PHASE II ENVIRONMENTAL SITE ASSESSMENT
MERRITTVILLE SPEEDWAY
2371 MERRITTVILLE HIGHWAY
THOROLD, ONTARIO

Submitted to:
Merrittville Speedway
P.O. Box 35
Thorold, Ontario
L2V 1W0

Submitted by:
Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited
3300 Merrittville Highway, Unit #5
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December 4, 2018

TG181101

Distribution:
- Merrittville Speedway – 1 electronic copy; and
- Wood Environment and Infrastructure Solutions – 1 electronic copy.

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1.0 INTRODUCTION

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood), was *retained by Merrittville Speedway (the Client), to conduct a Phase II Environmental Site* Assessment (ESA) of the property located at 2371 Merrittville Highway in Thorold, Ontario (the Site; **Figure 1**). At the time of the Phase II ESA, the Site was owned by the Client and was occupied by a stock car racing track and associated operations.

The CLIENT retained Wood to provide an evaluation of known and possible environmental issues at the Site in support of mortgage financing for the potential future construction of a residential dwelling at the southwest corner of the Site.

1.1 Background

Wood completed a Phase I ESA at the Site entitled, *"Phase I Environmental Site Assessment, 2371 Merrittville Highway, Thorold, Ontario"* (Phase I ESA) *dated September 25, 2018 and prepared for* the CLIENT. Relevant information from the Phase I ESA is presented below.

The Site is a rectangular-shaped property, approximately 10 hectares (25 acres) in area. Multiple buildings and structures were noted on the Site associated with the stock car race track. Granular material covered the eastern half of the Site. The central portion of the Site was mainly covered with soil (race track) and some grass/vegetation. The northern and southern areas of the Site on either side of the race track were also covered by soil and granular material with various small buildings and structures. In the southwest corner of the Site, there is a man-made pond used for dust control purposes for the race track. Along the western boundary of the Site is a trailer with two aboveground storage tanks (ASTs), one containing gasoline and the other containing diesel. Two domestic wells are located on the Site, one close to the northern central property boundary and one opposite on the southern property boundary. Four sewage holding tanks are located on the property, three along the northern property boundary and one in the central southern portion of the Site. Excluding the eastern parking lot, the Site was fully fenced with multiple access gates and included a large berm running north-south between the parking lot and race track. In addition, based on information obtained by the Client from a previous owner, an AST for waste oil storage was previously located along the concrete barrier on the south side of the racetrack.

The properties in the general area surrounding the Site were primarily agricultural and some residential land use. No current or historical potential environmental issues were identified concerning these surrounding properties.

However, areas of potential environmental concern (APECs) were identified pertaining to the long-term use of the property for stock car racing and the potentially contaminating activities (PCAs) associated with this use. The APECs include unknown historical automobile activities and waste management, current fuel storage, unknown historical fuel storage activities, historical waste oil storage AST, unknown fill material associated with the berm and potential spills of automobile fluids following any car crashes or maintenance work completed at the Site.

A Phase Two ESA was recommended to address these concerns.

1.2 Objective and Scope of Work

Wood's scope of work for the Phase II ESA included the drilling of eleven boreholes (with associated soil sampling and analytical programs) and the installation of three monitoring wells (with associated ground water sampling and analytical programs) in an effort to determine Site characteristics and contaminants of potential concern (COPCs) including, metals, including hydrides, fractionized petroleum hydrocarbons (PHCs) in the F1 to F4 ranges, benzene, toluene, ethyl benzene and xylenes (collectively referred to as BTEX) and/or polycyclic aromatic hydrocarbons (PAHs).

As this work is not being completed to support a Record of Site Condition (RSC) under Ontario Regulation 153/04 (*O. Reg. 153/04*), as amended, all work completed under this project was performed in general accordance with standard engineering practices and the following documents:

- Ministry of the Environment (MOE) document entitled "*Guide for Completing Phase Two Environmental Site Assessments under Ontario Regulation 153/04*" dated June 2011;
- Ministry of the Environment and Energy (MOEE) document entitled "*Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario*", dated December 1996;
- MOE document entitled "*Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act*" issued by the Laboratory Services Branch of the MOE and dated March 9, 2004, amended as of July 1, 2011 (Analytical Protocol); and
- All analytical results were compared to the appropriate standards identified in the Ministry of the Environment document entitled; "*Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*" dated April 15, 2011 (MOE SCS).

All work completed during the Phase II ESA was carried out in accordance with the Terms of Reference as provided in Wood's proposal dated July 25, 2018 and authorized by the CLIENT on August 15, 2018, and Change Order #1, executed by the Client on October 25, 2018. It must be noted that the scope of work completed by Wood, as part of this assessment, may not be sufficient (in and of itself) to meet the reporting requirements for the submission of a RSC in accordance with *O. Reg. 153/04*, as amended. If a RSC is an intended product of work conducted at the Site, further consultation and/or work is required.

2.0 WORK PROGRAM AND METHODOLOGY

This section describes the methods used during this subsurface investigation work, including all *drilling, and soil and ground water sampling activities.* Laboratory quality assurance/quality control (QA/QC) procedures are also discussed.

Borehole drilling, soil sampling and ground water monitoring well installation and sampling activities were undertaken on October 9, 2018. Ground water monitoring well development and sampling activities were undertaken between October 18 and November 15, 2018.

All borehole and monitoring well locations in the investigation area are illustrated on **Figure 2**. The borehole/monitoring well locations were selected to address potential environmental concerns associated with the existing use of the Site, as noted in Section 1.2.

The borehole drilling, monitoring well installation, and soil and ground water sampling procedures used are detailed below.

2.1 Field Preparation

2.1.1 Subsurface Utility Locates

The locations of all buried and overhead services were obtained prior to the initiation of the subsurface investigation. Peninsula Video and Sound (PVS), located some of the public utilities on-Site (telephone, natural gas, hydro), as per their contract with Ontario-One-Call and the service providers. Niagara Locates Inc., a specialist private utility locating firm, was retained to undertake the private subsurface utility locates (for utilities not located by the above-referenced service providers).

2.2 Subsurface Investigations and Soil Sampling

2.2.1 Borehole Drilling and Soil Sampling

Under the supervision of Wood, a total of eleven boreholes were drilled on October 9, 2018 by Direct Environmental Drilling of St. Thomas, Ontario (MOE License Number 7320). The boreholes were advanced to a maximum depth of 6.1 metres below ground surface (mbgs) using a Geoprobe 7822 DT track mounted drill rig. Continuous samples were obtained in 1.5 m intervals throughout the borehole advancement. Soil cuttings generated during the investigation were minimal and left on-Site in the vicinity of each borehole.

In addition, two surface samples were obtained from an area that the Client identified as the location of a former waste oil AST. These samples were obtained from surface to 0.3 mbgs using a shovel.

The locations of the boreholes, monitoring wells and surface samples are shown on **Figure 2**. Details of the borehole drilling, as well as soil sampling, are provided in the borehole logs in **Appendix A**. All drilling activities were completed under the supervision of Wood field staff.

2.2.2 Field Screening Measurements

All soil samples collected during drilling were screened in the field for gross evidence of negative environmental impact including staining and odours. Soil sample headspace screening was also performed to facilitate sample selections for laboratory analysis and to provide an assessment of the vertical contaminant distributions at each location. The duplicate soil sample fractions were screened for combustible organic vapour (COV) and total organic vapour (TOV) concentrations using the sample headspace method. COV and TOV concentrations were measured using a RKI EAGLE 2™ combustible vapour analyzer equipped with dual sensors and calibrated to known hexane and isobutylene standards and operated in methane elimination mode. The RKI EAGLE 2™ can detect 0-11,000 parts per million (ppm) and 0-100 % Lower Explosive Limit (LEL) with an accuracy of ±5% and the calibration standard is Hexane. The equipment is calibrated every day prior to the commencement of fieldwork.

The TOV/COV screening measures the cumulative organic/combustible vapour present within sample headspace. TOV/COV results are semi-quantitative at best and are generally only used for relative sample comparison purposes when selecting samples from individual boreholes for laboratory analysis.

The soil vapour concentrations are included in the borehole logs in **Appendix A**.

2.2.3 Sample Logging and Handling

The soil samples retrieved during the field investigations were examined, classified, and logged per soil type, moisture content, colour, consistency, and presence of visual and/or olfactory indicators of negative impact.

All soil samples were collected in accordance with strict environmental sampling protocols to minimize loss of volatile organics and to ensure reliable and representative results. All soil sampling equipment was thoroughly decontaminated between soil sample locations to prevent

potential cross-contamination. Decontamination activities included:

- Physical removal of any adhered debris;
- *Wash/scrub in "Alconox" soap solution;*
- Distilled water rinse; and
- Methanol rinse/air drying.

Soil samples collected during the drilling investigation were split into duplicate fractions upon recovery. The primary sample fractions were placed into glass jars with Teflon-lined lids supplied by the laboratory with no preservative and samples that were potentially going to be submitted for analysis for PHC F1 and BTEX were sampled using dedicated laboratory prepared syringes into a 40 millilitre (mL) vial preserved with methanol. Each sample was labeled using a unique identifier (borehole of origin and depth interval below grade). All samples were subsequently stored in coolers on ice for future potential laboratory analysis.

The duplicate sample fractions were placed in resealable plastic sample bags for the purposes of field screening of TOV/COV.

All laboratory chemical analyses were conducted by Paracel Laboratories Limited (Paracel), an ISO 17025-accredited laboratory located in Ottawa, Ontario.

The criteria for the selection of soil samples for laboratory analysis were based visual/olfactory observations and TOV/COV readings. The soil samples were submitted for pH determination, and analysis of metals including hydrides, fractionized PHCs (F1 to F4), BTEX and PAHs. The specific borehole/monitoring well locations and depth intervals of samples selected for analysis and the parameters they were submitted for are included in the Tables appendix at the end of this report.

2.3 Monitoring Well Installations

Three overburden monitoring wells were installed at the site at locations shown on **Figure 2**. The wells were installed at these locations to obtain hydrogeologic and ground water quality information from the hydrostratigraphic zone. These locations were selected for the monitoring wells as they represent the areas on the Site with the highest potential for ground water impact (adjacent to fuel storage) and/or for coverage of the Site (BH/MW2 and BH/MW3).

The monitoring wells were constructed using 51-millimetre (mm) diameter, schedule 40, flush-joint threaded PVC monitoring well supplies. The wells were completed with a 3.05 m length of #10 mill slotted intake screen. The top of the intake screen was then extended to the ground

surface using solid riser pipe. A silica sand filter pack was placed between the intake screen and the wall of the borehole. The filter pack was extended approximately 0.3 m above the top of the well screen. A bentonite seal was placed above the sand pack to surface. The wells were completed with flush mount protective casings. Details of the monitoring well construction are included in the borehole logs in **Appendix A**.

2.3.1 Well Development, Ground Water Level Measurement, Purging and Sampling

The ground water monitoring wells installed at the Site during the investigation were instrumented with dedicated Waterra™ foot valve inertial pumps fitted with polyethylene tubing to facilitate well development. The newly installed wells were developed on October 18, 2018 by purging three well volumes using dedicated instrumentation (i.e., foot valve and tubing). The monitoring wells were subsequently purged using low flow sampling techniques on October 25, 2018 until various parameters (including pH, conductivity and temperature) had reached stabilization criteria. During development and purging, an oil/water interface meter was used to measure potential accumulations of Light Non-Aqueous Phase Liquids (LNAPL) or Dense Non-Aqueous Phase Liquids (DNAPL), and ground water levels in the well.

Following monitoring and purging activities, Wood collected a ground water sample from each monitoring well into labelled, laboratory-provided containers using the low flow sampling system with dedicated instrumentation. The samples were stored in a cooler on ice after collection and during transportation to the laboratory where they were delivered under continuous Chain of Custody documentation. The sampling methodology including jar, bottle and preservative requirements followed the Analytical Protocol.

The representative ground water samples collected during the investigation was submitted for laboratory analysis of suspect COPCs including metals, PHCs and BTEX. All laboratory chemical analyses were conducted by Paracel.

3.0 RESULTS OF THE FIELD INVESTIGATION

3.1 Site Geology

The subsurface conditions encountered at the Site are described in the borehole logs provided in **Appendix A**.

In general, the surficial conditions encountered at the Site during the borehole drilling program consisted of surficial fill, including granular and/or pulverized asphalt in parking areas and/or silty clay/clayey silt fill, over native brown silty clay/clayey silt with traces of sand and/or gravel. The silty clay/clayey silt extended to the maximum drilled depth of 6.1 mbgs in all boreholes except BH/MW1, where a layer of silty sand was encountered from 4.9 mbgs to the termination depth of 6.1 mbgs. The fill materials extended to depths between 0.3 m and 1.5 mbgs in most boreholes, with the exception of BH4, drilled on the berm located east of the racetrack, where the fill extended to 4.9 mbgs.

All boreholes were open and dry upon completion of the drilling program, with the exception of BH/MW1 (water level not measured).

3.2 Field Measurements

3.2.1 Staining and Odours

Petroleum-like odours and staining were noted in the fill in BH4 (4.4-4.9 mbgs), however, laboratory analysis indicated low levels of PHCs present which met the standards (see Section 5.1), and therefore, the staining is inferred to be related to the decomposition of woody materials found in the overlaying fill material.

Visual and/or olfactory evidence of petroleum hydrocarbon or any other chemical-like impact was not observed during the remainder of the drilling or ground water monitoring/sampling programs.

3.2.2 COV and TOV Concentrations

COV concentration headspace measurements recorded in the soil samples collected from the boreholes ranged from non-detectable to 320 parts per million (ppm). TOV concentration headspace measurements recorded in the soil samples collected from the boreholes were non-detectable. The COV and TOV concentrations headspace measurements are summarized in the

borehole logs in **Appendix A**.

It is Wood's opinion that the results of the screening program suggest a low potential for the *presence of significant combustible soil headspace vapour levels* in the soil/fill samples collected from the boreholes. However, samples, including the sample with the highest COV reading (320 ppm in BH9-1-C) was submitted for laboratory analysis of PHCs/BTEX to confirm and quantify these results (refer to **Section 5.1**).

3.2.3 LNAPL and DNAPL

During the development, purging and sampling of the monitoring well, no LNAPL or DNAPL were observed.

4.0 REGULATORY FRAMEWORK

The SCS applicable to the Site have been evaluated based on the following rationale:

- The Site is currently in community use (outdoor, stadium-type use). There is no proposed change in land use;
- The results of the grain size tests indicated approximately 86% of the native silty clay/clayey silt material consisted of particles less than 75 micrometres (µm) in diameter (**Appendix A**). The soil at the Phase Two Property was classified as a medium and fine textured soil (i.e., contains 50% or more by mass of particles that are smaller than 75 µm (*O. Reg. 153/04, s.42 (2)*));
- Two water wells are present on the Site. As such, the SCS for use in a potable ground water condition are applicable to the Site;
- In accordance with *O. Reg. 153/04*, the Site does not include land that is within 30 m of a "water body";
- Based on the boreholes drilled for the Phase II ESA, the depth to bedrock is greater than 2 m; and
- The Site is not classified as an environmentally sensitive area under *O. Reg. 153/04* as amended, as:
    - Based on a review of the City's Official Plan, the RMON's Core Natural Heritage Map, the Ministry of Natural Resources and Forestry Make a Map application and Niagara Peninsula Conservation Authority mapping, the Phase Two Property does not appear to include land, or be within 30 m of land, that would be classified as an area of natural significance as defined by O. Reg. 153/04 as amended; and
    - Soil pH values of between 7.6 and 7.8 were reported for the four soil/fill samples submitted from the borehole samples. The reported soil pH for all soil samples was within 5.0 to 9.0 units for surface soil (surface to 1.5 mbgs) and 5.0 to 11.0 units for subsurface soil (below 1.5 mbgs) (**Table 2**).

Based on the above site characteristics, the SCS currently applicable to the Site are the Table 2 Full Depth Generic Site Condition Standards in a Potable Ground Water Condition, industrial/commercial/community property use and medium-fine textured soils (the Table 2 SCS).

It is noted that the Client is proposing to build a residential dwelling at the southeast end of the Site and so the results were also compared to the Table 2 SCS for residential/parkland/institutional property use.

5.0 LABORATORY ANALYSES

5.1 Soil Sample Analyses

The results of the soil sample analyses, and their respective Table 2 SCS, are summarized in **Tables 1 and 2**. The laboratory certificates of analysis are included in **Appendix B**.

The results of the analyses are summarized below:

- The pH in four soil samples from the borehole drilling program fell within the range of 7.6 to 7.8 (**Table 1**).
- Metals testing was completed on nine samples, as well as one field duplicate. Metals concentrations were below the Table 2 SCS in all submitted samples (**Table 1**).
- PHC and BTEX testing was completed on eleven samples, as well as one field duplicate. PHC and BTEX concentrations were below the Table 2 SCS in all submitted samples (**Table 2**).
- PAH testing was completed on two samples. PAH concentrations were below the Table 2 SCS in all submitted samples (**Table 2**).

The results of the soil sample analyses were also compared to the Table 2 SCS for residential/ parkland/institutional land use. All samples met the Table 2 SCS for residential/parkland/ institutional land use.

5.2 Ground Water Sample Analyses

The results of the ground water sample analyses, and their respective Table 2 SCS, are summarized in **Tables3 and 4**. The laboratory certificates of analysis are included in **Appendix B**.

The results of the analyses are summarized below:

- Samples from all three ground water monitoring wells (BH/MW1, BH/MW2 and BH/MW3) plus a field duplicate (Dup AA, collected at BH/MW3) were submitted for metals. Concentrations of all metals parameters were not detected above the laboratory MDLs or were present at levels below the Table 2 SCS in all samples (**Table 3**); and

- Samples from all three ground water monitoring wells (BH/MW1, BH/MW2 and BH/MW3) plus a field duplicate (Dup AA, collected at BH/MW3) were submitted for PHCs and BTEX. Concentrations of PHC and BTEX parameters were not detected above the laboratory MDLs (**Table 4**) and were therefore below the Table 2 SCS in all samples.

The results of the ground water sample analyses were also compared to the Table 2 SCS for residential/parkland/institutional land use. All samples met the Table 2 SCS for residential/ parkland/institutional land use.

5.3 Quality Assurance Program

5.3.1 Accreditation

The analytical laboratory employed to perform the laboratory analyses (Paracel) is accredited by the Standards Council of Canada/Canadian Association for Laboratory Accreditation Standards in accordance with ISO/IEC 17025:2005 – *"General Requirements for the Competence of Testing and Calibration Laboratories"* for the tested parameters and has met the standards for proficiency testing developed by the Standards Council of Canada for parameters set out in the Soil, Ground Water and Sediment Standards.

5.3.2 Data Validation

Field QA/QC Program

The field QA/QC program consisted of analyzing one blind field duplicate soil sample for pH and metals (Dup FC, a field duplicate of BH/4-1-C) and one blind field duplicate soil sample for PHC and BTEX (Dup CD, a field duplicate of BH/MW2-3-D) and one blind field duplicate ground water sample for metals, PHCs and BTEX (Dup AA, a field duplicate of BH/MW3). Duplicate samples are analyzed to assess the precision of the field sampling and laboratory analytical processes. To accurately calculate a statistically valid relative percent difference (RPD) for the duplicate sample, the concentration of the analytes found in both the original and duplicate sample must be greater than five (5) times the MDL. An assessment of the RPDs for the duplicate samples was completed (**Tables 1-4**). The RPDs were either not calculable as both values were not greater than 5 times the MDL or were below the RPD limits, with the exception of chromium, lead and zinc in the soil sample BH4-1C/duplicate Dup FC (37%, 223% and 59% respectively, vs the RPD limit of 30%).

It is noted that the RPD values in the Analytical Protocol are for duplicate samples collected at the laboratory and are used for comparison to the RPDs calculated for field duplicates.

A field blank sample was submitted for analysis of BTEX and F1 PHCs. Field blanks are samples of laboratory provided reverse osmosis deionized (RODI) water, which is poured into a set of sample bottles at the same time and in the same general area as the samples are collected. The field blank is used to determine if there is presence of contamination as a result of field handling. The field blank was non-detectable for all parameters analyzed, indicating that the field activities did not bias the reported results.

A trip blank was submitted for analysis for BTEX and PHCs F1. A trip blank is a sample of RODI water prepared and filled into the relevant sample bottles by the laboratory. The sample is sent with the bottle shipment, taken out to the field and then shipped back with the collected samples for analysis (not opened at any time by field staff). All parameters were found to be non-detectable in the trip blank.

A trip spike was submitted for analysis for BTEX and PHCs F1. A trip spike is a sample of RODI water to which a known amount of analyte of interest and appropriate preservative has been added by the laboratory. This sample is also sent with the bottle shipment, taken out to the field and then shipped back with the collected samples for analysis (not opened at any time by field staff). The spike recoveries were within the acceptable limits, except for molybdenum which had a slightly low recovery. These results are not expected to have a significant effect on the results of this Phase II ESA.

All fieldwork was conducted in accordance with the applicable sampling guidelines, which included dedicated sampling equipment, disposable gloves, and sample preservation, where required.

Laboratory QA/QC Program

All sample analyses were performed within the required sample/extract hold times.

The analytical results reported for all laboratory duplicate, blank and spike samples were acceptable, with the exceptions noted on the laboratory certificates of analysis in **Appendix B**. The analyses were accepted by the laboratory based on other QC in the batch.

In general, no information provided in the QA/QC results for soil and ground water samples would impact the findings of the Phase II ESA.

6.0 CONCLUSIONS

The Phase II ESA included the drilling of eleven borehole, installation of three ground water monitoring wells (with associated sampling and analytical programs) and collection of two surface soil samples to determine if any impacts were present at the Site associated with the long-term use of the property for stock car racing.

In general, the surficial conditions encountered at the Site during the borehole drilling program consisted of surficial fill, including granular and/or pulverized asphalt in parking areas and/or silty clay/clayey silt fill, over native brown silty clay/clayey silt with traces of sand and/or gravel. The silty clay/clayey silt extended to the maximum drilled depth of 6.1 mbgs in all boreholes except BH/MW1, where a layer of silty sand was encountered from 4.9 mbgs to the termination depth of 6.1 mbgs. The fill materials extended to depths between 0.3 m and 1.5 mbgs in most boreholes, with the exception of BH4, drilled on the berm located east of the racetrack, where the fill extended to 4.9 mbgs.

The results of the soil and ground water chemical analyses indicated that the concentrations of metals, PHC and BTEX parameters in all samples were below the Table 2 SCS for industrial/commercial/community land use. The Client intends to construct a dwelling in the southeast corner of the Site. As such, the results of the soil and ground water sample analyses were also compared to the Table 2 SCS for residential/parkland/institutional land use. All samples met the Table 2 SCS for residential/parkland/institutional land use.

No evidence of impacts associated with the use of the property for stock car racing were identified.

Should the ground water monitoring wells no longer be required, they must be maintained or abandoned in accordance with the requirements of Section 21(3) of Ontario Regulation 903 – Wells which states *"the well owner shall immediately abandon the well if it is not being used or maintained for future use as a well"*.

7.0 LIMITATIONS

This report was prepared for the exclusive use of Merrittville Speedway and is intended to provide Phase II ESA of Merrittville Speedway, located at 2371 Merrittville Highway, Thorold, Ontario at the time of the Site visit. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. Should additional parties require reliance on this report, written authorization from Wood will be required. With respect to third parties, Wood has no liability or responsibility for losses of any kind whatsoever, including direct or consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

The investigation undertaken by Wood with respect to this report and any conclusions or recommendations made in this report reflect Wood's judgment based on the Site conditions observed at the time of the Site inspections set out in this report and on information available at the time of preparation of this report. This report has been prepared for specific application to this Site and it is based, in part, upon visual observation of the Site, subsurface investigation at discrete locations and depths, and specific analysis of specific chemical parameters and materials during a specific time interval, all as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future Site conditions, portions of the Site, which were unavailable for direct investigation, subsurface locations, which were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Wood has used its professional judgment in analysing this information and formulating these conclusions.

Wood makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

This Report is also subject to the further Standard Limitations contained in **Appendix C**.

8.0 CLOSURE

We trust that the information presented in this report meets your current requirements. Should you have any questions, or concerns, please do not hesitate to contact the undersigned.

Yours truly,

Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited.

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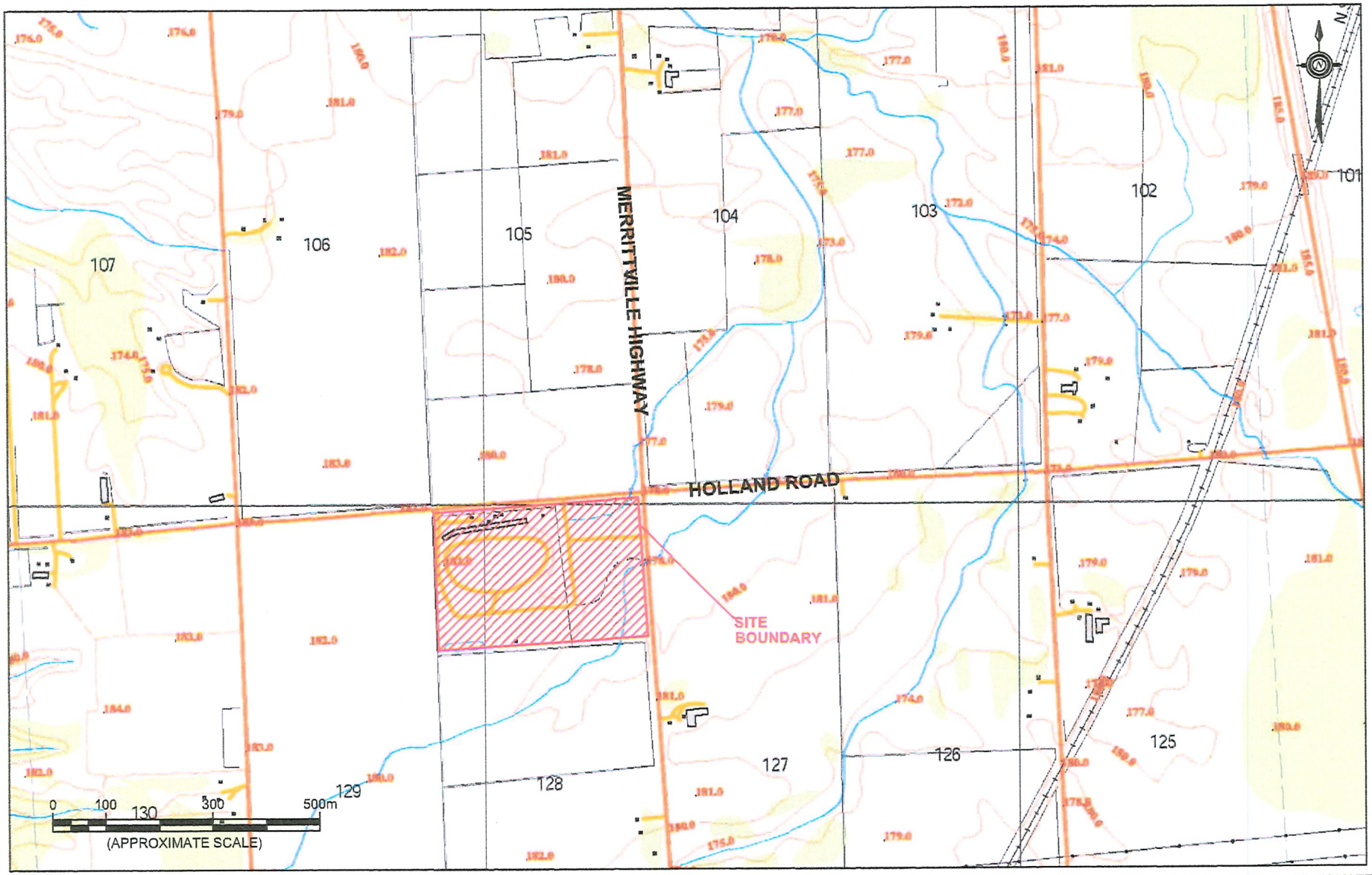
Senior Environmental Scientist

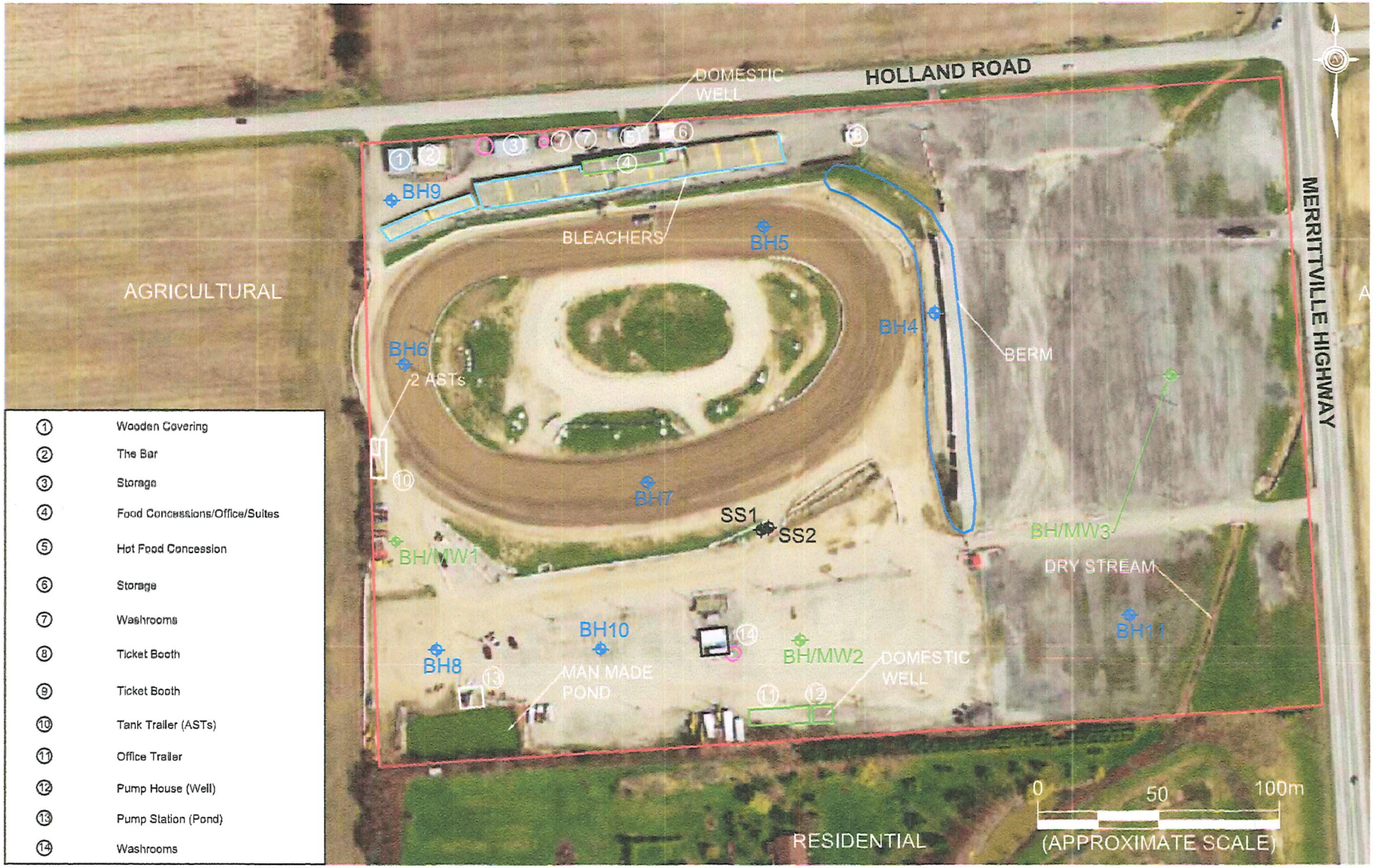
FIGURES



REFERENCE: Base plan provided by First Base Solutions.

FOR ILLUSTRATION PURPOSES ONLY. ALL LOCATIONS APPROXIMATE.

CLIENT: Merrittville Speedway	DWN BY: KH CHK'D BY: PS	PROJECT: PHASE II ENVIRONMENTAL SITE ASSESSMENT 2371 MERRITTVILLE HIGHWAY, THOROLD, ONTARIO	REV. NO.: A DATE: DEC 2018
Wood Environment & Infrastructure Solutions 3300 Merrittville Hwy, Unit 5 Thorold, Ontario wood.	DATUM: NAD83 PROJECTION: UTM Zone 17 SCALE: AS SHOWN	TITLE: SITE LOCATION PLAN	PROJECT NO: TG181101 NO. : FIGURE 1



①	Wooden Covering
②	The Bar
③	Storage
④	Food Concessions/Office/Suites
⑤	Hot Food Concession
⑥	Storage
⑦	Washrooms
⑧	Ticket Booth
⑨	Ticket Booth
⑩	Tank Trailer (ASTs)
⑪	Office Trailer
⑫	Pump House (Well)
⑬	Pump Station (Pond)
⑭	Washrooms

REFERENCE: Base plan provided by Niagara Navigator.

FOR ILLUSTRATION PURPOSES ONLY. ALL LOCATIONS APPROXIMATE.

CLIENT: Merrittville Speedway

Wood Environment Infrastructure Solutions
3300 Merrittville Hwy, Unit 5
Thorold, Ontario

LEGEND:
- Site Boundary
- Sewage Holding Tanks Cap
- Borehole Location
- Borehole/Monitoring Well Location
- Surface Sample Location

DWN BY:	KH
CHK'D BY:	PS
DATUM:	NAD83
PROJECTION:	UTM Zone 17
SCALE:	AS SHOWN

PROJECT: PHASE II ENVIRONMENTAL SITE ASSESSMENT, 2371 MERRITTVILLE HIGHWAY, THOROLD, ONTARIO

TITLE: SAMPLE LOCATION PLAN

REV. NO.:	A
DATE:	DEC 2018
PROJECT NO:	TG181101
NO. :	FIGURE 2

TABLES

Table 1: Summary of Soil Analyses for pH and Metals

Client: Merrittville Speedway
Site: 2371 Merrittville Highway, Thorold, Ontario
Project: TG181101

Sample ID				BH/MW1-3-D	BH/MW2-3-D	BH/MW3-1A-C	BH4-1-C	Dup FC	Duplicate Average	RPD	BH5-1-C	BH6-1-C	BH7-1-C	BH8-1C	BH9-1-C	BH10-1-C	BH11-1-C
Sample Depth (m)				3.4	3.4	0.3 - 0.6	0.0 - 1.5	Field Duplicate of BH4-1-C 0.0 - 1.5	(BH4-1-C and Dup FC)	(BH4-1-C and Dup FC)	0.0 - 1.5	0.0 - 1.5	0.0-1.5	0-1.5	0.5 - 1.5	0.3 -1.5	0.2 - 1.5
Date Collected				9-Oct-18	9-Oct-18	9-Oct-18	9-Oct-18	9-Oct-18			9-Oct-18	9-Oct-18	9-Oct-18	9-Oct-18	9-Oct-18	9-Oct-18	9-Oct-18
Laboratory ID				1841221-01	1841221-02	1841221-03	1841221-04	1841221-19			1841221-06	1841221-08	1841221-10	1842247-01	1841221-13	1841221-15	1841221-17
Parameter	Units	MDL	Table 2 SCS[a]														
General Inorganics																	
pH	pH units	0.05	+	7.7	7.8	-	7.6	7.7	7.7	0.1 pH Units	-	-	-	-	-	7.6	-
Metals																	
Antimony	µg/g	1.0	50	-	-	<	<	<	<	NC	<	<	<	<	<	<	<
Arsenic	µg/g	1.0	18	-	-	2.7	2.7	3.1	2.9	NC	2.9	2.7	3.1	6.1	2.7	3.0	2.7
Barium	µg/g	1.0	670	-	-	91.2	103	105	104	2%	135	87.5	104	208	141	128	91.1
Beryllium	µg/g	1.0	10	-	-	0.7	0.8	0.8	0.8	NC	0.8	0.7	0.8	1.6	1.0	1.1	0.8
Boron	µg/g	1.0	120	-	-	9.6	11.6	11.6	11.6	0%	10.7	10.1	11.4	13.6	10.3	10.4	10.4
Cadmium	µg/g	0.5	1.9	-	-	<	<	<	<	NC	<	<	<	<	<	<	<
Chromium	µg/g	1.0	160	-	-	19.0	20.0	27.4	23.7	**37%**	23.5	19.4	24.1	42.0	26.1	27.8	19.9
Cobalt	µg/g	1.0	100	-	-	9.1	9.3	10.0	9.7	8%	11.8	9.7	10.3	19.0	11.2	12.5	9.4
Copper	µg/g	1.0	300	-	-	16.5	18.6	22.5	20.6	21%	19.8	18.8	30.5	31.2	22.4	19.1	18.2
Lead	µg/g	1.0	120	-	-	7.0	12.0	38.8	25.4	**223%**	11.8	9.0	20.4	15.5	10.5	12.6	7.6
Molybdenum	µg/g	1.0	40	-	-	<	<	<	<	NC	<	<	<	<	<	<	<
Nickel	µg/g	1.0	340	-	-	21.3	21.8	24.0	22.9	10%	25.1	22.2	23.5	38.0	28.3	26.3	21.5
Selenium	µg/g	1.0	5.5	-	-	<	<	<	<	NC	<	<	<	<	<	<	<
Silver	µg/g	0.5	50	-	-	<	<	<	<	NC	<	<	<	<	<	<	<
Thallium	µg/g	1.0	3.3	-	-	<	<	<	<	NC	<	<	<	<	<	<	<
Uranium	µg/g	1.0	33	-	-	<	<	<	<	NC	<	<	<	<	<	<	<
Vanadium	µg/g	1.0	86	-	-	27.2	29.0	33.3	31.2	15%	33.9	28.4	31.5	53.6	36.0	37.8	29.4
Zinc	µg/g	1.0	340	-	-	34.4	36.6	58.3	47.5	**59%**	45.7	31.4	61.6	85.6	36.6	43.9	32.0

Notes

"a" - Table 2: Full Depth Generic Site Condition Standards in a Non-potable Ground Water Condition for industrial/commercial/community property use; established in *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the* Environmental Protection Act", Ontario Ministry of the Environment and Climate Change, 15 April 2011 (MOECC), SCS for medium to fine textured soils utilized.

Bolded values exceed the Table 2 SCS.

"µg/g" - micrograms per gram, parts per million.

"MDL" - method detection limit.

"<" - sample results less than the MDL.

"-" - not applicable or parameter not analyzed.

"Duplicate Average" - average of results of sample and it's field duplicate; where parameter <MDL, MDL used to calculate average. Note: the duplicate average must exceed the SCS for there to be an exceedance.

"RPD" - relative percent difference.

"NC" - RPD not calculable as both values are not greater than 5x the MDL.

Bold - means RPD outside of the sample duplicate value as outlined in the 2011 Analytical Protocol (Metals 30%, pH 0.3 pH units).

"+" means as per O. Reg. 153/04 as amended, in order to apply the generic Site Condition Standards, pH for surface soil (<1.5 mbgs) should be between 5 and 9 and pH for subsurface soil (>1.5 mbgs) should be between 5 and 11.

Table 2: Summary of Soil Analyses for PHCs, BTEX and PAHs

Client: Merrittville Speedway
Site: 2371 Merrittville Highway, Thorold, Ontario
Project: TG181101

Sample ID				BH/MW1-3-D	BH/MW2-3-D	Dup CD Field Duplicate of BH/MW2-3-D	Duplicate Average (Average between BH/MW2-3-D and Dup CD)	RPD (Between BH/MW2-3-D and Dup CD)	BH4-3B-D	BH4-4-C	BH5-1-C	BH5-1-D	BH6-1-D	BH7-1-D	BH8-1-D	BH9-1-D	BH10-1-D	SS1	SS2
Sample Depth (m)				3.4	3.4	3.4			3.5	4.6 - 6.0	0.0 - 1.5	0.8	0.8	0.9	0.8	0.8	0.8	0-0.3	0-0.3
Date Collected				9-Oct-18	9-Oct-18	9-Oct-18			9-Oct-18	9-Oct-18	9-Oct-18	9-Oct-18	9-Oct-18	9-Oct-18	9-Oct-18	9-Oct-18	9-Oct-18	15-Nov-18	15-Nov-18
Laboratory ID				1841221-01	1841221-02	1841221-18			1841221-20	1841221-05	1841221-06	1841221-07	1841221-09	1841221-11	1841221-12	1841221-14	1841221-16	1846438-01	1846438-02
Parameter	Units	MDL	Table 2 SCS[a]																
Petroleum Hydrocarbons (PHCs)																			
F1 PHCs (C6-C10)	µg/g	7	65	<	<	<	<	NC	<	-	-	<	<	<	<	<	<	<	<
F2 PHCs (C10-C16)	µg/g	4	250	<	<	<	<	NC	8	-	-	<	<	<	<	<	<	<	<
F3 PHCs (C16-C34)	µg/g	8	2,500	<	<	<	<	NC	38	-	-	<	<	<	<	9	<	121	29
F4 PHCs (C34-C50)	µg/g	6	6,600	<	<	<	<	NC	15	-	-	<	<	<	<	20	<	101	35
Benzene, Toluene, Ethylbenzene and Xylenes (BTEX)																			
Benzene	µg/g	0.02	0.4	<	<	<	<	NC	<	-	-	<	<	<	<	<	<	<	<
Ethylbenzene	µg/g	0.05	1.6	<	<	<	<	NC	<	-	-	<	<	<	<	<	<	<	<
Toluene	µg/g	0.05	9	<	<	<	<	NC	<	-	-	<	<	<	<	<	<	<	<
m/p-Xylene	µg/g	0.05	-	<	<	<	<	NC	<	-	-	<	<	<	<	<	<	<	<
o-Xylene	µg/g	0.05	-	<	<	<	<	NC	<	-	-	<	<	<	<	<	<	<	<
Xylenes, total	µg/g	0.05	30	<	<	<	<	NC	<	-	-	<	<	<	<	<	<	<	<
Polycylic Aromatic Hydrocarbons (PAHs)																			
Acenaphthene	µg/g	0.02	29	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Acenaphthylene	µg/g	0.02	0.17	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Anthracene	µg/g	0.02	0.74	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Benzo[a]anthracene	µg/g	0.02	0.96	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Benzo[a]pyrene	µg/g	0.02	0.3	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Benzo[b]fluoranthene	µg/g	0.02	0.96	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Benzo[g,h,i]perylene	µg/g	0.02	9.6	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Benzo[k]fluoranthene	µg/g	0.02	0.96	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Chrysene	µg/g	0.02	9.6	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Dibenzo[a,h]anthracene	µg/g	0.02	0.1	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Fluoranthene	µg/g	0.02	9.6	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Fluorene	µg/g	0.02	69	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Indeno[1,2,3-cd]pyrene	µg/g	0.02	0.95	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
1-Methylnaphthalene	µg/g	0.02	42	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
2-Methylnaphthalene	µg/g	0.02	42	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Methylnaphthalene (1&2)	µg/g	0.04	42	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Naphthalene	µg/g	0.01	28	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-
Phenanthrene	µg/g	0.02	16	-	-	-	-	-	-	0.04	<	-	-	-	-	-	-	-	-
Pyrene	µg/g	0.02	96	-	-	-	-	-	-	<	<	-	-	-	-	-	-	-	-

Notes:
"a" - Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for industrial/commercial/communnity property use; established in " *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the* Environmental Protection Act", Ontario Ministry of the Environment and Climate Change, 15 April 2011 (MOECC).
SCS for medium to fine textured soils utilized.
Bolded values exceed the Table 2 SCS.
"µg/g" - micrograms per gram, parts per million.
"MDL" - method detection limit.
"NV" - no value derived
"<" - sample results less than the MDL.
"-" - not applicable or parameter not analyzed.
"Duplicate Average" - average of results of sample and it's field duplicate; where parameter <MDL, MDL used to calculate average. Note: the duplicate average must exceed the SCS for there to be an exceedance.
"RPD" - relative percent difference.
"NC" - RPD not calculable as both values are not greater than 5x the MDL.
Bold - means RPD outside of the sample duplicate value as outlined in the 2011 Analytical Protocol (VOCs - 50%, PHCs - 30%).

Table 3: Summary of Ground Water Analyses for Metals

Client: Merrittville Speedway
Site: 2371 Merrittville Highway, Thorold, Ontario
Project: TG181101

Sample ID				BH/MW1	BH/MW2	BH/MW3	Dup AA	RPD
							Field duplicate of BH/MW3	BH/MW3 & Dup AA
Date Collected				26-Oct-18	26-Oct-18	26-Oct-18	26-Oct-18	
Laboratory ID				1844077-01	1844077-02	1844077-03	1844077-04	
Date Analyzed - Metals								
Parameter	Units	MDL	Table 2 SCS[a]					
Metals								
Antimony	µg/L	0.5	6 ug/L	<	<	<	<	NC
Arsenic	µg/L	1	25 ug/L	<	<	1	1	NC
Barium	µg/L	1	1000 ug/L	82	152	48	48	0%
Beryllium	µg/L	0.5	4 ug/L	<	<	<	<	NC
Boron	µg/L	10	5000 ug/L	33	20	47	47	NC
Cadmium	µg/L	0.1	2.7 ug/L	<	<	<	<	NC
Chromium	µg/L	1	50 ug/L	<	<	<	<	NC
Cobalt	µg/L	0.5	3.8 ug/L	<	0.5	0.5	0.5	NC
Copper	µg/L	0.5	87 ug/L	0.7	1.1	<	0.5	NC
Lead	µg/L	0.1	10 ug/L	<	<	<	<	NC
Molybdenum	µg/L	0.5	70 ug/L	2.3	1.1	2.6	2.5	4%
Nickel	µg/L	1	100 ug/L	1	<	1	2	NC
Selenium	µg/L	1	10 ug/L	<	<	<	<	NC
Silver	µg/L	0.1	1.5 ug/L	<	<	<	<	NC
Thallium	µg/L	0.1	2 ug/L	<	<	<	<	NC
Uranium	µg/L	0.1	20 ug/L	5.2	3.9	5.8	5.8	0%
Vanadium	µg/L	0.5	6.2 ug/L	<	<	<	<	NC
Zinc	µg/L	5	1100 ug/L	<	<	<	7	NC

"a" - Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition, all types of property use; established in "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", Ontario Ministry of the Environment and Climate Change, 15 April 2011 (MOECC).

Bolded values exceed the Table 2 SCS.

"µg/L" - micrograms per Litre, parts per billion.

"MDL" - method detection limit.

"<" - sample results less than the MDL.

"-" - not applicable or parameter not analyzed.

"RPD" - relative percent difference.

"NC" - RPD not calculable as both values are not greater than 5x the MDL.

Bold - means RPD outside of the sample duplicate value as outlined in the 2011 Analytical Protocol (Metals - 20%,).

Table 4: Summary of Ground Water Analyses for BTEX and PHCs

Client: Merrittville Speedway
Site: 2371 Merrittville Highway, Thorold, Ontario
Project: TG181101

Sample ID				BH/MW1	BH/MW2	BH/MW3	Dup AA	RPD	Field Blank	Trip Spike	Trip Blank
							Field duplicate of BH/MW3	BH/MW3 & Dup AA			
Date Collected				26-Oct-18	26-Oct-18	26-Oct-18	26-Oct-18		26-Oct-18	24-Oct-18	24-Oct-18
Laboratory ID				1844077-01	1844077-02	1844077-03	1844077-04		1844077-05	1844077-06	1844077-07
Parameter	Units	MDL	Table 2 SCS[a]								
BTEX											
Benzene	ug/L	0.5	5	<	<	<	<	NC	<	17.8	<
Ethylbenzene	ug/L	0.5	2	<	<	<	<	NC	<	22.4	<
Toluene	ug/L	0.5	24	<	<	<	<	NC	<	21.5	<
m/p-Xylene	ug/L	0.5	-	<	<	<	<	NC	<	47.8	<
o-Xylene	ug/L	0.5	-	<	<	<	<	NC	<	25.3	<
Xylenes, total	ug/L	0.5	300	<	<	<	<	NC	<	73.1	<
Hydrocarbons											
F1 PHCs (C6-C10)	ug/L	25	750	<	<	<	<	NC	<	1560	<
F2 PHCs (C10-C16)	ug/L	100	150	<	<	<	<	NC	-	-	-
F3 PHCs (C16-C34)	ug/L	100	500	<	<	<	<	NC	-	-	-
F4 PHCs (C34-C50)	ug/L	100	500	<	<	<	<	NC	-	-	-

"a" - Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition, all types of property use; established in "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", Ontario Ministry of the Environment and Climate Change, 15 April 2011 (MOECC).

Bolded values exceed the Table 2 SCS.

"µg/L" - micrograms per Litre, parts per billion.

"MDL" - method detection limit.

"<" - sample results less than the MDL.

"-" - not applicable or parameter not analyzed.

"RPD" - relative percent difference.

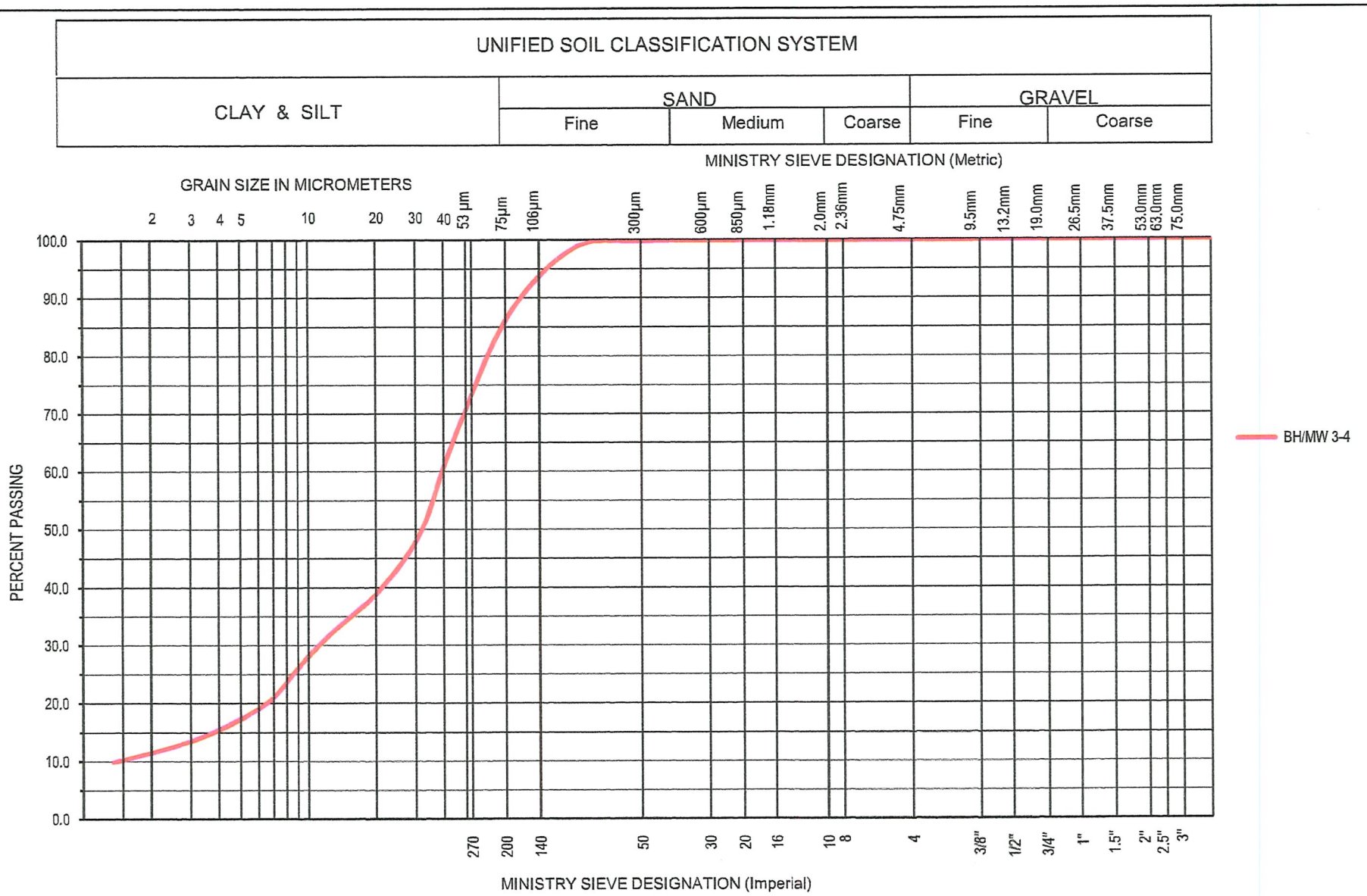
"NC" - RPD not calculable as both values are not greater than 5x the MDL.

Bold - means RPD outside of the sample duplicate value as outlined in the 2011 Analytical Protocol (PHCs, BTEX - 30%).

Trip Spike prepared at 2,000 µg/L for PHC F1, 40 µg/L for benzene, ethylbenzene and toluene and 80 µg/L for xylenes.

APPENDIX A

GRAIN SIZE ANALYSES AND BOREHOLE LOGS



CLIENT: **Merrittville Speedway**		PREPARED BY: AM	PROJECT: Merrittville Speedway Phase II ESA	DATE: November 2, 2018
Wood Environment & Infrastructure Solutions 3300 Merrittville Highway, Unit #5 Thorold, Ontario	wood.	CHECKED BY: KP	TITLE: Grain Size Distribution	PROJECT NO: TG181101 FIGURE NO: 1

RECORD OF MONITORING WELL No. BH/MW1

Project Number:	TG181101	Drilling Method:	50 mm Direct Push		
Project Client:	Merrittville Speedway	Drilling Machine:	Geoprobe		
Project Name:	Phase II ESA	Date Started:	Oct 9, 18	Date Completed:	Oct 9, 18
Project Location:	2371 Merrittville Speedway, Thorold, ON	Logged by:	LJ	Compiled by:	KH
Drilling Location:	As shown on Borehole Location Plan	Reviewed by:	PS	Revision No.:	0, 12/4/18

wood.

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	SOIL SCREENING		
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ● DCPT 20 40 60 80	* Combustible Organic Vapour (ppm) ❖ Combustible Organic Vapour (%LEL) △ Total Organic Vapour (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	COMMENTS
	Local Ground Surface Elevation:										
	Brown, FILL, Silty Clay/Clayey Silt, Trace asphalt, Moist 0.3										
	Brown, Silty Clay/Clayey Silt, DTPL	CS	1	100		1			0 / 20.0		
		CS	2	100		2			0 / 25.0		
	Trace reddish brown seams,					3 ▽					
		CS	3	100		4			0 / 20.0		Soil sample BHMW1-3-D submitted for laboratory analysis of PHCs(F1-F4)/BTEX and pH.
	Brown 4.9 SILTY SAND Saturated	CS	4	100		5			0 / 0.0		
	BOREHOLE TERMINATED. 6.1					6					Upon Completion: Borehole Remained Open. Monitoring Well Installation: 5cm diameter, schedule 40 pipe with 3.0m length #10 slotted screen, flushmount casing.

Wood Environment & Infrastructure Solutions

Unit 5-3300 Merritville Highway
Thorold, Ontario L2V 4Y6
Tel: (905) 687-6616
Fax: (905) 687-6620
www.woodplc.com

▽ Groundwater depth encountered on completion of drilling: 2.9 m.

Scale: 1 : 44

RECORD OF MONITORING WELL No. BH/MW2

Project Number:	TG181101	Drilling Method:	50 mm Direct Push		
Project Client:	Merrittville Speedway	Drilling Machine:	Geoprobe		
Project Name:	Phase II ESA	Date Started:	Oct 9, 18	Date Completed:	Oct 9, 18
Project Location:	2371 Merrittville Speedway, Thorold, ON	Logged by:	LJ	Compiled by:	KH
Drilling Location:	As shown on Borehole Location Plan	Reviewed by:	PS	Revision No.:	0, 12/4/18

wood.

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	SOIL SCREENING		
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: ○ SPT ● DCPT 20 40 60 80	* Combustible Organic Vapour (ppm) ◆ Combustible Organic Vapour (%LEL) △ Total Organic Vapour (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	COMMENTS
	Brown, **FILL,** Silty Clay/Clayey Silt, Trace grey seams, DTPL										
	Brown, 0.8 **Silty Clay/Clayey Silt,** Trace grey seams, DTPL	CS	1	100		1			0 35.0		
		CS	2	100		2			0 30.0		
	Wet-saturated silt seam Brown to Grey, DTPL/APL	CS	3	100		3 4			0 40.0		Soil sample BHMW2-3-D and Dup CD submitted for laboratory analysis of PHCs(F1-F4)/BTEX and pH.
	Changing to grey, trace gravel, oxidized seams, APL	CS	4	100		5			0 30.0		
	BOREHOLE TERMINATED. 6.1					6					Upon Completion: Borehole Remained Open. Monitoring Well Installation: 5cm diameter, schedule 40 pipe with 3.0m length #10 slotted screen, flushmount casing.

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Thorold, Ontario L2V 4Y6
Tel: (905) 687-6616
Fax: (905) 687-6620
www.woodplc.com

▽ Groundwater depth encountered on completion of drilling: 3.5 m.

Scale: 1 : 44

RECORD OF MONITORING WELL No. BH/MW3

Project Number:	TG181101	Drilling Method:	50 mm Direct Push		
Project Client:	Merrittville Speedway	Drilling Machine:	Geoprobe		
Project Name:	Phase II ESA	Date Started:	Oct 9, 18	Date Completed:	Oct 9, 18
Project Location:	2371 Merrittville Speedway, Thorold, ON	Logged by:	LJ	Compiled by:	KH
Drilling Location:	As shown on Borehole Location Plan	Reviewed by:	PS	Revision No.:	0, 12/4/18

wood.

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	SOIL SCREENING		
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ● DCPT 20 40 60 80	* Combustible Organic Vapour (ppm) ❖ Combustible Organic Vapour (%LEL) △ Total Organic Vapour (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	COMMENTS
	Asphalt/Granular											
	Brown, Silty Clay/Clayey Silt, APL Trace gravel, some reddish seams,	0.3	CS	1	100		1			0 30.0		Soil sample BHMW3-1A-C submitted for laboratory analysis of Metals.
	Brown, Silty Clay/Clayey Silt, Trace gravel, some reddish seams, APL	1.5	CS	2	100		2			0 30.0		
	Saturated		CS	3	100		3 4			0 20.0		
			CS	4	100		5			0 0.0		
	BOREHOLE TERMINATED.	6.1					6					Upon Completion: Borehole Remained Open. Monitoring Well Installation: 5cm diameter, schedule 40 pipe with 3.0m length #10 slotted screen, flushmount casing.

Wood Environment & Infrastructure Solutions

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▽ Groundwater depth encountered on completion of drilling: 2.5 m.

RECORD OF BOREHOLE No. BH4

Project Number:	TG181101	Drilling Method:	50 mm Direct Push		
Project Client:	Merrittville Speedway	Drilling Machine:	Geoprobe		
Project Name:	Phase II ESA	Date Started:	Oct 9, 18	Date Completed:	Oct 9, 18
Project Location:	2371 Merrittville Speedway, Thorold, ON	Logged by:	LJ	Compiled by:	KH
Drilling Location:	As shown on Borehole Location Plan	Reviewed by:	PS	Revision No.:	0, 12/4/18

wood.

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	SOIL SCREENING			COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ● DCPT 20 40 60 80	* Combustible Organic Vapour (ppm) ◆ Combustible Organic Vapour (%LEL) △ Total Organic Vapour (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	
	Brown, **Fill,** Silty Clay/Clayey Silt, With trace gravel and asphalt, DTPL/APL	CS	1	100		1			0 25.0			Soil sample BH4-1-C and Dup FC submitted for laboratory analysis of Metals and pH.
		CS	2	100		2			0 30.0			
		CS	3	100		3			0 40.0			Soil sample BH4-3-BD submitted for laboratory analysis of PHCs/BTEX.
	Gravel layer 4.0 Wood and gravel layer 4.1					4						
	black staining with some petroleum odour 4.4											
	Brown, 4.9 **Silty Clay/Clayey Silt,** native, grey fissures, DTPL/APL	CS	4	100		5			0 145.0			Soil sample BH4-4-C submitted for laboratory analysis of PAHs.
	BOREHOLE TERMINATED. 6.1					6						Upon Completion: Borehole remained open and dry. This borehole drilled in Berm. From 0 to 4.9m above ground surface.

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH5

Project Number:	TG181101	Drilling Method:	50 mm Direct Push		
Project Client:	Merrittville Speedway	Drilling Machine:	Geoprobe		
Project Name:	Phase II ESA	Date Started:	Oct 9, 18	Date Completed:	Oct 9, 18
Project Location:	2371 Merrittville Speedway, Thorold, ON	Logged by:	LJ	Compiled by:	KH
Drilling Location:	As shown on Borehole Location Plan	Reviewed by:	PS	Revision No.:	0, 12/4/18

wood.

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	SOIL SCREENING		
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ● DCPT 20 40 60 80	* Combustible Organic Vapour (ppm) ◆ Combustible Organic Vapour (%LEL) △ Total Organic Vapour (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	COMMENTS
	Brown, **Fill** Silty Clay/Clayey Silt, Trace gravel, rust staining, black/dark brown patches, DTPLAPL		CS	1	100		1			0 △ 50		Soil sample BH5-1-C submitted for laboratory analysis of Metals and PAHs. Soil sample BH5-1-D submitted for laboratory analysis of PHCs(F1-F4)/BTEX.
	Brown, **Silty Clay/Clayey Silt,** Native, Grey seams/fissures, traces of gravel, DTPL/APL	1.5	CS	2	100		2			0 ✳ △ 75.0		
	BOREHOLE TERMINATED.	3.0					3					Upon Completion: Borehole remained open and dry.

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH6

Project Number:	TG181101	Drilling Method:	50 mm Direct Push		
Project Client:	Merrittville Speedway	Drilling Machine:	Geoprobe		
Project Name:	Phase II ESA	Date Started:	Oct 9, 18	Date Completed:	Oct 9, 18
Project Location:	2371 Merrittville Speedway, Thorold, ON	Logged by:	LJ	Compiled by:	KH
Drilling Location:	As shown on Borehole Location Plan	Reviewed by:	PS	Revision No.:	0, 12/4/18

wood.

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	SOIL SCREENING		
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ● DCPT 20 40 60 80	✳ Combustible Organic Vapour (ppm) ❖ Combustible Organic Vapour (%LEL) △ Total Organic Vapour (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	COMMENTS
	Brown, Fill, Silty Clay/Clayey Silt, traces of gravel, DTPL Sandy seam, moist	CS	1	100		1			✳ 0 △ 20.0		Soil sample BH6-1-C submitted for laboratory analysis of Metals. Soil sample BH6-1-D submitted for laboratory analysis of PHCs(F1-F4)/BTEX.
	Brown, 1.5 Silty Clay/Clayey Silt, Native, traces of gravel, DTPL	CS	2	100		2			✳ 0 0.0		
	BOREHOLE TERMINATED. 3.0					3					Upon Completion: Borehole remained open and dry.

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH7

Project Number:	TG181101	Drilling Method:	50 mm Direct Push		
Project Client:	Merrittville Speedway	Drilling Machine:	Geoprobe		
Project Name:	Phase II ESA	Date Started:	Oct 9, 18	Date Completed:	Oct 9, 18
Project Location:	2371 Merrittville Speedway, Thorold, ON	Logged by:	LJ	Compiled by:	KH
Drilling Location:	As shown on Borehole Location Plan	Reviewed by:	PS	Revision No.:	0, 12/4/18

wood.

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	SOIL SCREENING		
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ● DCPT 20 40 60 80	✳ Combustible Organic Vapour (ppm) ❖ Combustible Organic Vapour (%LEL) △ Total Organic Vapour (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	COMMENTS
	Brown/Dark Brown, **Fill** Silty Clay/Clayey Silt, traces fo gravel, minor rust staining, DTPL to APL	CS	1	100		1			0 ✳ 0.0		Soil sample BH7-1-C submitted for laboratory analysis of Metals. Soil sample BH7-1-D submitted for laboratory analysis of PHCs(F1-F4)/BTEX.
	Brown, **Silty Clay/Clayey Silt,** Native, Grey fissures, APL Silty grey seam 1.5	CS	2	8#		2			0 ✳ △ 75.0		
	BOREHOLE TERMINATED. 3.0					3					Upon Completion: Borehole remained open and dry.

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH8

Project Number:	TG181101	Drilling Method:	50 mm Direct Push		
Project Client:	Merrittville Speedway	Drilling Machine:	Geoprobe		
Project Name:	Phase II ESA	Date Started:	Oct 9, 18	Date Completed:	Oct 9, 18
Project Location:	2371 Merrittville Speedway, Thorold, ON	Logged by:	LJ	Compiled by:	KH
Drilling Location:	As shown on Borehole Location Plan	Reviewed by:	PS	Revision No.:	0, 12/4/18

wood.

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	SOIL SCREENING		
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ● DCPT 20 40 60 80	✳ Combustible Organic Vapour (ppm) ◆ Combustible Organic Vapour (%LEL) △ Total Organic Vapour (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	COMMENTS
	Asphalt with gravel						0					
	Brown, Silty Clay/Clayey Silt, traces of gravel, fissured, DTPL	0.3	CS	1	100		1			0 20.0		Soil sample BH8-1-D submitted for laboratory analysis of PHCs(F1-F4)/BTEX. Soil sample BH8-1-C submitted for laboratory analysis of Metals.
			CS	2	100		2			0 5.0		
	BOREHOLE TERMINATED.	3.0					3					Upon Completion: Borehole remained open and dry.

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH9

Project Number:	TG181101	Drilling Method:	50 mm Direct Push		
Project Client:	Merrittville Speedway	Drilling Machine:	Geoprobe		
Project Name:	Phase II ESA	Date Started:	Oct 9, 18	Date Completed:	Oct 9, 18
Project Location:	2371 Merrittville Speedway, Thorold, ON	Logged by:	LJ	Compiled by:	KH
Drilling Location:	As shown on Borehole Location Plan	Reviewed by:	PS	Revision No.:	0, 12/4/18

wood.

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	SOIL SCREENING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ● DCPT 20 40 60 80	✳ Combustible Organic Vapour (ppm) ❖ Combustible Organic Vapour (%LEL) △ Total Organic Vapour (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	
	Black and Brown, **Asphalt** with gravel										
	Brown, 0.5 **Silty Clay/Clayey Silt**, native, traces of gravel, grey fissures, DTPL to APL	CS	1	100		1			✳ 0 △ 320.0		Soil sample BH9-1-C submitted for laboratory analysis of Metals. Soil sample BH9-1-D submitted for laboratory analysis of PHCs(F1-F4)/BTEX.
		CS	2	100		2			✳ 0 △ 25.0		
	BOREHOLE TERMINATED. 3.0					3					Upon Completion: Borehole remained open and dry.

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

Scale: 1 : 44

RECORD OF BOREHOLE No. BH10

Project Number:	TG181101	Drilling Method:	50 mm Direct Push		
Project Client:	Merrittville Speedway	Drilling Machine:	Geoprobe		
Project Name:	Phase II ESA	Date Started:	Oct 9, 18	Date Completed:	Oct 9, 18
Project Location:	2371 Merrittville Speedway, Thorold, ON	Logged by:	LJ	Compiled by:	KH
Drilling Location:	As shown on Borehole Location Plan	Reviewed by:	PS	Revision No.:	0, 12/4/18

wood.

LITHOLOGY PROFILE			SOIL SAMPLING						FIELD TESTING	SOIL SCREENING		
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:		Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ● DCPT 20 40 60 80	* Combustible Organic Vapour (ppm) ◆ Combustible Organic Vapour (%LEL) △ Total Organic Vapour (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	COMMENTS
	Granular Fill											
	Brown, Silty Clay/Clayey Silt, traces of gravel, DTPL	0.3	CS	1	100		1			0 15.0		Soil sample BH10-1-C submitted for laboratory analysis of Metals and pH. Soil sample BH10-1-D submitted for laboratory analysis of PHCs(F1-F4)/BTEX.
	Brown, Silty Clay/Clayey Silt, Native, grey fissures, DTPL/APL	1.8	CS	2	100		2			0 5.0		
	BOREHOLE TERMINATED.	3.0					3					Upon Completion: Borehole remained open and dry.

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⊻ No freestanding groundwater measured in open borehole on completion of drilling.

RECORD OF BOREHOLE No. BH11

Project Number:	TG181101	Drilling Method:	50 mm Direct Push		
Project Client:	Merrittville Speedway	Drilling Machine:	Geoprobe		
Project Name:	Phase II ESA	Date Started:	Oct 9, 18	Date Completed:	Oct 9, 18
Project Location:	2371 Merrittville Speedway, Thorold, ON	Logged by:	LJ	Compiled by:	KH
Drilling Location:	As shown on Borehole Location Plan	Reviewed by:	PS	Revision No.:	0, 12/4/18

wood.

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	SOIL SCREENING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ● DCPT 20 40 60 80	* Combustible Organic Vapour (ppm) ◆ Combustible Organic Vapour (%LEL) △ Total Organic Vapour (ppm) 100 200 300 400	INSTRUMENTATION INSTALLATION	
	Granular with topsoil 0.2 Brown, Silty Clay/Clayey Silt, native, traces of gravel, DTPL	CS	1	100		1			0 △ 15.0		Soil sample BH11-1-C submitted for laboratory analysis of Metals.
		CS	2	100		2			0 △ 15.0		
	BOREHOLE TERMINATED. 3.0					3					Upon Completion: Borehole remained open and dry.

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▽ No freestanding groundwater measured in open borehole on completion of drilling.

APPENDIX B

LABORATORY CERTIFICATES OF ANALYSES

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Certificate of Analysis

Wood Environment & Infrastructure (Thorold)

3300 Merrittville Hwy, Unit 5
Thorold, ON L2V 4Y6
Attn: Tracy Wolowidnek

Client PO:
Project: TG181101
Custody: 114555/554/553/556/552/551/641/642

Report Date: 18-Oct-2018
Order Date: 10-Oct-2018

Revised Report | **Order #: 1841221**

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

Paracel ID	Client ID
1841221-01	BHMW1-3-D
1841221-02	BHMW2-3-D
1841221-03	BHMW3-1a-C
1841221-04	BH4-1-C
1841221-05	BH4-4-C
1841221-06	BH5-1-C
1841221-07	BH5-1-D
1841221-08	BH6-1-C
1841221-09	BH6-1-D
1841221-10	BH7-1-C
1841221-11	BH7-1-D
1841221-12	BH8-1-D
1841221-13	BH9-1-C
1841221-14	BH9-1-D
1841221-15	BH10-1-C
1841221-16	BH10-1-D
1841221-17	BH11-1-C
1841221-18	Dup CD
1841221-19	Dup FC
1841221-20	BH4-3b-D

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Wood Environment & Infrastructure (Thorold)
Client PO:

Report Date: 18-Oct-2018
Order Date: 10-Oct-2018
Project Description: TG181101

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	12-Oct-18	13-Oct-18
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	15-Oct-18	15-Oct-18
PHC F1	CWS Tier 1 - P&T GC-FID	12-Oct-18	13-Oct-18
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	12-Oct-18	14-Oct-18
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	15-Oct-18	15-Oct-18
REG 153: PAHs by GC-MS	EPA 8270 - GC-MS, extraction	11-Oct-18	11-Oct-18
Solids, %	Gravimetric, calculation	13-Oct-18	13-Oct-18

PARACEL LABORATORIES LTD.

Order #: 1841221

Certificate of Analysis
Client: Wood Environment & Infrastructure (Thorold)
Client PO:

Report Date: 18-Oct-2018
Order Date: 10-Oct-2018
Project Description: TG181101

	Client ID:	BHMW1-3-D	BHMW2-3-D	BHMW3-1a-C	BH4-1-C
	Sample Date:	10/09/2018 09:54	10/09/2018 11:45	10/09/2018 12:49	10/09/2018 14:40
	Sample ID:	1841221-01	1841221-02	1841221-03	1841221-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	85.0	79.2	81.3	85.3
General Inorganics					
pH	0.05 pH Units	7.70	7.76	-	7.62
Metals					
Antimony	1.0 ug/g dry	-	-	<1.0	<1.0
Arsenic	1.0 ug/g dry	-	-	2.7	2.7
Barium	1.0 ug/g dry	-	-	91.2	103
Beryllium	0.5 ug/g dry	-	-	0.7	0.8
Boron	5.0 ug/g dry	-	-	9.6	11.6
Cadmium	0.5 ug/g dry	-	-	<0.5	<0.5
Chromium	5.0 ug/g dry	-	-	19.0	20.0
Cobalt	1.0 ug/g dry	-	-	9.1	9.3
Copper	5.0 ug/g dry	-	-	16.5	18.6
Lead	1.0 ug/g dry	-	-	7.0	12.0
Molybdenum	1.0 ug/g dry	-	-	<1.0	<1.0
Nickel	5.0 ug/g dry	-	-	21.3	21.8
Selenium	1.0 ug/g dry	-	-	<1.0	<1.0
Silver	0.3 ug/g dry	-	-	<0.3	<0.3
Thallium	1.0 ug/g dry	-	-	<1.0	<1.0
Uranium	1.0 ug/g dry	-	-	<1.0	<1.0
Vanadium	10.0 ug/g dry	-	-	27.2	29.0
Zinc	20.0 ug/g dry	-	-	34.4	36.6
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	89.6%	89.2%	-	-
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	-	-

PARACEL LABORATORIES LTD.

Order #: 1841221

Certificate of Analysis
Client: Wood Environment & Infrastructure (Thorold)
Client PO:

Report Date: 18-Oct-2018
Order Date: 10-Oct-2018
Project Description: TG181101

	Client ID:	BH4-4-C	BH5-1-C	BH5-1-D	BH6-1-C
	Sample Date:	10/09/2018 14:50	10/09/2018 14:56	10/09/2018 14:56	10/09/2018 15:05
	Sample ID:	1841221-05	1841221-06	1841221-07	1841221-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	78.7	83.7	80.5	88.1
Metals					
Antimony	1.0 ug/g dry	-	<1.0	-	<1.0
Arsenic	1.0 ug/g dry	-	2.9	-	2.7
Barium	1.0 ug/g dry	-	135	-	87.5
Beryllium	0.5 ug/g dry	-	0.8	-	0.7
Boron	5.0 ug/g dry	-	10.7	-	10.1
Cadmium	0.5 ug/g dry	-	<0.5	-	<0.5
Chromium	5.0 ug/g dry	-	23.5	-	19.4
Cobalt	1.0 ug/g dry	-	11.8	-	9.7
Copper	5.0 ug/g dry	-	19.8	-	18.8
Lead	1.0 ug/g dry	-	11.8	-	9.0
Molybdenum	1.0 ug/g dry	-	<1.0	-	<1.0
Nickel	5.0 ug/g dry	-	25.1	-	22.2
Selenium	1.0 ug/g dry	-	<1.0	-	<1.0
Silver	0.3 ug/g dry	-	<0.3	-	<0.3
Thallium	1.0 ug/g dry	-	<1.0	-	<1.0
Uranium	1.0 ug/g dry	-	<1.0	-	<1.0
Vanadium	10.0 ug/g dry	-	33.9	-	28.4
Zinc	20.0 ug/g dry	-	45.7	-	31.4
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	-	-	91.4%	-
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	-
Semi-Volatiles					
Acenaphthene	0.02 ug/g dry	<0.02	<0.02	-	-

Certificate of Analysis
Client: Wood Environment & Infrastructure (Thorold)
Client PO:

Report Date: 18-Oct-2018
Order Date: 10-Oct-2018
Project Description: TG181101

	Client ID:	BH4-4-C	BH5-1-C	BH5-1-D	BH6-1-C
	Sample Date:	10/09/2018 14:50	10/09/2018 14:56	10/09/2018 14:56	10/09/2018 15:05
	Sample ID:	1841221-05	1841221-06	1841221-07	1841221-08
	MDL/Units	Soil	Soil	Soil	Soil
Acenaphthylene	0.02 ug/g dry	<0.02	<0.02	-	-
Anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [a] anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [a] pyrene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [b] fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [g,h,i] perylene	0.02 ug/g dry	<0.02	<0.02	-	-
Benzo [k] fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	-
Chrysene	0.02 ug/g dry	<0.02	<0.02	-	-
Dibenzo [a,h] anthracene	0.02 ug/g dry	<0.02	<0.02	-	-
Fluoranthene	0.02 ug/g dry	<0.02	<0.02	-	-
Fluorene	0.02 ug/g dry	<0.02	<0.02	-	-
Indeno [1,2,3-cd] pyrene	0.02 ug/g dry	<0.02	<0.02	-	-
1-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	-	-
2-Methylnaphthalene	0.02 ug/g dry	<0.02	<0.02	-	-
Methylnaphthalene (1&2)	0.04 ug/g dry	<0.04	<0.04	-	-
Naphthalene	0.01 ug/g dry	<0.01	<0.01	-	-
Phenanthrene	0.02 ug/g dry	0.04	<0.02	-	-
Pyrene	0.02 ug/g dry	<0.02	<0.02	-	-
2-Fluorobiphenyl	Surrogate	111%	111%	-	-
Terphenyl-d14	Surrogate	120%	123%	-	-

Certificate of Analysis
Client: Wood Environment & Infrastructure (Thorold)
Client PO:

Report Date: 18-Oct-2018
Order Date: 10-Oct-2018
Project Description: TG181101

	Client ID:	BH6-1-D	BH7-1-C	BH7-1-D	BH8-1-D
	Sample Date:	10/09/2018 15:05	10/09/2018 15:20	10/09/2018 15:20	10/09/2018 15:50
	Sample ID:	1841221-09	1841221-10	1841221-11	1841221-12
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	85.3	89.1	84.5	85.3
Metals					
Antimony	1.0 ug/g dry	-	<1.0	-	-
Arsenic	1.0 ug/g dry	-	3.1	-	-
Barium	1.0 ug/g dry	-	104	-	-
Beryllium	0.5 ug/g dry	-	0.8	-	-
Boron	5.0 ug/g dry	-	11.4	-	-
Cadmium	0.5 ug/g dry	-	<0.5	-	-
Chromium	5.0 ug/g dry	-	24.1	-	-
Cobalt	1.0 ug/g dry	-	10.3	-	-
Copper	5.0 ug/g dry	-	30.5	-	-
Lead	1.0 ug/g dry	-	20.4	-	-
Molybdenum	1.0 ug/g dry	-	<1.0	-	-
Nickel	5.0 ug/g dry	-	23.5	-	-
Selenium	1.0 ug/g dry	-	<1.0	-	-
Silver	0.3 ug/g dry	-	<0.3	-	-
Thallium	1.0 ug/g dry	-	<1.0	-	-
Uranium	1.0 ug/g dry	-	<1.0	-	-
Vanadium	10.0 ug/g dry	-	31.5	-	-
Zinc	20.0 ug/g dry	-	61.6	-	-
Volatiles					
Benzene	0.02 ug/g dry	<0.02	-	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	-	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Toluene-d8	Surrogate	88.3%	-	90.2%	89.7%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	-	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	<6	<6

Certificate of Analysis
Client: Wood Environment & Infrastructure (Thorold)
Client PO:

Report Date: 18-Oct-2018
Order Date: 10-Oct-2018
Project Description: TG181101

	Client ID:	BH9-1-C	BH9-1-D	BH10-1-C	BH10-1-D
	Sample Date:	10/09/2018 15:50	10/09/2018 15:50	10/09/2018 16:25	10/09/2018 16:25
	Sample ID:	1841221-13	1841221-14	1841221-15	1841221-16
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	80.3	83.6	83.9	83.1
General Inorganics					
pH	0.05 pH Units	-	-	7.64	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	<1.0	-
Arsenic	1.0 ug/g dry	2.7	-	3.0	-
Barium	1.0 ug/g dry	141	-	128	-
Beryllium	0.5 ug/g dry	1.0	-	1.1	-
Boron	5.0 ug/g dry	10.3	-	10.4	-
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	-
Chromium	5.0 ug/g dry	26.1	-	27.8	-
Cobalt	1.0 ug/g dry	11.2	-	12.5	-
Copper	5.0 ug/g dry	22.4	-	19.1	-
Lead	1.0 ug/g dry	10.5	-	12.6	-
Molybdenum	1.0 ug/g dry	<1.0	-	<1.0	-
Nickel	5.0 ug/g dry	28.3	-	26.3	-
Selenium	1.0 ug/g dry	<1.0	-	<1.0	-
Silver	0.3 ug/g dry	<0.3	-	<0.3	-
Thallium	1.0 ug/g dry	<1.0	-	<1.0	-
Uranium	1.0 ug/g dry	<1.0	-	<1.0	-
Vanadium	10.0 ug/g dry	36.0	-	37.8	-
Zinc	20.0 ug/g dry	36.6	-	43.9	-
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	-	90.5%	-	86.9%
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	-	9	-	<8
F4 PHCs (C34-C50)	6 ug/g dry	-	20	-	<6

Certificate of Analysis
Client: Wood Environment & Infrastructure (Thorold)
Client PO:

Report Date: 18-Oct-2018
Order Date: 10-Oct-2018
Project Description: TG181101

	Client ID:	BH11-1-C	Dup CD	Dup FC	BH4-3b-D
	Sample Date:	10/09/2018 16:30	10/09/2018 11:45	10/09/2018 14:40	10/09/2018 14:45
	Sample ID:	1841221-17	1841221-18	1841221-19	1841221-20
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	83.4	80.1	84.7	86.6
General Inorganics					
pH	0.05 pH Units	-	-	7.74	-
Metals					
Antimony	1.0 ug/g dry	<1.0	-	<1.0	-
Arsenic	1.0 ug/g dry	2.7	-	3.1	-
Barium	1.0 ug/g dry	91.1	-	105	-
Beryllium	0.5 ug/g dry	0.8	-	0.8	-
Boron	5.0 ug/g dry	10.4	-	11.6	-
Cadmium	0.5 ug/g dry	<0.5	-	<0.5	-
Chromium	5.0 ug/g dry	19.9	-	27.4	-
Cobalt	1.0 ug/g dry	9.4	-	10.0	-
Copper	5.0 ug/g dry	18.2	-	22.5	-
Lead	1.0 ug/g dry	7.6	-	38.8	-
Molybdenum	1.0 ug/g dry	<1.0	-	<1.0	-
Nickel	5.0 ug/g dry	21.5	-	24.0	-
Selenium	1.0 ug/g dry	<1.0	-	<1.0	-
Silver	0.3 ug/g dry	<0.3	-	<0.3	-
Thallium	1.0 ug/g dry	<1.0	-	<1.0	-
Uranium	1.0 ug/g dry	<1.0	-	<1.0	-
Vanadium	10.0 ug/g dry	29.4	-	33.3	-
Zinc	20.0 ug/g dry	32.0	-	58.3	-
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	-	88.2%	-	91.6%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	-	<7	-	<7
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	-	8
F3 PHCs (C16-C34)	8 ug/g dry	-	<8	-	38
F4 PHCs (C34-C50)	6 ug/g dry	-	<6	-	15

Certificate of Analysis
Client: Wood Environment & Infrastructure (Thorold)
Client PO:

Report Date: 18-Oct-2018
Order Date: 10-Oct-2018
Project Description: TG181101

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g						
Acenaphthylene	ND	0.02	ug/g						
Anthracene	ND	0.02	ug/g						
Benzo [a] anthracene	ND	0.02	ug/g						
Benzo [a] pyrene	ND	0.02	ug/g						
Benzo [b] fluoranthene	ND	0.02	ug/g						
Benzo [g,h,i] perylene	ND	0.02	ug/g						
Benzo [k] fluoranthene	ND	0.02	ug/g						
Chrysene	ND	0.02	ug/g						
Dibenzo [a,h] anthracene	ND	0.02	ug/g						
Fluoranthene	ND	0.02	ug/g						
Fluorene	ND	0.02	ug/g						
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g						
1-Methylnaphthalene	ND	0.02	ug/g						
2-Methylnaphthalene	ND	0.02	ug/g						
Methylnaphthalene (1&2)	ND	0.04	ug/g						
Naphthalene	ND	0.01	ug/g						
Phenanthrene	ND	0.02	ug/g						
Pyrene	ND	0.02	ug/g						
Surrogate: 2-Fluorobiphenyl	*1.51*		*ug/g*		*113*	*50-140*			
Surrogate: Terphenyl-d14	*1.73*		*ug/g*		*130*	*50-140*			
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	*3.04*		*ug/g*		*95.1*	*50-140*			

Certificate of Analysis
Client: Wood Environment & Infrastructure (Thorold)
Client PO:

Report Date: 18-Oct-2018
Order Date: 10-Oct-2018
Project Description: TG181101

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
pH	7.58	0.05	pH Units	7.60			0.3	10	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	ND	1.0	ug/g dry	ND			0.0	30	
Arsenic	2.0	1.0	ug/g dry	1.8			11.1	30	
Barium	77.0	1.0	ug/g dry	70.5			8.8	30	
Beryllium	0.6	0.5	ug/g dry	0.6			1.7	30	
Boron	11.9	5.0	ug/g dry	11.7			1.9	30	
Cadmium	ND	0.5	ug/g dry	ND			0.0	30	
Chromium	17.8	5.0	ug/g dry	16.3			8.6	30	
Cobalt	7.3	1.0	ug/g dry	6.7			8.4	30	
Copper	13.1	5.0	ug/g dry	11.9			9.3	30	
Lead	8.3	1.0	ug/g dry	7.6			8.8	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	19.3	5.0	ug/g dry	17.8			7.7	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.3	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND			0.0	30	
Vanadium	25.0	10.0	ug/g dry	22.9			8.9	30	
Zinc	28.2	20.0	ug/g dry	25.8			8.9	30	
Physical Characteristics									
% Solids	82.4	0.1	% by Wt.	84.0			1.9	25	
Semi-Volatiles									
Acenaphthene	ND	0.02	ug/g dry	ND				40	
Acenaphthylene	ND	0.02	ug/g dry	ND				40	
Anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] anthracene	ND	0.02	ug/g dry	ND				40	
Benzo [a] pyrene	ND	0.02	ug/g dry	ND				40	
Benzo [b] fluoranthene	ND	0.02	ug/g dry	ND				40	
Benzo [g,h,i] perylene	ND	0.02	ug/g dry	ND			0.0	40	
Benzo [k] fluoranthene	ND	0.02	ug/g dry	ND				40	
Chrysene	ND	0.02	ug/g dry	ND				40	
Dibenzo [a,h] anthracene	ND	0.02	ug/g dry	ND				40	
Fluoranthene	ND	0.02	ug/g dry	ND			0.0	40	
Fluorene	ND	0.02	ug/g dry	ND				40	
Indeno [1,2,3-cd] pyrene	ND	0.02	ug/g dry	ND				40	
1-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
2-Methylnaphthalene	ND	0.02	ug/g dry	ND				40	
Naphthalene	ND	0.01	ug/g dry	ND				40	
Phenanthrene	ND	0.02	ug/g dry	ND				40	
Pyrene	ND	0.02	ug/g dry	ND			0.0	40	
Surrogate: 2-Fluorobiphenyl	*1.86*		*ug/g dry*		*115*	*50-140*			
Surrogate: Terphenyl-d14	*1.97*		*ug/g dry*		*123*	*50-140*			
Volatiles									
Benzene	ND	0.02	ug/g dry	ND				50	
Ethylbenzene	ND	0.05	ug/g dry	ND				50	
Toluene	ND	0.05	ug/g dry	ND				50	
m,p-Xylenes	ND	0.05	ug/g dry	ND				50	
o-Xylene	ND	0.05	ug/g dry	ND				50	
Surrogate: Toluene-d8	*3.55*		*ug/g dry*		*92.0*	*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)	208	7	ug/g		104	80-120			
F2 PHCs (C10-C16)	108	4	ug/g	ND	119	60-140			
F3 PHCs (C16-C34)	276	8	ug/g	ND	125	60-140			
F4 PHCs (C34-C50)	183	6	ug/g	ND	131	60-140			
Metals									
Antimony	42.7		ug/L		85.5	70-130			
Arsenic	36.2		ug/L	1.1	70.2	70-130			
Barium	71.7		ug/L	28.2	86.9	70-130			
Beryllium	40.9		ug/L	ND	81.4	70-130			
Boron	43.7		ug/L	ND	78.0	70-130			
Cadmium	44.7		ug/L		89.4	70-130			
Chromium	46.6		ug/L	6.5	80.2	70-130			
Cobalt	41.9		ug/L	2.7	78.4	70-130			
Copper	43.5		ug/L	ND	77.5	70-130			
Lead	45.6		ug/L	3.0	85.1	70-130			
Molybdenum	43.4		ug/L		86.8	70-130			
Nickel	46.5		ug/L	7.1	78.6	70-130			
Selenium	35.1		ug/L	ND	70.2	70-130			
Silver	46.3		ug/L	ND	92.6	70-130			
Thallium	42.6		ug/L	ND	85.1	70-130			
Uranium	43.0		ug/L	ND	85.7	70-130			
Vanadium	50.4		ug/L	ND	82.4	70-130			
Zinc	47.0		ug/L	ND	67.3	70-130			QM-07
Semi-Volatiles									
Acenaphthene	0.230	0.02	ug/g	ND	114	50-140			
Acenaphthylene	*0.193*	*0.02*	*ug/g*	*ND*	96.1	50-140			
Anthracene	0.213	0.02	ug/g	ND	106	50-140			
Benzo [a] anthracene	0.178	0.02	ug/g	ND	88.8	50-140			
Benzo [a] pyrene	0.181	0.02	ug/g	ND	90.1	50-140			
Benzo [b] fluoranthene	0.238	0.02	ug/g	ND	118	50-140			
Benzo [g,h,i] perylene	0.211	0.02	ug/g	ND	105	50-140			
Benzo [k] fluoranthene	0.225	0.02	ug/g	ND	112	50-140			
Chrysene	0.233	0.02	ug/g	ND	116	50-140			
Dibenzo [a,h] anthracene	0.203	0.02	ug/g	ND	101	50-140			
Fluoranthene	0.213	0.02	ug/g	ND	106	50-140			
Fluorene	0.225	0.02	ug/g	ND	112	50-140			
Indeno [1,2,3-cd] pyrene	0.206	0.02	ug/g	ND	102	50-140			
1-Methylnaphthalene	0.229	0.02	ug/g	ND	114	50-140			
2-Methylnaphthalene	0.244	0.02	ug/g	ND	122	50-140			
Naphthalene	0.246	0.01	ug/g	ND	122	50-140			
Phenanthrene	0.227	0.02	ug/g	ND	113	50-140			
Pyrene	0.218	0.02	ug/g	ND	108	50-140			
Surrogate: 2-Fluorobiphenyl	*1.85*		*ug/g*		*115*	*50-140*			
Volatiles									
Benzene	3.56	0.02	ug/g		88.9	60-130			
Ethylbenzene	3.75	0.05	ug/g		93.7	60-130			
Toluene	3.40	0.05	ug/g		85.0	60-130			
m,p-Xylenes	7.71	0.05	ug/g		96.4	60-130			
o-Xylene	3.97	0.05	ug/g		99.2	60-130			

Qualifier Notes:

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:

Revision 1 - Metals results for sample BHMW3-1a-C have been updated based on re-analysis of the original sample

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.