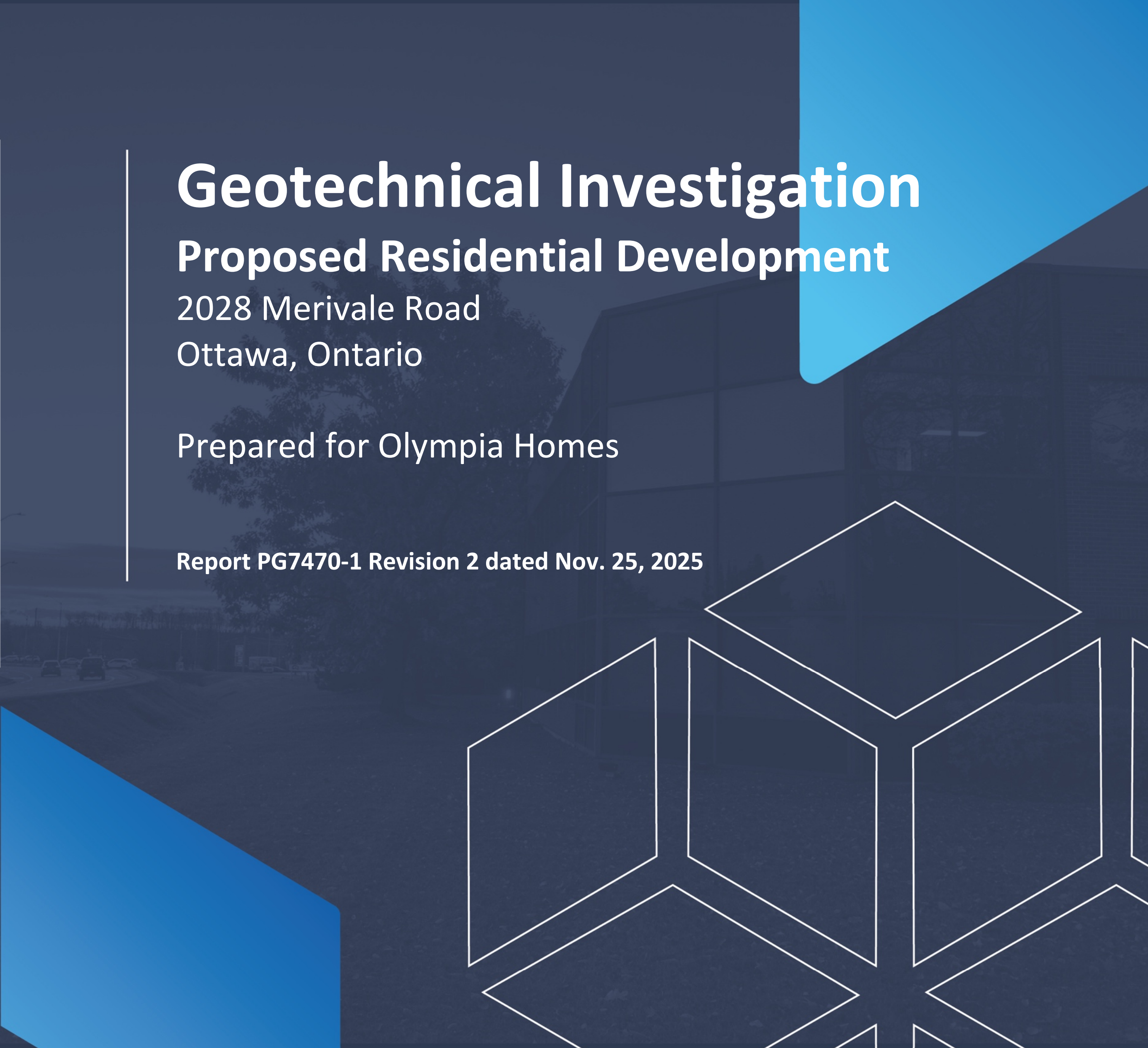

Geotechnical Investigation

Proposed Residential Development

2028 Merivale Road
Ottawa, Ontario

Prepared for Olympia Homes

Report PG7470-1 Revision 2 dated Nov. 25, 2025

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Olympia Homes to conduct a geotechnical investigation for the proposed residential development to be located at 2028 Merivale Road in the City of Ottawa (reference should be made to Figure 1 - Key Plan in Appendix 2 of this report for the general site location).

The objectives of the geotechnical investigation were to:

☐ Determine the subsoil and groundwater conditions at this site by means of boreholes and to;

☐ Provide geotechnical recommendations pertaining to the design of the proposed development including construction considerations which may affect the design.

This report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

2.0 Proposed Development

Based on the available site plan, it is understood that the proposed development will consist of 9 single-family residential dwellings, each with a basement level and attached garage. The proposed buildings will be surrounded by associated asphalt-paved driveways and access lanes with landscaped margins.

It is also expected that the proposed development will be municipally serviced.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current geotechnical investigation was carried out on March 17, 2025, and consisted of advancing 3 boreholes to a maximum depth of 6.7 m below existing ground surface. The borehole locations were distributed in a manner to provide general coverage of the subject site, taking into consideration underground utilities and site features.

The approximate borehole locations are shown on Drawing PG7470-1 – Test Hole Location Plan included in Appendix 2.

The boreholes were completed using a low clearance auger drill rig operated by a two-person crew. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The testing procedure consisted of augering to the required depths at the selected locations, and sampling the overburden.

Sampling and In Situ Testing

Soil samples were collected from the boreholes using two different techniques, namely, sampled directly from the auger flights (AU) or collected using a 50 mm diameter split spoon (SS) sampler. All samples were visually inspected and initially classified on-site, and then placed in sealed plastic bags.

All samples were transported to our laboratory for further examination and classification. The depths at which the auger and split spoon samples were recovered from the boreholes are shown as AU, and SS, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1.

The Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples. The SPT results are recorded as “N” values on the Soil Profile and Test Data sheets. The “N” value is the number of blows required to drive the split-spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Undrained shear strength testing was carried out at regular depth intervals in cohesive soils.

The subsurface conditions observed in the boreholes were recorded in detail in the field. The soil profiles are logged on the Soil Profile and Test Data Sheets in Appendix 1 of this report.

Groundwater

Groundwater monitoring wells were installed in all boreholes to permit monitoring of the groundwater levels subsequent to the completion of the sampling program. The groundwater level readings were obtained after a suitable stabilization period subsequent to the completion of the field investigation.

3.2 Field Survey

The borehole locations, and ground surface elevation at each borehole location, were surveyed by Paterson using a handheld GPS and referenced to a geodetic datum. The locations of the boreholes, and the ground surface elevation at each borehole location, are presented on Drawing PG7470-1 – Test Hole Location Plan in Appendix 2.

3.3 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 3 grain size distribution analysis, and 1 Atterberg limits test were completed on selected soil samples. The results are presented in Section 4.2 and on the Grain Size Distribution and Hydrometer Testing Results, Atterberg Limit Results and Shrinkage Test Results sheets presented in Appendix 1.

All samples will be stored in the laboratory for a period of 1 month after issuance of this report. They will then be discarded unless we are directed otherwise.

3.4 Analytical Testing

One (1) soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was submitted to determine the concentration of sulphate and chloride, the resistivity, and the pH of the sample. The results are presented in Appendix 1 and are discussed further in Section 6.7.

4.0 Observations

4.1 Surface Conditions

The subject site is currently vacant, with its surface covered in shredded wood particles, roots, and concrete debris as a result of recent tree clearance and demolition activities. Previously a large residential dwelling was located in the central part of the site. The site is enclosed by a fence along the property boundaries.

The site is bordered to the north by Cassone Court, to the south and west by residential properties, and to the east by Merivale Road. The ground surface across the subject site is relatively flat at approximate geodetic elevation 93 to 94 m.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile at the borehole locations consists of fill underlain by silty clay to clayey silt followed by a deposit of silty sand to sandy silt. The fill was generally observed to consist of brown silty sand with varying amounts of gravel, clay, topsoil and organics extending to approximate depths of 0.9 to 2.2 m.

A deposit of very stiff to stiff, brown silty clay was encountered underlying the fill material, extending to depths ranging from 3.7 to 4.4 m below the existing ground elevation.

The silty clay layer was underlain by a deposit of compact to dense, brown silty sand to sandy silt, which became grey in colour at approximate depths ranging from 4.4 m to 5.9 m below the existing ground surface.

Reference should be made to the Soil Profile and Test Data sheets in Appendix 1, for the details of the soil profile encountered at each borehole hole location.

Bedrock

Based on available geological mapping, bedrock in the area of the subject site consists of interbedded Sandstone and Dolomite of the March Formation with an overburden drift thickness of about 10 to 15 m in depth.

Laboratory Testing

Atterberg limits testing, as well as associated moisture content testing, was completed on a select silty clay sample. The result of the Atterberg limits test is presented in Table 1 and on the Atterberg limits Results sheet in Appendix 1. The results of the moisture content testing are presented on the Soil Profile and Test Data Sheet in Appendix 1. The tested silty clay sample classifies as inorganic clay of high plasticity (CH) in accordance with the Unified Soil Classification System.

Table 1 - Atterberg Limits Results

Sample	Depth (m)	LL (%)	PL (%)	PI (%)	w (%)	Classification
BH 2-25	2.6	57	23	34	23.4	CH

Notes: LL: Liquid Limit; PL: Plastic Limit; PI: Plasticity Index; w: water content;
CH: Inorganic Clay of High Plasticity

Grain size distribution analyses were also completed on 3 select samples. The results of the grain size distribution analyses are presented in Table 2 below and on the Grain Size Distribution sheet in Appendix 1.

Table 2 – Grain Size Distribution Results

Sample	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH 1-25	0.85	0.0	0.7	42.3	57
BH 2-25	2.57	0.0	1.3	39.2	59.5
BH 3-25	3.35	0.0	2.6	38.4	59

4.3 Groundwater

Groundwater levels were measured within the Monitoring wells at the time of the investigation. The measured groundwater levels noted at that time are presented in Table 3 on next page, and are also presented on the Soil Profile and Test Data sheets in Appendix 1.

Table 3 – Summary of Groundwater Levels

Borehole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Dated Recorded
		Depth (m)	Elevation (m)	
BH 1-25 *	92.97	1.55	91.42	March 21, 2025
BH 2-25 *	93.63	2.41	91.22	
BH 3-25 *	93.85	2.04	91.81	
BH 3A-25 *	93.88	0.99	92.89	

Note: Ground surface elevations at borehole location are referenced to a geodetic datum.
***-** Denotes Monitoring well

Long-term groundwater levels can also be estimated based on the observed colour and consistency of the recovered soil samples. Based on these observations, the long-term groundwater table can be expected at approximately 2 to 3 m below ground surface.

However, it should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is considered suitable for the proposed development. It is recommended that the proposed structures be founded on conventional spread footings placed on the undisturbed, very stiff to stiff silty clay or compact to dense silty sand.

Where fill is encountered at the underside of footing elevation, it should be sub-excavated to the surface of the undisturbed, very stiff to stiff silty clay or compact to dense silty sand, and replaced with engineered fill up to the proposed founding elevation. The lateral limits of the engineered fill placement should be in accordance with our lateral support recommendations provided herein.

Due to the presence of a silty clay deposit at the site, the proposed development will be subject to grade raise restrictions. Our permissible grade raise recommendations are discussed in Section 5.3.

The above and other considerations are discussed in the following sections.

5.2 Grading and Preparation

Stripping Depth

Topsoil, debris and other fill, such as those containing organic or deleterious materials, should be stripped from under any buildings and other settlement sensitive structures.

Existing foundation walls and other construction debris should be entirely removed from within the footprints of the proposed buildings and paved areas.

Fill Placement

Fill used for grading beneath the building areas should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site. The fill should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the proposed building areas should be compacted to at least 98% of its standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil can be used as general landscaping fill and beneath exterior parking areas where settlement of the ground surface is of minor concern.

In landscaped areas, these materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If these materials are to be used to build up the subgrade level for areas to be paved, they should be compacted in thin lifts to a minimum density of 95% of their respective SPMDD.

5.3 Foundation Design

Bearing Resistance Values

Strip footings, up to 3 m wide, and pad footings, up to 5 m wide, founded on the undisturbed, very stiff to stiff silty clay or compact to dense silty sand, or on engineered fill placed over these strata, can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa**. A geotechnical resistance factor of 0.5 was applied to the above-noted bearing resistance value at ULS.

An undisturbed soil bearing surface consists of one from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, have been removed prior to the placement of concrete for footings.

Footings placed on an undisturbed, approved bearing surface and designed using the bearing resistance values at SLS, provided above, will be subjected to post-construction total and differential settlements of 25 and 20 mm, respectively.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Above the groundwater level, adequate lateral support is provided to the in-situ bearing medium soils when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in-situ soil.

Permissible Grade Raise Recommendations

Due to the presence of the silty clay deposit at the site, a permissible grade raise restriction of **2 m** is recommended for grading at the subject site.

If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill, and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.

5.4 Design for Earthquakes

The seismic site designation can be taken as **Class XD** for the foundations considered at this site. Soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the Ontario Building Code (OBC) 2024 for a full discussion of the earthquake design requirements.

5.5 Basement Slab

With the removal of all topsoil and deleterious fill from within the footprint of the proposed buildings, the native soil surface or approved fill subgrade will be considered an acceptable subgrade on which to commence backfilling for floor slab construction.

Any soft areas should be removed and backfilled with appropriate backfill material prior to placing any fill. OPSS Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. It is recommended that the upper 200 mm of sub-floor fill consists of 19 mm clear crushed stone. All backfill materials within the footprint of the proposed building should be placed in a maximum of 300 mm thick loose layers and compacted to at least 98% of the SPMDD.

5.6 Pavement Design

For design purposes, the pavement structures presented in Tables 4 and 5, given below, are recommended for the design of the driveways, and car parking areas.

Table 4 - Recommended Pavement Structure – Driveways & Car Only parking Areas

Thickness (mm)	Material Description
50	**Wear Course** – HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for the driveways and car-only parking areas.

Table 5 – Recommended Pavement Structure – Local Roadways and Access Lanes

Thickness (mm)	Material Description
40	**Wear Course** - Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE – Either existing fill, in-situ soil, or OPSS Granular B Type I or II material placed over in-situ soil or fill.	

Minimum Performance Graded (PG) 64-34 asphalt cement should be used for paving along local roadways, such as Cassone Court.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the material's SPMDD using suitable vibratory equipment.

5.7 Retaining Wall Design

It is recommended that proposed retaining walls at the subject site consist of segmental concrete blocks. Retaining walls over 1 m in height shall be designed by a structural and geotechnical engineer registered in the Province of Ontario.

Existing retaining walls will be removed in maximum 3 m wide sections and backfilled sequentially in order to mitigate impacts to the neighbouring properties. New retaining walls will also be constructed and backfilled in sections in order to mitigate impacts to the neighbouring properties.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

A perimeter foundation drainage system is recommended for each proposed structure. The system should consist of a 150 mm diameter, geotextile-wrapped, perforated and corrugated plastic pipe surrounded on all sides by 150 mm of 19 mm clear crushed stone which is placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Backfill against the exterior sides of the foundation walls should consist of free-draining non frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a drainage geocomposite, such as Delta Drain 6000, connected to the perimeter foundation drainage system. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should otherwise be used for this purpose.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are recommended to be insulated against the deleterious effects of frost action. A minimum 1.5 m thick soil cover, or an equivalent combination of soil cover and foundation insulation, should be provided in this regard.

Exterior unheated footings, such as isolated piers, are more prone to deleterious movement associated with frost action than the exterior walls of the structure, and require additional protection, such as soil cover of 2.1 m, or an equivalent combination of soil cover and foundation insulation.

It is recommended that Paterson review the proposed frost protection for each structure at the time of detailed design.

6.3 Excavation Side Slopes

The temporary excavation side slopes anticipated should either be excavated to acceptable slopes or retained by shoring systems from the beginning of the excavation until the structure is backfilled. It is expected that sufficient room will be available for the greater part of the excavation to be undertake by open-cut methods (i.e. unsupported excavations).

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. The subsurface soil is considered to be mainly a Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should maintain safe working distance from the excavation sides.
Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by “cut and cover” methods and excavations will not be left open for extended periods of time.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent material specifications and standard detail drawings from the department of public works and services, infrastructure services branch of the City of Ottawa.

A minimum of 150 mm of OPSS Granular A should be placed for bedding for sewer or water pipes when placed on a soil subgrade. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to a minimum of 300 mm above the obvert of the pipe, should consist of OPSS Granular A (concrete or PSM PVC pipes) or sand (concrete pipe). The bedding and cover materials should be placed in maximum 300 mm thick lifts and compacted to 98% of the SPMDD.

It should generally be possible to re-use the moist (not wet) site-generated fill above the cover material if the excavation and filling operations are carried out in dry weather conditions.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material’s SPMDD. All cobbles larger than 200 mm in their longest direction should be segregated from re-use as trench backfill.

6.5 Groundwater Control

It is anticipated that groundwater infiltration into the excavations should be low to moderate and controllable using open sumps. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

Groundwater Control for Building Construction

A temporary Ministry of Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required if more than 400,000 L/day of ground and/or surface water are to be pumped during the construction phase. At least 4 to 5 months should be allowed for completion of the application and issuance of the permit by the MECP.

For typical ground or surface water volumes being pumped during the construction phase, typically between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration.

Impacts to Neighbouring Properties

Due to the depth of the groundwater level encountered at the subject site and the anticipated depth of excavation, significant dewatering is not anticipated during or following construction.

Therefore, it should be noted that no issues are expected that would cause long term adverse effects to adjacent structures in the vicinity of the proposed buildings.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost in the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions. Additional information could be provided, if required.

6.7 Corrosion Potential and Sulphate

The results of analytical testing show that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (GU – General Use cement) would be appropriate for this site. The chloride content and pH of the sample indicate that they are not a significant factor in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of a mild to slightly aggressive corrosive environment.

6.8 Landscaping Considerations

In accordance with the City of Ottawa Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines), Paterson completed a soils review of the site to determine applicable tree planting setbacks. Atterberg limits testing was completed for a recovered silty clay sample from the subject site. The soil sample was recovered from an elevation below the anticipated design underside of footing elevation and approximately 3.5 m depth below anticipated finished grade. The results of our testing are presented in Table 1 in Section 4.2 and in Appendix 1.

Based on the results of the Atterberg limit testing mentioned above, the plasticity index was found to be less than 40% in the tested silty clay sample.

The following tree planting setbacks are therefore recommended for the low to moderate sensitivity silty clay deposit throughout the subject site.

Large trees (mature height over 14 m) can be planted within these areas provided that a tree to foundation setback equal to the full mature height of the tree can be provided. Tree planting setback limits are **4.5 m** for small (mature tree height up to 7.5 m) and medium size trees (mature tree height 7.5 m to 14 m) provided that the conditions noted below are met.

- ☐ The underside of footing (USF) is 2.1 m or greater below the lowest finished grade for footings within 10 m from the tree, as measured from the center of the tree trunk and verified by means of the Grading Plan.

☐ A small tree must be provided with a minimum of 25 m^3 of available soils volume while a medium tree must be provided with a minimum of 30 m^3 of available soil volume, as determined by the Landscape Architect. The developer is to ensure that the soil is generally un-compacted when backfilling in street tree planting locations.

☐ The tree species must be small (mature tree height up to 7.5 m) to medium size (mature tree height 7.5 m to 14 m) as confirmed by the Landscape Architect.

☐ The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall).

☐ Grading surrounding the tree must promote drainage to the tree root zone (in such a manner as not to be detrimental to the tree), as noted on the Grading Plan.

It is well documented in the literature, and is our experience, that fast-growing trees located near buildings founded on cohesive soils that shrink on drying can result in long-term differential settlements of the structures. Tree varieties that have the most pronounced effect on foundations are seen to consist of poplars, willows and some maples (i.e. Manitoba Maples) and, as such, they should not be considered in the landscaping design.

7.0 Recommendations

A materials testing and observation services program is a requirement for the provided foundation design data to be applicable. The following aspects of the program should be performed by the geotechnical consultant:

☐ Review of the Grading Plan, from a geotechnical perspective.

☐ Observation of all bearing surfaces prior to the placement of concrete.

☐ Sampling and testing of the concrete and fill materials used.

☐ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.

☐ Observation of all subgrades prior to backfilling.

☐ Field density tests to determine the level of compaction achieved.

☐ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

All excess soil must be handled as per ***Ontario Regulation 406/19: On-Site and Excess Soil Management*****.**

8.0 Statement of Limitations

The recommendations provided are in accordance with the present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a 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 our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine the suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Olympia Homes, or their agents, is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

Paterson Group Inc.

Deepak k Rajendran, E.I.T.

LICENSED PROFESSIONAL ENGINEER
Nov. 25, 2025
S. S. DENNIS
100519516
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PROVINCE OF ONTARIO

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Scott S. Dennis, P.Eng.

Report Distribution:

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APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ATTERBERG LIMITS RESULTS

GRAIN SIZE ANALYSIS RESULTS

ANALYTICAL TESTING RESULTS

PATERSON GROUP

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2028 Merivale Road, Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 366105.99 **NORTHING:** 5020437.28 **ELEVATION:** 92.97

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

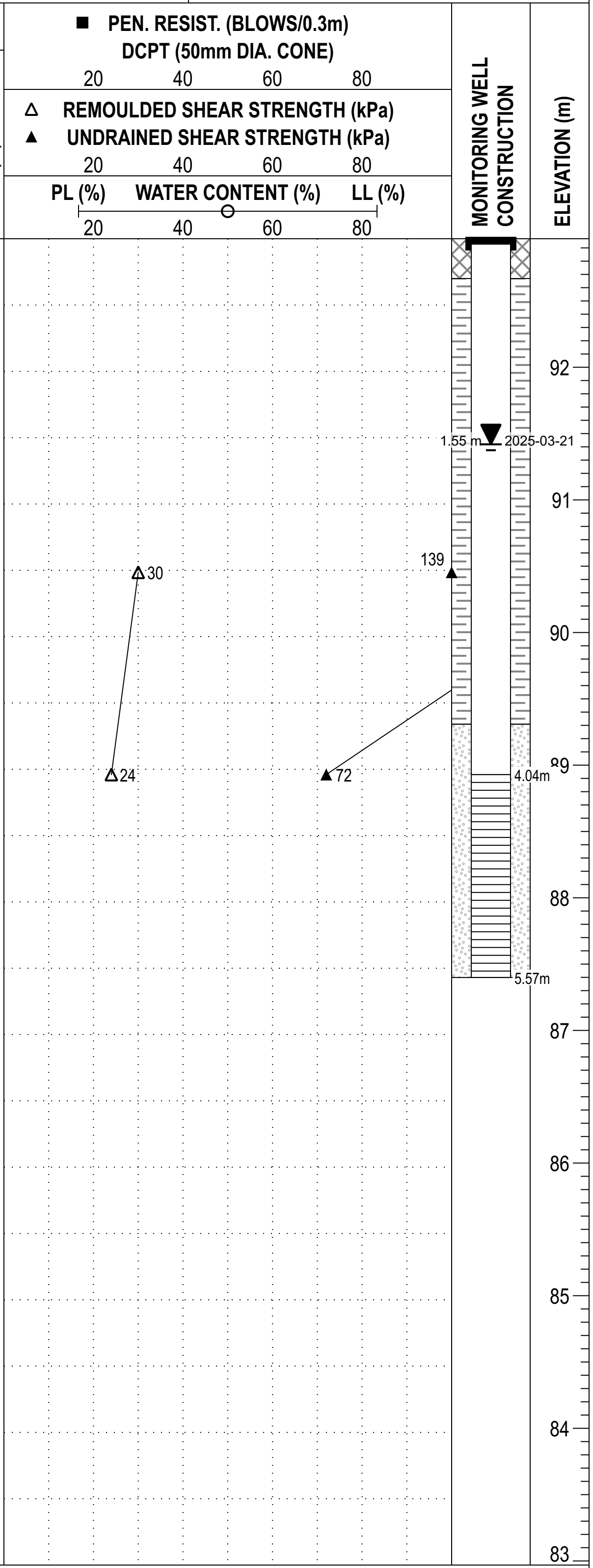
REMARKS:

DATE: March 17, 2025

FILE NO. : PG7470

HOLE NO. : BH1-25

SAMPLE DESCRIPTION	DEPTH (m)	TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
GROUND SURFACE					
FILL: Loose, brown silty sand with gravel, trace topsoil 0.05m [92.92m]		AU 1			
FILL: Loose, brown silty fine sand 0.91m [92.06m]					
Compact, brown **SILTY CLAY** to **SILTY SAND**, trace clay 1.45m [91.52m]	1	SS 2	100	4-5-5-5 10	
Very stiff, brown **SILTY CLAY**	2	SS 3	100	2-3-4-4 7	
		SS 4	100	P	
- Stiff, with orange brown sand seam by 3.0 m depth	3	SS 5	100	1-2-3-4 5	
4.42m [88.55m]	4				
Compact, grey **SILTY SAND** to **SANDY SILT**	5	SS 6	42	4-7-8-6 15	
	6	SS 7	42	4-7-7-7 14	
6.71m [86.26m]		SS 8	50	2-3-6-6 9	
End of Borehole (GWL at 1.55 m depth - March 21, 2025)	7				
	8				
	9				
	10				



DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

PATERSON GROUP

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2028 Merivale Road, Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 366175.38 **NORTHING:** 5020470.89 **ELEVATION:** 93.63

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: March 17, 2025

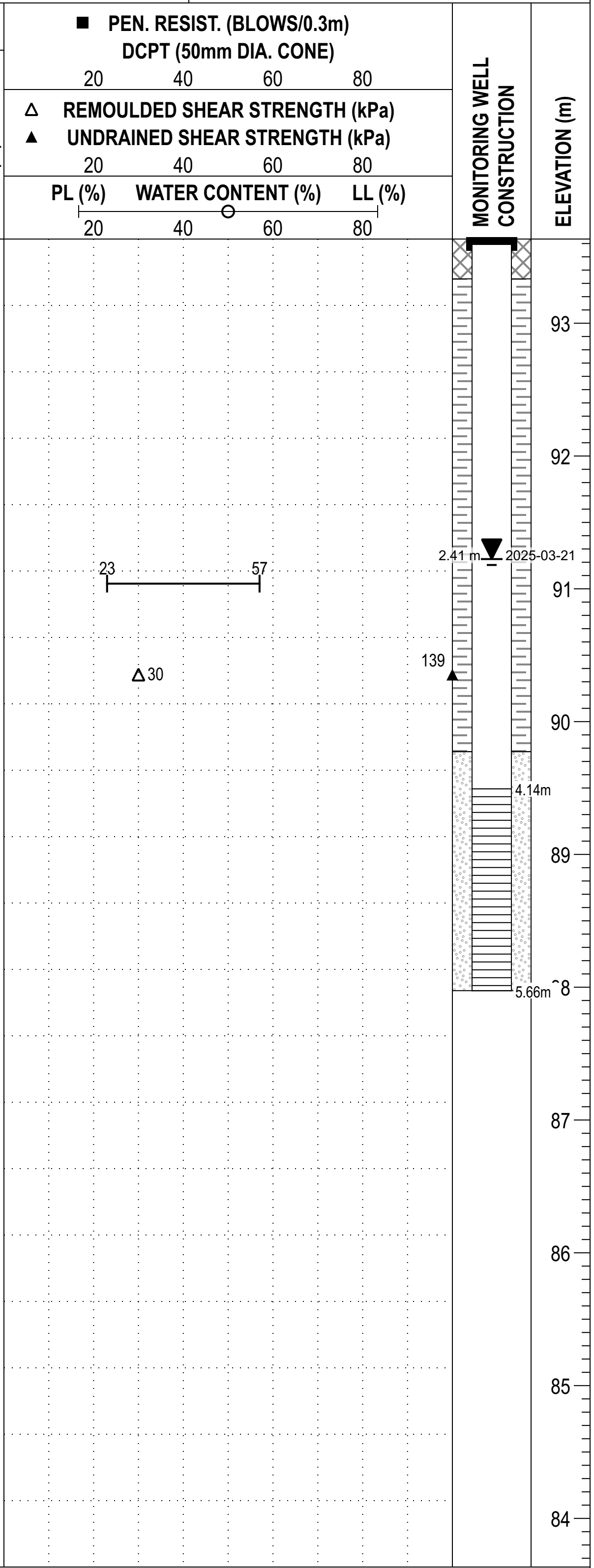
FILE NO. : PG7470

HOLE NO. : BH2-25

SAMPLE DESCRIPTION	
GROUND SURFACE	
FILL: Loose, brown silty sand, some gravel, trace topsoil	1.45m [92.18m]
FILL: Loose, brown silty sand, trace clay	2.21m [91.42m]
Very stiff, brown **SILTY CLAY**, trace sand	3.73m [89.90m]
Compact to dense, brown **SILTY SAND** to **SANDY SILT** - Dense to very dense below 4.57 m depth - Grey by 5.94 m depth	6.71m [86.92m]
End of Borehole (GWL at 2.41 m depth - March 21, 2025)	

SAMPLE TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
AU 1			
SS 2	50	3-3-2-2 5	
SS 3	50	2-2-2-2 4	
SS 4	100	2-3-2-3 5	
SS 5	100	P	
SS 6	67	5-14-18-16 32	
SS 7	67	13-20-23-24 43	
SS 8	42	8-14-14-15 28	
SS 9	42	6-14-13-13 27	

DEPTH (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10



PATERSON GROUP

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2028 Merivale Road, Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 366144.26 **NORTHING:** 5020434.68 **ELEVATION:** 93.85

PROJECT: Proposed Development

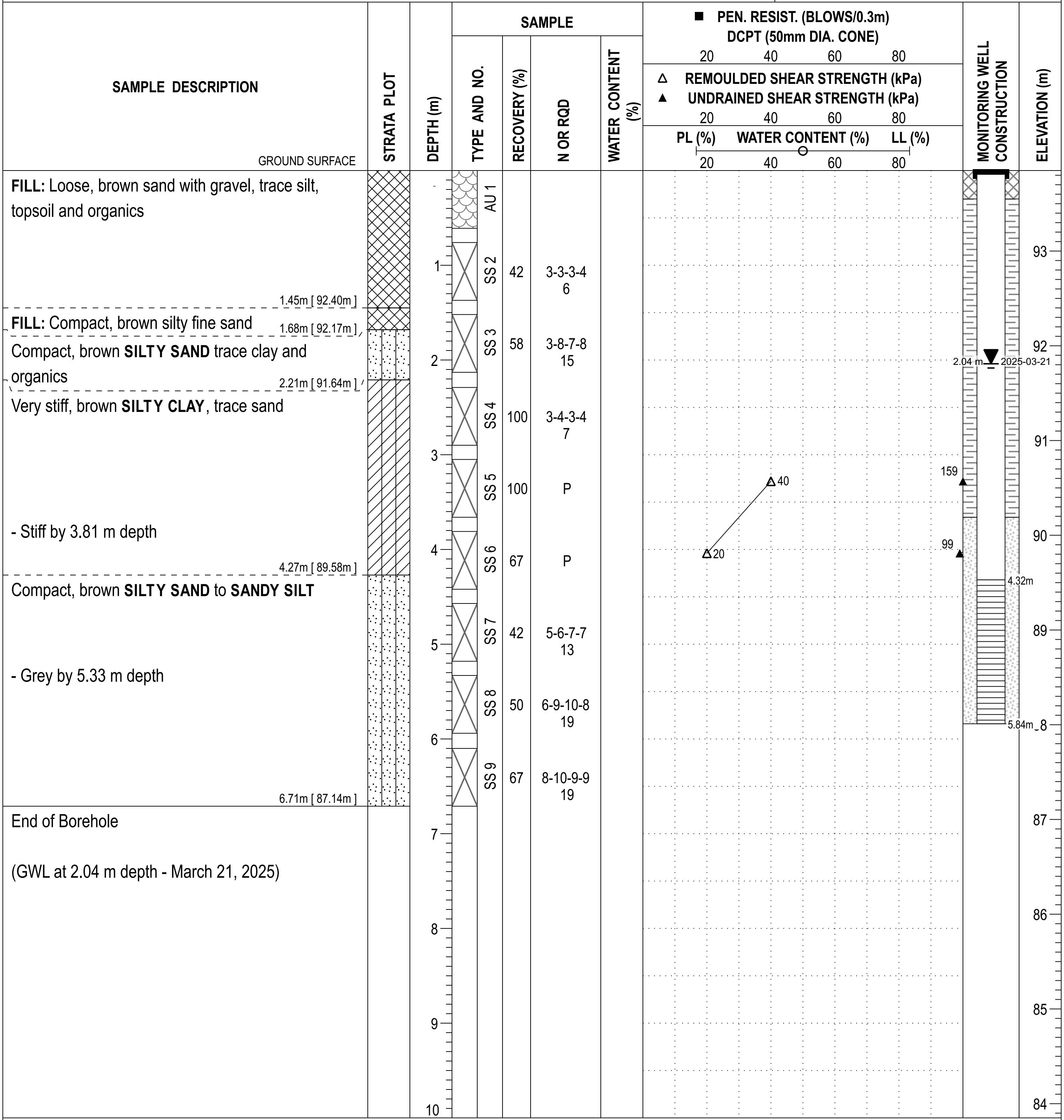
ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: March 17, 2025

FILE NO. : PG7470

HOLE NO. : BH3-25



SAMPLE DESCRIPTION	Bottom depth [elevation]
FILL: Loose, brown sand with gravel, trace silt, topsoil and organics	1.45m [92.40m]
FILL: Compact, brown silty fine sand	1.68m [92.17m]
Compact, brown **SILTY SAND** trace clay and organics	2.21m [91.64m]
Very stiff, brown **SILTY CLAY**, trace sand - Stiff by 3.81 m depth	4.27m [89.58m]
Compact, brown **SILTY SAND** to **SANDY SILT** - Grey by 5.33 m depth	6.71m [87.14m]
End of Borehole (GWL at 2.04 m depth - March 21, 2025)	

TYPE AND NO.	RECOVERY (%)	N OR RQD
AU 1		
SS 2	42	3-3-3-4 6
SS 3	58	3-8-7-8 15
SS 4	100	3-4-3-4 7
SS 5	100	P
SS 6	67	P
SS 7	42	5-6-7-7 13
SS 8	50	6-9-10-8 19
SS 9	67	8-10-9-9 19

PATERSON GROUP

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

2028 Merivale Road, Ottawa, ON

COORD. SYS.: MTM ZONE 9 **EASTING:** 366141.33 **NORTHING:** 5020434.47 **ELEVATION:** 93.88

PROJECT: Proposed Development

ADVANCED BY: CME-55 Low Clearance Drill

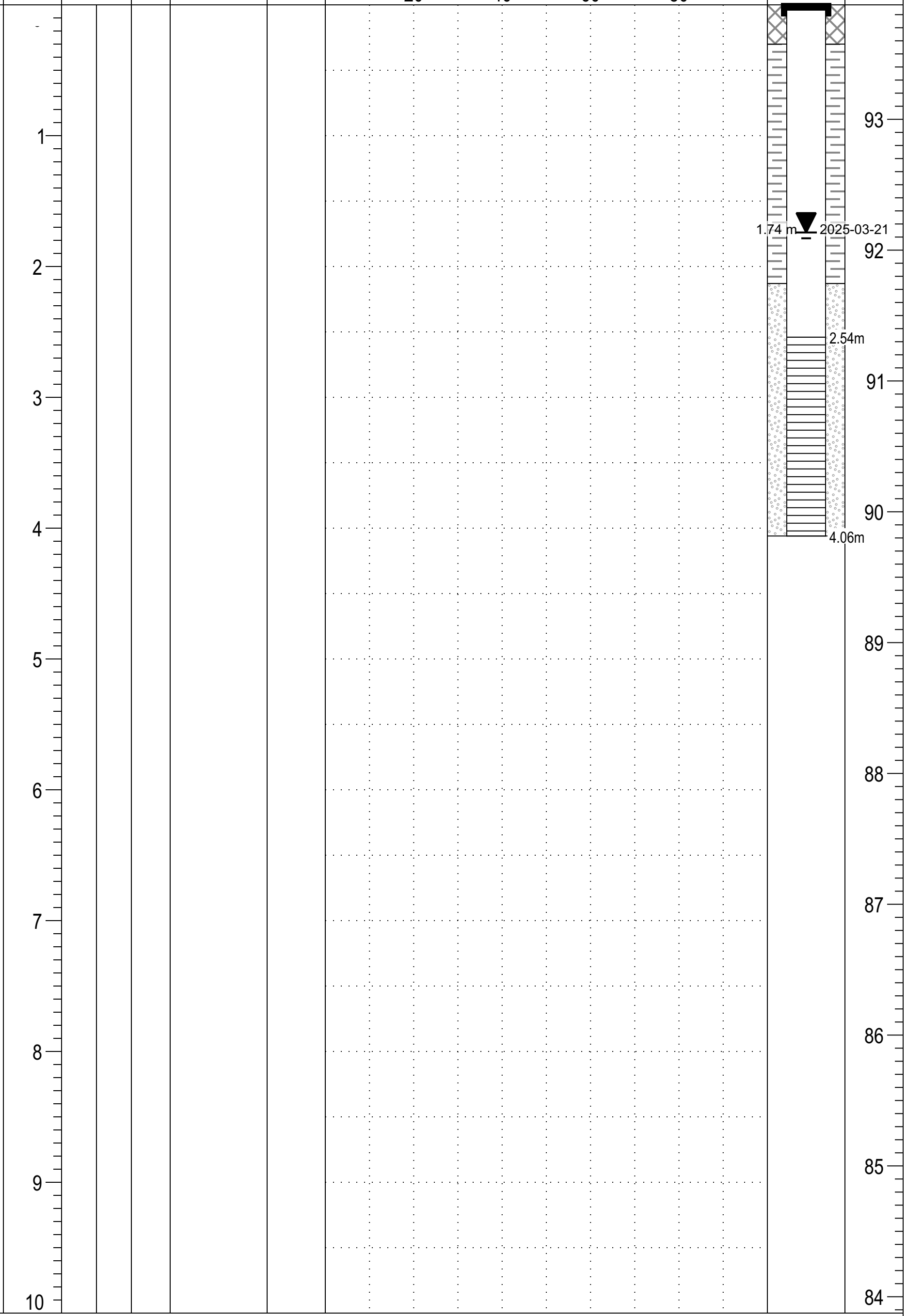
REMARKS:

DATE: March 17, 2025

FILE NO. : PG7470

HOLE NO. : BH3A-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE: TYPE AND NO.	SAMPLE: RECOVERY (%)	SAMPLE: N OR RQD	SAMPLE: WATER CONTENT (%)	■ PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 △ REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
* Refer Soil Profile BH3-25 4.14m [89.73m]									
End of Borehole (GWL at 1.74 m depth - March 21, 2025)									



P:/AutoCAD Drawings/Test Hole Data Files/PG74xx/PG7470/data.sqlite 2025-04-09, 11:36 Paterson_Template AE

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) ‘N’ value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of “P” denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	‘N’ Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

Consistency	Undrained Shear Strength (kPa)	‘N’ Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity: $S_t < 2$
Medium Sensitivity: $2 < S_t < 4$
Sensitive: $4 < S_t < 8$
Extra Sensitive: $8 < S_t < 16$
Quick Clay: $S_t > 16$

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	**ROCK QUALITY**
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS - Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW - Thin wall tube or Shelby tube, generally recovered using a piston sampler
G - "Grab" sample from test pit or surface materials
AU - Auger sample or bulk sample
WS - Wash sample
RC - Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC% - Natural water content or water content of sample, %
LL - Liquid Limit, % (water content above which soil behaves as a liquid)
PL - Plastic Limit, % (water content above which soil behaves plastically)
PI - Plasticity Index, % (difference between LL and PL)

Dxx - Grain size at which xx% of the soil, by weight, is of finer grain sizes
These grain size descriptions are not used below 0.075 mm grain size
D10 - Grain size at which 10% of the soil is finer (effective grain size)
D60 - Grain size at which 60% of the soil is finer

Cc - Concavity coefficient = $(D30)^2 / (D10 \times D60)$
Cu - Uniformity coefficient = $D60 / D10$

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

p'_o - Present effective overburden pressure at sample depth
p'_c - Preconsolidation pressure of (maximum past pressure on) sample
Ccr - Recompression index (in effect at pressures below p'_c)
Cc - Compression index (in effect at pressures above p'_c)

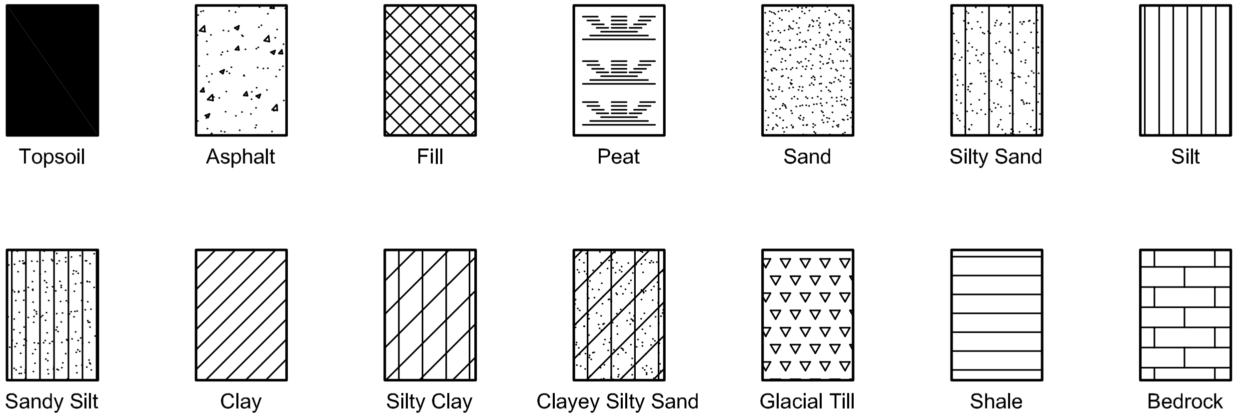
OC Ratio Overconsolidaton ratio = p'_c / p'_o
Void Ratio Initial sample void ratio = volume of voids / volume of solids
Wo - Initial water content (at start of consolidation test)

PERMEABILITY TEST

k - Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

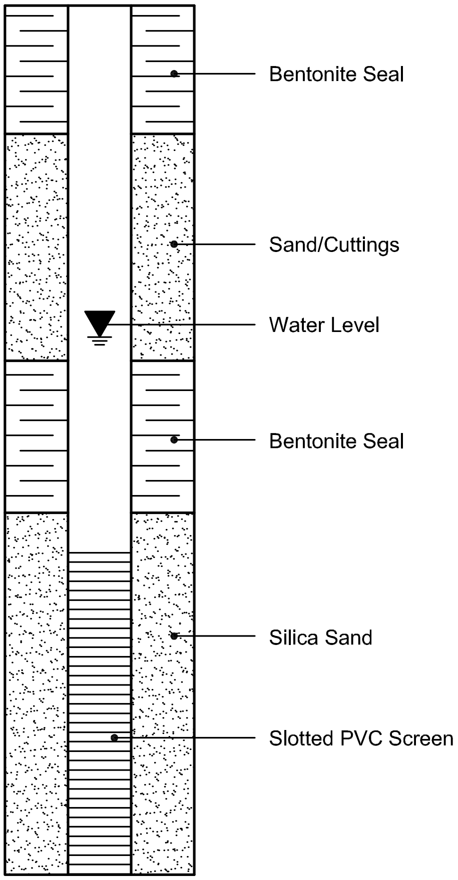
SYMBOLS AND TERMS (continued)

STRATA PLOT

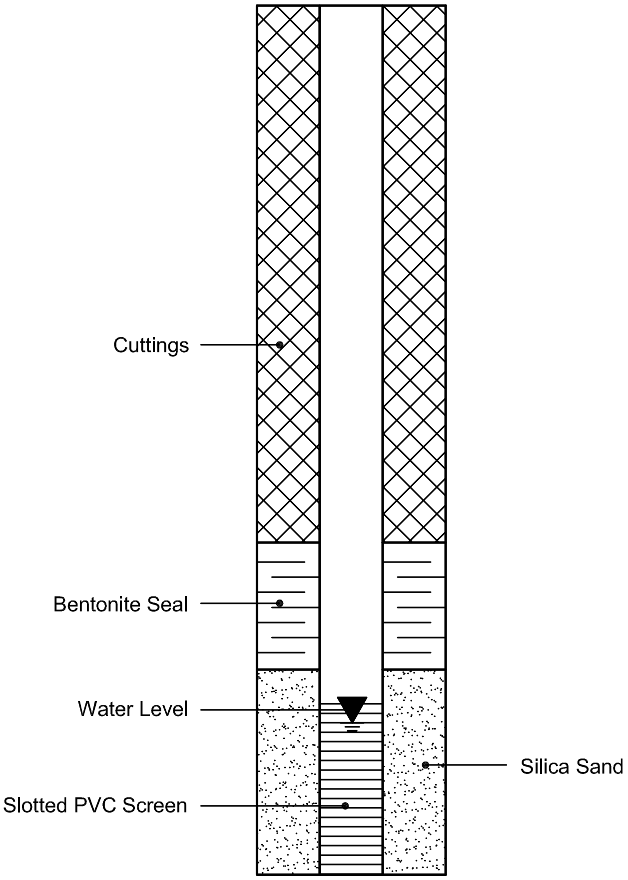


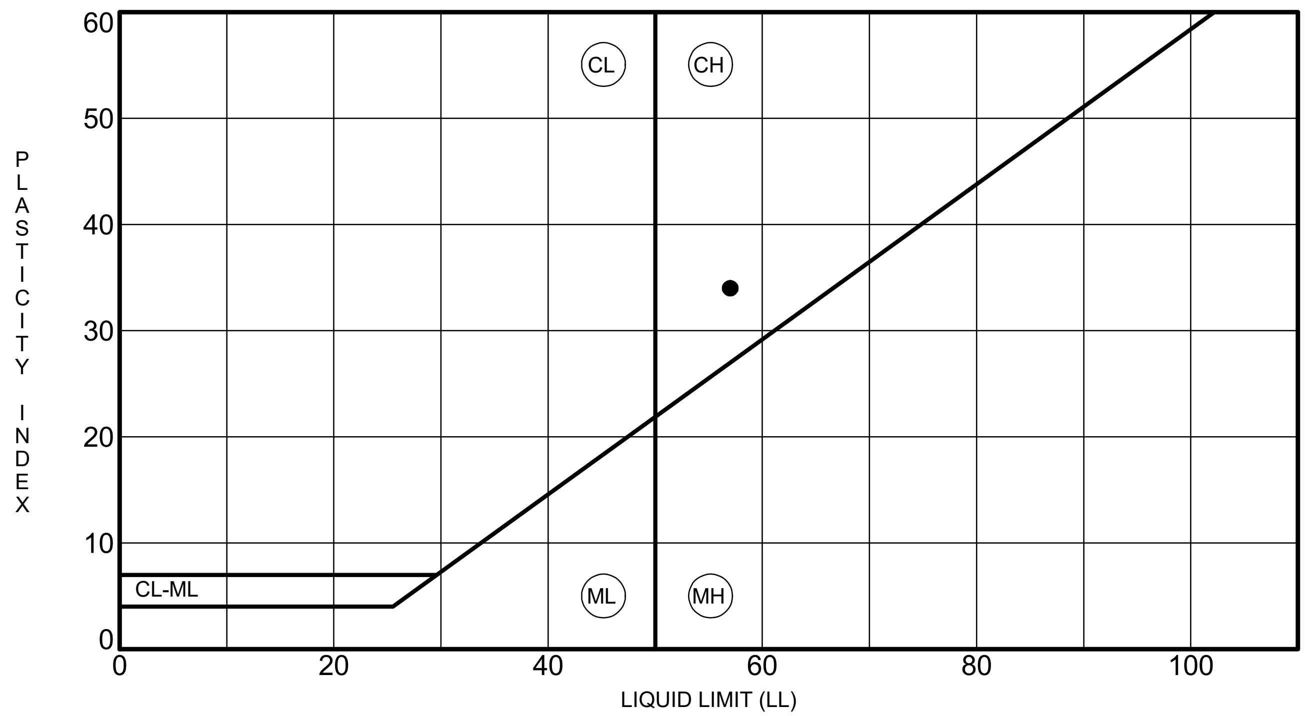
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION





	Specimen Identification		LL	PL	PI	Fines	Classification
●	**BH 2-25**	**SS4**	**57**	**23**	**34**		**CH - Inorganic clays of high plasticity**

CLIENT **Olympia Homes**

FILE NO. **PG7470**

PROJECT **Geotechnical Investigation -**

2028 Merivale Road, Ottawa, Ontario

DATE **21 Mar 25**

PATERSON GROUP

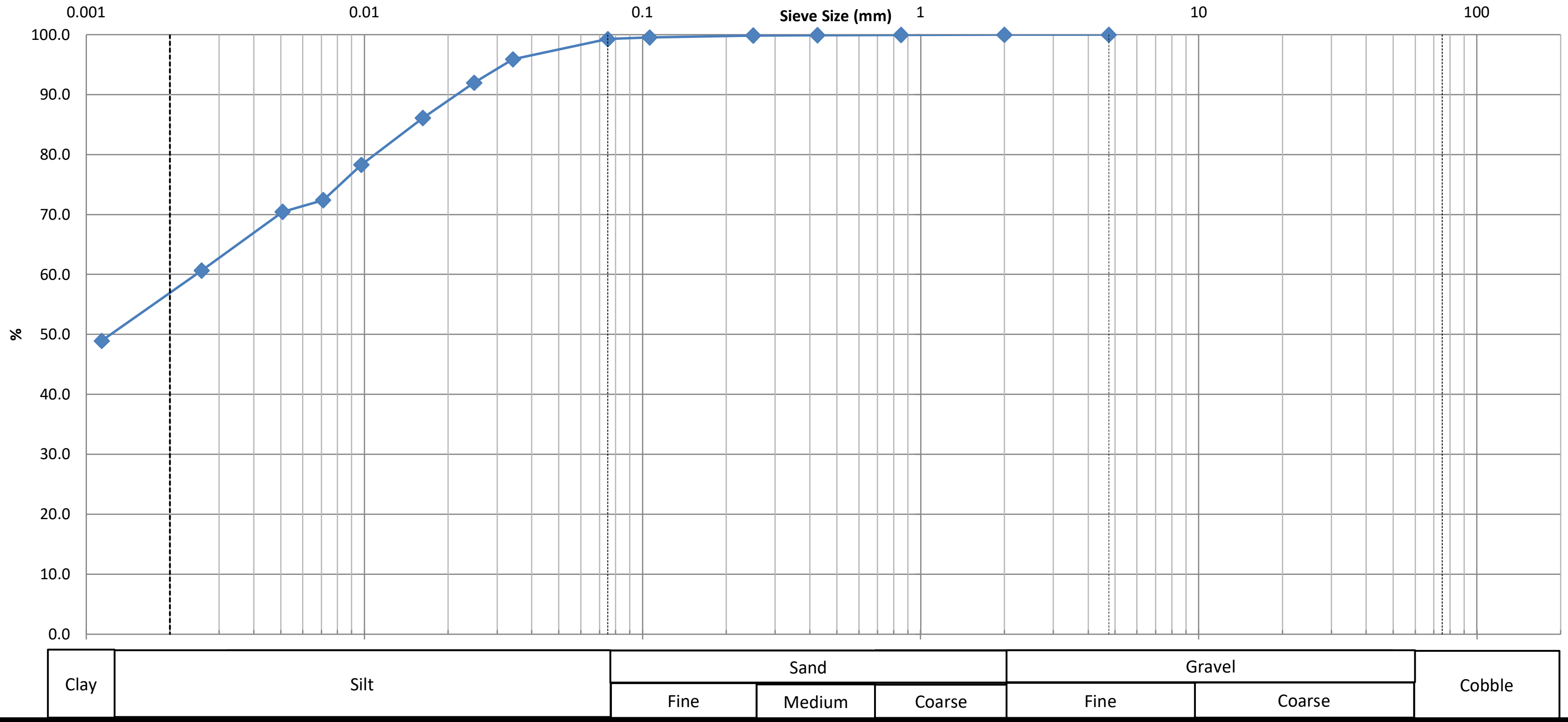
9 Auriga Drive
Ottawa, Ontario
K2E 7T9
TEL: (613) 226-7381

ATTERBERG LIMITS' RESULTS

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Olympia Homes	DEPTH:	BH1-25 SS3	FILE NO:	PG7470
CONTRACT NO.:		BH OR TP No.:	5' - 7'	LAB NO:	59094
PROJECT:	2028 Merivale Road, Ottawa, Ontario			DATE RECEIVED:	18-Mar-25
				DATE TESTED:	18-Mar-25
DATE SAMPLED:	17-Mar-25			DATE REPORTED:	21-Mar-25
SAMPLED BY:	Adam E.			TESTED BY:	D.K



Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
		40.1%					

D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
				0.0	0.7	42.3	57.0

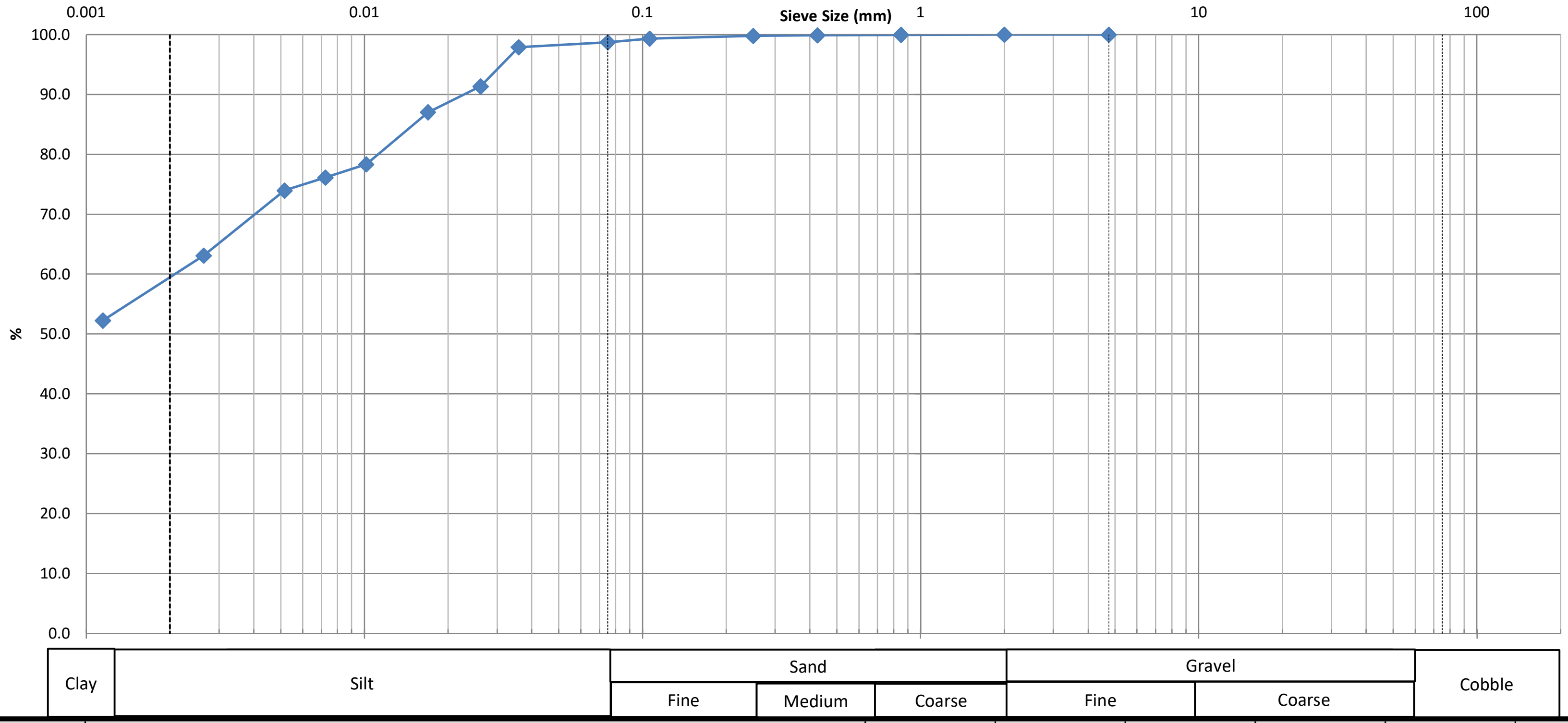
Comments:

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

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Olympia Homes	DEPTH:	BH2-25 SS4	FILE NO:	PG7470
CONTRACT NO.:		BH OR TP No.:	7'5" - 9'5"	LAB NO:	59095
PROJECT:	2028 Merivale Road, Ottawa, Ontario			DATE RECEIVED:	18-Mar-25
				DATE TESTED:	18-Mar-25
DATE SAMPLED:	17-Mar-25			DATE REPORTED:	21-Mar-25
SAMPLED BY:	Adam E.			TESTED BY:	D.K



Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					41.9%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)
					0.0	1.3		39.2		59.5

Comments:

REVIEWED BY:

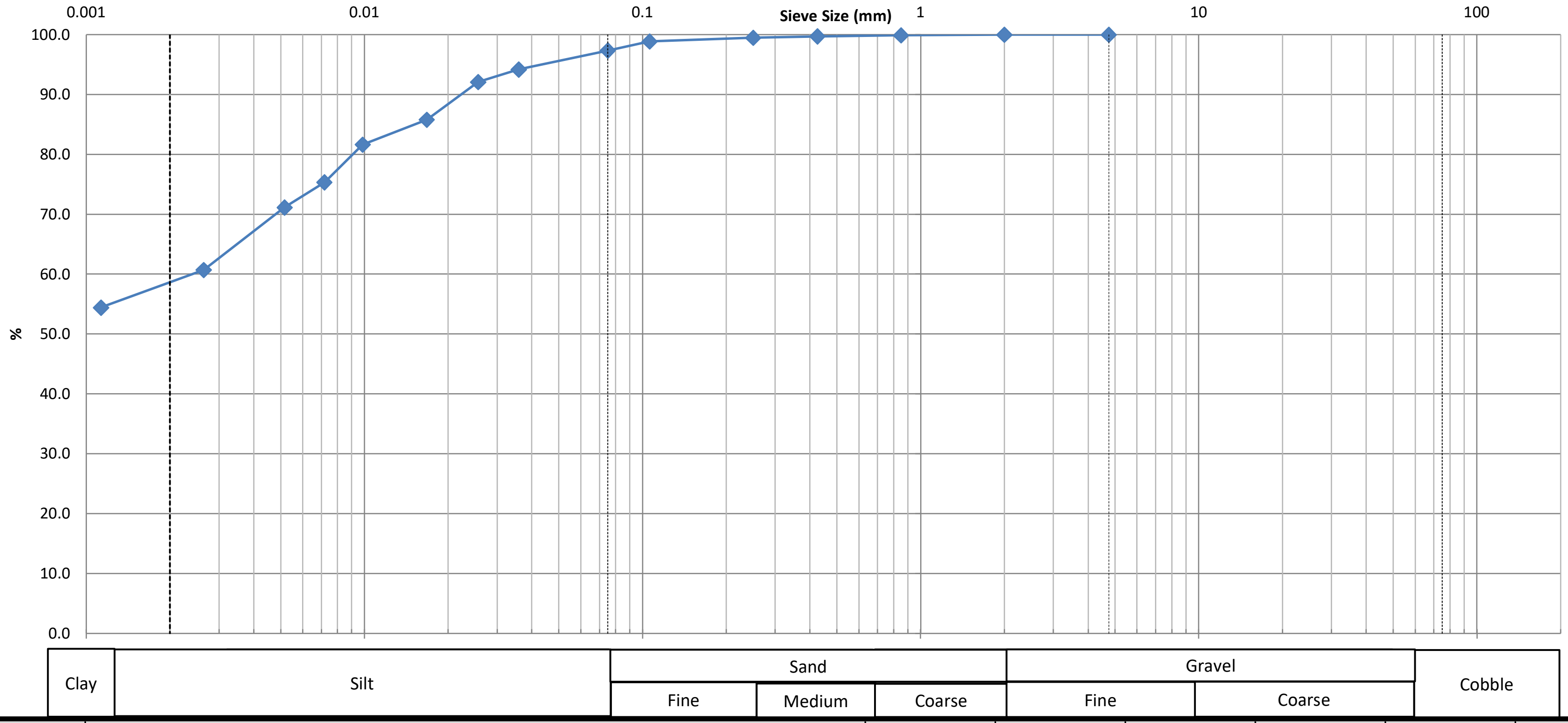
Curtis Beadow

Joe Forsyth, P. Eng.

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Olympia Homes	DEPTH:	BH3-25 SS5	FILE NO:	PG7470
CONTRACT NO.:		BH OR TP No.:	10' - 12'	LAB NO:	59096
PROJECT:	2028 Merivale Road, Ottawa, Ontario			DATE RECEIVED:	18-Mar-25
				DATE TESTED:	18-Mar-25
DATE SAMPLED:	17-Mar-25			DATE REPORTED:	21-Mar-25
SAMPLED BY:	Adam E.			TESTED BY:	D.K



Identification	Soil Classification	MC(%)	LL	PL	PI	Cc	Cu
		48.4%					

	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
					0.0	2.6	38.4	59.0

Comments:

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

Client ID:		BH3-25 SS3 BOTTOM	-	-	-		
Sample Date:		17-Mar-25 09:00	-	-	-	-	-
Sample ID:		2512194-01	-	-	-		
Matrix:		Soil	-	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	79.0	-	-	-	-	-
General Inorganics							
pH	0.05 pH Units	6.16	-	-	-	-	-
Resistivity	0.1 Ohm.m	157	-	-	-	-	-
Anions							
Chloride	10 ug/g	<10	-	-	-	-	-
Sulphate	10 ug/g	31	-	-	-	-	-

APPENDIX 2

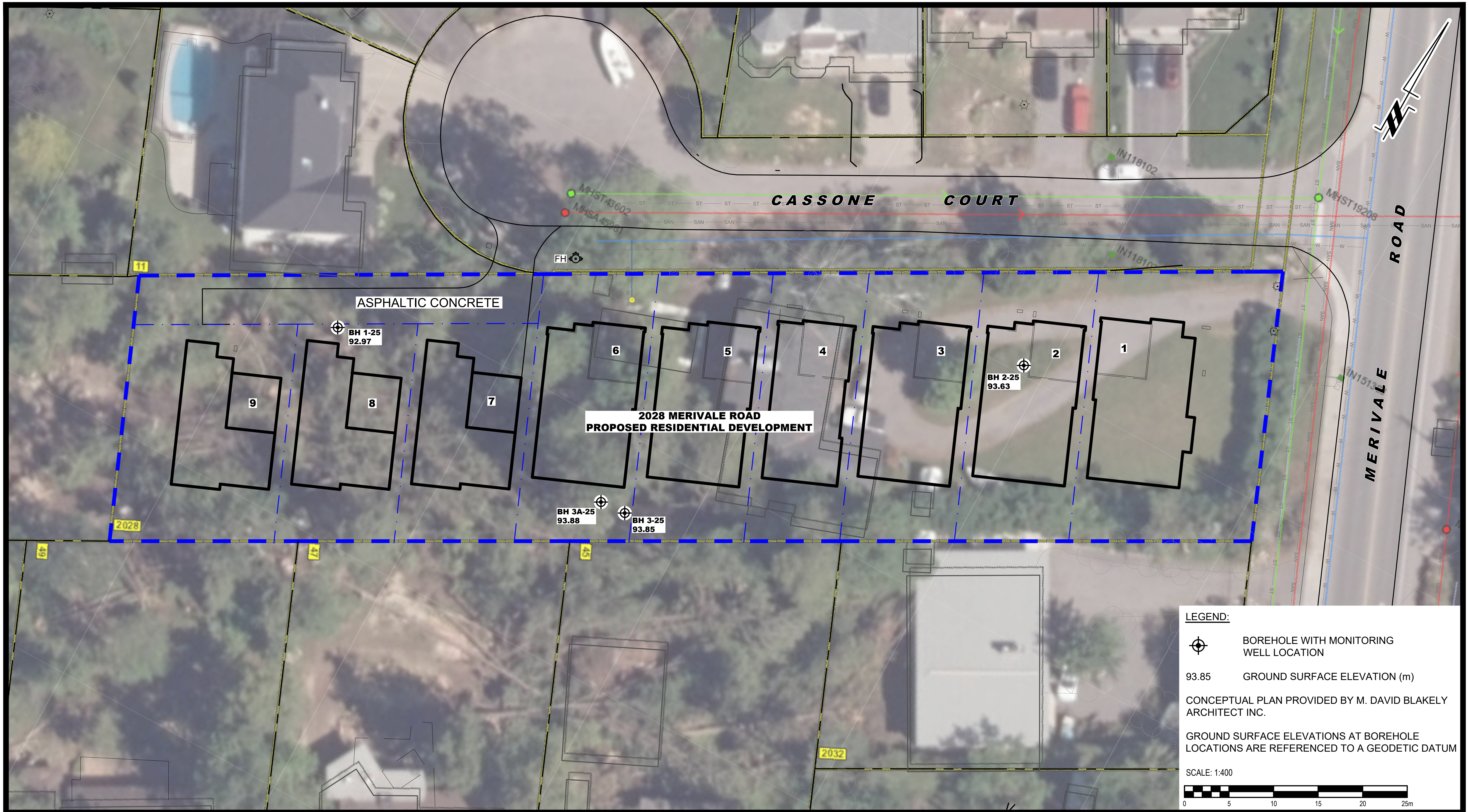
FIGURE 1 - KEY PLAN

DRAWING PG7470-1 - TEST HOLE LOCATION PLAN

FIGURE 1

KEY PLAN

PATERSON
GROUP



LEGEND:

⌖ BOREHOLE WITH MONITORING WELL LOCATION

93.85 GROUND SURFACE ELEVATION (m)

CONCEPTUAL PLAN PROVIDED BY M. DAVID BLAKELY ARCHITECT INC.

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
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TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

OLYMPIA HOMES
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
2028 MERIVALE ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:400
Date: 03/2025
Drawn by: YA
Report No.: PG7470-1
Checked by: DR
Dwg. No.: **PG7470-1**
Approved by: SD
Revision No.:

11x17

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