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Phase II Environmental Site Assessment

Part of 1615 Orleans Boulevard
Ottawa, Ontario

Prepared For

Orleans Garden Developments Inc.

February 24, 2020

Report: PE1962-4

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EXECUTIVE SUMMARY

Assessment

A Phase II ESA was conducted for the northern part of 1615 Orleans Boulevard, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that are considered to result in areas of potential environmental concern (APECs) on the Phase II Property. The subsurface investigation was carried out in conjunction with a Geotechnical Investigation and consisted of drilling six boreholes, three of which were constructed with groundwater monitoring wells.

The borehole profiles of the paved areas generally consist of asphaltic concrete, followed by a crushed stone fill material, underlain by sand, followed by silty clay. The borehole profiles of the landscaped areas generally consisted of sand and/or reworked native sand and clay, underlain by silty clay.

Six soil samples were submitted for laboratory analysis of Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), Petroleum Hydrocarbons (PHC, fractions 1-4), Electrical Conductivity (EC) and Sodium Absorption Ratio (SAR). No detectable BTEX or PHC concentrations were identified in any of the soil samples. EC and SAR parameters meet the standards at all locations based on Section 49.1 of O.Reg. 153/04.

Three groundwater samples from monitoring wells BH1, BH2 and BH3 were collected on July 17, 2019. Groundwater samples were analyzed for BTEX, PHC and/or sodium and chloride analysis. No detectable BTEX or PHC concentrations were identified in the groundwater samples. Chloride and sodium concentrations were detected in the groundwater samples analyzed. All tests results are in compliance with the MECP Table 3 Standards.

Recommendations

Based on the finding of the Phase II ESA, soil exists at the subject property with elevated EC and SAR parameters which exceed the applicable MECP Table 3 Residential Standards. These standards have been exceeded solely because a substance (road salt) has been used for the purpose of keeping pedestrian and vehicular traffic areas safe under conditions of snow and/or ice. Therefore, the applicable standard is not considered to have been exceeded due the application of salt for safety purposes. However, if soil is to be removed for the purpose of redevelopment, supplemental soil analysis and handling procedures may be required.

It is recommended that the monitoring wells on-site be maintained for future groundwater monitoring purposes. 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. More information may be provided upon request.

1.0 INTRODUCTION

At the request of Ms. Victoria McCrum of Orleans Garden Developments Inc., Paterson Group (Paterson) conducted a Phase II Environmental Site Assessment on part of 1615 Orleans Boulevard, in the City of Ottawa, Ontario. The purpose of this Phase II ESA has been to address areas of potential environmental concern (APECs) identified during the Phase I ESA conducted by Paterson, dated February 19, 2020.

1.1 Site Description

Address:	Part of 1615 Orleans Boulevard, Ottawa, Ontario
Legal Description:	Part of Lots 3 and 4, Concession 2 (Ottawa Front), Township of Gloucester, now in the City of Ottawa, Ontario.
Property Identification Number (PIN):	Part of 04419-0606
Location:	The site is located on the south side of Jeanne d'Arc Boulevard South, between Orleans Boulevard and Cedar Mills Road, in the City of Ottawa, Ontario. Refer to Figure 1 - Key Plan in the Figures section following the text.
Latitude and Longitude:	45° 27' 3.53" N, 75° 31' 29" W
Zoning:	GM – General Mixed-Use Zone
Configuration:	Irregular
Area:	0.76ha (approximate)

1.2 Property Ownership

Paterson was retained to complete this Phase II ESA by Ms. Victoria McCrum of Orleans Garden Developments Inc. The offices of Orleans Garden Developments Inc. are located at 1-2851 John Street, Markham, Ontario. Ms. McCrum can be reached by telephone at (905) 477-9200.

1.3 Current and Proposed Future Uses

Part of the property is currently used for parking for the adjacent commercial plaza.

It is our understanding that the proposed site plan for the subject site includes the construction of residential dwellings and associated private parking areas.

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
- Full depth generic site conditions
- Non-potable groundwater conditions
- Residential land use

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 vacant land that has been partially developed with an access roadway fronting Jeanne d'Arc Boulevard South and asphaltic paved parking areas along the west and south sides of the property for the commercial retail units located immediately west and south of the subject site. The non-paved areas are landscaped. Onsite drainage of the paved areas occurs through sheet flow to catch basins located on the south end of the site and on the adjacent roadways. Overland flow and infiltration occur on the landscaped areas of the site.

The site topography is relatively flat and at the grade of Jeanne d'Arc Boulevard South and Orleans Boulevard. The regional topography slopes downwards in a north/northwesterly direction towards the Ottawa River.

No water bodies or areas of natural or scientific (ANSIs) are present on the subject site or within the 250m study area.

2.2 Past Investigations

Paterson completed a Phase I ESA for the subject site. Based on the findings of the Phase I ESA, two Potentially Contaminating Activities (PCAs) were identified: a former retail fuel outlet (RFO) located on the adjacent property to the west (1599 Orleans Boulevard) and a former fuel oil underground storage tank located approximately 220 m south of the subject site (1619 Orleans Boulevard). Based on the separation distance, the former UST located at 1619 Orleans Boulevard is not considered to represent an area of potential environmental concern (APEC) on the Phase I Property. The former RFO is considered to represent an APEC on the subject site and a Phase II ESA was recommended.

3.0 SCOPE OF INVESTIGATION

3.1 Overview of Site Investigation

The subsurface investigation was conducted on July 10, 2019 and July 11, 2019. The field program consisted of drilling six (6) boreholes, three (3) of which were instrumented with groundwater monitoring wells. Boreholes were drilled to a maximum depth of 6.70 m below the existing ground surface.

3.2 Media Investigated

During the subsurface investigation, soil 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.

Contaminants of potential concern include benzene, toluene, ethylbenzene, xylenes (BTEX), petroleum hydrocarbons (PHC fractions 1-4), in soil and groundwater on the Phase II Property.

Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR) were analysed in soil and Sodium and Chlorides were analysed in groundwater. These parameters are not considered to be CPCs (based on Section 49.1 of O.Reg. 153/04).

3.3 Phase I Conceptual Site Model

Geological and Hydrogeological Setting

Based on information from the Geological Survey of Canada, drift thickness in the area of the subject site is estimated to be on the order of 50 to 100 m. The site consists of nearshore marine sediments of sandy silt and clay. Bedrock in the area consists of shale of the Rockcliffe Formation.

The regional topography slopes down in a northwesterly direction. The local groundwater beneath the Phase I Property is interpreted to flow in a northwesterly direction.

Contaminants of Potential Concern

The contaminants of potential concern identified on the Phase I Property consist of BTEX and PHCs in the soil and groundwater.

Water Bodies and Areas of Natural Significance

No water bodies or areas of natural significance were identified on the subject site or in the Phase I Study Area.

Water Wells (Drinking Wells and Monitoring Wells)

No potable water wells were identified on the subject site. The MECP well records search returned two (2) well records: one monitoring well and an abandoned well record located at 1615 Orleans Boulevard.

Existing Buildings and Structures

The Phase I Property is currently vacant. The asphaltic paved parking areas and roadway are the only permanent structures on the subject site. No other structures exist on the Phase I Property.

Subsurface Structures and Utilities

There are two (2) streetlights on the Phase I Property as well as underground utilities to service the immediate area along the west and south property boundaries. The Phase I Property is situated in a municipally serviced area.

Neighbouring Land Use

Neighbouring land use within the Phase I Study Area consists of residential and commercial properties.

Potentially Contaminating Activities and Areas of Potential Environmental Concern

As per Section 7.1 of this report, two potentially contaminating activities (PCAs) were identified in the study area. The following PCAs, as per Table 2, O.Reg. 153/04, amended by, O.Reg. 269/11 include:

- PCA 1: Former retail fuel outlet, 1599 Orleans Boulevard.
- PCA 2: Former UST, 1619 Orleans Boulevard.

The rationale for identifying the above PCAs is based on aerial photographs, city directories, previous reports and field observations identified within the Phase I Study Area. PCA 2, is not considered to result in an APEC based on the separation distance (over 220 m).

APECs on the Phase I Property as well as contaminants of potential concern, are presented in Table 3.

TABLE 3: Areas of Potential Environmental Concern

Area of Potential Environmental Concern (APEC)	Location of APEC on Phase I Property	Potentially Contaminating Activity (PCA)	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Soil and/or Groundwater)
APEC 1: Former presence of a retail fuel outlet (UST nest and pump stations)	On the western portion of the property	Item 28: Gasoline and associated product storage in fixed tanks	Off-Site	BTEX, PHC	Soil and Groundwater

The APEC on the Phase I Property is presented on Drawing PE1962-3 – Site Plan. PCAs identified within the Phase I Study Area are outlined in green on Drawing PE1962-4 – Surrounding Land Use Plan.

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 is one PCA that has resulted in an APEC on the Phase I Property. A variety of independent sources were consulted as part of this assessment, and as such, 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. It should be noted that the groundwater samples that were collected on July 17, 2019, were miss-labelled 'July 14, 2019' as shown on the Laboratory Chain of Custody and Laboratory Results, appended in Appendix 1.

3.5 Impediments

Drilling locations were partially restricted based on utilities located along the eastern access roadway of the Phase II Property. The boreholes were placed approximately 3 m from the roadway.

4.0 INVESTIGATION METHOD

4.1 Subsurface Investigation

The subsurface investigation was conducted on July 10th and 11th, 2019. The field program consisted of drilling six boreholes on the Phase II Property, three of which were instrumented with groundwater monitoring wells. The boreholes were drilled to a maximum depth of 6.70 m below the ground surface to intercept the groundwater table.

The boreholes were placed to address the aforementioned APEC, as presented in Table 1. The boreholes were drilled using truck mounted drill rig provided by George Downing Estate Drilling of Hawkesbury, Ontario, under full-time supervision of Paterson personnel. The borehole locations are indicated on the attached Drawing PE1962-5 - Test Hole Location Plan, appended to this report.

4.2 Soil Sampling

A total of 52 soil samples were obtained from the boreholes by means of grab sampling from auger flights/auger samples and split spoon sampling. Split spoon samples were taken at approximate 0.76 m intervals. The depths at which auger samples and split spoon samples were obtained from the boreholes are shown as "**AU**" and "**SS**" on the Soil Profile and Test Data Sheets.

The borehole profiles of the paved areas generally consist of asphaltic concrete, followed by an engineered fill material, underlain by sand, followed by clayey silt, overlying silty clay. All fill material encountered at the site was either engineered fill (crushed stone) or reworked native soil, both of which are not considered to represent a PCA or an APEC on the site. The borehole profiles of the landscaped

areas generally consisted of sand and gravel, followed by silty sand, underlain by silty clay.

4.3 Field Screening Measurements

An RKI Eagle gastech with methane elimination and calibrated to hexane was used to measure the combustible vapour concentrations in the headspace of the soil samples recovered from the boreholes. The results of the vapour survey are discussed in Subsection 5.4 and are available on the Soil Profile & Test Data sheets in Appendix 1.

The technical protocol was obtained from Appendix C of the MECP document entitled “Interim Guidelines for the Remediation of Petroleum Contamination at Operating Retail and Private Fuel Outlets in Ontario”, dated March 1992.

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 ambient temperature prior to conducting the vapour survey. Allowing the samples to stabilize to ambient 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 gastech calibrated to hexane is used for this purpose. 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 parts per million (ppm) scale is used to measure concentrations of hydrocarbon vapours that are too low to register on the Lower Explosive Limit (LEL) scale. The explosive point, 100% LEL, represents the leanest mixture which will burn (or explode) if ignited.

The combustible vapour readings ranged from 0 to 25 ppm in the recovered samples and were not considered to be indicative of lighter fraction petroleum hydrocarbon compounds. Vapour readings are noted on the Soil Profile and Test Data Sheets in Appendix 1.

No visual or olfactory indications of potential hydrocarbons, or visual indications of deleterious fill material, were identified in the soil samples. Soil samples were selected based on a combination of the results of the vapour screening, visual screening, sample depth and/or sample location.

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 50 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.

A summary of the monitoring well construction details is provided below in Table 2. Boreholes were surveyed relative to a temporary benchmark (top of spindle of a fire hydrant on Orleans Boulevard) with an assumed elevation of 100 metres 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	99.62	6.70	3.70-6.70	2.50-6.70	0.16-2.50	Flushmount
BH2	99.50	6.40	3.40-6.40	2.64-6.40	0.16-2.64	Flushmount
BH3	99.63	6.70	3.70-6.70	2.74-6.70	0.16-2.74	Flushmount

4.5 Field Measurement of Water Quality Parameters

Groundwater samples were collected on July 17, 2019. Parameters measured in the field included water levels, temperature, pH and electrical conductivity.

Field parameters were measured after each well volume purged. Wells were purged prior to sampling until at least three well volumes had been removed or the field parameters were relatively stable. Stabilized field parameter values are summarized in Table 3.

TABLE 3: Field Measurement of Water Quality Parameters

Parameter	BH1	BH2	BH3
Temperature (°C)	15	17.7	14.7
pH	7.07	7.98	6.99
Electrical Conductivity (µS/cm)	1220	Not measured	1163

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 in Appendix 1, the following soil and groundwater samples, as well as analyzed parameters are presented in Tables 4 and 5.

TABLE 4: Soil Samples Submitted and Analyzed Parameters

Sample ID	Sample Depth or Stratigraphic Unit	Parameters Analyzed				Rationale
		PHCs (F1-F4)	BTEX	EC/SAR	pH	
July 10, 2019						
BH1-SS2	0.76 – 1.4 m Sand			X	X	Assess the soil quality for future off-site disposal purposes
BH1-SS6	3.84 – 4.14 m Silty clay	X	X			Assess potential impacts due to the presence of a former retail fuel outlet
BH2-SS2	0.61– 1.22 m Sand			X		Assess the soil quality for future off-site disposal purposes
BH2-SS5	2.44-3 .65 m Silty clay	X	X			Assess potential impacts due to the presence of a former retail fuel outlet
BH3-SS2	0.76-1.40 m Silty sand			X		Assess the soil quality for future off-site disposal purposes
BH3-SS4	2.29- 2.89 m Silty clay	X	X		X	Assess potential impacts due to the presence of a former retail fuel outlet
July 11, 2019						
BH4-SS2	0.76-1.4 m Clayey silt			X		Assess the soil quality for future off-site disposal purposes
BH5-SS3	0.61-1.22m Clayey silt			X		Assess the soil quality for future off-site disposal purposes
BH6-SS2	0.76-1.4 m Clayey silt			X		Assess the soil quality for future off-site disposal purposes

TABLE 5: Groundwater Samples Submitted and Analyzed Parameters					
Sample ID	Screened Interval (m)	Parameters Analyzed			Rationale
		PHCs (F1-F4)	Sodium	Chloride	
July 17, 2019					
BH1-GW1	3.70-6.70 m	X	X	X	Assess potential impacts due to the presence of a former retail fuel outlet
BH2-GW1	3.40-6.40 m	X	X	X	Assess potential impacts due to the presence of a former retail fuel outlet
BH3-GW1	3.70-6.70 m		X	X	Site Coverage

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

Boreholes were surveyed using a temporary benchmark, being the top spindle of a fire hydrant with an assumed elevation of 100 m above sea level (m ASL).

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 topsoil, followed by a native silty sand material, overlying silty clay. Paved areas were underlain by engineered fill.

The boreholes were terminated a maximum depth of 6.70 m BGS. Groundwater was encountered within the overburden at depths ranging from approximately 1.81 to 3.65 m BGS. The 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 July 17, 2019, using an electronic water level meter. Groundwater levels are summarized below in Table 6.

TABLE 6: Groundwater Level Measurements

Borehole Location	Ground Surface Elevation (m)	Water Level Depth (m below grade)	Water Level Elevation (m ASL)	Date of Measurement
BH1	99.62	3.65	95.97	July 17, 2019
BH2	99.50	3.37	96.13	July 17, 2019
BH3	99.36	1.81	97.55	July 17, 2019

Based on the groundwater elevations measured during the sampling event, a groundwater contour mapping was completed. Groundwater contours are shown on Drawing PE1962-5. Based on the contour mapping, groundwater flow at the subject site is in a northwesterly direction. A horizontal hydraulic gradient of approximately 0.025 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 vapour readings ranging from 0 to 25 ppm. No obvious visual or olfactory indications of potential environmental concerns were identified in the soil 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

Nine (9) soil samples were submitted for PHC (F1-F4), BTEX, EC, SAR and/or pH analysis. The results of the analytical testing are presented below in Tables 7, 8 and 9. The laboratory certificate of analysis is provided in Appendix 1.

TABLE 7: Analytical Test Results – Soil – BTEX and PHC (F_1-F_4)

Parameter	MDL (µg/g)	Soil Samples (µg/g)			MECP Table 3 Residential Standards (µg/g)
		July 10, 2019			
		BH1-SS6	BH2-SS5	BH3-SS4	
Benzene	0.02	nd	nd	nd	0.21
Ethylbenzene	0.05	nd	nd	nd	2
Toluene	0.05	nd	nd	nd	2.3
Xylenes (total)	0.05	nd	nd	nd	3.1
PHC F_1	7	nd	nd	nd	55
PHC F_2	4	nd	nd	nd	98
PHC F_3	8	nd	nd	nd	300
PHC F_4	6	nd	nd	nd	2800

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

No detectable BTEX or PHC concentrations were identified in any of the soil samples. The soil results are in compliance with the MECP Table 3 Residential Standards.

TABLE 8: Analytical Test Results – Soil – EC, SAR and pH

Parameter	MDL	Soil Samples				MECP Table 3 Residential Standards
		July 10, 2019				
		BH1-SS2	BH2-SS2	BH3-SS2	BH3-SS4	
SAR	0.01	**5.85**	3.07	**14.2**	NA	5
EC (µS/cm)	5	568	426	**1790**	NA	700
pH	0.05	7.17	NA	NA	7.54	5-11

Notes:
- MDL - Method Detection Limit
- NA – Parameter not analyzed
- **Bold and Underlined** – Parameter is deemed in compliance with the applicable MECP standards based on Section 49.1 of O.Reg. 153/04

TABLE 8 Continued: Analytical Test Results – Soil – EC, SAR and pH					
Parameter	MDL	Soil Samples July 11, 2019			MECP Table 3 Residential Standards
		BH4-SS2	BH5-SS3	BH6-SS2	
SAR	0.01	2.56	**5.43**	**10.5**	5
EC (µS/cm)	5	380	**724**	**1140**	700

Notes:
- MDL - Method Detection Limit
- NA – Parameter not analyzed
- **Bold and Underlined** – Parameter is deemed in compliance with the applicable MECP standards based on Section 49.1 of O.Reg. 153/04

The SAR and/or electrical conductivity parameters in soil samples BH1-SS2, BH3-SS2, BH5-SS3 and BH6-SS2 are deemed in compliance with the applicable MECP Standards based on Section 49.1 of O.Reg.153/04.

The analytical results for BTEX, PHC, EC and SAR parameters tested in soil are shown on Drawing PE1962-6 and PE1962-7.

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

TABLE 9: Maximum Concentrations – Soil			
Parameter	Maximum Value	Borehole	Depth Interval (m BGS)
SAR	**14.2**	BH3-SS2	0.76-1.4 m Silty sand
EC (µS/cm)	**1790**		

Notes:
- **Bold and Underlined** – Parameter is deemed in compliance with the applicable MECP standards based on Section 49.1 of O.Reg. 153/04

All other parameters analysed were non-detect. The EC and SAR parameters are deemed in compliance with the appliable MECP Standards based on Section 49.1 of O.Reg. 153/04.

5.6 Groundwater Quality

Groundwater samples from monitoring wells installed in BH1, BH2 and BH3 were submitted for laboratory analysis of BTEX, PHC (fractions, F1-F4), Sodium and Chloride parameters. The groundwater samples were obtained from the screened intervals noted on Table 2. The results of the analytical testing are presented in Tables 10 and 11. The laboratory certificates of analysis are provided in Appendix 1.

TABLE 10: Analytical Test Results – Groundwater – PHCs and BTEX				
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)		MECP Table 3 Standards (µg/L)
		July 17, 2019		
		BH1-GW1	BH2-GW1	
Benzene	0.5	nd	nd	44
Ethylbenzene	0.5	nd	nd	2300
Toluene	0.5	nd	nd	18000
Xylenes (total)	0.5	nd	nd	4200
PHC F_1	25	nd	nd	750
PHC F_2	100	nd	nd	150
PHC F_3	100	nd	nd	500
PHC F_4	100	nd	nd	500

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

No detectable BTEX or PHC concentrations were identified in the groundwater samples analysed. All test results are in compliance with the MECP Table 3 Standards for BTEX and PHCs.

TABLE 11: Analytical Test Results – Groundwater – Salt (Sodium and Chloride)					
Parameter	MDL (µg/L)	Groundwater Samples (µg/L)			MECP Table 3 Standards (µg/L)
		July 17, 2019			
		BH1-GW1	BH2-GW1	BH3-GW1	
Chloride	1000	411,000	90,000	135,000	2,300,000
Sodium	200	124,000	39,500	66,500	2,300,000

Notes:
- MDL - Method Detection Limit
- nd - Not Detected (i.e <MDL)

Detectable chloride and sodium concentrations were identified in all the groundwater samples analyzed. All test results are in compliance with the MECP Table 3 Standards.

The analytical results for BTEX, PHC, sodium and chloride parameters tested in groundwater are shown on Drawing PE1962-8. All parameter concentrations are in compliance with the MECP Table 3 Standards.

The maximum concentrations of analyzed parameters in the groundwater at the site are summarized in Table 12.

TABLE 12: Maximum Concentrations – Groundwater			
Parameter	Maximum Concentration (µg/L)	Monitoring Well	Screened Interval (m BGS)
Chloride	411,000	BH1	3.70-6.70 m
Sodium	124,000		

All other test parameters were non-detect. All parameter concentrations in groundwater are in compliance with the MECP Table 3 Standards.

Based on the finding of the Phase II ESA, soil exists at the subject property with elevated EC and SAR parameters which exceed the applicable MECP Table 3 Residential Standards. These standards have been exceeded solely because a substance (road salt) has been used for the purpose of keeping pedestrian and vehicular traffic areas safe under conditions of snow and/or ice. Therefore, the applicable standard is not considered to have been exceeded due the application of salt for safety purposes. However, if soil is to be removed for the purpose of redevelopment, supplemental soil analysis and handling procedures may be required.

5.7 Quality Assurance and Quality Control Results

All samples submitted as part of the July 10 and 14, 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

Based on the results of the Phase I ESA completed for the subject site, two PCAs have been identified within the study area. However, only one of the PCAs is considered to have resulted in an APEC on the Phase II Property:

- ❑ APEC 1: Former retail fuel outlet at 1599 Orleans Boulevard.

The rationale for identifying the above APEC is based on aerial photographs, city directories, previous reports and field observations. The remaining PCA is not considered to represent an APEC due to the separation distance and information contained within our files.

Contaminants of Potential Concern

The following contaminants of potential concern (CPCs) are identified with respect to the Phase II Property:

- ❒ Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX). These parameters were selected as CPCs for the Phase II Property due to the former presence of a retail fuel outlet situated on the adjacent property to the west at 1599 Orleans Boulevard.

- ❒ Petroleum Hydrocarbons fractions 1 through 4 (PHCs F_1-F_4). These parameters encompass gasoline (Fraction 1), diesel and fuel oil (Fraction 2), and heavy oils (Fractions 3 and 4). PHCs F_1-F_4 were selected as CPCs for the Phase II Property due to the former presence of a retail fuel outlet situated on the adjacent property to the west at 1599 Orleans Boulevard.

Subsurface Structures and Utilities

Utilities on the Phase II Property included sanitary/storm sewer lines, a municipal water service, electrical services and telephone lines. Based on standard practice for subsurface utility installation, service trenches are expected to be present approximately 2 m below the existing grade. Subsurface infrastructures on the Phase II Property are shown illustrated on Drawing PE1962-5.

Physical Setting

Site Stratigraphy

The site stratigraphy, from ground surface to the deepest aquifer or aquitard investigated, is illustrated on Drawings PE1962-6A, 6B, 7A, 7B, 8A and 8B. The site stratigraphy consists of:

- ❒ Pavement structure, consisting of approximately 0.08m of asphaltic concrete over 0.8 to 0.66m of engineered fill material (crushed stone) was encountered at BH1, BH2, BH5 and BH6. Groundwater was not encountered in this layer.

- Native soil consisting of sand was encountered at BH3 and BH4 at depths. Groundwater was not encountered in this layer.
- Silty sand was encountered at BH1 and BH2, and BH3, respectively at a depth of 0.6 m below the existing grade. Groundwater was not encountered in this layer.
- Silty clay was encountered in all boreholes at depths between approximately 1.47 m and 2.64 m below grade and extended until the borehole was terminated. Groundwater was encountered in this layer at BH1, BH2 and BH3.

Hydrogeological Characteristics

Groundwater at the Phase II Property was encountered in the native silty clay layer. During the most recent groundwater monitoring event, groundwater flow was measured in a northwesterly direction, towards the Ottawa River, with a hydraulic gradient of 0.025 m/m. Groundwater contours are shown on Drawing PE1962-5.

Approximate Depth to Water Table

Depth to the water table at the subject site varies between approximately 1.81m and 3.65 m below existing grade.

Approximate Depth to Bedrock

Bedrock was not confirmed during the drilling program. All boreholes were completed in the native soil and did not reach refusal, as the drift thickness is estimated to be on the order of 50 to 100 m.

Well records for the Phase II Property and study area did not provide any information regarding the bedrock depth.

Sections 41 and 43.1 of the Regulation

Section 41 of the Regulation does not apply to the Phase II Property, in that the subject property is not within 30m of an environmentally sensitive area, and the pH of the soil is between 5 and 9.

Section 43.1 of the Regulation does not apply to the subject site as bedrock is not located less than 2 m below ground surface.

Fill Placement

Engineered fill is present on the Phase II Property and exists as part of the pavement structure. The fill material consists of crushed stone larger than 2 millimeters in size and is not considered to be soil as defined by O.Reg.153/04. The engineered fill material is not considered to represent an APEC on the Phase II Property. Fill material consisting of a brown silty clay was also present on site, this fill material is re-worked native soil from site grading and servicing. This material is not considered to represent a PCA or APEC on the subject site.

Existing Buildings and Structures

The Phase II Property is currently vacant and partially used for parking. The asphaltic paved parking areas, lights and roadway fronting Jeanne d'Arc Boulevard South are the only permanent structures on the subject site. No other structures exist on the Phase II Property.

Proposed Buildings and Other Structures

The proposed site development for the subject site includes several blocks of attached residential dwellings on the northern, central and eastern portions of the property with associated parking on the southern part of the property. The footprint of the development will cover the majority of the site.

Areas of Natural Significance

No areas of natural significance are present on the Phase II Property or within the 250 m study area.

Environmental Condition

Areas Where Contaminants are Present

Based on the analytical test results and Section 49.1 of O.Reg. 153/04 there are no contaminants exceeding the appliable MECP Standards on the subject site.

6.0 CONCLUSIONS

Assessment

A Phase II ESA was conducted for the northern part of 1615 Orleans Boulevard, in the City of Ottawa, Ontario. The purpose of the Phase II ESA was to address potentially contaminating activities (PCAs) that are considered to result in areas of potential environmental concern (APECs) on the Phase II Property. The subsurface investigation was carried out in conjunction with a Geotechnical Investigation and consisted of drilling six boreholes, three of which were constructed with groundwater monitoring wells.

The borehole profiles of the paved areas generally consist of asphaltic concrete, followed by a crushed stone fill material, underlain by sand, followed by silty clay. The borehole profiles of the landscaped areas generally consisted of sand and/or reworked native sand and clay, underlain by silty clay.

Six soil samples were submitted for laboratory analysis of Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX), Petroleum Hydrocarbons (PHC, fractions 1-4), Electrical Conductivity (EC) and Sodium Absorption Ratio (SAR). No detectable BTEX or PHC concentrations were identified in any of the soil samples. EC and SAR parameters meet the standards at all locations based on Section 49.1 of O.Reg. 153/04.

Three groundwater samples from monitoring wells BH1, BH2 and BH3 were collected on July 17, 2019. Groundwater samples were analyzed for BTEX, PHC and/or sodium and chloride analysis. No detectable BTEX or PHC concentrations were identified in the groundwater samples. Chloride and sodium concentrations were detected in the groundwater samples analyzed. All tests results are in compliance with the MECP Table 3 Standards.

Recommendations

Based on the finding of the Phase II ESA, soil exists at the subject property with elevated EC and SAR parameters which exceed the applicable MECP Table 3 Residential Standards. These standards have been exceeded solely because a substance (road salt) has been used for the purpose of keeping pedestrian and vehicular traffic areas safe under conditions of snow and/or ice. Therefore, the applicable standard is not considered to have been exceeded due the application of salt for safety purposes. However, if soil is to be removed for the purpose of

redevelopment, supplemental soil analysis and handling procedures may be required.

It is recommended that the monitoring wells on-site be maintained for future groundwater monitoring purposes. 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. More information may be provided upon request.

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 Orleans Garden Developments Inc. Notification from Orleans Garden Developments Inc. and Paterson Group will be required to release this report to any other party.

Paterson Group Inc.

Michael Beaudoin, P.Eng., QP$_{ESA}$

Mark S. D'Arcy, P.Eng., QP$_{ESA}$

Report Distribution:

- Orleans Garden Developments Inc.
- Paterson Group

FIGURES

FIGURE 1 – KEY PLAN

DRAWING PE1962-5 – TEST HOLE LOCATION PLAN

DRAWING PE1962-6– ANALYTICAL TESTING PLAN–SOIL (EC, SAR)

DRAWING PE1962-6A – CROSS-SECTION A – A' – SOIL (EC, SAR)

DRAWING PE1962-6B – CROSS-SECTION B – B' – SOIL(EC, SAR)

DRAWING PE1962-7– ANALYTICAL TESTING PLAN – SOIL

(BTEX, PHC)

DRAWING PE1962-7A – CROSS-SECTION A – A' – SOIL (BTEX, PHC)

DRAWING PE1962-7B – CROSS-SECTION B – B' – SOIL (BTEX, PHC)

DRAWING PE1962-8 – ANALYTICAL TESTING PLAN – GROUNDWATER

DRAWING PE1962-8A – CROSS-SECTION A – A' – GROUNDWATER

DRAWING PE1962-8B – CROSS-SECTION B – B' – GROUNDWATER

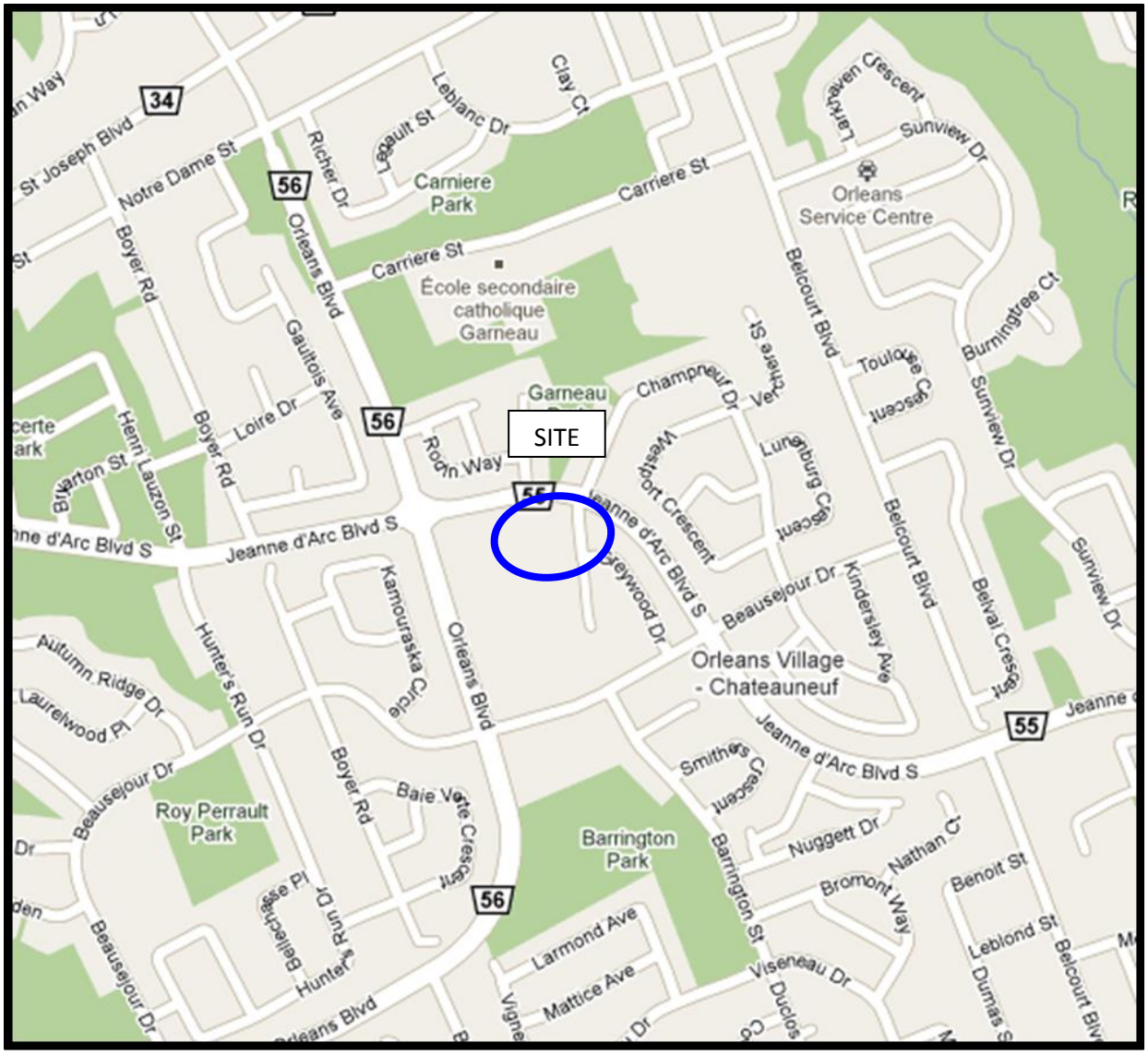
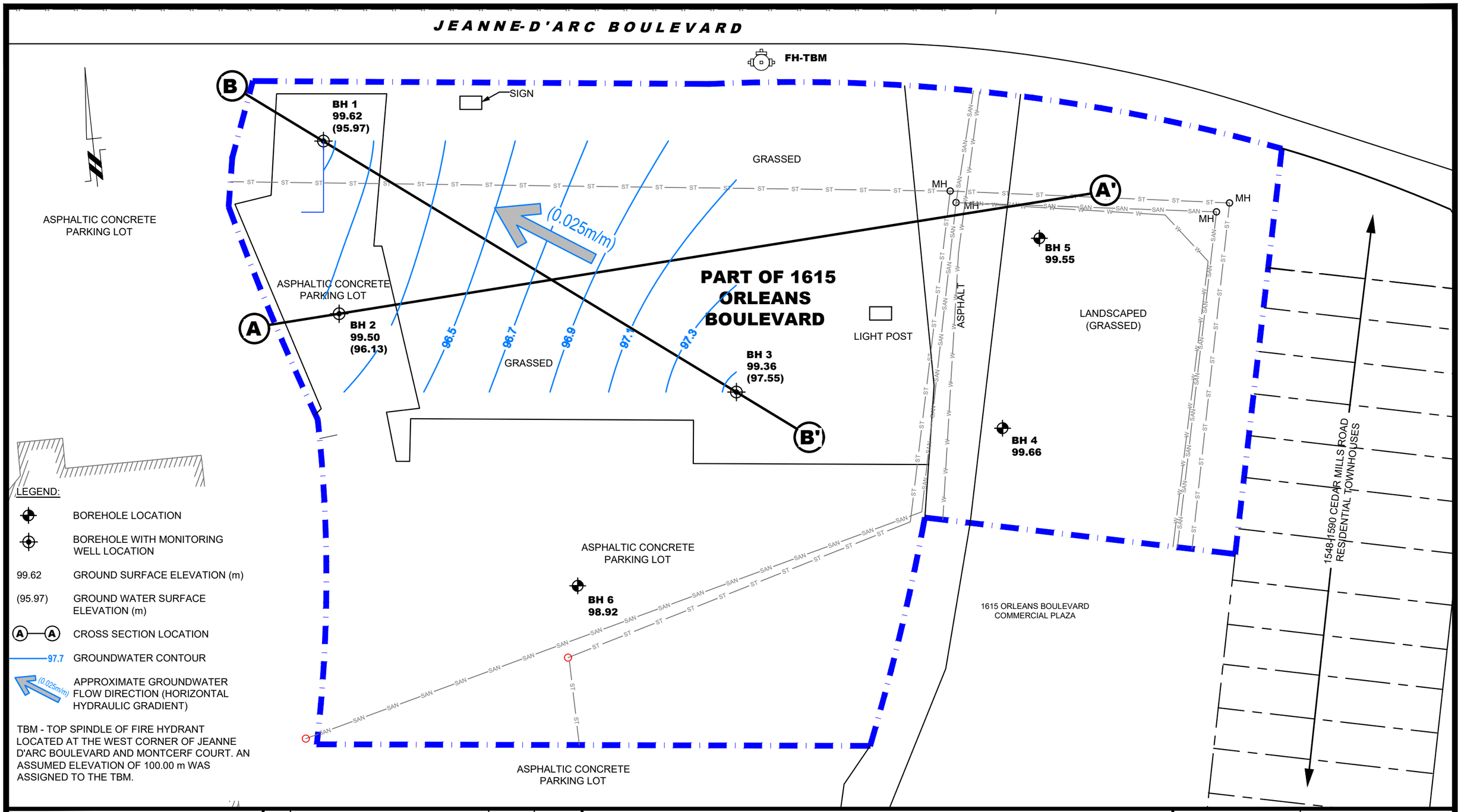


FIGURE 1

KEY PLAN



LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- 99.62 GROUND SURFACE ELEVATION (m)
- (95.97) GROUND WATER SURFACE ELEVATION (m)
- A—A CROSS SECTION LOCATION
- 97.7 GROUNDWATER CONTOUR
- (0.025m/m) APPROXIMATE GROUNDWATER FLOW DIRECTION (HORIZONTAL HYDRAULIC GRADIENT)

TBM - TOP SPINDLE OF FIRE HYDRANT LOCATED AT THE WEST CORNER OF JEANNE D'ARC BOULEVARD AND MONTCERF COURT. AN ASSUMED ELEVATION OF 100.00 m WAS ASSIGNED TO THE TBM.

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NO.	REVISIONS	DATE	INITIAL

ORLEANS GARDEN DEVELOPMENTS INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
1615 ORLEANS BOULEVARD

ORLEANS, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:500	Date: 02/2020
Drawn by: YA	Report No.: PE1962-4
Checked by: MB	Dwg. No.: PE1962-5
Approved by: MSD	Revision No.:

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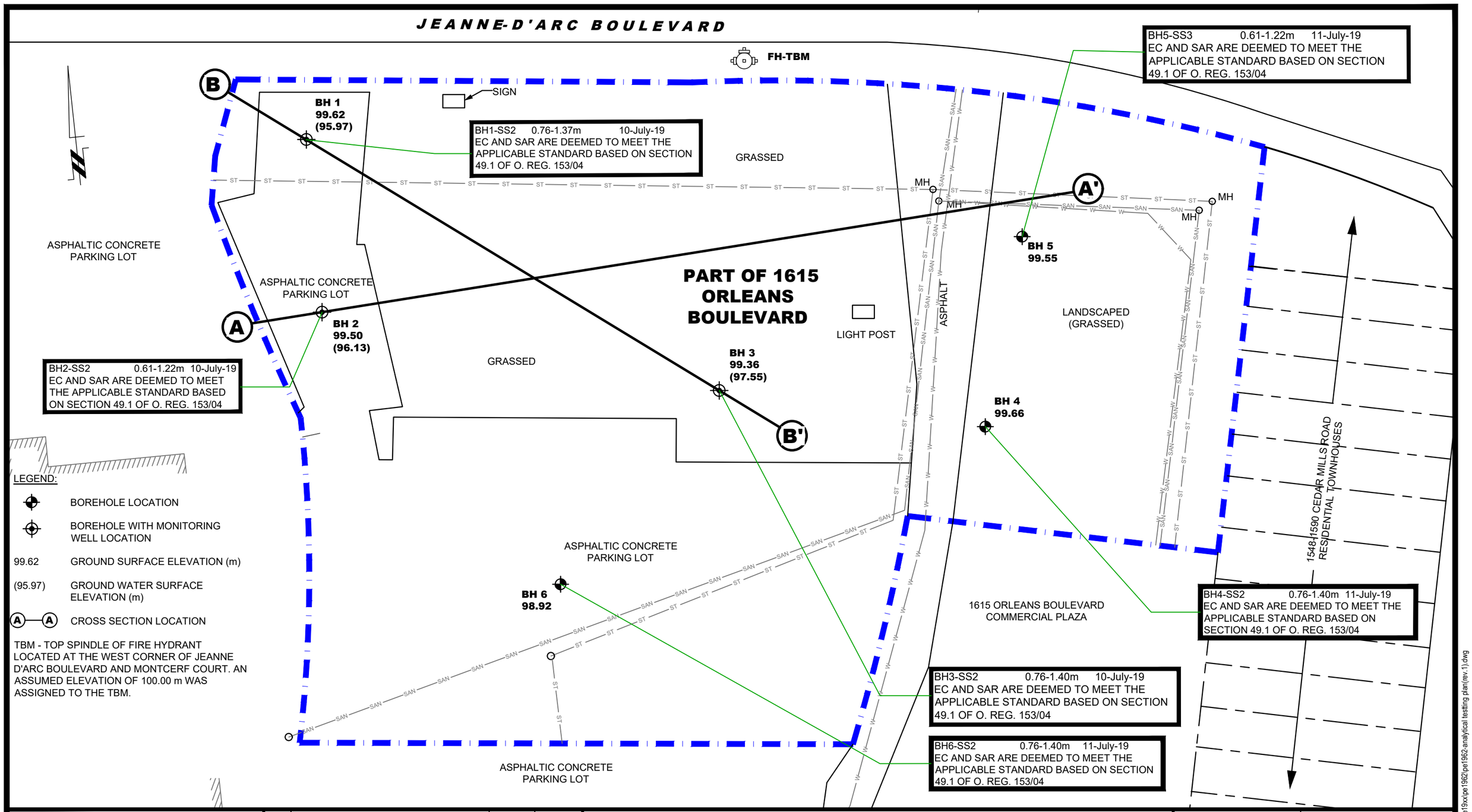

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1615 ORLEANS BOULEVARD

ORLEANS, ONTARIO

Title:

ANALYTICAL TESTING PLAN - SOIL (EC,SAR)

Scale: 1:500	Date: 02/2020
Drawn by: YA	Report No.: PE1962-4
Checked by: MB	Dwg. No.: PE1962-6
Approved by: MSD	Revision No.:

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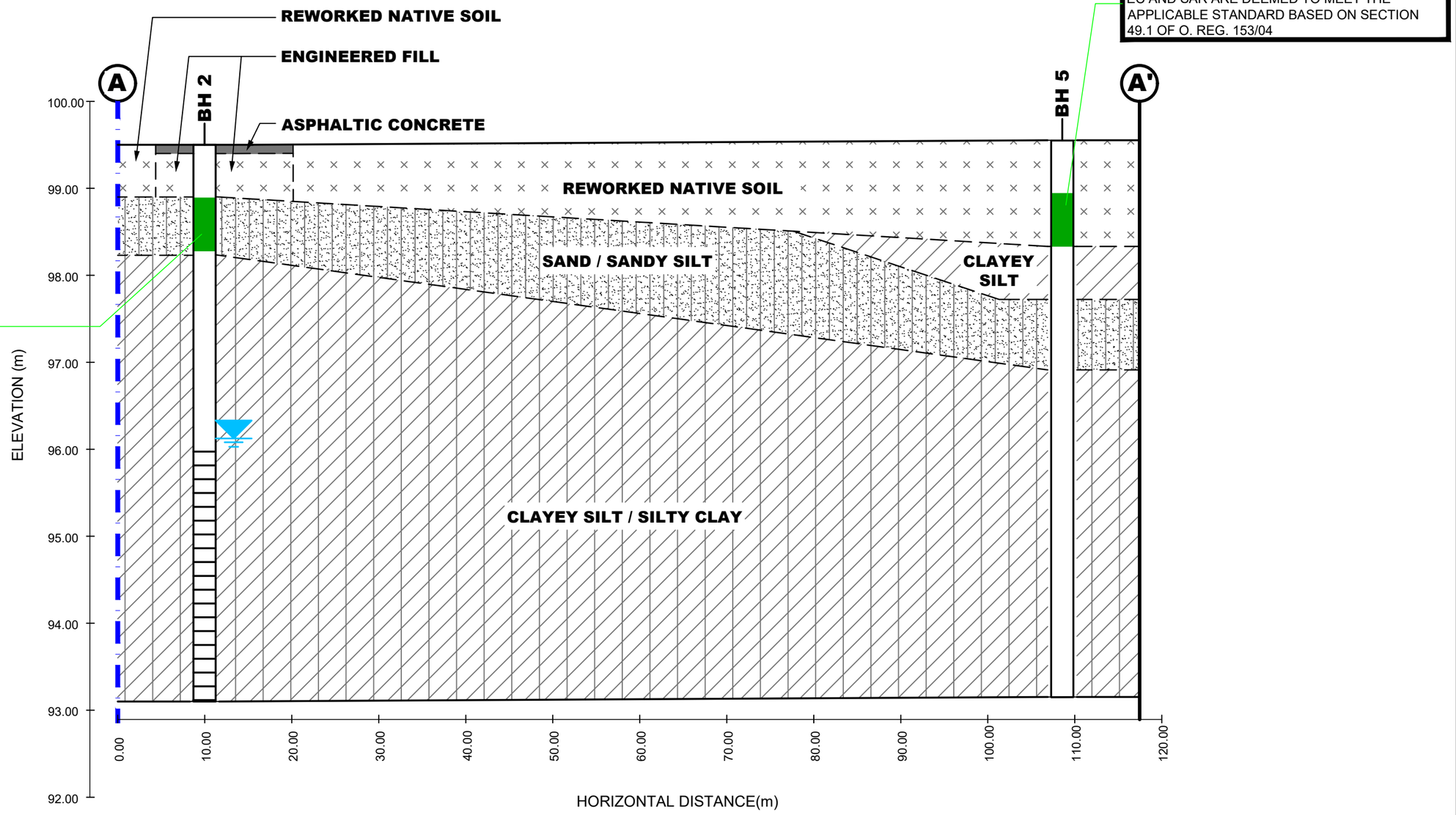

SOIL RESULT IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

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ORLEANS GARDEN DEVELOPMENTS INC

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1615 ORLEANS BOULEVARD

ORLEANS, ONTARIO

Title:

CROSS SECTION A-A' - SOIL (EC AND SAR)

Scale: AS SHOWN	Date: 02/2020
Drawn by: RCG	Report No.: PE1962-4
Checked by: MB	Dwg. No.: PE1962-6A
Approved by: MSD	Revision No.:

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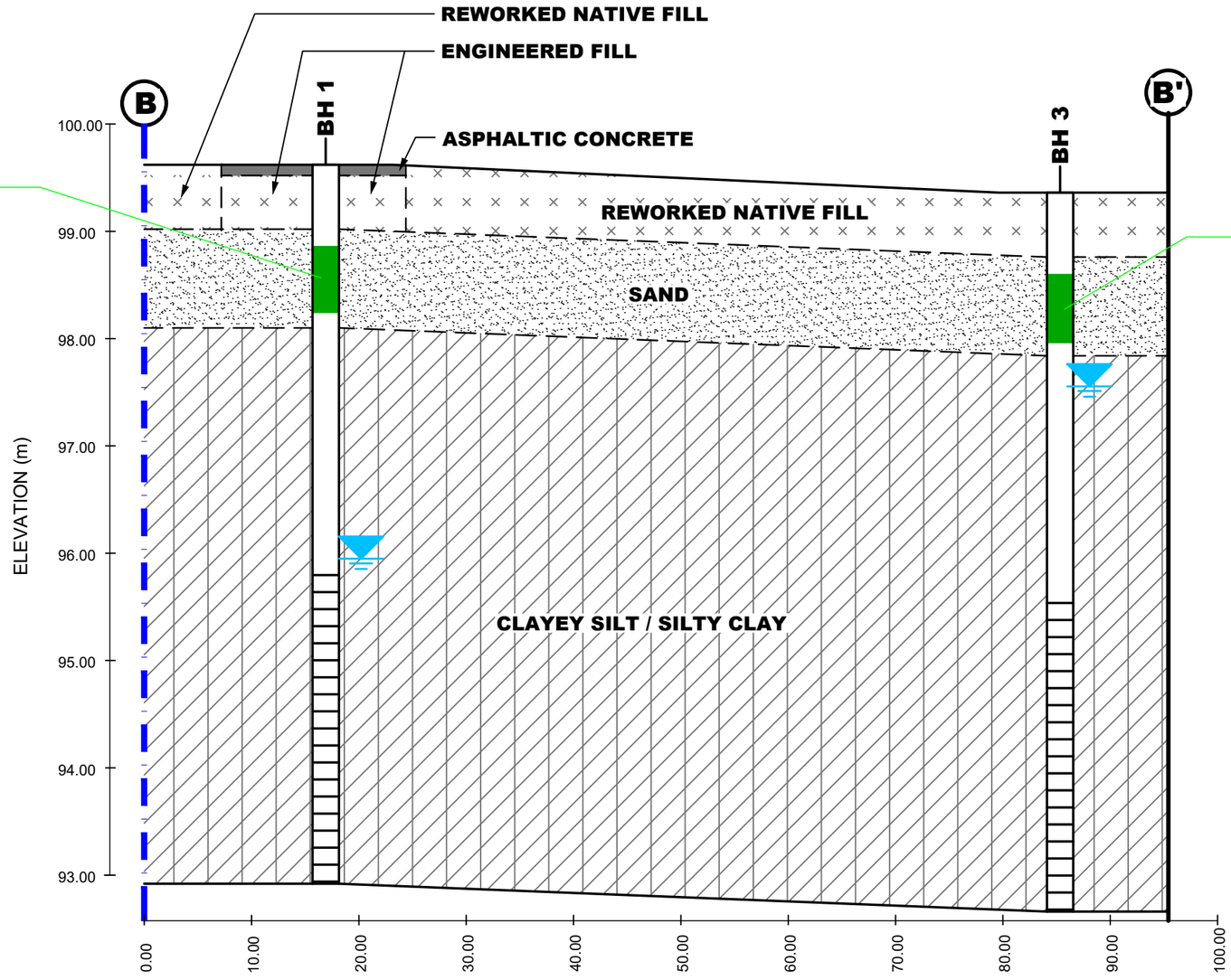

BH1-SS2 0.76-1.37m 10-July-19
EC AND SAR ARE DEEMED TO MEET THE APPLICABLE STANDARD BASED ON SECTION 49.1 OF O. REG. 153/04

BH3-SS2 0.76-1.40m 10-July-19
EC AND SAR ARE DEEMED TO MEET THE APPLICABLE STANDARD BASED ON SECTION 49.1 OF O. REG. 153/04

SOIL RESULT IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

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ORLEANS GARDEN DEVELOPMENTS INC

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1615 ORLEANS BOULEVARD

ORLEANS, ONTARIO

Title:

CROSS SECTION B-B' - SOIL (EC AND SAR)

Scale: AS SHOWN	Date: 02/2020
Drawn by: RCG	Report No.: PE1962-4
Checked by: MB	Dwg. No.: PE1962-6B
Approved by: MSD	Revision No.:

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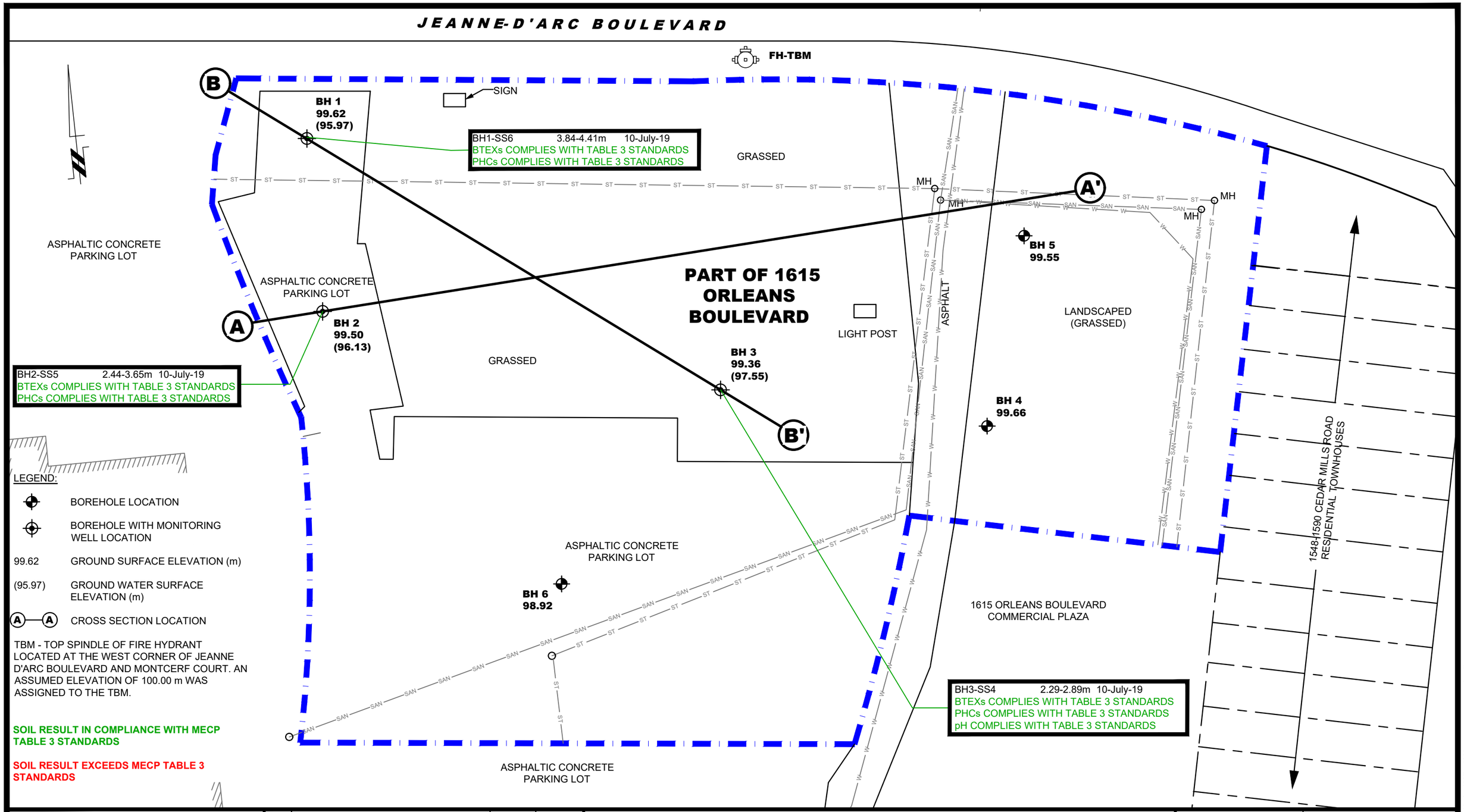

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ORLEANS GARDEN DEVELOPMENT INC.

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1615 ORLEANS BOULEVARD

ORLEANS, ONTARIO

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

Scale: 1:500	Date: 02/2020
Drawn by: YA	Report No.: PE1962-4
Checked by: MB	Dwg. No.: PE1962-7
Approved by: MSD	Revision No.:

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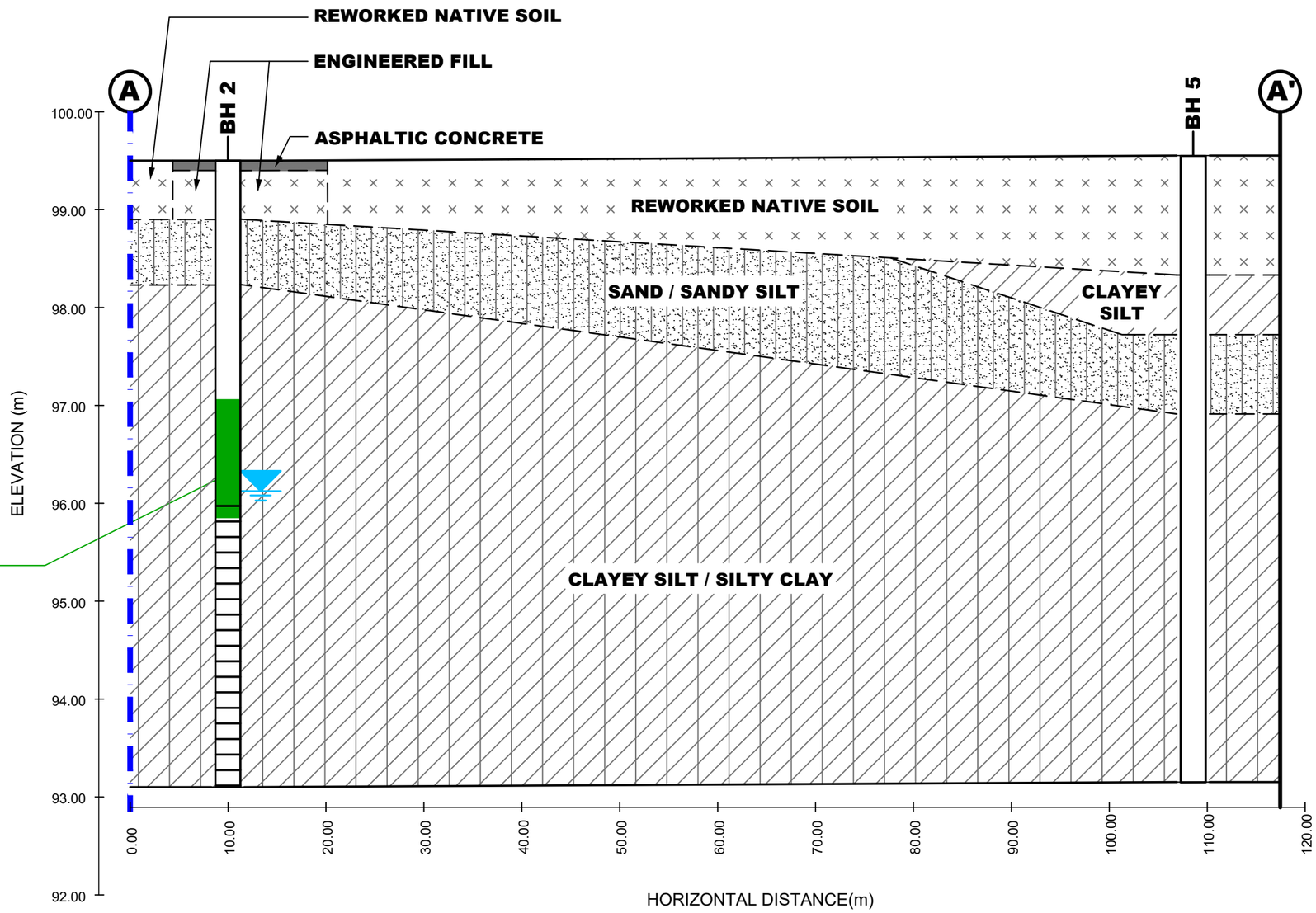

BH2-SS5 2.44-3.65m 10-July-19
BTEXs COMPLIES WITH TABLE 3 STANDARDS
PHCs COMPLIES WITH TABLE 3 STANDARDS

SOIL RESULT IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1615 ORLEANS BOULEVARD

ORLEANS, ONTARIO

Title:

CROSS SECTION A-A' - SOIL (BTEX AND PHC)

Scale: AS SHOWN	Date: 02/2020
Drawn by: RCG	Report No.: PE1962-4
Checked by: MB	Dwg. No.: PE1962-7A
Approved by: MSD	Revision No.:

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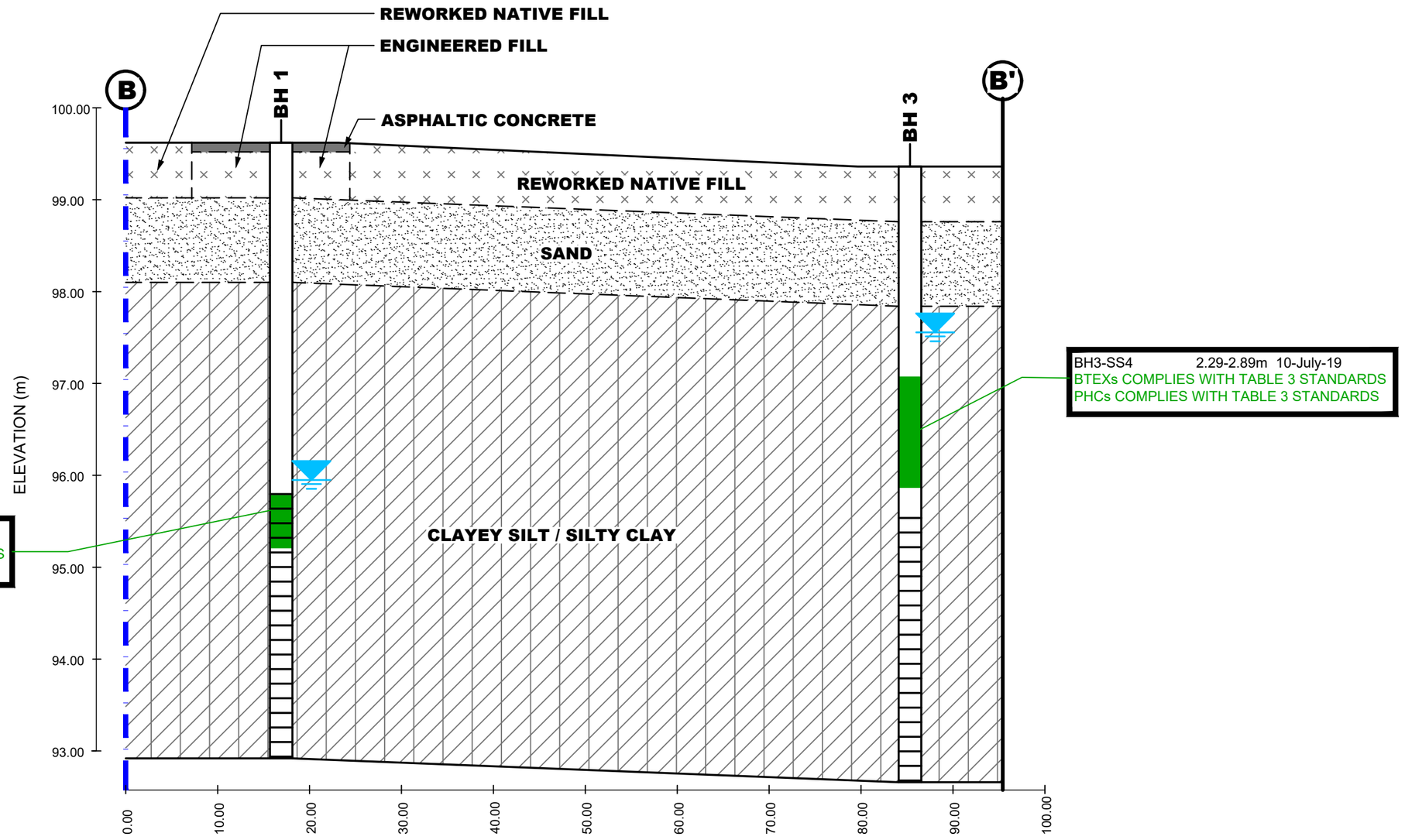

SOIL RESULT IN COMPLIANCE WITH MECP TABLE 3 STANDARDS

SOIL RESULT EXCEEDS MECP TABLE 3 STANDARDS

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ORLEANS GARDEN DEVELOPMENTS INC

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1615 ORLEANS BOULEVARD

ORLEANS, ONTARIO

Title:
CROSS SECTION B-B' - SOIL (BTEX AND PHCs)

Scale: AS SHOWN	Date: 02/2020
Drawn by: RCG	Report No.: PE1962-4
Checked by: MB	Dwg. No.: PE1962-7B
Approved by: MSD	Revision No.:

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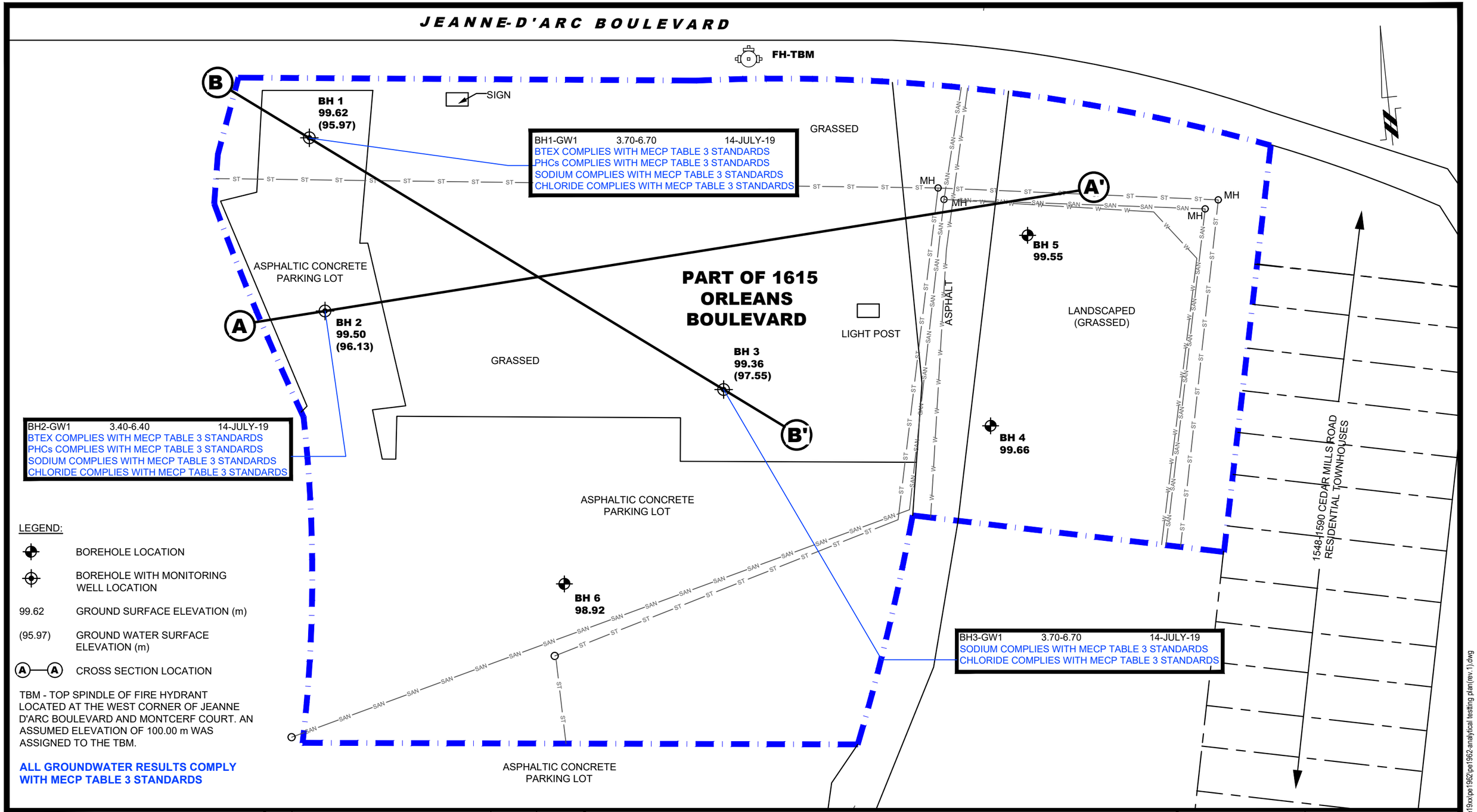

LEGEND:

- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- 99.62 GROUND SURFACE ELEVATION (m)
- (95.97) GROUND WATER SURFACE ELEVATION (m)
- A—A CROSS SECTION LOCATION

TBM - TOP SPINDLE OF FIRE HYDRANT LOCATED AT THE WEST CORNER OF JEANNE D'ARC BOULEVARD AND MONTCERF COURT. AN ASSUMED ELEVATION OF 100.00 m WAS ASSIGNED TO THE TBM.

ALL GROUNDWATER RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1615 ORLEANS BOULEVARD

ORLEANS, ONTARIO

Title:

ANALYTICAL TESTING PLAN (GROUNDWATER)

Scale: 1:500	Date: 02/2020
Drawn by: YA	Report No.: PE1962-4
Checked by: MB	Dwg. No.: PE1962-8
Approved by: MSD	Revision No.:

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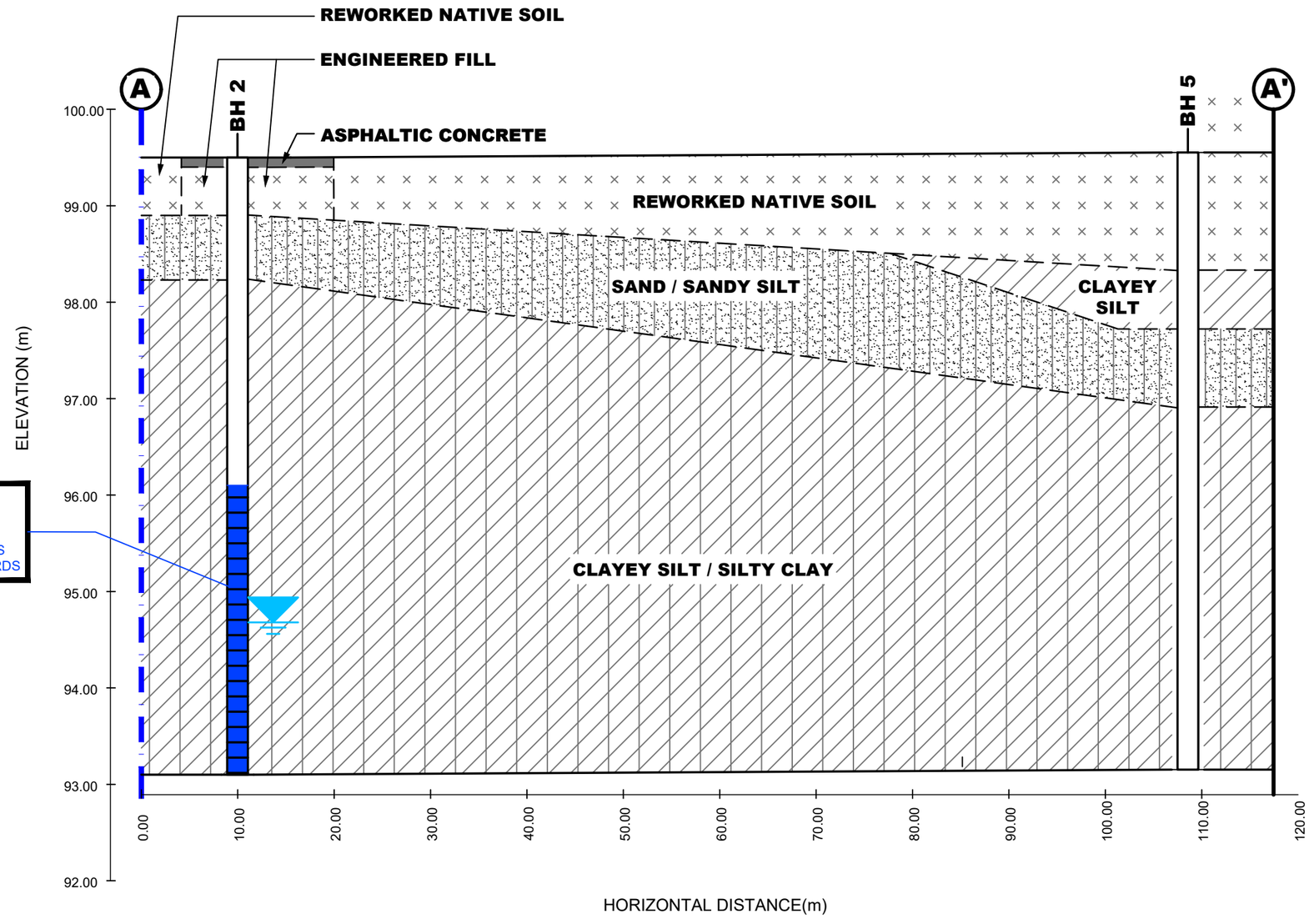

BH2-GW1 3.40-6.40 14-JULY-19
BTEX COMPLIES WITH MECP TABLE 3 STANDARDS
PHCs COMPLIES WITH MECP TABLE 3 STANDARDS
SODIUM COMPLIES WITH MECP TABLE 3 STANDARDS
CHLORIDE COMPLIES WITH MECP TABLE 3 STANDARDS

ALL GROUNDWATER RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

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ORLEANS GARDEN DEVELOPMENTS INC

PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1615 ORLEANS BOULEVARD

ORLEANS, ONTARIO

Title:

CROSS SECTION A-A' - GROUNDWATER

Scale: AS SHOWN	Date: 02/2020
Drawn by: RCG	Report No.: PE1962-4
Checked by: MB	Dwg. No.: PE1962-8A
Approved by: MSD	Revision No.:

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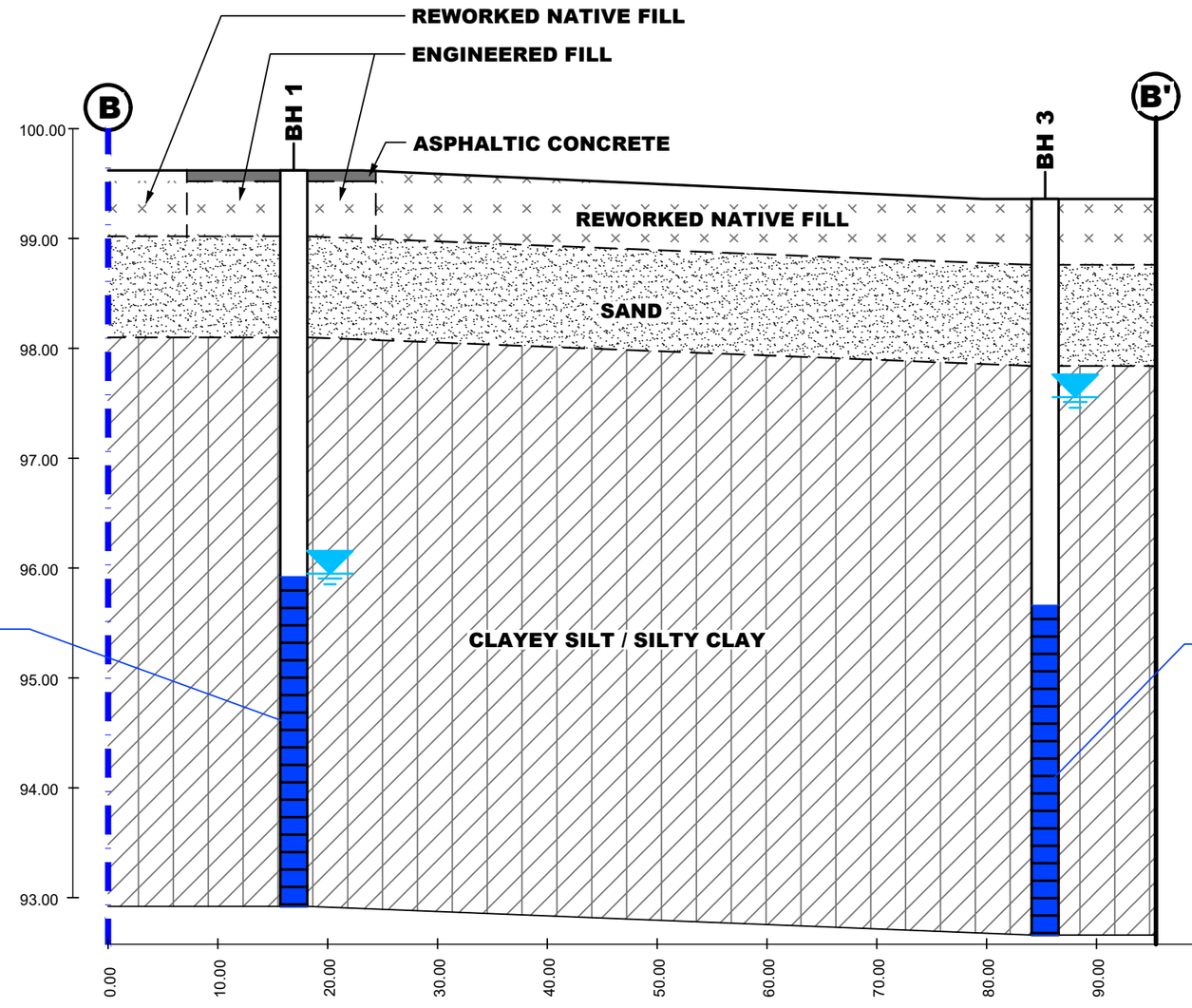

BH1-GW1 3.70-6.70 14-JULY-19
BTEX COMPLIES WITH MECP TABLE 3 STANDARDS
PHCs COMPLIES WITH MECP TABLE 3 STANDARDS
SODIUM COMPLIES WITH MECP TABLE 3 STANDARDS
CHLORIDE COMPLIES WITH MECP TABLE 3 STANDARDS

BH3-GW1 3.70-6.70 14-JULY-19
SODIUM COMPLIES WITH MECP TABLE 3 STANDARDS
CHLORIDE COMPLIES WITH MECP TABLE 3 STANDARDS

ALL GROUNDWATER RESULTS COMPLY WITH MECP TABLE 3 STANDARDS

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PHASE II - ENVIRONMENTAL SITE ASSESSMENT
PART OF 1615 ORLEANS BOULEVARD

ORLEANS, ONTARIO

Title:

CROSS SECTION B-B' - GROUNDWATER

Scale: AS SHOWN	Date: 02/2020
Drawn by: RCG	Report No.: PE1962-4
Checked by: MB	Dwg. No.: PE1962-8B
Approved by: MSD	Revision No.:

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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

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Sampling & Analysis Plan

Phase II Environmental Site Assessment
Part of 1615 Orleans Boulevard
Ottawa, Ontario

Prepared For

Orleans Garden Developments Inc.

July 2019

Report: PE1962-SAP

Table of Contents

1.0 SAMPLING PROGRAM

Paterson Group Inc. (Paterson) was commissioned by Ms. Victoria McCrum of Orleans Garden Developments Inc. to conduct a Phase II Environmental Site Assessment (ESA) for the northern part of the property addressed 1615 Orleans Boulevard, 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	Placed on the western portion of the site to assess potential subsurface impacts due to the former retail fuel outlet.	Boreholes to be advanced to intercept water table to facilitate installation of groundwater monitoring wells.
BH2	Placed on the western portion of the site to assess potential subsurface impacts due to the former retail fuel outlet.	
BH3	Placed on the central portion of the site to assess potential subsurface impacts due to the potential environmental concerns.	
BH4	Placed on the eastern portion of the site for general coverage and assess the application of road salt for de-icing purposes.	Borehole advanced to approximately 3 m or more for the geotechnical investigation.
BH5	Placed on the eastern portion of the site for general coverage and assess the application of road salt for de-icing purposes.	
BH6	Placed on the southern portion of the site for general coverage and assess the application of road salt for de-icing purposes.	

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 (top spindle of a fire hydrant located on Orleans Boulevard). The elevation of the benchmark was 72.77 metres above ground surface.

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
Part of 1615 Orleans Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north property boundary, along Jeanne D'Arc Blvd. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE1962

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** 2019 July 10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.62
Asphaltic concrete 0.08							
FILL: Brown silty sand with gravel, crushed stone 0.60		AU	1				
Compact, brown **SAND**		SS	2	58	15	1	98.62
1.52							
Very stiff, brown **CLAYEY SILT / SILTY CLAY**		SS	3	92	7	2	97.62
- silt content decreasing with depth 2.29							
		SS	4	96	4	3	96.62
Stiff, brown **SILTY CLAY**		SS	5	0	3		
- firm and grey by 3.8m depth		SS	6	88	W	4	95.62
		SS	7	100	W	5	94.62
		SS	8	100	W		
		SS	9	100	W	6	93.62
6.70							
End of Borehole							
(GWL @ 3.65m - July 17, 2019)							

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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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 1615 Orleans Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north property boundary, along Jeanne D'Arc Blvd. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE1962

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** 2019 July 10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Asphaltic concrete 0.08						0	99.50
FILL: Brown silty sand with gravel, crushed stone 0.60		AU	1				
Comapct to loose, brown **SILTY SAND** with clay 1.27		SS	2	67	8	1	98.50
		SS	3	100	6	2	97.50
		SS	4	0	2		
Very stiff to firm, brown **SILTY CLAY**		SS	5	100	W	3	96.50
- firm and grey by 3.5m depth		SS	6	100	W	4	95.50
		SS	7	100	W	5	94.50
		SS	8	100	W	6	93.50
6.40 End of Borehole							
(GWL @ 3.37m - July 17, 2019)							

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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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 1615 Orleans Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north property boundary, along Jeanne D'Arc Blvd. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE1962

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** 2019 July 10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.36
FILL: Brown silty sand with gravel and organics		AU	1				
0.60							
		SS	2	88	9	1	98.36
		SS	3	100	6	2	97.36
Very stiff to stiff, brown **SILTY CLAY**		SS	4	100	W		
- firm and grey by 3.0m depth		SS	5	100	W	3	96.36
		SS	6	100	W	4	95.36
		SS	7	100	W	5	94.36
		SS	8	100	W	6	93.36
		SS	9	100	W		
6.70							
End of Borehole							
(GWL @ 1.81m - July 17, 2019)							

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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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 1615 Orleans Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north property boundary, along Jeanne D'Arc Blvd. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE1962

REMARKS

HOLE NO. BH 4

BORINGS BY Geoprobe **DATE** 2019 July 11

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	99.66		
FILL: Brown silty sand, some gravel		S	1	25	26				
0.91		SS	2	100	9	1	98.66		
		SS	3	100	2				
		SS	4	100	W	2	97.66		
Very stiff to stiff, brown **SILTY CLAY**		SS	5	100	W				
						3	96.66		
- firm and grey by 3.2m depth									
		SS	7	100	W	4	95.66		
		SS	8	100	W				
		SS	9	100	W	5	94.66		
		SS	10	100	W				
		SS	11	100	W	6	93.66		
6.70									
End of Borehole									

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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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 1615 Orleans Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north property boundary, along Jeanne D'Arc Blvd. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE1962

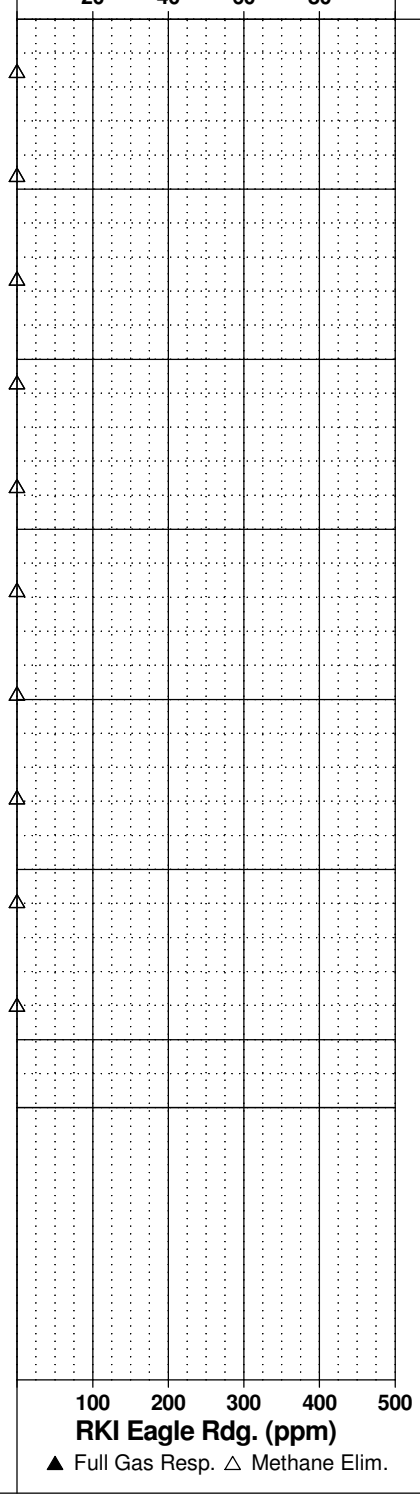
REMARKS

HOLE NO. BH 5

BORINGS BY Geoprobe **DATE** 2019 July 11

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.55
FILL: Brown silty sand with gravel 0.25		SS	1	88	72		
FILL: Brown silty sand with gravel and crushed stone 1.22		SS	2	38	38	1	98.55
		SS	3	62	3		
FILL: Brown silty clay with sand and gravel 2.70		SS	4	83	12	2	97.55
		SS	5	67	3		
Stiff, brown **SILTY CLAY**		SS	6	100	W	3	96.55
- firm and grey by 3.2m depth		SS	7	100	W	4	95.55
		SS	8	100	W		
		SS	9	100	W	5	94.55
		SS	10	100	W		
						6	93.55
6.40 End of Borehole							

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



Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Phase II - Environmental Site Assessment
Part of 1615 Orleans Boulevard
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the north property boundary, along Jeanne D'Arc Blvd. An arbitrary elevation of 100.00m was assigned to the TBM.

FILE NO. PE1962

REMARKS

HOLE NO. BH 6

BORINGS BY Geoprobe **DATE** 2019 July 11

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									
Asphaltic concrete 0.08						0	98.92		
FILL: Brown sand with gravel and crushed stone 0.66		SS	1	10					
		SS	2	75	5	1	97.92		
Very stiff to stiff, brown **SILTY CLAY**		SS	3	100	3				
		SS	4	100	W	2	96.92		
- firm and grey by 2.6m depth		SS	5	100	W				
3.05						3	95.92		
End of Borehole									

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.

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 strength of cohesionless soils is the relative density, 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.

Relative Density	'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 vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

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 is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

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 NXL size core. However, it can be used on smaller core sizes, such as BX, 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
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture 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 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

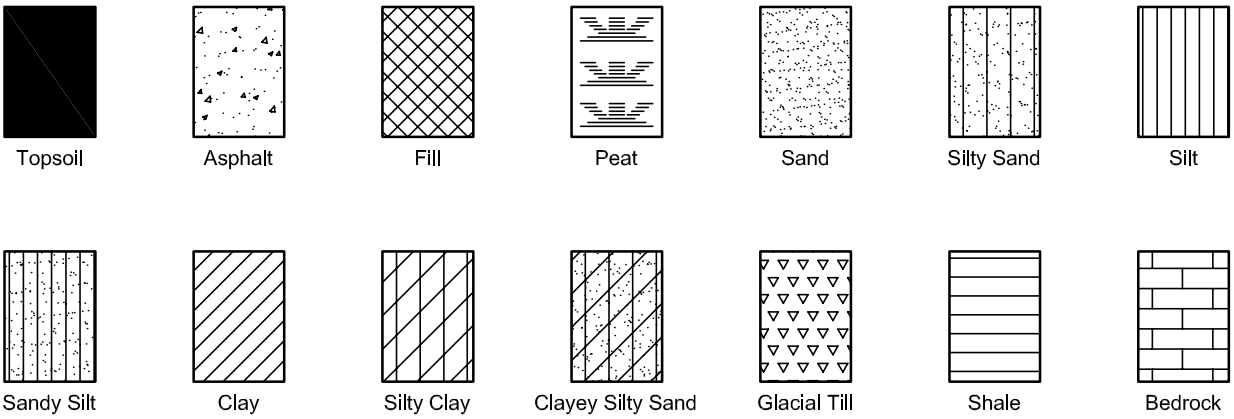
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

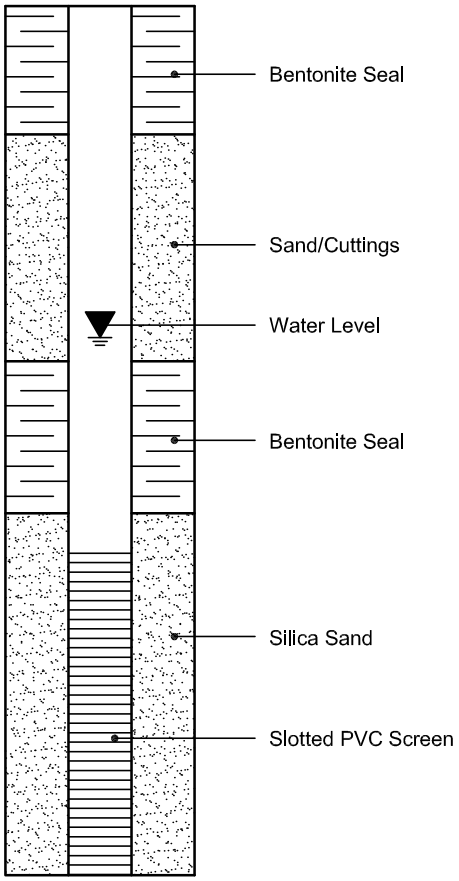
SYMBOLS AND TERMS (continued)

STRATA PLOT

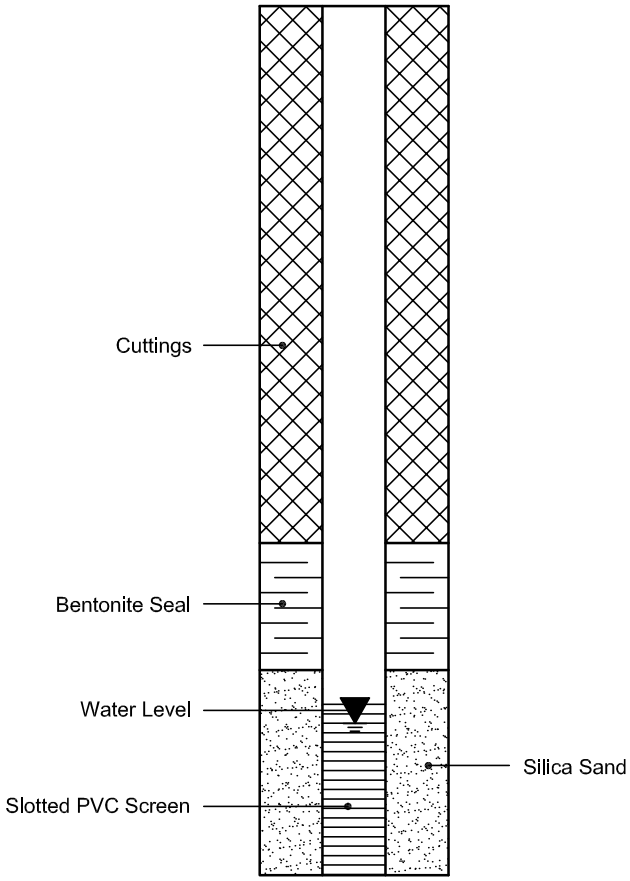


MONITORING WELL AND PIEZOMETER CONSTRUCTION

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: Mark D'Arcy

Client PO: 27106
Project: PE1962
Custody: 122840

Report Date: 24-Jul-2019
Order Date: 18-Jul-2019

Order #: 1929548

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

Paracel ID	Client ID
1929548-01	BH1-GW1
1929548-02	BH2-GW1
1929548-03	BH3-GW1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27106

Report Date: 24-Jul-2019
Order Date: 18-Jul-2019
Project Description: PE1962

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	19-Jul-19	19-Jul-19
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	22-Jul-19	22-Jul-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	23-Jul-19	23-Jul-19
PHC F1	CWS Tier 1 - P&T GC-FID	20-Jul-19	22-Jul-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	24-Jul-19	24-Jul-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27106

Report Date: 24-Jul-2019

Order Date: 18-Jul-2019

Project Description: PE1962

	Client ID:	BH1-GW1	BH2-GW1	BH3-GW1	-
	Sample Date:	17-Jul-19 09:00	17-Jul-19 09:00	17-Jul-19 09:00	-
	Sample ID:	1929548-01	1929548-02	1929548-03	-
	MDL/Units	Water	Water	Water	-
Anions					
Chloride	1 mg/L	411	90	135	-
Metals					
Sodium	200 ug/L	124000	39500	66500	-
Volatiles					
Benzene	0.5 ug/L	<0.5	<0.5	-	-
Ethylbenzene	0.5 ug/L	<0.5	<0.5	-	-
Toluene	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	-	-
Toluene-d8	Surrogate	118%	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	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
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									
Sodium	ND	200	ug/L						
Volatiles									
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	*79.2*		*ug/L*		*99.0*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	135	1	mg/L	133			1.6	10	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND				30	
Metals									
Sodium	15900	200	ug/L	15800			0.7	20	
Volatiles									
Benzene	ND	0.5	ug/L	1.24			0.0	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	*79.5*		*ug/L*		*99.3*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	143	1	mg/L	133	101	77-123			
Hydrocarbons									
F1 PHCs (C6-C10)	1950	25	ug/L		97.3	68-117			
F2 PHCs (C10-C16)	1610	100	ug/L		101	60-140			
F3 PHCs (C16-C34)	3850	100	ug/L		98.3	60-140			
F4 PHCs (C34-C50)	2580	100	ug/L		104	60-140			
Metals									
Sodium	23500		ug/L	15800	77.1	80-120			QM-07
Volatiles									
Benzene	29.9	0.5	ug/L		74.7	60-130			
Ethylbenzene	50.6	0.5	ug/L		127	60-130			
Toluene	39.0	0.5	ug/L		97.6	60-130			
m,p-Xylenes	86.7	0.5	ug/L		108	60-130			
o-Xylene	49.0	0.5	ug/L		122	60-130			
Surrogate: Toluene-d8	*69.1*		*ug/L*		*86.3*	*50-140*			

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match -
Applies to samples: BH2-GW1, BH3-GW1

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

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.

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.
- When reported, data for F4G has been processed using a silica gel cleanup.

PARACEL LABORATORIES LTD.

Paracel ID: 1929548

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e: paracel@paracellabs.com

Chain of Custody
(Lab Use Only)
№ 122840

Page ___ of ___

Client Name: Paterson Group Inc.	Project Reference: PE1962	**Turnaround Time:**
Contact Name: Mark D'Arcy	Quote #	☐ 1 Day ☐ 3 Day
Address: 154 Colonnade Rd S	PO # 27106	☐ 2 Day ☐ Regular
Telephone: (613) 226-7381	Email Address: mdarcy@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: 1929548

	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)	Sodium Chloride						
1	BH1-GW1	GW		4	July 14/19	AM	X							X						
2	BH2-GW2	↓		5	Jul 14/19	↓	X							X						
3	BH3-GW3	↓		2	↓	↓								X						
4																				
5																				
6																				
7																				
8	Reporting guidelines. Reporting																			
9																				
10																				

Comments: Date of Samples read July 17 2019 ; No. 2 Sample ID on PHC + VOCs, Metals read = BH2 GW-1
No. 3 = ~~General~~ + Metals read = ~~BH3-GW1~~ BH3-GW3

Method of Delivery: Swift

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab: Samuel	Verified By: Mark
Relinquished By (Print):	Date/Time:	Date/Time: 07/18/19 15:57	Date/Time: 7-18-19 1614
Date/Time:	Temperature: °C	Temperature: 10.3 °C	pH Verified ☐ By: NB

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 27299
Project: PE1962
Custody: 122819

Report Date: 17-Jul-2019
Order Date: 11-Jul-2019

Order #: 1928549

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

Paracel ID	Client ID
1928549-01	BH1-SS2
1928549-02	BH1-SS6
1928549-03	BH2-SS2
1928549-04	BH2-SS5
1928549-05	BH3-SS2
1928549-06	BH3-SS4

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	15-Jul-19	16-Jul-19
Conductivity	MOE E3138 - probe @25 °C, water ext	17-Jul-19	17-Jul-19
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	17-Jul-19	17-Jul-19
PHC F1	CWS Tier 1 - P&T GC-FID	15-Jul-19	16-Jul-19
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	15-Jul-19	17-Jul-19
SAR	Calculated	16-Jul-19	16-Jul-19
Solids, %	Gravimetric, calculation	16-Jul-19	16-Jul-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27299

Report Date: 17-Jul-2019

Order Date: 11-Jul-2019

Project Description: PE1962

	Client ID:	BH1-SS2	BH1-SS6	BH2-SS2	BH2-SS5
	Sample Date:	10-Jul-19 09:00	10-Jul-19 09:00	10-Jul-19 09:00	10-Jul-19 09:00
	Sample ID:	1928549-01	1928549-02	1928549-03	1928549-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	83.0	57.9	84.1	61.1
General Inorganics					
SAR	0.01 N/A	5.85	-	3.07	-
Conductivity	5 uS/cm	568	-	426	-
pH	0.05 pH Units	7.17	-	-	-
Volatiles					
Benzene	0.02 ug/g dry	-	<0.02	-	<0.02
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	<0.05
Toluene	0.05 ug/g dry	-	<0.05	-	<0.05
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
Toluene-d8	Surrogate	-	80.4%	-	76.1%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	<7
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	-	<4
F3 PHCs (C16-C34)	8 ug/g dry	-	<8	-	<8
F4 PHCs (C34-C50)	6 ug/g dry	-	<6	-	<6

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27299

Report Date: 17-Jul-2019
Order Date: 11-Jul-2019
Project Description: PE1962

	Client ID:	BH3-SS2	BH3-SS4	-	-
	Sample Date:	10-Jul-19 09:00	10-Jul-19 09:00	-	-
	Sample ID:	1928549-05	1928549-06	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	63.3	58.9	-	-
General Inorganics					
SAR	0.01 N/A	14.2	-	-	-
Conductivity	5 uS/cm	1790	-	-	-
pH	0.05 pH Units	-	7.54	-	-
Volatiles					
Benzene	0.02 ug/g dry	-	<0.02	-	-
Ethylbenzene	0.05 ug/g dry	-	<0.05	-	-
Toluene	0.05 ug/g dry	-	<0.05	-	-
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	-	-
Toluene-d8	Surrogate	-	83.8%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	-
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	-	-
F3 PHCs (C16-C34)	8 ug/g dry	-	<8	-	-
F4 PHCs (C34-C50)	6 ug/g dry	-	<6	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	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: Toluene-d8	*2.88*		*ug/g*		*90.0*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	0.18	0.01	N/A	0.19			5.4	200	
Conductivity	1960	5	uS/cm	1950			0.2	5	
pH	7.55	0.05	pH Units	7.60			0.7	2.3	
Hydrocarbons									
F1 PHCs (C6-C10)	29	7	ug/g dry	27			7.9	40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND			0.0	30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND			0.0	30	
Physical Characteristics									
% Solids	96.2	0.1	% by Wt.	96.1			0.1	25	
Volatiles									
Benzene	1.22	0.02	ug/g dry	1.31			7.0	50	
Ethylbenzene	2.81	0.05	ug/g dry	3.07			8.9	50	
Toluene	0.441	0.05	ug/g dry	0.474			7.2	50	
m,p-Xylenes	6.13	0.05	ug/g dry	6.85			11.1	50	
o-Xylene	0.862	0.05	ug/g dry	0.859			0.3	50	
Surrogate: Toluene-d8	*3.61*		*ug/g dry*		*87.1*	*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)	197	7	ug/g		98.6	80-120			
F2 PHCs (C10-C16)	98	4	ug/g	ND	114	60-140			
F3 PHCs (C16-C34)	252	8	ug/g	ND	119	60-140			
F4 PHCs (C34-C50)	165	6	ug/g	ND	124	60-140			
Volatiles									
Benzene	5.01	0.02	ug/g		125	60-130			
Ethylbenzene	4.39	0.05	ug/g		110	60-130			
Toluene	4.37	0.05	ug/g		109	60-130			
m,p-Xylenes	8.58	0.05	ug/g		107	60-130			
o-Xylene	4.42	0.05	ug/g		111	60-130			
Surrogate: Toluene-d8	*2.13*		*ug/g*		*66.5*	*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.

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.
- When reported, data for F4G has been processed using a silica gel cleanup.

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PARACEL WO: 1928549

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№ 122819

Page 1 of 1

Client Name: ~~Golder~~ PATERSON GROUP
Contact Name: MIKE BEAUDOIN
Address: 154 Colonnade Rd S.
Telephone: 613-226-7381

Project Reference: PE1962
Quote #
PO # 27299
Email Address: mbeaudoin@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: 1928549

	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)	EC/SAR	pH					
1	BH1-SS2	S		1	July 10/19									X	X	120 ml				
2	BH1-SS6	S		2	↓		X									120 ml x vial				
3	BH2-SS2	S		1										X		120 ml				
4	BH2-SS5	S		2	↓		X									120 ml x vial				
5	BH3-SS2	S		1										X		120 ml				
6	BH3-SS4	S		2	↓		X								X	120 ml x vial				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print):	Date/Time: 11/07/19 220 PM	Date/Time: 07/11/19 14:54	Date/Time: 7-11-19 17:55
Date/Time:	Temperature: °C	Temperature: 14.2 °C	pH Verified [ ] By:

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Certificate of Analysis

Paterson Group Consulting Engineers

154 Colonnade Road South
Nepean, ON K2E 7J5
Attn: Mike Beaudoin

Client PO: 27300
Project: PE1962
Custody: 122821

Report Date: 18-Jul-2019
Order Date: 12-Jul-2019

Order #: 1928679

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

Paracel ID	Client ID
1928679-01	BH4-SS2
1928679-02	BH5-SS3
1928679-03	BH6-SS2

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Paterson Group Consulting Engineers
Client PO: 27300

Report Date: 18-Jul-2019
Order Date: 12-Jul-2019
Project Description: PE1962

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Conductivity	MOE E3138 - probe @25 °C, water ext	17-Jul-19	17-Jul-19
SAR	Calculated	16-Jul-19	18-Jul-19
Solids, %	Gravimetric, calculation	15-Jul-19	15-Jul-19

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 27300

Report Date: 18-Jul-2019

Order Date: 12-Jul-2019

Project Description: PE1962

	Client ID:	BH4-SS2	BH5-SS3	BH6-SS2	-
	Sample Date:	11-Jul-19 09:00	11-Jul-19 09:00	11-Jul-19 09:00	-
	Sample ID:	1928679-01	1928679-02	1928679-03	-
	MDL/Units	Soil	Soil	Soil	-
Physical Characteristics					
% Solids	0.1 % by Wt.	82.7	82.2	75.4	-
General Inorganics					
SAR	0.01 N/A	2.56	5.43	10.5	-
Conductivity	5 uS/cm	380	724	1140	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	0.18	0.01	N/A	0.19			5.4	200	
Conductivity	1960	5	uS/cm	1950			0.2	5	
Physical Characteristics									
% Solids	88.8	0.1	% by Wt.	88.4			0.4	25	

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 WO: 1928679

TRR

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e: paracel@paracellabs.com

Chain of Custody
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№ 122821

Page 1 of 1

Client Name: Paterson	Project Reference: PE1962
Contact Name: MIKE BEAUDOIN	Quote #
Address: 154 Colonnade Rd S.	PO # 27300
Telephone: 613-226-7381	Email Address: mbeaudoin@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: 1928679

	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)	EC/SAR					
1	BH4-SS2	S		1	July 11/19									X			120 mL		
2	BH5-SS3	S		1	↓									X			↓		
3	BH6-SS2	S		1										X					
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Paracel

Relinquished By (Sign):	Received by Driver/Depot: T. Scouie	Received at Lab: Sureeporn Dahmai	Verified By:
Relinquished By (Print):	Date/Time: 12/07/19 4:30 pm	Date/Time: JUL 12, 2019 05:15	Date/Time: 7-12-19 18:14
Date/Time:	Temperature: °C	Temperature: 11.6 °C	pH Verified [ ] By: