Final Preliminary Hydrogeological Investigation

Upper West Side Draft Plan of Industrial Sub-Division Twenty Road West, Hamilton, Ontario

Client: Corbett Land Strategies Inc.

Project Number: BRM-00801363—B0

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1 Introduction

1.1 Project Description

EXP Services Inc. (EXP) was retained by Corbett Land Strategies Inc. to prepare a Preliminary Hydrogeological Investigation for the property located at Twenty Road West, Hamilton, Ontario (hereinafter referred to as the 'Site'). It is EXP's understanding that the subject lands occupy approximately 961 acres (388.9 ha) in the area bounded by Twenty Road West to the north, Upper James Street to the East, Dickenson Road West to the south, and by Glancaster Road to the West. Figure 1 presents the Site location plan.

The Preliminary Hydrogeological Investigation is required to evaluate the local hydrogeological setting at the Site and to provide recommendations regarding construction dewatering/depressurization in support of the proposed industrial development.

The current Preliminary Hydrogeological Investigation is completed in conjunction with a Preliminary Geotechnical Investigation (EXP, 2018) reported separately.

1.2 Project Objectives

The main objectives of the Preliminary Hydrogeological Investigation are to:

- Establish the local hydrogeological settings within proposed road alignment, SWM ponds and overall Site;
- Assess preliminary construction dewatering/depressurization;
- Asses groundwater quality; and
- Prepare a Preliminary Hydrogeological Investigation Report.

1.3 Scope of Work

To achieve the study objectives, EXP completed the following scope of work:

- Review available geological and hydrogeological information for the Site;
- Install five (5) nested (five (5) shallow and five (5) deep) monitoring well pairs to approximately 6 and 12 mbgs at the possible locations of the SWM ponds.
- Install four (4) intermediate monitoring wells to approximately 8 mbgs along the road alignment;
- Install eight (8) shallow monitoring wells to approximately 6 mbgs distributed across the Site;
- All wells will be installed with 50 mm diameter wells in geotechnical boreholes;
- Develop and conduct Single Well Response Tests (SWRTs) on all monitoring wells to evaluate hydraulic properties of the saturated soils at the Site;
- Complete two (2) rounds of groundwater level measurements in all monitoring wells;
- Collect one (1) groundwater sample from a shallow monitoring well for laboratory testing of the City of Hamilton Sanitary and Storm Sewer Use By-Law parameters, and general chemistry;
- Evaluate the information collected during the field investigation program, including borehole geological information, SWRT results, groundwater level measurements and groundwater water quality;



- Prepare site plans, cross sections, geological mapping, and groundwater contour mapping for the Site;
- Assess vertical hydraulic gradients between shallow and deep monitoring wells;
- Estimate construction dewatering flow rates for the proposed site plan configuration;
- Prepare a Preliminary Hydrogeological Investigation Report.

1.4 Review of Previous Reports

The following reports were reviewed as part of this Preliminary Hydrogeological Investigation:

• **Exp** (June 8, 2018). DRAFT Preliminary Geotechnical Investigation, Upper West Side Draft Plan of Industrial Sub-division, Twenty Road West, Hamilton Ontario.

Relevant information from the referred study was reviewed and utilized for the current Preliminary Hydrogeological Investigation.



2 Hydrogeological Setting

2.1 Regional Setting

2.1.1 Regional Physiography

The Site is located between the Niagara Escarpment and Lake Erie, approximately 5.5 km south of the Niagara Escarpment and 9.0 km south of the Hamilton Harbor. The physiographic region is known as the Haldimand Clay Plain, and the physiographic landform is described as the Clay Plains (Chapman and Putnam, 2007). These clay plains were deposited during the time of Lake Warren (Chapman & Putnam, 2007), around 12,700 years before present. Although the area was all submerged in Lake Warren the underlying till was not all buried by stratified clay. The till comes to surface on the low ridges of the Fort Erie Moraine (Figure 2).

2.1.2 Regional Geology and Hydrogeology

The Site consists predominantly of fine-textured glaciolacustrine deposits. (Ministry of Northern Development and Mines, 2012). The surficial geology for the Site and surrounding areas is shown on Figure 3.

The bedrock in this region consists of dolostone of the Guelph Formation of Lower Silurian Age (Ontario Geological Survey, 2011). The dolostone is sucrosic, fossiliferous, locally biohermal; and locally bituminous (Eramosa Mb). Regions of carbonate rock were identified as susceptible to karstification, and were mapped as potential karst areas beneath the entire Site.

Regional groundwater flow across the area is expected to be generally directed to the north, towards Lake Ontario. However, the flow pattern in the bedrock aquifer is anticipated to be complex due to the influence of karst. Locally, shallow groundwater discharges into Twenty Mile Creek. A portion of the shallow groundwater is interpreted to seep downward into the regional aquifer system. Changes in topography and/or soils, as well as the presence of surface water features and/or existing subsurface infrastructure may influence the regional groundwater flow path. Fragmented recharge areas for the carbonate aquifers of the Niagara Escarpment are presently under investigation by Burt & Mulligan (2017) and Priebe at al. (2018).

2.1.3 Existing Water Well Survey

Well Records from the MOECC Water Well Record (WWR) Database were reviewed to determine the number of water wells present within a 500 m radius of the Site.

The MOECC WWR database indicated total of ninety-seven (97) WWRs in the 500 m zone. These included seven (7) records of wells reportedly located on-site and ninety (90) off-site well records. All the on-site well records are reported as domestic water supply wells, observation/monitoring wells, and abandoned or not used. The domestic wells were reportedly installed from 1949 to 1989, with water found at depths of between 5.1 and 29.4 m.

Reported depth to water (where available) ranged from approximately 2 to 42 mbgs.



It is anticipated that majority of properties in the area are provided with municipal water and sewer services. A well survey is recommended to very the status of the on and off-site water supply wells.

The locations of the MOECC WWRs within 500 m of the Site are shown on Figure 4. A summary of the available MOECC WWRs is included in Appendix A.

2.2 Site Setting

2.2.1 Site Topography

The Site is located within the jurisdiction of the City of Hamilton, at the southeastern fringe of the currently urbanized area, and is surrounded by agricultural fields. The grading of the Site gently slopes east-northeast towards Twenty Mile Creek, with elevations between 234 and 222 masl (borehole elevations). Just south of Dickinson Rd W lies the John C. Munro Hamilton International Airport.

2.2.2 Local Surface Water Features

The Site is located at the headwaters of the Upper Twenty Mile Creek. A series of unnamed, SW to NE striking, streams drain the Site. The flow direction is from a moraine ridge towards Twenty Mile Creek, which eventually discharges into Lake Ontario. In the central portion of the Site there are two smaller ponds along two streams. Twenty Mile Creek flows parallel to the Niagara Escarpment, and is located about 360 m east-northeast of the Site. Lake Ontario is located approximately 14 km northeast of the Site.

Within the Site, patches of MNR evaluated wetlands were delineated about 245 m NE of Dickenson Rd E, Niagara Peninsula Conservation Authority (2006). Several wooded areas were also mapped on-site. Offsite, the entire length of Twenty Mile Creek has been designated as a provincially significant wetland. This wetland is protected under the Greenbelt Act (2005) and it has been designated by the Ministry of Natural Resources as an area of high biodiversity for aquatic and related terrestrial functions. The Rymal Road Wetland Complex is a significant natural area north of the Site, and has been designated as a locally significant wetland.

2.2.3 Wellhead Protection Areas

The Site does not lie within delineated Wellhead Protection Areas (WHPAs). As shown in Figure 5. WHPAs were reviewed for the surrounding source water protection areas for rounding areas of Halton, Hamilton, Grand River and Niagara Conservation Authorities. Lynden well #1 is outside of Twenty Mile Creek watershed, and more than 15.0 km away/ east-northeast from the Site.

2.2.4 Significant Groundwater Recharge Areas

Significant Groundwater Recharge Areas (SGRAs) were reviewed for the surrounding source water protection areas for rounding areas of Halton, Hamilton, Grand River and Niagara Conservation Authorities (Figure 6). As seen in Figure 6, most of the Site lies within SGRAs with vulnerability scores of 4 and 6.

2.2.5 Local Geology and Hydrogeology

Based on the results of the Geotechnical Investigation (**exp** 2018) and the current Preliminary Hydrogeological Investigation, a brief description of the general surficial geology at the Site from top to



bottom, is summarized in the following sections. Borehole completion depths ranged between 6.6 and 12.7 mbgs during the current investigations conducted at the Site. The Preliminary Geotechnical and this Hydrogeological Investigations included a total of thirty-three (33) boreholes advanced at the Site.

A brief description of the soil profiles, in order of depth, follows:

<u>Topsoil</u>

Topsoil was encountered at all borehole locations. The topsoil thicknesses ranged from approximately 100 mm to 175 mm. It should be noted that the topsoil measurements were carried out at the borehole locations only and were found to be variable. A more detailed analysis (involving test pits) is recommended to accurately quantify the amount of topsoil to be removed for construction purposes. Consequently, topsoil quantities should not be established from the information provided at the borehole locations only.

Fill

Fill material consisting of silty clay or silt was encountered at Boreholes BH-02 to BH-04, BH-06 to BH-12, BH-14 and BH-15 below the surficial topsoil and extending to a depth of less than 1.0 m below grade. The material classified as fill may be reworked native soil which was disturbed during the agricultural operations at the Site. The fill was brown or dark brown, in a moist to very moist state, and generally noted to contain rootlets. The moisture content of the fill ranged from 21 to 32 percent of dry mass.

Silt to Sand

Native soils ranging in grain size from silt to silty sand to sand were encountered at all borehole locations. The silts and sands contained varying amounts of clay and gravel and were brown, typically becoming grey below depths of approximately 3 m to 5 m. Silt was encountered beneath the fill in BH-01 to BH-07, BH-09 to BH-11, BH-14 and BH15, underlain by silty sand in BH-01, BH-04 and BH-06; silt carried down to the termination depth of boreholes BH-03, BH-07, BH-08 and BH-10 to BH-14. Silty sand to sand was encountered beneath the fill in Borehole BH-13, in turn underlain by silt, and below silty clay in BH-05 and BH-15.

The soils were in a moist to wet state with moisture contents ranging from 9 to 25 percent of dry mass. Based on SPT N values ranging from 2 to greater than 100 blows per 305 mm of penetration, the soils were classified as very loose to very dense in compactness condition but were more typically in a compact to dense state.

Based on five (5) grain size analyses, the soils ranged from 35 to 86 percent silt, 4 to 63 percent sand, and 2 to 20 percent clay

Silty Clay

Native silty clay strata were encountered at BH-1, BH-2, BH-4, BH-5, BH-8, BH-9, BH-12, and BH-15 at widely varying depths and with variable thicknesses. The silty clay was generally noted to contain trace to some sand and occasional gravel with pockets or layers of sand and silt materials noted at Borehole BH-15. The silty clay was brown or grey and in a damp to wet state with moisture contents ranging from 11 to 32 percent of dry mass. Based on SPT N values ranging from 3 to 50 blows per 305 mm of penetration and undrained shear strengths from pocket penetrometer readings of 25 to greater than 225 kPa, the silty clay is classified as soft to hard in consistency but was more typically very stiff to hard.



Based on two (2) grain size analyses, the silty clay consisted of 53 to 69 percent silt, 25 to 26 percent clay, 5 to 18 percent sand, and 0 to 4 percent gravel. The silty clay was of low plasticity based on two (2) Atterberg Limits tests.

The borehole/monitoring well locations are shown on Figure 7. Geological cross-sections were generated based on the available borehole logs completed as part of the current investigations and shown on Figure 8 (Cross-Section A-A'), and Figure 9 (Cross-Section B-B'). Borehole logs used to generate the cross-sections are provided in Appendix B.



3 Background

3.1 Monitoring Well Details

As part of the current investigations, thirty-three (33) boreholes were advanced at the Site. Twenty-two (22) of which were completed with monitoring well installations (BH1, BH5, BH7, BH8, BH9, BH11, BH12, BH13, BH15, BH17, BH18, BH25, BH29S/D, BH30S/D, BH31S/D, BH32S/D and BH33S/D). All on-site wells were completed as 50 mm diameter monitoring wells to depths ranging from 6.1 to 12.7 mbgs. The monitoring wells have 3 m long screens and above ground monument protective casings.

The monitoring well locations are shown on Figure 4. The borehole logs for each monitoring well of this investigation are presented in Appendix B. A geodetic elevation survey was completed as part of exp's current investigation.

3.2 Water Level Monitoring

Static water levels were recorded on various dates in June 2018, for the current investigation. A summary of all water level monitoring data to date as it relates to the elevation survey is summarized in Appendix C.

The groundwater elevation in the shallow wells ranged from 221.36 masl (0.63 m bgs in BH/WW 32-S on June 14, 2018) to 234.96 masl (0.34 m bgs in BH/MW 25 on June 5, 2018).

The groundwater elevation in the deep/intermediate wells ranged from 221.26 masl (0.73 m bgs in BH/WW 32-D on June 14, 2018) to 237.15 masl (0.78 mbgs in BH/MW 1 on June 5, 2018).

The nested monitoring wells all indicated upward vertical gradients except for BH/MW 32-S/D and BH/MW 33-S/D.

Several monitoring wells had artesian conditions during the monitoring events, including BH/MW 11, BH/MW 13, BH/MW 18, BH/MW 29-S, BHMW 29-D, BH/MW 30-D, and BH/MW 31-D. These wells exhibited water levels up to 2.8 m above ground surface.

Figure 10 presents the interpreted shallow groundwater contour map for the overburden flow system as measured on June 13/14, 2018. Based on the water level measurements obtained, the inferred direction of shallow groundwater flow across the Site is interpreted to be easterly, towards the Upper Twenty Mile Creek.

Figure 11 depicts the deduced deep groundwater contour map for the deep aquifer flow system as measured on June 13/14, 2018. Based on the measured water levels, the inferred flow direction of deep groundwater across the Site is concluded to be east, also towards the Upper Twenty Mile Creek.

It should be noted that groundwater levels are subject to seasonal fluctuations and can vary in response to prevailing climate conditions; this may also affect the direction of shallow groundwater flow.

3.3 Hydraulic Conductivity Testing

Twenty-two (22) Single Well Response Tests (SWRTs) were completed during the current investigation. The SWRTs (rising and falling head tests) were completed at all monitoring wells beginning on June 13, 2018. The SWRTs were completed to estimate the hydraulic conductivity (K) of the soils at the well screen depths.



The static water level within each monitoring well was measured prior to the start of testing. In advance of performing SWRTs, each monitoring well underwent development to remove fines introduced into the screens following construction. The development process involved purging of the monitoring wells to induce the flow of fresh formation water through the screen. Each monitoring well was permitted to fully recover prior to performing SWRTs.

Hydraulic conductivity values were calculated from the SWRT data as per the Hvorslev's solution included in the AQTESOLV V.4.50.002 software package. The semi-log plots for normalized head versus time analytical results (h/h_0) and the standard operating procedures (SOP) for SWRTs are included in Appendix D.

A summary of the hydraulic conductivity (K) values estimated from the SWRTs are provided in Table 3-1.

Monitoring Well ID	Well Depth (mbgs)	Screened Interval (mbgs)	Formation Screened	Estimated Hydraulic Conductivity (m/s)					
BH/MW 1	7.6	4.6 - 7.6	Silt	1.1 x 10 ⁻⁸					
BH/MW 5	6.1	4.6 - 6.1	Silt	6.2 x 10 ⁻⁷					
BH/MW 7	7.7	4.7 – 7.7	Silt	6.8 x 10 ⁻⁸					
BH/MW 8	8.1	5.1 – 8.1	Sandy Silt to Silty Sand, Silty Clay	7.3 x 10 ⁻⁸					
BH/MW 9	6.2	4.7 - 6.2	Silt	9.3 x 10⁻ ⁸					
BH/MW 11	8.1	6.7 – 8.1	Silty Sand to Sand	1.4 x 10 ⁻⁵					
BH/MW 12	6.1	4.6 - 6.1	Silt, Silty Sand to Sandy Silt	4.6 x 10 ⁻⁶					
BH/MW 13	6.1	4.6 - 6.1	Silt	1.8 x 10⁻ ⁸					
BH/MW 15	6.6	3.6 - 6.6	Silt, Silty Clay	4.1 x 10 ⁻⁸					
BH/MW 17	6.2	4.7 - 6.2	Silt	3.6 x 10⁻ ⁸					
BH/MW 18	6.2	4.7 - 6.2	Silty Sand to Sandy Silt	1.0 x 10 ⁻⁶					
BH/MW 25	6.2	4.7 - 6.2	Silt	1.8 x 10 ⁻⁶					
BH/MW 29-S	6.2	4.7 - 6.2	Sandy Silt to Sandy Silt	1.8 x 10 ⁻⁶					
BH/MW 29-D	12.2	10.7– 12.2	Silty Sand to Sandy Silt	2.4 x 10 ⁻⁵					
BH/MW 30-S	6.2	4.7 - 6.2	Silt	1.2 x 10 ⁻⁸					
BH/MW 30-D	12.2	10.7 – 12.2	Silty Sand to Sandy Silt	4.9 x 10 ⁻⁶					
BH/MW 31-S	6.2	4.7 – 6.2	Silty Clay	7.4 x 10 ⁻⁸					
BH/MW 31-D	10.3	8.8 – 10.3	Silty Clay, Silty Sand	1.3 x 10 ⁻⁶					
BH/MW 32-S	6.2	4.7 - 6.2	Silty Clay	9.1 x 10 ⁻⁸					
BH/MW 32-D	12.2	10.7 – 12.2	Silty Clay	5.5 x 10 ⁻⁸					
BH/MW 33-S	6.2	4.7 - 6.2	Silt	9.2 x 10 ⁻⁸					
BH/MW 33-D	12.2	10.7 – 12.2	Silty Sand	3.9 x 10 ⁻⁷					
	Highest K estimate								
Geor	3.8 x 10⁻ ⁶								

Table 3-1: Summary of Hydraulic Conductivity Testing



Monitoring Well ID	Well Depth (mbgs)	Screened Interval (mbgs)	Formation Screened	Estimated Hydraulic Conductivity (m/s)		
	7.8 x 10⁻ ⁸					

Note: Monitoring well installation details were obtained from the borehole logs (Appendix B).

SWRTs provide estimates of K for the geological formation in the immediate media zone surrounding the well screens. As shown in Table 3-1 the highest measured K estimate is 2.4×10^{-5} m/s and the geometric mean K value for the Sandy deposits is calculated as 3.8×10^{-6} m/s and for silts and clays 7.8×10^{-8} m/sec.

3.4 Groundwater Quality

To assess the suitability for discharge of pumped groundwater to the City of Hamilton's Sanitary and Strom Sewer during dewatering activities, one (1) groundwater sample was collected from monitoring well BH/MW29-D (artesian well) on June 14, 2018 using a peristaltic pump. Prior to collecting the sample, approximately three (3) standing well volumes of groundwater were purged from the well.

The sample was collected unfiltered and placed into pre-cleaned laboratory-supplied vials and/or bottles provided with analytical test group specific preservatives, as required. Dedicated nitrile gloves were used during sample handling. The groundwater samples were submitted to a CALA certified independent laboratory, Maxxam Analytics Inc., in Mississauga, Ontario for analysis.

The laboratory CofA shows that all parameters were detected at concentrations below both the Sanitary and Storm Sewer Use By-Law criteria.

When compared to Provincial Water Quality Objectives (PWQO), the concentration of Total Iron was above the criteria. It is noted that the detection limits of certain semi-volatiles, metals and pesticides and herbicides were above the PWQO limits.

Analytical results are provided in Appendix E.

It should be noted that, during construction, it is anticipated that TSS levels and some other parameters (for example, Total Metals) in the pumped groundwater may become elevated and exceed the By-Law limits. Therefore, it is recommended that a suitable treatment method be implemented (filtration or decantation facilities and/ or any other applicable treatment system) during construction dewatering activities to discharge to storm sewer, if applicable. The specifications of the treatment system will need to be adjusted to the water quality by the treatment contractor/process engineer.

Approval to discharge water to municipal sewer system during construction will be required from the City of Hamilton prior to any discharge.



4 Preliminary Safe Excavation Depth (SED) Estimates

4.1 Methodology

The presence of confined/semi confined water bearing deposits underlying the silty clay, may cause, under certain conditions, basal heave or base instability during excavations. The potential for basal heave during excavation activities exists, if there is an insufficient weight or downward pressure from the overlying overburden onto the confined aquifer and granular interlayers. As a result, SEDs were estimated for the Site.

The SEDs at the Site were estimated as per the general guidelines provided in the Canadian Foundation Engineering Manual (CFEM), 4th Edition (2006). It is noted that the IMED is referred to as the Safe Excavation Depth (SED) in the CFEM (2006). The CFEM (2006) recommends maintaining a minimum of a 1.4 factor of safety when estimating the safe excavation depths in an area having base heave potential. Therefore, for estimating SEDs for the Site, a safety factor of 1.4 was used.

The SED equation is described as follows:

$$h = (F_s \times \gamma_\omega \times h_\omega)/\gamma_s$$

Where:

- h: Remaining cover thickness above (confined) aquifer top (m)
- Fs: Factor of Safety (1.4)
- γ_{ω} : Unit weight of water (9.81 KN/m³)
- h_{ω} : Piezometric level above aquifer top (m)
- γ_s : Unit weight of soil cover (21 KN/m³)

The SEDs were estimated at each monitoring well location, for boreholes where granular deposits (sand, silts) and where pressurized conditions were observed, as shown in Appendix F. The SED ranged from ground surface to 2.4 mbgs. The safe excavation elevation at the BH locations ranged from 221.1 to 236.9 masl and SED contours are shown on Figure 12 enclosed. SED estimates should be revisited upon final design.

4.2 Safe Excavation Depth and Implications on Development

Although the site plan details were not available at the time of writing this report, it's our understanding that the that development includes a mixed-use commercial, employment blocks, construction of five (5) SWM ponds, and installation of underground services.

The following must be considered for the proposed development:

Temporary Excavation



Temporary excavations below the SED are feasible for service installations, provided the areas are depressurized during construction and backfilled to restore pre-development conditions (i.e. replacement of the confining cap) and potential settlement monitoring.

Permanent Excavation

Permanent excavations below the SED for the SWM ponds would require continuous depressurization of the underlying deposits. However, depressurization is not a suitable long-term solution. The SWM ponds should be constructed above the SED.

Permanent excavations below the SED for any underground structures (basements) would require continuous depressurization of the underlying deposits (or impermeable structures of sufficient weight). However, depressurization is not a suitable long-term solution. The basements should be constructed above the SED.

It should be noted that the SED at BH/MW18 and BHM 29-D are at ground surface. Consideration should be given to fill this area prior to any development.



5 Construction Dewatering Assessment

5.1 Construction Dewatering

Although the site plan details were not available at the time of writing this report, it's our understanding that the development will include mixed-use commercial, employment blocks, construction of five (5) SWM ponds, and installation of underground services.

The groundwater elevation in the shallow wells ranged from 221.36 masl (0.63 m bgs in BH/WW 32-S on June 14, 2018) to 234.96 masl (0.34 m bgs in BH/MW 25 on June 5, 2018).

The groundwater elevation in the deep/intermediate wells ranged from 221.26 masl (0.73 m bgs in BH/WW 32-D on June 14, 2018) to 237.15 masl (0.78 mbgs in BH/MW 1 on June 5, 2018).

Several monitoring wells had artesian conditions during the monitoring events, including BH/MW 11, BH/MW 13, BH/MW 18, BH/MW 29-S, BHMW 29-D, BH/MW 30-D, and BH/MW 31-D. These wells exhibited water levels up to 2.8 m above ground surface.

Artesian conditions recorded at the Site are expected to be associated with the silty sand layer encountered at numerous monitoring wells, that is confined by the overlying silty clay.

The main soil formations at the Site are silty sand/sandy silt and clayey silt/silty clay. The SWRT test results show that the hydraulic conductivity values for the shallow soil formations at the Site with the highest measured K estimate for sandy deposit is 2.4×10^{-5} m/s and the geometric mean K of sandy deposits is estimated as 7.8×10^{-8} m/s.

The soil types, groundwater elevations and estimated hydraulic conductivity values for the Site suggests that if the construction remains above the SED elevations, this would limit the dewatering effort. However, if construction is below the SED, construction dewatering will be required to depressurize the underlying aquifer to prevent basal heave.

Artesian groundwater conditions were encountered during the groundwater monitoring events at the Site. This may bring excavation depth restrictions, in addition to the groundwater management requirements during the construction phase of the project. During construction groundwater levels should be lowered to below the excavation bottom.

Based on the artesian conditions encountered and site, seasonal and continuous groundwater monitoring is recommended to support final designs. SED estimates and dewatering approaches should be revisited upon final design.

When site plan details become available, construction and long-term dewatering rates can be estimated. Due to the confined and artesian conditions we recommend keeping as much of the design and construction above the SED as possible, otherwise the underlying confined aquifer will need to be depressurized to limit the risk of basal heave.



6 Conclusions and Recommendations

Based on the findings of the Preliminary Hydrogeological Investigation, the following summary of findings and conclusions are provided:

- The Site is located between the Niagara Escarpment and Lake Erie, within a physiographic region known as the Haldimand Clay Plain, and a physiographic landform described as the Clay Plains (Chapman and Putnam, 2007).
- Regional groundwater flow across the area is expected to be generally directed to the north, towards Lake Ontario. However, the flow pattern in the bedrock aquifer is anticipated to be complex due to the influence of karst. Locally, shallow groundwater discharges into Twenty Mile Creek.
- It is anticipated that majority of properties in the area are provided with municipal water and sewer services. A well survey is recommended to very the status of the on and off-site water supply wells.
- The grading of the Site gently slopes east-northeast towards Twenty Mile Creek, with elevations between 234 and 222 masl.
- The Site is located at the headwaters of the Upper Twenty Mile Creek. A series of unnamed, SW to NE striking, streams drain the Site. The flow direction is from a moraine ridge towards Twenty Mile Creek, which eventually discharges into Lake Ontario. In the central portion of the Site there are two smaller ponds along two streams. Twenty Mile Creek flows parallel to the Niagara Escarpment, and is located about 360 m east-northeast of the Site. Lake Ontario is located approximately 14 km northeast of the Site.
- Within the Site, patches of MNR evaluated wetlands were delineated about 245 m NE of Dickenson Rd E, Niagara Peninsula Conservation Authority (2006). Several wooded areas were also mapped on-site. Off-site, the entire length of Twenty Mile Creek has been designated as a provincially significant wetland. This wetland is protected under the Greenbelt Act (2005) and it has been designated by the Ministry of Natural Resources as an area of high biodiversity for aquatic and related terrestrial functions. The Rymal Road Wetland Complex is a significant natural area north of the Site, and has been designated as a locally significant wetland.
- The Site does not lie within delineated Wellhead Protection Areas (WHPAs).
- Significant Groundwater Recharge Areas (SGRAs) were reviewed for the surrounding source water protection areas for rounding areas of Halton, Hamilton, Grand River and Niagara Conservation Authorities (Figure 6). As seen in Figure 6, most of the Site lies within SGRAs with vulnerability scores of 4 and 6. In light of artesian conditions in certain areas of the site, these areas are not likely Significant Groundwater Recharge Areas.
- The groundwater elevation in the shallow wells ranged from 221.36 masl (0.63 m bgs in BH/WW 32-S on June 14, 2018) to 234.96 masl (0.34 m bgs in BH/MW 25 on June 5, 2018).
- The groundwater elevation in the deep/intermediate wells ranged from 221.26 masl (0.73 m bgs in BH/WW 32-D on June 14, 2018) to 237.15 masl (0.78 mbgs in BH/MW 1 on June 5, 2018). Seasonal and continuous groundwater level monitoring is recommended.



- The nested monitoring wells all indicated upward vertical gradients except for BH/MW 32-S/D and BH/MW 33-S/D.
- Seven (7) monitoring wells had artisian conditions during the monitoring events, including BH/MW 11, BH/MW 13, BH/MW 18, BH/MW 29-S, BHMW 29-D, BH/MW 30-D, and BH/MW 31-D. These wells exhibited water levels up to 2.8 m above ground surface.
- It is expected that groundwater in the silty sand bed encountered at depth is confined.
- The highest measured K estimate is 2.4 x10⁻⁵ m/s and the geometric mean K value for the sandy deposit is 3.8 x 10⁻⁶ m/s and for the silt and clay deposits 7.8 x 10⁻⁸ m/sec.
- The laboratory CofA shows that all parameters were detected at concentrations below both the Sanitary and Storm Sewer Use By-Law criteria.
- When compared to Provincial Water Quality Objectives (PWQO), the concentration of Total Iron was above the criteria. It is noted that the detection limits of certain semi-volatiles, metals and pesticides and herbicides were above the PWQO limits.
- Due to the confined and artisan conditions we recommend keeping as much of the design and construction above the SED as possible, otherwise the underlying aquifer will need to be depressurized to limit the risk of basal heave. The SED at BH/MW 18 and BHM 29-D are at ground surface. Consideration should be given to fill this area prior to any development. SED estimates should be revisited upon final design.
- Once design details are available, construction dewatering flow rates and potential impact can be evaluated.



7 Limitations

This report is based on a limited investigation designed to provide information to support an assessment of the current hydrogeological conditions within the study area. The conclusions and recommendations presented within this report reflect Site conditions existing at the time of the assessment. **exp** must be contacted immediately if any unforeseen Site conditions are experienced during the dewatering activities. This will allow **exp** to review the new findings and provide appropriate recommendations to allow the construction to proceed in a timely and cost effective manner.

Our undertaking at **exp**, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the geoscience/engineering profession. No other warranty or representation, either expressed or implied, is included or intended in this report.

This report was prepared for the exclusive use of Corbet Land Strategies. This report may not be reproduced in whole or in part, without the prior written consent of **exp**, or used or relied upon in whole or in part by other parties for any purposes whatsoever. Any use which a third party makes of this report, or any part thereof, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. **exp** Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We trust that this information is satisfactory for your purposes. Should you have any questions or comments, please do not hesitate to contact this office.

ROFES Sincerely, **EXP Services Inc.** 69 E E REINHARD C. ZAPATA BLOSA PRACTISING MEMBER 0 CHRISTOPHER RYAN SMITH 1426 PRACTISING MEMBER 1950 Ryan Smith, M.Sc., P. Geo Reinhard Zapata, PH.D, P. Geo Senior Hydrogeologist Senior Hydrogeologist **Environmental Services Environmental Services** FRANCOIS CHARTIER PRACTISING MEMORE Francois Chartier, M.Sc., P. Geo PRACTISING MEMBER Head of Hydrogeology Group 2270 **Environmental Services** ONTAR



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Figures





Carrer Rollwings Rot- Burter Rollwings Rot-	ADTUINE PUT DECEMBER ADT DECEMBER ADT DEC	Contracting of the second of t	
Legend Approximate Site Boundary Escarpments Till Moraines Clay Plains Kame Moraines		0 500 1,000 2,000	3,000 4,000 5,000 m
EXP Services Inc. 1595 Clark Boulevard Brampton, ON, L6T 4V1 Phone: +1.905.793.9800 Fax: +1.905.793.0641	PROJECT TITLE: PRELIMINARY HYDROGEOLOGICAL INVESTIGATION PROPOSED GLANBROOK INDUSTRIAL PARK TWENTY ROAD WEST HAMILTON, ONTARIO	DRAWING TITLE: REGIONAL PHYSIOGRAPHY	PROJECT No.: DVN: BRM-00801363-B0 AC SCALE: AS NOTED DATE: FEBRUARY 2018 DWG No.: 2

Dickensor	Row Contract Ave to Tallorest Trail	Abbotsford Trail - E	Veroaks Dr. Oran Ba Cathy Dr. Oran Ba Cathy Dr. Oran Ba Creating Creating Creatin
Legend Approximate Site Boundary 8a: Fine-textured glaciolacustrine deposits 19: Modern alluvial deposits		0 100 200 400	600 800 1,000 m
EXP Services Inc. 1595 Clark Boulevard Brampton, ON, L&T 4V1 Phone: +1.905.793.9800 Fax: +1.905.793.0641	PROJECT TITLE: PRELIMINARY HYDROGEOLOGICAL INVESTIGATION PROPOSED GLANBROOK INDUSTRIAL PARK TWENTY ROAD WEST HAMILTON, ONTARIO	DRAWING TITLE:	PROJECT No.: BRM-00801363-B0 AC SCALE: AS NOTED RS DATE: FEBRUARY 2018 DWG. No.: 3



				PROJECT No.:	DWN:
1 AND	EXP Services Inc.		DRAWING TITLE:	BRM-00801363-B0	AC
rexp.	1595 Clark Boulevard Brampton, ON, L6T 4V1 Phone: 11 005 703 0800	PRELIMINARY HYDROGEOLOGICAL INVESTIGATION PROPOSED GLANBROOK INDUSTRIAL PARK TWENTY ROAD WEST HAMILTON, ONTARIO	MOECC WATER WELL RECORDS MAP	SCALE: AS NOTED	CHKD: RS
I	Fax: +1.905.793.0641			DATE: FEBRUARY 2018	DWG. No.: 4



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EXP Services Inc. 1595 Clark Boulevard Brampton, ON, L6T 4V1 Phone: +1.905.793.9800 Fax: +1.905.793.0641	PROJECT TITLE: PRELIMINARY HYDROGEOLOGICAL INVESTIGATION PROPOSED GLANBROOK INDUSTRIAL PARK TWENTY ROAD WEST HAMILTON, ONTARIO	DRAWING TITLE: SIGNIFICANT GROUNDWATER RECHARGE AREAS	PROJECT No.: BRM-00801363-B0 SCALE: AS NOTED DATE: FEBRUARY 2018	DWN: AC CHKD: RS DWG, No.: 6





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t: +1.905.793.9800 | f: +1.905.793.0641 1595 Clark Boulevard SAFE EXCAVATION ELEVATION Brampton, ON L6T 4V1 Safe Excavation Elevation (m) / Preliminary Hydrogeological Investigation 0.1 m Canada Safe Excavation Depth (m bgs) RS AS NOTED www.exp.com Twenty Road West Hamilton, Ontario 180 270 360 450 0 90 12 **JUNE 2018** •BUILDINGS • EARTH & ENVIRONMENT • ENERGY • m INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY •

Appendix A: Available MOECC WWR Summary Table



	On-Site												
		DATE	F 4 67-00	NORTHON	ELEVATION		CTREET		DISTANCE TO SITE	WATER	4.1.1105	a	
BORE_HOLE_	WELL_ID	DATE	EAST83	NORTH83	(m ASL)	LOCATION ACCURACY	STREET	CITY	CENTROID (m)	FOUND	1st USE	2nd USE	FINAL STATUS
10481063	6803602	6/21/1966	587680	4782126	233.5	margin of error : 100 m - 300 m			449	95 ft	Livestock	Domestic	Water Supply
10481068	6803607	8/27/1949	588858	4782664	224.3	unknown UTM			943	66 ft	Domestic		Water Supply
10481302	6803841	10/19/1953	587499	4781912	237.6	unknown UTM			728		Domestic		Water Supply
10481303	6803842	9/15/1965	587805	4781825	235.3	margin of error : 100 m - 300 m			685	96 ft	Domestic		Water Supply
10486258	6808904	7/18/1974	587371	4783224	235.5	margin of error : 30 m - 100 m			915	20 ft	Domestic		Water Supply
10486709	6809363	4/10/1976	587410	4782459	235.1	margin of error : 30 m - 100 m			521	97 ft	Domestic		Water Supply
10488954	6811640	3/6/1989	588244	4782872	229.8	margin of error : 100 m - 300 m			488	17 ft	Domestic		Water Supply
							Off-Site						
	WELL ID	DATE	EACTOD		ELEVATION		CTREET	CITY	DISTANCE TO SITE	WATER		and LISE	EINAL STATUS
BORE_HOLE_	WELL_ID	DATE	EASTOS	NORTHOS	(m ASL)	LOCATION ACCURACY	JINEEI	GIT	CENTROID (m)	FOUND	151 032	2110 036	FINAL STATUS
10480605	6803144	9/25/1957	587096	4783492	237.5	unknown UTM			1297	90 ft	Domestic		Water Supply
10480610	6803149	9/19/1960	586917	4783555	238.6	margin of error : 100 m - 300 m			1463	113 ft	Domestic		Water Supply
10480611	6803150	9/25/1965	587259	4783470	234.0	margin of error : 100 m - 300 m			1180	38 ft	Domestic		Water Supply
10480612	6803151	5/4/1966	587063	4783515	239.2	margin of error : 100 m - 300 m			1335	36 ft	Domestic		Water Supply
10480614	6803153	9/13/1952	587447	4783438	231.6	unknown UTM			1056	70 ft	Domestic		Water Supply
10480615	6803154	9/15/1953	587374	4783410	230.6	unknown UTM			1067	90 ft	Domestic		Water Supply
10480616	6803155	9/21/1953	587389	4783412	230.7	unknown UTM			1061	82 ft	Domestic		Water Supply
10480617	6803156	11/30/1957	587648	4783337	231.4	unknown UTM			884	109 ft	Domestic		Water Supply
10480618	6803157	7/31/1959	587655	4783342	231.2	margin of error : 100 m - 300 m			887	116 ft	Domestic		Water Supply
10480619	6803158	2/23/1955	588102	4783203	229.9	unknown UTM			725	80 ft	Domestic		Water Supply
10480620	6803159	5/11/1955	588190	4783168	229.9	unknown UTM			718	100 ft	Domestic		Water Supply
10480621	6803160	5/1/1956	588097	4783208	229.8	unknown UTM			728	100 ft	Domestic		Water Supply
10480623	6803162	1/26/1957	587979	4783376	226.9	unknown UTM			878	75 ft	Domestic		Water Supply
10480631	6803170	2/2/1954	588722	4783033	221.2	unknown UTM			956	94 ft	Domestic		Water Supply
10480634	6803173	7/27/1964	588398	4783103	224.9	margin of error : 100 m - 300 m			764	80 ft	Domestic		Water Supply
10480678	6803217	3/26/1955	589311	4782698	220.2	unknown UTM			1396	108 ft	Domestic		Water Supply
10480685	6803224	10/7/1955	588953	4782813	221.2	unknown UTM			1070	108 ft	Domestic		Water Supply
10480702	6803241	9/16/1957	589303	4782709	220.3	unknown UTM			1389	62 ft	Domestic		Water Supply
10480704	6803243	3/5/1958	589391	4782687	217.8	unknown UTM			1473	78 ft	Domestic		Water Supply
10481062	6803601	11/12/1964	586882	4782130	238.9	margin of error : 100 m - 300 m			1111	115 ft	Domestic		Water Supply
10481064	6803603	11/10/1954	588662	4782890	222.5	unknown UTM			830	100 ft	Livestock	Domestic	Water Supply
10481065	6803604	10/8/1956	588152	4781783	230.1	unknown UTM			750	120 ft	Domestic		Water Supply
10481066	6803605	5/22/1958	588129	4781783	230.2	unknown UTM			743	86 ft	Domestic		Water Supply
10481067	6803606	5/29/1967	588410	4782021	227.1	margin of error : 100 m - 300 m			678	15 ft	Domestic		Water Supply
10481072	6803611	10/18/1954	589308	4782309	222.9	unknown UTM			1391	58 ft	Domestic		Water Supply
10481074	6803613	6/17/1955	589138	4781842	222.4	unknown UTM			1375	100 ft	Domestic		Water Supply
10481075	6803614	6/24/1955	589308	4782346	222.0	unknown UTM			1387	56 ft	Domestic		Water Supply
10481076	6803615	7/26/1955	589313	4782354	221.7	unknown UTM			1391	56 ft	Domestic		Water Supply
10481077	6803616	8/20/1955	589298	4782288	223.4	unknown UTM			1385	58 ft	Domestic		Water Supply
10481078	6803617	10/26/1955	589288	4782213	223.2	unknown UTM			1388	41 ft	Domestic		Water Supply
10481079	6803618	3/26/1957	589166	4782805	219.6	unknown UTM			1274	55 ft	Domestic		Water Supply
10481080	6803619	5/21/1957	589153	4781834	222.8	unknown UTM			1392	65 ft	Domestic		Water Supply
10481082	6803621	1/25/1958	589417	4782662	217.9	unknown UTM			1496	71 ft	Domestic		Water Supply
10481083	6803622	4/24/1958	589263	4782186	222.9	unknown UTM			1370	50 ft	Domestic		Water Supply
10481084	6803623	5/20/1958	589114	4782830	220.1	unknown UTM			1230	70 ft	Domestic		Water Supply
10481085	6803624	5/23/1958	589071	4782828	220.1	unknown UTM			1188	56 ft	Domestic		Water Supply
10481086	6803625	7/10/1958	589071	4782828	220.1	unknown UTM			1188	0 ft	Not Used		Abandoned-Quality
10481087	6803626	7/24/1958	589193	4781950	220.3	margin of error : 100 m - 300 m			1378	84 ft	Domestic		Water Supply
10481088	6803627	8/8/1958	589333	4782409	220.2	margin of error : 100 m - 300 m			1406	82 ft	Domestic		Water Supply

10481090	6803629	8/15/1958	589345	4782391	220.3	margin of error : 100 m - 300 m			1420	86 ft	Domestic	Water Supply
10481091	6803630	8/20/1958	589063	4782840	220.1	margin of error : 100 m - 300 m			1184	77 ft	Domestic	Water Supply
10481092	6803631	1/15/1959	589225	4782070	220.5	margin of error : 100 m - 300 m			1365	62 ft	Domestic	Water Supply
10481093	6803632	3/2/1959	588991	4782865	220.6	margin of error : 100 m - 300 m			1123	76 ft	Domestic	Water Supply
10481094	6803633	3/9/1959	589048	4782843	220.1	margin of error : 100 m - 300 m			1170	70 ft	Domestic	Water Supply
10481095	6803634	5/7/1960	589163	4781877	221.4	margin of error : 100 m - 300 m			1381	60 ft	Domestic	Water Supply
10481097	6803636	3/15/1961	589149	4782833	220.2	margin of error : 100 m - 300 m			1264	68 ft	Domestic	Water Supply
10481100	6803639	8/14/1963	589250	4782158	222.3	margin of error : 100 m - 300 m			1364	15 ft	Domestic	Water Supply
10481119	6803658	5/5/1962	589238	4781997	220.2	margin of error : 100 m - 300 m			1401	32 ft	Domestic	Water Supply
10481298	6803837	7/16/1956	586857	4782094	239.0	unknown UTM			1147	110 ft	Domestic	Water Supply
10481299	6803838	7/21/1956	587175	4781979	237.2	unknown UTM			916	140 ft	Domestic	Water Supply
10481300	6803839	8/27/1956	587045	4782040	237.9	unknown UTM			997	127 ft	Domestic	Water Supply
10481301	6803840	1/20/1965	586892	4782097	238.8	margin of error : 100 m - 300 m			1113	119 ft	Domestic	Water Supply
10484370	6806931	2/19/1968	586779	4782083	240.0	margin of error : 30 m - 100 m			1223	24 ft	Domestic	Water Supply
10484444	6807008	2/20/1969	586774	4782003	240.0	margin of error : 30 m - 100 m			1258	30 ft	Domestic	Water Supply
10484470	6807034	2/24/1969	587359	4781868	237.7	margin of error : 30 m - 100 m			851	44 ft	Domestic	Water Supply
10484758	6807337	10/9/1969	588334	4783043	226.9	margin of error : 30 m - 100 m			678	80 ft	Domestic	Water Supply
10484771	6807351	8/20/1969	588344	4783033	226.8	margin of error : 30 m - 100 m			676	25 ft	Domestic	Water Supply
10484774	6807354	9/6/1969	588294	4783043	227.8	margin of error : 30 m - 100 m			655	40 ft	Domestic	Water Supply
10484836	6807419	10/8/1969	587594	4783253	231.6	margin of error : 30 m - 100 m			825	20 ft	Domestic	Water Supply
10485508	6808127	6/23/1972	586834	4782043	239.1	margin of error : 30 m - 100 m			1187	30 ft	Domestic	Water Supply
10485510	6808129	6/23/1972	587554	4781763	235.4	margin of error : 30 m - 100 m			826	50 ft	Domestic	Water Supply
10485831	6808463	5/30/1973	588753	4782918	223.1	margin of error : 30 m - 100 m			924	5 ft	Domestic	Water Supply
10485868	6808501	7/13/1973	586914	4781963	237.6	margin of error : 30 m - 100 m			1148	35 ft	Domestic	Water Supply
10485967	6808601	9/6/1973	586934	4781953	237.4	margin of error : 30 m - 100 m			1135	37 ft	Domestic	Water Supply
10485970	6808604	9/4/1973	587094	4781903	236.3	margin of error : 30 m - 100 m			1026	48 ft	Domestic	Water Supply
10486186	6808826	6/13/1974	588702	4782951	221.7	margin of error : 30 m - 100 m			895	20 ft	Domestic	Water Supply
10486256	6808901	7/23/1974	587054	4783403	240.0	margin of error : 30 m - 100 m			1259	2010 8 ft	Domestic	Water Supply
10486259	6808905	7/25/1974	588141	4781653	229.8	margin of error : 30 m - 100 m			872	30 ft	Domestic	Water Supply
10486343	6808990	10/15/1974	589116	4782711	221.0	margin of error : 30 m - 100 m			1205	15 ft	Domestic	Water Supply
10486420	6809067	1/3/1975	587066	4783419	239.3	margin of error : 30 m - 100 m			1262	15 ft	Domestic	Water Supply
10486569	6809218	7/30/1975	587777	4783191	230.2	margin of error : 30 m - 100 m			709	33 ft	Domestic	Water Supply
10487503	6810174	8/7/1980	58709/	4783383	240.0	margin of error : 30 m - 100 m			1216	10 ft	Domestic	Water Supply
10487964	6810640	1/13/1983	588489	4782221	227.6	unknown UTM			625	47 ft	Domestic	water suppry
10488374	6811058	7/4/1986	586993	4783073	240.2	margin of error : 100 m - 300 m			1099	15 ft	Domestic	Water Supply
10488406	6811091	11/20/1986	587510	4783279	234.9	margin of error : 100 m - 300 m			886	15 ft	Domestic	Water Supply
10488651	6811336	9/1//1987	587087	4781920	236.5	margin of error : 100 m - 300 m			1023	110 ft	Domestic	water suppry
10489061	6811747	7/27/1989	587277	4781826	235.6	margin of error : 100 m - 300 m			938	93 ft	Domestic	
10489242	6811928	7/11/1990	587007	4781931	235.0	margin of error : 100 m - 300 m			1084	135 ft	Not Used	Observation Wells
10489452	6812138	10/21/1991	587858	4783180	230.0	margin of error : 100 m - 300 m			685	155 ft	Domestic	Water Supply
10489530	6812216	5/25/1992	587471	4781784	226.2	margin of error : 100 m - 300 m			850	25 ft	Domestic	Water Supply Water Supply
1001582819	710/587	11/28/2007	587/8/	4781642	235.1	margin of error : 100 m - 300 m	95/11 DICKENSON RD		966	4.5 m	Not Used	Test Hole
1001562015	7104507	11/28/2007	587/52	4781642	235.1	margin of error : $100 \text{ m} - 300 \text{ m}$	9541 DICKENSON RD	GLANBROOK	980	4.5 m	Not Used	Test Hole
1002003442	7104587	11/28/2007	587452	4701045	235.2	margin of error : 100 m - 300 m	9541 DICKENSON RD.	GLANBROOK	986	4.5 m	Not Used	Test Hole
1002003431	7104307	7/2/2007	507400 E07040	4781017	235.0	margin of orror : 20 m 100 m		Hamilton	1251	4.5 11	Not oseu	restrible
1004723340	7210337	2/20/2014	580388	4703300	240.2	margin of error : 30 m - 100 m	2012 LIDDED INMES ST	Hamilton	1/58	0 ft	Monitoring	Observation Wells
1005122070	7220033	7/18/2014	580338	4782430	220.1	margin of error $: 30 \text{ m} - 100 \text{ m}$	2012 OFFER JAMES 31		1430	0 ft	Monitoring	Observation Wells
1005122370	7227212	7/10/2014	500000	4702410	220.1	margin of error : 20 m = 100 m			1//7	010	Monitoring	
1003122981	7204000	1/10/2014 1/22/2012	587100	4/02404 //781065	220.1	margin of error $: 30 \text{ m} - 100 \text{ m}$	2012 UFFER JAIVIES	HAMILION	082	υπ	womening	Observation Wells
1004202702	7204000	1/21/2013	507100	4701505	237.1	margin of error : 20 m = 100 m			907			
1004303/92	7204011	+/24/2013 1/21/2012	50/4/0	4/01011	233.0	margin of error : 20 m = 100 m			997			
1004202/92	1204012	4/24/2013	J0///I	+/01202	234.2	margin or en or : 50 m - 100 m			549			

Appendix B: Borehole Logs






Time	Water Level (m)	Depth to Cave (m)									
on completion	5.22 bgs	no cáve									
June 5, 2018	0.78 bgs										
·	U										
ags (above ground sur bgs (below ground sur	ags (above ground surface) bgs (below ground surface)										

Project: Location:	Proposed Glanbrook Indust Twenty Road West, Hamilto	rial Sul on, ON	odi v	isi	on							_	Sł	neet N	0	1	of
Date Drilled: Drill Type:	March 27, 2018 D-50 Track Mount. Solid St	em.	- - s	luger SPT (I	Samp N) Valu nic Co	le Je ne Te	est	(S ⊠ ⊠		Com Natu Plas Undi	nbustible ural Mois tic and I rained T	e Vap sture Liquio riaxia	oour Rea d Limit al at	ading	 ×] ()
Datum:	Geodetic		_ S	helb ield \	/ Tube /ane T	est			s		% St Pene	train at l etromete	Failur er	e		₽	
G Y M W B U O L	Soil Description	ELEV. m		Shea	20 Ir Strer	4i igth	N Vali	ue 60	80	kPa	Com N Atte	bustible \ 25 Natural M erberg Li	Vapou 50 loistur mits (ir Readii 7 e Conte % Dry W	ng (ppm) /5 nt % /eight)	SAMPLE	N W k
FILL mois	SOIL: (~175 mm thick) : silty clay, trace sand, brown, t, some rootlets (possible reworked o coll	~235.31 ~235.1 ~234.6		о 0									20				
SILT wet, mois	: trace clay, trace sand, brown, loose - t, compact below 1.5 m	-			26 Ö							>	<				
2.3 n	e clay, occasional gravel, grey below _ 1 -		3+		25 O							>	<				
	-		4		2							×					
SAN	DY SILT to SILTY SAND: grey, t, dense, some clay seams	~230.7	5				44 O										
very	dense, wet below 6.1 m	~228.8	6					ő					×				
NOT	hole terminated at 6.6 m depth. ES: is drawing is to be read with the		7+														
subje prese 2. Int requi	ect report and project number as ented above. erpretation assistance by EXP is red before use by others.		8														
6/27/18			9														
NEW.GDT			10														
вокеноц			12														
JFHAM-EXP			14														
LAGWGI			15														
[*] ех	EXP Services Inc.										Tin	ne		Wa Lev (m	ter /el 1)	De	ep Ca (n



Time	Water Level (m)	Depth to Cave (m)
on completion	5.83 bgs	no cáve
ags (above ground su	face)	

Loadio: Twendy Road West, Hamilton, OM Date Drilles: March 28, 2018 Date Drilles: D-50 Track Mount Solid Stem. Date Drilles: D-50 Track Mount Solid Stem. Date Drilles: Geodetic Date Drilles: March 28, 2018 Date Drilles: Geodetic Dat	Project:	Proposed Glanbrook Indust	rial Sul	bdiv	/isi	on										She	et N	o. _.	1
	Location:	Twenty Road West, Hamilto	on, ON																
Date Differ: March 28, 2018 Description Description </td <td></td> <td></td> <td></td> <td>- ,</td> <td>\ugo</td> <td>Som</td> <td>nlo</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Co</td> <td>mbus</td> <td>stible \</td> <td>/apou</td> <td>ır Rea</td> <td>ading</td> <td></td>				- ,	\ugo	Som	nlo						Co	mbus	stible \	/apou	ır Rea	ading	
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Datum Gendent Predometrie Predometrie Image: Second transmission of the s	Drill Type:	D-50 Track Mount. Solid St	em.	_ L)yna Shelb	mic C y Tub	one I De	est					Un % :	drain Strair	ed Tria 1 at Fa	axial a ilure	at		e
Image: solid Description ELEV. model Image: solid Description Image: solid Description <td>Datum:</td> <td>Geodelic</td> <td></td> <td>_ F</td> <td>ield</td> <td>Vane</td> <td>Test</td> <td></td> <td></td> <td></td> <td>s</td> <td></td> <td>Pe</td> <td>netro</td> <td>meter</td> <td></td> <td></td> <td></td> <td>4</td>	Datum:	Geodelic		_ F	ield	Vane	Test				s		Pe	netro	meter				4
COPSOL: (-150 mm thick) -232.6	G S Y M B L O L	Soil Description	ELEV. m	D E P T H	She	20 ar Stre	ength	N V 40	alue 60	I	80	kPa	Coi	mbust 25 Natur tterbe	ible Va ral Mois rg Limi	pour F 50 sture (ts (%	Readir 7 Conte Dry W	ig (ppi '5 nt % /eight	m))
Borehole terminated at 6.6 m depth. NOTES: 1. This drawing is to be read with the subject report and project number as presented above. -227.6 1. This drawing is to be read with the subject report and project number as presented above. -227.6 1. This drawing is to be read with the subject report and project number as presented above. -227.6 1. This drawing is to be read with the subject report and project number as presented above. -227.6 1. This drawing is to be read with the subject report and project number as presented above. -227.6 1. This drawing is to be read with the subject report and project number as presented above. -227.6 1. The drawing is to be read with the subject report and project number as presented above. -227.6 1. The drawing is to be read with the subject report and project number as presented above. -227.6 1. The drawing is to be read with the subject report and project number as presented above. -227.6 1. The drawing is to be read with the subject report and project number as presented above. -227.6 1. The drawing is to be read with the subject report and project number as presented above. -227.6 1. The drawing is to be read with the subject report and project number as presented above. -227.6 1. The drawing is to be read with the subject report and project number as presented above. -227.6 1. The d		PSOIL: (~150 mm thick)	~234.16	0	3)						200					20	2	k	
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-occasional gravel, grey below 2.3 m -casinil gravel, grey below 2.3 m -casinil gravel, grey below 4.6 m -moist, very dense -casinil gravel, grey below 4.6 m -dense below 6.1 m -casinil gravel, grey below 2.7 m -casinil gravel, grey below 4.6 m -casinil gravel, grey below 2.7 m -casinil gravel, grey below 4.6 m -casinil gravel,		-	-	2		Q										×			
SANDY SILT to SILTY SAND: grey, moist, very dense wet below 4.6 m dense below 6.1 m Borehole terminated at 6.6 m depth. NOTE: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others.		asional gravel, grey below 2.3 m _	-			²¹ O									×				
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dense below 6.1 m -227.6 7 Borehole terminated at 6.6 m depth. -227.6 7 NOTES: 1. This drawing is to be read with the subject report and project number as presented above. - 2. Interpretation assistance by EXP is required before use by others. 9 10 10 10 11 11 12 13 12 13 14 13 14 14 14 15 14 15 Time Level (m) for completion (c) for completic)																			+
Borehole terminated at 6.6 m depth. -2276 NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others. 10 10 11 12 13 14 15 EXP Services Inc. Hamilton, Ontario Tielephone: 905.573.4000 EXP Services Inc. Hamilton, Ontario Tielephone: 905.573.4000 Exp Services Inc. Hamilton, Ontario Tielephone: 905.573.4000	den	se below 6.1 m		6				47								2			
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Subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others.		TES: This drawing is to be read with the																Ħ	
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Telephone: 905.573.4000 Facsimile: 905.573.9693	"e>	EXP Services Inc. Hamilton. Ontario									╞	or		nplet	tion	6	<u>(m</u> 6.05	i) bgs	_
		Telephone: 905.573.400 Facsimile: 905.573.969	00 3																



Timo	Water	Depth to
TITLE	(m)	(m)
on completion	6.05 bgs	no cave
ags (above ground su	face)	

Ρ	roject	:	Proposed Glanbrook Indus	trial Su	bdi	visi	ion									She	et No	o	1	of
L	ocatio	n:	Twenty Road West, Hamilt	on, ON																
					_									Combi	ıstihle	Vanou	r Rea	dina	Г	1
D	ate D	rilled:	April 3, 2018		_ ;	Auge	er Sa (N) \	mple /alue			0	8 12		×						
D	rill Ty	pe:	D-50 Track Mount. Solid S	tem.		Dyna	mic	Cone	Test		<u> </u>	_		Undrai	and L	iquid L iaxial a	imit it	•	—(Ð	ر
D	atum:		Geodetic		_	Field	Van	ide le Tes	t			s.		% Stra Penetre	omete	allure r		4		
G W L	SYMBO-		Soil Description	ELEV. m		She	20 ear S) trength	N 40	Value 6	0	80 kF	Pa -	Combus 2 Nat Atterb	stible V 5 ural Mo berg Lir	apour R 50 bisture C nits (% I	Reading 75 Conten Dry We	g (ppm) 5 t % eight)	SAMPLE	Natur Uni Weig
	ŤŤ	TOP	SOIL: (~150 mm thick)	230.70	0	$\mathbf{\hat{O}}^{6}$			100			200		1	0	20	30)	Š	
			Y CLAY: brown, moist, firm, ets	~229.9	and the second		2	2												
		_ SILT _ mois	: some clay, trace sand, brown, t, compact		1														ľ	
		L		_	2		ł	5							*				V	
		dens	se below 2.3 m	_	1111				38 O						*					
		trace	e clay trace to some sand	-	3						52									
		-occa	isional gravel, very dense w 3.1 m	-											*				ľ	
		+		-	4															
		grey	below 4.6 m		1.1.1.1.1.1						67 O				x					
					5														ľ	
				~224 6	6															
		SILT	Y SAND: grey, wet, very dense	~224.0						Ö					×					
		Bore	enole terminated at 6.6 m depth.		7															
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6	F	λć	EXP Services Inc.										on		etion	5	Leve (m) 5 79 h)))as		Jave (m)
			Telephone: 905.573.40	000									511	compre	24011			.95	.1	5 0a
			Facsimile: 905.573.96	33																



Time	Water Level	Depth to Cave
	(m)	(m)
on completion	5.79 bgs	no cáve
ags (above ground sur	face)	

Project:	Proposed Glanbrook Indus	trial Su	bdi	vision							5	Sheet N	No	1	of
Location:	Twenty Road West, Hamilt	on, ON													
			_					57	Co	ombust	tible V;	apour Re	eading	٢	
Date Drilled:	April 18, 2018		_	Auger Sam SPT (N) Va	ple lue		0	Ø	Na Pl	atural N astic a	Noistur	e uid Limit	· F	>	≺
Drill Type:	D-50 Track Mount. Solid S	tem.	_	Dynamic Co Shelby Tub	one Te e	est		_ ■	Uı %	ndraine Strain	≥d Triax at Fail	kial at lure	-	\oplus	-
Datum:	Geodetic		_	Field Vane	Test			s	Pe	enetron	neter				
G Y		FLEV	P			N Value			Co	ombustil 25	ble Vap	our Read 50	ling (ppm 75) S A) Na
	Soil Description	m	Р Т Н	20 Shear Stre	4(ength 10	<u>) (</u>	50	80 kPa	1	Natura Atterber	al Moist g Limits	ure Conte ३ (% Dry \ २०	ent % Weight) 30		' W
	PSOIL: (~150 mm thick)	~228.6	0	5 O								×		ľ	
moi	st (possible reworked native soil)	~228.0	1	19											
	st, compact														2
			2	Ő							×				4
san	dy, occasional gravel, dense to very	_	1.6.6.6.1			48 O					×			Þ	
	/ below 3.1 m	-	3			47									
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som	he sand below 6.1 m	-222.2							φ		×				4
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"e>	EXP Services Inc.									IME	ion	Le (r 4 01	vel n) Lbas	,	Ca (n
0/	Hamilton, Ontario Telephone: 905.573.40	100							June	5, 20 ⁻	18	0.73	bgs bgs		
		10													



Time	Water Level	Depth to Cave
	(m)	(m)
on completion	4.91 bgs	no cáve
June 5, 2018	0.73 bgs	
	-	
ags (above ground su	face)	

Project:	Proposed Glanbrook Indust	trial Su	bdi	vis	ion						_	She	et No	o1	1_ of
Location:	Twenty Road West, Hamilt	on, ON													
			_		0					Com	bustibl	e Vapo	ur Rea	ding	
Date Drilled:	April 3, 2018		- 1	Auge SPT	er Sar (N) V	npie alue		0	Ø	Natu Plas	ral Moi tic and	sture Liquid∣	Limit	-	×
Drill Type:	D-50 Track Mount. Solid St	tem.	-	Dyna Shell	amic (bv Tu	Cone T be	est		 ■	Undr % St	ained ⁻ rain at	Triaxial Failure	at	e	Ð
Datum:	Geodetic		_	Field	l Vane	e Test			s	Pene	etromet	er		4	•
GW BOL	Soil Description	ELEV. m		She	20 ear Str	rength	N Va 10	alue 60	80 kPa 200	Coml N Atte	oustible 25 latural N erberg L	Vapour 50 Moisture imits (%	Reading 75 Content Dry We	g (ppm) 5 t % eight)	SAMPLES
	OIL: (~150 mm thick)	~223.65	0	ð								×		,	Ø
rootlet	S	~223.1			15										
BILT:	some clay, trace sand, brown, -	1	1		U 							*			Ø
dense	below 1.5 m		2			Č							×		
occasi	ional gravel below 2.3 m	-	4			33 O							×		
sandy	, compact below 3.1 m	-	3		18 Ö							×			
	-	1	1.1.1.1.1.1.1												
	-		4												
grey, o	dense below 4.6 m		5			Ö Ö					×				
		\leq													
	ense below 6.1 m		6					57							
Boreh	ole terminated at 6.6 m depth.	~217.3						O				×			4
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"ex	EXP Services Inc. Hamilton, Ontario									n com	oletion	1	(m) 5.84 b	gs	(r no (
	Telephone: 905.573.40 Facsimile: 905.573 969)00 93													
		-													



Time	Water Level	Depth to Cave
	(m)	(m)
on completion	5.84 bgs	no cáve
ags (above ground sur	face)	





Time	Water Level (m)	Depth to Cave (m)							
on completion	9.21 bgs	no cáve							
June 4, 2018	0.27 bgs								
ags (above ground surface) bgs (below ground surface)									





Time	Water Level (m)	Depth to Cave (m)
on completion	7.61 bgs	no cáve
June 4, 2018	0.53 bgs	
	-	
ags (above ground su	face)	

Project:	Proposed Glanbrook Indust	rial Sul	odiv	visio	n							_	Sh	eet N	o	1	of				
Location:	Twenty Road West, Hamilto	on, ON																			
			_						_	C	omb	ustible	vapo	our Rea	ading	Γ]				
Date Drilled:	April 18, 2018	April 18, 2018 Auger Sample Ser (N) Value O				oril 18, 2018 Auger Sample SPT (N) Value O							 Instant Annual Moisture Instant Annual Moisture Plastic and Liquid Limit Important 								(
Drill Type:	D-50 Track Mount. Solid Ste	em.	- ;	Dynami Shelbv	c Co Tube	ne Tes	st			U %	ndrai	ined Tr ain at F	riaxial ailure	at	•	Ð	0				
Datum:	Geodetic		_	Field Va	ane T	est			s	P	enetr	romete	er			A					
G X W B L O L	Soil Description	ELEV.		Shear	20 Stren	40 gth	N Value	60	80 kPa		ombu 2 Nat Attert	istible V 25 tural Mo berg Lir	/apour 50 oisture mits (%	Readin 7 Conter 6 Dry W	ig (ppm) '5 nt % /eight)	SAMPLE	N W k				
	SOIL: (~175 mm thick)	233.03 ~232.9	0	ð					200					، د							
Mois	t (possible reworked native soil)	~232232.3	8	10																	
moist	: some sand, trace clay, brown, – t, compact			U										×		P	1				
	sional gravel below 1.5 m		2	Ö								×	(Z					
	-				25																
	_	_	3		ľ				00		#										
sand	y, trace gravel, dense to very dense v 3.1 m –	-							ð			×				Ø					
	-	_	4																		
	holow 4.6 m							71			#										
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Bore	hole terminated at 6.6 m depth.	~226.5				\circ						×				K					
NOT	ES:		7																		
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° A X	EXP Services Inc.									Т	ïme	•		Lev (m	′el ı)		Ċa (r				
	Hamilton, Ontario Telephone: 905.573.400	00								on co June	mpl 4, 2	etion 2018		4.63 I 0.74	bgs bgs	n	10 C				
	Facsimile: 905.573.969	3																			



Time	Water Level (m)	Depth to Cave (m)								
on completion	4.63 bgs	no cáve								
June 4, 2018	0.74 bgs									
ags (above ground surface) bgs (below ground surface)										

Project:	Proposed Glanbrook Indus	trial Su	bdi	visi	on							_	Sh	ieet N	lo	1	_ of
Location:	Twenty Road West, Hamilt	on, ON															
	Marak 00, 0040		_	Auge	r Sar	nole					Com	bustik	ole Vapo	our Re	ading		
Date Drilled:	March 29, 2018		_	SPT	(N) V	alue		C) Ø		Natu Plas	ral Mo tic and	oisture d Liquid	Limit	⊢		× -0
Drill Type:	D-50 Track Mount. Solid St	tem.	_	Dyna Shelt	mic (by Tu	Cone ⁻ be	Test	_			Undr % St	ained rain a	Triaxial t Failure	l at e		\oplus	
Datum:	Geodetic		_	Field	Vane	e Test			s		Pene	etrome	eter				
S Y W B L O	Soil Description	ELEV. m	DHPT	She	20 ar Sti	rength	N V 40	alue 60	80	kPa	Coml N Atte	oustible 25 atural erberg	e Vapour 50 Moisture Limits (%	r Readi e Conte % Dry \	ing (ppn 75 ent % Veight)	n)	SAMPL
	PSOIL: (~150 mm thick)	233.47	н 0	4			100		200)		10	20		30	Ŧ	s 7
FIL moi	L: silty clay, trace sand, brown, st_some rootlets (possible reworked	_		Ŭ											X		2
	ve soil)	< <tr> ~232.6</tr>	1	Ô											*		2
	st, loose asional gravel, dense below 1.5 m	-											×				7
		-	2				40									ľ	
		-					Ø						×			ł	2
SIL	TY SAND: occasional gravel, brown,	=~230.4	3				Ś	3					*				Ż
	, uchot															ľ	1
		~220 0	4														
SIL	TY CLAY: trace sand, occasional /el, grey, moist. verv stiff to hard	~228.9	5			28 O				225			×				\mathbb{Z}
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			6			00											
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Bor	ehole terminated at 6.6 m depth.		7														
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°D)	EXP Services Inc.										Tin	ie		Le (n	vel n)		Č
\cup	Hamilton, Ontario Telephone: 905.573 40	000								or	n com	oletio	n	dı	y		no
	Facsimile: 905.573.969	93															



Time	Water	Depth to
TITLE	(m)	(m)
on completion	drý	no cáve
ags (above ground su	face)	





	Water	Depth to
Time	Level	Cave
	(m)	(m)
on completion	àgś	6.7Ó
May 10, 2018	ags	
June 5, 2018	1.20 ags	
age (above ground su	rfaco)	

Project:	Proposed Glanbrook Indus	strial Su	bdi	visi	on									_	:	Shee	et No	o	1
Location:	Twenty Road West, Hamil	ton, ON																	
			_	Aude	r San	nnle						(Com	busti	ble V	'apour	Rea	iding	
Date Drilled:	April 17, 2018	tom	_	SPT (N) Va	alue	- .		0	Ø		۲ F	Vatu Plas	ral M tic an	oistu Id Liq	re Juid Li	mit	⊢	_
Drill Type:	D-50 Track Mount. Solid S	iem.	_	Dynai Shelb	mic C by Tul	cone coe	lest					L 9	Jndr % St	aineo rain a	d Tria at Fai	xial at lure			ŧ
Datum:	Geodetic		_	Field	Vane	e Test				s		F	Pene	etrom	eter				
G Y		ELEV.	P				NV	alue				0	Com	oustib 25	le Vap	oour R 50	eadin 7	g (ppm 5)
	Soil Description	m	Р Т Н	She	20 ar Str	ength	40 100	6	0	200	kPa		N Atte	latura erberg 10	l Mois Limit	sture C s (% E 20	onten)ry W วเ	nt % 'eight) n	
	SOIL: (~150 mm thick)	~232292.	1	ð												>	∢		Ē
mois	st (possible reworked native soil)	~231.4	1	10													2		E
brov	vn, moist, compact	_				29													ŧ
		_	2			Õ										×			
	asional gravel, dense to very dense	_	1.1.1.1.1					55 O						>	<				ŧ
	w 2.5 m	_	3				44												#
		_	1.1.1.1.1.1																
		-	4																
	TY SAND to SANDY SILT: grey,	=~227.6	Laboration and the second				47 C								>	×			
	dense		5																
			6																
							47 C								×				=
Bor	ehole terminated at 6.6 m depth.		7																
NO 1. T	TES: his drawing is to be read with the																		
pres	ect report and project number as ented above.		8																
requ	ired before use by others.																		
∞ com	pletion. Monitoring well installed May 2018.		9																
			10																
			11																
			12																
JKEHC			to to the fit																
			13																
			1000																
			14																
			100																
			- 15-														Not	or	Ť
°Ογ	FXP Services Inc												Tim	ne			Leve	el)	
	Hamilton, Ontario Telephone: 905 573 4	000										on c May	om 10	oletio , 201	on 8		ags ags	, 5 5	Γ
	Facsimile: 905.573.96	93										June	e 5,	201	8	0	.04 k	ogs	1



	Water	Depth to
Time	Level	Cave
	(m)	(m)
on completion	àgś	3.70
May 10, 2018	ags	
June 5, 2018	0.04 bgs	
age (above ground su	faco)	

Projec	st:	Proposed Glanbrook Indust	<u>rial S</u> ub	di	<u>vis</u> io	<u>n_</u>									She	et N	lo.	1	_ c
Locati	on:	Twenty Road West, Hamilto	on, ON																
Date I	Drilled:	April 17, 2018								Co Na	mbus itural	stible Moist	our Reading			□ ×			
Drill T	ype:	D-50 Track Mount. Solid St	em.	- :	SPT (N Dynami) Value ic Cone	Test		<u> </u>	Ľ⊿ 		Pla Un	astic a Idrain	and Li ed Tri	iquid iaxial	Limit at	⊢	¢	-C
Datun	1:	Geodetic			Shelby Field Va	Tube ane Tes	st			s S		% Pe	Strair netro	n at Fa metei	ailure r			▲	
G S Y M B O L O		Soil Description	ELEV. m		Shear	20 Strength	N 40	Value 6	0	80	kPa	Co	mbust 25 Natu Atterbe	tible Va 5 ral Mo erg Lin	apour 50 isture nits (%	Readir 7 Conter Dry W	ng (ppm 75 nt % Veight)	1) i	SAMPLE
		SOIL: (~150 mm thick)	230.40 ~230 <u>2</u> 30.4	0			100			200			10		20	3	30		<u>s</u>
	FILL	.: silty clay, trace sand, brown,st, rootlets (possible reworked native	~220.5			19												ľ	
	SILT	f: trace to some sand, trace clay,	220.0	1		Э									X			ľ	2
	brow	/n, moist, compact				ő									×			ł	7]
		- asional gravel, dense to verv dense					43							¥					7
	belov	w 2.3 m	4	3					64									ľ	<u>/</u>
	grey	below 3.1 m	-						Ö					×				ł	//
	⊫	-	-	4															
	╟	-						50						¥.					7
	╞	-		5														ľ	<u>//</u>
	╞																		
Ë	sand	dy, compact below 6.1 m		6		29								×					7]
	Bore	ehole terminated at 6.6 m depth.	=~223.9	7		ľ												ľ	<u>′</u>
	NOT	ES: his drawing is to be read with the		++++++++++++++++++++++++++++++++++++															
	subje pres	ect report and project number as ented above.		8															
	2. In requ	terpretation assistance by EXP is ired before use by others.																	
	3. Ar	rtesian conditions encountered.		911															
				10															
3				12															
				13															
				14															
• .			1	15								ΓT							-
*	עב	In EXP Services Inc										Ti	ime			VVat Lev (m	ເer /el າ)		ט
C		Hamilton, Ontario	00								oı J	n cor une	nple 5, 20	tion)18	1	dry 0.19	y ags		n
		Facsimile: 905.573.969	3									-	,	-		-	5		
																			_



Time	Water Level (m)	Depth to Cave (m)
on completion June 5, 2018	drý 0.19 ags	no cáve
ags (above ground su	rface)	

Project:	Proposed Glanbrook Indust	trial Sub	odiv	visio	า					S	Sheet	No.	1	of					
Location:	Twenty Road West, Hamilt	on, ON								_									
			-	Auger S	ample		r	21	Comb	oustible Va	apour R	eading							
Date Drilled:	April 17, 2018	pril 17, 2018 SPT (N) Value O					April 17, 2018 Auger Sample SPT (N) Value C								al Moistur c and Liqւ	e uid Limi	t 🛏		× -0
Drill Type:	D-50 Track Mount. Solid St	iem.	- ;	Dynamio Shelby 1	c Cone T Tube	Fest		- -	Undra % Str	ained Triax ain at Fail	dal at ure		\oplus						
Datum:	Geodetic		_	Field Va	ne Test		I	s	Penet	rometer									
G W L	Soil Description	ELEV. m	D U P T H	2 Shear \$	20 4 Strength	N Valu 40	e 60	80 kPa	Comb Na Atter	ustible Vapo 25 5 atural Moist berg Limits	our Read 50 ure Con 5 (% Dry	ding (pp 75 tent % Weight)	m) ;)	SAI MPLU					
	PSOIL: (~150 mm thick)	229.76	0	Å	1	100		200		10 2	20	30		s //					
FIL moi	L: silty clay, trace sand, brown, - st, rootlets (possible reworked native	~228.9		♀ 3_25															
SIL)		1) ≜								×		2					
moi	st to wet, soft to firm			3 0 4								×		3					
	-			5 5	o							v		7					
	-	=~226.7	3											2					
SIL com	T: trace to some clay, grey, moist, ppact			Ö						×				2					
	-	-	4																
	dy occasional gravel dense bolow					40													
	m		5			Ψ					*		Ħ	4					
			6			47								7					
Bor	whole terminated at 6.6 m depth.	~223.2				Ψ								2					
	TES:																		
sub	ject report and project number as		8																
	nterpretation assistance by EXP is uired before use by others.																		
	,		9																
6/27/1																			
GDT			10																
NEW																			
S.GPJ			11																
			12																
BORE			13																
1-EXP			191																
JEHAN			14																
3WGL																			
I			15																
	(ID)								Tim		W	ater	1	De					
••• e>	EXP Services Inc.											n) <u>m)</u> J/A		ں (
•	Telephone: 905.573.40	100												~ (r					
	Facsimile: 905.573.969	13																	



Time	Water Level (m)	Depth to Cave (m)
on completion	Ň/Á	0.9 (bridged)
ags (above ground su bgs (below ground su	face) rface)	

Project:	Proposed Glanbrook Indust	rial Sub	bdi	visi	on								ç	Sheet	No.	_			
Location:	Twenty Road West, Hamilto	on, ON																	
Data Drillad	March 26, 2018		-	Augei	Samp	ole			\boxtimes		Combustible Vapour Reading								
Date Drilled:	D-50 Track Mount Solid St	em	-	SPT (Dvnar	N) Val nic Co	ue ne Te	et	<u> </u>) Ø		Pla	stic ar	nd Liqu	uid Limi	t F	-			
Datum:	Geodetic		-	Shelb	y Tube	, io io					Un % S	draine Strain :	d Triax at Fail	dal at ure					
Datum.			-	Field	vane	lest			S		Pei	netrom	eter						
S S W M	Soil Description	ELEV.	ршо		20	40	N Valu	ue 60	80		Cor	nbustib 25 Natura	le Vapo E al Moist	our Read 50 ture Con	ding (pp 75 tent %	р —			
		m 232,19	Т Н	She	ar Strer	ngth 10	0		200	kPa)	A	tterberg	j Limits	s (% Dry 20	Weight 30	ıt			
Fill	SOIL: (~100 mm thick) / : silty clay, brown and dark brown, _	~231.5	1.1.1.1.1	Ô										×					
nativ	t, some rootlets (possible reworked e soil)	_~231.4 ***	1	Ċ	3								×						
SILT	trace clay, trace sand, brown, t, compact	-	يا ما ما ما م		23											-			
		_	2			33													
dens	e below 2.3 m		ded al a la factoria de			Õ							×						
	-		3			¢	5					>	ĸ						
u, u -	-	-	4																
		~227.6				31				225									
SIL I	o hard		5			0													
			11111																
sand	y silt seams at 6.1 m		6			9				225			×						
	-		1													_			
	_															-			
		~224.1	8		Ö					225			×						
Bore	hole terminated at 8.1 m depth. $\Box \circ$.																		
1. Th	is drawing is to be read with the		9																
prese	ented above. erpretation assistance by EXP is																		
requi	red before use by others.		10																
			11																
			halo halo h																
			12																
			1000																
			13																
																-			
			143								Ì								
			15																
														w	ater	-			
"ex	EXP Services Inc.										Ti	me			evel m)				
	Hamilton, Ontario Telephone: 905.573.40	00									Ma	r. 27		1.5	9 bgs				



	Water	Depth to
Time	Level	Cave
	(m)	(m)
on completion	drý	no cave
Mar. 27	1.59 bgs	
June 4, 2018	0.65 bgs	
	_	
ags (above ground sur	face)	•

Project: <u>Pro</u> Location: <u>Twe</u>	posed Glanbrook Indu enty Road West, Hami	strial Sul Iton, ON	vibc	visi	on										Sh	eet N	0.
Date Drilled: Apr	il 17, 2018		-	Auger	Sam	ple			•			Co Na	ombu atural	stible ' Moist	Vapo ure	our Rea	ading
Drill Type: D-5	0 Track Mount. Solid S	Stem.	_ (SPT (l Dynar	N) Val nic Co	ue one T	est		0	<u> </u>		Pla Ur	astic ndrair	and Li ned Tri	iquid axial	Limit at	F
Datum: Geo	odetic Shelby Tube Field Vane Test							= *		% Pe	Strai enetro	n at Fa ometer	ailure r	•			
G Y G M	Soil Description	ELEV.	DEB		20		N V:	alue		80		Co	ombus 2:	tible Va 5	apour 50	Readir	ng (pp
Ŭ B L	Con Description	m 228.88	H	Shea	r Strei	ngth 1	00			200	kPa	<i>^</i>	Atterb	erg Lim 0	nits (%	6 Dry W	/eight 0
TOPSOIL:	(~150 mm thick)	~228.7		ð												×	
moist, rootl	ets (possible reworked native	~228.1		1	3											2	
SILT: some moist, com dense to ve	e sand, trace clay, brown, pact ry dense below 1.5 m		2			31 O								>	¢		
_ occasional	gravel below 2.3 m	_					đ2 O							×			
sandy, trac below 3.1 r	e gravel, grey, very dense n	_	3++++++++++++++++++++++++++++++++++++++								78/28	8 B mr	n	×			
			4					e	3 3					×			
		K	0														
		~222.3					ť	3						×			
NOTES:	erminated at 6.6 m depth.		7														
subject rep presented a 2. Interpret	ort and project number as above. ation assistance by EXP is		8														
57/18			9														
W.GDI 90			10														
SS.GPJ NE			11+														
			12														
EXP BORE			13														
JFHAM-			14														
LAGWGL			- 15														
*ovr	EVD Sonices Inc.											Т	ime			Wat Lev	ter



Time	Water Level	Depth to Cave
	(m)	(m)
on completion	5.80 bgs	no cáve
ags (above ground sur	face)	

Project:	Proposed Glanbrook Indust	rial Sub	div	isic	n							_	Sł	neet l	No.
Location:	Twenty Road West, Hamilte	on, ON													
Data Dalla i	April 17, 2019		- A	uger	Sampl	le					Com	bustible	e Vap	our Re	eadi
Date Drilled:	April 17, 2018	pril 17, 2018 SPT (N) Value C									Natu Plasi	ral Moi: tic and	sture Liquio	l Limit	t
Drill Type:	D-50 Track Mount. Solid St	em.	- - -	ynam helby	ic Cor Tube	ne Te	st				Undr % St	ained T rain at l	Triaxia Failur	l at e	
Datum:	Geodetic		_ F	ield V	ane T	est			s		Pene	etromet	er		
G Y M	Soil Description	ELEV.	DEB		20	40	N Val	ue 60	80		Comt	25	Vapou 50	r Read	ling 75
	Soli Description	m 231.03	H H	Shear	Streng	gth 100	, 0	00	200	kPa	Atte	erberg Li 10	imits (' 20	% Dry	Wei 30
	PSOIL: (~150 mm thick)	~230.9 ~230.5		5 D									>	ĸ	
i interest mo interest mo	ist, rootlets (possible reworked native	~230.3		14											
SIL	T: some sand, trace clay, brown,	_			7										
		_	2	(3								*		ŧ
	-	_			23 O								×		Ŧ
	-	_	3	14											ŧ
gre	y, some clay seams below 3.1 m -	-		C									×		
	-	-	4												I
	-			11											Ŧ
	-		5	υ									×		
\$ ⊢															Ŧ
봐 - ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	asional gravel, very dense below 6.1		6						78						
	zahola terminated at 6.6 m denth	~224.5							0			×			Ŧ
	TES.		7												ŧ
	This drawing is to be read with the iect report and project number as														Ŧ
pre	sented above.		8												Ŧ
req	uired before use by others.														ŧ
			⁹												ŧ
															ŧ
			12												Ŧ
															Ŧ
			13												ŧ
															ŧ
			14												
															Ŧ
			₁₅ ‡	Ħ									Ħ		Ŧ
	'n										Tim	ne		Wa Le	ate
e)	EXP Services Inc. Hamilton. Ontario									01	n com	oletion	+	(r d	<u>n)</u> Iry
_	Telephone: 905.573.40	00								J	une 5,	2018		0.50) b



Time	Water Level (m)	Depth to Cave (m)
on completion June 5, 2018	drý 0.50 bgs	no cáve
ags (above ground su	face)	
bgs (below ground su	rface)	

Project:	Proposed Glanbrook Indus	trial Sul	bdi	vis	ion									S	heet	No.	1	1	of
Location:	Twenty Road West, Hamili	ton, ON											_						
			_									Corr	husti	hla \/a	pour F	Roadir	na	_	1
Date Drilled:	March 28, 2018		_	Auge	r Sam (N) Va	ple lue			0	0 0		Natu	•	×	; ;				
Drill Type:	D-50 Track Mount. Solid S	tem.	_	Dyna	mic C	one T	est		<u> </u>	_		Plas Und	stic an rainec	d Liqu d Triaxi	id Lim al at	⊢	0 ⊕		
Datum:	Geodetic		_	Field	Vane	e Test				s		% S Pen	train a etrom	eter	ire				
G X Y M W B L O	Soil Description	ELEV. m	DUPTI	She	20 ear Stre	4 ength	N Va IO	alue 60		80 k	Pa	Com Att	bustibl 25 Vatural erberg	le Vapo 5i I Moistu I Limits	our Rea 0 Ire Cor (% Dry	ading () 75 ntent % y Weig	ppm) % ght)	SAMPLE	Na U W
	SOIL: (~150 mm thick)	233.81	0	5		10	00			200			10	2	0 {	30		Ī	
FILL rootle	: silty clay, brown, moist, some ets (possible reworked native soil)	~233.1													•				
- SILT	Y CLAY: brown, moist, stiff	_	1												X			Ľ	1
SILT	Y SAND to SANDY SILT: brown, compact	_~232.3	2		24 C)									×			V	
	sional gravel, moist, very dense								65		I		×						
	v 2.3 m	_	3				E		Ĭ										
grey	below 3.1 m	_					Č	8						×				V	
		_	4																
										7									
			5											×				Ľ	
III -																			
SILT	Y CLAY: grey, damp, hard	~227.7	6								3		×						
Bore	Borehole terminated at 6.6 m depth.																	14	1
NOT	ES: is drawing is to be read with the																		
subje	ect report and project number as		8																
2. Int	erpretation assistance by EXP is red before use by others.																		
3. Ar	tesian conditions encountered.		9																
			10																
			11																
			12																
			13																
			14																
			15															1	L
	'n											Tin	ne		W	/ater evel		De	ep Ca
-ex	EXP Services Inc. Hamilton. Ontario									\vdash	on	com	pletic	on	5.3	(<u>m)</u> 3 bgs	5	n	(I 0
_	Telephone: 905.573.40 Facsimile: 905.573.96	000 93									Ju	ine 4	, 201	8	0.8	85 ag	s		-



Time	Water Level (m)	Depth to Cave (m)
on completion	5.3 bgs	no cáve
June 4, 2018	0.85 ags	
	-	
ags (above ground su	rface)	

Project:	Proposed Glanbrook Indust	rial Sul	odiv	/isi	on								_	S	heet l	۷o	1			
Location:	Twenty Road West, Hamilte	on, ON																		
			_						_	_		Com	bustibl	le Vap	oour Re	eading				
Date Drilled:	March 28, 2018		ہ ج –	Auge SPT (r Sar (N) V	nple alue				× 2	Natural Moisture Plastic and Liquid Limit									
Drill Type:	D-50 Track Mount. Solid St	em.	_ [) Shelb	mic (ov Tu	Cone ⁻ be	Test			-		Undra % Str	ained '	Triaxia	alat re	•	\oplus			
Datum:	Geodetic		_ F	ield	Vane	e Test				s		Pene	trome	ter						
GW L GW L	Soil Description	ELEV.	D E P T H	She	20 ar Sti	rength	N ' 40	Value 6)	80 F	:Pa	Comb Na Atte	ustible 25 atural M rberg L	Vapou 50 Moistu Limits (ur Read) re Cont (% Dry '	ling (ppr 75 ent % Weight)	m)			
	SOIL: (~150 mm thick)	235.00 ~234.9	0	6 O						200				20	×	30				
root	ets (possible reworked native soil)	~234.2			15										•					
	t, compact																			
	-	_	2		ð									×			ł			
	se below 2.3 m	-					41 0						×							
	verv dense below 3.1 m	-	3					54												
		-																		
	-	1	4																	
silty	sand layer at 4.6 m							6 C))					×						
		2																		
			6					7												
	abole terminated at 6.6 m doubt	~228.5					Č	>						<						
	FISE terminated at 0.0 m depth.		7																	
1. Ti subi	his drawing is to be read with the ect report and project number as																			
pres 2. In	ented above. terpretation assistance by EXP is		8																	
requ	ired before use by others.																			
			10																	
CGPJ																				
			12																	
BORE			13																	
			14																	
<u>s</u>		1	_ ₁₅ ±														Ħ			
*~~	(n									Γ		Tim	е		Wa Le	ater evel	1			
"ex	EXP Services Inc. Hamilton, Ontario									$\left \right $	on	comp	letior	<u>ו</u> ו	(r d	<u>n)</u> ry	+			
	Telephone: 905.573.40	00																		



Time	Water Level (m)	Depth to Cave (m)
on completion	drý	no cáve
ags (above ground su bgs (below ground su	rface) rface)	

Project:	Proposed Glanbrook Indus	trial Su	bdiv	visi	on											S	Shee	t No		1	of _					
Location:	Twenty Road West, Hamilt	on, ON																								
Date Drilled:	March 28, 2018						− C Auger Sample ⊠ N ¬ SPT (N) Value O ☑ n										Combustible Vapour Reading Natural Moisture X									
Drill Type:	D-50 Track Mount. Solid St	tem.	- : 	SPT (Dyna	N) Va nic C	alue Cone	Tes	t	-	0	⊠		F	Plastic Indrai	and	Liqu Triaxi	iid Lir ial at	nit	⊢	((С					
Datum:	Geodetic		_ : _ i	Shelb Field	y Tul Vane	oe e Tes	st				•		9 F	6 Stra Peneti	ain at romet	Failu ter	ure		(⊕						
s								l Valı	10		5			Combu	stible	Vapo	our Re	ading	(ppm)	ş	Notu					
G Y W B L O	Soil Description	ELEV. m	DEP TH	She	20 ar Str	engtł	40 h	• • cile	60		80	kPa	-	Na Atter	25 tural N berg L	5 Noistu Limits	0 ure Co (% D	75 ontent ry We	% eight)		Weig kN/n					
	SOIL: (~175 mm thick)	234.76 ~234.6	0	5			100				200				10	2	0	30		Ī						
FILL	.: silty clay, brown, moist, some	~234.0		v																Ľ						
-SILT	: trace to some clay, trace to some		1	(3											×				V						
	i, brown, moisi, compaci	-	4		12																					
		-	2		Y											*				ľ						
		-			Č	5										×				V						
	holow 2.1 m	-	3	1	2																					
	below 5.1 m	_		E)	4										X				V	1					
		_	4																							
									57																	
	dense below 4.6 m		5					(Ò							×				V						
													ļ													
			6									07														
		~228.2										Ő				×				V						
Bore	ehole terminated at 6.6 m depth.		7																							
NOT	ES: his drawing is to be read with the																									
subj	ect report and project number as ented above		8																							
2. In	terpretation assistance by EXP is ired before use by others																									
			9																							
			10																							
			11																							
			12										ļ													
			13										Ì													
			1																							
			14																							
			- 15																							
			10															A/ - 1 -								
°Ον	n												-	Time	9			Leve	er el	D	Cave					
∇	Hamilton, Ontario											0	n co	ompl	etior	۱		dry		n	o ca\					
	Telephone: 905.573.40 Facsimile: 905.573.969)00 93																								
												1														



Time	Water Level (m)	Depth to Cave (m)
on completion	drý	no cave
ags (above ground su bgs (below ground su	rface) rface)	

Project:	Proposed Glanbrook Indus	trial Su	bdi	visio	n							_	Sh	neet N	lo.	1	of
Location:	Twenty Road West, Hamilt	on, ON															
			_								Com	hustibl	la Van		a din a	,	
Date Drilled:	April 3, 2018			Auger	Sampl	le		~			Natu	ral Moi	isture	our Rea	ading	:	×
Drill Type:	D-50 Track Mount. Solid S	tem.	:	SPT (№ Dynam	i) Valu iic Cor	ie ne Te	st	_			Plast Undr	ic and ained	Liquid Triaxia	l Limit I at	F		-0
Datum:	Geodetic		:	Shelby Field V	Tube ane T	est			-		% St Pene	rain at etrome ^r	Failure ter	е		⊕	
									S		Com		Vapou	ur Poodi	ng (nnm	<u></u>	्रा
G Y W B L O	Soil Description	ELEV. m	DEP TH	Shea	20 r Stren	40 gth	N Valu	e 60	80	kPa	Atte	25 atural N erberg L	Vapou 50 Moisture Limits (9	e Conte % Dry V	75 nt % Veight)		
	SOIL: (~175 mm thick)	228.50 ~228.3	0	4		10	0		200			10	20	3	30		s //
FILL root	.: silty clay, brown, moist, some	_		Ý												ŧ	2
SILT	TY CLAY: brown, moist, firm	~227.6	1	Ŏ								×	(ł	2
SILT	Γ: sandy, brown, moist, compact	~227.0			18								×				7
		_	2		-											ľ	2
som	e sand, very dense below 2.3 m	_						Ö				×					2
	asional gravel, grey below 3.1 m	_	3					64				y				ŧ.	7
		-														ŧ	4
		-	4														
SILT	FY CLAY: grey, moist, hard	~223.9					54			>225							∄
			5													ŧ	4
som	e sand seams at 6 1 m		6			ł	2			>225						ŧ	7
Bore	ehole terminated at 6.6 m depth.	~222.0														¥	2
	TES:		7														
1. Tł	his drawing is to be read with the ect report and project number as																
pres 2. In	ented above. terpretation assistance by EXP is		8														
requ	ired before use by others.																
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			_ ₁₅ 1												1 1 1 1	±1	
	'n										Tim	ne		Wa Lev	iter vel		De
EX	EXP Services Inc. Hamilton. Ontario									or	ר comp	oletior	1	<u>(m</u> 5.51	<u>1)</u> bgs	+	(no
	Telephone: 905.573.40	000															



Time	Water Level (m)	Depth to Cave (m)
on completion	5.51 bgs	no cáve
ags (above ground su	face)	

Locator: Twenty Road West, Hamilton, ON Date Driffer: April 3, 2018 April 5 with the presentation of the presentatio	Project:	Proposed Glanbrook Indus	trial Sul	odi	visio	n							_	Sh	eet N	lo.
<text></text>	Location:	Twenty Road West, Hamil	ton, ON													
Date Drillet: April 3, 2018 April 5 annyle April 5 annyle Paste and Lipad Limit. Datum: Geodetic Field Vane Test Image Sample Image Sample <td< td=""><td></td><td></td><td></td><td>_</td><td></td><td></td><td></td><td></td><td>_</td><td>_</td><td>Co</td><td>ombu</td><td>stible</td><td>Vapo</td><td>our Rea</td><td>adir</td></td<>				_					_	_	Co	ombu	stible	Vapo	our Rea	adir
Drill Type: D-50 Track Mount. Solid Stem. Drawner Coar Feat	Date Drilled:	April 3, 2018		- :	Auger S SPT (N)	ample Value				3	Na	atural	Moist	ture	Limit	
Datum: Geodetic Description Field Vana Test Prediment Image: Solid Description ELEV. Image: Solid Description Image: Solid D	Drill Type:	D-50 Track Mount. Solid S	tem.	- !	Dynami	c Cone	e Test			-	UI 0/	asuc ndrair Stro:	ned Tri	iaxial	at	
Image: Solid Description ELEV. m Image: Solid Description Contraction of the solid Description Contraction of the solid Description Contraction of the solid Description Image: Solid Description FLEV. m Image: Solid Description	Datum:	Geodetic		_ 1	Field Va	ine Tes	st		5		‰ P€	enetro	ometer	r	:	
C COPSOL: (~150 mm thick) FILL: silly day, brown, most, some FUL: silly day, brown, most, compact most, compact occasional gravel, dense below 1.5 m grey, very dense below 4.6 m grey, very dense below 4.6 m Sandy below 6.1 m Borehole terminated at 6.6 m depth. NOTES: 2. Interpretation assistance by EXP is required before use by others. 1	G Y W B L B	Soil Description	ELEV.	D E P T	Shear	20 Strength	N 40 h	Value 60) 8	30 kPa	Co	ombus 2: Natu Atterb	stible Va 5 ural Mo erg Lin	apour 50 bisture	Readin 7 Conte 6 Drv V	ng (p 75 nt % Veic
		PSOII · (~150 mm thick)	226.26	н 0	5	g	100		2	00		1(0	20	3	30
Subject report and project number as presented above. 2 100 100 100 100 100 100 100 100 100 10	FIL	L: silty clay, brown, moist, some			o									X		Ħ
Inclus, compact		T : some sand, trace clay, brown,	~220.5	1	Ć)							X			₿
grey, very dense below 4.6 m grey, very dense below 4.6 m sandy below 6.1 m Borehole terminated at 6.6 m depth. NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others. 1. Ther pretation assistance by EXP is required before use by others. 1. There are an assistance of the the subject report and the subject rep		ιsι, compacι asional gravel, dense below 1.5 m	-			3	4						¥			Ħ
grey, very dense below 4.6 m sandy below 6.1 m Borehole terminated at 6.6 m depth. NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others. 1. Therefore the subject report and project number as presented above. 1. Interpretation assistance by EXP is required before use by others. 1. Therefore the subject report and project number as presented above. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others.		.	-	2			10									Ħ
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grey, very dense below 4.6 m andy below 6.1 m Borehole terminated at 6.6 m depth. NOTES: 1. This drawing is to be read with the subject report and project number as prequired before use by others. 2. Interpretation assistance by EXP is required before use by others. 10 10 10 10 10 10 10 10 10 10			1	3			43 O									Ħ
grey, very dense below 4.6 m sandy below 6.1 m Borehole terminated at 6.6 m depth. NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others.			1													ŧ
grey, very dense below 4.6 m sandy below 6.1 m Borehole terminated at 6.6 m depth. NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others. a iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii				4												Ħ
Sandy below 6.1 m -219.7 Borehole terminated at 6.6 m depth. -219.7 NOTES: 1. This drawing is to be read with the subject report and project number as required before use by others. 2. Interpretation assistance by EXP is required before use by others. -10 10 11 11 12 12 13 13 14 14 14 15 Time		y, very dense below 4.6 m		5				51 O							×	₿
sandy below 6.1 m Borehole terminated at 6.6 m depth. NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by others. 1. Interpretation assistance by EXP is required before use by other assistance by EXP is required before use by other assistance by EXP is required before use by other assistance by EXP is required by the term is required before use by other assistance by EXP is required by the term is required by th			\mathbf{Y}													Ħ
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Exerence terminated at 6.6 m depth. NOTES: 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by EXP is required before use by others. 9 10 11 12 13 14 15 EVID Services Ins	sai	ndy below 6.1 m	-~219.7	1				Č	ý					×		Ħ
Initial of the subject report and project number as presented above. a		renoie terminated at 6.6 m depth.		7												Ħ
Presented above. 2. Interpretation assistance by EXP is required before use by others. 0 10 10 10 11 10 12 10 13 10 14 10 15 10 16 10 17 10 18 10 19 10 10 10 10 10 11 10 12 10 13 10 14 10 15 10 16 10 18 10 19 10 10 10 11 10 12 10 13 10 14 10 15 10 16 10 17 10 18 10 19 10 10 10 10 10 10 10 10		This drawing is to be read with the														Ħ
required before use by others.	pre	sented above. nterpretation assistance hv FXP is		8												≣
	rec	uired before use by others.														≣
				9												≣
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				12												
				1.1111												Ħ
				13												
				14												Ē
				Laboration in the												
				_ ₁₅]											++-	<u>+</u>
											Т	ïme			Wa Lev	te /el
CAP Services Inc. Hamilton, Ontario	5	Hamilton, Ontario									on co	mple	etion		<u>(11</u> 5.90	ı) bg



Time	Water Level (m)	Depth to Cave (m)
on completion	5.90 bgs	no cave
ags (above ground su bgs (below ground su	rface) rface)	

Project:	Proposed Glanbrook Indust	rial Sul	odi	visior	1							S	heet	No.	1
Location:	Twenty Road West, Hamilto	on, ON													
	A 11 40 0040		_	Auger Sa	mnle			Þ	1	Con	nbusti	ble Vaj	pour R	eading	[
Date Drilled:	April 18, 2018		-	SPT (N)	√alue			OE	3	Nati Plas	ural M stic an	oisture d Liqui	; id Limi	t 📙	
Drill Type:	D-50 Track Mount. Solid St	em.	_	Dynamic Shelby T⊧	Cone ube	Test			- 	Und % S	Iraineo Strain a	d Triaxia at Failu	al at ire		\oplus
Datum:	Geodetic		_	Field Var	ne Test	t				Pen	etrom	eter			
G M BOL	Soil Description	ELEV. m	DEP T H	20 Shear S) trength	N V 40	alue 60	2	i0 kPa	Com At	nbustib 25 Natura terberg 10	le Vapor 50 I Moistu Limits	ur Read) ure Coni (% Dry 0	tent % Weight)	n) SAN
	SOIL: (~150 mm thick)	~223.80	0	ô									,	X	
mois	t (possible reworked native soil)	~223.0		14											
mois	: some sand, trace clay, brown, - t, compact		1-	U								Ť			ľ
occa:	sional gravel below 1.5 m				25 O							×			
	donso bolow 2.2 m	1	2			44									F.
=grey,	uchse delow 2.3 []]	1				O						×			ŧ
sand	y below 3.1 m	1	3			43 0						×			ŧ.
	-	1													Ē
	-	1	4												
very	moist below 4.6 m				31 O							×			ŧ
			5												ľ
			6		30										ŧ
Bore	hole terminated at 6.6 m depth.	~217.3			U										ŧ
NOT	ES:		7												Ŧ
1. Th	is drawing is to be read with the ect report and project number as														
prese 2. Int	ented above. erpretation assistance bv EXP is		8												
requi	red before use by others.														
			9												
			10												
			11												
			12												
			13												
															Ŧ
			14												
			15							<u>I</u>					<u></u>
	'n									Tir	ne		Wa L€	ater evel	
- ex	EXP Services Inc. Hamilton. Ontario								0	n com	pletio	on	<u>(1</u> 5.2	<u>m)</u> 1 bgs	+,
	Telephone: 905.573.40 Facsimile: 905.573.969	00 13											1		
		-													



Time	Water	Depth to
Time	(m)	(m)
on completion	5.21 bgs	no cáve
ags (above ground su	face)	1

Project:	Proposed Glanbrook Indus	trial Su	bdi	vis	ion									s	heet N	No.	1
Location:	Twenty Road West, Hamilt	on, ON											_			_	
			_							_		Com	bustil	ble Va	oour Re	eading	
Date Drilled:	March 26, 2018		_	Auge SPT	er Sa (N) \	mple /alue			0	\boxtimes		Natu Plas	iral M	oisture d Liaui	d Limit	F	
Drill Type:	D-50 Track Mount. Solid S	tem.	_	Dyna Shel	amic by Ti	Cone Jbe	Test					Undr % St	rainec train a	l Triaxi I Failu	alat re	•	\oplus
Datum:	Geodetic		_	Field	l Var	e Tes	st			s		Pene	etrom	eter			
G Y W B L O	Soil Description	ELEV. m	DUPTI	She	2(ear S) trength	N 40 1	Value 6	0	80	(Pa	Com N Atte	bustibl 25 latural erberg	e Vapo 50 Moistu Limits	ur Read) re Conti (% Dry \	ling (ppr 75 ent % Weight)	n)
	PSOIL: (~150 mm thick)	236.17	0	4			100			200			10	20	×	30	
-FIL root	L: silty clay, brown, moist, some lets (possible reworked native soil) TY CLAY: brown, moist, very stiff to	~235.4	1		15 O					2	25				×		
SIL 	- T: trace clay, brown, moist, ipact, some sand pockets at 1.5 m		2		13 O									×			
trac	e to some sand, grey below 2.3 m		3		16 O									×			
	v moist to wet below 3.1 m	_			ő									×			
	e at 4.6 m		4	8													
			5		,									^			
com	npact below 6.1 m	~220.6	6			25 O								×			
Bor NO	ehole terminated at 6.6 m depth. TES:	- 223.0	7														
1. T sub	his drawing is to be read with the ject report and project number as sented above.		8														
requ	lired before use by others.		9														
0T 6/27/18			10														
NEW.GD			10														
OGS.GP			11														
SEHOLE I			12														
EXP BO			13														
GLJFHAM			14														
LAGW			15														
* 										ſ		Tim	ne		Wa Le	ater vel	
5	EXP Services Inc. Hamilton, Ontario Telephone: 905.573.40	000									on	com	pletic	n	<u>(r</u> 5.52	11) 2 bgs	
	Facsimile: 905.573.96	93															



Time	Water Level (m)	Depth to Cave (m)
on completion	5.52 bgs	no cáve
ags (above ground su bgs (below ground su	rface) rface)	

Project:		Proposed Glanbrook Indust	rial Sub	<u>div</u>	visio	n									She	et N	lo.
Location	:	Twenty Road West, Hamilte	on, ON														
		Manak 07, 0040		-	uder	Sami	ole					C	ombust	tible \	/apou	ır Rea	ading
Date Dril	led:	March 27, 2018		- s	PT (N	l) Val	ue		(ם כ		Na Pl	atural N astic a	Noistu nd Lio	ire quid L	.imit	F
Drill Type	e:	D-50 Track Mount. Solid St	em.	- 5	ynam helby	ic Co Tube	one Te e	est	-			Ui %	ndraine Strain	ed Tria at Fa	axial a ilure	ıt	
Datum:		Geodetic		_ F	ield V	ane [·]	Test			s		Pe	enetron	neter			
G Y			ELEV.	D		00		N Valu	ie co			С	ombustil 25	ble Va	pour F 50	Readin	ng (pp 75
		Soli Description	m 235 30	H H	Shea	20 r Strei	ngth 10	0	60	20	, kPa 0	1	Natura Atterber 10	al Moi: rg Limi	sture 0 ts (% 20	Jonter Dry W 3	nt % Veight 30
		SOIL: (~150 mm thick)	~235.2 ~235.0)												×
	rootle	ets (possible reworked native soil)	~234.5		10					75							
	SILT	Y CLAY: brown, moist, stiff to hard -	1		U							ļ			×		
	-	-			t C	5					225				×		
	-	-	~233.0	2			34					l				₿	
	-SILT: comp	: trace to some sand, brown, moist, _ pact to dense					Ŏ								×		
	_ some	۔ clay seams at 3.1 m, grey below		3	ļ	5									×		
	-3.1 m	1 -										İ					
	-	-	-	4													
	_ some	e clay, occasional gravel					32							.			Ħ
	-below	- 4.6 m		5			V							^			
	-																
	-			6				54									
╽┝┷┷╪	some dense	e sand seams, very moist, very	-~228.8					C)			ļ		×			
	Bore	hole terminated at 6.6 m depth.		7													
	NOTE	ES: is drawing is to be read with the															
	subje	ct report and project number as		8													
	2. Inte	erpretation assistance by EXP is															
	requi	red before use by others.		9													
																▦	Ħ
				10													
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												ł					
				13													
				14													
••			1	J ₁₅ ‡								1					
	\sim	n synamical and										Т	ïme			Wat Lev	ter /el
C	γV	Hamilton, Ontario									0	n co	mpleti	ion	Ę	5.81 5.81	bgs
		Telephone: 905.573.40	00								`	June	o, 20	ıð		J.34 I	ogs



	Water	Depth to
Time	Level	Cave
	(m)	(m)
on completion	5.81 bgs	no cáve
June 5, 2018	0.34 bgs	
-		
ags (above ground su	rface)	





Time	Water Level (m)	Depth to Cave (m)
on completion	4.32 bgs	no cáve
ags (above ground sur	rface)	
bgs (below ground su	rface)	

Project:	Proposed Glanbrook Indus	strial Su	bdi	vis	sior	า											She	eet N	No.	_1	
Location	m: <u>Twenty Road West, Hamil</u>	ton, ON																			
			_		_						57			Cor	nbus	tible \	/apo	ur Re	eadin	g	
Date Dr	illed: April 18, 2018		_	Aug SP1	jer S Γ(N)	amp Valı	ue ue			С	⊠ 0			Nat Pla	ural M stic a	Moistu nd Lie	ure quid	Limit			× —C
Drill Typ	e: D-50 Track Mount. Solid S	Stem.	_	Dyn She	iamio elby 1	c Co Fube	ne Te	est		_				Uno % S	draine Strain	ed Tria at Fa	axial ilure	at		Ð	Ð
Datum:	Geodetic		_	Fiel	d Va	ne 1	est				s			Per	netror	neter				4	•
G V M BO	Soil Description	ELEV. m	DUPTH	Sł	2 near \$	20 Strer	4 ngth	N \ 0	/alue 6	0	8) kPa	a	Cor	nbusti 25 Natur terbei	ble Va al Moi rg Limi	pour 50 sture its (%	Read	ing (p 75 ent % Weigł	ppm) ht)	SAMPLE
	TOPSOIL: (~150 mm thick)	232.44 232.3	0	ć)		10	50			20				10		20		30		
	 moist (possible reworked native soil) SILT: some sand, trace clay, brown, 	~231.7	1		ł	9											×				
	moist, compact	_			12	Į															
	_	-	2		C																ľ
	_	-				ő											×				
	_	-	3			22 0										×					
	_																				
	_		4				30														
	grey, occasional gravel, dense – below 4.6 m		5				Ő									<					Ø
		\mathbf{K}																			
	-		6				30														
	Borehole terminated at 6.6 m depth.	~225.9					ر ا									×					Ø
	NOTES:		7																		
	subject report and project number as presented above.		8																		
	2. Interpretation assistance by EXP is required before use by others.																				
<u>•</u>			9																		
01711																					
			10																		
S NE			11																		
0GS.GI																					
			12																		
OREHC																					
й 			13																		
HAM-E																					
VGLJF			14																		
LAG			15																		
<u>.</u>														Tie	me			Wa	ater		De
"E	EXP Services Inc. Hamilton. Ontario											\vdash	on	con	nplet	ion	-	(r 5.83	n) bgs	5	no
	Telephone: 905.573.4 Facsimile: 905.573.96	000 393																	-		



Time	Water Level (m)	Depth to Cave (m)				
on completion	5.83 bgs	no cáve				
ags (above ground surface) bgs (below ground surface)						

Project:	Proposed Glanbrook Indust	rial Sul	bdiv	visio	on						5	Sheet N	lo.	1
Location:	Twenty Road West, Hamilto	on, ON	, ON											
	April 40, 2040		_ ,	Auger	Sam	ple		l	\boxtimes	Co	mbustible Va	apour Re	ading	
Date Drilled:	April 18, 2018	SPT (N) Value O				Na Pla	tural Moistur astic and Liqu	re uid Limit						
Drill Type:	D-50 Track Mount. Solid St	em.	- :	Jynan Shelb <u>y</u>	nic C / Tub	one le e	st			Undrained Tr % Strain at F		axial at ailure		\oplus
Datum:	Geodetic		_ F	Field \	/ane	Test		I	s	Pe	netrometer			
G Y W B	Soil Description	ELEV.	Dup	D N Value E 20 40 60 80			80	Cor	mbustible Vap 25 5 Natural Moist	our Readi	ing (ppi 75 ent %	n) S Na M U P W		
		m 225.12	Т Н 0-	Shea	r Stre	ngth 10	0		kPa 200	A	tterberg Limits	(% Dry \ 0	Veight) 30)
FIL	PSOIL: (~150 mm thick) L: silt, some sand, trace clay, brown, _	~225.0	e	>								×		
moi	st (possible reworked native soil) T: some sand trace clay brown	~224.4			6						×			
moi	st, compact	_			19									
	-	4	2		φ						×			
	y, occasional gravel below 2.3 m	-			ð						×			
	du tropp group un der states -	-	3				52							
san	uy, nace gravel, very dense bw 3.1 m –	-					0				X			
	-	-	4											
	-							70						
	-		5					0			*			
	below 6.1 m		6					67						
	ehole terminated at 6.6 m depth.	~218.6						O			×			
NO	TES:		7											
1. T	his drawing is to be read with the ject report and project number as													
2. li	sented above. nterpretation assistance by EXP is		8											
requ	uired before use by others.													
			9											
T 6/2														
M.GU			10											
3S.GF														
ы П Ш			12											
GEHOI														
BOF			13											
M-EXF														
			14											
Ĕ			_ _15											
	(n)									Ti	me	Wa Le	ater vel	
- e>	EXP Services Inc. Hamilton Ontario								0	n con	npletion	(n 5.94	n) bgs	+
	Telephone: 905.573.40	00 3											-	
		5												



Time	Water Level (m)	Depth to Cave (m)				
on completion	5.94 bgs	no cave				
ags (above ground surface) bgs (below ground surface)						





	Water	Depth to					
Time	Level	Cave					
	(m)	(m)					
on completion	0.84 bgs	6.Í					
Mar. 29 (shallow)	ags						
Mar. 29 (deep)	ags						
Jun. 5 (shallow)	2.90 ags						
Jun. 5 (deep)	1.37 ags						
ags (above ground surface)							





Time	Water Level (m)	Depth to Cave (m)							
on completion	àgś	9.3							
Jun. 5 (shallow)	1.18 bgs								
Jun. 5 (deep)	0.70 ags								
	-								
ags (above ground surface)									



[‰]exp.

EXP Services Inc. Hamilton, Ontario Telephone: 905.573.4000 Facsimile: 905.573.9693

Time	Water Level (m)	Depth to Cave (m)						
on completion	3.10 bgs	10.41						
Mar. 27 (shallow)	0.51 bgs							
Mar. 27 (deep)	0.50 ags							
Jun. 5 (shallow)	0.20 bgs							
Jun. 5 (deep)	1.12 ags							
ags (above ground surface)								





Time	Water Level (m)	Depth to Cave (m)						
on completion	drý	no cáve						
Jun. 5 (shallow)	0.46 bgs							
Jun. 5 (deep)	0.56 bgs							
ags (above ground surface)								





Time	Water Level (m)	Depth to Cave (m)						
on completion	11.62 bgs	no cáve						
Jun. 4 (shallow)	0.66 bgs							
Jun. 4 (deep)	0.71 bgs							
,	_							
ags (above ground surface)								

Corbet Land Strategies Final Preliminary Hydrogeological Investigation Upper West Side Draft Plan of Industrial Sub-division Twenty Road West, Hamilton, ON BRM-00801363--B0 July 5, 2018

Appendix C: Water Levels



TABLE C: Groundwater Elevation Summary

Monitoring Well ID	Ground Surface Elevation (masl)	Stick Up (+) / Stick Down (-) (m)	Approximate Full Well Depth (mbTOP)	Approximate Full Well Depth (mbgs)	Depth	4-Jun-18	5-Jun-18	13-Jun-18	14-Jun-18	19-Jun-18
					mbTOP	-	1.74	-	1.99	-
BH1	237.93	0.960	8.3	7.3	mbgs	-	0.78	-	1.03	-
					masl	-	237.15	-	236.90	-
					mbTOP	-	1.80		1.99	
BH5	228.76	1.069	7.0	6.0	mbgs	-	0.73	-	0.92	-
					masl	-	228.03	-	227.84	-
					mbTOP	1.15	-	-	1.46	-
BH7	222.10	0.884	10.0	9.2	mbgs	0.27	-	-	0.58	-
					masl	221.83	-	-	221.52	-
					mbTOP	1.33	-	-	1.45	-
BH8	232.15	0.800	8.5	7.7	mbgs	0.53	-	-	0.65	-
					masl	231.62	-	-	231.50	-
					mbTOP	1.62	-	-	1.81	-
BH9	233.03	0.880	7.0	6.1	mbgs	0.74	-	-	0.93	-
					masl	232.29	-	-	232.10	-
					mbTOP	-	1.33	-	1.16	-
BH11	231.57	2.530	9.5	7.0	mbgs	-	-1.20	-	-1.37	-
					masi	-	232.77	-	232.94	-
DUM	000.40				MDTOP	-	2.45	0.97	-	
BH12	232.18	2.410	8.1	5.7	mogs	-	0.04	0.19	-	-
					masi	-	232.14	231.99	-	-
BU42	220.40	1 025	6.0	5.0	mbTOP	-	0.84	1.21		
БПІЗ	230.40	1.025	0.9	5.9	mogs	-	-0.19	0.16	-	-
					masi	-	230.59	230.22	-	-
DU15	222.10	0.022	0 4	75	mbroe	1.56	-	-	-	1.40
вніз	232.19	0.922	0.4	1.5	mag	0.05	-	-	-	0.54
					mhTOP	231.34	1 20	1 50	-	231.03
BH17	231.03	0.883	7.0	61	mbas	-	0.50	0.61	-	-
впп	231.03	0.005	7.0	0.1	mael	-	230.54	230.42	-	
					mhTOP	0.06	230.34	0.43		
BH18	233.81	0 905	72	63	mbas	-0.85		-0.47		
Billo	200.01	0.303	1.2	0.5	mael	234.66		234.28	-	
					mhTOP	-	1 29	1 41	-	-
BH25	235.30	0.950	7.0	6.1	mbas	-	0.34	0.46	-	
2.1.20	200.00	0.000			masl	-	234.96	234.85	-	
					mbTOP	-	201.00	201.00		
BH29-S	231.97	0.74	7.0	6.2	mbas	-	-2.63	-2.80	-2.73	-
		-	-		masl	-	234.60	234.77	234.70	-
					mbTOP	-				-
BH29-D	231.97	3.940	13.9	9.9	mbgs	-	-2.57	-2.82	-2.79	-
					masl	-	234.54	234.79	234.76	-
					mbTOP	-	2.04	1.17	-	-
BH30-S	233.53	0.864	6.9	6.0	mbgs	-	1.18	0.30	-	-
					masl	-	232.36	233.23	-	-
					mbTOP	-	0.29	0.41		0.53
BH30-D	233.53	0.980	11.6	10.6	mbgs	-	-0.70	-0.57	-	-0.45
					masl	-	234.23	234.10	-	233.98
					mbTOP	-	1.02	1.12	-	-
BH31-S	231.94	0.82	6.94	6.1	mbgs	-	0.20	0.31	-	-
					masl	-	231.74	231.64	-	-
					mbTOP	-	1.32	1.31	-	
BH31-D	231.94	2.440	11.7	9.3	mbgs	-	-1.12	-1.13	-	-
					masl	-	233.06	233.07	-	-
					mbTOP	1.37	-	-	1.54	-
BH32-S	221.99	0.905	7.1	6.1	mbgs	0.46	-	-	0.63	-
					masl	221.53	-	-	221.36	-
		I			mbTOP	1.33	-	-	1.49	-
BH32-D	221.99	0.765	13.1	12.4	mbgs	0.56	-	-	0.73	-
L				ļ	masl	221.43	-	-	221.26	-
		I			mbTOP	1.59	-	-	1.81	-
BH33-S	229.31	0.930	7.0	6.1	mbgs	0.66	-	-	0.88	-
					masl	228.66	-	-	228.43	-
					mbTOP	1.66	-	-	1.89	-
BH33-D	229.31	0.950	11.9	11.0	mbgs	0.71	-	-	0.94	-
1	1	I	1	1	mas	228.60	-	-	228.37	-

Notes:

mbTOP - meters below top of the pipe

mbgs - meters below ground surface

masl - meters above mean sea level

Artesian (Water Level Above Ground Surface)

Corbet Land Strategies Final Preliminary Hydrogeological Investigation Upper West Side Draft Plan of Industrial Sub-division Twenty Road West, Hamilton, ON BRM-00801363--B0 July 5, 2018

Appendix D: SWRT Procedures and Results














































Corbet Land Strategies Final Preliminary Hydrogeological Investigation Upper West Side Draft Plan of Industrial Sub-division Twenty Road West, Hamilton, ON BRM-00801363--B0 July 5, 2018

Appendix E: Laboratory Certificates of Analysis





Your P.O. #: BRM-ENV Your Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your C.O.C. #: 667541-01-01

Attention: Ryan Smith

exp Services Inc 1595 Clark Blvd Brampton, ON CANADA L6T 4V1

> Report Date: 2018/06/21 Report #: R5260005 Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8E5608

Received: 2018/06/14, 19:53

Sample Matrix: Water # Samples Received: 1

		Date	Date		
Analyses	Quantity	Extracted	Analyzed	Laboratory Method	Reference
Sewer Use By-Law Semivolatile Organics	1	2018/06/15	2018/06/16	EPA 8270	EPA 8270 m
				CAM SOP 00301	
Carbonaceous BOD	1	2018/06/15	2018/06/20	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	1	N/A	2018/06/18	CAM SOP-00463	EPA 325.2 m
Total Cyanide	1	2018/06/15	2018/06/19	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2018/06/15	2018/06/19	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2018/06/19	2018/06/19	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	1	N/A	2018/06/20	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL)	1	N/A	2018/06/15	CAM SOP-00552	MOE LSB E3371
Animal and Vegetable Oil and Grease	1	N/A	2018/06/16	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2018/06/16	2018/06/16	CAM SOP-00326	EPA1664B m,SM5520A m
OC Pesticides (Selected) & PCB (1)	1	2018/06/15	2018/06/16	CAM SOP-00307	EPA 8081A/8082B m
OC Pesticides Summed Parameters	1	N/A	2018/06/15	CAM SOP-00307	EPA 8081A/8082B m
рН	1	N/A	2018/06/19	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2018/06/19	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2018/06/18	CAM SOP-00464	EPA 375.4 m
Total Kjeldahl Nitrogen in Water	1	2018/06/18	2018/06/19	CAM SOP-00938	OMOE E3516 m
Total PAHs (Hamilton Sewer By-law) (2)	1	N/A	2018/06/18	CAM SOP - 00301	EPA 8270 m
Mineral/Synthetic O & G (TPH Heavy Oil) (3)	1	2018/06/16	2018/06/16	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2018/06/15	2018/06/16	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2018/06/19	CAM SOP-00228	EPA 8260C m

Remarks:

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

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

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed



Your P.O. #: BRM-ENV Your Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your C.O.C. #: 667541-01-01

Attention: Ryan Smith

exp Services Inc 1595 Clark Blvd Brampton, ON CANADA L6T 4V1

> Report Date: 2018/06/21 Report #: R5260005 Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8E5608

Received: 2018/06/14, 19:53

or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

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

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane

(2) Total PAHs include only those PAHs specified in the sewer use by-by-law.

(3) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager. Deepthi Shaji, Project Manager Email: dshaji@maxxam.ca Phone# (905)817-5700 Ext:5807

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



Report Date: 2018/06/21

exp Services Inc Client Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

HAMILTON SANITARY SEWER BYLAW (06-228)

Maxxam ID					GYQ545			GYQ545		
Sompling Date					2018/06/14			2018/06/14		
Samping Date			ļ		16:30			16:30		
COC Number			<u> </u>		667541-01-01			667541-01-01		
		UNITS	Criteria	Criteria-2	BH29-D	RDL	QC Batch	BH29-D Lab-Dup	RDL	QC Batch
Calculated Parameters	<u></u> S									
Total Animal/Vegetabl	e Oil and Grease	mg/L	150	10	ND	0.50	5582125			
Inorganics										
Total Carbonaceous BC)D	mg/L	300	-	2	2	5582809			
Fluoride (F-)		mg/L	10	-	0.13	0.10	5583635			
Total Kjeldahl Nitrogen	ı (TKN)	mg/L	100	-	ND	0.10	5585579			
рН		рН	5.5:9.5	5.5:9.5	8.08		5583636			
Phenols-4AAP		mg/L	1	0.02	ND	0.0010	5587501			
Total Suspended Solids	5	mg/L	350	15	ND	10	5583935			
Dissolved Sulphate (SO)4)	mg/L	1500	-	42	1.0	5584658			
Total Cyanide (CN)		mg/L	2	-	ND	0.0050	5583472			
Dissolved Chloride (Cl)		mg/L	1500	-	2.7	1.0	5584657			
Petroleum Hydrocarbo	ons									
Total Oil & Grease		mg/L		-	ND	0.50	5584407			
Total Oil & Grease Min	eral/Synthetic	mg/L	15	-	ND	0.50	5584408			
Metals										
Mercury (Hg)		mg/L	0.01	-	ND	0.0001	5587046			
Semivolatile Organics										
Di-N-butyl phthalate		ug/L	80	-	ND	2	5583033	83033 ND		5583033
Bis(2-ethylhexyl)phtha	late	ug/L	12	-	ND	2	5583033	ND	2	5583033
3,3'-Dichlorobenzidine		ug/L	2	-	ND	0.8	5583033	ND	0.8	5583033
Pentachlorophenol		ug/L	5	-	ND	1	5583033	ND	1	5583033
Phenanthrene		ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Anthracene		ug/L	-		ND	0.2	5583033	ND	0.2	5583033
Fluoranthene		ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Pyrene		ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
No Fill	No Exceedance									
Grey	Exceeds 1 criteri	a policy	/level							
Black	Exceeds both cri	iteria/le	vels							
RDL = Reportable Dete	ction Limit									
QC Batch = Quality Cor	QC Batch = Quality Control Batch									
Lab-Dup = Laboratory	Initiated Duplicate	!								
Criteria: City of Hamilton	on Sanitary and co	mbined	Sewer D	ischarge By	Law No. 14-090) April 2	3, 2014			
Criteria-2: City of Hami April 23, 2014	ilton Storm Discha	rge By L	aw No. 1	4-090						
ND = Not detected										



HAMILTON SANITARY SEWER BYLAW (06-228)

Maxxam ID				GYQ545			GYQ545		
Sampling Date				2018/06/14 16:30			2018/06/14 16:30		
COC Number				667541-01-01			667541-01-01		
	UNITS	Criteria	Criteria-2	BH29-D	RDL	QC Batch	BH29-D Lab-Dup	RDL	QC Batch
Benzo(a)anthracene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Chrysene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(b/j)fluoranthene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(k)fluoranthene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(a)pyrene	ug/L	-	-	ND	0.2 5583033 ND		ND	0.2	5583033
Indeno(1,2,3-cd)pyrene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Dibenz(a,h)anthracene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(g,h,i)perylene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Dibenzo(a,i)pyrene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(e)pyrene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Perylene	ug/L	-	-	ND	0.2	5583033	ND	0.2	5583033
Dibenzo(a,j) acridine	ug/L	-	-	ND	0.4	5583033	ND	0.4	5583033
7H-Dibenzo(c,g) Carbazole	ug/L -		-	ND	0.4	5583033	ND	0.4	5583033
Calculated Parameters	_					I	L		
Total PAHs (18 PAHs)	ug/L	5	-	ND	0.96	5582441			
Volatile Organics	_					I	I		
Benzene	ug/L	10	-	ND	0.50	5584557			
Chloroform	ug/L	40	-	ND	0.50	5584557			
1,2-Dichlorobenzene	ug/L	50	-	ND	1.3	5584557			
1,4-Dichlorobenzene	ug/L	80	-	ND	1.3	5584557			
cis-1,2-Dichloroethylene	ug/L	4000	-	ND	1.3	5584557			
trans-1,3-Dichloropropene	ug/L	140	-	ND	1.0	5584557			
Ethylbenzene	ug/L	160	-	ND	0.50	5584557			
Methylene Chloride(Dichloromethane)	ug/L	2000	-	ND	5.0	5584557			
1,1,2,2-Tetrachloroethane	ug/L	1400	-	ND	1.3	5584557			
Tetrachloroethylene	ug/L	1000	-	ND	0.50	5584557			
No Fill No Exceedance				•			•		
Grey Exceeds 1 crite	ria policy	/level							
Black Exceeds both c	riteria/le	vels							
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									
Lab-Dup = Laboratory Initiated Duplicate									
Criteria: City of Hamilton Sanitary and c	ombined	Sewer D	ischarge By	Law No. 14-090) April 2	23, 2014			
Criteria-2: City of Hamilton Storm Disch April 23, 2014	arge By L	aw No. 1	4-090						
ND = Not detected									



HAMILTON SANITARY SEWER BYLAW (06-228)

Maxxam ID					GYQ545			GYQ545		
Sampling Date					2018/06/14			2018/06/14		
				<u> </u>	16:30			16:30	<u> </u>	
COC Number				ļ	667541-01-01			667541-01-01	<u> </u>	
		UNITS	Criteria	Criteria-2	BH29-D	RDL	QC Batch	BH29-D Lab-Dup	RDL	QC Batch
Toluene		ug/L	16	-	ND	0.50	5584557			
Trichloroethylene		ug/L	400	-	ND	0.50	5584557			
p+m-Xylene		ug/L		<u> </u>	ND	0.50	5584557			
o-Xylene		ug/L	-	-	ND	0.50	5584557			
Total Xylenes		ug/L	1400	-	ND	0.50	5584557			
Pesticides & Herbicide	25									
Aldrin		ug/L	-	-	ND	0.005	5584043			
Dieldrin		ug/L	-	-	ND	0.005	5584043			
a-Chlordane		ug/L	-	-	ND	0.005	5584043			
g-Chlordane		ug/L	-	-	ND	0.005	5584043			
o,p-DDT		ug/L	-	-	ND	0.005	5584043			
p,p-DDT		ug/L	-	-	ND	0.005	5584043			
Lindane		ug/L	100	-	ND	0.003	5584043			
Hexachlorobenzene		ug/L	0.1	-	ND	0.005	5584043			
Mirex		ug/L	100	-	ND	0.005	5584043			
Surrogate Recovery (%	6)									
2,4,6-Tribromophenol		%	-	-	89		5583033	70		5583033
2-Fluorobiphenyl		%	-	-	55		5583033 49			5583033
D14-Terphenyl (FS)		%	-	-	104		5583033	104		5583033
D5-Nitrobenzene		%	-	-	74		5583033	72		5583033
D8-Acenaphthylene		%	-	-	64		5583033	60		5583033
2,4,5,6-Tetrachloro-m-	-xylene	%	-	-	84		5584043			
Decachlorobiphenyl		%	-	-	101		5584043			
4-Bromofluorobenzen	e	%	-	-	90		5584557			
D4-1,2-Dichloroethane	2	%	-	-	116		5584557			
D8-Toluene		%	-	-	92		5584557			
No Fill	No Exceedance				•	1				L
Grey	Exceeds 1 criteri	ia policy	/level							
Black	Exceeds both cri	iteria/le	vels							
RDI = Reportable Dete	ection Limit	,								
OC Batch = Quality Cor	ΩC Batch = Quality Control Batch									
Lab-Dup = Laboratory Initiated Duplicate										
Criteria: City of Hamilt	on Sanitary and co	mbined	Sewer D	ischarge By	Law No. 14-090) April 2	23, 2014			
Criteria-2: City of Hami	ilton Storm Discha	rge By L	aw No. 1	4-090		•				
April 23, 2014										
ND = Not detected										



Report Date: 2018/06/21

exp Services Inc Client Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

Maxxam ID					GYQ545		
Sampling Date					2018/06/14		
Sampling Date					16:30		
COC Number					667541-01-01		
		UNITS	Criteria	Criteria-2	BH29-D	RDL	QC Batch
Metals							
Total Aluminum (AI)	ug/L	50000	-	23	5.0	5587524
Total Antimony (S	Sb)	ug/L	5000	-	ND	0.50	5587524
Total Arsenic (As))	ug/L	1000	-	6.1	1.0	5587524
Total Bismuth (Bi)	ug/L	5000	-	ND	1.0	5587524
Total Cadmium (C	Cd)	ug/L	700	1000	ND	0.10	5587524
Total Chromium ((Cr)	ug/L	5000	1000	ND	5.0	5587524
Total Cobalt (Co)		ug/L	5000	-	ND	0.50	5587524
Total Copper (Cu))	ug/L	2000	1000	ND	1.0	5587524
Total Iron (Fe)		ug/L	50000	-	640	100	5587524
Total Lead (Pb)		ug/L	2000	1000	ND	0.50	5587524
Total Manganese	(Mn)	ug/L	5000	- 37		2.0	5587524
Total Molybdenu	m (Mo)	ug/L	1000	-	ND	0.50	5587524
Total Nickel (Ni)		ug/L	2000	1000	ND	1.0	5587524
Total Phosphorus	; (P)	ug/L	10000	-	ND	100	5587524
Total Selenium (S	e)	ug/L	1000	-	ND	2.0	5587524
Total Silver (Ag)		ug/L	5000	-	ND	0.10	5587524
Total Tin (Sn)		ug/L	5000	-	ND	1.0	5587524
Total Titanium (Ti	i)	ug/L	5000	-	ND	5.0	5587524
Total Vanadium (V)	ug/L	5000	-	ND	0.50	5587524
Total Zinc (Zn)		ug/L	3000	3000	ND	5.0	5587524
Microbiological						-	
Escherichia coli		CFU/100mL	-	2400	<10	10	5584111
No Fill	No Exceeda	nce					
Grey	Exceeds 1 c	riteria policy/	level				
Black	Exceeds bot	th criteria/lev	els				
RDL = Reportable	Detection L	imit					
QC Batch = Qualit	ty Control Ba	atch					
Criteria: City of Ha 2014	amilton Sani	itary and com	bined Sev	wer Dischar	ge By Law No. 1	L4-090) April 23,
Criteria-2: City of April 23, 2014	Hamilton St	orm Discharg	e By Law	No. 14-090	1		
ND = Not detecte	d						

HAMILTON STORM SEWER USE-BYLAW (WATER)



ORGANOCHLORINATED PESTICIDES BY GC-ECD (WATER)

			1			
Maxxam ID				GYQ545		
formuling Do				2018/06/14		
Sampling Da	le			16:30		
COC Number	•			667541-01-01		
		UNITS	Criteria	BH29-D	RDL	QC Batch
Calculated Pa	arameters					
Aldrin + Dielo	ug/L	0.2	ND	0.005	5582440	
Chlordane (T	ug/L	100	ND	0.005	5582440	
o,p-DDT + p,p	ug/L	0.1	ND	0.005	5582440	
Total PCB		ug/L	1	ND	0.05	5582440
No Fill	No Exceedance	е				
Grey	Exceeds 1 crite	eria poli	cy/level			
Black	Exceeds both	criteria/	levels			
RDL = Report	able Detection L	imit				
QC Batch = Q	uality Control Ba	tch				
Criteria: City 14-090 Apri	of Hamilton Sani I 23, 2014	tary and	d combin	ed Sewer Discha	arge By	Law No.
ND = Not det	ected					



Report Date: 2018/06/21

Test Description

exp Services Inc Client Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

TEST SUMMARY

Batch

Instrumentation

Maxxam ID:	GYQ545
Sample ID:	BH29-D
Matrix:	Water

		Collected: Shipped: Received:	2018/06/14 2018/06/14
Extracted	Date Analyzed	Analyst	
2018/06/15	2018/06/16	Kathy Horv	at
2018/06/15	2018/06/20	Prakash Piy	/a

Sewer Use By-Law Semivolatile Organics	GC/MS	5583033	2018/06/15	2018/06/16	Kathy Horvat
Carbonaceous BOD	DO	5582809	2018/06/15	2018/06/20	Prakash Piya
Chloride by Automated Colourimetry	KONE	5584657	N/A	2018/06/18	Deonarine Ramnarine
Total Cyanide	SKAL/CN	5583472	2018/06/15	2018/06/19	Xuanhong Qiu
Fluoride	ISE	5583635	2018/06/15	2018/06/19	Yogesh Patel
Mercury in Water by CVAA	CV/AA	5587046	2018/06/19	2018/06/19	Ron Morrison
Total Metals Analysis by ICPMS	ICP/MS	5587524	N/A	2018/06/20	Thao Nguyen
E.coli, (CFU/100mL)	PL	5584111	N/A	2018/06/15	Sonja Elavinamannil
Animal and Vegetable Oil and Grease	BAL	5582125	N/A	2018/06/16	Automated Statchk
Total Oil and Grease	BAL	5584407	2018/06/16	2018/06/16	Mansoor Ahmed
OC Pesticides (Selected) & PCB	GC/ECD	5584043	2018/06/15	2018/06/16	Mahmudul Khan
OC Pesticides Summed Parameters	CALC	5582440	N/A	2018/06/15	Automated Statchk
рН	AT	5583636	N/A	2018/06/19	Yogesh Patel
Phenols (4AAP)	TECH/PHEN	5587501	N/A	2018/06/19	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5584658	N/A	2018/06/18	Deonarine Ramnarine
Total Kjeldahl Nitrogen in Water	SKAL	5585579	2018/06/18	2018/06/19	Bramdeo Motiram
Total PAHs (Hamilton Sewer By-law)	CALC	5582441	N/A	2018/06/18	Automated Statchk
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	5584408	2018/06/16	2018/06/16	Mansoor Ahmed
Total Suspended Solids	BAL	5583935	2018/06/15	2018/06/16	Mandeep Kaur
Volatile Organic Compounds in Water	GC/MS	5584557	N/A	2018/06/19	Juan Pangilinan

Maxxam ID: Sample ID: Matrix:	GYQ545 Dup BH29-D Water					Collected: Shipped: Received:	2018/06/14 2018/06/14
Test Description		Instrumentation	Batch	Extracted	Date Analyzed	Analyst	
Sewer Use By-Law Semivo	olatile Organics	GC/MS	5583033	2018/06/15	2018/06/16	Kathy Horv	at



GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt									
	Package 1	14.0°C							
Sample GYQ545 [BH29-D] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.									
Results	relate only to the it	ems tested.							

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca



QUALITY ASSURANCE REPORT

exp Services Inc Client Project #: BRM-00801363

Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

			Matrix	Spike	SPIKED BLANK		Method Blank		RPD		QC Sta	ndard
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5583033	2,4,6-Tribromophenol	2018/06/16	117	10 - 130	98	10 - 130	84	%				
5583033	2-Fluorobiphenyl	2018/06/16	74	30 - 130	73	30 - 130	77	%				
5583033	D14-Terphenyl (FS)	2018/06/16	110	30 - 130	101	30 - 130	102	%				
5583033	D5-Nitrobenzene	2018/06/16	103	30 - 130	87	30 - 130	84	%				
5583033	D8-Acenaphthylene	2018/06/16	86	30 - 130	75	30 - 130	72	%				
5584043	2,4,5,6-Tetrachloro-m-xylene	2018/06/16	80	50 - 130	77	50 - 130	77	%				
5584043	Decachlorobiphenyl	2018/06/16	108	50 - 130	112	50 - 130	112	%				
5584557	4-Bromofluorobenzene	2018/06/18	100	70 - 130	101	70 - 130	96	%				
5584557	D4-1,2-Dichloroethane	2018/06/18	110	70 - 130	107	70 - 130	112	%				
5584557	D8-Toluene	2018/06/18	100	70 - 130	103	70 - 130	91	%				
5582809	Total Carbonaceous BOD	2018/06/20					ND,RDL=2	mg/L	0	30	93	85 - 115
5583033	3,3'-Dichlorobenzidine	2018/06/16	0.47 (1)	30 - 130	104	30 - 130	ND, RDL=0.8	ug/L	NC	40		
5583033	7H-Dibenzo(c,g) Carbazole	2018/06/16	102	30 - 130	96	30 - 130	ND, RDL=0.4	ug/L	NC	40		
5583033	Anthracene	2018/06/16	91	30 - 130	91	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(a)anthracene	2018/06/16	106	30 - 130	97	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(a)pyrene	2018/06/16	98	30 - 130	101	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(b/j)fluoranthene	2018/06/16	109	30 - 130	109	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(e)pyrene	2018/06/16	116	30 - 130	115	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(g,h,i)perylene	2018/06/16	112	30 - 130	105	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(k)fluoranthene	2018/06/16	107	30 - 130	109	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Bis(2-ethylhexyl)phthalate	2018/06/16	107	30 - 130	100	30 - 130	ND,RDL=2	ug/L	NC	40		
5583033	Chrysene	2018/06/16	104	30 - 130	106	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Dibenz(a,h)anthracene	2018/06/16	98	30 - 130	94	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Dibenzo(a,i)pyrene	2018/06/16	100	30 - 130	112	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Dibenzo(a,j) acridine	2018/06/16	100	30 - 130	96	30 - 130	ND, RDL=0.4	ug/L	NC	40		
5583033	Di-N-butyl phthalate	2018/06/16	114	30 - 130	108	30 - 130	ND,RDL=2	ug/L	NC	40		
5583033	Fluoranthene	2018/06/16	109	30 - 130	106	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Indeno(1,2,3-cd)pyrene	2018/06/16	104	30 - 130	95	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Pentachlorophenol	2018/06/16	103	30 - 130	57	30 - 130	ND,RDL=1	ug/L	NC	40		
5583033	Perylene	2018/06/16	120	30 - 130	108	30 - 130	ND, RDL=0.2	ug/L	NC	40		



QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc Client Project #: BRM-00801363

Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5583033	Phenanthrene	2018/06/16	98	30 - 130	97	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Pyrene	2018/06/16	108	30 - 130	107	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583472	Total Cyanide (CN)	2018/06/19	99	80 - 120	103	80 - 120	ND, RDL=0.0050	mg/L	NC	20		
5583635	Fluoride (F-)	2018/06/19	100	80 - 120	98	80 - 120	ND, RDL=0.10	mg/L	1.4	20		
5583636	рН	2018/06/19			102	98 - 103			0.079	N/A		
5583935	Total Suspended Solids	2018/06/16					ND, RDL=10	mg/L	NC	25	96	85 - 115
5584043	a-Chlordane	2018/06/16	101	50 - 130	104	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Aldrin	2018/06/16	80	50 - 130	84	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Dieldrin	2018/06/16	113	50 - 130	116	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	g-Chlordane	2018/06/16	99	50 - 130	101	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Hexachlorobenzene	2018/06/16	94	50 - 130	96	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Lindane	2018/06/16	85	50 - 130	85	50 - 130	ND, RDL=0.003	ug/L	NC	30		
5584043	Mirex	2018/06/16	106	30 - 130	99	30 - 130	ND, RDL=0.005	ug/L	NC	40		
5584043	o,p-DDT	2018/06/16	94	50 - 130	89	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	p,p-DDT	2018/06/16	82	50 - 130	71	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584407	Total Oil & Grease	2018/06/16			100	85 - 115	ND, RDL=0.50	mg/L	4.9	25		
5584408	Total Oil & Grease Mineral/Synthetic	2018/06/16			94	85 - 115	ND, RDL=0.50	mg/L	2.6	25		
5584557	1,1,2,2-Tetrachloroethane	2018/06/18	99	70 - 130	101	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	1,2-Dichlorobenzene	2018/06/18	88	70 - 130	93	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	1,4-Dichlorobenzene	2018/06/18	88	70 - 130	95	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	Benzene	2018/06/18	97	70 - 130	101	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Chloroform	2018/06/18	99	70 - 130	103	70 - 130	ND, RDL=0.20	ug/L	NC	30		



QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc Client Project #: BRM-00801363

Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5584557	cis-1,2-Dichloroethylene	2018/06/18	101	70 - 130	105	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	Ethylbenzene	2018/06/18	87	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Methylene Chloride(Dichloromethane)	2018/06/18	95	70 - 130	96	70 - 130	ND, RDL=2.0	ug/L	NC	30		
5584557	o-Xylene	2018/06/18	84	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	p+m-Xylene	2018/06/18	87	70 - 130	95	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Tetrachloroethylene	2018/06/18	87	70 - 130	93	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Toluene	2018/06/18	90	70 - 130	97	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Total Xylenes	2018/06/18					ND, RDL=0.20	ug/L	NC	30		
5584557	trans-1,3-Dichloropropene	2018/06/18	75	70 - 130	76	70 - 130	ND, RDL=0.40	ug/L	NC	30		
5584557	Trichloroethylene	2018/06/18	91	70 - 130	96	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584657	Dissolved Chloride (Cl)	2018/06/18	100	80 - 120	104	80 - 120	ND, RDL=1.0	mg/L	0.071	20		
5584658	Dissolved Sulphate (SO4)	2018/06/18	104	75 - 125	101	80 - 120	ND, RDL=1.0	mg/L	0.49	20		
5585579	Total Kjeldahl Nitrogen (TKN)	2018/06/19	103	80 - 120	102	80 - 120	ND, RDL=0.10	mg/L	0	20	99	80 - 120
5587046	Mercury (Hg)	2018/06/19	92	75 - 125	91	80 - 120	ND, RDL=0.0001	mg/L	NC	20		
5587501	Phenols-4AAP	2018/06/19	91	80 - 120	93	80 - 120	ND, RDL=0.0010	mg/L	0	20		
5587524	Total Aluminum (Al)	2018/06/20	NC	80 - 120	105	80 - 120	ND, RDL=5.0	ug/L	1.8	20		
5587524	Total Antimony (Sb)	2018/06/20	107	80 - 120	100	80 - 120	ND, RDL=0.50	ug/L				
5587524	Total Arsenic (As)	2018/06/20	103	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L				
5587524	Total Bismuth (Bi)	2018/06/20	92	80 - 120	94	80 - 120	ND, RDL=1.0	ug/L	NC	20		
5587524	Total Cadmium (Cd)	2018/06/20	100	80 - 120	100	80 - 120	ND, RDL=0.10	ug/L	NC	20		
5587524	Total Chromium (Cr)	2018/06/20	100	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L	NC	20		
5587524	Total Cobalt (Co)	2018/06/20	98	80 - 120	96	80 - 120	ND, RDL=0.50	ug/L	16	20		
5587524	Total Copper (Cu)	2018/06/20	103	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	3.0	20		
5587524	Total Iron (Fe)	2018/06/20	99	80 - 120	97	80 - 120	ND, RDL=100	ug/L	1.8	20		
5587524	Total Lead (Pb)	2018/06/20	93	80 - 120	95	80 - 120	ND, RDL=0.50	ug/L	0.78	20		
5587524	Total Manganese (Mn)	2018/06/20	97	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	2.5	20		
5587524	Total Molybdenum (Mo)	2018/06/20	107	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L	5.5	20		
5587524	Total Nickel (Ni)	2018/06/20	97	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	4.7	20		



QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc Client Project #: BRM-00801363

Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5587524	Total Phosphorus (P)	2018/06/20	110	80 - 120	107	80 - 120	ND, RDL=100	ug/L	1.1	20		
5587524	Total Selenium (Se)	2018/06/20	108	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L				
5587524	Total Silver (Ag)	2018/06/20	97	80 - 120	95	80 - 120	ND, RDL=0.10	ug/L	NC	20		
5587524	Total Tin (Sn)	2018/06/20	103	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L				
5587524	Total Titanium (Ti)	2018/06/20	104	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L				
5587524	Total Vanadium (V)	2018/06/20	102	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	2.1	20		
5587524	Total Zinc (Zn)	2018/06/20	100	80 - 120	104	80 - 120	ND, RDL=5.0	ug/L	1.1	20		

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

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

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

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

(1) Some recoveries were below the lower control limits. This may represent a low bias in some results for these flagged analytes.


exp Services Inc Client Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

VALIDATION SIGNATURE PAGE

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

Cuistin Camiere

Cristina Carriere, Scientific Service Specialist

Eve Eva Prahilo

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Sonja Elavinamannil, Analyst I

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



Exceedence Summary Table – Hamiton Sanitary & comb.

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						
The exceedence summa	ry table is for information p	urposes only and should no	ot be considered a compret	nensive listing or	statement of	conformance
to applicable regulatory	guidelines.					

Exceedence Summary Table – Hamiton Storm

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
No Exceedences						
The exceedence summary to applicable regulatory g	y table is for information p juidelines.	ourposes only and should not	be considered a compre	hensive listing or	statement of	conformance

T A		6740 Campobello Road, Mississaug WORDS TO:	a, Ontano Canada L5N 2	L8 Tel (905) 817-	5700 Toll-free 800	-563-6266 Fa	ix:(905) 817-57	77 www.maxi	kam,ca							a na manana a sa farita da	Pag	e of 1
	#20554 000 00				REPO	RT TO:					PROJEC	T INFORMATI	ON:			Laboratory L	Jse Only:	
any Nam	Central Services	rvices inc	Company	/ Name:	EXP Serv	ices.			Quotatio	n #	B4599	97 Stre	am 2			Maxxam Job #:	Bottle Ord	ler#:
ion:	1595 Clark Blvd		Attention	-Ry	in Smith	Qex	plon		P.O. #:		BR	M-ENV.	10.0		-			
58	Brampton ON L6	ST 4V1	Address		in bad	100	P.Com		Project:		Bizm	1-00 80	1363	3	_	724-01-0	667541	1
	(905) 793-9800	Env (905) 793-0	641 Tel	100	ison · nece	(and	nt co		Project N	lame	-Ta	venty	RD 6	vest,		COC #:	Project Mar	nager:
n.	Karen.Burke@e:	xp.com; Luizza.Jose@exp.cor	n; AP@e Email	Mino	o. Jazoto	mpanh	Oux).co	Site #	By	Ha	mitton	M.Y	& Hal	7	C#667541-01-01	Deepthi S	ihaji
DE RE	GULATED DRINKIN	G WATER OR WATER INTEND	ED FOR HUMAN C	ONSUMPTION	MUST BE	1			ANALYSIS RI	EQUESTE	D (PLEASE B	BE SPECIFIC)		- 10-1		Turnaround Time (T	AT) Required:	_
	CODMITTED		VATER CHAIN OF C	JUSTODY		e)	5								Regular (S	Please provide advance no	tice for rush projects	
Regula	tion 153 (2011)	Other Regul	ations	Special Ir	nstructions	/ circl	Sew								(will be applie	d if Rush TAT is not specified):		
e2 [Ind/Comm Coarse	TVFine CCME Senitary	Sewer Bylaw			ase	torm								Standard TA	T = 5-7 Working days for most test	s	V
e3 [Agri/Other For RS	SC MISA Municipality	Hamilton			(ple	SPE								Please note.	Standard TAT for certain tests suc	h as BOD and Dioxins/Fura	ns are > 5
(e		PWQ0	<u></u>			s / H	ary a								Job Cosell	- Duck TAT III conflict the conflict	and a start of the	
		Other				Filte	228)								Date Require	d:	Time Required.	
	Include Criteri	a on Certificate of Analysis (Y/N)	2 Yes			M	Iton v (06-								Rush Confirm	nation Number	200 Mar 200 M	
Sam	le Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	·	Bylaw								# of Bottles	C	(call lab for #)	
		BH 29-D	2018/06/14	4:30	Gω	N									17	Iron analysi	s please	
														_		Olaria	. Clays	TAT
																prease me	et solog	[H]
																	10.10.52	
																14-Jun-	18 19:53	-
		- in .														Deepthi Shaji		
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	RELINQUISHED BY: (Si	gnature/Print) Date:	YY/MM/DD) Tie	né –	RECEIVED B	V: (Signature	(Print)	Detro	00/00/002									
Min	co Vazilant	unt and Dails	66110 71	18.74	ALGEIVED B	UAA		Date:		10	ime	≠ jars used not submit	ted	ma Sanadi -	Laborat	ory Use Only	du Real V	L NZ
Mar	many	della	100114 1.0	TOPP C	and the second	114-2)17	hiw	-01	3/04/14	19	:15	-	III	me genariive	Temperatu 14/1	re (°C) on Recei Custo Prei 14/14 04/14 Int	sent Yes	No
SS OTHER	WISE AGREED TO IN WR	ITING, WORK SUBMITTED ON THIS CH	AIN OF CUSTODY IS SUE	JECT TO MAXXAN	S STANDARD TE	RMS AND CON	DITIONS. SIG	NING OF THIS	CHAIN OF CUS	TODY DOG	UMENT IS		ale and the second	A STREET		11.1 - 1 - 1	White: Maxxa Vella	w: Clien

Maxxam Analytics International Corporation o/a Maxxam Analytics



Your P.O. #: BRM-ENV Your Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your C.O.C. #: 667541-01-01

Attention: Ryan Smith

exp Services Inc 1595 Clark Blvd Brampton, ON CANADA L6T 4V1

> Report Date: 2018/07/03 Report #: R5278713 Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B8E5608

Received: 2018/06/14, 19:53

Sample Matrix: Water # Samples Received: 1

		Date	Date		
Analyses	Quantity	Extracted	Analyzed	Laboratory Method	Reference
Sewer Use By-Law Semivolatile Organics	1	2018/06/15	2018/06/16	EPA 8270	EPA 8270 m
				CAM SOP 00301	
Carbonaceous BOD	1	2018/06/15	2018/06/20	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	1	N/A	2018/06/18	CAM SOP-00463	EPA 325.2 m
Total Cyanide	1	2018/06/15	2018/06/19	CAM SOP-00457	OMOE E3015 5 m
Fluoride	1	2018/06/15	2018/06/19	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	1	2018/06/19	2018/06/19	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	1	N/A	2018/06/20	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL)	1	N/A	2018/06/15	CAM SOP-00552	MOE LSB E3371
Animal and Vegetable Oil and Grease	1	N/A	2018/06/16	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	1	2018/06/16	2018/06/16	CAM SOP-00326	EPA1664B m,SM5520A m
OC Pesticides (Selected) & PCB (1)	1	2018/06/15	2018/06/16	CAM SOP-00307	EPA 8081A/8082B m
OC Pesticides Summed Parameters	1	N/A	2018/06/15	CAM SOP-00307	EPA 8081A/8082B m
рН	1	N/A	2018/06/19	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	1	N/A	2018/06/19	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	1	N/A	2018/06/18	CAM SOP-00464	EPA 375.4 m
Total Kjeldahl Nitrogen in Water	1	2018/06/18	2018/06/19	CAM SOP-00938	OMOE E3516 m
Total PAHs (Hamilton, Ottawa S.U.B.) (2)	1	N/A	2018/06/18	CAM SOP - 00301	EPA 8270 m
Mineral/Synthetic O & G (TPH Heavy Oil) (3)	1	2018/06/16	2018/06/16	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	1	2018/06/15	2018/06/16	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	1	N/A	2018/06/19	CAM SOP-00228	EPA 8260C m

Remarks:

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

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

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed



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or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

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

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Chlordane (Total) = Alpha Chlordane + Gamma Chlordane

(2) Total PAHs include only those PAHs specified in the sewer use by-by-law.

(3) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager. Deepthi Shaji, Project Manager Email: dshaji@maxxam.ca Phone# (905)817-5700 Ext:5807

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

Maxxam Analytics International Corporation o/a Maxxam Analytics 6740 Campobello Road, Mississauga, Ontario, LSN 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca



HAMILTON SANITARY SEWER BYLAW (06-228)

Maxxam ID				GYQ545			GYQ545			
Sampling Date				2018/06/14 16:30			2018/06/14 16:30			
COC Number				667541-01-01			667541-01-01			
		UNITS	Criteria	BH29-D	RDL	QC Batch	BH29-D Lab-Dup	RDL	QC Batch	
Calculated Paramete	ers									
Total Animal/Vegeta	ble Oil and Grease	mg/L	-	ND	0.50	5582125				
Inorganics			-							
Total Carbonaceous	BOD	mg/L	-	2	2	5582809				
Fluoride (F-)		mg/L	-	0.13	0.10	5583635				
Total Kjeldahl Nitrog	en (TKN)	mg/L	-	ND	0.10	5585579				
рН		рН	6.5:8.5	8.08		5583636				
Phenols-4AAP		mg/L	0.001	ND	0.0010	5587501				
Total Suspended Soli	ds	mg/L	-	ND	10	5583935				
Dissolved Sulphate (S	504)	mg/L	-	42	1.0	5584658				
Total Cyanide (CN)		mg/L	-	ND	0.0050	5583472				
Dissolved Chloride (C	mg/L	-	2.7	1.0	5584657					
Petroleum Hydrocarbons										
Total Oil & Grease	mg/L	-	ND	0.50	5584407					
Total Oil & Grease Mineral/Synthetic			0.5	ND	0.50	5584408				
Metals	Metals									
Mercury (Hg)		mg/L	0.0002	ND	0.0001	5587046				
Semivolatile Organic	S									
Di-N-butyl phthalate		ug/L	4	ND	2	5583033	ND	2	5583033	
Bis(2-ethylhexyl)phth	nalate	ug/L	0.6	ND (1)	2	5583033	ND (1)	2	5583033	
3,3'-Dichlorobenzidir	ne	ug/L	0.6	ND (1)	0.8	5583033	ND (1)	0.8	5583033	
Pentachlorophenol		ug/L	0.5	ND (1)	1	5583033	ND (1)	1	5583033	
Phenanthrene		ug/L	0.03	ND (1)	0.2	5583033	ND (1)	0.2	5583033	
Anthracene		ug/L	0.0008	ND (1)	0.2	5583033	ND (1)	0.2	5583033	
Fluoranthene		ug/L	0.0008	ND (1)	0.2	5583033	ND (1)	0.2	5583033	
Pyrene		ug/L	-	ND	0.2	5583033	ND	0.2	5583033	
No Fill	No Exceedance									
Grey	Exceeds 1 criteria	policy/le	evel							
Black Exceeds both criteria/levels										
RDL = Reportable Detection Limit										
QC Batch = Quality Control Batch										
Lab-Dup = Laboratory Initiated Duplicate										
Criteria: Ontario Prov Ref. to MOEE Water	Criteria: Ontario Provincial Water Quality Objectives Ref. to MOEE Water Management document dated Feb.1999									
ND = Not detected										
(1) RDL exceeds crite	1) RDL exceeds criteria									



exp Services Inc Client Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

HAMILTON SANITARY SEWER BYLAW (06-228)

Maxxam ID				GYQ545			GYQ545		
Sampling Date				2018/06/14			2018/06/14		
				16:30			16:30		
COC Number				667541-01-01			667541-01-01		
		UNITS	Criteria	BH29-D	RDL	QC Batch	BH29-D Lab-Dup	RDL	QC Batch
Benzo(a)anthracene		ug/L	0.0004	ND (1)	0.2	5583033	ND (1)	0.2	5583033
Chrysene		ug/L	0.0001	ND (1)	0.2	5583033	ND (1)	0.2	5583033
Benzo(b/j)fluoranthe	ene	ug/L	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(k)fluoranthen	e	ug/L	0.0002	ND (1)	0.2	5583033	ND (1)	0.2	5583033
Benzo(a)pyrene		ug/L	-	ND	0.2	5583033	ND	0.2	5583033
Indeno(1,2,3-cd)pyre	ene	ug/L	-	ND	0.2	5583033	ND	0.2	5583033
Dibenz(a,h)anthrace	ne	ug/L	0.002	ND (1)	0.2	5583033	ND (1)	0.2	5583033
Benzo(g,h,i)perylene		ug/L	0.00002	ND (1)	0.2	5583033	ND (1)	0.2	5583033
Dibenzo(a,i)pyrene		ug/L	-	ND	0.2	5583033	ND	0.2	5583033
Benzo(e)pyrene		ug/L	-	ND	0.2	5583033	ND	0.2	5583033
Perylene		ug/L	0.00007	ND (1)	0.2	5583033	ND (1)	0.2	5583033
Dibenzo(a,j) acridine		ug/L	-	ND	0.4	5583033	ND	0.4	5583033
7H-Dibenzo(c,g) Cart	ug/L	-	ND	0.4	5583033	ND	0.4	5583033	
Calculated Paramete	ers								
Total PAHs (18 PAHs	ug/L	-	ND	0.96	5582441				
Volatile Organics									
Benzene		ug/L	100	ND	0.50	5584557			
Chloroform		ug/L	-	ND	0.50	5584557			
1,2-Dichlorobenzene		ug/L	2.5	ND	1.3	5584557			
1,4-Dichlorobenzene	1	ug/L	4	ND	1.3	5584557			
cis-1,2-Dichloroethyl	ene	ug/L	200	ND	1.3	5584557			
trans-1,3-Dichloropr	opene	ug/L	7	ND	1.0	5584557			
Ethylbenzene		ug/L	8	ND	0.50	5584557			
Methylene Chloride(Dichloromethane)	ug/L	100	ND	5.0	5584557			
1,1,2,2-Tetrachloroe	thane	ug/L	70	ND	1.3	5584557			
Tetrachloroethylene		ug/L	50	ND	0.50	5584557			
No Fill	No Exceedance								
Grey Exceeds 1 criteria policy/level									
Black Exceeds both criteria/levels									
RDL = Reportable De	tection Limit								
QC Batch = Quality C	ontrol Batch								
Lab-Dup = Laborator	y Initiated Duplicate								
Criteria: Ontario Prov	vincial Water Quality	y Object	ives						
Ref. to MOEE Water	Ref. to MOEE Water Management document dated Feb.1999								

ND = Not detected

(1) RDL exceeds criteria



exp Services Inc Client Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

HAMILTON SANITARY SEWER BYLAW (06-228)

Maxxam ID				GYQ545			GYQ545		
Sampling Date				2018/06/14 16:30			2018/06/14 16:30		
COC Number				667541-01-01			667541-01-01		
		UNITS	Criteria	BH29-D	RDL	QC Batch	BH29-D Lab-Dup	RDL	QC Batch
Toluene		ug/L	0.8	ND	0.50	5584557			
Trichloroethylene		ug/L	20	ND	0.50	5584557			
p+m-Xylene		ug/L	-	ND	0.50	5584557			
o-Xylene		ug/L	40	ND	0.50	5584557			
Total Xylenes		ug/L	-	ND	0.50	5584557			
Pesticides & Herbicio	des			•					
Aldrin		ug/L	0.001	ND (1)	0.005	5584043			
Dieldrin		ug/L	0.001	ND (1)	0.005	5584043			
a-Chlordane		ug/L	0.06	ND	0.005	5584043			
g-Chlordane		ug/L	0.06	ND	0.005	5584043			
o,p-DDT		ug/L	0.003	ND (1)	0.005	5584043			
p,p-DDT		ug/L	0.003	ND (1)	0.005	5584043			
Lindane		ug/L	0.01	ND	0.003	5584043			
Hexachlorobenzene		ug/L	0.0065	ND	0.005	5584043			
Mirex		ug/L	0.001	ND (1)	0.005	5584043			
Surrogate Recovery	(%)								
2,4,6-Tribromophend	ol	%	-	89		5583033	70		5583033
2-Fluorobiphenyl		%	-	55		5583033	49		5583033
D14-Terphenyl (FS)		%	-	104		5583033	104		5583033
D5-Nitrobenzene		%	-	74		5583033	72		5583033
D8-Acenaphthylene		%	-	64		5583033	60		5583033
2,4,5,6-Tetrachloro-r	n-xylene	%	-	84		5584043			
Decachlorobiphenyl		%	-	101		5584043			
4-Bromofluorobenze	ne	%	-	90		5584557			
D4-1,2-Dichloroethar	ne	%	-	116		5584557			
D8-Toluene		%	-	92		5584557			
No Fill	No Exceedance								
Grey	Exceeds 1 criteria	policy/l	evel						
Black	Black Exceeds both criteria/levels								
RDL = Reportable De	tection Limit								
QC Batch = Quality C	ontrol Batch								
Lab-Dup = Laborator	y Initiated Duplicate								
Criteria: Ontario Prov	vincial Water Quality	object	ives						
Ref. to MOEE Water Management document dated Feb.1999									

ND = Not detected

(1) RDL exceeds criteria



exp Services Inc Client Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

Maxxam ID				GYQ545				
Sampling Date	9			2018/06/14				
	e			16:30				
COC Number				667541-01-01				
		UNITS	Criteria	BH29-D	RDL	QC Batch		
Metals								
Total Aluminu	m (Al)	ug/L	- 23		5.0	5587524		
Total Antimon	ıy (Sb)	ug/L	20	ND	0.50	5587524		
Total Arsenic (As)		ug/L	100	6.1	1.0	5587524		
Total Bismuth	(Bi)	ug/L	-	ND	1.0	5587524		
Total Cadmiur	m (Cd)	ug/L	0.2	ND	0.10	5587524		
Total Chromiu	ım (Cr)	ug/L	-	ND	5.0	5587524		
Total Cobalt (0	Co)	ug/L	0.9	ND	0.50	5587524		
Total Copper ((Cu)	ug/L	5	ND	1.0	5587524		
Total Iron (Fe)		ug/L	300	640	100	5587524		
Total Lead (Pb)	ug/L	5	ND	0.50	5587524		
Total Mangan	ese (Mn)	ug/L	-	37	2.0	5587524		
Total Molybde	enum (Mo)	ug/L	40	ND	0.50	5587524		
Total Nickel (N	Ji)	ug/L	25	ND	1.0	5587524		
Total Phospho	orus (P)	ug/L	10	ND (1)	100	5587524		
Total Seleniun	n (Se)	ug/L	100	ND	2.0	5587524		
Total Silver (A	g)	ug/L	0.1	ND	0.10	5587524		
Total Tin (Sn)		ug/L	-	ND	1.0	5587524		
Total Titanium	n (Ti)	ug/L	-	ND	5.0	5587524		
Total Vanadiu	m (V)	ug/L	6	ND	0.50	5587524		
Total Zinc (Zn)		ug/L	30	ND	5.0	5587524		
Microbiologic	al							
Escherichia co	li	CFU/100mL	100	<10	10	5584111		
No Fill	No Exceedan	ce						
Grey Exceeds 1 criteria policy/level								
Black Exceeds both criteria/levels								
RDL = Reportable Detection Limit								
QC Batch = Qu	uality Control Ba	atch						
Criteria: Ontai	rio Provincial W	ater Quality C	Objectives	5				
Ref. to MOEE	Water Manage	ment docume	ent dated	Feb.1999				
ND = Not dete	ND = Not detected							
RDL exceed	as criteria							

HAMILTON STORM SEWER USE-BYLAW (WATER)



exp Services Inc Client Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

ORGANOCHLORINATED PESTICIDES BY GC-ECD (WATER)

Maxxam ID				GYQ545		
Sampling Da	te			2018/06/14 16:30		
COC Number	r			667541-01-01		
		UNITS	Criteria	BH29-D	RDL	QC Batch
Calculated P						
Aldrin + Dielo	ug/L	0.001	ND (1)	0.005	5582440	
Chlordane (T	ug/L	0.06	ND	0.005	5582440	
o,p-DDT + p,	ug/L	-	ND	0.005	5582440	
Total PCB		ug/L	0.001	ND (1)	0.05	5582440
No Fill	No Exceedanc	e				
Grey	Exceeds 1 crite	eria poli	cy/level			
Black	Exceeds both	criteria/	levels			
RDL = Report	able Detection L	imit				
QC Batch = Quality Control Batch						
Criteria: Ontario Provincial Water Quality Objectives Ref. to MOEE Water Management document dated Feb.1999						
ND = Not detected						
(1) RDL excee	eds criteria					



Phenols (4AAP)

Sulphate by Automated Colourimetry

Total PAHs (Hamilton, Ottawa S.U.B.)

Volatile Organic Compounds in Water

Mineral/Synthetic O & G (TPH Heavy Oil)

Total Kjeldahl Nitrogen in Water

Total Suspended Solids

exp Services Inc Client Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

TEST SUMMARY

Maxxam ID:	GYQ545
Sample ID:	BH29-D
Matrix:	Water

Maxxam ID: GYQ545 Sample ID: BH29-D					Collected: 2018/06/14 Shipped:
Matrix: Water					Received: 2018/06/14
Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sewer Use By-Law Semivolatile Organics	GC/MS	5583033	2018/06/15	2018/06/16	Kathy Horvat
Carbonaceous BOD	DO	5582809	2018/06/15	2018/06/20	Prakash Piya
Chloride by Automated Colourimetry	KONE	5584657	N/A	2018/06/18	Deonarine Ramnarine
Total Cyanide	SKAL/CN	5583472	2018/06/15	2018/06/19	Xuanhong Qiu
Fluoride	ISE	5583635	2018/06/15	2018/06/19	Yogesh Patel
Mercury in Water by CVAA	CV/AA	5587046	2018/06/19	2018/06/19	Ron Morrison
Total Metals Analysis by ICPMS	ICP/MS	5587524	N/A	2018/06/20	Thao Nguyen
E.coli, (CFU/100mL)	PL	5584111	N/A	2018/06/15	Sonja Elavinamannil
Animal and Vegetable Oil and Grease	BAL	5582125	N/A	2018/06/16	Automated Statchk
Total Oil and Grease	BAL	5584407	2018/06/16	2018/06/16	Mansoor Ahmed
OC Pesticides (Selected) & PCB	GC/ECD	5584043	2018/06/15	2018/06/16	Mahmudul Khan
OC Pesticides Summed Parameters	CALC	5582440	N/A	2018/06/15	Automated Statchk
pH	AT	5583636	N/A	2018/06/19	Yogesh Patel

N/A

N/A

N/A

N/A

2018/06/18

2018/06/16

2018/06/15

2018/06/19

2018/06/18

2018/06/19

2018/06/18

2018/06/16

2018/06/16

2018/06/19

Zahid Soikot

Deonarine Ramnarine

Bramdeo Motiram

Automated Statchk

Mansoor Ahmed

Mandeep Kaur

Juan Pangilinan

Maxxam ID: Sample ID: Matrix:	GYQ545 Dup BH29-D Water					Collected: 2018/06/14 Shipped: Received: 2018/06/14
Test Description		Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sewer Use By-Law Semive	olatile Organics	GC/MS	5583033	2018/06/15	2018/06/16	Kathy Horvat

5587501

5584658

5585579

5582441

5584408

5583935

5584557

TECH/PHEN

KONE

SKAL

CALC

BAL

BAL

GC/MS



GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt										
	Package 1	14.0°C								
Revised Report (2018/07/03): Requested regulatory criteria have been revised as per client request										
Sample GYQ545 [BH29-D] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.										
Result	s relate only to th	e items tested.								



QUALITY ASSURANCE REPORT

exp Services Inc Client Project #: BRM-00801363

Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

			Matrix Spike		SPIKED	BLANK	Method B	lank	RPD		QC Sta	ndard
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5583033	2,4,6-Tribromophenol	2018/06/16	117	10 - 130	98	10 - 130	84	%				
5583033	2-Fluorobiphenyl	2018/06/16	74	30 - 130	73	30 - 130	77	%				
5583033	D14-Terphenyl (FS)	2018/06/16	110	30 - 130	101	30 - 130	102	%				
5583033	D5-Nitrobenzene	2018/06/16	103	30 - 130	87	30 - 130	84	%				
5583033	D8-Acenaphthylene	2018/06/16	86	30 - 130	75	30 - 130	72	%				
5584043	2,4,5,6-Tetrachloro-m-xylene	2018/06/16	80	50 - 130	77	50 - 130	77	%				
5584043	Decachlorobiphenyl	2018/06/16	108	50 - 130	112	50 - 130	112	%				
5584557	4-Bromofluorobenzene	2018/06/18	100	70 - 130	101	70 - 130	96	%				
5584557	D4-1,2-Dichloroethane	2018/06/18	110	70 - 130	107	70 - 130	112	%				
5584557	D8-Toluene	2018/06/18	100	70 - 130	103	70 - 130	91	%				
5582809	Total Carbonaceous BOD	2018/06/20					ND,RDL=2	mg/L	0	30	93	85 - 115
5583033	3,3'-Dichlorobenzidine	2018/06/16	0.47 (1)	30 - 130	104	30 - 130	ND, RDL=0.8	ug/L	NC	40		
5583033	7H-Dibenzo(c,g) Carbazole	2018/06/16	102	30 - 130	96	30 - 130	ND, RDL=0.4	ug/L	NC	40		
5583033	Anthracene	2018/06/16	91	30 - 130	91	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(a)anthracene	2018/06/16	106	30 - 130	97	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(a)pyrene	2018/06/16	98	30 - 130	101	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(b/j)fluoranthene	2018/06/16	109	30 - 130	109	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(e)pyrene	2018/06/16	116	30 - 130	115	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(g,h,i)perylene	2018/06/16	112	30 - 130	105	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Benzo(k)fluoranthene	2018/06/16	107	30 - 130	109	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Bis(2-ethylhexyl)phthalate	2018/06/16	107	30 - 130	100	30 - 130	ND,RDL=2	ug/L	NC	40		
5583033	Chrysene	2018/06/16	104	30 - 130	106	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Dibenz(a,h)anthracene	2018/06/16	98	30 - 130	94	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Dibenzo(a,i)pyrene	2018/06/16	100	30 - 130	112	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Dibenzo(a,j) acridine	2018/06/16	100	30 - 130	96	30 - 130	ND, RDL=0.4	ug/L	NC	40		
5583033	Di-N-butyl phthalate	2018/06/16	114	30 - 130	108	30 - 130	ND,RDL=2	ug/L	NC	40		
5583033	Fluoranthene	2018/06/16	109	30 - 130	106	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Indeno(1,2,3-cd)pyrene	2018/06/16	104	30 - 130	95	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Pentachlorophenol	2018/06/16	103	30 - 130	57	30 - 130	ND,RDL=1	ug/L	NC	40		
5583033	Perylene	2018/06/16	120	30 - 130	108	30 - 130	ND, RDL=0.2	ug/L	NC	40		



QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc Client Project #: BRM-00801363

Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

			Matrix Spike		SPIKED BLANK		Method E	Blank	RP	D	QC Sta	indard
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5583033	Phenanthrene	2018/06/16	98	30 - 130	97	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583033	Pyrene	2018/06/16	108	30 - 130	107	30 - 130	ND, RDL=0.2	ug/L	NC	40		
5583472	Total Cyanide (CN)	2018/06/19	99	80 - 120	103	80 - 120	ND, RDL=0.0050	mg/L	NC	20		
5583635	Fluoride (F-)	2018/06/19	100	80 - 120	98	80 - 120	ND, RDL=0.10	mg/L	1.4	20		
5583636	рН	2018/06/19			102	98 - 103			0.079	N/A		
5583935	Total Suspended Solids	2018/06/16					ND, RDL=10	mg/L	NC	25	96	85 - 115
5584043	a-Chlordane	2018/06/16	101	50 - 130	104	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Aldrin	2018/06/16	80	50 - 130	84	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Dieldrin	2018/06/16	113	50 - 130	116	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	g-Chlordane	2018/06/16	99	50 - 130	101	50 - 130	ND, RDL=0.005 ug/L		NC	30		
5584043	Hexachlorobenzene	2018/06/16	94	50 - 130	96	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	Lindane	2018/06/16	85	50 - 130	85	50 - 130	ND, RDL=0.003	ug/L	NC	30		
5584043	Mirex	2018/06/16	106	30 - 130	99	30 - 130	ND, RDL=0.005	ug/L	NC	40		
5584043	o,p-DDT	2018/06/16	94	50 - 130	89	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584043	p,p-DDT	2018/06/16	82	50 - 130	71	50 - 130	ND, RDL=0.005	ug/L	NC	30		
5584407	Total Oil & Grease	2018/06/16			100	85 - 115	ND, RDL=0.50	mg/L	4.9	25		
5584408	Total Oil & Grease Mineral/Synthetic	2018/06/16			94	85 - 115	ND, RDL=0.50	mg/L	2.6	25		
5584557	1,1,2,2-Tetrachloroethane	2018/06/18	99	70 - 130	101	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	1,2-Dichlorobenzene	2018/06/18	88	70 - 130	93	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	1,4-Dichlorobenzene	2018/06/18	88	70 - 130	95	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	Benzene	2018/06/18	97	70 - 130	101	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Chloroform	2018/06/18	99	70 - 130	103	70 - 130	ND, RDL=0.20	ug/L	NC	30		



QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc Client Project #: BRM-00801363

Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

			Matrix Spike		SPIKED	BLANK	Method B	Blank	RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5584557	cis-1,2-Dichloroethylene	2018/06/18	101	70 - 130	105	70 - 130	ND, RDL=0.50	ug/L	NC	30		
5584557	Ethylbenzene	2018/06/18	87	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Methylene Chloride(Dichloromethane)	2018/06/18	95	70 - 130	96	70 - 130	ND, RDL=2.0	ug/L	NC	30		
5584557	o-Xylene	2018/06/18	84	70 - 130	94	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	p+m-Xylene	2018/06/18	87	70 - 130	95	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Tetrachloroethylene	2018/06/18	87	70 - 130	93	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Toluene	2018/06/18	90	70 - 130	97	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584557	Total Xylenes	2018/06/18					ND, RDL=0.20	ug/L	NC	30		
5584557	trans-1,3-Dichloropropene	2018/06/18	75	70 - 130	76	70 - 130	ND, RDL=0.40	ug/L	NC	30		
5584557	Trichloroethylene	2018/06/18	91	70 - 130	96	70 - 130	ND, RDL=0.20	ug/L	NC	30		
5584657	Dissolved Chloride (Cl)	2018/06/18	100	80 - 120	104	80 - 120	ND, RDL=1.0	ID, RDL=1.0 mg/L		20		
5584658	Dissolved Sulphate (SO4)	2018/06/18	104	75 - 125	101	80 - 120	ND, RDL=1.0	mg/L	0.49	20		
5585579	Total Kjeldahl Nitrogen (TKN)	2018/06/19	103	80 - 120	102	80 - 120	ND, RDL=0.10	mg/L	0	20	99	80 - 120
5587046	Mercury (Hg)	2018/06/19	92	75 - 125	91	80 - 120	ND, RDL=0.0001	mg/L	NC	20		
5587501	Phenols-4AAP	2018/06/19	91	80 - 120	93	80 - 120	ND, RDL=0.0010	mg/L	0	20		
5587524	Total Aluminum (Al)	2018/06/20	NC	80 - 120	105	80 - 120	ND, RDL=5.0	ug/L	1.8	20		
5587524	Total Antimony (Sb)	2018/06/20	107	80 - 120	100	80 - 120	ND, RDL=0.50	ug/L				
5587524	Total Arsenic (As)	2018/06/20	103	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L				
5587524	Total Bismuth (Bi)	2018/06/20	92	80 - 120	94	80 - 120	ND, RDL=1.0	ug/L	NC	20		
5587524	Total Cadmium (Cd)	2018/06/20	100	80 - 120	100	80 - 120	ND, RDL=0.10	ug/L	NC	20		
5587524	Total Chromium (Cr)	2018/06/20	100	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L	NC	20		
5587524	Total Cobalt (Co)	2018/06/20	98	80 - 120	96	80 - 120	ND, RDL=0.50	ug/L	16	20		
5587524	Total Copper (Cu)	2018/06/20	103	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	3.0	20		
5587524	Total Iron (Fe)	2018/06/20	99	80 - 120	97	80 - 120	ND, RDL=100	ug/L	1.8	20		
5587524	Total Lead (Pb)	2018/06/20	93	80 - 120	95	80 - 120	ND, RDL=0.50	ug/L	0.78	20		
5587524	Total Manganese (Mn)	2018/06/20	97	80 - 120	97	80 - 120	ND, RDL=2.0	ug/L	2.5	20		
5587524	Total Molybdenum (Mo)	2018/06/20	107	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L	5.5	20		
5587524	Total Nickel (Ni)	2018/06/20	97	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L	4.7	20		



QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc Client Project #: BRM-00801363

Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Sta	ndard
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5587524	Total Phosphorus (P)	2018/06/20	110	80 - 120	107	80 - 120	ND, RDL=100	ug/L	1.1	20		
5587524	Total Selenium (Se)	2018/06/20	108	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L				
5587524	Total Silver (Ag)	2018/06/20	97	80 - 120	95	80 - 120	ND, RDL=0.10	ug/L	NC	20		
5587524	Total Tin (Sn)	2018/06/20	103	80 - 120	97	80 - 120	ND, RDL=1.0	ug/L				
5587524	Total Titanium (Ti)	2018/06/20	104	80 - 120	98	80 - 120	ND, RDL=5.0	ug/L				
5587524	Total Vanadium (V)	2018/06/20	102	80 - 120	97	80 - 120	ND, RDL=0.50	ug/L	2.1	20		
5587524	Total Zinc (Zn)	2018/06/20	100	80 - 120	104	80 - 120	ND, RDL=5.0	ug/L	1.1	20		

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

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

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

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

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

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

(1) Some recoveries were below the lower control limits. This may represent a low bias in some results for these flagged analytes.



exp Services Inc Client Project #: BRM-00801363 Site Location: TWENTY RD WEST, HAMILTON Your P.O. #: BRM-ENV Sampler Initials: MY

VALIDATION SIGNATURE PAGE

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

auistin Camiere

Cristina Carriere, Scientific Service Specialist



Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Sonja Elavinamannil, Analyst I

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



Exceedence Summary Table – Prov. Water Quality Obj.

Result Exceedences

Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
BH29-D	GYQ545-07	Total Iron (Fe)	300	640	100	ug/L
		Detection Limit Exceede	ences			
Sample ID	Maxxam ID	Parameter	Criteria	Result	DL	Units
BH29-D	GYQ545-01	3,3'-Dichlorobenzidine	0.6	<0.8	0.8	ug/L
BH29-D	GYQ545-01-Lab Dup	3,3'-Dichlorobenzidine	0.6	<0.8	0.8	ug/L
BH29-D	GYQ545-05	Aldrin	0.001	<0.005	0.005	ug/L
BH29-D	GYQ545-05	Aldrin + Dieldrin	0.001	< 0.005	0.005	ug/L
BH29-D	GYQ545-01	Anthracene	0.0008	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Anthracene	0.0008	<0.2	0.2	ug/L
BH29-D	GYQ545-01	Benzo(a)anthracene	0.0004	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Benzo(a)anthracene	0.0004	<0.2	0.2	ug/L
BH29-D	GYQ545-01	Benzo(g,h,i)perylene	0.00002	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Benzo(g,h,i)perylene	0.00002	<0.2	0.2	ug/L
BH29-D	GYQ545-01	Benzo(k)fluoranthene	0.0002	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Benzo(k)fluoranthene	0.0002	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Bis(2-ethylhexyl)phthalate	0.6	<2	2	ug/L
BH29-D	GYQ545-01	Bis(2-ethylhexyl)phthalate	0.6	<2	2	ug/L
BH29-D	GYQ545-01	Chrysene	0.0001	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Chrysene	0.0001	<0.2	0.2	ug/L
BH29-D	GYQ545-01	Dibenz(a,h)anthracene	0.002	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Dibenz(a,h)anthracene	0.002	<0.2	0.2	ug/L
BH29-D	GYQ545-05	Dieldrin	0.001	<0.005	0.005	ug/L
BH29-D	GYQ545-01	Fluoranthene	0.0008	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Fluoranthene	0.0008	<0.2	0.2	ug/L
BH29-D	GYQ545-05	Mirex	0.001	<0.005	0.005	ug/L
BH29-D	GYQ545-05	o,p-DDT	0.003	<0.005	0.005	ug/L
BH29-D	GYQ545-05	p,p-DDT	0.003	< 0.005	0.005	ug/L
BH29-D	GYQ545-01	Pentachlorophenol	0.5	<1	1	ug/L
BH29-D	GYQ545-01-Lab Dup	Pentachlorophenol	0.5	<1	1	ug/L
BH29-D	GYQ545-01	Pervlene	0.00007	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dup	Pervlene	0.00007	<0.2	0.2	ug/L
BH29-D	GYQ545-01	Phenanthrene	0.03	<0.2	0.2	ug/L
BH29-D	GYQ545-01-Lab Dun	Phenanthrene	0.03	<0.2	0.2	ug/L
BH29-D	GYQ545-07	Total Phosphorus (P)	10	<100	100	ug/l
BH29-D	GYQ545-05	Total PCB	0.001	<0.05	0.05	ug/L
The exceedence summa	ary table is for information pur	noses only and should not be co	nsidered a compre	hensive listing o	r statement of	conformance

The exceedence summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

Corbet Land Strategies Final Preliminary Hydrogeological Investigation Upper West Side Draft Plan of Industrial Sub-division Twenty Road West, Hamilton, ON BRM-00801363--B0 July 5, 2018

Appendix F: Safe Excavation Depth (SED) Calculations



Twenty Road West Development: Safe Excavation Depths and Elevations

Location			Ground Elevation	Interface for SED calculations: Top of Aquifer/permeable strata							Piezometric Leve (highest measure		Bulk Unit Weight of Cover ¹	Bulk Unit Weight of Water ²	Factor of Safety Fe	Piezometric Level above Aquifer Top	Minimum Soil Cover Required (above Aquifer Top)	Inferred Safe Excavation Depth (SED)	Inferred Safe Excavation Depth Elevation
	Easting	Northing	masl	In Situ Hydraulic Conductivity (Slug Test) (M/sec)	Soil Type WL and K at MW level	mbgs	masl	Lower K Interface used for SED: Top of Upper Strata/impermeable Strata)	Rational for Choosing Interface with upper lower K deposit	SED	mbgs	masl	KN/m ³	KN/m ³	• 5	m	m	m	masl
	1	[1										1	1			1	[
BH/MW1			237.93		Silt	1.50	236.43	Silty Clay		SED	0.78	237.15	21	9.81	1.4	0.7	0.47	1.0	236.9
BH/MW7			222.10		Silt	2.30	219.80	Silty Clay		SED	0.27	221.83	21	9.81	1.4	2.0	1.33	1.0	221.1
BH/MW11			231.57		Silty Sand to Sand	4.60	226.97	Silty Clay		SED	-1.37	232.94	21	9.81	1.4	6.0	3.90	0.7	230.9
BH/MW12			232.18		Silty Sand to Sandy Silt	4.60	227.58	Silt	Confining Layer Silt which seems unconfined but artesian	SED	0.04	232.14	21	9.81	1.4	4.6	2.98	1.6	230.6
Bh/MW13			230.40		Silt with occasional gravel, becoming sandy	2.30	228.10	Silt	Confining Layer Silt which seems unconfined but artesian	SED	-0.19	230.59	21	9.81	1.4	2.5	1.63	0.7	229.7
BH/MW18			233.81		Silty Sand to Sandy Silt	1.50	232.31	Silty Clay		SED	-0.85	234.66	21	9.81	1.4	2.3	1.54	0.0	233.8
BH/MWW25			235.30		Silt	2.30	233.00	Silty Clay		SED	0.34	2.00	21	9.81	1.4	2.0	1.28	1.0	234.3
BH/MW29-D			231.97		Silty Sand to Sandy Silt	1.60	230.37	Silty Clay	Silty Clay overlying Silt	SED	-2.82	234.79	21	9.81	1.4	4.4	2.89	0.0	232.0
BH/MW30-D			233.53		Silty Sand to Silt	1.60	231.93	Silty Clay		SED	-0.70	234.23	21	9.81	1.4	2.3	1.50	0.1	233.4
BH/MW31-D			231.94		Silty Sand	9.20	222.74	Silty Clay		SED	-1.13	233.07	21	9.81	1.4	10.3	6.76	2.4	229.5

Notes

1

2

Bulk Unit Weight for overburden cover=21 KN/m³

Bulk Unit Weight of water = 9.81 KN/m³

ARTESIAN (groundwater level above ground surface - true artesian)