Geotechnical Investigation

Rock Developments Inc.

Project Name:
Proposed Commercial Development
Catherine Street
Windsor, Ontario

Project Number:
LON-23015536-A0

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Date Submitted:
March 15, 2024

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Type of Document:

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1. Introduction and Background

1.1 Introduction

EXP Services Inc. (EXP) was retained by **Rock Developments Inc.** (Client) to carry out a geotechnical investigation and prepare a geotechnical report relating to the proposed commercial development in Windsor, Ontario, hereinafter referred to as the 'Site'.

Based on the information and a site plan provided by the Client, it is understood that the proposed development will include a new 158,000 square foot slab-on-grade commercial building with 1,030 parking spots. A gas bar is proposed at the south end of the Site. The overall Site area is about 14.6 hectares (ha). Catherine Street and Rose-Ville Garden Drive are also planned to be extended as part of the project.

Based on an interpretation of the factual test hole data and a review of soil and groundwater information from test holes advanced at the Site, EXP has provided geotechnical engineering guidelines to support the proposed Site development.

1.2 Terms of Reference

Authorization for EXP to proceed with this geotechnical investigation was received from Mr. Josh Way of **Rock Developments Inc.** via a signed Work Authorization form on December 11, 2023.

The purpose of the investigation was to examine the subsoil and groundwater conditions at the Site by advancing twenty eight (28) boreholes at the locations chosen by EXP and illustrated on the attached Borehole Location Plan (**Drawing 1**).

Based on an interpretation of the factual borehole data, and a review of soil and groundwater information from test holes advanced at the site, EXP Services Inc. has provided engineering guidelines to assist with the geotechnical design and construction of the proposed development. More specifically, this report provides comments on site preparation, excess soil management, excavations, dewatering, foundations, slab-on-grade construction, bedding and backfill, earthquake design considerations, pavement recommendations, and curbs and sidewalks.

This report is provided based on the terms of reference presented above, and on the assumption that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning geotechnical aspects of the codes and standards, this office should be contacted to review the design.

The information in this report in no way reflects the environmental aspects of the soil. Should specific information in this regard be needed, additional testing may be required.

Reference is made to **Appendix C** of this report, which contains further information necessary for the proper interpretation and use of this report.

2. Methodology

The fieldwork was carried out between February 16 and 22, 2024. In general, the geotechnical investigation consisted of the advancement of twenty-eight (28) boreholes at the locations denoted on **Drawing 1** as BH1 to BH28, inclusive. MW was suffixed to the borehole symbol (BH) where monitoring wells were installed. BH1 to BH5 were drilling within the proposed roadway extensions, BH15 to BH27 were advanced at locations associated with the proposed commercial building, BH7/MW and BH8 were advanced in the area of the gas bar and all remaining boreholes except BH28 were drilled at the proposed parking lot locations.

Prior to drilling, buried service clearances were obtained for the test hole locations by EXP.

The boreholes and monitoring wells were completed by a specialist drilling subcontractor under the full-time supervision of EXP geotechnical staff. The boreholes were advanced utilizing a track-mounted drill rig equipped with continuous flight solid and hollow stem augers, soil sampling and soil testing equipment. In each borehole, disturbed soil samples were recovered at depth intervals of 0.75 m and 1.5 m using conventional split spoon sampling equipment. The boreholes drilled at the Site were terminated at depths of between 2.0 and 6.6 metres (m) below ground surface.

Within the boreholes, Standard Penetration Tests (SPTs) were performed to assess the compactness or consistency of the underlying soils, and to obtain representative samples. During the drilling, the soil samples obtained from the boreholes were examined and logged in the field by EXP geotechnical personnel.

Short-term groundwater levels within the open boreholes were observed. These observations pertaining to groundwater conditions and stabilized groundwater levels at the test hole locations are recorded in the borehole logs found in **Appendix A**. Following the drilling, the boreholes which did not require a well installation were backfilled with the excavated materials and bentonite, to satisfy the requirements of Ontario Regulation 903.

Representative samples of the various soil strata encountered at the test locations were taken to our laboratory in London for further examination by a Geotechnical Engineer and laboratory classification testing. Laboratory testing for this investigation comprised routine moisture content determinations, with results presented on the borehole logs found in **Appendix A**.

Samples remaining after the classification testing will be stored for a period of three months following the issuance of this report. After this time, they will be discarded unless prior arrangements have been made for longer storage.

The location of each borehole was established in the field in conjunction with a site plan provided by the Client. The ground surface elevations at the borehole locations have been determined by EXP using the Trimble® R12i GNSS system. The elevations are referenced to geodetic datum.

3. Site and Subsurface Conditions

3.1 Site Description

The Site is located on the north side of Tecumseh Road East, north of an existing commercial development, subset approximately 300 metres north from Tecumseh Road East in the City of Windsor, Ontario. Two (2) road extensions of Rose-Ville Garden Drive to the south of the Site and Catherine Street to the east are also proposed (see **Drawing 1**). The Site is irregular in shape and measures approximately 14.6 hectares (36.1 acres) in area with a small lot frontage along Tecumseh Road East of 25 m for a proposed Rose-Ville Garden Drive extension to the north and a small lot frontage along Catherine Street of 22 m for a proposed Catherine Street extension to the west. At the time of the investigation the property was vacant with the ground surface covered with early growth trees, reeds, and bushes, with some low-lying areas having shallow standing water.

The Site is generally level with elevation generally ranging from 180.0 m to 181.3 m. The following sections provide a summary of the soil and groundwater conditions.

3.2 Soil Stratigraphy

The detailed stratigraphy encountered in each test hole is shown on the borehole logs found in **Appendix A** and summarized in the following paragraphs. It must be noted that the boundaries of the soil indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect transition zones for geotechnical design and should not be interpreted as exact planes of geological change.

3.2.1 Topsoil

All boreholes except BH8, BH10, BH11, BH17, BH23, BH26 and BH27 surfaced with a layer of topsoil. The topsoil ranged between 50 mm and 350 mm in thickness. A 300 mm thick buried topsoil layer was observed below the sand and gravel fill layer in BH2.

It should be noted that topsoil quantities should not be established from the information provided at the test hole locations only. If required, a more detailed analysis (involving additional shallow test pits) is recommended to accurately quantify the amount of topsoil to be removed for construction purposes.

3.2.2 Fill

Fill layers were observed at the surface or beneath the topsoil at all boreholes except for BH3, BH12, BH13, BH14, BH19, BH20 and BH28. The fill layer extended to 0.2 m below ground surface (bgs) to 0.6 m bgs in the area of the proposed roadway extensions and 0.2 m bgs to 2.3 m bgs in the building and parking areas.

The fill layer was predominantly clayey silt and was typically described as brown in colour, mottled and contained trace to some sand, trace gravel, and trace organics or topsoil inclusions. It was loose to compact (based on Standard Penetration Test (SPT) N Values of 4 to 26 blows per 300 mm split spoon sampler penetration) and moist (based on tactile examination and *in situ* moisture contents of 12 to 19 percent). Construction debris and occasional cobbles were observed in some boreholes within this layer. This clayey silt fill layer was observed at the surface or beneath the topsoil or below the sand and gravel fill layer, described below.

A sand and gravel fill layer was observed at the surface or below the topsoil in BH2, BH11, BH23, BH25, BH26 and BH27. The sand and gravel fill was described as brown to light brown with trace to some silt. The relative density of the layer was loose to compact (SPT N Values of 7 to 18) and moist (tactile examination and *in situ* moisture contents of 15 and 28 percent).

3.2.3 Clayey Silt Till

Each borehole was terminated in a layer of clayey silt till, the predominant deposit encountered in the drilling program. The clayey silt till layer was described as brown turning grey with depth, mottled in the upper level and contained trace sand, trace gravel and occasional cobbles. This glacial layer was typically described as firm to very stiff in consistency, occasionally hard at lower depth (SPT N Values of 6 to 45) and moist (tactile examination and *in situ* moisture contents of 12 to 21 percent).

3.3 Groundwater Conditions

Details of the groundwater conditions observed within the boreholes are provided on the attached Borehole Logs. Moisture contents of selected samples are also recorded on the attached Borehole Logs.

Upon completion of drilling, the open boreholes were examined for the presence of groundwater and groundwater seepage. All boreholes were open and dry upon completion of drilling.

It should be noted that insufficient time was available for the measurement of the depth to the stabilized groundwater table prior to backfilling the borehole.

Two (2) groundwater monitoring wells were installed during the drilling between February 16 and 22, 2024 at the Site. Well construction details are shown in **Table 1** below.

Table 1 – Monitoring Well Construction Details

Well ID	Ground Surface Elevation (m)	Completion Depth (m bgs)	Screen Length (m)
BH6/MW	180.2	6.1	3.0
BH7/MW	181.2	6.1	3.0

The monitoring wells have been registered with the Ministry of the Environment, Conservation and Parks (MECP), in accordance with Ontario Regulation 903, and remain intact for the purposes of ongoing monitoring of stabilized groundwater conditions, as required.

The brown/grey colour interface within the clayey silt, between depths of about 3.0 and 5.6 m at the Site, is typically indicative of the long-term groundwater level.

It is noted that the depth to the groundwater table may vary in response to climatic or seasonal conditions, and, as such, may differ at the time of construction, with higher levels in wet seasons.

3.4 Methane Gas

No methane gas producing materials or significant organic matter was encountered at the borehole locations.

An RKI Gx-2003 Gas Detector was used in the upper levels of the open boreholes. The unit measures LEL combustibles, methane gas, oxygen content, carbon monoxide and hydrogen sulfide in standard confined space gases. No significant methane gas concentration was detected in the boreholes.

4. Discussion and Recommendations

Based on the information provided by the Client, it is understood that the proposed commercial development will consist of a one (1) storey, 158,000 square foot slab-on-grade commercial building and gas bar with parking. Two (2) roadway extensions, Catherine Street and Rose-Ville Garden Drive, are proposed as part of the overall development. Other associated features of the development include full municipal servicing, access roads and landscaped areas.

The following sections of this report provide geotechnical comments and recommendations regarding site preparation, excess soil management, excavations, dewatering, foundations, slab-on-grade construction, bedding and backfill, earthquake design considerations, pavement recommendations, and curbs and sidewalks.

4.1 Site Preparation

Prior to the placement of foundations, pipe bedding and/or engineered fill, all surficial topsoil, vegetation and/or otherwise deleterious materials should be stripped. The surficial topsoil may be stockpiled on site for possible reuse for landscaping fill.

Based on a review of historical aerial photographs, historical maps, and other records review, the Site was agricultural/vacant land from at least the early 1910s until the early 1950s when two (2) small buildings were observed near the west boundary of Site. By the early 1970s the buildings were no longer present. Considering construction debris was observed at the time of the investigation, it is believed that some building debris from the demolished structures may be present. The removal of previous building foundations, if any, should include all building debris, foundation walls, footings and concrete floor slabs, if present. The removal and disposal of the previously occupied buildings must satisfy the local building standards, Ontario Building Code (OBC), Ministry of Labour (MOL) and the Ministry of Environment, Conservation and Parks (MECP) requirements. Removal of the associated septic tank and field tile, if present, will also be required.

Following the removal of the topsoil and any building debris and prior to fill placement, the exposed subgrade should be thoroughly proof-rolled with a heavy smooth drum roller and inspected by a Geotechnical Engineer. Any soft or loose areas detected during this operation should be sub-excavated and replaced with approved fill.

It is recommended that construction traffic be minimized on the finished subgrade, and that the subgrade be sloped to promote surface drainage and runoff.

In the building areas where the grade will be raised, the fill material should comprise imported granular or approved onsite (excavated) material. The fill material should be inspected and approved by a geotechnical engineer and should be placed in maximum 300 mm (12 inch) thick lifts and uniformly compacted to 100 percent Standard Proctor Maximum Dry Density (SPMDD) within 3 percent of optimum moisture content. The geometric requirements for engineered fill are provided on **Drawing 2**.

The natural and inorganic fill materials on site would be suitable for reuse as engineered fill. The material should be examined and approved by a geotechnical engineer prior to reuse.

In areas along the proposed roadways, fill material used to raise grades may comprise onsite competent inorganic excavated soils, or imported granular fill approved by an engineer. The fill should be placed in maximum 300 mm (12 inch) thick loose lifts and uniformly compacted to 95/98 percent SPMDD, depending on depth, within 3 percent of optimum moisture content to provide adequate stability for the new pavements.

In situ compaction testing should be carried out during the fill placement to ensure that the specified compaction is being achieved.

If imported fill material is utilized at the site, verification of the suitability of the fill may be required from an environmental standpoint. Conventional geotechnical testing will not determine the suitability of the material in this regard. Analytical testing and environmental site assessment may be required at the source. This will best be assessed prior to the selection of the material source.

Excess material should be removed from the site and disposed of in accordance with Ministry of the Environment, Conservation and Parks (MECP) guidelines and requirements. Analytical sampling and testing may be required in accordance with O. Reg. 406/19 for transportation and off-site disposal of excavated material. EXP can be of assistance if an assessment of the materials is required.

4.2 Excavation and Groundwater Control

4.2.1 Excess Soil Management

It should be noted that the Geotechnical Investigation does not include any testing for off-site disposal according to the new Regulation O. Reg. 406/19.

Ontario Regulation 406/19 made under the Environmental Protection Act (November 28, 2019) was implemented on January 1, 2021. The new regulation dictates the testing protocol that is required for the management and disposal of Excess Soils. As set forth in the Regulation, specific analytical testing protocols will need to be implemented and followed based on the quality and quantity of soil to be managed.

The quality of soils is assessed through an Assessment of Past Uses (APU) including the provision of an Ecolog ERIS data base report to determine if there are any Areas of Potential Environmental Concern (APEC). The parameters to be tested will be determined by the APU results.

The testing protocols are specific as to whether the soil is stockpiled or in situ. In either scenario, the testing protocols are far more onerous than have been historically carried out as part of standard industry practices. These decisions should be factored in and accounted for prior to the initiation of the project-defined scope of work. EXP would be pleased to assist with the implementation of a soil management and testing program that would satisfy the requirements of Ontario Regulation 406/19.

Soil sampling requirements for Areas of Potential Environmental Concern (APEC) related to the new standard effective January 1, 2022 are provided below.

Table 2 – Recommended Ex-Situ (e.g., Stockpiles)

Soil Volume	Sampling Frequency
< 130 m^3	Minimum of 3
> 130 - 220 m^3	4
> 220 – 5,000 m^3	5-32*
> 5,000 m^3	N = 32 + (Volume – 5,000) / 300

*refer to stockpile sampling frequency in O.Reg. 153/04 for specifics. Essentially, one sample for every 150 m^3 after 800 m^3

Table 3 – Recommended In Situ

Soil Volume	Sampling Frequency
< 600 m^3	Minimum of 3
> 600 m^3 - 10,000 m^3	1 sample per every additional 200 m^3
> 10,000 m^3 – 40,000 m^3	1 sample per every additional 450 m^3
> 40,000 m^3	1 sample per every additional 2,000 m^3

In areas where no APECs have been identified, the sampling frequency in the tables noted above do not need to be followed and can be determined at the discretion of the QP.

In addition to the above tables, one field duplicate should be submitted for approximately every 10 samples taken for quality control/quality assurance purposes.

Soil Analytical Testing Requirements:

- Samples to be tested for a minimum of Petroleum Hydrocarbons (PHCs) – Fractions F1-F4, Benzene, Toluene, Ethylbenzene & Xylenes (BTEX), Metals & Inorganics, including Electrical Conductivity (EC) and Sodium Absorption Ration (SAR);
- Any additional potential Contaminant of Concern identified in past uses report (comes into effect January 1st, 2022); and,
- mSPLP Leachate testing (metals and VOCs) (not required for volumes under 350 m^3: between 350 m^3 and 600 m^3 (minimum of 3); greater than 600 m^3 (10 % of samples).

Other components of the new regulation include:

- The Sampling and Analysis Plan (SAP) which follows the APU;
- The Soil Characterization Report (SCR) which follows the sampling program;
- The Excess Soil Destination Assessment Report (ESDAR) which follows the SCR;
- Notice of Project on the Resouce Productivity and Recovery Authority (RPRA) which is usually the responsibility of the Contractor during the construction phase; and,
- Tracking Requirements on the RPRA, again, usually the responsibility of the Contractor during the construction phase.

In general, it is most economical to provide a site grading plan that keeps all excess soils on site so that O. Reg 406/19 is not invoked.

4.2.2 General

All work associated with design and construction relative to excavations must be carried out in accordance with Part III of Ontario Regulation 213/91 under the Occupational Health and Safety Act. Based on the results of the investigation and in accordance with Section 226 of Ontario Regulation 213/91, the very stiff to hard clayey silt till soils are classified as Type 2 soils, while the fill and firm to stiff clayey silt till soils are classified as Type 3 soils.

Temporary excavation sidewalls which extend through and terminate within Type 2 soil may be cut vertical in the bottom 1.2 m (4 ft.) and cut back at an inclination of 1 horizontal to 1 vertical above that level. Where excavations extend into or through Type 3 soil, excavation side slopes must be cut back at a maximum inclination of about 1H:1V from the base of the excavation. Should groundwater egress loosen the side slopes of Type 2 or Type 3 soils, slopes of 3H:1V or flatter will be required.

Geotechnical inspection at the time of excavation can confirm the soil type present.

It should be noted that the presence of cobbles and boulders in natural glacial deposits may influence the progress of excavation and construction.

4.2.3 Excavation Support

The recommendations for side slopes given in the above section would apply to most of the conventional excavations expected for the proposed development. However, in areas adjacent to buried services that are located above the base of the excavations, side slopes may require support to prevent possible disturbance or distress to these structures. This concept also applies to connections to existing services. In granular soils above the groundwater and in cohesive natural soils, bracing will not normally be required if the structures are behind a 45-degree line drawn up from the toe of the excavation. In wet sandy or silty soils, the setback should be about 3H to 1V if bracing is to be avoided.

For support of excavations such as for any deep manholes, shoring such as sheeting or soldier piles and lagging can be considered. The design and use of the support system should conform to the requirements set out in the most recent version of the Occupational Health and Safety Act for Construction Projects and approved by the Ministry of Labour. Excavations should conform to the guidelines set out in the proceeding section and the Safety Act.

The shoring should also be designed in accordance with the guidelines set out in the Canadian Foundation Engineering Manual, 5th Edition. Soil-related parameters considered appropriate for a soldier pile and lagging system are shown below.

Where applicable, the lateral earth pressure acting on the excavation shoring walls may be calculated from the following equation:

$$P = K (\gamma h + q)$$

where, P = lateral earth pressure in kPa acting at depth h;

γ = natural unit weight, a value of 20.4 kN/m3 may be assumed;

h = depth of point of interest in m;

q = equivalent value of any surcharge on the ground surface in kPa.

The earth pressure coefficient (K) may be taken as 0.25 where small movements are acceptable and adjacent footing or movement sensitive services are not above a line extending at 45 degrees from the bottom edge of the excavation; 0.35 where utilities, roads, sidewalks must be protected from significant movement; and 0.45 where adjacent building footings or movement sensitive services (gas and water mains) are above a line of 60 degrees from the horizontal extending from the bottom edge of the excavation.

For long term design, a K at rest (K_o) of a minimum of 0.5 should be considered.

The above expression assumes that no hydrostatic pressure will be applied against the shoring system. It should be recognized that the final shoring design will be prepared by the shoring contractor. It is not possible to comment further on specific design details until this design is completed.

If the shoring is exposed to freezing temperatures, appropriate insulation may be provided to prevent outward movement.

The performance of the shoring must be checked through monitoring for lateral movement of the walls of the excavation to ensure that the shoring movements remain within design limits. The most effective method for monitoring the shoring movements can best be devised by this office when the shoring plans become available. The shoring designer should however assess the specific site requirements and submit the shoring plans to the engineer for review and comment.

4.2.4 Construction Dewatering

Based on the soil texture encountered during the investigation, significant groundwater infiltration is not anticipated within service trench and foundation excavations at conventional depths (i.e. less than 4 m). Any minor groundwater infiltration can likely be accommodated using conventional sump pumping techniques; however, if groundwater infiltration persists, more extensive dewatering measures may be required. EXP would be pleased to provide further information in this regard, upon request.

The collected water should be discharged a sufficient distance away from the excavated area to prevent the discharge water from returning to the excavation. Sediment control measures should be provided at the discharge point of the dewatering system. Caution should also be taken to avoid any adverse impacts to the environment.

It is important to mention that for any projects requiring positive groundwater control with a removal rate of 50,000 liters to less than 400,000 liters per day, an Environmental Activity and Sector Registry (EASR) will be required. Permit to Take Water (PTTW) applications are required for removal rates more than 400,000 L per day and will need to be approved by the MECP per Sections 34 and 98 of the Ontario Water Resources Act R.S.O. 1990 and the Water Taking and Transfer Regulation O. Reg. 387/04. It is noted that a standard geotechnical investigation will not determine all the groundwater parameters which may be required to support the application.

4.3 Building Foundations

The proposed 158,000 square foot commercial building and the gas bar can be supported on conventional spread and strip footings founded below the unsuitable soils on the natural competent subgrade soils or engineered fill. Foundations for the two buildings can be set on the natural, competent clayey silt till soils at the depths shown in Table **4** and **5** below.

Table 4 – Foundation Depth and Bearing Capacity – Commercial Building

Borehole ID	Ground Surface Elevation (m)	Minimum Depth to Achieve 190 kPa (SLS) and 285 kPa (ULS)		Minimum Depth to Achieve 145 kPa (SLS) and 215 kPa (ULS)	
		Depth (m bgs)	Elevation (m)	Depth (m bgs)	Elevation (m)
BH15	181.1	2.2	178.9	1.2	179.9
BH16	181.1	2.2	178.9	1.5	179.6
BH17	181.1	2.9	178.2	2.5	178.6
BH18	180.8	2.2	178.6	2.2	178.6
BH19	181.0	1.5	179.5	1.5	179.5
BH20	180.9	2.2	178.7	0.8	180.1
BH21	180.7	2.2	178.5	1.1	179.6
BH22	181.1	2.5	178.6	1.8	179.3
BH23	181.0	2.2	178.8	1.8	179.2
BH24	180.9	2.2	178.7	0.8	180.1
BH25	181.2	2.2	179.0	1.0	180.2
BH26	181.2	2.9	178.3	2.9	178.3
BH27	181.3	1.0	180.3	2.9	178.3

Table 5 – Foundation Depth and Bearing Capacity – Gas Bar

Borehole ID	Ground Surface Elevation (m)	Minimum Depth to Achieve 145 kPa (SLS) and 215 kPa (ULS)	
		Depth (m bgs)	Elevation (m)
BH7/MW	181.2	1.8	179.4
BH8	181.3	1.8	179.5

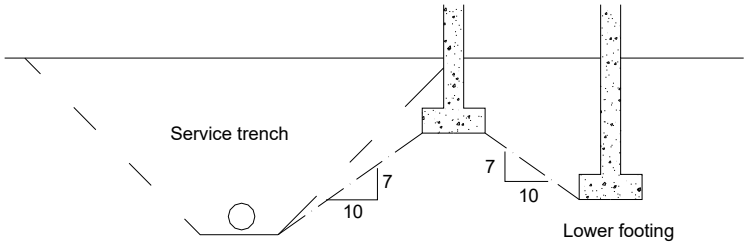
*Note: The depths to the competent natural subgrade soils for some boreholes are deeper than others because of the presence of the fill and/or unsuitable materials. The recommended founding depths listed above are minimum depths.

If the grades are to be raised or restored, engineered fill can be used for foundation support. The geometric requirements for the fill placement are shown on **Drawing 2**, appended. The available SLS bearing capacity for the engineered fill is 145 kPa (3,000 psf). Verification of the soil conditions are best determined by the Geotechnical Engineer at the time of excavation.

Inspection by the Geotechnical Engineer is considered imperative to confirm that competent clayey silt till is encountered at the founding elevation(s) and that all soft and loose materials are removed from the excavations.

4.3.1 Foundations - General

Footings at different elevations should be located such that the higher footings are set below a line drawn up at 10 horizontal to 7 vertical from the near edge of the lower footing. This concept should also be applied to service excavation, etc. to ensure that undermining is not a problem.



FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

Provided that the footing bases are not disturbed due to construction activity, precipitation, freezing and thawing action, etc., and the aforementioned bearing pressures are not exceeded, the total and differential settlements of footings designed in accordance with the recommendations of this report and with careful attention to construction detail are expected to be less than 25 mm and 20 mm (1 and ¾ inch) respectively.

All footings exposed to seasonal freezing conditions should be protected from frost action by at least 1.2 m (4 ft) of soil cover or equivalent insulation.

It should be noted that the recommended bearing capacities have been calculated by EXP from the borehole information for the design stage only. The investigation and comments are necessarily on-going as new information of underground conditions becomes available. For example, if more specific information becomes available with respect to conditions between boreholes when foundation construction is underway. The interpretation between the boreholes and the recommendations of this report must therefore be checked through field inspections provided by EXP to validate the information for use during the construction stage.

4.4 Slab-on-Grade Construction

Preparation of the subgrade should include the removal of all topsoil and/or deleterious material from the proposed building areas. The entire floor slab area should then be thoroughly proof rolled with a heavy roller and examined by a Geotechnical Engineer. Any excessively soft or loose areas should be sub-excavated and replaced with suitable compacted fill. Where the exposed subgrade requires reconstruction to achieve the design elevations, structural fill should be used. It is recommended that structural fill comprises granular material, such as OPSS Granular 'B', or approved alternative material. The fill should be placed in maximum 300 mm thick lifts and compacted to a minimum of 98 percent Standard Proctor Maximum Dry Density (SPMDD). For best compaction results, the *in situ* moisture content of the fill should be within about three percent of optimum, as determined by Standard Proctor density testing.

No special underfloor drains are required provided that the exterior grades are lower than the floor slab, and positively sloped away from the slab. It is recommended that an impermeable soil seal such as clay, asphalt or concrete be provided on the surface to minimize water infiltration from the exterior of the building. See **Drawing 4** for Drainage and Backfill recommendations for slab-on-grade construction.

A moisture barrier, consisting of a 200 mm (8 in.) thick, compacted layer of 19 mm (3/4 in.) clear stone, should be then placed between the prepared granular sub-base and the floor slab. An alternative option would be to place 300 mm of OPSS Granular 'A' material compacted to 100 percent SPMDD.

The installation and requirement of a vapour barrier under a concrete slab should conform to the flooring manufacturer's and designer's requirements. Moisture emission testing will be required to determine the concrete condition prior to flooring installation. In order to minimize the potential for excess moisture in the floor slab at the time of the flooring installation, a concrete mixture with a low water-to-cement ratio (i.e., 0.45 to 0.55) should be used. Chemical additives may be required at the time of placement to make the concrete workable and should be used in place of additional water at the point of placement. Ongoing liaison from this office will be required.

For slab on grade design, the modulus of subgrade reaction (k) can be taken as 20 MPa/m for the compacted stone layer over the compacted granular subbase.

The water-to-cement ratio and slump of concrete utilized in the floor slabs should be strictly controlled to minimize shrinkage of the slabs. Adequate joints should be provided in the floor slab to further control cracking. During placement of concrete at the construction site, testing should be performed on the concrete.

4.5 Foundation Backfill

In general, the existing natural soils excavated from the foundation area should be suitable for re-use as foundation wall backfill exterior to the foundation wall drainage system if the work is carried out during relatively dry weather. The materials to be re-used should be within three percent of optimum moisture for best compaction results. Materials should be stockpiled per their composition, i.e. sandy soils should not be mixed with clayey soils.

If the weather conditions are very wet during construction, then imported granular material such as OPSS Granular 'B' should be used. Site review by the geotechnical consultant may be advised.

The backfill must be brought up evenly on both sides of walls not designed to resist lateral earth pressures.

During construction, the fill surface around the perimeter of structures should be sloped in such a way that the surface runoff water does not accumulate around the structure.

4.6 Site Servicing

The subgrade soils beneath the water and sewer pipes which will service the Site are generally expected to comprise clayey silt till. For services constructed on the natural soils or engineered fill, the bedding should conform to City of Windsor and OPS Standards. The bedding course may be thickened if portions of the subgrade become wet during excavation. Bedding aggregate should be placed around the pipe to at least 300 mm (12 inch) above the pipe and be compacted to a minimum 95 percent SPMDD.

Water and sewer lines installed outside of heated areas should be provided with a minimum 1.2 m (4 ft.) of soil cover for frost protection.

The bases of excavations which cut into and terminate in competent natural soils are expected to remain stable for the short construction period. For bases terminated in wet silty layers, localized improvement will be required. Base improvement may also be required if work is carried out in wet weather seasons. The extent of base improvement or stabilization is best determined in the field during construction, with consultation from a Geotechnical Engineer.

To minimize disturbance to the base, pipe laying should be carried out in short sections, with backfilling following closely after laying and no section of trench should be left open overnight.

The trenches above the specified pipe bedding should be backfilled with inorganic on-site soils placed in 300 mm thick loose lifts and uniformly compacted to at least 95% SPMDD. For trench backfill within 1 metre below the roadway subbase, the fill should be uniformly compacted to at least 98% SPMDD. A program of *in situ* density testing should be set up to ensure that satisfactory levels of compaction are achieved.

Requirements for backfill in service trenches, etc. should also have regard for OPS and City of Windsor requirements. A summary of the general recommendations for trench backfill is presented on **Drawings 5** and **6**. A program of *in situ* density testing should be set up to ensure that satisfactory levels of compaction are achieved.

Based on the results of this investigation, the majority of the excavated natural and fill material are considered suitable for construction backfill.

Soils excavated from below the stabilized groundwater table may be too wet for reuse as backfill unless adequate time is allowed for drying, or if the material is blended with approved dry fill; otherwise, it may be stockpiled onsite for reuse as landscape fill.

As noted previously, disposal of excavated materials off site should conform to current MECP guidelines.

4.7 Earthquake Design Considerations

The recommendations for the geotechnical aspects to determine the earthquake loading for design using the OBC 2012 are presented below.

The subsoil and groundwater information at this Site have been examined in relation to Section 4.1.8.4 of the OBC 2012. The subsoils at the Site generally consist of topsoil and fill over clayey silt till deposits. It is anticipated that the proposed structures will be founded on the natural deposits, below any loose or soft zones.

Table 4.1.8.4.A. Site Classification for Seismic Site Response in OBC 2012 indicated that to determine the site classification, the average properties in the top 30 m (below the lowest basement level) are to be used. The boreholes advanced at this Site were advanced to a maximum depth of 6.7 m below existing grade. Therefore, the Site Classification recommendation would be based on the available information as well as our interpretation of conditions below the boreholes based on our knowledge of the soil conditions in the area.

Based on the above assumptions, interpretations in combination with the known local geological conditions, the Site Class for the proposed development is “D” as per Table 4.1.8.4.A, Site Classification for Seismic Site Response, OBC 2012. Additional depth drilling may be advised to determine if the soil conditions below the current depth of exploration can support a higher Site Classification.

4.8 Site Pavement Design

Areas to be paved should be stripped of all topsoil, organics and other obviously unsuitable material. The exposed subgrade must then be thoroughly proof rolled. Any soft areas revealed by this or any other observations must be over-excavated and backfilled with approved material. All fill required to backfill service trenches or to raise the subgrade to design levels must conform to requirements outlined previously. Preferably, the natural inorganic excavated soils should be used to maintain uniform subgrade conditions, provided adequate compaction can be achieved.

Provided the preceding recommendations are followed, the pavement thickness design requirements given in the following table are recommended for the anticipated traffic loading and subgrade conditions.

Table 6 – Recommended Pavement Structure Thicknesses

Pavement Layer	Compaction Requirements	Light Duty Pavement Structure (Cars Only)	Heavy Duty Pavement Structure (Cars and Trucks)
Asphaltic Concrete	92% MRD[1] or 97% BRD[1]	40 mm HL-3 50 mm HL-8	50 mm HL-3 60 mm HL-8
Granular 'A' (Base)	100% SPMDD[1]	150 mm	150 mm
Granular 'B' (Sub-Base)	100% SPMDD[1]	300 mm	450 mm

*Notes: 1) SPMDD denotes Standard Proctor Maximum Dry Density, MRD denotes Maximum Relative Density, BRD denotes Bulk Relative Density.
2) The subgrade must be compacted to 98% SPMDD.
3) The above recommendations are minimum requirements.
3) Catherine Street and Rose-Ville Garden Drive are considered to be Heavy Duty Pavement Structure

The recommended pavement structures provided in the above table are based on the existing subgrade soil properties determined from visual examination and textural classification of the soil samples. Consequently, the recommended pavement structures should be considered for preliminary design purposes only. Other granular configurations may also be possible provided the granular base equivalency (GBE) thickness is maintained. These recommendations on thickness design are not intended to support heavy and concentrated construction traffic, particularly where only a portion of the pavement section is installed.

If construction is undertaken under adverse weather conditions (i.e., wet or freezing conditions) subgrade preparation and granular sub-base requirements should be reviewed by the Geotechnical Engineer. If the sub-base is set on wet or dilatant silty soils, a geotextile will be required. A woven type of geotextile such as Terrafix 200W or equivalent would be suitable for this application.

If only a portion of the pavement will be in place during construction, the granular subbase may have to be thickened. This is best determined in the field during the site servicing stage of construction, prior to road construction.

Samples of both the Granular 'A' and Granular 'B' aggregate should be checked for conformance to OPSS 1010 and City of Windsor requirements prior to utilization on Site, and during construction. The Granular 'B' subbase and the Granular 'A' base courses must be compacted to 100 percent SPMDD.

The asphaltic concrete paving materials should conform to the requirements of OPSS MUNI 1150 or OPSS MUNI 1151. The asphalt should be placed in accordance with OPSS 310 and compacted to at least 97 percent of the Marshall mix design bulk relative density or 92% of maximum relative density. A tack coat should be applied between the surface and binder asphalt courses.

Good drainage provisions will optimize pavement performance. The finished pavement surface should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage toward catch basins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. In low areas, sub-drains should be installed to intercept excess subsurface moisture and prevent subgrade softening, as shown on **Drawing 6**. This is particularly important in heavier traffic areas at the site entrances. The locations and extent of sub-drainage required within the paved areas should be reviewed by this office in conjunction with the proposed grading.

A program of *in situ* density testing must be carried out to verify that satisfactory levels of compaction are being achieved.

4.9 Methane Gas

An RKI Gx-2003 Gas Detector was used in the upper levels of the open boreholes. The unit measures low explosive limits (LEL) combustibles, methane gas, oxygen content, carbon monoxide and hydrogen sulfide in standard confined space gases. Methane gas was not detected in any of the boreholes at the time of this investigation. Based on the present information, no special methane gas abatement measures are indicated at this Site.

4.10 Curbs and Sidewalks

It is recommended that the concrete for curb and gutter and sidewalks should be proportioned, mixed, placed, and cured in accordance with the requirements of OPSS 353, OPSS 1350 and City of Windsor Standards.

During cold weather, the freshly placed concrete must be covered with insulating blankets to protect against freezing. Three cylinders from each day's pour should be taken for compressive strength testing. Air entrainment, temperature, and slump tests should be made from the same batch of concrete from which test cylinders are made.

The subgrade for the sidewalks should comprise undisturbed natural competent soil of well-compacted fill. A minimum 150 mm thick layer of compacted Granular 'A' type aggregate should be placed beneath the sidewalk slabs. It is recommended that the Granular 'A' be compacted to a minimum 100 percent SPMDD, to provide adequate support for the concrete sidewalk. Construction traffic should be kept off the placed curbs and sidewalks as they are not designed to withstand heavy traffic loads.

4.11 Inspection and Testing Requirements

An effective inspection and testing program is an essential part of construction monitoring. The Inspection and Testing Program typically includes the following items:

- Subgrade examination following removal of existing fill and organics, prior to foundation installation and engineered fill placement (if required);
- Inspection and Materials testing during engineered fill placement (full-time supervision is recommended) and site servicing works, including soil sampling, laboratory testing (moisture contents and Standard Proctor

density test on the pipe bedding, trench backfill and engineered fill material), monitoring of fill placement, and *in situ* density testing;

- Footing base examinations to confirm suitability to support the design bearing pressures;
- Visual examination of concrete reinforcing steel placement;
- Materials testing for concrete foundations, floor slab, curbs and sidewalks;
- Inspection and Materials testing during paved area construction, including subgrade examination of the paved area subgrade soils following site servicing, laboratory testing (grain size analyses and Standard Proctor density tests on the Granular A and B material placed on site roadways), and *in situ* density testing;
- Inspection and Materials testing for base and surface asphalt, including laboratory testing on asphalt sampling to confirm conformance to project specifications and standards.

EXP would be pleased to prepare an inspection and testing work program prior to construction, incorporating the above items.

5. General Comments

The information presented in this report is based on a limited investigation designed to provide information to support an assessment of the current geotechnical conditions within the subject property. The conclusions and recommendations presented in this report reflect site conditions existing at the time of the investigation. Consequently, during the future development of the property, conditions not observed during this investigation may become apparent. Should this occur, EXP Services Inc. should be contacted to assess the situation, and the need for additional testing and reporting. EXP has qualified personnel to provide assistance in regard to any future geotechnical and environmental issues related to this property.

Our undertaking at EXP, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the engineering profession.

The comments given in this report are intended only for the guidance of design engineers. The number of test holes required to determine the localized underground conditions between test holes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should in this light, decide on their own investigations, as well as their own interpretations of the factual test pit results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

EXP Services Inc. should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not afforded the privilege of making this review, EXP Services Inc. will assume no responsibility for interpretation of the recommendations in this report.

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

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

Drawings

-LEGEND-

BH1 Approximate Borehole Location

-NOTES-

1. The boundaries and soil types have been established only at test hole locations. Between test holes they are assumed and may be subject to considerable error.
2. Soil samples will be retained in storage for 3 months and then destroyed unless client advises that an extended time period is required.
3. Topsoil quantities should not be established from the information provided at the test hole locations.
4. The site plan was reproduced from Google Earth Pro and should be read in conjunction with EXP Geotechnical Report LON-23015536-A0.

Geotechnical Investigation

Proposed Commercial Development

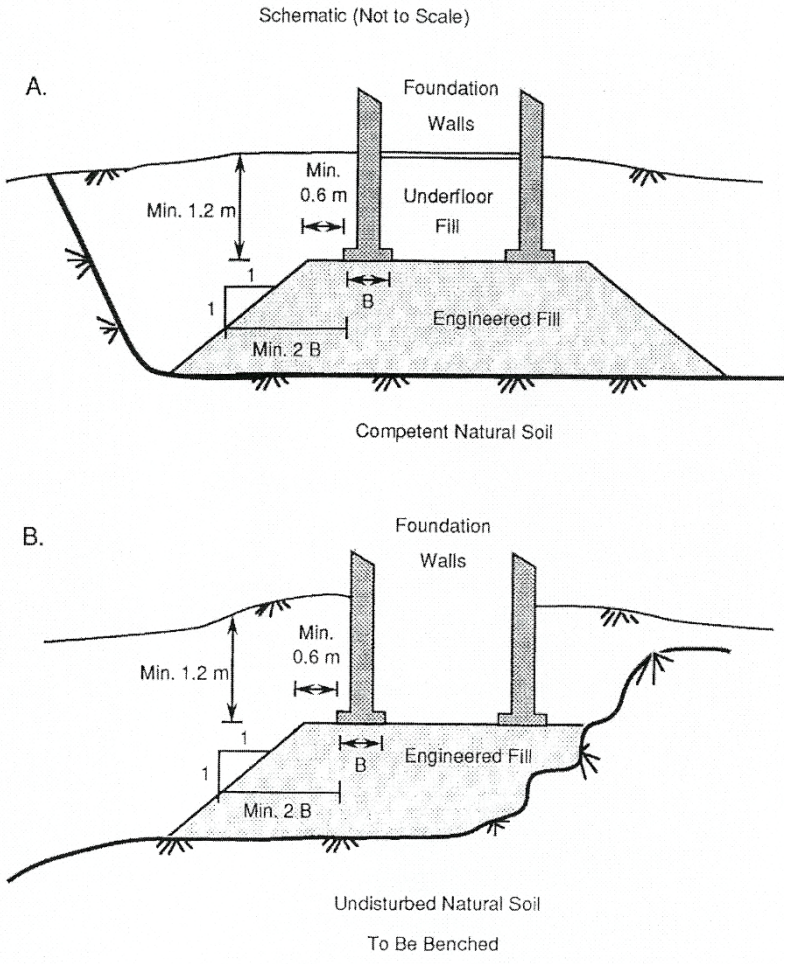
Catherine Street, Windsor, Ontario

CLIENT	Rock Developments Inc.
TITLE	Borehole Location Plan
Prepared By: E.B.	Reviewed By: C.S.

EXP Services Inc.
15701 Robin's Hill Road, London, ON, N5V 0A5

DATE	APPROXIMATE SCALE	PROJECT NO.	DWG.
FEBRUARY 2024	1:5,000	LON-23015536-A0	1

DRAWING 2 – GEOMETRIC REQUIREMENTS FOR FOUNDATIONS ON ENGINEERED FILL

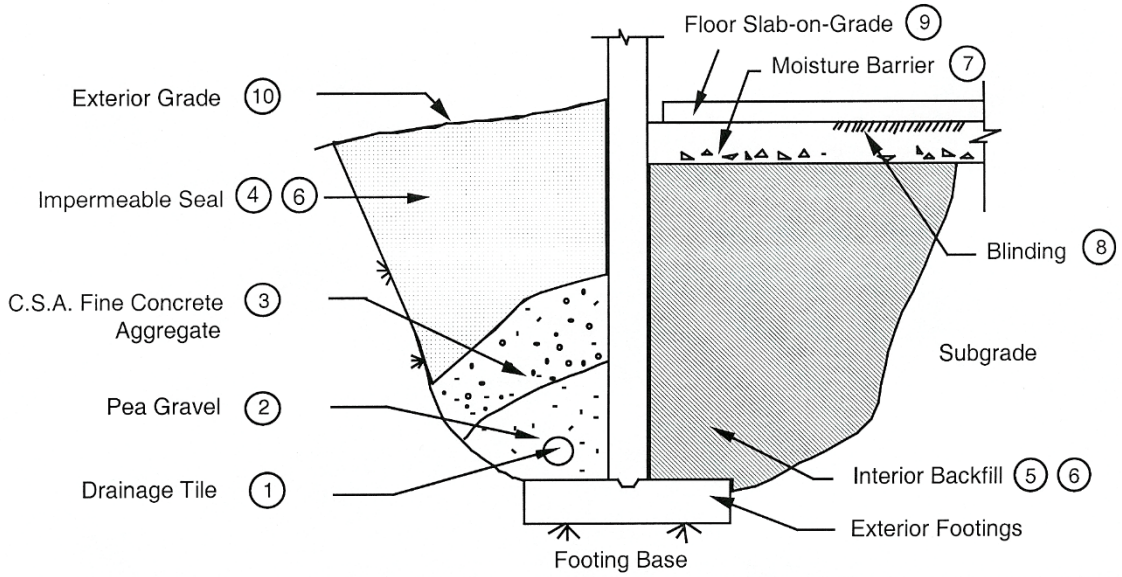


- SECTION VIEW

NOTES:

1. The area must be stripped of all topsoil contaminated fill material and proof rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by an EXP engineer prior to placement of fill.
2. The approved engineered fill must be compacted to 100% Standard Proctor dry density throughout. Granular fill is required.
3. Fulltime geotechnical inspection by EXP is required during placement of the engineered fill.
4. The fill must be placed such that the specified geometry is achieved. Refer to sketches for minimum requirements.
5. An allowable SLS bearing pressure of 145 kPa (3,000 psf) may be used provided that all conditions outlined above, are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and as a precautionary measure, footings should be provided with nominal steel reinforcement.
6. All excavations must be done in accordance with the Occupational Health and Safety Regulation of Ontario (Construction Projects - O.Reg. 213.91)
7. These guidelines are to be read in conjunction with the attached EXP Report for Project Number LON-23015536-A0.

DRAWING 3 – DRAINAGE AND BACKFILL RECOMMENDATIONS (NOT TO SCALE)

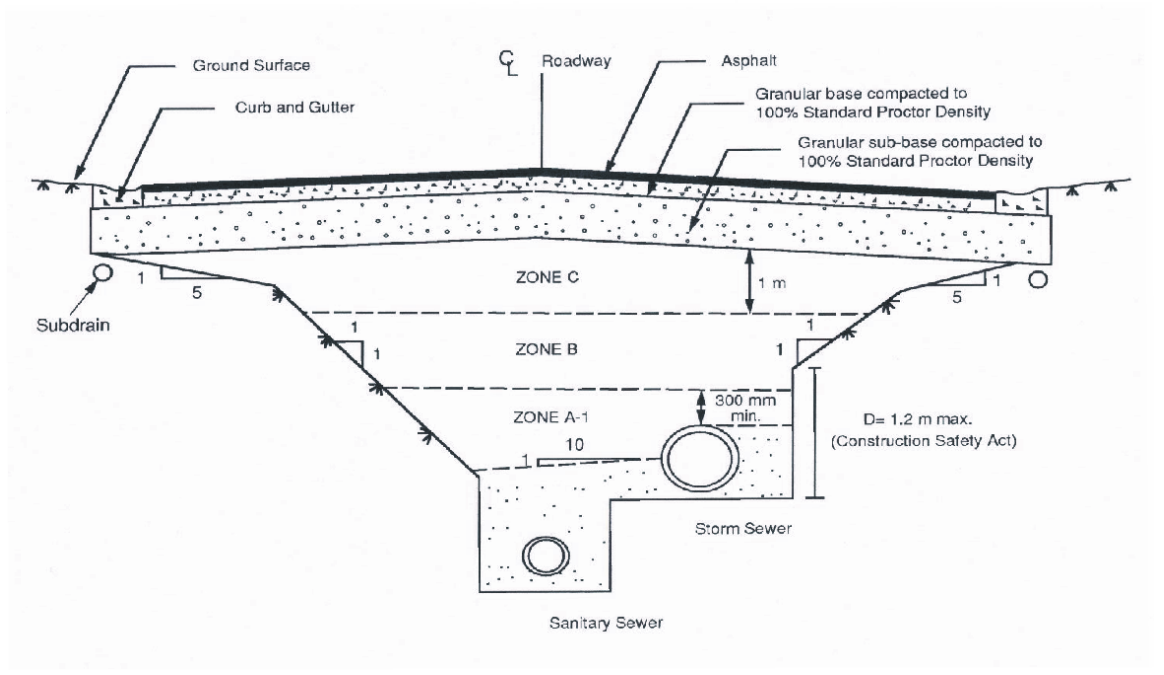


NOTES:

1. Drainage tile to consist of 100 mm (4 in.) diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. Invert to be minimum of 150 mm (6 in.) below underside of interior floor slab.
2. Pea gravel 150 mm (6 in.) top and sides of drain. If drain is not on footing, place 100 mm (4 in.) of pea gravel below drain. 20 mm (3/4 in.) clear stone may be used provided if it is covered by an approved porous geotextile fabric membrane (Terrafix 270R or equivalent).
3. C.S.A. fine concrete aggregate to act as filter material. Minimum 300 mm (12 in.) top and side of drain. This may be replaced by an approved porous geotextile membrane (Terrafix 270R or equivalent).
4. Impermeable backfill seal of compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted. Compact backfill to 95 percent Standard Proctor Maximum Dry Density.
5. The interior fill may be any clean, inorganic soil which may be compacted to at least 95 percent Standard Proctor density in this confined space.
6. Do not use heavy compaction equipment within 450 mm (18 in.) of the wall. Do not fill or compact within 1.8 m (6 ft) of wall unless fill is placed on both sides simultaneously.
7. Moisture barrier to be at least 200 mm (8 in.) of compacted 20 mm (3/4 in.) clear, crushed stone or equivalent free-draining material.
8. If the 20 mm (3/4 in.) clear stone requires surface binding, use 60 mm (1/4 in.) clear stone chips.
9. Slab on grade should not be structurally connected to wall or footing.
10. Exterior grade to slope away from building.

This system is not normally required if the floor is at least 300 mm (1 ft.) above exterior grade.

DRAWING 4 – TYPICAL BACKFILL DETAIL
STORM AND SANITARY SEWER (COMMON TRENCH)



SECTION VIEW

NOTES:

ZONE A
Granular bedding satisfying current City of Windsor Standards compacted to 95% Standard Proctor maximum dry density.

ZONE A-l
To be compacted to 95% Standard Proctor maximum dry density.

ZONE B
To be compacted to 95% Standard Proctor maximum dry density.

ZONE C
To be compacted to 98% Standard Proctor maximum dry density.

The excavations shown above are for Type 1 or 2 soils. Where excavations extend through Type 3 soils, the side walls should be sloped back at a maximum inclination of 1 horizontal to 1 vertical from the base (Reference O.Reg 219/31).

DRAWING 5 – TRENCH BACKFILL REQUIREMENTS

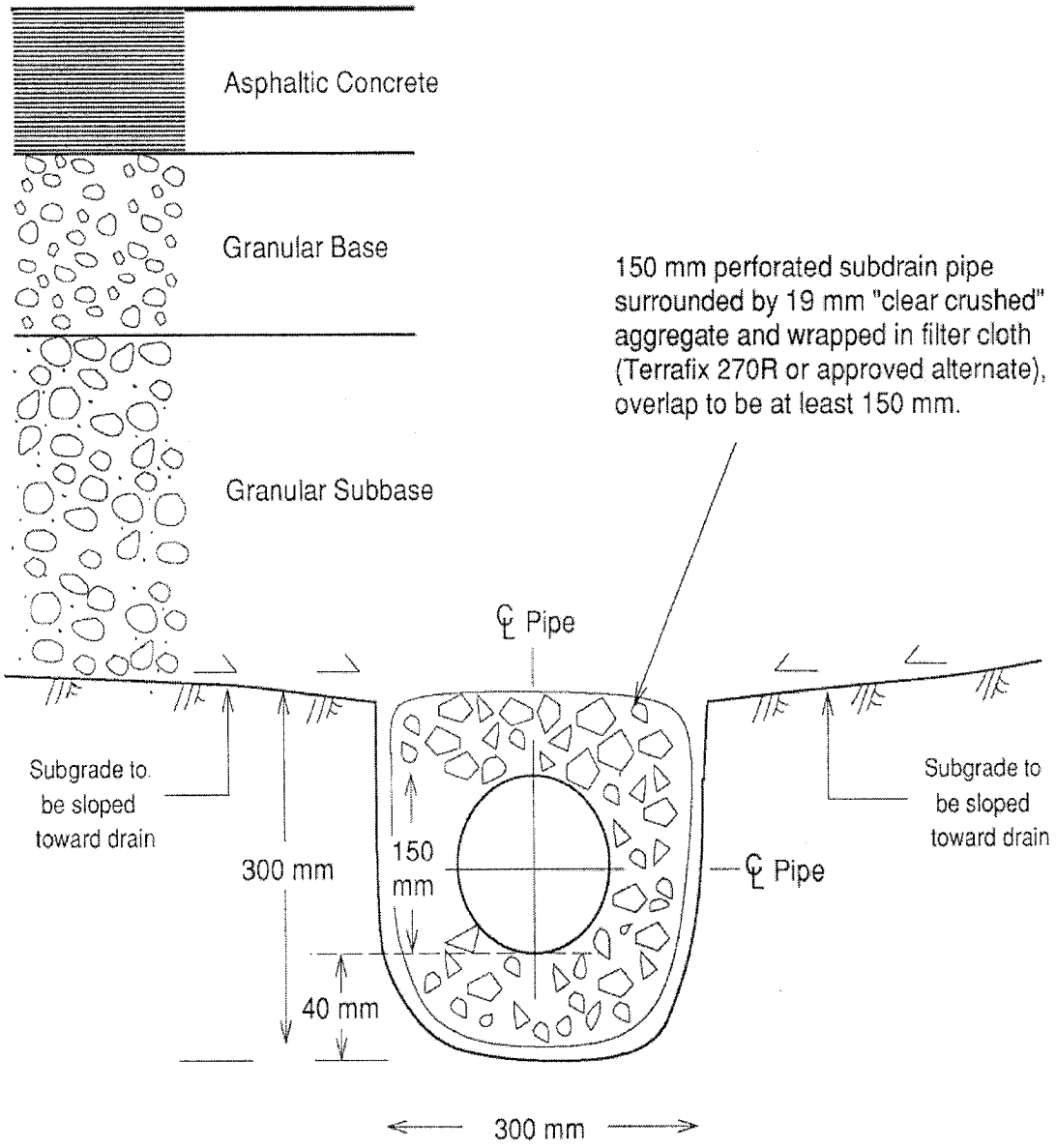
Requirements for backfill in service trenches, etc. should conform to current City of Windsor and OPSS requirements. A summary of the general recommendations for trench backfill is presented on **Drawing 4**.

The bedding materials for the services designated as Zone A on the attached drawings should consist of approved granular material satisfying the current City of Windsor minimum standards and specifications. (Class B bedding should provide adequate support for the pipes). These materials should be uniformly compacted to 95 percent of standard Proctor dry density. Some problems may be encountered in maintaining alignment when bedding pipes in wet sandy soil. If Granular 'A' or other sandy material is used for bedding, they may become 'spongy' when saturated. If significant amounts of clear stone are used to stabilize the base, a geotextile should be incorporated to avoid problems with migration of fine grained materials and differential settlement under the pipes as the groundwater rises after backfilling. For minor local use of crushed stone without a geotextile filter, a graded HL3 stone is preferable.

The backfill in Zone B will consist of the native material. This material should be placed in loose lifts not exceeding 300 mm (12 inches) and be uniformly compacted to 95 percent of the standard Proctor maximum dry density. Material wetter than 5 percent above optimum must be allowed to dry sufficiently or should be discarded or used in landscaped areas.

The upper 1 meter of the general backfill (i.e. Zone C) should be placed in loose lifts not exceeding 300 mm (12 inches) and be uniformly compacted to at least 98 percent of the standard Proctor maximum dry density. To achieve satisfactory compaction, the fill material should be within 3 percent of standard Proctor optimum moisture content at placement.

DRAWING 6 – PAVEMENT SUBDRAIN DETAIL



NOTES:

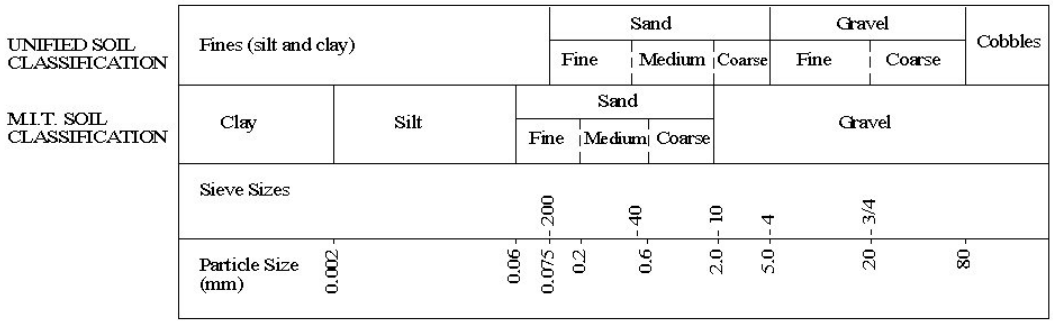
1. All dimensions in millimetres.
2. All sub drains to be set on at least 1% grade draining to a positive outlet.
3. Subgrade soil conditions should be verified onsite, during subgrade preparation works, following site servicing installations.

Scale: NTS

Appendix A – Borehole Logs

NOTES ON SAMPLE DESCRIPTIONS

1. All descriptions included in this report follow the 'modified' Massachusetts Institute of Technology (M.I.T.) soil classification system. The laboratory grain-size analysis also follows this classification system. Others may designate the Unified Classification System as their source; a comparison of the two is shown for your information. Please note that, with the exception of those samples where the grain size analysis has been carried out, all samples are classified visually and the accuracy of the visual examination is not sufficient to differentiate between the classification systems or exact grain sizing. The M.I.T. system has been modified and the EXP classification includes a designation for cobbles above the 75 mm size and boulders above the 200 mm size.



2. **Fill**: Where fill is designated on the borehole log, it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description therefore, may not be applicable as a general description of the site fill material. All fills should be expected to contain obstructions such as large concrete pieces or subsurface basements, floors, tanks, even though none of these obstructions may have been encountered in the borehole. Despite the use of boreholes, the heterogeneous nature of fill will leave some ambiguity as to the exact and correct composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. The fill at this site has been monitored for the presence of methane gas and the results are recorded on the borehole logs. The monitoring process neither indicates the volume of gas that can be potentially generated or pinpoints the source of the gas. These readings are to advise of a potential or existing problem (if they exist) and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic waste that renders the material unacceptable for deposition in any but designated land fill sites; unless specifically stated, the fill on the site has not been tested for contaminants that may be considered hazardous. This testing and a potential hazard study can be carried out if you so request. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common, but not detectable using conventional geotechnical procedures.

3. **Glacial Till**: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process, the till must be considered heterogeneous in composition and as such, may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (75 to 200 mm in diameter) or boulders (greater than 200 mm diameter) and therefore, contractors may encounter them during excavation, even if they are not indicated on the borehole logs. It should be appreciated that normal sampling equipment can not differentiate the size or type of obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited area; therefore, caution is essential when dealing with sensitive excavations or dewatering programs in till material.

BOREHOLE LOG

BH1
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 22, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	180.3								
	180.2	**TOPSOIL** - 75mm							
		FILL - clayey silt, brown, trace organics, some sand, compact, moist			SS	SA 1	600	12	19
	179.5								
1		**CLAYEY SILT TILL** - brown, mottled in the upper layer, trace sand, trace gravel, firm to very stiff, moist			SS	SA 2	400	7	20
2					SS	SA 3	450	8	14
					SS	SA 4	450	25	12
3		- grey, occassional cobbles and hard near 3.1 m bgs			SS	SA 5	250	45	13
4									
	175.2				SS	SA 6	450	14	14
5		**End of borehole at 5.0 m bgs.**							
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value × Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH2
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**

PROJECT **Proposed Commercial Development** DATUM **Geodetic**

LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 21, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	180.0								
	180.0	**TOPSOIL** - 50 mm							
	179.9	**FILL** - sand and gravel, light brown, trace silt, very moist			SS	SA 1	600	7	33
	179.6	**TOPSOIL** - 300 mm							
1		**CLAYEY SILT TILL** brown, mottled in the upper layer, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 2	450	11	14
2					SS	SA 3	450	20	13
					SS	SA 4	450	29	12
3					SS	SA 5	450	30	12
		- occasional cobble and grey observed near 3.3 m bgs							
4									
	175.0				SS	SA 6	450	11	14
5		**End of borehole at 5.0 m bgs.**							
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value × Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH3
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 22, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	180.2								
	179.8	**TOPSOIL** - 350 mm							
		CLAYEY SILT TILL - brown, mottled in the upper layer, trace sand, trace gravel, firm to very stiff, moist			SS	SA 1	550	6	23
1					SS	SA 2	450	7	12
2					SS	SA 3	450	23	15
					SS	SA 4	450	30	13
3					SS	SA 5	450	24	13
		- grey near 3.3 m bgs							
4									
	175.1				SS	SA 6	450	10	16
5		**End of borehole at 5.0 m bgs.**							
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L

SPT N Value × Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH4
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 22, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	180.8								
	180.6	**TOPSOIL** - 250 mm							
	180.2	**FILL** - clayey silt, brown, trace organics, some sand, trace gravel, loose, moist			SS	SA 1	600	4	18
1		**CLAYEY SILT TILL** - brown, mottled in the upper layer, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 2	400	11	19
2					SS	SA 3	450	22	13
					SS	SA 4	450	26	13
3		- grey near 3.0 m bgs			SS	SA 5	450	27	12
4									
	175.8				SS	SA 6	450	14	15
5		**End of borehole at 5.0 m bgs.**							
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value × Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH5
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 16, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	180.3								
	180.2	**TOPSOIL** - 75 mm							
	179.7	**FILL** - clayey silt, trace sand, trace gravel, organics, loose, moist			SS	SA 1	600	7	19
1		**CLAYEY SILT TILL** - brown, mottled in the upper layer, occassional cobbles, trace sand, trace gravel, firm, moist			SS	SA 2	325	5	17
		- very stiff to stiff below 1.4 m bgs			SS	SA 3	450	23	18
2									
					SS	SA 4	450	32	12
3		- grey near 3.0 m bgs			SS	SA 5	450	29	12
4									
	175.3				SS	SA 6	450	10	15
5		**End of borehole at 5.0 m bgs.**							
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value × Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH6/MW
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 20, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	180.2								
	180.1	**TOPSOIL** - 100 mm							
		FILL - clayey silt, brown, trace sand, trace gravel, trace organics, loose, moist			SS	SA 1	525	6	17
1	179.2				SS	SA 2	450	6	20
		CLAYEY SILT TILL - brown, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 3	450	14	12
2					SS	SA 4	450	27	12
3					SS	SA 5	100	36	13
		- occasional cobbles and hard near 3.3 m bgs							
4		- grey near 4.0 m bgs							
					SS	SA 6	450	16	15
5									
6	174.2								
		End of borehole at 6.1 m bgs.							
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) No significant methane gas detected upon completion of drilling.
3) bgs denotes below ground surface.
4) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity
H Hydrometer
S Sieve Analysis
γ Unit Weight
P Field Permeability
K Lab Permeability
C Consolidation
CD Consolidated Drained Triaxial
CU Consolidated Undrained Triaxial
UU Unconsolidated Undrained Triaxial
UC Unconfined Compression
DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH7/MW
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 21, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	181.2						
	181.1	**TOPSOIL** - 50 mm					
		FILL - clayey silt, brown, some organics pockets, trace sand, trace gravel, loose to compact, moist	SS	SA 1	550	8	18
1		- sand and gravel layering near 0.9 m bgs	SS	SA 2	450	13	13
	179.4		SS	SA 3	450	9	18
2		**CLAYEY SILT TILL** - brown, mottled in the upper layer, trace sand, trace gravel, stiff to very stiff, moist	SS	SA 4	450	10	13
3			SS	SA 5	450	28	11
4		- grey near 4.0 m bgs					
5			SS	SA 6	450	16	11
6							
	174.5		SS	SA 7	450	8	14
7		**End of borehole at 6.7 m bgs.**					
8							
9							
10							

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) No significant methane gas detected upon completion of drilling.
3) bgs denotes below ground surface.
4) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity
H Hydrometer
S Sieve Analysis
γ Unit Weight
P Field Permeability
K Lab Permeability
C Consolidation
CD Consolidated Drained Triaxial
CU Consolidated Undrained Triaxial
UU Unconsolidated Undrained Triaxial
UC Unconfined Compression
DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH8
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 16, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	181.3	**FILL** - sand and gravel, brown, some silt, compact, moist			SS	SA 1	525	29	9
	180.6	**FILL** - clayey silt, brown, mottled, trace sand, trace gravel, topsoil incusions, occasional cobbles, compact, moist			SS	SA 2	450	26	
1	179.9	**CLAYEY SILT TILL** - brown, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 3	400	8	18
2					SS	SA 4	450	9	14
3					SS	SA 5	450	29	11
4									
5	176.2				SS	SA 6	450	21	14
		End of borehole at 5.0 m bgs.							
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value × Dynamic Cone
10 20 30 40

NOTES

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2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH9
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 22, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	180.2								
	179.9	**TOPSOIL** - 315 mm			SS	SA 1	575	6	20
	179.6	**FILL** - clayey silt, brown, mottled, trace sand, trace gravel, topsoil incusions, loose, moist							
1		**CLAYEY SILT TILL** - brown, mottled in the upper layer, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 2	450	11	20
	178.2				SS	SA 3	450	26	13
2		**End of borehole at 2.0 m bgs.**							
3									
4									
5									
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

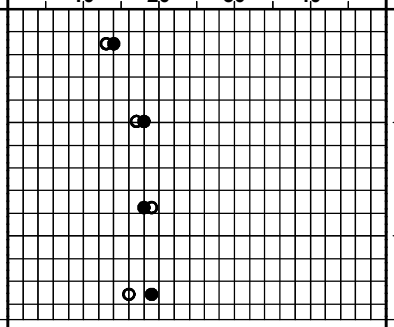
BOREHOLE LOG

BH10
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 16, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	181.2	**FILL** - sand and gravel, silty, brown, trace clay, trace gravel, trace construction/debris, compact, moist			SS	SA 1	500	14	13
	180.5	**FILL** - clayey silt, brown, trace sand, trace gravel, trace organics, compact, moist			SS	SA 2	450	18	17
1	179.3				SS	SA 3	450	18	19
2		**CLAYEY SILT TILL** - brown, clayey silt, mottled in the upper layer, trace sand, trace gravel, very stiff, moist			SS	SA 4	450	19	16
	178.5								
3		**End of borehole at 2.7 m bgs.**							
4									
5									
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa
Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40



NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH11
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 16, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)	SHEAR STRENGTH / Atterberg Limits and Moisture
	181.1									S Field Vane Test (#=Sensitivity); ▲ Penetrometer; ■ Torvane; 100 – 200 kPa; W_P W W_L; ● SPT N Value; × Dynamic Cone; 10 20 30 40
0	180.9	**FILL** - sand and gravel, brown, trace silt, loose, moist			SS	SA 1	550	8	18	
1		**CLAYEY SILT TILL** - brown, mottled in the upper layer, trace sand, trace gravel, very stiff to stiff, moist			SS	SA 2	450	16	13	
2	179.1				SS	SA 3	450	11	17	
		End of borehole at 2.0 m bgs.								
3										
4										
5										
6										
7										
8										
9										
10										

NOTES

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2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
☒ AS Auger Sample ▨ SS Split Spoon ■ ST Shelby Tube
▥ Rock Core (eg. BQ, NQ, etc.) ▣ VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
▽ Apparent ▼ Measured ▲ Artesian (see Notes)

BOREHOLE LOG

BH12
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**

PROJECT **Proposed Commercial Development** DATUM **Geodetic**

LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 22, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)	SHEAR STRENGTH / Atterberg Limits and Moisture
	180.2									
0	180.0	**TOPSOIL** - 265 mm								
		CLAYEY SILT TILL - brown, trace to some sand, trace gravel, stiff to very stiff, moist			SS	SA 1	600	6	18	
1					SS	SA 2	400	15	17	
	178.2				SS	SA 3	450	20	14	
2		**End of borehole at 2.0 m bgs.**								
3										
4										
5										
6										
7										
8										
9										
10										

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa
Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity
H Hydrometer
S Sieve Analysis
γ Unit Weight
P Field Permeability
K Lab Permeability
C Consolidation
CD Consolidated Drained Triaxial
CU Consolidated Undrained Triaxial
UU Unconsolidated Undrained Triaxial
UC Unconfined Compression
DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH13
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 22, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)	SHEAR STRENGTH / Atterberg Limits and Moisture
	180.2									S Field Vane Test (#=Sensitivity); ▲ Penetrometer; ■ Torvane; 100 200 kPa; W_P W W_L; ● SPT N Value; × Dynamic Cone; 10 20 30 40
0	179.9	**TOPSOIL** - 280 mm								
		CLAYEY SILT TILL - brown, mottled in the upper layer, trace sand, trace gravel, firm to very stiff, moist			SS	SA 1	600	5	21	● ○
1					SS	SA 2	450	6	18	● ○
	178.2				SS	SA 3	450	27	14	○ ●
2		**End of borehole at 2.0 m bgs.**								
3										
4										
5										
6										
7										
8										
9										
10										

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
☒ AS Auger Sample ▨ SS Split Spoon ■ ST Shelby Tube
▥ Rock Core (eg. BQ, NQ, etc.) ▣ VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
▽ Apparent ▼ Measured ▲ Artesian (see Notes)

BOREHOLE LOG

BH14
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 22, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	180.2								
	180.0	**TOPSOIL** - 265 mm							
		CLAYEY SILT TILL - brown, mottled in the upper layer, trace sand, trace gravel, very stiff, moist			SS	SA 1	600	5	21
1					SS	SA 2	450	17	15
	178.3				SS	SA 3	450	29	14
2		**End of borehole at 2.0 m bgs.**							
3									
4									
5									
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH15
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 21, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	181.1								
	181.0	**TOPSOIL** - 100 mm							
		FILL - clayey silt, brown, trace sand, trace gravel, trace organics, loose, moist			SS	SA 1	500	8	15
1	180.1				SS	SA 2	300	9	17
		CLAYEY SILT TILL - brown, mottled in the upper layer, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 3	400	11	15
2					SS	SA 4	450	26	13
3	177.6				SS	SA 5	450	29	12
		End of borehole at 3.5 m bgs.							
4									
5									
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH16
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 21, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	181.1								
	181.0	**TOPSOIL** - 100 mm							
		FILL - clayey silt, brown, trace sand, trace gravel, trace organics/topsoil, loose, moist			SS	SA 1	550	6	15
1	180.1				SS	SA 2	375	8	19
		CLAYEY SILT TILL - brown, mottled in the upper layer, trace sand, trace gravel, stiff to hard, moist			SS	SA 3	450	10	18
2					SS	SA 4	450	28	12
3					SS	SA 5	450	34	10
4		- becoming grey near 4.0 m bgs							
5					SS	SA 6	450	30	13
6	174.5				SS	SA 7	450	11	15
		End of borehole at 6.6 m bgs.							
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value × Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH17
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 21, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	181.1	**FILL** - clayey silt, brown, trace organics, trace sand, trace gravel, loose to compact, moist			SS	SA 1	325	5	18
1					SS	SA 2	400	13	15
2		- construction debris near 1.5 m bgs			SS	SA 3	450	8	18
	178.8								
3		**CLAYEY SILT TILL** - brown, mottled in the upper layer, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 4	450	8	18
	177.6				SS	SA 5	450	29	13
4		**End of borehole at 3.5 m bgs.**							
5									
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

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3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
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SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

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Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 21, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	180.8	**TOPSOIL** - 50 mm							
		FILL - clayey silt, brown, trace sand, trace gravel, trace construction debis, occasional cobbles, loose to compact, moist			SS	SA 1	425	9	15
1					SS	SA 2	450	15	17
					SS	SA 3	100	9	18
2	178.7								
		CLAYEY SILT TILL - brown, trace sand, trace gravel, very stiff, moist			SS	SA 4	450	23	11
3					SS	SA 5	400	27	13
4		- occasional cobbles observed near 4.0 m bgs							
					SS	SA 6	450	30	12
5		- becoming grey near 5.6 m bgs							
6		- stiff near 6.1 m bgs			SS	SA 7	400	10	16
	174.3								
7		**End of borehole at 6.6 m bgs.**							
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value × Dynamic Cone
10 20 30 40

NOTES

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2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

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Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 20, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	181.0								
	180.9	**TOPSOIL** - 100 mm							
		CLAYEY SILT TILL - brown, mottled in the upper layer, trace sand, trace gravel, firm to very stiff, moist			SS	SA 1	575	6	18
1					SS	SA 2	400	6	15
2					SS	SA 3	400	16	13
					SS	SA 4	450	27	13
3					SS	SA 5	450	27	12
4		- becoming grey near 4.0 m bgs							
	176.0				SS	SA 6	450	24	14
5		**End of borehole at 5.0 m bgs.**							
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L

SPT N Value × Dynamic Cone
10 20 30 40

NOTES

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4) bgs denotes below ground surface.
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SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH20
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**

PROJECT **Proposed Commercial Development** DATUM **Geodetic**

LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 20, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	180.9								
	180.9	**TOPSOIL** - 75 mm							
		CLAYEY SILT TILL - brown, mottled in the upper layer, trace sand, trace gravel, stiff, moist			SS	SA 1	600	6	13
1					SS	SA 2	450	10	13
					SS	SA 3	450	11	16
2									
		- very stiff below 2.3 m bgs			SS	SA 4	425	25	13
3		- grey and occasional cobbles observed near 3.0 m bgs			SS	SA 5	450	26	13
4									
	175.9				SS	SA 6	350	23	14
5		**End of borehole at 5.0 m bgs.**							
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value × Dynamic Cone
10 20 30 40

NOTES

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3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
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SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

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Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**

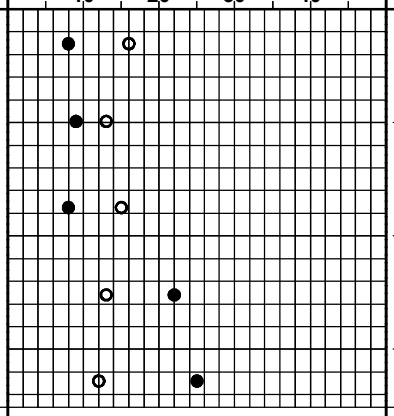
PROJECT **Proposed Commercial Development** DATUM **Geodetic**

LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 20, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	180.7								
	180.6	**TOPSOIL** - 75 mm							
		FILL - clayey silt, brown, trace sand, trace gravel, loose, moist			SS	SA 1	525	8	16
	179.8								
1		**CLAYEY SILT TILL** - brown, mottled in the upper layer, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 2	350	9	13
					SS	SA 3	400	8	15
2									
					SS	SA 4	450	22	13
3									
	177.2				SS	SA 5	450	25	12
		End of borehole at 3.5 m bgs.							
4									
5									
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40



NOTES

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SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH22
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**

PROJECT **Proposed Commercial Development** DATUM **Geodetic**

LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 20, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
	181.1								
0	181.1	**TOPSOIL** - 50 mm							
		FILL - clayey silt, brown, trace sand, trace gravel, trace construction debris/organics, loose, moist			SS	SA 1	575	6	15
1	179.7				SS	SA 2	450	7	19
		CLAYEY SILT TILL - brown, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 3	450	6	17
2					SS	SA 4	450	14	12
3	177.6				SS	SA 5	450	28	13
		End of borehole at 3.5 m bgs.							
4									
5									
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

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SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH23
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**

PROJECT **Proposed Commercial Development** DATUM **Geodetic**

LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 20, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	181.0								
	180.3	**FILL** - sand and gravel, light brown, some silt, loose, moist			SS	SA 1	550	8	28
1	179.6	**FILL** - clayey silt, brown, trace sand, trace gravel, trace organics, topsoil inclusions, loose, moist			SS	SA 2	450	8	12
		CLAYEY SILT TILL - brown, mottled in the upper layer, trace sand, trace gravel, firm, moist			SS	SA 3	450	7	21
2		- very stiff below 2.1 m bgs			SS	SA 4	450	20	12
3					SS	SA 5	450	27	12
4		- becoming grey near 4.0 m bgs							
	176.0				SS	SA 6	400	20	13
5		**End of borehole at 5.0 m bgs.**							
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L

SPT N Value × Dynamic Cone
10 20 30 40

NOTES

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SAMPLE LEGEND
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OTHER TESTS

G Specific Gravity	C Consolidation
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S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH24
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 20, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
	180.9								
0	180.8	**TOPSOIL** - 100 mm							
	180.5	**FILL** - clayey silt, brown, trace sand, trace gravel, loose, moist			SS	SA 1	600	6	17
	180.1	**FILL** - sand and gravel, brown, trace silt, moist							
1		**CLAYEY SILT TILL** - brown, mottled in the upper layer, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 2	450	9	12
2					SS	SA 3	450	10	17
					SS	SA 4	450	18	13
3		- hard near 3.1 m bgs			SS	SA 5	450	31	13
		- grey near 3.5 m bgs							
4		- occasional cobbles observed near 4.0 m bgs							
	175.8				SS	SA 6	50	29	13
5		**End of borehole at 5.0 m bgs.**							
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

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SAMPLE LEGEND
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Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
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S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH25
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**

PROJECT **Proposed Commercial Development** DATUM **Geodetic**

LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 16, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	181.2	~~181.1~~ **TOPSOIL** - 50 mm			SS	SA 1	600	7	15
	181.1	**FILL** - sand and gravel, light brown, trace silt, moist							
	180.6	**FILL** - clayey silt, brown, trace sand, trace gravel, trace organics, loose, moist			SS	SA 2	200	21	16
1		**CLAYEY SILT TILL** - brown, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 3	450	9	13
2					SS	SA 4	450	18	14
3		- hard near 3.1 m bgs			SS	SA 5	400	33	11
4									
5					SS	SA 6	450	28	12
		- grey near 5.6 m bgs							
6	174.6				SS	SA 7	450	14	16
7		**End of borehole at 6.6 m bgs.**							
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value × Dynamic Cone
10 20 30 40

NOTES

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SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH26
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**
PROJECT **Proposed Commercial Development** DATUM **Geodetic**
LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 16, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
	181.2								
0	181.0	**FILL** - brown, sand and gravel, some silt, loose, moist			SS	SA 1	325	9	20
		FILL - clayey silt, brown, trace sand, trace gravel, trace organics, trace construction debris, compact, moist							
1					SS	SA 2	450	12	15
	179.2				SS	SA 3	450	12	18
2		**CLAYEY SILT TILL** - brown, trace sand, trace gravel, firm to hard, moist							
					SS	SA 4	450	6	17
3	177.7				SS	SA 5	450	34	11
		End of borehole at 3.5 m bgs.							
4									
5									
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH27
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**

PROJECT **Proposed Commercial Development** DATUM **Geodetic**

LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 16, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	181.3	**FILL** - sand and gravel, light brown, trace silt, trace construction debris, compact, moist			SS	SA 1	575	18	28
	180.6	**CLAYEY SILT TILL** - brown, mottled in the upper layer, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 2	450	9	13
1					SS	SA 3	450	9	13
2					SS	SA 4	350	9	15
3					SS	SA 5	450	23	12
4		- becoming grey near 4.0 m bgs			SS	SA 6	450	28	13
5									
6	174.7				SS	SA 7	350	11	13
7		**End of borehole at 4.0 m bgs.**							
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value × Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH28
Sheet 1 of 1

CLIENT **Rock Developments Inc.** PROJECT NO. **LON-23015536-A0**

PROJECT **Proposed Commercial Development** DATUM **Geodetic**

LOCATION **Catherine Street, Windsor, ON** DATES: Boring **Feb 22, 2024** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
	180.0								
0	179.8	**TOPSOIL** - 260 mm							
		CLAYEY SILT TILL - brown, mottled in the upper layer, trace sand, trace gravel, stiff to very stiff, moist			SS	SA 1	600	7	19
1					SS	SA 2	450	13	17
	178.0				SS	SA 3	450	28	11
2		**End of borehole at 2.0 m bgs.**							
3									
4									
5									
6									
7									
8									
9									
10									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015536-A0.
2) Borehole open and dry upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.
5) Geodetic borehole ground elevations were surveyed using the Trimble® R12i GNSS system.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS
G Specific Gravity
H Hydrometer
S Sieve Analysis
γ Unit Weight
P Field Permeability
K Lab Permeability
C Consolidation
CD Consolidated Drained Triaxial
CU Consolidated Undrained Triaxial
UU Unconsolidated Undrained Triaxial
UC Unconfined Compression
DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

Appendix B – Inspection and Testing Schedule

INSPECTION & TESTING SCHEDULE

The following program outlines suggested minimum testing requirements during backfilling of service trenches and construction of pavements. In adverse weather conditions (wet/freezing), increased testing will be required. The testing frequencies are general requirements and may be adjusted at the discretion of the engineer based on test results and prevailing construction conditions.

I TRENCH BACKFILL

ZONE A	- one *in situ* density test per 100 cubic meters or 50 linear metres of trench whichever is less - one laboratory grain size and Proctor density test per 50 density tests or 4000 cubic metres or on change of material (source, visual)
ZONE A1	- one *in situ* density test per 75 cubic metres of material or 25 linear metres of each lift of fill - one laboratory grain size and Proctor density test per each 50 density tests or 4000 cubic metres of material placed or as directed by the engineer
ZONES B & C	- one *in situ* density test per 150 cubic metres of material or 50 linear metres or each lift whichever is less - one laboratory grain size and Proctor density test per 50 density tests or 4000 cubic metres of material placed or as directed by the engineer

II PAVEMENT MATERIALS

GRANULAR SUBBASE	- one *in situ* density test per 50 linear metres of road - one laboratory grain size and standard Proctor test per 50 density tests or 4000 cubic metres or each change of material (visual, source), as determined by the engineer
GRANULAR BASE	- one *in situ* density test per 50 linear metres of road - one laboratory grain size and Proctor per 50 density tests or 8000 cubic metres or change in material (visual, source), as determined by the engineer - Benkelman beam testing at 10 metre intervals per lane, after final grading and compaction. Asphaltic concrete should not be placed until rebound criteria have been satisfied.
ASPHALTIC CONCRETE	- one *in situ* density test per 25 linear metres of roadway - one complete Marshall Compliance test including stability flow, etc. for each mix type to check mix acceptability. One extraction and gradation test per each day of paving to be compared to job mix formula

NOTES: Where testing indicates inadequate compaction, additional fill should not be placed until the area is recompacted and retested at the discretion of the engineer.

Appendix C – Limitations and Use of Report

LIMITATIONS AND USE OF REPORT

BASIS OF REPORT

This report ("Report") is based on site conditions known or inferred by the geotechnical investigation undertaken as of the date of the Report. Should changes occur which potentially impact the geotechnical condition of the site, or if construction is implemented more than one year following the date of the Report, the recommendations of EXP may require re-evaluation.

The Report is provided solely for the guidance of design engineers and on the assumption that the design will be in accordance with applicable codes and standards. Any changes in the design features which potentially impact the geotechnical analyses or issues concerning the geotechnical aspects of applicable codes and standards will necessitate a review of the design by EXP. Additional field work and reporting may also be required.

Where applicable, recommended field services are the minimum necessary to ascertain that construction is being carried out in general conformity with building code guidelines, generally accepted practices and EXP's recommendations. Any reduction in the level of services recommended will result in EXP providing qualified opinions regarding the adequacy of the work. EXP can assist design professionals or contractors retained by the Client to review applicable plans, drawings, and specifications as they relate to the Report or to conduct field reviews during construction.

Contractors contemplating work on the site are responsible for conducting an independent investigation and interpretation of the borehole results contained in the Report. The number of boreholes necessary to determine the localized underground conditions as they impact construction costs, techniques, sequencing, equipment and scheduling may be greater than those carried out for the purpose of the Report.

Classification and identification of soils, rocks, geological units, contaminant materials, building envelopment assessments, and engineering estimates are based on investigations performed in accordance with the standard of care set out below and require the exercise of judgment. As a result, even comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations or building envelope descriptions involve an inherent risk that some conditions will not be detected. All documents or records summarizing investigations are based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated. Some conditions are subject to change over time. The Report presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, these should be disclosed to EXP to allow for additional or special investigations to be undertaken not otherwise within the scope of investigation conducted for the purpose of the Report.

RELIANCE ON INFORMATION PROVIDED

The evaluation and conclusions contained in the Report are based on conditions in evidence at the time of site inspections and information provided to EXP by the Client and others. The Report has been prepared for the specific site, development, building, design or building assessment objectives and purpose as communicated by the Client. EXP has relied in good faith upon such representations, information and instructions and accepts no responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of any misstatements, omissions, misrepresentation or fraudulent acts of persons providing information. Unless specifically stated otherwise, the applicability and reliability of the findings, recommendations, suggestions or opinions expressed in the Report are only valid to the extent that there has been no material alteration to or variation from any of the information provided to EXP.

STANDARD OF CARE

The Report has been prepared in a manner consistent with the degree of care and skill exercised by engineering consultants currently practicing under similar circumstances and locale. No other warranty, expressed or implied, is made. Unless specifically stated otherwise, the Report does not contain environmental consulting advice.

COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment form part of the Report. This material includes, but is not limited to, the terms of reference given to EXP by its client ("Client"), communications between EXP and the Client, other reports, proposals or documents prepared by EXP for the Client in connection with the site described in the Report. In order to properly understand the suggestions, recommendations and opinions expressed in the Report, reference must be made to the Report in its entirety. EXP is not responsible for use by any party of portions of the Report.

USE OF REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. No other party may use or rely upon the Report in whole or in part without the written consent of EXP. Any use of the Report, or any portion of the Report, by a third party are the sole responsibility of such third party. EXP is not responsible for damages suffered by any third party resulting from unauthorized use of the Report.

REPORT FORMAT

Where EXP has submitted both electronic file and a hard copy of the Report, or any document forming part of the Report, only the signed and sealed hard copy shall be the original documents for record and working purposes. In the event of a dispute or discrepancy, the hard copy shall govern. Electronic files transmitted by EXP have utilize specific software and hardware systems. EXP makes no representation about the compatibility of these files with the Client's current or future software and hardware systems. Regardless of format, the documents described herein are EXP's instruments of professional service and shall not be altered without the written consent of EXP.

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