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October 23, 2023
File: PH4282-LET.02 Revision 1

Omar Alnader
314 Maxwell Bridge Road
Kanata, Ontario
K2W 0A5

Attention: **Omar Alnader**

Subject: **Subsurface Investigation and Groundwater Monitoring**
Proposed Commercial Development
2742 Dunrobin Road - Ottawa

Dear Sir,

Further to your request, Paterson Group (Paterson) was commissioned to conduct a subsurface investigation and groundwater monitoring program for the proposed development to be located at 2742 Dunrobin Road in the City of Ottawa. The purpose of the current investigation is to provide subsoil and hydrogeological conditions in support of a stormwater management design for the proposed development.

1.0 Proposed Development

Based on the available drawings in support of a stormwater management design, it is understood that the proposed commercial development and design will consist of a permeable parking lot, as well as soil amendments and an evapotranspiration tree grove/meadow within the northern catchment of the site. The south catchment will be directed to a dry pond facility adjacent to the Dunrobin Road ditch. A temporary site trailer will also be located within the western portion of the parking lot.

2.0 Method of Investigation

2.1 Field Investigation

Field program

The field program conducted by Paterson for the current investigation was completed between April 20 and July 14, 2023. At that time, four (4) hand auger was advanced to a maximum depth of 2.3 m below ground surface (bgs). One (1) hand auger was completed with the proposed dry pond facility, as requested by City of Ottawa staff, while the remaining hand auger hole locations were selected by Paterson and completed with the proposed parking lot to provide additional coverage.

Previous investigations have been completed between May 13, 2021 and June 13, 2022. During this time, two (2) boreholes and five (5) hand auger holes were extended to a maximum depth of 5.2 and 0.9 m bgs, respectively. The test hole locations were selected by Paterson and distributed in a manner to provide general coverage of the proposed development.

The test hole locations are presented on Drawing PH4282-1 - Test Hole Location Plan, attached to this report.

Groundwater Monitoring Well Installation

Groundwater monitoring wells were installed at each borehole location to permit monitoring of the groundwater levels subsequent to the completion of the field investigation. The monitoring wells consisted of 51 mm diameter PVC risers and 1.5 m long screens. Specific details of the installation of each monitoring well are further included in the Soil Profile and Test Data sheets and attached to the current letter report.

Groundwater Monitoring

Each monitoring well has been equipped with a Van Essen Instrument Mini-Diver Water Level Logger to monitor fluctuations in the groundwater levels within the proposed development. In addition, a Van Essen Instruments Baro-Diver was installed in borehole BH 2-22 to monitor changes in atmospheric pressure. The Mini-Divers have been programmed to continuously measure and record groundwater levels within the development at a rate of 1 reading every 24 hours for a maximum 12 month period.

2.2 Laboratory Testing

Soil samples were recovered from the subject site and visually examined in our laboratory to review the results of the field logging. A total of one (1) grain size distribution analysis was completed on one silty clay sample during the current investigation. The results of the testing are presented in Section 3.3 and attached to the current report.

2.3 Permeameter Testing

In-situ permeameter testing was completed at select hand auger locations using a Pask (Constant Head Well) Permeameter during the previous investigation. Testing was carried out to determine field saturated hydraulic conductivity values and estimated infiltration rates of the subsurface material. Permeameter testing results have been summarized in Paterson Report PH4282-LET.01 dated June 4, 2021.

2.4 Hydraulic Conductivity (Slug) Testing

Hydraulic conductivity (slug) testing was conducted at each monitoring well location during the current investigation. The testing was completed to assist in confirming anticipated groundwater flow rates at the subject site. The test data was analysed as per the method set out by Hvorslev (1951). Assumptions inherent in the Hvorslev method include a homogeneous and isotropic aquifer of infinite extent with zero-storage assumption, and a screen length significantly greater than the monitoring well diameter. The assumption regarding aquifer storage is considered to be appropriate for groundwater inflow through the overburden aquifers. The assumption regarding screen length and well diameter is considered to be met based on a screen length of 1.5 m and a diameter of 0.05 m.

While the idealized assumptions regarding aquifer extent, homogeneity, and isotropy are not strictly met in this case (or in any real-world situation), it has been our experience that the Hvorslev method produces effective point estimates of hydraulic conductivity in conditions similar to those encountered at the subject site.

The Hvorslev analysis is based on the line of best fit through the field data (hydraulic head recovery vs. time), plotted on a semi-logarithmic scale. In cases where the initial hydraulic head displacement is known with relative certainty, such as in this case where a physical slug has been introduced, the line of best fit is considered to pass through the origin. The semi-log drawdown vs. time plots for rising and falling head at each borehole location have been attached to the current report. The results of testing are further discussed in Sections 3.5.

3.0 Field Observations

3.1 Surface Conditions

The ground surface across the majority of the subject site is relatively with a gentle downward slope towards the northeast. The majority of the site is currently vacant and grass covered with a temporary structure located within the central portion of the site. An asphalt-paved access lane links the subject site to Dunrobin Road.

3.2 Subsurface Profile

Generally, the subsurface profile encountered at the test hole locations consists of a topsoil layer overlying a loose brown silty sand and/or hard to stiff brown silty clay crust, extending to an observed depth of about 5.2 m below ground surface. Fill material was identified underlying the topsoil in HA 1 and HA 2 and is comprised of a brown silty sand with crushed stone. All test holes were dry upon completion of the field investigations . However, It should be noted that groundwater levels can fluctuate seasonally and with precipitation events.

Based on available geological mapping, provided by Natural Resources Canada Urban Geology of the National Capital Region, the subject site is located in an area where the bedrock consists of dolostone of the Oxford formation with an estimated drift thickness of up to 10 m.

Reference should be made to the Soil Profile and Test Data sheets and Test Hole Location Plans attached to the current report for the details of the soil profiles encountered at each test hole location.

3.3 Grain Size Distribution

A total of one (1) grain size distribution analysis/hydrometer test was completed to classify the silty clay deposit according to the Unified Soil Classification System (USCS). The results are summarized in Table 1. The results of the hydrometer test have also been attached to the current report.

Table 1 - Summary of Grain Size Distribution Analysis

Test Hole	Sample	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
HA 4-23	G2	-	3.3	21.7	75.0

3.4 Permeameter Testing Results

A total of 6 in-situ permeameter tests were conducted within the brown silty clay deposit at 3 locations at the subject site during the previous investigation. Field saturated hydraulic conductivity values for the brown silty clay deposit ranged from $<5.3 \times 10^{-8}$ to 1.6×10^{-7} m/sec. The design infiltration rate of the silty clay deposit ranges from <8.0 to 10.8 mm/hr. Further details regarding the permeameter testing program and results have been summarized in Paterson Report PH4282-LET.01 dated June 4, 2021.

3.5 Hydraulic Conductivity Values

Hydraulic conductivity (slug testing) values were recorded at each monitoring well location. The results are presented in Table 2 below.

Table 2 - Summary of Hydraulic Conductivity Values

Test Hole ID	Ground Surface Elevation (m)	K (m/sec)	Test Type	Soil Type
BH 1-22	65.97	1.1×10^{-8}	Falling Head	Silty Clay
BH 2-22	65.54	7.6×10^{-8}	Falling Head	Silty Clay

Slug testing completed at the test hole locations screened in the silty clay deposit identified hydraulic conductivity values of the shallow overburden aquifer raging from approximately 1.1×10^{-8} to 7.6×10^{-8} m/sec. These values are generally consistent with similar material Paterson has encountered on other sites and typical published values for brown silty clay, which typically range from 1×10^{-9} to 1×10^{-7} m/sec.

4.0 Groundwater Monitoring Program

On June 14, 2022, each monitoring well was equipped with a Van Essen Instrument Mini-Diver Water Level Logger to monitor seasonal fluctuations in the groundwater levels within the proposed development. In addition, a Van Essen Instruments Baro-Diver was installed in borehole BH 2-22 to monitor changes in atmospheric pressure. The Mini-Divers have been programmed to continuously measure and record groundwater levels within the development at a rate of 1 reading every 24 hours for a maximum 12 month period.

The continuous groundwater level readings at each of the monitoring well locations have been presented in Figure 1 and Figure 2 attached to the current report.

4.1 Groundwater Monitoring Results

The data presented in Figure 1 and Figure 2 illustrate the collected groundwater elevations between June 14, 2022 and June 20, 2023. The groundwater readings measured within the monitoring wells across the subject area varied from an elevation of 62.2 m asl to a maximum elevation of 65.5 m asl. However, it should be noted that a significant response in the measured groundwater level at the monitoring well locations generally occurred immediately following a substantial rain event. Extreme groundwater fluctuations noted during this monitoring period is inconsistent with the low hydraulic properties of a silty clay, and is not representative of the high groundwater table. This may be further supported by Paterson's field observation following the completion of HA 1-23. Groundwater was not encountered in HA 1-23 at the time of the field investigation (April 20, 2023), as a dry silty clay was noted to extended to an elevation of 63.7 m asl. Contrary to our field observations, groundwater level measurements at the monitoring wells at this time were recorded between 64.7 and 64.8 m asl. This discrepancy in groundwater level is indicative of a surficial connection to the monitoring well screen. As such, a conservative groundwater table at each monitoring well has been inferred based on the monitoring results and field observations. The inferred groundwater level has been conservatively estimated to vary from an elevation of 62.2 m asl to a maximum elevation of approximately 64.4 m asl during the monitoring period.

Based on the Hydrology and Stormwater Management Assessment Memo prepared by Aquafor Beech Limited (Ref. No. 67067, dated August 2022), it is understood the invert of the permeable parking lot will be located within the silty clay deposit and extend to maximum elevation of approximately 65.5 m asl. The proposed shallow dry pond located within the southern portion of the subject site consists of invert elevation of 65.7 m asl. Based on the separation between the inferred high groundwater table and proposed invert of the LID facility, a groundwater mounding analysis has been completed for the subject site and discussed in Section 5.0 below.

5.0 Mounding Analysis

For the purpose of this review, a representative mounding analysis was carried out on the anticipated runoff volumes generated by the parking lot and dry pond for the 2 through 100-year design storm. Runoff volumes for the above noted design storms have been provided by Aquafor Beech Limited in support of their stormwater management design. The analysis was completed based on available details related to the proposed LID system and subsurface conditions across the subject site. LID details provided by Aquafor Beech Limited and other modelling parameters are summarized in Table 3 below. The modelling was completed with the use of MOUNDSOLV 4 from HydroSOLVE, Inc.

Hydraulic conductivity testing (slug testing) completed by Paterson as part of the field investigation found that the silty clay had a hydraulic conductivity ranging from 1.1×10^{-8} to 7.6×10^{-8} m/sec. The specific yield of the aquifer was selected based representative values provided by Morris and Johnson (1967) for a given material, and the grain size distribution analysis/hydrometer results of the silty clay.

Table 3 - Parameters for Analysis	
Hydraulic Conductivity of Aquifer (m/sec)	1.1×10^{-8}
LID Dimensions (m^2)	1,476 (Parking Lot; 40 (Dry Pond)
Thickness of Aquifer (m)	10
Specific Yield of Aquifer	0.1

Based on the above noted parameters and the anticipated runoff volumes for the 2 through 100-year design storm, the mounding analysis for the parking lot and dry pond varies from 0.6 to 1.5 m and 1.5 to 2.8 m, respectively. The mounding analysis for the 2 through 100-year design storm for the parking lot and dry pond have been summarized in Table 4 and Table 5 below. The mounding analysis for the estimated high groundwater table separation has also been summarized in Table 6.

Table 4 - Parking Lot Mounding Summary		
Design Storm Event (Years)	**Parking Lot Runoff Volume (m^3)**	**Groundwater Mounding Height (m)**
2	89	0.6
5	116	0.8
10	136	0.9
25	164	1.1
50	189	1.3
100	215	1.5

Table 5 - Dry Pond Mounding Summary		
Design Storm Event (Years)	**Dry Pond Runoff Volume (m^3)**	**Groundwater Mounding Height (m)**
2	6	1.5
5	8	2
10	9	2.2
25	11	2.8
50	13	3.2
100	14	3.5

Table 6 - Mounding Summary of High Groundwater Separation (1.1m)		
Location	**Runoff Volume (m^3)**	**Groundwater Mounding Height (m)**
Parking Lot	164	1.1
Dry Pond	4.4	1.1

Based on the proposed stormwater management design and the inferred high groundwater separation of approximately 1.1 m, runoff in excess of approximately 164 m^3 (parking lot) and 4 m^3 (dry pond), will be pumped to the two (2) available outlets; front ditch at the maximum permissible discharge rate, and to the back towards the evapotranspiration area via the control manhole. Reference should be made to stormwater management design prepared by Aquafor Beech Limited regarding specific details and functionality of their design.

6.0 Geotechnical Review

From a geotechnical perspective, the subject site is suitable for the proposed gravel parking lot. Topsoil and fill containing organic or deleterious materials should be stripped within the footprint of the proposed parking lot. It is anticipated that the existing fill, free of deleterious and significant amounts of organics can be left in place. With the removal of all topsoil and deleterious fill, the existing undisturbed fill, silty sand and silty clay will be considered acceptable subgrades on which to construct the permeable parking lot. The gravel fill material should be placed in maximum 300 mm thick loose lifts and compacted to at least 98% of the materials standard Proctor maximum dry density.

7.0 Statement of Limitations

The recommendations provided in the report are in accordance with Paterson's present understanding of the project and are preliminary in nature.

The field investigation is a limited sampling of the site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of the recommendations.

The recommendations provided should only be used by the design professionals associated with this project. The recommendations are not intended for contractors bidding on or constructing the project. The latter should evaluate the factual information provided in the report. The contractor should also determine the suitability and completeness for the intended construction schedule and methods. Additional testing may be required for the contractors purpose. The present report applies only to the project described in the report. The use of the report for purposes other than those described herein or by person(s) other than Omar Alnader or their agents are not authorized without review by Paterson.

We trust that his information satisfies your requirements.

Paterson Group Inc.

Nicholas Zulinski, P.Geo., géo.

Scott S. Dennis, P.Eng.

Attachments

- ❑ PH4282 - Soil Profile and Test Data
- ❑ Drawing PH4282-1 - Test Hole Location Plan
- ❑ Figure 1 and Figure 2 - Monitoring Well Water Elevations
- ❑ Hydraulic Conductivity (Slug) Testing
- ❑ Grain Size Distribution/Hydrometer Analysis
- ❑ Paterson Report PH4282-LET.01

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SOIL PROFILE AND TEST DATA

Subsurface Investigation
2742 Dunrobin Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY Hand Auger **DATE** April 20, 2023

FILE NO. PH4282

HOLE NO. HA 1-23

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
Ground Surface						0	66.04		
TOPSOIL		G	1						
0.34		G	2						
Very stiff, brown **SILTY CLAY**		G	3			1	65.04	182	
		G	4						
2.29						2	64.04		
End of Hand Auger Hole									
(HA dry upon completion)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

SOIL PROFILE AND TEST DATA

SUBSURFACE INVESTIGATION

2742 Dunrobin Road, Ottawa, Ontario

DATUM: Geodetic **EASTING:** **NORTHING:** **ELEVATION:** 65.43

PROJECT: Prop. Commercial Development

BORINGS BY: Hand Auger

REMARKS:

DATE: July 14, 2023

FILE NO. **PH4282**

HOLE NO. HA 2-23

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE No.	SAMPLE Type	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 25 50 75 100	Peak Shear Strength (kPa) 0 25 50 75 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 25 50 75 100	Piezometer Construction
Ground Surface EL 65.43 m											
TOPSOIL 0.1 m EL 65.33 m							0				
Brown SILTY CLAY 0.5 m EL 64.93 m		G1	[#]								
End of Hand Auger Hole							1				
(HA dry upon completion)							2				
							3				

SOIL PROFILE AND TEST DATA

SUBSURFACE INVESTIGATION

2742 Dunrobin Road, Ottawa, Ontario

DATUM: Geodetic **EASTING:** **NORTHING:** **ELEVATION:** 65.60

PROJECT: Prop. Commercial Development

BORINGS BY: Hand Auger

REMARKS:

DATE: July 14, 2023

FILE NO. **PH4282**

HOLE NO. HA 3-23

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE No.	SAMPLE Type	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 25 50 75 100	Peak Shear Strength (kPa) 0 25 50 75 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 25 50 75 100	Piezometer Construction
Ground Surface EL 65.6 m											
TOPSOIL 0.1 m EL 65.5 m							0				
Brown SILTY CLAY											
1.2 m EL 64.4 m		G1	[#]				1				
End of Hand Auger Hole											
(HA dry upon completion)							2				
							3				

SOIL PROFILE AND TEST DATA

SUBSURFACE INVESTIGATION

2742 Dunrobin Road, Ottawa, Ontario

DATUM: Geodetic **EASTING:** **NORTHING:** **ELEVATION:** 65.90

PROJECT: Prop. Commercial Development

BORINGS BY: Hand Auger

REMARKS:

DATE: July 14, 2023

FILE NO. **PH4282**

HOLE NO. HA 4-23

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE No.	SAMPLE Type	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 25 50 75 100	Peak Shear Strength (kPa) 0 25 50 75 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 25 50 75 100	Piezometer Construction
Ground Surface EL 65.9 m											
TOPSOIL 0.1 m EL 65.8 m							0				
SILTY SAND		G1	#								
0.95 m EL 64.95 m							1				
Brown SILTY CLAY		G2	#								
1.5 m EL 64.4 m							2				
End of Hand Auger Hole											
(HA dry upon completion)							3				

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SOIL PROFILE AND TEST DATA

Subsurface Investigation
2742 Dunrobin Road
Ottawa, Ontario

DATUM Geodetic

REMARKS

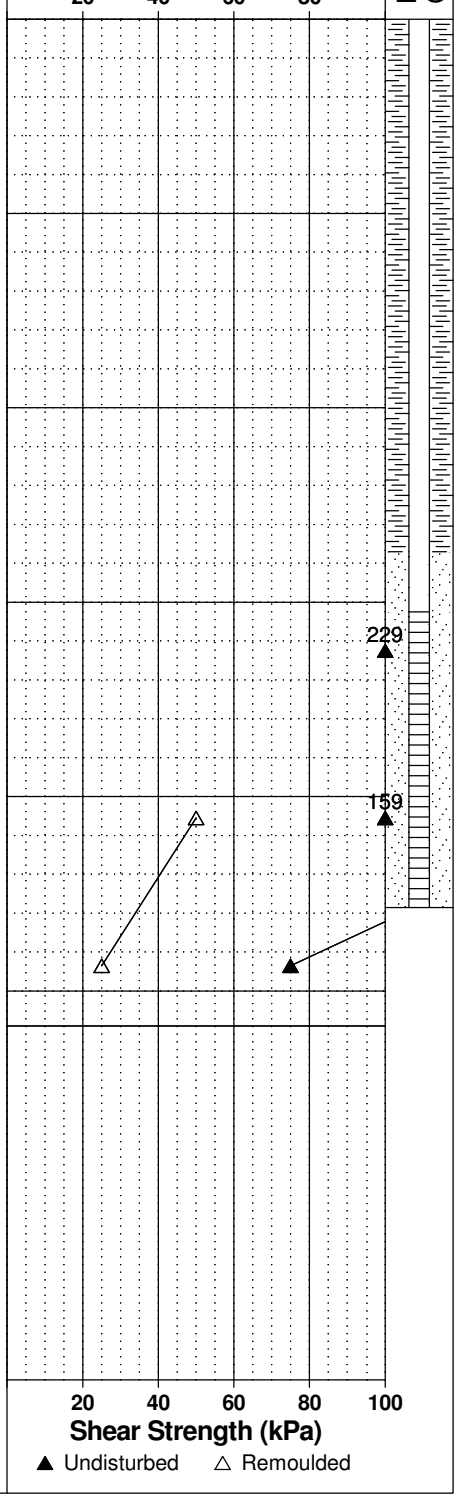
BORINGS BY Track-Mount Power Auger **DATE** 2022 June 13

FILE NO. PH4282

HOLE NO. BH 1-22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	65.97
TOPSOIL with organics 0.20		AU	1				
		SS	2	83	12	1	64.97
		SS	3	100	12	2	63.97
Hard to very stiff, brown **SILTY CLAY,** trace sand		SS	4	100	7		
		SS	5	67	P	3	62.97
		SS	6	100	P	4	61.97
- stiff by 4.5m depth		SS	7	100	P		
5.18						5	60.97
End of Borehole							
(Observed GWL at time of investigation - Dry)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**



Monitoring Well Construction

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SOIL PROFILE AND TEST DATA

Subsurface Investigation
2742 Dunrobin Road
Ottawa, Ontario

DATUM Geodetic

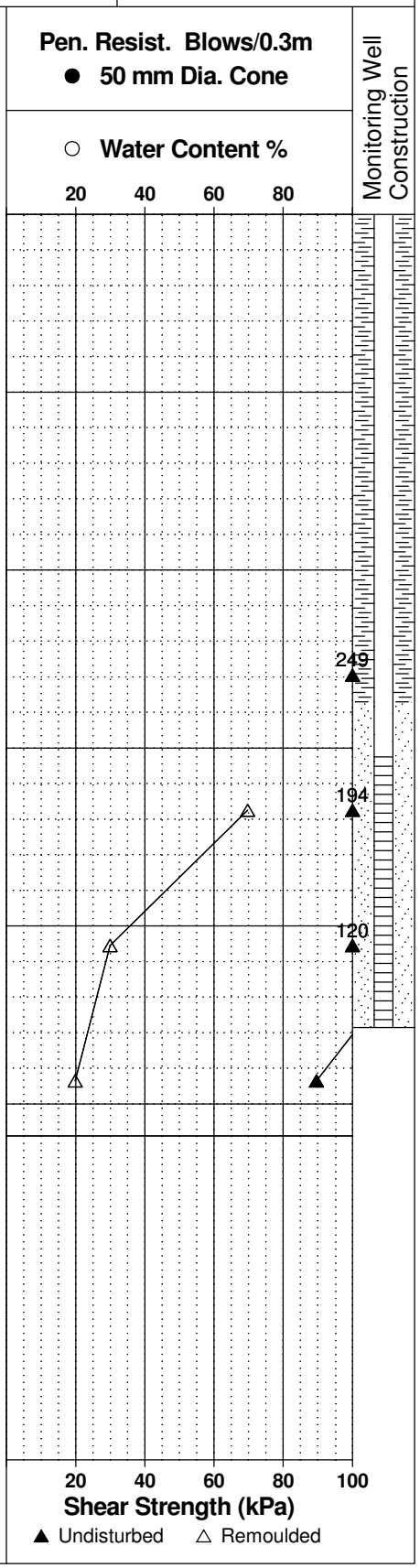
REMARKS

BORINGS BY Track-Mount Power Auger **DATE** 2022 June 13

FILE NO. PH4282

HOLE NO. BH 2-22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	65.54
TOPSOIL with organics 0.19							
Loose, brown **SILTY SAND** trace organics 0.43		AU	1				
		SS	2	83	8	1	64.54
		SS	3	100	9	2	63.54
Hard to very stiff, brown **SILTY CLAY,** trace sand		SS	4	100	P		
		SS	5	100	P	3	62.54
		SS	6	100	P	4	61.54
- stiff by 4.5m depth		SS	7	100	P		
5.18						5	60.54
End of Borehole							
(Observed GWL at time of investigation - Dry)							



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SOIL PROFILE AND TEST DATA

Proposed Commercial Development
2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

FILE NO. PH4282

HOLE NO. HA 1

BORINGS BY Hand Auger **DATE** May 21, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL 0.05									
FILL: Brown silty sand, trace crushed stone 0.20		G	1						
Stiff, brown **SILTY CLAY**		G	2						
0.90 End of Hand Auger Hole									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Proposed Commercial Development
2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Hand Auger **DATE** May 21, 2021

FILE NO. PH4282

HOLE NO. HA 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL 0.09									
FILL: Brown silty sand trace crushed stone 0.19		G	1						
Stiff, brown **SILTY CLAY**		G	2						
0.92 End of Hand Auger Hole									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Proposed Commercial Development
2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

FILE NO. PH4282

HOLE NO. HA 3

BORINGS BY Hand Auger **DATE** May 21, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL 0.18									
Stiff, brown **SILTY CLAY**		G	1						
		G	2						
0.93 End of Hand Auger Hole									

Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Proposed Commercial Development
2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Hand Auger **DATE** May 21, 2021

FILE NO. PH4282

HOLE NO. HA 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL		G	1						
0.22									
Loose, brown **SILTY SAND**		G	2						
		G	3						
0.93									
End of Hand Auger Hole									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Proposed Commercial Development
2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Hand Auger **DATE** May 21, 2021

FILE NO. PH4282

HOLE NO. HA 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL		G	1				
0.19							
Compact, brown **SILTY SAND** - trace clay by 0.45m depth		G	2				
0.50							
Stiff, brown **SILTY CLAY,** trace sand		G	3				
		G	4				
0.96							
End of Hand Auger Hole							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

Piezometer Construction

#2744 DUNROBIN ROAD

DUNROBIN ROAD

EXISTING WELL

PROPOSED OFFICE

WB

HA 3

HA 3-23
65.60

HA 4

BH 2-22
65.54

#2742 DUNROBIN ROAD
(PROPOSED GRAVEL PARKING LOT)

PROPOSED POND

BH 1-22
65.97

HA 2

HA 2-23
65.43

HA 4-23
65.90

HA 1-23
66.04

HA 1

HA 5

PROPOSED BERM

PROPOSED MANHOLE WITH PUMP

PROPOSED BASINS

PROPOSED LANDSCAPED

LEGEND:

- HAND AUGER HOLE LOCATION CURRENT INVESTIGATION (2023)
- BOREHOLE WITH MONITORING WELL LOCATION
- HAND AUGER HOLE LOCATION
- HAND AUGER HOLE WITH PERMEAMETER TESTING LOCATION

65.54 GROUND SURFACE ELEVATION (m)

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:400

0 5 10 15 20 25m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL
3.	ADDED HA 2-23 TO HA 4-23 AUGER HOLE LOCATION	01/09/2023	AS
2.	ADDED 2023 AUGER HOLE LOCATION	12/05/2023	ZB
1.	UPDATED SITE PLAN AND TEST HOLES	06/28/2022	NZ

OMAR ALNADER

GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
2742 DUNROBIN ROAD

OTTAWA, ONTARIO

Title:

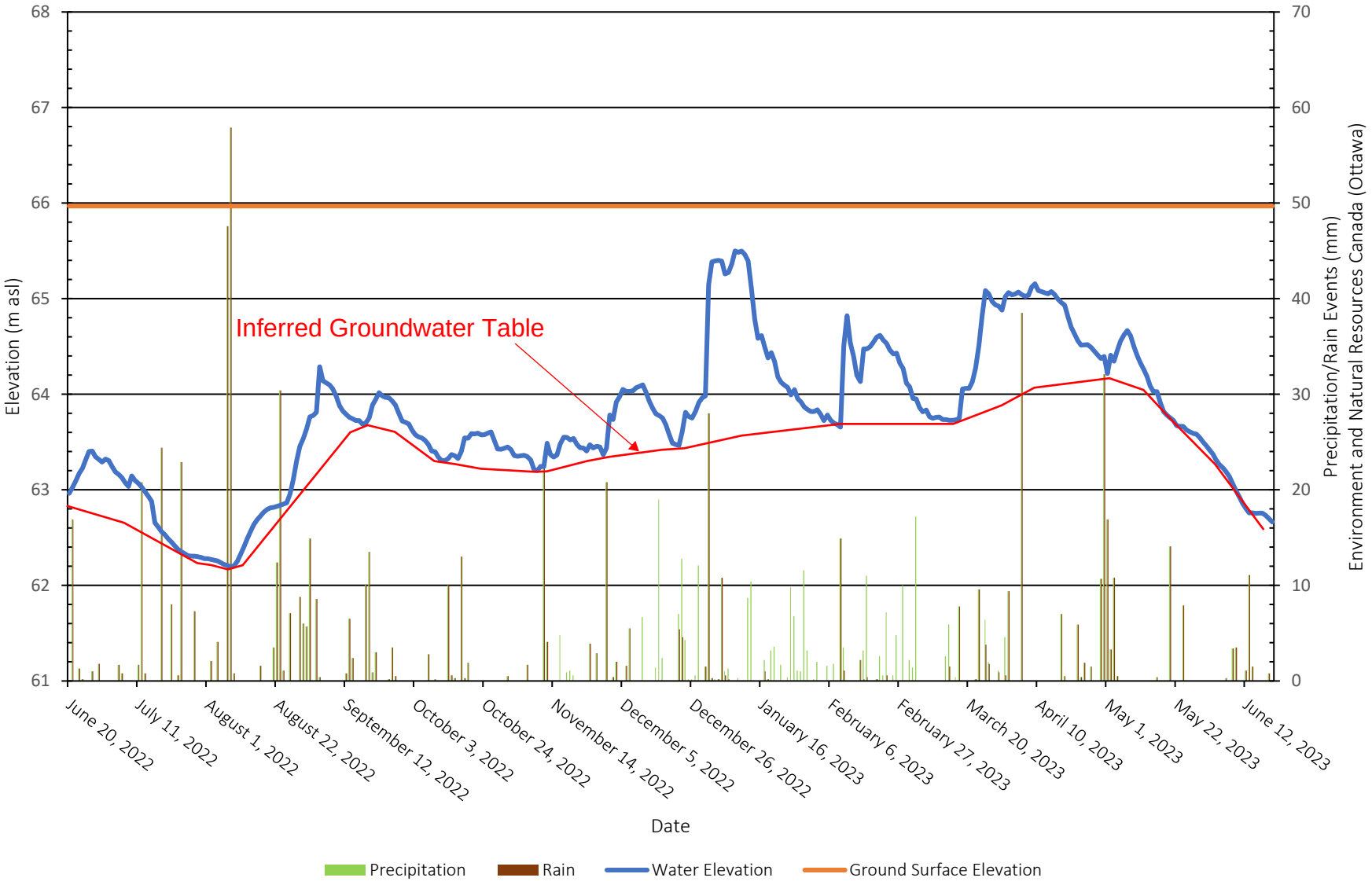
TEST HOLE LOCATION PLAN

Scale: 1:400	Date: 06/2022
Drawn by: GK	Report No.: PH4282-2
Checked by: EA	Dwg. No.: PH4282-1
Approved by: NZ	Revision No.: 3

p:\autocad drawings\hydrogeology\ph42xx\ph4282\ph4282_thlp (rev.02).dwg

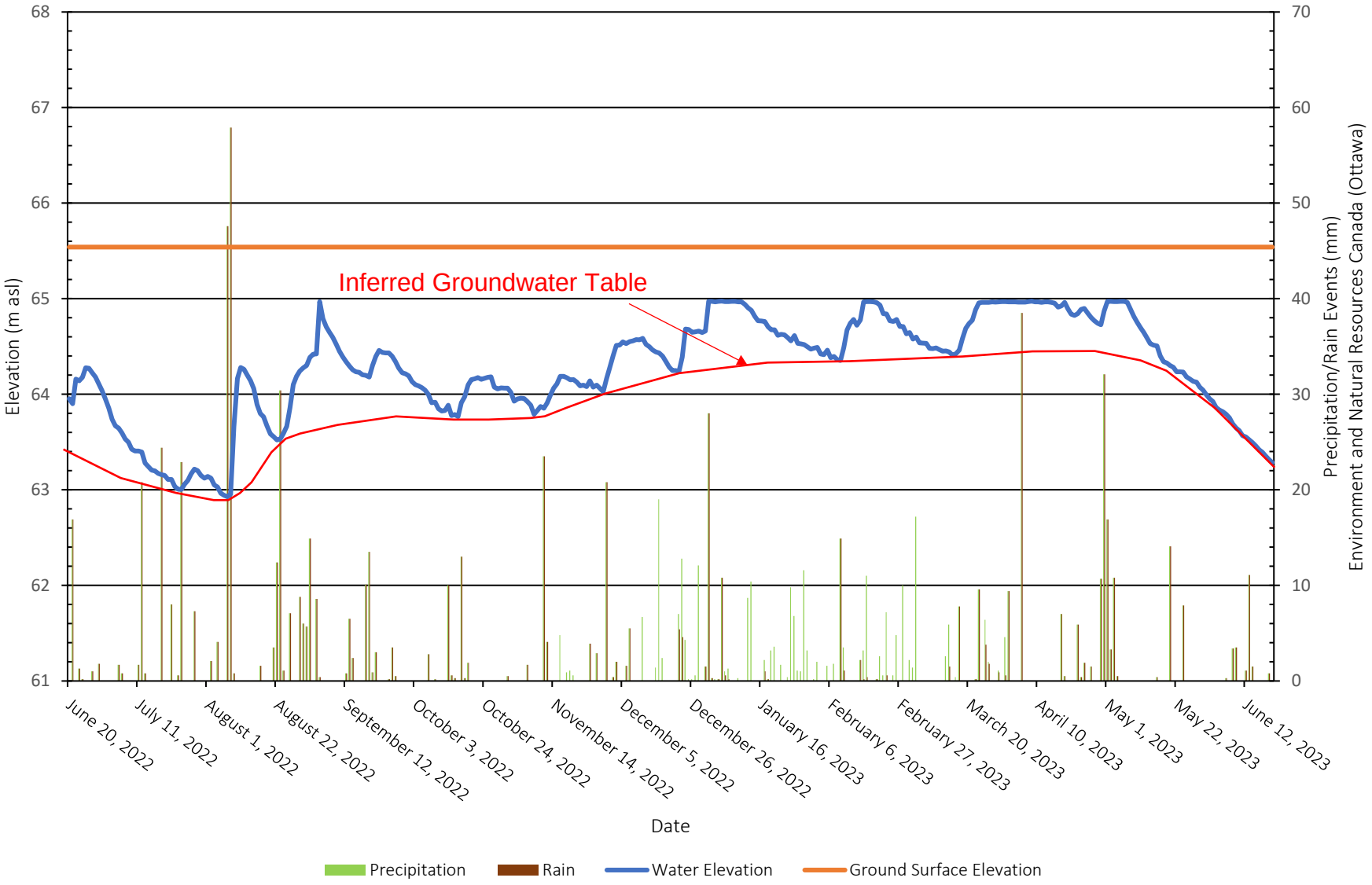
11x17

Figure 1: BH1-22 - Monitoring Well Water Elevations



PATERSON GROUP

Figure 2: BH2-22 - Monitoring Well Water Elevations

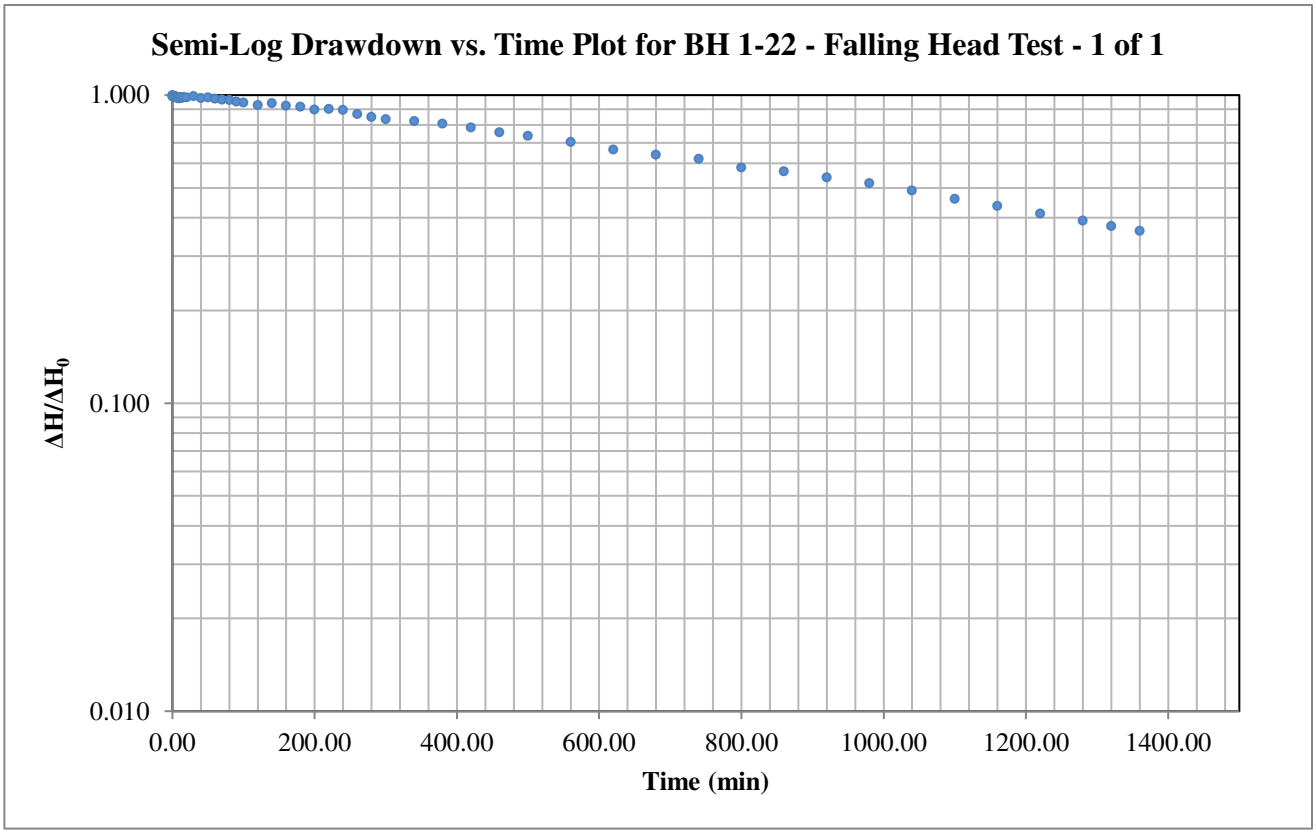


PATERSON GROUP

Report: PH4282-1

Hvorslev Hydraulic Conductivity Analysis

Project: Omar Alnader - 4742 DunRobin
Test Location: BH 1-22
Test: Falling Head - 1 of 1
Date: July 14, 2023



Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.31086

Well Parameters:

L	1.5	m	Saturated length of screen or open hole
D	0.0508	m	Diameter of well
r_c	0.0254	m	Radius of well

Data Points (from plot):

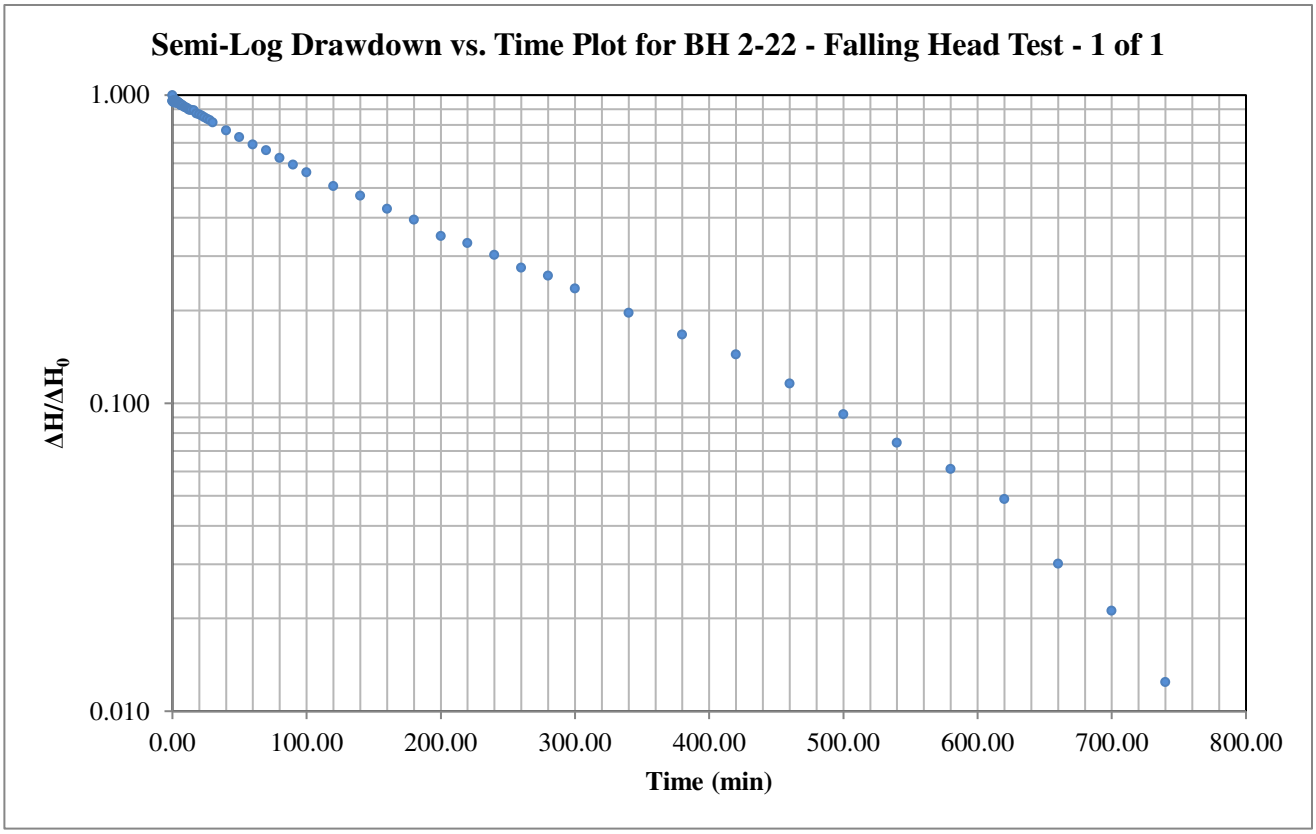
t*: 1347.399 minutes $\Delta H^*/\Delta H_0$: 0.37

Horizontal Hydraulic Conductivity
K = 1.08E-08 m/sec

Report: PH4282-1

Hvorslev Hydraulic Conductivity Analysis

Project: Omar Alnader - 4742 DunRobin
Test Location: BH 2-22
Test: Falling Head - 1 of 1
Date: July 14, 2023



Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.31086

Well Parameters:

L	1.5	m	Saturated length of screen or open hole
D	0.0508	m	Diameter of well
r_c	0.0254	m	Radius of well

Data Points (from plot):

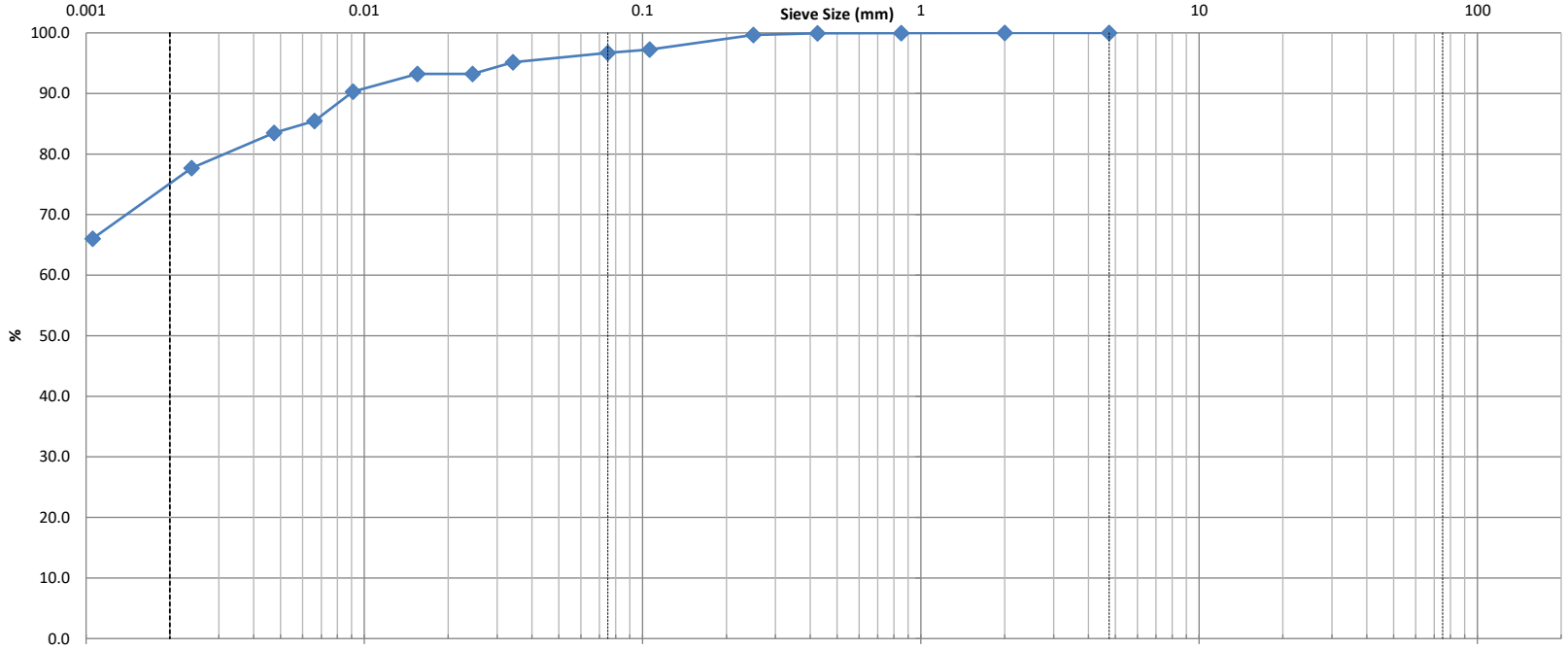
t*: 191.886 minutes $\Delta H^*/\Delta H_0$: 0.37

Horizontal Hydraulic Conductivity
K = 7.57E-08 m/sec

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Omar Alnader	DEPTH:	G2	FILE NO:	PH4282
CONTRACT NO.:		BH OR TP No.:	HA 4-23	LAB NO:	45045
PROJECT:	2742 Dunrobin Road			DATE RECEIVED:	17-Jul-23
				DATE TESTED:	18-Jul-23
DATE SAMPLED:	14-Jul-23			DATE REPORTED:	20-Jul-23
SAMPLED BY:	A.S			TESTED BY:	DK



Clay	Silt	Sand			Gravel		Cobble
		Fine	Medium	Coarse	Fine	Coarse	

Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
		37.8					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	3.3	21.7	75.0

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

HYDROMETER
LS-702 ASTM-422

CLIENT:	Omar Alnader	DEPTH:	G2	FILE NO.:	PH4282
PROJECT:	2742 Dunrobin Road	BH OR TP No.:	HA 4-23	DATE SAMPLEI	14-Jul-23
LAB No. :	45045	TESTED BY:	DK	DATE RECEIVE	17-Jul-23
SAMPLED BY:	A.S	DATE REPT'D:	20-Jul-23	DATE TESTED:	18-Jul-23

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
138.9	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	44.49	TARE WEIGHT	0.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	1.66	AIR DRY	156.10	156.10
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	138.90	138.90
		CORRECTED	0.890	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**138.9**		
0.850	**0.01**	0.0	**100.0**
0.425	**0.03**	0.1	**99.9**
0.250	**0.17**	0.3	**99.7**
0.106	**1.37**	2.7	**97.3**
0.075	**1.65**	3.3	**96.7**
Pan	**1.66**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	1:38	55.0	6.0	23.0	0.0342	95.2	**95.2**
2	1:39	54.0	6.0	23.0	0.0245	93.2	**93.2**
5	1:42	54.0	6.0	23.0	0.0155	93.2	**93.2**
15	1:52	52.5	6.0	23.0	0.0091	90.3	**90.3**
30	2:07	50.0	6.0	23.0	0.0066	85.4	**85.4**
60	2:37	49.0	6.0	23.0	0.0047	83.5	**83.5**
250	5:47	46.0	6.0	23.0	0.0024	77.7	**77.7**
1440	1:37	40.0	6.0	23.0	0.0011	66.0	**66.0**

Moisture = 37.8%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

patersongroup

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Geotechnical Engineering
Environmental Engineering
Hydrogeology
Geological Engineering
Materials Testing
Building Science
Noise and Vibration Studies

www.patersongroup.ca

June 4, 2021
File: PH4282-LET.01

Omar Alnader
314 Maxwell Bridge Road
Kanata, Ontario
K2W 0A5

Attention: **Omar Alnader**

Subject: **Permeameter Testing and Geotechnical Assessment**
Proposed Commercial Development
2742 Dunrobin Road - Ottawa

Dear Sir,

Further to your request, Paterson Group (Paterson) was commissioned to conduct a permeameter test investigation and geotechnical assessment for the proposed development to be located at 2742 Dunrobin Road in the City of Ottawa. The purpose of the current investigation is to provide design infiltration rates for the subsoils below the proposed infiltration system in support of the site servicing and water management brief completed by others. A geotechnical review and recommendations for the proposed gravel parking lot have been provided.

1.0 Proposed Development

Based on the available drawings, it is understood that the proposed commercial development will consist of a gravel-surfaced parking lot with a temporary structure and drainage ditch located within the southwest portion of the subject site. The proposed development will also include landscaped areas.

2.0 Field Investigation

Field Program

The field program conducted by Paterson for the current investigation was completed on May 21, 2021. At that time, 3 hand auger holes (HA 1 to HA 3) were excavated to an approximate depth of 0.2 m below ground surface (bgs) followed by permeameter testing over a depth of 0.3 to 0.7 m below the base of the excavation. Upon completion of the permeameter testing, HA 1 to HA 3 were extended to approximate depths of 0.9 m bgs for geotechnical purposes. Two (2) additional test holes (HA 4 and HA 5) were excavated to an approximate depth of 0.9 m bgs geotechnical purposes.

The test hole locations were selected by Paterson and distributed in a manner to provide general coverage of the proposed development. The test holes which received permeameter testing were selected to provide general coverage of the proposed drainage ditch, which is anticipated to be located within the central portion of the subject site. The test hole locations are presented on Drawing PH4282-1 - Test Hole Location Plan, attached to this report.

In-Situ Testing

Permeameter testing was conducted using a Pask (Constant Head Well) Permeameter. Test holes HA 1 through HA 3 were excavated to an approximate depth of 0.2 m bgs and an 83 mm diameter hole was excavated using a Riverside/Bucket auger to a depth of 0.1 and 0.5 m below the base of the excavation at each test hole location. All soil from the auger flights were visually inspected and initially classified on site. The permeameter reservoir was filled with water and inverted into the hole, ensuring it was relatively vertical and rests on the bottom of the hole. The water level of the reservoir was monitored at various intervals until the rate of fall of water in the permeameter reservoir reached equilibrium, known as *quasi "steady state"* flow rate. Quasi steady state flow can be considered to have been obtained after measuring 3 to 5 consecutive rate of fall readings with identical values. The values for the quasi steady state rate of fall were recorded for each location.

3.0 Field Observations

Surface Conditions

The ground surface across the majority of the subject site is relatively level. However, the ground surface at the southwestern limit of the subject site slopes gently upwards toward Dunrobin Road. The majority of the site is currently vacant and grass covered with a temporary structure located within the central portion of the site. An asphalt-paved access lane links the subject site to Dunrobin Road.

Subsurface Profile

Generally, the subsurface profile encountered at the test hole locations consists of a thin topsoil layer overlying either fill material or silty sand. The fill material was observed underlying the topsoil in hand auger holes HA 1 and HA 2 and consists of a brown silty sand with crushed stone.

A brown silty clay deposit was observed underlying the fill or the silty sand layer at approximate depths ranging from 0.2 to 0.5 m below the existing ground surface, at all hand auger locations with the exception of HA 4. Permeameter testing for HA 1 to HA 3 was carried out in the silty clay deposit. Reference should be made to the Soil Profile and Test Data sheets and Test Hole Location Plans attached to the current report for the details of the soil profiles encountered at each test hole location.

Based on available geological mapping, the subject site is located in an area where the bedrock consists of dolostone of the Oxford formation. The overburden drift thickness is estimated to range from 1 to 10 m within the subject site.

Groundwater

All hand auger holes were dry upon completion. Based on our field observations, the long-term groundwater table was not encountered at the test hole locations. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.

4.0 Discussion

4.1 Permeameter Results

A total of 6 constant head Pask permeameter tests were conducted at 3 locations within the proposed drainage ditch to determine the design infiltration rates of the underlying soils. Based on Site Grading Plan - Drawing SG-1 prepared by NorthTown Engineering Inc., it is understood the invert of the drainage ditch has been proposed to be approximately 0.3 m below existing ground surface. The permeameter test locations were selected by Paterson in a manner to provide general coverage of the proposed drainage ditch, taking into consideration site features. Preparation and testing of this investigation are in accordance with the Canadian Standards Association (CSA) B65-12 - Annex E. The field saturated hydraulic conductivity (K_{fs}) and estimated infiltration values for each test hole location are presented in Table 1.

Field saturated hydraulic conductivity values were determined using Engineering Technologies Canada (ETC) Ltd. reference tables provided in the most recent ETC Pask Permeameter User Guide dated March 2016. The field saturated hydraulic conductivity values were used to determine the design infiltration rates using the approximate relationship between infiltration rate and hydraulic conductivity, as described in the Draft LID Guidance Document, dated December 2019. It should be noted that a safety correction factor was applied for calculating design infiltration rates at each test hole location.

Table 1 - Field Saturated Hydraulic Conductivity and Infiltration Results

Test Hole ID	Invert of Permeameter Testing (m bgs)	Material	K_{fs} (m/sec)	Infiltration Rate (mm/hr)	Design Infiltration Rate (mm/hr)
HA 1	0.4	Brown Silty Clay	1.6×10^{-7}	28	<8.0
	0.7	Brown Silty Clay	$<5.3 \times 10^{-8}$	<22	
HA 2	0.3	Brown Silty Clay	$<5.3 \times 10^{-8}$	<22	<8.8
	0.6	Brown Silty Clay	1.1×10^{-7}	27	
HA 3	0.4	Brown Silty Clay	1.1×10^{-7}	27	10.8
	0.7	Brown Silty Clay	1.1×10^{-7}	27	

Based on Paterson's field investigation, the field saturated hydraulic conductivity values and design infiltration rates measured at the test hole locations are consistent with similar material Paterson has encountered on other sites with similar subsoil structures and typical values for brown silty clay material. Field saturated hydraulic conductivity values for the brown silty clay ranged from $<5.3 \times 10^{-8}$ to 1.6×10^{-7} m/sec. The design infiltration rate at the approximate invert of the proposed drainage ditch location ranges from <8.0 to 10.8 mm/hr. It is recommended that the proposed invert of the proposed drainage ditch is constructed a minimum 1 m above the long-term groundwater table and sound bedrock surface to promote infiltration.

4.2 Geotechnical Review

From a geotechnical perspective, the subject site is suitable for the proposed gravel parking lot. Topsoil and fill containing organic or deleterious materials should be stripped within the footprint of the proposed parking lot. It is anticipated that the existing fill, free of deleterious and significant amounts of organics can be left in place. With the removal of all topsoil and deleterious fill, the existing undisturbed fill, silty sand and silty clay will be considered an acceptable subgrade on which to construct the gravel parking lot. The gravel fill material should be placed in maximum 300 mm thick loose lifts and compacted to at least 98% of the materials standard Proctor maximum dry density.

5.0 Statement of Limitations

The recommendations provided in the report are in accordance with Paterson's present understanding of the project and are preliminary in nature.

The field investigation is a limited sampling of the site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of the recommendations.

The recommendations provided should only be used by the design professionals associated with this project. The recommendations are not intended for contractors bidding on or constructing the project. The latter should evaluate the factual information provided in the report. The contractor should also determine the suitability and completeness for the intended construction schedule and methods. Additional testing may be required for the contractors purpose. The present report applies only to the project described in the report. The use of the report for purposes other than those described herein or by person(s) other than Omar Alnader or their agents are not authorized without review by Paterson.

We trust that his information satisfies your requirements.

Paterson Group Inc.

Nicholas Zulinski, P.Geo., géo.

Scott S. Dennis, P.Eng.

Attachments

- ❑ PH4282-1 - Soil Profile and Test Data
- ❑ Drawing PH4282-1 - Test Hole Location Plan

Report Distribution

- ❑ Omar Alnader (1 copy)
- ❑ Paterson Group (1 copy)

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Proposed Commercial Development
2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

FILE NO. PH4282

HOLE NO. HA 1

BORINGS BY Hand Auger **DATE** May 21, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL 0.05									
FILL: Brown silty sand, trace crushed stone 0.20		G	1						
Stiff, brown **SILTY CLAY**		G	2						
0.90 End of Hand Auger Hole									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Proposed Commercial Development
2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Hand Auger **DATE** May 21, 2021

FILE NO. PH4282

HOLE NO. HA 2

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL 0.09									
FILL: Brown silty sand trace crushed stone 0.19		G	1						
Stiff, brown **SILTY CLAY**		G	2						
0.92 End of Hand Auger Hole									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Proposed Commercial Development
2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

FILE NO. PH4282

HOLE NO. HA 3

BORINGS BY Hand Auger **DATE** May 21, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL 0.18									
Stiff, brown **SILTY CLAY**		G	1						
		G	2						
0.93 End of Hand Auger Hole									

Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Proposed Commercial Development
2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Hand Auger **DATE** May 21, 2021

FILE NO. PH4282

HOLE NO. HA 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0			
TOPSOIL		G	1						
0.22									
Loose, brown **SILTY SAND**		G	2						
		G	3						
0.93									
End of Hand Auger Hole									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Proposed Commercial Development
2742 Dunrobin Road
Ottawa, Ontario

DATUM

REMARKS

BORINGS BY Hand Auger **DATE** May 21, 2021

FILE NO. PH4282

HOLE NO. HA 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	
TOPSOIL		G	1				
0.19							
Compact, brown **SILTY SAND** - trace clay by 0.45m depth		G	2				
0.50							
Stiff, brown **SILTY CLAY,** trace sand		G	3				
		G	4				
0.96							
End of Hand Auger Hole							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

Piezometer Construction

DUNROBIN ROAD

PROPERTY LINE

EXISTING WELL

EXISTING SWALE

GRASS YARD

LANDSCAPED BUFFER & MOUND

EXISTING DITCH

EXISTING CULVERT

TRAILER

WR

99.00
98.70

99.15
98.85

1

2

3

4

PARKING

1.9%

99.13
98.83

99.05
98.75

SNOW PILE

98.78
98.48

98.74
98.44

2.4%

2.9%

98.69
98.39

CAR SALES (112 STALLS)

PROPOSED GRAVEL LOT

99.07
98.77

2.5%

98.87
98.57

98.80
98.57

98.69
98.69

1.9%

98.92
98.92

VEHICLAR ACCESS

98.77
98.77

HA 1

HA 2

HA 3

HA 4

HA 5

0.5%

30m

5.0m

PROPOSED RIP-RAP WEIR

PROPOSED DRAINAGE DITCH SEE DETAILS

98.844

SIB BENCHMARK

3.5m X 3m SIGN

EXISTING ASPHALT PAVED ACCESS

PROPERTY LINE

LEGEND:

- HAND AUGER HOLE LOCATION
- HAND AUGER HOLE WITH PERMEAMETER TESTING LOCATION

DD/MM/YY	DESCRIPTION	REV.

Consultant:

patersongroup
consulting engineers

Client:

OMAR ALNADER

Project:

PROPOSED COMMERCIAL DEVELOPMENT

2742 DUNROBIN ROAD
OTTAWA, ONTARIO

Drawing:

PERMEAMETER TESTING LOCATION PLAN

Scale:	Reviewed by:
1:200	KP
Date:	Checked by:
06/2021	NZ

Drawing No.:

PH4282-1

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