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY K, cm/sec				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	S	L	U	10					10
		BEDROCK SURFACE		118.79																
5		Slightly weathered to fresh, thinly to medium bedded, light grey, medium grained, faintly porous, strong to very strong GREYWACKE - Broken core from 4.88 m to 4.93 m		4.79	1											R4	W2			
6					2											R5	W2			
7					3											R5	W1			
8					4											R4	W1			
9					5											R5	W1			
10		Fresh, thinly bedded, dark grey, fine grained, faintly porous, medium strong mudstone ARGILLITE		113.44 10.14	5											R3	W1			
11					6											R3	W1			
12																				
13		End of Drillhole		111.20 12.38																

FEATURES LEGEND				HYDRAULIC CONDUCTIVITY LEGEND	
	BROKEN CORE		FAULT		LOST CORE
	CLAY SEAM		PACKER TESTING		SINGLE WELL RESPONSE TESTING

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-10A

SHEET 2 OF 3

LOCATION: N 539251.877; E 4998600.504

DRILLING DATE: August 4, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.25	DIP W.I.L. CORE AXIS	DISCONTINUITY DATA				HYDRAULIC CONDUCTIVITY			ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	S	U	T	P					K ₁
		BEDROCK SURFACE		137.96																
2.35		Slightly weathered, medium bedded, grey, medium with fines grains, slightly porous, medium strong, interbedded GREYWACKE-ARGILLITE - Broken core from 2.72 m to 2.78 m																		
3					1															
4		- Broken core from 3.80 m to 3.84 m			2															
5					3															
6		- Clay seam from 6.05 m to 6.08 m			4															
7	Rotary Drill HQ3 Core				5															
8					6															
8.19		Fresh, medium bedded, grey, medium with fine grains, slightly porous, medium strong, interbedded GREYWACKE-ARGILLITE		132.12																
8.9		Drill flush return reduced from full to partial around contact																		
9					7															
10					8															
11																				

CONTINUED NEXT PAGE

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/AKV

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-10B

SHEET 1 OF 1

LOCATION: N 539248.832; E 4998600.75

DRILLING DATE: August 6, 2018

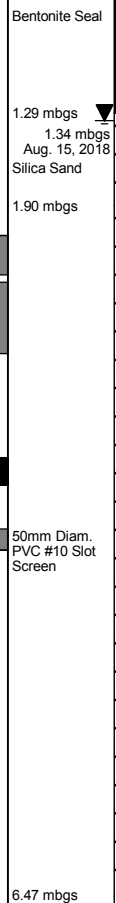
DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.25 m	DIP W.I. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	J	U	W	K, cm/sec					10
0		GROUND SURFACE		140.19																
0.00		Overburden drilled out. For soil stratigraphy refer to Record of Borehole FMS-HG18-10A																		
1	Rotary Drill HW Casing																			
2		Slightly weathered to fresh, medium bedded, grey, medium to fine grained, moderately porous, medium strong, interbedded GREYWACKE-ARGILLITE - Broken core from 2.10 m to 2.36 m - Broken core from 2.41 m to 2.88 m		138.09 2.10	1															
3					2															
4	Rotary Drill HQ3 Core	- Lost core from 3.57 m to 3.75 m - Broken core from 4.04 m to 4.16 m			3															
5					4															
6					5															
6.47		End of Drillhole		133.63 6.56																
7		NOTE: 1. Single well response testing (rising head test) performed from 1.9 m to 6.47 m depth.																		
8																				
9																				



FEATURES LEGEND				HYDRAULIC CONDUCTIVITY LEGEND	
	BROKEN CORE		FAULT		LOST CORE
	CLAY SEAM		PACKER TESTING		SINGLE WELL RESPONSE TESTING

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

DEPTH SCALE
1 : 50



LOGGED: AKV/KL
CHECKED: CM

PROJECT: 1895674

RECORD OF BOREHOLE: FMS-HG18-11A

SHEET 1 OF 3

LOCATION: N 538575.327 ;E 4997758.942



BORING DATE: August 2, 2018

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				STANDARD PENETRATION RESISTANCE, N VALUE				HYDRAULIC CONDUCTIVITY, k, cm/s				REMARKS, ADDITIONAL LAB. TESTING & GRAIN SIZE DISTRIBUTION (%)	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	REC LENGTH (mm) SA LENGTH (mm)	BLOWS/0.15m	N VALUE	SHEAR STRENGTH				WATER CONTENT PERCENT					
										20 40 60 80		10 ⁻⁵ 10 ⁻⁴ 10 ⁻³		nat V. + Q - rem V. ⊕ U -				Wp	
0	Rotary Drill HW Casing	GROUND SURFACE		162.38													GR SA SI CL		
		FILL - (SM) SILTY SAND, some gravel, some peat; brown; non-cohesive, dry, loose		0.00	1A	SS	457 610	3 4 4	8										
		(SM) gravelly SILTY SAND; grey brown, contains cobbles and/or boulders (GLACIAL TILL); non-cohesive, dry, compact to very dense		0.48	1B			4 4											
1				161.30	2	SS	279 356	10 25 50/0.05	>75									Bentonite Seal	
		Borehole continued on RECORD OF DRILLHOLE FMS-HG18-11A		1.08															
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

MIS-BHS 014 1895674.GPJ_GAL-MIS.GDT 4/29/19_ZS

DEPTH SCALE

1 : 50



LOGGED: CM/KL

CHECKED: SB

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-11A

SHEET 2 OF 3

LOCATION: N 538575.327; E 4997758.942

DRILLING DATE: August 2, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER				
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP W.I.T CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX		
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2	3	10					20	30
		BEDROCK SURFACE		161.30																	
		Slightly weathered, medium bedded, grey, medium grained, slightly to faintly porous, medium to very strong GREYWACKE, with vuggy quartz, iron stained pyrite veinlets and some silicified beds		1.08																	
1					1																
2					2																
3					3																
4					4																
5					5																
6					6																
7					7																
8					8																
9					9																
10					10																

CONTINUED NEXT PAGE

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

3.90 mbgs
Aug. 15, 2018
Bentonite Seal

7.29 mbgs
Silica Sand
7.87 mbgs

50 mm Diam.
PVC #10 Slot
Screen

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-11A

SHEET 3 OF 3

LOCATION: N 538575.327; E 4997758.942

DRILLING DATE: August 2, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75



DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP W.I.L CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	U	U _{10m}	K	U					U _{10m}
		-- CONTINUED FROM PREVIOUS PAGE --																		
	Relay Drill HQ3 Core	Slightly weathered, medium bedded, grey, medium grained, slightly to faintly porous, medium to very strong GREYWACKE, with vuggy quartz, iron stained pyrite veinlets and some silicified beds		151.46	7															
11		End of Drillhole		10.92																
12		NOTES: 1. Packer testing (falling head test, constant rate injection) performed from 3.16 m to 10.92 m depth. 2. Single well response testing (rising head test) performed from 7.87 m to 10.92 m depth.																		
13																				
14																				
15																				
16																				
17																				
18																				
19																				

FEATURES LEGEND

-  BROKEN CORE
-  FAULT
-  LOST CORE
-  CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

-  PACKER TESTING
-  SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/KL

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-11B

SHEET 1 OF 1

LOCATION: N 538573.361; E 4997760.251

DRILLING DATE: August 3, 2018

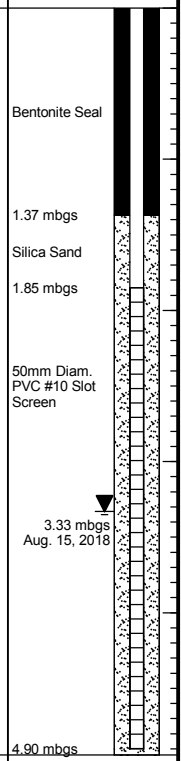
DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.25	DIP W.I.I. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2	3	K, cm/sec					1
0		GROUND SURFACE		162.41																
	Rotary Drill HW Casing	Overburden drilled out. For soil stratigraphy refer to Record of Borehole FMS-HG18-11A		0.00																
1				161.14																
		Slightly weathered, medium bedded, grey, medium grained, faintly porous, strong to very strong GREYWACKE		1.27	1					JN,PL,RO SA,Ca	1.5	2	20		R4	W2	1.37 mbgs			
2																				
					2					JN,PL,RO SA,FeOx JN,UN,RO SO,FeOx	1.5	2	20	1.5	3	25		R5	W2	1.85 mbgs
3	Rotary Drill HC3 Core									JN,PL,RO SO,FeOx	1.5	1	20							
										BD,UN,RO SA,FeOx	3	2	22							
4																				
					3					JN,PL,RO SO,FeOx	1.5	1	20							
										JN,PL,RO SO,FeOx	1.5	1	20							
										BD,UN,SM SA,FeOx BD,PL,RO SO,FeOx BD,UN,RO SO,FeOx	2 1.5 3	2 1 1	20 20 25							
5		End of Drillhole		157.47																
		NOTE: 1. Single well response testing (rising head test) performed from 1.85 m to 4.9 m depth.		4.94																
6																				
7																				
8																				
9																				



FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE
1 : 50



LOGGED: CM/KL
CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF BOREHOLE: FMS-HG18-13A

SHEET 1 OF 3

LOCATION: N 539918.735 ;E 4997839.078

BORING DATE: August 7, 2018

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				STANDARD PENETRATION RESISTANCE, N VALUE				HYDRAULIC CONDUCTIVITY, k, cm/s				REMARKS, ADDITIONAL LAB. TESTING & GRAIN SIZE DISTRIBUTION (%)	PIEZOMETER OR STANDPIPE INSTALLATION			
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	REC LENGTH (mm)	SA LENGTH (mm)	BLOWS/0.15m	N VALUE	SHEAR STRENGTH				WATER CONTENT PERCENT					
											20 40 60 80				10 ⁻⁵ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³					
		GROUND SURFACE		151.29													GR SA SI CL			
0	Rotary Drill HW Casing	(SM) gravelly SILTY SAND; brown, contains argillite/greywacke fragments (GLACIAL TILL); non-cohesive, dry, dense to very dense		0.00	1	SS	230 610	19 24 35	43	43										
				2	SS	230 230	60 50/0.08	>50	>50											
1				- OS3 sampled from 1.22 m to 1.60 m depth		3	SS	330 380	47 77	>127	>127									35 37 25 3
						4	SS	0 76	50/0.08	>50	>50									
2	Weathered BEDROCK (Drilled out)		149.40																	
	- Washed out during setting of casing and drilling of initial run in bedrock		1.89																	
3	Borehole continued on RECORD OF DRILLHOLE FMS-HG18-13A		148.59																	
	NOTE: 1. "OS" denotes oversized split spoon sample (0.08 m outer diameter)		2.70																	

MIS-BHS 014 1895674.GPJ GAL-MIS.GDT 4/29/19 ZS

DEPTH SCALE

1 : 50



LOGGED: AKV/KL

CHECKED: SB

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-13A

SHEET 2 OF 3

LOCATION: N 539918.735; E 4997839.078

DRILLING DATE: August 7, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.25 m	DIP W.I.T. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2	3	K, cm/sec					1
		BEDROCK SURFACE		148.59																
3		Slightly weathered to fresh, medium bedded, grey, medium to fine grained, slightly to faintly porous, medium strong ARGILLITE-GREYWACKE - Broken core from 2.7 m to 2.80 m - Broken core from 2.93 m to 3.13 m - Broken core from 3.24 m to 3.39 m - Lost core from 3.39 m to 3.65 m - Broken core from 3.65 m to 3.91 m		2.70	1															
4					2													3.67 mbgs Aug. 15, 2018		
5		- Broken core from 4.69 m to 4.75 m - Lost core from 4.89 m to 4.96 m - Broken core from 5.08 m to 5.31 m - Clay seam from 5.31 m to 5.57 m			3															
6		- Broken core from 6.33 m to 6.52 m			4															
7	Rotary Drill NQ3 Core				5															
8					6															
9					7													8.84 mbgs Silica Sand 9.38 mbgs		
10		- Broken core from 10.04 m to 10.07 m			8													50 mm Diam. PVC #10 Slot Screen		
11																				

CONTINUED NEXT PAGE

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: AKV/KL

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF BOREHOLE: FMS-HG18-14A

SHEET 1 OF 3

LOCATION: N 536802.336 ;E 4998352.852



BORING DATE: June 8, 2018

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES				STANDARD PENETRATION RESISTANCE, N VALUE				HYDRAULIC CONDUCTIVITY, k, cm/s				REMARKS, ADDITIONAL LAB. TESTING & GRAIN SIZE DISTRIBUTION (%)	PIEZOMETER OR STANDPIPE INSTALLATION			
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	REC LENGTH (mm) SA LENGTH (mm)	BLOWS/0.15m	N VALUE	20	40	60	80	10 ⁻⁵	10 ⁻⁶			10 ⁻⁴	10 ⁻³	
0	Rotary Drill HTW Casing	GROUND SURFACE		116.89																
		FILL - (GM/SM) SILTY GRAVEL and SAND; brown, contains cobbles and/or boulders; non-cohesive, dry, dense to very dense		0.00	1	SS	406 610	4 9 24 25 30	33											
1					2	SS	381 457	30 30 50/0.15	>80											41 41 11 7
		(SM) gravelly SILTY SAND; brown grey, contains cobbles and/or boulders (GLACIAL TILL); non-cohesive, wet, very dense		115.37 1.52	3	SS	305 457	0 25 18 41 50/0.15	>80											
2				4	SS	229 457	29 34 50/0.15	>84												
3		Borehole continued on RECORD OF DRILLHOLE FMS-HG18-14A		114.15 2.74																
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Bentonite Seal

MIS-BHS 014 1895674.GPJ GAL-MIS.GDT 4/29/19 ZS

DEPTH SCALE

1 : 50



LOGGED: CM/CDM

CHECKED: SB

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-14A

SHEET 2 OF 3

LOCATION: N 536802.336; E 4998352.852

DRILLING DATE: June 8, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER	
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25 m	DIP WELL CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY K, cm/sec	ROCK STRENGTH INDEX			WEATHERING INDEX
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2					
		BEDROCK SURFACE		114.15														
3		Slightly weathered, thinly bedded, fine grained, dark grey, Slightly to moderately porous, medium to very strong mudstone ARGILLITE		2.74	1													
		Drill flush return partial from weathered top of rock			2													
		- Broken core from 2.74 m to 2.84 m																
4		- Lost drill flush circulation			3													
5																		
6																		
7																		
8		Slightly weathered, medium bedded, grey, medium grained, faintly porous, medium to strong, interbedded GREYWACKE-ARGILLITE, with rip-up structure along bedding contacts		8.00	6													
9																		
10																		
11		Slightly weathered, medium bedded, light grey, medium grained, faintly porous, medium to strong GREYWACKE		11.00	8													

CONTINUED NEXT PAGE

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/CDM

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-14B

SHEET 1 OF 1

LOCATION: N 536804.298; E 4998352.727

DRILLING DATE: June 10, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.25 m	DIP W.I.T. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	J	K	L	K					T
0		GROUND SURFACE		116.97																
0	Rotary Drill HTW Casing	Overburden drilled out. For soil stratigraphy refer to Record of Borehole FMS-HG18-14A		0.00																
1																				
2																				
3		Slightly weathered, medium bedded, grey, medium and fine grained, moderately to slightly porous, medium to very strong, interbedded GREYWACKE-ARGILLITE Partial Flush return from top of rock, lost at 3.08 m		114.47 2.50	1															
3					2															
3					3															
4					4															
4		- Void from 4.54 m to 4.56 m																		
5	Rotary Drill HQ3 Core				5															
5																				
6																				
6																				
7					6															
7		- Broken core from 7.18 m to 7.24 m																		
8		End of Drillhole		109.14 7.83																
8		NOTE: 1. Single well response testing (rising head test) performed from 1.86 m to 6.43 m depth.																		
9																				

Bentonite Seal

1.22 mbgs

Silica Sand

1.86 mbgs

50 mm Diam. PVC #10 Slot Screen

4.71 mbgs Aug. 15, 2018

6.43 mbgs

Silica Sand

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE
1 : 50



LOGGED: CM/CDM
CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF BOREHOLE: FMS-HG18-15A

SHEET 1 OF 3

LOCATION: N 536367.439 ;E 4998746.870

BORING DATE: June 11, 2018

DATUM: CGVD28

SAMPLER HAMMER, 64kg; DROP, 760mm

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES					STANDARD PENETRATION RESISTANCE, N VALUE				HYDRAULIC CONDUCTIVITY, k, cm/s				REMARKS, ADDITIONAL LAB. TESTING & GRAIN SIZE DISTRIBUTION (%)	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	REC LENGTH (mm)	SA LENGTH (mm)	BLOWS/0.15m	N VALUE	SHEAR STRENGTH				WATER CONTENT PERCENT					
											20 40 60 80		10 ⁻⁵ 10 ⁻⁶ 10 ⁻⁴ 10 ⁻³		nat V. + Q - rem V. ⊕ U -				Wp	
0	Rotary Drill HTW Casing	GROUND SURFACE		107.46																
		TOPSOIL - (PT) Fibrous PEAT; dark brown; non-cohesive, dry, very loose (GM) sandy SILTY GRAVEL; brown, contains cobbles and/or boulders (GLACIAL TILL); non-cohesive, dry to wet, loose to very dense		0.00 0.10	1	SS	305 610	1 6	1 23	7										
					2	SS	127 229	12	50/0.08	>50										
1			(ML/GM) sandy SILT and GRAVEL; brown, contains cobbles and/or boulders (GLACIAL TILL); non-cohesive, wet, dense to very dense		106.03 1.43	3	SS	102 152	50/0.15	>50										
2				4	SS	127 254	35	50/0.10	>50											
3		Borehole continued on RECORD OF DRILLHOLE FMS-HG18-15A		105.11 2.35																
4																				
5																				
6																				
7																				
8																				
9																				
10																				

0.66 mbgs
Aug. 15, 2018

Bentonite Seal

MIS-BHS 014 1895674.GPJ_GAL-MIS.GDT 4/29/19_ZS

DEPTH SCALE

1 : 50



LOGGED: CM/CDM

CHECKED: SB

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-15A

SHEET 2 OF 3

LOCATION: N 536367.439; E 4998746.87

DRILLING DATE: June 11, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										ROCK STRENGTH INDEX	WEATHERING INDEX	FEATURES	PIEZOMETER		
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP W.I. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY							
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	JT	JS	JSM	K, cm/sec					10	10
		BEDROCK SURFACE		105.11																	
3		Slightly weathered to fresh, medium bedded, grey, fine to medium grained, moderately to faintly porous, medium strong, interbedded ARGILLITE-GREYWACKE - Broken core from 3.02 m to 3.14 m		2.35	1																
					2																
4					3																
5					4																
6					5																
7					6																
8					7																
9																					
10																					
11		End of Drillhole		96.58																	
		NOTES:		10.88																	
		CONTINUED NEXT PAGE																			

FEATURES LEGEND				HYDRAULIC CONDUCTIVITY LEGEND	
	BROKEN CORE		FAULT		LOST CORE
	CLAY SEAM		PACKER TESTING		SINGLE WELL RESPONSE TESTING

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-15A

SHEET 3 OF 3

LOCATION: N 536367.439; E 4998746.87

DRILLING DATE: June 11, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75



DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY											FEATURES	PIEZOMETER		
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP w.r.t CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY					ROCK STRENGTH INDEX	WEATHERING INDEX
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	U	V	W	K ₁	K ₂				
						000000	000000													
12		<p>-- CONTINUED FROM PREVIOUS PAGE --</p> <p>1. Packer testing (falling head test, constant rate injection) performed from 5.12 m to 10.83 m depth.</p> <p>2. Single well response testing (rising head test) performed from 7.73 m to 10.78 m depth.</p>																		
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				

FEATURES LEGEND

-  BROKEN CORE
-  FAULT
-  LOST CORE
-  CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

-  PACKER TESTING
-  SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/CDM

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-15B

SHEET 1 OF 1

LOCATION: N 536367.09; E 4998743.627

DRILLING DATE: June 13, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER				
						RECOVERY		R.Q.D. %	FRACT INDEX PER 0.25	DIP W.I.T. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX		
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	S	L	U	K, cm/sec					10	100
0		GROUND SURFACE		107.56																	
0.00		Overburden drilled out. For soil stratigraphy refer to Record of Borehole FMS-HG18-15A																			
1	Rotary Drill HTW Casing																				
2		Slightly weathered, medium bedded, light and dark grey, medium and fine grained, slightly to faintly porous, medium strong, interbedded GREYWACKE-ARGILLITE, with rip-up structures on contact beddings		105.55 2.01	1																
3	Rotary Drill HQ3 Casing																				
4					2																
4		End of Drillhole		103.39 4.17																	
5		NOTE: 1. Single well response testing (rising head test) performed from 1.03 m to 4.08 m depth.																			
6																					
7																					
8																					
9																					

Bentonite Seal

0.76 mbgs

0.92 mbgs
Aug. 15, 2018

50 mm Diam. PVC #10 Slot Screen

4.07 mbgs

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: CM/CDM

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-16A

SHEET 2 OF 3

LOCATION: N 540442.988; E 4999567.685

DRILLING DATE: August 9-10, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	NOTE: For abbreviations, symbols and descriptions refer to LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY										FEATURES	PIEZOMETER			
						RECOVERY		R.Q.D. %	FRACT. INDEX PER 0.25	DIP W.I.T. CORE AXIS	DISCONTINUITY DATA			HYDRAULIC CONDUCTIVITY				ROCK STRENGTH INDEX	WEATHERING INDEX	
						TOTAL CORE %	SOLID CORE %				TYPE AND SURFACE DESCRIPTION	1	2	3	1					2
		BEDROCK SURFACE		140.11																
		Slightly weathered to fresh, medium bedded, grey, medium to fine grained, slightly to faintly porous, medium strong GREYWACKE-ARGILLITE		2.06																
1		- Broken core from 2.06 m to 2.18 m - Broken core from 2.52 m to 2.53 m																		
3		- Lost core from 2.99 m to 3.08 m - Broken core from 3.23 m to 3.25 m - Broken core from 3.36 m to 3.36 m																		
4		- Lost core from 3.64 m to 4 m - Broken core from 4 m to 4.1 m																		
5		- Broken core from 4.5 m to 4.75 m																		
6		- Broken core from 5.64 m to 5.88 m - Lost core from 5.88 m to 5.95 m																		
7																				
8																				
9																				
10																				
11				131.15																

CONTINUED NEXT PAGE

FEATURES LEGEND

- BROKEN CORE
- FAULT
- LOST CORE
- CLAY SEAM

HYDRAULIC CONDUCTIVITY LEGEND

- PACKER TESTING
- SINGLE WELL RESPONSE TESTING

DEPTH SCALE

1 : 50



LOGGED: AKV/KL

CHECKED: CM

MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

PROJECT: 1895674

RECORD OF DRILLHOLE: FMS-HG18-16B

SHEET 1 OF 1

LOCATION: N 540445.433; E 4999567.498

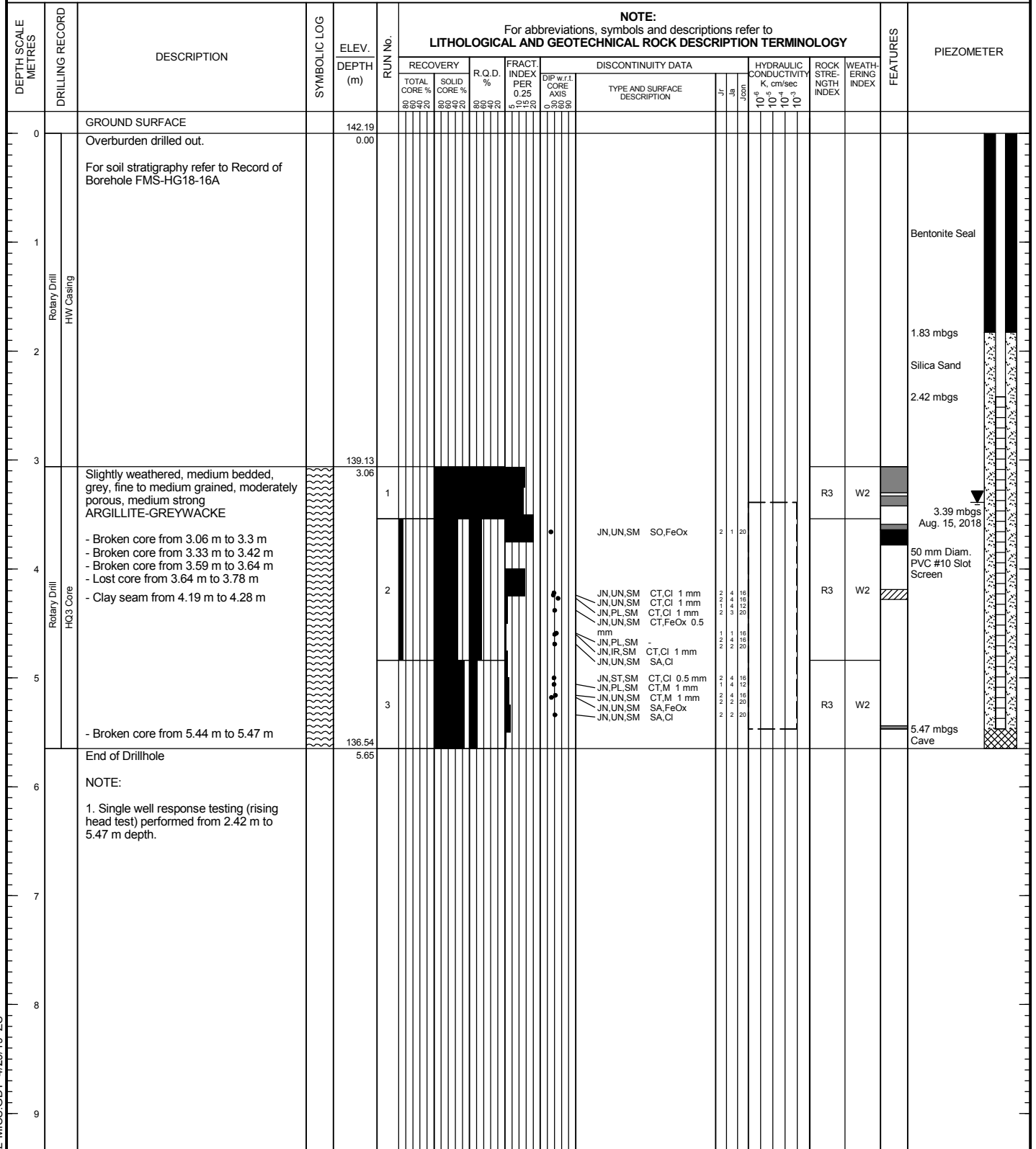
DRILLING DATE: August 11, 2018

DATUM: CGVD28

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Logan Drilling



MIS-RCK 022 1895674.GPJ GAL-MISS.GDT 4/29/19 ZS

DEPTH SCALE

1 : 50



LOGGED: AKV/MA

CHECKED: CM

APPENDIX B

**Photography of Soil Split Spoons
and Rock Cores**



GOLDER

Appendix B1 – Soil Split Spoon Photos

1895674 – FIFTEEN MILE STREAM

2019-09-10

FMS-HG18-02X



FMS-HG18-02X



FMS-HG18-03A



FMS-HG18-03A



FMS-HG18-03A



FMS-HG18-03A



FMS-HG18-03A



FMS-HG18-03A



FMS-HG18-03A



FMS-HG18-03A



FMS-HG18-04A



FMS-HG18-04A



FMS-HG18-04A



FMS-HG18-04A



FMS-HG18-04A



FMS-HG18-04A



FMS-HG18-04A



FMS-HG18-05A



FMS-HG18-05A



FMS-HG18-05A



FMS-HG18-05A



FMS-HG18-05A



FMS-HG18-05A



FMS-HG18-06A



FMS-HG18-06A



FMS-HG18-06A



FMS-HG18-06A



FMS-HG18-07A



FMS-HG18-07A



FMS-HG18-07A



FMS-HG18-07A



FMS-HG18-07A



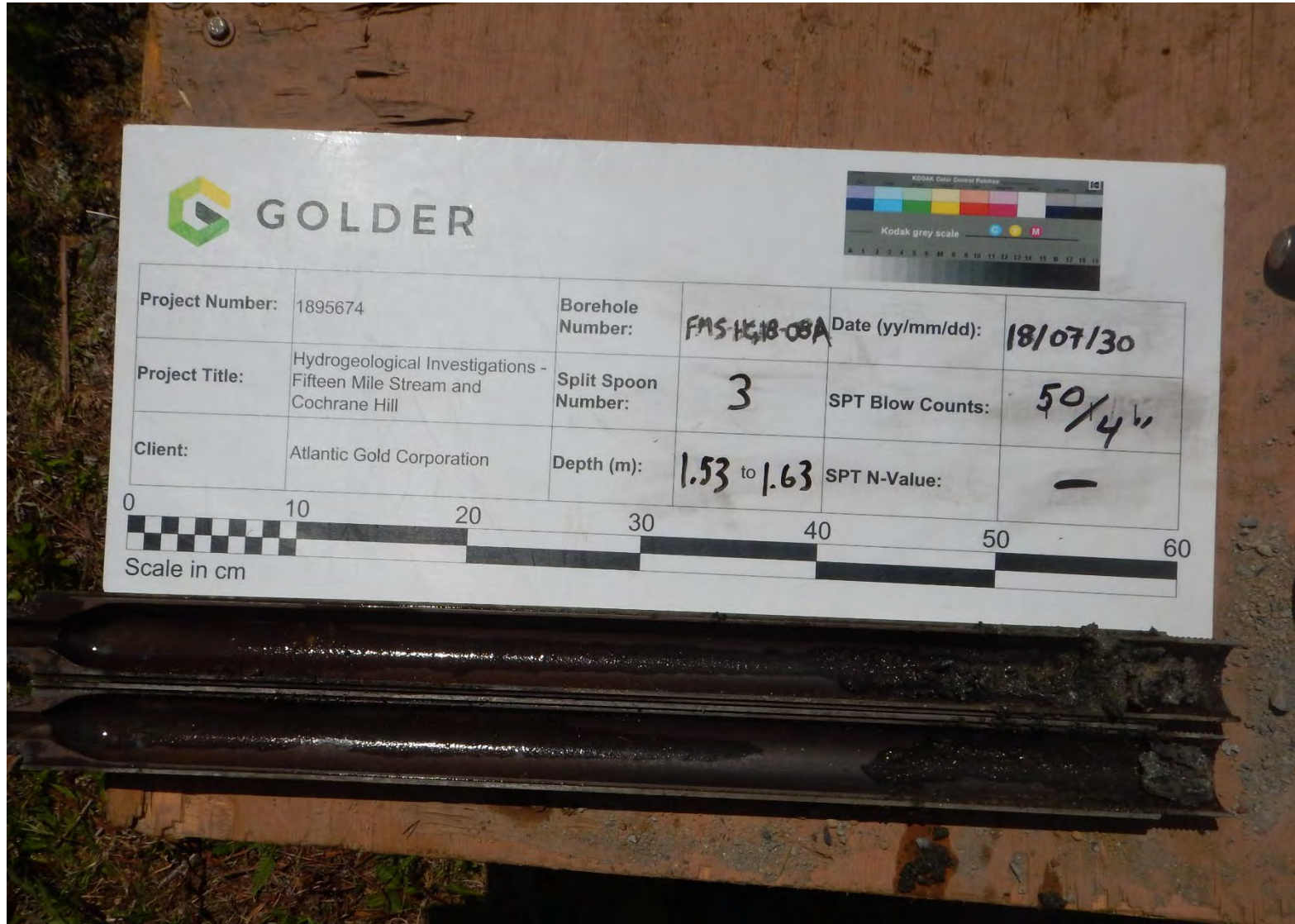
FMS-HG18-08A



FMS-HG18-08A



FMS-HG18-08A



FMS-HG18-09A



FMS-HG18-09A



FMS-HG18-09A

GOLDER

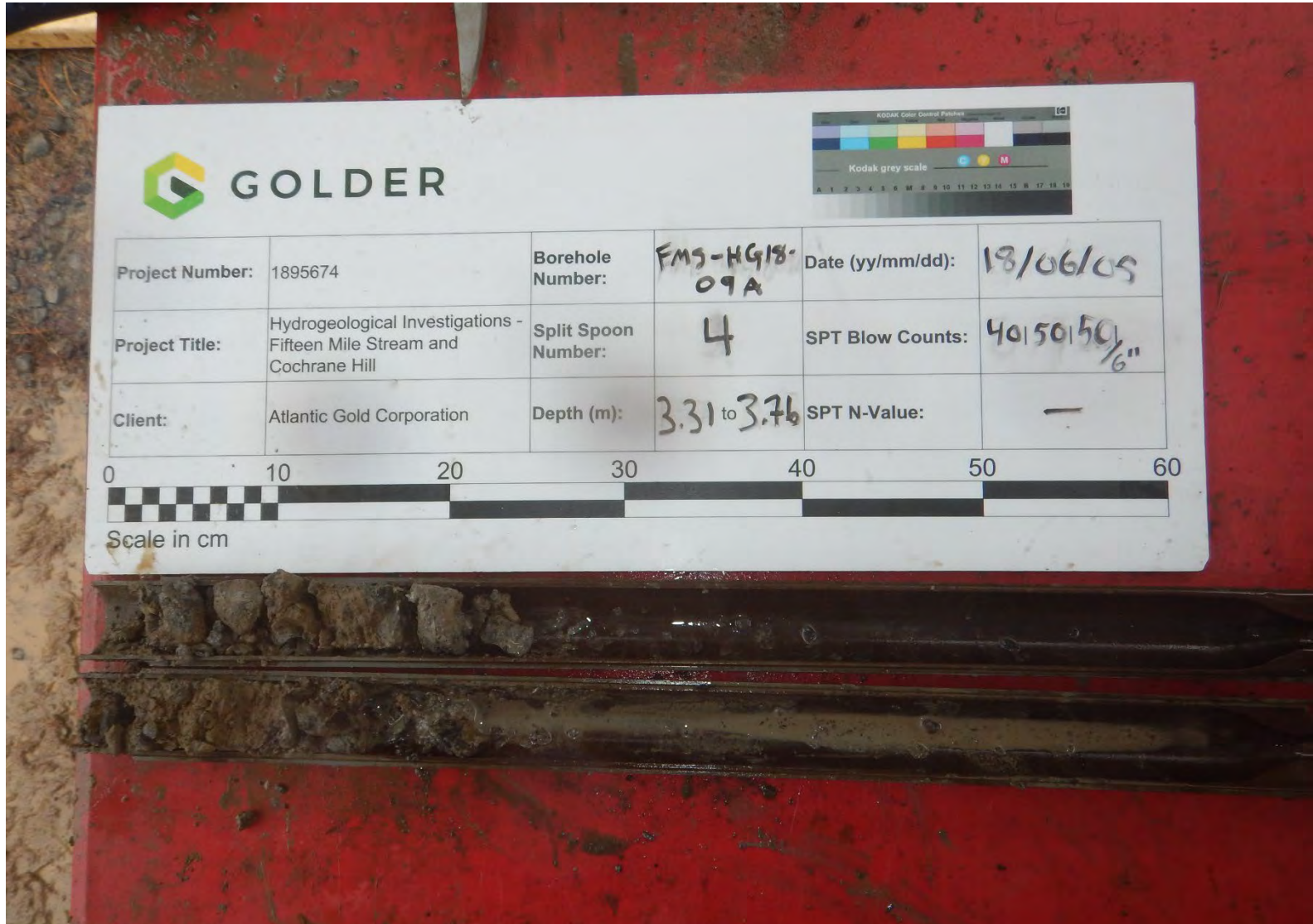
KODAK Color Control Chart
Kodak gray scale

Project Number:	1895674	Borehole Number:	FMS-HG18-09A	Date (yy/mm/dd):	8/26/05
Project Title:	Hydrogeological Investigations - Fifteen Mile Stream and Cochrane Hill	Split Spoon Number:	3	SPT Blow Counts:	6 128 150 1/6"
Client:	Atlantic Gold Corporation	Depth (m):	1.57 to 2.03	SPT N-Value:	

0 10 20 30 40 50 60

Scale in cm

FMS-HG18-09A



FMS-HG18-09A



FMS-HG18-10A



FMS-HG18-10A



FMS-HG18-10A



FMS-HG18-11A



FMS-HG18-11A



FMS-HG18-13A

