FINAL REPORT

Geotechnical Investigation

Hillis Road Upgrades
From Intersection of Hillis Road and County Road 12 to the Entrance of Ready Mix Plant, Peterborough, Ontario

Submitted to:

Sunrock Industries Canada ULC
2 Campbell Drive, Suite 200
Uxbridge, ON L9P 1H6

Submitted by:

WSP Canada Inc.
1931 Robertson Road,
Ottawa, Ontario, K2H 5B7, Canada

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1.0 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Sunrock Industries Canada ULC (Sunrock) to carry out a geotechnical investigation for the planning and design of the proposed upgrades to Hillis Road, extending from the intersection of Hillis Road and County Road 12 to the entrance of an existing aggregates pit / proposed ready-mix plant site, about 395 m to the west. The investigation and reporting were carried out in general accordance with WSP's proposal dated February 14, 2025.

The purpose of this investigation was to assess the general subsurface and groundwater conditions within the study area by means of ten boreholes and associated laboratory testing. The subsurface conditions encountered in the current investigation and available project details were used to prepare recommendations related to design aspects of the project, including construction considerations which could influence design decisions.

Reference should be made to the "*Important Information and Limitations of This Report*", which follows the text but forms part of this document.

2.0 SITE AND PROJECT DESCRIPTIONS

It is understood that WSP was retained by Sunrock for various engineering consulting services at the Dunford Pit property located on Hillis Road in Peterborough, legally described as part of Lot 6, Concession 3 in the Township of Smith. The Dunford Pit is licensed under the Aggregate Resources Act (ARA) as a Class A Pit Above the Water Table and has a licensed boundary of 19.9 hectares. We understand that Sunrock is completing due diligence ahead of the potential purchase of the property and wishes to develop a concrete ready-mix plant on the property. The upgrades to the Hillis Road, specifically the section extending approximately 395 m from the intersection of Hillis Road and County Road 12 to the entrance of a ready-mix concrete plant are being considered as part of Sunrock's due diligence before the possible acquisition of the Dunford Pit property.

Planned improvements include widening Hillis Road to 8 m, including 3.5 m wide traffic lanes and minimum 0.5 m gravel shoulders on each side. The project will also include pavement rehabilitation and strengthening to support increased truck traffic to and from the plant, improvement to drainage ditches along the south side of the road, and minor grade adjustments with turning tapers at the intersection with County Road 12. The intention is to ensure that the road infrastructure can accommodate the operational requirements of the prospective concrete ready-mix facility, while still supporting safe and efficient local transportation for the area.

The existing Hillis Road is a two-lane, undivided roadway that runs in an east-west direction. The road currently serves low-volume traffic and features a typical rural cross-section, with drainage ditches present along both sides. Within this stretch of Hillis Road, only one residential property is situated along the westbound lane, while the remaining land towards the north and South of Hillis Road is largely vegetated with mature trees and dense shrubs. An overhead Hydro line runs parallel to the eastbound lane, and an overhead communication line is present along the westbound lane.

A visual preliminary pavement condition survey indicates that the existing pavement is generally in fair condition, with slight to moderate signs of distress such as transverse, longitudinal and localized alligator cracking, ravelling, wheel track rutting, and pavement edge breaks. Photographs of pavement taken during the site visit on July 8, 2025, are included in Appendix A of this report.

3.0 METHOD OF INVESTIGATION

3.1 Field Investigation

The field work for the current geotechnical investigation was carried out on June 9, 2025, and included advancing a total of ten boreholes (25-01 to 25-10). The approximate borehole locations are shown on Figure 1.

The boreholes were advanced with a B-29 truck mounted drill rig supplied and operated by Landshark Group of Brantford, Ontario.

Soil samples were obtained using a 35 mm inside diameter split-spoon sampler in general accordance with the Standard Penetration Test (SPT) procedure (ASTM D1586). Soil samples were obtained at vertical sampling intervals of about 0.76 m. All boreholes were terminated to a planned depth of about 3.6 m below the existing ground surface.

Fieldwork was supervised by WSP’s geotechnical staff who logged the boreholes, directed in-situ testing, and collected soil samples retrieved from the boreholes. On completion of the drilling operations, the boreholes were backfilled with the native materials and soil samples were transported to WSP’s laboratory for further examination by the project engineer and for laboratory testing.

The borehole locations were selected in consultation with Sunrock, marked in the field and subsequently surveyed by WSP. The borehole coordinates and existing ground surface elevations were measured using a Trimble R10 GPS survey unit. The geodetic reference system used for the survey is the North American datum of 1983 (NAD83).

3.2 Laboratory Testing

Laboratory testing was completed on selected soil samples, which include:

- Water content (53 tests)
- Grain size distribution (5 tests)
- Organic content (2 tests)

All tests were completed at WSP’s Laboratory. The laboratory test results are summarized in the borehole logs. The testing reports are also included in Appendix C of this report.

4.0 SUBSURFACE CONDITIONS

4.1 Desktop REVIEW

Based on published geological mapping, it is expected that the site is located at the boundary of two quaternary age deposits comprising granular till and organic muck / peat. Swamp features (presumed saturated organic soils) exist along the south side of Hillis Road. Based on available water well records, it is expected that the site is underlain by a limestone bedrock with a reported overburden thickness of approximately 30 m.

4.2 Summary of Subsurface Stratigraphy

The Record of Borehole sheets in Appendix B describes the subsurface conditions at the borehole locations only. The stratigraphic boundaries shown on the borehole records are inferred from non-continuous sampling, observations of drilling progress as well as results of Standard Penetration Tests and, therefore, represent transitions between soil types rather than exact planes of geological change. Furthermore, subsurface soil and groundwater conditions will vary between and beyond the borehole locations.

Based on the results of the borehole investigation, the general subsurface stratigraphy along Hillis Road consists of asphaltic concrete overlying a granular pavement structure, granular fill, peat, and native granular soils. Peat was not encountered in boreholes drilled in the western portion of Hillis Road. In these locations, the stratigraphy consists of asphaltic concrete over granular pavement structure, underlain by existing granular fill over native granular soils.

Further descriptions of the soil layers are provided in the subsections below.

4.2.1.1 Surface Cover - Topsoil and Asphalt

Approximately 80 mm of surficial topsoil was encountered at the ground surface at borehole 25-07, which was drilled north of the Hillis Road alignment.

Asphaltic concrete with thickness of about 10 mm to 20 mm was encountered at ground surface at boreholes 25-02 to 25-06, 25-08, and 25-10, which were drilled within the travel lanes of Hillis Road.

4.2.1.2 Existing Fill

Cohesionless fills consisting of sand with varying amounts of gravel were encountered at the ground surface at boreholes 25-01, 25-09, below the topsoil at borehole 25-07, and below the asphaltic concrete at boreholes 25-02 to 25-06, 25-08, and 25-10. It should be noted that the granular base, subbase, and existing fill soils were difficult to distinguish at the time of investigation as all comprise mainly sandy material.

The fill extended to a depth of about 0.7 m to 1.5 m (~El. 206.9 m to 214.3 m) below the existing ground surface at boreholes 25-01 to 25-08. Boreholes 25-09 and 25-10 were terminated within the fill layer at depths of about 3.7 m (~El. 216.1 m to 216.3 m). SPT ‘N’ values in the fill ranged from 3 to 43 blows per 0.3 m of penetration, which indicates a very loose to dense state of packing; more typically compact to dense.

The water content measured in 26 selected samples of the fill material ranged from about 1% to 23%. The results of grain size distribution tests carried out on four samples of the fill layer are presented in Figure C1 in Appendix C.

4.2.1.3 Peat

Silty peat was encountered below the existing fill materials at boreholes 25-01 to 25-06. The top of peat deposit was encountered at depths of about 0.7 m to 1.5 m (~El. 206.9 m to 208.0 m). At the location of borehole 25-06, peat extended to a depth of about 3.0 m (~ El. 206.5 m) below the existing ground surface. Boreholes 25-01 to 25-05 were terminated within peat deposit to depth of about 3.7 m (~El. 204.4 m to 205.1 m). SPT ‘N’ values in the peat ranged from 0 to 8 blows per 0.3 m of penetration, which indicates a very soft to firm consistency; more typically very soft.

The water content measured in 19 selected sample of peat ranged from about 62% to 500%. The organic content measured in two selected samples of peat ranged from 0.7% to 2.8% (Loss on Ignition method).

4.2.1.4 Sand

Sand was encountered below the peat at borehole 25-06 and below the fill at boreholes 25-07 and 25-08. The sand layer was encountered at a depth of about 0.7 m to 3.0 m (~El. 206.5 m to 214.3 m) and extended to the borehole termination depth of about 3.7 m (~El. 205.8 m to 211.5 m). SPT ‘N’ values recorded in the sand ranged from 6 to 38 blows per 0.3 m of penetration, which indicates a loose to dense state of packing; more typically compact.

The water content measured on eight samples of the sand ranged from 3% to 24%. The results of grain size distribution tests carried out on a single sample of the sand layer are presented in Figure C2 in Appendix C.

4.3 Groundwater Conditions

Monitoring wells were not installed in drilled boreholes as part of the geotechnical investigation. However, open hole water levels were observed during and after the completion of borehole drilling and sampling and are presented in Table 1 below.

Groundwater levels are expected to fluctuate seasonally and over shorter periods of time. Higher groundwater levels are expected during wet periods of the year, such as spring after the snowmelt or during periods of heavy rain.

Table 1: Summary of Groundwater Conditions

Open Borehole Water Levels (Note: This does not represent the stabilized groundwater level)				
Borehole	Ground Surface Elevation (m)	Depth to Groundwater Level (m)	Groundwater Elevation (m)	Date
25-01	208.0	2.0	206.0	July 9, 2025
25-02	208.2	1.1	207.1	
25-03	208.3	1.8	206.5	
25-04	208.5	2.1	206.4	
25-05	208.7	1.1	207.6	
25-06	209.4	2.3	207.1	
25-07	215.0	2.4	212.6	
25-08	215.2	2.2	213.0	
25-09	219.7	Dry	-	
25-10	219.9	Dry	-	

5.0 GEOTECHNICAL RECOMMENDATIONS

5.1 General

This section of the report provides discussion and engineering recommendations for the geotechnical design aspects of the proposed Hillis Road upgrades based on our interpretation of the available information obtained from the boreholes advanced during the current investigation and on our understanding of the project requirements.

The information in this section of the report is provided for the guidance of the design team. Where comments are made on construction, they are provided only in order to highlight aspects of construction which could affect the design of the project. Contractors bidding on the work should make their own interpretations of the site conditions and their potential impact on construction, means and methods, equipment requirements, progress rates, etc.

5.2 Frost Penetration Depth

The frost penetration depth at the project site is estimated to be 1.6 m based on Ontario Provincial Standard Drawing (OPSD) 3090.101.

5.3 Site Servicing

5.3.1 Temporary Trench Excavation for Open Cut Sections

It is anticipated that excavations for this project will be primarily through the pavement structure, fill, peat and sandy material at different locations.

No unusual problems are anticipated in excavating in the above soils using conventional excavating equipment, understanding that boulder and cobble removal may be required during excavation. Cobbles and boulders may be present within the existing fill.

As a minimum requirement, all side slopes of temporary open cut excavations should conform to the Occupational Health and Safety Act (OHSA) – Regulation for Construction Projects (O. Reg. 213/91). The existing fill soil would be classified as Type 4 soils, and excavations in these materials should be sloped no steeper than 3H:1V based on OSHA requirements. Boulders and cobbles should be removed from the excavation side slopes for worker safety. Stockpiling and equipment operating should be avoided from excavation edge to a distance at least equal to the excavation depth to reduce potential instability of unsupported excavation slopes.

Where the available space limits the above cutback slopes, the temporary excavations can be advanced at steeper slopes and protected by temporary shoring systems, or possibly trench boxes designed and installed by a specialist contractor.

5.3.2 Groundwater Control

Based on the groundwater observation in open hole, the depth to the groundwater table is approximately 1 m to 2.5 m beneath the existing ground surface. Depending on the time of year when construction would occur, excavations for road reconstruction are anticipated to be above the groundwater level. If buried services are to be installed below frost penetration depths, trenching close to or below the groundwater table could be required. Seasonal fluctuations in groundwater levels and soil moisture are to be expected.

The rate of groundwater inflow to excavations depends on many factors, including timing and schedule, and the size and rate of excavation. There may also be instances where precipitation collects in an open excavation and must be rapidly pumped out.

According to O. Reg. 63/16 and O. Reg. 387/04, if the volume of water to be pumped from excavations for the purpose of construction dewatering is greater than 50,000 litres per day and less than 400,000 litres per day, the water taking will need to be registered as a prescribed activity in the Environmental Activity and Sector Registry (EASR) and requires the completion of a “Water Taking Plan”. A Permit to Take Water (PTTW) is required from the Ministry of the Environment Conservation and Parks (MECP) if a volume of water greater than 400,000 litres per day is to be pumped out from an excavation.

Dewatering systems are the Contractor’s responsibility and the rate and volume required for dewatering is dependent on the construction methods and staging chosen by the Contractor. In general, however, it is anticipated that the volume of dewatering required in the excavations for the Hillis Road upgrades can be handled, as required, using properly filtered sumps, ditches, pumps, etc.

5.3.3 Pipe Bedding and Cover

Peat was encountered at depths of about 0.7 m to 1.5 m (~El. 206.9 m to 208.0 m) below the existing ground surface at the project area. Peat is a highly compressible organic material that can undergo significant long-term settlement under load. If the proposed pipe inverts, bedding, or buried utilities are located within or directly above this layer, there is a potential for differential settlement, which may impact the integrity of the pipes or associated infrastructure. As such, it is recommended that where the pipe bedding would be supported on peat, the peat be removed to a depth of at least 0.5 m below the pipe invert or until competent native soil is encountered and replaced with compacted Granular B Type I or II or approved engineered fill. Alternatively, where full removal is not feasible, a non-woven geotextile separator may be placed at the subgrade level to improve stability and reduce migration of fines.

At least 150 mm of Granular A meeting the Ontario Provincial Standard Specification (OPSS 1010) is adequate as pipe bedding, if required. The bedding material should, in all cases, extend to the spring line of the pipe and should be compacted to at least 95 % of the Standard Proctor Maximum Dry Density (SPMDD) using suitable vibratory compaction equipment.

Cover material, from the spring line of the pipe to at least 300 mm above the top of the pipe, should consist of additional Granular A or Granular B Type I or II with a maximum particle size of 25 mm.

The use of clear crushed stone as a bedding layer should not be permitted anywhere on this project since fine particles from sandy backfill materials could potentially migrate into the voids in the clear crushed stone and cause loss of lateral pipe support or surface settlement.

The potential for settlement due to the presence of peat should be carefully evaluated during the final design phase. WSP should be contacted to conduct settlement analysis for proposed services, when more information is available.

5.3.4 Trench Backfill

Trench backfill may consist of approved excavated material such as the existing pavement granular base and subbase fill. These materials should be reviewed during excavation and suitable portions set aside for re-use. Alternatively, if native backfill cannot be reused due to high moisture content or scheduling/stockpiling constraints, select subgrade material (SSM) or additional granular fill (Granular A, B Type I or B Type II) may also be utilized as backfill material providing it meets OPSS.MUNI 1010 specifications for gradation.

It is important for frost heave compatibility that the trench backfill within the design frost penetration zone of 1.6 m depth below final pavement grade matches the soil exposed on the trench walls to the extent practically possible. This may require careful separation of materials upon excavation, and appropriate planning for optimal re-use.

Trench backfill should be placed in maximum 300 mm thick lifts and should be compacted to at least 95% of the SPMDD using suitable compaction equipment.

5.4 Pavement Design

The subgrade soil in the project area contains peat of unknown depth, which presents significant challenges for long-term pavement performance. Complete removal and replacement of the peat with suitable material is not being proposed due to feasibility constraints and high associated costs. As a result, the pavement structure will be constructed over the existing peat deposits, which are known to exhibit high compressibility, low shear strength, and long-term settlement characteristics.

It should be anticipated that the pavement constructed over this subgrade will be subject to higher maintenance requirements and reduced performance compared to pavements built on typical, more stable soils. Differential settlement, surface deformation, and loss of structural support over time are potential risks that must be considered in the lifecycle planning of the pavement.

An alternative approach involving subgrade improvement techniques such as preloading, reinforcement, or soil stabilization, may offer better performance outcomes. However, this would require more detailed geotechnical investigations and analysis to accurately determine the peat depth and properties, and to evaluate the feasibility and effectiveness of such improvement methods.

The following pavement design recommendations are based on the assumption that the existing peat will remain in place, and a deleterious surficial soil will be stripped within the limits of the pavement area.

5.4.1 Traffic Data

The Annual Average Daily Traffic (AADT), percentage of heavy vehicles (trucks) and growth rate for Hillis Road is calculated based on the provided pick hour traffic data received from Client and are presented in Table 2.

Table 2: Traffic Data

Road	AADT (Year)	Percent Trucks (%)	Growth Rate (%)*
Hillis Road	672 (2025)	82	1.0

**Growth rate was not available and was assumed*

5.4.2 Equivalent Single Axle Loads

The equivalent single axle loads (ESALs) for the design lanes were calculated using the traffic data presented above. The input parameters for the design lane ESAL calculation were derived in accordance with the MTO Publication: Procedures for Estimating Traffic Loads for Pavement design with applicable lane and directional distribution factors as outlined in MTO's "Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions, 2008" and the MTO Pavement Design and Rehabilitation Manual.

The estimated design ESALs for Hillis Road within the project limits are presented in the Table 3 below.

Table 3: Design ESALs

Road Section	Lane Distribution Factor	Directional Distribution Factor	20-year Design ESALs
Hillis Road	1	0.5	1,727,000

5.4.3 Pavement Design Analysis

Pavement design analysis was completed to determine the structural requirements for the proposed pavement improvements within the project limits. Pavement Designs were completed in accordance with 1993 AASHTO "Guide for the Design of Pavement Structures as modified by the MTO's "Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions, 2008" and the MTO Pavement Design and Rehabilitation Manual. Based on the field investigation, the subgrade soils within the project limits mainly consisted of sand with low susceptibility to frost heaving (LSFH). Silty peat was encountered below the existing fill deposit at the location of boreholes 25-01 to 25-06.

Generally, if the soil types in the roadway and widening areas are the same or similar, a higher subgrade resilient modulus value is used for the soil under existing lanes, as the subgrade soil has been in place for several years and has been subjected to repeated traffic loading, compared to soil types in the widening areas that have not been subjected to traffic loading. Therefore, based on the condition of the subgrade soils and the MI-183 guidelines, we assigned subgrade resilience modulus values of 35 MPa for the rehabilitation of the existing lanes and 20 MPa for the widening design. An analysis of the existing structural number (SN) was calculated using the available borehole data. The following input parameters were selected to generate a Structural Number (SN) target for the project limits:

Table 4: AASHTO Pavement Input Design Parameters

Design Parameter		Value
Design Year		20
Design Reliability (%)		80
Standard Deviation		0.44
Serviceability	Initial	4.4
	Terminal	2.2
Subgrade Strength	Subgrade Modulus for existing Lane (MPa)	35
	Subgrade Modulus for Widening (MPa)	20
Structural (SN) Coefficients	New Asphalt	0.42
	New Granular Base (Granular A)	0.14
	New Granular Subbase (Granular B Type II)	0.14
	Existing Granular	0.1
Drainage Coefficients	New Granular Base (Granular A)	1.0
	New Granular Subbase (Granular B Type II)	1.0
	Existing Granular	0.90

The required pavement structure thickness for the design lane was determined using the AASHTO design method and the Ministry of Transportation’s Pavement Design Manual. Input parameters are shown in Table 4, and the design output sheets are presented in Appendix D.

Table 5: Target Structural Numbers

Road Section	Existing Structural Number	Required Structural Number (SNReq) For Widening	Required Structural Number (SNReq) For Rehabilitation
Hillis Road	47	117	97

5.4.4 Pavement Recommendations

Based on the results of the geotechnical investigation and pavement design analysis, the existing pavement structure is not sufficient to carry the calculated future traffic load (including proposed truck traffic), and hence the following pavement structures are recommended for the reconstruction of Hillis Road. AASHTO design outputs is presented in Appendix D.

Table 6: Recommended Flexible Pavement Structure

Road Section	Hillis Road Widening and Turning Tapers at the Intersection with County Road 12	Hillis Road Rehabilitation
Estimated Service Life	20 Years	20 Years
Hot Mix Asphalt	50 mm SP 12.5 80 mm SP 19.0	50 mm SP 12.5 80 mm SP 19.0
Existing Granular Base/Subbase	-	400 mm
New Base (Granular A)	150 mm	
New Subbase (Granular B Type II)	300 mm	
Geogrid	1 layer of NX850 or equivalent	
Geotextile	1 layer of Terrafix 270R or equivalent	
Total Pavement Thickness	580 mm	530 mm
Design SN	118	98

Prior to placing the widening pavement structure, WSP recommends stripping topsoil, organic materials and any deleterious materials within the proposed widening areas to a depth of 580 mm below proposed finished pavement grade. Proof roll and inspect the existing subgrade prior to placing any new materials under the direction of the Geotechnical Engineer. Any areas encountered peat or exhibiting excessive deformation during proof-rolling should be sub-excavated and reinstated with new Granular B Type I or II materials with an additional layer of geogrid with geotextile.

Widening of Hillis Road and Turning Tapers:

- Remove the existing topsoil and underlying materials to a depth 580 mm below the finished grade;
- Proof-roll the exposed subgrade, repair soft-spots with Granular B Type I or II and re-grade as necessary; and
- Place 300 mm Granular B Type II followed by placing a minimum of 150 mm Granular A. All granular materials should be placed in lift thicknesses of 150 mm or less and compacted to a minimum of 100 % SPMDD.

Rehabilitation of the existing Hillis Road:

Remove the existing asphalt and proof roll the exposed road base, any areas exhibiting excessive deformation during proof-rolling should be sub-excavated and reinstated with new granular B Type I or II materials and pave the whole roadway including the widening section and turning taper as follow:

- Place and compact 80 mm SP19.0 hot-mix asphalt in one lift and compact to minimum 91% Maximum Relative Density (MRD);
- Apply SS-1 Tack Coat on Binder Course; and
- Place and compact one lift of 50 mm SP12.5 hot-mix asphalt and compact to minimum 92% MRD.

The above pavement structure has an approximate design SN of 98 with a service life of up to 20 years and there will be a grade raise of 100 mm.

The Superpave 12.5 surface asphalt and Superpave 19.0 binder asphalt shall use Performance Graded Asphalt Cement (PGAC) 64-28. Ontario Traffic Category C should be used in the design of the pavement structure. Asphalt concrete should be in accordance with OPSS 1151 for Superpave mix designs.

The asphalt should be produced, placed, and compacted in accordance with the current OPSS requirements. In areas where new pavements abut existing pavements, a 500 mm wide notch to the depth of the surface course should be provided to create a staggered joint. Care should be taken to properly tack coat all butt joints and milled surfaces.

The Granular base and subbase for pavements should be compacted to 100% of the material's SPMDD, within 2% of the optimum moisture content according to OPSS.MUNI 501.

5.5 Additional Considerations

The soils at this site are sensitive to disturbance from construction, traffic, and frost.

During construction, sufficient subgrade inspections, in-situ density tests, and materials testing should be carried out to confirm that the conditions exposed are consistent with those encountered in the boreholes, and to monitor conformance to the pertinent project specifications.

It is understood that Sunrock intends to use Granular A and Granular B materials produced from limestone for the project. This is acceptable, provided that the materials comply with all applicable requirements of OPSS 1010, including gradation, durability, and other relevant physical property specifications. Verification of compliance should be confirmed through appropriate testing and documentation from the supplier.

WSP should be retained to review the final drawings and specifications for this project prior to tendering to ensure that the guidelines in this report have been adequately interpreted.

6.0 CLOSURE

This report was prepared by Ms. Kinjal Gajjar, Geotechnical Engineer and Mr. Atiqur Rahman, Principal Pavement Engineer. Mr. Steve Ash, a Senior Geotechnical Engineer conducted an independent technical and quality control review of this report.

We trust this report contains sufficient information for your present purposes. If you have any questions regarding this report or if you have any questions, please reach out to us.

Signature Page

WSP Canada Inc.

Reviewed by:

LICENSED PROFESSIONAL ENGINEER
K. GAJJAR
100577339
Nov11,2025
PROVINCE OF ONTARIO

Kinjal Gajjar, P.Eng.
Geotechnical Engineer

Steve Ash, P.Eng., P.Geo.
Senior Geotechnical Engineer

LICENSED PROFESSIONAL ENGINEER
M. A. RAHMAN
100154543
Nov11,2025
PROVINCE OF ONTARIO

Atiqur Rahman, P.Eng.
Principal Pavement Engineer

KG/AR/JSA/yj

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The report is of a summary nature and is not intended to stand alone without reference to the instructions given to WSP by the Client, communications between WSP and the Client, and to any other reports prepared by WSP for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. WSP can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Ground Water Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, WSP does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that WSP interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: WSP will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client’s expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of WSP's report. WSP should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of WSP's report.

During construction, WSP should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of WSP's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in WSP's report. Adequate field review, observation and testing during construction are necessary for WSP to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, WSP's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that WSP be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that WSP be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. WSP takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

FIGURES

Figure 1 – Borehole Location Plan

LEGEND

●	APPROXIMATE BOREHOLE LOCATION

REFERENCE(S)

1. AERIAL SOURCE - © 2025 Microsoft Corporation © 2025 Maxar ©CNES (2025) Distribution Airbus DS.

0 25 50

1:1,500 METRES

CLIENT
SUNROCK INDUSTRIES CANADA ULC

PROJECT
GEOTECHNICAL INVESTIGATION
HILLIS ROAD UPGRADES

TITLE
BOREHOLE LOCATION PLAN

CONSULTANT

wsp

YYYY-MM-DD	2025-09-24
DESIGNED	
PREPARED	DD
REVIEWED	KG
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
CA0054344.1346	0001	A	1

Path: \\corp.pbwan.net\CA\CAMIS300\CTX_Data\SIM\Clients\Sunset_Rock\Hillis_Road\99_PROJ\CA0054344_1346\40_PROD\0001_Geotech_Invest\ | File Name: CA0054344_1346-0001-BG-0001.dwg | Last Edited By: gld_ddojcinovic Date: 2025-09-04 Time:3:03:00 PM | Printed By: gld_ddojcinovic Date: 2025-09-24 Time:2:38:52 PM

APPENDIX A

Photographs of Existing Pavement

Photograph 1: Moderate Transverse Cracking (July 8, 2025)

Photograph 2: Moderate Ravelling (July 8, 2025)

Photograph 3: Severe Ravelling (July 8, 2025)

Photograph 4: Slight to moderate Wheel Track Rutting (July 8, 2025)

Photograph 5: Moderate Wheel Track Rutting and Alligator Cracking (July 8, 2025)

Photograph 6: Slight Pavement Edge Cracking (July 8, 2025)

Photograph 7: Slight to moderate Pavement Edge Break (July 8, 2025)

APPENDIX B

Method of Soil Classification

Abbreviations and Terms used on Records of Boreholes

List of symbols

Record of Borehole Sheets

METHOD OF SOIL CLASSIFICATION

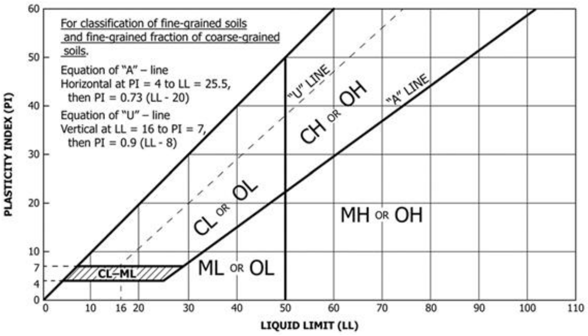
The WSP Canada Soil Classification[1] System is based on the Unified Soil Classification System (USCS) (after ASTM D2487)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} x D_{60}}$	Organic Content [6,9]	USCS Group Symbol[3,5,7]	Primary Group Name[2]
INORGANIC (Organic Content <30% by mass)	**COARSE-GRAINED SOILS** (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Clean Gravels with <5% fines [3] (by mass)	Well Graded	≥4 (and)	≥1 to ≤3	≤30%	GW	Well-graded GRAVEL [4,6]
				Poorly Graded	<4 (and/or)	<1 or >3		GP	Poorly graded GRAVEL [4,6]
			Gravels with >12% fines [3] (by mass)	Below A Line	n/a			GM	SILTY GRAVEL [4,6]
				Above A Line	n/a			GC	CLAYEY GRAVEL [4,5,6]
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Clean Sands with <5% fines [7] (by mass)	Well Graded	≥6 (and)	≥1 to ≤3		SW	Well-graded SAND [6,8]
				Poorly Graded	<6 (and/or)	<1 or >3		SP	Poorly graded SAND [6,8]
			Sands with >12% fines [7] (by mass)	Below A Line	n/a			SM	SILTY SAND [6,8]
				Above A Line	n/a			SC	CLAYEY SAND [5,6,8]

Organic or Inorganic	Soil Group	Type of Soil	Laboratory Tests	Field Indicators					Organic Content [B,H]	USCS Group Symbol [A]	Primary Group Name [A]
				Dilatancy	Dry Strength	Shine Test	Thread Diameter (mm)	Toughness (of 3 mm thread)			
INORGANIC (Organic Content <30% by mass)	**FINE-GRAINED SOILS** (≥50% by mass is smaller than 0.075 mm)	SILTS (Nonplastic or PI and LL plot **below A-Line** on Plasticity Chart below) [C]	Liquid Limit <50 [D]	Rapid	None to Low	Dull to None	3 to >6	Low/can't roll 3 mm	<15%	ML	SILT [H]
				None to Slow	Low to Medium	Dull to Slight	3 to 6	Low	15% to 30%	OL	ORGANIC SILT
			Liquid Limit ≥50 [D]	None to V.Slow	Low to Medium	Slight	3 to 6	Low to Medium	<15%	MH	ELASTIC SILT[H]
				None	Medium to High	Dull to Slight	1 to 3	Low to Medium	15% to <30%	OH	ORGANIC SILT
		CLAYS (PI and LL plot **above A-Line** on Plasticity Chart below) [A]	Liquid Limit <50 [D]	None to Medium Slow	Medium to High	Slight to Shiny	1 to 3	Medium	<15%	CL	LEAN CLAY [A,E,F,G,H]
				None to V.Slow	Medium to High	Slight to Shiny	1 to 3	Medium	15% to <30%	OL	ORGANIC CLAY [E,F,G]
			Liquid Limit ≥50 [D]	None	High to V.High	Shiny	<1	High	<15%	CH	FAT CLAY [E,F,G,H]
				None	High	Shiny	<1 to 1	High	15% to <30%	OH	ORGANIC CLAY [E,F,G]
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures	Relatively lightweight, possibly spongy. Some water may squeeze from sample. Some shrinkage may occur on air drying. Sand fraction may be visible. Low to high dilatancy. Thread weak near plastic limit. Low to medium dry strength.						30% to <75%	PT	SILTY PEAT, SANDY PEAT
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat	Lightweight, spongy. Much water squeezes from sample. Shrinks considerably on air drying (i.e., very high water content). Plant structure identiable to altered.						75% to 100%		PEAT

Coarse-Grained Soil Note(s):

1. Based on the material passing the 75 mm sieve.
2. If field sample contains or drilling observations indicate cobbles or boulders or both, add, "with cobbles" or "with cobbles and boulders". Include notes on the depth(s) encountered, and sizes if possible.
3. Gravels with 5% to 12% fines require dual symbols:
   (GW-GM) Well-graded GRAVEL with silt,
   (GW-GC) Well-graded GRAVEL with clay,
   (GP-GM) Poorly graded GRAVEL with silt,
   (GP-GC) Poorly graded GRAVEL with clay.
4. If soil contains ≥15% sand, add "with sand" to Group Name.
5. If fines classify as CL-ML, use dual symbol (GC-GM) or (SC-SM) for Group Symbol.
6. If the soil has an organic content (OC) 15%≤OC<30% the prefix "Organic" should be added before the Group Name. If the soil has an organic content 3%≤OC<15% add "with organic fines" to Group Name. If the soil contains >0% to ≤3% organics, the descriptor "trace organics" may be added to the Group Name.
7. Sands with 5% to 12% fines require dual symbols:
   (SW-SM) Well-graded SAND with silt,
   (SW-SC) Well-graded SAND with clay,
   (SP-SM) Poorly graded SAND with silt,
   (SP-SC) Poorly graded SAND with clay.
8. If soil contains ≥15% gravel, add "with gravel" to Group Name.



Fine-Grained Soil Note(s):

- **A.** If Atterberg limits plot above the A-line but in the 'hatched' area on the plasticity chart, soil is a (CL-ML) SILTY CLAY.
- **B.** If the soil contains >0% to ≤3% organics, the descriptor "trace organics" may be added to the Group Name.
- **C.** If fine-grained materials are nonplastic (i.e., a plastic limit (PL) cannot be measured), soil is a (ML) SILT.
- **D.** If soil has a liquid limit (LL) >30% to <50%, the term 'medium plasticity' may be included in the description, but the Group Name/Symbol is not changed.
- **E.** If soil contains 15% to <30% +No.200, add "with sand" or "with gravel".
- **F.** If soil contains ≥30% +No.200 mainly sand, add "Sandy" to Group Name.
- **G.** If soil contains ≥30% +No.200 mainly gravel, add "Gravelly" to Group Name.
- **H.** If the soil has an organic content (OC) 3%≤OC<15% add "with organic fines" to Group Name.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

GRADATIONAL COMPONENT TERMS

% (by mass)	Term
< 5	Use "trace"
≥ 5 to ≤ 12	Use "few"
> 12 to <30	Use "little"
≥ 30 to <50	Use "some"
≥ 50	Use "mostly"

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

Cone Penetration Test (CPT)
An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); Nd:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven, pushed tube sampler, or geoprobe macro-core – note size
DS	Denison type sample
FS	Foil Sample
GS	Grab Sample
MC	Modified California Samples – note sample diameter and hammer weight
MS	Modified Shelby (for frozen soil)
RC	Rock core
SC	Soil core
SS	Split-spoon sampler (50 mm OD); larger sizes use MC
ST	Slotted tube
TO	Thin-walled, open – note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample

SOIL TESTS

PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness[2]

Term	SPT 'N' (blows/0.3m)[1]
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in general accordance with ASTM D1586, uncorrected for the effects of overburden pressure.
2. Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grainsize. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1,2] (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in general accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows.

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\ \sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma$ - u)
σ'_{vo}	initial effective overburden stress
σ_1, σ_2, σ_3	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation
w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
NP	nonplastic
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c'	effective cohesion
c_u, s_u	undrained shear strength (ϕ = 0 analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p'	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes

* Density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

1. $\tau = c' + \sigma' \tan \phi'$
2. shear strength = (compressive strength)/2

RECORD OF BOREHOLE: BH25-01

Sheet 1 of 1

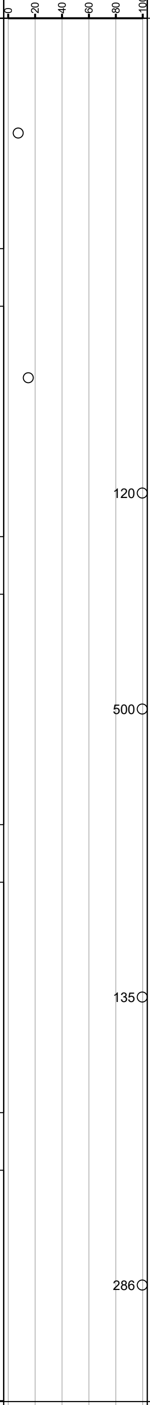
CLIENT: Sunrock Industries Canada ULC
PROJECT: Sunrock Hillis Pit
PROJECT NO: CA0054344.1346
LOCATION: 424 Hillis Road, Peterborough
DATE: July 09, 2025
INCLINATION: 90.0°
CONTRACTOR: Landshark
ELEVATION: 208.03 m (Ground)
COORDINATES: Lat: 44.324768° Long: -78.394944°
COORD SYS: Geographical Coordinates
HORZ DATUM: NAD83

Drill rig: Truck Mount Mobile Drilling B-29
Drill method: Solid Stem Auger - 152-mm Hole Dia.

Samples: Hammer: Automatic, ASTM D1586, Blows per 0.15 m, 623-N hammer, 0.76-m drop

Water content: H Plastic & Liquid Limits (%); ○ Water Content (%); NP Nonplastic

DESCRIPTION	USCS	ELEV. / DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT	GRAVEL	SAND	FINES	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
FILL - (SP-SM) Poorly graded SAND with silt and gravel, mostly SAND, little gravel; grey; non-cohesive, moist, very loose to loose.	SP-SM	0.00	1	SS	88	1-2-2-2	4	○						
			2A	SS	33	1-0-1-1	1	○						
		206.89												
(PT) SILTY PEAT, some organic fines; dark grey; non-cohesive, w > PL, very soft.	PT	1.14	2B					120○						
			3	SS	83	0-1-0-0	1	500○				OC = 0.7%		
			4	SS	4	1-0-0-1	0	135○						
			5	SS	21	1-0-0-0	0	286○						
		204.38												



End of hole at 3.66 m.
(1) Water level measured inside cased hole at a depth of 1.98 metre below ground surface.
(2) Borehole caved to a depth of 2.44 metre below ground surface at upon completion of drilling.

DEPTH SCALE: 1:20
HAMMER TYPE: Automatic

REV: 1

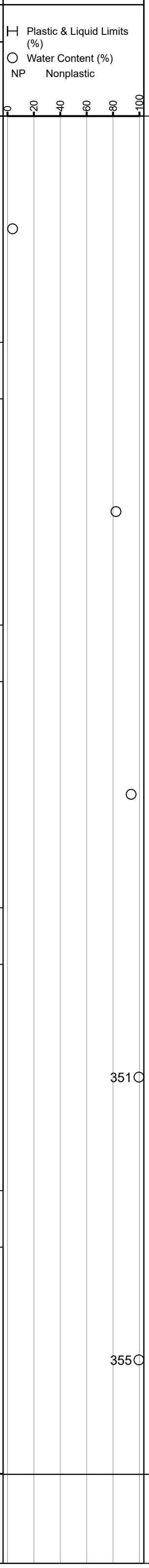
LOGGED: Biswajit Nandi DATE: Jul 09, 2025
CHECKED: BN DATE: Aug 15, 2025

RECORD OF BOREHOLE: BH25-02

Sheet 1 of 1

CLIENT:	Sunrock Industries Canada ULC	DATE:	July 09, 2025	ELEVATION:	208.21 m (Ground)
PROJECT:	Sunrock Hillis Pit			COORDINATES:	Lat: 44.324784° Long: -78.394951°
PROJECT NO:	CA0054344.1346	INCLINATION:	90.0°	COORD SYS:	Geographical Coordinates
LOCATION:	424 Hillis Road, Peterborough	CONTRACTOR:	Landshark	HORZ DATUM:	NAD83

DEPTH (m)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE DESCRIPTION	USCS	STRATA PLOT	ELEV. ----------- DEPTH (m)	SAMPLES Hammer: Automatic ASTM D1586, Blows per 0.15 m 623-N hammer, 0.76-m drop NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT	GRAVEL	SAND	FINES	ADDITIONAL OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
	Truck Mount Mobile Drilling B-29	Solid Stem Auger - 152-mm Hole Dia.	ASPHALT.			0.00											
			FILL - (SP) Poorly graded SAND with gravel, mostly SAND, little gravel; grey with brown; non-cohesive, moist, dense.	SP		208.19 0.02	1	SS	50	10-20-23-15	43						
1			(PT) SILTY PEAT, some organic fines; dark grey; cohesive, w > PL, very soft to firm.	PT		207.52 0.69	2	SS	54	5-5-3-2	8						
2							3	SS	21	3-2-2-1	4						
							4	SS	25	1-1-0-1	1	351					
3							5	SS	12	1-0-0-1	0	355					
						204.55											



End of hole at 3.66 m.
(1) Water level measured inside cased hole at a depth of 1.07 metre below ground surface.
(2) Borehole caved to a depth of 2.38 metre below ground surface at upon completion of drilling.

DEPTH SCALE: 1:20
HAMMER TYPE: Automatic

REV: 1

wsp

LOGGED: Biswajit Nandi — DATE: Jul 09, 2025
CHECKED: BN — DATE: Aug 15, 2025

RECORD OF BOREHOLE: BH25-03

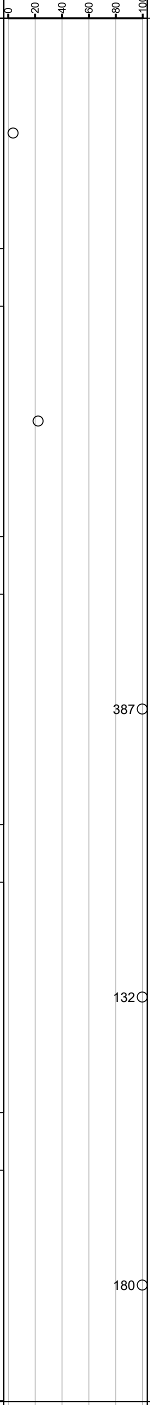
CLIENT: Sunrock Industries Canada ULC
PROJECT: Sunrock Hillis Pit
PROJECT NO: CA0054344.1346
LOCATION: 424 Hillis Road, Peterborough
DATE: July 09, 2025
INCLINATION: 90.0°
CONTRACTOR: Landshark
ELEVATION: 208.30 m (Ground)
COORDINATES: Lat: 44.324577° Long: -78.395785°
COORD SYS: Geographical Coordinates
HORZ DATUM: NAD83

DRILL RIG: Truck Mount Mobile Drilling B-29
DRILL METHOD: Solid Stem Auger - 152-mm Hole Dia.

SAMPLES: Hammer: Automatic, ASTM D1586, Blows per 0.15 m, 623-N hammer, 0.76-m drop

WATER CONTENT: H Plastic & Liquid Limits (%); ○ Water Content (%); NP Nonplastic

MATERIAL PROFILE DESCRIPTION	USCS	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT (%)	GRAVEL	SAND	FINES	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
ASPHALT.		0.00												
FILL - (SM) SILTY SAND with gravel, mostly SAND, little gravel; grey; non-cohesive, loose to compact.	SM	208.29 0.01	1	SS	77	11-16-16-10	32	○	19	62	19	M		
			2	SS	87	6-4-4-2	8	○						
(PT) SILTY PEAT, some organic fines; dark grey; cohesive, w > PL, very loose.	PT	206.85 1.45	3	SS	21	1-0-0-0	0	387○						
			4	SS	8	0-1-0-0	1	132○						
			5	SS	13	0-0-0-1	0	180○						
		204.64												



End of hole at 3.66 m.
(1) Water level measured inside cased hole at a depth of 1.83 metre below ground surface.
(2) Borehole caved to a depth of 2.74 metre below ground surface at upon completion of drilling.

DEPTH SCALE: 1:20
HAMMER TYPE: Automatic

REV: 1

LOGGED: Biswajit Nandi DATE: Jul 09, 2025
CHECKED: BN DATE: Aug 15, 2025

RECORD OF BOREHOLE: BH25-04

CLIENT: Sunrock Industries Canada ULC
PROJECT: Sunrock Hillis Pit
PROJECT NO: CA0054344.1346
LOCATION: 424 Hillis Road, Peterborough

DATE: July 09, 2025
INCLINATION: 90.0°
CONTRACTOR: Landshark

ELEVATION: 208.46 m (Ground)
COORDINATES: Lat: 44.324505° Long: -78.396211°
COORD SYS: Geographical Coordinates
HORZ DATUM: NAD83

DRILL RIG: Truck Mount Mobile Drilling B-29
DRILL METHOD: Solid Stem Auger - 152-mm Hole Dia.

MATERIAL PROFILE

DESCRIPTION	USCS	ELEV. ----------- DEPTH (m)
ASPHALT.		0.00
FILL - (SP) Poorly graded SAND with gravel with organic fines, mostly SAND, little gravel, few organic fines; grey; non-cohesive, compact.	SP	208.44 0.02
(PT) SILTY PEAT, some organic fines; dark grey; cohesive, w > PL, very soft to soft.	PT	207.01 1.45
End of hole at 3.66 m.		204.80

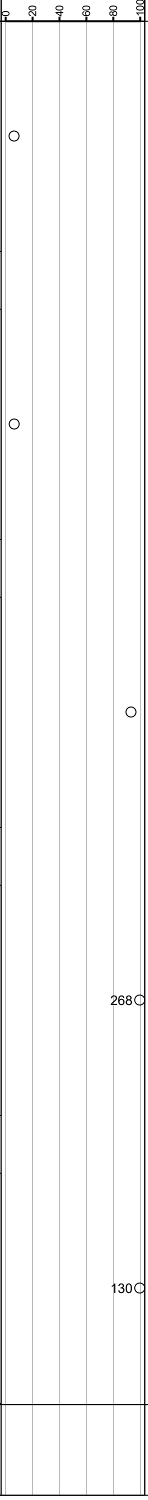
SAMPLES

Hammer: Automatic
ASTM D1586, Blows per 0.15 m
623-N hammer, 0.76-m drop

NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT (%)
1	SS	79	21-17-11-17	28	
2	SS	50	14-10-5-3	15	
3	SS	0	4-1-2-1	3	
4	SS	17	0-1-0-1	1	268
5	SS	83	0-0-1-0	1	130

WATER CONTENT

H Plastic & Liquid Limits (%)
○ Water Content (%)
NP Nonplastic



GRAVEL | SAND | FINES | ADDITIONAL OBSERVATIONS | CONSTRUCTION AND INSTALLATION DETAILS

End of hole at 3.66 m.
(1) Water level measured inside cased hole at a depth of 2.07 metre below ground surface.
(2) Borehole caved to a depth of 2.89 metre below ground surface at upon completion of drilling.

DEPTH SCALE: 1:20
HAMMER TYPE: Automatic

REV: 1

LOGGED: Biswajit Nandi DATE: Jul 09, 2025
CHECKED: BN DATE: Aug 15, 2025

RECORD OF BOREHOLE: BH25-05

CLIENT: Sunrock Industries Canada ULC
DATE: July 09, 2025
ELEVATION: 208.75 m (Ground)
PROJECT: Sunrock Hillis Pit
COORDINATES: Lat: 44.324366° Long: -78.396615°
PROJECT NO: CA0054344.1346
INCLINATION: 90.0°
COORD SYS: Geographical Coordinates
LOCATION: 424 Hillis Road, Peterborough
CONTRACTOR: Landshark
HORZ DATUM: NAD83

DEPTH (m)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE DESCRIPTION	USCS	STRATA PLOT	ELEV. ----------- DEPTH (m)	SAMPLES NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT (Hammer: Automatic ASTM D1586, Blows per 0.15 m 623-N hammer, 0.76-m drop; H Plastic & Liquid Limits (%); ○ Water Content (%); NP Nonplastic; 0 20 40 60 80 100)	GRAVEL	SAND	FINES	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
	Truck Mount Mobile Drilling B-29	Solid Stem Auger - 152-mm Hole Dia.	ASPHALT.			0.00												
			FILL - (SP-SM) Poorly graded SAND with silt and gravel, some SAND, some GRAVEL; grey; non-cohesive, moist, compact.	SP-SM		208.73 0.02	1	SS	100	15-16-11-15	27	○						
							2	SS	79	10-15-12-8	27	○	44	47	9	M		
			(PT) SILTY PEAT, mostly organic fines; dark grey; cohesive, w ~ PL to w > PL, very soft to soft.	PT		207.30 1.45	3	SS	21	1-1-1-0	2	216○						
							4	SS	8	3-2-0-1	2	138○						
						205.09	5	SS	33	0-0-1-0	1	278○						
			End of hole at 3.66 m. (1) Water level measured inside cased hole at a depth of 1.12 metre below ground surface. (2) Borehole caved to a depth of 2.66 metre below ground surface at upon completion of drilling.															

DEPTH SCALE: 1:20
HAMMER TYPE: Automatic

REV: 1

LOGGED: Biswajit Nandi
DATE: Jul 09, 2025
CHECKED: BN
DATE: Aug 15, 2025

RECORD OF BOREHOLE: BH25-06

CLIENT:	Sunrock Industries Canada ULC	DATE:	July 09, 2025	ELEVATION:	209.43 m (Ground)
PROJECT:	Sunrock Hillis Pit			COORDINATES:	Lat: 44.324318° Long: -78.396889°
PROJECT NO:	CA0054344.1346	INCLINATION:	90.0°	COORD SYS:	Geographical Coordinates
LOCATION:	424 Hillis Road, Peterborough	CONTRACTOR:	Landshark	HORZ DATUM:	NAD83

DRILL RIG: Truck Mount Mobile Drilling B-29

DRILL METHOD: Solid Stem Auger - 152-mm Hole Dia.

MATERIAL PROFILE

DESCRIPTION	USCS	STRATA PLOT	ELEV. ----------- DEPTH (m)
ASPHALT.		■	0.00
FILL - (SM) SILTY SAND with gravel, mostly fine to medium SAND, little gravel; grey with brown; non-cohesive, compact to dense.	SM	▨	209.41 0.02
(PT) SILTY PEAT, mostly organic fines; dark grey; cohesive, w ~ PL to w > PL, soft to firm.	PT		207.98 1.45
(SP) Poorly graded SAND, mostly SAND; brown; non-cohesive, wet, loose.	SP		206.46 2.97
End of hole at 3.66 m. (1) Water level measured inside cased hole at a depth of 2.29 metre below ground surface. (2) Borehole caved to a depth of 2.88 metre below ground surface at upon completion of drilling.			205.77

SAMPLES

Hammer: Automatic ASTM D1586, Blows per 0.15 m 623-N hammer, 0.76-m drop

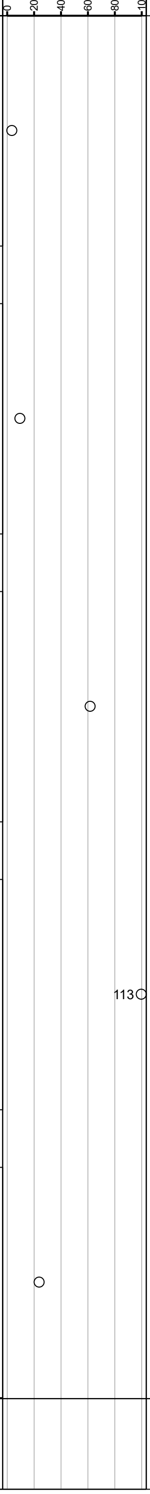
NUMBER	TYPE	REC %	BLOWS	N-VALUE	GRAVEL	SAND	FINES	ADDITIONAL LAB TESTING
1	SS	100	14-11-31-26	42	25	62	13	M
2	SS	100	11-15-10-5	25				
3	SS	58	2-3-4-2	7				OC = 2.8%
4	SS	0	2-0-4-3	4				
5	SS	29	1-2-4-3	6				

WATER CONTENT

H Plastic & Liquid Limits (%)

○ Water Content (%)

NP Nonplastic



ADDITIONAL OBSERVATIONS

CONSTRUCTION AND INSTALLATION DETAILS

DEPTH (m): 1, 2, 3

DEPTH SCALE: 1:20

HAMMER TYPE: Automatic

REV: 1

LOGGED: Biswajit Nandi DATE: Jul 09, 2025

CHECKED: BN DATE: Aug 15, 2025

RECORD OF BOREHOLE: BH25-07

Sheet 1 of 1

CLIENT:	Sunrock Industries Canada ULC	DATE:	July 09, 2025	ELEVATION:	214.97 m (Ground)
PROJECT:	Sunrock Hillis Pit			COORDINATES:	Lat: 44.324042° Long: -78.397856°
PROJECT NO:	CA0054344.1346	INCLINATION:	90.0°	COORD SYS:	Geographical Coordinates
LOCATION:	424 Hillis Road, Peterborough	CONTRACTOR:	Landshark	HORZ DATUM:	NAD83

SAMPLES: Hammer: Automatic, ASTM D1586, Blows per 0.15 m, 623-N hammer, 0.76-m drop

WATER CONTENT: H Plastic & Liquid Limits (%); ○ Water Content (%); NP Nonplastic; scale 0, 20, 40, 60, 80, 100

DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	ELEV. / DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	N-VALUE	GRAVEL	SAND	FINES	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
Truck Mount Mobile Drilling B-29	Solid Stem Auger - 152-mm Hole Dia.	FILL - (ML) SILT with sand, mostly non plastic silty fines, little sand, few gravel; brown; non-cohesive, compact.	ML	0.00	1A	SS	92	2-7-6-9	13						
		FILL - (SP) Poorly graded SAND with gravel, mostly SAND, little gravel; brown; non-cohesive, moist, compact.	SP	214.59 0.38	1B										
		(SP-SM) Poorly graded SAND with silt, mostly SAND; grey; non-cohesive, moist, compact to dense.	SP-SM	214.28 0.69	2	SS	79	7-8-9-10	17						
					3	SS	33	8-12-12-11	24	0	90	10	M		
		- 2.44 to 2.59 m: encountered gravel layer.			4	SS	87	13-21-17-14	38						
				211.31	5	SS	13	11-16-17-14	33						
		End of hole at 3.66 m. (1) Water level measured inside cased hole at a depth of 2.44 metre below ground surface. (2) Borehole caved to a depth of 2.97 metre below ground surface at upon completion of drilling.													

DEPTH (m): 1, 2, 3

DEPTH SCALE: 1:20

HAMMER TYPE: Automatic

REV: 1

LOGGED: Biswajit Nandi DATE: Jul 09, 2025

CHECKED: BN DATE: Aug 15, 2025

RECORD OF BOREHOLE: BH25-08

Sheet 1 of 1

CLIENT: Sunrock Industries Canada ULC
PROJECT: Sunrock Hillis Pit
PROJECT NO: CA0054344.1346
LOCATION: 424 Hillis Road, Peterborough
DATE: July 09, 2025
INCLINATION: 90.0°
CONTRACTOR: Landshark
ELEVATION: 215.17 m (Ground)
COORDINATES: Lat: 44.324018° Long: -78.397843°
COORD SYS: Geographical Coordinates
HORZ DATUM: NAD83

DRILL RIG: Truck Mount Mobile Drilling B-29
DRILL METHOD: Hollow Stem Auger - 152-mm Hole Dia.

SAMPLES: Hammer: Automatic, ASTM D1586, Blows per 0.15 m, 623-N hammer, 0.76-m drop

WATER CONTENT: H Plastic & Liquid Limits (%); ○ Water Content (%); NP Nonplastic; 0 20 40 60 80 100

MATERIAL PROFILE: DESCRIPTION	USCS	ELEV. ----------- DEPTH (m)	NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT	GRAVEL	SAND	FINES	ADDITIONAL OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
ASPHALT.		0.00											
FILL - (SP) Poorly graded SAND, mostly SAND, few fine to coarse rounded to subrounded gravel; brown to grey; non-cohesive, loose to compact.		215.15 0.02	1	SS	46	5-15-8-7	23	○					
			2	SS	67	1-2-5-5	7	○					
(SP) Poorly graded SAND, mostly SAND; brown and grey; non-cohesive, moist, compact.	SP	213.72 1.45	3	SS	67	5-6-6-6	12	○					
			4	SS	79	5-9-11-12	20	○					
			5	SS	75	9-11-12-13	23	○					
		211.51											

End of hole at 3.66 m.
(1) Water level measured inside cased hole at a depth of 2.21 metre below ground surface.
(2) Borehole caved to a depth of 2.69 metre below ground surface at upon completion of drilling.

DEPTH SCALE: 1:20
HAMMER TYPE: Automatic

REV: 1

LOGGED: Biswajit Nandi DATE: Jul 09, 2025
CHECKED: BN DATE: Aug 15, 2025

RECORD OF BOREHOLE: BH25-09

Sheet 1 of 1

CLIENT:	Sunrock Industries Canada ULC	DATE:	July 09, 2025	ELEVATION:	219.73 m (Ground)
PROJECT:	Sunrock Hillis Pit			COORDINATES:	Lat: 44.323795° Long: -78.398968°
PROJECT NO:	CA0054344.1346	INCLINATION:	90.0°	COORD SYS:	Geographical Coordinates
LOCATION:	424 Hillis Road, Peterborough	CONTRACTOR:	Landshark	HORZ DATUM:	NAD83

DEPTH (m)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE DESCRIPTION	USCS	STRATA PLOT	ELEV. ----------- DEPTH (m)
0	Truck Mount Mobile Drilling B-29	Hollow Stem Auger - 152-mm Hole Dia.	FILL - (GP-GM) Poorly graded GRAVEL with silt and sand, some fine to coarse rounded to subrounded GRAVEL, some SAND; grey and brown; non-cohesive, compact to dense.	GP-GM	▨	0.00
3.66						216.07
			End of hole at 3.66 m. (1) Borehole dry upon completion of drilling, (2) Borehole caved to a depth of 2.44 metre below ground surface at upon completion of drilling.			

SAMPLES — Hammer: Automatic ASTM D1586, Blows per 0.15 m 623-N hammer, 0.76-m drop

WATER CONTENT: H Plastic & Liquid Limits (%); ○ Water Content (%); NP Nonplastic; scale 0 20 40 60 80 100

NUMBER	TYPE	REC %	BLOWS	N-VALUE	WATER CONTENT	GRAVEL	SAND	FINES	ADDITIONAL LAB TESTING	ADDITIONAL OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
1	SS	87	8-22-19-20	41	○						
2	SS	62	19-21-24-23	45	○	48	43	9	M		
3	SS	67	12-13-13-14	26	○						
4	SS	62	19-21-20-19	41	○						
5	SS	75	15-15-21-19	36	○						

DEPTH SCALE: 1:20

HAMMER TYPE: Automatic

REV: 1

LOGGED: Biswajit Nandi DATE: Jul 09, 2025

CHECKED: BN DATE: Aug 15, 2025

RECORD OF BOREHOLE: BH25-10

Sheet 1 of 1

CLIENT:	Sunrock Industries Canada ULC	DATE:	July 09, 2025	ELEVATION:	219.94 m (Ground)
PROJECT:	Sunrock Hillis Pit			COORDINATES:	Lat: 44.323760° Long: -78.398960°
PROJECT NO:	CA0054344.1346	INCLINATION:	90.0°	COORD SYS:	Geographical Coordinates
LOCATION:	424 Hillis Road, Peterborough	CONTRACTOR:	Landshark	HORZ DATUM:	NAD83

DRILL RIG: Truck Mount Mobile Drilling B-29

DRILL METHOD: Solid Stem Auger - 152-mm Hole Dia.

MATERIAL PROFILE

DESCRIPTION	USCS	ELEV. ----------- DEPTH (m)
ASPHALT.		0.00
FILL - (SP) Poorly graded SAND with gravel, mostly SAND, little fine to coarse rounded to subrounded gravel; grey and brown; non-cohesive, moist, very loose to dense.	SP	219.92 0.02
		216.28

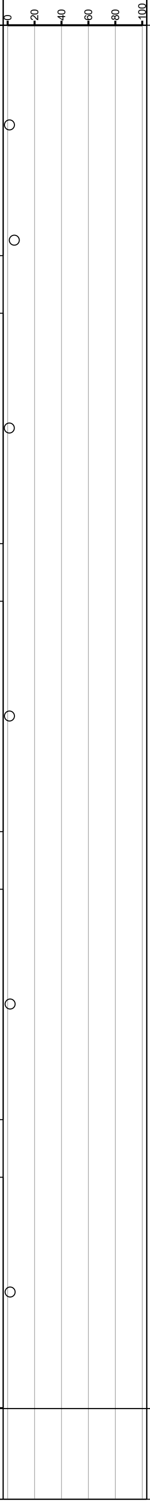
SAMPLES

Hammer: Automatic ASTM D1586, Blows per 0.15 m 623-N hammer, 0.76-m drop

NUMBER	TYPE	REC %	BLOWS	N-VALUE
1A	SS	100	27-32-11-11	43
1B				
2	SS	71	10-12-13-13	25
3	SS	83	4-12-12-17	24
4	SS	42	1-5-9-22	14
5	SS	33	3-2-1-2	3

WATER CONTENT

H Plastic & Liquid Limits (%)
○ Water Content (%)
NP Nonplastic



GRAVEL | SAND | FINES | ADDITIONAL OBSERVATIONS | CONSTRUCTION AND INSTALLATION DETAILS

End of hole at 3.66 m.
(1) Borehole dry upon completion of drilling,
(2) Borehole caved to a depth of 2.57 metre below ground surface at upon completion of drilling.

DEPTH SCALE: 1:20

HAMMER TYPE: Automatic

REV: 1

LOGGED: Biswajit Nandi — DATE: Jul 09, 2025

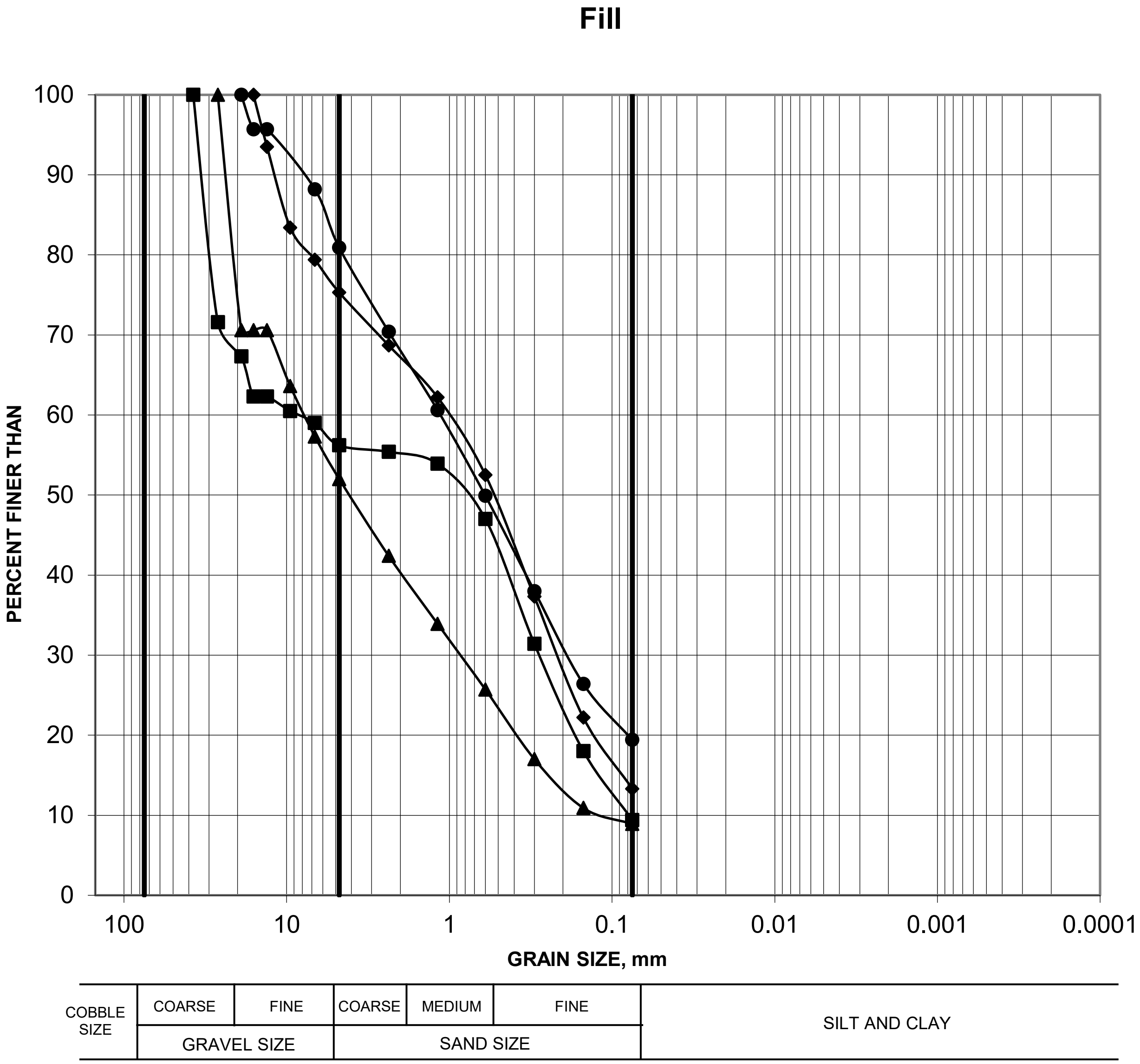
CHECKED: BN — DATE: Aug 15, 2025

APPENDIX C

Geotechnical Laboratory Testing Results

GRAIN SIZE DISTRIBUTION

FIGURE C1



				Constituents (%)			
Borehole		Sample	Depth (m)	Gravel	Sand	Silt	Clay
●	25-03	1	0.00-0.61	19	62	19	
■	25-05	2	0.76-1.37	44	47	9	
◆	25-06	1	0.00-0.61	25	62	13	
▲	25-09	2	0.76-1.37	48	43	9	

Project: CA0054344.1346

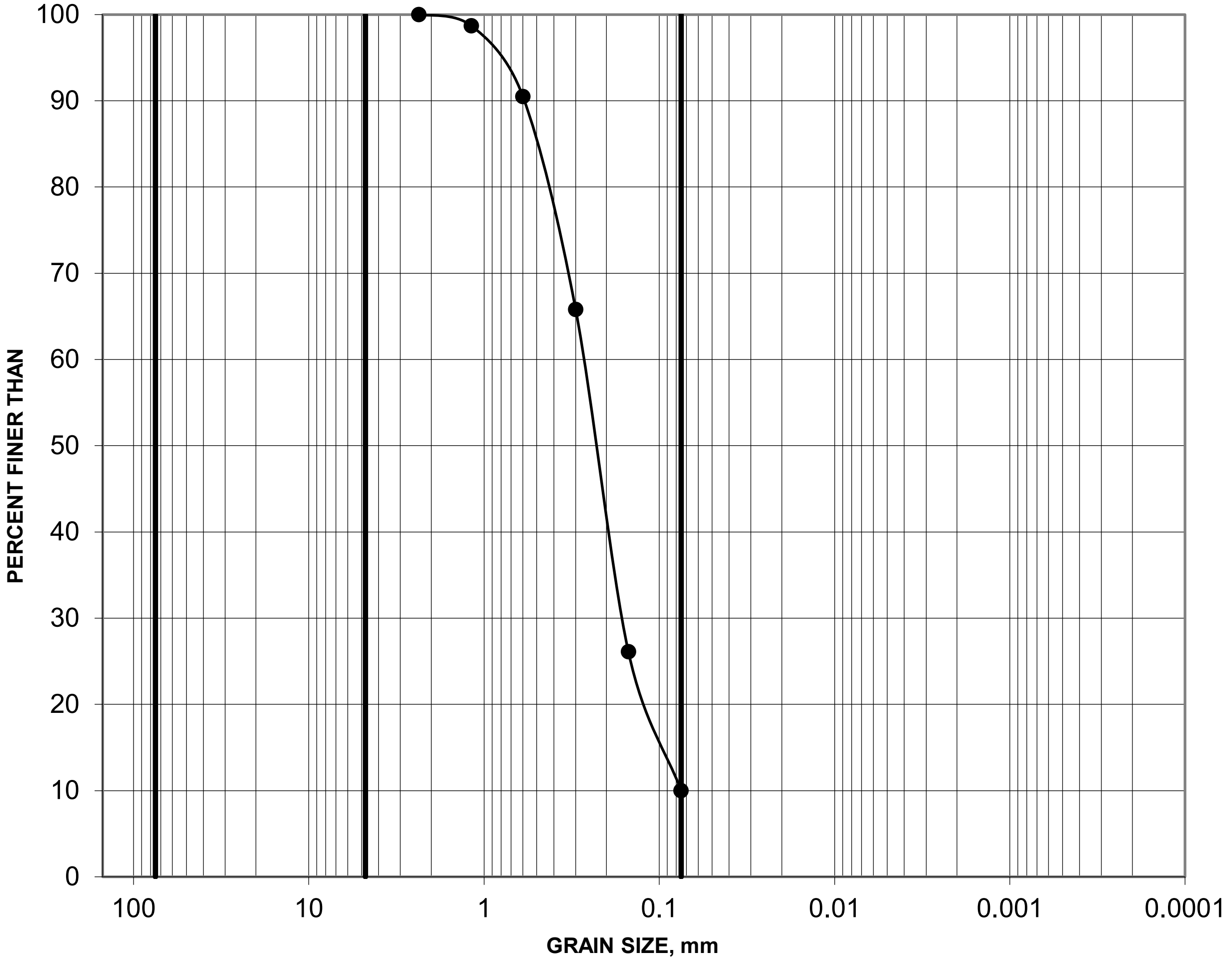
Created by:	KG
Checked by:	CW

https://wsponlinecan.sharepoint.com/sites/CA-CA0054344.1346/Shared Documents/05. Technical/Geotechnical/Lab/Lab Results/Lab Figures/

GRAIN SIZE DISTRIBUTION

FIGURE C2

Poorly Graded SAND with silt



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

			Constituents (%)			
Borehole	Sample	Depth (m)	Gravel	Sand	Silt	Clay
—●— 25-07	3	1.52-2.13	0	90	10	

Project: CA0054344.1346

Created by: KG
Checked by: CW

https://wsponlinecan.sharepoint.com/sites/CA-CA0054344.1346/Shared Documents/05. Technical/Geotechnical/Lab/Lab Results/Lab Figures/

APPENDIX D

Pavement Design Output

Table 1
EQUIVALENT SINGLE AXLE LOAD CALCULATION

Hillis Road From Intersection of Hillis Road and County Road 12 to the Entrance of Ready Mix Plant, Peterborough, Ontario - 20 Year

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1) Traffic Analysis

Traffic Data Year	2025		2035		2045
Design Year	**2025**				
Traffic Analysis Period		10		10	
Average Annual Daily Traffic (AADT)	672		742		820
Average Rate of Increase in Traffic (%)		1.00		1.00	
Truck Fraction of Total Traffic (%)	82		82		82
Average Rate of Increase in Truck Fraction (%)		0.00		0.00	
Number of Lanes in One Direction	1		1		1
Directional Factor	0.5		0.5		0.5
Lane Distribution Factor	1		1		1
Daily Truck Volume	**276**		**304**		**336**

2) Daily ESALs Analysis

Road Classification			***Rural Collector***	
Traffic Analysis Base Year		2025	2035	2045
Breakdown of Truck Proportions (%)	Class 1	90		
	Class 2	2		
	Class 3	4		
	Class 4	4		
Daily Truck Volumes for 4 Classes	Class 1	248	274	303
	Class 2	6	6	7
	Class 3	11	12	13
	Class 4	11	12	13
Truck Factors for 4 Classes of Truck	Class 1	0.5		
	Class 2	2.3		
	Class 3	1.6		
	Class 4	5.5		
Weighted Average Truck Factor			**0.780**	
Daily ESALs per Truck Class	Class 1	124	137	151
	Class 2	13	14	15
	Class 3	18	19	22
	Class 4	61	67	74
Total Daily ESALs in Design Lane		**215**	**237**	**262**

3) Total ESALs for Base Year

Base Year	2025	2035	2045
Number of Days of Truck Traffic	365	365	365
Total ESALs for Base Year	**78,441**	**86,611**	**95,716**

4) Cumulative ESALs for the Design Period

Design Period (Years)		**20**	
Span of Design Periods	2025 to 2035		2035 to 2045
Average Rate of Increase in Truck Volume (%)	1.00		1.00
Years of Design Periods	10		10
Growth Factor	10.46		10.46
ESALs for the Design Periods	821,000		906,000
Cumulative ESALs for the Design Period		**1,727,000**	

Note: The ESAL calculations are baesd on the guidelines "Procedures for Estimating Traffic Loads for Pavement Design" by Jerry Hajek, 1995, and on MTO's "Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions", March 19, 2008.

Table 2
PAVEMENT DESIGN AND ANALYSIS - FLEXIBLE STRUCTURAL DESIGN MODULE

Pavement Design Hillis Road From Intersection of Hillis Road and County Road 12 to the Entrance of Ready Mix Plant, Peterborough, Ontario, Ontario - 20 Year

---

Flexible Structural Design- Lane Widening

80-kN ESALs Over Initial Performance Period	1,727,000
Initial Serviceability	4.4
Terminal Serviceability	2.2
Reliability Level (%) (Zr = -0.841)	80
Overall Standard Deviation	0.44
Roadbed Soil Resilient Modulus	20,000 kPa
Stage Construction	1.0
Calculated Design Structural Number	117

Specified Layer Design

3 Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di) (mm)	Required Thickness (mm)	Calculated SN (mm)
1	New Hot Mix Asphalt	0.42	1.00	130	130	55
2	New Granular A Base	0.14	1.00	150	150	21
3	New Granular B,Type II	0.14	1.00	300	300	42
Total	-	-	-	580	580	118

Layered Thickness Design

Thickness precision

				Actual				
Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Spec Thickness (Di) (mm)	Min Thickness (Di) (mm)	Elastic Modulus (kPa)	Calculated Thickness (mm)	Calculated SN (mm)
1	New Hot Mix Asphalt	0.42	1.00	-	-	2,750,000	114	48
2	New Granular A Base	0.14	1.00	-	-	250,000	123	17
3	New Granular B,Type II	0.14	1.00	-	-	110,000	369	52
Total	-	-	-	-	-	-	607	117

-

Table 3
PAVEMENT DESIGN AND ANALYSIS - FLEXIBLE STRUCTURAL DESIGN MODULE

Pavement Design Hillis Road From Intersection of Hillis Road and County Road 12 to the Entrance of Ready Mix Plant, Peterborough, Ontario, Ontario - 20 Year

Flexible Structural Design-Rehabilitation

80-kN ESALs Over Initial Performance Period	1,727,000
Initial Serviceability	4.4
Terminal Serviceability	2.2
Reliability Level (%) (Zr = -0.841)	80
Overall Standard Deviation	0.44
Roadbed Soil Resilient Modulus	35,000 kPa
Stage Construction	1.0
Calculated Design Structural Number	97

Specified Layer Design

2 Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Thickness (Di) (mm)	Required Thickness (mm)	Calculated SN (mm)
1	New Hot Mix Asphalt	0.42	1.00	130	130	55
2	Existing Granular Base	0.12	0.90	400	400	43
Total	-	-	-	530	530	98

Layered Thickness Design

Thickness precision

Layer	Material Description	Struct Coef. (Ai)	Drain Coef. (Mi)	Actual Spec Thickness (Di) (mm)	Min Thickness (Di) (mm)	Elastic Modulus (kPa)	Calculated Thickness (mm)	Calculated SN (mm)
1	New Hot Mix Asphalt	0.42	1.00	-	-	2,750,000	155	65
2	Existing Granular Base	0.12	0.90	-	-	110,000	297	32
Total	-	-	-	-	-	-	453	97

-

Checked by: AR

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