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Phase II Environmental Site Assessment

383 Slater Street, 388-400 Albert Street
and 156-160 Lyon Street
Ottawa, Ontario

Prepared For

Main & Main Developments

April 15, 2019

Report: PE4581-2

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the properties addressed 383 Slater Street, 388-400 Albert Street and 156-160 Lyon Street, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address a potentially contaminating activity (PCA) that was identified during the Phase I ESA and considered to result in an area of potential environmental concern (APEC) on the Phase II Property. The subsurface investigation consisted of nine (9) test pits and drilling three (3) boreholes, all of which were constructed with groundwater monitoring wells.

Soil samples were obtained from the test pits located on the western portion of the subject property and screened using visual observations. Five (5) soil samples were submitted for laboratory analysis of metals. All metal parameter concentrations were in compliance with the MECP Table 3 Standards.

Soil results from the 2012 and 2017 Phase II ESAs conducted by Golder Associates and Paterson, respectively, identified mercury and lead concentrations in excess of the MECP Table 3 Standards. Impacted soil was identified on the eastern portion of Phase II Property. The extent of contamination is considered to be limited to the fill material beneath the asphaltic concrete and/or gravel layer.

Groundwater samples from monitoring wells installed in BH1, BH2 and BH3 were recovered and analyzed for volatile organic compounds (VOCs) to confirm that groundwater beneath the site is free of contaminants. All VOC parameter concentrations were in compliance with the MECT Table 3 Standards, with the exception of chloroform detected in two monitoring wells (BH1 and BH2). Chloroform is considered to be related to the municipal water used to core the bedrock on the subject site and is expected to dissipate in the near future. Therefore, groundwater is considered to be in compliance with the selected MECP standards.

Groundwater results from the 2012 and 2017 Phase II ESAs concluded all analyzed parameters were in compliance with the MECP Table 3 Standards.

Recommendations

Soil

Based on the findings of the Phase II ESA, soil/fill impacted with mercury and lead is present on the eastern portion of the Phase II Property. It is expected that the impacted fill will be removed from the subject site during the redevelopment process. The

excavation of the fill from the property should be monitored and confirmed by Paterson. Any impacted fill and construction debris being removed from the property is to be disposed of at an approved waste disposal facility.

Groundwater

It is recommended that any monitoring wells that had elevated chloroform concentrations in them be resampled to confirm that the chloroform has dissipated.

Monitoring Wells

If the monitoring wells installed on the subject site are not going to be used in the future, or will be destroyed during site redevelopment, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

1.0 INTRODUCTION

At the request of Mr. Rooie Ash of Main & Main Developments, Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment of 383 Slater Street, 388-400 Albert Street, 156-160 Lyon Street, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified on the Phase II Property, during the Phase I ESA conducted by Paterson in March 2019 and previous Phase II ESAs conducted by Golder Associates and Paterson in January 2012 and May 2017, respectively.

1.1 Site Description

Address:	383 Slater Street, 388-400 Albert Street, 156-160 Lyon Street, Ottawa, Ontario.
Legal Description:	West Part Lot 16; Lots 12, 13, 14, 15, 16, and Part of Lot 17 (North Slater Street) and Lots 14 and 15 (South Albert Street), Registered Plan 3922, City of Ottawa, Ontario; Part of Lot 16 (East Albert Street); Part of Lot 17, Registered Plan 3922, City of Ottawa, Ontario.
Property Identification Number(s):	04114-0008; 04114-0011; 04114-0012; 04114-0010 and 04114-0009
Location:	The subject site is bound by Bay Street to the West, Lyon Street to the East, Slater Street to the South, and Albert Street to the North. The subject site is shown on Figure 1 - Key Plan following the body of this report.
Latitude and Longitude:	45° 23' 04" N, 75° 44' 12" W
Zoning:	R5A – Residential 5th Density
Configuration:	Irregular
Site Area:	1.05 hectares (approximate)

1.2 Property Ownership

Paterson was retained to complete this Phase II ESA by Mr. Rooie Ash of Main & Main Developments, the prospective buyer. Main & Main Developments' office is located at 109 Atlantic Avenue, Suite 302B, Toronto, Ontario. Mr. Ash can be reached by telephone at (416) 530-2438.

1.3 Current and Proposed Future Uses

The Phase II Property is currently occupied by a vacant two (2) storey commercial restaurant building. The site is primarily used for vehicular parking. It is our understanding that the Phase II Property will be redeveloped with three (3) residential complexes with retail/commercial space available on the ground level and multiple levels of underground parking.

1.4 Applicable Site Condition Standard

The site condition standards for the property were obtained from Table 3 of the document entitled "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", prepared by the Ministry of the Environment, Conservation and Parks (MECP), April 2011. The selected MECP Table 3 Standards are based on the following considerations:

- ❒ Coarse-grained soil conditions
- ❒ Surface soil and groundwater conditions
- ❒ Non-potable groundwater conditions
- ❒ Residential land use

The residential standards were selected based on the future land use of the subject site. Coarse grained soil standards were chosen as a conservative approach. Grain size analysis was not completed.

2.0 BACKGROUND INFORMATION

2.1 Physical Setting

The Phase II Property is bound by Bay Street to the West, Lyon Street to the East, Slater Street to the South, and Albert Street to the north. The site is in a downtown urban setting. The ground surface at the site is gravel covered along the western portion of the property, while the eastern portion is asphaltic concrete covered. The site is at the grade of Albert Street and Slater Street, sloping down in a north-to-south direction. The regional topography slopes downwards in a northerly direction towards the Ottawa River, approximately 520 m away.

2.2 Past Investigations

Paterson completed a Phase I ESA in March 2019 for the subject site. Based on the findings of the Phase I ESA, one Potentially Contaminating Activity (PCA) was identified, metal impacted fill material on site. This PCA was considered to represent an APEC on the Phase I Property.

PCAs that represented APECs on the Phase I and II Property as well as the Contaminants of Potential Concern (CPCs) are presented in Table 1.

Table 1. Areas of Potential Environmental Concern

Area of Potential Environmental Concern and location	Potentially Contaminating Activity, as per Table 2 of O.Reg 153/04, as amended by, O.Reg 269/11	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, Soil, and/or Sediment)
APEC 1: Fill Material located on the site	Item 30, “Importation of Fill Material of Unknown Quality”	On Site – southern portion and northeast quadrant of the site	Metals	Soil

A Phase II ESA was recommended to address the aforementioned APEC.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The original subsurface investigation was conducted in April 2017, while recent cork was conducted in March 2019 in conjunction with a Geotechnical Investigation. In 2017, four (4) boreholes were drilled at the subject site. Boreholes were drilled through overburden soils and into bedrock to a maximum depth of 8.3 m below ground surface (GBS). Groundwater monitoring wells were installed in three (3) boreholes. Five (5) additional boreholes which had been previously drilled for geotechnical purposes were also reviewed as part of the 2017 Phase II ESA.

The field program in March 2019 consisted of nine (9) test pits to assess the quality of the fill material on the western half of the 383 Slater Street. Three (3) deep boreholes were drilled to depths of 17.9 to 19.4 m BGS and completed as groundwater monitoring wells.

3.2 Media Investigated

During the subsurface investigation, soil samples and groundwater samples were obtained and submitted for laboratory analysis. The rationale for sampling and analyzing these media is based on the Contaminants of Potential Concern identified in the Phase I ESA and confirmation of existing groundwater conditions.

Contaminants of potential environmental concern for soil include metals (chromium VI and mercury). Additional testing of groundwater included volatile organic compounds (VOCs) for confirmatory purposes only.

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

The Geological Survey of Canada website on the Urban Geology of the National Capital Area was consulted as part of this assessment. Based on this information, bedrock in the area of the site consists of interbedded limestone and dolomite of the Gull River Formation. Overburden is reported to consist of Glacial Till of depths ranging from 0-5m.

Based on the findings of the Geotechnical investigation conducted by Paterson, overburden generally consists of fill material in former building locations over silty

slay and/or glacial till over bedrock. Bedrock ranges in depth from approximately 3-5 m below grade.

The regional topography slopes down in a northerly direction, however the topography in the immediate vicinity of the Phase I Property slopes down towards the south. The local groundwater flow beneath the Phase I Property is inferred to be in a north-westerly/northerly direction.

Contaminants of Potential Concern

As per Section 7.1 of the Phase I ESA report, metals were identified as contaminants of potential concern (CPCs) in the fill on the subject site.

Existing Buildings and Structures

The Phase I Property is occupied by a vacant two (2) storey building that was constructed pre-1920 with a stone and mortar foundation, finished in red brick and a sloped style shingle roof. The building was used as a restaurant since the mid 1990s. Remnants (foundation walls) of the former building on the northwest corner of the property are present.

Water Bodies

There are no water bodies on the Phase I Property or within the Phase I study area. The closest water body is the Ottawa River, located approximately 500 m to the north.

Areas of Natural Significance

No areas of natural significance were identified on the Phase I Property or in the Phase I Study Area.

Drinking Water Wells

No drinking water wells are located on the Phase I Property or within the Phase I Study Area.

Neighbouring Land Use

Neighbouring land use in the Phase I Study Area is a combination of residential, commercial retail, restaurants and an institution. Land use is shown on Drawing PE4581-2 - Surrounding Land Use Plan in the Phase I ESA report.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Table 5 in Section 7.1, one Potentially Contaminating Activity (PCA) was identified on the Phase I Property resulting in an Area of Potential Environmental Concern (APEC):

- Fill material of unknown quality in select areas of the Phase I Property

Historical PCAs were identified within the Phase I Study Area, however these activities were previously addressed and are no longer considered to represent APECs on the Phase I Property based on their respective separation distances and/or orientations with respect to the Phase I Property.

Assessment of Uncertainty and/or Absence of Information

The information available for review as part of the preparation of this Phase I ESA is considered to be sufficient to conclude that there are areas of potential environmental concern on the subject site resulting from current and historical uses of neighbouring properties. The presence of potentially contaminating activities was confirmed by a variety of independent sources. The conclusions of this report are not affected by uncertainty which may be present with respect to the individual sources.

3.4 Deviations from Sampling and Analysis Plan

The Sampling and Analysis Plan for this project is included in Appendix 1 of this report.

3.5 Impediments

No physical impediments were encountered during the Phase II ESA program.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation conducted for this Phase II ESA consisted of drilling three (3) boreholes that were completed as groundwater monitoring wells. Boreholes were drilled through overburden soils and into bedrock to a maximum depth of 19.4 m BGS to intercept groundwater. Nine (9) additional test pits were conducted to assess the quality of the fill on site. This subsurface investigation was conducted in conjunction with a Geotechnical Investigation.

The test pits were placed to address the aforementioned APEC in the southwestern quadrant of the property. The boreholes were advanced using a truck-mounted CME 55 power auger drill rig. The drilling contractor was George Downing Estate Drilling of Hawkesbury, Ontario. Drilling occurred under full-time supervision of Paterson personnel. The borehole locations are indicated on the attached Drawing PE4581-3 - Test Hole Location Plan.

4.2 Soil Sampling

A total of nine (9) soil samples were obtained from the test pits by means of sampling from grab samples.

A total of sixteen (16) soil samples were obtained from the boreholes by means of split spoon sampling and grab sampling from auger flights. Split spoon samples were taken at approximate 0.76 m intervals. The bedrock was cored to facilitate the installation of groundwater monitoring wells. The depths at which grab samples and split spoon samples were obtained from the boreholes are shown as "**G**" and "**SS**" on the Soil Profile and Test Data Sheets, appended to this report.

The borehole profiles generally consist of asphaltic concrete or gravel over crushed stone and silty sand with gravel fill material, underlain silty sand and/or till and bedrock. Fill material present beneath the pavement structure extended to depths ranging from 2.39 to 3.28 m. Till was present beneath the fill and extended to depths ranging from 2.84 to 4.29 m below the existing grade.

4.3 Field Screening Measurements

Soil samples recovered at the time of sampling were placed immediately into airtight plastic bags with nominal headspace. All lumps of soil inside the bags were broken by hand, and the soil was allowed to come to room temperature prior to conducting the vapour survey. Allowing the samples to stabilize to room temperature ensures consistency of readings between samples.

To measure the soil vapours, the analyser probe is inserted into the nominal headspace above the soil sample. A photo ionization detector (PID) was used to measure the volatile organic vapour concentrations. The sample is agitated/manipulated gently as the measurement is taken. The peak reading registered within the first 15 seconds is recorded as the vapour measurement.

The PID readings were found to be zero in the soil samples obtained. These results do not indicate the potential for significant contamination from volatile

contaminants. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

No olfactory indications of potential contamination were identified in the soil samples; however, some demolition debris was identified in a few samples.

4.4 Groundwater Monitoring Well Installation

Three (3) groundwater monitoring wells were installed on the subject site as part of the subsurface investigation. The monitoring wells consisted of 32 mm diameter Schedule 40 threaded PVC risers and screens. Monitoring well construction details are listed below in Table 2 and are also presented on the Soil Profile and Test Data Sheets provided in Appendix 1.

Boreholes were surveyed using a benchmark elevation of the top grate of a manhole located on Bay Street, at the Slater Street at Bay Street intersection as presented in Drawing PE4581-3, with a geodetic elevation of 72.77 m above sea level (m ASL).

TABLE 2: Monitoring Well Construction Details

Well ID	Ground Surface Elevation	Total Depth (m BGS)	Screened Interval (m BGS)	Sand Pack (m BGS)	Bentonite Seal (m BGS)	Casing Type
BH1	73.24	18.01	15.01-18.01	13.70-18.01	0.61-13.70	Flushmount
BH2	71.99	17.88	14.88-17.88	13.66-17.88	0.61-13.66	Flushmount
BH3	72.28	19.38	16.38-19.38	13.70-19.38	0.61-13.70	Flushmount

4.5 Field Measurement of Water Quality Parameters

Groundwater sampling was conducted at BH1, BH2 and BH3 on April 9, 2019. Water levels were measured. No other field parameters were measured.

4.6 Groundwater Sampling

Groundwater sampling protocols were followed using the MECP document entitled “Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario”, dated May 1996. Groundwater samples were obtained from each monitoring well, using dedicated sampling equipment. Standing water was purged from each well prior to sampling. Samples were stored in coolers to reduce analyte volatilization during transportation. Details of our standard operating procedure for groundwater sampling are provided in the Sampling and Analysis Plan in Appendix 1.

4.7 Analytical Testing

Based on the guidelines outlined in the Sampling and Analysis Plan appended to this report, the following soil and groundwater samples as well as analyzed parameters are presented in Tables 3 and 4. For reference purposes, previous sample ID(s) and analyzed parameters from the 2012 and 2017 Phase II ESAs conducted by Golder and Paterson, respectively, have been included in the table.

TABLE 3. Soil Samples Submitted and Analyzed Parameters

Sample ID	Sample Depth / Stratigraphic Unit	Parameters Analyzed				Rationale
		Metals[1]	BTEX / VOCs	PAHs	PHCs (F1-F4)	
March 29, 2019						
TP1-G1	0.2-0.3 m, Fill	X				Assess the quality of the fill material on the southwest portion of the subject site.
TP2-G1	0.1-0.2 m, Fill	X				Assess the quality of the fill material on the southwest portion of the subject site.
TP3-G1	0.2-0.3 m, Fill	X				Assess the quality of the fill material on the southwest portion of the subject site.
TP4-G1	0.2-0.3 m, Fill	X				Assess the quality of the fill material on the southwest portion of the subject site.
TP5-G1	0.2-0.3 m, Fill	X				Assess the quality of the fill material on the southwest portion of the subject site.
April 18-27, 2017 (Paterson, 2017)						
BH9-SS2	0.76-1.37 m, Fill	X		X		Assess fill material of unknown quality
BH10-SS1B	0.31-0.76 m, Fill	X				Assess former garage, welding shop and fill quality
BH10-SS2	0.76-1.37 m, Fill		X	X	X	Assess former garage, welding shop and fill quality
BH10-SS4	2.29-2.90 m, silty sand	X				Vertical delineation of Mercury impacts
BH11-SS1B	0.25-0.91 m, Fill	X				Assess fill material of unknown quality
BH11-SS2A	0.91-1.37 m, Fill	X				Vertical delineation of Mercury and

TABLE 3. Soil Samples Submitted and Analyzed Parameters

Sample ID	Sample Depth / Stratigraphic Unit	Parameters Analyzed				Rationale
		Metals[1]	BTEX / VOCs	PAHs	PHCs (F1-F4)	
						Lead impacts
BH11-SS3	1.52-2.13 m, Till	X				Vertical delineation of Mercury impacts
BH11-SS6	3.81-4.22 m, Till		X			Assess former cleaners and fill material of unknown quality
BH12-SS1B	0.31-0.76 m, Fill	X				Assess fill material of unknown quality
BH12-SS2	0.76-1.37 m, Fill	X				Vertical delineation of Mercury impacts
BH12-SS5	3.04-3.66 m, Till		X		X	Assess former cleaners
May 19, 2011 (Golder, 2012)						
T-72 SA1	0.76-1.37 m, Fill	X	X		X	Assess APECs on northwest corner of the subject site
T-72 SA4	3.04-3.66 m, Till	X	X		X	Assess APECs on northwest corner of the subject site
T-306 SA1	0.76-1.37 m, Fill	X	X		X	Assess APECs on northwest corner of the subject site
T-306 SA3	2.29-2.90 m, Till		X		X	Assess APECs on northwest corner of the subject site
T-307 SA1	0.76-1.37 m, Fill	X	X		X	Assess APECs on northwest corner of the subject site
T-307 SA5	3.80-4.42 m, Till		X		X	Assess APECs on northwest corner of the subject site
T-308 SA3	2.29-2.90 m, silty clay		X		X	Assess APECs on northwest corner of the subject site
T-308 SA6*	3.80-4.27 m, Till		X		X	Assess APECs on northwest corner of the subject site
T-309 SA1	0.91-1.52 m, Fill	X	X		X	Assess APECs on northwest corner of the subject site
T-309 SA4	3.05-3.66 m, Till		X		X	Assess APECs on northwest corner of the subject site
T-309 SA4A	3.05-3.66 m, Till		X		X	Duplicate Sample

Notes:
1 – Metals including Chromium VI and/or Mercury
* - Identified as SA5 on borehole log

TABLE 4. Groundwater Samples Submitted and Analyzed Parameters

Sample ID	Screened Depth/ Stratigraphic Unit	Parameters Analyzed				Rationale
		Metals[1]	VOCs	PAHs	PHCs (F1-F4)	
April 9, 2019						
BH1-GW1	15.01-18.01 m, Limestone bedrock		X			Confirm that there are no VOC impacts beneath the subject site
BH2-GW1	14.88-17.88 m, Limestone bedrock		X			Confirm that there are no VOC impacts beneath the subject site
BH3-GW1	16.38-19.38 m, Limestone bedrock		X			Confirm that there are no VOC impacts beneath the subject site
April 27, 2017 (Paterson, 2017)						
BH9-GW1	3.81-7.14 m, Limestone bedrock	X		X	X	Assess potential groundwater impacts due to the presence of the former welding shop and garage
BH10-GW1	3.73- 8.31 m, Limestone bedrock		X	X	X	Assess potential groundwater impacts due to the presence of the former drycleaners and garage
BH11-GW1	4.89-6.81 m Limestone bedrock	X	X			Assess potential groundwater impacts due to the presence of the former drycleaners and welding shop
June 28 – December 5, 2011 (Golder, 2012)						
T-72A	33.3-39.3 m, Limestone bedrock		X		X	Assess potential groundwater impacts due to the presence of the former drycleaner
T-72B	12.2-15.2 m, Limestone bedrock		X		X	Assess potential groundwater impacts due to the presence of the former drycleaner
T-306A	13.6-15.1 m, Limestone bedrock		X			Assess potential groundwater impacts due to the presence of the former drycleaner
T-306B	4.9-6.4 m, Limestone bedrock		X		X	Assess potential groundwater impacts due to the presence of the former drycleaner
T-307A	13.5-15.0 m, Limestone bedrock		X			Assess potential groundwater impacts due to the presence of the former drycleaner
T-308A	13.5-15.0 m, Limestone bedrock		X			Assess potential groundwater impacts due to the presence of the former drycleaner
T-308B	5.5-7.0 m, Limestone bedrock		X		X	Assess potential groundwater impacts due to the presence of the former drycleaner

TABLE 4. Groundwater Samples Submitted and Analyzed Parameters

Sample ID	Screened Depth/ Stratigraphic Unit	Parameters Analyzed				Rationale
		Metals[1]	VOCs	PAHs	PHCs (F1-F4)	
T-309A	12.2-15.1 m, Limestone bedrock		X			Assess potential groundwater impacts due to the presence of the former drycleaner
T-309B	5.5-7.0 m, Limestone bedrock				X	Assess potential groundwater impacts due to the presence of the former drycleaner

Notes:
A, B – Indicates 'Deep Well' and 'Shallow Well,' respectively

Paracel Laboratories (Paracel), of Ottawa, Ontario, performed the laboratory analysis on the samples submitted for analytical testing. Paracel is a member of the Standards Council of Canada/Canadian Association for Laboratory Accreditation (SCC/CALA). Paracel is accredited and certified by SCC/CALA for specific tests registered with the association.

4.8 Residue Management

All soil cuttings, purge water and fluids from equipment cleaning were retained on-site.

4.9 Elevation Surveying

An elevation survey of all borehole locations was completed by Paterson at the time of the subsurface investigation. Elevations were surveyed relative to a geodetic benchmark (manhole cover located along east side of Bay Street, just north of Slater Street). The elevation of the benchmark was 72.77 metres above sea level (m ASL). The location of the site benchmark is shown on Drawing PE4581-3 – Test Hole Location Plan.

4.10 Quality Assurance and Quality Control Measures

A summary of quality assurance and quality control (QA/QC) measures, including sampling containers, preservation, labelling, handling, and custody, equipment cleaning procedures, and field quality control measurements is provided in the Sampling and Analysis Plan in Appendix 1.

5.0 REVIEW AND EVALUATION

5.1 Geology

Site soils consist of an asphaltic paved layer or gravel, underlain by fill material (crushed stone and silty sand with some gravel), overlying glacial till (clayey silt with sand and gravel) and subsequent limestone bedrock.

Groundwater was encountered within bedrock at depths ranging from approximately 2.20 to 4.37 m BGS.

Site geology details are provided in the Soil Profile and Test Data Sheets provided in Appendix 1.

5.2 Groundwater Elevations, Flow Direction, and Hydraulic Gradient

Groundwater levels were measured during the groundwater sampling event on April 9, 2019 using an electronic water level meter. Groundwater levels are summarized below in Table 5.

TABLE 5: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	73.24	4.37	68.87	April 9, 2019
BH2	71.99	2.20	69.79	April 9, 2019
BH3	72.28	3.50	68.78	April 9, 2019

Based on the groundwater elevations measured during the April 2019 sampling event, groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE4581-3. Based on the contour mapping, groundwater flow at the subject site appears to be in a northwesterly direction. A horizontal hydraulic gradient of approximately 0.04 m/m was calculated.

5.3 Fine-Coarse Soil Texture

No grain size analysis was completed for the subject site. Coarse grained standards were chosen as a conservative approach.

5.4 Soil: Field Screening

Field screening of the soil samples collected during drilling resulted in zero-vapour readings. No obvious olfactory indications of potential environmental concerns were identified in the soil samples; however, some demolition debris

was present in a few samples. The field screening results of each individual soil sample are provided on the Soil Profile and Test Data Sheets appended to this report.

5.5 Soil Quality

Five (5) soil samples were submitted for metals analysis. The results of the analytical testing are presented below in Table 6. The laboratory certificate of analysis is provided in Appendix 1.

TABLE 6: Analytical Test Results - Soil – Metals

Parameter	MDL (µg/g)	Soil Samples (µg/g) March 29, 2019					MECP Table 3 Residential Standards (µg/g)
		TP1-G1	TP2-G1	TP3-G1	TP4-G1	TP5-G1	
Antimony	1.0	nd	nd	1.1	nd	1.2	7.5
Arsenic	1.0	1.8	3.3	3.8	2.9	4.2	18
Barium	1.0	20.0	123	53.0	102	104	390
Beryllium	0.5	nd	nd	nd	nd	nd	4
Boron	5.0	nd	26.1	7.5	8.7	8.9	120
Cadmium	0.5	nd	nd	nd	nd	nd	1.2
Chromium	5.0	8.8	10.3	11.5	19.8	16.3	160
Chromium (VI)	0.2	nd	nd	nd	nd	nd	8
Cobalt	1.0	3.5	4.1	4.4	6.9	5.7	22
Copper	5.0	6.5	15.3	12.7	17.0	17.6	140
Lead	1.0	3.9	16.0	10.3	26.3	29.8	120
Mercury	0.1	nd	nd	nd	nd	nd	0.27
Molybdenum	1.0	nd	2.5	3.0	1.0	4.2	6.9
Nickel	5.0	6.1	10.2	9.2	17.2	13.2	100
Selenium	1.0	nd	nd	nd	nd	nd	2.4
Silver	0.3	nd	nd	nd	nd	nd	20
Thallium	1.0	nd	nd	nd	nd	nd	1
Uranium	1.0	nd	nd	nd	nd	1.4	23
Vanadium	10.0	18.7	13.6	17.4	34.8	21.9	86
Zinc	20.0	nd	51.6	25.3	86.5	48.7	340

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- **Bold and Underlined** – Value exceeds selected MECP Standards
- NA – Parameter not tested

Several metal parameters were detected in the soil samples; however, the concentrations are in compliance with the MECP Table 3 Standards. Analytical results for metals with respect to borehole locations are shown on Drawing PE4581-4 – Analytical Testing Plan – Soils (Metals). It should be noted, that the 2012 and 2017 Phase II ESA results for metals have been included in the above noted drawing.

Based on the combined analytical results for soil, mercury and/or lead concentrations exceeded the selected MECP standards in boreholes T-306, T-307, BH10, BH11 and BH12. Metal contamination was identified in samples retrieved from the fill layer.

The analytical results for all other parameters (BTEX, PAHs, PHCs, and VOCs) tested in soil from the 2012 and 2017 Phase II ESAs are shown on Drawing PE4581-5 – Analytical Testing Plan – Soils (BTEX, PAHs, PHCs, VOCs). All other parameter concentrations were in compliance with the MECP Table 3 Standards.

The maximum concentrations of analyzed parameters in the soil at the site are summarized below in Table 7.

TABLE 7. Maximum Concentrations – Soil

Parameter	Maximum Concentration (µg/g)	Borehole	Depth Interval (m BGS)
Antimony	1.2	TP5-G1	0.2-0.3 m, Fill
Arsenic	4.2		
Barium	123	TP2-G1	0.1-0.2 m, Fill
Boron	26.1		
Chromium	19.8	TP4-G1	0.2-0.3 m, Fill
Cobalt	6.9		
Copper	17.6	TP5-G1	0.2-0.3 m, Fill
Lead	29.8		
Molybdenum	4.2		
Nickel	17.2	TP4-G1	0.2-0.3 m, Fill
Vanadium	34.8		
Zinc	86.5		

Notes:
- **Bold and Underlined** – Value exceeds MECP Table 3, Residential Standards

5.6 Groundwater Quality

Groundwater samples from monitoring wells installed in BH1, BH2 and BH3 were submitted for laboratory analysis of VOC parameters. The groundwater samples were obtained from the screened intervals noted on Table 2. The results of the analytical testing are presented in Table 8. The laboratory certificates of analysis are provided in Appendix 1.

TABLE 8. Analytical Test Results – Groundwater (VOCs)

Parameter	MDL (µg/L)	Groundwater Samples (µg/L) April 9, 2019			MECP Table 3 Residential Standards (µg/L)
		BH1-GW1	BH2-GW1	BH3-GW1	
Acetone	5	nd	nd	nd	130,000
Benzene	0.5	nd	nd	nd	44
Bromodichloromethane	0.5	3.2	3.0	nd	85,000
Bromoform	0.5	nd	nd	nd	380
Bromomethane	0.5	nd	nd	nd	5.6
Carbon Tetrachloride	0.2	nd	nd	nd	0.79
Chlorobenzene	0.5	nd	nd	nd	630
Chloroform	0.5	**27.1**	**25.7**	nd	2.4
Dibromochloromethane	0.5	nd	nd	nd	82,000
Dichlorodifluoromethane	1	nd	nd	nd	4,400
1,2-Dichlorobenzene	0.5	nd	nd	nd	4,600
1,3-Dichlorobenzene	0.5	nd	nd	nd	9,600
1,4-Dichlorobenzene	0.5	nd	nd	nd	8
1,1-Dichloroethane	0.5	nd	nd	nd	320
1,2-Dichloroethane	0.5	nd	nd	nd	1.6
1,1-Dichloroethylene	0.5	nd	nd	nd	1.6
cis-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
trans-1,2-Dichloroethylene	0.5	nd	nd	nd	1.6
1,2-Dichloropropane	0.5	nd	nd	nd	16
1,3-Dichloropropene, total	0.5	nd	nd	nd	5.2
Ethylbenzene	0.5	nd	nd	nd	2,300
Ethylene dibromide	0.2	nd	nd	nd	0.25
Hexane	1	nd	nd	nd	51
Methyl Ethyl Ketone	5	nd	nd	nd	470,000
Methyl Isobutyl Ketone	5	nd	nd	nd	140,000
Methyl tert-butyl ether	2	nd	nd	nd	190
Methylene Chloride	5	nd	nd	nd	610
Styrene	0.5	nd	nd	nd	1,300
1,1,1,2-Tetrachloroethane	0.5	nd	nd	nd	3.3
1,1,2,2-Tetrachloroethane	0.5	nd	nd	nd	3.2
Tetrachloroethylene	0.5	nd	nd	nd	1.6
Toluene	0.5	nd	nd	nd	18,000
1,1,1-Trichloroethane	0.5	nd	nd	nd	640
1,1,2-Trichloroethane	0.5	nd	nd	nd	4.7
Trichloroethylene	0.5	nd	nd	nd	1.6
Trichlorofluoromethane	1	nd	nd	nd	2,500
Vinyl Chloride	0.5	nd	nd	nd	0.5
Xylenes, total	0.5	nd	nd	nd	4,200

Notes:
- MDL – Method Detection Limit
- nd – not detected above the MDL
- NA – Parameter not tested

VOC parameter concentrations were not detected in the groundwater samples analyzed, with the exception of bromodichloromethane and chloroform. Chloroform concentrations were identified in BH1 and BH2 in excess of the selected MECP standard; however, the chloroform concentrations are considered to be residual from the municipal water used during rock coring and thus, are not considered contaminants. All remaining VOC parameters comply with the MECP Table 3 Standards.

Analytical results of groundwater sampled with respect to borehole locations are shown on Drawing PE4581-6 – Analytical Testing Plan – Groundwater.

The maximum concentrations of analyzed parameters in the groundwater at the site are summarized in Table 9.

TABLE 9. Maximum Concentrations – Groundwater

Parameter	Maximum Concentration (µg/L)	Borehole	Screened Interval (m BGS)
Bromodichloromethane	3.1	BH1-GW1	15.01-18.01 m
Chloroform	**27.1**	BH1-GW1	15.01-18.01 m

Notes:
- **Bold and Underlined** – Value exceeds MECP Table 3, Residential Standards

All other parameter concentrations were below laboratory detection limits.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the April 2017 and 2019 sampling events were handled in accordance with the Analytical Protocol with respect to preservation method, storage requirement, and container type. As per Subsection 47(3) of O.Reg. 153/04, as amended, under the Environmental Protection Act, a Certificate of Analysis has been received for each sample submitted for analysis and all Certificates of Analysis are appended to this report.

Overall, the quality of the field data collected during this Phase II ESA is considered to be sufficient to meet the overall objectives of this assessment.

5.8 Phase II Conceptual Site Model

The following section has been prepared in accordance with the requirements of O.Reg. 153/04, as amended by the Environmental Protection Act. Conclusions and recommendations are discussed in a subsequent section.

Site Description

Potentially Contaminating Activity and Areas of Potential Environmental Concern

As indicated in the Phase I-ESA report and Section 2.2 of this report, the following PCA, as per Table 2, O.Reg. 153/04, as amended, under the Environmental Protection Act, is considered to result in an APEC on the Phase I and Phase II Property:

- *Item 30*, *"Importation of Fill Material of Unknown Quality"*

Former onsite PCAs and off-site PCAs in the area are not considered to have resulted in APECs, based on available documentation regarding those concerns (2012 and 2017 Phase II ESAs) and/or their location relative to the subject site.

Contaminants of Potential Concern

The CPCs for the Phase II Property include metals present in the fill material.

Subsurface Structures and Utilities

The subject site is located in a municipally serviced area. The site is currently vacant and based on the underground service locates completed prior to the field program no utilities remain on the subject site.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is provided in the Soil Profile and Test Data Sheets in Appendix 1 and is depicted in Drawings PE4581-6 to PE4581-9 – Cross-Sections A – A' Soil/Groundwater. The stratigraphy of the subject site generally consists of:

- Paved asphalt/concrete, approximately 0.05 m below grade;
- Fill material (crushed stone and silty sand with gravel and some clay), extending to depths ranging from approximately 2.39 to 3.28 m below grade;
- Glacial till (clayey silt with sand and gravel), extending to depths ranging from approximately 2.84 to 4.29 m below grade;
- Bedrock (limestone), extending to depths ranging from approximately 17.88 to 19.38 m below grade.

Hydrogeological Characteristics

Groundwater at the Phase II Property was encountered in the glacial till and limestone bedrock. The bedrock is interpreted to function as a local aquifer at the subject site.

Water levels were measured at the subject site on April 9, 2019, at depths ranging from 2.20 to 4.37 m BGS. Based on the groundwater elevations measured, a groundwater contour map was completed. Groundwater contours are shown on Drawing PE4581-3. Based on the contour mapping, groundwater flow at the subject site appears to be in a northwesterly direction. A horizontal hydraulic gradient of approximately 0.04 m/m was calculated.

Approximate Depth to Bedrock

Bedrock is present at approximately 2.84 to 4.29 m below the existing grade, as determined by rock coring at the subject site.

Approximate Depth to Water Table

Depth to water table at the subject site varies between approximately 2.20 to 4.37 m below the existing grade.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation does not apply to the subject site as there are no areas of natural significance or bodies of water located on the subject site or within 30 m of the subject site. The subject site is not considered to be environmentally sensitive.

Section 43.1 of the Regulation does not apply to the subject site as bedrock is located more than 2 m below ground surface and thus, not considered a Shallow Soil Property.

Fill Placement

Fill placement has occurred at the subject site. The fill material consists of fill material of unknown quality in areas of former asphaltic concrete paved areas except within the former building footprints, where traces of demolition debris had been identified. Analytical results for metals indicate that the impacted fill material is present in the eastern portion of the subject site. Soil results for metals are shown in Drawing PE4581- 4 – Analytical Testing Plan – Soil (Metals).

It is understood that the impacted fill material and any demolition debris will be removed in conjunction with the redevelopment of the Phase II Property.

Existing Buildings and Structures

The Phase II Property is occupied by an uninhabited/vacant two (2) storey building that was constructed pre-1920 with a stone and mortar foundation, finished in red brick and a sloped style shingle roof. The building was used as a restaurant since the mid 1990s. Retaining walls are present on the northwest corner of the property.

Proposed Buildings and Other Structures

It is our understanding that combined commercial/residential high-rise buildings with multiple levels of underground parking are proposed for the site. The footprint of the development will cover the majority of the site.

Areas of Natural Significance and Water Bodies

No areas of natural significance or water bodies are present on or within the vicinity of the Phase II Property. The closest water body is the Ottawa River, located approximately 500 m to the north/northwest.

Environmental Condition

Areas Where Contaminants are Present

The impacted fill material is present on the eastern potion of the subject property. The southwestern and northern limits of contamination have been delineated, based on the analytical results of the 2017 Phase II ESA conducted by Paterson. It appears that the contamination is confined in the fill material, as shown in Drawing PE4581-7-Cross-Section A-A'. It is not expected that the contaminants have penetrated the underlying clayey layer.

Chloroform was present in the groundwater in wells (BH1 and BH2) in excess of the MECP Table 3 Standard, however, it is considered to be residual from the core water utilized during rock coring and is not a contaminant.

Analytical test results for soil and groundwater are shown on Drawings PE4581-4 through PE4581-7 – Analytical Testing Plans.

Types of Contaminants

The confirmed contaminants of concern in the soil/fill include mercury and lead.

Contaminated Media

Based on the results of the Phase II ESA, the fill material on the eastern portion of the subject site is impacted with mercury and/or lead.

What Is Known About Areas Where Contaminants Are Present

The fill material is impacted on the eastern portion of the Phase II Property. Analytical test results identified mercury and lead exceeding the MECP Table 3 Standards. No other contaminants were identified in soil or groundwater.

Distribution and Migration of Contaminants

As previously noted, impacted soil was identified in the eastern portion of the subject site. The marginal metals impacts identified in the fill are not expected to migrate into the native soil. Based on the vertical delineation samples the native soil/till has not been impacted.

Chloroform in groundwater exceeding the selected MECP Standards is believed to be remnant from the municipal core water used during the bedrock coring process. As a result, chloroform concentrations are not considered an environmental concern. Groundwater beneath the Phase II Property has not been impacted.

Discharge of Contaminants

The metal impacted soil is considered to have been associated with the historical land use and the possible importation of fill material. No activities currently taking place on the subject site are expected to discharge contaminants.

The chloroform is related to the municipal drinking water used as part of the rock coring process.

Climatic and Meteorological Conditions

In general, climatic and meteorological conditions have the potential to affect contaminant distribution. Two (2) ways by which climatic and meteorological conditions may affect contaminant distribution include the downward leaching of contaminants by means of the infiltration of precipitation, and the migration of contaminants via groundwater levels and/or flow, which may fluctuate seasonally.

Leaching is not an issue since metals do not readily dissolve and contaminants are under asphaltic concrete and above the water table. Therefore, contaminants are not exposed to the groundwater on the Phase II Property.

Potential for Vapour Intrusion

Based on the soil and groundwater results vapour intrusion is not considered to be a concern at the Phase II-ESA Property.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the properties addressed 383 Slater Street, 388-400 Albert Street and 156-160 Lyon Street, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address a potentially contaminating activity (PCA) that was identified during the Phase I ESA and considered to result in an area of potential environmental concern (APEC) on the Phase II Property. The subsurface investigation consisted of nine (9) test pits and drilling three (3) boreholes, all of which were constructed with groundwater monitoring wells.

Soil samples were obtained from the test pits located on the western portion of the subject property and screened using visual observations. Five (5) soil samples were submitted for laboratory analysis of metals. All metal parameter concentrations were in compliance with the MECP Table 3 Standards.

Results of the 2012 and 2017 Phase II ESAs conducted by Golder Associates and Paterson, respectively, identified mercury and lead concentrations in excess of the MECP Table 3 Standards. Impacted soil was identified on the eastern portion of Phase II Property. The extent of contamination is considered to be limited to the fill material beneath the asphaltic concrete and/or gravel layer.

Groundwater samples from monitoring wells installed in BH1, BH2 and BH3 were recovered and analyzed for volatile organic compounds (VOCs) to confirm that groundwater beneath the site is free of contaminants. All VOC parameter concentrations were in compliance with the MECT Table 3 Standards, with the exception of chloroform detected in two monitoring wells (BH1 and BH2). Chloroform is considered to be related to the municipal water used to core the bedrock on the subject site and is expected to dissipate in the near future. Therefore, groundwater is considered to be in compliance with the selected MECP standards.

Groundwater results from the 2012 and 2017 Phase II ESAs concluded all analyzed parameters were in compliance with the MECP Table 3 Standards.

Recommendations

Soil

Based on the findings of the Phase II ESA, soil/fill impacted with mercury and lead is present on the eastern portion of the Phase II Property. It is expected that

the impacted fill will be removed from the subject site during the redevelopment process. The excavation of the fill from the property should be monitored and confirmed by Paterson. Any impacted fill and construction debris being removed from the property is to be disposed of at an approved waste disposal facility.

Groundwater

It is recommended that any monitoring wells that had elevated chloroform concentrations in them be resampled to confirm that the chloroform has dissipated.

Monitoring Wells

If the monitoring wells installed on the subject site are not going to be used in the future, or will be destroyed during site redevelopment, they should be abandoned according to Ontario Regulation 903. The wells will be registered with the MECP under this regulation.

7.0 STATEMENT OF LIMITATIONS

This Phase II - Environmental Site Assessment report has been prepared in general accordance with O.Reg. 153/04, as amended, and meets the requirements of CSA Z769-00. The conclusions presented herein are based on information gathered from a limited sampling and testing program. The test results represent conditions at specific test locations at the time of the field program.

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes themselves.

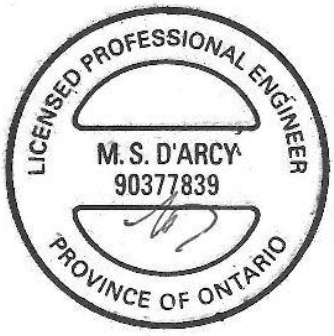
Should any conditions be encountered at the subject site and/or historical information that differ from our findings, we request that we be notified immediately in order to allow for a reassessment.

This report was prepared for the sole use of Main & Main Developments. Notification from Main & Main and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Mandy Witteman, M.A.Sc.

Mark S. D'Arcy, P.Eng.



Report Distribution:

- Main & Main Developments
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE4581-3 – TEST HOLE LOCATION PLAN

DRAWING PE4581-4 – ANALYTICAL TESTING PLAN – SOIL (METALS)

DRAWING PE4581-5– ANALYTICAL TESTING PLAN – SOIL (BTEX, PAHs, PHCs, VOCs)

DRAWING PE4581-6 – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE4581-7 – CROSS-SECTION A – A' – SOIL (METALS)

DRAWING PE4581-8 – CROSS-SECTION A – A' – SOIL (BTEXs, PHCs, PAHs, VOCs)

DRAWING PE4581-9 – CROSS-SECTION A – A' –GROUNDWATER

FIGURE 1

KEY PLAN

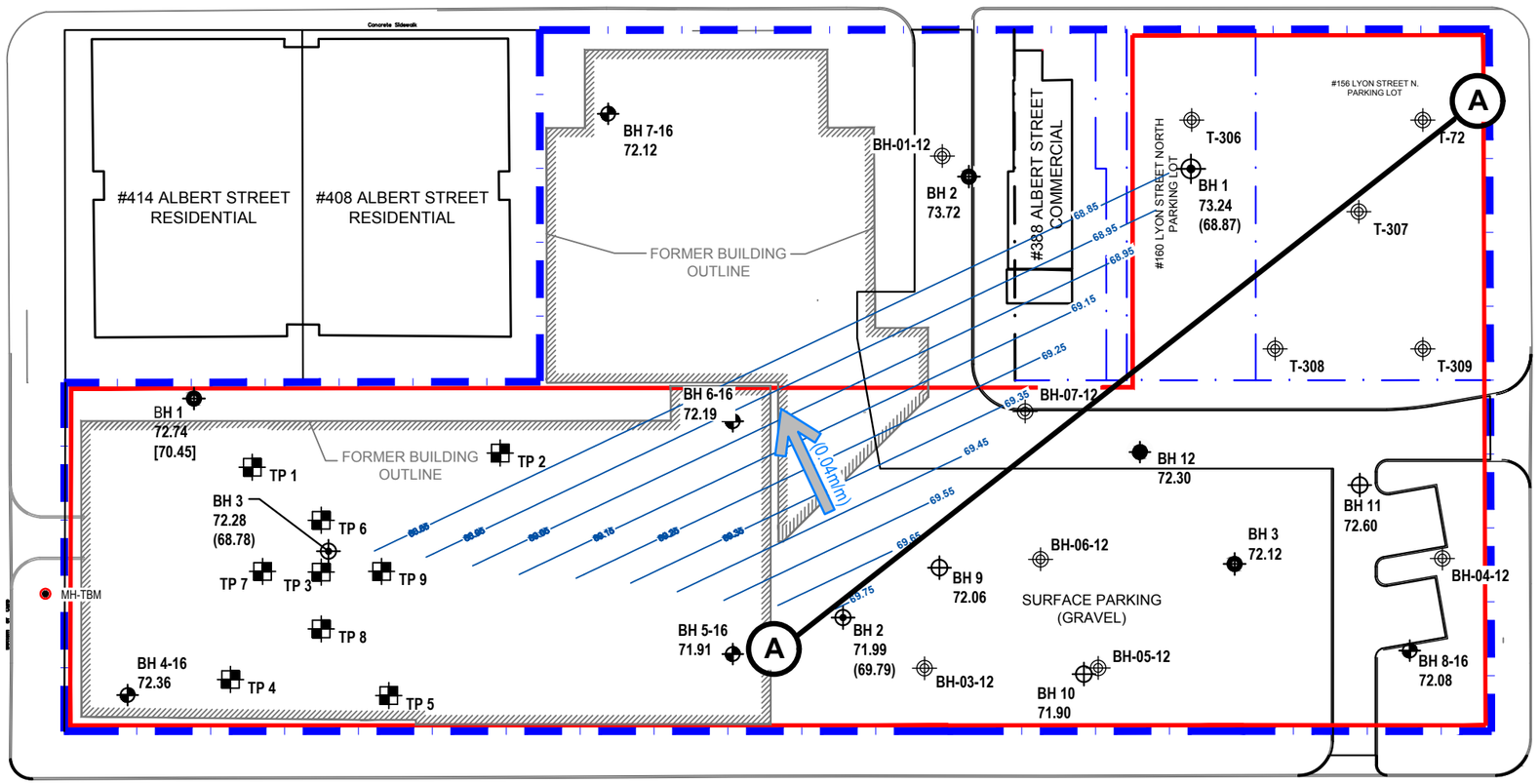
#415 ALBERT STREET
HOTEL

#151 BAY STREET
RESIDENTIAL

#383 ALBERT STREET
PARKING / O-TRAIN

#330 QUEEN STREET
HOTEL DELTA

ALBERT STREET



LYON STREET NORTH

#150 KENT STREET
OFFICES / COMMERCIAL
(CONSTITUTION SQUARE)

SLATER STREET

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT PG4793/PE4581
- BOREHOLE LOCATION, PATERSON GROUP REPORT NO. PG3914
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PE3774
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PG3543
- APPROX. BOREHOLE LOCATION BY OTHERS
- TEST PIT LOCATION (GEOTECHNICAL INVESTIGATION PG4793/PE4581, 2019)
- 73.24 GROUND SURFCAE ELEVATION(m)
- (68.87) GROUNDWATER SURFACE ELEVATION (m)
- 68.95 GROUNDWATER CONTOUR (m)
- (0.06m/m) APPROX. GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)
- A—A CROSS SECTION LOCATION

TBM - TOP COVER OF MANHOLE LOCATED ALONG EAST SIDE OF BAY STREET, JUST NORTH OF SLATER STREET. A GEODETIC ELEVATION OF 72.77m WAS PROVIDED FOR THE TBM BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

#400 SLATER STREET
RESIDENTIAL / UNDERGROUND PARKING

#368-360 SLATER STREET
APPLETREE MEDICAL CENTRE

#433 LAURIER AVENUE WEST
OFFICES / COMMERCIAL
(MINTO PLACE)

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
0			

MAIN AND MAIN DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:500	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-3
Approved by: MSD	Revision No.: 0

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#415 ALBERT STREET
HOTEL

#151 BAY STREET
RESIDENTIAL

#383 ALBERT STREET
PARKING / O-TRAIN

#330 QUEEN STREET
HOTEL DELTA

T-306-SA1 0.76-1.37m 1-NOV-11

Parameter	Result(µg/g)	Standard(µg/g)
Lead	438	120
Mercury	1.2	0.27

TP2-G1 1.2-0.2m 29-MAR-19
Metals - comply with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards
Chromium VI - complies with MECP Table 3 Standards

TP3-G1 0.2-0.3m 29-MAR-19
Metals - comply with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards
Chromium IV - complies with MECP Table 3 Standards

TP1-G1 0.2-0.3m 29-MARr-19
Metals - comply with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards
Chromium VI - complies with MECP Table 3 Standards

#440 ALBERT STREET
OTTAWA TECHNICAL
HIGH SCHOOL

ALBERT STREET

Concrete Sidewalk

#414 ALBERT STREET
RESIDENTIAL

#408 ALBERT STREET
RESIDENTIAL

BH 7-16
72.12

BH-01-12

BH 2
73.72

FORMER BUILDING OUTLINE

#388 ALBERT STREET
COMMERCIAL

#160 LYON STREET NORTH
PARKING LOT

#156 LYON STREET N.
PARKING LOT

T-306

BH 1
73.24
(68.87)

T-72

T-307

T-308

T-309

T-72-SA1 0.76-1.37m 1-NOV-11
Metals - comply with MECP Table 3 Standards

T-72-SA4 3.05-3.66m 1-NOV-11
Metals - comply with MECP Table 3 Standards

N.

T-307-SA1 0.76-1.37m 1-NOV-11

Parameter	Results(µg/g)	Standards(µg/g)
Lead	258	120
Mercury	0.7	0.29

T-309-SA1 0.91-1.52m 1-NOV-11
Metals comply with MECP Table 3 Standards

ST.

TP5-G1 0.2-0.3m 29-MAR-19
Metals - comply with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards
Chromium VI - complies with MECP Table 3 Standards

BH 1
72.74
[70.45]

BH 6-16
72.19

FORMER BUILDING OUTLINE

TP 2

TP 1

BH 3
72.28
(68.78)

TP 6

TP 7

TP 3

TP 9

MH-TBM

TP 8

BH 4-16
72.36

TP 4

TP 5

BH 5-16
71.91

BH9-SS2 0.76-1.37m 29-MAR-19
Metals comply with MECP Table 3 Standards

BH 9
72.06

BH-06-12

BH 2
71.99
(69.79)

BH-03-12

SURFACE PARKING
(GRAVEL)

BH 3
72.12

BH-07-12

BH 12
72.30

BH 11
72.60

BH-04-12

BH 8-16
72.08

BH-05-12

BH 10
71.90

BH11-SS1B 0.25-0.91m 18-APR-17

Parameter	Results(µg/g)	Standards(µg/g)
Lead	129	120
Mercury	0.8	0.27

BH11-SS2A 0.91-1.37m 18-APR-17

Parameter	Result(µg/g)	Standard(µg/g)
Mercury	0.6	0.27

Lead - complies with MECP Table 3 Standards

BH11-SS3 1.52-2.13m 18-APR-17
Mercury - complies with MECP Table 3 Standards

LYON

#150 KENT STREET
OFFICES / COMMERCIAL
(CONSTITUTION SQUARE)

BH10-SS1B 0.31-0.76m 18-APR-17

Parameter	Result(µg/g)	Standard(µg/g)
Mercury	0.5	0.27

Lead - complies with MECP Table 3 Standards

BH10-SS2 0.76-1.37m 18-APR-17
Metals comply with MECP Table 3 Standards

BH10-SS4 2.29-2.90m 18-APR-17
Mercury - complies with MECP Table 3 Standards

TP4-G1 0.2-0.3m 29-MAR-19
Metals - comply with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards
Chromium VI - complies with MECP Table 3 Standards

SLATER STREET

BH12-SS1B 0.31-0.76m 18-APR-17

Parameter	Result(µg/g)	Standard(µg/g)
Lead	126	120

BH12-SS2 0.76-1.37m 18-APR-17
Lead - complies with MECP Table 3 Standards
Mercury - complies with MECP Table 3 Standards

#368-360 SLATER STREET
APPLETREE MEDICAL CENTRE

#433 LAURIER AVENUE WEST
OFFICES / COMMERCIAL
(MINTO PLACE)

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT PG4793
- BOREHOLE LOCATION, PATERSON GROUP REPORT NO. PG3914
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PE3774
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PG3543
- APPROX. BOREHOLE LOCATION BY OTHERS
- TEST PIT LOCATION GEOTECHNICAL INVESITGATION (PG4793, 2019)
- 73.24 GROUND SURFCAE ELEVATION(m)
- (68.87) GROUNDWATER SURFACE ELEVATION (m)

TBM - TOP COVER OF MANHOLE LOCATED ALONG EAST SIDE OF BAY STREET, JUST NORTH OF SLATER STREET. A GEODETIC ELEVATION OF 72.77m WAS PROVIDED FOR THE TBM BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
0			

MAIN AND MAIN DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - SOIL (METALS)

Scale: 1:500	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-4
Approved by: MSD	Revision No.: 0

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#415 ALBERT STREET
HOTEL

#151 BAY STREET
RESIDENTIAL

#383 ALBERT STREET
PARKING / O-TRAIN

#330 QUEEN STREET
HOTEL DELTA

ALBERT STREET

T-306-SA1 0.76-1.37m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-306-SA3 2.29-2.90m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-72-SA1 0.76-1.37m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-72-SA4 3.05-3.66m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-307-SA1 0.76-1.37m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-307-SA5 3.80-4.42m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-309-SA1 0.91-1.52m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-309-SA4 3.05-3.66m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

#440 ALBERT STREET
OTTAWA TECHNICAL
HIGH SCHOOL

#414 ALBERT STREET
RESIDENTIAL

#408 ALBERT STREET
RESIDENTIAL

Concrete Sidewalk

BH 7-16
72.12

BH-01-12

BH 2
73.72

#388 ALBERT STREET
COMMERCIAL

#156 LYON STREET N.
PARKING LOT

#160 LYON STREET NORTH
PARKING LOT

T-306

BH 1
73.24
(68.87)

T-72

T-307

T-308

T-309

T-308-SA3 2.29-2.90m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - compy with MECP Table 3 Standards

T-308-SA6 3.80-4.27m 1-NOV-11
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

FORMER BUILDING
OUTLINE

BH 1
72.74
[70.45]

BH 6-16
72.19

FORMER BUILDING
OUTLINE

TP 1

TP 2

BH 3
72.28
(68.78)

TP 6

TP 7

TP 3

TP 9

TP 8

BH 4-16
72.36

TP 4

TP 5

MH-TBM

BH9-SS2 0.76-1.37m 18-APR-17
PAHs - comply with MECP Table 3 Standards

BH 5-16
71.91

BH 9
72.06

BH-06-12

BH 2
71.99
(69.79)

BH-03-12

SURFACE PARKING
(GRAVEL)

BH 3
72.12

BH-07-12

BH 12
72.30

BH-05-12

BH 10
71.90

BH 11
72.60

BH-04-12

BH 8-16
72.08

BH12-SS5 3.04-3.66m 18-APR-17
PHCs (F1-F4) - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

BH11-SS6 3.81-4.22m 18-APR-17
VOCs - comply with MECP Table 3 Standards

BH10-SS2 0.76-1.37m 18-APR-17
BTEX - comply with MECP Table 3 Standards
PAHs - comply with MECP Table 3 Standards
PHCs (F1-F4) - comply with MECP Table 3 Standards

ST.

LYON

#150 KENT STREET
OFFICES / COMMERCIAL
(CONSTITUTION SQUARE)

SLATER STREET

#368-360 SLATER STREET
APPLETREE MEDICAL CENTRE

#433 LAURIER AVENUE WEST
OFFICES / COMMERCIAL
(MINTO PLACE)

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT PG4793
- BOREHOLE LOCATION, PATERSON GROUP REPORT NO. PG3914
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PE3774
- BOREHOLE WITH MONITORING WELL LOCATION, PATERSON GROUP REPORT NO. PG3543
- APPROX. BOREHOLE LOCATION BY OTHERS
- TEST PIT LOCATION GEOTECHNICAL INVESITGATION (PG4793, 2019)
- 73.24 GROUND SURFCAE ELEVATION(m)
- (68.87) GROUNDWATER SURFACE ELEVATION (m)

TBM - TOP COVER OF MANHOLE LOCATED ALONG EAST SIDE OF BAY STREET, JUST NORTH OF SLATER STREET. A GEODETIC ELEVATION OF 72.77m WAS PROVIDED FOR THE TBM BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
0			

MAIN AND MAIN DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - SOIL (BTEX, PHC, VOC & PAH)

Scale: 1:500	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-5
Approved by: MSD	Revision No.: 0

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#415 ALBERT STREET
HOTEL

#151 BAY STREET
RESIDENTIAL

#383 ALBERT STREET
PARKING / O-TRAIN

#330 QUEEN STREET
HOTEL DELTA

#440 ALBERT STREET
OTTAWA TECHNICAL
HIGH SCHOOL

BH1-GW1 15.0-18.0m 9-APR-19

Parameter	Results(µg/L)	Standards(µg/L)
Chloroform	27.1	2.4

VOCs - comply with MECP Table 3 Standards

T-306A 13.6-15.1m 10-NOV-11

Parameter	Result (µg/L)	Standard(µg/L)
Chloroform	13.5	2.4

VOCs - comply with MECP Table 3 Standards

T-306B 5.50-7.00m 10-NOV-11
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

ALBERT STREET

T-72A 33.3-39.3m 25-AUG-11
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

T-72B 12.2-15.2m 25-AUG-11
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

#414 ALBERT STREET
RESIDENTIAL

#408 ALBERT STREET
RESIDENTIAL

T-308A 13.5-15.0m 10-NOV-11

Parameter	Result (µg/L)	Standard(µg/L)
Chloroform	18.2	2.4

VOCs - comply with MECP Table 3 Standards

T-308B 5.50-7.00m 10-NOV-11
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

#388 ALBERT STREET
COMMERCIAL

#156 LYON STREET N.
PARKING LOT

#160 LYON STREET NORTH
PARKING LOT

T-307A 13.5-15.0m 10-NOV-11
VOCs - comply with MECP Table 3 Standards

T-309A 12.2-15.1m 10-NOV-11

Parameter	Result (µg/L)	Standard(µg/L)
Chloroform	5.4	2.4

VOCs - comply with MECP Table 3 Standards

T-309B 5.50-7.00m 10-NOV-11
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

BH 7-16 72.12
BH-01-12
BH 2 73.72
T-306
BH 1 73.24 (68.87)
T-72
T-307
T-308
T-309
BH-07-12
BH 12 72.30
BH 6-16 72.19
BH 1 72.74 [70.45]
FORMER BUILDING OUTLINE
TP 1
TP 2
BH 3 72.28 (68.78)
TP 6
TP 7
TP 3
TP 9
TP 8
TP 4
TP 5
BH 4-16 72.36
BH 5-16 71.91
MH-TBM
BH 9 72.06
BH-06-12
BH 3 72.12
SURFACE PARKING (GRAVEL)
BH 2 71.99 (69.79)
BH-03-12
BH-05-12
BH 10 71.90
BH 11 72.60
BH-04-12
BH 8-16 72.08

BH3-GW1 16.4-19.4m 9-APR-19
VOCs - complies with MECP Table 3 Standards

BH11-GW1 4.89-6.81m 27-APR-17
Metals - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

LYON

#150 KENT STREET
OFFICES / COMMERCIAL
(CONSTITUTION SQUARE)

BH2-GW1 14.9-17.9m 9-APR-19

Parameter	Results(µg/L)	Standards(µg/L)
Chloroform	25.7	2.4

VOCs - comply with MECP Table 3 Standards

BH10-GW1 3.73-8.31m 27-APR-17
PAHs - comply with MECP Table 3 Standards
PHCs - comply with MECP Table 3 Standards
VOCs - comply with MECP Table 3 Standards

SLATER STREET

BH9-GW1 3.81-7.14m 27-APR-17
PAHs - comply with MECP Table 3 Standards
PHCs - comply with MECP Table 3 Standards
Metals - comply with MECP Table 3 Standards

#368-360 SLATER STREET
APPLETREE MEDICAL CENTRE

#433 LAURIER AVENUE WEST
OFFICES / COMMERCIAL
(MINTO PLACE)

LEGEND:

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GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL
0			

MAIN AND MAIN DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:
ANALYTICAL TESTING PLAN - GROUNDWATER

Scale: 1:500	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-6
Approved by: MSD	Revision No.: 0

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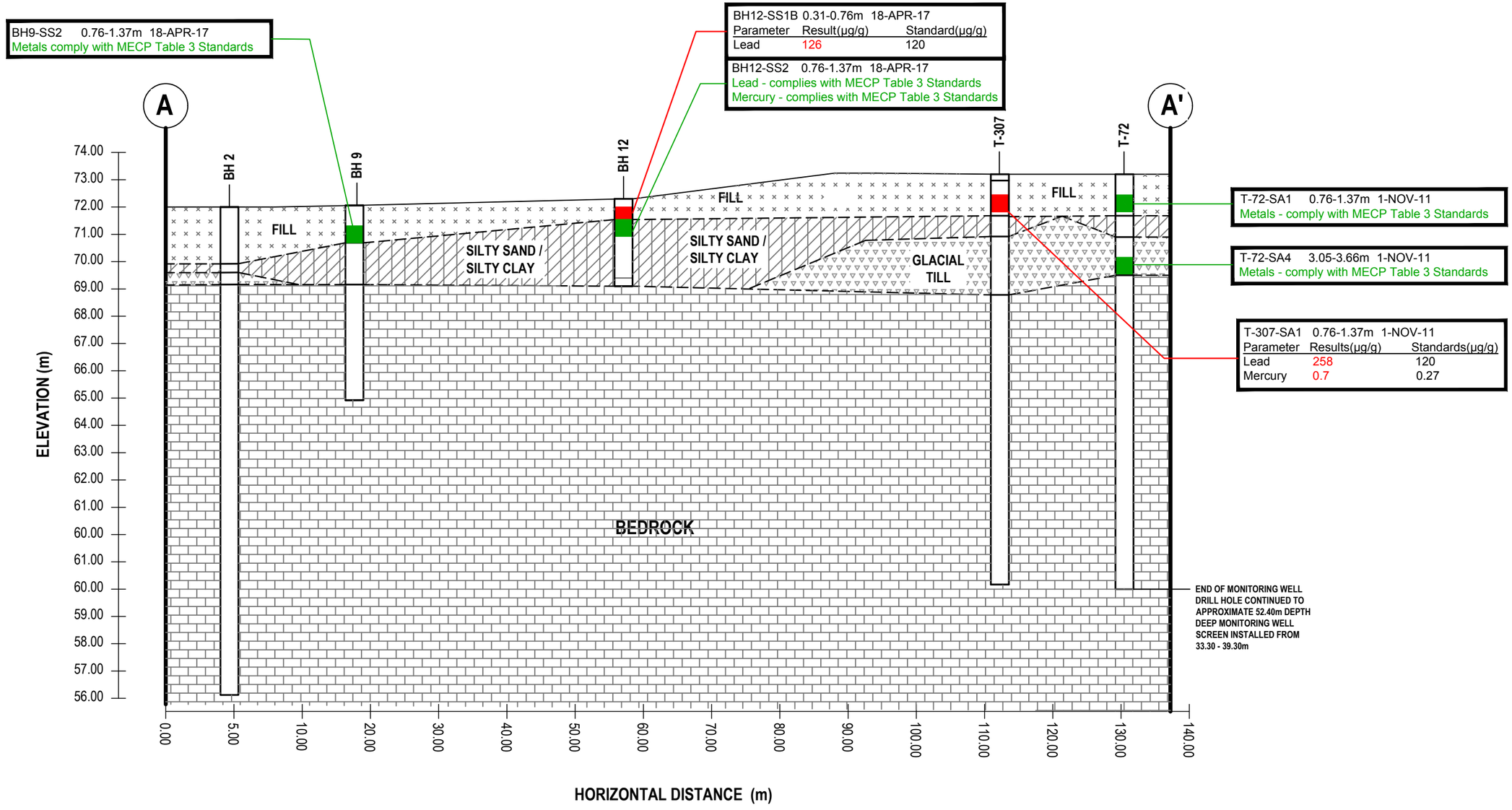

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL
0			

MAIN AND MAIN DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' -SOIL (METALS)

Scale: AS SHOWN	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-7
Approved by: MSD	Revision No.: 0

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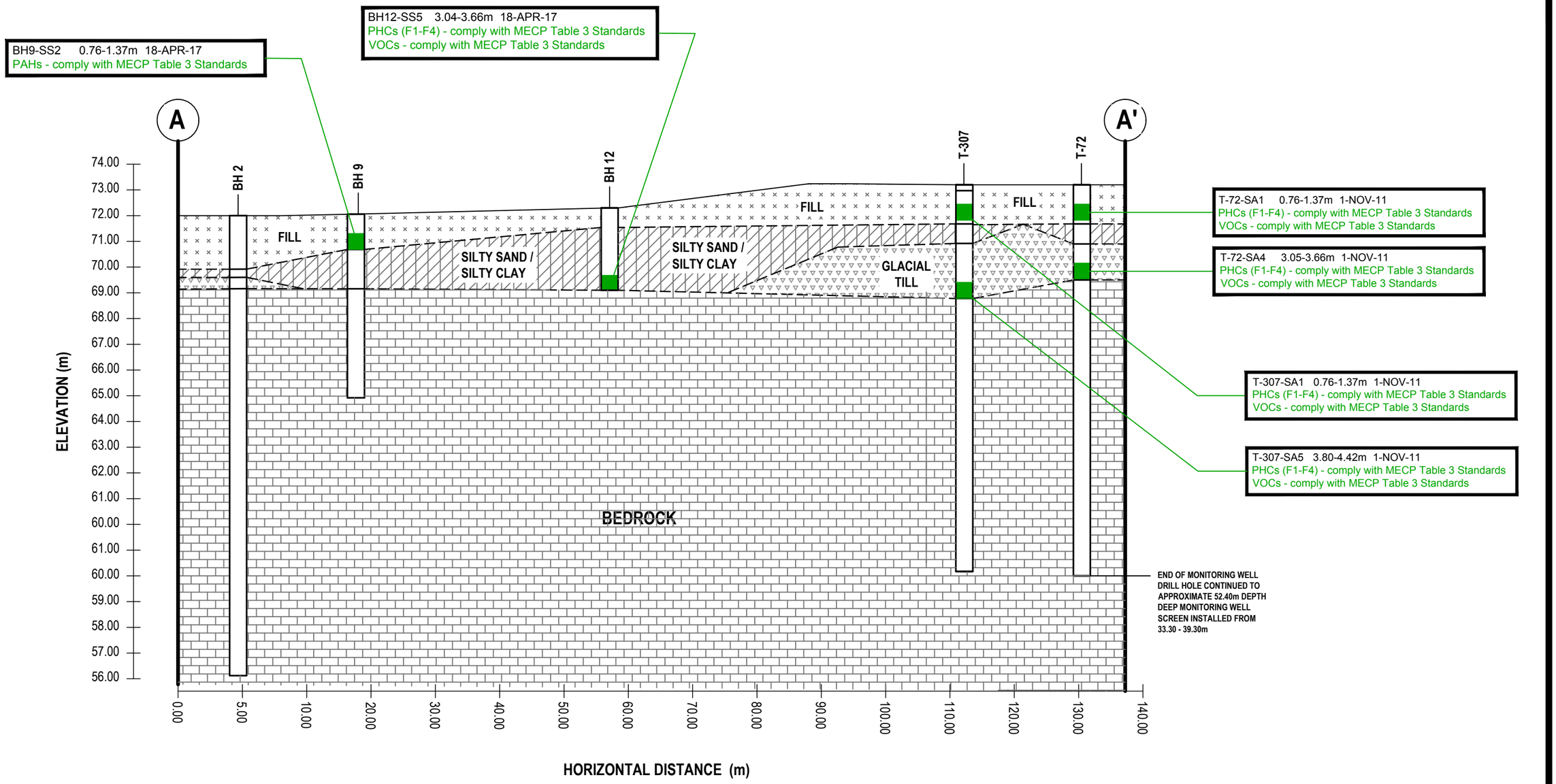

SOIL RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

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NO.	REVISIONS	DATE	INITIAL
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MAIN AND MAIN DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:
CROSS SECTION A-A' - SOIL (BTEX, PHC, VOC & PAH)

Scale: AS SHOWN	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-8
Approved by: MSD	Revision No.: 0

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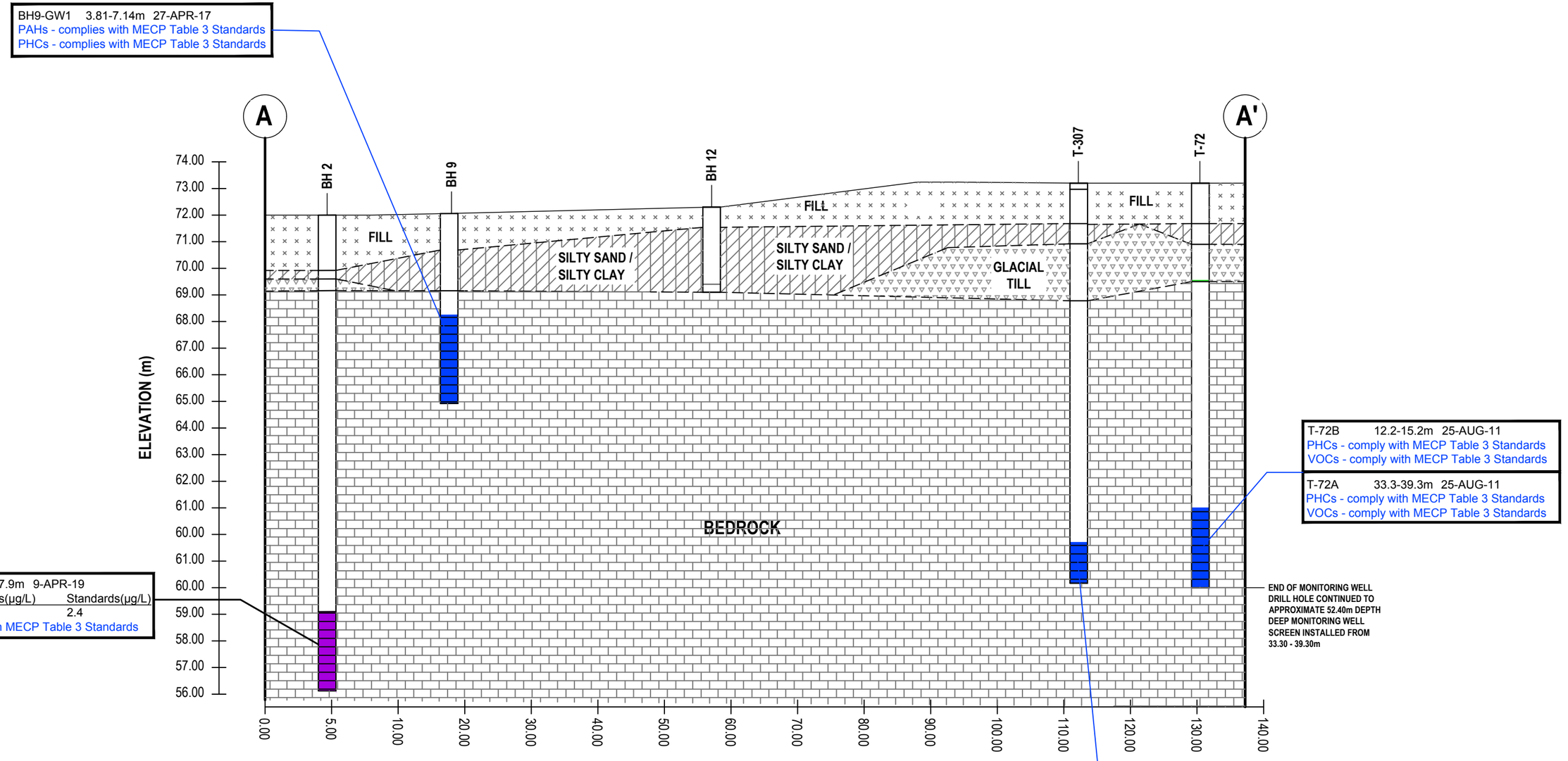

GROUNDWATER RESULT COMPLIES WITH MECP TABLE 3 STANDARDS

GROUNDWATER RESULT EXCEEDS MECP TABLE 3 STANDARDS

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MAIN AND MAIN DEVELOPMENTS

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
383 SLATER STREET, 388-400 ALBERT STREET & 156-160 LYON STREET
OTTAWA, ONTARIO

Title:

CROSS SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 04/2019
Drawn by: MPG	Report No.: PE4581-2
Checked by: MW	Dwg. No.: PE4581-9
Approved by: MSD	Revision No.: 0

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APPENDIX 1

SAMPLING AND ANALYSIS PLAN

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

LABORATORY CERTIFICATES OF ANALYSIS

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Paterson Group Inc.

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Sampling & Analysis Plan

Phase II Environmental Site Assessment
383 Slater Street, 388-400 Albert Street
and 156-160 Lyon Street
Ottawa, Ontario

Prepared For

Main & Main Developments

March 2019

Report: PE4581-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Mr. Rooie Ash of Main & Main Developments to conduct a Phase II Environmental Site Assessment (ESA) for the properties addressed 383 Slater, 388-400 Albert Street and 156-160 Lyon Street, in the City of Ottawa, Ontario

The Phase II ESA was carried out to address the APECs identified in the Paterson Phase I ESA. The following subsurface investigation program was developed to identify and delineate potential concerns. A geotechnical investigation was conducted concurrently with the environmental subsurface investigation.

Borehole	Location & Rationale	Proposed Depth & Rationale
BH1	Confirm groundwater quality beneath the Phase II Property	Boreholes to be advanced to intercept water table to facilitate installation of groundwater monitoring wells.
BH2	Confirm groundwater quality beneath the Phase II Property	
BH3	Confirm groundwater quality beneath the Phase II Property	
TP1	Assess the quality of the fill material on the southwest portion of the subject site	Intercept the fill material on the southwest portion to obtain soil samples for analytical testing.
TP2	Assess the quality of the fill material on the southwest portion of the subject site	
TP3	Assess the quality of the fill material on the southwest portion of the subject site	
TP4	Assess the quality of the fill material on the southwest portion of the subject site	
TP5	Assess the quality of the fill material on the southwest portion of the subject site	
TP6	Assess the quality of the fill material on the southwest portion of the subject site	
TP7	Assess the quality of the fill material on the southwest portion of the subject site	
TP8	Assess the quality of the fill material on the southwest portion of the subject site	
TP9	Assess the quality of the fill material on the southwest portion of the subject site	

At each borehole, split-spoon samples of overburden soils will be obtained at 0.76 m (2'6") intervals until practical refusal to augering. All soil samples will be retained,

and samples will be selected for submission following a preliminary screening analysis.

Following borehole drilling, monitoring wells will be installed in selected boreholes (as above) for the measurement of water levels and the collection of groundwater samples. Borehole locations are shown on the Test Hole Location Plan appended to the main report.

2.0 ANALYTICAL TESTING PROGRAM

The analytical testing program for soil at the subject site is based on the following general considerations:

- ❒ At least one sample from each borehole should be submitted, in order to delineate the horizontal extent of contamination across the site.
- ❒ At least one sample from each stratigraphic unit should be submitted, in order to delineate the vertical extent of contamination at the site.
- ❒ In boreholes where there is visual or olfactory evidence of contamination, or where organic vapour meter or photoionization detector readings indicate the presence of contamination, the 'worst-case' sample from each borehole should be submitted for comparison with MOECC site condition standards.
- ❒ In boreholes with evidence of contamination as described above, a sample should be submitted from the stratigraphic unit below the 'worst-case' sample to determine whether the contaminant(s) have migrated downward.
- ❒ Parameters analyzed should be consistent with the Contaminants of Potential Concern identified in the Phase I ESA.

The analytical testing program for groundwater at the subject site is based on the following general considerations:

- ❒ Groundwater monitoring wells should be installed in all boreholes with visual or olfactory evidence of soil contamination, in stratigraphic units where soil contamination was encountered, where those stratigraphic units are at or below the water table (i.e. a water sample can be obtained).
- ❒ Groundwater monitoring well screens should straddle the water table at sites where the contaminants of concern are suspected to be LNAPLs.

- ❒ At least one groundwater monitoring well should be installed in a stratigraphic unit below the suspected contamination, where said stratigraphic unit is water-bearing.
- ❒ Parameters analyzed should be consistent with the Contaminants of Concern identified in the Phase I ESA and with the contaminants identified in the soil samples.

3.0 STANDARD OPERATING PROCEDURES

3.1 Environmental Drilling Procedure

Purpose

The purpose of environmental boreholes is to identify and/or delineate contamination within the soil and/or to install groundwater monitoring wells in order to identify contamination within the groundwater.

Equipment

The following is a list of equipment that is in addition to regular drilling equipment stated in the geotechnical drilling SOP:

- ❒ glass soil sample jars
- ❒ two buckets
- ❒ cleaning brush (toilet brush works well)
- ❒ dish detergent
- ❒ methyl hydrate
- ❒ water (if not available on site - water jugs available in trailer)
- ❒ latex or nitrile gloves (depending on suspected contaminant)
- ❒ RKI Eagle organic vapour meter or MiniRae photoionization detector (depending on contamination suspected)

Determining Borehole Locations

If conditions on site are not as suspected, and planned borehole locations cannot be drilled, **call the office to discuss**. Alternative borehole locations will be determined in conversation with the field technician and supervising engineer.

After drilling is completed a plan with the borehole locations must be provided. Distances should be measured using a measuring tape or wheel rather than paced off. Elevations were surveyed relative to a geodetic benchmark (manhole cover

located along east side of Bay Street, just north of Slater Street). The elevation of the benchmark was 72.77 metres above

Drilling Procedure

The actual drilling procedure for environmental boreholes is the same as geotechnical boreholes (see SOP for drilling and sampling) with a few exceptions as follows:

- ❒ Continuous split spoon samples (every 0.6 m or 2') or semi-continuous (every 0.76 m or 2'6") are required.
- ❒ Make sure samples are well sealed in plastic bags with no holes prior to screening and are kept cool but unfrozen.
- ❒ If sampling for VOCs, BTEX, or PHCs F1, a soil core from each soil sample which may be analyzed must be taken and placed in the laboratory-provided methanol vial.
- ❒ Note all and any odours or discolouration of samples.
- ❒ Split spoon samplers must be washed between samples.
- ❒ If obvious contamination is encountered, continue sampling until vertical extent of contamination is delineated.
- ❒ As a general rule, environmental boreholes should be deep enough to intercept the groundwater table (unless this is impossible/impractical - call project manager to discuss).
- ❒ If at all possible, soil samples should be submitted to a preliminary screening procedure on site, either using a RKI Eagle, PID, etc. depending on type of suspected contamination.

Spoon Washing Procedure

All sampling equipment (spilt spoons, etc.) must be washed between samples in order to prevent cross contamination of soil samples.

- ❒ Obtain two buckets of water (preferably hot if available)
- ❒ Add a small amount of dish soap to one bucket
- ❒ Scrub spoons with brush in soapy water, inside and out, including tip
- ❒ Rinse in clean water
- ❒ Apply a small amount of methyl hydrate to the inside of the spoon. (A spray bottle or water bottle with a small hole in the cap works well)
- ❒ Allow to dry (takes seconds)
- ❒ Rinse with distilled water, a spray bottle works well.

The methyl hydrate eliminates any soap residue that may be on the spoon, and is especially important when dealing with suspected VOCs.

Screening Procedure

The RKI Eagle is used to screen most soil samples, particularly where petroleum hydrocarbon contamination is suspected. The MiniRae is used when VOCs are suspected, however it also can be useful for detecting petroleum. These tools are for screening purposes only and cannot be used in place of laboratory testing. Vapour results obtained from the RKI Eagle and the PID are relative and must be interpreted.

Screening equipment should be calibrated on an approximately monthly basis, more frequently if heavily used.

- ❒ Samples should be brought to room temperature; this is specifically important in colder weather. Soil must not be frozen.
- ❒ Turn instrument on and allow to come to zero - calibrate if necessary
- ❒ If using RKI Eagle, ensure instrument is in methane elimination mode unless otherwise directed.
- ❒ Ensure measurement units are ppm (parts per million) initially. RKI Eagle will automatically switch to %LEL (lower explosive limit) if higher concentrations are encountered.
- ❒ Break up large lumps of soil in the sample bag, taking care not to puncture bag.
- ❒ Insert probe into soil bag, creating a seal with your hand around the opening.
- ❒ Gently manipulate soil in bag while observing instrument readings.
- ❒ Record the highest value obtained in the first 15 to 25 seconds
- ❒ Make sure to indicate scale (ppm or LEL); also note which instrument was used (RKI Eagle 1 or 2, or MiniRae).
- ❒ Jar samples and refrigerate as per Sampling and Analysis Plan.

3.2 Monitoring Well Installation Procedure

Equipment

- ❒ 5’ x 2” [1.52 m x 50 mm] threaded sections of Schedule 40 PVC slotted well screen (5’ x 1 ¼” [1.52 m x 32 mm] if installing in cored hole in bedrock)
- ❒ 5’ x 2” [1.52 m x 50 mm] threaded sections of Schedule 40 PVC riser pipe (5’ x 1 ¼” [1.52 m x 32 mm] if installing in cored hole in bedrock)
- ❒ Threaded end-cap
- ❒ Slip-cap or J-plug
- ❒ Asphalt cold patch or concrete
- ❒ Silica Sand
- ❒ Bentonite chips (Holeplug)
- ❒ Steel flushmount casing

Procedure

- ❒ Drill borehole to required depth, using drilling and sampling procedures described above.
- ❒ If borehole is deeper than required monitoring well, backfill with bentonite chips to required depth. This should only be done on wells where contamination is not suspected, in order to prevent downward migration of contamination.
- ❒ Only one monitoring well should be installed per borehole.
- ❒ Monitoring wells should not be screened across more than one stratigraphic unit to prevent potential migration of contaminants between units.
- ❒ Where LNAPLs are the suspected contaminants of concern, monitoring wells should be screened straddling the water table in order to capture any free product floating on top of the water table.
- ❒ Thread the end cap onto a section of screen. Thread second section of screen if required. Thread risers onto screen. Lower into borehole to required depth. Ensure slip-cap or J-plug is inserted to prevent backfill materials entering well.
- ❒ As drillers remove augers, backfill borehole annulus with silica sand until the level of sand is approximately 0.3 m above the top of the screen.
- ❒ Backfill with holeplug until at least 0.3 m of holeplug is present above the top of the silica sand.
- ❒ Backfill remainder of borehole with holeplug or with auger cuttings (if contamination is not suspected).
- ❒ Install flushmount casing. Seal space between flushmount and borehole annulus with concrete, cold patch, or holeplug to match surrounding ground surface.

3.3 Monitoring Well Sampling Procedure

Equipment

- ❒ Water level metre or interface probe on hydrocarbon/LNAPL sites
- ❒ Spray bottles containing water and methanol to clean water level tape or interface probe
- ❒ Peristaltic pump
- ❒ Polyethylene tubing for peristaltic pump
- ❒ Flexible tubing for peristaltic pump
- ❒ Latex or nitrile gloves (depending on suspected contaminant)
- ❒ Allen keys and/or 9/16" socket wrench to remove well caps
- ❒ Graduated bucket with volume measurements
- ❒ pH/Temperature/Conductivity combo pen
- ❒ Laboratory-supplied sample bottles

Sampling Procedure

- ❒ Locate well and use socket wrench or Allan key to open metal flush mount protector cap. Remove plastic well cap.
- ❒ Measure water level, with respect to existing ground surface, using water level meter or interface probe. If using interface probe on suspected NAPL site, measure the thickness of free product.
- ❒ Measure total depth of well.
- ❒ Clean water level tape or interface probe using methanol and water. Change gloves between wells.
- ❒ Calculate volume of standing water within well and record.
- ❒ Insert polyethylene tubing into well and attach to peristaltic pump. Turn on peristaltic pump and purge into graduated bucket. Purge at least three well volumes of water from the well. Measure and record field chemistry. Continue to purge, measuring field chemistry after every well volume purged, until appearance or field chemistry stabilizes.
- ❒ Note appearance of purge water, including colour, opacity (clear, cloudy, silty), sheen, presence of LNAPL, and odour. Note any other unusual features (particulate matter, effervescence (bubbling) of dissolved gas, etc.).
- ❒ Fill required sample bottles. If sampling for metals, attach 75-micron filter to discharge tube and filter metals sample. If sampling for VOCs, use low flow rate to ensure continuous stream of non-turbulent flow into sample bottles. Ensure no headspace is present in VOC vials.
- ❒ Replace well cap and flushmount casing cap.

4.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The QA/QC program for this Phase II ESA is as follows:

- ❒ All non-dedicated sampling equipment (split spoons) will be decontaminated according to the SOPs listed above.
- ❒ All groundwater sampling equipment is dedicated (polyethylene and flexible peristaltic tubing is replaced for each well).
- ❒ Where groundwater samples are to be analyzed for VOCs, one laboratory-provided trip blank will be submitted for analysis with every laboratory submission.
- ❒ Approximately one (1) field duplicate will be submitted for every ten (10) samples submitted for laboratory analysis. A minimum of one (1) field duplicate per project will be submitted. Field duplicates will be submitted for soil and groundwater samples
- ❒ Where combo pens are used to measure field chemistry, they will be calibrated on an approximately monthly basis, according to frequency of use.

5.0 DATA QUALITY OBJECTIVES

The purpose of setting data quality objectives (DQOs) is to ensure that the level of uncertainty in data collected during the Phase II ESA is low enough that decision-making is not affected, and that the overall objectives of the investigation are met.

The quality of data is assessed by comparing field duplicates with original samples. If the relative percent difference (RPD) between the duplicate and the sample is within 20%, the data are considered to be of sufficient quality so as not to affect decision-making. The RPD is calculated as follows:

$$RPD = \left| \frac{x_1 - x_2}{(x_1 + x_2)/2} \right| \times 100\%$$

Where x_1 is the concentration of a given parameter in an original sample and x_2 is the concentration of that same parameter in the field duplicate sample.

For the purpose of calculating the RPD, it is desirable to select field duplicates from samples for which parameters are present in concentrations above laboratory detection limits, i.e. samples which are expected to be contaminated. If parameters are below laboratory detection limits for selected samples or duplicates, the RPD may be calculated using a concentration equal to one half (0.5 x) the laboratory detection limit.

It is also important to consider data quality in the overall context of the project. For example, if the DQOs are not met for a given sample, yet the concentrations of contaminants in both the sample and the duplicate exceed the MOE site remediation standards by a large margin, the decision-making usefulness of the sample may not be considered to be impaired. The proximity of other samples which meet the DQOs must also be considered in developing the Phase II Conceptual Site Model; often there are enough data available to produce a reliable Phase II Conceptual Site Model even if DQOs are not met for certain individual samples.

These considerations are discussed in the body of the report.

6.0 PHYSICAL IMPEDIMENTS TO SAMPLING & ANALYSIS PLAN

Physical impediments to the Sampling and Analysis plan may include:

- ❒ The location of underground utilities
- ❒ Poor recovery of split-spoon soil samples
- ❒ Insufficient groundwater volume for groundwater samples
- ❒ Breakage of sampling containers following sampling or while in transit to the laboratory
- ❒ Elevated detection limits due to matrix interference (generally related to soil colour or presence of organic material)
- ❒ Elevated detection limits due to high concentrations of certain parameters, necessitating dilution of samples in laboratory
- ❒ Drill rig breakdowns
- ❒ Winter conditions
- ❒ Other site-specific impediments

Site-specific impediments to the Sampling and Analysis plan are discussed in the body of the Phase II ESA report.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** March 28, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE									
25mm Asphaltic concrete over		AU	1			0	73.24		
0.60 **FILL:** Brown clayey sand with sand and gravel									
0.86		SS	2	79	12	1	72.24		
Compact, brown **SILTY SAND**		SS	3	4	62	2	71.24		
Very stiff, brown **SILTY CLAY,** some gravel									
2.44		SS	4	88	10	3	70.24		
GLACIAL TILL: Brown clayey silt with sand and gravel		SS	5	62	10				
		SS	6	47	50+	4	69.24		
4.29		RC	1	100	0				
		RC	2	98	96	5	68.24		
						6	67.24		
		RC	3	100	84	7	66.24		
		RC	4	100	89	8	65.24		
						9	64.24		
		RC	5	100	100	10	63.24		
BEDROCK: Fair to excellent quality, grey limestone									
		RC	6	100	97	11	62.24		
						12	61.24		
		RC	7	100	100	13	60.24		
		RC	8	100	97	14	59.24		
						15	58.24		
		RC	9	100	100	16	57.24		
		RC	10	100	100	17	56.24		
18.01						18	55.24		
End of Borehole									
(GWL @ 4.37m - April 9, 2019)									

Lower Explosive Limit %: 20 40 60 80

RKI Eagle Rdg. (ppm): 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** March 29, 2019

SOIL DESCRIPTION		STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							0	71.99
Asphaltic concrete	0.06		AU	1				
FILL: Brown silty sand with gravel			SS	2	50	52	1	70.99
	2.08		SS	3	46	17	2	69.99
Compact, brown **SILTY SAND**	2.39		SS	4	33	2		
GLACIAL TILL: Brown clayey silt with sand and gravel	2.84		RC	1	100	87	3	68.99
			RC	2	100	93	4	67.99
			RC	3	100	95	5	66.99
			RC	4	100	95	6	65.99
BEDROCK: Good to excellent quality, grey limestone			RC	5	100	100	7	64.99
			RC	6	100	100	8	63.99
			RC	7	100	100	9	62.99
			RC	8	100	100	10	61.99
			RC	9	100	97	11	60.99
			RC	10	100	100	12	59.99
	17.88						13	58.99
End of Borehole							14	57.99
(GWL @ 2.20m - April 9, 2019)							15	56.99
							16	55.99
							17	54.99

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ **Lower Explosive Limit %**

20 40 60 80

100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** April 1, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0	72.28		
FILL: Grey silty sand with gravel, some clay		AU	1						
		SS	2	38	66	1	71.28		
		SS	3	46	21	2	70.28		
		SS	4	8	11				
3.28		SS	5	44	50+	3	69.28		
Concrete with rebar and ties 3.73		RC	1	17	0	4	68.28		
		RC	2	97	83	5	67.28		
		RC	3	100	61	6	66.28		
		RC	4	100	82	7	65.28		
		RC	5	100	93	8	64.28		
		RC	6	100	100	9	63.28		
		RC	7	100	100	10	62.28		
BEDROCK: Good to excellent quality, grey limestone		RC	8	100	100	11	61.28		
		RC	9	100	100	12	60.28		
		RC	10	100	95	13	59.28		
		RC	11	100	100	14	58.28		
		RC	12	100	10	15	57.28		
19.38						16	56.28		
End of Borehole						17	55.28		
(GWL @ 3.50m - April 9, 2019)						18	54.28		
						19	53.28		

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 1

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed Stone									
0.15									
FILL: Brown sitly sand		G	1						
0.35									
End of Test Pit									
TP terminated on concrete surface @ 0.35m depth									

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 2

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone		HAND	1						
0.20									
End of Test Pit TP terminated on concrete surface @ 0.2m depth									

Lower Explosive Limit %: 20 40 60 80

RKI Eagle Rdg. (ppm): 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 3

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone									
0.20									
FILL: Brown silty sand, some wood fragments and construction debris		G	1					●	
0.30									
End of Test Pit									
TP terminated on concrete surface @ 0.3m depth									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 4

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone									
0.15									
FILL: Brown silty sand, some gravel and construction debris		G	1					●	
0.30									
End of Test Pit									
TP terminated on concrete surface @ 0.3m depth									

Photo Ionization Detector: ○ Lower Explosive Limit %
20 40 60 80

100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
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Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 5

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone		G	1						
0.25									
End of Test Pit TP terminated on concrete surface @ 0.25m depth									

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 6

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone									
0.20									
FILL: Brown silty sand with gravel, some construction debris		G	1					●	
0.30									
End of Borehole									
TP terminated on concrete surface @ 0.3m depth									

Lower Explosive Limit %: 20 40 60 80

RKI Eagle Rdg. (ppm): 100 200 300 400 500

▲ Full Gas Resp. △ Methane Elim.

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SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 7

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone									
0.20									
FILL: Brown silty sand, some gravel and construction debris		G	1					●	
0.30									
End of Test Pit									
TP terminated on concrete surface @ 0.3m depth									

Photo Ionization Detector: ● Volatile Organic Rdg. (ppm); ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 8

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone									
0.10									
FILL: Brown silty sand, some gravel and construction debris		G	1						
0.20									
End of Test Pit									
TP terminated on concrete surface @ 0.2m depth									

Photo Ionization Detector
● Volatile Organic Rdg. (ppm)
○ Lower Explosive Limit %
20 40 60 80
100 200 300 400 500
RKI Eagle Rdg. (ppm)
▲ Full Gas Resp. △ Methane Elim.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
383 Slater St., 400 Albert St. & 156-160 Lyon Street
Ottawa, Ontario

DATUM TBM - Top of manhole cover located along east side of Bay Street, north of Slater Street. Geodetic elevation = 72.77m

FILE NO. PE4581

REMARKS

HOLE NO. TP 9

BORINGS BY Backhoe **DATE** March 29, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Photo Ionization Detector: Volatile Organic Rdg. (ppm) / Lower Explosive Limit %	Monitoring Well Construction
GROUND SURFACE						0			
FILL: Crushed stone									
0.10									
FILL: Brown silty sand, some gravel and construction debris		G	1					●	
0.20									
End of Test Pit									
TP terminated on concrete surface @ 0.2m depth									

Photo Ionization Detector: ○ Lower Explosive Limit %

20 40 60 80

100 200 300 400 500

RKI Eagle Rdg. (ppm)

▲ Full Gas Resp. △ Methane Elim.

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	**ROCK QUALITY**
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic Limit, % (water content above which soil behaves plastically)
PI	-	Plasticity Index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

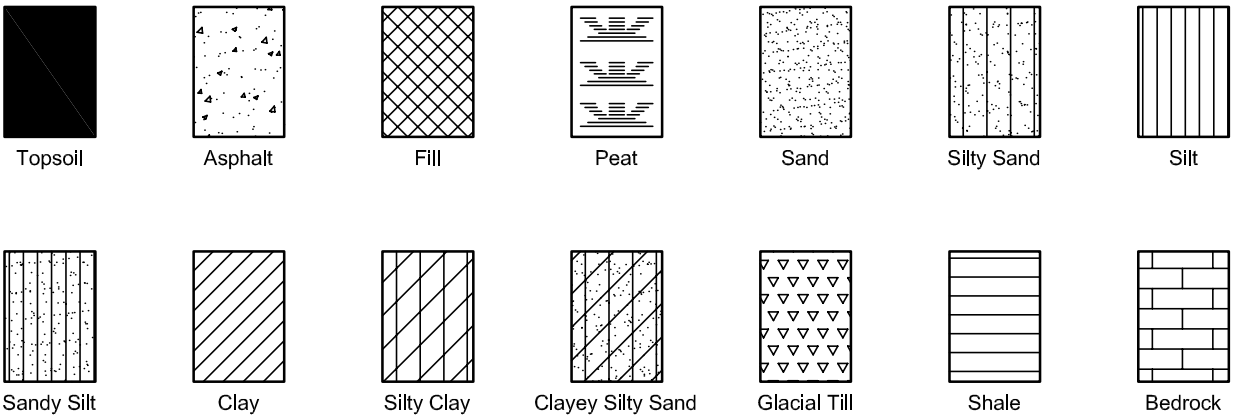
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

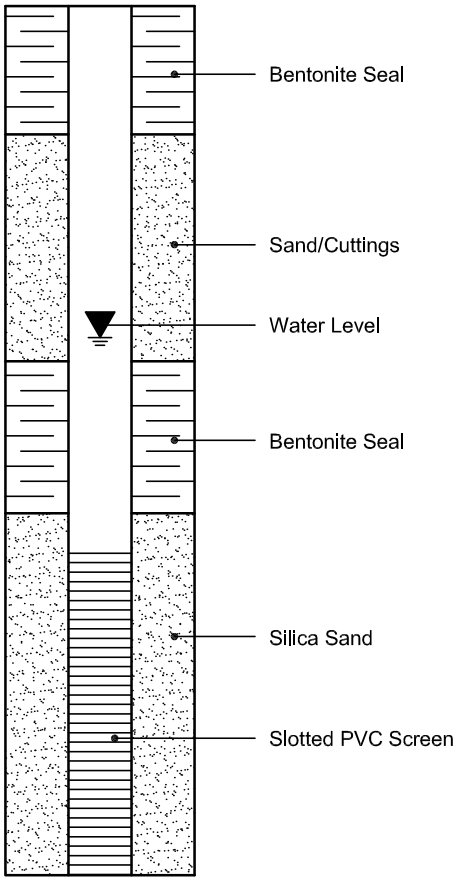
SYMBOLS AND TERMS (continued)

STRATA PLOT

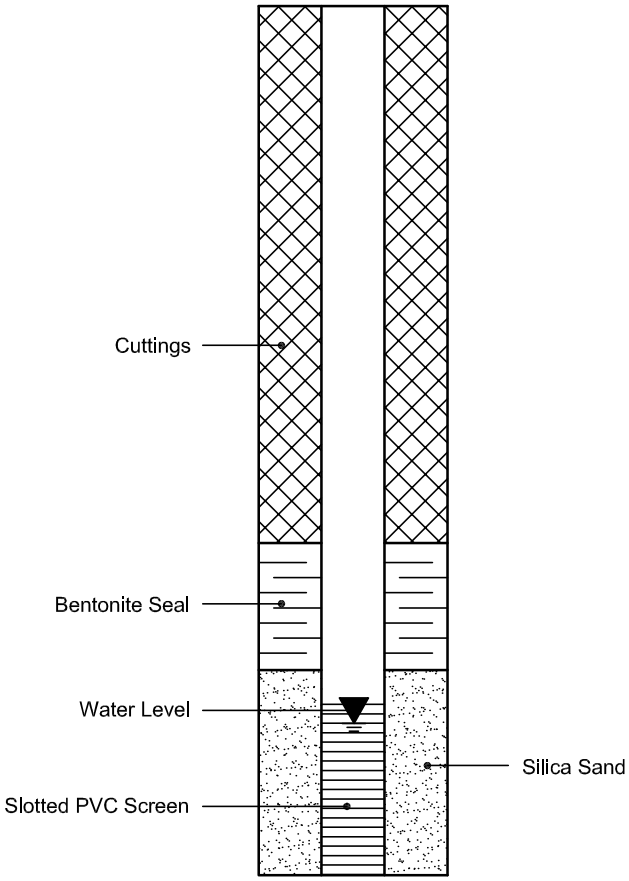


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mandy Witteman

Client PO:
Project: PE4581
Custody: 121626

Report Date: 3-Apr-2019
Order Date: 2-Apr-2019

Order #: 1914267

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1914267-01	TP3-G1
1914267-02	TP5-G1
1914267-03	TP1-G1
1914267-04	TP2-G1
1914267-05	TP4-G1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO:

Report Date: 03-Apr-2019
Order Date: 2-Apr-2019
Project Description: PE4581

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	3-Apr-19	3-Apr-19
Mercury by CVAA	EPA 7471B - CVAA, digestion	3-Apr-19	3-Apr-19
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	3-Apr-19	3-Apr-19
Solids, %	Gravimetric, calculation	3-Apr-19	3-Apr-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO:

Report Date: 03-Apr-2019

Order Date: 2-Apr-2019

Project Description: PE4581

	Client ID:	TP3-G1	TP5-G1	TP1-G1	TP2-G1
	Sample Date:	03/29/2019 09:00	03/29/2019 09:00	03/29/2019 09:00	03/29/2019 09:00
	Sample ID:	1914267-01	1914267-02	1914267-03	1914267-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	80.1	76.4	76.4	82.0
Metals					
Antimony	1.0 ug/g dry	1.1	1.2	<1.0	<1.0
Arsenic	1.0 ug/g dry	3.8	4.2	1.8	3.3
Barium	1.0 ug/g dry	53.0	104	20.0	123
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron	5.0 ug/g dry	7.5	8.9	<5.0	26.1
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	11.5	16.3	8.8	10.3
Chromium (VI)	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Cobalt	1.0 ug/g dry	4.4	5.7	3.5	4.1
Copper	5.0 ug/g dry	12.7	17.6	6.5	15.3
Lead	1.0 ug/g dry	10.3	29.8	3.9	16.0
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	3.0	4.2	<1.0	2.5
Nickel	5.0 ug/g dry	9.2	13.2	6.1	10.2
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	1.4	<1.0	<1.0
Vanadium	10.0 ug/g dry	17.4	21.9	18.7	13.6
Zinc	20.0 ug/g dry	25.3	48.7	<20.0	51.6

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO:

Report Date: 03-Apr-2019

Order Date: 2-Apr-2019

Project Description: PE4581

	Client ID:	TP4-G1	-	-	-
	Sample Date:	03/29/2019 09:00	-	-	-
	Sample ID:	1914267-05	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	79.6	-	-	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	2.9	-	-	-
Barium	1.0 ug/g dry	102	-	-	-
Beryllium	0.5 ug/g dry	<0.5	-	-	-
Boron	5.0 ug/g dry	8.7	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	19.8	-	-	-
Chromium (VI)	0.2 ug/g dry	<0.2	-	-	-
Cobalt	1.0 ug/g dry	6.9	-	-	-
Copper	5.0 ug/g dry	17.0	-	-	-
Lead	1.0 ug/g dry	26.3	-	-	-
Mercury	0.1 ug/g dry	<0.1	-	-	-
Molybdenum	1.0 ug/g dry	1.0	-	-	-
Nickel	5.0 ug/g dry	17.2	-	-	-
Selenium	1.0 ug/g dry	<1.0	-	-	-
Silver	0.3 ug/g dry	<0.3	-	-	-
Thallium	1.0 ug/g dry	<1.0	-	-	-
Uranium	1.0 ug/g dry	<1.0	-	-	-
Vanadium	10.0 ug/g dry	34.8	-	-	-
Zinc	20.0 ug/g dry	86.5	-	-	-

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO:

Report Date: 03-Apr-2019
Order Date: 2-Apr-2019
Project Description: PE4581

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	ND	1.0	ug/g dry	1.1			0.0	30	
Arsenic	3.6	1.0	ug/g dry	3.8			6.8	30	
Barium	60.6	1.0	ug/g dry	53.0			13.4	30	
Beryllium	ND	0.5	ug/g dry	ND			0.0	30	
Boron	7.8	5.0	ug/g dry	7.5			4.2	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium (VI)	ND	0.2	ug/g dry	ND				35	
Chromium	10.5	5.0	ug/g dry	11.5			9.1	30	
Cobalt	4.3	1.0	ug/g dry	4.4			2.8	30	
Copper	12.9	5.0	ug/g dry	12.7			1.3	30	
Lead	9.8	1.0	ug/g dry	10.3			5.6	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	2.9	1.0	ug/g dry	3.0			4.9	30	
Nickel	8.8	5.0	ug/g dry	9.2			4.3	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	18.2	10.0	ug/g dry	17.4			4.4	30	
Zinc	35.7	20.0	ug/g dry	25.3			34.0	30	
Physical Characteristics									
% Solids	83.2	0.1	% by Wt.	83.1			0.2	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Metals									
Antimony	42.0		ug/L	ND	83.2	70-130			
Arsenic	47.3		ug/L	1.5	91.6	70-130			
Barium	65.4		ug/L	21.2	88.3	70-130			
Beryllium	48.0		ug/L	ND	95.9	70-130			
Boron	43.8		ug/L	ND	81.7	70-130			
Cadmium	43.3		ug/L	ND	86.4	70-130			
Chromium	53.1		ug/L	ND	97.1	70-130			
Cobalt	48.9		ug/L	1.8	94.2	70-130			
Copper	51.7		ug/L	5.1	93.3	70-130			
Lead	52.9		ug/L	4.1	97.6	70-130			
Mercury	1.68	0.1	ug/g	ND	112	70-130			
Molybdenum	47.2		ug/L	1.2	92.0	70-130			
Nickel	50.1		ug/L	ND	92.7	70-130			
Selenium	45.2		ug/L	ND	90.2	70-130			
Silver	44.2		ug/L	ND	88.2	70-130			
Thallium	45.9		ug/L	ND	91.7	70-130			
Uranium	46.5		ug/L	ND	92.3	70-130			
Vanadium	56.1		ug/L	ND	98.2	70-130			
Zinc	53.5		ug/L	ND	86.7	70-130			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

PARACEL LABORATORIES LTD.

Paracel ID: 1914267

Head Office
300-2319 St. Laurent Blvd.
Ottawa, Ontario K1G 4J8
p: 1-800-749-1947
e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 121626

Page ___ of ___

Client Name: Paterson Group.	Project Reference: PE4581	**Turnaround Time:**
Contact Name: Mandy Witteman	Quote #	☒ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd S	PO #	☐ 2 Day ☐ Regular
Telephone: (613) 226-7381	Email Address: mwitteman@patersongroup.ca	Date Required:

Criteria: ☐ O. Reg. 153/04 (As Amended) Table ___ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ___ ☐ Other: ___

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

	Paracel Order Number: 1914267 / Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)							
1	TP3-G1	S		1	Mar 29/19					X	X	X								
2	TP5-G1	S		1						X	X	X								
3	TP1-G1	S		1						X	X	X								
4	TP2-G1	S		1						X	X	X								
5	TP4-G1	S		1	↓					X	X	X								
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Nick Sullivan	Date/Time: 02/04/19 4:30 pm	Date/Time: 04/02/19 17:17	Date/Time:
Date/Time: April 2/2019	Temperature: ___ °C	Temperature: 15.9 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mandy Witteman

Client PO: 26322
Project: PE4581
Custody: 121641

Report Date: 11-Apr-2019
Order Date: 9-Apr-2019

Order #: 1915241

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1915241-01	BH1-GW1
1915241-02	BH2-GW1
1915241-03	BH3-GW1

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26322

Report Date: 11-Apr-2019
Order Date: 9-Apr-2019
Project Description: PE4581

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	10-Apr-19	10-Apr-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26322

Report Date: 11-Apr-2019

Order Date: 9-Apr-2019

Project Description: PE4581

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	-
	Sample Date:	04/09/2019 09:00	04/09/2019 09:00	04/09/2019 09:00	-
	Sample ID:	1915241-01	1915241-02	1915241-03	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	3.2	3.0	<0.5	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroform	0.5 ug/L	27.1	25.7	<0.5	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylene dibromide (dibromoethan	0.2 ug/L	<0.2	<0.2	<0.2	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26322

Report Date: 11-Apr-2019

Order Date: 9-Apr-2019

Project Description: PE4581

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	-
	Sample Date:	04/09/2019 09:00	04/09/2019 09:00	04/09/2019 09:00	-
	Sample ID:	1915241-01	1915241-02	1915241-03	-
	MDL/Units	Water	Water	Water	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	102%	101%	102%	-
Dibromofluoromethane	Surrogate	107%	104%	110%	-
Toluene-d8	Surrogate	94.8%	92.6%	96.1%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroform	ND	0.5	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Ethylene dibromide (dibromoethane	ND	0.2	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*88.3*		*ug/L*		*110*	*50-140*			
Surrogate: Dibromofluoromethane	*73.6*		*ug/L*		*92.1*	*50-140*			
Surrogate: Toluene-d8	*79.8*		*ug/L*		*99.8*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Ethylene dibromide (dibromoethane	ND	0.2	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*81.8*		*ug/L*		*102*	*50-140*			
Surrogate: Dibromofluoromethane	*84.8*		*ug/L*		*106*	*50-140*			
Surrogate: Toluene-d8	*76.3*		*ug/L*		*95.4*	*50-140*			

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 26322

Report Date: 11-Apr-2019
Order Date: 9-Apr-2019
Project Description: PE4581

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	81.8	5.0	ug/L		81.8	50-140			
Benzene	33.5	0.5	ug/L		83.8	60-130			
Bromodichloromethane	31.5	0.5	ug/L		78.7	60-130			
Bromoform	30.8	0.5	ug/L		76.9	60-130			
Bromomethane	37.9	0.5	ug/L		94.8	50-140			
Carbon Tetrachloride	29.7	0.2	ug/L		74.2	60-130			
Chlorobenzene	38.7	0.5	ug/L		96.8	60-130			
Chloroform	37.2	0.5	ug/L		93.0	60-130			
Dibromochloromethane	32.6	0.5	ug/L		81.4	60-130			
Dichlorodifluoromethane	42.0	1.0	ug/L		105	50-140			
1,2-Dichlorobenzene	31.3	0.5	ug/L		78.2	60-130			
1,3-Dichlorobenzene	30.9	0.5	ug/L		77.2	60-130			
1,4-Dichlorobenzene	28.6	0.5	ug/L		71.5	60-130			
1,1-Dichloroethane	34.4	0.5	ug/L		86.0	60-130			
1,2-Dichloroethane	43.5	0.5	ug/L		109	60-130			
1,1-Dichloroethylene	34.3	0.5	ug/L		85.6	60-130			
cis-1,2-Dichloroethylene	33.3	0.5	ug/L		83.3	60-130			
trans-1,2-Dichloroethylene	34.8	0.5	ug/L		86.9	60-130			
1,2-Dichloropropane	31.8	0.5	ug/L		79.6	60-130			
cis-1,3-Dichloropropylene	35.7	0.5	ug/L		89.3	60-130			
trans-1,3-Dichloropropylene	34.3	0.5	ug/L		85.7	60-130			
Ethylbenzene	30.6	0.5	ug/L		76.5	60-130			
Ethylene dibromide (dibromoethane	35.6	0.2	ug/L		89.0	60-130			
Hexane	26.1	1.0	ug/L		65.3	60-130			
Methyl Ethyl Ketone (2-Butanone)	75.2	5.0	ug/L		75.2	50-140			
Methyl Isobutyl Ketone	60.0	5.0	ug/L		60.0	50-140			
Methyl tert-butyl ether	67.5	2.0	ug/L		67.5	50-140			
Methylene Chloride	35.2	5.0	ug/L		88.1	60-130			
Styrene	32.4	0.5	ug/L		81.0	60-130			
1,1,1,2-Tetrachloroethane	32.9	0.5	ug/L		82.2	60-130			
1,1,2,2-Tetrachloroethane	45.5	0.5	ug/L		114	60-130			
Tetrachloroethylene	33.5	0.5	ug/L		83.8	60-130			
Toluene	38.9	0.5	ug/L		97.2	60-130			
1,1,1-Trichloroethane	29.6	0.5	ug/L		73.9	60-130			
1,1,2-Trichloroethane	32.3	0.5	ug/L		80.7	60-130			
Trichloroethylene	29.7	0.5	ug/L		74.3	60-130			
Trichlorofluoromethane	37.8	1.0	ug/L		94.4	60-130			
Vinyl chloride	39.5	0.5	ug/L		98.8	50-140			
m,p-Xylenes	66.7	0.5	ug/L		83.4	60-130			
o-Xylene	37.0	0.5	ug/L		92.4	60-130			
Surrogate: 4-Bromofluorobenzene	*75.6*		*ug/L*		*94.5*	*50-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Paracel ID: 1915241

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Page ___ of ___

Client Name: Paterson Group
Contact Name: Mandy Witteman
Address: 154 Colonnade Rd. S.
Telephone: 613-226-7381

Project Reference: PE4581
Quote #
PO # 26322
Email Address: mwitteman@patersongroup.ca

Turnaround Time:
☐ 1 Day ☐ 3 Day
☒ 2 Day ☐ Regular
Date Required: _____

Criteria: ☒ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number: 1915241

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)
1	BH1-GW1	GW		2	Apr 9/19	AM		X					
2	BH2-GW1	↓		2	↓	↓		X					
3	BH3-GW1	↓		2	↓	↓		X					
4													
5													
6													
7													
8													
9													
10													

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:
Relinquished By (Print): Nick Sullivan	Date/Time: 09/04/19 3:30 PM	Date/Time: Apr 09, 2019 04:25
Date/Time: Apr 9, 2019	Temperature:	Temperature: 15.5°C
Verified By:		
Date/Time: 04/09/19 16:25		
pH Verified [ ] By:		

APPENDIX 2

PHASE II ESA REPORT (GOLDER ASSOCIATES)

January 2012

FINAL REPORT

Phase II Environmental Site Assessment 156 - 160 Lyon Street Ottawa Light Rail Transit Project

Submitted to:
Capital Transit Partners
24th Floor, 160 Elgin Street
Ottawa, Ontario
K2P 2P7

REPORT

Report Number: 10-1121-0222

Distribution:

2 copies	-	Capital Transit Partners
1 e-copy	-	Capital Transit Partners
2 copies	-	Golder Associates Ltd.

Golder Associates

EXECUTIVE SUMMARY

Golder Associates Ltd. (Golder) was retained by Capital Transit Partners (CTP) to prepare a Phase II Environmental Site Assessment (Phase II ESA) on a property currently used as a parking lot located on the southwest corner of Lyon Street and Albert Street with address 156-160 Lyon Street (Site) within the City of Ottawa (City) as shown in Figure 1. Golder understands that the City is considering expropriation of this property for the purpose of redevelopment and potential use as part of the future underground train access station to Queen Street for the Ottawa Light Rail Transit (OLRT) system.

The Executive Summary highlights key points from the report only; for complete information and findings, as well as the limitations, the reader should examine the complete report.

The current Phase II ESA was completed in general accordance with the protocols and procedures outlined in the Canadian Standards Association (CSA) *Standard Z769-00 Phase II Environmental Site Assessment* and employing the most up to date Ministry of the Environment (MOE) Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act (April 15, 2011) from the Ontario Regulation 153/04 (O. Reg. 153/04), as amended.

The objective of the Phase II ESA was to investigate soil and groundwater quality on the Site in order to address areas of potential environment concern (APECs) identified in the report entitled "Phase I Environmental Site Assessment, 156-160 Lyon Street, Ottawa, Ontario" conducted by Golder, dated October 2011 and hereafter referred to as 'Phase I ESA'.

Based on the information obtained during the Phase I ESA, issues of potential environmental concern related to potential impacts to soil and/or groundwater were identified as follows:

- Aerial photographs indicate that there have been a wide variety of facilities and land uses in the subject area. Many of the buildings in the area appear to have been used for manufacturing/industrial purposes as well as residential and unknown commercial uses;
- The review of the fire insurance plans (FIPs) has indicated that several of the properties surrounding the Site have historically been used as gasoline service stations with underground storage tanks (USTs), auto repair shops, laundry services and manufacturing/industrial operations;
- The HLUI database indicated that there was once a dry cleaner located on the Site. The HLUI report also returned an exhaustive list of historical land uses within 250 m of the Site that could have potential environmental impacts including gasoline service stations, motor vehicle repair shops, laundry and cleaning operations, manufacturing/industrial operations and petroleum product businesses; and,
- The Ecolog ERIS report indicated that there are a number of waste generators on adjacent properties (up-gradient and cross-gradient to the Site), as well as spill occurrences on adjacent land up-gradient to the Site and fuel storage tanks in the vicinity of the Site. The presence of these facilities and associated activities is considered an issue of potential environmental concern for the Site.

The Phase II ESA consisted of the collection of fill, soil and groundwater samples across the Site and submission for laboratory analysis of the following contaminants of concern (COC): select metals, petroleum hydrocarbons (PHCs) and volatile organic compounds (VOCs).

The Phase II consisted of drilling four geo-environmental boreholes T-306, T-307, T-308 and T-309 as shown on Figure 2. As part of the OLRT protocol, all boreholes must undergo a geotechnical review. As such, these are combination geotechnical and environmental purpose boreholes and for the purposes of this report 'borehole' refers to geo-environmental borehole. Each borehole had a deep monitoring well (denoted as 'A', ie T-306A) and a shallow monitoring well (denoted as 'B', ie. T-306B) installed. From these boreholes and monitoring wells the following soil and groundwater samples were collected by Golder and analysed by Paracel Laboratories:

- Three soil samples T-306 SA1 (where 'SA' denotes 'sample' and '1' refers to the first sample collected), T-307 SA1 and T-309 SA1 were analysed for selected metal concentrations;
- Nine soil samples T-306 SA1, T-306 SA3, T-307 SA1, T-307 SA5, T-308 SA3, T-308 SA6, T-309 SA1, T-309 SA4 and T-309 SA4A (duplicate sample) were analysed for PHC and VOC concentrations;
- Two groundwater samples T-308B and T-309B were collected on November 10, 2011 and analysed for PHC concentrations. On December 5, 2011 T-309B was re-sampled and T-306B was sampled and analysed for PHC concentrations; and,
- Six groundwater samples T-306A, T-307A, T-308A, T-308B, T-309A and T-309B plus one duplicate sample for T-306A were collected on November 10, 2011 and analysed for VOC concentrations. On December 5, 2011, T-309B was re-sampled and T-306B was sampled and analysed for VOC concentrations.

In addition to the above soil and groundwater samples, borehole T-72, located on the Site as shown on Figure 2, was completed between May 19 and 31, 2011 as part of the original OLRT alignment along Albert Street. One deep monitoring well T-72A (screen interval of ~33.3 - 39.3 meters below ground surface [mbgs]) and one shallow monitoring well T-72B (screen interval of ~12.2 - 15.2 mbgs) were installed in this borehole. Soil and groundwater samples were collected during this installation and were reviewed as part of the Phase I ESA. Groundwater samples were also collected from T-72A and T-72B on August 25, 2011 and analyzed for PHC and VOC concentrations. Groundwater samples were also collected from the shallow monitoring well T-72B on December 5, 2011 and analyzed for PHCs and VOCs.

Based on the findings of the Phase II ESA and the soil and groundwater results from borehole T-72, the following exceedances above the applicable MOE Table 1 and Table 3 Standards and other applicable standards were identified:

- The Site is underlain by fill materials which range in depth from 1.50 to 1.83 mbgs. The metal concentrations of antimony, barium, lead and mercury within these fills at T-306 SA1 and barium, lead, mercury and zinc in T-307 SA1 are in exceedance of MOE Table 1 Standards. Lead concentrations exceeded the MOE Table 3 Standards in the same two fill samples. Elevated metal concentrations in soil, compared to typical background levels identified in this area, are likely associated with fill containing demolition material from the former buildings on the Site. It is anticipated that the fill likely covers most of if not the entire Site;
- A soil sample collected from T-72 SA4 (3.05 to 3.66 mbgs) on May 19, 2011 indicated that Molybdenum and Silver exceeded the MOE Table 1 Standards. Note that this soil sample was taken from the native soil and not from the fill material;

- Groundwater exceedances for MOE Table 3 included chloroform at three well locations (T-306A, T-308A and T-309B). Chloroform was no longer identified above the MOE Table 3 standard at T-309B during the re-sampling event on December 5, 2011 but continued to be present at T-306A. T-308A was not re-sampled due to access issues. Chloroform concentrations in groundwater, which in absence of a source could potentially be attributed to municipal chlorinated water (potential water line breaks and/or the water used for coring the bedrock);
- Groundwater exceedances for MOE Table 3 included PHC F3 and F4 in three monitoring wells (T-72A, T-308B and T-309B). The results from the groundwater collected during the re-sampling event of T-72 on August 25, 2011 from T-72A and on December 5, 2011 from T-309B indicated that PHC concentrations were no longer present above the detection limits. T-308B could not be re-sampled on December 5, 2011 due to access issues. The F3 and F4 exceedances at this location are likely related to excess sediment in the first set of groundwater samples;
- Groundwater exceedances for the City of Ottawa Storm Sewer Discharge Criteria included chloroform in four well locations (T-306A, T-307A, T-308A and T-309B), and toluene in T-308A. The results from the groundwater collected during the re-sampling event on December 5, 2011 from T-309B indicated that chloroform was not longer present above the laboratory detection limits. Again, chloroform concentrations in groundwater, which in absence of a source could potentially be attributed to municipal chlorinated water (potential water line breaks and/or the water used for coring the bedrock), and the toluene exceedance is likely related to on or off-Site historical activities; and,
- Groundwater exceedances for the City of Ottawa Sanitary and Storm Sewer Discharge Criteria included PHC F3 + F4 (The commonly applied but unpublished City of Ottawa sanitary and storm sewer use limit is 500 ug/L for the total concentration of PHCs F1 to F4) in T-72A, T-308B and T-309B. The results from the groundwater collected during the re-sampling event on August 25, 2011 from T-72A and December 5, 2011 from T-309B indicated that PHC F3 and F4 were no longer present above the laboratory detection limit. T-308B could not be re-sampled on December 5, 2011 due to access issues. Although not confirmed, the F3 and F4 exceedances at this location are likely related to excess sediment in the original groundwater samples.

As indicated above, fill areas on the Site contain soil in excess of the applicable MOE Table 1 and Table 3 Standards. If excavated, these materials should be managed in accordance with the requirements of the Excess Materials Management Plan (EMMP) to be developed by Project Co as part of the OLRT Project. In general, material in excess of either of the Table 1 or Table 3 Standards will be considered a waste if it is removed from the Site. If managed on Site, material in excess of MOE Table 3 may require additional assessment (Site Specific Risk Assessment) and/or risk management to be considered suitable for use on the Site. Classification under Ontario Regulation 347 General – Waste Management as amended would be necessary if soil is to be disposed of at a licensed waste disposal facility.

As indicated above, groundwater concentrations exceeded the MOE Table 3 Standards and the City of Ottawa Storm Sewer and Sanitary Sewer discharge criteria for several parameters. However, following re-sampling the PHC concentrations were no longer detected above the laboratory detection limits. Therefore the exceedances of MOE Table 3 and Sanitary Sewers for PHCs were likely the result of elevated sediment in the original groundwater samples and are not likely present in the groundwater at the Site. Construction groundwater monitoring should be implemented to monitor the actual concentrations of contaminants during dewatering.

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APPENDICES

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Capital Transit Partners (CTP) to prepare a Phase II Environmental Site Assessment (Phase II ESA) on a property currently used as a parking lot located on the southwest corner of Lyon Street and Albert Street with address 156-160 Lyon Street (Site) within the City of Ottawa (City) as shown in Figure 1. Golder understands that the City is considering expropriation of this property for the purpose of redevelopment and potential use as part of the future underground train access station to Queen Street for the Ottawa Light Rail Transit (OLRT) system. For the purpose of this report, the Phase II ESA "Site" is defined as the aggregate of the two properties (156 and 150 Lyon Street) with the Site shown on Figure 2.

The Phase II ESA was completed in general accordance with the protocols and procedures outlined in the Canadian Standards Association (CSA) *Standard Z769-00 Phase II Environmental Site Assessment* and employing the most up to date Ministry of the Environment (MOE) Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act (April 15, 2011) from the Ontario Regulation 153/04 (O. Reg. 153/04), as amended.

The Phase II ESA property includes the following municipal addresses and property identification numbers (PINs):

Phase II ESA Property Information

Civic Address	Property Identification Number (PIN)	Approximate Area (ha)
156 Lyon Street	041140009	0.04
160 Lyon Street	041140010	0.06

1.1 Objectives

The objective of the Phase II ESA was to investigate soil and groundwater quality on the Site in order to address areas of potential environment concern (APECs) identified in the report entitled "Phase I Environmental Site Assessment, 156-160 Lyon Street, Ottawa, Ontario" conducted by Golder, dated October 2011 and hereafter referred to as 'Phase I ESA'.

The objectives of the Phase II ESA include:

1) Re-sampling the deep groundwater interval at geo-environmental borehole T-72 to verify a reported groundwater sample with concentration of PHC F2-F4 exceeding MOE Table 3 in this deep well in June of 2011. As part of the OLRT protocol, all boreholes must undergo a geotechnical review. As such, these boreholes are combination geotechnical and environmental purpose boreholes and for the purposes of this report 'borehole' refers to geo-environmental borehole;

2) Further investigate APECs identified in the Phase I ESA report through a borehole drilling and monitoring well installation program;

3) Identify soil concentrations in excess of the applicable Standards, as described in section 4.1, with regard to the potential chemicals of concern (COC) suspected on-Site: metals, petroleum hydrocarbons (PHCs) and volatile organic compounds (VOCs);

4) Evaluate groundwater quality within the Site boundaries with regard to the potential COCs suspected on-Site: PHCs and VOCs;

5) Determine groundwater elevations and flow direction; and,

6) Provide recommendations for additional work, remediation and/or risk management, where applicable.

1.2 Scope of Work

The Phase II ESA scope of work included:

- Re-sampling the groundwater in the deep monitoring well at borehole T-72A;
- Drilling of four geo-environmental boreholes;
- Collection of soil samples from boreholes;
- Laboratory analysis of soil samples for the COC for soil including metals, PHCs and VOCs in soils recovered from boreholes;
- Installation of a deep (denoted by 'A' at the end of the borehole name) and a shallow (denoted by 'B' at the end of the borehole name) monitoring well in each of the four boreholes;
- Groundwater elevation surveying;
- Groundwater sampling of monitoring wells T-306 to T-309, and existing deep monitoring well T-72A;
- Re-sampling of groundwater from monitoring wells T-72A, T-72B, T306B and T-309B;
- Groundwater laboratory analysis of PHC and VOC; and,
- Interpretation of results and preparation of this report.

2.0 BACKGROUND INFORMATION

2.1 Site Description

The Phase II ESA Site is located on the southwest quadrant of the intersection of Lyon Street and Albert Street in the downtown core of Ottawa, Ontario. The Site topography slopes slightly to the south. There are no water bodies present on-Site. The Site is currently used as a public parking lot and has asphalt pavement cover.

2.2 Current Property Use

Currently the main use of the Site is for public parking. The only structure is a small parking booth which is located along the north property line of the Site.

Additional detailed information regarding the Site history is provided in the Phase I ESA for the Site.

2.3 Summary of Findings from "Phase I Environmental Site Assessment, 156-160 Lyon Street, Ottawa, Ontario"

The Phase I ESA entitled "Phase I Environmental Site Assessment, 156-160 Lyon Street, Ottawa, Ontario" was conducted by Golder in June 2011. The following table is a summary of the APEC (see Figure 2) related to the potential impacts on soil and/or groundwater on the Site identified in the Phase I ESA.

Summary of APEC Identified in the Phase I ESA

Site	Ref#	Location of the Area of Potential Environmental Concern (APEC)	Finding & Justification	Information Sources	Contaminants of Concern
On-Site (Figure 2)					
380 Albert	1	Former laundries and cleaners	Historical research	City of Ottawa's Historical Land Use Inventory (HLUI)	The use of cleaning solvents (VOCs)

2.4 Previous Investigations by Others

No previous reports were examined as part of the Phase I ESA. However, as part of the original OLRT alignment along Albert Street, Golder completed borehole T-72 on the Site between May 19 and 31, 2011. This borehole log was reviewed as part of this Phase I ESA. The borehole log indicated the presence of approximately 1.5 metres of fill material that included brick which is likely related to the demolition of the former buildings on the Site. Originally there was an exceedance of petroleum hydrocarbon compounds (PHC F2 to F4) in the deep groundwater well (screen from ~33.3 – 39.3 meters below ground surface [mbgs]) in this borehole. Golder returned to the Site on August 25, 2011 to resample and re-analyze the deep groundwater well; based on the analytical results, there were no exceedances of PHC F2 to F4 found in the deep groundwater well during the repeat sampling (refer to Table 4 - Groundwater Analytical Results – Petroleum Hydrocarbons).

3.0 INVESTIGATION METHOD

3.1 General

The current Phase II ESA field program consisted of the advancement of four boreholes completed through fill material, native subsurface soils and into bedrock. The Phase II ESA also included deep ("A") and shallow ("B") monitoring well installation in all four boreholes along with the collection of soil and groundwater samples for analysis of the COCs - metals, PHCs and VOCs. Borehole and monitoring well placement was designed to address the APECs identified in the Phase I ESA. Depth to groundwater was measured to determine the shallow groundwater flow direction at the Site. Details regarding individual tasks are provided in the following sections.

3.2 Drilling

Prior to commencing the borehole drilling program, Golder retained Underground Service Locates (USL) Inc. of Ottawa, Ontario to identify the locations of all private and public utilities within the work area and to mark the location of these utilities.

Each borehole was drilled using a truck-mounted hollow stem drill rig (CME 55) operated by Downing Estate Drilling of Grenville, Quebec. Borehole logs with details of monitoring well installations were monitored in the field by Golder personnel. All soil cuttings were collected in drums and removed from the Site for eventual disposal as per Ministry of the Environment (MOE) regulation 347 General – Waste Management. Each borehole was advanced to a depth of approximately fifteen meters below ground surface to intercept the groundwater table (~5 to 6 mbgs) and correspond with the potential station access excavation and the depth of existing shallow monitoring well T-72B. Multi-level monitoring wells were installed in all four of the boreholes. The screened interval of the upper well was positioned to straddle the water table (~5 to 6.5 mbgs) and the screened interval of the lower well was placed at the bottom of the borehole in the bedrock (~13.5 to 15.0 mbgs). Borehole logs with monitoring well installations are provided in Appendix A.

The ground surface elevations at the four newly installed boreholes/wells were surveyed by Annis, O'Sullivan, Vollebekk Ltd. of Ottawa, Ontario and are referred to the NAD83 MTM zone 9 reference system.

3.3 Borehole and Monitoring Well Layout

Boreholes were positioned and drilled to provide coverage of the Site as shown in Figure 2.

3.4 Soil: Sampling and Analysis

Soil samples were recovered from each borehole during drilling using a split spoon sampler. Bedrock coring was completed using HQ diamond drill coring equipment. Each soil sample was logged in the field, placed in laboratory supplied glass sample jars and refrigerated until select samples were delivered under chain of custody documentation to Paracel Laboratories Ltd. of Ottawa for analysis. Where possible, soil split samples were collected in sealed plastic bags for subsequent soil headspace organic vapour measurements.

Samples were selected for laboratory analysis based on organic vapour measurements, visual observations and/or stratigraphic position. Two soil samples from each borehole were submitted for laboratory analysis to Paracel Laboratories Ltd. The COCs were selected based on the APEC identified in the Phase I ESA and include one or more of the PHC fractions F1 to F4, VOCs and select metals. The COCs were also considered in the context of the material. The following is a summary of soil samples submitted for analysis of the corresponding COCs.

Collected Soil Samples and Analyzed Parameters

Borehole/Monitoring Well	Sample Depth Interval (mbgs)	Parameter
T-72	SA1 0.76-1.37	PHCs, VOCs, metals
	SA4 3.05-3.66	PHCs, VOCs, metals
T-306	SA1 0.76–1.37	PHC, VOCs, metals
	SA3 2.29-2.90	PHC, VOCs
T-307	SA1 0.76-1.37	PHC, VOCs, metals, pH*
	SA5 3.8-4.42	PHC, VOCs, pH*
T-308	SA3 2.29-2.9	PHC, VOCs
	SA6** 3.8-4.27	PHC, VOCs
T-309	SA1 0.91-1.52	PHC, VOCs, metals
	SA4 3.05-3.66	PHC, VOCs
	SA4A 3.05-3.66 (duplicate sample)	PHC, VOCs

Notes: mbgs: metres below ground surface
* pH measured to determine applicable Site Condition Standard as outlined in Section 4.1
** Identified on T-308 borehole log as sample '5'

Laboratory Certificates of Analysis are provided in Appendix C and soil analytical results are presented in Tables 1 to 3. A summary of the identified soil sample exceedances for the analysed parameters is presented in Section 4.5.

3.5 Field Screening Measurements

Soil sample vapour levels were measured using a Mini-rae PGM 7300 (serial no. 590-001-611) photo ionization detector ("PID") calibrated using an isobutylene gas Standard of 100 parts per million (ppm) on October 31, 2011 prior to the commencement of drilling. Soil samples were collected from regular intervals within 60 cm (2 foot) sections recovered from a split spoon sampler during borehole excavation, bagged and allowed to equilibrate to the ambient temperature prior to vapour level measurements in the field. Soil sample vapour level readings were used to identify "worst case" soil samples to be submitted for laboratory analysis. Soil sample vapour level readings and the PID certificate of calibration are provided in Appendix B.

3.6 Ground Water: Monitoring Well Installation

In order to investigate groundwater quality, multi-level monitoring wells were installed in each borehole and the installation was supervised in the field by Golder personnel. In general, the lower level monitoring wells ("A") were constructed of 32 millimetre diameter PVC pipe equipped with a 1.5 metre screened interval placed at the bottom of the borehole in the bedrock. The upper level monitoring wells ("B") were constructed with 25 millimetre diameter PVC pipe equipped with a 1.5 m screened interval placed approximately between 5 and 6.5 mbgs intercepting the groundwater table. Detailed monitoring well instrumentation logs are provided on the borehole logs in Appendix A.

An attempt was made to install the shallow monitoring well screens at an elevation that would straddle the inferred water table. Silica sand backfill (granular filter) was placed in the annular space of the boreholes around the screened portion of the monitoring well, and bentonite was used to seal the upper portion of the annular space between the well risers and the walls of the borehole up to ground surface. A bentonite seal was placed between the shallow and deep well screens and also to seal the interface between the bedrock and the overburden.

Ground surface elevations at each of the newly installed wells were surveyed by Annis, O'Sullivan, Vollebekk Ltd. of Ottawa, Ontario and are referred to the geodetic datum. Following well development and recovery, the depth to the groundwater surface was documented in all wells and groundwater surface elevations were calculated in order to determine the groundwater flow direction at the Site.

3.7 Ground Water: Sampling and Analysis

The scope of work of the Phase II ESA included groundwater sampling of each interval for the newly installed wells T-306 to T-309 and one existing well T-72 (see Figure 2). T-72A and T-72B were re-sampled on August 25, 2011 and monitoring wells T-306 to T-309 were sampled on November 10, 2011.

T-306 and T-307 were not sampled during the initial sampling program as there was insufficient water in the wells for collection. A re-sampling event took place on December 5, 2011 to obtain the missing samples and to address excess sediment issues that were encountered in T-308B and T-309B as noted by Paracel Laboratories. During the re-sampling event groundwater samples were collected from T-306B, T309B and T-72B. Groundwater was collected from T-306B using a low flow peristaltic pump as the standard footvalve was unable to collect a sample. T-307 continued to be dry and T-308 could not be re-sampled due to access issues.

Prior to sampling, the depth to static groundwater level was recorded in each borehole/monitoring well. As the groundwater was located within the bedrock, the wells were purged once until dry and then sampled after recovery. Well purging and sampling was completed using dedicated polyethylene tubing and a Waterra foot valve. Groundwater samples were placed in laboratory supplied sample bottles, placed in a cooler with ice, and delivered to the laboratory for analysis on the same day of collection. Recorded groundwater levels and elevations are presented in Section 4.3.

Groundwater samples were submitted for laboratory analysis to Paracel Laboratories Ltd. The COCs were selected based on the activities of potential environmental concern identified in the Phase I ESA report. The COCs included PHC fractions F1 to F4 and VOCs. The COCs were also considered in the context of the material. The following is a summary of groundwater samples submitted for analysis of the corresponding COCs.

Groundwater Sampling Locations and Analyzed Parameters

Borehole/Monitoring Well	Parameter	Date
T-72B	PHcs, VOCs	June 28, 2011
T-72A	PHCs, VOCs	June 30, 2011
T-72A	PHCs, VOCs	August 25, 2011
T-72B	PHCs, VOCs	August 25, 2011
T-72B	PHC, VOCs	December 5, 2011
T-306A	VOCs	November 10, 2011
T-306B	VOCs, PHCs	December 5, 2011
T-307A	VOCs	November 10, 2011
T-307B	Insufficient water to sample	N/A
T-308A	VOCs	November 10, 2011
T-308B	PHCs, VOCs	November 10, 2011
T-309A	VOCs	November 10, 2011
T-309B	PHCs	November 10, 2011
T-309B	PHCs, VOCs	December 5, 2011

Note: T-72A is existing monitoring well from a previous OLRT alignment borehole

Laboratory Certificates of Analysis are provided in Appendix C and groundwater analytical results are presented in Tables 4 and 5. A summary of the identified groundwater sample exceedances for the analysed parameters is presented in Section 4.6.

4.0 RESULTS

4.1 Applicable Site Condition Standard

Provincial Standards described in the MOE document entitled "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*" dated April, 2011 (the Standard Document) are currently used for the assessment of potentially contaminated sites in the context of Ontario Regulation (O. Reg.) 153/04 as amended.

The following rationale was used for the selection of the applicable Site Standards to be used:

- The Site is located in an area which is serviced by a municipal drinking water supply which does not rely on the local groundwater. Thus, existing private and municipal water supplies will not be adversely affected if non-potable groundwater Standards are utilized for this Site;
- The most sensitive land use of the site is commercial;
- The Site is not located within 30 metres of a water body;
- The Site is not located within an area of natural significance, or included or adjacent to such an area;
- The Site is not considered environmentally sensitive by O. Reg. 153/04 Standards given that the pH range of soil samples analyzed from T-307 SA1 and SA5 was within 5 to 11; and,
- Based on observed soil and groundwater conditions in the boreholes, glacial till was assumed to be a possible pathway for the migration of groundwater with concentrations of parameters greater than the applicable Standard and therefore the criteria associated with a coarse textured soil were considered most applicable to this Site (conservative approach).

Based on the above considerations, MOE Table 3 Standards: Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition for Industrial/Commercial/Community Property Use (coarse-grained soil) is applicable. Analytical results for soil and groundwater samples submitted for laboratory analysis were compared against Table 3 Standards. All soil and groundwater samples in exceedance of Table 3 Standards may require further investigation or assessment.

In addition the following Standards and criteria were employed for comparative purposes and may be used to aid in fill and groundwater management strategies for the Site.

Soil

Soil analytical results were also compared to the MOE Table 1 Full Depth Background Site Condition Standards (coarse-grained soil) for Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use, in order to examine the quality of fill on-Site.

Groundwater

Groundwater analytical results were also compared to the City of Ottawa Sewer Use By-Law (No. 2003-514, Schedule "A" Table 1) for discharge to sanitary and combined sewers, and the City of Ottawa Sewer Use By-Law (No. 2003-514, Schedule "A" Table 1) for discharge to storm sewers.

4.2 Subsurface Conditions

The subsurface conditions encountered in the boreholes are shown on borehole logs provided in Appendix A. Information obtained from boreholes forms the basis of the following subsurface description.

In general, the subsurface conditions at the Site consist of pavement structure over fill, underlain by silty clay, and subsequently underlain by glacial till and limestone bedrock.

Fill was encountered at all borehole locations from below the asphaltic pavement to a maximum depth of 1.83 mbgs. Native soils were encountered at the shallowest depth of 1.5 mbgs and consisted of silty clay underlain by glacial till composed of cobbles and boulders in a matrix of silty sand/sandy silt, some gravel with a trace of clay. Glacial till generally extended down to depths ranging from approximately 4.37 to 4.62 mbgs and varied in thickness from 1.0 to 2.4 m. Bedrock in the form of fresh to slightly weathered limestone was typically encountered between 4.37 to 4.62 mbgs.

4.3 Hydrogeology

4.3.1 Ground Water Elevations and Flow Direction

Golder visited the Site on November 10, 2011 after the wells were installed to record the depth of static groundwater levels in the eight monitoring wells installed in the four boreholes. A summary of the measured depth to groundwater and groundwater elevations is presented below.

Measured Depth of Groundwater and Calculated Groundwater Elevations in Installed Monitoring Wells

Borehole/monitoring well locations	Approximate Screen Depth Interval (m)	Approximate Ground Surface Elevation[(1)] (mASL)	Depth of Groundwater Level Below Ground Surface (m)	Groundwater Level Elevation[(1)] (mASL)	Date of Measurement
T-72B	12.2 – 15.2	73.20	5.50	67.70	Aug. 25, 2011
T-72A	33.3 - 39.3	73.20	5.50	67.70	Aug. 25, 2011
T-306B	5.5 – 7.0	73.42	4.49	68.93	Nov. 10, 2011
T-306A	13.6 - 15.1	73.42	5.48	67.94	Nov. 10, 2011
T-307B	4.9 – 6.4	73.20	5.64	67.56	Nov. 10, 2011
T-307A	13.5 – 15.0	73.20	5.63	67.57	Nov. 10, 2011
T-308B	5.5 – 7.0	73.08	5.54	67.54	Nov. 10, 2011
T-308A	13.5 – 15.0	73.08	4.28	68.80	Nov. 10, 2011
T-309B	5.5 – 7.0	72.94	5.40	67.54	Nov. 10, 2011
T-309A	12.2 – 15.1	72.94	5.38	67.56	Nov. 10, 2011

Notes:

1. The elevations are referred to a Geodetic datum
   Highlighted values are used to indicate shallow groundwater flow direction on Figure 3.

Based on the above calculated water level elevations from the shallow ("B") monitoring wells on November 10, 2011, shallow groundwater at the Site is interpreted to flow towards the southeast as shown on Figure 3. This corresponds with the general topography of the Site and the surrounding properties.

4.3.2 General Hydrogeological Conditions

During the drilling of the boreholes, there was no evidence of the groundwater surface observed within the overburden. Based on observations during drilling and the inferred shallow groundwater flow direction towards the southeast on the Site, it is presumed that the shallow groundwater flow is predominantly within the upper limestone unit and to a lesser extent within the base of the glacial till.

4.4 Soil Headspace Vapour Measurements and Odours

The measured soil headspace vapour concentrations ranged between 0.1 and 1.4 ppm. Field soil vapour measurements are presented in Appendix A.

No hydrocarbon odours were noted during drilling and sampling of each of the four boreholes. Due to a limited quantity of soil recovered within the split spoon sampler, the following samples could not be tested for soil vapour measurements; T-306 SA-3 and T-308, SA1, SA2, SA4 and SA6.

4.5 Soil Analytical Results

A total of nine soil samples were submitted for laboratory analysis (including one soil duplicate) based on soil headspace organic vapour measurements in the field and visual observations/stratigraphic positioning. The laboratory analytical program included the following analysis of the COCs based on APECs identified in the Phase I ESA:

- Metals: antimony, arsenic, barium, beryllium, boron, cadmium, chromium, chromium (VI), cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, and zinc in fill materials;
- VOCs (including benzene, toluene, ethylbenzene and xylenes [BTEX]); and,
- PHC Fractions F1 to F4.

The soil analytical results were compared to applicable site Standards (MOE Table 1 and Table 3). The results are summarized below. Soil analytical results are presented in Tables 1 to 3. The soil concentrations in excess of the MOE Table 3 Standards are shown on Figure 4.

4.5.1 MOE Table 1 Standards

The MOE Table 1 Standards are typically applied to classify soils for off-site disposal. Material which meets the MOE Table 1 Standard is generally considered clean/inert fill, which can be used at any site. The following is a summary of the MOE Table 1 Standard exceedances of soil:

- T-306 SA1:
  - 0.91-1.52 mbgs: antimony, barium, lead and mercury;
- T-307 SA1:
  - 0.76-1.37 mbgs: barium, lead, mercury and zinc.

A previous soil test result from T-72 SA4 (3.05 to 3.66 mbgs) on May 19, 2011 indicated that Molybdenum and Silver exceeded the MOE Table 1 Standards. Note that this soil sample was taken from the native soil and not from the fill material.

4.5.2 MOE Table 3 Standards

The MOE Table 3 Standards are used to classify the suitability of materials at sites where groundwater is not used for consumption (i.e. non-potable). The following is a summary of the MOE Table 3 soil exceedances:

- T-306 SA1:
  - 0.91-1.52 mbgs: lead;
- T-307 SA1:
  - 0.76-1.37 mbgs: lead.

4.6 Groundwater Analytical Results

A total of seventeen groundwater samples were submitted for laboratory analyses (includes one duplicate sample at T-306A). T-307B did not have a sufficient amount of water in order to submit groundwater samples to the laboratory. At the time of sampling, light non-aqueous phase liquids (LNAPL) were not observed in any of the monitoring wells. The laboratory analytical program included the following analysis of the COCs based on APECs identified in the Phase I ESA:

- VOCs (including BTEX); and,
- PHC Fractions F1 to F4.

The groundwater analytical results compared to the applicable Standards (MOE Table 3) and to supplementary criteria are summarized below. Groundwater analytical results are presented in Tables 4 and 5. The groundwater concentrations greater than the MOE Table 3 Standards is shown on Figure 5.

4.6.1 City of Ottawa Storm Sewer Discharge Criteria

The City of Ottawa Storm Sewer discharge criteria are used to classify water for discharge to the municipal storm sewers. The commonly applied but unpublished City of Ottawa sanitary and storm sewer use limit is 500 ug/L for the total concentration of PHCs F1 to F4. The following is a summary of the exceedances of the storm sewer discharge criteria:

- T306A: Chloroform;
- Duplicate T-306A: Chloroform;
- T-307A: Chloroform;
- T-308A: Chloroform and Toluene;
- T-309B: Chloroform on November 10, 2011 but not on December 5, 2011;
- T-308B: F3 + F4 (based on the unpublished concentration of 500 ug/L maximum limit for F1 to F4);
- T-309B: F3 + F4 (based on the unpublished concentration of 500 ug/L maximum limit for F1 to F4) on November 10, 2011 but not on December 5, 2011; and,
- T-72A: F2 + F3 + F4 (based on the unpublished concentration of 500 ug/L maximum limit for F1 to F4) on June 30, 2011 but not on August 25, 2011.

4.6.2 City of Ottawa Sanitary Sewer Discharge Criteria

The City of Ottawa Sanitary Sewer discharge criteria are used to classify water for discharge to the municipal sanitary sewers. The commonly applied but unpublished City of Ottawa sanitary and storm sewer use limit is 500 ug/L for the total concentration of PHCs F1 to F4. The following is a summary of the exceedances of the sanitary sewer discharge criteria:

- T-308B: F3 + F4 (based on the unpublished concentration of 500 ug/L maximum limit for F1 to F4);
- T-309B: F3 + F4 (based on the unpublished concentration of 500 ug/L maximum limit for F1 to F4) on November 10, 2011 but not on December 5, 2011; and,
- T-72A: F2 + F3 + F4 (based on the unpublished concentration of 500 ug/L maximum limit for F1 to F4) on June 30, 2011 but not on August 25, 2011.

4.6.3 MOE Table 3 Standards

The MOE Table 3 Standards are used to classify the suitability of materials at sites where groundwater is not used for consumption (i.e. non-potable). The following is a summary of the MOE Table 3 groundwater exceedances:

- T-306A: Chloroform;
- Duplicate T-306A: Chloroform;
- T-308A: Chloroform;
- T-308B: F3 and F4;
- T-309B: Chloroform, F3 and F4 on November 10, 2011 but not on December 5, 2011; and,
- T-72A: F2 on June 30, 2011 but not on August 25, 2011.

4.7 Quality Assurance and Quality Control Results

As part of the Phase II ESA, Golder implemented the following field quality control measures:

- Use of dedicated or cleaned sampling equipment between sampling events;
- Use of calibrated field monitoring equipment (PID);
- Use of appropriate laboratory supplied sampling jars;
- Analysis within an acceptable holding time;
- Delivery of samples under a Chain of Custody; and,
- Laboratory analysis by CALA accredited laboratory (Paracel Laboratories Ltd).

In addition to the above, Golder implemented the following laboratory analytical quality control measures:

- Collection and submission of one duplicate soil sample:
  - Duplicate soil sample of T-309 SA4 (duplicate identification: T-309 SA4A);
- Collection and submission of one duplicate groundwater sample:
  - Duplicate groundwater sample from monitoring well T-306A (duplicate identification: Dupe).

A review of the laboratory analytical results for the duplicate samples compared to the analytical results for the original samples show acceptable differences in results.

A review of the laboratory internal blanks, spikes and recoveries were all within acceptable ranges.

During the initial sampling program excessive sediment in the groundwater samples was noted by Paracel Laboratories, in samples T-308B and T-309B. As a result, the sediment present in the groundwater samples would have been digested with the groundwater sample during analysis which may have resulted in higher PHC groundwater concentrations than what is actually dissolved in the groundwater. During re-sampling on December 5, 2011 using low flow techniques to reduce the sediment collected with the groundwater, no detectable PHC was identified. Therefore it is considered that the sediment present in the initial samples had resulted in an elevated PHC concentration, potentially due to shale brought into suspension during drilling activities which is known to contain naturally occurring PHCs.

5.0 DISCUSSION OF RESULTS

Based on the findings of the Phase II ESA, the following exceedances above the applicable MOE Table 1 and Table 3 Standards and other applicable standards were identified:

- The Site is underlain by fill materials which range in depth from 1.50 to 1.83 mbgs. The metal concentrations of antimony, barium, lead and mercury within these fills at T-306 SA1 and barium, lead, mercury and zinc in T-307 SA1 are in exceedance of MOE Table 1 Standards. Lead concentrations exceeded the MOE Table 3 Standards in the same two fill samples. Elevated metal concentrations in soil, compared to typical background levels identified in this area, are likely associated with fill containing demolition material from the former buildings on the Site. It is anticipated that the fill likely covers most of if not the entire Site;
- A soil sample collected from T-72 SA4 (3.05 to 3.66 mbgs) on May 19, 2011 indicated that Molybdenum and Silver exceeded the MOE Table 1 Standards. Note that this soil sample was taken from the native soil and not from the fill material;
- Groundwater exceedances for MOE Table 3 included chloroform at three well locations (T-306A, T-308A and T-309B). Chloroform was no longer identified above the MOE Table 3 at T-309B during the re-sampling event on December 5, 2011 but continued to be present at T-306A, T-308A was not re-sampled. Chloroform concentrations in groundwater, which in absence of a source could potentially be attributed to municipal chlorinated water (potential water line breaks and/or the water used for coring the bedrock);
- Groundwater exceedances for MOE Table 3 included PHC F3 and F4 in three monitoring wells (T-72A, T-308B and T-309B). The results from the groundwater collected during the re-sampling event of T-72 on August 25, 2011 from T-72A and on December 5, 2011 from T-309B indicated that PHC concentrations were no longer present above the detection limits. T-308B could not be re-sampled on December 5, 2011 due to access issues. The F3 and F4 exceedances at this location are likely related to excess sediment in the first set of groundwater samples;
- Groundwater exceedances for the City of Ottawa Storm Sewer Discharge Criteria included chloroform in four well locations (T-306A, T-307A, T-308A and T-309B), and toluene in T-308A. The results from the groundwater collected during the re-sampling event on December 5, 2011 from T-309B indicated that chloroform was not longer present above the laboratory detection limits. Again, chloroform concentrations in groundwater, which in absence of a source could potentially be attributed to municipal chlorinated water (potential water line breaks and/or the water used for coring the bedrock), and the toluene exceedance is likely related to on or off-site historical activities; and,
- Groundwater exceedances for the City of Ottawa Sanitary and Storm Sewer Discharge Criteria included PHC F3 + F4 (The commonly applied but unpublished City of Ottawa sanitary and storm sewer use limit is 500 ug/L for the total concentration of PHCs F1 to F4) in T-72A, T-308B and T-309B. The results from the groundwater collected during the re-sampling event on August 25, 2011 from T-72A and December 5, 2011 from T-309B indicated that PHC F3 and F4 were no longer present above the laboratory detection limit. T-308B could not be re-sampled on December 5, 2011 due to access issues. Although not confirmed, the F3 and F4 exceedances at this location are likely related to excess sediment in the original groundwater samples.

6.0 CONCLUSIONS AND RECOMMENDATIONS

As indicated in Section 5.0, fill areas on the Site contain soil in excess of the applicable MOE Table 1 and Table 3 Standards. If excavated, these materials should be managed in accordance with the requirements of the Excess Materials Management Plan (EMMP) to be developed by Project Co as part of the OLRT Project. In general, material in excess of either of the Table 1 or Table 3 Standards will be considered a waste if removed from the Site. If managed on Site, material in excess of MOE Table 3 may require additional assessment (Site Specific Risk Assessment) and/or risk management to be considered suitable for use on the Site. Classification under Ontario Regulation 347 General – Waste Management as amended would be necessary if soil is to be disposed of at a licensed waste disposal facility.

As indicated in Section 5.0, groundwater results had concentrations above the MOE Table 3 Standards and the City of Ottawa Storm Sewer and Sanitary Sewer discharge criteria. However, following re-sampling the PHC concentrations were no longer detected above the laboratory detection limits. Therefore the exceedances of MOE Table 3 and Sanitary Sewers for PHCs were likely the result of elevated sediment in the original groundwater samples and are not likely present in the groundwater at the Site. Construction groundwater monitoring should be implemented to monitor the actual concentrations of contaminants during dewatering.

7.0 REPORT LIMITATIONS

This report was prepared for the exclusive use of Capital Transit Partners and the City of Ottawa. The report, which specifically includes all text and figures, is based on data and information collected during the document review and Site investigation work conducted by Golder Associates Ltd. and is based solely on the Site conditions at the time of the Site work, supplemented by historical information and data obtained by Golder Associates Ltd. as described in this report.

The assessment of environmental conditions at the Site has been made using the results of chemical analysis of discrete soil and groundwater samples from a limited number of locations. The Site conditions between sampling locations have been inferred based on conditions observed at sampling locations. Additional study, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of study. However, it is never possible, even with exhaustive sampling and testing, to dismiss the possibility that part of a Site may be contaminated and remain undetected.

The services performed, as described in this report, were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The content of this report is based on information collected during Golder Associates Ltd. Site work; present understanding of the Site conditions, and professional judgment in light of such information at the time of this report. This report provides a professional opinion and therefore no warranty is either expressed, implied, or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statutes are subject to change.

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

8.0 CLOSURE

We trust that this report meets your current needs. If you have any questions, or if we may be of further assistance, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

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Senior Due Diligence Assessor

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9.0 REFERENCES

City of Ottawa, Sewer Use BY-LAW NO. 2003-514, SCHEDULE "A" - TABLES, Table 1. Limits for Sanitary and Combined Sewers Discharge

City of Ottawa, Sewer Use BY-LAW NO. 2003-514, SCHEDULE "A" - TABLES, Table 1. Limits for Storm Sewer Discharge

Golder Associates Ltd. Phase I Environmental Site Assessment, 156-160 Lyon Street, Ottawa, Ontario. September, 2011.

Ministry of the Environment (MOE). 2011. Soil, Ground Water and Sediment Standards for Use under Part XV.1 of the Environmental Protection Act, dated April 15, 2011

Parameter	MOE Table 1 [1]	MOE Table 3[2]	T-72 SA1	T-72 SA4	T-306 SA1	T-307 SA1	T-309 SA1
Sample Date			**19-May-11**	**19-May-11**	**3-Nov-11**	**2-Nov-11**	**1-Nov-11**
pH (pH Units)						7.8	
Metals							
Antimony	1.3	40	<1	<1	**4**	<1	<1
Arsenic	18	18	3	2	<1	5	<1
Barium	220	670	213	41	**413**	**255**	40
Beryllium	2.5	8	<0.5	<0.5	<0.5	<0.5	<0.5
Boron			7.6	<5.0	<5.0	<5.0	<5.0
Cadmium	1.2	1.9	<0.5	<0.5	<0.5	0.8	<0.5
Chromium	70	160	17	15	7	18	<5
Chromium VI	0.66	8	<1.0	<0.4	<0.4	<0.4	<0.4
Cobalt	21	80	4	4	2	5	2
Copper	92	230	22	16	7	27	5
Lead	120	120	53	4	**438**	**258**	25
Mercury	0.27	3.9	0.2	<0.1	**1.2**	**0.7**	<0.1
Molybdenum	2	40	2	**4**	<1	<1	<1
Nickel	82	270	15	10	6	13	7
Selenium	1.5	5.5	<1	<1	<1	<1	<1
Silver	0.5	40	<0.3	**2.2**	<0.3	<0.3	<0.3
Thallium	1	3.3	<1	<1	<1	<1	<1
Uranium	2.5	33	<1	<1	<1	<1	<1
Vanadium	86	86	19	19	<10	24	<10
Zinc	290	340	39	<20	266	**312**	42

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Checked by: BGS/BCJM

All units expressed in ug/g.

Bold Underlined Exceeds MOE Table 1 Standards

Shaded Exceeds MOE Table 3 Standards

1- Ontario Soil, Groundwater & Sediment Standards (O. Reg 153/04 as amended) - Table 1 - Background for Res./Parkland/Institutional/Ind./Com./Community Property Use (all soil textures)

2- Ontario Soil, Groundwater & Sediment Standards (O. Reg. 154/04 as amended) - Table 3 - for a Non-Potable Groundwater Situation in an Industrial/Commercial/Community property use (coarse textured soil)

Parameter	MOE Table 1 [1]	MOE Table 3 [2]	T-72 SA1	T-72 SA4	T-306 SA1	T-306 SA3	T-307 SA1	T-307 SA5	T-308 SA3	T-308 SA6	T-309 SA1	T-309 SA4	T-309 SA4A (duplicate sample)
			19-May-11	19-May-11	3-Nov-11	3-Nov-11	2-Nov-11	2-Nov-11	1-Nov-11	1-Nov-11	1-Nov-11	1-Nov-11	1-Nov-11
Hydrocarbons													
F1 PHCs (C6-C10)	25	55	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F2 PHCs (C10-C16)	10	230	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
F3 PHCs (C16-C34)	240	1700	<10	<10	40	<10	82	<10	<10	<10	28	<10	<10
F4 PHCs (C34-C50)	120	3300	<10	<10	101	<10	40	<10	<10	<10	29	<10	<10

All units expressed in ug/g.

Created by: KF
Checked by: BGS/BCJM

Bold Underlined Exceeds MOE Table 1 Standards
Shaded Exceeds MOE Table 3 Standards

1- Ontario Soil, Groundwater & Sediment Standards (O. Reg 153/04 as amended) - Table 1 - Background for Res./Parkland/Institutional/Ind./Com./Community Property Use (all soil textures)

2- Ontario Soil, Groundwater & Sediment Standards (O. Reg. 154/04 as amended) - Table 3 - for a Non-Potable Groundwater Situation in an Industrial/Commercial/Community property use (coarse textured soil)

Table 3: Soil Analytical Results - VOCs

Parameter	MOE Table 1[1]	MOE Table 3[2]	T-72 SA1	T-72 SA4	T-306 SA1	T-306 SA3	T-307 SA1	T-307 SA5
Sample Date			19-May-11	19-May-11	3-Nov-11	3-Nov-11	2-Nov-11	2-Nov-11
Volatile Organic Compounds								
Acetone	0.5	16	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzene	0.2	0.32	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Bromodichloromethane	0.05	18	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Bromoform	0.05	0.61	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Bromomethane	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Carbon Tetrachloride	0.05	0.21	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorobenzene	0.05	2.4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloroethane	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloroform	0.05	0.47	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chloromethane	0.2	--	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dibromochloromethane	0.05	13	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dichlorodifluoromethane	0.05	16	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,2-Dichlorobenzene	0.05	6.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,3-Dichlorobenzene	0.05	9.6	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,4-Dichlorobenzene	0.05	0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethane	0.05	17	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,2-Dichloroethane	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethylene	0.05	0.064	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
cis-1,2-Dichloroethylene	0.05	55	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
trans-1,2-Dichloroethylene	0.05	1.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,2-Dichloropropane	0.05	0.16	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
cis-1,3-Dichloropropylene	0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
trans, 1,3-Dichloropropylene	0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,3-dichloropropene, total	0.05	0.18	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	0.05	9.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexane	0.05	46	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methyl Ethyl Ketone (2-Butanone)	0.5	70	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl Ethyl Ketone (2-Hexanone)	2	--	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Methyl Isobutyl Ketone	0.5	31	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl-t-Butyl Ether	0.05	11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methylene Chloride	0.05	1.6	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05
Styrene	0.05	34	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05
1,1,1,2-Tetrachloroethane	0.05	0.087	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05
1,1,2,2-Tetrachloroethane	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05
Tetrachloroethylene	0.05	4.5	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05
Toluene	0.2	68	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05
1,1,1-Trichloroethane	--	6.1	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05
1,1,2-Trichloroethane	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05
Trichloroethylene	0.05	0.91	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05
Trichlorofluoromethane	0.25	4	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05
1,3,5-Trimethylbenzene	0.05	--	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05
Vinyl Chloride	0.2	0.032	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
m/p-Xylene	0.5	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.5	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.5	26	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

All units expressed in ug/L.
-- no criteria available

Bold Underlined Exceeds MOE Table 1 Standards

Shaded Exceeds MOE Table 3 Standards

1- Ontario Soil, Groundwater & Sediment Standards (O. Reg 153/04 as amended July 2009 - Table 1 - Background for Res./Parkland/Institutional/Ind./Com./Community Property Use (all soil textures)

2- Ontario Soil, Groundwater & Sediment Standards (O. Reg 154/04 as amended July 2009 - Table 3 - for a Non-Potable Groundwater Situation in an Industrial/Commercial/Community property use (coarse textured soil)

Table 3: Soil Analytical Results - VOCs

Parameter	MOE Table 1[1]	MOE Table 3[2]	T-308 SA3	T-308 SA6	T-309 SA1	T-309 SA4	T-309 SA4A (duplicate sample)
Sample Date			1-Nov-11	1-Nov-11	1-Nov-11	1-Nov-11	1-Nov-11
Volatile Organic Compounds							
Acetone	0.5	16	<0.5	<0.5	<0.5	<0.5	<0.5
Benzene	0.2	0.32	<0.02	<0.02	<0.02	<0.02	<0.02
Bromodichloromethane	0.05	18	<0.05	<0.05	<0.05	<0.05	<0.05
Bromoform	0.05	0.61	<0.05	<0.05	<0.05	<0.05	<0.05
Bromomethane	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Carbon Tetrachloride	0.05	0.21	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorobenzene	0.05	2.4	<0.05	<0.05	<0.05	<0.05	<0.05
Chloroethane	--	--	<0.05	<0.05	<0.05	<0.05	<0.05
Chloroform	0.05	0.47	<0.05	<0.05	<0.05	<0.05	<0.05
Chloromethane	0.2	--	<0.2	<0.2	<0.2	<0.2	<0.2
Dibromochloromethane	0.05	13	<0.05	<0.05	<0.05	<0.05	<0.05
Dichlorodifluoromethane	0.05	16	<0.05	<0.05	<0.05	<0.05	<0.05
1,2-Dichlorobenzene	0.05	6.8	<0.05	<0.05	<0.05	<0.05	<0.05
1,3-Dichlorobenzene	0.05	9.6	<0.05	<0.05	<0.05	<0.05	<0.05
1,4-Dichlorobenzene	0.05	0.2	<0.05	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethane	0.05	17	<0.05	<0.05	<0.05	<0.05	<0.05
1,2-Dichloroethane	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethylene	0.05	0.064	<0.05	<0.05	<0.05	<0.05	<0.05
cis-1,2-Dichloroethylene	0.05	55	<0.05	<0.05	<0.05	<0.05	<0.05
trans-1,2-Dichloroethylene	0.05	1.3	<0.05	<0.05	<0.05	<0.05	<0.05
1,2-Dichloropropane	0.05	0.16	<0.05	<0.05	<0.05	<0.05	<0.05
cis-1,3-Dichloropropylene	0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05
trans, 1,3-Dichloropropylene	0.05	--	<0.05	<0.05	<0.05	<0.05	<0.05
1,3-dichloropropene, total	0.05	0.18	<0.05	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	0.05	9.5	<0.05	<0.05	<0.05	<0.05	<0.05
Hexane	0.05	46	<0.05	<0.05	<0.05	<0.05	<0.05
Methyl Ethyl Ketone (2-Butanone)	0.5	70	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl Ethyl Ketone (2-Hexanone)	2	--	<2.0	<2.0	<2.0	<2.0	<2.0
Methyl Isobutyl Ketone	0.5	31	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl-t-Butyl Ether	0.05	11	<0.05	<0.05	<0.05	<0.05	<0.05
Methylene Chloride	0.05	1.6	<0.05	<0.05	<0.5	<0.5	<0.5
Styrene	0.05	34	<0.05	<0.05	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	0.05	0.087	<0.05	<0.05	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.05	0.05	<0.05	<0.05	<0.5	<0.5	<0.5
Tetrachloroethylene	0.05	4.5	<0.05	<0.05	<0.5	<0.5	<0.5
Toluene	0.2	68	<0.05	<0.05	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	--	6.1	<0.05	<0.05	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	0.05	0.05	<0.05	<0.05	<0.5	<0.5	<0.5
Trichloroethylene	0.05	0.91	<0.05	<0.05	<0.5	<0.5	<0.5
Trichlorofluoromethane	0.25	4	<0.05	<0.05	<0.5	<0.5	<0.5
1,3,5-Trimethylbenzene	0.05	--	<0.05	<0.05	<0.5	<0.5	<0.5
Vinyl Chloride	0.2	0.032	<0.02	<0.02	<0.02	<0.02	<0.02
m/p-Xylene	0.5	--	<0.05	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.5	--	<0.05	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.5	26	<0.05	<0.05	<0.05	<0.05	<0.05

Table 4: Groundwater Analytical Results - Petroleum Hydrocarbons

Parameter	City of Ottawa Storm Sewer Limit[1]	City of Ottawa Sanitary Sewer Limit[2]	MOE Table 3[3]	T-72A	T-72B	T-72A	T-72B	T-72B	T-306B	T-308B	T309B	T309B
Sample Date				30-Jun-11	28-Jun-11	25-Aug-11	25-Aug-11	5-Dec-11	5-Dec-11	10-Nov-11	10-Nov-11	5-Dec-11
Hydrocarbons												
F1 (C6-C10)	500 ug/L	500 ug/L	750	<25	<25	<25	<25	<25	<25	<25	<25	<25
F2 (C10-C16)			150	**180**	<100	<100	<100	<100	<100	<100	<100	<100
F3 (C16-C34)			500	**246**	<100	<100	<100	<100	<100	**1680**	**3080**	<100
F4 (C34-C50)			500	**429**	<100	<100	<100	<100	<100	**856**	**1060**	<100

All units expressed in ug/L.

Created by: KF
Checked by: BGS/NM

Bold Underlined Exceeds Sewer Use Discharge (unpublished) Criteria[4]

Shaded Exceeds MOE Table 3

1- City of Ottawa Sewer Use Discharge Criteria for Storm Sewers

2- City of Ottawa Sewer Use Dishcarge Criteria for Sanitary or Combined Sewers

3- Ontario Soil, Groundwater and Sediment Standards (O. Reg. 153/04 as amended) -Table 3 - Non-Potable Ground Water in an Industrial/Commercial/Community/Property Use (Coarse Textured Soil)

4- The City of Ottawa unpublished sewer use limit is 500 ug/L for the total concentration of F1 to F4

Parameter	City of Ottawa Storm Sewer Limit[1]	City of Ottawa Sanitary Sewer Limit[2]	MOE Table 3[3]	T-72A	T-72B	T-72A	T-72B	T-72B	T-306A	DUPE (for T-306A)
Sample Date				30-Jun-11	28-Jun-11	23-Aug-11	23-Aug-11	5-Dec-11	10-Nov-11	10-Nov-11
Volatile Organic Compounds										
Acetone	--	--	130000	<5.0	<5.0	<5.0	<5.0	<5.0	41.9	45.7
Benzene	2	10	44	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	--	350	85000	<0.5	<0.5	<0.5	<0.5	<0.5	1.9	1.6
Bromoform	--	630	380	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromomethane	--	110	5.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	--	57	0.79	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	--	57	630	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroethane	--	--	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	2	80	2.4	<0.5	<0.5	<0.5	<0.5	<0.5	**13.5**	**13.9**
Chloromethane		--	--	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Dibromochloromethane	--	57	82000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	--	--	4400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	--	--	0.25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	5.6	88	4600	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	--	36	9600	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	6.8	17	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	--	200	320	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-dichloroethane	--	210	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,2-dichloroethylene	5.6	200	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropane, total	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethylene, total	--	40	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0	850	16	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	--	70	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	--	70	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	2	57	2300	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexane	--	--	51	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	--	--	470000	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl Ethyl Ketone (2-Hexanone)	--	--	470000	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Methyl Isobutyl Ketone	--	--	140000	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl-t-Butyl Ether	--	--	190	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.2	210	610	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Styrene	--	40	1300	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	--	--	3.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	17	40	3.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	4.4	50	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	2	80	18000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	--	54	640	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	--	80	4.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	7.6	54	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	--	--	2500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl Chloride	--	400	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
m/p-Xylene	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
o-Xylene	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes, total	4.4	320	4200	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

All units expressed in ug/L.

-- no criteria available

Bold Underlined	Exceeds Storm Sewer Discharge Criteria
Italics	Exceeds Sanitary or Combined Sewer Discharge Criteria
Shaded	Exceeds MOE Table 3 Standards

1- City of Ottawa Sewer Use Discharge Criteria for Storm Sewers

2- City of Ottawa Sewer Use Dishcarge Criteira for Sanitary or Combined Sewers

3- Ontario Soil, Groundwater and Sediment Standards (O. Reg. 153/04 as amended -Table 3 - Non-Potable Ground Water in an Industrial/Commercial/Community/Property Use (Coarse Textured Soil)

Parameter	City of Ottawa Storm Sewer Limit[1]	City of Ottawa Sanitary Sewer Limit[2]	MOE Table 3[3]	T-306B	T-307A	T-308A	T-308B	T-309A	T-309B	T-309B
Sample Date				5-Dec-11	10-Nov-11	10-Nov-11	10-Nov-11	10-Nov-11	10-Nov-11	5-Dec-11
Volatile Organic Compounds										
Acetone	--	--	130000	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzene	2	10	44	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	--	350	85000	<0.5	<0.5	3.4	<0.5	<0.5	<0.5	<0.5
Bromoform	--	630	380	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromomethane	--	110	5.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	--	57	0.79	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	--	57	630	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroethane	--	--	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	2	80	2.4	<0.5	**2.1**	**18.6**	2.0	1.9	**5.4**	<0.5
Chloromethane		--	--	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Dibromochloromethane	--	57	82000	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	--	--	4400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	--	--	0.25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	5.6	88	4600	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	--	36	9600	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	6.8	17	8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	--	200	320	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-dichloroethane	--	210	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,2-dichloroethylene	5.6	200	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropane, total	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethylene, total	--	40	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0	850	16	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	--	70	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	--	70	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	2	57	2300	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexane	--	--	51	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	--	--	470000	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl Ethyl Ketone (2-Hexanone)	--	--	470000	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Methyl Isobutyl Ketone	--	--	140000	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl-t-Butyl Ether	--	--	190	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.2	210	610	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Styrene	--	40	1300	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1,2-Tetrachloroethane	--	--	3.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	17	40	3.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	4.4	50	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	2	80	18000	<0.5	<0.5	**8.2**	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	--	54	640	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	--	80	4.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	7.6	54	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	--	--	2500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl Chloride	--	400	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
m/p-Xylene	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
o-Xylene	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes, total	4.4	320	4200	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

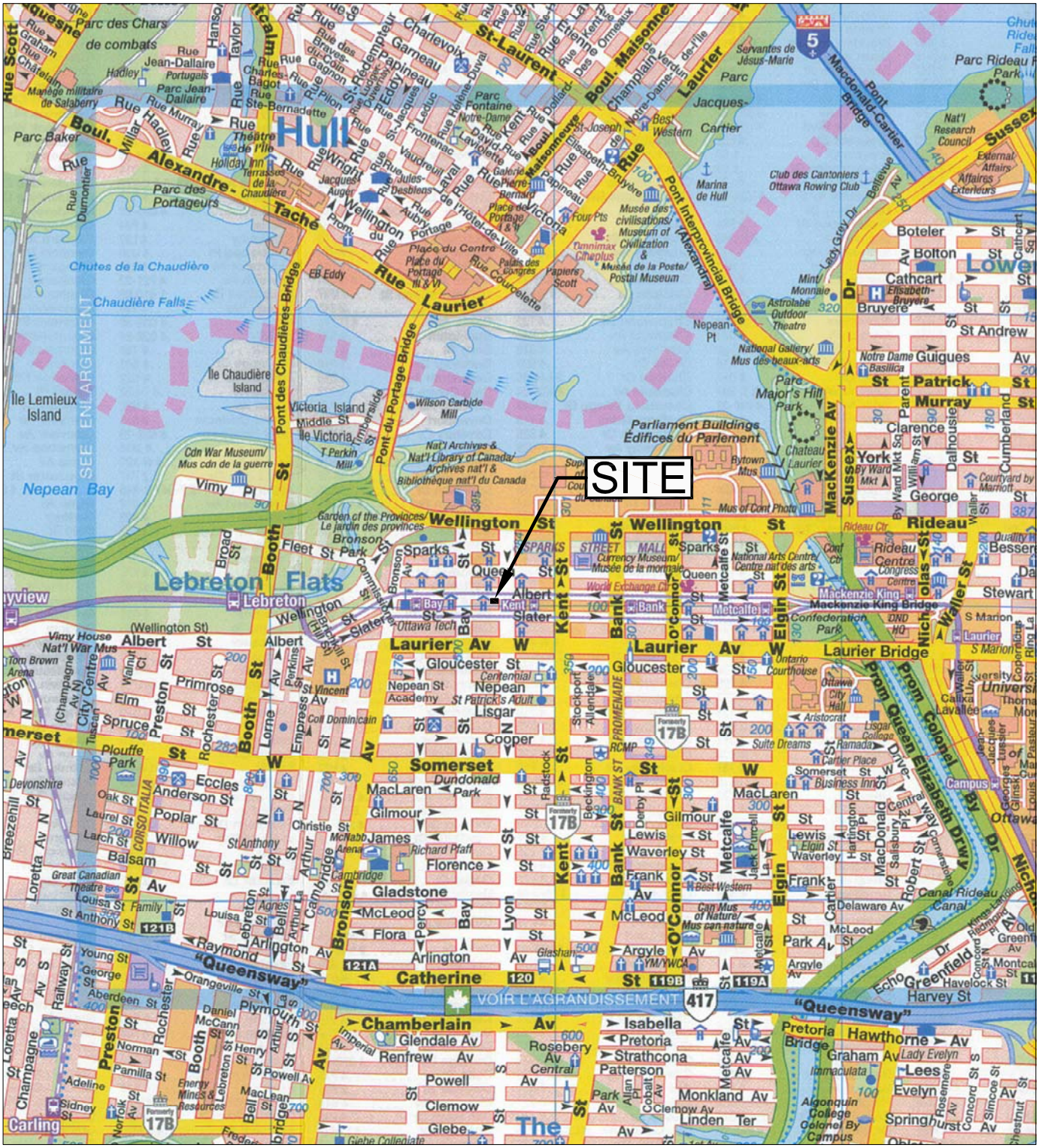
All units expressed in ug/L.

-- no criteria available

Created by: KF
Checked by: BGS/NM

Bold Underlined	Exceeds Storm Sewer Discharge Criteria
Italics	Exceeds Sanitary or Combined Sewer Discharge Criteria
Shaded	Exceeds MOE Table 3 Standards

1- City of Ottawa Sewer Use Discharge Criteria for Storm Sewers
2- City of Ottawa Sewer Use Dishcarge Criteira for Sanitary or Combined Sewers
3- Ontario Soil, Groundwater and Sediment Standards (O. Reg. 153/04 as amended -Table 3 - Non-Potable Ground Water in an Industrial/Commercial/Community/Property Use (Coarse Textured Soil)



NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD. REPORT No. 10-1122-0222/1300-1340

Golder Associates
Ottawa, Ontario, Canada

SCALE	1:20,000
DATE	25 Nov. 2011
DESIGN	B.G.S.
CAD	P.G.
CHECK	B.G.S.
REVIEW	T.D.R.

TITLE

KEY PLAN

FILE No.	1011220222-1300-1340-01.dwg
PROJECT No.	10-1121-0222
REV.	

OTTAWA LIGHT RAIL TRANSIT
PHASE II ESA, 156-160 LYON ST. OTTAWA, ON

FIGURE 1

PLOT DATE: January 10, 2012
FILENAME: N:\Active\GISClients\CityofOttawa\OLRT\ACAD\10-1121-0222\Phase 1300\Task 1340-Phasell\1011220222-1300-1340-01.dwg

ALBERT ST

LYON ST N

156 LYON

160 LYON

APEC 1

T-72

T-306

T-307

T-309

T-308

N

W

E

S

LEGEND

- APPROXIMATE BOREHOLE LOCATION IN PLAN
- SITE BOUNDARY
- APEC 1 - APPROXIMATE LOCATION OF 380 ALBERT STREET, FORMER DRY CLEANER
- APPROXIMATE LOCATION OF PROPERTY LINES

KEY MAP

6 0 6

SCALE 1:300 METRES

REFERENCE

BASE PLAN PROVIDED IN ELECTRONIC FORMAT BY THE CITY OF OTTAWA.

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM MTM9

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD.REPORT No. 10-1121-0222/1300-1340

PROJECT

OTTAWA LIGHT RAIL TRANSIT
PHASE II ESA, 156-160 LYON ST. OTTAWA, ON

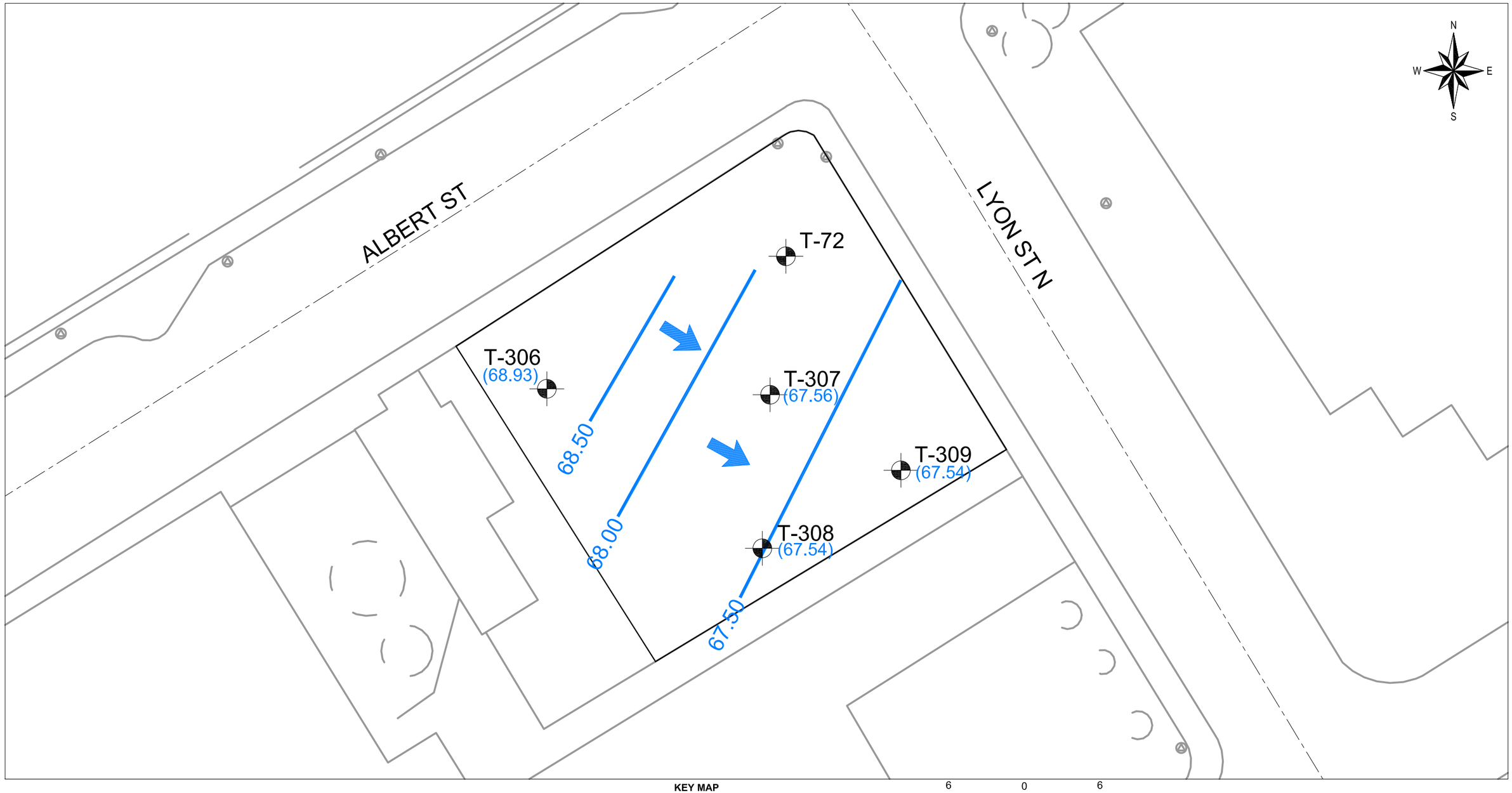
TITLE

SITE PLAN, BOREHOLE/MONITORING WELL LOCATIONS & APECS

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		10-1121-0222	FILE No.	1011220222-1300-1340-02.dwg	
DESIGN	B.G.S.	25 Nov. 2011	SCALE	1:300	REV.
CAD	P.G.	5 Jan. 2012	FIGURE		
CHECK	B.G.S.	Jan. 2012		2	
REVIEW	T.D.R.	Jan. 2012			

PLOT DATE: January 10, 2012
FILENAME: N:\Active\GIS\Clients\CityofOttawa\OLRT\ACAD\10-1121-0222\Phase 1300\Task 1340-Phasell\1011220222-1300-1340-02.dwg



LEGEND

- APPROXIMATE BOREHOLE LOCATION IN PLAN
- (68.93) GROUNDWATER ELEVATION AT MONITORING WELL, metres
- 68.5 GROUNDWATER ELEVATION, metres
- APPROXIMATE SHALLOW GROUNDWATER FLOW DIRECTION

KEY MAP

6 0 6

SCALE 1:300 METRES

REFERENCE

BASE PLAN PROVIDED IN ELECTRONIC FORMAT BY THE CITY OF OTTAWA.

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM MTM9

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD.REPORT No. 10-1121-0222/1300-1340

PROJECT

OTTAWA LIGHT RAIL TRANSIT
PHASE II ESA, 156-160 LYON ST. OTTAWA, ON

TITLE

SHALLOW GROUNDWATER ELEVATION COUNTOURS AND INTERPRETED SHALLOW GROUNDWATER FLOW

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		10-1121-0222	FILE No.	1011220222-1300-1341-03.dwg	
DESIGN	B.G.S.	25 Nov. 2011	SCALE	1:300	REV.
CAD	P.G.	5 Jan. 2012	FIGURE		
CHECK	B.G.S.	Jan. 2012		3	
REVIEW	T.D.R.	Jan. 2012			

PLOT DATE: January 10, 2012
FILENAME: N:\Active\GISClients\CityofOttawa\OLRT\ACAD\10-1121-0222\Phase 1300\Task 1340-PhaseII\1011220222-1300-1341-03.dwg

LEGEND

- APPROXIMATE BOREHOLE LOCATION IN PLAN
- INTERPRETED METAL EXCEEDANCES IN THE FILL MATERIAL ACROSS THE SITE
- SA1 - LEAD — LEAD EXCEEDANCE IN SAMPLE 1

KEY MAP

6 0 6
SCALE 1:300 METRES

REFERENCE

BASE PLAN PROVIDED IN ELECTRONIC FORMAT BY THE CITY OF OTTAWA.

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM MTM9

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD.REPORT No. 10-1121-0222/1300-1340

PROJECT

OTTAWA LIGHT RAIL TRANSIT
PHASE II ESA, 156-160 LYON ST. OTTAWA, ON

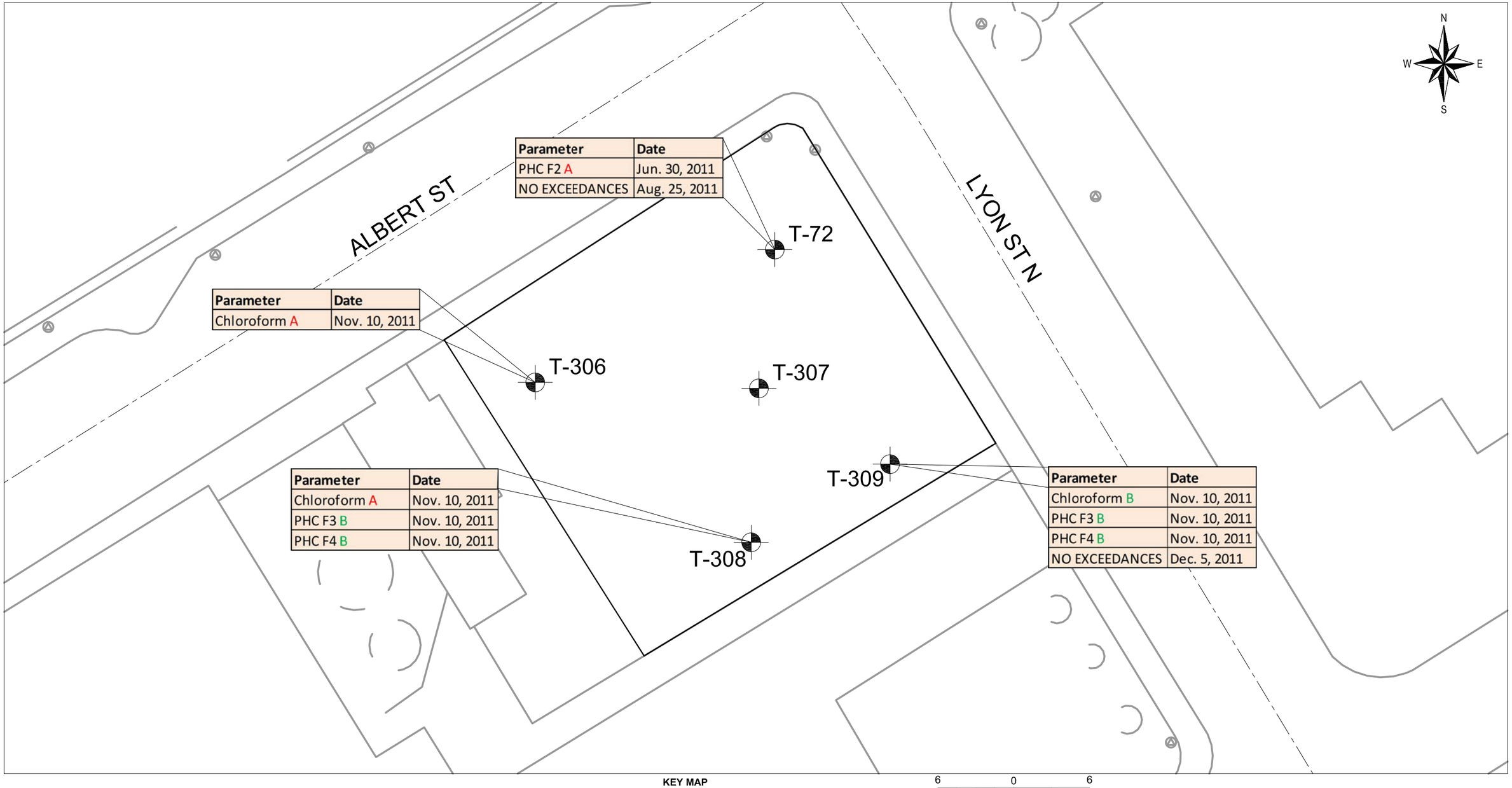
TITLE

SUMMARY OF MOE TABLE 3 SOIL EXCEEDANCES

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		10-1121-0222	FILE No.	1011220222-1300-1341-04.dwg	
DESIGN	B.G.S.	25 Nov. 2011	SCALE	1:300	REV.
CAD	P.G.	5 Jan. 2012	FIGURE		
CHECK	B.G.S.	Jan. 2012		4	
REVIEW	T.D.R.	Jan. 2012			

PLOT DATE: January 10, 2012
FILENAME: N:\Active\GIS\Clients\CityofOttawa\OLRT\ACAD\10-1121-0222\Phase 1300\Task 1340-Phasell\1011220222-1300-1341-04.dwg



LEGEND

- APPROXIMATE BOREHOLE LOCATION IN PLAN
- A — DEEP WELLS
- B — SHALLOW WELLS

KEY MAP

SCALE 1:300 — 6 0 6 METRES

REFERENCE

BASE PLAN PROVIDED IN ELECTRONIC FORMAT BY THE CITY OF OTTAWA.

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM MTM9

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING GOLDER ASSOCIATES LTD.REPORT No. 10-1121-0222/1300-1340

PROJECT
OTTAWA LIGHT RAIL TRANSIT
PHASE II ESA, 156-160 LYON ST. OTTAWA, ON

TITLE
SUMMARY OF MOE TABLE 3 GROUNDWATER EXCEEDANCES

Golder Associates
Ottawa, Ontario, Canada

PROJECT No.		10-1121-0222	FILE No.	1011220222-1300-1341-05.dwg
DESIGN	B.G.S.	25 Nov. 2011	SCALE	1:300 REV.
CAD	P.G.	5 Jan. 2012	FIGURE	5
CHECK	B.G.S.	Jan. 2012		
REVIEW	T.D.R.	Jan. 2012		

PLOT DATE: January 12, 2012
FILENAME: N:\Active\GISClients\CityofOttawa\OLRT\ACAD\10-1121-0222\Phase 1300\Task 1340-Phase II\1011220222-1300-1341-05.dwg

APPENDIX A

Borehole and Well Instrumentation Logs

LIST OF ABBREVIATIONS

The abbreviations commonly employed on Records of Boreholes, on figures and in the text of the report are as follows:

I. SAMPLE TYPE

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Denison type sample
FS	Foil sample
RC	Rock core
SC	Soil core
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample
DT	Dual Tube sample

II. PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:
The number of blows by a 63.5 kg. (140 lb.) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) drive open Sampler for a distance of 300 mm (12 in.)
DD- Diamond Drilling

Dynamic Penetration Resistance; N_d:
The number of blows by a 63.5 kg (140 lb.) hammer dropped 760 mm (30 in.) to drive Uncased a 50 mm (2 in.) diameter, 60^0 cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

Peizo-Cone Penetration Test (CPT):
An electronic cone penetrometer with a 60^0 conical tip and a projected end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (Q_t), porewater pressure (PWP) and friction along a sleeve are recorded Electronically at 25 mm penetration intervals.

III. SOIL DESCRIPTION

(a) Cohesionless Soils

Density Index (Relative Density)	**N** Blows/300 mm Or Blows/ft.
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	over 50

(b) Cohesive Soils

Consistency	**C_u or S_u** Kpa	Psf
Very soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1,000
Stiff	50 to 100	1,000 to 2,000
Very stiff	100 to 200	2,000 to 4,000
Hard	Over 200	Over 4,000

IV. SOIL TESTS

w	water content
w_p	plastic limited
w_1	liquid limit
C	consolidaiton (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, G_s)
DS	direct shear test
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	modified Proctor compaction test
SPC	standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V	field vane test (LV-laboratory vane test)
γ	unit weight

Note:
1. Tests which are anisotropically consolidated prior shear are shown as CAD, CAU.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	= 3.1416
ln x, natural logarithm of x	
$\log_{10}$ x or log x,	logarithm of x to base 10
g	Acceleration due to gravity
t	time
F	factor of safety
V	volume
W	weight

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma'$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
ν	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma''-u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1\sigma_2\sigma_3$	principal stresses (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress = $(\sigma_1+\sigma_2+\sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight*)
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma'=\gamma-\gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R= p_s/p_w$) formerly (G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is p. Unit weight symbol is γ where γ=pg(i.e. mass density x acceleration due to gravity)

(a) Index Properties (cont'd.)

w	water content
w_1	liquid limit
w_p	plastic limit
I_p	plasticity Index=(w_1-w_p)
w_s	shrinkage limit
I_L	liquidity index=$(w-w_p)/I_p$
I_c	consistency index=$(w_1-w)/I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index-$(e_{max}-e)/(e_{max}-e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (overconsolidated range)
C_s	swelling index
C_a	coefficient of secondary consolidation
m_v	coefficient of volume change
c_v	coefficient of consolidation
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation pressure
OCR	Overconsolidation ratio=σ'_p/σ'_{vo}

(d) Shear Strength

$\tau_p\tau_r$	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction=tan δ
c'	effective cohesion
c_u, s_u	undrained shear strength (ϕ=0 analysis)
p	mean total stress $(\sigma_1+\sigma_3)/2$
p'	mean effective stress $(\sigma'_1+\sigma'_3)/2$
q	$(\sigma_1-\sigma_3)/2$ or $(\sigma'_1-\sigma_3)/2$
q_u	compressive strength $(\sigma_1-\sigma_3)$
S_t	sensitivity

Notes: 1. $\tau=c'\sigma'\tan\phi'$

2. Shear strength=(Compressive strength)/2

PROJECT: 10-1121-0222

RECORD OF BOREHOLE: T-72

SHEET 1 OF 1

LOCATION: N 5031198.61 ;E 367059.95

BORING DATE: May 19-31, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-6} 10^{-4} 10^{-2}) / WATER CONTENT PERCENT (Wp, W, Wl)	ADDITIONAL LAB. TESTING	
		GROUND SURFACE		73.20							'B' 'A'
0	Power Auger 200mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.00							Flush mount casing set in Bentonite
		Compact brown sandy gravel, trace brick, with cobble and boulders (FILL)		0.08							
1					1	50 DO	25				
				71.68							
		COBBLES and BOULDERS		1.52	2	HQ RC	DD				
2				70.91							
		Compact to dense grey brown SILTY SAND, some gravel, trace clay, with cobbles and boulders (GLACIAL TILL)		2.29	3	50 DO	16		O	MH	
3											
					4	50 DO	46				W.L. in Screen 'A' at Elev. 67.5m on Aug. 2, 2011
4					5	50 DO	>50				W.L. in Screen 'B' at Elev. 67.5m on Aug. 2, 2011
				68.50							
		Borehole continued on RECORD OF DRILLHOLE T-72									
5											Bentonite Seal
6											
7											
8											
9											
10											

OLRT-SOIL 101121022-1300.GPJ GAL-MIS.GDT 10/21/11 JEM/JM

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: DAC

CHECKED: MRR

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-72

SHEET 1 OF 5

LOCATION: N 5031198.61 ;E 367059.95

DRILLING DATE: May 19-31, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing

JN - Joint, FLT - Fault, SH - Shear, VN - Vein, CJ - Conjugate; BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Clean; PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular; PO- Polished, K - Slickensided, SM- Smooth, RO- Rough, MB- Mechanical Break; BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	WEATHERING INDEX	NOTES
		BEDROCK SURFACE		68.50														'B' 'A'
5	Rotary Drill HQ Core	Fresh to slightly weathered, dark brownish grey, fine grained with widely disseminated medium grained calcite crystals, non porous, medium bedded, medium strong, argillaceous to shaley, micritic NODULAR LIMESTONE, 5 to 15 cm nodules in dark grey to black shaley matrix with fossil. Shale and shaley limestone comprises approximately 12.5 % to 17.5 % of sequence.		4.70	1	0						JN,UN,Ro Cl JN,UN,Ro Cl BD,UN,SM Fe ox	12 12 15	3 3 2	4 4 2			
												BD,PL,Ro Fe ox	16	1.5	2			
6		LINDSAY FORMATION UNIT 2										BD,UN,SM Cl BD,UN,Ro Cl BD,UN,SM Cl	12 12 12	3 3 3	4 4 4			
					2	0						BD,PL,Ro Fe ox	16	1.5	2			
7												BD,PL,Ro Cl BD,PL,SM	12 12	1.5 1	4 2			
				65.74								BD,UN,Ro Br	20	3	2			
		Fresh, medium brownish grey, fine to medium grained crystalline, non porous, medium to thickly bedded, medium strong, argillaceous, calcarenitic NODULAR LIMESTONE with 5 to 10 cm nodules and individual beds of calcarenite. Shale and shaley limestone comprise approximately 5 % to 7.5 % of sequence.		7.46														
8					3	0						BD,PL,Ro	20	1.5	1			Bentonite Seal
9		- No recovery/broken core from 8.87m to 9.40m, cobble sized fragments of limestone, fresh			4	0						BD,PL,SM Br	12	1	2			
10												HVN,, Ca 1mm	25	4	0.75			
												BD,UN,Ro BD,PL,SM Br	20 12	3 1	2 2			
11		- Shale bed from 10.90m to 10.98m - Shale bed from 11.23m to 11.27m			5	25						BD,PL,SM Br	12	1	2			
												JN,PL,Ro Br	6	1	3			Silica Sand
12												JN,PL,Ro Cl 2mm BD,PL,Ro Br	15 18	1.5 1.5	2 2			
					6	0						BD,ST,Ro Br	9	1	3			
13				60.20														
		Fresh, medium brownish grey, fine to medium grained crystalline, non porous, medium to thickly bedded, medium strong, calcarenitic, weakly fossiliferous, argillaceous NODULAR LIMESTONE with 2 to 8 cm nodules. Shale and shaley limestone comprise <2.5 % of sequence.		13.00								HVN,, Cl 1mm	25	4	0.75			32mm Diam. PVC #10 Slot Screen 'B'
14		LINDSAY FORMATION UNIT 1			7	0						BD,UN,Ro Ca 1mm	20	3	2			
		CONTINUED NEXT PAGE																

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: DAC

CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 10/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-72

SHEET 2 OF 5

LOCATION: N 5031198.61 ;E 367059.95

DRILLING DATE: May 19-31, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing

JN - Joint, FLT - Fault, SH - Shear, VN - Vein, CJ - Conjugate
BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Clean
PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular
PO - Polished, K - Slickensided, SM - Smooth, RO - Rough, MB - Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA DIP W.J.I. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	WEATHERING INDEX	NOTES
		--- CONTINUED FROM PREVIOUS PAGE ---																'B' 'A'
15	Rotary Drill HQ Core	Fresh, medium brownish grey, fine to medium grained crystalline, non porous, medium to thickly bedded, medium strong, calcarenitic, weakly fossiliferous, argillaceous NODULAR LIMESTONE with 2 to 8 cm nodules. Shale and shaley limestone comprise <2.5 % of sequence.			7	0						BD,UN,Ro	20	3	2			32mm Diam. PVC #10 Slot Screen 'B'
												BD,UN,Ro	20	3	1			
16		LINDSAY FORMATION UNIT 1			8	0						BD,UN,Ro	20	3	1			Silica Sand
												BD,IR,Ro	20	3	1			
17												HVN,PL,Ro Ca 2mm	16	4	0.75			
					9	0						BD,IR,Ro	16	3	2			
												JN,PL,Ro	12	1.5	1			
												BD,ST,Ro	20	3	1			
												BD,PL,Ro	20	1.5	1			
18												BD,ST,Ro	20	3	1			
												HVN,,	25		0.75			
19					10	0						BD,UN,Ro	16	3	2			
												BD,UN,Ro	16	3	2			
20																		
					11	0						BD,UN,Ro	20	3	2			
21												JN,PL,Ro	20	1.5	1			Bentonite Seal
												HVN,UN,						
												BD,UN,Ro	20	3	1			
					12	0						BD,UN,SM	16	2	1			
22																		
23												BD,PL,Ro	16	1.5	1			
					13	0						BD,UN,Ro	22	3	1			
				49.45								JN,IR,Ro	20	3	1			
				23.75								JN/VN,PL,SM Ca	12	1	1			
24												BD,UN,Ro	22	3	1			
					14	0						BD,UN,Ro	20	3	1			
		CONTINUED NEXT PAGE																

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: DAC
CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 10/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-72

SHEET 3 OF 5

LOCATION: N 5031198.61 ;E 367059.95

DRILLING DATE: May 19-31, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing

JN - Joint; FLT - Fault; SH - Shear; VN - Vein; CJ - Conjugate

BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Clean

PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular

PO- Polished; K - Slickensided; SM- Smooth; RO- Rough; MB- Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA: DIP W.R.T. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	WEATHERING INDEX	NOTES
		— CONTINUED FROM PREVIOUS PAGE —																'B' 'A'
25	Rotary Drill HQ Core	Fresh, medium brownish grey, fine to medium grained crystalline, non porous, thinly to medium bedded, medium strong, SHALEY CALCARENITIC LIMESTONE, subordinate nodular limestone, minor thin lithoclastic calcarenite beds and interbeds of dark grey, bedding laminations and very thin to thinly bedded, calcareous, slake susceptible shale at semi regular intervals of 0.25 to 2.5 m. Contains traces of fossil fragments. Top contact of formation is partly obscured by veining. Shale and shaley limestone comprise 7.5 % to 10 % of sequence.			14	0						BD,PL,Ro BD,PL,SM	16 16	1.5 1	1 1			
26					15	25						BD,UN,SM BD,UN,SM CI BD,UN,SM	20 16 16	2 2 2	1 2 2			
27		VERULAM FORMATION UNIT 2 - Shale bed from 26.11m to 26.13m										BD,UN,SM	20	2	1			
		- Shale bed from 27.20m to 27.24m										BD,PL,SM	12	1	2			
28		- Intermittent thin beds of broken shale and limestone from 27.79m to 28.00m			16	25						BD,UN,SM BD,UN,Ro BD,UN,SM BD,UN,Ro CI BD,UN,Ro CI 14cm BD,UN,SM BD,CU,SM BD,UN,Ro BD,UN,Ro BD,UN,SM	20 20 16 20 20 20 20 20 20 28	2 3 1 3 3 2 1 1 3 2	1 1 2 2 1 1 1 2 3 1			Bentonite Seal
		- Shale bed from 28.49m to 28.50m										BD,UN,Ro	20	3	2			
29					17	25						BD,UN,Ro BD,UN,SM BD,UN,Ro BD,UN,SM BD,UN,SM BD,UN,Ro BD,UN,Ro BD,UN,SM BD,PL,SM BD,UN,SM	20 16 20 20 20 20 20 20 16 25	3 2 2 2 2 3 3 2 1 2	2 2 2 1 1 2 1 1 1 1			
30		- Shale bed from 30.12m to 30.16m - Shale bed from 30.34m to 30.38m										BD,UN,SM BD,PL,SM	20 16	2 1	1 1			
31		- Shale bed from 30.89m to 30.91m			18	25						BD,UN,SM BD,UN,SM BD,UN,SM BD,UN,SM BD,UN,SM BD,UN,SM BD,PL,SM BD,PL,SM BD,UN,SM	16 20 20 20 20 20 16 20 20	2 2 2 2 1 3 1 2 2	2 1 1 1 1 1 1 1 1			
32		- Shale bed from 32.13m to 32.14m - Shale bed from 32.22m to 32.28m			19	25						BD,UN,SM BD,UN,Ro BD,PL,SM BD,UN,SM BD,UN,SM BD,PL,Ro BD,UN,Ro BD,UN,SM	20 22 16 20 20 20 22 20	2 3 1 2 2 1.5 3 2	1 1 1 1 1 1 1 1			
		- Shale bed from 32.64m to 32.67m - Shale bed from 32.77m to 32.80m										BD,UN,Ro CI BD,UN,SM	20 20	3 2	2 1			Silica Sand
33												BD,UN,SM BD,. BD,CU,SM	20 20	2 2	1 1			
34		- Shale bed from 34.13m to 34.19m			20	25						BD,UN,SM BD,UN,Ro BD,PL,SM BD,PL,SM BD,PL,SM BD,PL,SM	20 22 16 16 12 12	2 3 1 1 1 1	1 1 1 1 2 2			32mm Diam. PVC #10 Slot Screen 'A'
		CONTINUED NEXT PAGE																

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: DAC

CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 10/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-72

SHEET 4 OF 5

LOCATION: N 5031198.61 ;E 367059.95

DRILLING DATE: May 19-31, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing

JN - Joint, FLT - Fault, SH - Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Clean
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, RO- Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	WEATHERING INDEX	NOTES
		— CONTINUED FROM PREVIOUS PAGE —																'B' 'A'
35	Rotary Drill HQ Core	Fresh, medium brownish grey, fine to medium grained crystalline, non porous, thinly to medium bedded, medium strong, SHALEY CALCARENITIC LIMESTONE, subordinate nodular limestone, minor thin lithoclastic calcarenite beds and interbeds of dark grey, bedding laminations and very thin to thinly bedded, calcareous, slake susceptible shale at semi regular intervals of 0.25 to 2.5 m. Contains traces of fossil fragments. Top contact of formation is partly obscured by veining. Shale and shaley limestone comprise 7.5 % to 10 % of sequence.										BD,UN,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
					21	0						BD,UN,Ro	22	3	1			
												BD,PL,Ro	20	1.5	1			
												BD,PL,Ro Ca <1mm	16	1.5	3			
36												BD,CU,Ro	22	3	1			
												BD,CU,Ro	22	3	1			
												BD,PL,Ro Ca	20	1.5	1			
												JN,PL,Ro Ca	16	1.5	2			
												BD,UN,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
37					22	0						BD,UN,Ro	22	3	1			32mm Diam. PVC #10 Slot Screen 'A'
												BD,UN,Ro	22	3	1			
												BD,PL,Ro	20	1.5	1			
												BD,UN,Ro Br 2mm	12	1	4			
												BD,UN,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
38												BD,CU,Ro	20	1.5	1			
												BD,PL,Ro	22	3	1			
												BD,UN,Ro	20	2	1			
												BD,UN,SM						
												BD,CU,Ro	22	3	1			
					23	0						BD,CU,Ro	22	3	1			
39												BD,CU,Ro Br <1mm	20	3	2			
												BD,UN,Ro	22	3	1			
												BD,CU,Ro	22	3	1			
												BD,PL,Ro	20	1.5	1			
												BD,UN,Ro Cl	20	3	2			
												BD,UN,Ro	22	3	1			
												BD,CU,Ro Ca	20	3	2			
40					24	0						BD,UN,Ro	22	3	1			
												BD,CU,SM Cl	20	2	1			
												BD,PL,Ro Br	16	1.5	2			
												BD,UN,Ro	22	3	1			Silica Sand
												BD,UN,Ro Br <1mm	12	1	4			
												BD,UN,Ro Br <1mm	12	1	4			
												BD,UN,Ro	22	3	1			
41												BD,UN,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
												BD,PL,Ro	20	1.5	1			
					25	0						BD,PL,Ro	20	1.5	1			
												BD,PL,Ro	20	1.5	1			
42												BD,PL,Ro Cl <1mm	12	1.5	3			
												BD,UN,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
43					26	0						BD,PL,Ro Cl	16	1.5	2			Bentonite Seal
												BD,UN,SM Cl <1mm	12	2	3			
44												BD,CU,Ro	22	3	1			
					27	0						BD,PL,Ro Cl	16	1.5	2			
		CONTINUED NEXT PAGE																

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: DAC

CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 10/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-72

SHEET 5 OF 5

LOCATION: N 5031198.61 ;E 367059.95

DRILLING DATE: May 19-31, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing

JN - Joint, FLT - Fault, SH - Shear, VN - Vein, CJ - Conjugate
BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Clean
PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular
PO - Polished, K - Slickensided, SM - Smooth, RO - Rough, MB - Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcond	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	WEATHERING INDEX	NOTES
		— CONTINUED FROM PREVIOUS PAGE —																'B' 'A'
45	Rotary Drill HQ Core	Fresh, medium brownish grey, fine to medium grained crystalline, non porous, thinly to medium bedded, medium strong, SHALEY CALCARENITIC LIMESTONE, subordinate nodular limestone, minor thin lithoclastic calcarenite beds and interbeds of dark grey, bedding laminations and very thin to thinly bedded, calcareous, slake susceptible shale at semi regular intervals of 0.25 to 2.5 m. Contains traces of fossil fragments. Top contact of formation is partly obscured by veining. Shale and shaley limestone comprise 7.5 % to 10 % of sequence.			27	0					BD,UN,Ro Cl	20	3	2			
												BD,CU,Ro	22	3	1			
												BD,PL,Ro	20	1.5	1			
46												BD,CU,Ro	22	3	1			
					28	0						BD,PL,Ro Cl	16	1.5	2			
												BD,UN,Ro	22	3	1			
												JN,IR,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
		VERULAM FORMATION UNIT 2										BD,UN,Ro	22	3	1			
47												BD,UN,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
												BD,PL,Ro	20	1.5	1			
					29	0						BD,PL,Ro	20	1.5	1			
												BD,UN,Ro	22	3	1			
48												BD,PL,Ro	20	1.5	1			
												BD,CU,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
												BD,PL,Ro	20	1.5	1			
												BD,PL,Ro	20	1.5	1			
49												BD,PL,Ro	20	1.5	1			
												BD,CU,Ro Br	20	3	2			
					30	0						BD,UN,Ro Br	20	3	2			
												BD,UN,Ro Cl <1mm	12	3	3			
												BD,UN,Ro Cl <1mm	12	3	3			
												BD,UN,Ro Cl <1mm	12	3	3			
												JN,PL,Ro Ca <1mm	12	3	3			
												BD,UN,Ro Cl 80mm	12	3	3			Bentonite Seal
												GO,UN,SM	8	1	8			
50		- Weathered clay filled fracture occurs between 49.65m and 49.82m with 1 to 2cm wide calcite vein from 49.82m to 50.00m - Clay gouge from 49.70m to 49.77m, small angular pieces, likely swelling clay, calcite crystals (1-2cm) filling open vertical joint										BD,UN,Ro	22	3	1			
												BD,UN,Ro Cl	20	2	2			
												BD,UN,Ro Cl	20	3	2			
												BD,UN,Ro Cl	20	3	2			
												BD,UN,Ro Cl	20	3	2			
												JN,UN,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
					31	0						BD,UN,Ro	22	3	1			
												BD,UN,Ro	20	3	2			
												BD,UN,Ro Cl	20	3	2			
51												BD,UN,Ro Cl	20	3	2			
												BD,UN,Ro Cl	20	3	2			
												JN,UN,Ro	22	3	1			
												JN,UN,Ro	22	3	1			
												BD,PL,Ro	20	1.5	1			
					32	0						JN,UN,Ro	22	3	1			
52												BD,PL,Ro	20	1.5	1			
												BD,UN,Ro	22	3	1			
												BD,UN,Ro	22	3	1			
												BD,PL,Ro	16	1.5	1			W.L. in Screen 'A' at Elev. 67.5m on Aug. 2, 2011
53												BD,PL,SM	12	1	1			
					33	0												W.L. in Screen 'B' at Elev. 67.5m on Aug. 2, 2011
54												BD,PL,Ro	12	1	1			
				18.88														
		End of Drillhole		54.32														

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: DAC
CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 10/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF BOREHOLE: T-306

SHEET 1 OF 1

LOCATION: N 5031188.05 ;E 367040.95

BORING DATE: November 3, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa nat V. + Q - rem V. ⊕ U - (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-2}) / WATER CONTENT PERCENT Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	'B' 'A'
0		GROUND SURFACE		73.42							
		ASPHALTIC CONCRETE		0.00							Flush Mount Protective Casing set in Asphalt
		Brown crushed stone (FILL)		73.14							
		Brown silty sand, some gravel, with cobbles (FILL)		0.28							
				72.76							
1	Power Auger 200mm Diam. (Hollow Stem)	Loose brown sandy silt, trace to some gravel, with cobbles, ash, paper, shingles, mortar, wood and organic matter (FILL)		0.66	1	50 DO	5				
				71.92							
2		Very stiff grey brown SILTY CLAY (Weathered Crust)		1.50	2	50 DO	17				
				71.29							
		Loose to compact brown SILTY SAND to SANDY SILT, some gravel, trace clay, with cobbles and boulders (GLACIAL TILL)		2.13							
3					3	50 DO	8				Bentonite Seal
					4	50 DO	18				
4	Rotary Drill HQ core			68.90							
		Borehole continued on RECORD OF DRILLHOLE T-306									
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RI
CHECKED: MRR

OLRT-SOIL 1011210222-1300.GPJ GAL-MIS.GDT 11/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-306

SHEET 1 OF 2

LOCATION: N 5031188.05 ;E 367040.95

DRILLING DATE: November 3, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing

JN - Joint, FLT - Fault, SH - Shear, VN - Vein, CJ - Conjugate; BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Clean; PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular; PO - Polished, K - Slickensided, SM - Smooth, RO - Rough, MB - Mechanical Break; BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	WEATHERING INDEX	NOTES
		BEDROCK SURFACE		68.90														'B' 'A'
	Rotary Drill HQ Core	Fresh, medium bedded, dark brownish grey, fine grained, crystalline, non-porous, medium strong, argillaceous, micritic NODULAR LIMESTONE BEDROCK, with medium to thick interbedding of dark grey to black, fossiliferous shale LINDSAY FORMATION UNIT 2		4.52	1	100						BD,UN,SM	16	2	2			Bentonite Seal Silica Sand
					2	100						BD,PL,SM	16	1	1.5			25mm Diam. PVC #10 Slot Screen 'B'
												BD,PL,Ro	12	1.5	2			
					3	100						BD,UN,SM	16	2	2			Silica Sand
												BD,PL,SM	12	1	2			
												BD,CU,SM	16	2	2			
					4	100						BD,PL,Ro	16	1	2			Bentonite Seal
					5	100												
		Fresh, medium bedded, medium brownish grey, fine to medium grained, crystalline, non-porous, medium strong, calcarenitic, weakly fossiliferous, argillaceous NODULAR LIMESTONE BEDROCK, with thin interbedded dark grey to black shale laminates LINDSAY FORMATION UNIT 1		61.17 12.25	6	100												Silica Sand
					7	100												32mm Diam. PVC #10 Slot Screen 'A'
		CONTINUED NEXT PAGE																

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: RI

CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 11/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-306

SHEET 2 OF 2

LOCATION: N 5031188.05 ;E 367040.95

DRILLING DATE: November 3, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 75

DRILLING CONTRACTOR: Downing

JN - Joint, FLT - Fault, SH - Shear, VN - Vein, CJ - Conjugate
BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Clean
PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular
PO - Polished, K - Slickensided, SM - Smooth, RO - Rough, MB - Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	WEATHERING INDEX	NOTES
		--- CONTINUED FROM PREVIOUS PAGE ---																'B' 'A'
15	Rotary Drill / HQ Core				7	100												32mm Diam. PVC #10 Slot Screen 'A'
				58.31														
		End of Drillhole		15.11														
16																		
17																		
18																		
19																		
20																		
21																		
22																		
23																		
24																		

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: RI
CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 11/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF BOREHOLE: T-307

SHEET 1 OF 1

LOCATION: N 5031187.57 ;E 367058.63

BORING DATE: November 2, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-2}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	'B' 'A'
0		GROUND SURFACE		73.20							
	Power Auger 200mm Diam. (Hollow Stem)	ASPHALTIC CONCRETE		0.00							Flush Mount Protective Casing set in Sand
		Grey crushed stone (FILL)		72.97 0.23							Silica Sand
		Compact red brown sand, some gravel, trace silt and brick fragments (FILL)			1	50 DO	14				
				71.68							
2		Stiff brown SILTY CLAY (Weathered Crust)		1.52	2	50 DO	7				
				70.92							
		Loose to compact brown SANDY SILT to SILTY SAND, some gravel, trace clay, with cobbles and boulders (GLACIAL TILL)		2.28	3	50 DO	8				Bentonite Seal
3					4	50 DO	>50				
4					5	50 DO	10				
				68.78							
		Borehole continued on RECORD OF DRILLHOLE T-307									
5											
6											
7											
8											
9											
10											

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: DWM
CHECKED: MRR

OLRT-SOIL 1011210222-1300.GPJ GAL-MIS.GDT 11/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-307

SHEET 1 OF 2

LOCATION: N 5031187.57 ;E 367058.63

DRILLING DATE: November 2, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing

JN - Joint, FLT - Fault, SH - Shear, VN - Vein, CJ - Conjugate; BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Clean; PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular; PO - Polished, K - Slickensided, SM - Smooth, RO - Rough, MB - Mechanical Break; BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	HYDRAULIC CONDUCTIVITY K, cm/sec: Jcon	Jr	Ja	WEATHERING INDEX	NOTES
		BEDROCK SURFACE		68.78													'B' 'A'
5	Rotary Drill HQ Core	Fresh to slightly weathered, medium bedded, dark brownish grey, fine grained, crystalline, non-porous, medium strong to strong, argillaceous, mictritic NODULAR LIMESTONE BEDROCK, with thin interbeds of grey to black, fossiliferous shale LINDSAY FORMATION UNIT 2 - Possible mechanically broken core from 4.42m to 4.90m		4.42	1	100						FR,, FR,, BD,CU,SM Shale 8mm BD,CU,SM	16 16	2 2	2 2	W1 W2 W3 W4 W5 W6	Bentonite Seal 25mm Diam. PVC #10 Slot Screen 'B'
6					2	0						BD,ST,SM BD,PL,SM JN,UN,SM	16 16 16	2 1 2	3 2 3		
7																	
8					3	0						BD,PL,SM	16	1	3		Silica Sand
9												BD,CU,SM BD,PL,SM	16	2 1	2 2		
10					4	0						BD,CU,SM	16	2	2		
11					5	0						BD,CU,SM BD,PL,SM BD,PL,SM	16 16 16	2 1 1	3 3 3		Bentonite Seal
12				60.70													
13		Fresh, medium bedded, medium brownish grey, fine to medium grained, crystalline, non-porous, medium strong to strong, calcarenitic, weakly fossiliferous, argillaceous NODULAR LIMESTONE BEDROCK, with interbeds of dark grey to black shale laminates LINDSAY FORMATION UNIT 1		12.50	6	0						JN,ST,SM	16	3	3		Silica Sand
14					7	0											32mm Diam. PVC #10 Slot Screen 'A'
		CONTINUED NEXT PAGE															

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: DWM

CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 11/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-307

SHEET 2 OF 2

LOCATION: N 5031187.57 ;E 367058.63

DRILLING DATE: November 2, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing

JN - Joint, FLT - Fault, SH - Shear, VN - Vein, CJ - Conjugate
BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Clean
PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular
PO - Polished, K - Slickensided, SM - Smooth, RO - Rough, MB - Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	WEATHERING INDEX W1	W2	W3	W4	W5	W6	NOTES
		— CONTINUED FROM PREVIOUS PAGE —																					'B' 'A'
15	Rotary Drill HQ Core			58.17	7	0						BD,CU,SM	20	2	2								32mm Diam. PVC #10 Slot Screen 'A'
		End of Drillhole		15.03																			
16																							
17																							
18																							
19																							
20																							
21																							
22																							
23																							
24																							

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: DWM
CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 11/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF BOREHOLE: T-308

SHEET 1 OF 1

LOCATION: N 5031175.40 ;E 367058.02

BORING DATE: November 1, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-2}) / WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	'B' 'A'
0	Power Auger 200mm Diam. (Hollow Stem)	GROUND SURFACE		73.08							
		ASPHALTIC CONCRETE		0.08							Flush Mount Protective Casing set in Asphalt Silica Sand
		Grey crushed stone (FILL)		0.15							
		Loose brown to dark brown sandy silt, some gravel, trace clay, with brick and ash fragments, shale gravel and organic matter (FILL)			1	50 DO	6				
1				71.25							
		Very stiff brown SILTY CLAY (Weathered Crust)		1.83	2	50 DO	10				
2					3	50 DO	19				
											Bentonite Seal
3				69.73	4	50 DO	6				
		Loose to compact grey brown SILTY SAND to SANDY SILT, some gravel, trace clay, with cobbles and boulders (GLACIAL TILL)		3.35							
4					5	50 DO	>50				
				68.71							
		Borehole continued on RECORD OF DRILLHOLE T-308									
5											
6											
7											
8											
9											
10											

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: MRR

OLRT-SOIL 1011210222-1300.GPJ GAL-MIS.GDT 11/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-308

SHEET 1 OF 2

LOCATION: N 5031175.40 ;E 367058.02

DRILLING DATE: November 1, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing

JN - Joint, FLT - Fault, SH - Shear, VN - Vein, CJ - Conjugate | BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Clean | PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular | PO- Polished, K - Slickensided, SM- Smooth, RO- Rough, MB- Mechanical Break | BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	WEATHERING INDEX	NOTES
		BEDROCK SURFACE		68.71														'B' 'A'
		Slightly weathered, medium bedded, dark brownish grey, fine grained, crystalline, non-porous, weak to medium strong, argillaceous, micritic NODULAR LIMESTONE BEDROCK, with thin interbeds of dark grey to black, fossiliferous shale		4.37								VFR,PL,SM JN,PL,Ro VFR,PL,SM JN,CU,Ro Cl <1mm JN,CU,SM Cl 3mm	12 12 12 6 0	1 1 1 2 2	1 2 1 4 8			Bentonite Seal
5		LINDSAY FORMATION UNIT 2			1	100												Silica Sand
		- Broken core from 5.69m to 5.75m										BD,UN,Ro Sa 5mm VFR,PL,SM	0 12	1 1	5 1			
6		- Broken core from 5.96m to 6.04m										JN,UN,Ro Cl <1mm VFR,PL,Ro Ca <1mm	6 16	2 1	4 2			25mm Diam. PVC #10 Slot Screen 'B'
					2	100						BD,PL,SM	12	1	1			
7		- Broken core from 6.97m to 7.08m										VFR,PL,SM BD,UN,SM	12 16	1 2	2 2			
																		Silica Sand
8					3	100												
												BD,CU,SM	16	2	2			
9	Rotary Drill											BD,PL,SM	12	1	2			
	HQ Core				4	100												
10																		Bentonite Seal
												BD,PL,SM	12	1	2			
11					5	100						BD,PL,SM	12	1	2			
12																		
		Fresh, medium bedded, medium brownish grey, fine to medium grained, crystalline, non-porous, medium strong, calcarenitic, weakly fossiliferous, argillaceous NODULAR LIMESTONE BEDROCK, with thin interbeds of dark grey to black shale laminates		60.37 12.71	6	100												
13		LINDSAY FORMATION UNIT 1																Silica Sand
					7	100												32mm Diam. PVC #10 Slot Screen 'A'
14																		
		CONTINUED NEXT PAGE																

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 11/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-308

SHEET 2 OF 2

LOCATION: N 5031175.40 ;E 367058.02

DRILLING DATE: November 1, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing

JN - Joint; FLT - Fault; SH - Shear; VN - Vein; CJ - Conjugate

BD - Bedding; FO - Foliation; CO - Contact; OR - Orthogonal; CL - Clean

PL - Planar; CU - Curved; UN - Undulating; ST - Stepped; IR - Irregular

PO - Polished; K - Slickensided; SM - Smooth; RO - Rough; MB - Mechanical Break

BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	WEATHERING INDEX	NOTES
		— CONTINUED FROM PREVIOUS PAGE —																'B' 'A'
15	Rotary Drill / HQ Core				7	100												32mm Diam. PVC #10 Slot Screen 'A'
				58.05														
		End of Drillhole		15.03														
16																		
17																		
18																		
19																		
20																		
21																		
22																		
23																		
24																		

DEPTH SCALE

1 : 50

Golder Associates

LOGGED: RI

CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 11/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF BOREHOLE: T-309

SHEET 1 OF 1

LOCATION: N 5031181.59 ;E 367069.01

BORING DATE: November 1, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)	SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-3} 10^{-5} 10^{-4} 10^{-2})	WATER CONTENT PERCENT (Wp, W, Wl) (20 40 60 80)	ADDITIONAL LAB. TESTING	
0	Power Auger 200mm Diam. (Hollow Stem)	GROUND SURFACE		72.94									'B' 'A'
		ASPHALTIC CONCRETE		0.00									Flush Mount Protective Casing set in Sand Silica Sand
		Grey crushed stone (FILL)		0.07									
		Dense red brown to brown sand, some gravel, trace silt and brick fragments (FILL)		0.20	1	50 DO	34						
1													
				71.42									
		Very stiff brown SILTY CLAY (Weathered Crust)		1.52	2	50 DO	13						
2					3	50 DO	11						
				69.89									Bentonite Seal
3		Compact grey brown SILTY SAND to SANDY SILT, some gravel, trace clay, with cobbles and boulders (GLACIAL TILL)		3.05	4	50 DO	14						
					5	50 DO	25						
4													
				68.32									
		Borehole continued on RECORD OF DRILLHOLE T-309											
5													
6													
7													
8													
9													
10													

DEPTH SCALE
1 : 50

Golder Associates

LOGGED: DWM
CHECKED: MRR

OLRT-SOIL 10112102222-1300.GPJ GAL-MIS.GDT 11/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-309

SHEET 1 OF 2

LOCATION: N 5031181.59 ;E 367069.01

DRILLING DATE: November 1, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing

JN - Joint, FLT - Fault, SH - Shear, VN - Vein, CJ - Conjugate; BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Clean; PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular; PO - Polished, K - Slickensided, SM - Smooth, RO - Rough, MB - Mechanical Break; BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	WEATHERING INDEX	NOTES
		BEDROCK SURFACE		68.32														'B' 'A'
5	Rotary Drill HQ Core	Fresh to slightly weathered, medium bedded, dark brownish grey, fine grained, crystalline, non-porous, medium strong to strong, argillaceous, micritic NODULAR LIMESTONE BEDROCK, with thin interbeds of dark grey to black, fossiliferous shale LINDSAY FORMATION UNIT 2		4.62	1	100						BD,CU,SM FR,,	16	2	2			Bentonite Seal
												FR,ST,SM	20	3	2			
												BD,CU,Ro	20	2	2			Silica Sand
6												BD,IR,Ro	16	2	2			
					2	100						BD,CU,SM Shale 10mm	16	2	2			25mm Diam. PVC #10 Slot Screen 'B'
												BD,PL,SM	12	1	2			
7												BD,CU,SM	16	2	2			
												BD,UN,SM	16	2	2			
												BD,CU,SM	16		2			Silica Sand
8					3	100												
												BD,CU,SM	18	2	2			
												BD,CU,SM	16	2	3			
9												BD,UN,SM	16	2	3			
					4	100												Bentonite Seal
10												BD,CU,SM	16	2	2			
		- Healed fracture from 10.54m to 10.82m, calcite infilled										BD,PL,SM	12	1	2			
												FR,,	25	4	3.75			
11												BD,PL,SM	16	2	2			
					5	100						BD,PL,SM	12	1	2			
												BD,CU,SM	16	2	2			Silica Sand
12																		
				60.44														
		Fresh, medium bedded, medium brownish grey, fine to medium grained, crystalline, non-porous, medium strong to strong, calcarenitic, weakly fossiliferous, argillaceous NODULAR LIMESTONE BEDROCK, with thin dark grey to black shale interbeds LINDSAY FORMATION UNIT 1		12.50	6	100						JN,ST,Ro Shale 5mm	20	2	2			
13																		32mm Diam. PVC #10 Slot Screen 'A'
												FR,.		.75				
					7	100						BD,UN,SM	16	2	2			
14												BD,UN,SM	16	2	2			
		CONTINUED NEXT PAGE																

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: DWM

CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 11/21/11 JEM/JM

PROJECT: 10-1121-0222

RECORD OF DRILLHOLE: T-309

SHEET 2 OF 2

LOCATION: N 5031181.59 ;E 367069.01

DRILLING DATE: November 1, 2011

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: —

DRILL RIG: CME 55

DRILLING CONTRACTOR: Downing

JN - Joint, FLT - Fault, SH - Shear, VN - Vein, CJ - Conjugate | BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Clean | PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular | PO - Polished, K - Slickensided, SM - Smooth, RO - Rough, MB - Mechanical Break | BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH RETURN	RECOVERY: TOTAL CORE %	RECOVERY: SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25m	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jcon	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	WEATHERING INDEX	NOTES
		— CONTINUED FROM PREVIOUS PAGE —																'B' 'A'
15	Rotary Drill / HQ Core			57.82	7	100					4	BD,PL,SM	12	1	2		W1 W2 W3 W4 W5 W6	32mm Diam. PVC #10 Slot Screen 'A'
		End of Drillhole		15.12														
16																		
17																		
18																		
19																		
20																		
21																		
22																		
23																		
24																		

DEPTH SCALE 1 : 50

Golder Associates

LOGGED: DWM

CHECKED: MRR

OLRT-ROCK 1011210222-1300.GPJ GAL-MISS.GDT 11/21/11 JEM/JM

APPENDIX B

Soil Sample Vapour Levels and PID Certificate of Calibration

Certificate of Calibration

Model	Part Number	Serial Number
PGM7300	N/A	590-001611

This instrument has been calibrated using calibration gases and procedures which are traceable to N.I.S.T. Test and calibration data is on file with the manufacturer.

Calibration Date	Calibrated By
31 oct 2011	R. Ireland

Golder Associates Inc.

Golder Associates

Golder Associates

SOIL SAMPLE VAPOUR LEVELS

JOB NUMBER 10-1121-0222 SHORT TITLE CTP/Quartz/Off- DATE 4 Nov 2011

TECHNICIAN R. Ireland ENGINEER Maria S. PAGE 1 OF 1

INSTRUMENT MiniRae Lite TYPE OF VAPOUR: ORGANIC [X] COMBUSTIBLE [ ]

CALIBRATED TO Isobutylene DATE OF CALIBRATION 31 Oct 2011

BH.# T-300 SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)	BH.#_____ SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)
R1	0.91 TO 1.52	0.3 ppm		TO	
2	1.52 TO 2.13	0.2 ppm		TO	
3	2.29 TO 2.90	No Bag.		TO	
3A	2.29 TO 2.90	Dup for #3		TO	
4	3.05 TO 3.58	0.3 ppm		TO	
	TO			TO	
	TO			TO	
	TO			TO	

BH.#_____ SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)	BH.#_____ SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	

NOTES:

Golder Associates

SOIL SAMPLE VAPOUR LEVELS

JOB NUMBER 10-1121-0222 SHORT TITLE CTP/CART/OTT. DATE 2 Nov 2011

TECHNICIAN R. Ireland ENGINEER Maria S. PAGE 1 OF 1

INSTRUMENT Mini Rae Lite TYPE OF VAPOUR: ORGANIC ☒ COMBUSTIBLE ☐

CALIBRATED TO Isobutylene DATE OF CALIBRATION 31 Oct 2011

BH.# T-307 SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)	BH.#_____ SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)
#1	0.76 TO 1.37	0.4 ppm		TO	
2	1.52 TO 2.13	0.3 ppm		TO	
3	2.29 TO 2.90	0.4 ppm		TO	
5	3.81 TO 4.40	0.60 ppm		TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	

BH.#_____ SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)	BH.#_____ SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	

NOTES:

Golder Associates

SOIL SAMPLE VAPOUR LEVELS

JOB NUMBER 10-1121-0222 SHORT TITLE CTP Courtlot DATE 2 Nov 2011

TECHNICIAN R. Ireland ENGINEER Maria S. PAGE 1 OF 1

INSTRUMENT MiniRae Lite TYPE OF VAPOUR: ORGANIC [X] COMBUSTIBLE [ ]

CALIBRATED TO Isobutylene DATE OF CALIBRATION 31 Oct 2011

BH.# 1-303 SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)	BH.#_____ SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)
R1	0.76 TO 1.37	No Bag		TO	
2	1.52 TO 2.13	No Bag		TO	
3	2.29 TO 2.90	0.2 ppm		TO	
4	3.05 TO 3.66	No Bag		TO	
5	3.05 TO 3.66	Field Dup #4		TO	
6	3.81 TO 4.24	No Bag.		TO	
	TO			TO	
	TO			TO	

BH.#_____ SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)	BH.#_____ SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	

NOTES:

Golder Associates

SOIL SAMPLE VAPOUR LEVELS

JOB NUMBER 10-1121-0222 SHORT TITLE CTP/OLRT DATE Nov 1, 2011

TECHNICIAN DWM ENGINEER SS PAGE 1 OF 1

INSTRUMENT MiniRae Lite TYPE OF VAPOUR: ORGANIC ☑ COMBUSTIBLE ☐

CALIBRATED TO Iso Butylene DATE OF CALIBRATION Oct 31, 2011 by Rob Ireland.

BH.# T-309 SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)	BH.#_____ SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)
1	0.76 TO 1.37	1.4		TO	
2	1.52 TO 2.13	0.4		TO	
3	2.28 TO 2.89	0.4		TO	
4	3.05 TO 3.66	0.60		TO	
5	3.81 TO 4.37	0.6		TO	
	TO			TO	
	TO			TO	
	TO			TO	

BH.#_____ SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)	BH.#_____ SAMPLE	DEPTH (m)	VAPOUR LEVEL (ppm/%LEL)
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	
	TO			TO	

NOTES: * Duplicate Sample Taken From SA 4.

APPENDIX C

Laboratory Certificates of Analysis

PARACEL LABORATORIES LTD.
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300-2319 St. Laurent Blvd.
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e: paracel@paracellabs.com
www.paracellabs.com

Certificate of Analysis

Golder Associates Ltd. (Ottawa)
32 Steacie Dr.
Kanata, ON K2K 2A9
Attn: Keith Holmes

Phone: (613) 592-9600
Fax: (613) 592-9601

Client PO:
Project: 10-1121-0222
Custody: 29086

Report Date: 6-Jun-2011
Order Date: 30-May-2011
Order #: 1123066

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1123066-01	T72-SA1
1123066-02	T72-SA4

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME PHC F1	CWS Tier 1 - P&T GC-FID	30-May-11	3-Jun-11
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	31-May-11	2-Jun-11
Chromium, hexavalent	MOE E3056 - Extraction, colourimetric	3-Jun-11	3-Jun-11
Mercury	EPA 7471A - CVAA, digestion	1-Jun-11	1-Jun-11
Metals	EPA 6020 - Digestion - ICP-MS	1-Jun-11	1-Jun-11
PAHs by GC-MS, standard scan	EPA 8270 - GC-MS, extraction	2-Jun-11	2-Jun-11
Solids, %	Gravimetric, calculation	3-Jun-11	3-Jun-11
VOCs	EPA 8260 - P&T GC-MS	30-May-11	3-Jun-11

PARACEL LABORATORIES LTD.

Order #: 1123066

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

	Client ID:	T72-SA1	T72-SA4	-	-
	Sample Date:	19-May-11	19-May-11	-	-
	Sample ID:	1123066-01	1123066-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	92.5	95.2	-	-
Metals					
Antimony	1 ug/g dry	<1	<1	-	-
Arsenic	1 ug/g dry	3	2	-	-
Barium	1 ug/g dry	213	41	-	-
Beryllium	0.5 ug/g dry	<0.5	<0.5	-	-
Boron	5.0 ug/g dry	7.6	<5.0	-	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	-	-
Chromium	5 ug/g dry	17	15	-	-
Chromium (VI)	0.4 ug/g dry	<1.0 [1]	<0.4	-	-
Cobalt	1 ug/g dry	4	4	-	-
Copper	5 ug/g dry	22	16	-	-
Lead	1 ug/g dry	53	4	-	-
Mercury	0.1 ug/g dry	0.2	<0.1	-	-
Molybdenum	1 ug/g dry	2	4	-	-
Nickel	5 ug/g dry	15	10	-	-
Selenium	1 ug/g dry	<1	<1	-	-
Silver	0.3 ug/g dry	<0.3	2.2	-	-
Thallium	1 ug/g dry	<1	<1	-	-
Uranium	1 ug/g dry	<1	<1	-	-
Vanadium	10 ug/g dry	19	19	-	-
Zinc	20 ug/g dry	39	<20	-	-
Volatiles					
Acetone	0.5 ug/g dry	<0.5	<0.5	-	-
Benzene	0.02 ug/g dry	<0.02	<0.02	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Bromoform	0.05 ug/g dry	<0.05	<0.05	-	-
Bromomethane	0.05 ug/g dry	<0.05	<0.05	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	<0.05	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Chloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
Chloroform	0.05 ug/g dry	<0.05	<0.05	-	-
Chloromethane	0.2 ug/g dry	<0.2	<0.2	-	-

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

	Client ID:	T72-SA1	T72-SA4	-	-
	Sample Date:	19-May-11	19-May-11	-	-
	Sample ID:	1123066-01	1123066-02	-	-
	MDL/Units	Soil	Soil	-	-
Volatiles (continued)					
Dibromochloromethane	0.05 ug/g dry	<0.05	<0.05	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dibromoethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloroethylene, total	0.05 ug/g dry	<0.05	<0.05	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	<0.05	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	<0.05	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Hexane	0.05 ug/g dry	<0.05	<0.05	-	-
Methyl Ethyl Ketone (2-Butanone)	0.5 ug/g dry	<0.5	<0.5	-	-
Methyl Butyl Ketone (2-Hexanone)	2.0 ug/g dry	<2.0	<2.0	-	-
Methyl Isobutyl Ketone	0.5 ug/g dry	<0.5	<0.5	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	<0.05	-	-
Methylene Chloride	0.05 ug/g dry	<0.05	<0.05	-	-
Styrene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
Toluene	0.05 ug/g dry	<0.05	<0.05	-	-
1,2,4-Trichlorobenzene	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	<0.05	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	<0.05	-	-

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

	Client ID:	T72-SA1	T72-SA4	-	-
	Sample Date:	19-May-11	19-May-11	-	-
	Sample ID:	1123066-01	1123066-02	-	-
	MDL/Units	Soil	Soil	-	-
Volatiles (continued)					
1,3,5-Trimethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	<0.02	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	-
4-Bromofluorobenzene	Surrogate	101%	99.8%	-	-
Dibromofluoromethane	Surrogate	72.7%	67.2%	-	-
Toluene-d8	Surrogate	93.6%	96.1%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10 [2]	<10 [2]	-	-
F2 PHCs (C10-C16)	10 ug/g dry	<10	<10	-	-
F3 PHCs (C16-C34)	10 ug/g dry	<10	<10	-	-
F4 PHCs (C34-C50)	10 ug/g dry	<10	<10	-	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	-	-
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	-	-
Anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [a] anthracene	0.02 ug/g dry	0.02	<0.02	-	-
Benzo [a] pyrene	0.02 ug/g dry	0.02	<0.02	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	0.02	<0.02	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	-
Biphenyl	0.02 ug/g dry	<0.02	<0.02	-	-
Chrysene	0.02 ug/g dry	0.02	<0.02	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Fluoranthene	0.02 ug/g dry	0.04	<0.02	-	-
Fluorene	0.02 ug/g dry	<0.02	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	<0.02	-	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	-	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	-	-
Naphthalene	0.02 ug/g dry	<0.02	<0.02	-	-
Phenanthrene	0.02 ug/g dry	0.02	<0.02	-	-
Pyrene	0.02 ug/g dry	0.03	<0.02	-	-

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

	Client ID:	T72-SA1	T72-SA4	-	-
	Sample Date:	19-May-11	19-May-11	-	-
	Sample ID:	1123066-01	1123066-02	-	-
	MDL/Units	Soil	Soil	-	-
Semi-Volatiles (continued)					
2-Fluorobiphenyl	Surrogate	46.8%	93.1%	-	-
Terphenyl-d14	Surrogate	77.5%	108%	-	-

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	10	ug/g						
F2 PHCs (C10-C16)	ND	10	ug/g						
F3 PHCs (C16-C34)	ND	10	ug/g						
F4 PHCs (C34-C50)	ND	10	ug/g						
Metals									
Antimony	ND	1	ug/g						
Arsenic	ND	1	ug/g						
Barium	ND	1	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.4	ug/g						
Chromium	ND	5	ug/g						
Cobalt	ND	1	ug/g						
Copper	ND	5	ug/g						
Lead	ND	1	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1	ug/g						
Nickel	ND	5	ug/g						
Selenium	ND	1	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1	ug/g						
Uranium	ND	1	ug/g						
Vanadium	ND	10	ug/g						
Zinc	ND	20	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Biphenyl	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.02	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.31*	*0.01*	*ug/g*		*98.1*	*32-156*			
Surrogate: Terphenyl-d14	*1.11*	*0.01*	*ug/g*		*82.9*	*39-146*			

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Volatiles									
Acetone	ND	0.5	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroethane	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Chloromethane	ND	0.2	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dibromoethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloroethylene, total	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.5	ug/g						
Methyl Butyl Ketone (2-Hexanone)	ND	2.0	ug/g						
Methyl Isobutyl Ketone	ND	0.5	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,2,4-Trichlorobenzene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
1,3,5-Trimethylbenzene	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*3.23*		*ug/g*		*101*	*50-140*			

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Dibromofluoromethane	*3.34*		*ug/g*		*104*	*50-140*			
Surrogate: Toluene-d8	*3.12*		*ug/g*		*97.4*	*50-140*			

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	10	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	10	ug/g dry	ND				50	
F3 PHCs (C16-C34)	50	10	ug/g dry	54			8.2	50	
F4 PHCs (C34-C50)	61	10	ug/g dry	68			11.1	50	
Metals									
Antimony	ND	1	ug/g dry	ND				26	
Arsenic	3.4	1	ug/g dry	3.1			11.7	35	
Barium	94.6	1	ug/g dry	98.2			3.7	34	
Beryllium	ND	0.5	ug/g dry	ND				25	
Boron	7.7	5.0	ug/g dry	5.9			26.8	33	
Cadmium	ND	0.5	ug/g dry	ND				33	
Chromium (VI)	ND	3.0	ug/g dry	ND				35	GEN02
Chromium	24.3	5	ug/g dry	25.1			3.2	32	
Cobalt	6.5	1	ug/g dry	6.8			4.5	32	
Copper	17.3	5	ug/g dry	17.7			2.5	32	
Lead	31.2	1	ug/g dry	31.6			1.2	44	
Mercury	0.113	0.1	ug/g dry	0.121			7.1	35	
Molybdenum	1.9	1	ug/g dry	ND				29	
Nickel	16.1	5	ug/g dry	16.9			4.7	29	
Selenium	1.8	1	ug/g dry	ND				28	
Silver	ND	0.3	ug/g dry	ND				28	
Thallium	ND	1	ug/g dry	ND				27	
Uranium	ND	1	ug/g dry	ND				27	
Vanadium	32.1	10	ug/g dry	33.2			3.6	27	
Zinc	37.7	20	ug/g dry	42.0			10.8	27	
Physical Characteristics									
% Solids	94.0	0.1	% by Wt.	93.9			0.2	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				50	
Acenaphthylene	ND	0.02	ug/g dry	ND				50	
Anthracene	ND	0.02	ug/g dry	ND				50	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND				50	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND				50	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND				50	
Benzo [g,h,i] perylene	0.033	0.02	ug/g dry	0.024			31.4	50	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND				50	
Biphenyl	ND	0.02	ug/g dry	ND				50	
Chrysene	ND	0.02	ug/g dry	ND				50	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				50	
Fluoranthene	0.036	0.02	ug/g dry	ND				50	
Fluorene	ND	0.02	ug/g dry	ND				50	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND				50	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				50	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				50	
Naphthalene	ND	0.02	ug/g dry	ND				50	

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Phenanthrene	ND	0.02	ug/g dry	ND				50	
Pyrene	0.023	0.02	ug/g dry	ND				50	
Surrogate: 2-Fluorobiphenyl	*1.40*	*0.01*	*ug/g dry*	*ND*	*98.1*	*32-156*			
Surrogate: Terphenyl-d14	*0.903*	*0.01*	*ug/g dry*	*ND*	*63.1*	*39-146*			
Volatiles									
Acetone	ND	0.5	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroethane	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Chloromethane	ND	0.2	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dibromoethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.5	ug/g dry	ND				50	
Methyl Butyl Ketone (2-Hexanone)	ND	2.0	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.5	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,2,4-Trichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
1,3,5-Trimethylbenzene	ND	0.05	ug/g dry	ND				50	

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*4.40*		*ug/g dry*	*ND*	*104*	*50-140*			
Surrogate: Dibromofluoromethane	*3.70*		*ug/g dry*	*ND*	*87.1*	*50-140*			
Surrogate: Toluene-d8	*3.99*		*ug/g dry*	*ND*	*93.9*	*50-140*			

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	210	10	ug/g	ND	105	80-120			
F2 PHCs (C10-C16)	50	10	ug/g	ND	62.5	61-129			
F3 PHCs (C16-C34)	154	10	ug/g	ND	77.0	61-129			
F4 PHCs (C34-C50)	120	10	ug/g	ND	100	61-129			
Metals									
Antimony	47.0		ug/L	ND	93.9	80-120			
Arsenic	44.1		ug/L	ND	88.1	80-120			
Barium	42.8		ug/L	ND	85.7	80-120			
Beryllium	42.2		ug/L	ND	84.5	80-120			
Boron	41.1		ug/L	ND	82.3	80-120			
Cadmium	43.4		ug/L	ND	86.8	80-120			
Chromium (VI)	4.9	0.4	ug/g	ND	98.0	89-123			
Chromium	46.3		ug/L	ND	92.6	80-120			
Cobalt	46.7		ug/L	ND	93.4	80-120			
Copper	46.2		ug/L	ND	92.4	80-120			
Lead	46.0		ug/L	ND	92.1	80-120			
Mercury	1.67	0.1	ug/g	ND	111	72-128			
Molybdenum	45.5		ug/L	ND	91.1	80-120			
Nickel	46.5		ug/L	ND	93.0	80-120			
Selenium	40.6		ug/L	ND	81.3	80-120			
Silver	42.8		ug/L	ND	85.5	80-120			
Thallium	48.0		ug/L	ND	96.0	80-120			
Uranium	44.5		ug/L	ND	89.0	80-120			
Vanadium	45.0		ug/L	ND	90.1	80-120			
Zinc	41.2		ug/L	ND	82.3	80-120			
Semi-Volatiles									
Acenaphthene	0.115	0.02	ug/g	ND	69.0	31-121			
Acenaphthylene	0.122	0.02	ug/g	ND	73.3	26-124			
Anthracene	0.121	0.02	ug/g	ND	72.9	29-128			
Benzo [a] anthracene	0.106	0.02	ug/g	ND	63.8	29-129			
Benzo [a] pyrene	0.121	0.02	ug/g	ND	72.3	29-111			
Benzo [b] fluoranthene	0.095	0.02	ug/g	ND	56.8	26-111			
Benzo [g,h,i] perylene	0.095	0.02	ug/g	ND	56.7	23-128			
Benzo [k] fluoranthene	0.119	0.02	ug/g	ND	71.2	23-135			
Biphenyl	0.117	0.02	ug/g	ND	70.1	31-107			
Chrysene	0.124	0.02	ug/g	ND	74.3	28-136			
Dibenzo [a,h] anthracene	0.110	0.02	ug/g	ND	65.9	20-131			
Fluoranthene	0.097	0.02	ug/g	ND	58.1	24-131			
Fluorene	0.105	0.02	ug/g	ND	63.0	28-123			
Indeno [1,2,3-cd] pyrene	0.120	0.02	ug/g	ND	72.1	20-128			
1-Methylnaphthalene	0.137	0.02	ug/g	ND	82.2	24-127			
2-Methylnaphthalene	0.123	0.02	ug/g	ND	73.6	21-127			
Naphthalene	0.125	0.02	ug/g	ND	75.3	29-118			
Phenanthrene	0.100	0.02	ug/g	ND	60.0	34-108			
Pyrene	0.082	0.02	ug/g	ND	49.3	29-131			
Surrogate: 2-Fluorobiphenyl	*1.23*	0.01	*ug/g*		*92.0*	*32-156*			

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: Terphenyl-d14	*1.23*	0.01	*ug/g*		*92.3*	*39-146*			
Volatiles									
Acetone	7.8	0.5	ug/g	ND	78.0	50-140			
Benzene	4.1	0.02	ug/g	ND	103	60-130			
Bromodichloromethane	3.5	0.05	ug/g	ND	88.5	60-130			
Bromoform	ND	0.05	ug/g	ND		60-130			
Bromomethane	3.4	0.05	ug/g	ND	84.0	50-140			
Carbon Tetrachloride	3.8	0.05	ug/g	ND	96.0	60-130			
Chlorobenzene	3.5	0.05	ug/g	ND	87.9	60-130			
Chloroethane	4.5	0.05	ug/g	ND	113	50-140			
Chloroform	4.2	0.05	ug/g	ND	104	60-130			
Chloromethane	4.1	0.2	ug/g	ND	101	50-140			
Dibromochloromethane	3.5	0.05	ug/g	ND	88.0	60-130			
Dichlorodifluoromethane	4.2	0.05	ug/g	ND	105	50-140			
1,2-Dibromoethane	3.9	0.05	ug/g	ND	98.3	60-130			
1,2-Dichlorobenzene	3.7	0.05	ug/g	ND	92.8	60-130			
1,3-Dichlorobenzene	3.9	0.05	ug/g	ND	97.3	60-130			
1,4-Dichlorobenzene	3.9	0.05	ug/g	ND	96.5	60-130			
1,1-Dichloroethane	4.7	0.05	ug/g	ND	117	60-130			
1,2-Dichloroethane	4.3	0.05	ug/g	ND	106	60-130			
1,1-Dichloroethylene	3.7	0.05	ug/g	ND	92.3	60-130			
cis-1,2-Dichloroethylene	4.0	0.05	ug/g	ND	99.9	60-130			
trans-1,2-Dichloroethylene	4.6	0.05	ug/g	ND	116	60-130			
1,2-Dichloropropane	4.0	0.05	ug/g	ND	98.8	60-130			
cis-1,3-Dichloropropylene	3.4	0.05	ug/g	ND	85.4	60-130			
trans-1,3-Dichloropropylene	2.8	0.05	ug/g	ND	70.7	60-130			
Ethylbenzene	3.4	0.05	ug/g	ND	86.0	60-130			
Hexane	3.6	0.05	ug/g	ND	89.0	60-130			
Methyl Ethyl Ketone (2-Butanone)	8.3	0.5	ug/g	ND	82.7	50-140			
Methyl Butyl Ketone (2-Hexanone)	8.5	2.0	ug/g	ND	84.8	50-140			
Methyl Isobutyl Ketone	7.2	0.5	ug/g	ND	72.2	50-140			
Methyl tert-butyl ether	10.5	0.05	ug/g	ND	105	50-140			
Methylene Chloride	3.3	0.05	ug/g	ND	82.4	60-130			
Styrene	3.3	0.05	ug/g	ND	82.6	60-130			
1,1,1,2-Tetrachloroethane	4.4	0.05	ug/g	ND	109	60-130			
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g	ND		60-130			
Tetrachloroethylene	3.4	0.05	ug/g	ND	84.2	60-130			
Toluene	4.0	0.05	ug/g	ND	98.9	60-130			
1,2,4-Trichlorobenzene	3.7	0.05	ug/g	ND	91.6	60-130			
1,1,1-Trichloroethane	4.5	0.05	ug/g	ND	112	60-130			
1,1,2-Trichloroethane	3.9	0.05	ug/g	ND	96.8	60-130			
Trichloroethylene	4.1	0.05	ug/g	ND	102	60-130			
Trichlorofluoromethane	4.3	0.05	ug/g	ND	108	50-140			
1,3,5-Trimethylbenzene	4.5	0.05	ug/g	ND	112	60-130			
Vinyl chloride	3.8	0.02	ug/g	ND	96.0	50-140			
m,p-Xylenes	7.2	0.05	ug/g	ND	89.5	60-130			
o-Xylene	3.7	0.05	ug/g	ND	91.4	60-130			

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: 4-Bromofluorobenzene	*3.22*		*ug/g*		*101*	*50-140*			
Surrogate: Dibromofluoromethane	*3.35*		*ug/g*		*105*	*50-140*			
Surrogate: Toluene-d8	*2.80*		*ug/g*		*87.5*	*50-140*			

Certificate of Analysis

Report Date: 06-Jun-2011
Order Date:30-May-2011

Client: **Golder Associates Ltd. (Ottawa)**
Client PO: Project Description: 10-1121-0222

Sample and QC Qualifiers Notes

1 - GEN02 : Elevated Reporting Limit due to matrix interference.

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

PARACEL Laboratories Ltd.

Environmental & Indoor Air Quality

300-2319 St. Laurent Blvd., Ottawa, ON K1G 4J8
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Toll Free: (800) 749-1947 email: paracel@paracellabs.com

Chain of Custody Record

№ 29086 Pg. __ of __

Contact: Keith Holmes & Maria Stavera
Company: Golder Associates Ltd.
Address: 32 Steacie Dr. Kanata, ON
Tel: 613 592 9600 Fax: ____

Project Ref: 10-1121-0222
PO #: ____
Quote #: 10-305 ☐Not Quoted
Email: mstavera@golder.com kholmes@golder.com
Preservative to be added by Paracel? ☐Yes ☒No

REPORTING REQUIREMENTS
[ ] Hard Copy [ ] Email - PDF
[ ] FAX [X] Email - spreadsheet

TURN AROUND TIME
[ ] 1-day [ ] 2-day [ ] Regular

REGULATORY/GUIDELINE REQUIREMENTS
Reg. 511/09, Table 1

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A-Air O-Other

Sample Information					Analysis Required															
Paracel Order # 1123066	Sample Identification	Matrix	# Bottles	Date Sampled d/m/y	PHCs F1	metals	PAH	VOC												
1	T72-SA1	S	2	May 19	✓	✓	✓	✓					250 + 120 mL							
2	T72-SA4	S	2	May 19	✓	✓	✓	✓					↓							
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: Temp: 22.7 °C

Relinquished by: M. Stavera
Date: May 30, 2011 Time: ____

Received by: A. Blouse
Date: 30 May 2011 Time: 12:26 p.m.

Verified by: MC
Date: May 30/11 Time: 5:56

MC May 30/11 4:00 pm

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Certificate of Analysis

Golder Associates Ltd. (Ottawa)
32 Steacie Dr.
Kanata, ON K2K 2A9
Attn: Maria Staneva

Phone: (613) 592-9600
Fax: (613) 592-9601

Client PO:
Project: 10-1121-0222
Custody: 87192

Report Date: 6-Jul-2011
Order Date: 28-Jun-2011
Order #: 1127152

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1127152-01	T-72B
1127152-02	W-10

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: **Golder Associates Ltd. (Ottawa)**

Client PO:

Project Description: 10-1121-0222

Report Date: 06-Jul-2011

Order Date:28-Jun-2011

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME PHC F1	CWS Tier 1 - P&T GC-FID	30-Jun-11	1-Jul-11
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	4-Jul-11	5-Jul-11
Chromium, hexavalent	MOE E3056 - colourimetric	28-Jun-11	29-Jun-11
Mercury	EPA 245.1 - Cold Vapour AA	30-Jun-11	30-Jun-11
Metals, low level	EPA 200.8 - ICP-MS	5-Jul-11	5-Jul-11
PAHs by GC-MS, standard scan	EPA 625 - GC-MS, extraction	4-Jul-11	4-Jul-11
PCBs, total	EPA 608 - GC-ECD	5-Jul-11	5-Jul-11
VOCs	EPA 624 - P&T GC-MS	30-Jun-11	1-Jul-11

Certificate of Analysis
Client: **Golder Associates Ltd. (Ottawa)**
Client PO:

Report Date: 06-Jul-2011
Order Date:28-Jun-2011

Project Description: 10-1121-0222

	Client ID:	T-72B	W-10	-	-
	Sample Date:	28-Jun-11	28-Jun-11	-	-
	Sample ID:	1127152-01	1127152-02	-	-
	MDL/Units	Water	Water	-	-
Metals					
Mercury	0.1 ug/L	<0.1	<0.1	-	-
Antimony	0.5 ug/L	<0.5	<0.5	-	-
Arsenic	1 ug/L	<1	<1	-	-
Barium	1 ug/L	92	4730	-	-
Beryllium	0.5 ug/L	<0.5	<0.5	-	-
Boron	10 ug/L	56	116	-	-
Cadmium	0.1 ug/L	<0.1	<0.1	-	-
Chromium	1 ug/L	12	79	-	-
Chromium (VI)	10 ug/L	<10	<10	-	-
Cobalt	0.5 ug/L	1.9	2.6	-	-
Copper	0.5 ug/L	4.1	4.2	-	-
Lead	0.1 ug/L	<0.1	<0.1	-	-
Molybdenum	0.5 ug/L	28.8	0.8	-	-
Nickel	1 ug/L	19	15	-	-
Selenium	1 ug/L	6	<1	-	-
Silver	0.1 ug/L	0.1	<0.1	-	-
Sodium	200 ug/L	846000	5670000	-	-
Thallium	0.1 ug/L	0.2	<0.1	-	-
Uranium	0.1 ug/L	8.3	<0.1	-	-
Vanadium	0.5 ug/L	3.1	18.8	-	-
Zinc	10 ug/L	17	<10	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	9.1	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	10.3	-	-
Chloroethane	1.0 ug/L	<1.0	<1.0	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	-	-
Chloromethane	3.0 ug/L	<3.0	<3.0	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis

Report Date: 06-Jul-2011

Client: **Golder Associates Ltd. (Ottawa)**

Order Date:28-Jun-2011

Client PO:

Project Description: 10-1121-0222

	Client ID:	T-72B	W-10	-	-
	Sample Date:	28-Jun-11	28-Jun-11	-	-
	Sample ID:	1127152-01	1127152-02	-	-
	MDL/Units	Water	Water	-	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dibromoethane	0.2 ug/L	<0.2	<0.2	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	2.4	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	1.7	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	<10.0	<10.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	0.5	-	-
1,2,4-Trichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2,4-Trimethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	4.8	-	-

Certificate of Analysis

Client: **Golder Associates Ltd. (Ottawa)**

Client PO:

Report Date: 06-Jul-2011

Order Date:28-Jun-2011

Project Description: 10-1121-0222

	Client ID:	T-72B	W-10	-	-
	Sample Date:	28-Jun-11	28-Jun-11	-	-
	Sample ID:	1127152-01	1127152-02	-	-
	MDL/Units	Water	Water	-	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	2.2	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	2.2	-	-
4-Bromofluorobenzene	Surrogate	112%	89.5%	-	-
Dibromofluoromethane	Surrogate	109%	124%	-	-
Toluene-d8	Surrogate	110%	108%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	<100	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	<100	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	<100	-	-
F1 + F2 PHCs	125 ug/L	<125	<125	-	-
F3 + F4 PHCs	200 ug/L	<200	<200	-	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	1.52	-	-
Acenaphthylene	0.05 ug/L	<0.05	0.77	-	-
Anthracene	0.01 ug/L	<0.01	2.87	-	-
Benzo [a] anthracene	0.01 ug/L	<0.01	6.91	-	-
Benzo [a] pyrene	0.01 ug/L	<0.01	4.71	-	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	4.47	-	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	2.71	-	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	2.07	-	-
Biphenyl	0.05 ug/L	<0.05	0.34	-	-
Chrysene	0.05 ug/L	<0.05	6.99	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	0.89	-	-
Fluoranthene	0.01 ug/L	<0.01	9.89	-	-
Fluorene	0.05 ug/L	<0.05	1.88	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	2.94	-	-
1-Methylnaphthalene	0.05 ug/L	<0.05	0.97	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	0.85	-	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	1.82	-	-
Naphthalene	0.05 ug/L	<0.05	2.55	-	-
Phenanthrene	0.05 ug/L	<0.05	8.50	-	-
Pyrene	0.01 ug/L	<0.01	7.03	-	-

Certificate of Analysis

Client: **Golder Associates Ltd. (Ottawa)**

Report Date: 06-Jul-2011

Order Date:28-Jun-2011

Client PO:

Project Description: 10-1121-0222

	Client ID:	T-72B	W-10	-	-
	Sample Date:	28-Jun-11	28-Jun-11	-	-
	Sample ID:	1127152-01	1127152-02	-	-
	MDL/Units	Water	Water	-	-
2-Fluorobiphenyl	Surrogate	96.9%	51.6%	-	-
Terphenyl-d14	Surrogate	98.9%	69.8%	-	-
PCBs					
PCBs, total	0.05 ug/L	-	<0.05	-	-
Decachlorobiphenyl	Surrogate	-	97.5%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	10	ug/L						
PCBs									
PCBs, total	ND	0.05	ug/L						
Surrogate: Decachlorobiphenyl	*0.443*		*ug/L*		*88.6*	*26-147*			
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Biphenyl	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*18.2*		*ug/L*		*91.1*	*31-154*			
Surrogate: Terphenyl-d14	*19.7*		*ug/L*		*98.6*	*37-156*			
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroethane	ND	1.0	ug/L						
Chloroform	ND	0.5	ug/L						
Chloromethane	ND	3.0	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dibromoethane	ND	0.2	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloroethylene, total	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,2,4-Trichlorobenzene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
1,2,4-Trimethylbenzene	ND	0.5	ug/L						
1,3,5-Trimethylbenzene	ND	0.5	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*87.2*		*ug/L*		*109*	*50-140*			
Surrogate: Dibromofluoromethane	*78.7*		*ug/L*		*98.4*	*50-140*			
Surrogate: Toluene-d8	*81.7*		*ug/L*		*102*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Metals									
Mercury	ND	0.1	ug/L	ND				20	
Antimony	ND	0.5	ug/L	ND				26	
Arsenic	1.1	1	ug/L	ND				29	
Barium	25.8	1	ug/L	24.8			3.8	34	
Beryllium	ND	0.5	ug/L	ND				25	
Boron	23	10	ug/L	19			20.4	33	
Cadmium	ND	0.1	ug/L	ND				33	
Chromium (VI)	ND	10	ug/L	ND				13	
Chromium	ND	1	ug/L	4.9				32	
Cobalt	ND	0.5	ug/L	ND				32	
Copper	ND	0.5	ug/L	0.58			0.0	32	
Lead	ND	0.1	ug/L	ND				32	
Molybdenum	0.94	0.5	ug/L	ND				29	
Nickel	1.6	1	ug/L	1.5			8.9	29	
Selenium	ND	1	ug/L	1.2				28	
Silver	0.13	0.1	ug/L	ND				28	
Sodium	15000	200	ug/L	14300			4.2	27	
Thallium	0.26	0.1	ug/L	ND				27	
Uranium	ND	0.1	ug/L	ND				27	
Vanadium	2.63	0.5	ug/L	1.51			53.9	27	QR-01
Zinc	ND	10	ug/L	ND				27	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroethane	ND	1.0	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Chloromethane	ND	3.0	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dibromoethane	ND	0.2	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	11.3	0.5	ug/L	10.7			5.6	30	
Toluene	ND	0.5	ug/L	ND				30	
1,2,4-Trichlorobenzene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	0.71				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
1,2,4-Trimethylbenzene	ND	0.5	ug/L	ND				30	
1,3,5-Trimethylbenzene	ND	0.5	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*91.6*		*ug/L*	*ND*	*115*	*50-140*			
Surrogate: Dibromofluoromethane	*67.9*		*ug/L*	*ND*	*84.9*	*50-140*			
Surrogate: Toluene-d8	*78.9*		*ug/L*	*ND*	*98.6*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1460	25	ug/L	ND	73.2	68-117			
F2 PHCs (C10-C16)	1970	100	ug/L	ND	123	61-129			
F3 PHCs (C16-C34)	3880	100	ug/L	ND	97.0	61-129			
F4 PHCs (C34-C50)	2560	100	ug/L	ND	107	61-129			
Metals									
Mercury	3.22	0.1	ug/L	ND	107	78-137			
Antimony	56.0		ug/L	ND	112	78-126			
Arsenic	54.5		ug/L	ND	109	83-119			
Barium	56.4		ug/L	ND	113	83-116			
Beryllium	51.2		ug/L	ND	102	72-132			
Boron	52		ug/L	ND	104	71-128			
Cadmium	55.1		ug/L	ND	110	78-119			
Chromium (VI)	205	10	ug/L	ND	102	75-120			
Chromium	59.5		ug/L	ND	119	80-124			
Cobalt	60.0		ug/L	ND	120	78-125			
Copper	61.7		ug/L	ND	123	75-123			
Lead	54.3		ug/L	ND	109	77-126			
Molybdenum	54.0		ug/L	ND	108	82-119			
Nickel	61.5		ug/L	ND	123	78-119			
Selenium	55.5		ug/L	ND	111	81-125			
Silver	55.5		ug/L	ND	111	70-128			
Sodium	831		ug/L	ND	83.1	67-132			
Thallium	57.5		ug/L	ND	115	82-127			
Uranium	59.7		ug/L	ND	119	70-131			
Vanadium	58.5		ug/L	ND	117	82-123			
Zinc	51		ug/L	ND	101	78-130			
PCBs									
PCBs, total	0.961	0.05	ug/L	ND	96.1	54-137			
Surrogate: Decachlorobiphenyl	*0.504*		*ug/L*		*101*	*26-147*			
Semi-Volatiles									
Acenaphthene	3.46	0.05	ug/L	ND	69.1	32-116			
Acenaphthylene	3.93	0.05	ug/L	ND	78.7	26-120			
Anthracene	3.78	0.01	ug/L	ND	75.7	29-126			
Benzo [a] anthracene	5.93	0.01	ug/L	ND	119	29-126			
Benzo [a] pyrene	4.80	0.01	ug/L	ND	96.0	29-111			
Benzo [b] fluoranthene	4.17	0.05	ug/L	ND	83.3	26-111			
Benzo [g,h,i] perylene	4.10	0.05	ug/L	ND	82.1	23-128			
Benzo [k] fluoranthene	3.73	0.05	ug/L	ND	74.6	23-135			
Biphenyl	3.21	0.05	ug/L	ND	64.1	31-107			
Chrysene	5.61	0.05	ug/L	ND	112	29-137			
Dibenzo [a,h] anthracene	4.26	0.05	ug/L	ND	85.3	20-131			
Fluoranthene	4.21	0.01	ug/L	ND	84.3	24-131			
Fluorene	4.26	0.05	ug/L	ND	85.2	28-123			
Indeno [1,2,3-cd] pyrene	4.28	0.05	ug/L	ND	85.5	20-128			
1-Methylnaphthalene	3.90	0.05	ug/L	ND	78.0	25-127			
2-Methylnaphthalene	3.93	0.05	ug/L	ND	78.5	21-119			
Naphthalene	3.93	0.05	ug/L	ND	78.6	29-118			
Phenanthrene	3.79	0.05	ug/L	ND	75.7	34-108			
Pyrene	3.78	0.01	ug/L	ND	75.7	29-131			
Surrogate: 2-Fluorobiphenyl	*20.7*		*ug/L*		*103*	*31-154*			
Surrogate: Terphenyl-d14	*20.9*		*ug/L*		*105*	*37-156*			
Volatiles									

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Acetone	108	5.0	ug/L	ND	108	50-140			
Benzene	49.3	0.5	ug/L	ND	123	60-130			
Bromodichloromethane	46.4	0.5	ug/L	ND	116	60-130			
Bromoform	31.4	0.5	ug/L	ND	78.4	60-130			
Bromomethane	43.3	0.5	ug/L	ND	108	50-140			
Carbon Tetrachloride	34.3	0.2	ug/L	ND	85.6	60-130			
Chlorobenzene	29.8	0.5	ug/L	ND	74.4	60-130			
Chloroethane	41.6	1.0	ug/L	ND	104	50-140			
Chloroform	38.9	0.5	ug/L	ND	97.2	60-130			
Chloromethane	41.7	3.0	ug/L	ND	104	50-140			
Dibromochloromethane	31.3	0.5	ug/L	ND	78.4	60-130			
Dichlorodifluoromethane	25.8	1.0	ug/L	ND	64.6	50-140			
1,2-Dibromoethane	30.9	0.2	ug/L	ND	77.4	60-130			
1,2-Dichlorobenzene	33.7	0.5	ug/L	ND	84.2	60-130			
1,3-Dichlorobenzene	33.1	0.5	ug/L	ND	82.7	60-130			
1,4-Dichlorobenzene	33.2	0.5	ug/L	ND	83.0	60-130			
1,1-Dichloroethane	42.0	0.5	ug/L	ND	105	60-130			
1,2-Dichloroethane	37.6	0.5	ug/L	ND	93.9	60-130			
1,1-Dichloroethylene	38.9	0.5	ug/L	ND	97.2	60-130			
cis-1,2-Dichloroethylene	38.4	0.5	ug/L	ND	96.1	60-130			
trans-1,2-Dichloroethylene	39.7	0.5	ug/L	ND	99.3	60-130			
1,2-Dichloropropane	35.5	0.5	ug/L	ND	88.7	60-130			
cis-1,3-Dichloropropylene	44.4	0.5	ug/L	ND	111	60-130			
trans-1,3-Dichloropropylene	50.8	0.5	ug/L	ND	127	60-130			
Ethylbenzene	29.5	0.5	ug/L	ND	73.7	60-130			
Hexane	24.3	1.0	ug/L	ND	60.7	60-130			
Methyl Ethyl Ketone (2-Butanone)	92.0	5.0	ug/L	ND	92.0	50-140			
Methyl Butyl Ketone (2-Hexanone)	115	10.0	ug/L	ND	115	50-140			
Methyl Isobutyl Ketone	112	5.0	ug/L	ND	112	50-140			
Methyl tert-butyl ether	76.0	2.0	ug/L	ND	76.0	50-140			
Methylene Chloride	41.9	5.0	ug/L	ND	105	60-130			
Styrene	30.6	0.5	ug/L	ND	76.6	60-130			
1,1,1,2-Tetrachloroethane	28.6	0.5	ug/L	ND	71.6	60-130			
1,1,2,2-Tetrachloroethane	33.7	0.5	ug/L	ND	84.2	60-130			
Tetrachloroethylene	25.2	0.5	ug/L	ND	62.9	60-130			
Toluene	40.7	0.5	ug/L	ND	102	60-130			
1,2,4-Trichlorobenzene	29.7	0.5	ug/L	ND	74.4	60-130			
1,1,1-Trichloroethane	33.9	0.5	ug/L	ND	84.7	60-130			
1,1,2-Trichloroethane	47.2	0.5	ug/L	ND	118	60-130			
Trichloroethylene	44.4	0.5	ug/L	ND	111	60-130			
Trichlorofluoromethane	40.6	1.0	ug/L	ND	102	60-130			
1,2,4-Trimethylbenzene	ND	0.5	ug/L	ND		50-140			
1,3,5-Trimethylbenzene	38.2	0.5	ug/L	ND	95.6	60-130			
Vinyl chloride	47.6	0.5	ug/L	ND	119	50-140			
m,p-Xylenes	60.1	0.5	ug/L	ND	75.1	60-130			
o-Xylene	31.6	0.5	ug/L	ND	79.0	60-130			
Surrogate: 4-Bromofluorobenzene	*79.6*		*ug/L*		*99.4*	*50-140*			
Surrogate: Dibromofluoromethane	*81.5*		*ug/L*		*102*	*50-140*			
Surrogate: Toluene-d8	*77.6*		*ug/L*		*97.0*	*50-140*			

Sample and QC Qualifiers Notes

1- QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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Chain of Custody
(Lab Use Only)
Nº 87192

Page 1 of 1

Client Name: Golder Associates Ltd.
Contact Name: Mariq Staneva
Address: 32 Steacie Dr. Kanata, ON
Telephone: 613-

Project Reference: 10 1121 0222
Quote #: 10-305
PO #:
Email Address: mstaneva@golder.com

TAT: [X] Regular [ ] 2 Day [ ] 1 Day [ ] Same Day
Date Required:

Samples Submitted Under: [ ] O. Reg. 153/04 Table __ [X] O. Reg 511/09 Table 1 [ ] PWQO [ ] CCME [ ] Sewer Use (Storm) [ ] Sewer Use (Sanitary) [ ] Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 112752.

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHC F1-F4	VOC	Metals	Mercury	Chrom. VI	PAH	PCB				
1	T-72B	GW	/	7	6/28/11	AM	X	X	X	X	X	X					
2	W-10	GW	/	8	6/28/11	PM	X	X	X	X	X	X	X				
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Comments:

Method of Delivery: Walk-in

Relinquished By (Print & Sign): Aaron Bradshaw/A. Bradshaw
Date/Time:

Received by Driver/Depot:
Date/Time:
Temperature: ___ °C

Received at Lab: Karen Wiggins
Date/Time: 06/28/11 2:55
Temperature: 16.6 °C

Verified By:
Date/Time: Jun 29, 11 10:20
pH Verified [ ] By:

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Certificate of Analysis

Golder Associates Ltd. (Ottawa)
32 Steacie Dr.
Kanata, ON K2K 2A9
Attn: Maria Staneva

Phone: (613) 592-9600
Fax: (613) 592-9601

Client PO:
Project: 10-1121-0222
Custody: 81530

Report Date: 8-Jul-2011
Order Date: 30-Jun-2011
Order #: 1128002

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1128002-01	T-72A
1128002-02	W-014
1128002-03	W-009

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME PHC F1	CWS Tier 1 - P&T GC-FID	5-Jul-11	7-Jul-11
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	5-Jul-11	6-Jul-11
Chromium, hexavalent	MOE E3056 - colourimetric	4-Jul-11	5-Jul-11
Mercury	EPA 245.1 - Cold Vapour AA	7-Jul-11	7-Jul-11
Metals, low level	EPA 200.8 - ICP-MS	5-Jul-11	5-Jul-11
PAHs by GC-MS, standard scan	EPA 625 - GC-MS, extraction	7-Jul-11	7-Jul-11
VOCs	EPA 624 - P&T GC-MS	5-Jul-11	7-Jul-11

PARACEL LABORATORIES LTD.

Order #: 1128002

Certificate of Analysis

Report Date: 08-Jul-2011

Client: **Golder Associates Ltd. (Ottawa)**

Order Date:30-Jun-2011

Client PO:

Project Description: 10-1121-0222

	Client ID:	T-72A	W-014	W-009	-
	Sample Date:	30-Jun-11	30-Jun-11	30-Jun-11	-
	Sample ID:	1128002-01	1128002-02	1128002-03	-
	MDL/Units	Water	Water	Water	-
Metals					
Mercury	0.1 ug/L	<0.1	<0.1	-	-
Antimony	0.5 ug/L	<0.5	<0.5	-	-
Arsenic	1 ug/L	2	2	-	-
Barium	1 ug/L	198	220	-	-
Beryllium	0.5 ug/L	<0.5	<0.5	-	-
Boron	10 ug/L	270	123	-	-
Cadmium	0.1 ug/L	<0.1	<0.1	-	-
Chromium	1 ug/L	10	<1	-	-
Chromium (VI)	10 ug/L	<10 [3]	<10 [3]	-	-
Cobalt	0.5 ug/L	0.6	3.4	-	-
Copper	0.5 ug/L	1.7	<0.5	-	-
Lead	0.1 ug/L	<0.1	<0.1	-	-
Molybdenum	0.5 ug/L	22.3	1.0	-	-
Nickel	1 ug/L	7	8	-	-
Selenium	1 ug/L	2	1	-	-
Silver	0.1 ug/L	<0.1	<0.1	-	-
Sodium	200 ug/L	700000	36800	-	-
Thallium	0.1 ug/L	<0.1	<0.1	-	-
Uranium	0.1 ug/L	20.5	0.2	-	-
Vanadium	0.5 ug/L	3.0	3.0	-	-
Zinc	10 ug/L	<10	<10	-	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	-	-
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	-	-
Bromoform	0.5 ug/L	<0.5	<0.5	-	-
Bromomethane	0.5 ug/L	<0.5	<0.5	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	-	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
Chloroethane	1.0 ug/L	<1.0	<1.0	-	-
Chloroform	0.5 ug/L	<0.5	<0.5	-	-
Chloromethane	3.0 ug/L	<3.0	<3.0	-	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis

Client: **Golder Associates Ltd. (Ottawa)**

Client PO:

Report Date: 08-Jul-2011

Order Date:30-Jun-2011

Project Description: 10-1121-0222

	Client ID:	T-72A	W-014	W-009	-
	Sample Date:	30-Jun-11	30-Jun-11	30-Jun-11	-
	Sample ID:	1128002-01	1128002-02	1128002-03	-
	MDL/Units	Water	Water	Water	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2-Dibromoethane	0.2 ug/L	<0.2	<0.2	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	<0.5	-	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Hexane	1.0 ug/L	<1.0	<1.0	-	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	-	-
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	<10.0	<10.0	-	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	-	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	-	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	-	-
Styrene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	0.5 ug/L	<0.5	<0.5	-	-
1,2,4-Trichlorobenzene	0.5 ug/L	<0.5	<0.5	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	-	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	-	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	-	-
1,2,4-Trimethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	<0.5	-	-

Certificate of Analysis

Report Date: 08-Jul-2011

Client: **Golder Associates Ltd. (Ottawa)**

Order Date:30-Jun-2011

Client PO:

Project Description: 10-1121-0222

	Client ID:	T-72A	W-014	W-009	-
	Sample Date:	30-Jun-11	30-Jun-11	30-Jun-11	-
	Sample ID:	1128002-01	1128002-02	1128002-03	-
	MDL/Units	Water	Water	Water	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	-	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	-	-
o-Xylene	0.5 ug/L	<0.5	<0.5	-	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	-	-
4-Bromofluorobenzene	Surrogate	113%	111%	-	-
Dibromofluoromethane	Surrogate	103%	99.2%	-	-
Toluene-d8	Surrogate	106%	105%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	180	226	-	-
F3 PHCs (C16-C34)	100 ug/L	246	376	-	-
F4 PHCs (C34-C50)	100 ug/L	429	424	-	-
F1 + F2 PHCs	125 ug/L	180	226	-	-
F3 + F4 PHCs	200 ug/L	675	800	-	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	<0.05	0.14	-
Acenaphthylene	0.05 ug/L	<0.05	<0.05	0.19	-
Anthracene	0.01 ug/L	<0.01	0.09	0.28	-
Benzo [a] anthracene	0.01 ug/L	<0.01	0.21	0.82	-
Benzo [a] pyrene	0.01 ug/L	<0.01	0.11	0.70	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	0.13	0.99	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	0.05	0.28	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	0.07	0.49	-
Biphenyl	0.05 ug/L	<0.05	0.07	0.14	-
Chrysene	0.05 ug/L	<0.05	0.24	0.99	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	<0.05	<0.05	-
Fluoranthene	0.01 ug/L	<0.01	0.32	0.87	-
Fluorene	0.05 ug/L	<0.05	0.09	0.22	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	0.05	0.27	-
1-Methylnaphthalene	0.05 ug/L	<0.05	0.05	0.36	-
2-Methylnaphthalene	0.05 ug/L	<0.05	0.07	0.40	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	0.13	0.75	-
Naphthalene	0.05 ug/L	<0.05	0.20	1.29	-
Phenanthrene	0.05 ug/L	<0.05	0.37	0.76	-
Pyrene	0.01 ug/L	<0.01	0.23	0.85	-

Certificate of Analysis

Report Date: 08-Jul-2011

Client: **Golder Associates Ltd. (Ottawa)**

Order Date:30-Jun-2011

Client PO:

Project Description: 10-1121-0222

	Client ID:	T-72A	W-014	W-009	-
	Sample Date:	30-Jun-11	30-Jun-11	30-Jun-11	-
	Sample ID:	1128002-01	1128002-02	1128002-03	-
	MDL/Units	Water	Water	Water	-
2-Fluorobiphenyl	Surrogate	48.1%	69.4%	58.1%	-
Terphenyl-d14	Surrogate	61.2%	88.6%	78.4%	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	10	ug/L						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Biphenyl	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*18.2*		*ug/L*		*91.1*	*31-154*			
Surrogate: Terphenyl-d14	*19.7*		*ug/L*		*98.6*	*37-156*			
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Chlorobenzene	ND	0.5	ug/L						
Chloroethane	ND	1.0	ug/L						
Chloroform	ND	0.5	ug/L						
Chloromethane	ND	3.0	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dibromoethane	ND	0.2	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloroethylene, total	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,2,4-Trichlorobenzene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
1,2,4-Trimethylbenzene	ND	0.5	ug/L						
1,3,5-Trimethylbenzene	ND	0.5	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*87.2*		*ug/L*		*109*	*50-140*			
Surrogate: Dibromofluoromethane	*78.7*		*ug/L*		*98.4*	*50-140*			
Surrogate: Toluene-d8	*81.7*		*ug/L*		*102*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Metals									
Mercury	ND	0.1	ug/L	ND				20	
Antimony	ND	0.5	ug/L	ND				26	
Arsenic	1.1	1	ug/L	ND				29	
Barium	25.8	1	ug/L	24.8			3.8	34	
Beryllium	ND	0.5	ug/L	ND				25	
Boron	23	10	ug/L	19			20.4	33	
Cadmium	ND	0.1	ug/L	ND				33	
Chromium (VI)	ND	10	ug/L	ND				13	
Chromium	ND	1	ug/L	4.9				32	
Cobalt	ND	0.5	ug/L	ND				32	
Copper	ND	0.5	ug/L	0.58			0.0	32	
Lead	ND	0.1	ug/L	ND				32	
Molybdenum	0.94	0.5	ug/L	ND				29	
Nickel	1.6	1	ug/L	1.5			8.9	29	
Selenium	ND	1	ug/L	1.2				28	
Silver	0.13	0.1	ug/L	ND				28	
Sodium	15000	200	ug/L	14300			4.2	27	
Thallium	0.26	0.1	ug/L	ND				27	
Uranium	ND	0.1	ug/L	ND				27	
Vanadium	2.63	0.5	ug/L	1.51			53.9	27	QR-01
Zinc	ND	10	ug/L	ND				27	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroethane	ND	1.0	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Chloromethane	ND	3.0	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dibromoethane	ND	0.2	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	11.3	0.5	ug/L	10.7			5.6	30	
Toluene	ND	0.5	ug/L	ND				30	
1,2,4-Trichlorobenzene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	0.71				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
1,2,4-Trimethylbenzene	ND	0.5	ug/L	ND				30	
1,3,5-Trimethylbenzene	ND	0.5	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*91.6*		*ug/L*	*ND*	*115*	*50-140*			
Surrogate: Dibromofluoromethane	*67.9*		*ug/L*	*ND*	*84.9*	*50-140*			
Surrogate: Toluene-d8	*78.9*		*ug/L*	*ND*	*98.6*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1460	25	ug/L	ND	73.2	68-117			
F2 PHCs (C10-C16)	1970	100	ug/L	ND	123	61-129			
F3 PHCs (C16-C34)	3880	100	ug/L	ND	97.0	61-129			
F4 PHCs (C34-C50)	2560	100	ug/L	ND	107	61-129			
Metals									
Mercury	3.67	0.1	ug/L	ND	122	78-137			
Antimony	56.0		ug/L	ND	112	78-126			
Arsenic	54.5		ug/L	ND	109	83-119			
Barium	56.4		ug/L	ND	113	83-116			
Beryllium	51.2		ug/L	ND	102	72-132			
Boron	52		ug/L	ND	104	71-128			
Cadmium	55.1		ug/L	ND	110	78-119			
Chromium (VI)	199	10	ug/L	ND	99.5	75-120			
Chromium	59.5		ug/L	ND	119	80-124			
Cobalt	60.0		ug/L	ND	120	78-125			
Copper	61.7		ug/L	ND	123	75-123			
Lead	54.3		ug/L	ND	109	77-126			
Molybdenum	54.0		ug/L	ND	108	82-119			
Nickel	61.5		ug/L	ND	123	78-119			
Selenium	55.5		ug/L	ND	111	81-125			
Silver	55.5		ug/L	ND	111	70-128			
Sodium	831		ug/L	ND	83.1	67-132			
Thallium	57.5		ug/L	ND	115	82-127			
Uranium	59.7		ug/L	ND	119	70-131			
Vanadium	58.5		ug/L	ND	117	82-123			
Zinc	51		ug/L	ND	101	78-130			
Semi-Volatiles									
Acenaphthene	3.46	0.05	ug/L	ND	69.1	32-116			
Acenaphthylene	3.93	0.05	ug/L	ND	78.7	26-120			
Anthracene	3.78	0.01	ug/L	ND	75.7	29-126			
Benzo [a] anthracene	5.93	0.01	ug/L	ND	119	29-126			
Benzo [a] pyrene	4.80	0.01	ug/L	ND	96.0	29-111			
Benzo [b] fluoranthene	4.17	0.05	ug/L	ND	83.3	26-111			
Benzo [g,h,i] perylene	4.10	0.05	ug/L	ND	82.1	23-128			
Benzo [k] fluoranthene	3.73	0.05	ug/L	ND	74.6	23-135			
Biphenyl	3.21	0.05	ug/L	ND	64.1	31-107			
Chrysene	5.61	0.05	ug/L	ND	112	29-137			
Dibenzo [a,h] anthracene	4.26	0.05	ug/L	ND	85.3	20-131			
Fluoranthene	4.21	0.01	ug/L	ND	84.3	24-131			
Fluorene	4.26	0.05	ug/L	ND	85.2	28-123			
Indeno [1,2,3-cd] pyrene	4.28	0.05	ug/L	ND	85.5	20-128			
1-Methylnaphthalene	3.90	0.05	ug/L	ND	78.0	25-127			
2-Methylnaphthalene	3.93	0.05	ug/L	ND	78.5	21-119			
Naphthalene	3.93	0.05	ug/L	ND	78.6	29-118			
Phenanthrene	3.79	0.05	ug/L	ND	75.7	34-108			
Pyrene	3.78	0.01	ug/L	ND	75.7	29-131			
Surrogate: 2-Fluorobiphenyl	*20.7*		*ug/L*		*103*	*31-154*			
Surrogate: Terphenyl-d14	*20.9*		*ug/L*		*105*	*37-156*			
Volatiles									
Acetone	108	5.0	ug/L	ND	108	50-140			
Benzene	49.3	0.5	ug/L	ND	123	60-130			
Bromodichloromethane	46.4	0.5	ug/L	ND	116	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Bromoform	31.4	0.5	ug/L	ND	78.4	60-130			
Bromomethane	43.3	0.5	ug/L	ND	108	50-140			
Carbon Tetrachloride	34.3	0.2	ug/L	ND	85.6	60-130			
Chlorobenzene	29.8	0.5	ug/L	ND	74.4	60-130			
Chloroethane	41.6	1.0	ug/L	ND	104	50-140			
Chloroform	38.9	0.5	ug/L	ND	97.2	60-130			
Chloromethane	41.7	3.0	ug/L	ND	104	50-140			
Dibromochloromethane	31.3	0.5	ug/L	ND	78.4	60-130			
Dichlorodifluoromethane	25.8	1.0	ug/L	ND	64.6	50-140			
1,2-Dibromoethane	30.9	0.2	ug/L	ND	77.4	60-130			
1,2-Dichlorobenzene	33.7	0.5	ug/L	ND	84.2	60-130			
1,3-Dichlorobenzene	33.1	0.5	ug/L	ND	82.7	60-130			
1,4-Dichlorobenzene	33.2	0.5	ug/L	ND	83.0	60-130			
1,1-Dichloroethane	42.0	0.5	ug/L	ND	105	60-130			
1,2-Dichloroethane	37.6	0.5	ug/L	ND	93.9	60-130			
1,1-Dichloroethylene	38.9	0.5	ug/L	ND	97.2	60-130			
cis-1,2-Dichloroethylene	38.4	0.5	ug/L	ND	96.1	60-130			
trans-1,2-Dichloroethylene	39.7	0.5	ug/L	ND	99.3	60-130			
1,2-Dichloropropane	35.5	0.5	ug/L	ND	88.7	60-130			
cis-1,3-Dichloropropylene	44.4	0.5	ug/L	ND	111	60-130			
trans-1,3-Dichloropropylene	50.8	0.5	ug/L	ND	127	60-130			
Ethylbenzene	29.5	0.5	ug/L	ND	73.7	60-130			
Hexane	24.3	1.0	ug/L	ND	60.7	60-130			
Methyl Ethyl Ketone (2-Butanone)	92.0	5.0	ug/L	ND	92.0	50-140			
Methyl Butyl Ketone (2-Hexanone)	115	10.0	ug/L	ND	115	50-140			
Methyl Isobutyl Ketone	112	5.0	ug/L	ND	112	50-140			
Methyl tert-butyl ether	76.0	2.0	ug/L	ND	76.0	50-140			
Methylene Chloride	41.9	5.0	ug/L	ND	105	60-130			
Styrene	30.6	0.5	ug/L	ND	76.6	60-130			
1,1,1,2-Tetrachloroethane	28.6	0.5	ug/L	ND	71.6	60-130			
1,1,2,2-Tetrachloroethane	33.7	0.5	ug/L	ND	84.2	60-130			
Tetrachloroethylene	25.2	0.5	ug/L	ND	62.9	60-130			
Toluene	40.7	0.5	ug/L	ND	102	60-130			
1,2,4-Trichlorobenzene	29.7	0.5	ug/L	ND	74.4	60-130			
1,1,1-Trichloroethane	33.9	0.5	ug/L	ND	84.7	60-130			
1,1,2-Trichloroethane	47.2	0.5	ug/L	ND	118	60-130			
Trichloroethylene	44.4	0.5	ug/L	ND	111	60-130			
Trichlorofluoromethane	40.6	1.0	ug/L	ND	102	60-130			
1,2,4-Trimethylbenzene	ND	0.5	ug/L	ND		50-140			
1,3,5-Trimethylbenzene	38.2	0.5	ug/L	ND	95.6	60-130			
Vinyl chloride	47.6	0.5	ug/L	ND	119	50-140			
m,p-Xylenes	60.1	0.5	ug/L	ND	75.1	60-130			
o-Xylene	31.6	0.5	ug/L	ND	79.0	60-130			
Surrogate: 4-Bromofluorobenzene	*79.6*		*ug/L*		*99.4*	*50-140*			
Surrogate: Dibromofluoromethane	*81.5*		*ug/L*		*102*	*50-140*			
Surrogate: Toluene-d8	*77.6*		*ug/L*		*97.0*	*50-140*			

Sample and QC Qualifiers Notes

1- QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

3- Z-01 : Sample was preserved, holding time not exceeded

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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Chain of Custody

(lab use only)

Nº 81530

Page 1 of 1

Client Name: Golder Associates Ltd.	Project Ref: 10 1121 0222	Reg. Drinking Water Waterworks Name:	
Contact Name: Maria Staneva	Quote # 10-305	Waterworks Number:	Sample Taken by: Print Name: Aaron Bradshaw
Address: 32 Steacie Dr. Kanata, ON	PO #	Address:	Signature: A. Bradshaw
Telephone:	E-mail Address: mstaneva@golder.com Fax:	After hours Contact: Public Health Unit:	TAT: [ ] 1-day [ ] 2-day [ ] Reg.

Matrix Types: S–Soil/Sed. GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer DW-Drinking Water RDW-Regulated Drinking Water P- Paint A-Air O-Other

Samples submitted under: (Indicate **ONLY** one)
☒ O. Reg 153 (511) Table 1 ☐ O. Reg 170/03 ☐ O. Reg 318/08 ☐ Private well
☐ CCME ☐ O. Reg 243/07 ☐ O. Reg 319/08 ☐ Other:

Type of DW Sample: **R** = Raw; **T** = Treated; **D** = Distribution
Location Types: **S** = Surface Water; **G** = Ground Water

Paracel Order Number: 1128002

	Sample ID / Location Name	Matrix	Air Volume	Type of Sample	# of Containers	Sample Taken: Date	Sample Taken: Time	Free / Combined Chlorine Residual mg/L	Required Analyses: PHCs F1-F4	VOCs	PAH	Metals	Mercury	Chromium VI			
1	T-72A	GW	\	G	2	6/30/11	AM	/	X	X	X	X	X	X			
2	W-014	↓	\	\	2	↓	PM	/	X	X	X	X	X	X			
3	W-009	↓	\	\	1	↓	PM	/			X						
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Comments: Dispose of empty set. Temp OK - in cooling down process

Preservation Verification: pH ____ Temperature ____
Verified by: ____

Relinquished By (Print & Sign): Aaron Bradshaw/A. Bradshaw

Date/Time: ____

Lab Use Only

Received By Driver/Depot:	Received at Lab:	Verified By:
Date/Time: 6/30/11 Walk-in	Date/Time: June 30/11 7:00p	Date/Time: July 1/11 7:53a

ChainOfCustody Rev 2.0. January 2010

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Certificate of Analysis

Golder Associates Ltd. (Ottawa)
32 Steacie Dr.
Kanata, ON K2K 2A9
Attn: Maria Staneva

Phone: (613) 592-9600
Fax: (613) 592-9601

Client PO:
Project: 10-1121-0222
Custody: 87848

Report Date: 31-Aug-2011
Order Date: 25-Aug-2011
Order #: 1135236

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1135236-01	T-72A
1135236-02	T-72B
1135236-03	E-112
1135236-04	E-006

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: **Golder Associates Ltd. (Ottawa)**
Client PO:

Report Date: 31-Aug-2011
Order Date:25-Aug-2011

Project Description: 10-1121-0222

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX	EPA 624 - P&T GC-MS	29-Aug-11	30-Aug-11
CCME PHC F1	CWS Tier 1 - P&T GC-FID	29-Aug-11	30-Aug-11
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	26-Aug-11	26-Aug-11
Chromium, hexavalent	MOE E3056 - colourimetric	26-Aug-11	30-Aug-11
Mercury	EPA 245.1 - Cold Vapour AA	30-Aug-11	30-Aug-11
Metals, low level	EPA 200.8 - ICP-MS	29-Aug-11	29-Aug-11
PAHs by GC-MS, standard scan	EPA 625 - GC-MS, extraction	29-Aug-11	29-Aug-11
VOCs	EPA 624 - P&T GC-MS	29-Aug-11	30-Aug-11

PARACEL LABORATORIES LTD.

Order #: 1135236

Certificate of Analysis

Report Date: 31-Aug-2011

Client: **Golder Associates Ltd. (Ottawa)**

Order Date:25-Aug-2011

Client PO:

Project Description: 10-1121-0222

	Client ID:	T-72A	T-72B	E-112	E-006
	Sample Date:	23-Aug-11	23-Aug-11	23-Aug-11	23-Aug-11
	Sample ID:	1135236-01	1135236-02	1135236-03	1135236-04
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.1 ug/L	-	-	<0.1	<0.1
Antimony	0.5 ug/L	-	-	0.7	<0.5
Arsenic	1 ug/L	-	-	1	1
Barium	1 ug/L	-	-	168	79
Beryllium	0.5 ug/L	-	-	<0.5	<0.5
Boron	10 ug/L	-	-	210	87
Cadmium	0.1 ug/L	-	-	<0.1	<0.1
Chromium	1 ug/L	-	-	22	27
Chromium (VI)	10 ug/L	-	-	<10	<10
Cobalt	0.5 ug/L	-	-	2.1	3.1
Copper	0.5 ug/L	-	-	2.9	3.6
Lead	0.1 ug/L	-	-	<0.1	<0.1
Molybdenum	0.5 ug/L	-	-	31.2	4.5
Nickel	1 ug/L	-	-	12	22
Selenium	1 ug/L	-	-	<1	<1
Silver	0.1 ug/L	-	-	<0.1	<0.1
Sodium	200 ug/L	-	-	875000	2750000
Thallium	0.1 ug/L	-	-	<0.1	<0.1
Uranium	0.1 ug/L	-	-	2.2	0.5
Vanadium	0.5 ug/L	-	-	7.5	5.9
Zinc	10 ug/L	-	-	40	21
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloromethane	3.0 ug/L	<3.0	<3.0	<3.0	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-

PARACEL LABORATORIES LTD.

Order #: 1135236

Certificate of Analysis

Report Date: 31-Aug-2011

Client: **Golder Associates Ltd. (Ottawa)**

Order Date:25-Aug-2011

Client PO:

Project Description: 10-1121-0222

	Client ID:	T-72A	T-72B	E-112	E-006
	Sample Date:	23-Aug-11	23-Aug-11	23-Aug-11	23-Aug-11
	Sample ID:	1135236-01	1135236-02	1135236-03	1135236-04
	MDL/Units	Water	Water	Water	Water
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dibromoethane	0.2 ug/L	<0.2	<0.2	<0.2	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	<10.0	<10.0	<10.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2,4-Trichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis

Report Date: 31-Aug-2011

Client: **Golder Associates Ltd. (Ottawa)**

Order Date:25-Aug-2011

Client PO:

Project Description: 10-1121-0222

	Client ID:	T-72A	T-72B	E-112	E-006
	Sample Date:	23-Aug-11	23-Aug-11	23-Aug-11	23-Aug-11
	Sample ID:	1135236-01	1135236-02	1135236-03	1135236-04
	MDL/Units	Water	Water	Water	Water
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	132%	138%	132%	-
Dibromofluoromethane	Surrogate	85.9%	86.5%	88.5%	-
Toluene-d8	Surrogate	110%	110%	108%	-
Benzene	0.5 ug/L	-	-	-	<0.5
Ethylbenzene	0.5 ug/L	-	-	-	<0.5
Toluene	0.5 ug/L	-	-	-	<0.5
m,p-Xylenes	0.5 ug/L	-	-	-	<0.5
o-Xylene	0.5 ug/L	-	-	-	<0.5
Xylenes, total	0.5 ug/L	-	-	-	<0.5
Toluene-d8	Surrogate	-	-	-	109%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	229
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	220
F1 + F2 PHCs	125 ug/L	<125	<125	<125	-
F1 + F2 PHCs	125 ug/L	-	-	-	<125
F3 + F4 PHCs	200 ug/L	<200	<200	<200	-
F3 + F4 PHCs	200 ug/L	-	-	-	449
Semi-Volatiles					
Acenaphthene	0.05 ug/L	-	-	1.28	<0.05
Acenaphthylene	0.05 ug/L	-	-	10.7	<0.05
Anthracene	0.01 ug/L	-	-	3.90	0.02
Benzo [a] anthracene	0.01 ug/L	-	-	2.94	0.13
Benzo [a] pyrene	0.01 ug/L	-	-	2.05	0.04
Benzo [b] fluoranthene	0.05 ug/L	-	-	2.63	0.12
Benzo [g,h,i] perylene	0.05 ug/L	-	-	1.06	0.07
Benzo [k] fluoranthene	0.05 ug/L	-	-	1.49	0.07
Biphenyl	0.05 ug/L	-	-	1.98	0.06
Chrysene	0.05 ug/L	-	-	3.68	0.19
Dibenzo [a,h] anthracene	0.05 ug/L	-	-	0.32	<0.05
Fluoranthene	0.01 ug/L	-	-	4.01	0.09

Certificate of Analysis

Report Date: 31-Aug-2011

Client: **Golder Associates Ltd. (Ottawa)**

Order Date:25-Aug-2011

Client PO:

Project Description: 10-1121-0222

	Client ID:	T-72A	T-72B	E-112	E-006
	Sample Date:	23-Aug-11	23-Aug-11	23-Aug-11	23-Aug-11
	Sample ID:	1135236-01	1135236-02	1135236-03	1135236-04
	MDL/Units	Water	Water	Water	Water
Fluorene	0.05 ug/L	-	-	5.97	<0.05
Indeno [1,2,3-cd] pyrene	0.05 ug/L	-	-	0.83	0.05
1-Methylnaphthalene	0.05 ug/L	-	-	14.3	<0.05
2-Methylnaphthalene	0.05 ug/L	-	-	18.0	<0.05
Methylnaphthalene (1&2)	0.10 ug/L	-	-	32.3	<0.10
Naphthalene	0.05 ug/L	-	-	43.6	<0.05
Phenanthrene	0.05 ug/L	-	-	10.9	0.16
Pyrene	0.01 ug/L	-	-	5.47	0.09
2-Fluorobiphenyl	Surrogate	-	-	50.2%	51.4%
Terphenyl-d14	Surrogate	-	-	56.4%	67.0%

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Mercury	ND	0.1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Chromium (VI)	ND	10	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.1	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Thallium	ND	0.1	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	10	ug/L						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Biphenyl	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Surrogate: 2-Fluorobiphenyl	*13.6*		*ug/L*		*68.1*	*31-154*			
Surrogate: Terphenyl-d14	*17.3*		*ug/L*		*86.5*	*37-156*			
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Chlorobenzene	ND	0.5	ug/L						
Chloroethane	ND	1.0	ug/L						
Chloroform	ND	0.5	ug/L						
Chloromethane	ND	3.0	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dibromoethane	ND	0.2	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloroethylene, total	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,2,4-Trichlorobenzene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
1,3,5-Trimethylbenzene	ND	0.5	ug/L						
Vinyl chloride	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*34.9*		*ug/L*		*109*	*50-140*			
Surrogate: Dibromofluoromethane	*33.0*		*ug/L*		*103*	*50-140*			
Surrogate: Toluene-d8	*35.3*		*ug/L*		*110*	*50-140*			
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*35.3*		*ug/L*		*110*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Metals									
Mercury	ND	0.1	ug/L	ND				20	
Antimony	ND	0.5	ug/L	ND				20	
Arsenic	1.2	1	ug/L	1.2			6.5	20	
Barium	23.5	1	ug/L	23.5			0.1	20	
Beryllium	ND	0.5	ug/L	ND				20	
Boron	22	10	ug/L	31			33.1	20	QR-01
Cadmium	ND	0.1	ug/L	ND				20	
Chromium (VI)	ND	10	ug/L	ND				13	
Chromium	8.2	1	ug/L	7.5			8.8	20	
Cobalt	ND	0.5	ug/L	ND				20	
Copper	1.64	0.5	ug/L	1.56			4.7	20	
Lead	0.10	0.1	ug/L	ND				20	
Molybdenum	1.08	0.5	ug/L	1.22			11.6	20	
Nickel	2.7	1	ug/L	2.7			2.7	20	
Selenium	1.9	1	ug/L	2.0			5.8	20	
Silver	ND	0.1	ug/L	ND				20	
Sodium	12000	200	ug/L	14000			15.7	20	
Thallium	ND	0.1	ug/L	ND				20	
Uranium	ND	0.1	ug/L	ND				20	
Vanadium	2.29	0.5	ug/L	2.08			9.5	20	
Zinc	ND	10	ug/L	ND				20	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroethane	ND	1.0	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Chloromethane	ND	3.0	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dibromoethane	ND	0.2	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,2,4-Trichlorobenzene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
1,3,5-Trimethylbenzene	ND	0.5	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: 4-Bromofluorobenzene	*35.9*		*ug/L*	*ND*	*112*	*50-140*			
Surrogate: Dibromofluoromethane	*29.5*		*ug/L*	*ND*	*92.3*	*50-140*			
Surrogate: Toluene-d8	*34.7*		*ug/L*	*ND*	*108*	*50-140*			
Benzene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	
Surrogate: Toluene-d8	*34.7*		*ug/L*	*ND*	*108*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1660	25	ug/L	ND	83.2	68-117			
F2 PHCs (C10-C16)	1140	100	ug/L	ND	71.4	60-140			
F3 PHCs (C16-C34)	2990	100	ug/L	ND	74.7	60-140			
F4 PHCs (C34-C50)	2080	100	ug/L	ND	86.6	60-140			
Metals									
Mercury	3.89	0.1	ug/L	ND	130	78-137			
Antimony	49.7		ug/L	ND	99.4	80-120			
Arsenic	45.1		ug/L	ND	90.2	80-120			
Barium	50.2		ug/L	ND	100	80-120			
Beryllium	36.6		ug/L	ND	73.2	80-120			QS-02
Boron	41		ug/L	ND	82.0	80-120			
Cadmium	47.8		ug/L	ND	95.5	80-120			
Chromium (VI)	207	10	ug/L	ND	104	75-120			
Chromium	49.0		ug/L	ND	98.1	80-120			
Cobalt	52.1		ug/L	ND	104	80-120			
Copper	50.4		ug/L	ND	101	80-120			
Lead	48.2		ug/L	ND	96.4	80-120			
Molybdenum	47.1		ug/L	ND	94.2	80-120			
Nickel	50.9		ug/L	ND	102	80-120			
Selenium	47.2		ug/L	ND	94.4	80-120			
Silver	50.7		ug/L	ND	101	80-120			
Sodium	658		ug/L	ND	65.8	80-120			QS-02
Thallium	50.4		ug/L	ND	101	80-120			
Uranium	47.4		ug/L	ND	94.9	80-120			
Vanadium	49.0		ug/L	ND	97.9	80-120			
Zinc	44		ug/L	ND	88.6	80-120			
Semi-Volatiles									
Acenaphthene	4.88	0.05	ug/L	ND	97.6	50-140			
Acenaphthylene	5.34	0.05	ug/L	ND	107	50-140			
Anthracene	5.09	0.01	ug/L	ND	102	50-140			
Benzo [a] anthracene	5.27	0.01	ug/L	ND	105	50-140			
Benzo [a] pyrene	4.18	0.01	ug/L	ND	83.5	50-140			
Benzo [b] fluoranthene	6.03	0.05	ug/L	ND	121	50-140			
Benzo [g,h,i] perylene	4.19	0.05	ug/L	ND	83.7	50-140			
Benzo [k] fluoranthene	5.43	0.05	ug/L	ND	109	50-140			
Biphenyl	4.39	0.05	ug/L	ND	87.8	50-140			
Chrysene	6.32	0.05	ug/L	ND	126	50-140			
Dibenzo [a,h] anthracene	3.00	0.05	ug/L	ND	60.0	50-140			
Fluoranthene	4.91	0.01	ug/L	ND	98.2	50-140			
Fluorene	4.89	0.05	ug/L	ND	97.7	50-140			
Indeno [1,2,3-cd] pyrene	3.30	0.05	ug/L	ND	66.0	50-140			
1-Methylnaphthalene	3.98	0.05	ug/L	ND	79.7	50-140			
2-Methylnaphthalene	3.90	0.05	ug/L	ND	77.9	50-140			
Naphthalene	4.79	0.05	ug/L	ND	95.9	50-140			
Phenanthrene	5.02	0.05	ug/L	ND	100	50-140			
Pyrene	4.61	0.01	ug/L	ND	92.2	50-140			
Surrogate: 2-Fluorobiphenyl	*14.1*		*ug/L*		*70.7*	*31-154*			
Volatiles									
Acetone	87.0	5.0	ug/L	ND	87.0	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzene	33.5	0.5	ug/L	ND	83.6	60-130			
Bromodichloromethane	34.3	0.5	ug/L	ND	85.8	60-130			
Bromoform	26.2	0.5	ug/L	ND	65.4	60-130			
Bromomethane	8.97	0.5	ug/L	ND	22.4	50-140			QS-02
Carbon Tetrachloride	36.2	0.2	ug/L	ND	90.4	60-130			
Chlorobenzene	31.1	0.5	ug/L	ND	77.6	60-130			
Chloroethane	26.3	1.0	ug/L	ND	65.8	50-140			
Chloroform	36.5	0.5	ug/L	ND	91.3	60-130			
Chloromethane	22.5	3.0	ug/L	ND	56.2	50-140			
Dibromochloromethane	29.2	0.5	ug/L	ND	73.0	60-130			
Dichlorodifluoromethane	27.6	1.0	ug/L	ND	69.0	50-140			
1,2-Dibromoethane	26.2	0.2	ug/L	ND	65.4	60-130			
1,2-Dichlorobenzene	35.1	0.5	ug/L	ND	87.8	60-130			
1,3-Dichlorobenzene	32.2	0.5	ug/L	ND	80.6	60-130			
1,4-Dichlorobenzene	39.4	0.5	ug/L	ND	98.6	60-130			
1,1-Dichloroethane	31.3	0.5	ug/L	ND	78.2	60-130			
1,2-Dichloroethane	37.0	0.5	ug/L	ND	92.6	60-130			
1,1-Dichloroethylene	34.9	0.5	ug/L	ND	87.2	60-130			
cis-1,2-Dichloroethylene	33.4	0.5	ug/L	ND	83.5	60-130			
trans-1,2-Dichloroethylene	35.7	0.5	ug/L	ND	89.2	60-130			
1,2-Dichloropropane	31.2	0.5	ug/L	ND	78.0	60-130			
cis-1,3-Dichloropropylene	31.4	0.5	ug/L	ND	78.4	60-130			
trans-1,3-Dichloropropylene	26.1	0.5	ug/L	ND	65.3	60-130			
Ethylbenzene	28.7	0.5	ug/L	ND	71.7	60-130			
Hexane	25.5	1.0	ug/L	ND	63.8	60-130			
Methyl Ethyl Ketone (2-Butanone)	70.2	5.0	ug/L	ND	70.2	50-140			
Methyl Butyl Ketone (2-Hexanone)	67.3	10.0	ug/L	ND	67.3	50-140			
Methyl Isobutyl Ketone	72.6	5.0	ug/L	ND	72.6	50-140			
Methyl tert-butyl ether	58.2	2.0	ug/L	ND	58.2	50-140			
Methylene Chloride	33.9	5.0	ug/L	ND	84.8	60-130			
Styrene	28.5	0.5	ug/L	ND	71.3	60-130			
1,1,1,2-Tetrachloroethane	29.9	0.5	ug/L	ND	74.8	60-130			
1,1,2,2-Tetrachloroethane	24.0	0.5	ug/L	ND	60.0	60-130			
Tetrachloroethylene	30.3	0.5	ug/L	ND	75.7	60-130			
Toluene	33.9	0.5	ug/L	ND	84.6	60-130			
1,2,4-Trichlorobenzene	25.5	0.5	ug/L	ND	63.8	60-130			
1,1,1-Trichloroethane	33.4	0.5	ug/L	ND	83.4	60-130			
1,1,2-Trichloroethane	32.5	0.5	ug/L	ND	81.3	60-130			
Trichloroethylene	31.9	0.5	ug/L	ND	79.7	60-130			
Trichlorofluoromethane	31.9	1.0	ug/L	ND	79.7	60-130			
1,3,5-Trimethylbenzene	34.4	0.5	ug/L	ND	86.1	60-130			
Vinyl chloride	29.3	0.5	ug/L	ND	73.2	50-140			
m,p-Xylenes	61.6	0.5	ug/L	ND	76.9	60-130			
o-Xylene	30.8	0.5	ug/L	ND	76.9	60-130			
Benzene	33.5	0.5	ug/L	ND	83.6	60-130			
Ethylbenzene	28.7	0.5	ug/L	ND	71.7	60-130			
Toluene	33.9	0.5	ug/L	ND	84.6	60-130			
m,p-Xylenes	61.6	0.5	ug/L	ND	76.9	60-130			
o-Xylene	30.8	0.5	ug/L	ND	76.9	60-130			

Sample and QC Qualifiers Notes

1- LG-SMP007 : Sample - Filtered and preserved by Paracel upon receipt at the laboratory

4- QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

5- QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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Chain of Custody
(Lab Use Only)
Nº 87848

Page 1 of 1

Client Name: GAL
Contact Name: Maria Stanevа
Address: 32 Steacie Dr. Kanata, ON
Telephone: 613-592-9600

Project Reference: 10 1121 0222
Quote #: 10-305
PO #:
Email Address: mstaneva@golder.com

TAT: [✓] Regular Ask [ ] 2 Day [ ] 1 Day Maria (Reg TAT) [ ] Same Day
Date Required: _____

Ask Maria Samples Submitted Under: [ ] O. Reg. 153/04 Table __ [ ] O. Reg 511/09 Table __ [ ] PWQO [ ] CCME [ ] Sewer Use (Storm) [ ] Sewer Use (Sanitary) [ ] Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number: 1135236

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs-Fw	VOC	Metals	Mercury	Chrom VI	PAH	BTEX				
1	T-72A	GW	/	3	25/8/11	PM	X	X									/
2	T-72B	GW	/	3	↓	↓	X	X									/
3	E-112	GW	/	7	↓	↓	X	X	X	X	X	X					/
4	E-006	GW	/	7	↓	↓	X		X	X	X	X	X				/
5																	
6																	
7																	
8																	
9																	
10																	

Comments: Taken today. Temp is fine. All metals field filtered per Maria - MJC
Full bottle extraction for PHCs per Maria. Subsampled for Cr6 - MJC

Method of Delivery: Walk-in

Relinquished By (Print & Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Aaron Bradshaw	Mail Kitchi	SUNEETHA	MJC
Date/Time:	Date/Time: 5:05	Date/Time: Aug 26/11 10:30	Date/Time: Aug 26/11 11:20
	Temperature: 20.2°C	Temperature: 21.5°C	pH Verified [ ] By: MJC

 Walk in

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Certificate of Analysis

Golder Associates Ltd. (Ottawa)
32 Steacie Dr.
Kanata, ON K2K 2A9
Attn: Basil Sullivan

Phone: (613) 592-9600
Fax: (613) 592-9601

Client PO:
Project: 10-1121-0222 (1300) (1340)
Custody: 29328

Report Date: 11-Nov-2011
Order Date: 7-Nov-2011
Order #: 1146028

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1146028-01	T-309 SA1
1146028-02	T-309 SA4
1146028-03	T-309 SA4A
1146028-04	T-307 SA1
1146028-05	T-307 SA5
1146028-06	T-306 SA1
1146028-07	T-306 SA3
1146028-08	T-308 SA3
1146028-09	T-308 SA6

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO: Project Description: 10-1121-0222 (1300) (1340)

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME PHC F1	CWS Tier 1 - P&T GC-FID	8-Nov-11	9-Nov-11
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	10-Nov-11	10-Nov-11
Chromium, hexavalent	MOE E3056 - Extraction, colourimetric	8-Nov-11	8-Nov-11
Mercury	EPA 7471A - CVAA, digestion	9-Nov-11	9-Nov-11
Metals	EPA 6020 - Digestion - ICP-MS	8-Nov-11	8-Nov-11
Solids, %	Gravimetric, calculation	9-Nov-11	9-Nov-11
VOCs	EPA 8260 - P&T GC-MS	8-Nov-11	10-Nov-11

PARACEL LABORATORIES LTD.

Order #: 1146028

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO:

Project Description: 10-1121-0222 (1300) (1340)

	Client ID:	T-309 SA1	T-309 SA4	T-309 SA4A	T-307 SA1
	Sample Date:	01-Nov-11	01-Nov-11	01-Nov-11	02-Nov-11
	Sample ID:	1146028-01	1146028-02	1146028-03	1146028-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	95.5	82.8	84.6	88.8
Metals					
Antimony	1 ug/g dry	<1	-	-	<1
Arsenic	1 ug/g dry	<1	-	-	5
Barium	1 ug/g dry	40	-	-	255
Beryllium	0.5 ug/g dry	<0.5	-	-	<0.5
Boron	5.0 ug/g dry	<5.0	-	-	<5.0
Cadmium	0.5 ug/g dry	<0.5	-	-	0.8
Chromium	5 ug/g dry	<5	-	-	18
Chromium (VI)	0.4 ug/g dry	<0.4	-	-	<0.4
Cobalt	1 ug/g dry	2	-	-	5
Copper	5 ug/g dry	5	-	-	27
Lead	1 ug/g dry	25	-	-	258
Mercury	0.1 ug/g dry	<0.1	-	-	0.7
Molybdenum	1 ug/g dry	<1	-	-	<1
Nickel	5 ug/g dry	7	-	-	13
Selenium	1 ug/g dry	<1	-	-	<1
Silver	0.3 ug/g dry	<0.3	-	-	<0.3
Thallium	1 ug/g dry	<1	-	-	<1
Uranium	1 ug/g dry	<1	-	-	<1
Vanadium	10 ug/g dry	<10	-	-	24
Zinc	20 ug/g dry	42	-	-	312
Volatiles					
Acetone	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Bromodichloromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Bromoform	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Bromomethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Carbon Tetrachloride	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Chlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Chloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Chloroform	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Chloromethane	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Dibromochloromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO:

Project Description: 10-1121-0222 (1300) (1340)

	Client ID:	T-309 SA1	T-309 SA4	T-309 SA4A	T-307 SA1
	Sample Date:	01-Nov-11	01-Nov-11	01-Nov-11	02-Nov-11
	Sample ID:	1146028-01	1146028-02	1146028-03	1146028-04
	MDL/Units	Soil	Soil	Soil	Soil
Volatiles (continued)					
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dibromoethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dichloroethylene, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dichloropropane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Hexane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Methyl Ethyl Ketone (2-Butanone)	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Methyl Butyl Ketone (2-Hexanone)	2.0 ug/g dry	<2.0	<2.0	<2.0	<2.0
Methyl Isobutyl Ketone	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Methylene Chloride	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Styrene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Tetrachloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2,4-Trichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Trichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Trichlorofluoromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,3,5-Trimethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Vinyl chloride	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO:

Project Description: 10-1121-0222 (1300) (1340)

	Client ID:	T-309 SA1	T-309 SA4	T-309 SA4A	T-307 SA1
	Sample Date:	01-Nov-11	01-Nov-11	01-Nov-11	02-Nov-11
	Sample ID:	1146028-01	1146028-02	1146028-03	1146028-04
	MDL/Units	Soil	Soil	Soil	Soil
Volatiles (continued)					
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
4-Bromofluorobenzene	Surrogate	109%	109%	109%	106%
Dibromofluoromethane	Surrogate	104%	103%	105%	106%
Toluene-d8	Surrogate	108%	109%	110%	107%
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	<10	<10
F2 PHCs (C10-C16)	10 ug/g dry	<10	<10	<10	<10
F3 PHCs (C16-C34)	10 ug/g dry	28	<10	<10	82
F4 PHCs (C34-C50)	10 ug/g dry	29	<10	<10	40

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO:

Project Description: 10-1121-0222 (1300) (1340)

	Client ID:	T-307 SA5	T-306 SA1	T-306 SA3	T-308 SA3
	Sample Date:	02-Nov-11	03-Nov-11	03-Nov-11	01-Nov-11
	Sample ID:	1146028-05	1146028-06	1146028-07	1146028-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	90.6	81.8	80.4	68.7
Metals					
Antimony	1 ug/g dry	-	4	-	-
Arsenic	1 ug/g dry	-	<1	-	-
Barium	1 ug/g dry	-	413	-	-
Beryllium	0.5 ug/g dry	-	<0.5	-	-
Boron	5.0 ug/g dry	-	<5.0	-	-
Cadmium	0.5 ug/g dry	-	<0.5	-	-
Chromium	5 ug/g dry	-	7	-	-
Chromium (VI)	0.4 ug/g dry	-	<0.4	-	-
Cobalt	1 ug/g dry	-	2	-	-
Copper	5 ug/g dry	-	7	-	-
Lead	1 ug/g dry	-	438	-	-
Mercury	0.1 ug/g dry	-	1.2	-	-
Molybdenum	1 ug/g dry	-	<1	-	-
Nickel	5 ug/g dry	-	6	-	-
Selenium	1 ug/g dry	-	<1	-	-
Silver	0.3 ug/g dry	-	<0.3	-	-
Thallium	1 ug/g dry	-	<1	-	-
Uranium	1 ug/g dry	-	<1	-	-
Vanadium	10 ug/g dry	-	<10	-	-
Zinc	20 ug/g dry	-	266	-	-
Volatiles					
Acetone	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Bromodichloromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Bromoform	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Bromomethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Carbon Tetrachloride	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Chlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Chloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Chloroform	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Chloromethane	0.2 ug/g dry	<0.2	<0.2	<0.2	<0.2
Dibromochloromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO: Project Description: 10-1121-0222 (1300) (1340)

	Client ID:	T-307 SA5	T-306 SA1	T-306 SA3	T-308 SA3
	Sample Date:	02-Nov-11	03-Nov-11	03-Nov-11	01-Nov-11
	Sample ID:	1146028-05	1146028-06	1146028-07	1146028-08
	MDL/Units	Soil	Soil	Soil	Soil
Volatiles (continued)					
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dibromoethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dichloroethylene, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2-Dichloropropane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Hexane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Methyl Ethyl Ketone (2-Butanone)	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Methyl Butyl Ketone (2-Hexanone)	2.0 ug/g dry	<2.0	<2.0	<2.0	<2.0
Methyl Isobutyl Ketone	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Methylene Chloride	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Styrene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Tetrachloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,2,4-Trichlorobenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Trichloroethylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Trichlorofluoromethane	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
1,3,5-Trimethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Vinyl chloride	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO:

Project Description: 10-1121-0222 (1300) (1340)

	Client ID:	T-307 SA5	T-306 SA1	T-306 SA3	T-308 SA3
	Sample Date:	02-Nov-11	03-Nov-11	03-Nov-11	01-Nov-11
	Sample ID:	1146028-05	1146028-06	1146028-07	1146028-08
	MDL/Units	Soil	Soil	Soil	Soil
Volatiles (continued)					
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
4-Bromofluorobenzene	Surrogate	109%	108%	108%	110%
Dibromofluoromethane	Surrogate	107%	104%	106%	109%
Toluene-d8	Surrogate	109%	108%	106%	106%
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	<10	<10	<10
F2 PHCs (C10-C16)	10 ug/g dry	<10	<10	<10	<10
F3 PHCs (C16-C34)	10 ug/g dry	<10	40	<10	<10
F4 PHCs (C34-C50)	10 ug/g dry	<10	101	<10	<10

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO: Project Description: 10-1121-0222 (1300) (1340)

	Client ID:	T-308 SA6	-	-	-
	Sample Date:	01-Nov-11	-	-	-
	Sample ID:	1146028-09	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	88.5	-	-	-
Volatiles					
Acetone	0.5 ug/g dry	<0.5	-	-	-
Benzene	0.02 ug/g dry	<0.02	-	-	-
Bromodichloromethane	0.05 ug/g dry	<0.05	-	-	-
Bromoform	0.05 ug/g dry	<0.05	-	-	-
Bromomethane	0.05 ug/g dry	<0.05	-	-	-
Carbon Tetrachloride	0.05 ug/g dry	<0.05	-	-	-
Chlorobenzene	0.05 ug/g dry	<0.05	-	-	-
Chloroethane	0.05 ug/g dry	<0.05	-	-	-
Chloroform	0.05 ug/g dry	<0.05	-	-	-
Chloromethane	0.2 ug/g dry	<0.2	-	-	-
Dibromochloromethane	0.05 ug/g dry	<0.05	-	-	-
Dichlorodifluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dibromoethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,4-Dichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
cis-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,2-Dichloroethylene	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloroethylene, total	0.05 ug/g dry	<0.05	-	-	-
1,2-Dichloropropane	0.05 ug/g dry	<0.05	-	-	-
cis-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
trans-1,3-Dichloropropylene	0.05 ug/g dry	<0.05	-	-	-
1,3-Dichloropropene, total	0.05 ug/g dry	<0.05	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Hexane	0.05 ug/g dry	<0.05	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.5 ug/g dry	<0.5	-	-	-
Methyl Butyl Ketone (2-Hexanone)	2.0 ug/g dry	<2.0	-	-	-
Methyl Isobutyl Ketone	0.5 ug/g dry	<0.5	-	-	-
Methyl tert-butyl ether	0.05 ug/g dry	<0.05	-	-	-

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO: Project Description: 10-1121-0222 (1300) (1340)

	Client ID:	T-308 SA6	-	-	-
	Sample Date:	01-Nov-11	-	-	-
	Sample ID:	1146028-09	-	-	-
	MDL/Units	Soil	-	-	-
Volatiles (continued)					
Methylene Chloride	0.05 ug/g dry	<0.05	-	-	-
Styrene	0.05 ug/g dry	<0.05	-	-	-
1,1,1,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2,2-Tetrachloroethane	0.05 ug/g dry	<0.05	-	-	-
Tetrachloroethylene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
1,2,4-Trichlorobenzene	0.05 ug/g dry	<0.05	-	-	-
1,1,1-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
1,1,2-Trichloroethane	0.05 ug/g dry	<0.05	-	-	-
Trichloroethylene	0.05 ug/g dry	<0.05	-	-	-
Trichlorofluoromethane	0.05 ug/g dry	<0.05	-	-	-
1,3,5-Trimethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Vinyl chloride	0.02 ug/g dry	<0.02	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
4-Bromofluorobenzene	Surrogate	109%	-	-	-
Dibromofluoromethane	Surrogate	107%	-	-	-
Toluene-d8	Surrogate	106%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	10 ug/g dry	<10	-	-	-
F2 PHCs (C10-C16)	10 ug/g dry	<10	-	-	-
F3 PHCs (C16-C34)	10 ug/g dry	<10	-	-	-
F4 PHCs (C34-C50)	10 ug/g dry	<10	-	-	-

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO:

Project Description: 10-1121-0222 (1300) (1340)

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	10	ug/g						
F2 PHCs (C10-C16)	ND	10	ug/g						
F3 PHCs (C16-C34)	ND	10	ug/g						
F4 PHCs (C34-C50)	ND	10	ug/g						
Metals									
Antimony	ND	1	ug/g						
Arsenic	ND	1	ug/g						
Barium	ND	1	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.4	ug/g						
Chromium	ND	5	ug/g						
Cobalt	ND	1	ug/g						
Copper	ND	5	ug/g						
Lead	ND	1	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1	ug/g						
Nickel	ND	5	ug/g						
Selenium	ND	1	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1	ug/g						
Uranium	ND	1	ug/g						
Vanadium	ND	10	ug/g						
Zinc	ND	20	ug/g						
Volatiles									
Acetone	ND	0.5	ug/g						
Benzene	ND	0.02	ug/g						
Bromodichloromethane	ND	0.05	ug/g						
Bromoform	ND	0.05	ug/g						
Bromomethane	ND	0.05	ug/g						
Carbon Tetrachloride	ND	0.05	ug/g						
Chlorobenzene	ND	0.05	ug/g						
Chloroethane	ND	0.05	ug/g						
Chloroform	ND	0.05	ug/g						
Chloromethane	ND	0.2	ug/g						
Dibromochloromethane	ND	0.05	ug/g						
Dichlorodifluoromethane	ND	0.05	ug/g						
1,2-Dibromoethane	ND	0.05	ug/g						
1,2-Dichlorobenzene	ND	0.05	ug/g						
1,3-Dichlorobenzene	ND	0.05	ug/g						
1,4-Dichlorobenzene	ND	0.05	ug/g						
1,1-Dichloroethane	ND	0.05	ug/g						
1,2-Dichloroethane	ND	0.05	ug/g						
1,1-Dichloroethylene	ND	0.05	ug/g						
cis-1,2-Dichloroethylene	ND	0.05	ug/g						
trans-1,2-Dichloroethylene	ND	0.05	ug/g						
1,2-Dichloroethylene, total	ND	0.05	ug/g						
1,2-Dichloropropane	ND	0.05	ug/g						

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO:

Project Description: 10-1121-0222 (1300) (1340)

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
cis-1,3-Dichloropropylene	ND	0.05	ug/g						
trans-1,3-Dichloropropylene	ND	0.05	ug/g						
1,3-Dichloropropene, total	ND	0.05	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Hexane	ND	0.05	ug/g						
Methyl Ethyl Ketone (2-Butanone)	ND	0.5	ug/g						
Methyl Butyl Ketone (2-Hexanone)	ND	2.0	ug/g						
Methyl Isobutyl Ketone	ND	0.5	ug/g						
Methyl tert-butyl ether	ND	0.05	ug/g						
Methylene Chloride	ND	0.05	ug/g						
Styrene	ND	0.05	ug/g						
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g						
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g						
Tetrachloroethylene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
1,2,4-Trichlorobenzene	ND	0.05	ug/g						
1,1,1-Trichloroethane	ND	0.05	ug/g						
1,1,2-Trichloroethane	ND	0.05	ug/g						
Trichloroethylene	ND	0.05	ug/g						
Trichlorofluoromethane	ND	0.05	ug/g						
1,3,5-Trimethylbenzene	ND	0.05	ug/g						
Vinyl chloride	ND	0.02	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: 4-Bromofluorobenzene	*8.64*		*ug/g*		*108*	*50-140*			
Surrogate: Dibromofluoromethane	*8.77*		*ug/g*		*110*	*50-140*			
Surrogate: Toluene-d8	*8.30*		*ug/g*		*104*	*50-140*			

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO:

Project Description: 10-1121-0222 (1300) (1340)

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	10	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	10	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	10	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	10	ug/g dry	ND				30	
Metals									
Antimony	ND	1	ug/g dry	ND				30	
Arsenic	ND	1	ug/g dry	ND				30	
Barium	36.1	1	ug/g dry	33.5			7.3	30	
Beryllium	ND	0.5	ug/g dry	ND				30	
Boron	ND	5.0	ug/g dry	ND				30	
Cadmium	ND	0.5	ug/g dry	ND				30	
Chromium (VI)	ND	0.4	ug/g dry	ND				35	
Chromium	ND	5	ug/g dry	ND				30	
Cobalt	3.5	1	ug/g dry	3.3			5.0	30	
Copper	7.5	5	ug/g dry	7.1			5.5	30	
Lead	7.1	1	ug/g dry	7.0			2.1	30	
Mercury	ND	0.1	ug/g dry	ND				35	
Molybdenum	ND	1	ug/g dry	ND				30	
Nickel	5.9	5	ug/g dry	5.6			4.0	30	
Selenium	ND	1	ug/g dry	ND				30	
Silver	ND	0.3	ug/g dry	ND				30	
Thallium	ND	1	ug/g dry	ND				30	
Uranium	ND	1	ug/g dry	ND				30	
Vanadium	15.4	10	ug/g dry	15.2			0.9	30	
Zinc	ND	20	ug/g dry	ND				30	
Physical Characteristics									
% Solids	74.4	0.1	% by Wt.	73.5			1.3	25	
Volatiles									
Acetone	ND	0.5	ug/g dry	ND				50	
Benzene	ND	0.02	ug/g dry	ND				50	
Bromodichloromethane	ND	0.05	ug/g dry	ND				50	
Bromoform	ND	0.05	ug/g dry	ND				50	
Bromomethane	ND	0.05	ug/g dry	ND				50	
Carbon Tetrachloride	ND	0.05	ug/g dry	ND				50	
Chlorobenzene	ND	0.05	ug/g dry	ND				50	
Chloroethane	ND	0.05	ug/g dry	ND				50	
Chloroform	ND	0.05	ug/g dry	ND				50	
Chloromethane	ND	0.2	ug/g dry	ND				50	
Dibromochloromethane	ND	0.05	ug/g dry	ND				50	
Dichlorodifluoromethane	ND	0.05	ug/g dry	ND				50	
1,2-Dibromoethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,3-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,4-Dichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,2-Dichloroethane	ND	0.05	ug/g dry	ND				50	
1,1-Dichloroethylene	ND	0.05	ug/g dry	ND				50	

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO: Project Description: 10-1121-0222 (1300) (1340)

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
cis-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
trans-1,2-Dichloroethylene	ND	0.05	ug/g dry	ND				50	
1,2-Dichloropropane	ND	0.05	ug/g dry	ND				50	
cis-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
trans-1,3-Dichloropropylene	ND	0.05	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Hexane	ND	0.05	ug/g dry	ND				50	
Methyl Ethyl Ketone (2-Butanone)	ND	0.5	ug/g dry	ND				50	
Methyl Butyl Ketone (2-Hexanone)	ND	2.0	ug/g dry	ND				50	
Methyl Isobutyl Ketone	ND	0.5	ug/g dry	ND				50	
Methyl tert-butyl ether	ND	0.05	ug/g dry	ND				50	
Methylene Chloride	ND	0.05	ug/g dry	ND				50	
Styrene	ND	0.05	ug/g dry	ND				50	
1,1,1,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2,2-Tetrachloroethane	ND	0.05	ug/g dry	ND				50	
Tetrachloroethylene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
1,2,4-Trichlorobenzene	ND	0.05	ug/g dry	ND				50	
1,1,1-Trichloroethane	ND	0.05	ug/g dry	ND				50	
1,1,2-Trichloroethane	ND	0.05	ug/g dry	ND				50	
Trichloroethylene	ND	0.05	ug/g dry	ND				50	
Trichlorofluoromethane	ND	0.05	ug/g dry	ND				50	
1,3,5-Trimethylbenzene	ND	0.05	ug/g dry	ND				50	
Vinyl chloride	ND	0.02	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: 4-Bromofluorobenzene	*9.44*		*ug/g dry*	*ND*	*106*	*50-140*			
Surrogate: Dibromofluoromethane	*10.1*		*ug/g dry*	*ND*	*114*	*50-140*			
Surrogate: Toluene-d8	*9.09*		*ug/g dry*	*ND*	*102*	*50-140*			

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO: Project Description: 10-1121-0222 (1300) (1340)

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	173	10	ug/g	ND	86.6	80-120			
F2 PHCs (C10-C16)	70	10	ug/g	ND	75.2	60-140			
F3 PHCs (C16-C34)	199	10	ug/g	ND	85.4	60-140			
F4 PHCs (C34-C50)	144	10	ug/g	ND	103	60-140			
Metals									
Antimony	40.6		ug/L	0.007	81.2	70-130			
Arsenic	38.7		ug/L	0.3	76.7	70-130			
Barium	57.9		ug/L	13.4	89.0	70-130			
Beryllium	40.9		ug/L	0.10	81.7	70-130			
Boron	40.6		ug/L	1.1	79.1	70-130			
Cadmium	38.7		ug/L	0.02	77.4	70-130			
Chromium (VI)	5.4	0.4	ug/g	ND	107	89-123			
Chromium	45.8		ug/L	1.4	88.9	70-130			
Cobalt	43.8		ug/L	1.3	84.9	70-130			
Copper	44.4		ug/L	2.8	83.1	70-130			
Lead	46.4		ug/L	2.8	87.2	70-130			
Mercury	1.37	0.1	ug/g	ND	91.6	72-128			
Molybdenum	39.3		ug/L	0.3	77.9	70-130			
Nickel	44.3		ug/L	2.3	84.1	70-130			
Selenium	39.4		ug/L	0.2	78.2	70-130			
Silver	30.8		ug/L	0.08	61.5	70-130			QS-02
Thallium	46.4		ug/L	0.05	92.7	70-130			
Uranium	40.8		ug/L	0.2	81.3	70-130			
Vanadium	48.2		ug/L	6.1	84.2	70-130			
Zinc	42.1		ug/L	6.1	71.9	70-130			
Volatiles									
Acetone	10.0	0.5	ug/g	ND	99.8	50-140			
Benzene	4.4	0.02	ug/g	ND	111	60-130			
Bromodichloromethane	4.6	0.05	ug/g	ND	114	60-130			
Bromoform	3.6	0.05	ug/g	ND	89.2	60-130			
Bromomethane	3.9	0.05	ug/g	ND	96.5	50-140			
Carbon Tetrachloride	4.5	0.05	ug/g	ND	112	60-130			
Chlorobenzene	4.0	0.05	ug/g	ND	101	60-130			
Chloroethane	4.3	0.05	ug/g	ND	108	50-140			
Chloroform	4.3	0.05	ug/g	ND	107	60-130			
Chloromethane	2.6	0.2	ug/g	ND	65.0	50-140			
Dibromochloromethane	3.2	0.05	ug/g	ND	79.2	60-130			
Dichlorodifluoromethane	4.1	0.05	ug/g	ND	102	50-140			
1,2-Dibromoethane	3.1	0.05	ug/g	ND	78.0	60-130			
1,2-Dichlorobenzene	2.8	0.05	ug/g	ND	70.1	60-130			
1,3-Dichlorobenzene	3.1	0.05	ug/g	ND	77.7	60-130			
1,4-Dichlorobenzene	2.9	0.05	ug/g	ND	72.2	60-130			
1,1-Dichloroethane	4.2	0.05	ug/g	ND	105	60-130			
1,2-Dichloroethane	4.5	0.05	ug/g	ND	113	60-130			
1,1-Dichloroethylene	3.6	0.05	ug/g	ND	91.1	60-130			
cis-1,2-Dichloroethylene	3.5	0.05	ug/g	ND	87.6	60-130			
trans-1,2-Dichloroethylene	3.4	0.05	ug/g	ND	86.2	60-130			

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO: Project Description: 10-1121-0222 (1300) (1340)

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
1,2-Dichloropropane	4.4	0.05	ug/g	ND	111	60-130			
cis-1,3-Dichloropropylene	4.6	0.05	ug/g	ND	114	60-130			
trans-1,3-Dichloropropylene	3.8	0.05	ug/g	ND	95.6	60-130			
Ethylbenzene	4.1	0.05	ug/g	ND	103	60-130			
Hexane	3.9	0.05	ug/g	ND	98.4	60-130			
Methyl Ethyl Ketone (2-Butanone)	6.2	0.5	ug/g	ND	61.6	50-140			
Methyl Butyl Ketone (2-Hexanone)	7.6	2.0	ug/g	ND	75.7	50-140			
Methyl Isobutyl Ketone	8.5	0.5	ug/g	ND	85.0	50-140			
Methyl tert-butyl ether	5.8	0.05	ug/g	ND	58.3	50-140			
Methylene Chloride	4.6	0.05	ug/g	ND	115	60-130			
Styrene	3.5	0.05	ug/g	ND	88.6	60-130			
1,1,1,2-Tetrachloroethane	4.1	0.05	ug/g	ND	102	60-130			
1,1,2,2-Tetrachloroethane	4.4	0.05	ug/g	ND	111	60-130			
Tetrachloroethylene	3.0	0.05	ug/g	ND	74.3	60-130			
Toluene	4.9	0.05	ug/g	ND	123	60-130			
1,2,4-Trichlorobenzene	5.1	0.05	ug/g	ND	127	60-130			
1,1,1-Trichloroethane	4.0	0.05	ug/g	ND	99.4	60-130			
1,1,2-Trichloroethane	3.5	0.05	ug/g	ND	87.4	60-130			
Trichloroethylene	3.9	0.05	ug/g	ND	98.4	60-130			
Trichlorofluoromethane	3.7	0.05	ug/g	ND	93.3	50-140			
1,3,5-Trimethylbenzene	2.6	0.05	ug/g	ND	65.2	60-130			
Vinyl chloride	4.2	0.02	ug/g	ND	105	50-140			
m,p-Xylenes	9.3	0.05	ug/g	ND	116	60-130			
o-Xylene	5.2	0.05	ug/g	ND	129	60-130			
Surrogate: 4-Bromofluorobenzene	*7.22*		*ug/g*		*90.2*	*50-140*			

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**

Report Date: 11-Nov-2011
Order Date:7-Nov-2011

Client PO: Project Description: 10-1121-0222 (1300) (1340)

Sample and QC Qualifiers Notes

1 - QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

PARACEL Laboratories Ltd.
Environmental & Indoor Air Quality

300-2319 St. Laurent Blvd., Ottawa, ON K1G 4J8
Tel: (613) 731-9577 Fax: (613) 731-9064
Toll Free: (800) 749-1947 email: paracel@paracellabs.com

Chain of Custody Record

№ 29328 Pg. __ of __

Contact: B. G. Sullivan
Company: GOLDER ASSOCIATES
Address: 32 STEACIE DRIVE
OTTAWA, ON
Tel: 613 592-9600 Fax: _____

Project Ref: 10-1121-0222 (1300) (1340)
PO #: _____
Quote #: 10-305 ☐ Not Quoted
Email: bsullivan@golder.com
Preservative to be added by Paracel? ☐ Yes ☒ No

REPORTING REQUIREMENTS
[ ] Hard Copy [✓] Email - PDF
[ ] FAX [✓] Email - spreadsheet

TURN AROUND TIME
[ ] 1-day [ ] 2-day [✓] Regular

REGULATORY GUIDELINE REQUIREMENTS

Matrix Types: S-Soil/Sed GW-Ground Water SW-Surface Water SS-Storm/Sanitary Sewer A-Air O-Other

	Paracel Order # 1146028 / Sample Identification	Matrix	# Bottles	Date Sampled d/m/y	Metals	PHC F1-F4	VOCs	
1	T-309 SA1	S	3	1/11/11	✓	✓	✓	✓
2	T-309 SA4	S	3	1/11/11	✓	✓	✓	✓
3	T-309 SA4A	S	3	1/11/11	✓	✓	✓	✓
4	T-307 SA1	S	3	2/11/11	✓	✓	✓	✓
5	T-307 SA5	S	3	2/11/11	✓	✓	✓	✓
6	T-306 SA1	S	3	3/11/11	✓	✓	✓	✓
7	T-306 SA3	S	3	3/11/11	✓	✓	✓	✓
8	T-308 SA3	S	3	1/11/11	✓	✓	✓	✓
9	T-308 SA6	S	3	1/11/11	✓	✓	✓	✓
10								

Note: Metals only on SA1 Samples

Comments:
* Full list metals - Subsurface. SC.

Relinquished by: B. G. Sullivan
Date: Nov. 7/11 Time: 12:25

Received by: [signature]
Date: Nov. 7/11 Time: 12:25p

Verified by: [signature]
Date: Nov. 7/11 Time: 12:36p

10.7 C

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e: paracel@paracellabs.com
www.paracellabs.com

Certificate of Analysis

Golder Associates Ltd. (Ottawa)
32 Steacie Dr.
Kanata, ON K2K 2A9
Attn: Basil Sullivan

Phone: (613) 592-9600
Fax: (613) 592-9601

Client PO:
Project: 10-1121-0222
Custody: 90310

Report Date: 16-Nov-2011
Order Date: 10-Nov-2011
Order #: 1146160

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1146160-01	T-306A
1146160-02	T-307A
1146160-03	T-308A
1146160-04	T-308B
1146160-05	T-309A
1146160-06	T-309B
1146160-07	DUPE

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 16-Nov-2011
Order Date:10-Nov-2011

Project Description: 10-1121-0222

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME PHC F1	CWS Tier 1 - P&T GC-FID	11-Nov-11	12-Nov-11
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	14-Nov-11	15-Nov-11
VOCs	EPA 624 - P&T GC-MS	11-Nov-11	12-Nov-11

Certificate of Analysis

Client **Golder Associates Ltd. (Ottawa)**

Report Date: 16-Nov-2011
Order Date:10-Nov-2011

Client PO:

Project Description: 10-1121-0222

	Client ID:	T-306A	T-307A	T-308A	T-308B
	Sample Date:	10-Nov-11	10-Nov-11	10-Nov-11	10-Nov-11
	Sample ID:	1146160-01	1146160-02	1146160-03	1146160-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	41.9	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	1.9	<0.5	3.4	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Chloroform	0.5 ug/L	13.5	2.1	18.6	2.0
Chloromethane	3.0 ug/L	<3.0	<3.0	<3.0	<3.0
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	<10.0	<10.0	<10.0	<10.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Client **Golder Associates Ltd. (Ottawa)**

Report Date: 16-Nov-2011
Order Date:10-Nov-2011

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Client PO: Project Description: 10-1121-0222

	Client ID:	T-306A	T-307A	T-308A	T-308B
	Sample Date:	10-Nov-11	10-Nov-11	10-Nov-11	10-Nov-11
	Sample ID:	1146160-01	1146160-02	1146160-03	1146160-04
	MDL/Units	Water	Water	Water	Water
Volatiles (continued)					
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	8.2	<0.5
1,2,4-Trichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	109%	112%	105%	109%
Dibromofluoromethane	Surrogate	124%	124%	122%	127%
Toluene-d8	Surrogate	99.4%	101%	102%	101%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	-	-	-	<25
F2 PHCs (C10-C16)	100 ug/L	-	-	-	<100 [1]
F3 PHCs (C16-C34)	100 ug/L	-	-	-	1680 [1]
F4 PHCs (C34-C50)	100 ug/L	-	-	-	856 [1]
F1 + F2 PHCs	125 ug/L	-	-	-	<125
F3 + F4 PHCs	200 ug/L	-	-	-	2530

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 16-Nov-2011
Order Date:10-Nov-2011

Project Description: 10-1121-0222

	Client ID:	T-309A	T-309B	DUPE	-
	Sample Date:	10-Nov-11	10-Nov-11	10-Nov-11	-
	Sample ID:	1146160-05	1146160-06	1146160-07	-
	MDL/Units	Water	Water	Water	-
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	45.7	-
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	1.6	-
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	-
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	-
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Chloroethane	1.0 ug/L	<1.0	<1.0	<1.0	-
Chloroform	0.5 ug/L	1.9	5.4	13.9	-
Chloromethane	3.0 ug/L	<3.0	<3.0	<3.0	-
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,2-Dibromoethane	0.2 ug/L	<0.2	<0.2	<0.2	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	-
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	<10.0	<10.0	<10.0	-
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	-
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	-
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	-
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	-

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 16-Nov-2011
Order Date:10-Nov-2011

Project Description: 10-1121-0222

	Client ID:	T-309A	T-309B	DUPE	-
	Sample Date:	10-Nov-11	10-Nov-11	10-Nov-11	-
	Sample ID:	1146160-05	1146160-06	1146160-07	-
	MDL/Units	Water	Water	Water	-
Volatiles (continued)					
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,2,4-Trichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	-
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	-
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	-
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	-
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	-
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	-
4-Bromofluorobenzene	Surrogate	110%	115%	118%	-
Dibromofluoromethane	Surrogate	124%	126%	127%	-
Toluene-d8	Surrogate	101%	102%	101%	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	-	<25	-	-
F2 PHCs (C10-C16)	100 ug/L	-	<100 [1]	-	-
F3 PHCs (C16-C34)	100 ug/L	-	3080 [1]	-	-
F4 PHCs (C34-C50)	100 ug/L	-	1060 [1]	-	-
F1 + F2 PHCs	125 ug/L	-	<125	-	-
F3 + F4 PHCs	200 ug/L	-	4140	-	-

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 16-Nov-2011
Order Date:10-Nov-2011

Project Description: 10-1121-0222

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroethane	ND	1.0	ug/L						
Chloroform	ND	0.5	ug/L						
Chloromethane	ND	3.0	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dibromoethane	ND	0.2	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloroethylene, total	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,2,4-Trichlorobenzene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
1,3,5-Trimethylbenzene	ND	0.5	ug/L						
Vinyl chloride	ND	0.5	ug/L						

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 16-Nov-2011
Order Date:10-Nov-2011

Project Description: 10-1121-0222

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*37.6*		*ug/L*		*118*	*50-140*			
Surrogate: Dibromofluoromethane	*35.4*		*ug/L*		*111*	*50-140*			
Surrogate: Toluene-d8	*32.1*		*ug/L*		*100*	*50-140*			

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 16-Nov-2011
Order Date:10-Nov-2011

Project Description: 10-1121-0222

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroethane	ND	1.0	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Chloromethane	ND	3.0	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dibromoethane	ND	0.2	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	ND	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,2,4-Trichlorobenzene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
1,3,5-Trimethylbenzene	ND	0.5	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 16-Nov-2011
Order Date:10-Nov-2011

Project Description: 10-1121-0222

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: 4-Bromofluorobenzene	*35.7*		*ug/L*	*ND*	*112*	*50-140*			
Surrogate: Dibromofluoromethane	*37.3*		*ug/L*	*ND*	*116*	*50-140*			
Surrogate: Toluene-d8	*32.8*		*ug/L*	*ND*	*102*	*50-140*			

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 16-Nov-2011
Order Date:10-Nov-2011

Project Description: 10-1121-0222

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1660	25	ug/L	ND	83.0	68-117			
F2 PHCs (C10-C16)	1510	100	ug/L	ND	94.6	60-140			
F3 PHCs (C16-C34)	3820	100	ug/L	ND	95.4	60-140			
F4 PHCs (C34-C50)	2400	100	ug/L	ND	100	60-140			
Volatiles									
Acetone	76.4	5.0	ug/L	ND	76.4	50-140			
Benzene	27.3	0.5	ug/L	ND	68.3	50-140			
Bromodichloromethane	28.2	0.5	ug/L	ND	70.6	50-140			
Bromoform	31.6	0.5	ug/L	ND	79.0	50-140			
Bromomethane	43.3	0.5	ug/L	ND	108	50-140			
Carbon Tetrachloride	34.3	0.2	ug/L	ND	85.8	50-140			
Chlorobenzene	31.6	0.5	ug/L	ND	78.9	50-140			
Chloroethane	32.3	1.0	ug/L	ND	80.8	50-140			
Chloroform	33.7	0.5	ug/L	ND	84.3	50-140			
Chloromethane	39.5	3.0	ug/L	ND	98.7	50-140			
Dibromochloromethane	28.2	0.5	ug/L	ND	70.5	50-140			
Dichlorodifluoromethane	35.9	1.0	ug/L	ND	89.8	50-140			
1,2-Dibromoethane	32.9	0.2	ug/L	ND	82.2	50-140			
1,2-Dichlorobenzene	28.5	0.5	ug/L	ND	71.2	50-140			
1,3-Dichlorobenzene	26.9	0.5	ug/L	ND	67.2	50-140			
1,4-Dichlorobenzene	32.4	0.5	ug/L	ND	81.0	50-140			
1,1-Dichloroethane	35.6	0.5	ug/L	ND	89.0	50-140			
1,2-Dichloroethane	30.8	0.5	ug/L	ND	77.0	50-140			
1,1-Dichloroethylene	37.1	0.5	ug/L	ND	92.8	50-140			
cis-1,2-Dichloroethylene	34.7	0.5	ug/L	ND	86.8	50-140			
trans-1,2-Dichloroethylene	37.1	0.5	ug/L	ND	92.8	50-140			
1,2-Dichloropropane	33.0	0.5	ug/L	ND	82.4	50-140			
cis-1,3-Dichloropropylene	38.2	0.5	ug/L	ND	95.4	50-140			
trans-1,3-Dichloropropylene	60.6	0.5	ug/L	ND	152	50-140			
Ethylbenzene	26.5	0.5	ug/L	ND	66.2	50-140			
Hexane	34.2	1.0	ug/L	ND	85.4	50-140			
Methyl Ethyl Ketone (2-Butanone)	77.7	5.0	ug/L	ND	77.7	50-140			
Methyl Butyl Ketone (2-Hexanone)	69.6	10.0	ug/L	ND	69.6	50-140			
Methyl Isobutyl Ketone	67.4	5.0	ug/L	ND	67.4	50-140			
Methyl tert-butyl ether	72.4	2.0	ug/L	ND	72.4	50-140			
Methylene Chloride	34.3	5.0	ug/L	ND	85.7	50-140			
Styrene	26.0	0.5	ug/L	ND	64.9	50-140			
1,1,1,2-Tetrachloroethane	27.8	0.5	ug/L	ND	69.6	50-140			
1,1,2,2-Tetrachloroethane	29.6	0.5	ug/L	ND	74.1	50-140			
Tetrachloroethylene	28.3	0.5	ug/L	ND	70.6	50-140			
Toluene	27.2	0.5	ug/L	ND	67.9	50-140			
1,2,4-Trichlorobenzene	28.1	0.5	ug/L	ND	70.3	50-140			
1,1,1-Trichloroethane	38.2	0.5	ug/L	ND	95.4	50-140			
1,1,2-Trichloroethane	30.8	0.5	ug/L	ND	77.1	50-140			
Trichloroethylene	29.0	0.5	ug/L	ND	72.6	50-140			
Trichlorofluoromethane	28.9	1.0	ug/L	ND	72.2	50-140			
1,3,5-Trimethylbenzene	37.8	0.5	ug/L	ND	94.5	50-140			

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 16-Nov-2011
Order Date:10-Nov-2011

Project Description: 10-1121-0222

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Vinyl chloride	41.1	0.5	ug/L	ND	103	50-140			
m,p-Xylenes	53.9	0.5	ug/L	ND	67.4	50-140			
o-Xylene	30.3	0.5	ug/L	ND	75.7	50-140			
Surrogate: 4-Bromofluorobenzene	*29.3*		*ug/L*		*91.5*	*50-140*			

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Report Date: 16-Nov-2011
Order Date:10-Nov-2011

Client PO: Project Description: 10-1121-0222

Sample and QC Qualifiers Notes

1 - SED >5 : Water sample included significant sediment amount that was included in extraction process. This is expected to result in reduced accuracy of the reported result.

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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www.paracellabs.com

Chain of Custody
(Lab Use Only)
No. 90310

Page 1 of 1

Client Name: GOLDER ASSOC. LTD.	Project Reference: 10-1121-0222
Contact Name: SULLY SULLIVAN	Quote # 10-305
Address: 32 STEACIE DR. KANATA ON	PO #
Telephone: 613-592-9600	Email Address: ssullivan@golder.com

TAT: | X | Regular | | 2 Day | | 1 Day

Date Required: _____

Criteria: | | O. Reg. 153/04 Table _ | | O. Reg 179/11 Table 1 | | RSC Filing | | O. Reg. 558/00 | | PWQO | | CCME | | SUB (Storm) | | SUB (Sanitary) Municipality: _____ | | Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number: 1146160

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	VOCs	PHC									
1	T-306A	GW		2	11/10/11		✓				Do not decant						✓
2	T-307A	↓		2	↓		✓				Samples						✓
3	T-308A			2			✓										✓
4	T-308B			3			✓	✓									✓
5	T-309A			2			✓										✓
6	T-309B			3			✓	✓									✓
7	DUPE			2			✓										✓
8																	
9																	
10		↓			↓												

Comments:

Method of Delivery: Walk-in

Relinquished By (Print & Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
MIKE ARMITAGE	Karen Wiggins	SUNEETPORN	MC
Date/Time: 11/10/11	Date/Time: 11/10/11 12:15	Date/Time: NOV 10 11 01:05	Date/Time: Nov 10/11 1:12
	Temperature: 4.2 °C	Temperature: 8.3 °C	pH Verified [X] By: N/A

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Certificate of Analysis

Golder Associates Ltd. (Ottawa)
32 Steacie Dr.
Kanata, ON K2K 2A9
Attn: Basil Sullivan

Phone: (613) 592-9600
Fax: (613) 592-9601

Client PO:
Project: 10-1121-0222 (1300) (1340)
Custody: 29328

Report Date: 22-Nov-2011
Order Date: 21-Nov-2011
Order #: 1148045

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1148045-01	T-307 SA1
1148045-02	T-307 SA5

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: **Golder Associates Ltd. (Ottawa)**
Client PO:

Report Date: 22-Nov-2011
Order Date:21-Nov-2011

Project Description: 10-1121-0222 (1300) (1340)

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
pH	EPA 150.1 - pH probe, CaCl buffered extraction	22-Nov-11	22-Nov-11
Solids, %	Gravimetric, calculation	22-Nov-11	22-Nov-11

Certificate of Analysis

Client: **Golder Associates Ltd. (Ottawa)**

Client PO:

Report Date: 22-Nov-2011

Order Date:21-Nov-2011

Project Description: 10-1121-0222 (1300) (1340)

	Client ID:	T-307 SA1	T-307 SA5	-	-
	Sample Date:	02-Nov-11	02-Nov-11	-	-
	Sample ID:	1148045-01	1148045-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	88.8	90.6	-	-
General Inorganics					
pH	0.1 pH Units	7.8	7.8	-	-

Certificate of Analysis
Client: **Golder Associates Ltd. (Ottawa)**
Client PO:

Report Date: 22-Nov-2011
Order Date:21-Nov-2011

Project Description: 10-1121-0222 (1300) (1340)

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
pH	7.6	0.1	pH Units	7.6			0.1	10	
Physical Characteristics									
% Solids	79.0	0.1	% by Wt.	79.3			0.4	25	

Certificate of Analysis
Client: **Golder Associates Ltd. (Ottawa)**
Client PO:

Report Date: 22-Nov-2011
Order Date:21-Nov-2011
Project Description: 10-1121-0222 (1300) (1340)

Sample and QC Qualifiers Notes

None

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

PARACEL Laboratories Ltd.
Environmental & Indoor Air Quality

Revised Nov 21/11 - MJC

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Toll Free: (800) 749-1947 email: paracel@paracellabs.com

Chain of Custody Record
№ 29328 Pg. of

Contact: B. G. Sullivan
Company: GOLDER ASSOCIATES
Address: 32 STEACIE DRIVE OTTAWA, ON
Tel: 613 592-9600 Fax:

Project Ref: 10-1121-0222 (1300) (1340)
PO #:
Quote #: 10-305 ☐Not Quoted
Email: bsullivan@golder.com
Preservative to be added by Paracel? ☐Yes ☒No

REPORTING REQUIREMENTS
[ ] Hard Copy [x] Email - PDF
[ ] FAX [ ] Email - spreadsheet

TURN AROUND TIME
[ ] 1 day [ ] 2 day [x] Regular

REGULATORY GUIDELINE REQUIREMENTS

Matrix Types: S–Soil/Sed GW–Ground Water SW–Surface Water SS–Storm/Sanitary Sewer A–Air O–Other

	Paracel Order # ~~1146028~~ 1148046 Sample Identification	Matrix	# Bottles	Date Sampled d/m/y	Metals	PHC F1-F4	VOCs	PH												
1	T-309 SA1	S	3	1/11/11	✓	✓	✓													✓
2	T-309 SA4	S	3	1/11/11	✓	✓	✓													✓
3	T-309 SA4A	S	3	1/11/11	✓	✓	✓													✓
4	T-307 SA1	S	3	2/11/11	✓	✓	✓	✓												✓
5	T-307 SA5	S	3	2/11/11	✓	✓	✓	✓												✓
6	T-306 SA1	S	3	3/11/11	✓	✓	✓													✓
7	T-306 SA3	S	3	3/11/11	✓	✓	✓													✓
8	T-308 SA3	S	3	4/11/11	✓	✓	✓													✓
9	T-308 SA6	S	3	4/11/11	✓	✓	✓													✓
10																				

Note: Metals only on SA1 Samples

Comments: ✱ Full list metals - Subsurface SC

Relinquished by:	Received by:	Verified by:
B. G. Sullivan		
Date: Nov. 7/11 Time: 12:25	Date: Nov 7/11 Time: 12:25p	Date: Nov. 7/11 Time: 12:36p

10.7 C

MJC Nov 21/11 3:05

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Certificate of Analysis

Golder Associates Ltd. (Ottawa)
32 Steacie Dr.
Kanata, ON K2K 2A9
Attn: Keith Holmes

Phone: (613) 592-9600
Fax: (613) 592-9601

Client PO:
Project: 10-1121-0222
Custody: 90751

Report Date: 7-Dec-2011
Order Date: 5-Dec-2011
Order #: 1150050

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1150050-01	T-306B
1150050-02	T-72B
1150050-03	T-309B
1150050-04	T-AB

Approved By: Mark Foto

Mark Foto, M.Sc. For Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO: Project Description: 10-1121-0222

Report Date: 07-Dec-2011
Order Date:5-Dec-2011

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME PHC F1	CWS Tier 1 - P&T GC-FID	6-Dec-11	6-Dec-11
CCME PHC F2 - F4	CWS Tier 1 - GC-FID, extraction	5-Dec-11	6-Dec-11
VOCs	EPA 624 - P&T GC-MS	6-Dec-11	6-Dec-11

Certificate of Analysis

Client **Golder Associates Ltd. (Ottawa)**

Report Date: 07-Dec-2011
Order Date:5-Dec-2011

Client PO:

Project Description: 10-1121-0222

	Client ID:	T-306B	T-72B	T-309B	T-AB
	Sample Date:	05-Dec-11	05-Dec-11	05-Dec-11	05-Dec-11
	Sample ID:	1150050-01	1150050-02	1150050-03	1150050-04
	MDL/Units	Water	Water	Water	Water
Volatiles					
Acetone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Benzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromoform	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Bromomethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Carbon Tetrachloride	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Chloroethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Chloroform	0.5 ug/L	<0.5	<0.5	<0.5	5.6
Chloromethane	3.0 ug/L	<3.0	<3.0	<3.0	<3.0
Dibromochloromethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,2-Dibromoethane	0.2 ug/L	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,3-Dichloropropene, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Hexane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
Methyl Ethyl Ketone (2-Butanone)	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl Butyl Ketone (2-Hexanone)	10.0 ug/L	<10.0	<10.0	<10.0	<10.0
Methyl Isobutyl Ketone	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Methyl tert-butyl ether	2.0 ug/L	<2.0	<2.0	<2.0	<2.0
Methylene Chloride	5.0 ug/L	<5.0	<5.0	<5.0	<5.0
Styrene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5

Certificate of Analysis

Client **Golder Associates Ltd. (Ottawa)**

Report Date: 07-Dec-2011
Order Date:5-Dec-2011

.

Client PO: Project Description: 10-1121-0222

	Client ID:	T-306B	T-72B	T-309B	T-AB
	Sample Date:	05-Dec-11	05-Dec-11	05-Dec-11	05-Dec-11
	Sample ID:	1150050-01	1150050-02	1150050-03	1150050-04
	MDL/Units	Water	Water	Water	Water
Volatiles (continued)					
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Tetrachloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Toluene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,2,4-Trichlorobenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane	1.0 ug/L	<1.0	<1.0	<1.0	<1.0
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
m,p-Xylenes	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
o-Xylene	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
Xylenes, total	0.5 ug/L	<0.5	<0.5	<0.5	<0.5
4-Bromofluorobenzene	Surrogate	111%	127%	126%	127%
Dibromofluoromethane	Surrogate	99.2%	95.5%	96.5%	94.3%
Toluene-d8	Surrogate	99.9%	99.1%	101%	101%
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	<25	<25	<25
F2 PHCs (C10-C16)	100 ug/L	<100	<100	<100	<100
F3 PHCs (C16-C34)	100 ug/L	<100	<100	<100	<100
F4 PHCs (C34-C50)	100 ug/L	<100	<100	<100	<100
F1 + F2 PHCs	125 ug/L	<125	<125	<125	<125
F3 + F4 PHCs	200 ug/L	<200	<200	<200	<200

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 07-Dec-2011
Order Date:5-Dec-2011

Project Description: 10-1121-0222

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Volatiles									
Acetone	ND	5.0	ug/L						
Benzene	ND	0.5	ug/L						
Bromodichloromethane	ND	0.5	ug/L						
Bromoform	ND	0.5	ug/L						
Bromomethane	ND	0.5	ug/L						
Carbon Tetrachloride	ND	0.2	ug/L						
Chlorobenzene	ND	0.5	ug/L						
Chloroethane	ND	1.0	ug/L						
Chloroform	ND	0.5	ug/L						
Chloromethane	ND	3.0	ug/L						
Dibromochloromethane	ND	0.5	ug/L						
Dichlorodifluoromethane	ND	1.0	ug/L						
1,2-Dibromoethane	ND	0.2	ug/L						
1,2-Dichlorobenzene	ND	0.5	ug/L						
1,3-Dichlorobenzene	ND	0.5	ug/L						
1,4-Dichlorobenzene	ND	0.5	ug/L						
1,1-Dichloroethane	ND	0.5	ug/L						
1,2-Dichloroethane	ND	0.5	ug/L						
1,1-Dichloroethylene	ND	0.5	ug/L						
cis-1,2-Dichloroethylene	ND	0.5	ug/L						
trans-1,2-Dichloroethylene	ND	0.5	ug/L						
1,2-Dichloroethylene, total	ND	0.5	ug/L						
1,2-Dichloropropane	ND	0.5	ug/L						
cis-1,3-Dichloropropylene	ND	0.5	ug/L						
trans-1,3-Dichloropropylene	ND	0.5	ug/L						
1,3-Dichloropropene, total	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Hexane	ND	1.0	ug/L						
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L						
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L						
Methyl Isobutyl Ketone	ND	5.0	ug/L						
Methyl tert-butyl ether	ND	2.0	ug/L						
Methylene Chloride	ND	5.0	ug/L						
Styrene	ND	0.5	ug/L						
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L						
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L						
Tetrachloroethylene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
1,2,4-Trichlorobenzene	ND	0.5	ug/L						
1,1,1-Trichloroethane	ND	0.5	ug/L						
1,1,2-Trichloroethane	ND	0.5	ug/L						
Trichloroethylene	ND	0.5	ug/L						
Trichlorofluoromethane	ND	1.0	ug/L						
1,3,5-Trimethylbenzene	ND	0.5	ug/L						
Vinyl chloride	ND	0.5	ug/L						

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 07-Dec-2011
Order Date:5-Dec-2011

Project Description: 10-1121-0222

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: 4-Bromofluorobenzene	*35.9*		*ug/L*		*112*	*50-140*			
Surrogate: Dibromofluoromethane	*25.6*		*ug/L*		*79.9*	*50-140*			
Surrogate: Toluene-d8	*34.4*		*ug/L*		*107*	*50-140*			

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 07-Dec-2011
Order Date:5-Dec-2011

Project Description: 10-1121-0222

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Volatiles									
Acetone	ND	5.0	ug/L	ND				30	
Benzene	ND	0.5	ug/L	ND				30	
Bromodichloromethane	ND	0.5	ug/L	ND				30	
Bromoform	ND	0.5	ug/L	ND				30	
Bromomethane	ND	0.5	ug/L	ND				30	
Carbon Tetrachloride	ND	0.2	ug/L	ND				30	
Chlorobenzene	ND	0.5	ug/L	ND				30	
Chloroethane	ND	1.0	ug/L	ND				30	
Chloroform	ND	0.5	ug/L	ND				30	
Chloromethane	ND	3.0	ug/L	ND				30	
Dibromochloromethane	ND	0.5	ug/L	ND				30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND				30	
1,2-Dibromoethane	ND	0.2	ug/L	ND				30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND				30	
1,1-Dichloroethane	ND	0.5	ug/L	ND				30	
1,2-Dichloroethane	ND	0.5	ug/L	ND				30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND				30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND				30	
1,2-Dichloropropane	ND	0.5	ug/L	ND				30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND				30	
Ethylbenzene	ND	0.5	ug/L	ND				30	
Hexane	ND	1.0	ug/L	ND				30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND				30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L	ND				30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND				30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND				30	
Methylene Chloride	ND	5.0	ug/L	ND				30	
Styrene	1.96	0.5	ug/L	ND				30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND				30	
Tetrachloroethylene	ND	0.5	ug/L	ND				30	
Toluene	ND	0.5	ug/L	ND				30	
1,2,4-Trichlorobenzene	ND	0.5	ug/L	ND				30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND				30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND				30	
Trichloroethylene	ND	0.5	ug/L	ND				30	
Trichlorofluoromethane	ND	1.0	ug/L	ND				30	
1,3,5-Trimethylbenzene	ND	0.5	ug/L	ND				30	
Vinyl chloride	ND	0.5	ug/L	ND				30	
m,p-Xylenes	ND	0.5	ug/L	ND				30	
o-Xylene	ND	0.5	ug/L	ND				30	

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 07-Dec-2011
Order Date:5-Dec-2011

Project Description: 10-1121-0222

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: 4-Bromofluorobenzene	*36.3*		*ug/L*	*ND*	*113*	*50-140*			
Surrogate: Dibromofluoromethane	*31.7*		*ug/L*	*ND*	*99.2*	*50-140*			
Surrogate: Toluene-d8	*32.4*		*ug/L*	*ND*	*101*	*50-140*			

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 07-Dec-2011
Order Date:5-Dec-2011

Project Description: 10-1121-0222

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1650	25	ug/L	ND	82.5	68-117			
F2 PHCs (C10-C16)	1540	100	ug/L	ND	96.2	60-140			
F3 PHCs (C16-C34)	4100	100	ug/L	ND	103	60-140			
F4 PHCs (C34-C50)	3040	100	ug/L	ND	127	60-140			
Volatiles									
Acetone	78.8	5.0	ug/L	ND	78.8	50-140			
Benzene	31.7	0.5	ug/L	ND	79.2	60-130			
Bromodichloromethane	35.0	0.5	ug/L	ND	87.6	60-130			
Bromoform	50.2	0.5	ug/L	ND	126	60-130			
Bromomethane	48.9	0.5	ug/L	ND	122	50-140			
Carbon Tetrachloride	38.7	0.2	ug/L	ND	96.7	60-130			
Chlorobenzene	33.1	0.5	ug/L	ND	82.8	60-130			
Chloroethane	43.8	1.0	ug/L	ND	109	50-140			
Chloroform	32.0	0.5	ug/L	ND	80.1	60-130			
Chloromethane	25.1	3.0	ug/L	ND	62.7	50-140			
Dibromochloromethane	44.3	0.5	ug/L	ND	111	60-130			
Dichlorodifluoromethane	27.2	1.0	ug/L	ND	67.9	50-140			
1,2-Dibromoethane	42.6	0.2	ug/L	ND	107	60-130			
1,2-Dichlorobenzene	35.1	0.5	ug/L	ND	87.8	60-130			
1,3-Dichlorobenzene	34.2	0.5	ug/L	ND	85.5	60-130			
1,4-Dichlorobenzene	41.0	0.5	ug/L	ND	103	60-130			
1,1-Dichloroethane	31.9	0.5	ug/L	ND	79.8	60-130			
1,2-Dichloroethane	28.5	0.5	ug/L	ND	71.2	60-130			
1,1-Dichloroethylene	31.8	0.5	ug/L	ND	79.4	60-130			
cis-1,2-Dichloroethylene	33.3	0.5	ug/L	ND	83.3	60-130			
trans-1,2-Dichloroethylene	30.4	0.5	ug/L	ND	76.1	60-130			
1,2-Dichloropropane	29.0	0.5	ug/L	ND	72.6	60-130			
cis-1,3-Dichloropropylene	38.1	0.5	ug/L	ND	95.2	60-130			
trans-1,3-Dichloropropylene	31.2	0.5	ug/L	ND	77.9	60-130			
Ethylbenzene	34.9	0.5	ug/L	ND	87.3	60-130			
Hexane	28.8	1.0	ug/L	ND	72.1	60-130			
Methyl Ethyl Ketone (2-Butanone)	88.4	5.0	ug/L	ND	88.4	50-140			
Methyl Butyl Ketone (2-Hexanone)	75.1	10.0	ug/L	ND	75.1	50-140			
Methyl Isobutyl Ketone	82.4	5.0	ug/L	ND	82.4	50-140			
Methyl tert-butyl ether	131	2.0	ug/L	ND	131	50-140			
Methylene Chloride	27.1	5.0	ug/L	ND	67.7	60-130			
Styrene	39.7	0.5	ug/L	ND	99.2	60-130			
1,1,1,2-Tetrachloroethane	32.7	0.5	ug/L	ND	81.8	60-130			
1,1,2,2-Tetrachloroethane	34.5	0.5	ug/L	ND	86.3	60-130			
Tetrachloroethylene	35.3	0.5	ug/L	ND	88.3	60-130			
Toluene	31.2	0.5	ug/L	ND	78.0	60-130			
1,2,4-Trichlorobenzene	29.7	0.5	ug/L	ND	74.2	60-130			
1,1,1-Trichloroethane	28.9	0.5	ug/L	ND	72.2	60-130			
1,1,2-Trichloroethane	29.3	0.5	ug/L	ND	73.2	60-130			
Trichloroethylene	31.6	0.5	ug/L	ND	79.0	60-130			
Trichlorofluoromethane	20.5	1.0	ug/L	ND	51.3	60-130			QS-02
1,3,5-Trimethylbenzene	42.4	0.5	ug/L	ND	106	60-130			

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.
Client PO:

Report Date: 07-Dec-2011
Order Date:5-Dec-2011

Project Description: 10-1121-0222

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Vinyl chloride	29.8	0.5	ug/L	ND	74.4	50-140			
m,p-Xylenes	72.5	0.5	ug/L	ND	90.6	60-130			
o-Xylene	32.3	0.5	ug/L	ND	80.7	60-130			
Surrogate: 4-Bromofluorobenzene	*30.8*		*ug/L*		*96.2*	*50-140*			

Certificate of Analysis
Client **Golder Associates Ltd. (Ottawa)**
.

Report Date: 07-Dec-2011
Order Date:5-Dec-2011

Client PO: Project Description: 10-1121-0222

Sample and QC Qualifiers Notes

1 - QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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Page 1 of 1

Client Name: Golder Associates Ltd.	Project Reference: 10 [illegible]1121 0222	TAT: [ ] Regular
Contact Name: Kieth Holmes	Quote # Light Rail Project	[X] 2 Day
Address: 32 Steacie Dr., Kanata, ON	PO #	[ ] 1 Day
	Email Address:	Date Required:
Telephone: 613-592-9600		

Criteria: [X] O. Reg. 153/04 Table 3 | [ ] O. Reg 179/11 Table _ | [ ] RSC Filing | [ ] O. Reg. 558/00 | [ ] PWQO | [ ] CCME | [ ] SUB (Storm) | [ ] SUB (Sanitary) Municipality:_____ | [ ] Other:_____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number: 1150050

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHC F1-F4	VOC's									
1	T-306B	GW		3	5/12/11	/	X	X									
2	T-72B	GW		3	↓	/	X	X									
3	T-309B	GW		3	↓	/	X	X									
4	T-AG	GW		3	↓	/	X	X									
5	Two empty sets	/		6	/	/	/	/									
6																	
7																	
8																	
9																	
10																	

Comments:

Method of Delivery: Walk-in

Relinquished By (Print & Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Aaron Bradshaw	MC		MC
Date/Time: 5/12/11	Date/Time: Dec 5/11 4:30	Date/Time: Dec. 5/11 2:55pm	Date/Time: Dec 5/11 4:53
	Temperature: 12.9 °C	Temperature: 8.5 °C	pH Verified [ ] By: N/A

At Golder Associates we strive to be the most respected global company providing consulting, design, and construction services in earth, environment, and related areas of energy. Employee owned since our formation in 1960, our focus, unique culture and operating environment offer opportunities and the freedom to excel, which attracts the leading specialists in our fields. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees who operate from offices located throughout Africa, Asia, Australasia, Europe, North America, and South America.

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