

# Geotechnical Investigation

## Proposed Development

6772 Rocque Street  
Ottawa, Ontario

Prepared for Kenvest Construction Inc.

Report PG7849-1 dated February 11, 2026

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## 1.0 Introduction

Paterson Group (Paterson) was commissioned by Kenvest Construction Inc. to conduct a geotechnical investigation for the proposed development to be located at 6772 Rocque Street in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2 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 test holes.
- ❑ 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.

Investigating for the presence or potential presence of contamination on the subject property was not part of the scope of the present investigation. Therefore, the present report does not address environmental issues.

## 2.0 Proposed Development

Based on the available drawings, it is understood that the proposed development will consist of a multi-storey residential building with a partial basement level.

Associated access lanes, parking areas and landscaped areas are anticipated surrounding the proposed building. It is further anticipated 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 January 14, 2026, and consisted of advancing 3 boreholes to maximum depths of 6.7 m below the existing ground surface. The borehole locations were distributed in a manner to provide general coverage of the proposed development, taking into consideration existing site features and underground services. The approximate locations of the boreholes are shown on Drawing PG7849-1 - Test Hole Location Plan included in Appendix 2.

The boreholes were advanced 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 borehole procedure consisted of augering to the required depths at the selected locations, and sampling and testing the overburden.

#### **Sampling and In-Situ Testing**

Soil samples were recovered 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 soil samples were visually inspected and classified on site. The soil samples were then placed in sealed plastic bags and transported to our laboratory for further review. The depths at which the split-spoon and auger samples were recovered from the boreholes are shown as SS and AU, respectively, on the Soil Profile and Test Data sheets in Appendix 1.

A Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples and 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 in cohesive soils using a field vane apparatus.

The overburden thickness was evaluated by completing dynamic cone penetration testing (DCPT) at borehole BH 3-26. The DCPT testing consisted of driving a steel drill rod, equipped with a 50 mm diameter cone at the tip, using a 63.5 kg hammer

falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

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

### **Groundwater**

A flexible polyethylene standpipe was installed in each completed borehole to permit monitoring of groundwater levels after the completion of the sampling program. The groundwater observations are discussed in Section 4.3 and presented on the Soil Profile and Test Data Sheets in Appendix 1.

## **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 ground surface elevation at each borehole location, are presented on Drawing PG7849-1 - Test Hole Location Plan in Appendix 2.

## **3.3 Laboratory Review**

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 1 shrinkage test, 1 grain size distribution and hydrometer test, and 1 Atterberg limits test were completed on selected soil samples. Moisture content tests were completed for all soil samples from the boreholes. The results are presented in Section 4.2 and in the Soil Profile and Test Data Sheets 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 otherwise directed.

## **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 samples. 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 occupied by an existing one-storey residential dwelling located in the central portion of the property. A paved driveway is present to the west of the dwelling, and the remainder of the site is generally landscaped with mature trees, shrubs, and lawns.

The subject site is bordered to the north by Rocque Street, to the east by an access road followed by residential properties, to the south by an institutional property, and to the west by a residential property. The ground surface across the site gently slopes downward from the south toward the north, with geodetic elevations ranging from approximately 64.0 m at the south end to about 63.5 m near the northern property limit.

### **4.2 Subsurface Profile**

#### **Overburden**

Generally, the subsurface profile at the borehole locations consists of topsoil or asphalt at the surface, underlain by fill and a silty clay deposit. The fill was generally observed to consist of brown silty sand with gravel, crushed stone, topsoil, and organics, extending to depths of approximately 0.3 to 0.7 m below the existing ground surface.

A hard to very stiff, brown silty clay deposit was encountered beneath the fill, becoming grey in colour below an approximate depth of 4.5 to 5.2 m. Sand seams were observed in the silty clay between depths of approximately 2.3 and 3.0 m.

A glacial till was encountered beneath the silty clay layer at depths of 5.3 to 6.0 m below ground surface, extending to the termination depths of the boreholes at depths of about 6.3 to 6.7 m. The glacial till was observed to consist of a silty clay to clayey silt with varying amounts of sand, gravel, cobbles, and boulders.

Practical refusal to the DCPT was encountered at a depth of about 6.6 m in borehole BH 3-26.

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 location.

## Bedrock

Based on available geological mapping, the subject site is located in an area where the bedrock consists of Limestone of the Bobcaygeon Formation, with an approximate overburden thickness of 5 to 10 m.

## Grain Size Distribution and Hydrometer Testing

Grain size distribution (sieve and hydrometer analysis) was completed on 1 selected soil sample. The results of the grain size analysis are summarized in Table 1 below and are presented in Appendix 1.

<b>Table 1 – Summary of Grain Size Distribution Analysis</b>					
<b>Borehole</b>	<b>Sample</b>	<b>Gravel (%)</b>	<b>Sand (%)</b>	<b>Silt (%)</b>	<b>Clay (%)</b>
BH 2-26	SS4	0.0	0.5	36	63.5

## Atterberg Limit Tests

A total of 1 silty clay sample was submitted for Atterberg limits testing. The test results indicate that the silty clay is generally classified as an Inorganic Clay of High Plasticity (CL). The results are summarized in Table 2 below.

<b>Table 2 – Summary of Atterberg Limits Results</b>						
<b>Borehole</b>	<b>Sample</b>	<b>Depth (m)</b>	<b>LL (%)</b>	<b>PL (%)</b>	<b>PI (%)</b>	<b>Classification</b>
BH 2-26	SS5	2.28	66	30	36	CH
Notes: LL: Liquid Limit; PL: Plastic Limit; PI: Plasticity Index; CL: Clay of Low Plasticity						

## Shrinkage Test

The results of the shrinkage limit test indicate a shrinkage limit of 18.73% and a shrinkage ratio of 1.83.

## 4.3 Groundwater

Groundwater level readings were measured in the installed standpipe piezometers on January 23, 2026. The groundwater level readings are summarized in Table 3 below and are also presented in the Soil Profile and Test Data sheets in Appendix 1.

<b>Table 3 – Summary of Groundwater Levels</b>				
<b>Borehole Number</b>	<b>Ground Surface Elevation (m)</b>	<b>Measured Groundwater Level</b>		<b>Dated Recorded</b>
		<b>Depth (m)</b>	<b>Elevation (m)</b>	
BH 1-26	64.03	3.10	60.93	January 23, 2026
BH 2-26	63.68	3.88	59.80	
BH 3-26	63.58	3.88	59.70	
<b>Note:</b> The ground surface elevation at each test hole location was surveyed using a GPS referenced to a geodetic datum.				

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 **3 to 4 m** below the existing 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 building be founded on conventional spread footings bearing on the undisturbed, hard to stiff silty clay.

Due to the presence of the silty clay deposit, the site is subject to a permissible grade raise restriction, which is discussed in Section 5.3.

Removal of concrete elements is likely due to the demolition of the existing structure on site.

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

### **5.2 Site Grading and Preparation**

#### **Stripping Depth**

Topsoil and deleterious fill, such as those containing organic or deleterious materials, should be stripped from under the proposed building and other settlement sensitive structures. Care should be taken not to disturb subgrade soil during site preparation activities.

If encountered, existing foundation walls and other construction debris should be entirely removed from within the building perimeters. Under paved areas, existing construction remnants, such as foundation walls, should be excavated to a minimum of 1 m below the final grade.

#### **Fill Placement**

Fill placed for grading beneath the building area should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The imported fill material should be tested and approved prior to delivery. The fill should be placed in maximum 300 mm thick loose lifts and compacted by suitable compaction equipment. Fill placed beneath proposed buildings should be compacted to a minimum 98% of the Standard Proctor Maximum Dry Density (SPMDD).

Non-specified existing fill, along with site-excavated soil, can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and at least compacted by the tracks of the

spreading equipment to minimize voids. If this material is to be used to build up the subgrade level for areas to be paved, it should be compacted in thin lifts to at least 95% of the material's SPMDD.

Fill used for grading beneath the base and subbase layers of paved areas should consist, unless otherwise specified, of clean imported granular fill, such as OPSS Granular A, Granular B Type II or select subgrade material. 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 paved areas should be compacted to at least 95% of its SPMDD.

### **Protection of Subgrade**

As the footing subgrades will consist of silty clay, it is recommended that a minimum 50 mm thick lean concrete mud slab be placed on the undisturbed silty clay subgrade shortly after the completion of the excavation. The main purpose of the concrete mud slab is to reduce the risk of disturbance of the subgrade under the traffic of workers and equipment.

## **5.3 Foundation Design**

### **Bearing Resistance Values**

Strip footings, up to 2 m wide, and pad footings, up to 5 m wide, placed on an undisturbed, hard to stiff silty clay bearing surface 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, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Footings placed on an undisturbed, hard to stiff silty clay bearing surface, and designed using the bearing resistance values at SLS given above, will be subjected to potential 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. Adequate lateral support is provided to an undisturbed soil bearing surface above the groundwater table when a plane extending horizontally and vertically from the bottom edge of the footing at a minimum of 1.5H:1V, passing through in situ soil of the same or higher capacity as the bearing medium soil.

### **Permissible Grade Raise Recommendations**

Due to the presence of a silty clay deposit, a permissible grade raise restriction of **2.0 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 site class for seismic site response can be taken as **Class X<sub>c</sub>**, as defined in the Ontario Building Code (OBC) 2024. Soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest version of the OBC 2024 for a full discussion of the earthquake design requirements.

## **5.5 Basement Slab**

With the removal of all topsoil and fill, containing significant amounts of deleterious or organic materials, the undisturbed, hard to stiff silty clay and/or existing fill is considered to be an acceptable subgrade surface on which to commence backfilling for floor slab construction.

It is recommended that the upper 200 mm of sub-floor fill underlying the basement slab consist of 19 mm clear crushed stone which is compacted with several passes of a large, vibratory plate compactor.

## **5.6 Basement Wall**

There are several combinations of retained soils that could be applicable for the basement walls of the proposed building. However, the conditions can be well-represented by assuming the retained soil consists of a material with an angle of internal friction of 30 degrees and a drained unit weight of 20 kN/m<sup>3</sup>.

Two distinct conditions, static and seismic, must be reviewed for design calculations. The parameters for design calculations for the two conditions are presented below.

## Lateral Earth Pressures

The static horizontal earth pressure ( $p_o$ ) can be calculated using a triangular earth pressure distribution equal to  $K_o \cdot \gamma \cdot H$  where:

- $K_o$  = at-rest earth pressure coefficient of the applicable retained material (0.5)
- $\gamma$  = unit weight of fill of the applicable retained soil ( $\text{kN/m}^3$ )
- $H$  = height of the wall (m)

An additional pressure having a magnitude equal to  $K_o \cdot q$  and acting on the entire height of the wall should be added to the above diagram for any surcharge loading,  $q$  (kPa), that may be placed at ground surface adjacent to the wall. The surcharge pressure will only be applicable for static analyses and should not be used in conjunction with the seismic loading case.

Actual earth pressures could be higher than the “at-rest” case if care is not exercised during the compaction of the backfill materials to maintain a minimum separation of 0.3 m from the walls with the compaction equipment.

## Seismic Earth Pressures

The total seismic force ( $P_{AE}$ ) includes both the earth force component ( $P_o$ ) and the seismic component ( $\Delta P_{AE}$ ).

The seismic earth force ( $\Delta P_{AE}$ ) can be calculated using  $0.375 \cdot a_c \cdot \gamma \cdot H^2/g$  where:

- $a_c = (1.45 - a_{max}/g)a_{max}$
- $\gamma$  = unit weight of fill of the applicable retained soil ( $\text{kN/m}^3$ )
- $H$  = height of the wall (m)
- $g$  = gravity,  $9.81 \text{ m/s}^2$

The peak ground acceleration ( $a_{max}$ ) for this site is  $0.398g$  according to OBC 2024 for a Site Class  $X_D$ . Note that the vertical seismic coefficient is assumed to be zero.

The earth force component ( $P_o$ ) under seismic conditions can be calculated using  $P_o = 0.5 K_o \gamma H^2$ , where  $K_o = 0.5$  for the soil conditions noted above.

The total earth force ( $P_{AE}$ ) is considered to act at a height,  $h$  (m), from the base of the wall, where:

$$h = \{P_o \cdot (H/3) + \Delta P_{AE} \cdot (0.6 \cdot H)\} / P_{AE}$$

The earth forces calculated are unfactored. For the ULS case, the earth loads should be factored as live loads, as per OBC 2024.

## 5.7 Pavement Design

The pavement structures presented in the following tables are recommended for the design of car-only parking, and access lanes areas.

<b>Table 4 – Recommended Asphalt Pavement Structure – Car Only Parking Areas</b>	
<b>Thickness (mm)</b>	<b>Material Description</b>
50	<b>Wear Course</b> – Superpave 12.5 Asphaltic Concrete
150	<b>BASE</b> – OPSS Granular A Crushed Stone
300	<b>SUBBASE</b> – OPSS Granular B Type II
<b>SUBGRADE</b> – Either fill, in situ soils or OPSS Granular B Type I or II material placed over in situ soil or bedrock.	

<b>Table 5 – Recommended Asphalt Pavement Structure – Access Lanes</b>	
<b>Thickness (mm)</b>	<b>Material Description</b>
40	<b>Wear Course</b> – Superpave 12.5 Asphaltic Concrete
50	<b>Binder Course</b> – Superpave 19.0 Asphaltic Concrete
150	<b>BASE</b> – OPSS Granular A Crushed Stone
450	<b>SUBBASE</b> – OPSS Granular B Type II
<b>SUBGRADE</b> – Either fill, in situ soils or OPSS Granular B Type I or II material placed over in situ soil or bedrock.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project. 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 SPMD using suitable compaction equipment.

### Pavement Structure Drainage

The pavement structure performance is largely dependent on the contact zone between the subgrade material and the base stone in a dry condition. Failure to

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provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing load carrying capacity.

Due to the impervious nature of the subgrade and fill materials and transitions between various pavement structures, consideration should be provided to installing subdrains during the pavement construction. At transition zones between various pavement structures, subdrains should be installed longitudinally to drain any potential water trapped in the granular layers. The subdrains at catch basins should extend in four orthogonal directions and longitudinally when placed along a curb.

## **6.0 Design and Construction Precautions**

### **6.1 Foundation Drainage and Backfill**

#### **Foundation Drainage & Backfill**

It is recommended that a perimeter foundation drainage system be provided for the proposed building. The system should consist of a 100 to 150 mm diameter perforated and corrugated plastic pipe, wrapped in a geosock, and 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 clear crushed stone should be wrapped in a non-woven geotextile. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

In addition, a geocomposite drainage board, such as Delta Drain 6000, should be installed over the exterior below-grade foundation walls and connected to the perimeter drainage system. The exterior foundation walls can then be backfilled with the site excavated materials, provided that they are maintained in an unfrozen state and at a suitable moisture content for compaction. Imported granular materials, such as clean sand or OPSS Granular B Type II granular material, should otherwise be used for this purpose.

#### **Underslab Drainage**

Underslab drainage will be required to control water infiltration below the basement slab. For preliminary design purposes, it is recommended that 100 mm perforated pipes be placed at approximately 6 m centers underlying the basement slab. The spacing of the underslab drainage system should be confirmed at the time of completing the excavation, when water infiltration can be better assessed.

### **6.2 Protection of Footings Against Frost Action**

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

Exterior unheated foundations, 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.

## 6.3 Excavation Side Slopes

The side slopes of excavations in the overburden materials should either be cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled. For the proposed development, it is anticipated that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations).

The excavation side slopes in the overburden soils, above the groundwater level and extending to a maximum depth of 3 m, should be cut back at 1H:1V or flatter. A flatter slope is required for excavation below groundwater level, such as 3H:1V. The subsurface soil at this site is considered to be mainly 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 be kept away from the excavation sides.

Excavation side slopes carried out for the proposed building footprint are recommended to be provided with surface protection from erosion due to rain and surface water runoff. This can be accomplished by covering the entire surface of the excavation side-slopes with tarps secured between the top and bottom of the excavation, and approved by Paterson personnel at the time of construction.

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 is used 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 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 or Granular B

Type II with a maximum size of 25 mm. The bedding layer should be increased to a minimum thickness of 300 mm where the subgrade consists of grey silty clay. The bedding and cover materials should be placed in maximum 300 mm thick lifts compacted to 95% of the material's standard Proctor maximum dry density.

It should generally be possible to re-use the site generated fill materials (moist, not wet) above the cover material if excavation and filling operations are carried out in dry and non-freezing weather conditions. The wet silty clay should be given a sufficient drying period to decrease its moisture content to an acceptable level to make compaction possible prior to being reused.

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) and above the cover material 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.

## **6.5 Groundwater Control**

It is anticipated that groundwater infiltration into the excavations should be 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.

Under the current regulations enacted by the Ministry of Environment, Conservation and Parks (MECP), any dewatering in excess of 50,000 L/day requires a registration on the Environmental Activity and Sector Registry (EASR), provided that dewatering is related to construction. If the dewatering is not related to construction, a Permit to Take Water obtained from the MECP will be required.

In the event that an EASR is required to facilitate dewatering of the proposed development, a minimum of 3 to 4 weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan, to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. Should a Permit to Take Water be required, a minimum of 5 to 6 months should be allotted for completion of the permit, due to the minimum review period imposed by the MECP.

## **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 using 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 into 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 low to moderate aggressive corrosive environment.

## **6.8 Landscaping Considerations**

### **Tree Planting Restrictions**

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. Grain size distribution and hydrometer testing was also completed on a selected soil sample. The above-noted soil samples were recovered from elevations below the anticipated design underside of footing elevation and 3.5 m depth below anticipated finished grade. The results of our testing are presented in Section 4.2 and on the Soil Profile and Test Data sheets in Appendix 1.

Based on the results of our Atterberg Limits tests, a low to medium plasticity clay soil (Plasticity index < 40%) was encountered between the anticipated underside of footing elevation and 3.5 m below the anticipated finished grade at the subject site. The following tree planting setbacks are therefore recommended for these areas.

Large trees (mature height over 14 m) can be planted provided a tree to foundation setback equal to the full mature height of the tree can be provided (e.g., in a park or other green space). Tree planting setback limits may be reduced to **4.5 m** for small (mature height up to 7.5 m) and medium-sized trees (mature tree height 7.5 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 must be satisfied for footings within 10 m from the tree, as measured from the centre of the tree trunk and verified by means of the Grading Plan as indicated procedural changes below.
- A small tree must be provided with a minimum 25 m<sup>3</sup> of available soil volume while a medium tree must be provided with a minimum of 30 m<sup>3</sup> 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).

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.

It is recommended that smaller plantings within 4.5 m of the foundation walls have shallow root systems that extend less than 1.2 m below ground surface.

## 7.0 Recommendations

It is recommended that the following be carried out by Paterson once preliminary and/or detailed designs of the proposed development have been prepared:

- Review detailed grading, servicing, landscaping, and structural plan(s), from a geotechnical perspective.

It is a requirement for the foundation design data provided herein to be applicable that the following material testing and observation program be performed by the geotechnical consultant. The following aspects of the program should be performed by Paterson:

- Review and inspection of the installation of the foundation drainage systems.
- Observation of all bearing surfaces prior to the placement of concrete.
- Sampling and testing of the concrete and fill materials.
- 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 and follow-up field density tests to determine the level of compaction achieved.
- 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 Kenvest Construction Inc., 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.**



Zubaida Al-Moselly, Ph.D., P.Eng.



Scott S. Dennis, P.Eng.

**Report Distribution:**

- Kenvest Construction Inc. (email copy)
- Paterson Group (1 copy)

# APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ATTERBERG LIMITS TESTING RESULTS

GRAIN SIZE DISTRIBUTION TESTING RESULTS

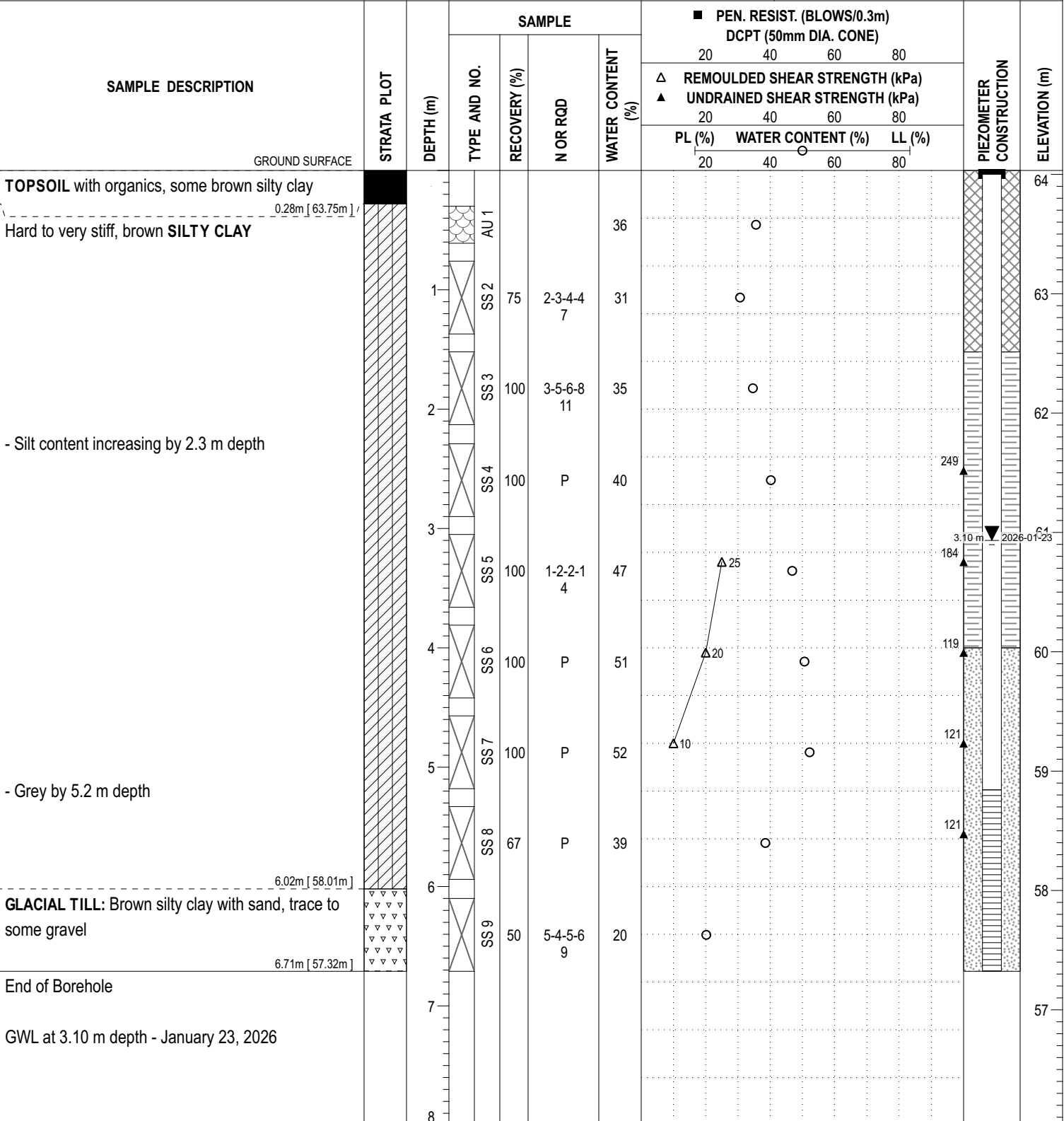
ANALYTICAL TESTING RESULTS

COORD. SYS.: MTM ZONE 9      EASTING: 381186.20      NORTHING: 5037664.20      ELEVATION: 64.03

PROJECT: Proposed Development      FILE NO.: **PG7849**

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: Datum: NAD1983 (Canada)      Geoid: HT2-2010      DATE: January 14, 2026      HOLE NO.: **BH 1-26**



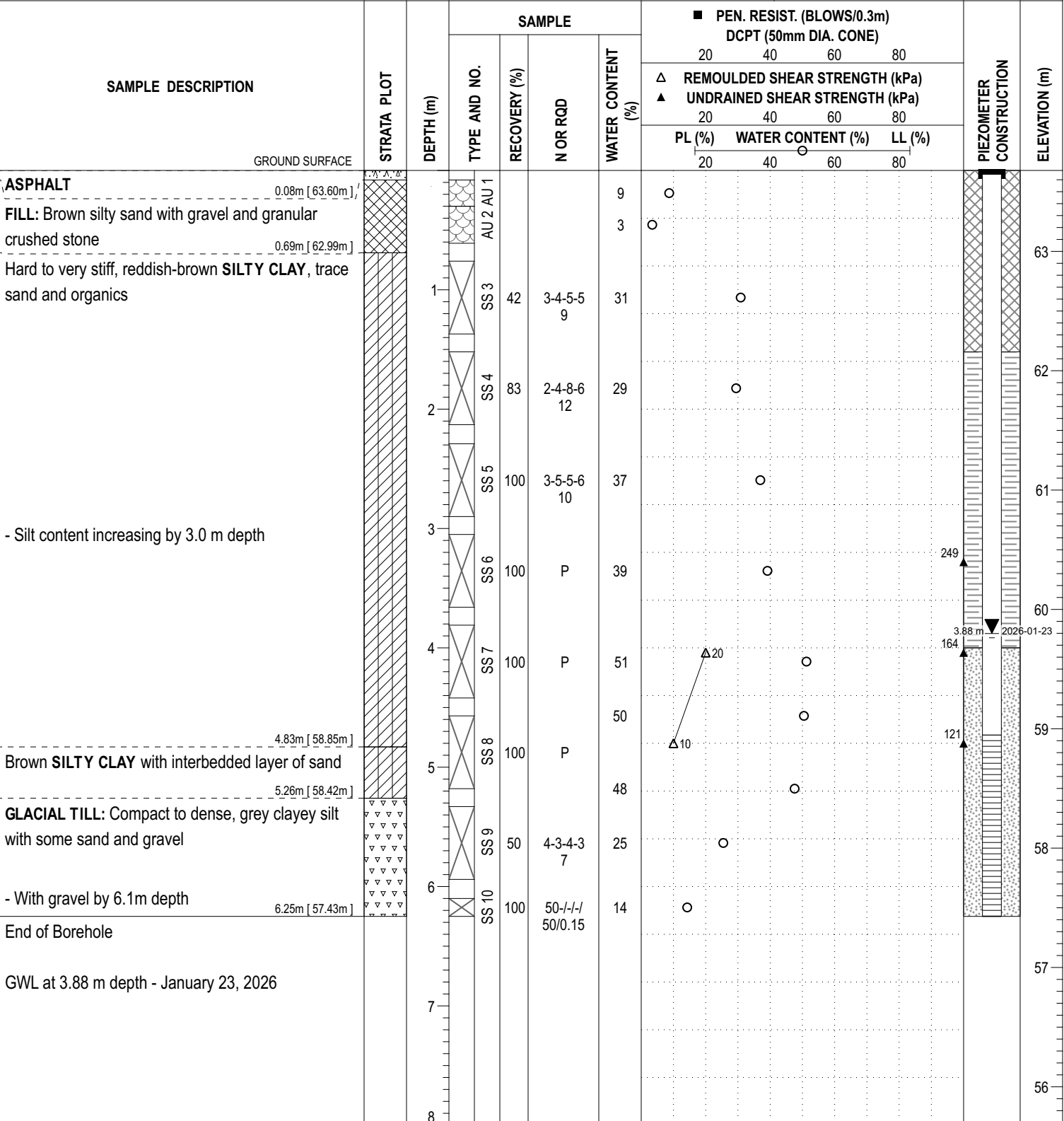
DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

COORD. SYS.: MTM ZONE 9      EASTING: 381169.58      NORTHING: 5037670.69      ELEVATION: 63.68

PROJECT: Proposed Development      FILE NO.: **PG7849**

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: Datum: NAD1983 (Canada)      Geoid: HT2-2010      DATE: January 14, 2026      HOLE NO.: **BH 2-26**



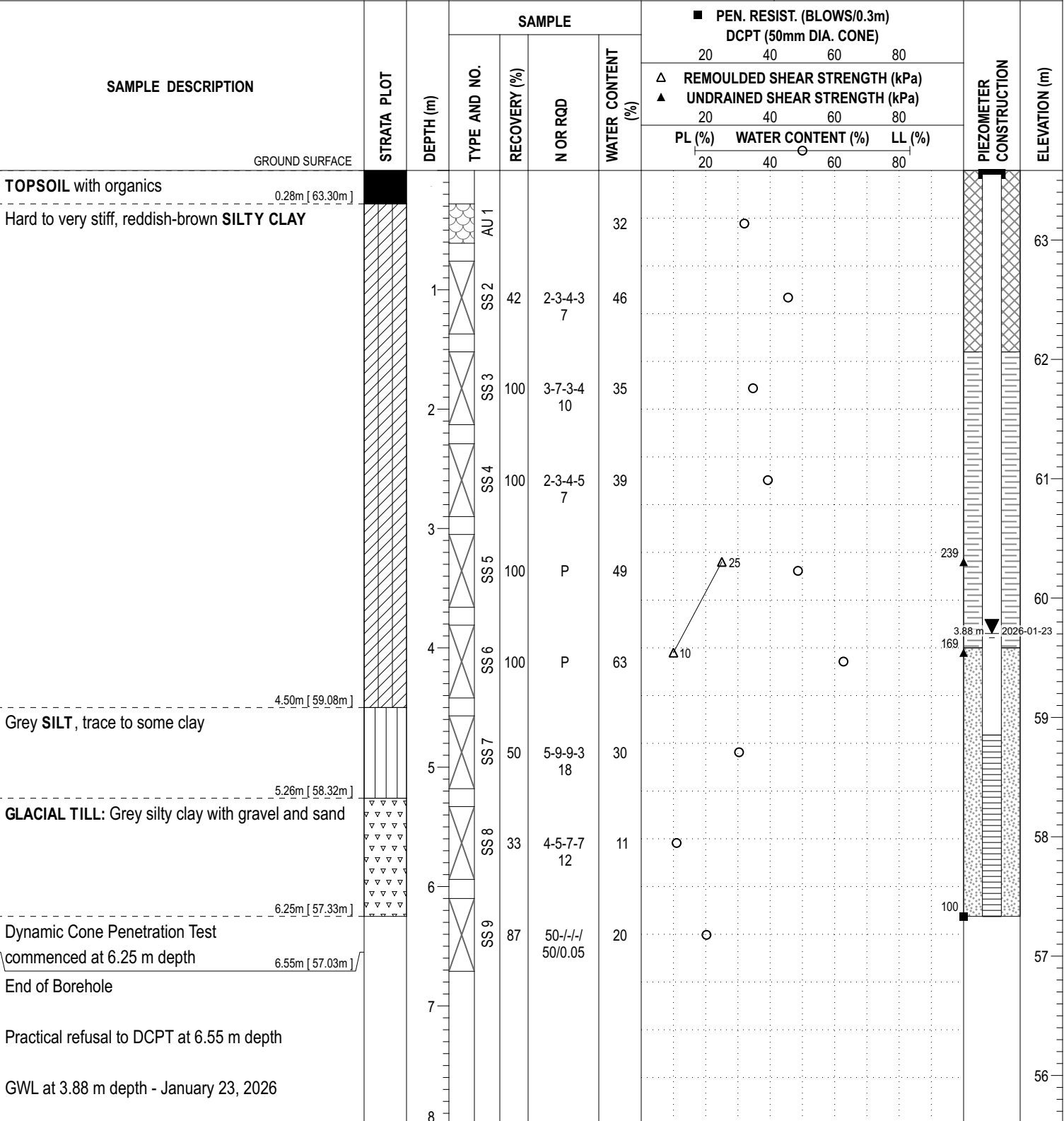
DISCLAIMER: THE DATA PRESENTED IN THIS SHEET IS THE PROPERTY OF PATERSON GROUP AND THE CLIENT FOR WHOM IT WAS PRODUCED. THIS SHEET SHOULD BE READ IN CONJUNCTION WITH ITS CORRESPONDING REPORT. PATERSON GROUP IS NOT RESPONSIBLE FOR THE UNAUTHORIZED USE OF THIS DATA.

COORD. SYS.: MTM ZONE 9      EASTING: 381173.72      NORTHING: 5037680.74      ELEVATION: 63.58

PROJECT: Proposed Development      FILE NO.: **PG7849**

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS: Datum: NAD1983 (Canada)      Geoid: HT2-2010      DATE: January 14, 2026      HOLE NO.: **BH 3-26**



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.

# 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 strength of cohesionless soils is the relative density, 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.

Relative Density	'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 vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

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 is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

### 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 NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called "mechanical breaks") are easily distinguishable from the normal in situ fractures.

<b>RQD %</b>	<b>ROCK QUALITY</b>
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
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

## SYMBOLS AND TERMS (continued)

### GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture 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 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 = $(D_{30})^2 / (D_{10} \times D_{60})$
Cu	-	Uniformity coefficient = $D_{60} / D_{10}$

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

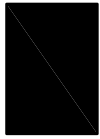
$p'_o$	-	Present effective overburden pressure at sample depth
$p'_c$	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below $p'_c$ )
Cc	-	Compression index (in effect at pressures above $p'_c$ )
OC Ratio		Overconsolidation ratio = $p'_c / p'_o$
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

### PERMEABILITY TEST

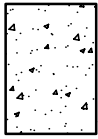
k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during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

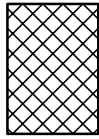
## STRATA PLOT



Topsoil



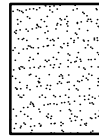
Asphalt



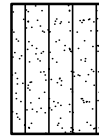
Fill



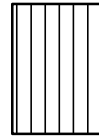
Peat



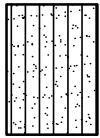
Sand



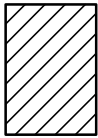
Silty Sand



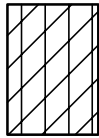
Silt



Sandy Silt



Clay



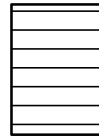
Silty Clay



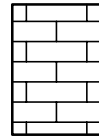
Clayey Silty Sand



Glacial Till



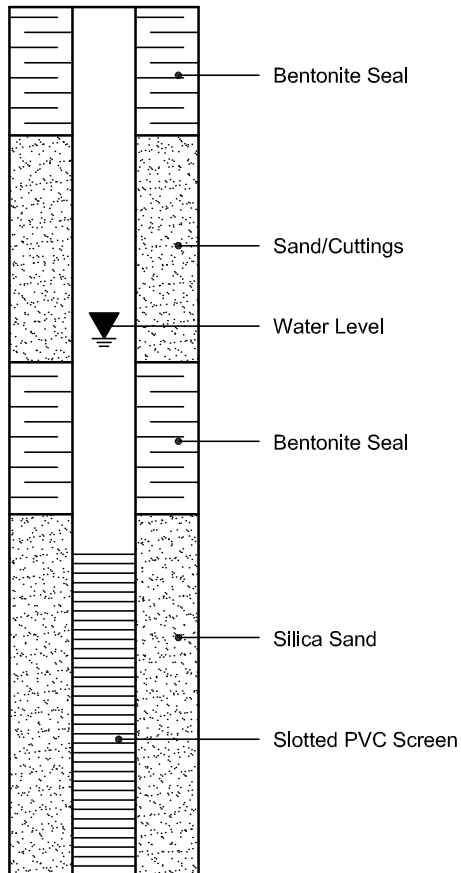
Shale



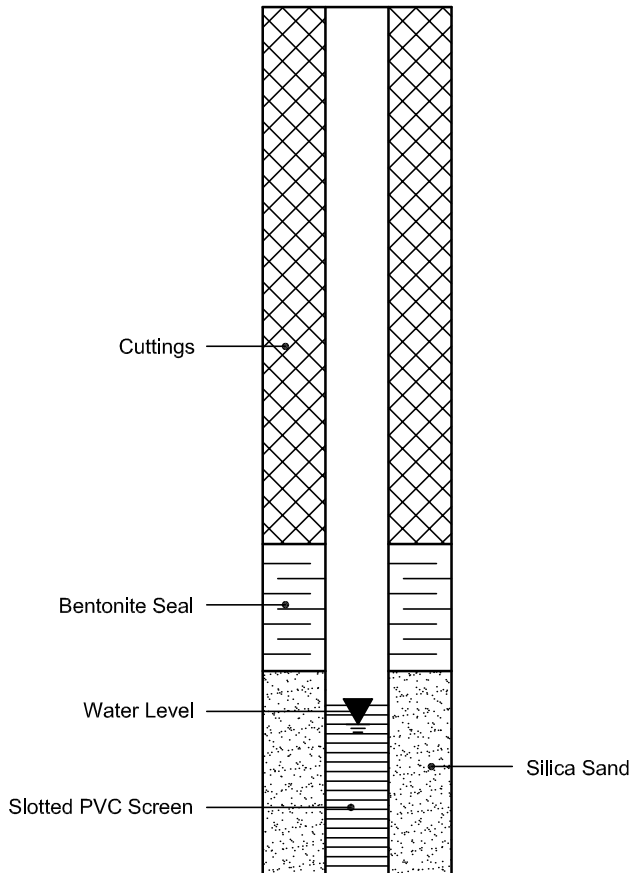
Bedrock

## MONITORING WELL AND PIEZOMETER CONSTRUCTION

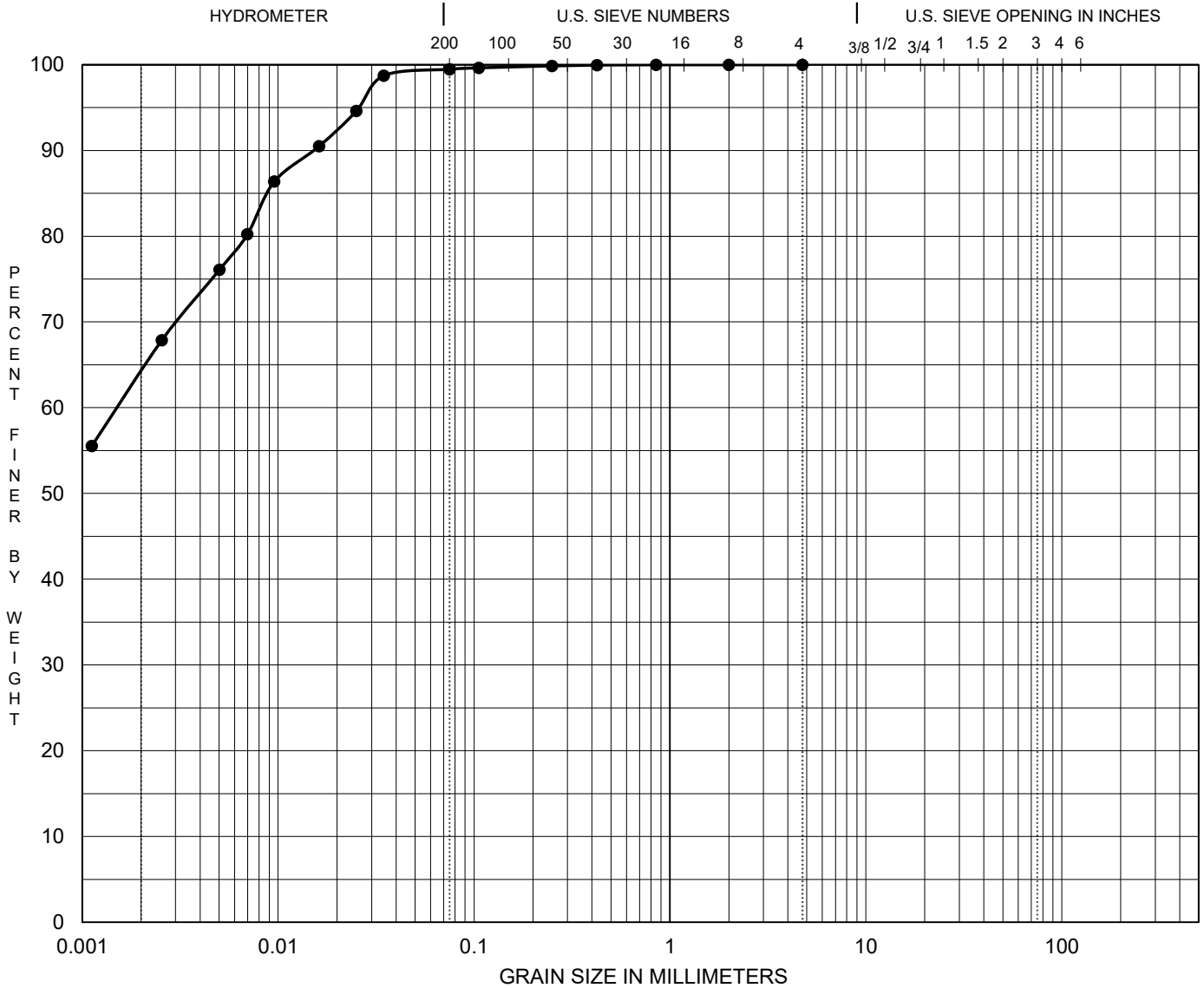
### MONITORING WELL CONSTRUCTION



### PIEZOMETER CONSTRUCTION







CLAY	SILT	SAND			GRAVEL		COBBLES
		fine	medium	coarse	fine	coarse	

Specimen Identification		Classification				MC%	LL	PL	PI	Cc	Cu
●	BH 2-26      SS4					30.7					
☒											
▲											
★											

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BH 2-26      SS4					0.0	0.5	36.0	63.5
☒									
▲									
★									

<b>CLIENT</b>	<u>Kenvest Construction Inc.</u>	<b>FILE NO.</b>	<u>PG7849</u>
<b>PROJECT</b>	<u>Geotechnical Investigation - Proposed Development</u>	<b>DATE</b>	<u>28-Jan-26</u>
	<u>6772 Rocque Street, Ottawa, Ontario</u>		

Certificate of Analysis

Report Date: 26-Jan-2026

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 20-Jan-2026

Client PO: 64894

Project Description: PG7849

<b>Client ID:</b>	BH3-26 SS4	-	-	-	-
<b>Sample Date:</b>	14-Jan-26 09:00	-	-	-	-
<b>Sample ID:</b>	2604225-01	-	-	-	-
<b>Matrix:</b>	Soil	-	-	-	-
<b>MDL/Units</b>					

**Physical Characteristics**

% Solids	0.1 % by Wt.	72.4	-	-	-	-
----------	--------------	------	---	---	---	---

**General Inorganics**

pH	0.05 pH Units	7.27	-	-	-	-
Resistivity	0.1 Ohm.m	76.1	-	-	-	-

**Anions**

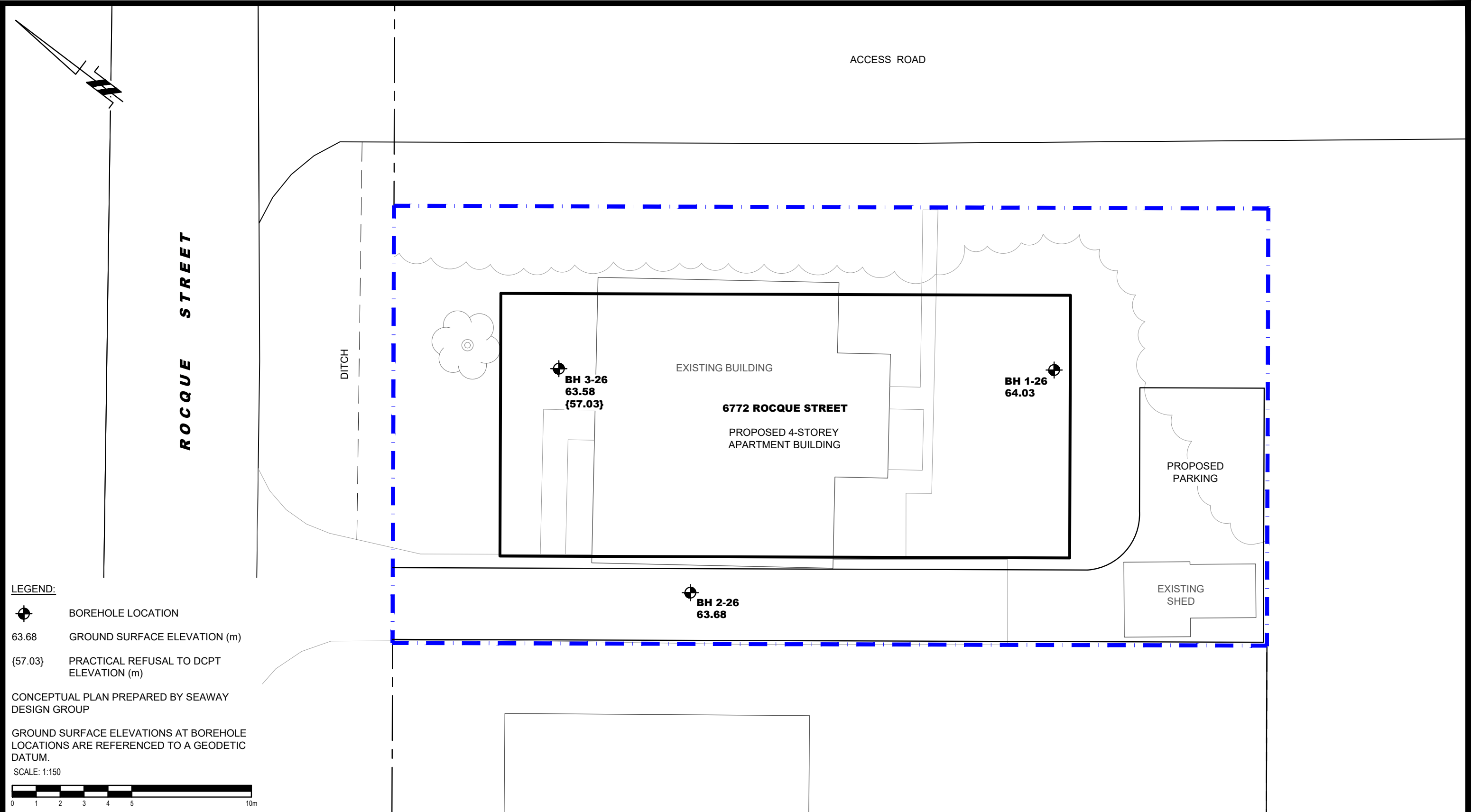
Chloride	10 ug/g	25	-	-	-	-
Sulphate	10 ug/g	17	-	-	-	-

# APPENDIX 2

FIGURE 1 - KEY PLAN

DRAWING PG7849-1 - TEST HOLE LOCATION PLAN





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

NO.	REVISIONS	DATE	INITIAL

**KENVEST CONSTRUCTION INC.  
GEOTECHNICAL INVESTIGATION  
PROPOSED RESIDENTIAL DEVELOPMENT  
6772 ROCQUE STREET**

**OTTAWA, ONTARIO**

**TEST HOLE LOCATION PLAN**

Scale:	1:150	Date:	01/2026
Drawn by:	ZS	Report No.:	PG7849-1
Checked by:	ZA	Dwg. No.:	<b>PG7849-1</b>
Approved by:	SD	Revision No.:	