PHASE 2 INITIAL BOREHOLE DRILLING AND TESTING, IGNACE AREA

Completion of Demobilization and Decommissioning activities at IG_BH01 Test Site, Ignace, ON

APM-REP-01332-0228 **November 2018**

Golder Associates Ltd.

nwmo
NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Nuclear Waste Management Organization
22 St. Clair Avenue East, 4th Floor
Toronto, Ontario
M4T 2S3
Canada

Tel: 416-934-9814
Web: www.nwmo.ca

TECHNICAL MEMORANDUM

DATE November 14, 2018 **Project No.** 1671632 (1100)

TO Maria Sánchez-Rico Castejón, Sarah Hirschorn
NWMO

CC Geoff Crann - NWMO

FROM George Schneider, Adrian Kowalchuk **EMAIL george_schneider@golder.com**

COMPLETION OF DEMOBILIZATION AND DECOMISSIONING ACTIVITES AT IG_BH01 TEST SITE, IGNACE, ON

INTRODUCTION

This technical memorandum describes demobilization and decommissioning activities carried out on March 16, 2018, and May 23, 2018 by Golder. The activities were performed as part of the decommissioning process for drill site IG_BH01 and included the removal of petroleum hydrocarbon (PHC) stained fill materials, which were identified during the demobilization and decommissioning activities. The demobilization and decommissioning activities are described in chronological order.

Figure 1: Location of four areas where hydrocarbon stained fill was removed on March 16, 2018

Golder Associates Ltd.
210 Sheldon Drive, Cambridge, Ontario N1T 1A8 Canada T: +1 519 620 1222 +1 519 620 9878

FIRST DEMOBILIZATION AND DECOMISSIONING EVENT - MARCH 16, 2018

Following demobilization of equipment and facilities at IG_BH01, hydrocarbon staining was observed at four locations shown on Figure 1: the fuel storage tank area, main site generator, northwest light tower, and the grader parking area.

The staining at the fuel tank, generator and light tower were the result of the inadvertent release of small amounts of diesel to the ground during fuel handling. The staining in the grader parking area is presumed to be related to a small oil leak from the grader which was parked on site and used to clear snow from the roadways over the winter. The leak is assumed to be related to the loss of brake fluid, which was documented to have occurred on January 7, 2017. Because of the small volumes of these leaks (< 1L), they were not classified as reportable spills.

FIELD ACTIVITIES

The fill removal was carried out under Golder supervision by Ricci's Trucking (Ricci), who were under contract to Rodren Drilling, using a track-mounted John Deere 2454D excavator. Approximately 5.7 m^3 of stained fill material in total was removed from the four locations and placed directly into lined soil storage totes. Details of the areas excavated, fill volume removed, and confirmatory samples taken for each area are summarized below, and are illustrated in Appendix A – Remedial Excavation Diagrams. The center of each excavation was surveyed using a Leica Viva GNSS, which was operated by Altus Geomatics on March 15, 2018.

The impacted fill in each area was excavated and removed until there was no visual indication of PHC remaining at that location. Following the removal of stained fill materials, a series confirmatory fill samples were collected from the base of each area, as noted in Table 1, and field screened for PHC vapours to help assess whether the PHC impacts had been removed.

The field screening consisted of measuring PHC vapour in the fill sample "headspace" using an RKI Eagle I which was calibrated by the supplier prior to shipping using a combustible gas standard of 100 parts per million (ppm). A portion of each sample was also retained for potential laboratory analysis. In the case of the generator area, additional fill material was removed from that area based on headspace readings, with the final confirmatory headspace readings presented in Table 1. It should be noted that headspace readings are qualitative in nature and do not directly measure the presence of contaminants in a sample. Headspace readings will vary based on contaminant properties (volatility), and soil properties (particle size, porosity, moisture content, adsorption capacity) and should only be used as a relative tool for selecting samples for laboratory analysis.

For each area where impacted fill was removed, the "worst case" fill sample (i.e. that having the highest headspace reading) was collected and stored following standard protocols and then shipped to Maxxam Analytics for PHC analysis, including: benzene, toluene, ethylbenzene, total xylenes (BTEX), and petroleum hydrocarbon fractions 1-4 (F1-F4).

Table 1: Summary of Fill Removal Areas

Excavation Location	Excavation Centroid	Volume Removed (m3)	Confirmatory Samples	Headspace Results (Combustible Gas)
Fuel Storage Tank	15U, 555962.55m E 5485999.13m N	2.0 m^3	FST-1	<0 ppm
			FST-	<0 ppm
			FST-3	**210 ppm**
			FST-4	10 ppm
			FST-5	50 ppm
			FST-6	<0 ppm
Main Generator	15U, 555956.21m E, 5485993.44m N	3.06 m^3	**GEN-1**	**35 ppm**
			(DUP-1)	**35 ppm**
			GEN-2	10
			GEN-3	<0 ppm
			GEN-4	<0 ppm
			GEN-5	<0 ppm
			GEN-6	5
NW Light Tower	15U, 555939.25m E, 5486020.45m N	0.42 m^3	**LT-1**	**85 ppm**
			LT-2	<0 ppm
			LT-3	55 ppm
Grader Parking	15U, 555941.47m E, 5485969.96m N	0.25 m^3	**GRADER-1**	**0 ppm**
			GRADER-2	<0 ppm
			GRADER-3	<0 ppm

Underlined/Bold - Samples selected for laboratory analysis.

In addition to the four confirmatory samples, one blind duplicate sample was also submitted for analysis of BTEX, F1-F4 for quality assurance and quality control (QA/QC) purposes, and one composite fill sample (sample I.D. “COMPOSITE”) was submitted for waste characterization under O.Reg. 588 (i.e. TCLP for BTEX), to determine fill management options. The fill was temporarily transported to a storage yard owned by Ricci Trucking, to wait for laboratory analysis for landfill waste characterization (Appendix B).

March 16, 2018 Analytical Results

The analytical results of the confirmatory soil samples collected on March 16, 2018 are summarized in Table2. Chain of Custody and Certificates of Analysis are provided in Appendix C.

Table 2: Petroleum Hydrocarbon Analytical Results for Confirmatory Samples in Fill Removal Areas

Parameter	MECP Table 2	Units	LT-01	GEN-1	(DUP-1)	GRADER-1	FST-3
Benzene	0.21	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	2.3	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020
Ethylbenzene	1.1	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes	3.1	mg/kg	<0.045	<0.045	<0.045	<0.045	<0.045
F1 (C6-C10)	55	mg/kg	<10	<10	<10	<10	<10
F2 (C10-C16)	98	mg/kg	12	48	94	**120**	16
F3 (C16-C34)	300	mg/kg	<50	50	140	160	<50
F4 (C34-C50)	2,800	mg/kg	<50	<50	120	<50	<50

Notes:

Bold/Underlined = exceeds Ministry of Environment, Conservation and Parks (MECP) Table 2 Guidelines

The analytical results were compared to MECP Table 2 - Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use (MECP, 2011). Only one of the five samples analysed contained PHC concentrations exceeding guideline criteria. Specifically, only the F2 concentrations in sample Grader-1 exceeded the MECP Table 2 guidelines (120 mg/kg vs. 98 mg/kg).

QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

To assess this project's QA/QC procedures and to evaluate the quality of the analytical data, the difference factor was calculated between one original sample (GEN-1) and its field duplicate (DUP-1). The difference factor is defined as the absolute difference between two values, divided by the reported detection limit (RDL). For duplicate concentrations less than five times the reportable detection limit, a value of +/- 2 times the detection limits is considered acceptable[1]. For samples where the concentrations of both the primary and duplicate sample are greater than five times the reportable detection limit, the quality of analytical data is evaluated by calculating the relative percent difference (RPD)[2]. There were no sample parameters with concentrations greater than five times the reportable detection limit for both the primary and duplicate sample, and so the RPD was not calculated for any of the sample parameters.

The QA/QC results are presented in Table 3 and indicate that the concentration differences between the original and duplicate samples were greater than two times the RDL for PHC fractions F2-F4. The concentration differences between the samples may be related to the small volumes of the PHC sources, which created relatively small areas of impact and uneven dispersal through the fill material. Considering that this area was re-excavated and resampled during the May 23, 2018 site visit, this variability does not affect the final conclusion of

[1] Canadian Council of Ministers of the Environment, (2016), Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment, Volume 4 Analytical Methods.

[2] Ministry of the Environment, Conservation and Parks, (2011), Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

this report. The difference factors were within 2 RDL for the remainder of the parameters that were assessed in the blind duplicate samples.

Table 3: Summary of QA/QC Program

Parameter	Unit	RDL	GEN-1	DUP-1	> 5x RDL	< 2x RDL	Pass or Fail
Benzene	mg/kg	0.0050	<0.0050	<0.0050	No	Yes	Pass
Toluene	mg/kg	0.020	<0.020	<0.020	No	Yes	Pass
Ethylbenzene	mg/kg	0.010	<0.010	<0.010	No	Yes	Pass
Xylenes	mg/kg	0.045	<0.045	<0.045	No	Yes	Pass
F1 (C6-C10)	mg/kg	10	<10	<10	No	Yes	Pass
F2 (>C_{10}-C_{16})	mg/kg	10	48	94	No	No	Fail
F3 (>C_{16}-C_{34})	mg/kg	50	50	140	No	No	Fail
F4 (>C_{34}-C_{50})	mg/kg	50	<50	120	No	No	Fail

SUMMARY OF MARCH 16, 2018 PROGRAM

The excavation and removal of suspected PHC impacted fill materials on March 16, 2018 was generally successful and the majority of PHC impacts were verified to have been removed from the four areas identified. A site inspection was performed by Golder and NWMO representatives, relative to the requirements outlined in the Site Decommissioning Checklist. Inspection results are provided in Appendix D.

Following receipt of the analytical results, one location beneath the grader parking area had a fill sample which slightly exceeded MECP Table 2 guideline concentrations for PHC-F2. Golder and NWMO agreed that a return visit to drill site IG_BH01 would be performed following the spring melt, so that additional fill could be excavated, and new confirmatory samples collected from the grader parking area, to ensure that MECP Table 2 guidelines were met. Additionally, during the return visit, the site would be inspected a second time, so that any other areas of PHC impacts identified during the spring site inspection could be similarly addressed.

SECOND DEMOBILIZATION AND DECOMISSIONING EVENT - MAY 23, 2018

A second site demobilization and decommissioning event at IG_BH01 was performed on May 23, 2018, as a follow-up to initial demobilization and decommissioning activities that took place on March 16, 2018.

The activities that took place on May 23, 2018 included a site walk-over by Golder and an NWMO representative, the removal of the silt and snow fencing around the site, and the removal of residual fill material in several locations which were known or inferred to potentially have residual petroleum hydrocarbon (PHC) impacts. The site walkover consisted of walking an east-west grid at 3-metre (m) intervals. During this walkover, the ground was visually scanned for waste and/or staining that had been obscured by snow and ice during the March 16, 2018 demobilization event. Waste and residual staining of the surface fill were removed during this second demobilization event, as described below.

FIELD ACTIVITIES

During the site walk-over by Golder and NWMO, residual staining of the surface fill was observed at nine locations, some of which were initially identified and excavated in March 2018, and some of which were not observed in March due to the snow and ice cover at surface.

These locations (EX1 to EX9) are shown on Figure 2 (below) and are described as follows.

- The staining at location EX1 was located is the same area as the previous excavation beneath the grader parking area and is presumed to be related to the same small oil leak that led to the March 2018 excavation.
- The staining at locations EX2 through EX8 are presumed to be the result of fueling activities for diesel powered equipment used during the drilling and testing program. Diesel powered equipment on site included light towers, generators, the drill rig, diesel fueled heaters, and one skid steer.
- The footprint of EX7 expanded into EX6, and all sample names were labelled as EX6 thereafter. The staining was located in the fueling areas of one light tower, and of the drill rig.
- The discolouration of fill at location EX9 may have been the result of organic rich fill materials and was removed and sampled as a precautionary measure.

The fill removal was carried out under Golder supervision by Ricci Trucking (Ricci), who were under contract to Rodren Drilling, using a track-mounted Hyundai 60CR-9R excavator. The centre of each excavation was geospatially located using a handheld Garmin GPSMap 60CSx, which had 3m location accuracy on the day of sampling.

Ricci also completed the removal of the snow and silt fencing from around the IG_BH01 site perimeter.

Figure 2: Location of the areas at the IG_BH01 drill site where PHC stained fill was observed and removed on May 23, 2018

An estimated 8.1 m^3 of stained fill material was removed from the locations listed below and placed directly into a tri-axle dump truck owned by Ricci's. The stained fill material was taken to the Township of Ignace waste disposal

site, in Ignace, Ontario. An additional 5.7 m^3 of stained fill material from the previous March 16th clean-up, which had been temporarily stored by Ricci in soil transfer bags were also taken to the Township of Ignace waste disposal site on May 23, 2018. Waste classification details are provided in a later section of this memorandum.

FIELD SCREENING AND LABORATORY ANALYSIS

Following the excavation of stained fill materials, confirmatory fill samples were collected from the base of each excavation and were split into three components. One component of each sample was placed into a laboratory supplied containers and stored in a cooler with ice for potential laboratory analyses. The second component was placed inside a labelled plastic bag for soil vapour measurements, and the third component was placed into a labelled OIL-IN-SOIL™ oil screening test kit.

The soil vapour measurements were made on all samples using an RKI Eagle II, which was calibrated with 100 ppm hexane gas. Field screening for PHC was also carried out on all samples using OIL-IN-SOIL™ test kits to assess the potential presence of PHC in the fill. These two field screening results were used in conjunction with visual observations to select confirmatory samples to be sent to the laboratory for quantitative PHC testing. The field screening results are listed in Table 4.

For each excavation area, the sample with the highest likelihood of impacts was selected for laboratory analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), and petroleum hydrocarbon fractions 1-4 (PHC F1-F4). Four confirmatory samples from EX1 were submitted for laboratory analysis, to provide coverage over the larger footprint of the excavation. Seven confirmatory samples were submitted from locations EX2 through EX9. In addition to the eleven confirmatory samples, two blind duplicate samples were submitted for analysis of BTEX, F1-F4 for quality assurance and quality control (QA/QC) purposes. These samples were packed on ice in coolers and transported to Maxxam Analytics in Mississauga, Ontario via Purolator courier following Chain of Custody protocols.

Chains of Custody and Certificates of Analysis are provided in Appendix E. Details of the areas excavated, fill volume removed, and confirmatory samples taken for each area are summarized in the table below, and illustrated in the excavation diagrams presented in Appendix A.

Table 4: Summary of Fill Removal from EX1 to EX9 on May 23, 2018

Excavation	Excavation Centroid	Volume Removed (m^3)	Confirmatory Samples	Headspace Results (Combustible Gas)	OIL-IN-SOIL™ Results
EX1	15 U, 555942m E, 5485970m N	3.3	EX1-1	<0 ppm	<500 ppm
			EX1-2	**<0 ppm**	**<500 ppm**
			EX1-3	<0 ppm	<500 ppm
			EX1-4	<0 ppm	<500 ppm
			EX1-5	<0 ppm	<500 ppm
			EX1-6	<0 ppm	<500 ppm
			EX1-7R	9 ppm	<500 ppm

Excavation	Excavation Centroid	Volume Removed (m^3)	Confirmatory Samples	Headspace Results (Combustible Gas)	OIL-IN-SOIL™ Results
EX1	15 U, 555942m E, 5485970m N	3.3	**EX1-8**	**<0 ppm**	**<500 ppm**
			EX1-9	<0 ppm	<500 ppm
			EX1-10	**<0 ppm**	**<500 ppm**
			EX1-11R	**11 ppm**	**<500 ppm**
EX2	15 U, 555960m E, 5485992m N	0.3	**EX2-1**	**<0 ppm**	**<500 ppm**
			EX2-2	<0 ppm	<500 ppm
EX3	15 U, 555958m E, 5485995m N	0.5	**EX3-1**	**<0 ppm**	**<500 ppm**
			EX3-2	<0 ppm	<500 ppm
EX4	15 U, 555958m E, 5486002m N	1.2	EX4-1	<0 ppm	<500 ppm
			EX4-2	**<0 ppm**	**<500 ppm**
EX5	15 U, 555954m E, 5486014m N	0.4	EX5-1	<0 ppm	<500 ppm
			EX5-2	**<0 ppm**	**<500 ppm**
EX6	15 U, 555942m E, 5486021 m N	1.6	EX6R-1	<0 ppm	<500 ppm
			EX6R-2	<0 ppm	<500 ppm
			EX6R2-3	**<0 ppm**	**<500 ppm**
EX7	N/A – The footprint of EX7 expanded into EX6, and the excavation was treated as EX6 thereafter.				
EX8	15 U, 555948m E, 5485991m N	0.7	EX8-1	<0 ppm	<500 ppm
			EX8-2	**<0 ppm**	**<500 ppm**
			EX8-3	<0 ppm	<500 ppm
EX9	15 U, 555944 m E, 5485962 m N	0.1	**EX9-1**	**<0 ppm**	**<500 ppm**

Underlined/Bold - Samples selected for laboratory analysis.

CONFIRMATORY SAMPLE RESULTS

The analytical results of the confirmatory fill samples are presented in Table 5, and Chains of Custody and Certificates of Analysis are provided in Appendix E. The analytical results were compared with the Ontario Ministry of Environment, Conservation and Parks (MECP) Table 2 Standards for “full depth generic site condition standards for a potable water condition in a coarse-textured soil” (MECP Table 2).

Table 5: Petroleum Hydrocarbon Analytical Results for Confirmatory Samples in Fill Removal Areas

Parameter	MECP Table 2	Units	EX1-2	EX1-8	EX1-10	EX1-11R	EX2-1	EX3-1
Benzene	0.21	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	2.3	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ethylbenzene	1.1	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Xylenes	3.1	mg/kg	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045
F1 (C6-C10)	55	mg/kg	<10	<10	<10	<10	<10	<10
F2 (C10-C16)	98	mg/kg	<10	<10	<10	<10	<10	19
F3 (C16-C34)	300	mg/kg	<50	<50	<50	78	<50	<50
F4 (C34-C50)	2,800	mg/kg	<50	<50	<50	<50	61	<50
Parameter	**MECP Table 2**	**Units**	**EX4-2**	**EX5-2**	**EX6R2-3**	**EX8-2**	**EX9-1**	
Benzene	0.21	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	
Toluene	2.3	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	
Ethylbenzene	1.1	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	
Xylenes	3.1	mg/kg	<0.045	<0.045	<0.045	<0.045	<0.045	
F1 (C6-C10)	55	mg/kg	<10	<10	<10	<10	<10	
F2 (C10-C16)	98	mg/kg	<10	<10	<10	<10	<10	
F3 (C16-C34)	300	mg/kg	87	<50	<50	<50	<50	
F4 (C34-C50)	2,800	mg/kg	280	<50	<50	<50	<50	

Of the eleven confirmatory fill samples that were submitted from the Site, none of the samples had PHC or BTEX concentrations which exceeded the Table 2 Standard. Concentrations of PHC fractions F2, F3, and F4 were detectable by laboratory analysis, but were lower than the Table 2 Standard.

WASTE CLASSIFICATION

One composite sample of representative waste fill (sample I.D. “COMPOSITE”) was collected during the March 16, 2018 excavation activities and was tested for toxicity characteristic leachate procedure (TCLP) of BTEX to assess fill disposal options under O. Reg. 588. The analytical results, provided in Appendix B, indicated the fill was non-hazardous. These analytical results were submitted to the Township of Ignace, who then approved the disposal of the material at the Township of Ignace Waste Disposal Site. An estimated 5.7 m^3 of stained fill material from the March 16, 2018 demobilization event, plus an estimated 8.1 m^3 of stained fill material from the May 23, 2018 demobilization event were delivered to The Township of Ignace Waste Disposal Site, on May 23, 2018. An additional sample was not collected from the newly excavated stained fill material, as the previous sample collected in March 2018 was accepted by the Township as a “worst case” sample representative of the leachate characteristics of the fill.

QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

To assess this project’s QA/QC procedures and to evaluate the quality of the analytical data, the difference factor was calculated between original samples EX1-2, EX4-2, and their field duplicates (EX1-22, and EX4-22, respectively). The difference factor is defined as the absolute difference between two values, divided by the reported detection limit (RDL). For duplicate concentrations less than five times the reportable detection limit, a

value of +/- 2 times the detection limits is considered acceptable[3]. For samples where the concentrations of both the primary and duplicate sample are greater than five times the reportable detection limit, the quality of analytical data is evaluated by calculating the relative percent difference (RPD)[4]. There were no sample parameters with concentrations greater than five times the reportable detection limit for both the primary and duplicate sample, and so the RPD was not calculated for any of the sample parameters.

The QA/QC results are presented in Table 6 and indicate that the concentration difference between the original and duplicate samples was greater than two times the RDL for PHC fraction F4 for samples EX4-2 and EX4-22. The concentration difference between the samples may be related to the small volumes of the PHC sources, which created relatively small areas of impact and uneven dispersal through the fill materials. Considering that the highest measured concentration of PHC F4 is 90% below the Table 2 Standard, this difference factor does not affect the interpretation of the data. The difference factors were within 2 RDL for the remainder of the parameters that were assessed in the blind duplicate samples.

Table 6: Summary of QA/QC Program

Parameter	Unit	RDL	EX1-2	EX1-22	> 5x RDL	< 2x RDL	Pass or Fail
Benzene	mg/kg	0.0050	<0.0050	<0.0050	No	Yes	Pass
Toluene	mg/kg	0.020	<0.020	<0.020	No	Yes	Pass
Ethylbenzene	mg/kg	0.010	<0.010	<0.010	No	Yes	Pass
Xylenes	mg/kg	0.045	<0.045	<0.045	No	Yes	Pass
F1 (C6-C10)	mg/kg	10	<10	<10	No	Yes	Pass
F2 (>C_{10}-C_{16})	mg/kg	10	<10	<10	No	Yes	Pass
F3 (>C_{16}-C_{34})	mg/kg	50	<50	<50	No	Yes	Pass
F4 (>C_{34}-C_{50})	mg/kg	50	<50	73	No	Yes	Pass
Parameter	**Unit**	**RDL**	**EX4-2**	**EX4-22**	**>5x RDL**	**< 2x RDL**	**Pass or Fail**
Benzene	mg/kg	0.0050	<0.0050	<0.0050	No	Yes	Pass
Toluene	mg/kg	0.020	<0.020	<0.020	No	Yes	Pass
Ethylbenzene	mg/kg	0.010	<0.010	<0.010	No	Yes	Pass
Xylenes	mg/kg	0.045	<0.045	<0.045	No	Yes	Pass
F1 (C6-C10)	mg/kg	10	<10	<10	No	Yes	Pass
F2 (>C_{10}-C_{16})	mg/kg	10	<10	<10	No	Yes	Pass
F3 (>C_{16}-C_{34})	mg/kg	50	87	<50	No	Yes	Pass
F4 (>C_{34}-C_{50})	mg/kg	50	280	<50	No	No	Fail

SUMMARY

Site demobilization and decommissioning was completed by Golder at the IG_BH01 drill site on May 23, 2018. The final activities included a site walk-over with an NWMO representative, the removal of snow and silt fencing, and the removal of fill material on the site known or suspected to contain residual PHCs. Inspection results are provided in Appendix D. The work was successfully completed, and confirmatory sampling indicates that fill material left in place at the site meets applicable MECP Standards.

[3] Canadian Council of Ministers of the Environment, (2016), Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment, Volume 4 Analytical Methods.

[4] Ministry of the Environment, Conservation and Parks, (2011), Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

CLOSURE

We trust that this memorandum meets your current needs. If you have any questions or require clarification, please contact the undersigned.

Adrian Kowalchuk, B.Sc.
Environmental Geoscientist

George Schneider, M.Sc., P.Geo.
Senior Geoscientist - Principal

AK/GWS/

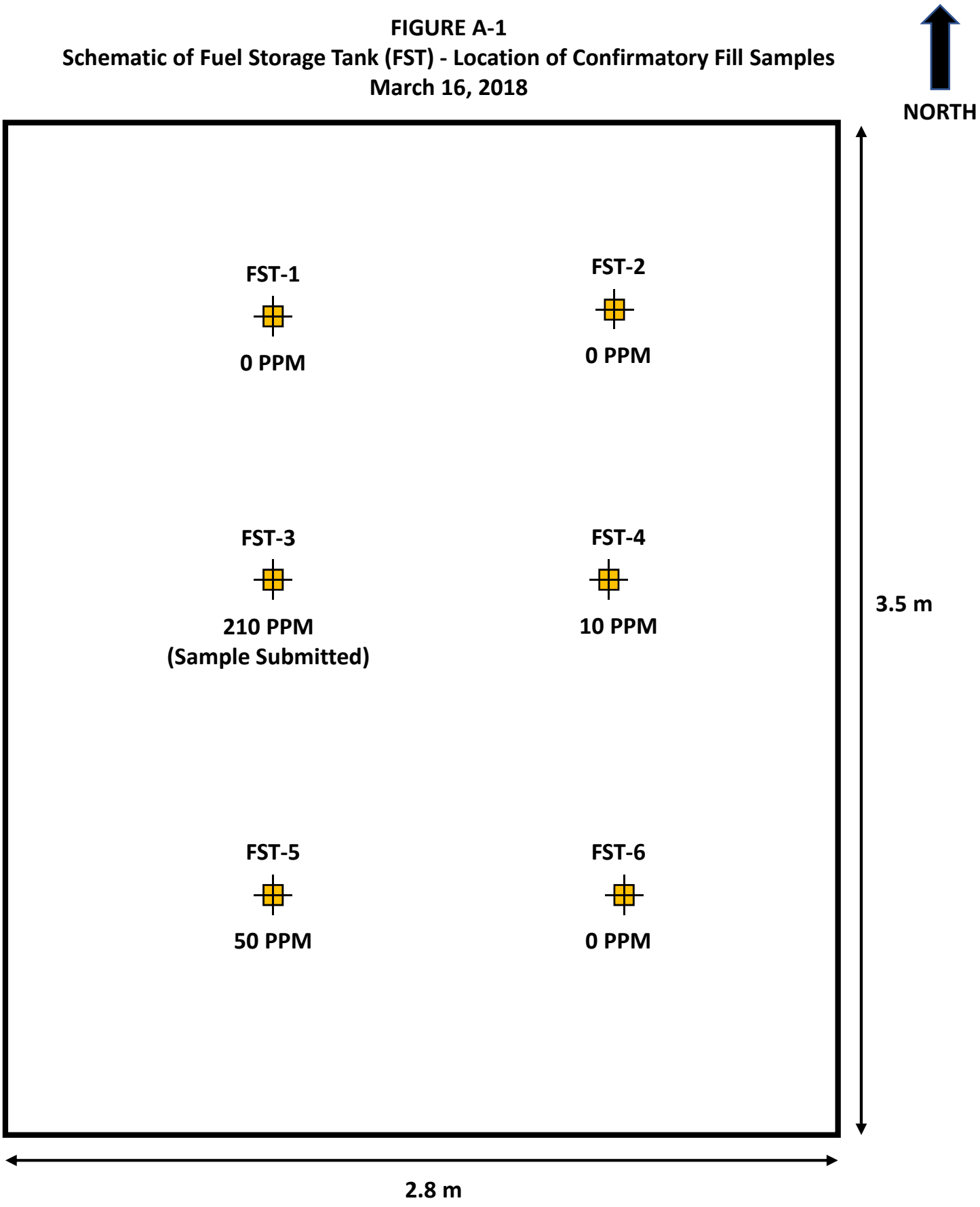
Attachments:
Appendix A – Remedial Excavation Diagrams
Appendix B – Chain of Custody and Certificates of Analysis – March 16, 2018 waste classification
Appendix C – Chain of Custody and Certificates of Analysis – March 16, 2018 confirmatory samples
Appendix D – Site Decommissioning Checklist Forms – March and May 2018
Appendix E – Chain of Custody and Certificates of Analysis – May 23, 2018 confirmatory samples

c:\users\gschneider\onedrive\1 - active\1671632 ignace bh drilling\08 bh01\06 wp1\24 revised decom rpt\03 rev 14nov2018\1671632 (1100) tm site demob 14nov2018.docx

APPENDIX A

Remedial Excavation Diagrams

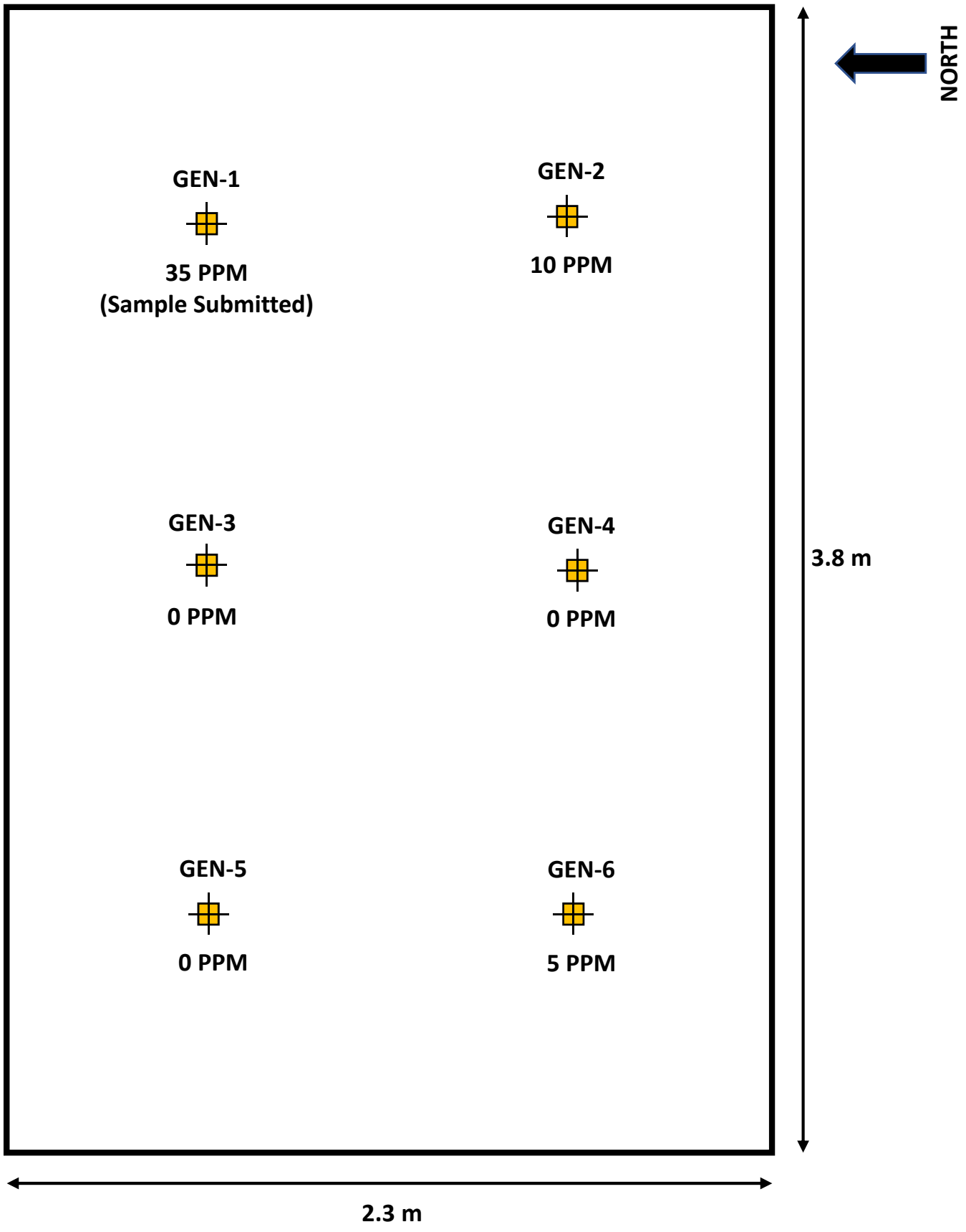
FIGURE A-1
Schematic of Fuel Storage Tank (FST) - Location of Confirmatory Fill Samples
March 16, 2018



GOLDER

Project Number: 1671632
October 2, 2018

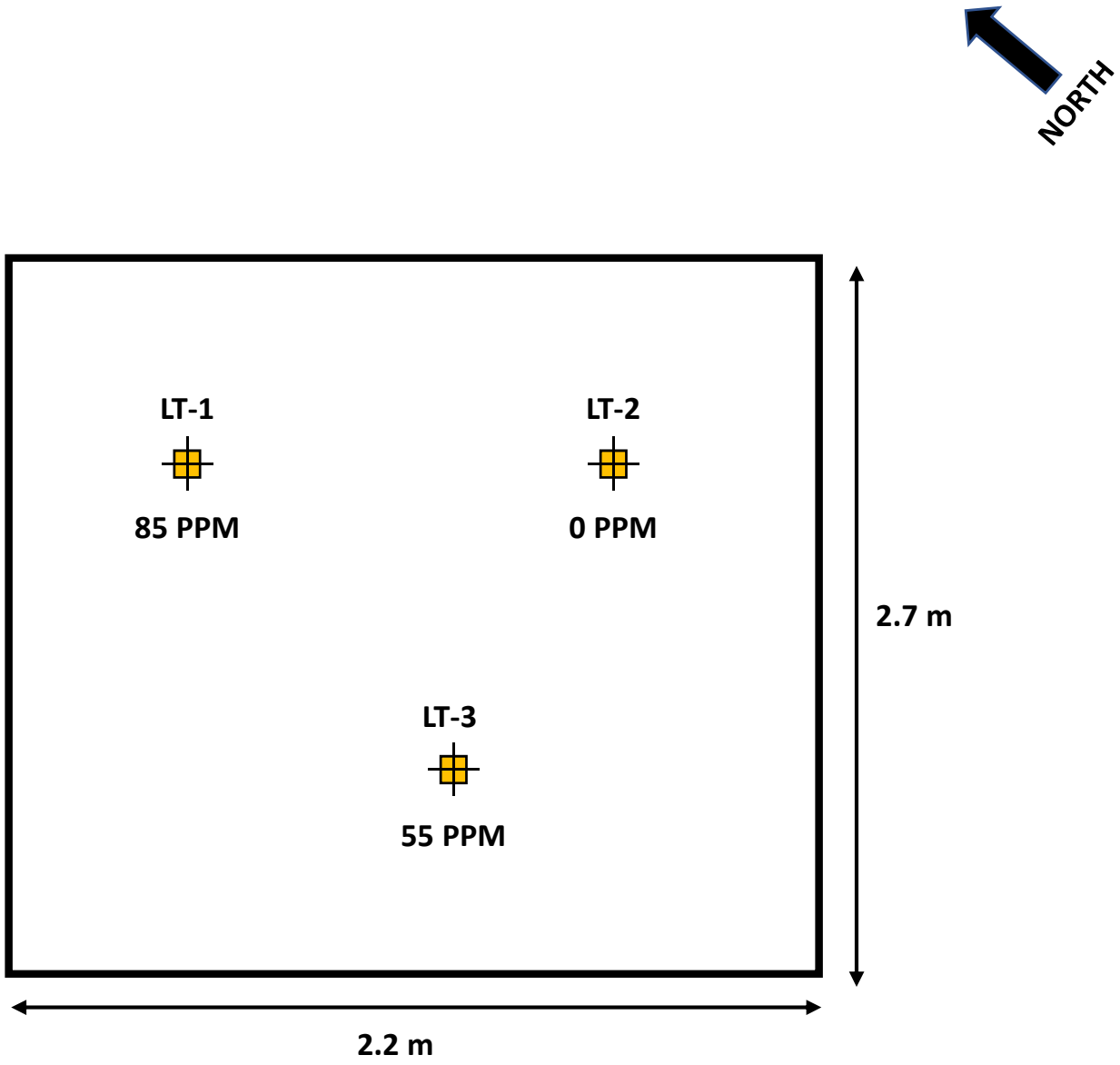
FIGURE A-2
Schematic of Main Generator (GEN) - Location of Confirmatory Fill Samples
March 16, 2018



GOLDER

Project Number: 1671632
October 2, 2018

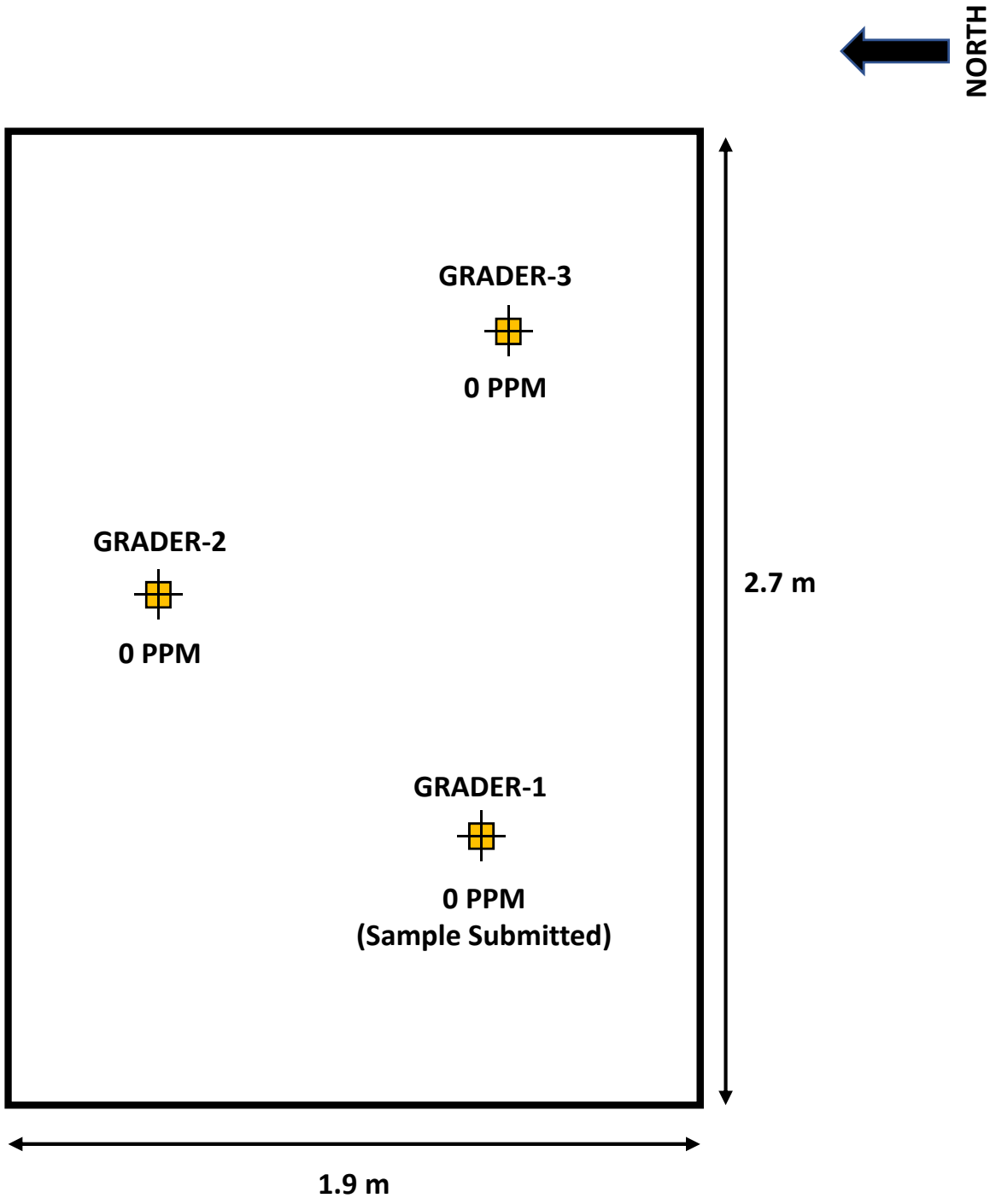
FIGURE A-3
Schematic of Light Tower Excavation (LT) - Location of Confirmatory Fill Samples
March 16, 2018



GOLDER

Project Number: 1671632
October 2, 2018

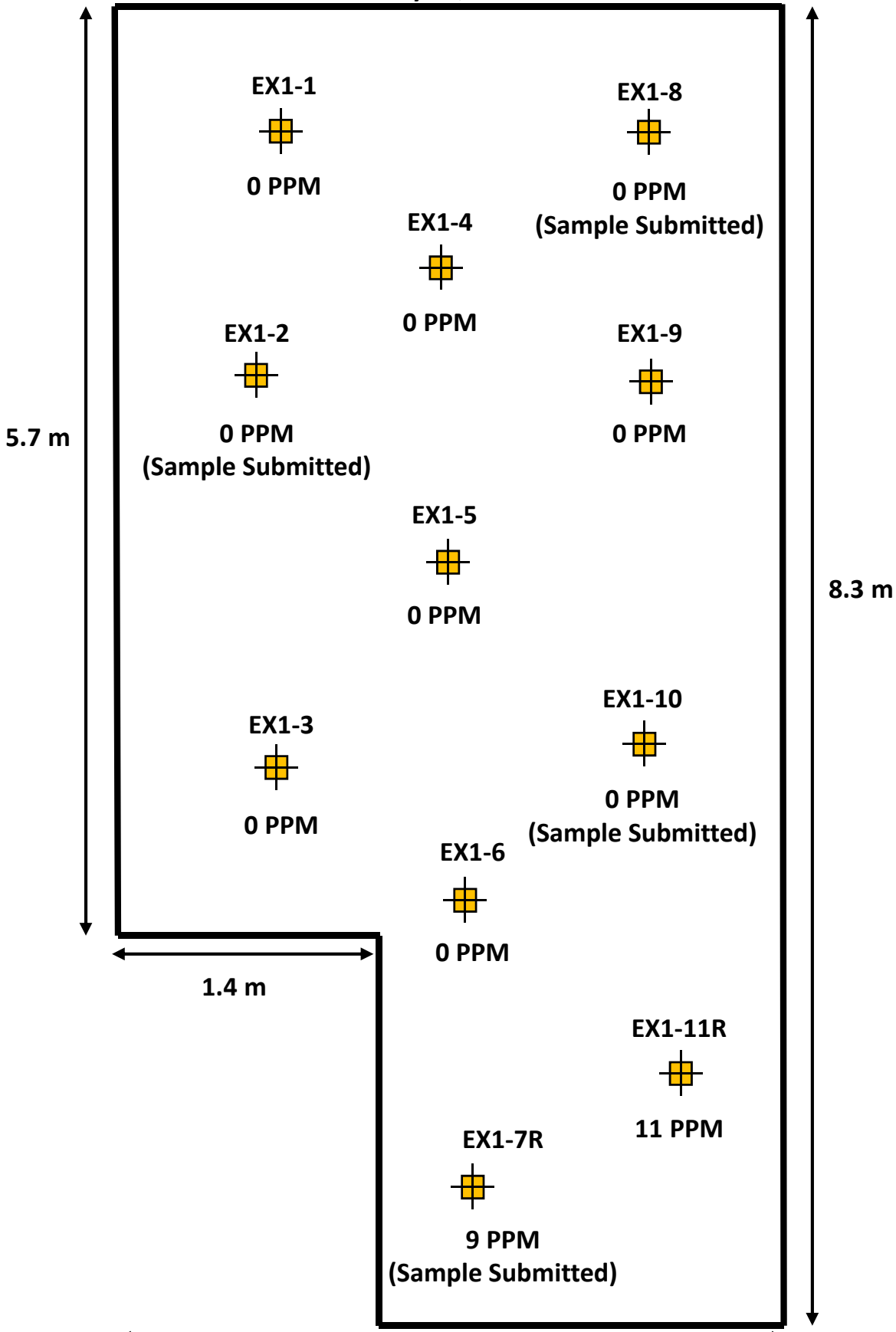
FIGURE A-4
Schematic of Grader Parking Excavation (GRADER) - Location of Confirmatory Fill Samples
March 16, 2018



GOLDER

Project Number: 1671632
October 2, 2018

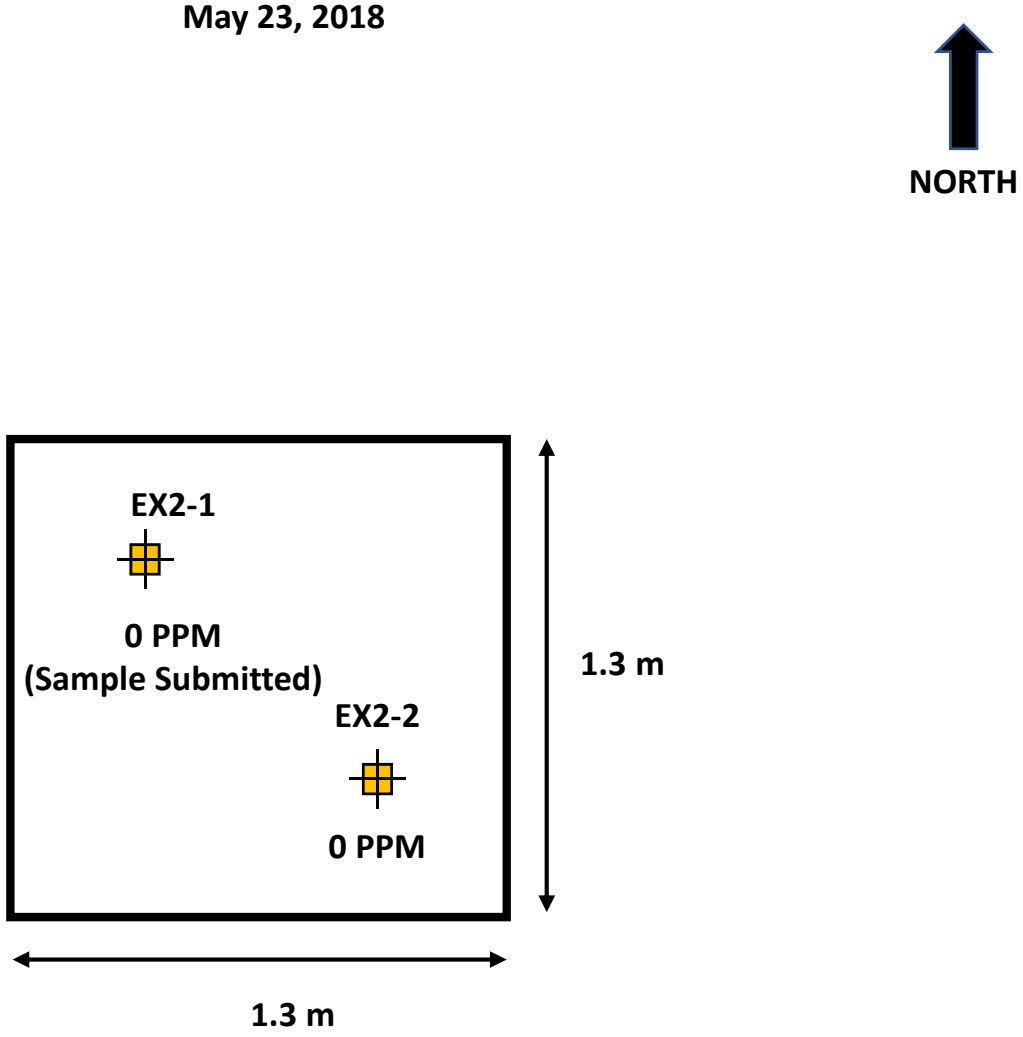
FIGURE A-5
Schematic of EX1 - Location of Confirmatory Fill Samples
May 23, 2018



GOLDER

Project Number: 1671632
October 2, 2018

FIGURE A-6
Schematic of EX2 - Location of Confirmatory Fill Samples
May 23, 2018



GOLDER

Project Number: 1671632
October 2, 2018

FIGURE A-7
Schematic of EX3 - Location of Confirmatory Fill Samples
May 23, 2018

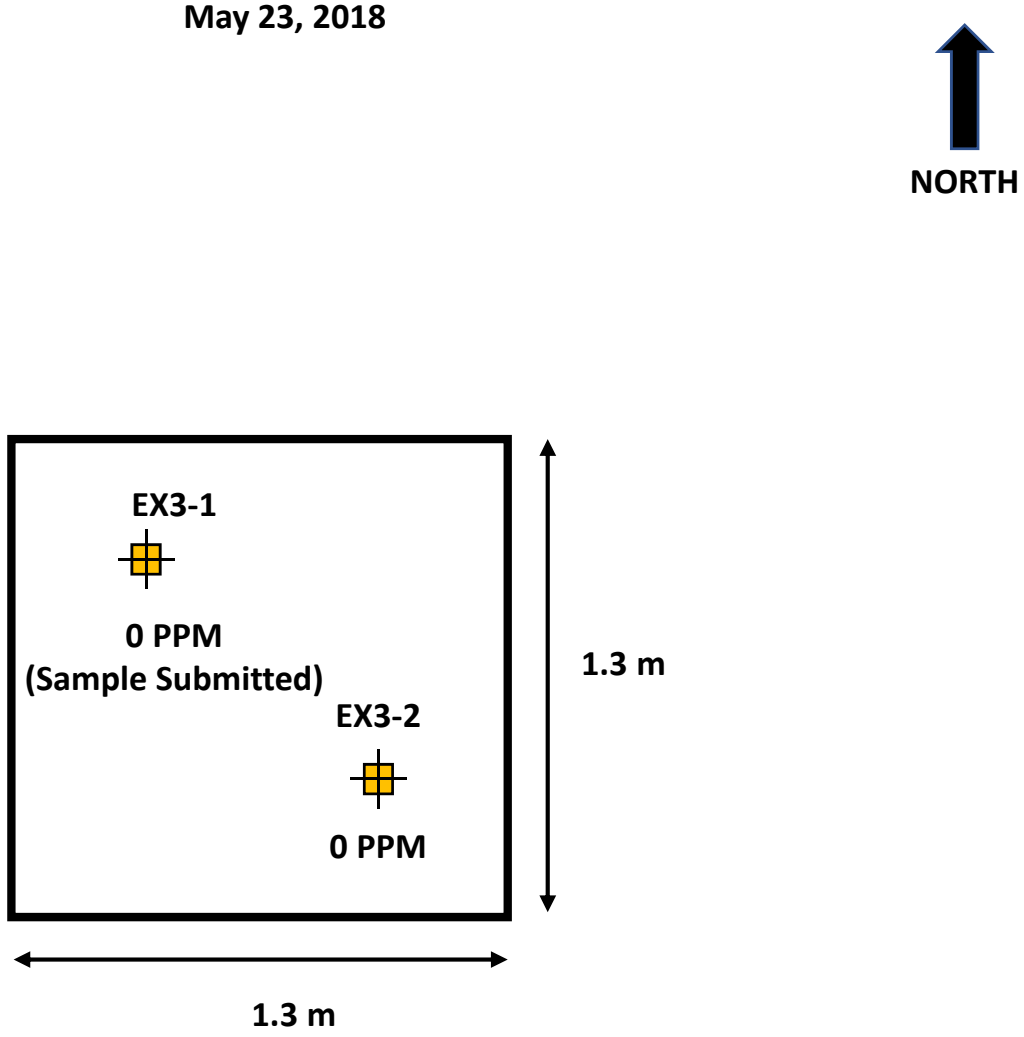
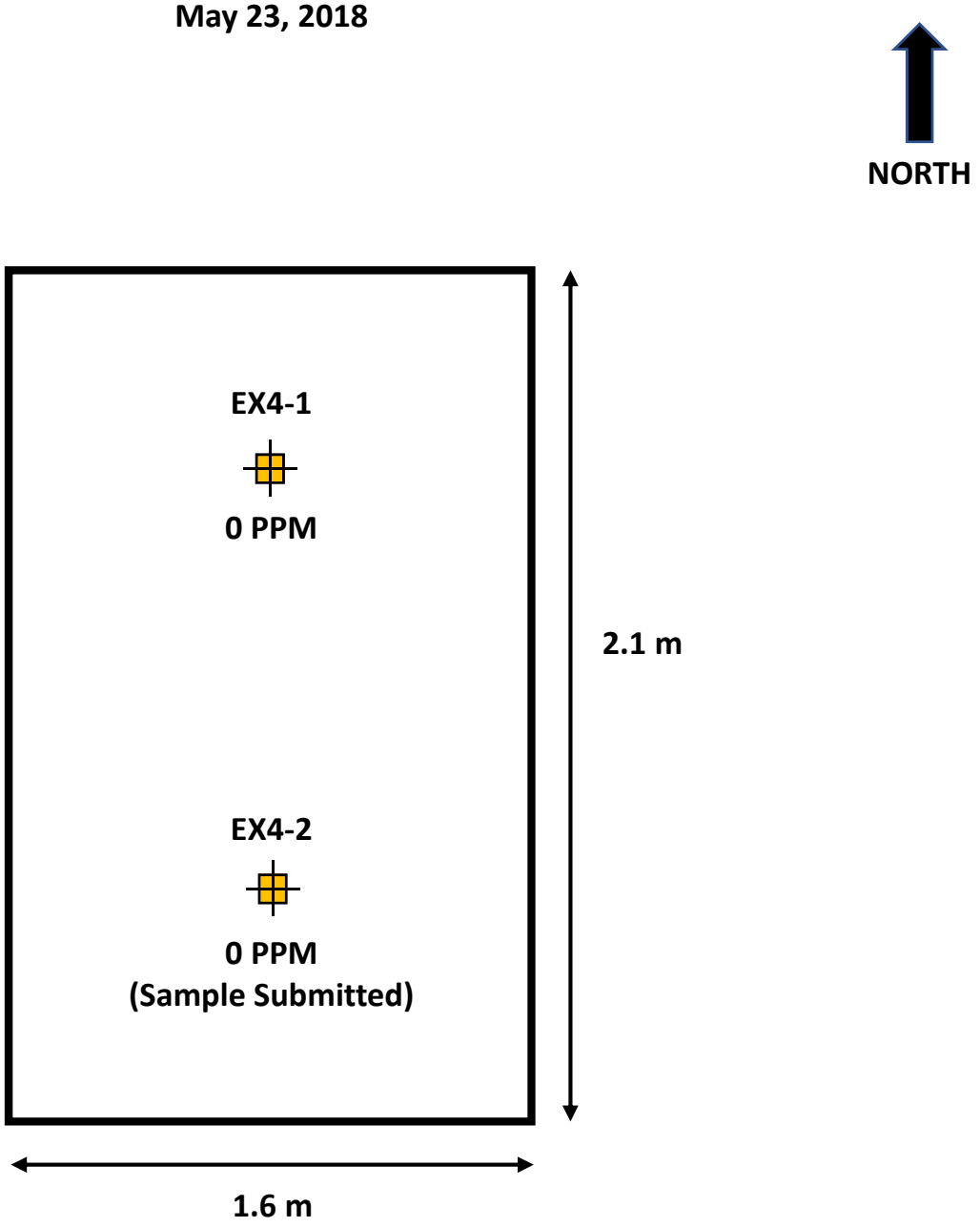


FIGURE A-8
Schematic of EX4 - Location of Confirmatory Fill Samples
May 23, 2018



GOLDER

Project Number: 1671632
October 2, 2018

FIGURE A-9
Schematic of EX5 - Location of Confirmatory Fill Samples
May 23, 2018

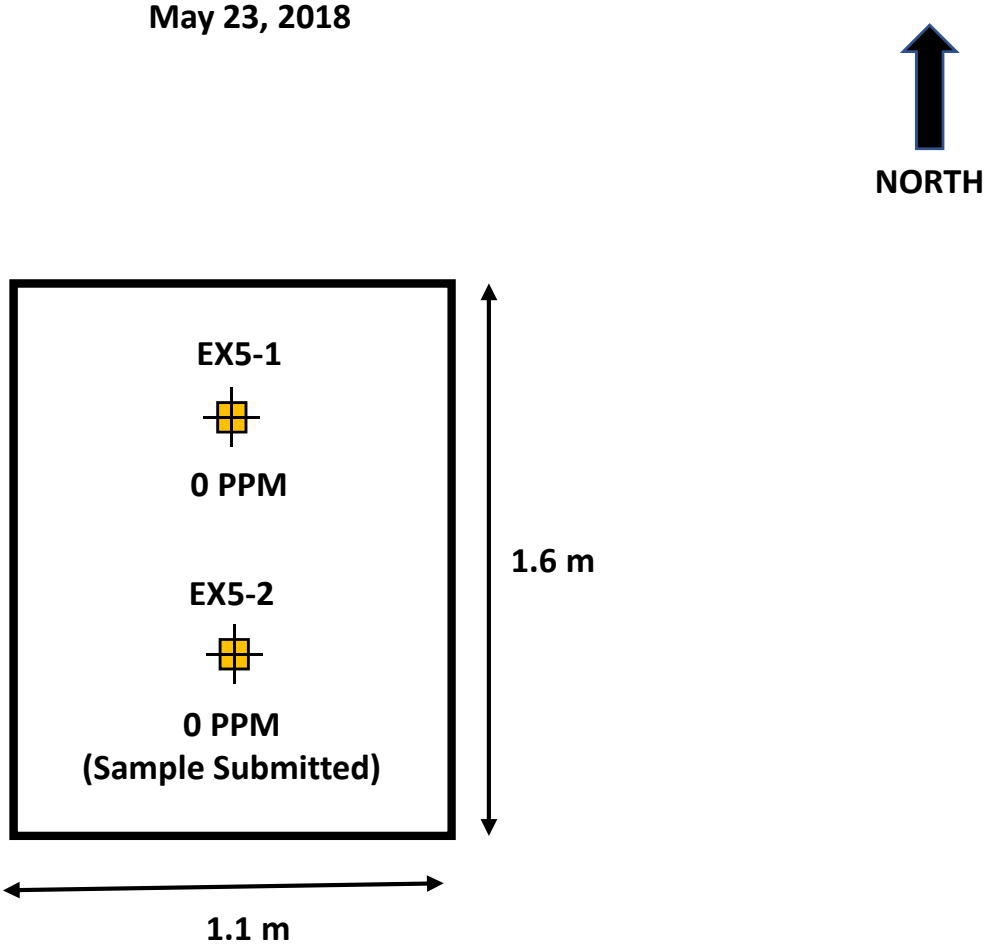
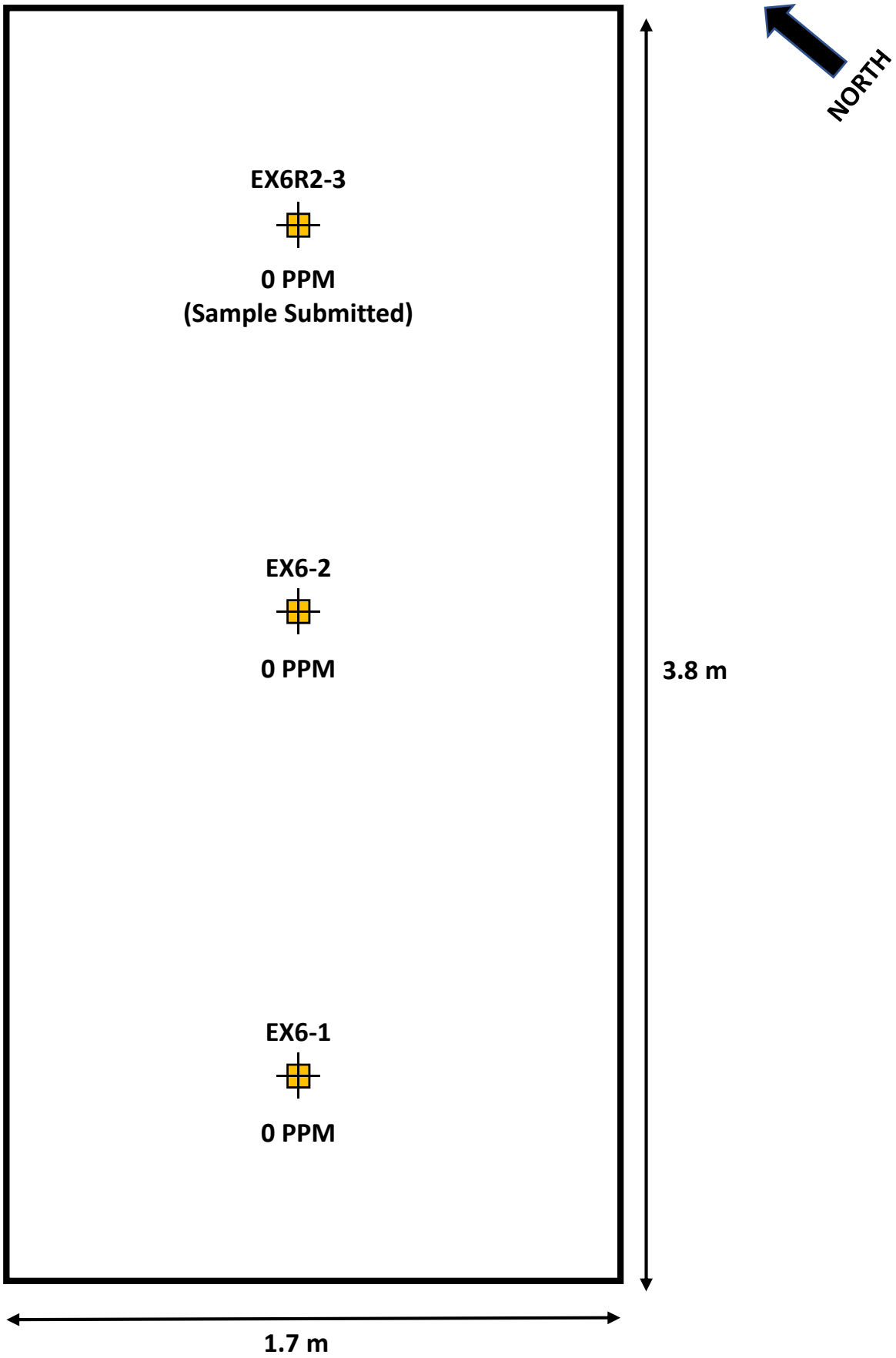


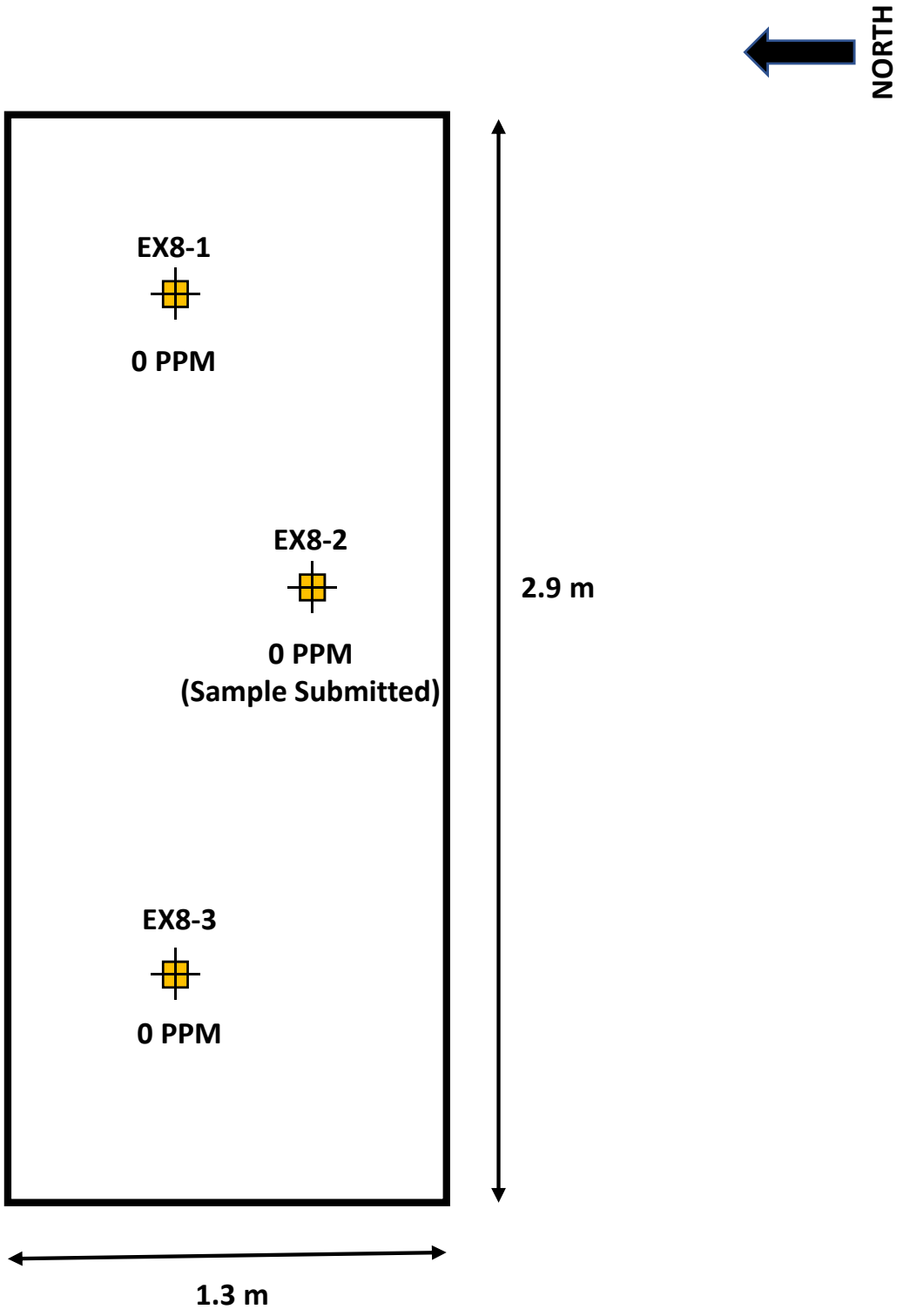
FIGURE A-10
Schematic of EX6 (Expanded to Include EX7) - Location of Confirmatory Fill Samples
May 23, 2018



GOLDER

Project Number: 1671632
October 2, 2018

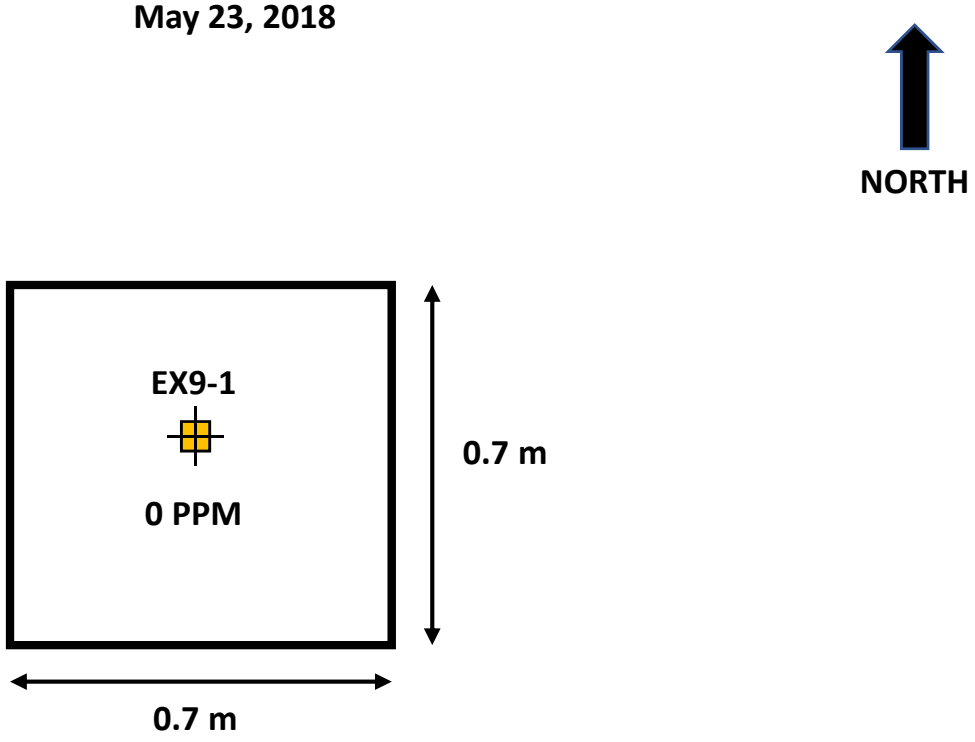
FIGURE A-11
Schematic of EX8 - Location of Confirmatory Fill Samples
May 23, 2018



GOLDER

Project Number: 1671632
October 2, 2018

FIGURE A-12
Schematic of EX9 - Location of Confirmatory Fill Samples
May 23, 2018



APPENDIX B

Chain of Custody and Certificates of Analysis – March 16, 2018 Waste Classification

Maxxam
A Bureau Veritas Group Company

Unit D, 675 Berry St., Winnipeg, MB R3H 1A7
Phone: 204-772-7276 Fax: 204-772-2386 Toll Free: (866) 800-6208

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE INFORMATION	REPORT INFORMATION (if different from invoice)	PROJECT INFORMATION	MAXXAM JOB NUMBER
Company Name: GOLDER ASSOCIATES	Company Name:	Quotation #:	
Contact Name: ADRIAN KOWALCHUK	Contact Name:	P.O. #:	CHAIN OF CUSTODY #
Address: 6925 Century Ave. MISSISSAUGA, ONT.	Address:	Project #: 1671632-1000	N 011746
Phone: (604)891-5172 Fax:	Phone: Fax:	Project Name: IG-BH01	
Email: AKOWALCHUK@GOLDER.COM	Email:	Location: IGNACE, ON.	
		Sampled By: ADRIAN KOWALCHUK	

REGULATORY REQUIREMENTS SERVICE REQUESTED:

- [ ] CCME
- [ ] DRINKING WATER
- [X] Other: MOECC REG.153

Special Instructions:

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM.

ANALYSIS REQUESTED (Please be specific)

TURNAROUND TIME (TAT) REQUIRED

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS.

Regular (Standard) TAT:
- [X] 5 to 7 Working Days

Rush TAT:
- [ ] 1 day [ ] 2 days [ ] 3 days

DATE Required:

TATs for certain tests are > 5 days. Please contact your Project Manager for details

	Lab Use	Sample Identification	Date Sampled	Time Sampled	Matrix (GW, SW, Soil etc)	Drinking Water? (Y / N)	Coliforms: (Method)	E. coli / Fecal / Total / MF	QT / MPN / MF	Dissolved Metals: Field Filtered?	Field Acidified?	Total Metal: Field Acidified?	BTEX / F1	F2 - F4	PCB	Biochemical Oxygen Demand	TCLP, BTEX	HOLD - DO NOT ANALYZE	# of Cont.	COMMENTS
1		COMPOSITE	March 14 2018	13:00	SOIL					N / Y	N / Y	N / Y					X		9	
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				

19-Mar-18 13:10
Amanda Hung
B820223
IH

RELINQUISHED BY (Signature/Print)	RECEIVED BY (Signature/Print)	Date	Time	RECEIVED ON ICE	Laboratory Use Only
Adrian Kowalchuk / Adrian Kowalchuk	Rachelle St Amant	March 19, 2018 / 18/03/19	17:10 / 13:10	Y ☑ N ☐	Temperature (°C) on Receipt: 1.8, 1.3, 5.5

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at www.maxxam.ca/terms

***MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.**

CoC-1028 Maxxam International Corporation o/a Maxxam White: Maxxam Yellow: Client Copy

Maxxam
A Bureau Veritas Group Company

Success Through Science®

Your Project #: 1671632-1000
Site#: IGNANCE, ON
Site Location: IG-BH01
Your C.O.C. #: N011746

Attention: ADRIAN KOWALCHUK

GOLDER ASSOCIATES LTD
400-70 ARTHUR STREET
WINNIPEG, MB
CANADA R3B 1G7

Report Date: 2018/03/23
Report #: R2531953
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B820223
Received: 2018/03/19, 13:10

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX in Leachates by HS GC/MS/FID (1, 2)	1	2018/03/21	2018/03/22	AB SOP-00039	EPA 8260c m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Calgary Environmental
(2) Samples were extracted as per EPA 1311 unless otherwise noted in the report.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Amanda Hung, B.Sc., Project Manager
Email: AHung@maxxam.ca
Phone# (204)772-7276 Ext:2215

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B820223
Report Date: 2018/03/23

GOLDER ASSOCIATES LTD
Client Project #: 1671632-1000
Site Location: IG-BH01
Sampler Initials: AK

BTEX BY GC-MS (SOIL)

Maxxam ID		TD0302		
Sampling Date		2018/03/16 13:00		
COC Number		N011746		
	UNITS	COMPOSITE	RDL	QC Batch
Volatiles				
Leachable (ZH) Benzene	ug/L	<10	10	8940768
Leachable (ZH) Toluene	ug/L	<10	10	8940768
Leachable (ZH) Ethylbenzene	ug/L	<10	10	8940768
Leachable (ZH) o-Xylene	ug/L	<10	10	8940768
Leachable (ZH) m & p-Xylene	ug/L	<20	20	8940768
Leachable (ZH) Xylenes (Total)	ug/L	<20	20	8940768
Surrogate Recovery (%)				
Leachable (ZH) 1,4-Difluorobenzene (sur.)	%	98		8940768
Leachable (ZH) 4-Bromofluorobenzene (sur.)	%	98		8940768
Leachable (ZH) D4-1,2-Dichloroethane (sur.)	%	91		8940768
RDL = Reportable Detection Limit				

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B820223
Report Date: 2018/03/23

GOLDER ASSOCIATES LTD
Client Project #: 1671632-1000
Site Location: IG-BH01
Sampler Initials: AK

GENERAL COMMENTS

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

Package 1	2.9°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B820223
Report Date: 2018/03/23

QUALITY ASSURANCE REPORT

GOLDER ASSOCIATES LTD
Client Project #: 1671632-1000
Site Location: IG-BH01
Sampler Initials: AK

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8940768	Leachable (ZH) 1,4-Difluorobenzene (sur.)	2018/03/22	100	50 - 140	99	50 - 140	98	%		
8940768	Leachable (ZH) 4-Bromofluorobenzene (sur.)	2018/03/22	98	50 - 140	99	50 - 140	100	%		
8940768	Leachable (ZH) D4-1,2-Dichloroethane (sur.)	2018/03/22	97	50 - 140	96	50 - 140	93	%		
8940768	Leachable (ZH) Benzene	2018/03/22	96	50 - 140	96	60 - 130	<10	ug/L	1.9	30
8940768	Leachable (ZH) Ethylbenzene	2018/03/22	87	50 - 140	88	60 - 130	<10	ug/L	NC	30
8940768	Leachable (ZH) m & p-Xylene	2018/03/22	86	50 - 140	86	60 - 130	<20	ug/L	NC	30
8940768	Leachable (ZH) o-Xylene	2018/03/22	87	50 - 140	88	60 - 130	<10	ug/L	NC	30
8940768	Leachable (ZH) Toluene	2018/03/22	87	50 - 140	88	60 - 130	<10	ug/L	2.5	30
8940768	Leachable (ZH) Xylenes (Total)	2018/03/22					<20	ug/L	NC	30

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

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

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

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

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B820223
Report Date: 2018/03/23

GOLDER ASSOCIATES LTD
Client Project #: 1671632-1000
Site Location: IG-BH01
Sampler Initials: AK

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Janet Gao, B.Sc., QP, Supervisor, Organics

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

APPENDIX C

Chain of Custody and Certificates of Analysis – March 16, 2018 Confirmatory Samples

Maxxam
A Bureau Veritas Group Company

Unit D, 675 Berry St., Winnipeg, MB R3H 1A7
Phone: 204-772-7276 Fax: 204-772-2386 Toll Free: (866) 800-6208

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE INFORMATION	REPORT INFORMATION (if different from invoice)	PROJECT INFORMATION	MAXXAM JOB NUMBER
Company Name: GOLDER ASSOCIATES	Company Name:	Quotation #:	
Contact Name: ADRIAN KOWALCHUK	Contact Name:	P.O. #:	CHAIN OF CUSTODY #
Address: 6925 CENTURY AVE. MISSISSAUGA, ON.	Address:	Project #: 1671672-1000	N 011745
Phone: (604)891-5372 Fax:	Phone: Fax:	Project Name: IG-BH01	
Email: AKOWALCHUK@GOLDER.COM	Email:	Location: IGNACE, ON.	
		Sampled By: ADRIAN KOWALCHUK	

REGULATORY REQUIREMENTS SERVICE REQUESTED:

- [ ] CCME
- [ ] DRINKING WATER
- [x] Other: MOECC REG 153

Special Instructions:

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM.

ANALYSIS REQUESTED (Please be specific)

TURNAROUND TIME (TAT) REQUIRED

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS.

Regular (Standard) TAT:
- [x] 5 to 7 Working Days

Rush TAT:
- [ ] 1 day [ ] 2 days [ ] 3 days

DATE Required:

TATs for certain tests are > 5 days. Please contact your Project Manager for details

	Lab Use	Sample Identification	Date Sampled	Time Sampled	Matrix (GW, SW, Soil etc)	Drinking Water? (Y / N)	Coliforms: (Method) Total / Fecal / E. coli / MF / MPN / OT	Dissolved Metals: Field Filtered? N / Y	Field Acidified? N / Y	Total Metal: Field Acidified? N / Y	BTEX / F1	F2 - F4	PCB	Biochemical Oxygen Demand	HOLD - DO NOT ANALYZE	# of Cont.	COMMENTS
1		LT-01	March 14, 2018	10:00	SOIL						X	X				3	
2		GEN-1	↓	10:30	↓												
3		DUP-1		10:30													
4		~~EXP~~ GRADER-1		11:00												↓	
5		FST-3	March 2018	12:00	SOIL						X	X				3	
6																	
7																	
8																	
9																	
10																	
11																	
12																	

19-Mar-18 13:10
Amanda Hung
B820218
IH

RELINQUISHED BY (Signature/Print)	RECEIVED BY (Signature/Print)	Date	Time	RECEIVED ON ICE	Laboratory Use Only
Adrian Kowalchuk / Adrian Kowalchuk		March 19, 2018	13:10	Y [x] N [ ]	Temperature (°C) on Receipt
	Rachelle St Amant	18/03/19	13:10		1.8, 1.3, 5.5

Unless otherwise agreed to in writing, work submitted on this Chain of Custody is subject to Maxxam's standard Terms and Conditions. Signing of this Chain of Custody document is acknowledgment and acceptance of our terms which are available for viewing at www.maxxam.ca/terms

***MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.**

CoC-1028 Maxxam International Corporation o/a Maxxam White: Maxxam Yellow: Client Copy

Your Project #: 1671632-1000
Site#: IGNANCE, ON
Site Location: IG-BH01
Your C.O.C. #: N011745

Attention: ADRIAN KOWALCHUK

GOLDER ASSOCIATES LTD
400-70 ARTHUR STREET
WINNIPEG, MB
CANADA R3B 1G7

Report Date: 2018/03/24
Report #: R2532349
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B820218
Received: 2018/03/19, 13:10

Sample Matrix: Soil
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS/FID (MeOH extract) (1, 2)	5	N/A	2018/03/20	AB SOP-00039	CCME CWS/EPA 8260c m
F1-BTEX (1)	5	N/A	2018/03/23	AB SOP-00039	Auto Calc
CCME Hydrocarbons (F2-F4 in soil) (1, 3)	5	2018/03/20	2018/03/20	AB SOP-00036	CCME PHC-CWS m
Moisture (1)	5	N/A	2018/03/21	AB SOP-00002	CCME PHC-CWS m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Maxxam Calgary Environmental
(2) No lab extraction date is given for F1BTEX & VOC samples that are field preserved with methanol. Extraction date is date sampled unless otherwise stated.
(3) All CCME results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following Alberta Environment's Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil, Validation of Performance-Based Alternative Methods September 2003. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.

Your Project #: 1671632-1000
Site#: IGNANCE, ON
Site Location: IG-BH01
Your C.O.C. #: N011745

Attention: ADRIAN KOWALCHUK

GOLDER ASSOCIATES LTD
400-70 ARTHUR STREET
WINNIPEG, MB
CANADA R3B 1G7

Report Date: 2018/03/24
Report #: R2532349
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B820218
Received: 2018/03/19, 13:10

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Amanda Hung, B.Sc., Project Manager
Email: AHung@maxxam.ca
Phone# (204)772-7276 Ext:2215

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B820218
Report Date: 2018/03/24

GOLDER ASSOCIATES LTD
Client Project #: 1671632-1000
Site Location: IG-BH01
Sampler Initials: AK

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		TD0279	TD0280	TD0281	TD0282	TD0283		
Sampling Date		2018/03/16 10:00	2018/03/16 10:30	2018/03/16 10:30	2018/03/16 11:00	2018/03/16 12:00		
COC Number		N011745	N011745	N011745	N011745	N011745		
	UNITS	LT-01	GEN-1	DUP-1	GRADER-1	FST-3	RDL	QC Batch
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/kg	12	48	94	120	16	10	8939679
F3 (C16-C34 Hydrocarbons)	mg/kg	<50	50	140	160	<50	50	8939679
F4 (C34-C50 Hydrocarbons)	mg/kg	<50	<50	120	<50	<50	50	8939679
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	Yes		8939679
Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	113	110	108	105	105		8939679
RDL = Reportable Detection Limit								

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B820218
Report Date: 2018/03/24

GOLDER ASSOCIATES LTD
Client Project #: 1671632-1000
Site Location: IG-BH01
Sampler Initials: AK

PHYSICAL TESTING (SOIL)

Maxxam ID		TD0279	TD0280		TD0281		TD0282	TD0283		
Sampling Date		2018/03/16 10:00	2018/03/16 10:30		2018/03/16 10:30		2018/03/16 11:00	2018/03/16 12:00		
COC Number		N011745	N011745		N011745		N011745	N011745		
	UNITS	LT-01	GEN-1	QC Batch	DUP-1	QC Batch	GRADER-1	FST-3	RDL	QC Batch
Physical Properties										
Moisture	%	7.1	9.0	8939665	8.1	8939714	9.8	11	0.30	8939665
RDL = Reportable Detection Limit										

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B820218
Report Date: 2018/03/24

GOLDER ASSOCIATES LTD
Client Project #: 1671632-1000
Site Location: IG-BH01
Sampler Initials: AK

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		TD0279	TD0280	TD0281	TD0282	TD0283		
Sampling Date		2018/03/16 10:00	2018/03/16 10:30	2018/03/16 10:30	2018/03/16 11:00	2018/03/16 12:00		
COC Number		N011745	N011745	N011745	N011745	N011745		
	UNITS	LT-01	GEN-1	DUP-1	GRADER-1	FST-3	RDL	QC Batch
Volatiles								
Xylenes (Total)	mg/kg	<0.045	<0.045	<0.045	<0.045	<0.045	0.045	8938023
F1 (C6-C10) - BTEX	mg/kg	<10	<10	<10	<10	<10	10	8938023
Field Preserved Volatiles								
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	8939442
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8939442
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	8939442
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	8939442
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	8939442
F1 (C6-C10)	mg/kg	<10	<10	<10	<10	<10	10	8939442
Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	98	99	99	99	98		8939442
4-Bromofluorobenzene (sur.)	%	104	103	102	103	103		8939442
D10-o-Xylene (sur.)	%	93	101	98	96	96		8939442
D4-1,2-Dichloroethane (sur.)	%	114	114	114	114	114		8939442

RDL = Reportable Detection Limit

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B820218
Report Date: 2018/03/24

GOLDER ASSOCIATES LTD
Client Project #: 1671632-1000
Site Location: IG-BH01
Sampler Initials: AK

GENERAL COMMENTS

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

Package 1	2.9°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B820218
Report Date: 2018/03/24

QUALITY ASSURANCE REPORT

GOLDER ASSOCIATES LTD
Client Project #: 1671632-1000
Site Location: IG-BH01
Sampler Initials: AK

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8939442	1,4-Difluorobenzene (sur.)	2018/03/20	102	50 - 140	101	50 - 140	102	%		
8939442	4-Bromofluorobenzene (sur.)	2018/03/20	101	50 - 140	103	50 - 140	103	%		
8939442	D10-o-Xylene (sur.)	2018/03/20	98	50 - 140	99	50 - 140	83	%		
8939442	D4-1,2-Dichloroethane (sur.)	2018/03/20	108	50 - 140	112	50 - 140	110	%		
8939679	O-TERPHENYL (sur.)	2018/03/20	107	60 - 130	95	60 - 130	109	%		
8939442	Benzene	2018/03/20	105	50 - 140	112	60 - 130	<0.0050	mg/kg	9.5	50
8939442	Ethylbenzene	2018/03/20	105	50 - 140	110	60 - 130	<0.010	mg/kg	NC	50
8939442	F1 (C6-C10)	2018/03/20	101	60 - 140	80	60 - 140	<10	mg/kg	NC	30
8939442	m & p-Xylene	2018/03/20	101	50 - 140	106	60 - 130	<0.040	mg/kg	NC	50
8939442	o-Xylene	2018/03/20	104	50 - 140	109	60 - 130	<0.020	mg/kg	NC	50
8939442	Toluene	2018/03/20	100	50 - 140	106	60 - 130	<0.020	mg/kg	0.54	50
8939665	Moisture	2018/03/21					<0.30	%	6.8	20
8939679	F2 (C10-C16 Hydrocarbons)	2018/03/20	133 (1)	60 - 130	94	70 - 130	<10	mg/kg	40	40
8939679	F3 (C16-C34 Hydrocarbons)	2018/03/20	108	60 - 130	93	70 - 130	<50	mg/kg	NC	40
8939679	F4 (C34-C50 Hydrocarbons)	2018/03/20	93	60 - 130	89	70 - 130	<50	mg/kg	NC	40
8939714	Moisture	2018/03/21					<0.30	%	0.80	20

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

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

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

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

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B820218
Report Date: 2018/03/24

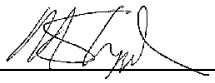
GOLDER ASSOCIATES LTD
Client Project #: 1671632-1000
Site Location: IG-BH01
Sampler Initials: AK

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Dennis Ngondu, B.Sc., P.Chem., QP, Supervisor, Organics

Janet Gao, B.Sc., QP, Supervisor, Organics



Michael Sheppard, B.Sc., P. Biol., QP, Senior Scientific Specialist, Organics

Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

APPENDIX D

Site Decomissioning Checklist Forms – March and May 2018

IG_BH01 Site Decommissioning Checklist

1671632

Item No.	Item	General Requirements	Date Completed	Checked by	Approved by	Comments
1.0	**SITE PREPARATION**					
1.1	Drill pad	Drill pad cleaned of debris and adequately graded.	March 16, 2018	Adrian Kowalchuk	Geoff Crann	Drill pad area scraped down with excavator and debris and material trucked off site.
1.3	General site levelling	General site cleaned of debris and adequately graded.	March 16, 2018	Adrian Kowalchuk	Geoff Crann	
1.4	General Site Condition	Site is free of oil sheens and staining.	March 16, 2018	Adrian Kowalchuk	Geoff Crann	Granular material removed from generator, diesel storage tank, light plant and grader parking areas as a precaution measure. Confirmatory samples taken and to be submitted for analysis. Material (6 $m^{3)}$ to be disposed of at licensed facility following receipt of analysis results.
2.0	**FENCING**					
2.1	Silt fencing	Silt fencing removed from site.				To be undertaken by Golder after thaw.
2.2	Snow fencing	Silt fencing removed from site.				To be undertaken by Golder after thaw.
2.3	Modulock security fencing	Security fencing dismantled and removed from site.	March 13, 2018	Adrian Kowalchuk	Geoff Crann	
3.0	**OFFICE TRAILERS**					
3.1	Trailer 1 (Golder)	Trailer removed from site.	March 13, 2018	Adrian Kowalchuk	Geoff Crann	
3.2	Trailer 2 (NWMO)	Trailer removed from site.	March 13, 2018	Adrian Kowalchuk	Geoff Crann	
3.3	Trailer 3 (Rodren)	Trailer removed from site.	March 13, 2018	Adrian Kowalchuk	Geoff Crann	
4.0	**CORE LOGGING AND STORAGE**					
4.1	Core Logging Shipping Container	Core Logging Shipping Container removed from site.	March 15, 2018	Adrian Kowalchuk	Geoff Crann	

Item No.	Item	General Requirements	Date Completed	Checked by	Approved by	Comments
4.2	Core Logging Table	Core logging table put away for storage.	March 8, 2018	Adrian Kowalchuk	Geoff Crann	
4.3	Camera Racking	Camera tracking put away for storage.	March 8, 2018	Adrian Kowalchuk	Geoff Crann	
4.4	Core Storage Shipping container	Core storage shipping container removed from site.	March 15, 2018	Adrian Kowalchuk	Geoff Crann	
4.5	Commercial Refrigerator	Refrigerators removed from site.	March 9, 2018	Adrian Kowalchuk	Geoff Crann	
5.0	**COMMUNICATIONS**					
5.1	Satellite phone	Satellite phone removed from site.	March 14, 2018	Adrian Kowalchuk	Geoff Crann	
5.2	Cellular internet	Cellular Internet Wi-Fi network removed from site.	March 14, 2018	Adrian Kowalchuk	Geoff Crann	
6.0	**GENERATOR**					
6.1	Generator	Generator removed from site.	March 15, 2018	Adrian Kowalchuk	Geoff Crann	
6.2	Secondary containment	Secondary spill containment removed from site.	March 16, 2018	Adrian Kowalchuk	Geoff Crann	
6.3	Power distribution	Power distribution cables and panels removed from site.	March 14, 2018	Adrian Kowalchuk	Geoff Crann	
7.0	**LIGHT TOWERS**					
7.1	Light Tower	All light towers removed from site.	March 14, 2018	Adrian Kowalchuk	Geoff Crann	
7.2	Secondary containment	All secondary spill containments for light towers removed from site.	March 16, 2018	Adrian Kowalchuk	Geoff Crann	

IG_BH01 Site Decommissioning Checklist

Item No.	Item	General Requirements	Date Completed	Checked by	Approved by	Comments
8.0	**FUEL STORAGE**					
8.1	Fuel tank	Fuel Tank removed from site.	March 12, 2018	Adrian Kowalchuk	Geoff Crann	
8.2	Secondary containment	Secondary spill containment removed from site.	March 12, 2018	Adrian Kowalchuk	Geoff Crann	
8.3	Protective barricade	Protective barricades removed from site.	March 13, 2018	Adrian Kowalchuk	Geoff Crann	
9.0	**SANITARY FACILITIES**					
9.1	Washroom	Washroom removed from site.	March 13, 2018	Adrian Kowalchuk	Geoff Crann	
9.2	Water tank	Water tank removed from site.	March 13, 2018	Adrian Kowalchuk	Geoff Crann	
9.3	Septic tank	Septic tank removed from site.	March 13, 2018	Adrian Kowalchuk		
9.3	Temporary Washroom Facilities	Temporary washroom facilities removed from site.	March 16, 2018	Adrian Kowalchuk	Geoff Crann	
10.0	**GARBAGE BINS**					
10.1	Garbage Bin	Garbage bin removed from site.	March 14, 2018	Adrian Kowalchuk	Geoff Crann	
10.2	Recycling Bin	Recycle bin removed from site.	March 14, 2018	Adrian Kowalchuk	Geoff Crann	
11.0	**WELL HEAD**					

IG_BH01 Site Decommissioning Checklist

Item No.	Item	General Requirements	Date Completed	Checked by	Approved by	Comments
11.1	Well Head Survey	Well head casing reference and Westbay casing is surveyed to benchmark.	March 15, 2018	Adrian Kowalchuk	Geoff Crann	
11.2	Well Head Security	Well head protective casing is installed, painted for visibility, and locked for security.	March 16, 2018	Adrian Kowalchuk	Geoff Crann	
12.0	**OTHER**					
12.1	Post-Thaw Site Condition	Post-thaw inspection for garbage and debris.				Site and surrounding area to be inspected for garbage/debris and previously frozen in wood pieces during monitoring event and post thaw.

Completed by: _____ 17/03/18 10:20

Adrian Kowalchuk (Golder) Date:

Verified by: _____ 17/03/18 10:20

Geoff Crann (NWMO) Date:

Item No.	Item	General Requirements	Date Completed	Checked by	Approved by	Comments
1.0	**SITE PREPARATION**					
1.1	Drill pad	Drill pad cleaned of debris and adequately graded.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
1.3	General site levelling	General site cleaned of debris and adequately graded.	May 23, 2018	Adrian Kowalchuk	Jim McLay	Walkover performed at site, and debris removed for disposal.
1.4	General Site Condition	Site is free of oil sheens and staining.	May 23, 2018	Adrian Kowalchuk	Jim McLay	Granular material removed from nine locations where apparent staining was observed. Confirmatory samples were collected and submitted for laboratory analysis. Material disposed of at the Township of Ignace landfill. NWMO approval conditional on laboratory results.
2.0	**FENCING**					
2.1	Silt fencing	Silt fencing removed from site.	May 23, 2018	Adrian Kowalchuk	Jim McLay	Silt fencing removed.
2.2	Snow fencing	Silt fencing removed from site.	May 23, 2018	Adrian Kowalchuk	Jim McLay	Snow fencing removed.
2.3	Modulok security fencing	Security fencing dismantled and removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
3.0	**OFFICE TRAILERS**					
3.1	Trailer 1 (Golder)	Trailer removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
3.2	Trailer 2 (NWMO)	Trailer removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
3.3	Trailer 3 (Rodren)	Trailer removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
4.0	**CORE LOGGING AND STORAGE**					
4.1	Core Logging Shipping Container	Core Logging Shipping Container removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.

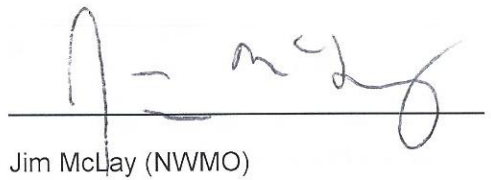
Item No.	Item	General Requirements	Date Completed	Checked by	Approved by	Comments
4.2	Core Logging Table	Core logging table put away for storage.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
4.3	Camera Racking	Camera tracking put away for storage.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
4.4	Core Storage Shipping container	Core storage shipping container removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
4.5	Commercial Refrigerator	Refrigerators removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
5.0	**COMMUNICATIONS**					
5.1	Satellite phone	Satellite phone removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
5.2	Cellular internet	Cellular Internet Wi-Fi network removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
6.0	**GENERATOR**					
6.1	Generator	Generator removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
6.2	Secondary containment	Secondary spill containment removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
6.3	Power distribution	Power distribution cables and panels removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
7.0	**LIGHT TOWERS**					
7.1	Light Tower	All light towers removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
7.2	Secondary containment	All secondary spill containments for light towers removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.

Item No.	Item	General Requirements	Date Completed	Checked by	Approved by	Comments
8.0	**FUEL STORAGE**					
8.1	Fuel tank	Fuel Tank removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
8.2	Secondary containment	Secondary spill containment removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
8.3	Protective barricade	Protective barricades removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
9.0	**SANITARY FACILITIES**					
9.1	Washroom	Washroom removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
9.2	Water tank	Water tank removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
9.3	Septic tank	Septic tank removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
9.3	Temporary Washroom Facilities	Temporary washroom facilities removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
10.0	**GARBAGE BINS**					
10.1	Garbage Bin	Garbage bin removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
10.2	Recycling Bin	Recycle bin removed from site.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
11.0	**WELL HEAD**					
11.1	Well Head Survey	Well head casing reference and Westbay casing is surveyed to benchmark.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.

Item No.	Item	General Requirements	Date Completed	Checked by	Approved by	Comments
11.2	Well Head Security	Well head protective casing is installed, painted for visibility, and locked for security.	N/A	N/A	N/A	Previously completed, refer to the Site Decommissioning Checklist completed March 16, 2018.
12.0	**OTHER**					
12.1	Post-Thaw Site Condition	Post-thaw inspection for garbage and debris.	May 23, 2018	Adrian Kowalchuk	Jim McLay	Walkover performed at site, and debris removed for disposal.

Completed by:  May 23, 2018

Adrian Kowalchuk (Golder) Date:

Verified by:  May 23, 2018

Jim McLay (NWMO) Date:

APPENDIX E

Chain of Custody and Certificates of Analysis – May 23, 2018 Confirmatory Samples

Maxxam

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5 Ph: (604) 734-7276 Fax: (604) 731-2386, Toll Free: (800) 665-8566

CHAIN OF CUSTODY RECORD

Click here to get the COC number

Maxxam Job #: B839951 **COC #:** _____ Page: 1 of 2

Invoice To: Require Report? Yes ☑ No ☐

Company Name:	#21375 Golder Associates LTD
Contact Name:	Accounts Payable
Address:	210 Sheldon Drive, Cambridge Ontario, Canada PC: N1T 1A8
Phone / Fax#:	Ph: 1 (519)620-8182 Fax:
E-mail	AP_CustomerService@Golder.com

Report To:

Company Name:	
Contact Name:	Adrian Kowalchuk
Address:	PC:
Phone / Fax#:	Ph: (204) 891-5372 Fax:
E-mail	AKowalchuk@Golder.com; Gschneider@Golder.com

PO #:	
Quotation #:	B70916
Project #:	1671632
Proj. Name:	IG_BH01
Location:	Ignace, Ontario
Sampled by:	Adrian Kowalchuk

REGULATORY REQUIREMENTS:

- ☐ CSR
- ☐ CCME
- ☐ BC Water Quality
- ☑ Other MOECC, Table 2
- ☐ DRINKING WATER

SERVICE REQUESTED:

- ◉ Regular Turn Around Time (TAT) (5 days for most tests)
- RUSH (Please contact the lab)
- ○ 1 Day ○ 2 Day ○ 3 Day

Date Required: _____

SPECIAL INSTRUCTIONS:

Return Cooler ☐ Ship Sample Bottles (please specify) ☐

Lab Use Only

ANALYSIS REQUESTED

	Sample Identification	Lab Identification	Sample Type	Date/Time(24hr) Sampled	Field Filtered? Y/N	Field Acidified? Y/N	Field Acidified? Y/N	Dissolved Metals (DM)	Total Metals	BTEX, F1-F4	Number of Containers
1	EX1-2		Soil	25/05/18 14:00						X	3
2	EX1-22		Soil	25/05/18 14:00						X	3
3	EX1-11R		Soil	25/05/18 14:40						X	3
4	EX1-8		Soil	25/05/18 14.15						X	3
5	EX1-10		Soil	25/05/18 14:30						X	3
6	EX2-1		Soil	25/05/18 12:00						X	3
7	EX3-1		Soil	25/05/18 12:30						X	3
8	EX4-2		Soil	25/05/18 11:00						X	3
9	EX4-22		Soil	25/05/18 11:00						X	3
10	EX5-2		Soil	25/05/18 10:00						X	3
11	EX6R2-3		Soil	25/05/18 13:00						X	3
12	EX8-2		Soil	25/05/18 13:30						X	3

Print name and sign

Print name and sign

Laboratory Use Only

*Relinquished By:	Date (yy/mm/dd):	Time (24hr):	Received by :	Date (yy/mm/dd):	Time (24 hr):	Time Sensitive	Temperature on Receipt (°C)	Custody Seal	Yes	No
Adrian Kowalchuk	18/05/25	10:15	Jaclyn M.	2018/05/25	1020	☑	A) 4.1 B) 4.3 C) 3.3	Present?	☐	☐
							Just sampled & rec'd on ice: ☐	Intact?	☐	☐

*IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORDS. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

ice present

Maxxam

Burnaby: 4606 Canada Way, Burnaby, BC V5G 1K5 Ph: (604) 734-7276 Fax: (604) 731-2386, Toll Free: (800) 665-8566

CHAIN OF CUSTODY RECORD

Click here to get the COC number

Maxxam Job #: B839951 **COC #:** _____ Page: 2 of 2

Invoice To: Require Report? Yes ☑ No ☐

Company Name:	#21375 Golder Associates LTD
Contact Name:	Accounts Payable
Address:	210 Sheldon Drive, Cambridge Ontario, Canada PC: N1T 1A8
Phone / Fax#:	Ph: 1 (519)620-8182 Fax:
E-mail	AP_CustomerService@Golder.com

Report To:

Company Name:	
Contact Name:	Adrian Kowalchuk
Address:	PC:
Phone / Fax#:	Ph: (204) 891-5372 Fax:
E-mail	AKowalchuk@Golder.com, Gschneider@Golder.com

PO #:	
Quotation #:	B70916
Project # :	1671632
Proj. Name:	IG_BH01
Location:	Ignace, Ontario
Sampled by:	Adrian Kowalchuk

REGULATORY REQUIREMENTS:

- ☐ CSR
- ☐ CCME
- ☐ BC Water Quality
- ☑ Other MOECC, Table 2
- ☐ DRINKING WATER

SERVICE REQUESTED:

- ◉ Regular Turn Around Time (TAT) (5 days for most tests)
- **RUSH** (Please contact the lab) ○ 1 Day ○ 2 Day ○ 3 Day

Date Required: _____

SPECIAL INSTRUCTIONS:

Return Cooler ☐ Ship Sample Bottles (please specify) ☐

Lab Use Only

ANALYSIS REQUESTED

	Sample Identification	Lab Identification	Sample Type	Date/Time(24hr) Sampled	Dissolved Metals (DM)	Field Filtered? Y/N	Total Metals	Field Acidified? Y/N	Field Acidified? Y/N	BTEX, F1-F4	Number of Containers
1	EX9-1		Soil	25/05/16 14:40						X	3
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											

Print name and sign

*Relinquished By:	Date (yy/mm/dd):	Time (24hr):	Received by :	Date (yy/mm/dd):	Time (24 hr):	Time Sensitive	Temperature on Receipt (°C)	Custody Seal	Yes	No
Adrian Kowalchuk	18/05/25	10:15	Jorelyn M.	2018/05/25	1020	☑	A) 4.1 B) 4.3 C) 3.3	Present?	☐	☐
							Just sampled & rec'd on ice: ☐	Intact?	☐	☐

*IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORDS. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

SBY FCD-00077R2_C

Maxxam Analytics Success Through Science ®

ice present

Your Project #: 1671632
Site#: IG_BH01
Site Location: IGNACE, ONTARIO

Attention: ADRIAN KOWALCHUK

GOLDER ASSOCIATES LTD
210 SHELDON DRIVE
CAMBRIDGE, ON
Canada N1T 1A5

Report Date: 2018/05/30
Report #: R2560799
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B839951
Received: 2018/05/25, 10:20

Sample Matrix: Soil
Samples Received: 13

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
F1-BTEX	13	N/A	2018/05/29	WIN SOP-00054	Auto Calc
BTEX/MTBE VH F1 in Soil - Field Pres. (1)	13	N/A	2018/05/28	WINSOP-00054	PA8260D/CCME PHCCWS
CCME Hydrocarbons (F2-F4 in soil) (2)	12	2018/05/28	2018/05/28	WIN SOP-00056	CCME PHC-CWS
CCME Hydrocarbons (F2-F4 in soil) (2)	1	2018/05/28	2018/05/29	WIN SOP-00056	CCME PHC-CWS
Moisture	13	N/A	2018/05/28	WIN SOP-00060	CCME PHC-CWS m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) The extraction date for VOC, BTEX, VH, or F1 samples that are field preserved with methanol equals the date sampled, unless otherwise stated.
(2) All CCME results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.

Your Project #: 1671632
Site#: IG_BH01
Site Location: IGNACE, ONTARIO

Attention: ADRIAN KOWALCHUK

GOLDER ASSOCIATES LTD
210 SHELDON DRIVE
CAMBRIDGE, ON
Canada N1T 1A5

Report Date: 2018/05/30
Report #: R2560799
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B839951
Received: 2018/05/25, 10:20

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Amanda Hung, B.Sc., Project Manager
Email: AHung@maxxam.ca
Phone# (204)772-7276 Ext:7062215

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B839951
Report Date: 2018/05/30

GOLDER ASSOCIATES LTD
Client Project #: 1671632
Site Location: IGNACE, ONTARIO
Sampler Initials: AK

FIELD PRESERVED BTEX/F1, F2-F4 IN SOIL (SOIL)

Maxxam ID		TM5629			TM5629			TM5697	TM5698		
Sampling Date		2018/05/23 14:00			2018/05/23 14:00			2018/05/23 14:00	2018/05/23 14:40		
	UNITS	EX1-2	RDL	QC Batch	EX1-2 Lab-Dup	RDL	QC Batch	EX1-22	EX1-11R	RDL	QC Batch
Physical Properties											
Moisture	%	3.5	0.3	9001230				3.8	16	0.3	9001230
Ext. Pet. Hydrocarbon											
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	10	9001241	<10	10	9001241	<10	<10	10	9001241
F3 (C16-C34 Hydrocarbons)	mg/kg	<50	50	9001241	<50	50	9001241	<50	78	50	9001241
F4 (C34-C50 Hydrocarbons)	mg/kg	<50	50	9001241	<50	50	9001241	73	<50	50	9001241
Reached Baseline at C50	mg/kg	Yes	N/A	9001241	Yes	N/A	9001241	Yes	Yes	N/A	9001241
Volatiles											
Benzene	mg/kg	<0.0050	0.0050	9002962				<0.0050	<0.0050	0.0050	9002962
Toluene	mg/kg	<0.020	0.020	9002962				<0.020	<0.020	0.020	9002962
Xylenes (Total)	mg/kg	<0.045	0.045	9000649				<0.045	<0.045	0.045	9000649
F1 (C6-C10) - BTEX	mg/kg	<10	10	9000649				<10	<10	10	9000649
Ethylbenzene	mg/kg	<0.010	0.010	9002962				<0.010	<0.010	0.010	9002962
m & p-Xylene	mg/kg	<0.040	0.040	9002962				<0.040	<0.040	0.040	9002962
o-Xylene	mg/kg	<0.020	0.020	9002962				<0.020	<0.020	0.020	9002962
F1 (C6-C10)	mg/kg	<10	10	9002962				<10	<10	10	9002962
Surrogate Recovery (%)											
1,4-Difluorobenzene (sur.)	%	109		9002962				108	111		9002962
4-Bromofluorobenzene (sur.)	%	93		9002962				93	93		9002962
D10-o-Xylene (sur.)	%	97		9002962				96	101		9002962
D4-1,2-Dichloroethane (sur.)	%	102		9002962				102	103		9002962
O-TERPHENYL (sur.)	%	94		9001241	91		9001241	91	90		9001241

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

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B839951
Report Date: 2018/05/30

GOLDER ASSOCIATES LTD
Client Project #: 1671632
Site Location: IGNACE, ONTARIO
Sampler Initials: AK

FIELD PRESERVED BTEX/F1, F2-F4 IN SOIL (SOIL)

Maxxam ID		TM5699	TM5700	TM5701	TM5702	TM5703	TM5704		
Sampling Date		2018/05/23 14:15	2018/05/23 14:30	2018/05/23 12:00	2018/05/23 12:30	2018/05/23 11:00	2018/05/23 11:00		
	UNITS	EX1-8	EX1-10	EX2-1	EX3-1	EX4-2	EX4-22	RDL	QC Batch
Physical Properties									
Moisture	%	2.1	3.8	3.8	5.5	5.0	4.9	0.3	9001230
Ext. Pet. Hydrocarbon									
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	<10	19	<10	<10	10	9001241
F3 (C16-C34 Hydrocarbons)	mg/kg	<50	<50	<50	<50	87	<50	50	9001241
F4 (C34-C50 Hydrocarbons)	mg/kg	<50	<50	61	<50	280	<50	50	9001241
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	Yes	Yes	N/A	9001241
Volatiles									
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9002962
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9002962
Xylenes (Total)	mg/kg	<0.045	<0.045	<0.045	<0.045	<0.045	<0.045	0.045	9000649
F1 (C6-C10) - BTEX	mg/kg	<10	<10	<10	<10	<10	<10	10	9000649
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	9002962
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.040	9002962
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	9002962
F1 (C6-C10)	mg/kg	<10	<10	<10	<10	<10	<10	10	9002962
Surrogate Recovery (%)									
1,4-Difluorobenzene (sur.)	%	112	110	112	112	115	114		9002962
4-Bromofluorobenzene (sur.)	%	92	91	91	90	89	89		9002962
D10-o-Xylene (sur.)	%	96	95	99	98	103	102		9002962
D4-1,2-Dichloroethane (sur.)	%	103	99	103	104	103	105		9002962
O-TERPHENYL (sur.)	%	91	87	90	97	97	99		9001241

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B839951
Report Date: 2018/05/30

GOLDER ASSOCIATES LTD
Client Project #: 1671632
Site Location: IGNACE, ONTARIO
Sampler Initials: AK

FIELD PRESERVED BTEX/F1, F2-F4 IN SOIL (SOIL)

Maxxam ID		TM5705	TM5706	TM5707	TM5708		
Sampling Date		2018/05/23 10:00	2018/05/23 13:00	2018/05/23 13:30	2018/05/23 14:40		
	UNITS	EX5-2	EX6R2-3	EX8-2	EX9-1	RDL	QC Batch
Physical Properties							
Moisture	%	5.2	3.5	3.8	5.6	0.3	9001230
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	<10	<10	10	9001241
F3 (C16-C34 Hydrocarbons)	mg/kg	<50	<50	<50	<50	50	9001241
F4 (C34-C50 Hydrocarbons)	mg/kg	<50	<50	<50	<50	50	9001241
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	9001241
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	9002962
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9002962
Xylenes (Total)	mg/kg	<0.045	<0.045	<0.045	<0.045	0.045	9000649
F1 (C6-C10) - BTEX	mg/kg	<10	<10	<10	<10	10	9000649
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	9002962
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	9002962
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	9002962
F1 (C6-C10)	mg/kg	<10	<10	<10	<10	10	9002962
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	112	115	114	107		9002962
4-Bromofluorobenzene (sur.)	%	90	89	91	91		9002962
D10-o-Xylene (sur.)	%	100	99	102	96		9002962
D4-1,2-Dichloroethane (sur.)	%	103	105	109	124		9002962
O-TERPHENYL (sur.)	%	90	98	97	99		9001241

RDL = Reportable Detection Limit
N/A = Not Applicable

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B839951
Report Date: 2018/05/30

GOLDER ASSOCIATES LTD
Client Project #: 1671632
Site Location: IGNACE, ONTARIO
Sampler Initials: AK

GENERAL COMMENTS

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

Package 1	3.9°C
Package 2	6.0°C

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B839951
Report Date: 2018/05/30

QUALITY ASSURANCE REPORT

GOLDER ASSOCIATES LTD
Client Project #: 1671632
Site Location: IGNACE, ONTARIO
Sampler Initials: AK

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9001241	O-TERPHENYL (sur.)	2018/05/28	101	60 - 130	95	60 - 130	99	%		
9002962	1,4-Difluorobenzene (sur.)	2018/05/28	96	50 - 140	96	50 - 140	98	%		
9002962	4-Bromofluorobenzene (sur.)	2018/05/28	103	50 - 140	107	50 - 140	99	%		
9002962	D10-o-Xylene (sur.)	2018/05/28	89	60 - 140	94	60 - 140	89	%		
9002962	D4-1,2-Dichloroethane (sur.)	2018/05/28	89	50 - 140	94	50 - 140	106	%		
9001230	Moisture	2018/05/28					<0.3	%	0	20
9001241	F2 (C10-C16 Hydrocarbons)	2018/05/28	NC	60 - 130	103	70 - 130	<10	mg/kg	NC	40
9001241	F3 (C16-C34 Hydrocarbons)	2018/05/28	NC	60 - 130	104	70 - 130	<50	mg/kg	NC	40
9001241	F4 (C34-C50 Hydrocarbons)	2018/05/28	NC	60 - 130	112	70 - 130	<50	mg/kg	NC	40
9001241	Reached Baseline at C50	2018/05/28					YES	mg/kg	NC	50
9002962	Benzene	2018/05/28	87	50 - 140	91	60 - 130	<0.0050	mg/kg	NC	50
9002962	Ethylbenzene	2018/05/28	97	50 - 140	99	60 - 130	<0.010	mg/kg	NC	50
9002962	F1 (C6-C10)	2018/05/28	86	60 - 140	77	60 - 140	<10	mg/kg	16	30
9002962	m & p-Xylene	2018/05/28	93	50 - 140	97	60 - 130	<0.040	mg/kg	NC	50
9002962	o-Xylene	2018/05/28	94	50 - 140	96	60 - 130	<0.020	mg/kg	NC	50
9002962	Toluene	2018/05/28	87	50 - 140	90	60 - 130	<0.020	mg/kg	NC	50

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

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

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

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

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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

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

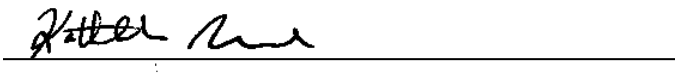
Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386

Maxxam Job #: B839951
Report Date: 2018/05/30

GOLDER ASSOCIATES LTD
Client Project #: 1671632
Site Location: IGNACE, ONTARIO
Sampler Initials: AK

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Kathleah Manuel, B.Sc, Analyst

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Winnipeg: Unit D, 675 Berry Street R3H 1A7 Telephone (204) 772-7276 Fax (204) 772-2386