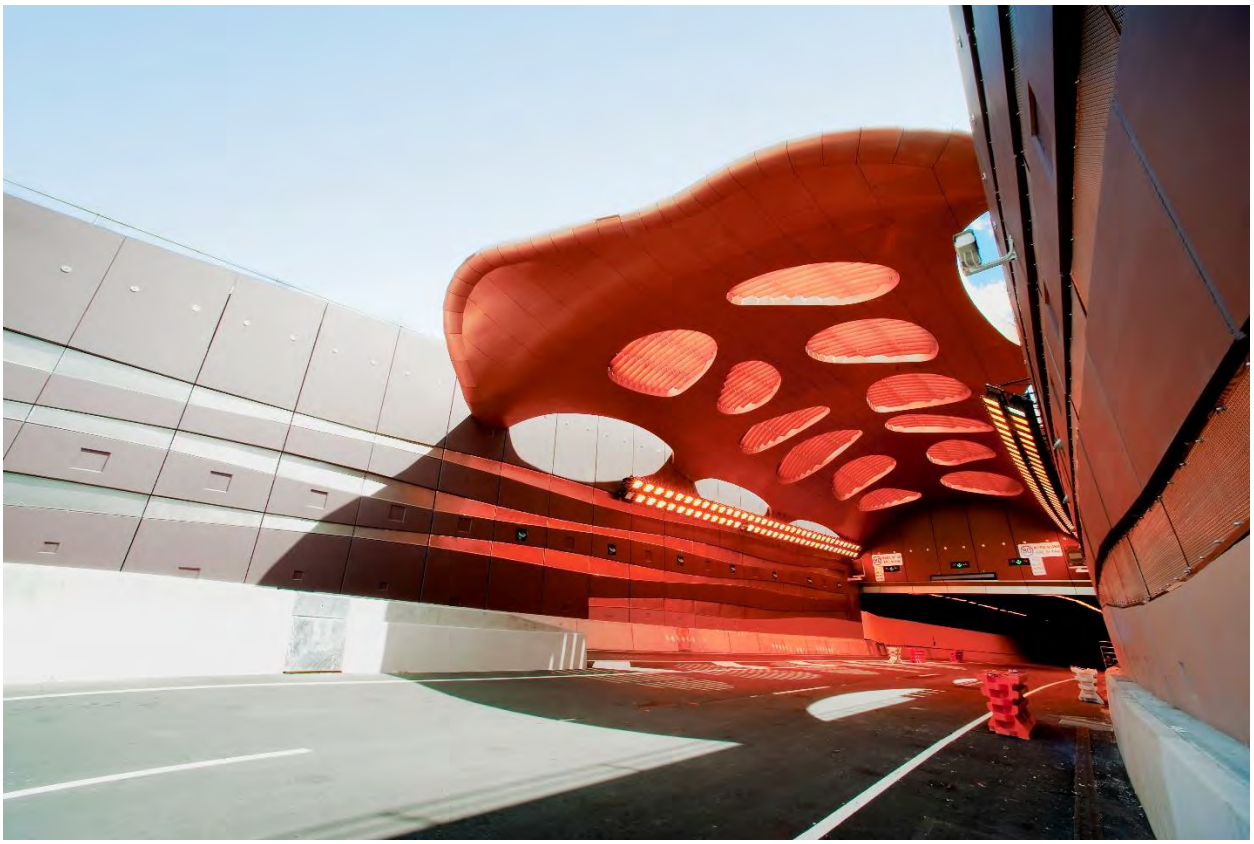
NATIONAL HOMES (PLAINS ROAD) LP

HYDROGEOLOGICAL STUDY

484-490 PLAINS ROAD, BURLINGTON, ONTARIO

OCTOBER 25, 2017



HYDROGEOLOGICAL STUDY

484-490 PLAINS ROAD, BURLINGTON, ONTARIO

NATIONAL HOMES (PLAINS ROAD) LP

PROJECT NO.: 161-09479-00
DATE: OCTOBER 2017

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October 25, 2017

Mr. Jason Pantalone
President & Managing Partner
National Homes (Plains Road) LP
291 Edgeley Boulevard, Suite 1
Concord, Ontario

Dear Mr. Pantalone:

WSP Canada Group Limited is pleased to present our Hydrogeological Study report which has been prepared for the proposed residential development located at 484-490 Plains Road East in Burlington, Ontario (the "Site").

The key findings of our Hydrogeological Study is that the annual water balance has demonstrated that as part of the proposed development of the Site, infiltration will be improved due to the proposed post-development plans to incorporate an increase in vegetative lands along the perimeter of the Site.

We trust that this report meets your current requirements. If you have any questions regarding this report, please contact the undersigned.

Yours truly,

Valyn Martinez, B.A.Sc, E.I.T
Designer

Andrew Kulin, M.A.Sc., M.B.A., P.Eng.
Senior Hydrogeologist/Geological Engineer



WSP ref.: 161-09479-00

SIGNATURES

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E WATER BALANCE CALCULATIONS

F STANDARD LIMITATIONS

1 INTRODUCTION

1.1 SITE DESCRIPTION

WSP Canada Group Limited (WSP), was retained by National Homes (Plains Road) LP to prepare a Hydrogeological Study for the proposed residential development located at 484-490 Plains Road East in Burlington, Ontario (the "Site"). The Site location is shown in **Figure 1.** The water balance analysis consisted of a site water balance examining the pre-existing and the proposed post-development conditions.

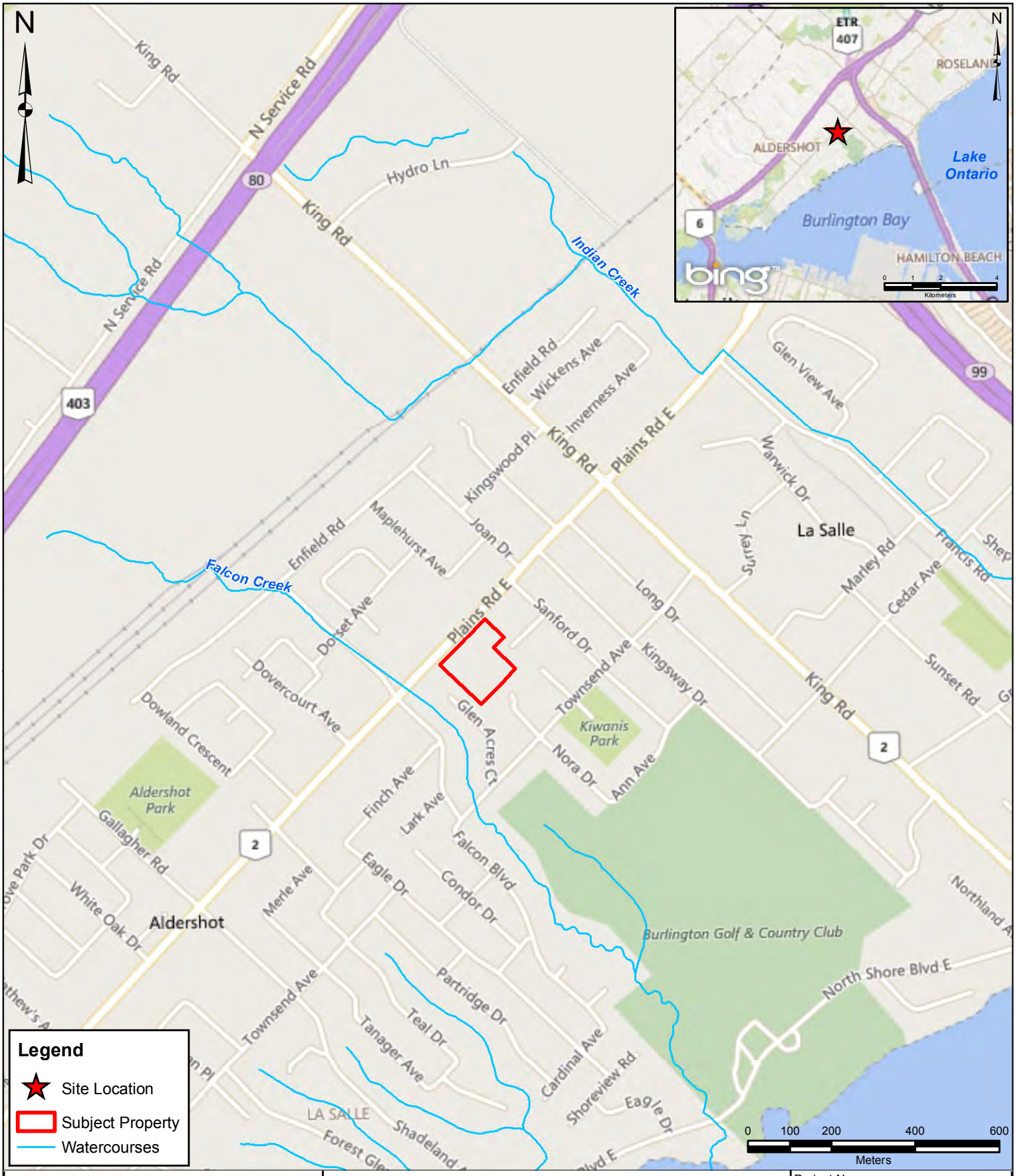
The Site is approximately 1.84 hectares (ha) in area and currently operates as a multi-tenant single level commercial property, with businesses such as Home Hardware, Dollar Tree, etc. The lands immediately surrounding the Site primarily consists of commercial, residential and institutional developments.

National Homes is proposing to redevelop the Site with two 8-storey condominiums and seven 3-storey stacked back-to-back townhome blocks, resulting in a total building coverage area of 7,565 m^2. The two condominiums and stacked townhomes will have one level of underground parking and will include municipal servicing for water and sewers.

1.2 SCOPE OF WORK

WSP's primary purpose of this assessment was to:

- Conduct a background review of previous site investigation reports and available published background hydrogeological reports, well records and geological mapping;
- Review of geological and hydrogeological conditions present at the boreholes on the Site. This includes a review of the following:
  - Results of groundwater level monitoring and interpreted groundwater flow directions and gradients;
  - Hydraulic conductivity testing results; and,
  - Groundwater quality results;
- Preparation of a site-specific annual water balance that assesses the pre-existing and post-development recharge (infiltration) at the Site. The water balance was prepared using local climate data provided by Environment Canada and the methodology outlined in the MOE Stormwater Management Planning and Design Manual (2003); and,
- Identify anticipated dewatering requirements that may be necessary during construction and long-term operation of the building complex.



Client: **National Homes (Plains Road) LP**		Project No.: **161-09479-00**	
Title: **Site Location Plan**		Drawn: **JS**	Approved: **AK**
Project: **Annual Water Balance 484-490 Plains Road East, Burlington, Ontario**		Date: **October 2017**	Scale: **As Shown**
Discipline: **ENVIRONMENT**		Original Size: **Letter**	Figure: **1**

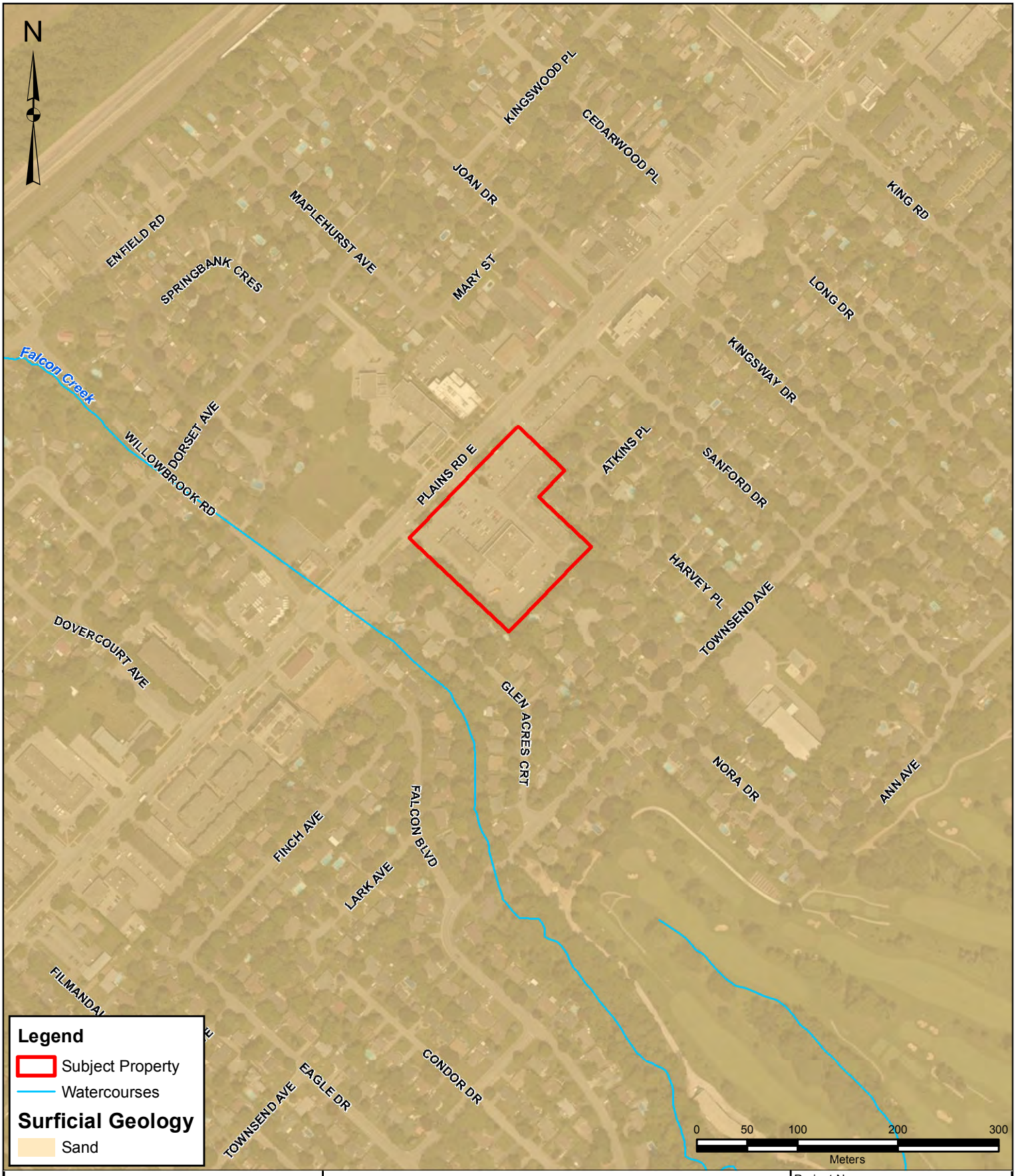
2 REGIONAL PHYSIOGRAPHY AND GEOLOGICAL SETTING

The Site is located in the Iroquois Plains physiographic region, as defined by Chapman and Putnam (1984). The Iroquois Plains extends 305 km along the western part of Lake Ontario, with varying conditions from the Niagara River to the Trent River. In more detail, Chapman and Putnam (1984) subdivided the Iroquois Plains into smaller areas to account for the varying conditions along this region. The Site and its surrounding area are described as being situated in a former gravel bar (extending between Hamilton and Toronto), with the nearby shoreline consisting of distinct bluff cuts into the red shale of the Queenston Formation.

The surficial geology of the Site and the surrounding area is mapped as sand and is shown on **Figure 2**. Ministry of Natural Resources mapping (accessed via Ontario Geological Survey (OGS) OGS Earth published by the Ontario Ministry of Natural Development, Mines and Forestry), indicates the regional surficial geology on the Site is comprised of coarse-textured glacio-lacustrine deposits of sand, gravel, minor silt and clay.

According to bedrock mapping provided by the OGS Earth website, bedrock in the area of the Site and the Study Area is identified as the Queenston Formation consisting of shale, limestone, dolostone, and siltstone. According to the Phase One ESA completed at the Site, the depth to bedrock is estimated to be approximately 17 mbgs in the vicinity of the Site, based on Geology Ontario drift thickness mapping for Ontario.

The Site is generally flat with a slight slope from the northwest to southeast and with elevations ranging between approximately 98.0 to 96.7 m above sea level (masl). Based on groundwater levels measured at the Site, the inferred shallow groundwater flow direction is southerly.



Client:	National Homes (Plains Road) LP	Project No.:	161-09479-00
Title:	Surficial Geology	Drawn: JS	Approved: AK
Project:	Annual Water Balance 484-490 Plains Road East, Burlington, Ontario	Date: October 2017	Scale: As Shown
Discipline:	ENVIRONMENT	Original Size: Letter	Figure: 2

3 HYDROGEOLOGICAL EVALUATION

3.1 SITE INVESTIGATIONS

WSP completed a Phase Two Environmental Site Assessment (ESA) and a geotechnical investigation at the Site between June 29, 2016 and August 9, 2017. A total of 39 boreholes were drilled to depths ranging from 6.1 to 17.4 metres below ground surface (mbgs) in 6 stages. Drilling was conducted in six separate drilling events, with progressive work programs to supplement subsurface data for the Phase Two ESA and geotechnical investigation. Details of the number of boreholes advanced and monitoring wells installed, including the dates of the investigations are listed in **Table 1** below:

Table 1: Summary of Site Investigations

DATE	TYPE OF SITE INVESTIGATION	SITE INVESTIGATION DETAILS
June 29 to 30, 2016	Phase Two ESA site characterization and geotechnical investigation	Drilling of 8 boreholes at 8 locations, with 5 installed as monitoring wells
October 18 to 20, 2016	Phase Two ESA delineation of soil impacts at depth	Drilling of 6 boreholes at 5 locations, with 6 installed as monitoring wells
November 21 to 23, 2016	Phase Two ESA additional horizontal delineation	Drilling of 7 boreholes at 5 locations, with 7 installed as monitoring wells
January 24 to 31, 2017	Phase Two ESA additional horizontal delineation	Drilling of 10 boreholes at 9 locations, with 10 installed as monitoring wells
April 17 to 18, 2017	Supplemental geotechnical investigation	Drilling of 5 boreholes at 5 locations, with 1 installed as a monitoring well
August 9, 2017	Supplemental Phase Two ESA additional	Drilling of 3 boreholes at 3 locations, with 3 installed as monitoring wells

Eighteen monitoring wells, equipped with 2-inch PVC well screens (3.0 m length) were installed at fifteen locations to depths ranging between 5.1 and 16.5 mbgs (base of screens). Fourteen monitoring wells, equipped with a 1.5 m length screen were installed at twelve locations to depths ranging between 6.8 and 16.7 mbgs. Shallow and deep nested wells were installed at five locations (BH16-3/D, BH16-6/D, BH16-9/D, BH16-11/D and BH17-6/I). Shallow, intermediate and deep nested wells were installed at three locations (BH16-10/I/D, BH16-12/I/D and BH16-13/I/D). The borehole and monitoring well locations are shown on **Figure 3** and the borehole logs are included in **Appendix A**.

The monitoring wells were used for obtaining water levels and conducting hydraulic conductivity testing (discussed in Section 3.2.3 and Section 3.2.4, respectively). Findings of the Phase Two ESA are summarized in Section 3.1.1 and the geotechnical investigations are discussed in Section 3.2.1.

3.1.1 FINDINGS OF PHASE TWO ENVIRONMENTAL SITE ASSESSMENT

Based on a review of the information collected in WSP's Phase Two ESA, dated July 2017, WSP provided the following findings:

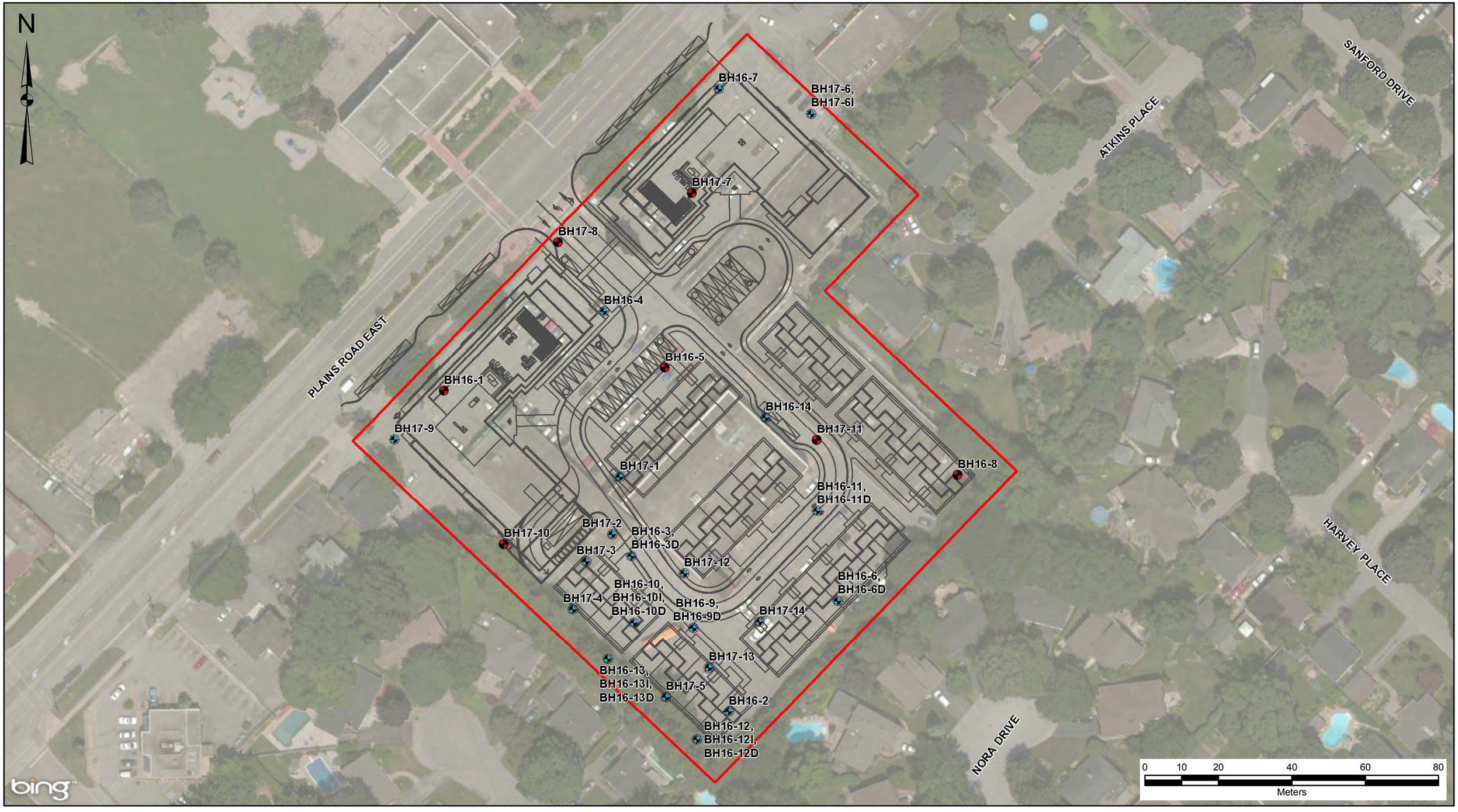
1. On October 24, 2016, groundwater samples from monitoring well BH16-10 indicated an exceedance for the VOC parameter tetrachloroethylene at the well. Subsequent resampling indicated a persistence of this parameter at this well, but not at the other locations and not in the deeper groundwater within the Silty Clay Till. Delineation has achieved for tetrachloroethylene;
2. On October 24, 2016, groundwater samples collected from monitoring wells: BH16-9 and BH16-11 were analyzed for the following Potential Contaminants of Concern (PCOCs): Metals and Inorganics (M&Is) and Volitile Organic

Compounds. The analytical results for groundwater indicated exceedances for copper and lead at the two wells. The other tested parameters met for the MOECC Site Condition Standards (SCS). Subsequent groundwater resampling on November 28, 2016 and March 29, 2017 did not exhibit exceedances for M&Is and therefore it was concluded these contaminants were not considered a concern in groundwater;

3 Similarly, on November 28, 2016, groundwater samples were collected from BH16-12 and analyzed for M&Is and VOCs. The analytical results reported elevated concentrations for tetrachlorethylene at the well. The other tested parameters met the MOECC SCSs. This tetrachloroethylene contamiantion is not considered a concern in groundwater at BH16-12; and,

4 On April 5, 2017, groundwater samples were collected from monitoring well BH16-9 and analyzed for the following potential contaminants of concerns PHCs and VOCs. The analytical results for groundwater indicated exceedances for PHC Fractions F2 and F3.

Supplemental investigations to delineate the PHC Fractions F2 and F3 at the Site were conducted in August 2017, with additional drilling to occur in October 2017. The monitoring of static water levels completed in September 2017 of BH17-12, BH17-13 and BH17-14 were taken into consideration as part of this Hydrogeological Study.



Legend

- Subject Property
- Borehole
- Monitoring Well
- Proposed Development Plan

Client: National Homes (Plains Road) LP		Project No.: 161-09479-00	Figure: 3
Drawn: JS	Approved: AK	Title: BOREHOLE AND MONITORING WELL LOCATION PLAN	
Date: October 2017	Scale: As Shown	Project: ANNUAL WATER BALANCE 484-490 PLAINS ROAD EAST, BURLINGTON, ONTARIO	
Original Size: Tabloid	Rev: 0	wsp	

3.2 SITE GEOLOGY

3.2.1 SITE STRATIGRAPHY

The borehole drilling completed by WSP indicates that asphalt was encountered in majority of the boreholes (asphalt was not observed in BH17-2, BH17-3, BH17-12, BH17-13 or BH17-14), ranging in thickness from 0.05 m to 0.18 m, overlaying granular base ranging in thickness from 0.08 m to 0.46 m. Concrete was encountered at the surface of two boreholes, BH17-2 and BH17-3, with thicknesses ranging from 0.10 to 0.36m. Fill material, generally described as silty sand with trace clay, was observed underlying the asphalt and granular base in all of the boreholes, and extended to depths ranging from 1.80 mbgs to 5.40 mbgs. Standard Penetration Testing was carried out within the fill material and 'N' values ranging from 0 to 16 blows per 300 mm penetration were recorded, indicating a very loose to compact state.

Silty sand deposits underlying the fill material were encountered in all the boreholes and extended to depths ranging from 5.60 mbgs to 8.10 mbgs. A silty sand seam was observed at BH17-9 between depths of 13.90 and 15.70 mbgs.

Silty Clay Till deposits were encountered in all boreholes with the exception of borehole BH16-1, BH16-5, BH16-12, BH16-13 and BH16-14 and extended to depths ranging from 8.23 mbgs to 15.7 mbgs. The Silty Clay Till was underlain by Silty Clay deposits in BH16-10D, BH16-11D, BH16-12D, BH16-13D, BH17-7 and BH17-9 to BH17-11 and extended to depths ranging from 13.9 mbgs to 17.7 mbgs.

3.2.2 GRAIN SIZE ANALYSIS

As part of geotechnical investigations, WSP submitted fourteen soil samples for grain size analysis. The results of these grain size analyses were reviewed and used to provide estimates of hydraulic conductivity and soil classification for use in the water balance analysis. The grain size curves are found in **Appendix B**. The location and depth of soil samples that were tested for grain size distribution and the estimated hydraulic conductivity are presented on **Table 2**.

The estimates of hydraulic conductivity presented in **Table 2** were obtained based on grain size results using the Hazen approximation:

$$K = 0.01 \times C d_{10}^{2} \text{ (m/sec)}$$

Where:

K = bulk hydraulic conductivity (m/sec);

d_{10} = grain size at which point 10% of the soil passes the sieve (mm); and,

C = a constant generally set at 1 for these units.

Table 2: Hydraulic Conductivity Estimates based on the Hazen Approximation

BOREHOLE ID	DEPTH (MBGS)	SOIL DESCRIPTION	D_{10} (MM)	HAZEN ESTIMATE (M/SEC)
BH16-3	1.5-2.1	Silt sand, trace clay	0.0135	1.82E-06
BH16-10I	7.3-8.1	Sand, trace silt & clay, trace gravel	0.0676	4.57E-05
BH16-12I	7.3-7.9	Sand, some silt, trace clay, trace gravel	0.0514	2.64E-05
BH16-13I	6.7-7.3	Sand, trace silt & clay, trace gravel	0.0598	3.58E-05
BH17-1	2.4-3.7	Silty sand, trace clay, trace gravel	0.0049	2.40E-07
BH17-1	7.3-8.2	Sand, some silt, some gravel, trace clay	0.0543	2.95E-05
BH17-2	6.1-6.7	Sand, trace silt & clay	0.0868	7.53E-05
BH17-3	0.5-1.2	Silty sand, some clay	0.0013	1.69E-08
BH17-3	3.1-3.7	Silty sand, trace clay	0.0055	3.03E-07
BH17-3	6.7-7.3	Sand, trace silt, trace clay, trace gravel	0.0615	3.78E-05
BH17-4	7.9-8.5	Sand, trace silt & clay, some gravel	0.0677	4.58E-05
BH17-5	7.3-8.23	Sand, some silt, trace clay	0.0234	5.48E-06
BH17-8	10.7-11.1	Silty clay till, some sand, trace gravel	***0.001***	1.00E-08
BH17-9	6.1-6.6	Sand, trace silt, trace clay, trace gravel	0.0699	4.89E-05

Notes:
Grain size diameters and calculated hydraulic conductivities shown with bold italics are estimated as grain size did not reach d_{10}

The tri-linear soil classifications obtained through the grain size analyses were used to derive the soil classification for estimating infiltration input into the water balance analysis. The percentage composition of soils was categorized as percentages of sand, silt, and clay and compared against classifications in a tri-linear soil classification chart. The results are presented on **Table 3**, and the tri-linear plot is found in **Appendix B**. As discussed in Section 3.2, the predominant soils found within shallow depths are Silty Sand (and typically classified as Loamy Sand), and underlying this material is generally observed to be Silty Clay Till (typically classified as Silty Clay Loam). Based on the information presented in **Table 3**, Loamy Sand was considered representative of the soils found near surface for input into the water balance.

Table 3: Tri-Linear Soil Classification

BOREHOLE ID	DEPTH (MBGS)	SOIL DESCRIPTION	% SAND	% SILT	% CLAY	SOIL CLASSIFICATION
BH16-3	1.5-2.1	SILTY SAND, trace clay	76	19	5	Loamy Sand
BH16-10I	7.3-8.1	SAND, trace silt & clay, trace gravel	89	8	3	Sand
BH16-12I	7.3-7.9	SAND, some silt, trace clay, trace gravel	84	13	4	Loamy Sand
BH16-13I	6.7-7.3	SAND, trace silt & clay, trace gravel	88	8	4	Loamy Sand
BH17-1	2.4-3.7	SILTY SAND, trace clay, trace gravel	65	28	7	Sandy Loam
BH17-1	7.3-8.2	SAND, some silt, some gravel, trace clay	85	12	3	Loamy Sand
BH17-2	6.1-6.7	SAND, trace silt & clay	91	7	2	Sand
BH17-3	0.5-1.2	SILTY SAND, some clay	61	27	12	Sandy Loam
BH17-3	3.1-3.7	SILTY SAND, trace clay	62	33	5	Sandy Loam
BH17-3	6.7-7.3	SAND, trace silt, trace clay, trace gravel	89	9	2	Loamy Sand
BH17-4	7.9-8.5	SAND, trace silt & clay, some gravel	88	9	3	Loamy Sand
BH17-5	7.3-8.23	SAND, some silt, trace clay	82	13	5	Loamy Sand
BH17-8	10.7-11.1	SILT CLAY TILL, some sand, trace gravel	13	50	37	Silty Clay Loam
BH17-9	6.1-6.6	SAND, trace silt, trace clay, trace gravel	89	7	4	Sand

Notes:

The percentages expressed in the table above are based on the proportions of Clay, Silt, and Sand sized particles only, excluding Gravel content.

3.2.3 HYDRAULIC CONDUCTIVITY TESTING

In situ hydraulic conductivity testing, consisting of falling and rising head tests, was carried out by WSP staff at BH16-3D, BH16-10I, BH16-12I, BH16-13I, BH17-1 and BH17-3 on February 6 and 7, 2017 and at BH16-11D, BH17-5 and BH17-9 on June 13, 2017 to provide estimates of in situ hydraulic conductivity of the deposits at the Site. The hydraulic conductivity testing was generally carried out by rapidly inserting a slug with a known volume down the well to displace the water, and a falling head test was carried out. After the water level stabilized, the slug was removed and a rising head test was carried

out[1]. The recovery of the water levels in the well was measured over time until they had recovered to the original water level. WSP's recovery data was analysed with Aquifer Test Pro software, using the Bouwer and Rice (1976) approach.

The analyses are found in **Appendix C** and the results of the tests are summarized on **Table 4**. These values are considered representative of the horizontal hydraulic conductivity in the immediate vicinity of the well.

Table 4: Hydraulic Conductivity Estimates based on Slug Testing

MONITORING WELL ID	SCREEN INTERVAL (MBGS)	SOIL DESCRIPTION	HYDRAULIC CONDUCTIVITY FALLING HEAD (M/SEC)	RISING HEAD (M/SEC)
BH16-3D	13.37-16.37	SILTY CLAY TILL	6.0×10^{-7}	N/A
BH16-10I	6.70-8.20	SANDY SILT to SILTY SAND	2.1×10^{-5} 1.9×10^{-5}	2.0×10^{-5}
BH16-11D	14.03-15.53	SILTY CLAY	5.7×10^{-8}	N/A
BH16-12I	6.81-8.31	SILTY SAND	1.1×10^{-5}	1.5×10^{-5}
BH16-13I	6.89-8.39	SILTY SAND	8.7×10^{-6}	8.8×10^{-6}
BH17-1	5.79-7.29	SAND, SILTY SAND	3.0×10^{-6}	N/A
BH17-3	6.72-8.22	SILTY SAND	2.9×10^{-5}	N/A
BH17-5	6.68-8.18	SILTY SAND to SANDY SILT	3.2×10^{-5}	N/A
BH17-9	5.29-6.79	SILTY SAND	4.7×10^{-7}	N/A

The hydraulic conductivities estimated by the slug testing fall within a range of 5.7×10^{-8} m/sec to 3.2×10^{-5} m/sec. The geometric mean hydraulic conductivity of the Silty Sand to Sandy Silt is 1.0×10^{-5} m/sec, while the geometric mean hydraulic conductivity of the Silty Clay 1.9×10^{-7} m/sec. It is noted that Freeze and Cherry (1979) indicates that the approximate hydraulic conductivity for silty sand may range from 10^{-7} m/sec to 10^{-3} m/sec, and the majority of these results fall within the middle portion of this range.

3.2.4 GROUNDWATER LEVEL MONITORING

Manual water level readings were recorded by WSP staff at the available monitoring wells on July 11, October 24, December 10, 2016 and February 7, June 13 and Sept 11, 2017. Static water levels were measured by lowering a water level meter into each of the monitoring wells, and the depth to the water recorded. The results of groundwater levels measured by WSP at the Site are tabulated in **Table SWL-1** provided in **Appendix D.** Groundwater levels across the Site decreased from July 11 to October 24, 2016 with declines observed to range between 0.15 and 0.17 m. During the fall months (October 24 to December 10, 2016), groundwater levels continued to generally decrease, with further declines in the water levels ranging from 0.03 and 0.09 m, with the exception of monitoring wells BH16-6D, BH16-16-9D and BH16-11D, where water levels were observed to rise, with ranges from 0.03 and 0.58 m.

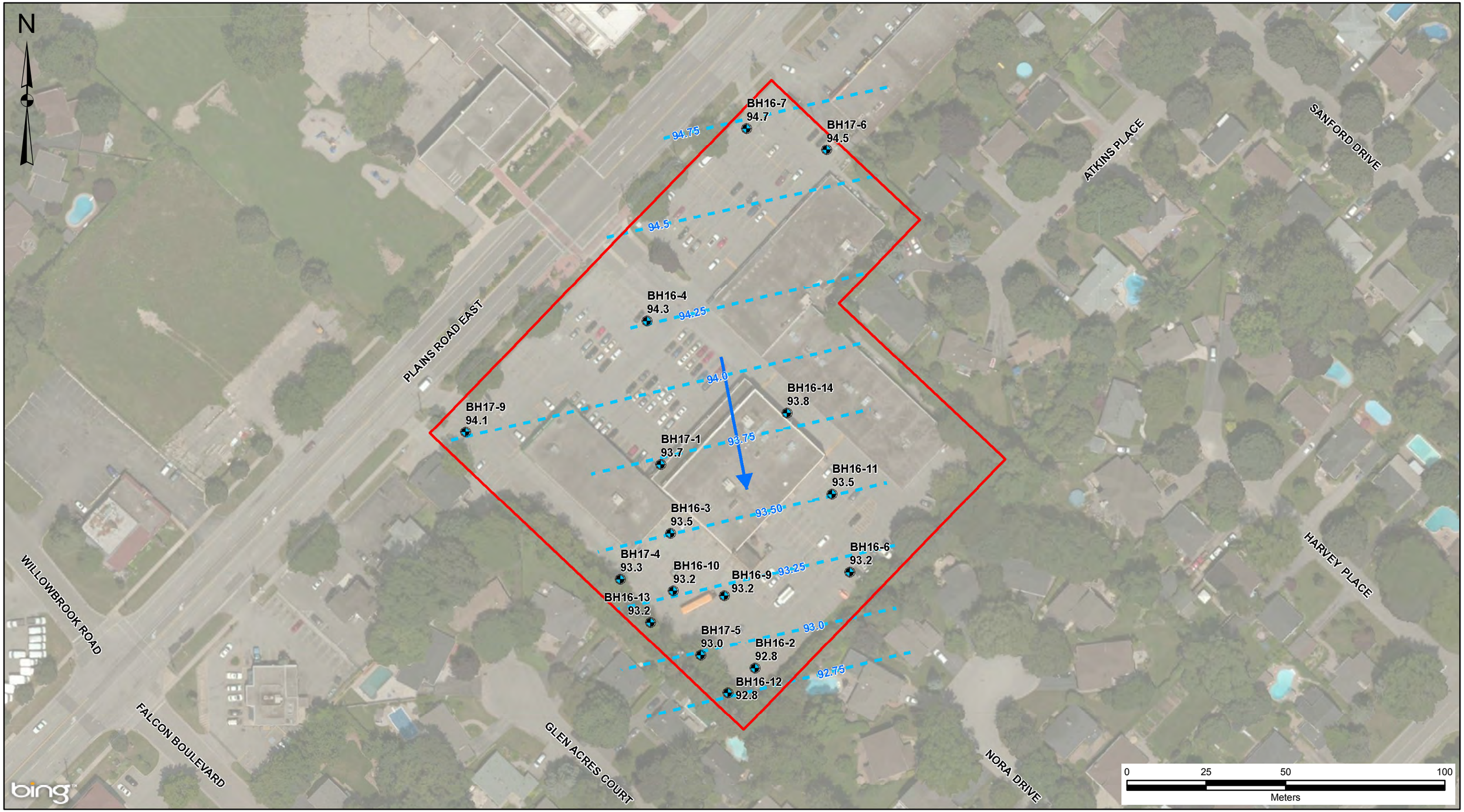
Groundwater levels generally increased from December 10, 2016 to February 7, 2017 with rises in the water levels ranging from 0.02 and 0.21 m, with the exception of monitoring wells BH16-3D, BH16-11, BH16-11D, and BH16-12D water levels decreased between 0.03 and 0.53 m. Groundwater levels continued to increase from February 7 to June 13, with ranges between 0.36 and 0.78 m. During the summer months (June 13 to September 11, 2017) groundwater levels were observed to decrease, with declines ranging between 0.18 and 0.28 m.

The shallow and deep interpreted groundwater flow patterns at the Site from June 2017 are shown on **Figure 4Error! Reference source not found.** and **Figure 5**, respectively. Shallow groundwater is interpreted to flow from northwest to

[1] A rising head test was not carried out at BH16-3D, BH16-11D, BH17-1, BH17-3, BH17-5 and BH17-9

southeast (94.75 masl to 92.75 masl) at a gradient of about 0.011. Deeper groundwater is interpreted to flow from northwest to southeast at the southern portion of the Site (93.5 masl to 92.75 masl) at a gradient of about 0.015.

Vertical gradients are available at eight monitoring well nests, (BH16-3/D, BH16-6/D, BH16-9/D, BH16-11/D, BH16-10/D, BH16-12/D, BH16-13/D BH17-6/I) (see **Table SWL-1** in **Appendix D**). Downward gradients were generally identified at all well nests, with the exception of locations BH16-6 and BH16-9 on December 10, 2016, locations BH16-3, BH16-10 and BH17-6 on June 13, 2017 and locations BH16-10, BH16-12 and BH17-6 on September 11, 2017, on which dates the above noted locations exhibited upward gradients. The downward gradients are generally higher at monitoring well nest location BH16-11, ranging between 0.07 and 0.10. The downward gradients are generally lower at the southern-most portion of the Site, ranging between 0.02 (downward) at location BH16-10 and 0.12 (upward) at location BH16-9. These findings imply that groundwater recharge is generally occurring at the Site.



Legend

- Subject Property
- Monitoring Well
- Groundwater Contours - 0.25 m Interval
- Inferred Groundwater Flow Direction

Client: National Homes (Plains Road) LP		Project No.: 161-09479-00	Figure: 4
Drawn: JS	Approved: AK	Title: INTERPRETED GROUNDWATER CONTOURS - UPPER SILTY SAND (JUNE 13, 2017)	
Date: October 2017	Scale: As Shown	Project: ANNUAL WATER BALANCE 484-490 PLAINS ROAD EAST, BURLINGTON, ONTARIO	
Original Size: Tabloid	Rev: 0	wsp	



Legend

- Subject Property
- Monitoring Well
- Groundwater Contours - 0.25 m Interval
- Inferred Groundwater Flow Direction

Note: Groundwater level data at BH16-11D appears to be anomalous and has not been used in interpreting the groundwater flow in the underlying Silty Clay Till.

Client: National Homes (Plains Road) LP		Project No.: 161-09479-00	Figure: 5
Drawn: JS	Approved: AK	Title: INTERPRETED GROUNDWATER CONTOURS - LOWER SILTY CLAY TILL (JUNE 13, 2017)	
Date: October 2017	Scale: As Shown	Project: ANNUAL WATER BALANCE 484-490 PLAINS ROAD EAST, BURLINGTON, ONTARIO	
Original Size: Tabloid	Rev: 0	wsp	

4 HYDROGEOLOGICAL ASSESSMENT

4.1 WATER BALANCE METHODOLOGY

The MOE Stormwater Planning and Design Manual (2003) offers a method to estimate the infiltration on the Site, based on a local infiltration factor "i", which is applied to the available water surplus to determine the groundwater recharge for a given area with pervious cover. The methodology considers factors such as the soil type, topography, and vegetation to arrive at the amount of water infiltrating into the ground. The remaining water surplus is considered runoff.

Under the post-development conditions, the infiltration factor is recalculated to account for changes in soil types, vegetation, and topography after development, and the infiltration and runoff at the pervious land areas are recalculated. As the land after development will have impervious surfaces that prevent infiltration, such as building footprints, road, and parking areas, the pervious area available for infiltration is generally reduced. Furthermore, there is limited opportunity for evapotranspiration (ETR) on these impervious surfaces, other than evaporative losses from wetting and ponding of water in shallow depressions (estimated at 10% of total precipitation), and so total precipitation is applied to these surfaced instead of the water surplus.

4.2 CLIMATE AND WATER SURPLUS

Environment Canada inputted their climate data into a computer model (Johnstone and Louie, 1983) to provide actual evapotranspiration and water surplus inputs for soils with different water holding capacities (WHCs). The inputs used for the water balance calculations are based on information provided by Environment Canada using climate data from the Hamilton Royal Botanical Gardens (RBG) meteorological station (43°16'-N 79°52'-W) for the period 1951 to 1996, using a water holding capacity of 75mm (section 4.3), with mean annual precipitation of 861 mm and actual evapotranspiration of 518 mm/year. The Hamilton RBG is located approximately 5.5 km southwest from the Site, along the edge of Hamilton Harbour.

4.3 INPUTS TO WATER BALANCE

Site specific inputs used in the water balance analyses are summarized in **Table 5.** The rationale for the pre-development and post-development inputs is discussed in Section 4.3.1 and Section 4.3.2.

Table 5: Site Specific Infiltration Factors

INFILTRATION FACTOR	PRE-DEVELOPMENT		POST-DEVELOPMENT	
Topography	Gentle Slopes (1.76%, 18,385 m^2)	0.12	Gentle Slopes (1.76%, 18,385 m^2)	0.12
Soils	Silty sand, trace clay (Loamy sand)	0.30	Silty sand, trace clay (Loamy sand)	0.30
Cover	Landscaping (1,724 m^2)	0.05	Landscaping (4,990 m^2)	0.05
Weighted i-Factor		**0.470**		**0.470**

4.3.1 PRE-DEVELOPMENT CONDITIONS

The pre-development conditions at the Site comprised of urban lawns which in a Loamy Sand (Section 3.2.24.3.1) would lead to a soil WHC of 75 mm as defined on Table 3.1 of the *MOE Stormwater Planning and Design Manual* (2003), which was used in analysing the existing condition for the water balance.

With the exception of some pervious vegetated areas found along the southwest, southeast and northeast limits of the site (1,724 m^2), the majority of the area of the Site (16,661 m^2) is impervious in the pre-development condition, consisting of roof and pavement areas. The pre-development infiltration factor for the Site is calculated at 0.470, based on the following:

- The surficial soils at the Site based on borehole drilling conducted by WSP consist of Silty Sand. As discussed in Section 3.2.2, based on grain size analysis the surficial soils are best classified as Loamy Sandy (i_{soil} = 0.30).
- Vegetation cover along the southwest, southeast and northeast limits of the Site consists predominantly of shallow rooted crops (i.e. manicured lawns) which has an i_{cover} of 0.05.
- Topography on the Site ranges from 0.62% grades to 2.90% grades (with an average of 1.76%), which has an i_{topo} of 0.12.

4.3.2 POST-DEVELOPMENT CONDITIONS

The Final site plan (dated October 2, 2017) was used to determine the pervious and impervious areas in the post-development conditions, which are summarized in **Table 6** below. The pervious area of the Site post-development was calculated to be 2,557 m^2 and the total impervious area is 15,828 m^2. Note that of this 15, 828 m^2 of impervious area, 2,433 m^2 of landscaped green space overlies the underground parking area and while classified as impervious, it is treated as having high ETR. The pervious and impervious areas, along with their relationships with ETR, evaporation and direct infiltration are summarized in **Table 6.**

Table 6: Summary of Pervious and Impervious Areas in the post-development conditions

SURFACE AREA TYPE	AREA (M^2)	ETR?	EVAPORATION?	DIRECT INFILTRATION?
IMPERVIOUS AREA (ROOF)	7,585	No	Yes – 10%	No
IMPERVIOUS AREA (LANDSCAPE OVER UNDERGROUND GARAGE)	2,433	Yes	Yes – Part of ETR	No
IMPERVIOUS AREA (PAVED SURFACES AND INTERLOCK)	5,810	No	Yes – 10%	No
PERVIOUS AREA (LANDSCAPED)	2,557	Yes	Yes – Part of ETR	Yes
TOTAL AREA	**18,385**			

The post-development infiltration factor for the Site was calculated at 0.470, based on the following:

- Existing fill material present at the Site, extending in depths to between 1.8 m and 5.4 mbgs, are not suitable for supporting any settlement sensitive structures. If engineered fill needs to be imported to the site, as recommended by the geotechnical investigations completed by WSP, engineered fill meeting OPSS Granular 'B' sand and gravel fill would be suitable for importation to the site and would need to be compacted to 100% Standard Proctor Maximum Dry Density throughout. Based on this information, the imported engineered fill and the existing fill on the site will be classified as Loamy Sand, and the i_{soil} was assigned a value of 0.30.
- Vegetation cover of the pervious areas will consist of landscaped lawns and was assigned an i_{cover} of 0.05. It should be noted that although the final site plans show a total area of landscaping across the Site of approximately 4,990 m^2, this entire area was not fully considered to be contributing to infiltration at the Site. About half of this landscaped area (2,443 m^2) is underlain by impervious subsurface structures (i.e. underground parking and basements), which would be constructed with drainage systems.
- Topography of the Site in the post-development condition will be generally flat and similar to the pre-development conditions. The i_{topo} was assigned a value of 0.12.

4.4 WATER BALANCE

4.4.1 PRE-DEVELOPMENT AND POST-DEVELOPMENT WATER BALANCE

Under the pre-development condition, the Site was considered pervious over an area of 1,724 m^2. Under the post-development condition, the Site is proposed to be pervious over an area of 2,557 m^2. Additionally, in the post-development scenario, the overall ETR across the Site is improved through the proposed landscaped areas over the underground garage (i.e. pervious areas that does not allow direct infiltration) consisting of 2,433 m^2. The water surplus under both these conditions is 343 mm/year and the infiltration factor was calculated to be 0.470. Therefore, pre- and post-development infiltration at the pervious areas across the Site is estimated at approximately 161.2 mm/year, with infiltration volumes estimated at approximately 278 m^3/year in the pre-development conditions and 412 m^3/year in the post-development conditions. Surface runoff at the Site for pre- and post-development conditions was estimated at roughly 13,224 m^3/year and 11,679 m^3/year, respectively. The water balance was prepared using the contributions listed in **Table 7** and inputs discussed in Section 4.3. The results of the post-development water balance for the Site (1.84 ha) are summarized in **Table 8** and detailed calculations presented in **Table WB-1** in **Appendix E**.

Under the post-development scenario, infiltration across the Site is calculated to be increased by 48% (albeit from 278 m^3/year to 412 m^3/year) and the overall runoff decreases by about 12%, resulting from an increase of urban landscaping in the post-development conditions.

Table 7: Contributions in Pre-Development and Post-Development Conditions

	PRE-DEVELOPMENT	POST-DEVELOPMENT	DIFFERENCE
Water Balance Statistics	**mm/year**	**mm/year**	**mm/year**
Precipitation	861.0	861.0	+0.0
Evapotranspiration	518.0	518.0	+0.0
Surplus	343.0	343.0	+0.0
Infiltration Factor (dimensionless)	0.470	0.470	+0.0
Infiltration	161.2	161.2	+0.0
Runoff (from pervious areas)	181.8	181.8	+0.0

Table 8: Pre and Post Development Water Balance

	PRE-DEVELOPMENT	POST-DEVELOPMENT	DIFFERENCE
Site Statistics	**m^2**	**m^2**	**m^2**
Impervious Area (Roofs)	5,200	7,585	2,385
Impervious Area (Pavement, etc.)	11,461	5,810	-5,651
Pervious Area (Underlain by Underground Parking Garage)	0	2,433	2,433
Total Impervious Area	**16,661**	**15,828**	**-833**
Pervious Area (Not Underlain by Underground Parking Garage)	**1,724**	2,557	833
Total Site Area	**18,385**	**18,385**	**+0.0**
Water Volumes	**m^3/year**	**m^3/year**	**m^3/year**
Precipitation (Entire Site Area)	15,829	15,829	+0.0
Evapotranspiration (Pervious Area)	893	1,325	+431
Evapotranspiration (Area Underlain by Underground Parking Garage)	0	1,260	+1,260
Total ETR	**893**	**2,585**	**+1,692**
Evaporation Impervious Surfaces	**1,435**	**1,153**	**-281**
Runoff (Impervious Surfaces - Roofs)	4,030	5,878	+1,848
Runoff (Impervious Surfaces - Pavement)	8,881	4,502	-4,379
Runoff (Landscaped Area Underlain by Underground Parking Garage)	0	835	+835
Runoff (Pervious Surfaces)	319	465	+151
Total Runoff	**13,224**	**11,679**	**-1,545**
Infiltration	**278**	**412**	**+134**
Total ETR, Evaporation, Runoff, Infiltration	**15,829**	**15,829**	**+0.0**

4.4.2 DEWATERING REQUIREMENTS

A review of available borehole logs, static water levels, findings of completed geotechnical investigations and known proposed depths of sub-surface foundation structures was conducted to determine anticipated dewatering requirements for construction activities. The geotechnical investigations completed by WSP in 2016 and 2017 recommended conventional shallow foundations to support the three-storey townhomes and deep foundations (i.e., caissons) to support the proposed six-storey condominiums. The conventional shallow foundations have proposed minimum founding depths ranging from 2.3 to 3.6 mbgs and the deep foundations have proposed minimum founding depths ranging from 10.1 to 11.0 mbgs.

Static water level measurements recorded across the Site between July 2016 and September 2017 ranges between 2.7 and 5.4 mbgs. The approximate depth of the underground parking garage is 3.6 mbgs and the proposed range of minimum depth for the conventional shallow foundations is between 2.3 and 3.6 mbgs. It is anticipated that dewatering may be required to excavate and install shallow foundations for the 3-storey townhomes with the 1 level underground parking garage.

Based on the information summarized above, it is anticipated that construction works associated with the installation of shallow foundations and/or sewer services at the Site will intercept the groundwater and that construction dewatering should be anticipated. The preliminary review of available information suggests that required dewatering rates will be in excess of 400,000 litres/day. Based on the anticipated dewatering rates being in excess of 400,000 litres/day, a Permit to Take Water (PTTW) from the Ministry of Environment and Climate Change will be required. Alternatively, if the dewatering rates are calculated to be less than 400,000 litres/day, an Environmental Activity Sector Registry (EASR) from the MOECC will be required.

Long-term operations of the building sub-drainage system network, will likely require pumping of the collected groundwater to the nearby sewer networks, which may also be subject to issuance of a separate, long-term PTTW for the operation of the system, if the daily maximum sub-drainage rates are found to exceed 50,000 litres/day.

A detailed assessment will be required at the detailed design stage to determine the quantity of groundwater required for dewatering, to support an anticipated Permit to Take Water (PTTW) application. The application for these permits requires the applicant to address how much water will be withdrawn, over what time period, where it will be discharged to, the water quality discharge parameters that are to be met, the expected zones of influence and effects on natural features. Monitoring and mitigation measures would also be required and would be identified in the application. For long term monitoring, information such as flow rates for pumping of sub-drainage networks and water treatment requirements, would also need to be addressed at the detailed design stage.

EASR and PTTW applications are submitted after detailed design and in advance of the construction works. Scheduling excavation works for the late summer, if practical, will further serve to reduce groundwater flows into excavations as this is the time of year when groundwater levels are typically at their lowest.

5 CONCLUSIONS AND RECOMMENDATIONS

The 1.84 ha Site is presently covered by buildings and asphalt ranging in thickness from 0.05 m to 0.18 m, overlaying granular base ranging in thickness from 0.08 m to 0.46 m. Fill material, generally described as silty sand with trace clay, extended to depths ranging from 1.8 mbgs to 5.4 mbgs. Silty sand deposits underlying the fill material extended to depths ranging from 5.6 mbgs to 8.1 mbgs. A silty sand seam was observed at BH17-9 between depths of 13.9 and 15.7 mbgs. Silty Clay Till deposits extended to depths ranging from 8.2 mbgs to 15.7 mbgs and was underlain by Silty Clay deposits at eight borehole locations and extended to depths ranging from 13.9 mbgs to 17.7 mbgs. Hydraulic conductivity testing performed at the Site has estimated the hydraulic conductivity of the Sandy Silt to be roughly $1.0x10^{-5}$ m/sec, and the Silty Clay about 1.9×10^{-7} m/sec.

Shallow groundwater is interpreted to flow from northwest to southeast (94.75 masl to 92.75 masl) at a gradient of about 0.011. Deeper groundwater is interpreted to flow from northwest to southeast at the southern portion of the Site (93.5 masl to 92.75 masl) at a gradient of about 0.011. Downward gradients were generally identified at the Site with lower gradients at the southern-most portion of the Site, ranging between 0.02 (downward) at BH16-10/D and 0.12 (upward) at BH16-9/D. These findings imply that groundwater recharge is generally occurring at the Site.

A hydrogeological assessment using a water balance methodology was carried out at the Site and it was demonstrated that infiltration at the Site will be improved due to the proposed post-development plans to incorporate an increase in vegetative lands along the perimeter of the Site. The findings of the annual water balance for the post-development conditions indicated that runoff across the Site is further reduced through the proposed 2,443 m^2 of landscaped area over the underground garage (i.e., impervious areas) which will contribute to the improvement of the overall ETR across the Site and thereby lower runoff from these areas. Under the proposed design, infiltration across the Site is calculated to be increased by 48% and the overall runoff decreases by about 12%.

Based on the a review of available borehole logs, static water levels, findings of completed geotechnical investigations and known proposed depths of sub-surface foundation structures, it is anticipated that construction works associated with the installation of shallow foundations and/or sewer services at the Site will intercept the groundwater and construction dewatering is anticipated. A detailed assessment will be required at the detailed design stage to determine the quantity of groundwater required for dewatering, to support an anticipated PTTW or EASR application with the MOECC.

Long-term operations of the building sub-drainage system network, will likely also require pumping of the collected groundwater to the nearby sewer network, and which may also be subject to issuance of a separate, long-term PTTW for the operation of the system if the maximum daily rates are calculated to exceed 50,000 litres/day.

6 STANDARD LIMITATIONS

Standard Limitations are presented in **Appendix F** as they apply to this report.

7 REFERENCES

Chapman, L.J. and Putnam, D.F., 1984, *The Physiography of Southern Ontario*. Ontario Geological Survey Special Volume 2, 270p.

Ontario Ministry of the Environment, 2003. *Stormwater Management Planning and Design Manual.*

Johnstone, K, and Louie, P. Y. T., 1983. Water Balance Tabulations for Canadian Climate Stations. Hydrometeorology Division, Canadian Climate Centre, Atmospheric Environment Service, DS#8-83.

WSP Canada Inc, 2017. *Geotechnical Investigation Proposed Mixed-Use Development, 484-490 Plains Road East, Burlington, Ontario.* June 2, 2017.

WSP Canada Inc, 2017. *Phase Two Environmental Site Assessment, 484-490 Plains Road East, Burlington, Ontario.* July 5, 2017.

APPENDIX

A BOREHOLE LOGS

LOG OF BOREHOLE BH16-1

PROJECT: Phase Two and Preliminary Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796798 E 594288

DRILLING DATA
Method: Solid Stem Auger
Diameter: 115mm
Date: Jun/29/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
97.98	Ground Surface						
97.81 / 0.17	**ASPHALT** (150 mm) **GRANULAR BASE** (80 mm) **FILL:** silty sand, trace clay, redish brown, moist, very loose.		1	AUGER			
			2	SS	0		97
			3	SS	2		96
			4	SS	3		
94.98 / 3.00	**SILTY SAND:**contains clayey silt layers, redishbrown, moist to wet, compact.		5	SS	14		95
							94
			6	SS	14		93
							92
			7	SS	14		
91.28 / 6.70	**END OF BOREHOLE** Notes: 1). Water was encountered at 4.6 m below ground surface (bgs) during drilling. 2). Water was at 4.3 m bgs upon completion of drilling. 3). Borehole caved in to a depth of 4.4 m bgs upon completion of drilling.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-2

PROJECT: Phase Two and Preliminary Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796711 E 594366

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun/30/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.30	Ground Surface											
0.00 / 96.97	**ASPHALT** (120 mm) **GRANULAR BASE** (210 mm)											
0.33	**FILL:** silty sand, trace clay, redish brown, moist, very loose to loose.		1	AUGER								
			2	SS	5		97					
			3	SS	6		96	Bentonite				
			4	SS	2		95					
93.90			5	SS	8		94					
3.40	**SILTY SAND:** trace clay, redishbrown, moist to wet, loose to compact.							Sand				
			6	SS	14		93	W. L. 92.4 m Oct 24, 2016				
							92	Screen				
			7	SS	27		91					
			8	SS	30		90					
89.15												
8.18 / 8.20	**SILTY CLAY TILL:** grey, moist, very stiff.											
	END OF BOREHOLE											

Notes:
1). Water was encountered at 4.6 m below ground surface (bgs) during drilling;
2). 2" well was installed in the borehole upon completion of drilling.

Water Level Reading:
Date Depth (m)
July 11, 2016 4.78

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-2

PROJECT: Phase Two and Preliminary Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796711 E 594366

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun/30/2016

REF. NO.: 161-09479-00
ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m							GR SA SI CL
	Continued											
	Oct 24, 2016 4.94											

WSP SOIL LOG 2DIG 161-0947900-00 484 PLAINS RD E, BURLINGTON 20161026.GPJ SPL.GDT 27/2/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-3

PROJECT: Phase Two and Preliminary Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796753 E 594339

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun/30/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.73	Ground Surface											
0.00 / 97.45	**ASPHALT** (180 mm) **GRANULAR BASE** (100 mm)											
0.28	**FILL:** silty sand, trace clay, redish brown, moist, very loose to loose.		1	AUGER					○			
			2	SS	4		97		○			
			3	SS	11		96		○			
95.53							Bentonite					
2.20	**SILTY SAND:** trace clay, redishbrown, moist to wet, loose to compact.		4	SS	14				○			
			5	SS	11		95		○			
							94					
							Sand					
			6	SS	20	▼	93 W. L. 93.0 m Feb 07, 2017		○			
							92					
							Screen					
			7	SS	24		91		○			
89.93												
7.80	**SILTY CLAY TILL:** grey, moist, very stiff.		8	SS	22		90		○			
89.53												
8.20	sand and gravel layer **END OF BOREHOLE**											

Notes:
1). Water was encountered at 4.6 m below ground surface (bgs) during drilling;
2). 2" well was installed in the borehole upon completion of drilling.

Water Level Reading:

Date	Depth (m)
July 11, 2016	4.58
Oct 24, 2016	4.75

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

PROJECT: Phase Two and Preliminary Geotechnical Investigation

CLIENT: National Homes (Plains Road) LP

PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario

DATUM: NAD83, ZONE 17

BH LOCATION: N 4796753 E 594339

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150 mm

Date: Jun/30/2016

REF. NO.: 161-09479-00

ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m							GR SA SI CL
	Continued											
	Dec 10, 2016 4.79 Feb 7, 2017 4.74											

WSP SOIL LOG 2DIG 161-0947900-00 484 PLAINS RD E, BURLINGTON 20161026.GPJ SPL.GDT 27/2/17

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16- 3D

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796753 E 594339

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Oct/18/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.70	Ground Surface											
0.00	**REFER TO BH16-3 FOR UPPER STRATIGRAPHY**											
90.08												
7.62	**SILTY SAND:** trace gravel, redishbrown, wet, compact.		1	SS	13							
89.01												
8.69	**SILTY CLAY TILL:** trace gravel, trace sand, redishbrown to grey, moist, very stiff to hard.		2	SS	17							

97
96
95
94
93
W. L. 92.8 m
Feb 07, 2017
92
Bentonite
91
90
89
88

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

WSP SOIL LOG 2DIG 161-09479-00 484 PLAINS RD E, BURLINGTON PHASE II 20161026.GPJ SPL.GDT 27/2/17

PROJECT: Phase II Environmental Site Assessment

CLIENT: National Homes (Plains Road) LP

PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario

DATUM: NAD83, ZONE 17

BH LOCATION: N 4796753 E 594339

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150 mm

Date: Oct/18/2016

REF. NO.: 161-09479-00

ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued											
	SILTY CLAY TILL: trace gravel, trace sand, redishbrown to grey, moist, very stiff to hard.(Continued)											
11			3	SS	47		87					
12			4	SS	58		86					
13							85					
14			5	SS	42		Sand 84					
82.92							83					
14.78	**SILTY CLAY:** trace sand, contains silt layers, grey, moist, very stiff.						Screen					
15			6	SS	21		82					
16												
17			7	SS	21		81					
80.33												
17.37	**END OF BOREHOLE**											

Notes:
1). Borehole was open upon completion of drilling.
2). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:

Date	W.L. Depth(m bgs)
Oct 24, 2016	4.76
Dec 10, 2016	4.83
Feb 7, 2017	4.87

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

PROJECT: Phase Two and Preliminary Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796820 E 594329

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun/29/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.81	Ground Surface											
0.00 / 97.51	**ASPHALT** (100 mm) **GRANULAR BASE** (200 mm)											
0.30	**FILL:** silty sand, trace clay, contains clayey silt layer, redish brown, moist, very loose.		1	AUGER								
			2	SS	4		97					
			3	SS	3		Bentonite 96					
			4	SS	2		95					
94.81												
3.00	**SILTY SAND:** trace clay, redishbrown, moist to wet, loose to compact.		5	SS	17		Sand 94					
							W. L. 93.7 m Feb 07, 2017					
			6	SS	22		93 Screen					
			7	SS	15		92					
90.65							91					
7.16	**SILTY CLAY TILL:** grey, moist, very stiff.		8	SS	23		90					
89.61												
8.20	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 4.6 m below ground surface (bgs) during drilling;
2). 2" well was installed in the borehole upon completion of drilling.

Water Level Reading:

Date	Depth (m)
July 11, 2016	3.90
Oct 24, 2016	4.07
Dec 10, 2016	4.15

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

PROJECT: Phase Two and Preliminary Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796820 E 594329

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun/29/2016

REF. NO.: 161-09479-00
ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m							GR SA SI CL
	Continued Feb 7, 2017 4.13											

WSP SOIL LOG 2DIG 161-0947900-00 484 PLAINS RD E, BURLINGTON 20161026.GPJ SPL.GDT 27/2/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-5

PROJECT: Phase Two and Preliminary Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796805 E 594348

DRILLING DATA
Method: Solid Stem Auger
Diameter: 115mm
Date: Jun/29/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.45	Ground Surface											
0.00 / 97.20	**ASPHALT** (90 mm) **GRANULAR BASE** (160 mm)											
0.25	**FILL:** silty sand, trace clay, redish brown, moist, very loose.		1	AUGER								
			2	SS	0							
			3	SS	3							
			4	SS	2							
94.45												
3.00	**SILTY SAND:** trace clay, redishbrown, moist to wet, loose to compact.		5	SS	8							
			6	SS	18							
			7	SS	11							
90.75												
6.70	**END OF BOREHOLE** Notes: 1). Water was encountered at 4.6 m below ground surface (bgs) during drilling; 2). 2" well was installed in the borehole upon completion of drilling.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 2DIG 161-0947900-00 484 PLAINS RD E, BURLINGTON 20161026.GPJ SPL.GDT 27/2/17

PROJECT: Phase Two and Preliminary Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796741 E 594395

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun/30/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT (w_P w w_L) WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
96.73	Ground Surface											
0.00 / 96.42	**ASPHALT** (100 mm) **GRANULAR BASE** (210 mm)											
0.31	**FILL:** silty sand, trace clay, redish brown, moist, very loose to compact.		1	AUGER								
			2	SS	3		96		○			
			3	SS	4		Bentonite		○			
93.73			4	SS	11		94		○			
3.00	**SILTY SAND:** trace clay, redishbrown, moist to wet, compact.		5	SS	19		93 Sand W. L. 92.8 m Feb 07, 2017		○			
			6	SS	11		92		○			
			7	SS	18		Screen 90		○			
89.57												
7.16	**SILTY CLAY TILL:** grey, moist, very stiff.		8	SS	20		89		○			
88.53												
8.20	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 4.6 m below ground surface (bgs) during drilling;
2). 2" well was installed in the borehole upon completion of drilling.

Water Level Reading:

Date	Depth (m)
July 11, 2016	3.86
Oct 24, 2016	4.03
Dec 10, 2016	4.10

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GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

PROJECT: Phase Two and Preliminary Geotechnical Investigation

CLIENT: National Homes (Plains Road) LP

PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario

DATUM: NAD83, ZONE 17

BH LOCATION: N 4796741 E 594395

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150 mm

Date: Jun/30/2016

REF. NO.: 161-09479-00

ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L / WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m							
	Continued											
	Feb 7, 2017 3.97											

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16- 6D

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796741 E 594395

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Oct/20/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT w_P w w_L WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
96.71	Ground Surface							20 40 60 80 100	10 20 30			
0.00	**REFER TO BH16-6 FOR UPPER STRATIGRAPHY**						96					
							95					
							94					
							93					
						▽						
								W. L. 92.7 m Feb 07, 2017				
							92					
							91					
								Bentonite				
							90					
89.09												
7.62	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist, very stiff to hard.		1	SS	23		89					
							88					
			2	SS	33							
							87					

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

WSP SOIL LOG 2DIG 161-09479-00 484 PLAINS RD E, BURLINGTON PHASE II 20161026.GPJ SPL.GDT 27/2/17

PROJECT: Phase II Environmental Site Assessment

CLIENT: National Homes (Plains Road) LP

PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario

DATUM: NAD83, ZONE 17

BH LOCATION: N 4796741 E 594395

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150 mm

Date: Oct/20/2016

REF. NO.: 161-09479-00

ENCL NO.:

SOIL PROFILE			SAMPLES												
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT w_P w w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued											
	SILTY CLAY TILL: trace gravel, trace sand, grey, moist, very stiff to hard.(Continued)											
11			3	SS	37		86					
12			4	SS	32		85					
13							84					
83.45												
13.26	**SILTY CLAY:** trace sand, trace gravel, contains sandy silt layers, grey, moist, stiff to very stiff.						Sand					
14			5	SS	22		83					
15							82					
							Screen					
16			6	SS	15		81					
17			7	SS	15		80					
79.34												
17.37	**END OF BOREHOLE**											

Notes:
1). Borehole was open upon completion of drilling.
2). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:

Date	W.L. Depth(m bgs)
Oct 24, 2016	4.04
Dec 10, 2016	4.01
Feb 7, 2017	3.97

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

WSP SOIL LOG 2DIG 161-09479-00 484 PLAINS RD E, BURLINGTON PHASE II 20161026.GPJ SPL.GDT 27/2/17

LOG OF BOREHOLE BH16-7

PROJECT: Phase Two and Preliminary Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796881 E 594363

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Jun/29/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.79	Ground Surface											
97.59 / 0.20	**ASPHALT** (110 mm) **GRANULAR BASE** (90 mm) **FILL:** silty sand, trace clay, redish brown, moist, very loose to compact.		1	AUGER								
			2	SS	8		97					
			3	SS	4		96					
							Bentonite					
			4	SS	4		95					
94.79 / 3.00	**SILTY SAND:** contains clayey silt layers, redishbrown, wet, very lose to compact.		5	SS	10							
			6	SS	4	▼	W. L. 94.1 m Feb 07, 2017					
							Sand					
			7	SS	11		93					
			8	SS	5		92					
							Screen					
			9	SS	15		91					
90.09 / 7.70	**SILTY CLAY TILL:** grey, moist, very stiff.		10	SS	19		90					
89.59 / 8.20	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 3 m below ground surface (bgs) during drilling;
2). 2" well was installed in the borehole upon completion of drilling.

Water Level Reading:

Date	Depth (m)
July 11, 2016	3.50
Oct 24, 2016	3.65
Dec 10, 2016	3.75

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

PROJECT: Phase Two and Preliminary Geotechnical Investigation

CLIENT: National Homes (Plains Road) LP

PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario

DATUM: NAD83, ZONE 17

BH LOCATION: N 4796881 E 594363

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150 mm

Date: Jun/29/2016

REF. NO.: 161-09479-00

ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m							GR SA SI CL
	Continued Feb 7, 2017 3.72											

WSP SOIL LOG 2DIG 161-0947900-00 484 PLAINS RD E, BURLINGTON 20161026.GPJ SPL.GDT 27/2/17

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-8

PROJECT: Phase Two and Preliminary Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796775 E 594428

DRILLING DATA
Method: Solid Stem Auger
Diameter: 115mm
Date: Jun/29/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
97.00	Ground Surface						
0.00 / 96.73	**ASPHALT** (120 mm) **GRANULAR BASE** (150 mm)						
0.27	**FILL:** silty sand, trace clay, redish brown, moist, very loose to compact.		1	AUGER			
			2	SS	14		96
			3	SS	8		95
94.75							
2.25	**SILTY SAND:** trace clay, redishbrown, moist to wet, compact.		4	SS	9		94
			5	SS	9		93
			6	SS	15		92
			7	SS	5		91
89.84							90
7.16	**SILTY CLAY TILL:** grey, moist, very stiff.		8	SS	29		89
88.80							
8.20	**END OF BOREHOLE** Notes: 1). Water was encountered at 4.6 m below ground surface (bgs) during drilling. 2). Water was at 4.3 m bgs upon completion of drilling. 3). Borehole caved in to a depth of 4.4 m bgs upon completion of drilling.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
$+^3$, $\times^3$: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16- 9

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796733.7 E 594356.07

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Oct/19/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.29	Ground Surface										
0.00	**REFER TO BH16-9D FOR UPPER STRATIGRAPHY**						97				
							Bentonite				
							96				
							Sand				
							94				
							Screen				
							93				
							W. L. 92.7 m Feb 07, 2017				
							92				
91.19											
6.10	**SILTY SAND:** trace gravel, redishbrown, wet, compact.		1	SS	17		91				
90.58											
6.71	**END OF BOREHOLE**										

Notes:
1). Water was measured at a depth of 5.8 m below the ground surface (bgs) upon completion of drilling.
2). Borehole was open upon completion of drilling.
3). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:

Date	W.L. Depth(m bgs)
Oct 24, 2016	4.60
Dec 10, 2016	4.63
Feb 7, 2017	4.60

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 2DIG 161-09479-00 484 PLAINS RD E, BURLINGTON PHASE II 20161026.GPJ SPL.GDT 27/2/17

LOG OF BOREHOLE BH16- 9D

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796733.7 E 594356.07

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Oct/19/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
97.29	Ground Surface						
97.06 0.23	**ASPHALT** (80 mm) **GRANULAR BASE** (150 mm) **FILL:** silty sand, trace gravel, trace clay, redishbrown, moist, loose to compact.			AUGER			
			1	SS	5		
			2	SS	11		
95.08							
2.21	**SILTY SAND:** trace gravel, redishbrown, moist to wet, compact.		3	SS	14		
			4	SS	14		
			5	SS	24	W. L. 92.6 m Dec 10, 2016	
			6	SS	19		
89.57						Bentonite	
7.72	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist, stiff to hard.		7	SS	10		
			8	SS	20		

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

ELEVATION: 97 96 95 94 93 92 91 90 89 88

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

WSP SOIL LOG 2DIG 161-09479-00 484 PLAINS RD E, BURLINGTON PHASE II 20161026.GPJ SPL.GDT 27/2/17

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796733.7 E 594356.07

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Oct/19/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued											
	SILTY CLAY TILL: trace gravel, trace sand, grey, moist, stiff to hard.(Continued)						87					
11			9	SS	24							
							86					
12												
			10	SS	60		85					
13												
							84					
14			11	SS	35							
							83					
82.51												
14.78	**SILTY CLAY:** trace sand, contains silt layers, grey, moist, very stiff.											
15							Sand					
			12	SS	17		82					
16							Screen					
							81					
17			13	SS	19							
79.92							80					
17.37	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 6.1 m below ground surface (bgs) during drilling.
2). Borehole was open upon completion of drilling.
3). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:

Date	W.L. Depth(m bgs)
Oct 24, 2016	4.88
Dec 10, 2016	4.67

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-10

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796735.21 E 594339.96

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Oct/19/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.50	Ground Surface											
97.42	**ASPHALT** (80 mm)											
0.08												
97.17	**GRANULAR BASE** (250 mm)											
0.33	**FILL:** silty sand, trace gravel, trace clay, redishbrown, moist to wet, very loose to loose.			AUGER								
			1	SS	4		97					
							Bentonite					
			2	SS	9		96					
			3	SS	4		95 Sand					
			4	SS	2		94					
93.39												
4.11	**SILTY SAND:** trace gravel, redishbrown, wet, compact.						Screen					
			5	SS	22		93 W. L. 92.8 m Feb 07, 2017					
							92					
			6	SS	25		91					
90.34												
7.16	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist, stiff.						90					
			7	SS	9							
89.27												
8.23	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 3.0 m below ground surface (bgs) during drilling.
2). Borehole was open upon completion of drilling.
3). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:

Date	W.L. Depth(m bgs)
Oct 24, 2016	4.76

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GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

PROJECT: Phase II Environmental Site Assessment

CLIENT: National Homes (Plains Road) LP

PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario

DATUM: NAD83, ZONE 17

BH LOCATION: N 4796735.21 E 594339.96

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150 mm

Date: Oct/19/2016

REF. NO.: 161-09479-00

ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m							GR SA SI CL
	Continued											
	Dec 10, 2016 4.81 Feb 7, 2017 4.75											

WSP SOIL LOG 2DIG 161-09479-00 484 PLAINS RD E, BURLINGTON PHASE II 20161026.GPJ SPL.GDT 27/2/17

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES

+ 3, × 3: Numbers refer to Sensitivity

○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-10I

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM:
BH LOCATION: See Borehole Location Plan

DRILLING DATA
Method: Direct Push
Diameter: 50 mm
Date: Jan/24/2017 to Jan/31/2017

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.49	Ground Surface											
0.00 / 97.19	**ASPHALT AND GRANULAR BASE** (300 mm)		1A	SS								SS1A PID reading: 0ppm
0.30	**FILL:** sandy silt to silty sand, trace to some clay, brown to reddish brown, moist.		1B	SS			97					SS1B PID reading: 0.5ppm
			2A	SS			96					SS2A PID reading: 0ppm
			2B	SS								SS2B PID reading: 0.1ppm
94.44			3A	SS			95					SS3A PID reading: 0ppm
3.05	**SANDY SILT TO SILTY SAND:** trace to some clay, brown to redish brown, moist to wet.		3B	SS								SS3B PID reading: 0ppm
			4	SS			94					SS4 PID reading: 0ppm
						▽	93					
								W. L. 92.7 m Feb 07, 2017				
			5A	SS								SS5A PID reading: 0.1ppm
			5B	SS			92					SS5B PID reading: 0.2ppm
			6A	SS								SS6A PID reading: 0ppm
			6B	SS			91					SS6B PID reading: 0ppm
			7A	SS			90					SS7A PID reading: 0ppm
89.41												
8.08 / 89.11	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist.		7B	SS								SS7B PID reading: 0ppm
8.38	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 4.9 m below ground surface (bgs) during drilling.
2). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:
Date Depth (m)
Feb 7, 2017 4.75

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3. Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-10D

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM:
BH LOCATION: See Borehole Location Plan

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: to Nov/21/2016

REF. NO.: 161-09479-00
ENCL NO.:

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa) / WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.49	Ground Surface										
0.00	**REFER TO BH16-10 FOR UPPER STRATIGRAPHY**						97				
							96				
							95				
							94				
						▽ W. L. 92.7 m Feb 07, 2017	93				
							92				
							91				
							90				
							89				
							88				

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

WSP SOIL LOG 2DIG 161-09479-00 484 PLAINS RD E, BURLINGTON ADDITIONAL PHASE II 20161207.GPJ SPL.GDT 27/2/17

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM:
BH LOCATION: See Borehole Location Plan

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: to Nov/21/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued											
	REFER TO BH16-10 FOR UPPER STRATIGRAPHY(Continued)											
86.82												
10.67	**SILTY CLAY TILL:** trace gravel, trace sand, brown, moist, very stiff to hard.		1	SS	36		87					SS1 PID reading: 0ppm
11												
12			2	SS	54		86					SS2 PID reading: 0ppm
13							85					
83.47			3	SS	27		84					SS3 PID reading: 0ppm
14.02	**SILTY CLAY:** trace sand, contains silt layers and wet sand pockets, grey, moist, stiff to very stiff.											
	Turned grey at 14.0m						83					
15			4	SS	14		82					SS4 PID reading: 0ppm
16												
							81					
17			5	SS	16							SS5 PID reading: 0ppm
80.12												
17.37	**END OF BOREHOLE**											

Notes:
1). Water was at a depth of 15.85m below ground surface upon completion of drilling.
2). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:

Date	W.L. Depth(m bgs)
Dec 10, 2016	4.79
Feb 7, 2017	4.75

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-11

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD83, ZONE 17
BH LOCATION: N 4796765.66 E 594389.79

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Oct/20/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
96.98	Ground Surface											
96.90 / 0.07	**ASPHALT** (70 mm)											
96.71 / 0.27	**GRANULAR BASE** (200 mm)											
	FILL: silty sand, trace gravel, trace clay, brown to redishbrown, moist, very loose to loose.			AUGER								
1			1	SS	4		96					
							Bentonite					
2			2	SS	4		95					
			3	SS	8		Sand					
94.01 / 2.97	**SILTY SAND:** trace gravel, redishbrown, moist to wet, compact.						94					
			4	SS	18							
4						▽	W. L. 93.0 m Feb 07, 2017					
							Screen					
			5	SS	15		92					
6												
			6	SS	13		91					
7							90					
89.82 / 7.16	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist, stiff.											
8			7	SS	11		89					
88.75 / 8.23	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 3.5 m below ground surface (bgs) during drilling.
2). Borehole was open upon completion of drilling.
3). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:

Date	W.L. Depth(m bgs)
Oct 24, 2016	4.02

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 2DIG 161-09479-00 484 PLAINS RD E, BURLINGTON PHASE II 20161026.GPJ SPL.GDT 27/2/17

PROJECT: Phase II Environmental Site Assessment

CLIENT: National Homes (Plains Road) LP

PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario

DATUM: NAD83, ZONE 17

BH LOCATION: N 4796765.66 E 594389.79

DRILLING DATA

Method: Hollow Stem Auger

Diameter: 150 mm

Date: Oct/20/2016

REF. NO.: 161-09479-00

ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT w_P w w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m						GR SA SI CL
	Continued										
	Dec 10, 2016 3.44 Feb 7, 2017 3.97										

GROUNDWATER ELEVATIONS

Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

WSP SOIL LOG 2DIG 161-09479-00 484 PLAINS RD E, BURLINGTON PHASE II 20161026.GPJ SPL.GDT 27/2/17

LOG OF BOREHOLE BH16-11D

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796765 E 594389

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: to Nov/22/2016

REF. NO.: 161-09479-00
ENCL NO.:

SOIL PROFILE			SAMPLES									
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.0												
0.0	**REFER TO BH16-11 FOR UPPER STRATIGRAPHY**						96					
1							95					
2							94					
3							93	W.L. 92.4 m Jun 13, 2017				
4							92					
5							91					
6							90					
7							89					
8							88					
9							87					
10												

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796765 E 594389

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: to Nov/22/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
86.3	**REFER TO BH16-11 FOR UPPER STRATIGRAPHY**(Continued)											
10.7	**SILTY CLAY TILL:** trace gravel, trace sand, brown to grey, moist, hard.		1	SS	57		86					SS1 PID reading: 0.5ppm
11												
12			2	SS	43		85					SS2 PID reading: 0.3ppm
13												
83.7												
13.3	**SILTY CLAY:** trace gravel, trace sand, contains sandy silt layers, grey, moist, very stiff to hard.		3	SS	34		84					SS3 PID reading: 0.5ppm
14												
15			4	SS	19		83					SS4 PID reading: 0.4ppm
16							82					
17			5	SS	60/250m		81					SS5 PID reading: 0.3ppm
79.8							80					
17.2	**END OF BOREHOLE** Notes: 1). Borehole was dry upon completion of drilling. 2). 2" well was installed in the borehole upon completion of drilling. Water Level Readings: Date W.L. Depth (mbgs) Dec 10, 2016 4.61 Feb 7, 2017 4.99 Jun 13, 2017 4.56											

WSP SOIL LOG 161-09479-00 484 PLAINS RD E, BURLINGTON ADDITIONAL PHASE II 20161210.GPJ SPL.GDT 9/15/17

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-12

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796703 E 594357

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: to Nov/23/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa) / WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.4											
0.0	**REFER TO BH16-12D FOR UPPER STRATIGRAPHY**						97				
							96				
							95				
							94				
							93	W.L. 92.7 m Jun 13, 2017			
91.3							92				
6.1	**SILTY SAND:** brown, moist, compact.		1	SS	30		91				SS1 PID reading: 0.2ppm
90.7											
6.7	**END OF BOREHOLE**										

Notes:
1). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:

Date	W.L. Depth (mbgs)
Dec 10, 2016	5.27
Feb 7, 2017	5.06
Jun 13, 2017	4.65

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ε=3% Strain at Failure

LOG OF BOREHOLE BH16-12I

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796703 E 594357

DRILLING DATA
Method: Direct Push
Diameter: 50 mm
Date: Jan/24/2017 to Jan/31/2017

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.4												
97.0 / 0.0	**ASPHALT** (100 mm)											
0.1 / 97.0	**GRANULAR BASE** (300 mm)		1A	SS			97					SS1A PID reading: 0.1ppm
0.4	**FILL:** silty sand, trace clay, brown to reddish brown, moist.		1B	SS								SS1B PID reading: 0ppm
1			2A	SS			96					SS2A PID reading: 0ppm
95.6												
1.8	**SILTY SAND:** trace clay, redish brown, moist to wet.		2B	SS								SS2B PID reading: 0ppm
2			3A	SS			95					SS3A PID reading: 0ppm
3			3B	SS								SS3B PID reading: 0ppm
4			4A	SS			94					SS4A PID reading: 0ppm
			4B	SS			93					SS4B PID reading: 0ppm
5			5A	SS								SS5A PID reading: 0.1ppm
			5B	SS			92					SS5B PID reading: 0.6ppm
6			6A	SS			91					SS6A PID reading: 0ppm
			6B	SS								SS6B PID reading: 0ppm
7 / 90.1												
7.3	**SAND:** some silt, trace gravel, trace clay, brown, wet.		7A	SS			90					SS7A PID reading: 0ppm 1 82 13 4
8			7B	SS								SS7B PID reading: 0ppm
89.2												
8.2 / 88.9	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist.		7C	SS			89					SS7C PID reading: 0ppm
8.5	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 4.9 m below ground surface (bgs) during drilling.
2). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:
Date Depth (m)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 161-09479-00 484 PLAINS RD E, BURLINGTON ADDITIONAL PHASE II 20161210.GPJ SPL.GDT 9/15/17

LOG OF BOREHOLE BH16-12D

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796703 E 594357

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: to Nov/22/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.4												
97.0	**ASPHALT** (130 mm)											
0.1	**FILL:** silty sand, trace gravel, trace clay, reddish brown, moist, loose to compact.		1	SS	16		97					SS1 PID reading: 0.7ppm
			2	SS	7		96					SS2 PID reading: 0.6ppm
			3	SS	8							SS3 PID reading: 0.8ppm
95.2												
2.2	**SILTY SAND:** trace gravel, brown, moist to wet, compact.		4	SS	11		95					SS4 PID reading: 0.4ppm
			5	SS	14		94					SS5 PID reading: 0.4ppm
			6	SS	36		93					SS6 PID reading: 0.3ppm
			7	SS	20		92					SS7 PID reading: 0.7ppm
	---------- spoon wet at 6.1m		8	SS	13		91					SS8 PID reading: 0.2ppm
89.6												
7.8	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist, very stiff to hard.		9	SS	30		89					SS9 PID reading: 0.3ppm
			10	SS	30		88					SS10 PID reading: 0.3ppm

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-12D

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796703 E 594357

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: to Nov/22/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY CLAY TILL: trace gravel, trace sand, grey, moist, very stiff to hard.(Continued)							
			11	SS	28			SS1 PID reading: 0.6ppm
85.6							87	
11.7	**SILTY CLAY:** trace sand, contains silty sand layers, grey, moist, very stiff to hard.							
			12	SS	40		86	SS12 PID reading: 0.2ppm
			13	SS	39		85	SS13 PID reading: 0.4ppm
			14	SS	17		84	SS14 PID reading: 0.4ppm
			15	SS	20		83	SS15 PID reading: 0.5ppm
80.0							82	
17.4	**END OF BOREHOLE**						81	
	Notes: 1). Water was encountered at 6.1 m below ground surface (bgs) during drilling. 2). Water was at 12.2 m below ground surface (bgs) during drilling.. 3). 2" well was installed in the borehole upon completion of drilling.						80	

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-13

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796725 E 594332

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: to Nov/23/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE & Sensitivity, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.6											
0.0	**REFER TO BH16-13D FOR UPPER STRATIGRAPHY**						97				SS1 PID reading: 0.2ppm
							96				
							95				
							94				
							93				
							92				
91.5											
6.1	**SILTY SAND:** brown, moist, compact.		1	SS	11		91				
90.9											
6.7	**END OF BOREHOLE**										

Notes:
1). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:
Date W.L. Depth(m bgs)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

WSP SOIL LOG 161-09479-00 484 PLAINS RD E, BURLINGTON ADDITIONAL PHASE II 20161210.GPJ SPL.GDT 9/15/17

LOG OF BOREHOLE BH16-13I

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796725 E 594332

DRILLING DATA
Method: Direct Push
Diameter: 50 mm
Date: Jan/24/2017 to Jan/31/2017

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.6												
97.3 0.3	**ASPHALT** (130 mm) / **GRANULAR BASE** (170 mm) / **FILL:** sandy silt, some clay, reddish brown, moist.		1A	SS			97					SS1A PID reading: 0ppm
			1B	SS								SS1B PID reading: 0ppm
95.8			2A	SS			96					SS2A PID reading: 0ppm
1.8	**SILTY SAND:** trace to some clay, redish brown, moist to wet.		2B	SS								SS2B PID reading: 0ppm
			3A	SS			95					SS3A PID reading: 0ppm
			3B	SS								SS3B PID reading: 0.1ppm
			4A	SS			94					SS4A PID reading: 0ppm
			4B	SS			93					SS4B PID reading: 0ppm
			5A	SS								SS5A PID reading: 0ppm
			5B	SS			92					SS5B PID reading: 0ppm
			6A	SS								SS6A PID reading: 0ppm
90.9							91					
6.7	**SAND:** trace gravel, trace silt, trace clay, brown, wet.		6B	SS								SS6B PID reading: 0ppm 3 85 8 4
			7A	SS			90					SS7A PID reading: 0ppm
89.5												
8.1	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist.		7B	SS								SS7B PID reading: 0ppm
89.1												
8.5	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 4.9 m below ground surface (bgs) during drilling.
2). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:
Date Depth (m)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 161-09479-00 484 PLAINS RD E, BURLINGTON ADDITIONAL PHASE II 20161210.GPJ SPL.GDT 9/15/17

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796725 E 594332

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: to Nov/21/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.6												
97.5 0.1	**ASPHALT** (115 mm)											
	FILL: silty sand, trace gravel, trace clay, reddish brown, moist, loose.		1	SS	8		97					SS1 PID reading: 0ppm
1			2	SS	7							SS2 PID reading: 0ppm
			3	SS	6		96					SS3 PID reading: 1ppm
2 95.4												
2.2	**SILTY SAND:** brown, moist to wet, loose to compact.		4	SS	11		95					SS4 PID reading: 0ppm
3			5	SS	13							SS5 PID reading: 0ppm
			6	SS	21		94					SS6 PID reading: 1ppm
4	---------- Spoon wet at 4.6m		7	SS	21		93					SS7 PID reading: 1ppm
5												
6			8	SS	22		92					SS8 PID reading: 1ppm
7							91					
89.8												
7.8	**SILTY CLAY TILL:** trace gravel, trace sand, brown, moist, stiff to hard.		9	SS	15		90					SS9 PID reading: 0ppm
8												
9			10	SS	19		89					SS10 PID reading: 0ppm
10							88					

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 161-09479-00 484 PLAINS RD E, BURLINGTON ADDITIONAL PHASE II 20161210.GPJ SPL.GDT 9/15/17

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796725 E 594332

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: to Nov/21/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY CLAY TILL: trace gravel, trace sand, brown, moist, stiff to hard.(Continued)						87					
11	100mm wet sand layer at 10.8m		11	SS	43							SS1 PID reading: 0ppm
12							86					
85.3												
12.3	**SILTY CLAY:** trace gravel, trace sand, contains silt layers, grey, moist, stiff to hard.		12	SS	66		85					SS12 PID reading: 0ppm
13	Turned grey at 12.3m											
14			13	SS	39		84					SS13 PID reading: 0ppm
15			14	SS	15		83					SS14 PID reading: 0ppm
16							82					
17			15	SS	14		81					SS15 PID reading: 0ppm
80.2												
17.4	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 6.1 m below ground surface (bgs) during drilling.
2). Water was at 12.4 m below ground surface (bgs) during drilling.
3). 2" well was installed in the borehole upon completion of drilling.

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH16-14

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796791 E 594375

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: to Nov/23/2016

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.5								
97.4 0.1	**ASPHALT** (75 mm)							
	FILL: silty sand, trace gravel, trace clay, reddish brown, moist, loose to compact.		1	SS	18		97	SS1 PID reading: 0.3ppm
			2	SS	6			SS2 PID reading: 0.4ppm
			3	SS	6		96	SS3 PID reading: 0.2ppm
94.5			4	SS	13		95	SS4 PID reading: 0.1ppm
3.0	**SILTY SAND:** brown, moist to wet, loose to compact.		5	SS	22		94	SS5 PID reading: 0.1ppm
	---------- spoon wet at 4.6m		6	SS	17		93	SS6 PID reading: 0.1ppm
			7	SS	7		92	SS7 PID reading: 0.2ppm
90.8							91	
6.7	**END OF BOREHOLE**							

Notes:
1). Water was encountered at 4.6 m below ground surface (bgs) during drilling.
2). Water was at 2.3 m below ground surface (bgs) during drilling.
3). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:
Date W.L. Depth(m bgs)

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

WSP SOIL LOG 161-09479-00 484 PLAINS RD E, BURLINGTON ADDITIONAL PHASE II 20161210.GPJ SPL.GDT 9/15/17

LOG OF BOREHOLE BH17-1

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796774 E 594336

DRILLING DATA
Method: Direct Push
Diameter: 50 mm
Date: Jan/24/2017 to Jan/31/2017

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS "N" 0.3 m	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.8 / 0.0	**ASPHALT** (100 mm)					
97.7 / 0.1	**GRANULAR BASE** (460 mm)	1A	SS			SS1A PID reading: 0ppm
97.3 / 0.6	**FILL:** silty sand to sandy silt, trace gravel, trace clay, reddish brown to black, moist to wet.	1B	SS		97	SS1B PID reading: 0ppm
		2	SS		96	SS2 PID reading: 0ppm
95.4 / 2.4	**SILTY SAND:** trace gravel, trace to some clay, redish brown to brown, moist to wet.	3	SS		95	SS3 PID reading: 0ppm 2 64 27 7
		4A	SS		94	SS4A PID reading: 0.1ppm
		4B	SS			SS4B PID reading: 0ppm
		5A	SS		93	SS5A PID reading: 0ppm
		5B	SS			SS5B PID reading: 0ppm
		6A	SS		92	SS6A PID reading: 0ppm
		6B	SS		91	SS6B PID reading: 0.1ppm
90.5 / 7.3	**SAND:** some gravel, some silt, trace clay, brown, moist.	7A	SS		90	SS7A PID reading: 0ppm 14 73 11 2
89.6 / 8.2	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist.	7B	SS			SS7B PID reading: 0ppm
89.3 / 8.5	**END OF BOREHOLE** Notes: 1). Water was encountered at 1.2 m below ground surface (bgs) during drilling. 2). 2" well was installed in the borehole upon completion of drilling. Water Level Readings: Date Depth (m)					

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)
GROUND WATER CONDITIONS
STRATA PLOT

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH17-2

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796759 E 594334

DRILLING DATA
Method: Direct Push
Diameter: 50 mm
Date: Jan/24/2017 to Jan/31/2017

REF. NO.: 161-09479-00
ENCL NO.:

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L; WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
98.0												
97.9	**CONCRETE** (110 mm)											
0.1	**ROCK** (330 mm)		1A	SS								SS1A PID reading: 0ppm
97.6												
0.4	**FILL:** silty sand, trace clay, reddish brown, moist.		1B	SS			97					SS1B PID reading: 0.1ppm
1			2A	SS								SS2A PID reading: 0ppm
96.2												
1.8	**SILTY SAND TO SANDY SILT:** trace gravel, trace to some clay, brown to redish brown, moist to wet.		2B	SS			96					SS2B PID reading: 0ppm
2			3A	SS								SS3A PID reading: 0ppm
3			3B	SS			95					SS3B PID reading: 0.1ppm
			4A	SS								SS4A PID reading: 0ppm
4			4B	SS			94					SS4B PID reading: 0.2ppm
5			5A	SS			93					SS5A PID reading: 0ppm
			5B	SS								SS5B PID reading: 0.1ppm
6 91.9												
6.1	**SAND:** trace silt, trace clay, brown, moist to wet.		6A	SS			92					SS6A PID reading: 0ppm 0 91 7 2
7			6B	SS			91					SS6B PID reading: 0ppm
			7A	SS								SS7A PID reading: 0ppm
8 89.9							90					
8.1	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist.		7B	SS								SS7B PID reading: 0ppm
89.5												
8.5	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 2.4 m below ground surface (bgs) during drilling.
2). 2" well was installed in the borehole upon completion of drilling.

Water Level Readings:
Date Depth (m)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 161-09479-00 484 PLAINS RD E, BURLINGTON ADDITIONAL PHASE II 20161210.GPJ SPL.GDT 9/15/17

LOG OF BOREHOLE BH17-3

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796751 E 594326

DRILLING DATA
Method: Direct Push
Diameter: 50 mm
Date: Jan/24/2017 to Jan/31/2017

REF. NO.: 161-09479-00
ENCL NO.:

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
98.0								
97.9	**CONCRETE** (100 mm)							
0.1	**ROCK** (360 mm)		1A	SS				SS1A PID reading: 0ppm
97.5								
0.5	**FILL:** silty sand, trace to some clay, trace gravel, containing pockets of sandy silt, brown to reddish brown, moist.		1B	SS			97	0 61 27 12 SS1B PID reading: 0.5ppm
1			2A	SS				SS2A PID reading: 0ppm
96.2								
1.8	**SILTY SAND:** trace to some gravel, trace clay, brown to redish brown, moist to wet.		2B	SS			96	SS2B PID reading: 0ppm
2			3A	SS				SS3A PID reading: 0.2ppm
3			3B	SS			95	SS3B PID reading: 0ppm 0 62 33 5
4			4A	SS			94	SS4A PID reading: 0ppm
			4B	SS				SS4B PID reading: 0ppm
5			5A	SS			93	SS5A PID reading: 0ppm
			5B	SS				SS5B PID reading: 0.6ppm
6			6A	SS			92	SS6A PID reading: 0ppm
91.3								SS6B PID reading: 0.4ppm
6.7	**SAND:** trace gravel, trace silt, trace clay, brown, wet.		6B	SS			91	2 87 9 2
7			7A	SS				SS7A PID reading: 0ppm
89.9			7B	SS			90	SS7B PID reading: 0ppm
8.1	**SILTY CLAY TILL:** trace gravel, trace sand, containing cobbles/boulders, grey, moist.		8A	SS				SS8A PID reading: 0ppm
9			8B	SS				SS8B PID reading: 0ppm
88.9							89	
9.1	**END OF BOREHOLE**							

Notes:
1). Water was encountered at 4.9 m below ground surface (bgs) during drilling.
2). 2" well was installed in the

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3 , × 3 : Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796751 E 594326

DRILLING DATA
Method: Direct Push
Diameter: 50 mm
Date: Jan/24/2017 to Jan/31/2017

REF. NO.: 161-09479-00
ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L / WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m						
	borehole upon completion of drilling. Water Level Readings: Date Depth (m)										

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796738 E 594323

DRILLING DATA
Method: Direct Push
Diameter: 50 mm
Date: Jan/24/2017 to Jan/31/2017

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.7												
97.6	**ASPHALT** (150 mm)		1A	SS								SS1A PID reading: 0ppm
0.2	**GRANULAR BASE** (150 mm)											
	FILL: sandy silt, trace to some clay, containing wood pieces, reddish brown, moist.		1B	SS			97					SS1B PID reading: 0ppm
1												SS2 PID reading: 0ppm
			2	SS			96					
2 95.2												
2.4	**SILTY SAND:** trace gravel, trace clay, containing sandy silt layers, brown to redish brown, moist to wet.		3A	SS			95					SS3A PID reading: 0.1ppm
3			3B	SS								SS3B PID reading: 0ppm
			3C	SS								SS3C PID reading: 0.1ppm
			4A	SS			94					SS4A PID reading: 0ppm
4			4B	SS			93					SS4B PID reading: 0ppm
5			5A	SS								SS5A PID reading: 0ppm
			5B	SS			92					SS5B PID reading: 0.1ppm
6			6A	SS								SS6A PID reading: 0ppm
			6B	SS			91					SS6B PID reading: 0ppm
7			7A	SS								SS7A PID reading: 0ppm
89.7							90					
8 7.9	**SAND:** some gravel, trace silt, trace clay, brown, wet.		7B	SS								SS7B PID reading: 0ppm 13 77 8 2
89.1												
8.5	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist.		8	SS			89					SS8 PID reading: 0ppm
9 88.5												
9.1	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 4.9 m below ground surface (bgs) during drilling.
2). 2" well was installed in the

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 161-09479-00 484 PLAINS RD E, BURLINGTON ADDITIONAL PHASE II 20161210.GPJ SPL.GDT 9/15/17

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796738 E 594323

DRILLING DATA
Method: Direct Push
Diameter: 50 mm
Date: Jan/24/2017 to Jan/31/2017

REF. NO.: 161-09479-00
ENCL NO.:

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m							GR SA SI CL
	borehole upon completion of drilling. Water Level Readings: Date Depth (m)											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH17-5

PROJECT: Phase II Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796714 E 594348

DRILLING DATA
Method: Direct Push
Diameter: 50 mm
Date: Jan/24/2017 to Jan/31/2017

REF. NO.: 161-09479-00
ENCL NO.:

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.6 / 0.0	**ASPHALT** (130 mm)							
97.5 / 0.1	**GRANULAR BASE** (350 mm)		1A	SS				SS1A PID reading: 0ppm
97.1 / 0.5	**FILL:** sandy silt, trace gravel, some clay, reddish brown, moist.		1B	SS			97	SS1B PID reading: 0ppm
			2A	SS			96	SS2A PID reading: 0ppm
95.8 / 1.8	**SILTY SAND TO SANDY SILT:** trace clay, redish brown, moist.		2B	SS				SS2B PID reading: 0ppm
			3	SS			95	SS3 PID reading: 0ppm
			4A	SS			94	SS4A PID reading: 0.1ppm
			4B	SS			93	SS4B PID reading: 0ppm
			5A	SS				SS5A PID reading: 0ppm
			5B	SS			92	SS5B PID reading: 0ppm
			6	SS			91	SS6 PID reading: 0ppm
90.3 / 7.3	**SAND:** some silt, trace clay, brown, moist to wet.		7A	SS			90	SS7A PID reading: 0ppm 0 82 13 5
89.4 / 8.2	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist.		7B	SS				SS7B PID reading: 0ppm
89.1 / 8.5	**END OF BOREHOLE** Notes: 1). 2" well was installed in the borehole upon completion of drilling. Water Level Readings: Date Depth (m)							

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 161-09479-00 484 PLAINS RD E, BURLINGTON ADDITIONAL PHASE II 20161210.GPJ SPL.GDT 9/15/17

LOG OF BOREHOLE BH17-6

PROJECT: Phase Two Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484-490 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796873 E 594388

DRILLING DATA
Method: Direct Push with Hollow Stem Auger
Diameter: 150 mm
Date: Mar/22/2017

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.8												
97.8 0.0	**REFER TO BH17-6I FOR UPPER STRATIGRAPHY**						Bentonite					
							97					
							Sand					
							96					
							95					
							Screen and Sand W. L. 94.3 m Mar 29, 2017					
							93					
							Bentonite					
							92					
91.7 6.1	**END OF BOREHOLE** Notes: 1). One 50 mm monitoring well was installed in borehole upon completion of drilling. Water Level Readings: Date W.L. Depth (mbgs) Mar 22, 2017 3.63 Mar 29, 2017 3.48											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 161-0947900-00 484 PLAINS RD E, BURLINGTON 20161026.GPJ SPL.GDT 9/15/17

LOG OF BOREHOLE BH17-6I

PROJECT: Phase Two Environmental Site Assessment
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484-490 Plains Road East, Burlington, Ontario
DATUM: UTM NAD 83 Zone 17
BH LOCATION: N 4796873 E 594388

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Mar/22/2017

REF. NO.: 161-09479-00
ENCL NO.:

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.8												
0.0 / 97.5	**ASPHALT** (100 mm) **GRANULAR BASE** (150 mm)											
0.3	**FILL:** silty sand, trace gravel, trace clay, reddish brown, damp.		1	DO			Bentonite					
			2	DO			97					
			3	DO			96					
			4	DO			95					
92.4			5	DO			Sand					
5.4	**SILTY SAND:** trace gravel, brown, moist to wet.		6	DO			W. L. 94.1 m Mar 29, 2017					
							93					
							92					
90.5							Screen and Sand					
7.3	**SILTY CLAY TILL:** trace gravel, trace sand, grey, moist, very stiff.		7	DO			90					
89.3							Bentonite					
8.5	**END OF BOREHOLE**											

Notes:
1). One 50 mm monitoring well was installed in borehole upon completion of drilling.

Water Level Readings:

Date	W.L. Depth (mbgs)
Mar 22, 2017	3.68
Mar 29, 2017	3.51

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 161-0947900-00 484 PLAINS RD E, BURLINGTON 20161026.GPJ SPL.GDT 9/15/17

LOG OF BOREHOLE BH17-7

PROJECT: Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD 83, ZONE 17
BH LOCATION: N 4796850.502 E 594358.633

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Apr/17/2017

REF. NO.: 161-09479-00
ENCL NO.: 10

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
97.6												
0.0 / 97.4	**ASPHALT** (100 mm) **GRANULAR BASE** (170 mm)											
0.3	**FILL:** silty sand, trace clay, reddish brown, moist to wet, very loose.		1	SS	8		97					
1			2	SS	3							
			3	SS	2		96					
2			4	SS	3		95					
94.7												
2.9	**SILTY SAND:** trace gravel, reddish brown, wet, compact to dense.		5	SS	13		94					
4												
	- Spoon wet		6	SS	26		93					
5												
6			7	SS	32		92					
7 / 90.5												
7.1	**SILTY CLAY TILL:** trace gravel, some sand, trace silty clay zones, grey, moist, very stiff to hard.		8	SS	23		91					
8							90					
9			9	SS	45		89					
10							88					

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 161-0947900-00 484 PLAINS RD E, BURLINGTON-BH17-7 TO BH17-11 20170602.GPJ SPL.GDT 2/6/17

LOG OF BOREHOLE BH17-7

PROJECT: Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD 83, ZONE 17
BH LOCATION: N 4796850.502 E 594358.633

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Apr/17/2017

REF. NO.: 161-09479-00
ENCL NO.: 10

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY CLAY TILL: trace gravel, some sand, trace silty clay zones, grey, moist, very stiff to hard.(Continued)		10	SS	50/ 150mm		87		○			
11												
12			11	SS	59		86		○			
13							85					
84.4												
13.2	**SILTY CLAY:** trace sand, trace silt zones, grey, moist, hard.											
14			12	SS	36		84		○			
82.9												
14.7	**SANDY SILT:** trace gravel, trace clay, trace silty clay zones, brown, wet, very dense.						83					
15			13	SS	68/ 250mm				○			
16							82					
							81					
17			14	SS	55				○			
80.4												
17.2	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 4.6 m below ground surface (bgs) during drilling.
2). Water was at 13.7 m bgs upon completion of drilling.
3). Borehole was open upon completion of drilling.

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 161-0947900-00 484 PLAINS RD E, BURLINGTON-BH17-7 TO BH17-11 20170602.GPJ SPL.GDT 2/6/17

LOG OF BOREHOLE BH17-8

PROJECT: Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD 83, ZONE 17
BH LOCATION: N 4796837.702 E 594319.883

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Apr/17/2017

REF. NO.: 161-09479-00
ENCL NO.: 11

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
98.0												
0.0 / 97.6	**ASPHALT** (120 mm) **GRANULAR BASE** (240 mm)		1	SS	16							
0.4 / 95.1	**FILL:** silty sand, trace clay, reddish brown, moist to wet, very loose to loose.		2	SS	6		97					
			3	SS	4		96					
			4	SS	2		95					
2.9 / 91.5	**SILTY SAND:** reddish brown, wet, loose to compact.		5	SS	6		94					
	- Spoon wet		6	SS	9		93					
			7	SS	19		92					
6.5	**SILTY CLAY TILL:** trace gravel, some sand, trace silty clay zones, reddish brown to grey, moist, very stiff to hard.		8	SS	24		91					
			9	SS	37		90					
							89					

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GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH17-8

PROJECT: Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD 83, ZONE 17
BH LOCATION: N 4796837.702 E 594319.883

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Apr/17/2017

REF. NO.: 161-09479-00
ENCL NO.: 11

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY CLAY TILL: trace gravel, some sand, trace silty clay zones, reddish brown to grey, moist, very stiff to hard.(Continued)											
11			10	SS	53		87					6 12 47 35
12			11	SS	36		86					
13							85					
14			12	SS	42		84					
15							83					
82.3			13	SS	40							
15.7	**END OF BOREHOLE** Notes: 1). Water was encountered at 4.6 m below ground surface (bgs) during drilling. 2). Water was at 12.8 m bgs upon completion of drilling. 3). Borehole was open upon completion of drilling.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 161-0947900-00 484 PLAINS RD E, BURLINGTON-BH17-7 TO BH17-11 20170602.GPJ SPL.GDT 2/6/17

LOG OF BOREHOLE BH17-9

PROJECT: Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD 83, ZONE 17
BH LOCATION: N 4796784.401 E 594276.799

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Apr/18/2017

REF. NO.: 161-09479-00
ENCL NO.: 12

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
98.0								
0.0 / 97.7	**ASPHALT** (120 mm) **GRANULAR BASE** (170 mm)							
0.3	**FILL:** silty sand, trace clay, reddish brown, moist to wet, very loose.		1	SS	8			
			2	SS	5		97	
							96	
95.5								Bentonite
2.5	**SILTY SAND:** reddish brown, wet, compact.		3	SS	18		95	
	- Spoon wet		4	SS	14	▽	94	W. L. 94.0 m May 25, 2017
92.5							93	
5.6	**SAND:** trace gravel, trace silt, trace clay, reddish brown, wet, compact.		5	SS	14		92	Sand Screen
90.9							91	1 88 7 4
7.1	**SILTY CLAY TILL:** trace gravel, some sand, grey, moist, very stiff to hard.		6	SS	31		90	
			7	SS	27		89	

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE — 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH17-9

PROJECT: Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD 83, ZONE 17
BH LOCATION: N 4796784.401 E 594276.799

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Apr/18/2017

REF. NO.: 161-09479-00
ENCL NO.: 12

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY CLAY TILL: trace gravel, some sand, grey, moist, very stiff to hard.(Continued)											
11			8	SS	39		87		○			
86.4							Bentonite					
11.6	**SILTY CLAY:** trace gravel, trace sand, grey, moist, hard.											
12			9	SS	45		86		○			
13							85					
84.1			10	SS	43		84		○			
14 13.9	**SILTY SAND:** trace gravel, trace clay, reddish brown to grey, moist to wet, very dense.											
15			11	SS	34		83		○			
82.3												
15.7	**END OF BOREHOLE** Notes: 1). Water was encountered at 4.6 m below ground surface (bgs) during drilling. 2). Water was at 13.7 m bgs upon completion of drilling. 3). Borehole was open upon completion of drilling. Water Level Readings: Date W. L. Depth (m bgs) May 25, 2017 4.06											

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP SOIL LOG 161-0947900-00 484 PLAINS RD E, BURLINGTON-BH17-7 TO BH17-11 20170602.GPJ SPL.GDT 2/6/17

LOG OF BOREHOLE BH17-10

PROJECT: Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD 83, ZONE 17
BH LOCATION: N 4796751.233 E 594311.141

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Apr/18/2017

REF. NO.: 161-09479-00
ENCL NO.: 13

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
97.8					
0.0 / 97.5	**ASPHALT** (120 mm) **GRANULAR BASE** (160 mm)				
0.3	**FILL:** silty sand, trace to some gravel, reddish brown, moist to wet, very loose to loose.	1	SS	12	
		2	SS	5	97
		3	SS	2	96
94.9		4	SS	3	
2.9	**SILTY SAND:** trace gravel, reddish brown, wet, compact.	5	SS	14	95
	- Spoon wet	6	SS	25	94
		7	SS	31	93
90.0	- Gravelly sand zone				92
7.8	**SILTY CLAY TILL:** trace gravel, some sand, grey, moist, very stiff to hard.	8	SS	24	91
		9	SS	34	90
					89
					88

STRATA PLOT
GROUND WATER CONDITIONS

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED
● QUICK TRIAXIAL
+ FIELD VANE & Sensitivity
× LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

PROJECT: Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD 83, ZONE 17
BH LOCATION: N 4796751.233 E 594311.141

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Apr/18/2017

REF. NO.: 161-09479-00
ENCL NO.: 13

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY CLAY TILL: trace gravel, some sand, grey, moist, very stiff to hard.(Continued)											
			10	SS	39		87		○			
			11	SS	76/ 280mm		86		○			
			12	SS	76		85		○			
83.1							84					
14.7	**SILTY CLAY:** trace sand, grey, moist, very stiff.		13	SS	29		83		○			
82.1												
15.7	**END OF BOREHOLE** Notes: 1). Water was encountered at 4.6 m below ground surface (bgs) during drilling. 2). Water was at 12.2 m bgs upon completion of drilling. 3). Borehole was open upon completion of drilling.											

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

WSP SOIL LOG 161-0947900-00 484 PLAINS RD E, BURLINGTON-BH17-7 TO BH17-11 20170602.GPJ SPL.GDT 2/6/17

PROJECT: Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD 83, ZONE 17
BH LOCATION: N 4796783.016 E 594391.601

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Apr/18/2017

REF. NO.: 161-09479-00
ENCL NO.: 14

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
97.1						
0.0 / 96.7	**ASPHALT** (50 mm) **GRANULAR BASE** (400 mm)		1	SS	12	97
0.5 / 94.6	**FILL:** silty sand, trace gravel, reddish brown, moist, compact.		2	SS	12	96
2.5 / 90.0	**SILTY SAND:** trace gravel, reddish brown, moist to wet, compact. - Spoon wet		3	SS	14	95
			4	SS	16	94
			5	SS	27	93
7.1	**SILTY CLAY TILL:** trace gravel, some sand, grey, moist, very stiff to hard.		6	SS	17	92
			7	SS	53	91
						90
						89
						88

GROUND WATER CONDITIONS

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED
● QUICK TRIAXIAL
+ FIELD VANE & Sensitivity
× LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

Continued Next Page

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH17-11

PROJECT: Geotechnical Investigation
CLIENT: National Homes (Plains Road) LP
PROJECT LOCATION: 484 Plains Road East, Burlington, Ontario
DATUM: NAD 83, ZONE 17
BH LOCATION: N 4796783.016 E 594391.601

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 150 mm
Date: Apr/18/2017

REF. NO.: 161-09479-00
ENCL NO.: 14

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	SILTY CLAY TILL: trace gravel, some sand, grey, moist, very stiff to hard.(Continued)						87					
11			8	SS	47		86		○			
12			9	SS	61		85		○			
13							84					
14			10	SS	90/ 250mm		83		○			
82.4												
14.7	**SILTY CLAY:** trace sand, grey, moist, hard.											
15			11	SS	77		82		○			
81.4												
15.7	**END OF BOREHOLE**											

Notes:
1). Water was encountered at 4.6 m below ground surface (bgs) during drilling.
2). Water was at 15.2 m bgs upon completion of drilling.
3). Borehole was open upon completion of drilling.

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Figure No. _____

LOG OF MONITORING WELL BH17-12

Project No. 161-09479-00
Project: 484-490 Plains Road East
Location: 484-490 Plains Road East, Pickering, ON
Co-ordinates: 594354E, 4796749N
Date Drilled: August 9, 2017
Datum: UTM NAD 83 Zone
Drill Type: Powerprobe 9700 Direct Push/Auger
Logged By: A. N.
Drilling Contractor: Profile Drilling Inc.
Checked By: C. R.

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (mbgs)	DEPTH (masl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
			SAND - reddish brown, trace silt, damp, some asphalt and concrete fragments		Cement / Bentonite	SS1		
0.61	97.14		**SILTY SAND** - reddish brown, damp			SS2		
			-moist			SS3		
1.83	95.92		**SAND** - brown, dry		Sand / Screen	SS4		
			- reddish brown, trace silt, damp			SS5		
						SS6		
			- some silt, moist, grey staining from 3.81 mbgs to 4.11 mbgs, strong hydrocarbon odours			SS7		
4.11	93.64		**SILTY SAND** - black staining, wet, strong hydrocarbon odours			SS8	PHCs BTEX	130
4.37	93.38		- reddish brown, saturated, no staining, no odour			SS9		
						SS10		
5.64	92.11		End of borehole at 5.64 mbgs		Water measured on August 16, 2017 masl 4.37 mbgs Well Diameter: 50 mm Well Material: Schedule 40 PVC			

WSP MW REPORT VER.3 484 PLAINS ROAD EAST - BH LOGS.GPJ GINT STD CANADA LAB.GDT 16/10/17

Figure No. _____

LOG OF MONITORING WELL BH17-13

Project No. 161-09479-00
Project: 484-490 Plains Road East
Location: 484-490 Plains Road East, Pickering, ON
Co-ordinates: 594360E, 4796723N
Date Drilled: August 9, 2017
Datum: UTM NAD 83 Zone
Drill Type: Powerprobe 9700 Direct Push/Auger
Logged By: A. N.
Drilling Contractor: Profile Drilling Inc.
Checked By: C. R.

● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (mbgs)	DEPTH (masl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
			SAND - reddish brown, damp, some asphalt and concrete fragments		Cement / Bentonite	SS1		
0.61	96.79		**SILTY SAND** - reddish brown, damp			SS2		
1.22	96.18		**SAND** - reddish brown, trace silt, damp			SS3		
					Sand / Screen	SS4		
2.44	94.96		**SILTY SAND** - reddish brown, damp			SS5		
						SS6		
3.85	93.55		- grey staining from 3.51 mbgs to 3.66 mbgs, wet, hydrocarbon odours - black staining from 3.66 mbgs to 3.96 mbgs, wet, strong hydrocarbon odours - wet			SS7	PHCs BTEX, DUP1	200
						SS8		
			- saturated			SS9		
5.49	91.91					SS10		
			End of borehole at 5.49 mbgs		Water measured on August 16, 2017 masl 3.85 mbgs Well Diameter: 50 mm Well Material: Schedule 40 PVC			

Figure No. _____

LOG OF MONITORING WELL BH17-14

Project No. 161-09479-00
Project: 484-490 Plains Road East
Location: 484-490 Plains Road East, Pickering, ON
Co-ordinates: 594374E, 4796735N
Date Drilled: August 9, 2017
Datum: UTM NAD 83 Zone
Drill Type: Powerprobe 9700 Direct Push/Auger
Logged By: A. N.
Drilling Contractor: Profile Drilling Inc.
Checked By: C. R.

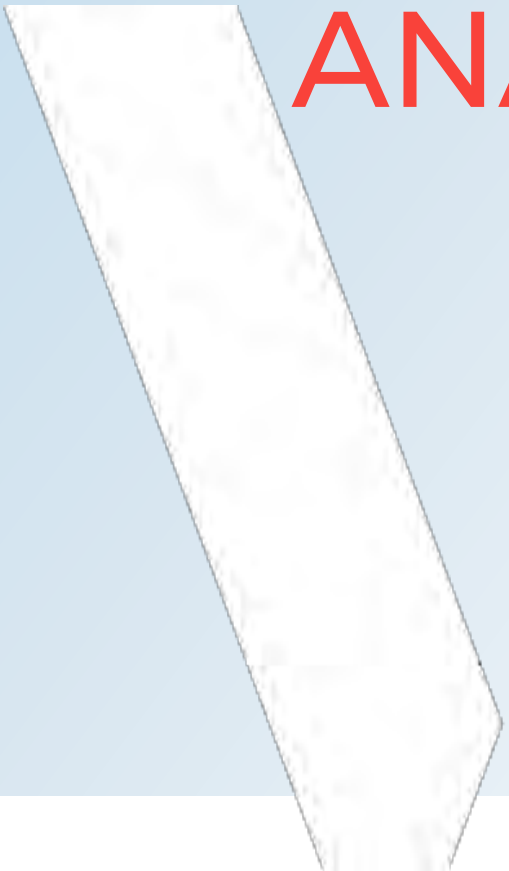
● VOCs (ppm)
▲ Combustible Gases (ppm)

DEPTH (mbgs)	DEPTH (masl)	LITHOLOGY	SOIL DESCRIPTION	WELL	INSTALLATION DETAILS	SAMPLE ID	SOIL SAMPLE TEST	VOCs (ppm) 40 80 120 160 / Combustible Gases (ppm) 20 40 60 80
			SAND		Cement			
			- reddish brown, damp, some asphalt and concrete fragments		Bentonite	SS1		
			- reddish brown, trace silt, damp			SS2		
						SS3		
					Sand	SS4		
			- trace silt and medium gravel		Screen	SS5		
						SS6		
			- black staining, strong hydrocarbon odour, wet from 3.66 mbgs to 4.11 mbgs			SS7	PHCs BTEX	
4.43	92.82		- reddish brown, some silt, wet			SS8		
			- reddish brown, some silt, saturated			SS9		
5.49	91.76					SS10		
			End of borehole at 5.49 mbgs		Water measured on August 16, 2017 masl 4.43 mbgs Well Diameter: 50 mm Well Material: Schedule 40 PVC			

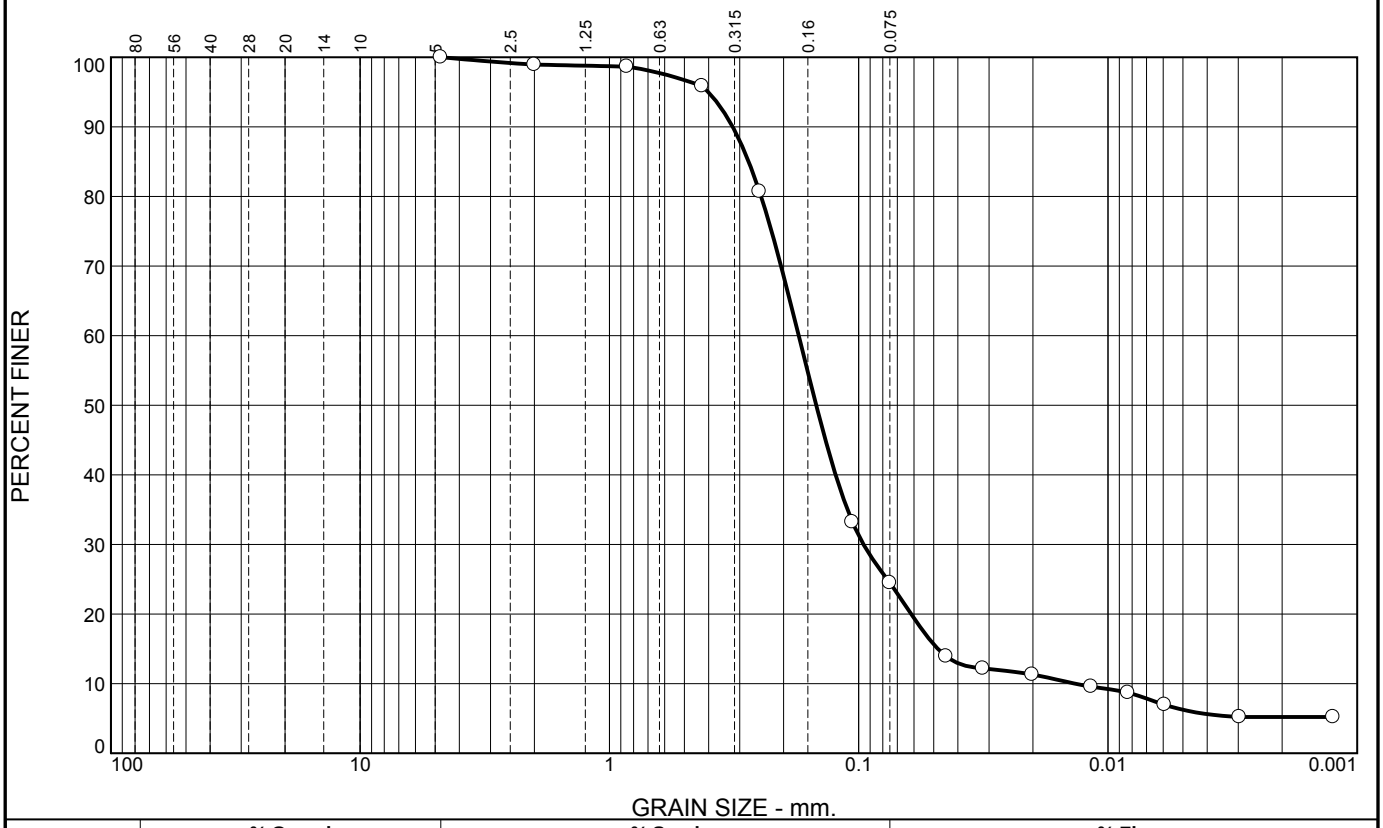
WSP MW REPORT VER.3 484 PLAINS ROAD EAST - BH LOGS.GPJ GINT STD CANADA LAB.GDT 16/10/17

APPENDIX

B GRAIN SIZE ANALYSES



Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.1	3.0	71.4	19.3	5.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4.75mm	100.0		
2mm	98.9		
0.850mm	98.7		
0.425mm	95.9		
0.250mm	80.7		
0.106mm	33.2		
0.075mm	24.5		
0.0446 mm.	13.9		
0.0317 mm.	12.2		
0.0201 mm.	11.3		
0.0117 mm.	9.6		
0.0083 mm.	8.7		
0.0059 mm.	7.0		
0.0030 mm.	5.2		
0.0012 mm.	5.2		

* (no specification provided)

Soil Description

Silty sand, trace clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3203 D_{85}= 0.2762 D_{60}= 0.1740
D_{50}= 0.1480 D_{30}= 0.0956 D_{15}= 0.0481
D_{10}= 0.0135 C_u= 12.89 C_c= 3.89

Classification

USCS= AASHTO=

Remarks

Sampled by Jack
F.M.=0.66

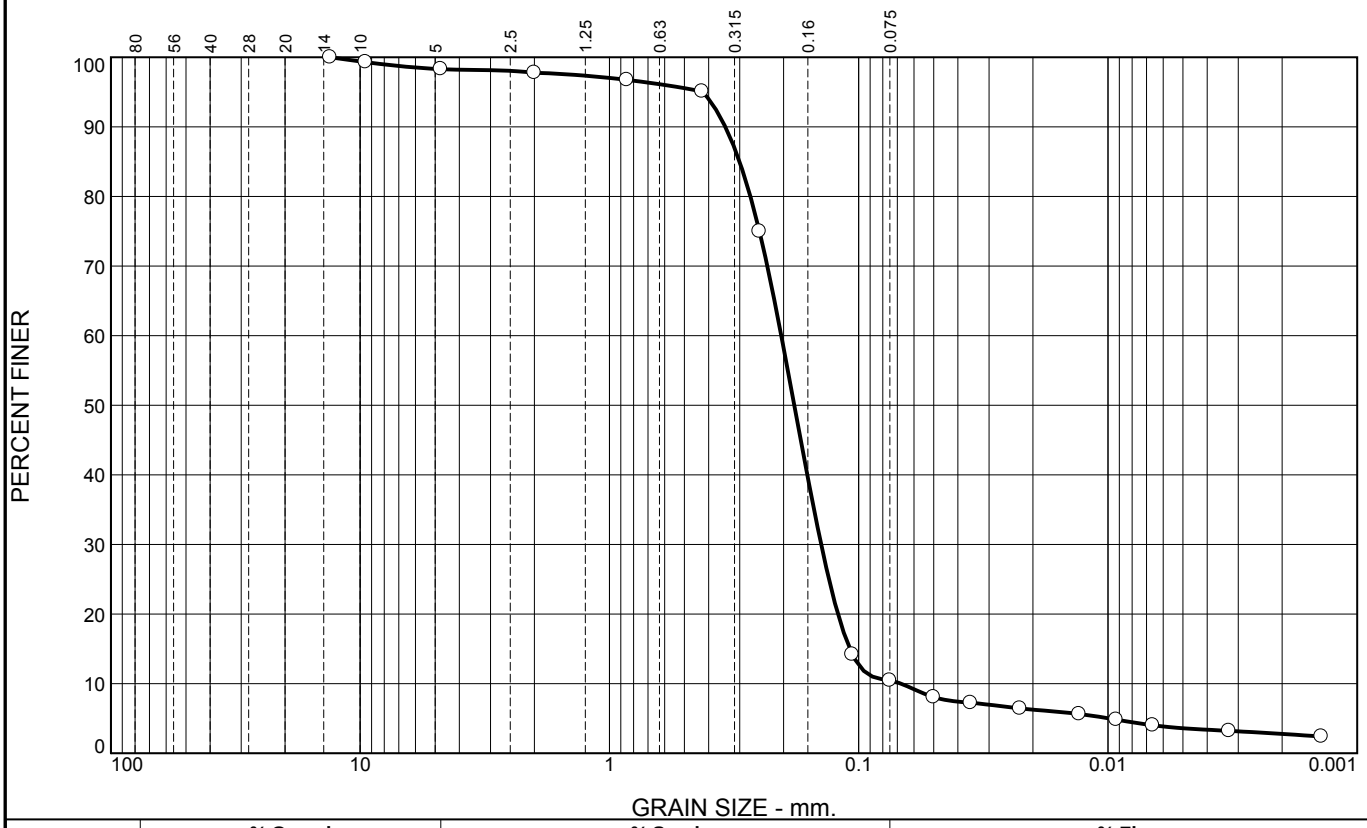
Location: BH16-3 SS6
Sample Number: MM-2775

Date:

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure** 1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.7	0.5	2.7	84.6	7.7	2.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
13.2mm	100.0		
9.5mm	99.3		
4.75mm	98.3		
2mm	97.8		
0.850mm	96.8		
0.425mm	95.1		
0.250mm	75.0		
0.106mm	14.2		
0.075mm	10.5		
0.0501 mm.	8.1		
0.0355 mm.	7.3		
0.0225 mm.	6.5		
0.0130 mm.	5.6		
0.0093 mm.	4.8		
0.0066 mm.	4.0		
0.0033 mm.	3.2		
0.0014 mm.	2.4		

* (no specification provided)

Soil Description

Sand, trace silt & clay, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3426 D_{85}= 0.3006 D_{60}= 0.2044
D_{50}= 0.1813 D_{30}= 0.1414 D_{15}= 0.1085
D_{10}= 0.0676 C_u= 3.02 C_c= 1.45

Classification

USCS= AASHTO=

Remarks

Sampled by Michael on Jan 24 to Jan 31, 2017
F.M.=0.92

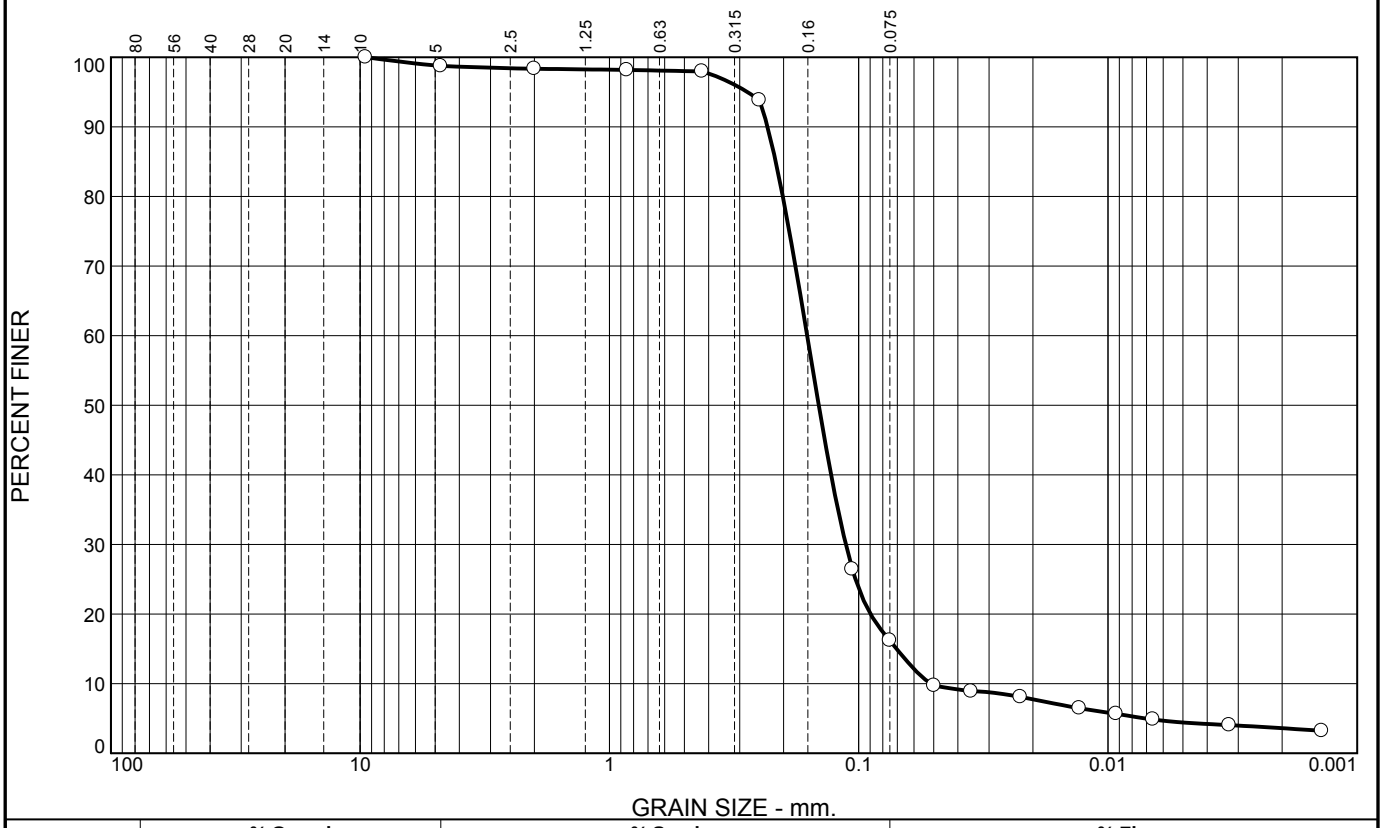
Location: BH16-101 SS7A
Sample Number: MM-3986

Date: Feb 8,2017

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.2	0.5	0.3	81.8	12.6	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5mm	100.0		
4.75mm	98.8		
2mm	98.3		
0.850mm	98.2		
0.425mm	98.0		
0.250mm	93.8		
0.106mm	26.4		
0.075mm	16.2		
0.0499 mm.	9.7		
0.0354 mm.	8.9		
0.0224 mm.	8.1		
0.0130 mm.	6.5		
0.0093 mm.	5.7		
0.0066 mm.	4.9		
0.0033 mm.	4.0		
0.0014 mm.	3.2		

* (no specification provided)

Soil Description

Sand, some silt, trace clay, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2321 D_{85}= 0.2151 D_{60}= 0.1610
D_{50}= 0.1446 D_{30}= 0.1127 D_{15}= 0.0704
D_{10}= 0.0514 C_u= 3.13 C_c= 1.53

Classification

USCS= AASHTO=

Remarks

Sampled by Michael Hu on Jan 24 to Jan 31, 2017
F.M.=0.57

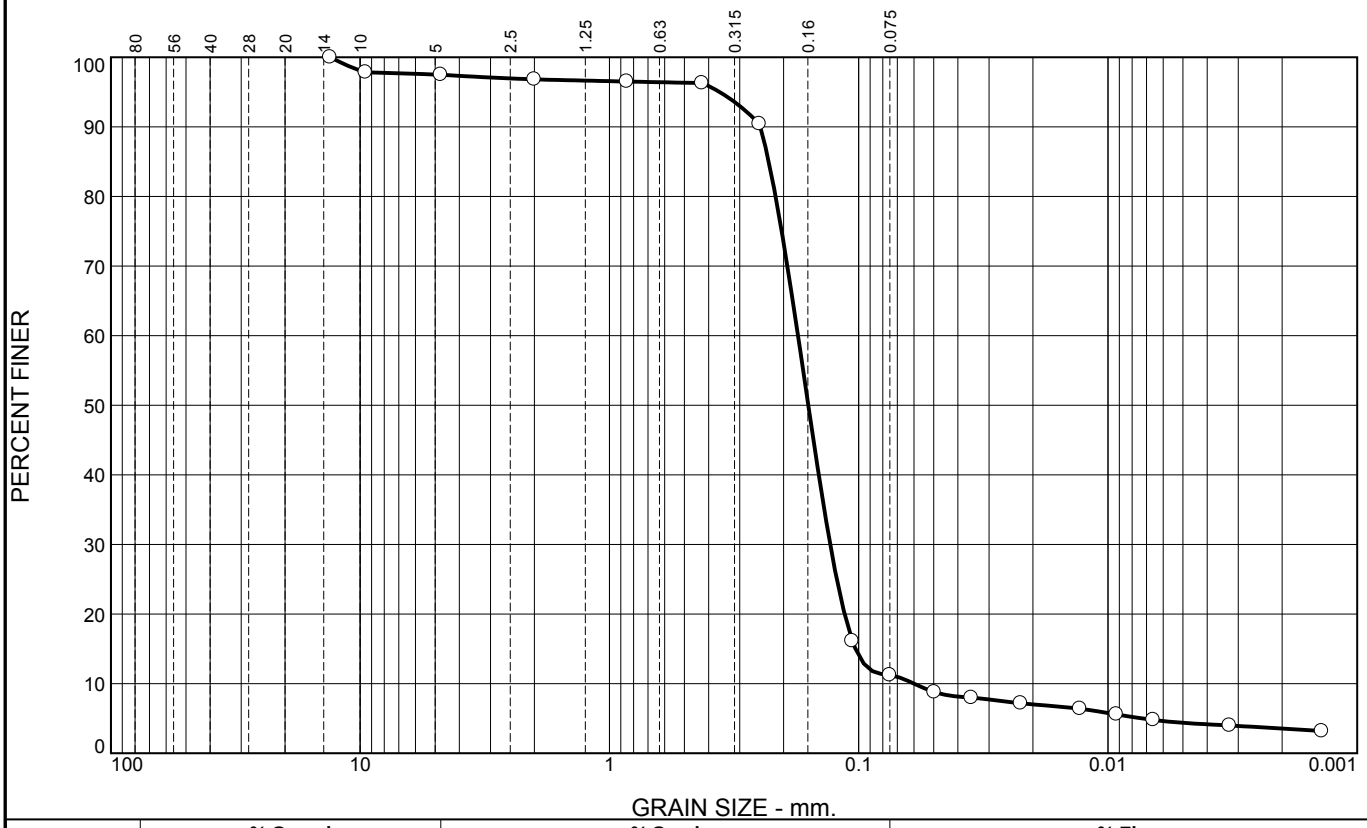
Location: BH16-121 SS7A
Sample Number: MM-3987

Date: Feb 8,2017

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.5	0.7	0.5	85.0	7.7	3.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
13.2mm	100.0		
9.5mm	97.8		
4.75mm	97.5		
2mm	96.8		
0.850mm	96.5		
0.425mm	96.3		
0.250mm	90.4		
0.106mm	16.1		
0.075mm	11.3		
0.0497 mm.	8.8		
0.0352 mm.	8.0		
0.0224 mm.	7.2		
0.0129 mm.	6.4		
0.0092 mm.	5.6		
0.0066 mm.	4.8		
0.0033 mm.	4.0		
0.0014 mm.	3.2		

* (no specification provided)

Soil Description

Sand, trace silt & clay, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2481 D_{85}= 0.2295 D_{60}= 0.1752
D_{50}= 0.1593 D_{30}= 0.1300 D_{15}= 0.1030
D_{10}= 0.0598 C_u= 2.93 C_c= 1.61

Classification

USCS= AASHTO=

Remarks

Sampled by Michael Hu on Jan 24 to Jan 31, 2017
F.M.=0.78

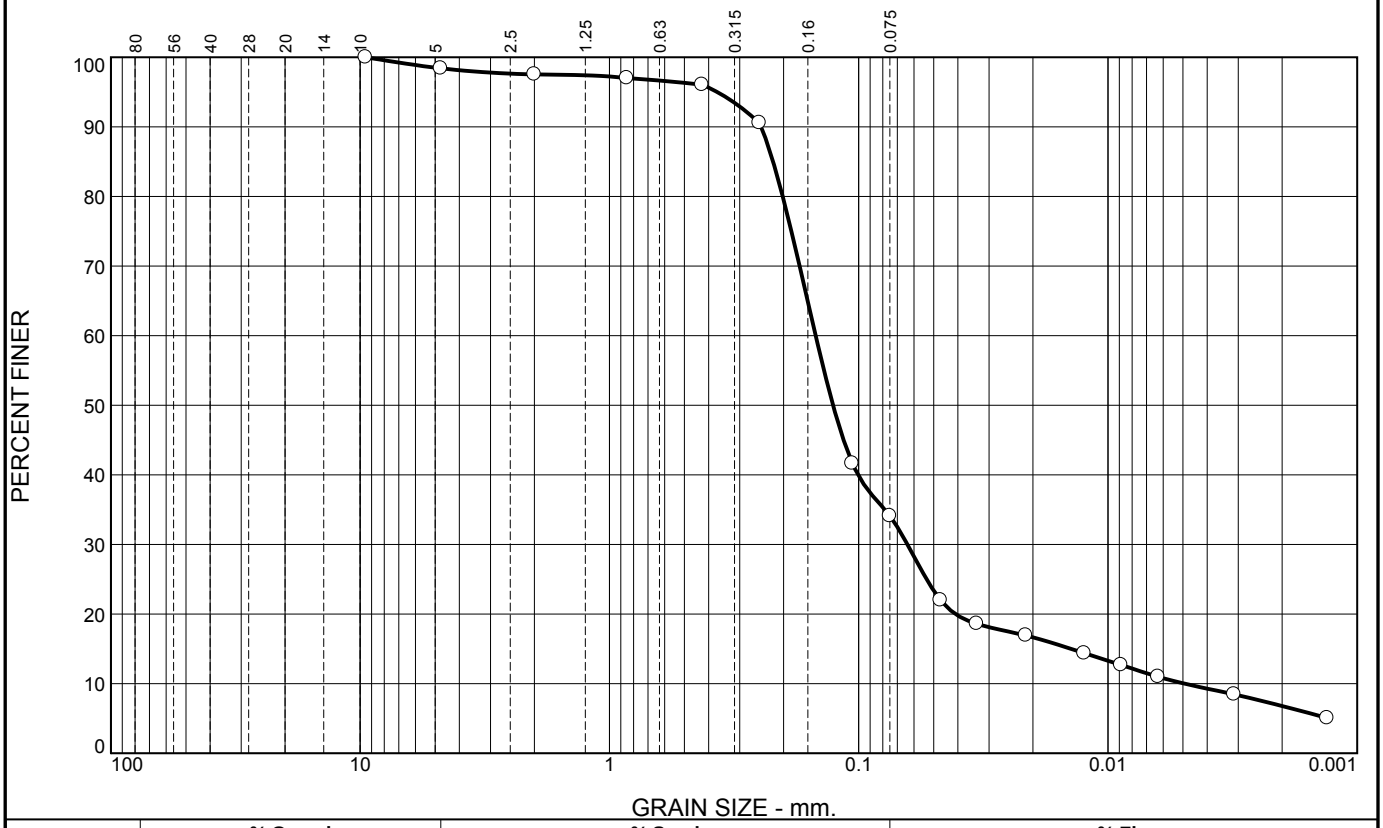
Location: BH16-131 SS6B
Sample Number: MM-3988

Date: Feb 8,2017

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.6	0.9	1.4	62.0	27.3	6.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5mm	100.0		
4.75mm	98.4		
2mm	97.5		
0.850mm	97.0		
0.425mm	96.1		
0.250mm	90.6		
0.106mm	41.7		
0.075mm	34.1		
0.0469 mm.	22.0		
0.0336 mm.	18.6		
0.0214 mm.	16.9		
0.0124 mm.	14.4		
0.0089 mm.	12.7		
0.0063 mm.	11.0		
0.0031 mm.	8.5		
0.0013 mm.	5.1		

* (no specification provided)

Soil Description

Silty sand, trace clay, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2462 D_{85}= 0.2205 D_{60}= 0.1488
D_{50}= 0.1267 D_{30}= 0.0637 D_{15}= 0.0141
D_{10}= 0.0049 C_u= 30.31 C_c= 5.56

Classification

USCS= AASHTO=

Remarks

Sampled by Michael Hu on Jan 24 to Jan 31, 2017
F.M.=0.57

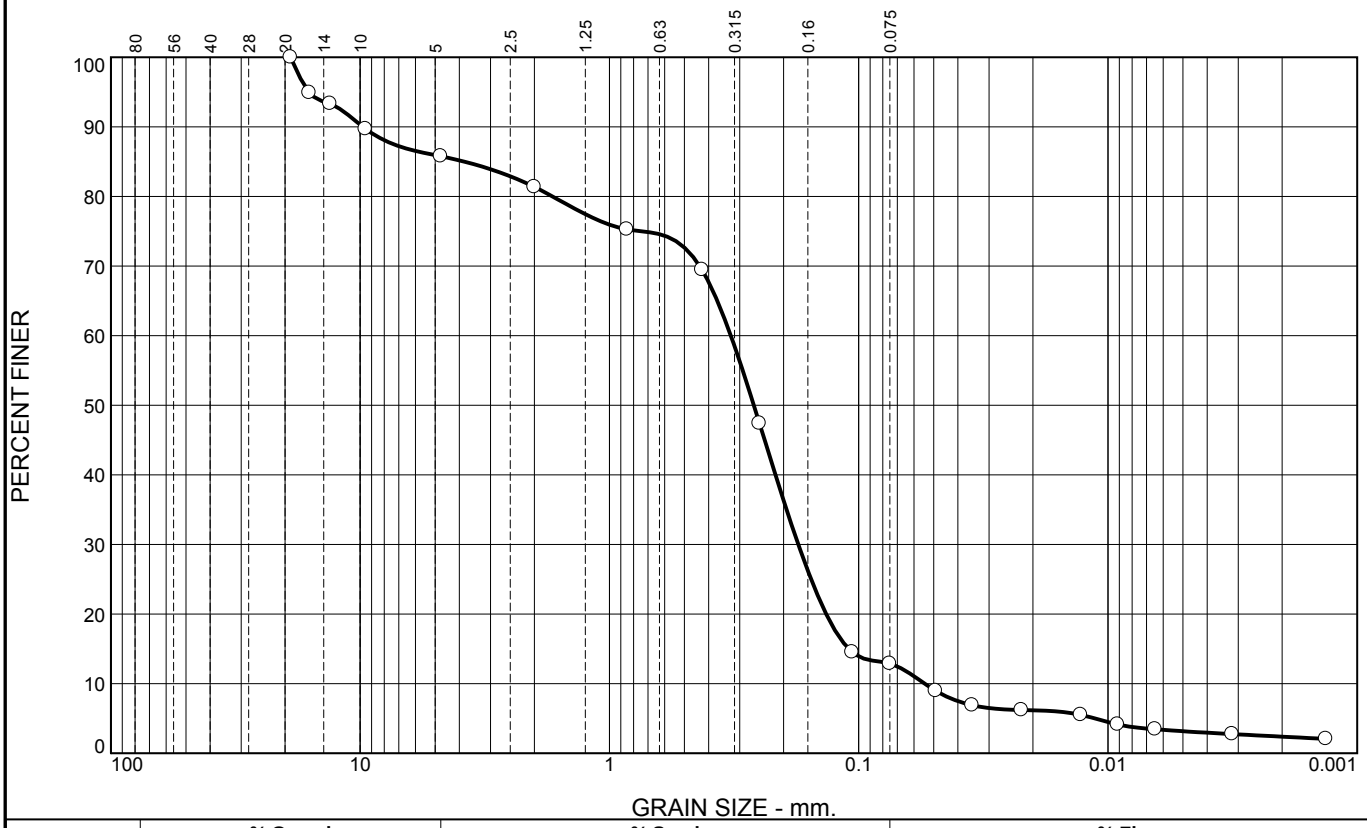
Location: BH17-1 SS3
Sample Number: MM-3978

Date: Feb 7,2017

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	14.2	4.4	11.9	56.6	10.5	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19mm	100.0		
16mm	94.9		
13.2mm	93.3		
9.5mm	89.7		
4.75mm	85.8		
2mm	81.4		
0.850mm	75.3		
0.425mm	69.5		
0.250mm	47.4		
0.106mm	14.5		
0.075mm	12.9		
0.0491 mm.	9.0		
0.0350 mm.	6.9		
0.0222 mm.	6.2		
0.0128 mm.	5.5		
0.0091 mm.	4.1		
0.0065 mm.	3.5		
0.0032 mm.	2.8		
0.0013 mm.	2.1		

* (no specification provided)

Soil Description

Sand, some silt, some gravel, trace clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 9.7511 D_{85}= 3.8138 D_{60}= 0.3258
D_{50}= 0.2634 D_{30}= 0.1747 D_{15}= 0.1097
D_{10}= 0.0543 C_u= 6.00 C_c= 1.73

Classification

USCS= AASHTO=

Remarks

Sampled by Michael Hu on Jan 24 to Jan 31,2017
F.M.=2.11

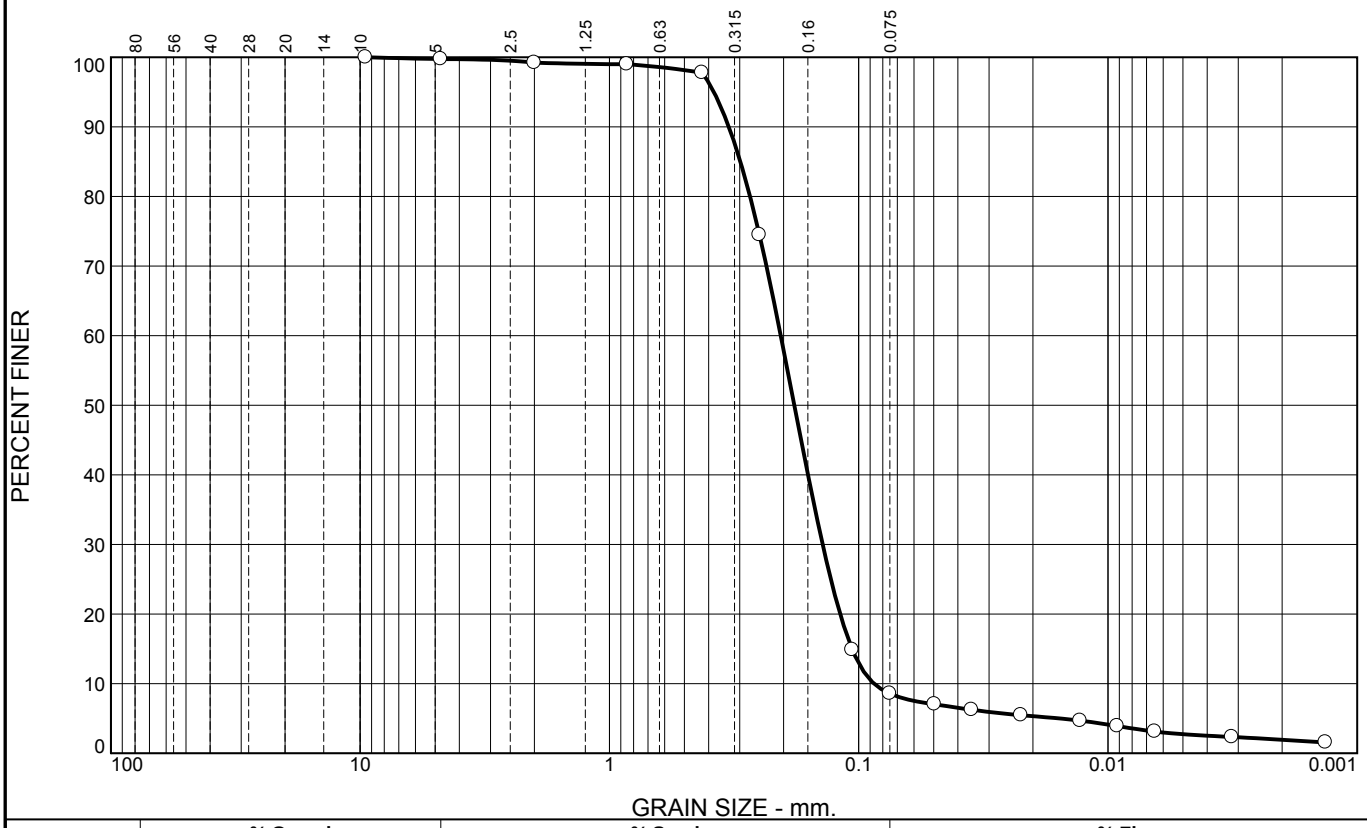
Location: BH17-1 SS7A
Sample Number: MM-3979

Date: Feb 7,2017

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	0.5	1.4	89.2	6.7	1.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5mm	100.0		
4.75mm	99.7		
2mm	99.2		
0.850mm	99.0		
0.425mm	97.8		
0.250mm	74.5		
0.106mm	14.9		
0.075mm	8.6		
0.0496 mm.	7.0		
0.0352 mm.	6.3		
0.0223 mm.	5.5		
0.0129 mm.	4.7		
0.0092 mm.	3.9		
0.0065 mm.	3.1		
0.0032 mm.	2.3		
0.0013 mm.	1.6		

* (no specification provided)

Soil Description

Sand, trace silt & clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3318 D_{85}= 0.2984 D_{60}= 0.2054
D_{50}= 0.1812 D_{30}= 0.1395 D_{15}= 0.1064
D_{10}= 0.0868 C_u= 2.37 C_c= 1.09

Classification

USCS= AASHTO=

Remarks

Sampled by Michael Hu on Jan 24 to Jan 31, 2017
F.M.=0.83

Location: BH17-2 SS6A
Sample Number: MM-3980

Date: Feb 7,2017

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	1.0	59.5	26.9	12.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4.75mm	100.0		
2mm	99.8		
0.850mm	99.6		
0.425mm	98.8		
0.250mm	95.4		
0.106mm	45.1		
0.075mm	39.3		
0.0465 mm.	29.5		
0.0332 mm.	26.7		
0.0212 mm.	23.0		
0.0124 mm.	20.3		
0.0088 mm.	18.4		
0.0062 mm.	16.6		
0.0031 mm.	12.9		
0.0013 mm.	10.1		
0.0009 mm.	5.5		

* (no specification provided)

Soil Description

Silty sand, some clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2212 D_{85}= 0.2027 D_{60}= 0.1409
D_{50}= 0.1191 D_{30}= 0.0480 D_{15}= 0.0048
D_{10}= 0.0013 C_u= 109.52 C_c= 12.69

Classification

USCS= AASHTO=

Remarks

Sampled by Michael Hu on Jan 24 to Jan 31, 2017
F.M.=0.40

Location: BH17-3 SS1B
Sample Number: MM-3981

Date: Feb 7,2017

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.5	61.5	32.9	5.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4.75mm	100.0		
2mm	99.9		
0.850mm	99.7		
0.425mm	99.4		
0.250mm	94.3		
0.106mm	46.9		
0.075mm	37.9		
0.0475 mm.	22.8		
0.0340 mm.	19.1		
0.0216 mm.	17.3		
0.0126 mm.	14.6		
0.0089 mm.	12.7		
0.0063 mm.	10.9		
0.0031 mm.	6.4		
0.0013 mm.	4.6		

* (no specification provided)

Soil Description

Silty sand, trace clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2252 D_{85}= 0.2045 D_{60}= 0.1374
D_{50}= 0.1144 D_{30}= 0.0596 D_{15}= 0.0137
D_{10}= 0.0055 C_u= 25.03 C_c= 4.71

Classification

USCS= AASHTO=

Remarks

Sampled by Michael Hu on Jan 24 to Jan 31, 2017
F.M.=0.39

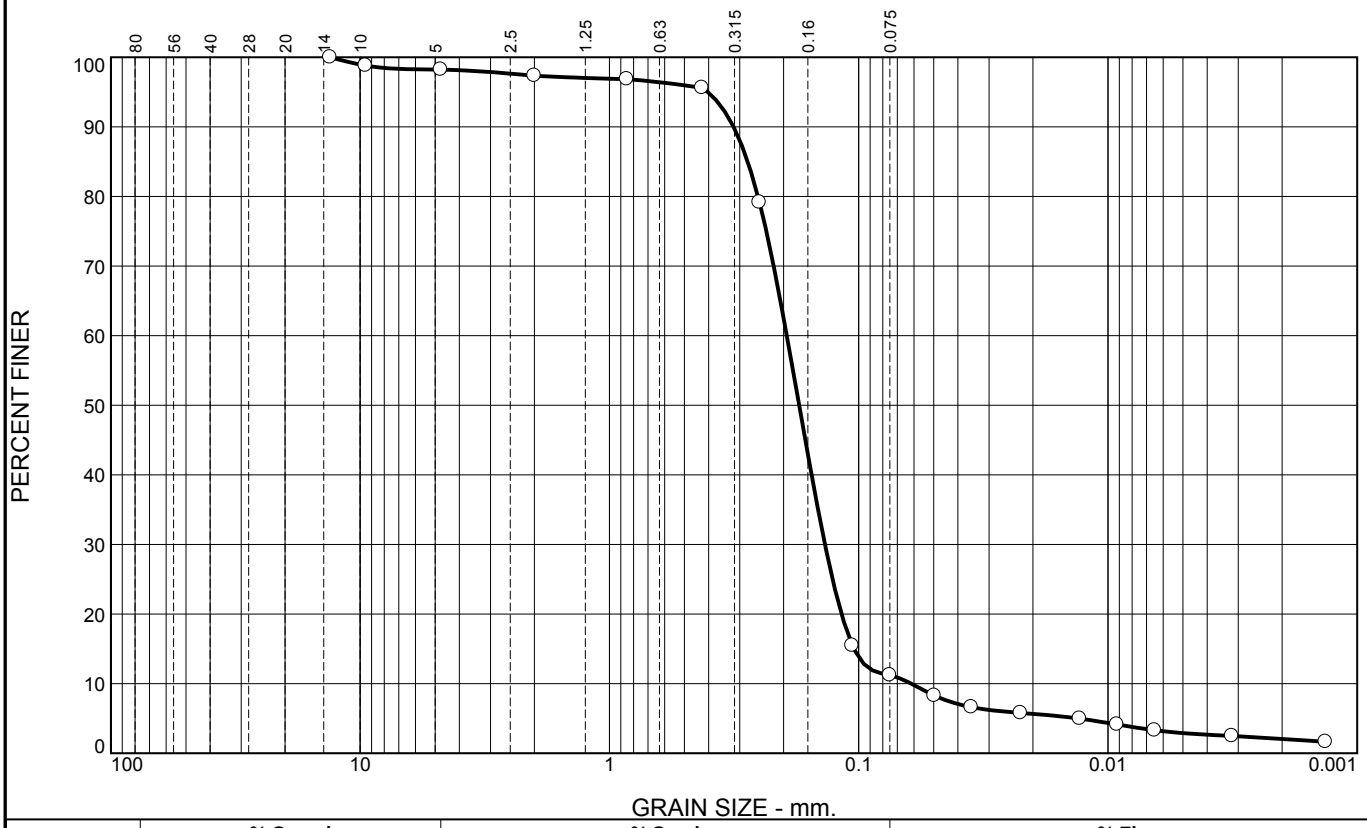
Location: BH17-3 SS3B
Sample Number: MM-3982

Date: Feb 7,2017

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.8	0.9	1.7	84.4	9.1	2.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
13.2mm	100.0		
9.5mm	98.8		
4.75mm	98.2		
2mm	97.3		
0.850mm	96.9		
0.425mm	95.6		
0.250mm	79.2		
0.106mm	15.5		
0.075mm	11.2		
0.0497 mm.	8.3		
0.0353 mm.	6.6		
0.0224 mm.	5.8		
0.0130 mm.	5.0		
0.0092 mm.	4.1		
0.0065 mm.	3.3		
0.0032 mm.	2.5		
0.0013 mm.	1.7		

* (no specification provided)

Soil Description

Sand, trace silt, trace clay, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3176 D_{85}= 0.2787 D_{60}= 0.1942
D_{50}= 0.1733 D_{30}= 0.1365 D_{15}= 0.1044
D_{10}= 0.0615 C_u= 3.16 C_c= 1.56

Classification

USCS= AASHTO=

Remarks

Sampled by Michael Hu on Jan 24 to Jan 31, 2017
F.M.=0.87

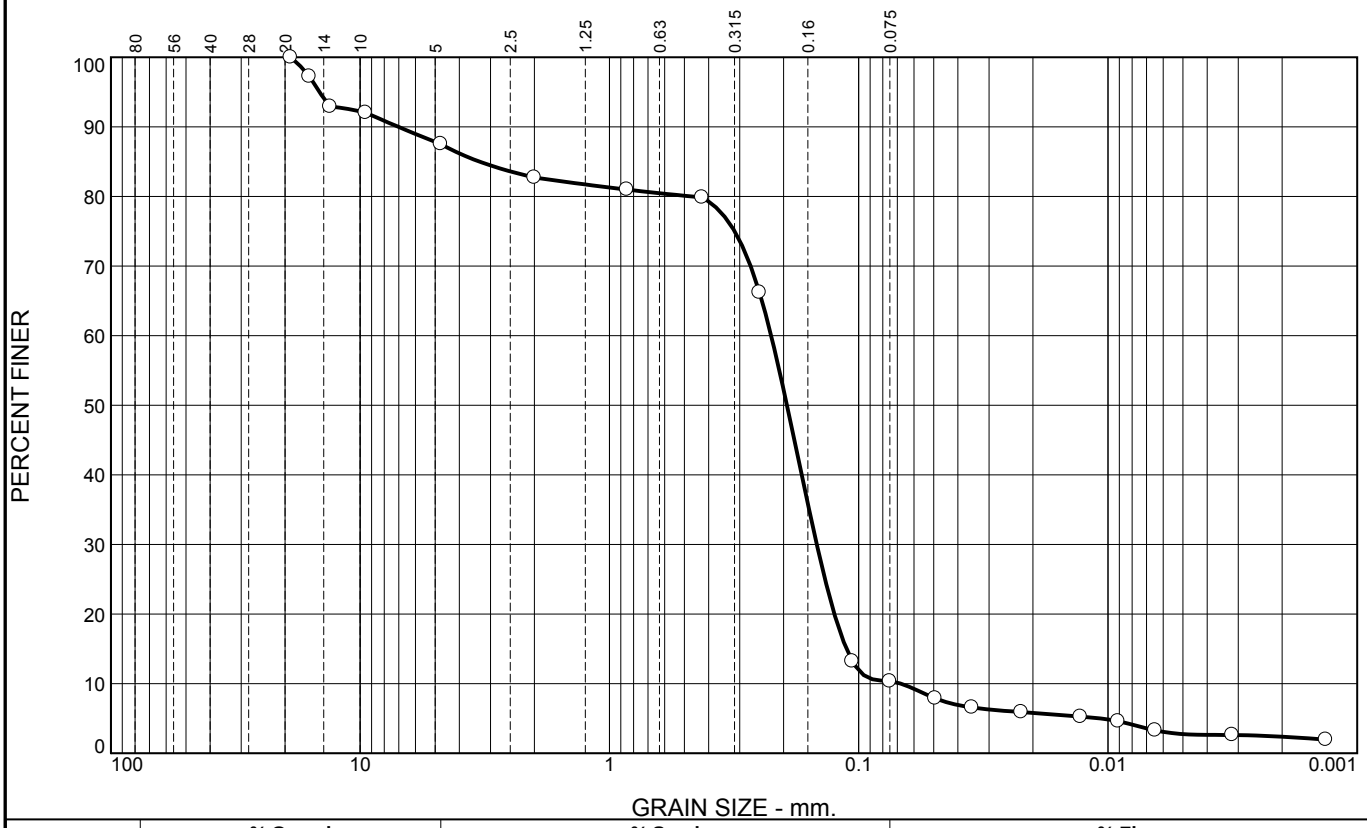
Location: BH17-3 SS6B
Sample Number: MM-3983

Date: Feb 7,2017

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.5	4.8	2.8	69.5	8.0	2.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19mm	100.0		
16mm	97.2		
13.2mm	92.9		
9.5mm	92.0		
4.75mm	87.5		
2mm	82.7		
0.850mm	81.0		
0.425mm	79.9		
0.250mm	66.2		
0.106mm	13.2		
0.075mm	10.4		
0.0493 mm.	7.9		
0.0351 mm.	6.6		
0.0222 mm.	5.9		
0.0129 mm.	5.3		
0.0091 mm.	4.6		
0.0065 mm.	3.3		
0.0032 mm.	2.6		
0.0013 mm.	2.0		

* (no specification provided)

Soil Description

Sand, trace silt & clay, some gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 7.0200 D_{85}= 3.3152 D_{60}= 0.2245
D_{50}= 0.1939 D_{30}= 0.1472 D_{15}= 0.1120
D_{10}= 0.0677 C_u= 3.32 C_c= 1.43

Classification

USCS= AASHTO=

Remarks

Sampled by Michael Hu on Jan 24 to Jan 31, 2017
F.M.=1.70

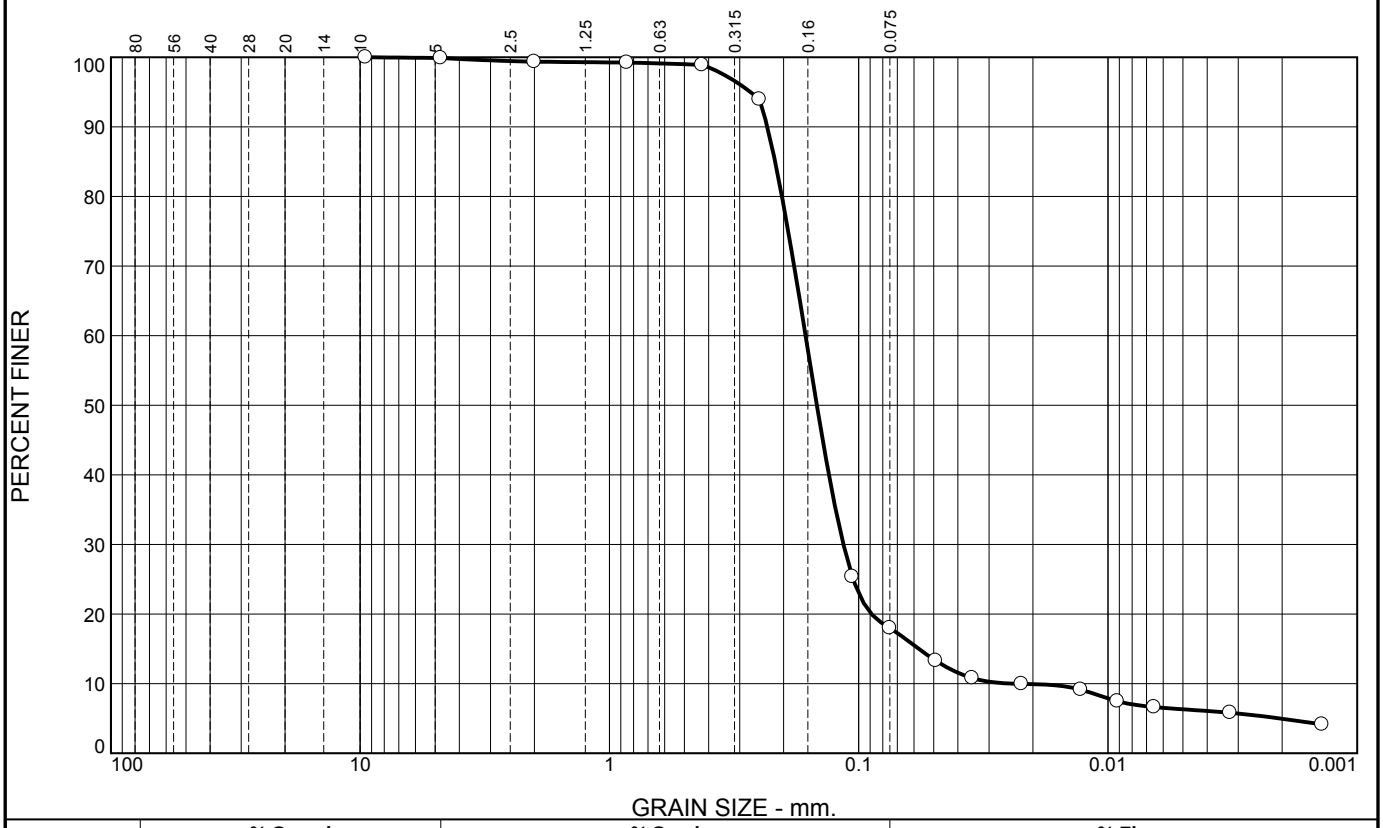
Location: BH17-4 SS7B
Sample Number: MM-3984

Date: Feb 7,2017

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.5	0.5	80.9	13.0	5.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5mm	100.0		
4.75mm	99.9		
2mm	99.4		
0.850mm	99.2		
0.425mm	98.9		
0.250mm	94.0		
0.106mm	25.4		
0.075mm	18.0		
0.0490 mm.	13.3		
0.0350 mm.	10.8		
0.0222 mm.	10.0		
0.0128 mm.	9.1		
0.0092 mm.	7.5		
0.0065 mm.	6.7		
0.0032 mm.	5.8		
0.0014 mm.	4.2		

* (no specification provided)

Soil Description

Sand, some silt, trace clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.2326 D_{85}= 0.2163 D_{60}= 0.1634
D_{50}= 0.1471 D_{30}= 0.1151 D_{15}= 0.0573
D_{10}= 0.0234 C_u= 6.98 C_c= 3.47

Classification

USCS= AASHTO=

Remarks

Sampled by Michael Hu on Jan 24 to Jan 31, 2017
F.M.=0.54

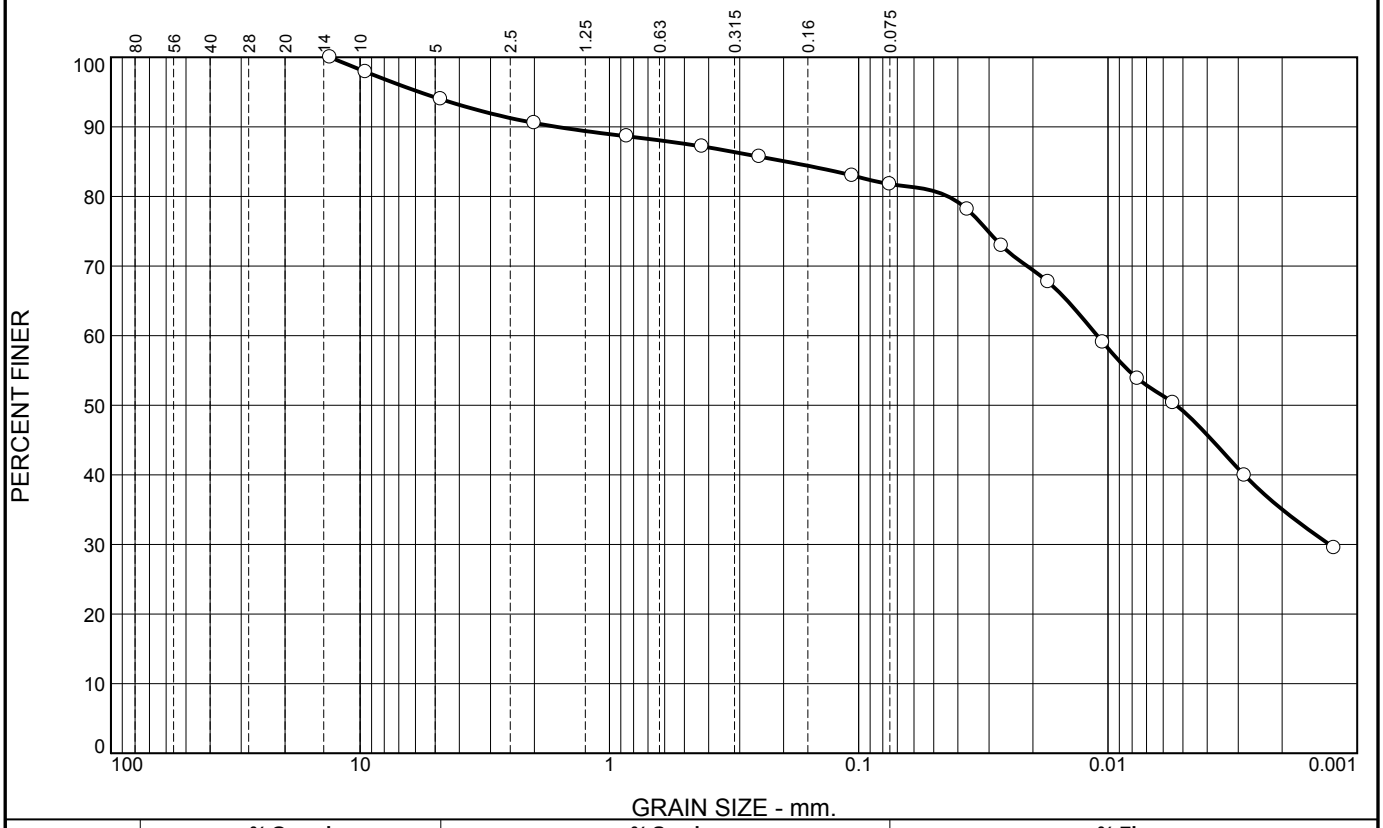
Location: BH17-5 SS7A
Sample Number: MM-3985

Date: Feb 8,2017

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.0	3.4	3.4	5.4	46.8	35.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
13.2mm	100.0		
9.5mm	97.9		
4.75mm	94.0		
2mm	90.6		
0.850mm	88.6		
0.425mm	87.2		
0.250mm	85.7		
0.106mm	83.0		
0.075mm	81.8		
0.0366 mm.	78.1		
0.0267 mm.	72.9		
0.0174 mm.	67.7		
0.0105 mm.	59.0		
0.0076 mm.	53.8		
0.0055 mm.	50.4		
0.0028 mm.	39.9		
0.0012 mm.	29.5		

* (no specification provided)

Soil Description

Silty clay, some sand, trace gravel

Atterberg Limits

PL= 16 LL= 30 PI= 14

Coefficients

D_{90}= 1.6253 D_{85}= 0.1951 D_{60}= 0.0110
D_{50}= 0.0053 D_{30}= 0.0013 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(10)

Remarks

Sampled by Michael Hu on April 2017
F.M.=0.69

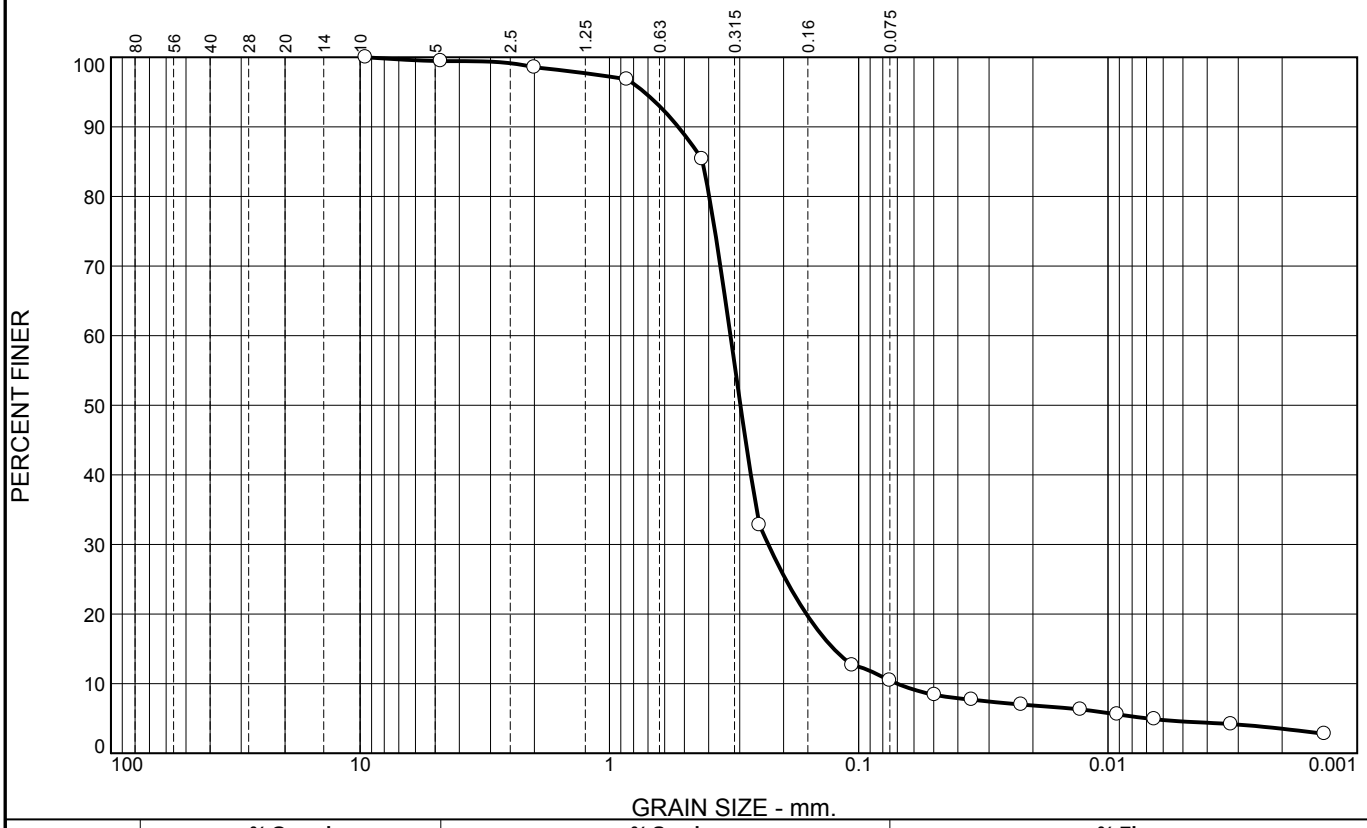
Location: BH17-8 SS10
Sample Number: MM-4227

Date: 20/04/17

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

Project No: 161-09479-00 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.5	0.9	13.2	74.9	7.0	3.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5mm	100.0		
4.75mm	99.5		
2mm	98.6		
0.850mm	96.8		
0.425mm	85.4		
0.250mm	32.8		
0.106mm	12.7		
0.075mm	10.5		
0.0496 mm.	8.4		
0.0352 mm.	7.7		
0.0223 mm.	7.0		
0.0129 mm.	6.3		
0.0092 mm.	5.6		
0.0065 mm.	4.9		
0.0032 mm.	4.2		
0.0014 mm.	2.8		

* (no specification provided)

Soil Description

Sand, trace silt, trace clay, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.5297 D_{85}= 0.4228 D_{60}= 0.3268
D_{50}= 0.2983 D_{30}= 0.2305 D_{15}= 0.1258
D_{10}= 0.0699 C_u= 4.67 C_c= 2.32

Classification

USCS= AASHTO=

Remarks

Sampled by Michael Hu on April 2017
F.M.=1.43

Location: BH17-9 SS5
Sample Number: MM-4226

Date: 21/04/2017

Client: National Homes (Plains Road) LP
Project: Geotechnical Investigation,Ph1&2, 484 Plains Road East, Burlington

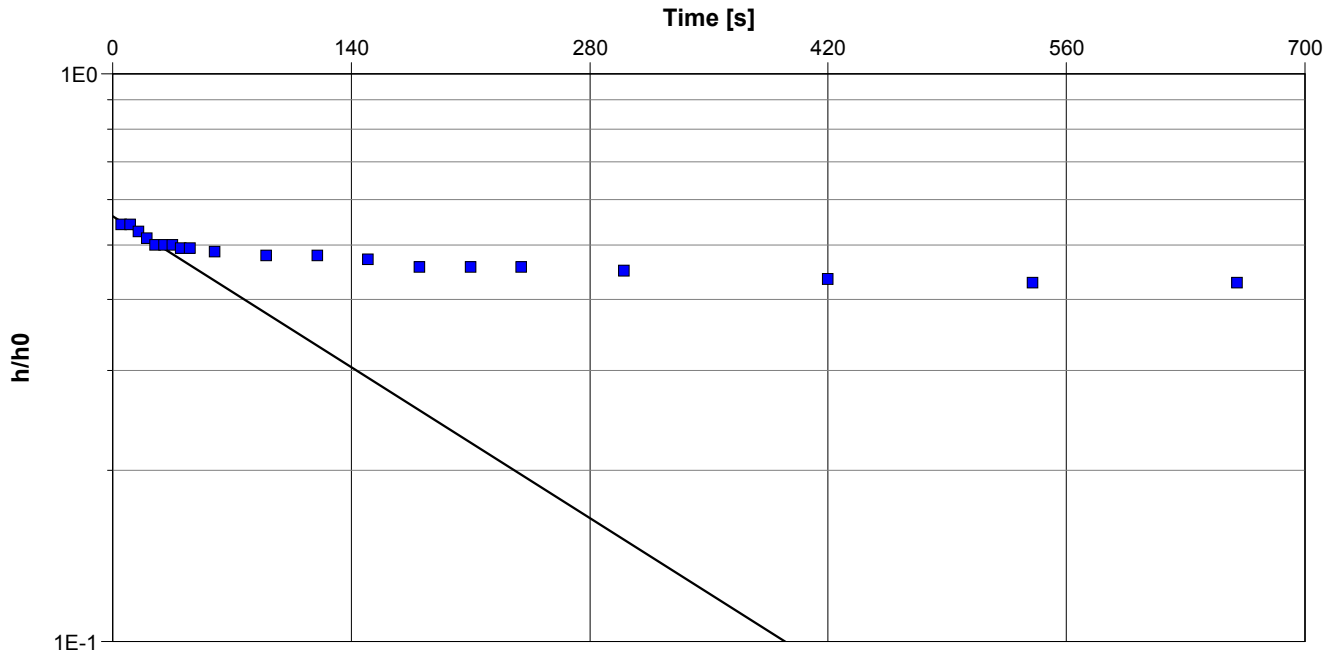
Project No: 161-09479-00 **Figure**

APPENDIX

C HYDRAULIC CONDUCTIVITY TESTING

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH17-1 FH Test	Test Well: BH17-1
Test Conducted by: A. Read		Test Date: 06/02/2017
Analysis Performed by: Carl Tin	BH17-1 Falling Head Test	Analysis Date: 23/02/2017
Aquifer Thickness: 3.60 m		



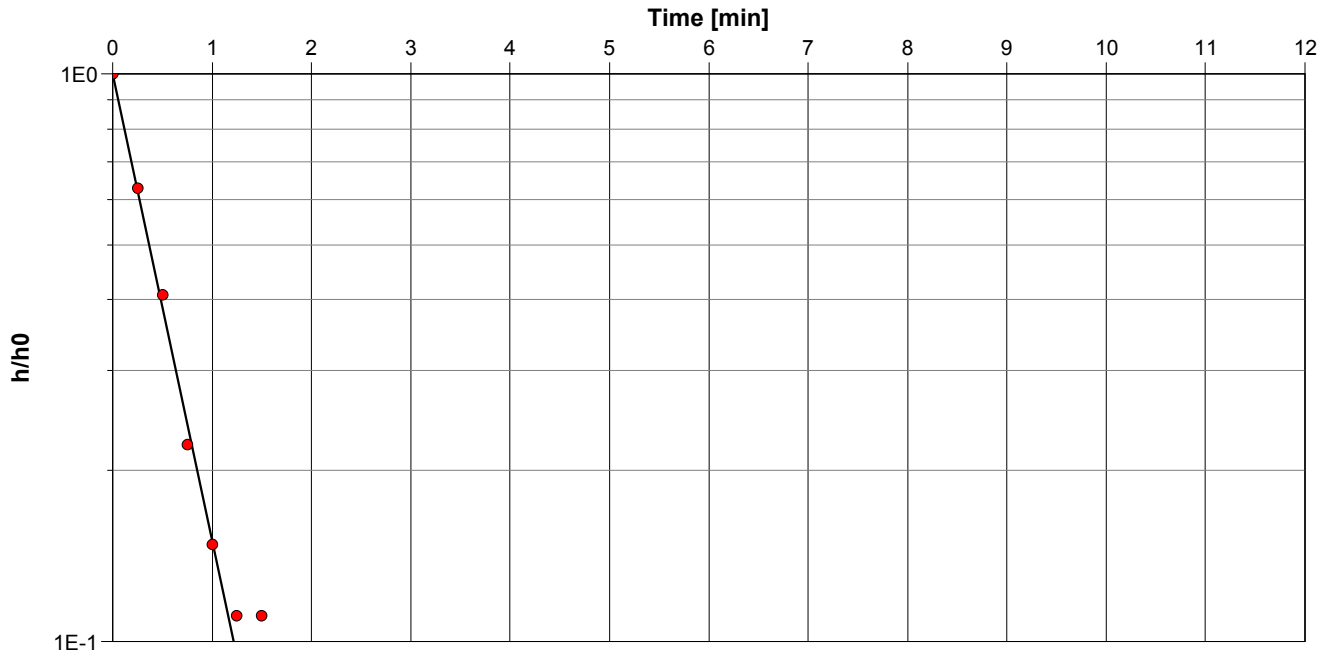
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH17-1	2.96×10^{-6}	

Sand, silty sand

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH16-10I FH Test R1	Test Well: BH16-10I
Test Conducted by: A. Read / N. Nalliah		Test Date: 06/02/2017
Analysis Performed by: Carl Tin	BH16-10I FH Test R1	Analysis Date: 23/02/2017
Aquifer Thickness: 3.33 m		



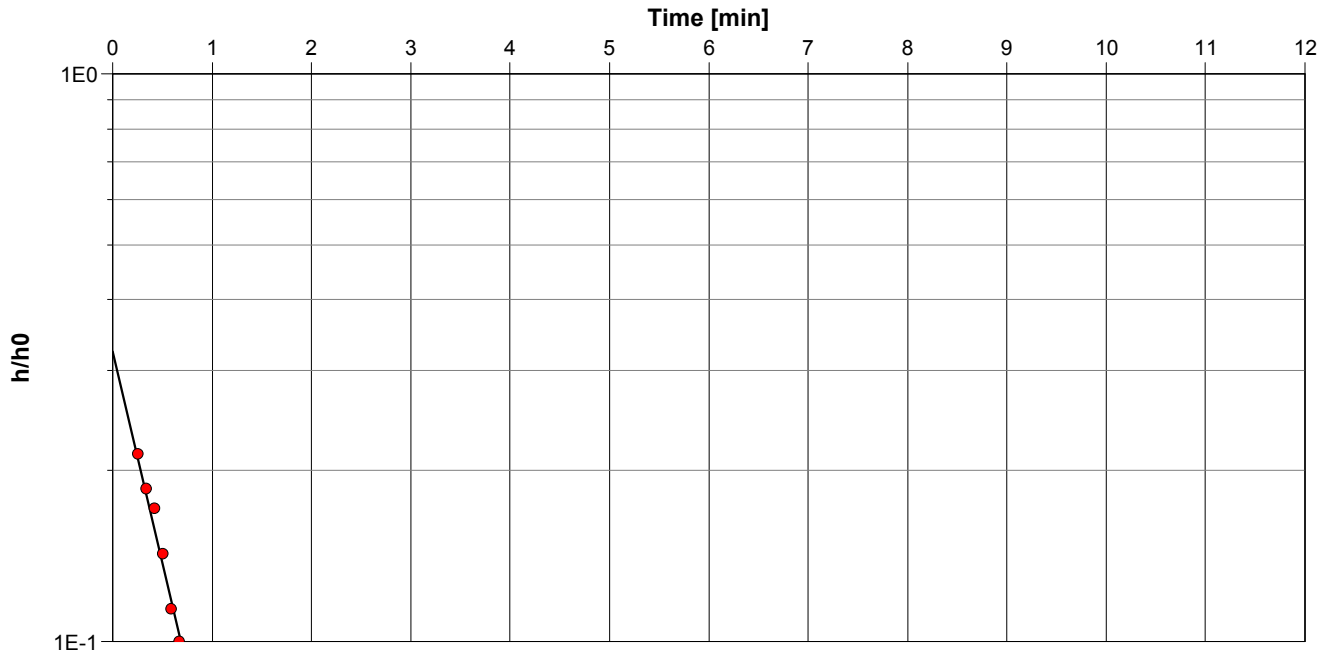
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH16-10I	2.13×10^{-5}	

Sandy silt to silty sand

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH16-10I FH Test R2	Test Well: BH16-10I
Test Conducted by: A. Read / N. Nalliah		Test Date: 06/02/2017
Analysis Performed by: Carl Tin	BH16-10I FH Test R2	Analysis Date: 23/02/2017
Aquifer Thickness: 3.33 m		



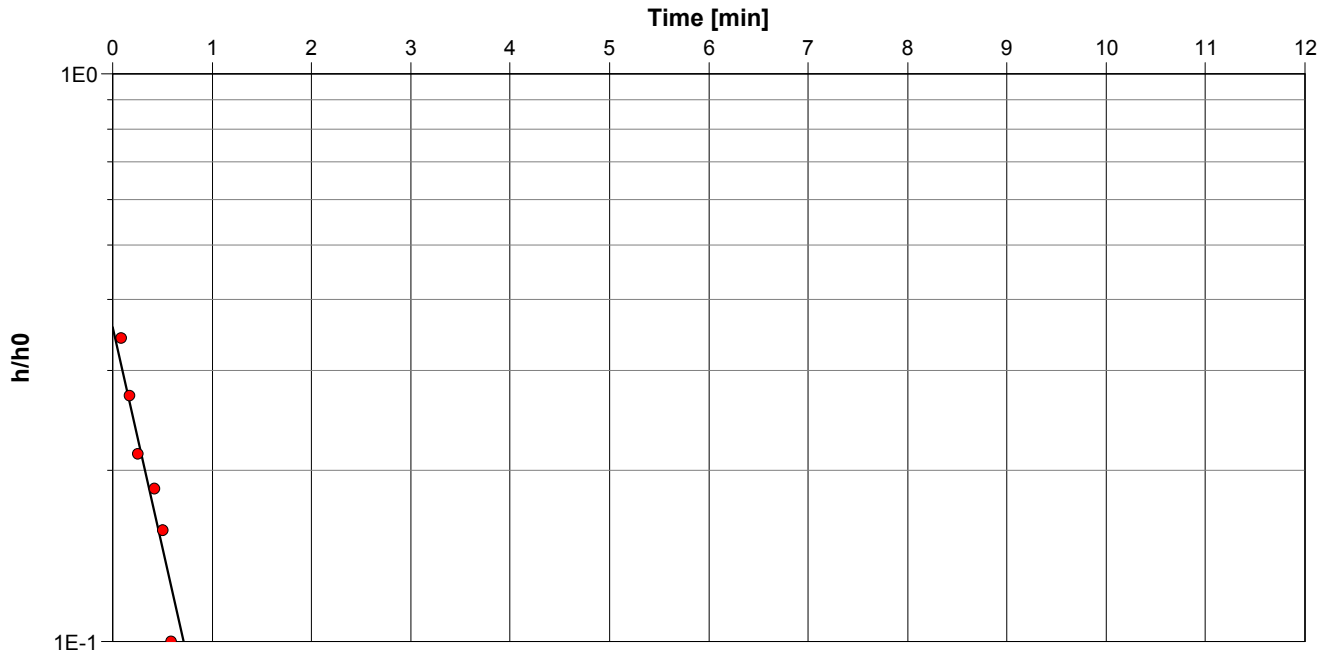
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH16-10I	1.93×10^{-5}	

Sandy silt to silty sand

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH16-10I RH Test	Test Well: BH16-10I
Test Conducted by: A. Read / N. Nalliah		Test Date: 06/02/2017
Analysis Performed by:	BH16-10I RH Test	Analysis Date: 23/02/2017
Aquifer Thickness: 3.33 m		



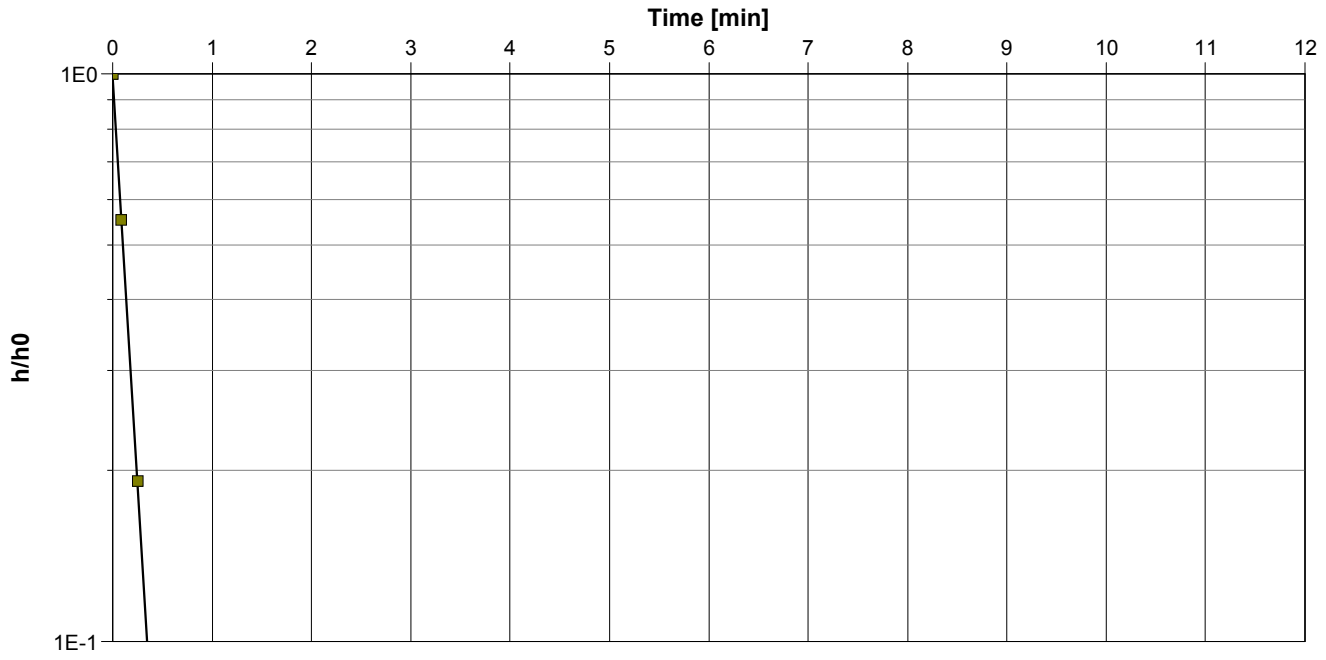
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH16-10I	2.01×10^{-5}	

Sandy silt to silty sand

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH17-3 FH Test	Test Well: BH17-3
Test Conducted by: A. Read		Test Date: 07/02/2017
Analysis Performed by: Carl Tin	BH17-3 FH Test	Analysis Date: 23/02/2017
Aquifer Thickness: 3.05 m		



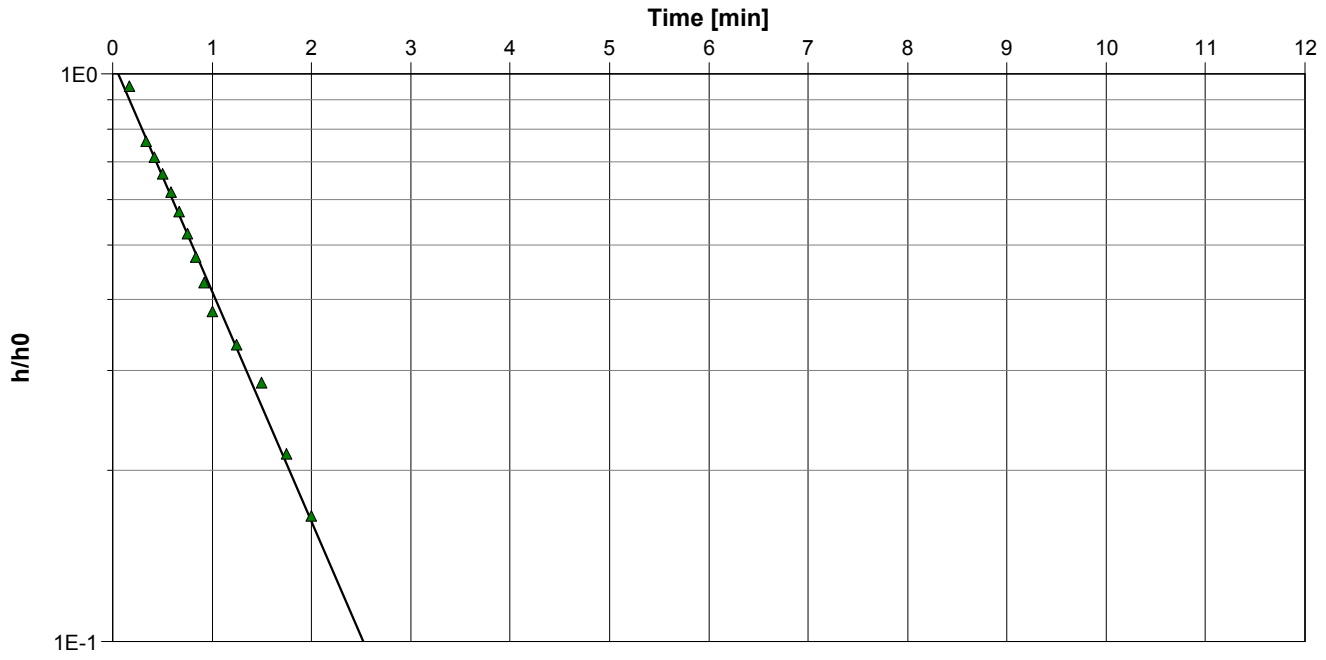
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH17-3	2.92×10^{-5}	

Silty sand

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH16-12I FH Test	Test Well: BH16-12I
Test Conducted by: A. Read / N. Nalliah		Test Date: 06/02/2017
Analysis Performed by: Carl Tin	BH16-12I FH Test	Analysis Date: 23/02/2017
Aquifer Thickness: 3.26 m		



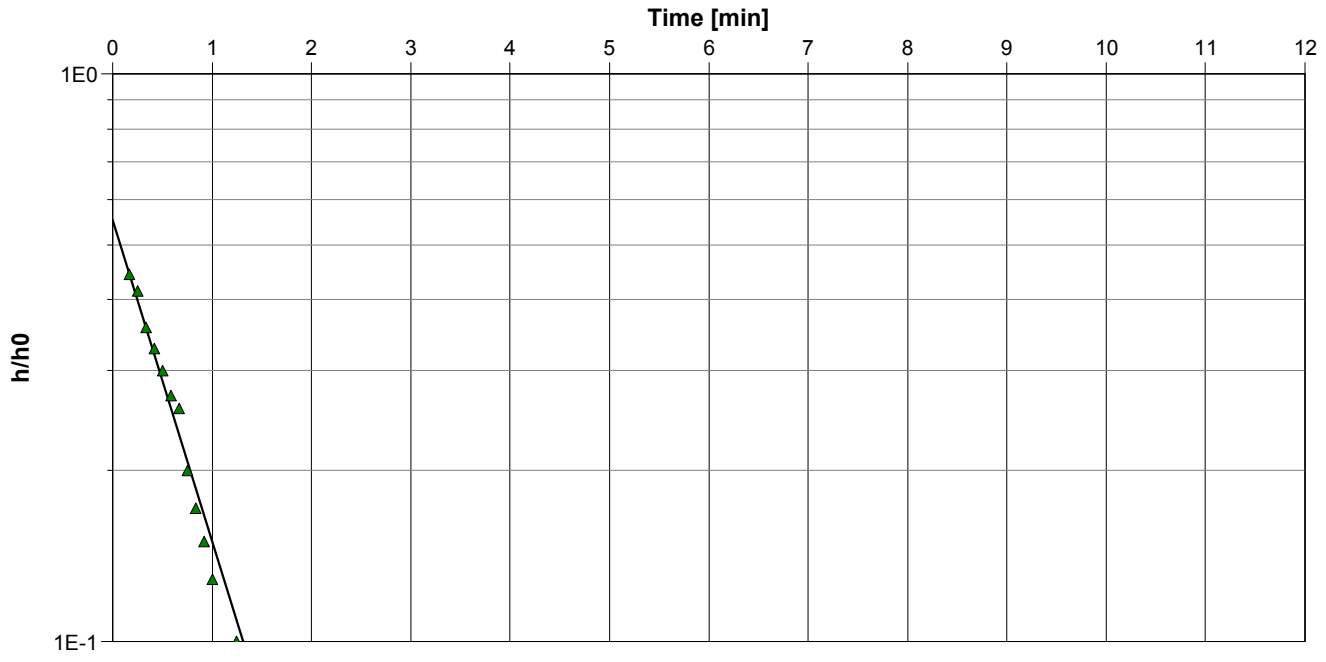
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH16-12I	1.05×10^{-5}	

Silty sand

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH16-12I RH Test	Test Well: BH16-12I
Test Conducted by: A. Read / N. Nalliah		Test Date: 06/02/2017
Analysis Performed by: Carl Tin	BH16-12I RH Test	Analysis Date: 23/02/2017
Aquifer Thickness: 3.26 m		



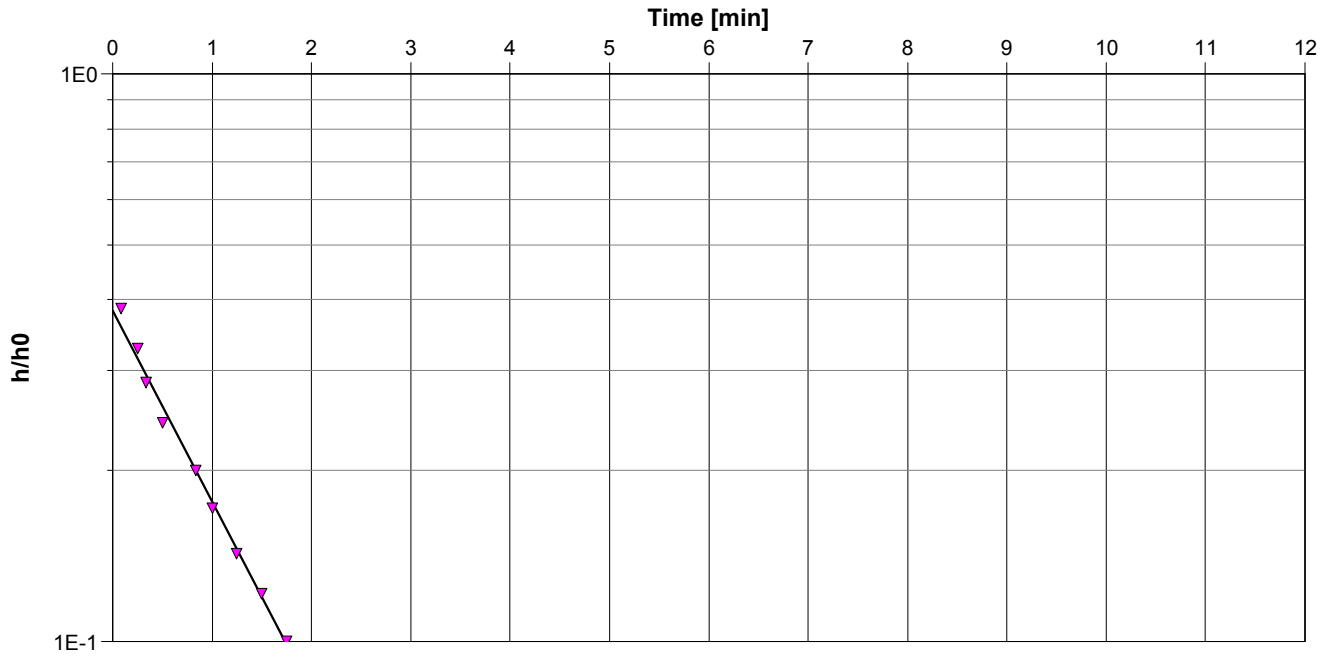
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH16-12I	1.47×10^{-5}	

Silty sand

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH16-13I FH Test	Test Well: BH16-13I
Test Conducted by: A. Read		Test Date: 07/02/2017
Analysis Performed by: Carl Tin	BH16-13I FH Test	Analysis Date: 23/02/2017
Aquifer Thickness: 3.10 m		



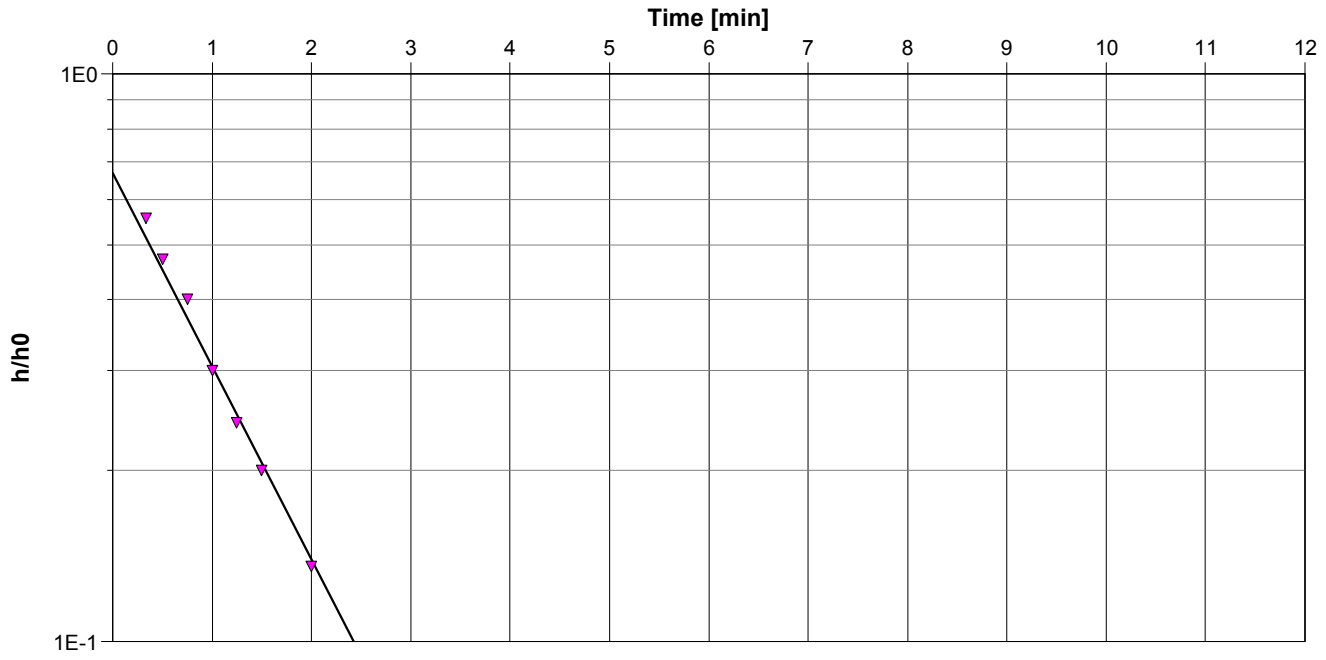
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH16-13I	8.72×10^{-6}	

Silty sand

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH16-13I RH Test	Test Well: BH16-13I
Test Conducted by: A. Read		Test Date: 07/02/2017
Analysis Performed by: Carl Tin	BH16-13I RH Test	Analysis Date: 23/02/2017
Aquifer Thickness: 3.10 m		



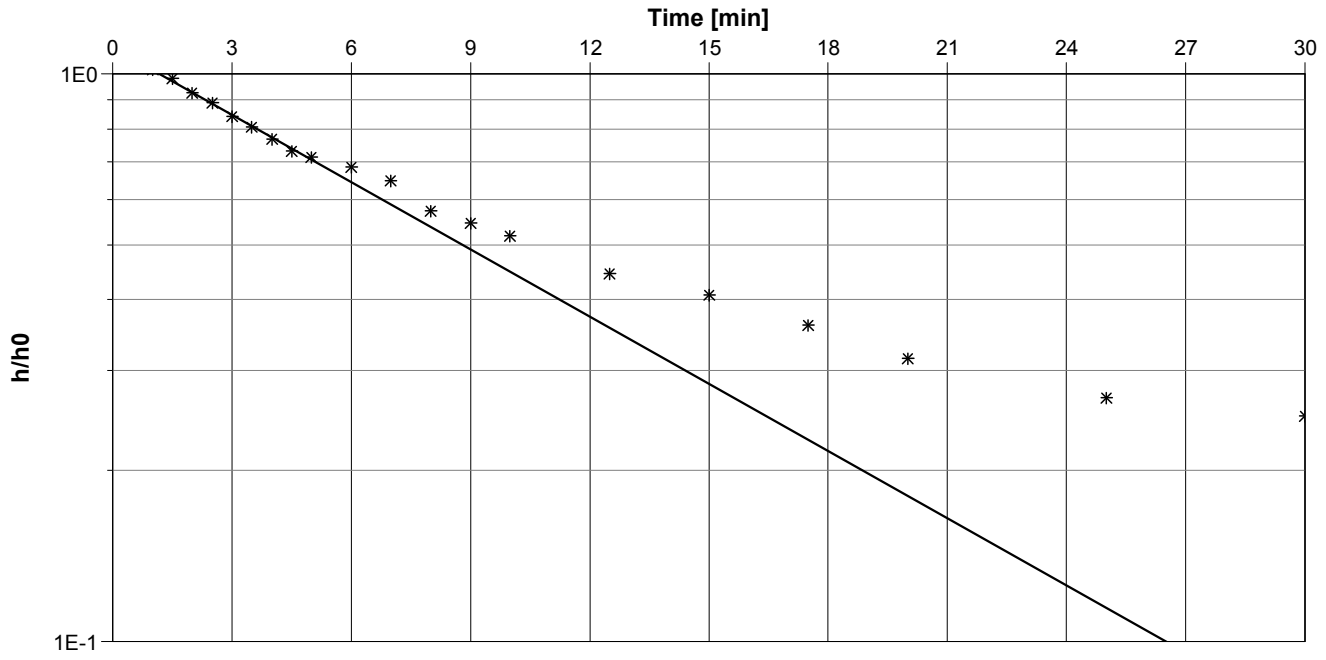
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH16-13I	8.84×10^{-6}	

Silty sand

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH16-3D FH Test	Test Well: BH16-3D
Test Conducted by: A. Read / N. Nalliah		Test Date: 06/02/2017
Analysis Performed by: Carl Tin	BH16-3D FH Test	Analysis Date: 23/02/2017
Aquifer Thickness: 9.80 m		



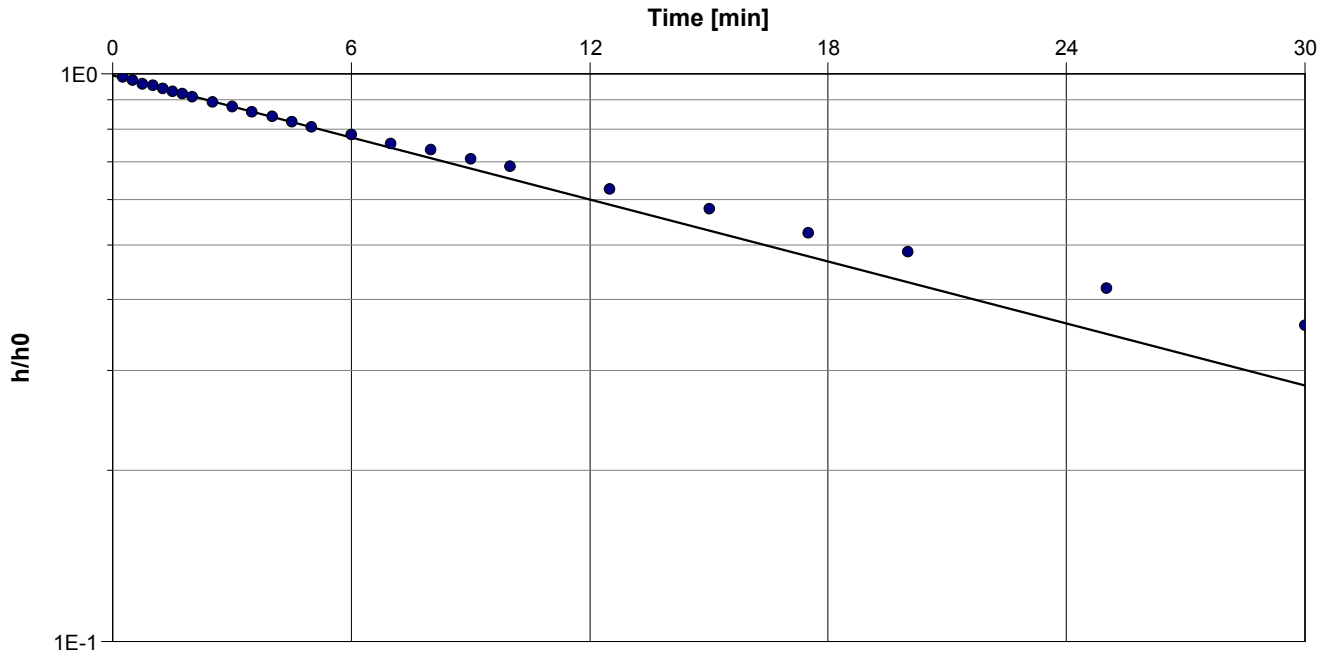
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH16-3D	6.04×10^{-7}	

Silty clay till

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH17-9 FH Test	Test Well: BH17-9
Test Conducted by: V. Martinez/M. McAlary		Test Date: 13/06/2017
Analysis Performed by: Carl Tin	BH17-9 FH Test	Analysis Date: 20/06/2017
Aquifer Thickness: 2.50 m		



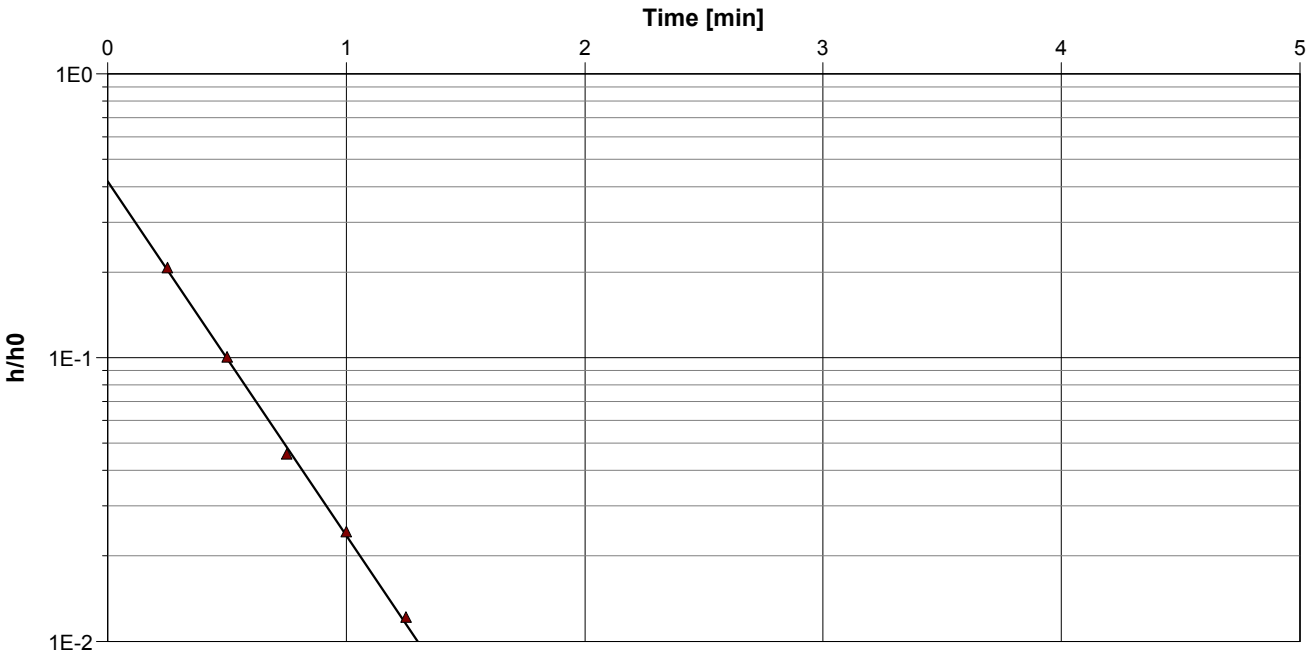
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH17-9	4.74×10^{-7}	

Silty sand

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH17-5 FH Test	Test Well: BH17-5
Test Conducted by: V. Martinez/M. McAlary		Test Date: 13/06/2017
Analysis Performed by: Carl Tin	BH17-5 FH Test	Analysis Date: 21/06/2017
Aquifer Thickness: 3.63 m		



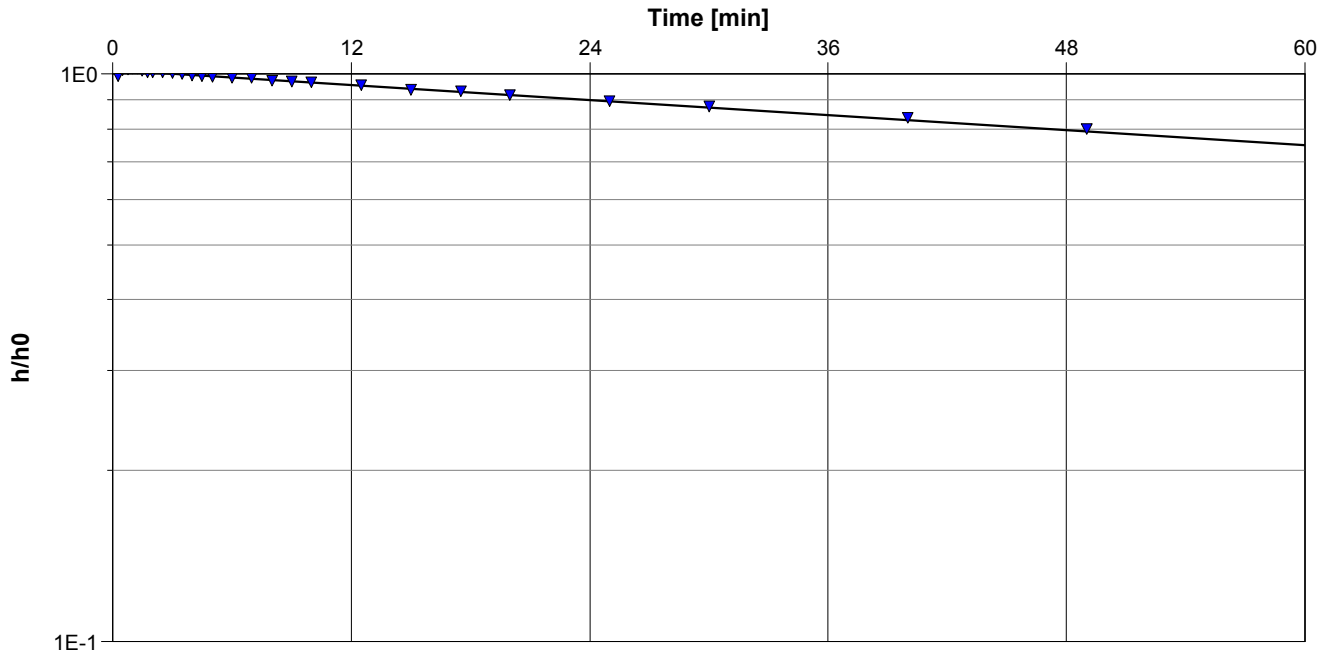
Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH17-5	3.24×10^{-5}	

Silty sand to sandy silt

	Slug Test Analysis Report
	Project: Plains Road
	Number: 161-09479-00
	Client: National Homes (Plains Road) LP

Location: 484 Plains Rd E, Burlington ON	Slug Test: BH16-11D FH Test	Test Well: BH16-11D
Test Conducted by: V. Martinez/M. McAlary		Test Date: 13/06/2017
Analysis Performed by: Carl Tin	BH16-11D FH Test	Analysis Date: 21/06/2017
Aquifer Thickness: 10.01 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
BH16-11D	5.73×10^{-8}	

Silty clay

APPENDIX

D WATER LEVEL DATA

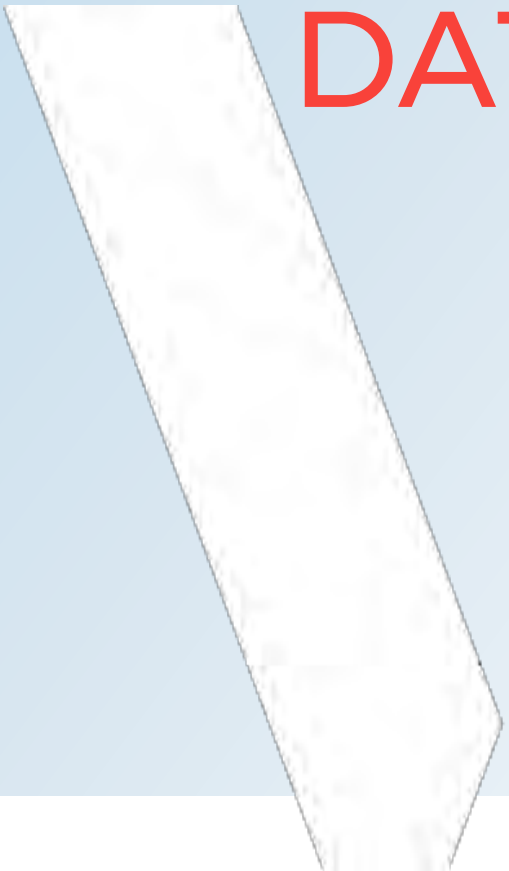


Table SWL-1: Static Water Levels at Monitoring Wells

Well ID	Location		Ground Elevation	Top Elevation	Screen Bottom	Screen Top	Screen Length	Install Date	*Water Level* 11-Jul-16			*Water Level* 24-Oct-16			*Water Level* 10-Dec-16			*Water Level* 07-Feb-17			*Water Level* 13-Jun-17			*Water Level* 11-Sep-17		
	Easting	Northing	masl	masl	mbg	mbg	m		mbtop	*mbgs*	*masl*	mbtop	*mbgs*	*masl*	mbtop	*mbgs*	*masl*	mbtop	*mbgs*	*masl*	mbtop	*mbgs*	*masl*	mbtop	*mbgs*	*masl*
	m	m																								
BH16-2	594366	4796711	97.29	97.20	7.11	4.11	3.00	30-Jun-16	4.70	4.78	92.51	4.85	4.93	92.36	Flush mounted lid frozen; could not collect data			Flush mounted lid frozen; could not collect data			4.39	4.47	92.81	4.62	4.70	92.58
BH16-3	594339	4796753	97.73	97.63	7.46	4.46	3.00	30-Jun-16	4.48	4.58	93.15	4.65	4.75	92.98	4.69	4.79	92.94	4.64	4.74	92.99	4.16	4.26	93.47	4.38	4.48	93.25
BH16-3D	594339	4796753	97.70	97.54	16.37	13.37	3.00	18-Oct-16	Monitoring well not installed at this date			4.60	4.76	92.94	4.68	4.83	92.87	4.58	4.74	92.96	4.06	4.22	93.48	4.29	4.45	93.25
BH16-4	594329	4796820	97.81	97.68	6.73	3.73	3.00	29-Jun-16	3.77	3.90	93.91	3.94	4.07	93.74	4.02	4.15	93.66	4.00	4.13	93.68	3.40	3.52	94.29	Monitoring well not accessible at this date		
BH16-6	594395	4796741	96.73	96.60	7.19	4.19	3.00	30-Jun-16	3.73	3.86	92.87	3.90	4.03	92.70	3.97	4.10	92.63	3.84	3.97	92.76	3.41	3.54	93.19	3.65	3.78	92.95
BH16-6D	594395	4796741	96.71	96.43	16.49	13.49	3.00	20-Oct-16	Monitoring well not installed at this date			3.76	4.04	92.67	3.74	4.01	92.70	3.69	3.97	92.74	3.33	3.61	93.10	3.53	3.81	92.90
BH16-7	594363	4796881	97.79	97.72	7.49	4.49	3.00	29-Jun-16	3.43	3.50	94.29	3.58	3.65	94.14	3.68	3.75	94.05	3.65	3.72	94.07	2.99	3.06	94.73	3.22	3.29	94.50
BH16-9	594356	4796733	97.29	97.08	5.45	2.45	3.00	19-Oct-16	Monitoring well not installed at this date			4.39	4.60	92.69	4.42	4.63	92.66	4.39	4.60	92.69	3.90	4.11	93.18	4.13	4.34	92.95
BH16-9D	594356	4796733	97.29	97.09	16.65	15.15	1.50	19-Oct-16	Monitoring well not installed at this date			4.68	4.88	92.41	4.47	4.67	92.62	Flush mounted lid frozen; could not collect data			4.03	4.23	93.07	4.23	4.43	92.86
BH16-10	594340	4796735	97.50	97.34	5.76	2.76	3.00	19-Oct-16	Monitoring well not installed at this date			4.60	4.76	92.74	4.65	4.81	92.69	4.59	4.75	92.75	4.13	4.29	93.21	4.37	4.53	92.97
BH16-10I	594340	4796735	97.49	97.42	8.20	6.70	1.50	24-Jan-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			4.68	4.75	92.74	4.22	4.29	93.20	Monitoring well not accessible at this date		
BH16-10D	594340	4796735	97.49	97.35	15.15	12.15	3.00	21-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			4.65	4.79	92.70	4.61	4.75	92.74	4.14	4.28	93.21	4.37	4.51	92.98
BH16-11	594390	4796766	96.98	96.74	5.80	2.80	3.00	20-Oct-16	Monitoring well not installed at this date			3.78	4.02	92.96	3.20	3.44	93.54	3.73	3.97	93.01	3.25	3.49	93.49	3.48	3.72	93.26
BH16-11D	594389	4796765	96.95	96.74	15.53	14.03	1.50	22-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			4.40	4.61	92.34	4.78	4.99	91.96	4.35	4.56	92.40	4.34	4.55	92.40
BH16-12	594357	4796703	97.41	97.28	5.74	2.74	3.00	23-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			5.00	5.13	92.28	4.93	5.06	92.35	4.52	4.65	92.75	4.80	4.93	92.48
BH16-12I	594357	4796703	97.38	97.31	8.31	6.81	1.50	24-Jan-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			4.97	5.04	92.34	4.56	4.63	92.75	4.79	4.86	92.52
BH16-12D	594357	4796703	97.36	97.26	16.14	14.64	1.50	22-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			4.98	5.08	92.28	5.33	5.43	91.93	4.55	4.65	92.71	4.76	4.86	92.50
BH16-13	594332	4796725	97.59	97.41	5.66	2.66	3.00	23-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			4.76	4.94	92.66	4.69	4.87	92.72	4.26	4.44	93.16	4.47	4.65	92.94
BH16-13I	594332	4796725	97.59	97.50	8.39	6.89	1.50	24-Jan-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			4.81	4.90	92.69	4.35	4.44	93.15	4.59	4.68	92.91
BH16-13D	594332	4796725	97.58	97.42	15.82	14.32	1.50	21-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			4.77	4.93	92.65	4.71	4.87	92.71	4.31	4.47	93.11	4.49	4.65	92.93
BH16-14	594375	4796791	97.47	97.29	5.65	2.65	3.00	23-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			4.10	4.28	93.19	4.04	4.22	93.25	3.54	3.71	93.76	3.76	3.94	93.53
BH17-1	594336	4796774	97.82	97.70	7.29	5.79	1.50	24-Jan-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			4.51	4.63	93.19	3.97	4.08	93.74	4.19	4.31	93.51
BH17-2	594334	4796759	98.01	97.89	7.54	6.04	1.50	24-Jan-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			4.82	4.94	93.07	Monitoring well not accessible at this date			Monitoring well not accessible at this date		
BH17-3	594326	4796751	98.00	97.90	8.22	6.72	1.50	24-Jan-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			4.92	5.02	92.98	Monitoring well not accessible at this date			Monitoring well not accessible at this date		
BH17-4	594323	4796738	97.66	97.48	9.11	7.61	1.50	24-Jan-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			4.64	4.82	92.84	4.17	4.35	93.32	4.39	4.57	93.09
BH17-5	594348	4796714	97.61	97.50	8.18	6.68	1.50	24-Jan-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			4.97	5.08	92.53	4.54	4.65	92.96	4.76	4.87	92.74
BH17-6	594388	4796873	97.78	97.64	5.05	2.05	3.00	24-Jan-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			3.12	3.26	94.52	3.35	3.49	94.29
BH17-6I	594388	4796873	97.78	97.66	7.53	6.03	1.50	24-Jan-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			3.13	3.25	94.53	3.36	3.48	94.30
BH17-9	594277	4796784	98.02	97.95	6.79	5.29	1.50	18-Apr-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			3.83	3.90	94.12	NA	-	-
BH17-12	594345	4796749	97.75	97.65	5.49	2.44	3.00	09-Aug-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			4.29	4.39	93.36
BH17-13	594360	4796723	97.40	97.30	5.39	2.35	3.00	09-Aug-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			3.82	3.92	93.48
BH17-14	594374	4796735	97.25	97.15	5.49	2.44	3.00	09-Aug-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			4.25	4.35	92.90

Table SWL-1: Static Water Levels at Monitoring Wells

Well ID	Ground Elevation masl	Top Elevation masl	Screen Bottom mbg	Screen Top mbg	Screen Length m	Mid-Screen masl	Install Date	*Water Level* 11-Jul-16 mbtop	*masl*	*Vert Grad m/m*	*Water Level* 24-Oct-16 mbtop	*masl*	*Vert Grad m/m*	*Water Level* 10-Dec-16 mbtop	*masl*	*Vert Grad m/m*	*Water Level* 07-Feb-17 mbtop	*masl*	*Vert Grad m/m*	*Water Level* 13-Jun-17 mbtop	*masl*
BH16-3	97.73	97.63	7.46	4.46	3.00	91.77	30-Jun-16	4.48	93.15		4.65	92.98		4.69	92.94		4.64	92.99		4.16	93.47
BH16-3D	97.70	97.54	16.37	13.37	3.00	82.83	18-Oct-16	Monitoring well not installed at this date			4.60	92.94	0.004	4.68	92.87	0.01	4.58	92.96	0.00	4.06	93.48
BH16-6	96.73	96.60	7.19	4.19	3.00	91.04	30-Jun-16	3.73	92.87		3.90	92.70		3.97	92.63		3.84	92.76		3.41	93.19
BH16-6D	96.71	96.43	16.49	13.49	3.00	81.72	20-Oct-16	Monitoring well not installed at this date			3.76	92.67	0.003	3.74	92.70	(0.01)	3.69	92.74	0.002	3.33	93.10
BH16-9	97.29	97.08	5.45	2.45	3.00	93.34	19-Oct-16	Monitoring well not installed at this date			4.39	92.69		4.42	92.66		4.39	92.69		3.90	93.18
BH16-9D	97.29	97.09	16.65	15.15	1.50	81.39	19-Oct-16	Monitoring well not installed at this date			4.68	92.41	0.02	4.47	92.62	0.00	Flush mounted lid frozen			4.03	93.07
BH16-10	97.50	97.34	5.76	2.76	3.00	93.24	19-Oct-16	Monitoring well not installed at this date			4.60	92.74		4.65	92.69		4.59	92.75		4.13	93.21
BH16-10D	97.49	97.35	15.15	12.15	3.00	83.84	21-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			4.65	92.70	(0.001)	4.61	92.74	0.0011	4.14	93.21
BH16-11	96.98	96.74	5.80	2.80	3.00	92.68	20-Oct-16	Monitoring well not installed at this date			3.78	92.96		3.20	93.54		3.73	93.01		3.25	93.49
BH16-11D	96.95	96.74	15.53	14.03	1.50	82.17	22-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			4.40	92.34	0.11	4.78	91.96	0.10	4.35	92.40
BH16-12	97.41	97.28	5.74	2.74	3.00	93.17	23-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			5.00	92.28		4.93	92.35		4.52	92.75
BH16-12D	97.36	97.26	16.14	14.64	1.50	81.97	22-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			4.98	92.28	(0.00)	5.33	91.93	0.04	4.55	92.71
BH16-13	97.59	97.41	5.66	2.66	3.00	93.43	23-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			4.76	92.66		4.69	92.72		4.26	93.16
BH16-13D	97.58	97.42	15.82	14.32	1.50	82.51	21-Nov-16	Monitoring well not installed at this date			Monitoring well not installed at this date			4.77	92.65	0.000	4.71	92.71	0.0009	4.31	93.11
BH17-6	97.78	97.64	5.05	2.05	3.00	94.23	24-Jan-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			3.12	94.52
BH17-6I	97.78	97.66	7.53	6.03	1.50	91.00	24-Jan-17	Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			Monitoring well not installed at this date			3.13	94.53

Notes:

Downward gradient are represented by positive values, upward gradients are represented by (negative) values.

Upward Gradient (Nests Only)

Downward Gradient (Nests Only)

Table SWL-1: Static Water Levels at Monitoring Wells

Well ID	Ground Elevation masl	Top Elevation masl	Screen Bottom mbg	Screen Top mbg	Screen Length m	Mid-Screen masl	Install Date	*Vert* Grad *m/m*	*Water Level* 11-Sep-17 mbtop	*mbgs*	*Vert* Grad *m/m*
BH16-3	97.73	97.63	7.46	4.46	3.00	91.77	30-Jun-16		4.38	93.25	
BH16-3D	97.70	97.54	16.37	13.37	3.00	82.83	18-Oct-16	(0.00045)	4.29	93.25	0.00000
BH16-6	96.73	96.60	7.19	4.19	3.00	91.04	30-Jun-16		3.65	92.95	
BH16-6D	96.71	96.43	16.49	13.49	3.00	81.72	20-Oct-16	0.01	3.53	92.90	0.01
BH16-9	97.29	97.08	5.45	2.45	3.00	93.34	19-Oct-16		4.13	92.95	
BH16-9D	97.29	97.09	16.65	15.15	1.50	81.39	19-Oct-16	0.01	4.23	92.86	0.01
BH16-10	97.50	97.34	5.76	2.76	3.00	93.24	19-Oct-16		4.37	92.97	
BH16-10D	97.49	97.35	15.15	12.15	3.00	83.84	21-Nov-16	(0.00043)	4.37	92.98	(0.00106)
BH16-11	96.98	96.74	5.80	2.80	3.00	92.68	20-Oct-16		3.48	93.26	
BH16-11D	96.95	96.74	15.53	14.03	1.50	82.17	22-Nov-16	0.10	4.34	92.40	0.08
BH16-12	97.41	97.28	5.74	2.74	3.00	93.17	23-Nov-16		4.80	92.48	
BH16-12D	97.36	97.26	16.14	14.64	1.50	81.97	22-Nov-16	0.00393	4.76	92.50	(0.00223)
BH16-13	97.59	97.41	5.66	2.66	3.00	93.43	23-Nov-16		4.47	92.94	
BH16-13D	97.58	97.42	15.82	14.32	1.50	82.51	21-Nov-16	0.00394	4.49	92.93	0.00092
BH17-6	97.78	97.64	5.05	2.05	3.00	94.23	24-Jan-17		3.35	94.29	
BH17-6I	97.78	97.66	7.53	6.03	1.50	91.00	24-Jan-17	(0.0012)	3.36	94.30	(0.0031)

Notes:

Downward gradient are represented by positive values, upward gradients are represented by (negative) values.

Upward Gradient (Nests Only)

Downward Gradient (Nests Only)

APPENDIX

E WATER BALANCE CALCULATIONS

Table WB-1 - Water Balance Calculations in Pre-Development and Post-Development Conditions

	Pre-Development Urban Lawns	Post-Development Urban Lawns	Difference
Water Balance Statistics	**mm/year**	**mm/year**	**mm/year**
Precipitation	861.0	861.0	0.0
Evapotranspiration	518.0	518.0	0.0
Surplus	343.0	343.0	0.0
Infiltration Factor (dimensionless)	0.470	0.470	0.0
Infiltration	161.2	161.2	0.0
Runoff (from pervious areas)	181.8	181.8	0.0
Site Statistics	**m^2**	**m^2**	**m^2**
Impervious Area (Roofs)	5,200	7,585	2,385
Impervious Area (Pavement and Hard Landscaped Surfaces)	11,461	5,810	-5,651
Landscaped Area (Underlain by Underground Parking Garage)	0	2,433	2,433
Total Impervious Area	**16,661**	**15,828**	**-833**
Total Pervious Area (Not Underlain by Underground Parking Garage)	**1,724**	**2,557**	**833**
Total Site Area	**18,385**	**18,385**	**0**
Water Volumes	**m^3/year**	**m^3/year**	**m^3/year**
Precipitation (Entire Site Area)	15,829	15,829	0
Evapotranspiration (Pervious Area)	893	1,325	431
Evapotranspiration (Area Underlain by Underground Parking Garage)	0	1,260	1,260
Total ETR	**893**	**2,585**	**1,692**
Evaporation Impervious Surfaces (Roofs)	448	653	205
Evaporation Impervious Surfaces (Pavement)	987	500	-487
Total Evaporation	**1,435**	**1,153**	**-281**
Runoff (Impervious Surfaces - Roofs)	4,030	5,878	1,848
Runoff (Impervious Surfaces - Pavement)	8,881	4,502	-4,379
Runoff (Landscaped Area Underlain by Underground Parking Garage)	0	835	835
Runoff (Pervious Surfaces)	313	465	151
Total Runoff	**13,224**	**11,679**	**-1,545**
Infiltration	**278**	**412**	**134**
Total ETR, Evaporation, Runoff, Infiltration	**15,829**	**15,829**	**0**

Notes:
assumes 10% evaporation off impervious surfaces

APPENDIX

F STANDARD LIMITATIONS

STANDARD LIMITATIONS
ENVIRONMENTAL INVESTIGATIONS and CHARACTERIZATION PROGRAMS

These Standard Limitations form part of the Report to which they are appended and any use of the Report is subject to them.

1. Exclusive Use By Client

This Report was prepared for the exclusive use of the client identified as the intended recipient. Any use of the Report by any other party without the written consent of WSP Canada Group Limited is the sole responsibility of such party. WSP Canada Group Limited accepts no responsibility for damages that may be suffered by any third party as a result of decisions made or actions taken based on the Report.

2. Scope, Terms and Conditions of Contract

The observations and investigations (hereinafter referred to as the "Work") upon which this Report is based were carried out in accordance with the scope, terms and conditions of the contract or the proposal pursuant to which the Work was commissioned. The conclusions presented in the Report are based solely upon the scope of services described in the contract or the proposal and governed by the time and budgetary constraints imposed by them.

3. Standard of Care

The principles, procedures and standards relevant to the nature of the services performed are not universally the same. The Work has been carried out in accordance with generally accepted environmental study and/or professional practices, industry standards and environmental regulations, where applicable. No other warranties are either expressed or implied with respect to the professional services provided under the terms of the contract or the proposal and represented in this Report.

4. Scope of the Work

This Report may be based in part on information obtained at discrete sampling and/or monitoring locations. The conditions reported herein were those encountered at the subject property at the time the Work was performed and as present at the discrete sampling/monitoring locations, if any. Conditions between sampling/monitoring locations may be different than those encountered at the sampling/monitoring locations and WSP Canada Group Limited is not responsible for such differences.

5. Reasonable Conclusions

The conclusions contained in this Report are based on the Work and may also consider a review of information from other sources as identified in the Report. The accuracy of information from other sources was not verified unless specifically noted in the Report, nor was it determined if the reviewed information constituted all information that exists and pertains to the subject property.

The conclusions made are based on reasonable and professional interpretation of the information considered. If additional information concerning conditions of relevance to this Report is obtained during future work at the subject property, WSP Canada Group Limited should be notified in order that we may determine if modifications to the conclusions presented in this Report are necessary.

6. Report as a Complete Document

This Report must be read as a whole and sections taken out of context may be misleading. If discrepancies occur between the preliminary (draft) and final versions of the Report, the final version of the report shall take precedence.

7. Limits of Liability

WSP Canada Group Limited's liability with respect to the Work is limited to re-performing, without cost, any part of the Work that is unacceptable solely as a result of failure to comply with industry standards. WSP Canada Group Limited's maximum liability is limited in accordance with terms in the original contract, provided that notice of claim is made within regulated timelines as of the date of delivery of the Report.