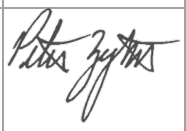
# Preliminary Geotechnical Investigation Report

## 4631 Sideroad 20 North, Puslinch Township, Ontario

Puslinch Development Limited Partnership

07 February 2025

→ The Power of Commitment

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Project name** | | Danby & UCF- TIS | | | | | |
| **Document title** | | Preliminary Geotechnical Investigation Report \| 4631 Sideroad 20 North, Puslinch Township, Ontario | | | | | |
| **Project number** | | 12618927 | | | | | |
| **File name** | | 12618927-RPT-Geotechnical Investigation (Final) | | | | | |
| **Status Code** | **Revision** | **Author** | **Reviewer** | | **Approved for issue** | | |
| | | | **Name** | **Signature** | **Name** | **Signature** | **Date** |
| S3 | A | Kateryna Pidriiko | Andrew Van Dyk | On File | Mark Moini | On File | Feb 9/24 |
| S4 | 0 | Kateryna Pidriiko | Andrew Van Dyk<br>Kateryna Pidriiko |  | Peter Zytner |  | Feb 7/25 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**GHD Limited**
Contact: Kateryna Pidriiko, Intermediate Geotechnical Engineer | GHD
100 Milverton Drive, Suite 404
Mississauga, Ontario L5R 4H1, Canada
**T** +1 905 712 0510 | **F** +1 905 712 0515 | **E** info-northamerica@ghd.com | **ghd.com**

# Executive summary

GHD Limited (GHD) has been retained by Puslinch Development Limited Partnership (Client) to undertake preliminary geotechnical investigation in support of a proposed industrial building at 4631 Sideroad 20 North, Puslinch Township, Ontario.The “Site” has been identified as an area bounded by Provincial Highway 6 (Hanlon Parkway) to the east, Concession Road 4 to the south and Side Road 20 N to the west.

The geotechnical investigation was undertaken concurrently with a hydrogeological assessment. The drilling program consisted of 13 boreholes drilled to depths of about 5.0 meters below ground surface (m BGS) and 11.0 m BGS. In addition, eight boreholes were instrumented with monitoring wells for groundwater monitoring. Select soil samples were collected and submitted for geotechnical laboratory testing.

The subsurface conditions encountered within the boreholes consisted of a surficial layer of topsoil, underlain by very loose to compact fill (i.e., disturbed native soil) generally consisting of mixtures of sand/silt or silt/clay, extending to depths of about 0.6 m to 3.0 m BGS. Below the fill a loose to dense native, granular deposit was encountered, consisting of mixed and interlayered sequences of silt, sand, and gravel. This deposit extends to the termination depth of the boreholes.

Groundwater levels were measured in the monitoring wells upon completion of drilling and during subsequent visits on November 29 and December 8, 2024. Groundwater was not encountered in any of the boreholes or monitoring wells. It should be noted that the perched water table condition could develop in the shallower soils and fill materials seasonally and/or after heavy precipitation events. Infiltration testing was completed at six selected locations across the site and results are reported in Hydrogeological Assessment Report by GHD. For additional information regarding groundwater conditions on site please refer to Hydrogeological Assessment Report by GHD, draft dated January 2025.

There are two minor conditions that would affect design and construction of the proposed development:

– thickness of the reworked/disturbed native soil, and
– presence of less compact granular soil at the foundation elevations, that would provide lower bearing resistances than the denser soil.

These conditions might require careful consideration of footing sizes in some locations, or implementation of a remove-and-replace strategy to remediate less-compact areas.

Beyond that, the conditions in the boreholes were relatively consistent such that we would expect future geotechnical investigations at other locations of the site would find similar results.

Overall, the soil conditions observed in the boreholes are suitable for supporting the proposed development, provided the recommendations given in the report are incorporated into the design and construction of the development.

# Contents

# Figure index



# Table index



# Appendices

# 1. Introduction

GHD Limited (GHD) has been retained by Puslinch Development Limited Partnership (Client) to undertake preliminary geotechnical investigation in support of a proposed industrial warehouse-style building at 4631 Sideroad 20 North, Puslinch Township, Ontario (hereafter referred to as the 'Site'). A Site location plan is provided in the attached **Figure 1**.

The geotechnical investigation was carried out in accordance with the approved scope of work. The purpose of the geotechnical investigation was to assess the subsurface soil and groundwater conditions at the Site by advancing boreholes, installing groundwater monitoring wells to support the hydrogeological assessment (will be issued under a separate cover) and conducting laboratory testing on selected soil samples. Engineering recommendations for the geotechnical aspects of the proposed development are provided based on our interpretation of the factual data.

The factual data, interpretations and preliminary recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. This report should be read in conjunction with the Statement of Limitations (See Section 7). The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report.

# 2. Site and Project Description

The site is located in the rural area of the Township of Puslinch, Wellington County, adjacent to the City of Guelph. More specifically, the subject property is bounded by Provincial Highway 6 (Hanlon Parkway) to the east, Concession Road 4 to the south and Side Road 20 N to the west. The subject property has a triangular shape with plan area of approximately 25.5 hectares (63 acres). The Site area is unoccupied land currently used for agricultural purposes, with a small vegetated/wetland area just north of Concession Road 4.

It is understood that the proposed development at the Site will include three slab-on-grade industrial structures surrounded by parking lot and paved aprons. It is assumed the proposed structures will be one to two stories high with no basements.

# 3. Investigation Procedures

## 3.1 Health & Safety Plan

Upon project initiation, a Site-specific Health and Safety Plan (HASP) was prepared in accordance with the requirements of the Occupational Health and Safety Act for implementation during the field investigation program. The HASP presents the visually observed Site conditions and identifies potential physical hazards to field personnel. Required personal protective equipment was also listed in the HASP. Health and Safety requirements in the HASP were implemented during the field investigation program and a copy of HASP was maintained on the Site during all field activities.

## 3.2 Utility Clearances

All applicable utility companies (gas, bell, network cables, pipeline and municipal sewers, etc.) were contacted through Ontario One-Call prior to the commencement of the drilling program. In addition, a private utility locator (Premier Locates) was retained to demarcate the locations of any traceable privately-owned utilities within the area of the boreholes.

## 3.3 Borehole Advancement Activities

The drilling program for this geotechnical investigation was carried out between November 20 to November 23, 2023, and consisted of advancing thirteen (13) boreholes, designated as Boreholes MW1-23 to MW13-23. Eight (8) boreholes (MW1-23, MW5-23 to MW7-23, and MW10-23 to MW13-23) were instrumented with Monitoring Wells. The boreholes were advanced at the locations shown on the Borehole and Monitoring Well Location Plan (**Figure 2**).

The drilling work was carried out utilizing a CME-850 rubber track-mounted drill rig supplied and operated by specialty drilling subcontractor Aardvark Drilling, under the full-time supervision of a GHD technical representative.

The boreholes were advanced utilizing 8-inch (203 mm) outer diameter hollow steam augers to the borehole termination depth. Soil samples were collected at every 0.75 m interval to 3.0 m and every 1.5 m interval thereafter to the termination depth of the boreholes. All overburden samplings were conducted using a 50 mm outside diameter split spoon sampler in general accordance with the specifications of the Standard Penetration Test (SPT) Method (ASTM D1586)[1]. In addition, at each borehole location, the relative density or consistency of the soil layers were measured by counting the number of SPT blows ('N' values) required to drive a conventional split-barrel soil sampler a vertical distance of 0.3 m. Soil samples were retrieved from each borehole location to verify strata boundaries and soil properties.

The GHD technical representative logged the material encountered in the boreholes and examined the samples as they were obtained. The recovered samples were sealed in clean, airtight containers and transferred to GHD's laboratory, where they were reviewed by a geotechnical engineer.

Groundwater level observations and measurements were made in the boreholes as drilling proceeded and upon completion of overburden drilling. All monitoring wells were instrumented with a 3 m long, 50 mm inside diameter, No. 10 slot, Schedule 40 PVC screen and riser pipe. The bottom of the borehole (below the monitoring well) was backfilled with cement/grout or Holeplug (bentonite). The borehole annulus surrounding the well screen was backfilled with sand and the remainder of the borehole was then backfilled with bentonite to or near to the ground surface. Monument protective casings were installed over all monitoring wells. The remainder of the boreholes were backfilled and sealed in accordance with Ontario Regulation 903, Wells (as amended). Details of monitoring well construction are presented in the borehole records (**Appendix A**). Additional groundwater level monitoring was conducted on November 29, 2023, and December 8, 2023.

## 3.4 Geotechnical Laboratory Testing

Prior to conducting geotechnical laboratory testing, the soil samples extracted from the boreholes drilled were subjected to visual and tactile examination by a geotechnical engineer who confirmed the field descriptions and selected representative samples for index testing.

Geotechnical laboratory testing was conducted in accordance with the American Society for Testing and Materials (ASTM) and Canadian Council of Independent Laboratories (CCIL) applicable standards. Laboratory testing consisted of moisture content tests on all recovered soil samples, grain size distribution analyses (washing on 75 µm, sieve and hydrometer testing) on eighteen (18) select soil samples and Atterberg Limits testing on two (2) soil samples for which grain size testing was conducted to assess soil plasticity index properties.

The results of water content, grain size distribution and Atterberg Limits tests are reported on the boreholes records presented in **Appendix A**. The associated laboratory test results are provided in **Appendix B**.

The soil testing program and soil classification conformed to the latest edition of the following standards:

– ASTM D6913 Standard Test Method for Particle Size Distribution (Gradation) of Soils using Sieve Analysis
– MTO LS-702 Standard Test Method for Particle Size Analysis of Soils (Hydrometer Analysis)
– ASTM D4318 Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils

[1] ASTM D1586-18 - Standard Test Method for Standard Penetration Test and Split-Barrel Samplings of the soil, ASTM International, West Conshohocken, PA 2015

– ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass Scope
– ASTM D1140 Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing

# 4. Site Geology and Subsurface Conditions

## 4.1 Site Topography and Regional Geology

In reference to the survey of existing conditions by GHD, dated December 18, 2023, the Site generally gently slopes to the south, southwest with elevations varying between 333.0 m to 346.0 m.

The general Site is situated in the physiographic region identified as the Horseshoe Moraines, according to *The Physiography of Southern Ontario* (Chapman and Putnam, 1984)[2]. Horseshoe Moraines is neighbouring Guelph Drumlin Field to the northwest, Waterloo Hills to the west, Mount Elgin Ridges to the southwest, Norfolk Sand Plain to the south, Flamborough Plain to the east and Niagara Escarpment to the north, northeast.

Horseshoe Moraines is characterized by till moraines. Surficial soils on site according to Surficial Geology of Southern Ontario[3].generally consist of ice-contact stratified deposits presented with sand and gravel, minor silt, clay and till, except for the small area of sandy silt to silty sand textured till on Paleozoic terrain to the north.

Bedrock in the area consists of sandstone, shale, dolostone, siltstone belonging to the Guelph Formation[4]. The depth to the bedrock is approximately 36 m to 39 m bgs (below ground surface) as per Bedrock Geology of Ontario Map[5].

## 4.2 Subsurface Conditions

The detailed subsurface soil and groundwater conditions as encountered in the boreholes advanced during the geotechnical investigation and the results of the laboratory tests carried out on selected soil samples are presented on the borehole records provided in **Appendix A**. The results of the geotechnical laboratory testing are presented in **Appendix B**. The results on in-situ field tests (i.e., SPT 'N' values), as presented on the borehole records and summarized in this report are uncorrected. The *Notes on Borehole and Test Pit Reports* are also included in **Appendix A** to assist in the interpretation of the borehole records.

The stratigraphic boundaries shown on the borehole records are inferred from non-continuous sampling, observations of drilling process and the results of Standard Penetration Tests. These boundaries, therefore, represent transitions between soil types rather than exact planes of geological change. Furthermore, subsurface conditions will vary between and beyond the borehole locations.

In summary, the boreholes consist of topsoil and disturbed native material, underlain by interlayered native granular deposits generally comprised of mixtures of silt, sand and gravel. The native soils extended to the termination depths of about 5.2 m and 11.3 m (ranging between Elevations 328.3 m and 337.6 m).

Detailed descriptions of subsurface conditions are provided in the following sections of this report. The subsurface conditions are described in accordance with the Unified Soil Classification System and the Canadian Foundation Engineering Manual, (CFEM 2006).

[2] Chapman, L.J. and Putnam, D.F. 1984. The Physiography of Southern Ontario, Ontario Geological Survey, Special Volume 2, Third Edition.
[3] Surficial Geology of Southern Ontario Map, (Ontario Geological Survey) issued 2003
[4] 1:250 000 manuscript Geology of Ontario maps created between 1986 and 1990
[5] Bedrock Geology of Ontario Map (Ontario Geological Survey, 2011).

### 4.2.1 Topsoil

A surficial layer of topsoil ranging in thickness from 76 mm to 600 mm was encountered in Boreholes MW1-23 to MW13-23.

### 4.2.2 Fill Material – Disturbed Native

Disturbed native material generally consisting of sandy silt / silty sand was encountered at northern portion of site in boreholes MW01-23 to BH9-23. This soil extended to depth of about 0.6 m to 3.0 m bgs) (Elevation 337.0 m to 341.2 m). In Borehole MW12-23, disturbed native consisted of sand and gravel was encountered immediately below the topsoil to the depth of 0.8 m (Elevation 334.2 m).

SPT 'N' values within the disturbed native silt and sand mixtures fill materials ranged between 2 and 26 blows per 0.3 m of penetration, indicating a very loose to compact state of compactness. SPT 'N' value within the disturbed native silt and gravel fill material was 16 blows per 0.3 m of penetration, indicating a compact state of compactness. Moisture contents measured on samples collected within the fill material range between 5 % and 43 %.

### 4.2.3 Native Granular Deposit (Sand, Silt and Gravel mixtures)

Granular deposits consisting of mixed and interlayered sequences of silt, sand, and gravel were prevalent across the site. Some layers were uniformly graded deposits of sand and silt, with little presence of one in the other. Native granular deposit was encountered in all boreholes below the disturbed native or topsoil to the termination depth.

The SPT 'N' values recorded in sand and silt mixtures deposit ranged between 6 to 93 blows per 0.3 m of penetration, except where the split spoon was refused on an obstruction. These results indicating a loose to very dense state of compactness. All cases of SPT 'N' values less than about 10 occurred at depths less than about 2 m. Moisture contents measured on samples of same deposit ranged from between 2% and 20%.

Grain size distribution testing was carried out on twelve (12) select soil samples within this granular deposit. The amount of material finer than 75-µm (No. 200) sieve was determined on six (6) select soil samples (BH4-23/SS2, BH4-23/SS4, MW12-23/SS3, MW13-23/SS3, and MW13-23/SS5). Additionally, Atterberg Limits tests were performed on two samples of the fine-grained till deposit (MW6-23, SS2 and MW7-23 SS9) that indicate the soil is non-plastic. All of these results are presented on the borehole records in **Appendix A** with individual lab reports provided in **Appendix B**

## 4.3 Groundwater Conditions

The groundwater level in the open boreholes recorded during and upon completion of drilling and the results are presented on the borehole records in **Appendix A**. Water level measurements were conducted on November 29, 2023 and December 8, 2023. The observed/inferred groundwater conditions at the borehole locations during the site investigation, as well as the recorded groundwater levels registered in the monitoring wells during the follow up visit are tabulated below:

***Table 4.1 Summary of Groundwater Observations During Drilling / Follow-up Well Measurements***

| Borehole / Well ID | Termination Depth (mbgs) | Ground Elevation (mAMSL) | Well Depth (m) | Groundwater Depth (mbgs) / Elevation (m) | | |
|---|---|---|---|---|---|---|
| | | | | Encountered During Drilling | Measured (Nov. 29) | Measured (Dec. 8) |
| MW1-23 | 5.2 | 341.49 | 4.6 | Dry | Dry | No data |
| BH2-23 | 5.2 | 340.37 | - | - | - | - |
| BH3-23 | 5.2 | 342.74 | - | - | - | - |
| BH4-23 | 11.3 | 339.62 | - | - | - | - |
| MW5-23 | 5.2 | 340.96 | 4.6 | Dry | Dry | Dry |

| Borehole / Well ID | Termination Depth (mbgs) | Ground Elevation (mAMSL) | Well Depth (m) | Groundwater Depth (mbgs) / Elevation (m) | | |
|---|---|---|---|---|---|---|
| | | | | Encountered During Drilling | Measured (Nov. 29) | Measured (Dec. 8) |
| MW6-23 | 5.2 | 339.36 | 4.6 | Dry | Dry | Dry |
| MW7-23 | 11.3 | 340.03 | 10.7 | Dry | Dry | No data |
| BH8-23 | 5.2 | 339.66 | - | - | - | - |
| BH9-23 | 5.2 | 338.77 | - | - | - | - |
| MW10-23 | 5.2 | 335.94 | 4.6 | Dry | Dry | Dry |
| MW11-23 | 5.2 | 338.18 | 4.6 | Dry | Dry | No data |
| MW12-23 | 5.2 | 334.95 | 4.6 | Dry | Dry | No data |
| MW13-23 | 5.2 | 336.24 | 4.6 | Dry | Dry | No data |

mbgs – Meters Below Ground Surface
mAMSL – Meters Above Mean Sea Level

It should be noted that the perched water table condition could develop in the shallower soils and fill materials seasonally and/or after heavy precipitation events. For additional information regarding groundwater conditions on site please refer to Hydrogeological Assessment Report by GHD, draft dated December 2023.

# 5. Engineering Discussion and Recommendations

This section of the report provides geotechnical engineering design recommendations for the proposed one to two-storey industrial buildings without basements. The following recommendations are based on the interpretation of the factual data obtained from the boreholes advanced during this subsurface investigation.

The information provided to GHD at the time of the investigation was conceptual in nature and limited to site layout options. As such, the scope of the investigation (i.e., number, location and depth of boreholes) was only intended to characterize the general site condition with the view of furthering the design to a preliminary state. Prior to detailed design, GHD should be given the opportunity to consider the current report relative to the detailed design, and to execute additional investigations should we find that the current investigation does not fully satisfy the geotechnical requirements of the detailed design.

The factual investigation data, engineering interpretation and recommendations are intended for design purposes only and should not be relied upon for any other purpose or by any other parties, including the construction or design-build contractor. Where comments are made on construction, they are provided to highlight those aspects of construction that might affect the underlying assumptions and intent of the geotechnical design.

Contractors bidding on or undertaking work at the Site should examine the factual results of the assessment, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their proposed construction techniques, equipment capabilities, costs, sequencing, scheduling and the like. Comments, techniques, or recommendations in this report pertaining to construction should not be construed as instructions to the contractor. Ongoing liaison with GHD during the final design and construction phase of the project is recommended to assure that the recommendations in this report are applicable and/or correctly interpreted and implemented.

The following sections provide preliminary comments and recommendations on the proposed work as well as geotechnical aspects of other design and construction considerations.

## 5.1 Frost Penetration Depth

The frost penetration depth is assumed to be about 1.4 m below the lowest adjacent surrounding grade, as per Ontario Provincial Standard Drawing (OPSD) 3090.101 (*Foundation, Frost Penetration Depths for Southern Ontario*). If constructing foundations at that depth is uneconomical, insulators such as expanded polystyrene could be used to reduce the frost penetration depth.

## 5.2 Seismic Site Classification

NBCC2020 (National Building Code of Canada, 2020) requires the assignment of a Seismic Site Class for evaluation of seismic hazard in the site. As per NBCC2020 requirements, two percent probability of exceedance in 50 years hazard level is to be adopted for different site classes. Seismic Site Class is a function of soil/rock profile and is based on the average properties of the subsurface strata. To assign the site class for a site, NBCC2020 provides the following three methods to obtain the average properties for the top 30 m of the ground strata:

– Average shear wave velocity.
– Average Standard Penetration Test (SPT) values (uncorrected for overburden).
– Average undrained shear strength.

For planning purposes, based on the criteria listed in Table 4.1.8.4.B. of the NBCC2020 and our knowledge of the regional geology, a **Seismic Site Class 'D'** can be used. Seismic hazard values for the project location at 2% probability of exceedance in 50 years was obtained through the Natural Resources Canada online tool and is presented in the **Appendix C**.

It is recommended that a site-specific test should be carried out to confirm the Seismic Site Class. The Multi-Channel Analysis of Surface Waves (MASW) is a relatively economical and quick method of determining shear wave velocity profile in the site which can be used to assign Seismic Site Class.

## 5.3 Foundations

Based on the available information, it is assumed that the proposed buildings will be constructed at-grade and founded on shallow strip or spread footings. At the time of preparing this report, additional details of the proposed structures (i.e., founding elevation, footing size, arrangement and embedment, structural loads, etc.) were unavailable to GHD.

From our interpretation of the Site conditions, lightweight structures can be supported on conventional spread and strip footing bearing on undisturbed native soils or on engineered fill. The existing disturbed native soil present across the Site is unsuitable for supporting the foundations of the proposed structures. Recommendations for preparing the foundation subgrade, including removal of unsuitable materials and replacement with appropriate fill are provided Section 6.1.3.

Bearing resistances for foundations supporting the proposed buildings are discussed in the following subsection. Assumptions affecting those foundation design recommendations are stated below. Where the listed assumptions are inconsistent with the final design, the SLS and ULS bearing resistances provided below should be revised.

– The footings will consist of shallow spread or strip footings.
– The footings will bear on compact to very dense undisturbed native soil or on engineered fill constructed as described in Section 6.1 and approved in advance by the geotechnical engineer.
– The minimum foundation depth below final grade will be at least 0.6 m for confinement purposes, or deeper as may be required to mitigate frost penetration.
– The foundations will be concentrically and vertically loaded.
– The serviceability limit state is associated with less than 25 mm of total settlement and less than 20 mm of differential settlement over a distance of about 7 m.

On a preliminary basis, spread footings (footing length to width ratios between 0.5 and 2) and strip footings can be sized using soil resistances at the Serviceability Limit State (SLS) and factored Ultimate Limit State (Φ-ULS) as per the values provided in the tables below.

The recommended bearing capacities are for a minimum footing width greater than 0.5 m and maximum width equal to or less than 3.0 m. The recommended values are contingent on having all bearing surfaces inspected and approved by the geotechnical engineer.

*Table 5.1 Soil Bearing Resistances for Strip and Spread Footings*

| Foundation type | Geotechnical Bearing Capacity | |
|---|---|---|
| | SLS (kPa) | Factored ULS (kPa) |
| Strip footings | 150 | 350 |
| Spread footings | 200 | 350 |
| **NOTES:** Looser deposits were observed at the locations of BH3-23, BH5-25, BH9-23, and so higher settlements may be expected. Additional excavation of loose deposits and replacement with engineered fill may be required at some locations. | | |

# 5.4 Slab-On-Grade Construction

We understand that the ground-level floors will consist of concrete slab-on-grade. The site conditions are appropriate for slab-on-grade construction provided the subgrade is properly prepared as described in Section 6.1.3. The undisturbed native, compact to very dense, granular deposits or approved engineered fill, free of uncontrolled fill and other deleterious materials (i.e., disturbed soil, organic material, debris, and free water), are suitable to support the slabs-on-grade.

Slabs should be cast on a base course comprising about 100 mm of 19 mm crusher-run limestone or equivalent. A moisture or vapour barrier such as polyethylene sheeting may be required if it is desired to inhibit moisture migration upwards through the slab. Placing a vapour barrier directly on the granular base can affect slab curing and certain floor finishes that are sensitive to moisture diffusion through the slab. Vapour barriers can puncture or tear against angular edges of fractured particle in the base courses. These concerns can be mitigated by bedding the vapour barrier between about 50 mm of uniform sand to allow moisture to escape at the underside slab and to cushion the plastic.

Groundwater was absent within more than 3 m below the proposed foundation depths (relative to the existing ground surface). As such, under-slab drainage system should not be required (provided surface water is well managed). There may be a potential for water to become perched on shallow layers of low hydraulic conductivity which should be identified by geotechnical personnel during a site review.

Slab cracking that can result from small differential settlements and concrete shrinkage can be reduced by reinforcing the slab, using a system of closely spaced cross-joints, and keeping the slab structurally separated from walls and columns.

The modulus of subgrade reaction is commonly used to design slabs-on-grade. That is not an intrinsic soil parameter. It depends on interaction between the soil and the structure transferring the load to the soil (i.e., geometry, stiffness, magnitude of loads, etc.). It is known that this design approach can lead to incorrect calculation of internal bending stresses and differential settlements. The Canadian Foundation Engineering Manual (2023) discourages modulus selection from a table and scaling of a modulus from a reference, except in low-risk projects. If this approach will be used in spite of these flaws, a floor slab constructed on an engineered fill pad or competent native soils could assume

a modulus of subgrade reaction of 5 MPa/m (for a one-foot square plate) for design of the floor slab. This value must be scaled to the higher values may be achievable by conducting field plate load tests.

# 5.5 Lateral Earth Pressure

Structures that are required to retain soil must be designed to resist lateral earth pressures imposed by that soil must be designed to resist the lateral stresses from soil surcharges and water. Such structures might include shoring systems, basement walls (if they were to be used on this project), landscaping or grading walls, and the like.

Surcharge loads and hydrostatic pressures should be considered as appropriate. Where elevated groundwater level is not anticipated to be present or where a below-grade drainage system is used to relieve hydrostatic pressures on the soil retaining structure, hydrostatic pressures can be omitted from the calculations.

The recommended soil parameters to be used for lateral earth pressure calculations at this Site are summarized in the following table:

*Table 5.2 Summary of Soil Parameters for Lateral Earth Pressure Calculations*

| Soil Type | Density/Compactness | Bulk Unit Weight | Effective Friction Angle | Coefficient of Lateral Earth Pressure | | |
|---|---|---|---|---|---|---|
| | | $\gamma$ (kN/m³) | $\phi'$ (°) | $K_a$ | $K_o$ | $K_p$ |
| Existing Fill | Very loose to compact | 19 | 25 | 0.41 | 0.58 | 2.46 |
| Sand and Gravel, Sandy Gravel and Gravelly Sand | Compact to very dense | 22 | 36 | 0.26 | 0.41 | 3.8 |
| Sand, Silt, Silty Sand and Sandy Silt | Compact to dense | 21 | 30 | 0.33 | 0.5 | 3.0 |

Large displacements are required to fully mobilize passive earth pressure, relative to the displacement that are required to mobilize active earth pressures. Where passive pressures are relied upon to resist active pressures, one-third of the passive earth pressure coefficient should be used. At-rest earth pressure should be used in design where the wall is sufficiently restrained to prevent active or passive conditions from developing or where it is intended to design the structure so that displacements are limited.

# 5.6 Pavement Recommendations

## 5.6.1 Driveways, Access Roads and Surface Parking

It is anticipated that vehicle traffic on the surface parking pavements will consist of light-duty (passenger cars, two-axle trucks, etc.) and heavy-duty vehicles (e.g., trailer trucks, waste collection, etc.). For the preliminary design of pavements for the light-duty and heavy-duty surface parking, driveways, access roads the recommended pavement structures are presented in the table below.

*Table 5.3 Recommended Pavement Designs for Driveways, Access Roads and Surface Parking*

| Pavement Layer | Compaction Requirements | Designated Light-Duty Vehicle Surface Parking | Designated Driveways and Access Road, and Heavy-Duty Vehicle Surface Parking |
|---|---|---|---|
| Surface Course Asphaltic Concrete HL3 (OPSS 1150) | 92% to 96.5% Maximum Relative Density (OPSS 310) | 40 mm | 40 mm |
| Base Course Asphaltic Concrete HL8 (OPSS 1150) | 92% to 97.5% Maximum Relative Density (OPSS 310) | 50 mm | 80 mm |
| Base Course: Granular A (OPSS.MUNI 1010) or 19 mm Crusher Run (OPSS.MUNI 1004) | 100% SPMDD | 150 mm | 150 mm |
| Subbase Course: Granular B Type I (OPSS.MUNI 1010) | 98% SPMDD | 400 mm | 500 mm |

It should be noted that information regarding the anticipated number of heavy-duty vehicles (e.g. trailer trucks, waste collection and fire trucks) that will be using the driveways, access roads and heavy-duty vehicle surface parking was not available for the development of these preliminary pavement design recommendations.

Therefore, the pavement design presented above for designated driveways, access roads and heavy-duty vehicle surface parking is sufficient for up to approximately 250 heavy-duty vehicles a day. If the actual anticipated heavy-duty vehicle traffic or loads are higher than this, then the pavement design should be updated to accommodate the actual traffic loads.

### 5.6.2 Drainage

The long-term performance of the proposed pavement structure is highly dependent upon subgrade support. Stringent construction control should be maintained to provide uniform subgrade moisture and density conditions as well as grading. The need for adequate drainage cannot be over-emphasized.

The subgrade should be sloped at about 3%, should be free of depressions and should be sloped to provide effective drainage toward subdrains and catch basins. The finished pavement surface should have a crossfall of about 2%. Surface water should not be allowed to pond or otherwise accumulate adjacent to the outside edges of pavement areas, whether at the ground surface or at the subgrade.

Subdrains should be installed along the perimeter of the driveways, access roads and surface parking areas. The invert of the subdrains should be at least 300 mm below the bottom of the subbase and should be sloped to drain to adjacent catch basins. The subdrains should be sized by the civil engineer to manage the anticipated stormwater, but for preliminary planning purposes, a 150 mm diameter perforated pipe should be suitable. The surrounded with a minimum thickness of 50 mm of free draining 19 mm clear stone or Granular A, all of which must be fully enveloped in a suitable geotextile. Failure to use geotextile of another means of filtration would likely lead to soil particle migration and loss of ground around the pipe trenches.

# 6. Construction Considerations

## 6.1 Site Preparation and Grading

### 6.1.1 Stripping

Based on the conditions encountered at the borehole locations, the Site is covered with topsoil and a layer of disturbed native granular soil (e.g., fill) that is generally underlain by mixed and interlayered sequences of native sand and silt to the termination depth of the boreholes. Soils with strong gravel content (e.g., gravel and sandy silt to gravelly sand) extended south from BH2-23 through to MW10-23, and across the south end of the site.

Topsoil and disturbed native soil containing organic matter should be stripped from grade fill areas prior to grading and earth filling. Likewise soft/loose soil, organic materials, or otherwise deleterious soil should also be removed. Stripped soil containing organic matter should be segregated from “clean” soil. The soil with organic matter can be used for landscaping purposes but cannot be used to support settlement sensitive structures. “Clean” earth fill can be used as engineered fill as described in Section 6.1.2.

The exposed subgrade soils should be visually compacted, then inspected and proof rolled using large vibratory roller in the presence of qualified geotechnical personnel. At that time, recommendations may be given for additional sub-excavation and replacement with engineered fill.

### 6.1.2 Engineered Fill and Grade Fill

Native soil encountered at the Site that is free of organics, rootlets, and debris is generally suitable for reuse as engineered fill. Soil with high fines content are sensitive to small changes in moisture content and generally require more effort to place and compact than granular soils with low fines content. Therefore, if the soils are to be reused, it should be anticipated that reworking of the soils will be necessary to facilitate compaction through drying or slight wetting and use of appropriate compactors. Engineered fill should be conditioned before placement to a moisture content that is ±2% of the laboratory optimum for compaction. After conditioning, the fill can be placed in thin layers (200 mm thick or less) and compacted by a heavy vibratory roller to 100 percent SPMDD.

Imported materials can be used to raise Site grades as well. Potential sources of imported fill should be evaluated for geotechnical and environmental quality prior to being received at the Site. The imported fill should be comprised of clean earth that is free of topsoil and building rubble.

### 6.1.3 Foundation and Slab-on-Grade Subgrade Preparation

Soil with organic content, disturbed native soil and loose to compact native soil (N-value below about 20) should be removed from the footprint of proposed buildings before subgrade preparation begins (to a maximum excavation depth equal to one footing width). The subgrade soils exposed after the removal of the unsuitable fill material is generally expected to consist of compact sand and silt mixtures or compact to very dense gravelly soils.

During construction, the foundation subgrade should be protected from construction traffic, inclement weather, freezing, excessive drying and ingress of free water. Suitable protection could comprise a mud slab consisting of lean concrete or compacted granular fill. Frozen, wet or disturbed materials should be removed from the subgrade and approved by a geotechnical professional prior to the placement of the protective layer.

Following completion of footing excavations, careful inspection of the subgrade by competent geotechnical personnel will be imperative to assure that the subgrade is consistent with the intent of these recommendations and suitable to provide the bearing support defined in Section 5.3.

### 6.1.4 Pavement Structure Subgrade Preparation

Areas of proposed pavements should be stripped, and the exposed subgrade surface inspected, as described in Section 6.1.1 above.

Where minor impairment of the pavement performance can be tolerated, disturbed native soil that is generally free of organic matter can remain in place after excavating to the design subgrade elevation. The exposed surface should be compacted as an engineered fill, then proof-rolled in the presence of geotechnical personnel also as described in Section 6.1.1 above.

As recommended in Section 5.6.2, the pavement subgrade should be uniformly graded without local depressions that might allow water to accumulate. The overall subgrade surface should be sloped at about 3% to provide effective drainage toward subdrains and catch basins.

## 6.2 Excavation and Temporary Shoring

Excavations must be carried out in accordance with the Occupational Health and Safety Act (OHSA) and Regulations for Construction Projects. Where workmen must enter an excavation deeper than 1.2 m, the excavation must be suitably sloped and/or braced in accordance with OHSA Section 20.77. OHSA specifies maximum slope of the excavations for four broad soil types.

Based on the results of the geotechnical Investigation, the fill and the compact to loose granular deposits are classified as Type 3 soils. However, in areas where these soils become affected by water (surface water or ground water), they are to be classified as Type 4 soils. Very dense granular deposit deposits are classified as Type 2 soils. However, in areas where these soils become affected by water, they are to be classified as Type 3 soils. The highest number soil type identified in an excavation must govern the excavation slopes from top to bottom of the excavation.

If the above recommended excavation side slopes cannot be maintained due to lack of space or any other reason, the excavation sides must be supported by an engineered shoring system. The shoring system should be designed in accordance with the latest edition of Canadian Foundation Engineering Manual (CFEM) and the OHSA Regulations for Construction Projects.

It is anticipated that foundation and utility excavations can be made with conventional excavation equipment.

## 6.3 Temporary Dewatering Requirements

Groundwater was not encountered during the drilling nor within the installed monitoring wells during subsequent visits.

We suspect that a temporary perched water condition could develop in the shallow soils overlying low permeability soil after heavy precipitation and/or during spring thaw. In such cases, GHD anticipates the rate of seepage will be minor and that pumping from filtered sumps should be sufficient to control groundwater seepage for shallow excavations.

The contractor should assess the current groundwater level at the Site prior and during construction and decide the method and technique of dewatering based on the information provided in this report. If conditions different than those observed during this investigation, GHD should be advised and permitted to revise these recommendations.

The design, equipment, installation, maintenance and removal of water control methods during excavation and backfill operations should be the responsibility of the contractor. Surface run-off, if any, should be directed away from the open excavations.

## 6.4 Site Servicing

The native soils encountered at the Site are considered suitable to support proposed Site services. The suitability of the subgrade to provide adequate support for buried services must be confirmed on site by qualified geotechnical personnel experienced in such works. Wet, soft, or otherwise unsuitable fills should be sub-excavated and replaced with additional bedding materials or clean earth fill compacted to minimum of 95% SPMDD.

The bedding for services installed in open cut trenches should consist of well-graded materials meeting OPSS requirements. The bedding should have a minimum thickness of 150 mm below the pipe and 300 mm above the pipe. Bedding and cover materials should be compacted to a about of 95 percent SPMDD  provided such compaction effort can be applied without damaging pipes.

If wet conditions are encountered from infiltration of stormwater or seasonally wet surface conditions, 'clear stone' bedding (such as 19 mm clear stone, OPSS 1004) may be considered, but only in conjunction with a suitable geotextile filter. Without proper filtering, there may be entry of fines from the existing fill or native soils and trench backfill into the bedding. This loss of fine soil particles could result in loss of support to the pipes and possible surface settlements.

## 6.5 Wet Weather or Winter Construction

Construction that occurs during periods of cold or wet weather may encounter difficulties when preparing the foundation subgrades or compacting fill where long-term settlement control is expected. Frozen soils, fill containing snow, or subgrade surfaces that are snow-covered or frozen could experience excessive post-construction settlements when the frozen soil thaws or the snow melts. Likewise, excessively wet subgrade or fill surfaces could experience excessive post-construction settlements upon draining. Considerations for managing winter construction and wet weather are provided below:

– Keep subgrade surfaces free of frost before, during, and after construction by using sacrificial lifts of fill or other means to reduce exposure.
– Keep fill free of snow, ice, and other deleterious materials and avoid placing fill on frozen or snow-covered surfaces.
– Cover fill stockpiles with tarpaulins to protect them from precipitation and to manage the soil water content.
– Place fill on surfaces that are free of standing water and that are not excessively wet (relative to the optimum water content for compaction purposes).
– Reduce standing water on exposed surfaces where fill or foundation elements will be placed by using an appropriate water management plan during construction, and/or by using sacrificial lifts of fill or other means to reduce exposure.
– Pour concrete on ground that is not frozen. Protect the concrete and the subgrade from freezing until permanent frost protection is in place.

## 6.6 Geotechnical Review

GHD was not provided with design details for the proposed reservoir. When available, site grading and foundation design drawings should be provided to the geotechnical engineer for review to confirm that they are consistent with the intent of this report, or to provide additional recommendations as necessary to meet the project requirements.

During construction, sufficient construction reviews and field testing should be carried out by the geotechnical engineer to confirm that the conditions encountered during construction are consistent with those encountered during our investigation and with the intent of the recommendations contained in this report. Construction reviews should further serve to observe conformance with the pertinent project specifications. For this purpose, we recommend a regular program of geotechnical field reviews and material testing during construction including but not limited to the following:

– Foundation and slab-on-grade subgrade reviews by the geotechnical engineer prior to fill or concrete placement to confirm that the exposed foundation subgrade is adequate to support the proposed buildings. The subgrade review should further confirm that the exposed surface has been adequately cleaned of ponded water and all disturbed, loosened, softened, organic soil and other deleterious material.
– Pavement area subgrade reviews by the geotechnical engineer prior to fill placement to confirm that the exposed foundation subgrade is adequate to support the proposed pavement structure. The subgrade review should

further confirm that the exposed surface has been adequately cleaned of ponded water and all disturbed, loosened, softened, organic soil and other deleterious material.

– Review of unsupported excavations to confirm that the cuts are appropriate for the soil type with respect to worker safety. Where appropriate, this should include an opportunity to provide recommendations for remediation of poorly performing cut faces such as flatter slopes, or use of temporary protection systems.
– In-situ density testing and periodic construction review by the geotechnical engineer during placement and compaction of engineered fill and grade beneath foundations and slabs-on-grade and in trenches under hard-surfaced areas, with the frequency of testing depending on the site conditions and the demonstrated capability of the contractor, as assessed by the geotechnical engineer.
– Sampling and compliance testing for materials such as imported engineered fill, underslab fill, pavement structure aggregates, concrete and asphalt.

# 7. Limitations

This report is intended solely for Puslinch Development Limited Partnership and is prohibited for use by others without GHD's prior written consent. This report is considered GHD's professional work product and shall remain the sole property of GHD. Any unauthorized reuse, redistribution of or reliance on the report shall be at the Client and recipient's sole risk, without liability to GHD. Client shall defend, indemnify and hold GHD harmless from any liability arising from or related to Client's unauthorized distribution of the report. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and appendices.

The recommendations made in this report are in accordance with our present understanding of the project, the current site use, ground surface elevations and conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent with that level of care and skill ordinarily exercised by members of geotechnical engineering professions currently practicing under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

All details of design and construction are rarely known at the time of completion of a geotechnical study. The recommendations and comments made in the study report are based on our subsurface investigation and resulting understanding of the project, as defined at the time of the study. We should be retained to review our recommendations when the drawings and specifications are complete. Without this review, GHD will not be liable for any misunderstanding of our recommendations or their application and adaptation into the final design.

By issuing this report, GHD is the geotechnical engineer of record. It is recommended that GHD be retained during construction of all foundations and during earthwork operations to confirm the conditions of the subsoil are actually similar to those observed during our study. The intent of this requirement is to verify that conditions encountered during construction are consistent with the findings in the report and that inherent knowledge developed as part of our study is correctly carried forward to the construction phases.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based on the results obtained at the test locations only. The subsurface conditions confirmed at the test locations may vary at other locations. The subsurface conditions can also be significantly modified by the construction activities on site (i.e., excavation, dewatering and drainage, blasting, pile driving, etc.). These conditions can also be modified by exposure of soils or bedrock to humidity, dry periods or frost. Soil and groundwater conditions between and beyond the test locations may differ both horizontally and vertically from those encountered at the test locations and conditions may become apparent during construction which could not be detected or anticipated at the time of our investigation. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations. If

changed conditions are identified during construction, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by GHD is completed.

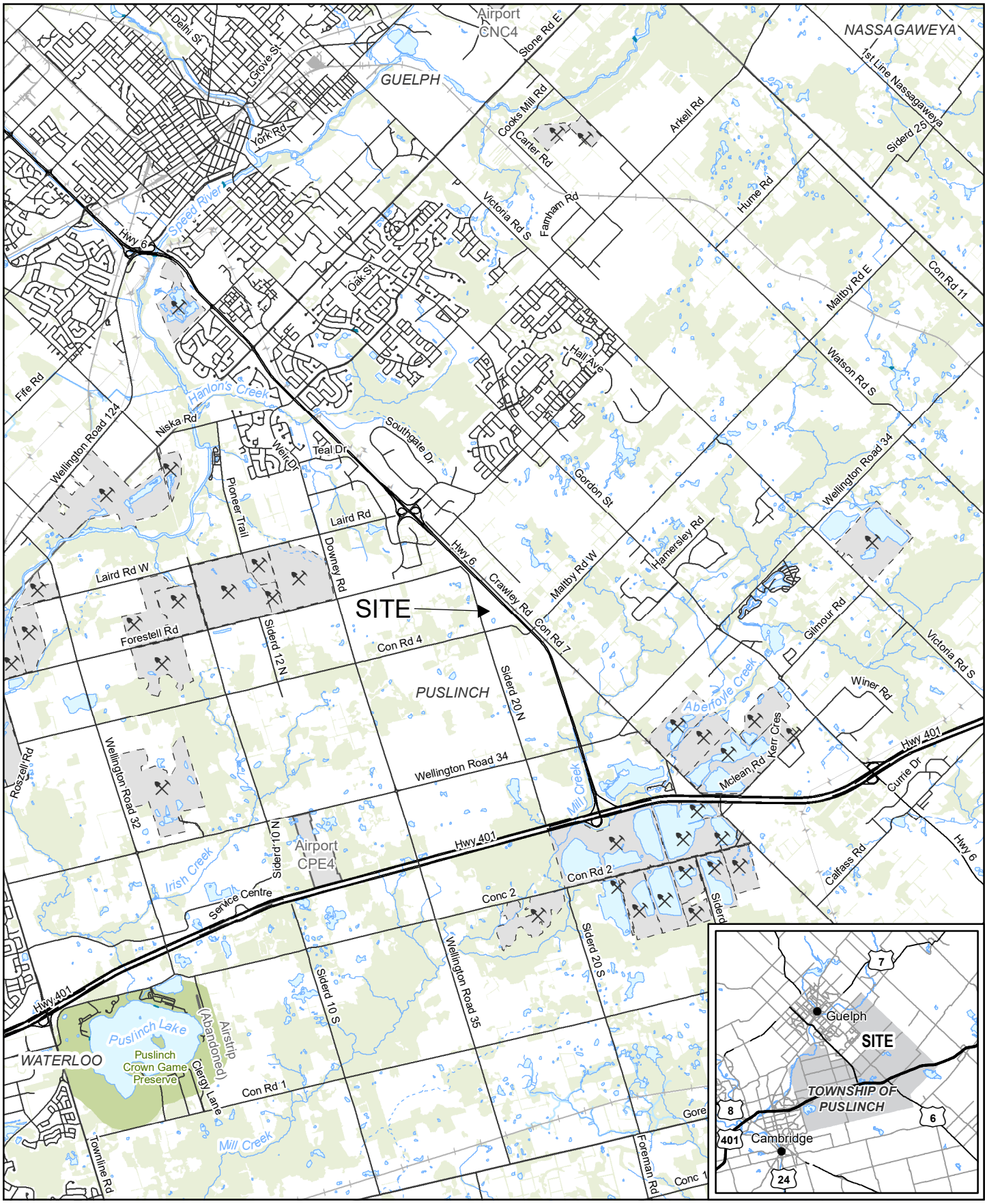
All of Which is Respectfully Submitted,

GHD

Kateryna Pidriiko, MSc., P.Eng.


Andrew Van Dyk, P.Eng. (BC, ON, AB), PMP

# Figures




Paper Size ANSI A

0 750 1,500 2,250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

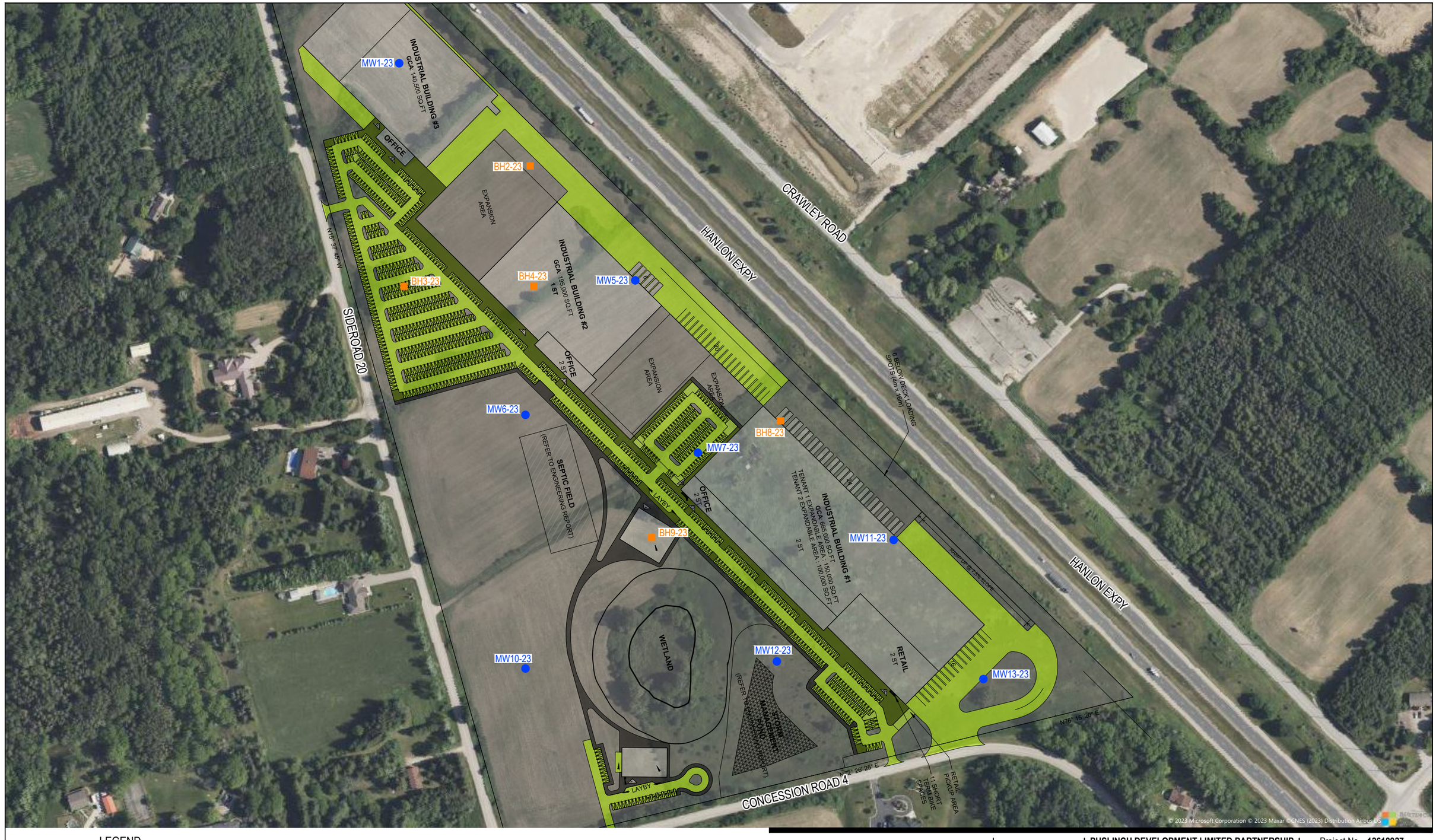
**PUSLINCH DEVELOPMENT LIMITED PARTNERSHIP**
**4631 SIDEROAD 20 NORTH,**
**PUSLINCH TOWNSHIP, ONTARIO**
**GEOTECHNICAL INVESTIGATION**

Project No. **12618927**
Revision No. **-**
Date **Jan 30, 2025**

## SITE LOCATION MAP

# FIGURE 1

O:\GIS\PROJECTS\12618000s\12618927\GIS\Maps\Deliverables\12618927-RPT-Geotech001\12618927-001-SiteLocationMap.mxd
Print date: 30 Jan 2025 - 16:17




LEGEND

- MONITORING WELL LOCATION
- BOREHOLE LOCATION

0 30 60 90m

1:3000

Coordinate System: UTM83-17

N

GHD

**PUSLINCH DEVELOPMENT LIMITED PARTNERSHIP**
**4631 SIDEROAD 20 NORTH,**
**PUSLINCH TOWNSHIP, ONTARIO**
**GEOTECHNICAL INVESTIGATION**

**BOREHOLE AND MONITORING WELL LOCATION PLAN**

Project No. **12618927**
Date **January 2025**

**FIGURE 2**

Filename: N:\CA\Waterloo\Projects\662\12618927\Digital_Design\ACAD\Figures\RPT-Geotech001\12618927-GHD-00-00-RPT-EN-D101_WA-Geotech001.dwg
Plot Date: 31 January 2025 12:22 PM

# Appendices

# Appendix A

## Borehole Records

REFERENCE No.: 12618927

# BOREHOLE REPORT

Page 1 of 1

**BOREHOLE No.:** MW1-23

**ELEVATION:** 341.5 m

CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 22 November 2023 DATE (FINISH): 22 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- - WATER LEVEL (MEASURED)
- - WATER LEVEL (OBSERVED)

NORTHING: 4814372.9 EASTING: 564734.0 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) KN/m³ | LAB Testing Moisture Content % | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 341.5 | | GROUND SURFACE | | | % | | % | % | | | |
| 1 | | | | TOPSOIL (229 mm)<br>SILTY CLAY, trace sand, trace gravel, trace corn husk, rootlets, dark brown, moist, firm | | SS1 | | | 18 | 66.7 | 2-2-3-3 | 5 | Concrete |
| 2 | 0.6 | 340.9 | | FILL:<br>SANDY SILT, trace gravel, trace corn husk, brown, moist, compact (Disturbed Native) | | | | | | | | | 0.6 m<br>Sand<br>0.9 m |
| 3 | 1.0 | | | | | SS2 | | | 8 | 50 | 1-5-5-12 | 10 | |
| 4 | | | | | | | | | | | | | |
| 5 | 1.5 | 340.0 | | NATIVE:<br>SILTY SAND, trace clay, trace gravel, brown, moist to wet, compact | | SS3 | | | 8 | 66.7 | 2-11-11-13 | 22 | Hole-plug |
| 6 | 2.0 | | | | | | | | | | | | |
| 7 | | | | moist below 2.3 m | | SS4 | | | 3 | 62.5 | 8-9-13-19 | 22 | 2.7 m |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | 3.0 m |
| 10 | 3.0 | | | | | SS5 | 9-56-28-7 | | 7 | 62.5 | 5-10-12-16 | 22 | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | auger grinding from 3.7 m bgs to 4.0 m bgs | | | | | | | | | Screen |
| 13 | 4.0 | | | | | SS6 | | | 6 | 54.2 | 12-12-16-20 | 28 | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | 4.6 m |
| 16 | 5.0 | | | | | SS7 | | | 9 | 70.8 | 8-12-10-11 | 22 | |
| 17 | 5.2 | 336.3 | | END OF BOREHOLE | | | | | | | | | 5.2 m |
| 18 | | | | NOTES:<br>- End of Borehole at 5.2 m bgs.<br>- Borehole was dry upon completion.<br>- bgs denotes 'below ground surface'. | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | 6.0 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | 7.0 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | 8.0 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | 9.0 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△³ Number refer to Sensitivity
○ Water content (%)
$W_p$ $W_l$ Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

COMMENTS: PIEZOMETER/ STANDPIPE INSTALLATION

REFERENCE No.: 12618927

# BOREHOLE REPORT

Page 1 of 1

**BOREHOLE No.:** BH2-23

**ELEVATION:** 340.4 m

CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 22 November 2023 DATE (FINISH): 22 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814286.2 EASTING: 564845.0 DRILLING TYPE:Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) KN/m³ | LAB Testing Moisture Content % | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS PIEZOMETER/ STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 340.4 | | GROUND SURFACE | | | % | | % | % | | | |
| | 0.6 | 339.8 | | TOPSOIL (356 mm)<br>CLAYEY SILT, trace sand, trace corn husk, rootlets, dark brown, moist, firm | | SS1 | | | 24 | 70.8 | 1-2-3-3 | 5 | |
| | 1.0 | | | SILTY SAND, brown, moist, loose (Disturbed Native) | | SS2 | | | 10 | 66.7 | 1-2-2-2 | 4 | |
| | 1.5 | 338.8 | | NATIVE:<br>SAND, trace to some silt, trace gravel, brown, moist, compact | | SS3 | | | 5 | 62.5 | 3-10-18-35 | 28 | |
| | 2.0 | | | | | SS4 | | | 6 | 45.8 | 17-31-28-29 | 59 | |
| | 2.3 | 338.1 | | SANDY GRAVEL, some silt, brown, moist, very dense | | | | | | | | | |
| | 3.0 | | | | | SS5 | 62-23-(15) | | 5 | 62.5 | 6-24-36-28 | 60 | |
| | 4.0 | | | | | | | | | | | | |
| | 5.0 | | | dense belolw 4.5 m bgs | | SS6 | | | 6 | 62.5 | 14-16-18-26 | 34 | |
| | 5.2 | 335.2 | | END OF BOREHOLE<br><br>NOTES:<br>- End of Borehole at 5.2 m bgs.<br>- Borehole was dry upon completion of drilling.<br>- bgs denotes 'below ground surface'. | | | | | | | | | |
| | 6.0 | | | | | | | | | | | | |
| | 7.0 | | | | | | | | | | | | |
| | 8.0 | | | | | | | | | | | | |
| | 9.0 | | | | | | | | | | | | |

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△³ Number refer to Sensitivity
○ Water content (%)
$W_p$ $W_l$ Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 12618927

**BOREHOLE No.:** BH3-23
**ELEVATION:** 342.7 m

# BOREHOLE REPORT



CLIENT: Danby Products Limited
PROJECT: Danby - Estill Innovation Company
LOCATION: Puslinch, Ontario
DESCRIBED BY: Carson Best
CHECKED BY: Kateryna Pidriiko
DATE (START): 22 November 2023
DATE (FINISH): 22 November 2023

**LEGEND**
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814184.8 EASTING: 564738.6 DRILLING TYPE:Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) KN/m³ | LAB Testing Moisture Content % | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS PIEZOMETER/ STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 342.7 | | GROUND SURFACE | | | % | | % | % | | | |
| 0 | | | | | | | | | | | | | |
| 1 | | | | TOPSOIL (457 mm)<br>SANDY SILT, trace corn husks, rootlets, dark brown, moist, loose | | SS1 | | | 21 | 58.3 | 2-2-2-7 | 4 | |
| 2 | 0.6 | 342.1 | | FILL:<br>SILTY SAND, rootlets, brown, moist, very loose (Disturbed Native) | | SS2 | | | 16 | 75 | 2-2-1-2 | 3 | |
| 3 | 1.0 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | 1.5 | 341.2 | | NATIVE:<br>SAND, some silt, some gravel to gravelly sand, brown, dry, compact | | SS3 | | | 5 | 54.2 | 2-8-10-19 | 18 | |
| 6 | | | | | | | | | | | | | |
| 7 | 2.0 | | | | | SS4 | | | 3 | 58.3 | 7-10-8-10 | 18 | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | 3.0 | | | | | SS5 | 20-67-(13) | | 2 | 58.3 | 3-6-6-14 | 12 | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | 4.0 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | some gravel to gravelly, very dense below 4.6 m bgs | | SS6 | | | 2 | 58.3 | 19-26-40-28 | 66 | |
| 16 | 5.0 | | | | | | | | | | | | |
| 17 | 5.2 | 337.6 | | END OF BOREHOLE<br><br>NOTES:<br>- End of Borehole at 5.2 m bgs.<br>- Borehole was dry upon completion of drilling.<br>- bgs denotes 'below ground surface'. | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | 6.0 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | 7.0 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | 8.0 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | 9.0 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |

Δ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
Δ³ Number refer to Sensitivity
○ Water content (%)
$W_p$ $W_l$ Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
★ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

File: N:\CA\WATERLOO\PROJECTS\66211261892\TECH\GEOTECH - ESTILL\GINT LOGS\12618927 LOG_GEOTECH.GPJ Library File: 12618927 GHD_GEOTECH_V10.GLB
Report: 12618927 SOIL LOG Date: 6/2/24

REFERENCE No.: 12618927

**BOREHOLE No.:** BH4-23
**ELEVATION:** 339.6 m

# BOREHOLE REPORT



CLIENT: Danby Products Limited
PROJECT: Danby - Estill Innovation Company
LOCATION: Puslinch, Ontario
DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko
DATE (START): 22 November 2023 DATE (FINISH): 22 November 2023

**LEGEND**
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814187.7 EASTING: 564849.4 DRILLING TYPE:Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) KN/m³ | LAB Testing Moisture Content % | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 339.6 | | GROUND SURFACE | | | % | | % | % | | | |
| | | | | TOPSOIL (330 mm) | | | | | | | | | |
| 1 | 0.3 | 339.3 | | FILL: SILTY SAND/SANDY SILT, trace corn husk, rootlets, dark brown, moist, loose (Disturbed Native) | | SS1 | | | 18 | 75 | 2-2-3-4 | 5 | |
| 2 | 0.8 | 338.9 | | NATIVE: SAND, some silt, brown, moist, loose | | SS2 | ---(15) | | 6 | 66.7 | 2-4-5-4 | 9 | |
| 3 | 1.0 | | | | | | | | | | | | |
| 5 | 1.5 | 338.1 | | SILT, trace sand, brown, moist, loose | | SS3 | | | 16 | 79.2 | 1-3-3-4 | 6 | |
| 6 | 2.0 | | | | | | | | | | | | |
| 8 | 2.3 | 337.3 | | SAND and SILT, trace gravel, brown, moist, compact | | SS4 | ---(48) | | 11 | 75 | 3-11-12-11 | 23 | |
| 10 | 3.0 | 336.6 | | SANDY GRAVEL, some silt, trace rock fragments, brown, dry, very dense to dense | | SS5 | | | 5 | 45.8 | 4-12-21-45 | 33 | |
| 13 | 4.0 | | | | | | | | | | | | |
| 15 | | | | very dense below 4.5 m bgs | | SS6 | | | 3 | 75 | 13-25-45-50/127mm | 70 | |
| 16 | 5.0 | | | | | | | | | | | | |
| 18 | | | | | | | 57-31-(12) SS6+SS7 | | -- | -- | -- | -- | |
| 20 | 6.0 | | | | | | | | | | | | |
| 21 | | | | | | SS7 | | | 3 | 79.2 | 19-47-46-40 | 93 | |
| 23 | 7.0 | | | | | | | | | | | | |
| 25 | | | | SPT refusal at 7.6 m bgs | | SS8 | | | -- | 0 | 50/154mm | -- | |
| 26 | 8.0 | | | | | | | | | | | | |
| 29 | 9.0 | | | | | | | | | | | | |
| 30 | | | | dense below 9.1 m bgs | | SS9 | | | 9 | 83.3 | 18-23-25-27 | 48 | |
| 32 | | | | | | | | | | | | | |

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△³ Number refer to Sensitivity
○ Water content (%)
$W_p$ $W_l$ Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

COMMENTS
PIEZOMETER/ STANDPIPE INSTALLATION

REFERENCE No.: 12618927

**BOREHOLE No.:** BH4-23

**ELEVATION:** 339.6 m

# BOREHOLE REPORT



CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 22 November 2023 DATE (FINISH): 22 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814187.7 EASTING: 564849.4 DRILLING TYPE:Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) | LAB Testing Moisture Content | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | Undisturbed Vane Value (kPa) / Remoulded Field Vane Value (kPa) / Number refer to Sensitivity / Water content (%) / Atterberg limits (%) / "N" Value (blows/12 in.-30 cm) / "DCPT" Value (blows/12 in.-30 cm) | COMMENTS (PIEZOMETER/ STANDPIPE INSTALLATION) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 339.6 | | GROUND SURFACE | | | % | KN/m³ | % | % | | | 10 20 30 40 50 60 70 80 90 | |
| | 10.7 | 329.0 | | SAND and SILT, trace gravel, brown, moist, very dense | | SS10 | | | 9 | 79.2 | 20-29-35-44 | 64 | | |
| | 11.0 | | | END OF BOREHOLE | | | | | | | | | | |
| | 11.3 | 328.3 | | NOTES:<br>- End of Borehole at 11.3 m bgs.<br>- Borehole was dry upon completion of drilling.<br>- bgs denotes 'below ground surface'. | | | | | | | | | | |

File: N:\CA\WATERLOO\PROJECTS\66211\261892\TECH\GEOTECH - ESTILL\GINT LOGS\12618927 LOG_GEOTECH.GPJ Library File: 12618927 GHD_GEOTECH_V10.GLB
Report: 12618927 SOIL LOG Date: 6/2/24

REFERENCE No.: 12618927

# BOREHOLE REPORT

Page 1 of 1

**BOREHOLE No.:** MW5-23

**ELEVATION:** 341.0 m

CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 23 November 2023 DATE (FINISH): 23 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814191.1 EASTING: 564933.0 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) KN/m³ | LAB Testing Moisture Content % | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 341.0 | | GROUND SURFACE | | | % | | % | % | | | |
| 1 | | | | TOPSOIL (279 mm)<br>SILTY SAND, corn husks, rootlets, dark brown, loose | | SS1 | | | 12 | 70.8 | 1-2-3-2 | 5 | Concrete |
| 2 | 0.6 | 340.4 | | FILL:<br>SAND, trace silt, trace gravel, brown, moist, very loose (disturbed native) | | | | | | | | | 0.6 m<br>Sand<br>0.9 m |
| 3 | 1.0 | | | | | SS2 | | | 6 | 29.2 | 1-1-1-1 | 2 | |
| 5 | 1.5 | 339.4 | | NATIVE:<br>SAND, trace to some silt, trace gravel, brown, dry, compact | | SS3 | | | 3 | -- | 1-5-9-8 | 14 | Hole-Plug |
| 7 | 2.0 | | | | | SS4 | ---(10) | | 3 | 54.2 | 3-6-7-8 | 13 | 2.7 m |
| 10 | 3.0 | | | some gravel to gravelly below 3.0 m bgs, SPT refusal due to possible obstruction | | SS5 | | | 2 | 37.5 | 10-34-50/51mm | 84/203 mm | 3.0 m |
| 12 | 3.8 | 337.2 | | SANDY SILT TILL, trace gravel, brown, moist, dense | | SS6 | | | 5 | 50 | 9-13-30-47 | 43 | Screen |
| 13 | 4.0 | | | | | | | | | | | | |
| 15 | | | | compact below 4.5 m bgs | | SS7 | | | 7 | 58.3 | 4-7-15-23 | 22 | 4.6 m |
| 16 | 5.0 | | | | | | | | | | | | |
| 17 | 5.2 | 335.8 | | END OF BOREHOLE | | | | | | | | | 5.2 m |
| 20 | 6.0 | | | NOTES:<br>- End of Borehole at 5.2 m bgs.<br>- Borehole was dry upon completion of drilling.<br>- bgs denotes 'below ground surface'. | | | | | | | | | |
| 23 | 7.0 | | | | | | | | | | | | |
| 26 | 8.0 | | | | | | | | | | | | |
| 29 | 9.0 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△³ Number refer to Sensitivity
○ Water content (%)
$W_p$ $W_l$ Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

PIEZOMETER/ STANDPIPE INSTALLATION

REFERENCE No.: 12618927

# BOREHOLE REPORT

Page 1 of 1

**BOREHOLE No.:** MW6-23

**ELEVATION:** 339.4 m

CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 22 November 2023 DATE (FINISH): 22 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- - WATER LEVEL (MEASURED)
- - WATER LEVEL (OBSERVED)

NORTHING: 4814078.3 EASTING: 564840.3 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) KN/m³ | LAB Testing Moisture Content % | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 339.4 | | GROUND SURFACE | | | % | | % | % | | | |
| | | | | TOPSOIL (356 mm) | | | | | | | | | |
| 1 | 0.4 | 339.0 | | FILL: | | SS1 | | | 23 | 70.8 | 1-2-2-3 | 4 | Concrete |
| 2 | 0.6 | 338.7 | | SILT, trace clay, rootlets. corn husks, dark brow, moist, loose | | | | | | | | | 0.6 m Sand 0.9 m |
| 3 | 1.0 | | | NATIVE: SILT, trace clay, trace sand, brown, moist, compact | | SS2 | 0-9-87-4 Non-Plastic | | 18 | 83.3 | 3-4-6-6 | 10 | |
| 6 | 2.0 | | | | | SS3 | | | 20 | 66.7 | 2-4-9-23 | 13 | Hole-plug |
| 7 | | | | trace, gravel, sand seam (approximately 50-80 mm) at 2.0 m bgs | | | | | | | | | |
| | 2.3 | 337.1 | | SANDY GRAVEL, some silt, brown, wet to moist, very dense | | SS4 | 66-20-(14) | | 19 | 70.8 | 4-30-26-27 | 56 | 2.7 m |
| 10 | 3.0 | | | SPT refusal due to possible obstruction | | SS5 | | | 3 | 85.7 | 22-46-50/21mm | 96/203 mm | 3.0 m |
| 13 | 4.0 | | | | | SS6 | 64-24-(12) | | 5 | 83.3 | 20-32-36-45 | 68 | Screen |
| 15 | 4.6 | 334.8 | | SILTY SAND, some gravel, brown, moist, very dense | | SS7 | | | 6 | 83.3 | 7-22-30-25 | 52 | 4.6 m |
| 17 | 5.2 | 334.2 | | END OF BOREHOLE | | | | | | | | | 5.2 m |
| 20 | 6.0 | | | | | | | | | | | | |
| 23 | 7.0 | | | | | | | | | | | | |
| 26 | 8.0 | | | | | | | | | | | | |
| 29 | 9.0 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |

Undisturbed Vane Value (kPa)
Remoulded Field Vane Value (kPa)
Number refer to Sensitivity
Water content (%)
Atterberg limits (%)
"N" Value (blows/12 in.-30 cm)
"DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

COMMENTS: PIEZOMETER/ STANDPIPE INSTALLATION

NOTES:
- End of Borehole at 5.2 m bgs.
- Borehole was dry upon completion of drilling.
- bgs denotes 'below ground surface'.

File: N:\CA\WATERLOO\PROJECTS\66211261892\TECH\GEOTECH - ESTILL\GINT LOGS\12618927 LOG_GEOTECH.GPJ Library File: 12618927 GHD_GEOTECH_V10.GLB
Report: 12618927 SOIL LOG Date: 6/2/24

REFERENCE No.: 12618927

**BOREHOLE No.:** MW7-23

**ELEVATION:** 340.0 m

# BOREHOLE REPORT



CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 20 November 2023 DATE (FINISH): 20 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814044.7 EASTING: 564988.1 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) KN/m³ | LAB Testing Moisture Content % | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 340.0 | | GROUND SURFACE | | | % | | % | % | | | |
| 1 | | | | TOPSOIL<br>SANDY SILT, trace grass, rootlets, dark brown, moist, loose | | SS1 | | | 16 | 25 | 1-2-5-4 | 7 | Concrete |
| 2 | 0.6 | 339.4 | | FILL:<br>SILTY SAND, some gravel, brown, moist compact (Disturbed Native) | | | | | | | | | 0.6 m<br>Sand<br>0.9 m |
| 3 | 1.0 | | | | | SS2 | | | 5 | 54.2 | 5-14-12-10 | 26 | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | rootlets at 1.8 m bgs | | SS3 | | | 6 | 70.8 | 5-6-13-10 | 19 | |
| 7 | 2.0 | | | | | | | | | | | | |
| 8 | 2.3 | 337.7 | | SILT, trace sand, rootlets, brown, moist, compact (Disturbed Native) | | SS4 | | | 16 | 83.3 | 3-6-11-9 | 17 | |
| 9 | | | | | | | | | | | | | |
| 10 | 3.0 | 337.0 | | NATIVE:<br>SILT, trace sand, brown, moist, compact | | SS5 | | | 16 | 79.2 | 4-5-15-9 | 20 | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | 4.0 | | | | | | | | | | | | Hole-plug |
| 14 | | | | | | | | | | | | | |
| 15 | 4.6 | 335.5 | | SILTY SAND, trace clay, some gravel, brown, moist to dry, dense | | SS6 | 15-51-26-8 | | 6 | 79.2 | 10-15-19-15 | 34 | |
| 16 | 5.0 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | 6.0 | | | | | | | | | | | | |
| 21 | | | | | | SS7 | | | 2 | 70.8 | 31-19-18-17 | 37 | |
| 22 | | | | | | | | | | | | | |
| 23 | 7.0 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | 7.3 m |
| 25 | | | | SPT obstructed, no recovery | | | | | | | | | 7.6 m |
| 26 | 8.0 | | | | | SS8 | | | 19 | 4.2 | 30-33-30-26 | 63 | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | 9.0 | | | | | | | | | | | | |
| 31 | 9.1 | 330.9 | | SILT and SAND, trace clay, trace gravel, brown, moist, dense | | SS9 | 8-43-39-10<br>Non-Plastic | | 8 | -- | 12-13-25-26 | 38 | Screen |
| 32 | | | | | | | | | | | | | |

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△³ Number refer to Sensitivity
○ Water content (%)
$w_p$ $w_l$ Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
★ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

PIEZOMETER/ STANDPIPE INSTALLATION

REFERENCE No.: 12618927

**BOREHOLE No.:** MW7-23

**ELEVATION:** 340.0 m

# BOREHOLE REPORT



CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 20 November 2023 DATE (FINISH): 20 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814044.7 EASTING: 564988.1 DRILLING TYPE:Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

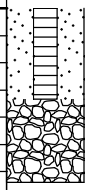
| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) KN/m³ | LAB Testing Moisture Content % | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS PIEZOMETER/ STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 340.0 | | GROUND SURFACE | | | % | | % | % | | | |
| | 10.7 | 329.4 | | SANDY SILT, trace to some gravel, brown, moist, dense | | SS10 | | | 8 | 25 | 8-16-14-13 | 30 | |
| | 11.0 | | | | | | | | | | | | |
| | 11.3 | 328.8 | | END OF BOREHOLE | | | | | | | | | |
| | 12.0 | | | NOTES:<br>- End of Borehole at 11.3 m bgs.<br>- Borehole was dry upon completion of drilling.<br>- bgs denotes 'below ground surface'. | | | | | | | | | |
| | 13.0 | | | | | | | | | | | | |
| | 14.0 | | | | | | | | | | | | |
| | 15.0 | | | | | | | | | | | | |
| | 16.0 | | | | | | | | | | | | |
| | 17.0 | | | | | | | | | | | | |
| | 18.0 | | | | | | | | | | | | |
| | 19.0 | | | | | | | | | | | | |

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△³ Number refer to Sensitivity
○ Water content (%)
$W_p$ $W_l$ Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

10.7 m

11.3 m



REFERENCE No.: 12618927

# BOREHOLE REPORT

Page 1 of 1

**BOREHOLE No.:** BH8-23

**ELEVATION:** 339.7 m

CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 21 November 2023 DATE (FINISH): 21 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814072.9 EASTING: 565056.0 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) KN/m³ | LAB Testing Moisture Content % | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 339.7 | | GROUND SURFACE | | | % | | % | % | | | |
| | | | | TOPSOIL (330 mm)<br>CLAYEY SILT, trace sand, rootlets, dark brown, moist, loose | | SS1 | | | 26 | 41.7 | 1-2-3-4 | 5 | |
| | 0.6 | 339.1 | | FILL:<br>SILTY SAND, trace gravel, rootlets, brown, moist, compact (Disturbed Native) | | SS2 | | | 7 | 66.7 | 2-6-5-8 | 11 | |
| | 1.0 | | | | | | | | | | | | |
| | 1.5 | 338.1 | | NATIVE:<br>SILTY SAND, trace clay, some gravel, brown, moist, dense | | SS3 | | | 5 | 62.5 | 2-11-22-11 | 33 | |
| | 2.0 | | | | | | 18-42-34-6 SS3+SS4 | | -- | -- | -- | -- | |
| | | | | compact below 2.5 m bgs<br>crushed rock fragments | | SS4 | | | 8 | 66.7 | 8-14-9-10 | 23 | |
| | 3.0 | | | very dense below 3.0 m bgs | | SS5 | | | 11 | 58.3 | 4-27-27-15 | 54 | |
| | 4.0 | | | | | | | | | | | | |
| | | | | trace clay, some gravel to gravelly, brown, moist dense below 4.6 m | | SS6 | | | 6 | 83.3 | 10-15-21-20 | 36 | |
| | 5.0 | | | | | | | | | | | | |
| | 5.2 | 334.5 | | END OF BOREHOLE | | | | | | | | | |
| | 6.0 | | | NOTES:<br>- End of Borehole at 5.2 m bgs.<br>- Borehole was dry upon completion of drilling.<br>- bgs denotes 'below ground surface'. | | | | | | | | | |
| | 7.0 | | | | | | | | | | | | |
| | 8.0 | | | | | | | | | | | | |
| | 9.0 | | | | | | | | | | | | |

Undisturbed Vane Value (kPa)
Remoulded Field Vane Value (kPa)
Number refer to Sensitivity
Water content (%)
Atterberg limits (%) $w_p$ $w_l$
"N" Value (blows/12 in.-30 cm)
"DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

COMMENTS
PIEZOMETER/ STANDPIPE INSTALLATION

File: N:\CA\WATERLOO\PROJECTS\66211261892\TECH\GEOTECH - ESTILL\GINT LOGS\12618927 LOG_GEOTECH.GPJ Library File: 12618927 GHD_GEOTECH_V10.GLB
Report: 12618927 SOIL LOG Date: 6/2/24

REFERENCE No.: 12618927

# BOREHOLE REPORT

Page 1 of 1

**BOREHOLE No.:** BH9-23

**ELEVATION:** 338.8 m

CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 20 November 2023 DATE (FINISH): 20 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4813973.9 EASTING: 564949.1 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth Feet | Depth Metres | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments Gravel Sand Silt Clay | LAB Testing Unit Weight (Dry) | LAB Testing Moisture Content | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS PIEZOMETER/ STANDPIPE INSTALLATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |
| 0 | | 338.8 | | GROUND SURFACE | | | % | KN/m³ | % | % | | | |
| | 0.1 | 338.6 | | TOPSOIL (127 mm) | | | | | | | | | |
| 1 | | | | FILL: SANDY SILT, trace to some gravel, trace corn husk, brown, wet, loose | | SS1 | | | 43 | 50 | 1-3-4-4 | 7 | |
| 2 | 0.6 | 338.2 | | NATIVE: SILTY SAND, trace sand, trace gravel, brown, moist, compact | | | | | | | | | |
| 3 | 1.0 | | | | | SS2 | | | 13 | 79.2 | 8-7-8-8 | 15 | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | loose at 1.6 m bgs | | | | | | | | | |
| 6 | | | | silt layers (approximately 100-150 mm) at 1.8 m bgs | | SS3 | | | 18 | 75 | 3-4-4-5 | 8 | |
| 7 | 2.0 | | | | | | | | | | | | |
| 8 | | | | silt layers (approximately 100 mm) at 2.3 m bgs | | SS4 | | | 14 | 79.2 | 5-10-7-8 | 17 | |
| 9 | | | | | | | | | | | | | |
| 10 | 3.0 | 335.7 | | SILT, some clay, trace sand, brown, moist, compact | | SS5 | 0-4-78-18 | | 18 | 79.2 | 5-8-7-7 | 15 | |
| 11 | 3.0 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | 4.0 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | 4.6 | 334.2 | | SAND, some silt, some gravel, brown, moist, dense | | SS6 | | | 5 | 37.5 | 14-14-18-21 | 32 | |
| 16 | 5.0 | | | | | | | | | | | | |
| 17 | 5.2 | 333.6 | | END OF BOREHOLE | | | | | | | | | |
| 18 | | | | NOTES: - End of Borehole at 5.2 m bgs. - Borehole was dry upon completion of drilling. - bgs denotes 'below ground surface'. | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | 6.0 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | 7.0 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | 8.0 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | 9.0 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△³ Number refer to Sensitivity
○ Water content (%)
$W_p$ $W_l$ Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
★ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

File: N:\CA\WATERLOO\PROJECTS\66211261892\TECH\GEOTECH - ESTILL\GINT LOGS\12618927 LOG_GEOTECH.GPJ Library File: 12618927 GHD_GEOTECH_V10.GLB
Report: 12618927 SOIL LOG Date: 6/2/24

REFERENCE No.: 12618927

# BOREHOLE REPORT

Page 1 of 1

**BOREHOLE No.:** MW10-23

**ELEVATION:** 335.9 m

CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 20 November 2023 DATE (FINISH): 20 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4813862.6 EASTING: 564840.1 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) | LAB Testing Moisture Content | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 335.9 | | GROUND SURFACE | | | % | KN/m³ | % | % | | | |
| 1 | | | | TOPSOIL: SILT and SAND, trace gravel, trace corn husk, brown to dark brown, moist, loose | | SS1 | | | 12 | 50 | 2-2-3-2 | 5 | Concrete |
| 2 | 0.6 | 335.3 | | NATIVE: SILTY SAND, trace to some gravel, brown, moist, compact | | | | | | | | | 0.6 m Sand |
| 3 | 1.0 | | | | | SS2 | | | 10 | 54.2 | 2-3-10-16 | 13 | 0.9 m |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | Hole-plug |
| 6 | | | | | | SS3 | | | 7 | 29.2 | 7-17-13-8 | 30 | |
| 7 | 2.0 | | | | | | | | | | | | |
| 8 | 2.3 | 333.7 | | SILT, trace sand, trace gravel, brown oxidized, moist, compact | | SS4 | | | 17 | 83.3 | 4-9-9-14 | 18 | 2.3 m |
| 9 | | | | | | | | | | | | | |
| 10 | 3.0 | | | SPT refusal due to possible obstruction | | SS5 | | | 4 | 45.5 | 40-50/127 mm | 50/127 mm | 3.0 m |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | Screen |
| 13 | 4.0 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | 4.6 | 331.4 | | SAND and SILT, trace clay, some gravel, brown, moist, dense | | SS6 | | | 8 | -- | 14-17-22-22 | 39 | 4.6 m |
| 16 | 5.0 | | | | | | | | | | | | |
| 17 | 5.2 | 330.8 | | END OF BOREHOLE | | | | | | | | | 5.2 m |
| 18 | | | | NOTES: | | | | | | | | | |
| 19 | | | | - End of Borehole at 5.2 m bgs. | | | | | | | | | |
| 20 | 6.0 | | | - Borehole was dry upon completion of drilling. | | | | | | | | | |
| 21 | | | | - bgs denotes 'below ground surface'. | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | 7.0 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | 8.0 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | 9.0 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△³ Number refer to Sensitivity
○ Water content (%)
$w_p$ $w_l$ Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

COMMENTS: PIEZOMETER/ STANDPIPE INSTALLATION

File: N:\CA\WATERLOO\PROJECTS\66211261892\TECH\GEOTECH - ESTILL\GINT LOGS\12618927 LOG_GEOTECH.GPJ Library File: 12618927 GHD_GEOTECH_V10.GLB
Report: 12618927 SOIL LOG Date: 6/2/24

REFERENCE No.: 12618927

# BOREHOLE REPORT

Page 1 of 1

**BOREHOLE No.:** MW11-23

**ELEVATION:** 338.2 m

CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 21 November 2023 DATE (FINISH): 21 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4813971.5 EASTING: 565153.3 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) | LAB Testing Moisture Content | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 338.2 | | GROUND SURFACE | | | % | KN/m³ | % | % | | | |
| 0 | | | | TOPSOIL (279 mm) | | | | | | | | | |
| 1 | | | | SANDY SILT. trace gravel, rootlets, dark brown, moist | | SS1 | | | 11 | 58.3 | 2-3-4-10 | 7 | Concrete |
| 2 | 0.6 | 337.6 | | NATIVE: | | | | | | | | | 0.6 m |
| | | | | GRAVELLY SILTY SAND, trace clay, rock fragments, brown, dry to moist, compact to very dense | | | | | | | | | Sand |
| 3 | 1.0 | | | | | SS2 | 25-47-23-5 | | 5 | 58.3 | 5-14-19-12 | 33 | 0.9 m |
| 4 | | | | | | | | | | | | | |
| 5 | | | | compact from 1.5 m to 2.5 m bgs | | | | | | | | | Hole-plug |
| 6 | | | | | | SS3 | | | 2 | 45.8 | 5-10-9-9 | 19 | |
| 7 | 2.0 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | 2.3 m |
| 9 | | | | | | SS4 | | | 3 | 66.7 | 9-13-17-21 | 30 | |
| 10 | 3.0 | | | dense below 3.0 m bgs | | | | | | | | | 3.0 m |
| 11 | | | | | | SS5 | | | 3 | 66.7 | 14-22-28-29 | 50 | |
| 12 | | | | | | | | | | | | | |
| 13 | 4.0 | | | | | | | | | | | | Screen |
| 14 | | | | | | | | | | | | | |
| 15 | 4.6 | 333.6 | | SILTY SAND, some gravel, brown, moist to wet, dense | | | | | | | | | 4.6 m |
| 16 | 5.0 | | | | | SS6 | | | 16 | 66.7 | 6-11-27-24 | 38 | |
| 17 | 5.2 | 333.0 | | silt layer (approximately 150-200 mm ) at 5.0 m bgs | | | | | | | | | 5.2 m |
| | | | | END OF BOREHOLE | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | 6.0 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | 7.0 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | 8.0 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | 9.0 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△³ Number refer to Sensitivity
○ Water content (%)
$w_p$ $w_l$ Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
★ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

PIEZOMETER/ STANDPIPE INSTALLATION

NOTES:
- End of Borehole at 5.2 m bgs.
- Borehole was dry upon completion of drilling.
- bgs denotes 'below ground surface'.

File: N:\CA\WATERLOO\PROJECTS\66211261892\TECH\GEOTECH - ESTILL\GINT LOGS\12618927 LOG_GEOTECH.GPJ Library File: 12618927 GHD_GEOTECH_V10.GLB
Report: 12618927 SOIL LOG Date: 6/2/24

REFERENCE No.: 12618927

# BOREHOLE REPORT

Page 1 of 1

**BOREHOLE No.:** MW12-23

**ELEVATION:** 334.9 m

CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 21 November 2023 DATE (FINISH): 21 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4813871.4 EASTING: 565052.0 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth (Feet) | Depth (Metres) | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) KN/m³ | LAB Testing Moisture Content % | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 334.9 | | GROUND SURFACE | | | % | | % | % | | | |
| | 0.1 | 334.9 | | TOPSOIL (76 mm) | | | | | | | | | |
| 1 | | | | FILL: SAND and GRAVEL, trace silt, rootlets, brown, moist, compact (Disturbed Native) | | SS1 | | | 8 | 50 | 2-6-10-12 | 16 | Concrete |
| 2 | | | | | | | | | | | | | 0.6 m Sand |
| | 0.8 | 334.2 | | NATIVE: GRAVEL and SANDY SILT, rock fragments, brown, dry, dense | | | | | | | | | 0.9 m |
| 3 | 1.0 | | | | | SS2 | | | 5 | 37.5 | 8-20-16-17 | 36 | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | compact from 1.5 m to 2.1 m bgs | | | | | | | | | |
| 6 | | | | | | SS3 | ---(39) | | 4 | 54.2 | 6-14-14-23 | 28 | Hole-plug |
| 7 | 2.0 | | | | | | | | | | | | |
| 8 | | | | | | SS4 | | | 2 | 58.3 | 15-20-16-29 | 36 | |
| 9 | | | | | | | | | | | | | 2.7 m |
| 10 | 3.0 | | | rock fragments, very dense below 3.1 m SPT refusal due to possible obstruction | | SS5 | | | 4 | 68.8 | 19-30-50/102mm | 80/254 mm | 3.0 m |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | Screen |
| 13 | 4.0 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | dense below 4.5 m bgs | | | | | | | | | 4.6 m |
| 16 | 5.0 | | | | | SS6 | | | 3 | 58.3 | 19-19-26-40 | 45 | |
| 17 | 5.2 | 329.8 | | END OF BOREHOLE | | | | | | | | | 5.2 m |
| 18 | | | | NOTES: - End of Borehole at 5.2 m bgs. - Borehole was dry upon completion of drilling. - bgs denotes 'below ground surface'. | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | 6.0 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | 7.0 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | 8.0 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | 9.0 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△³ Number refer to Sensitivity
○ Water content (%)
$w_p$ $w_l$ Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
★ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

PIEZOMETER/ STANDPIPE INSTALLATION

REFERENCE No.: 12618927

**BOREHOLE No.:** MW13-23

**ELEVATION:** 336.2 m

# BOREHOLE REPORT



CLIENT: Danby Products Limited

PROJECT: Danby - Estill Innovation Company

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 21 November 2023 DATE (FINISH): 21 November 2023

**LEGEND**

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4813852.2 EASTING: 565226.4 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

| Depth Feet | Depth Metres | Elevation (m) | Stratigraphy | DESCRIPTION OF SOIL | SAMPLES State | SAMPLES Type and Number | LAB Testing Comments (Gravel Sand Silt Clay) | LAB Testing Unit Weight (Dry) KN/m³ | LAB Testing Moisture Content % | Recovery/ TCR(%) | Blows per/15cm/ RQD(%) | 'N' Value SCR(%) | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 336.2 | | GROUND SURFACE | | | % | | % | % | | | |
| | 0.1 | 336.1 | | TOPSOIL (127 mm) | | | | | | | | | |
| 1 | | | | NATIVE: SAND and GRAVEL, trace silt, rock fragments, brown, dry to moist, dense | | SS1 | | | 5 | 79.2 | 2-15-27-21 | 42 | Concrete |
| 2 | | | | | | | | | | | | | 0.6 m Sand 0.9 m |
| 3 | 1.0 | | | | | SS2 | | | 4 | 41.7 | 7-19-18-20 | 37 | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | SS3 | ---(7) | | 4 | 54.2 | 15-24-18-11 | 42 | Hole-plug |
| 7 | 2.0 | | | | | | | | | | | | |
| 8 | | | | compact below 2.3 m bgs | | SS4 | | | 3 | 50 | 11-12-14-19 | 26 | |
| 9 | | | | | | | | | | | | | 2.7 m |
| 10 | 3.0 | 3.0 | 333.2 | SAND, trace silt, brown, dry, compact | | SS5 | ---(6) | | 3 | 66.7 | 6-10-13-12 | 23 | 3.0 m |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | Screen |
| 13 | 4.0 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | 4.6 | 331.7 | | SAND and SILT, brown, dry to wet, compact | | SS6 | | | 18 | 79.2 | 8-9-9-9 | 18 | 4.6 m |
| 16 | 5.0 | | | | | | | | | | | | |
| 17 | 5.2 | 331.1 | | END OF BOREHOLE | | | | | | | | | 5.2 m |
| 18 | | | | NOTES: | | | | | | | | | |
| 19 | | | | - End of Borehole at 5.2 m bgs. | | | | | | | | | |
| 20 | 6.0 | | | - Borehole was dry upon completion of drilling. | | | | | | | | | |
| 21 | | | | - bgs denotes 'below ground surface'. | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | 7.0 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | 8.0 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | 9.0 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△³ Number refer to Sensitivity
○ Water content (%)
$w_p$ $w_l$ Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
★ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

COMMENTS: PIEZOMETER/ STANDPIPE INSTALLATION

File: N:\CA\WATERLOO\PROJECTS\66211261892\TECH\GEOTECH - ESTILL\GINT LOGS\12618927 LOG_GEOTECH.GPJ Library File: 12618927 GHD_GEOTECH_V10.GLB
Report: 12618927 SOIL LOG Date: 6/2/24

# Appendix B

## Geotechnical Laboratory Results

# Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

| | | | |
|---|---|---|---|
| **Client:** | Danby Products Limited | **Lab no.:** | GS137 |
| **Project/Site:** | 4631 Sideroad 20 North, Puslinch, Ontario | **Project no.:** | 12618927 |

| | | | | | |
|---|---|---|---|---|---|
| Borehole no.: | MW6-23 | Sample no.: | SS2 | Sample Depth: | 0.8m - 1.4m |
| Soil Description: | No Plasticity (np) | | | Date sampled: | November 20, 2023 |

| | | | | | |
|---|---|---|---|---|---|
| Apparatus: | 1 | Balance no.: | 1 | Porcelain bowl no.: | 1 |
| Liquid limit device no.: | 1 | Oven no.: | 1 | Spatula no.: | 1 |
| Sieve no.: | 40 | Glass plate no.: | 1 | | |

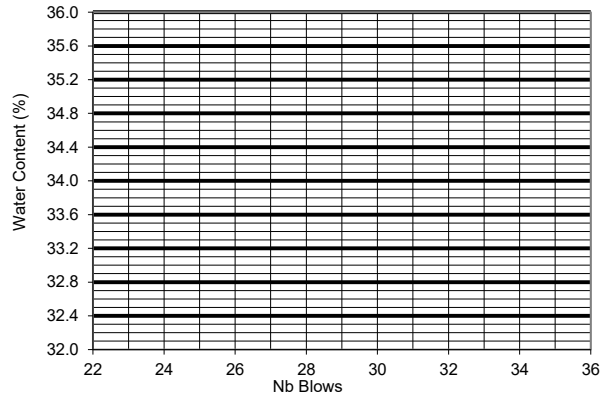
**Liquid Limit (LL):**

| | Test No. 1 | Test No. 2 | Test No. 3 |
|---|---|---|---|
| Number of blows | | | |
| **Water Content:** | | | |
| Tare no. | | | |
| Wet soil+tare, g | | | |
| Dry soil+tare, g | | | |
| Mass of water, g | | | |
| Tare, g | | | |
| Mass of soil, g | | | |
| Water content % | | | |
| **Plastic Limit (PL) - Water Content:** | | | |
| Tare no. | | | |
| Wet soil+tare, g | | | |
| Dry soil+tare, g | | | |
| Mass of water, g | | | |
| Tare, g | | | |
| Mass of soil, g | | | |
| Water content % | | | |
| Average water content % | | | |
| **Natural Water Content ( $W^n$ ):** | | | |
| Tare no. | D14 | | |
| Wet soil+tare, g | 40.6 | | |
| Dry soil+tare, g | 35.6 | | |
| Mass of water, g | 5.00 | | |
| Tare, g | 8.30 | | |
| Mass of soil, g | 27.30 | | |
| Water content % | 18.3% | | |

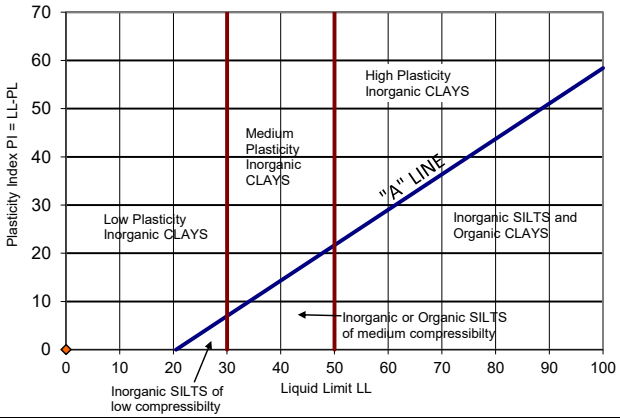
**Soil Preparation:**

- ☐ Cohesive <425 µm
- ☑ Dry preparation (oven dried))
- ☐ Cohesive >425 µm
- ☐ Dry preparation (air dried)
- ☑ Non-cohesive
- ☐ Wet preparation

**Results**




**Soil Plasticity Chart - Can Fdn Eng. Manual**




| Liquid Limit (LL) | Plastic Limit (PL) | Plasticity Index (PI) | Natural Water Content Wn |
|---|---|---|---|
| | | | 18 |

Plasticity Chart based on Canadian Foundation Engineering Manual, 2017, and Casagrande, 1948. Additional laboratory reporting information available upon request.

**Remarks:** Non-Plastic (np)

| | | | |
|---|---|---|---|
| **Performed by:** | Anwar rehani | **Date:** | January 16, 2024 |
| **Reviewed by:** | Raj Kadia C.E.T | **Date:** | January 18, 2024 |
| **Laboratory Location:** | 5582 Tomken Rd., Mississauga, Ontario L4W 1P4 | | |

# Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

| | | | |
|---|---|---|---|
| **Client:** | Danby Products Limited | **Lab no.:** | GS137 |
| **Project/Site:** | 4631 Sideroad 20 North, Puslinch, Ontario | **Project no.:** | 12618927 |
| Borehole no.: | MW7-23 | Sample no.: | SS9 |
| Soil Description: | Non- Plastic (np) | Sample Depth: | 9.1m - 9.7m |
| | | Date sampled: | November 20, 2023 |
| Apparatus: | 1 | Balance no.: | 1 |
| Liquid limit device no.: | 1 | Oven no.: | 1 |
| Sieve no.: | 40 | Glass plate no.: | 1 |
| | | Porcelain bowl no.: | 1 |
| | | Spatula no.: | 1 |

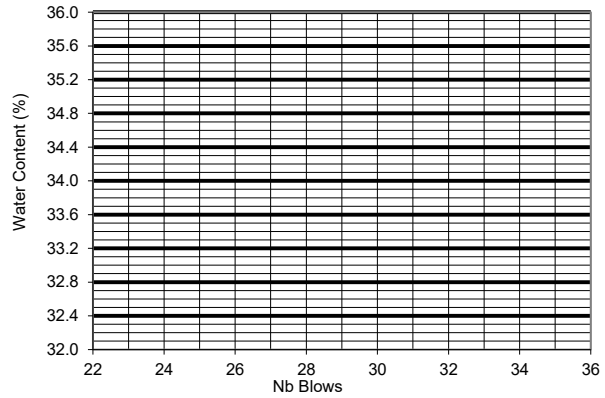
**Liquid Limit (LL):**

| | Test No. 1 | Test No. 2 | Test No. 3 |
|---|---|---|---|
| Number of blows | | | |
| **Water Content:** | | | |
| Tare no. | | | |
| Wet soil+tare, g | | | |
| Dry soil+tare, g | | | |
| Mass of water, g | | | |
| Tare, g | | | |
| Mass of soil, g | | | |
| Water content % | | | |
| **Plastic Limit (PL) - Water Content:** | | | |
| Tare no. | | | |
| Wet soil+tare, g | | | |
| Dry soil+tare, g | | | |
| Mass of water, g | | | |
| Tare, g | | | |
| Mass of soil, g | | | |
| Water content % | | | |
| Average water content % | | | |
| **Natural Water Content ( $W^n$ ):** | | | |
| Tare no. | A20 | | |
| Wet soil+tare, g | 45.8 | | |
| Dry soil+tare, g | 42.9 | | |
| Mass of water, g | 2.90 | | |
| Tare, g | 8.30 | | |
| Mass of soil, g | 34.60 | | |
| Water content % | 8.4% | | |

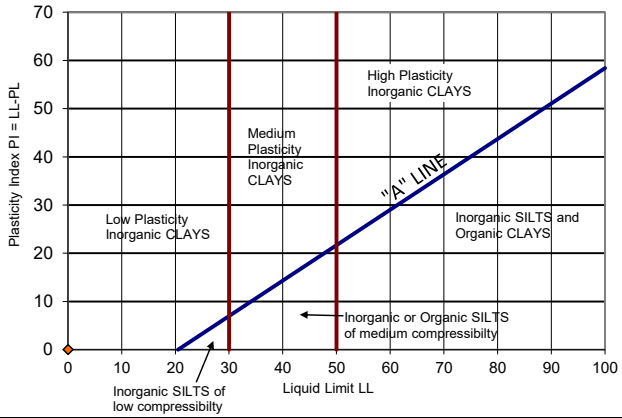
**Soil Preparation:**

- ☐ Cohesive <425 µm
- ☑ Dry preparation (oven dried))
- ☐ Cohesive >425 µm
- ☐ Dry preparation (air dried)
- ☑ Non-cohesive
- ☐ Wet preparation

**Results**




**Soil Plasticity Chart - Can Fdn Eng. Manual**




| Liquid Limit (LL) | Plastic Limit (PL) | Plasticity Index (PI) | Natural Water Content Wn |
|---|---|---|---|
| | | | 8 |

Plasticity Chart based on Canadian Foundation Engineering Manual, 2017, and Casagrande, 1948. Additional laboratory reporting information available upon request.

**Remarks:** Non-Plastic (np)

| | | | |
|---|---|---|---|
| **Performed by:** | Mohammad Amid / Anwar rehani | **Date:** | January 8, 2024 |
| **Reviewed by:** | Raj Kadia C.E.T | **Date:** | January 18, 2024 |
| **Laboratory Location:** | 5582 Tomken Rd., Mississauga, Ontario L4W 1P4 | | |

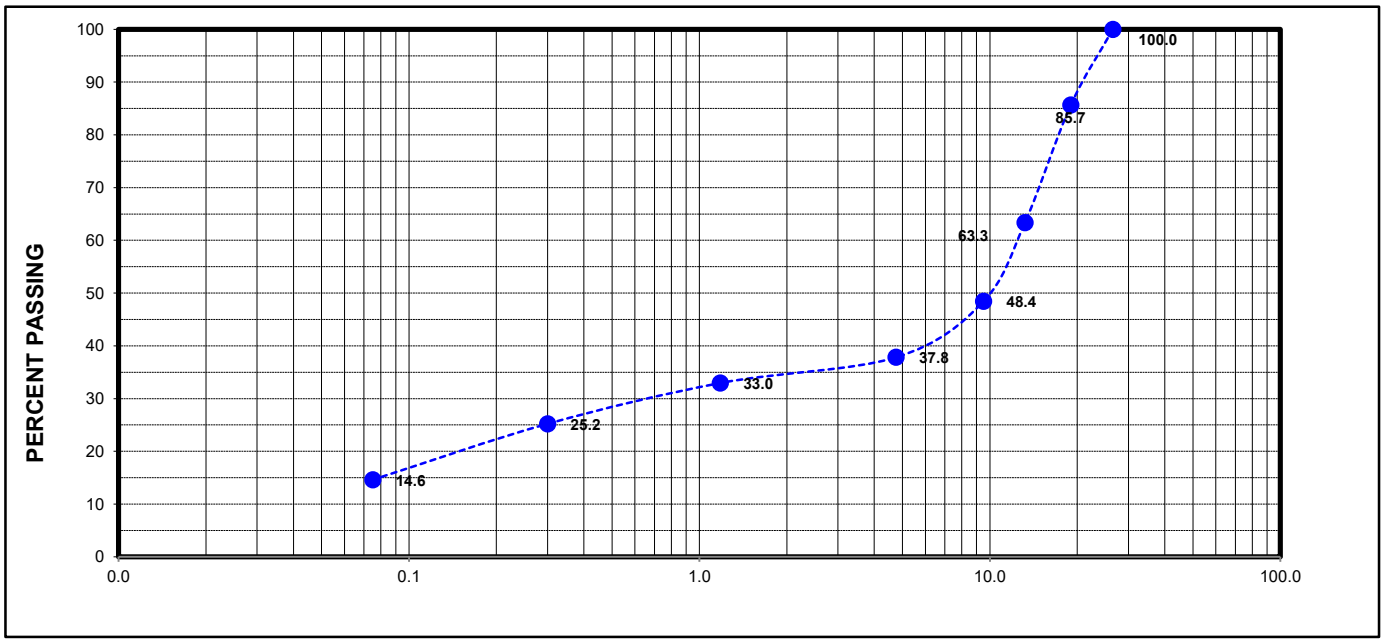
# Granular A Sieve Analysis (Pit)
# (LS-602)

| | | | |
|---|---|---|---|
| Client: | Danby Products Limited | Lab No.: | GS137 |
| Project: | 4631 Sideroad 20 North, Puslinch, Ontario | Project No.: | 12618927 |

| | | | |
|---|---|---|---|
| Soil Type: | Native Soil | Sample Source: | Borehole |
| Type of Material: | Sandy Gravel, Some Fines | Sample Location: | - |
| Proposed Use: | Other | Agg. Supplier/Source: | N/A |
| Sampled By: | Satbir | Sample Date: | November 22, 2023 |

Sample Location Remarks: BH2-23 / SS5 (Depth: 3.1m-3.7m)

| Sieve Size (mm) | % Passing |
|---|---|
| 26.5 | **100** |
| 19.0 | **86** |
| 13.20 | **63** |
| 9.5 | **48** |
| 4.75 | **38** |
| 1.180 | **33** |
| 0.300 | **25** |
| 0.075 | **15** |
| | |




**Remarks:** Gravel: 62%, Sand 23%, Fines 15%

| | | | |
|---|---|---|---|
| **Performed by:** | Riddhi Wilson | **Date:** | January 10, 2024 |
| **Verified by:** | Raj Kadia, C.E.T. | **Date:** | January 12, 2024 |

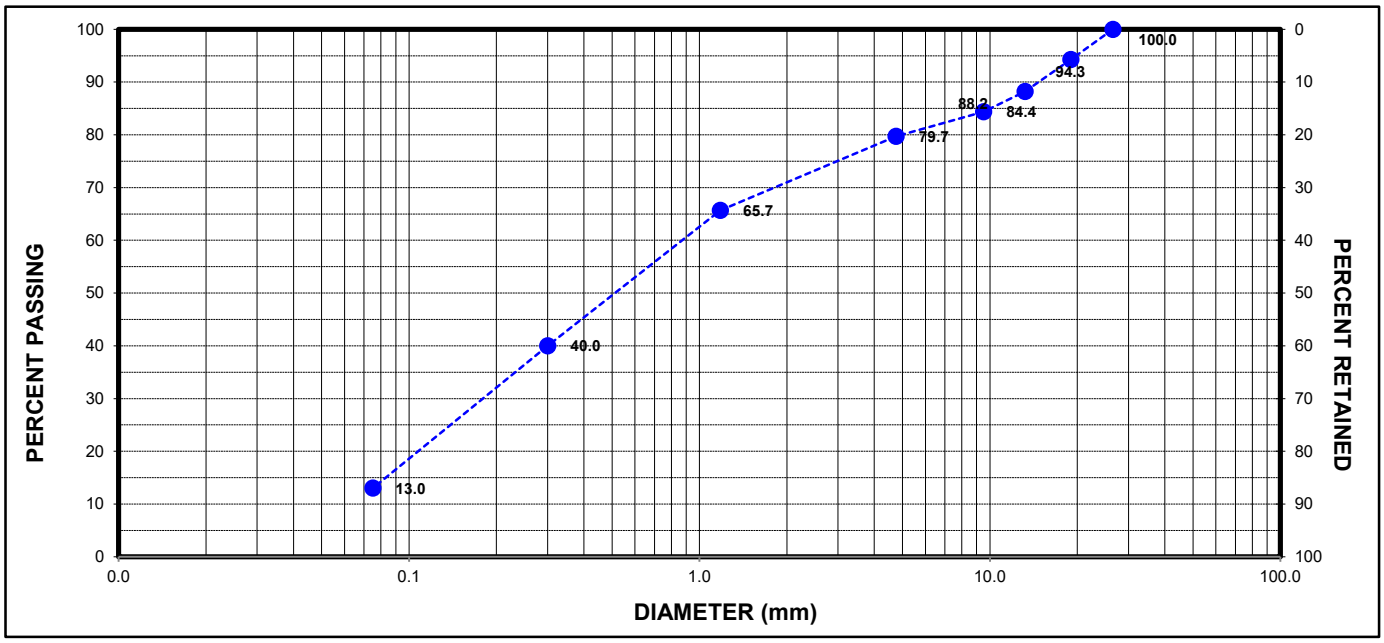
# Granular A Sieve Analysis (Pit)
# (LS-602)

| | | | |
|---|---|---|---|
| Client: | Danby Products Limited | Lab No.: | GS137 |
| Project: | 4631 Sideroad 20 North, Puslinch, Ontario | Project No.: | 12618927 |

| | | | |
|---|---|---|---|
| Soil Type: | Native Soil | Sample Source: | Borehole |
| Type of Material: | Sand, Some Gravel, Some Fines | Sample Location: | - |
| Proposed Use: | Other | Agg. Supplier/Source: | N/A |
| Sampled By: | N/A | Sample Date: | November 22, 2023 |

Sample Location Remarks: BH3-23 / SS5 (Depth: 3.1m-3.7m)

| Sieve Size (mm) | % Passing |
|---|---|
| 26.5 | **100** |
| 19.0 | **94** |
| 13.20 | **88** |
| 9.5 | **84** |
| 4.75 | **80** |
| 1.180 | **66** |
| 0.300 | **40** |
| 0.075 | **13** |
| | |




**Remarks:** Gravel: 20%, Sand 67%, Fines 13%

| | | | |
|---|---|---|---|
| **Performed by:** | Anwar Rehani | **Date:** | January 8, 2024 |
| **Verified by:** | Raj Kadia, C.E.T. | **Date:** | January 10, 2024 |

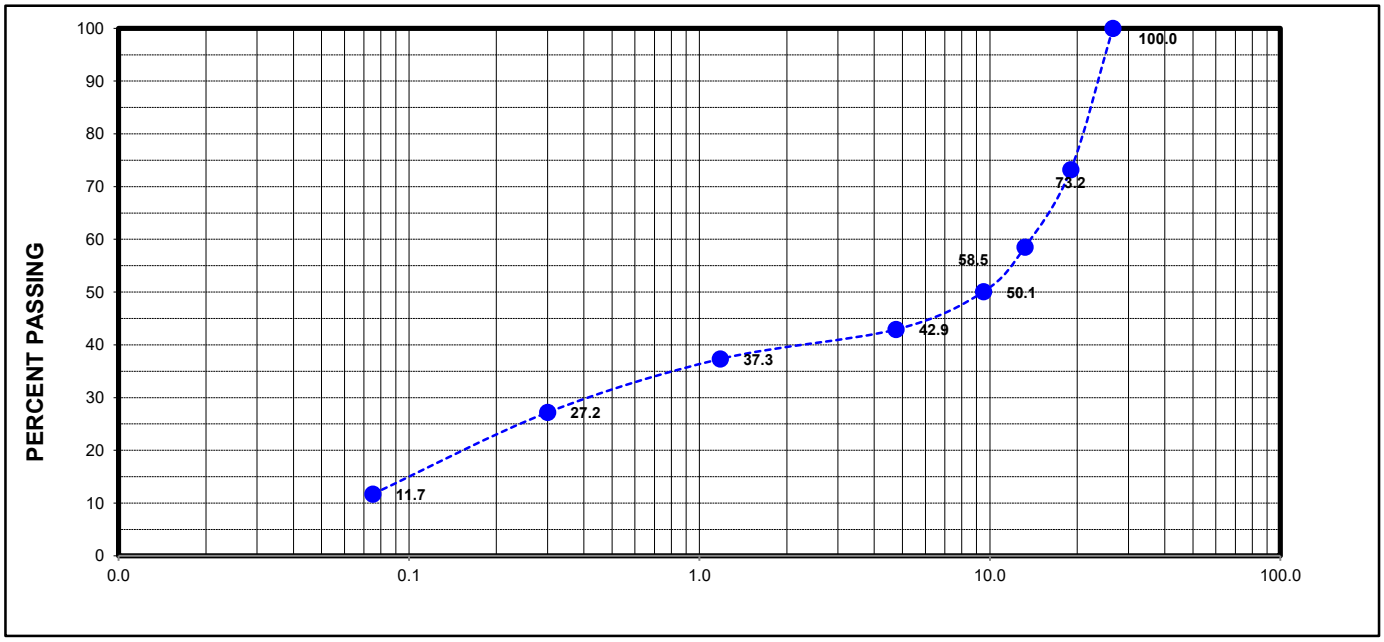
# Granular A Sieve Analysis (Pit)
# (LS-602)

| | | | |
|---|---|---|---|
| Client: | Danby Products Limited | Lab No.: | GS137 |
| Project: | 4631 Sideroad 20 North, Puslinch, Ontario | Project No.: | 12618927 |

| | | | |
|---|---|---|---|
| Soil Type: | Native Soil | Sample Source: | Borehole |
| Type of Material: | Sandy Gravel, Some Fines | Sample Location: | - |
| Proposed Use: | Other | Agg. Supplier/Source: | N/A |
| Sampled By: | N/A | Sample Date: | November 22, 2023 |

Sample Location Remarks: BH4-23 / SS6+SS7 (Depth: 3.1m-3.7m)

| Sieve Size (mm) | % Passing |
|---|---|
| 26.5 | **100** |
| 19.0 | **73** |
| 13.20 | **59** |
| 9.5 | **50** |
| 4.75 | **43** |
| 1.180 | **37** |
| 0.300 | **27** |
| 0.075 | **12** |
| | |




**Remarks:** Gravel: 57%, Sand 31%, Fines 12%

| | | | |
|---|---|---|---|
| **Performed by:** | Riddhi Wilson | **Date:** | January 10, 2024 |
| **Verified by:** | Raj Kadia, C.E.T. | **Date:** | January 12, 2024 |

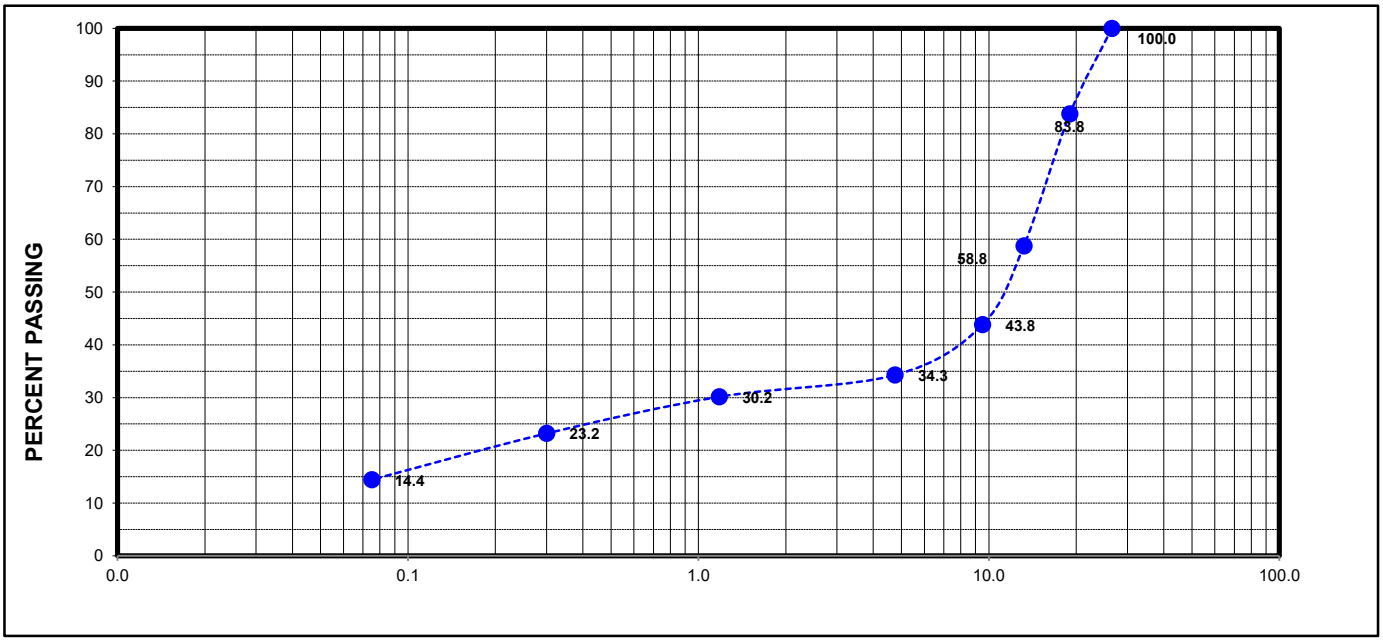
# Granular A Sieve Analysis (Pit)
# (LS-602)

| | | | |
|---|---|---|---|
| Client: | Danby Products Limited | Lab No.: | GS137 |
| Project: | 4631 Sideroad 20 North, Puslinch, Ontario | Project No.: | 12618927 |

| | | | |
|---|---|---|---|
| Soil Type: | Native Soil | Sample Source: | Borehole |
| Type of Material: | Sandy Gravel, Some Fines | Sample Location: | - |
| Proposed Use: | Other | Agg. Supplier/Source: | N/A |
| Sampled By: | Satbir | Sample Date: | November 22, 2023 |

Sample Location Remarks: BH6-23 / SS4 (Depth: 2.3m-2.9m)

| Sieve Size (mm) | % Passing |
|---|---|
| 26.5 | **100** |
| 19.0 | **84** |
| 13.20 | **59** |
| 9.5 | **44** |
| 4.75 | **34** |
| 1.180 | **30** |
| 0.300 | **23** |
| 0.075 | **14** |
| | |




**Remarks:** Gravel: 66%, Sand 20%, Fines 14%

| | | | |
|---|---|---|---|
| **Performed by:** | Riddhi Wilson | **Date:** | January 10, 2024 |
| **Verified by:** | Raj Kadia, C.E.T. | **Date:** | January 12, 2024 |

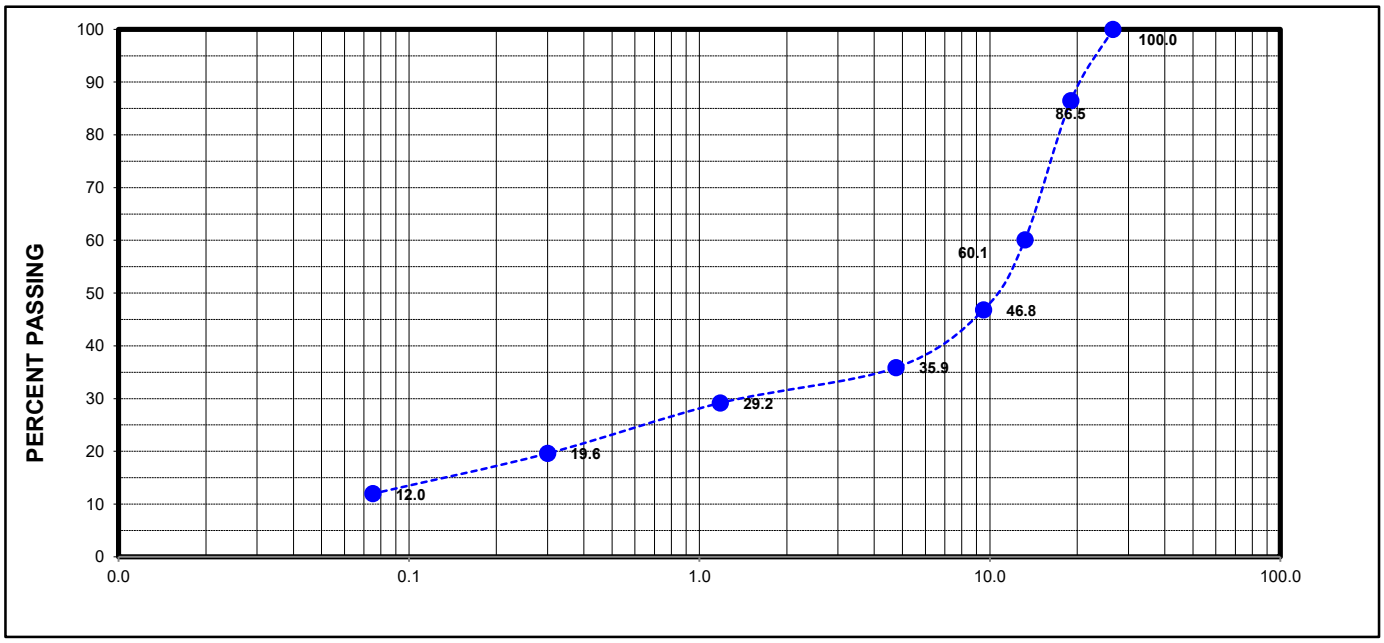
# Granular A Sieve Analysis (Pit)
# (LS-602)

| | | | |
|---|---|---|---|
| Client: | Danby Products Limited | Lab No.: | GS137 |
| Project: | 4631 Sideroad 20 North, Puslinch, Ontario | Project No.: | 12618927 |

| | | | |
|---|---|---|---|
| Soil Type: | Native Soil | Sample Source: | Borehole |
| Type of Material: | Sandy Gravel, Some Fines | Sample Location: | - |
| Proposed Use: | Other | Agg. Supplier/Source: | N/A |
| Sampled By: | Satbir | Sample Date: | November 22, 2023 |

Sample Location Remarks: BH6-23 / SS6 (Depth: 6.1m-6.7m)

| Sieve Size (mm) | % Passing |
|---|---|
| 26.5 | **100** |
| 19.0 | **86** |
| 13.20 | **60** |
| 9.5 | **47** |
| 4.75 | **36** |
| 1.180 | **29** |
| 0.300 | **20** |
| 0.075 | **12** |
| | |



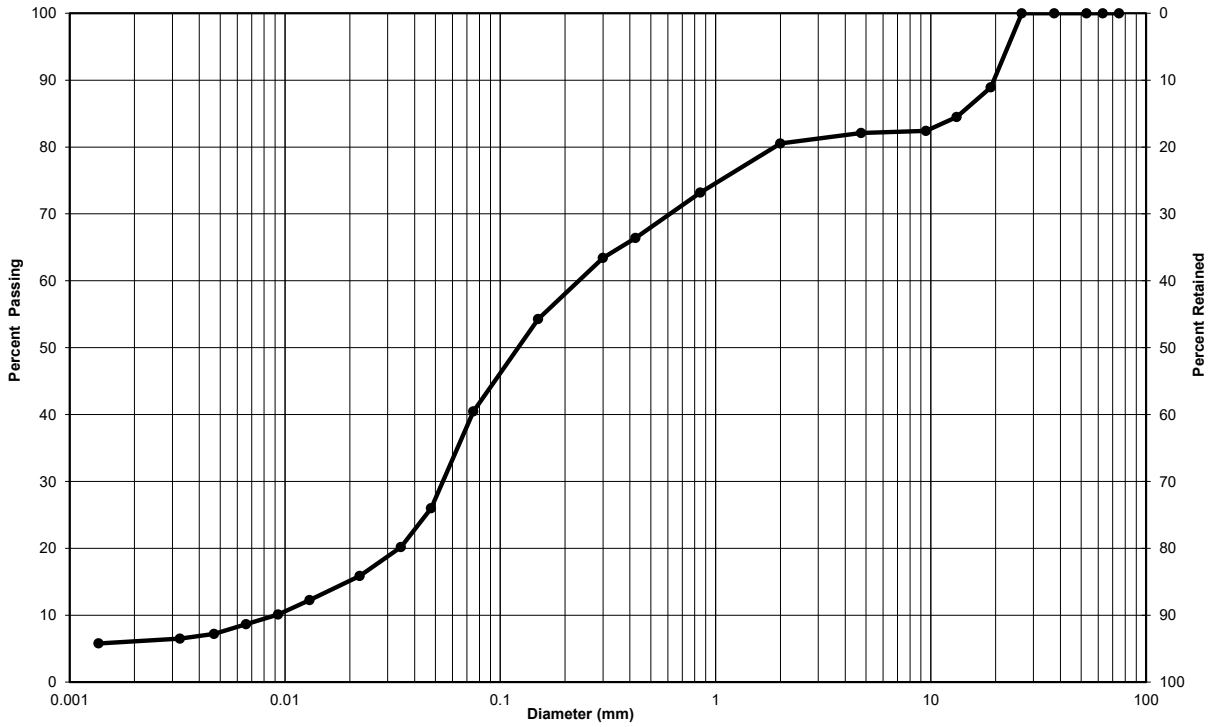

**Remarks:** Gravel: 64%, Sand 24%, Fines 12%

| | | | |
|---|---|---|---|
| **Performed by:** | Riddhi Wilson | **Date:** | January 10, 2024 |
| **Verified by:** | Raj Kadia, C.E.T. | **Date:** | January 12, 2024 |

# Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

| | | | |
|---|---|---|---|
| **Client:** | Danby Products Limited | **Lab No.:** | GS137 |
| **Project/Site:** | 4631 Sideroad 20 North, Puslinch, Ontario | **Project No.:** | 12618927 |

| | | | |
|---|---|---|---|
| Borehole no.: | BH8-23 | Sample no.: | SS3+SS4 |
| Depth: | 1.5m -2.9m | Enclosure: | |




| Clay & Silt | Sand | | | Gravel | |
|---|---|---|---|---|---|
| | Fine | Medium | Coarse | Fine | Coarse |
| Unified Soil Classification System | | | | | |

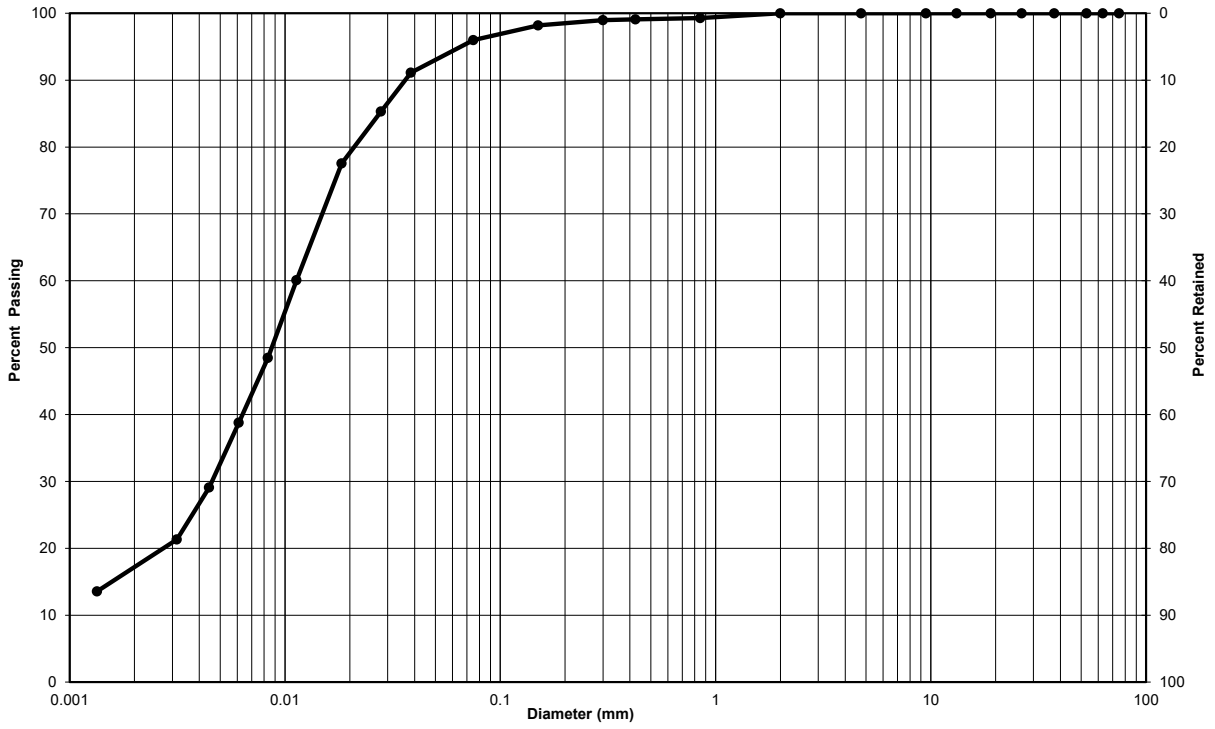
| Soil Description | Gravel (%) | Sand (%) | Clay & Silt (%) |
|---|---|---|---|
| Silty Sand, Some Cravel, Trace Clay | 18 | 42 | 40 |
| **Silt-size particles (%):** | 34 | | |
| **Clay-size particles (%) (<0.002mm):** | 6 | | |

**Remarks:**

| | | | |
|---|---|---|---|
| **Performed by:** | Riddhi Wilson / Malik | **Date:** | January 16, 2024 |
| **Verified by:** | Raj Kadia C.E.T | **Date:** | January 18, 2024 |

# Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

| | | | |
|---|---|---|---|
| **Client:** | Danby Products Limited | **Lab No.:** | GS137 |
| **Project/Site:** | 4631 Sideroad 20 North, Puslinch, Ontario | **Project No.:** | 12618927 |
| Borehole no.: | BH9-23 | Sample no.: | SS5 |
| Depth: | 3.1m -3.7m | Enclosure: | |




| Clay & Silt | Sand | | | Gravel | |
|---|---|---|---|---|---|
| | Fine | Medium | Coarse | Fine | Coarse |
| Unified Soil Classification System | | | | | |

| Soil Description | Gravel (%) | Sand (%) | Clay & Silt (%) |
|---|---|---|---|
| Clayey Silt, Trace Sand | 0 | 4 | 96 |
| **Silt-size particles (%):** | 78 | | |
| **Clay-size particles (%) (<0.002mm):** | 18 | | |

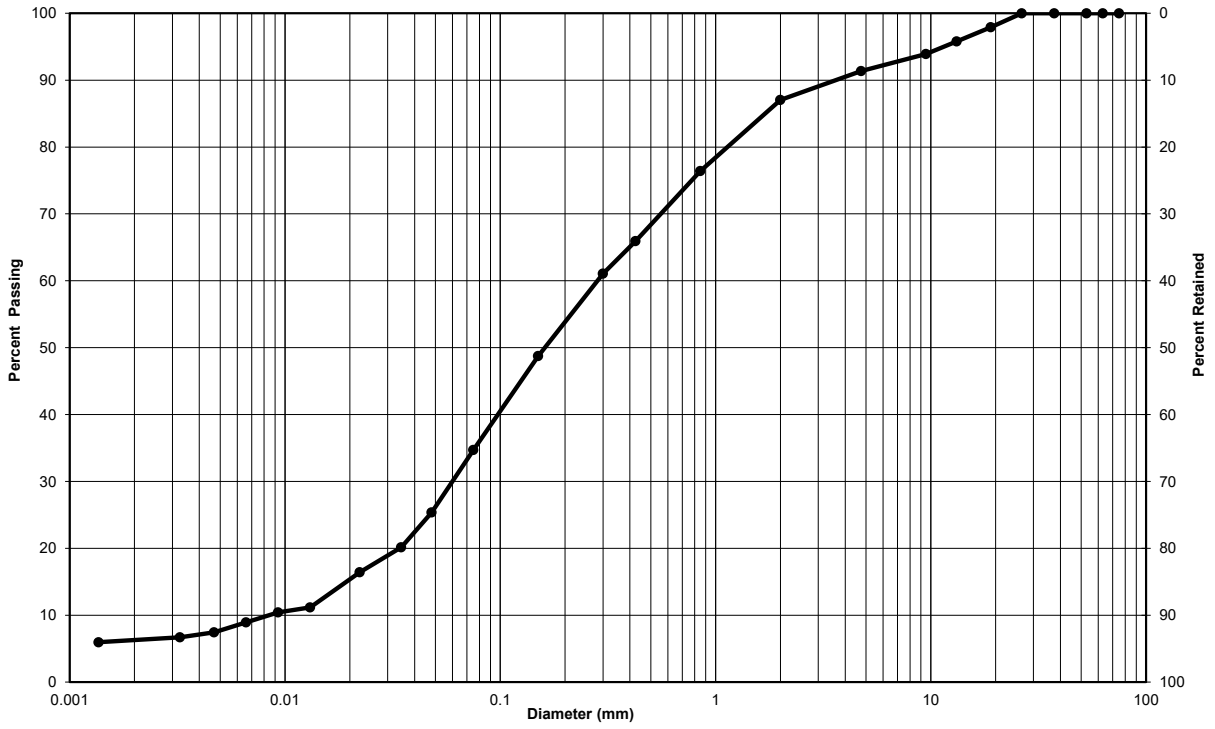
**Remarks:**

| | | | |
|---|---|---|---|
| **Performed by:** | Riddhi Wilson / Malik | **Date:** | January 16, 2024 |
| **Verified by:** | Raj Kadia C.E.T | **Date:** | January 18, 2024 |

# Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

| | | | |
|---|---|---|---|
| **Client:** | Danby Products Limited | **Lab No.:** | GS137 |
| **Project/Site:** | 4631 Sideroad 20 North, Puslinch, Ontario | **Project No.:** | 12618927 |

| | | | |
|---|---|---|---|
| Borehole no.: | MW1-23 | Sample no.: | SS5 |
| Depth: | 3.1m -3.7m | Enclosure: | |




| Clay & Silt | Sand | | | Gravel | |
|---|---|---|---|---|---|
| | Fine | Medium | Coarse | Fine | Coarse |
| Unified Soil Classification System | | | | | |

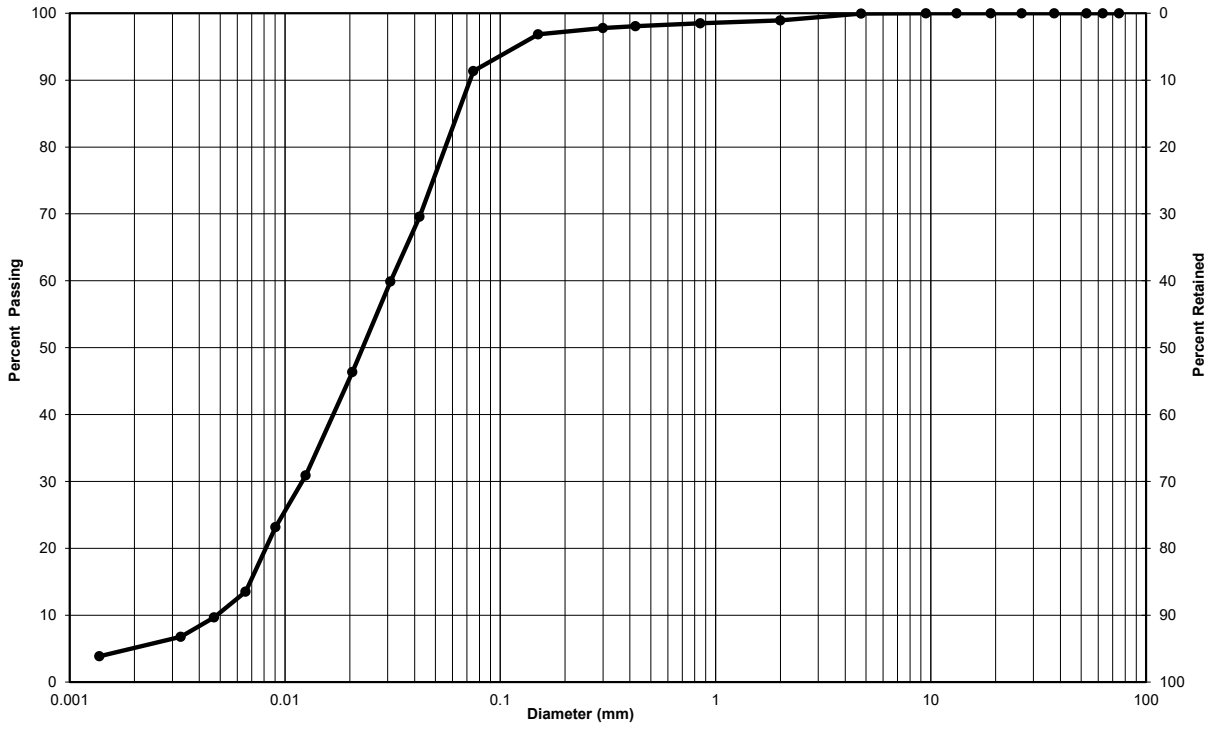
| Soil Description | Gravel (%) | Sand (%) | Clay & Silt (%) |
|---|---|---|---|
| Silty Sand, Trace Clay and Gravel | 9 | 56 | 35 |
| **Silt-size particles (%):** | 28 | | |
| **Clay-size particles (%) (<0.002mm):** | 7 | | |

**Remarks:**

| | | | |
|---|---|---|---|
| **Performed by:** | Riddhi Wilson / Malik | **Date:** | January 16, 2024 |
| **Verified by:** | Raj Kadia C.E.T | **Date:** | January 18, 2024 |

# Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

| | | | |
|---|---|---|---|
| **Client:** | Danby Products Limited | **Lab No.:** | GS137 |
| **Project/Site:** | 4631 Sideroad 20 North, Puslinch, Ontario | **Project No.:** | 12618927 |
| Borehole no.: | MW6-23 | Sample no.: | SS2 |
| Depth: | 0.76m -1.37m | Enclosure: | |




| Clay & Silt | Sand | | | Gravel | |
|---|---|---|---|---|---|
| | Fine | Medium | Coarse | Fine | Coarse |
| Unified Soil Classification System | | | | | |

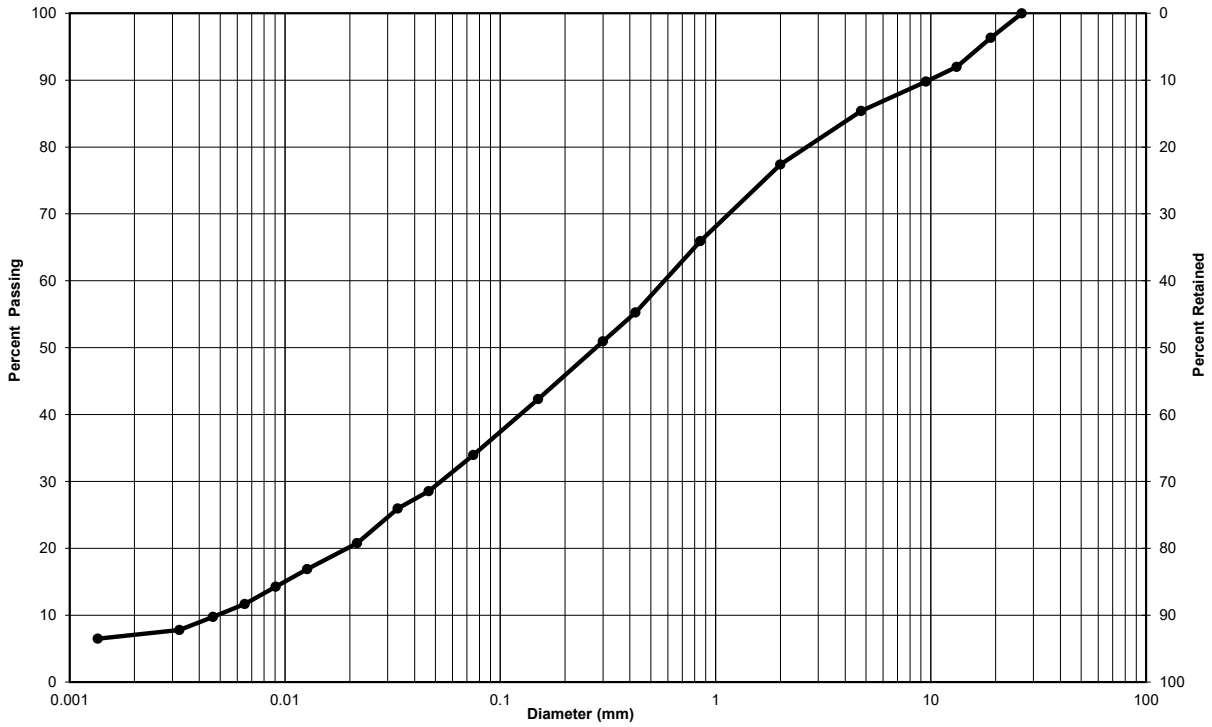
| Soil Description | Gravel (%) | Sand (%) | Clay & Silt (%) |
|---|---|---|---|
| Silt, Trace Clay and Sand | 0 | 9 | 91 |
| **Silt-size particles (%):** | 87 | | |
| **Clay-size particles (%) (<0.002mm):** | 4 | | |

**Remarks:**

| | | | |
|---|---|---|---|
| **Performed by:** | Riddhi Wilson / Malik | **Date:** | January 9, 2024 |
| **Verified by:** | Raj Kadia C.E.T | **Date:** | January 15, 2024 |

# Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

| | | | |
|---|---|---|---|
| **Client:** | Danby Products Limited | **Lab No.:** | GS137 |
| **Project/Site:** | 4631 Sideroad 20 North, Puslinch, Ontario | **Project No.:** | 12618927 |
| Borehole no.: | MW7-23 | Sample no.: | SS6 |
| Depth: | 4.6m -5.2m | Enclosure: | |




| Clay & Silt | Sand | | | Gravel | |
|---|---|---|---|---|---|
| | Fine | Medium | Coarse | Fine | Coarse |
| Unified Soil Classification System | | | | | |

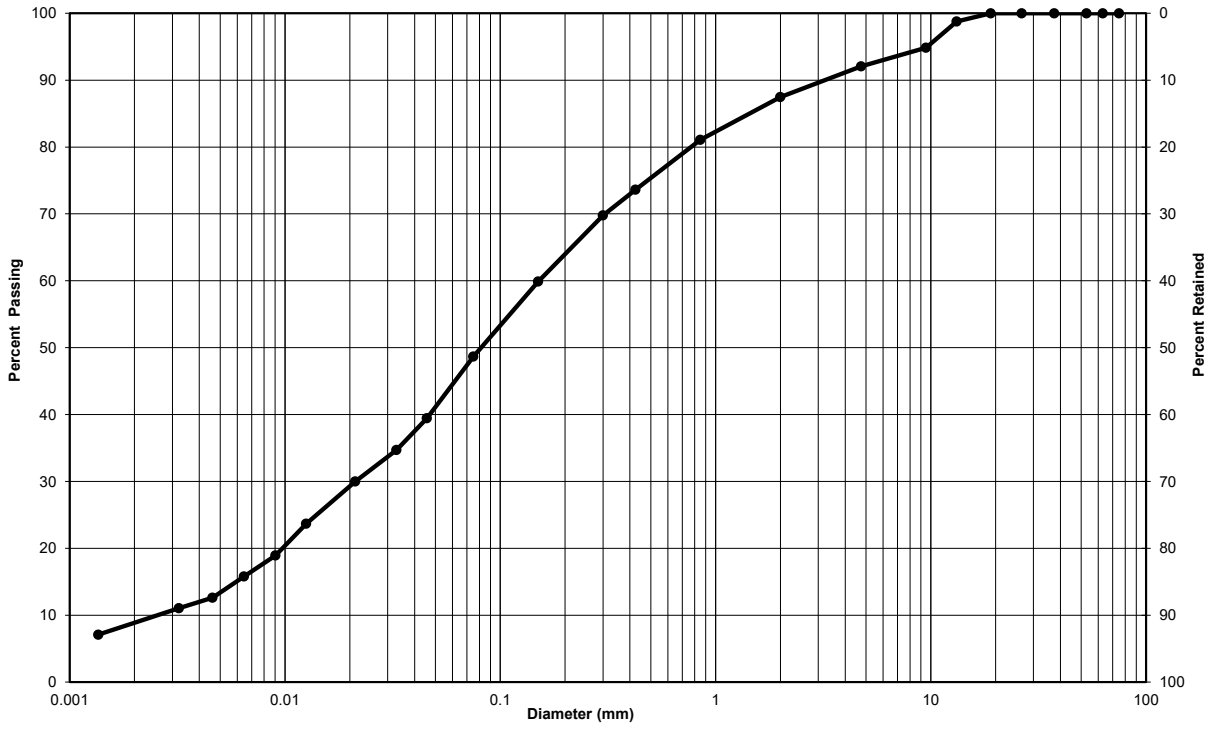
| Soil Description | Gravel (%) | Sand (%) | Clay & Silt (%) |
|---|---|---|---|
| Silty Sand, Trace Clay, Some Gravel | 15 | 51 | 34 |
| **Silt-size particles (%):** | 26 | | |
| **Clay-size particles (%) (<0.002mm):** | 8 | | |

**Remarks:**

| | | | |
|---|---|---|---|
| **Performed by:** | Riddhi Wilson / Malik | **Date:** | January 16, 2024 |
| **Verified by:** | Raj Kadia C.E.T | **Date:** | January 18, 2024 |

# Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

| | | | |
|---|---|---|---|
| **Client:** | Danby Products Limited | **Lab No.:** | GS137 |
| **Project/Site:** | 4631 Sideroad 20 North, Puslinch, Ontario | **Project No.:** | 12618927 |
| Borehole no.: | MW7-23 | Sample no.: | SS9 |
| Depth: | 9.1m -9.7m | Enclosure: | |




| Clay & Silt | Sand | | | Gravel | |
|---|---|---|---|---|---|
| | Fine | Medium | Coarse | Fine | Coarse |
| Unified Soil Classification System | | | | | |

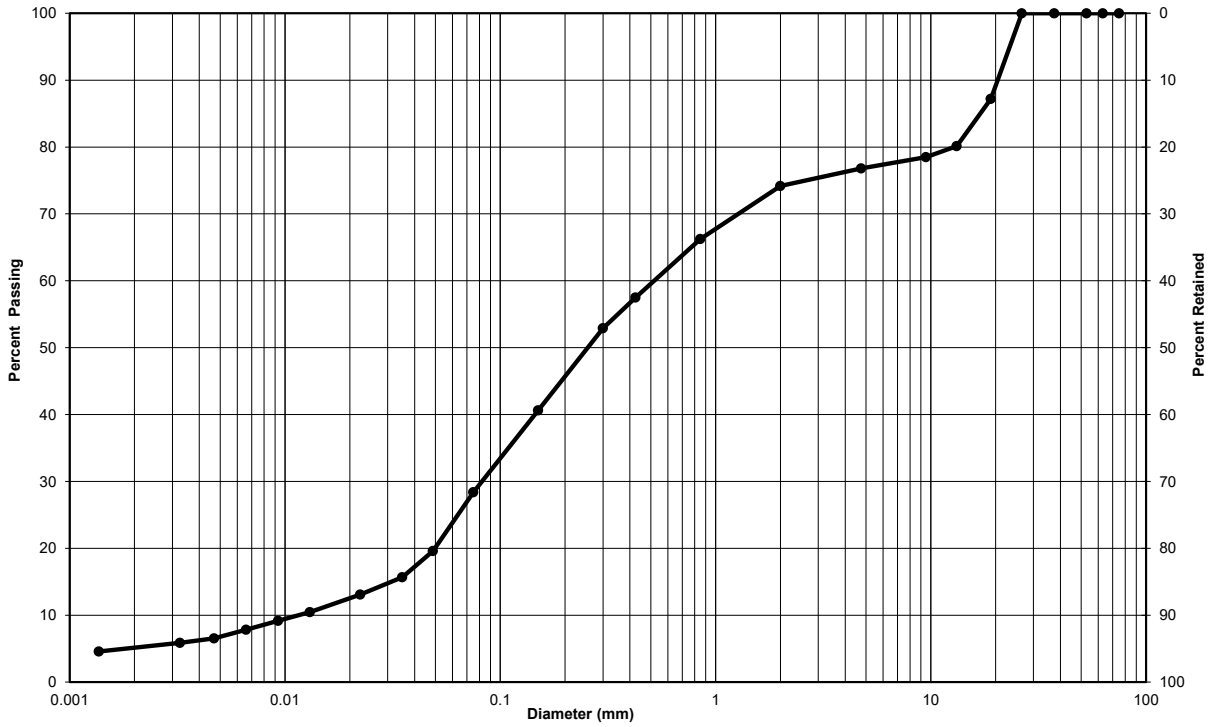
| Soil Description | Gravel (%) | Sand (%) | Clay & Silt (%) |
|---|---|---|---|
| Sand and Silt, Trace Clay and Gravel | 8 | 43 | 49 |
| **Silt-size particles (%):** | 40 | | |
| **Clay-size particles (%) (<0.002mm):** | 9 | | |

**Remarks:**

| | | | |
|---|---|---|---|
| **Performed by:** | Riddhi Wilson / Malik | **Date:** | January 16, 2024 |
| **Verified by:** | Raj Kadia C.E.T | **Date:** | January 18, 2024 |

# Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

| | | | |
|---|---|---|---|
| **Client:** | Danby Products Limited | **Lab No.:** | GS137 |
| **Project/Site:** | 4631 Sideroad 20 North, Puslinch, Ontario | **Project No.:** | 12618927 |
| Borehole no.: | MW11-23 | Sample no.: | SS2 |
| Depth: | 0.8m -1.4m | Enclosure: | |




| Clay & Silt | Sand | | | Gravel | |
|---|---|---|---|---|---|
| | Fine | Medium | Coarse | Fine | Coarse |
| Unified Soil Classification System | | | | | |

| Soil Description | Gravel (%) | Sand (%) | Clay & Silt (%) |
|---|---|---|---|
| Gravely Silty Sand, Trace Clay | 23 | 49 | 28 |
| **Silt-size particles (%):** | 23 | | |
| **Clay-size particles (%) (<0.002mm):** | 5 | | |

**Remarks:**

| | | | |
|---|---|---|---|
| **Performed by:** | Riddhi Wilson / Malik | **Date:** | January 16, 2024 |
| **Verified by:** | Raj Kadia C.E.T | **Date:** | January 18, 2024 |

# LOSS BY WASHING PASS 0.075MM SIEVE
## (LS-601)

| | | | |
|---|---|---|---|
| **CLIENT:** | Danby Products Limited | **LAB No.:** | **GS137** |
| **PROJECT/SITE:** | 4631 Sideroad 20 North, Puslinch, ON | **PROJECT No.:** | 12618927 |

Material Type: Borehole samples  Date Sampled: 11/22/2023

Source: Various sources as per the following the list below  Sampled By:

| Sample No. | Initial Mass Before Wash (g) | Mass After Wash (g) | Amount Loss By Wash (g) | Percent Loss By Washing (%) |
|---|---|---|---|---|
| *MW12-23/SS3 (1.5-2.1m)* | *353.7* | *215.6* | *138.1* | *39.06* |
| *BH4-23/SS4 (2.3-2.9m)* | *255.0* | *132.9* | *122.0* | *47.87* |
| *MW5-23/SS4 (2.3-2.9m)* | *273.3* | *246.2* | *27.1* | *9.9* |
| *BH4-23/SS2 (0.8-1.4m)* | *177.8* | *151.7* | *26.1* | *14.7* |
| *MW13-23/SS3 (1.5-2.1m)* | *350.1* | *325.5* | *24.6* | *7.0* |
| *MW13-23/SS5 (3.1-3.7m)* | *211.1* | *197.7* | *13.5* | *6.4* |
| | | | | |
| | | | | |

| Sample Size (based on Nomial Size) | |
|---|---|
| 2.36 mm | 100 g |
| 4.75 mm | 500 g |
| 9.50mm | 1000 g |
| 19.00 mm | 2500 g |
| 26.50 mm | 5000 g |

**Note:**

Nominal size defined in LS Manual LS-602 as the largest sieve in the applicable specification upon which any material is permitted to be retained

| Control Range |
|---|
| 0.40 - 0.90% Loss<br>Average - 0.70 |

**REMARKS:**

| | | | |
|---|---|---|---|
| **PERFORMED BY:** | Riddhi Wilson | **DATE:** | 1/9/2024 |
| **VERIFIED BY:** | Raj Kadia C.E.T | **DATE:** | 1/11/2024 |

# Appendix C

## Seismic Hazard Calculation

# 2020 National Building Code of Canada Seismic Hazard Tool

This application provides seismic values for the design of buildings in Canada under Part 4 of the National Building Code of Canada (NBC) 2020 as prescribed in Article 1.1.3.1. of Division B of the NBC 2020.

## Seismic Hazard Values

**User requested values**

| | |
|---|---|
| **Code edition** | NBC 2020 |
| **Site designation $X_S$** | $X_D$ |
| **Latitude (°)** | 43.476 |
| **Longitude (°)** | -80.196 |

**Please select one of the tabs below.**

NBC 2020 | Additional Values | Plots | API | Background Information

The 5%-damped spectral acceleration ($S_a(T,X)$, where T is the period, in s, and X is the site designation) and peak ground acceleration (PGA(X)) values are given in units of acceleration due to gravity (g, 9.81 $m/s^2$). Peak

ground velocity (PGV(X)) values are given in m/s. Probability is expressed in terms of percent exceedance in 50 years. Further information on the calculation of seismic hazard is provided under the *Background Information* tab.

The 2%-in-50-year seismic hazard values are provided in accordance with Article 4.1.8.4. of the NBC 2020. The 5%- and 10%-in-50-year values are provided for additional performance checks in accordance with Article 4.1.8.23. of the NBC 2020.

See the *Additional Values* tab for additional seismic hazard values, including values for other site designations, periods, and probabilities not defined in the NBC 2020.

**NBC 2020 - 2%/50 years (0.000404 per annum) probability**

| $S_a(0.2, X_D)$ | $S_a(0.5, X_D)$ | $S_a(1.0, X_D)$ | $S_a(2.0, X_D)$ | $S_a(5.0, X_D)$ | $S_a(10.0, X_D)$ | $PGA(X_D)$ | $PGV(X_D)$ |
|---|---|---|---|---|---|---|---|
| 0.291 | 0.27 | 0.159 | 0.0751 | 0.0196 | 0.00615 | 0.177 | 0.171 |

The log-log interpolated 2%/50 year $S_a(4.0, X_D)$ value is : **0.0272**

▼ Tables for 5% and 10% in 50 year values

**NBC 2020 - 5%/50 years (0.001 per annum) probability**

| $S_a(0.2, X_D)$ | $S_a(0.5, X_D)$ | $S_a(1.0, X_D)$ | $S_a(2.0, X_D)$ | $S_a(5.0, X_D)$ | $S_a(10.0, X_D)$ | $PGA(X_D)$ | $PGV(X_D)$ |
|---|---|---|---|---|---|---|---|
| 0.176 | 0.165 | 0.0939 | 0.0431 | 0.0105 | 0.00333 | 0.106 | 0.0973 |

The log-log interpolated 5%/50 year $S_a(4.0, X_D)$ value is : **0.0148**

**NBC 2020 - 10%/50 years (0.0021 per annum) probability**

| $S_a(0.2, X_D)$ | $S_a(0.5, X_D)$ | $S_a(1.0, X_D)$ | $S_a(2.0, X_D)$ | $S_a(5.0, X_D)$ | $S_a(10.0, X_D)$ | $PGA(X_D)$ | $PGV(X_D)$ |
|---|---|---|---|---|---|---|---|

| $S_a(0.2, X_D)$ | $S_a(0.5, X_D)$ | $S_a(1.0, X_D)$ | $S_a(2.0, X_D)$ | $S_a(5.0, X_D)$ | $S_a(10.0, X_D)$ | $PGA(X_D)$ | $PGV(X_D)$ |
|---|---|---|---|---|---|---|---|
| 0.109 | 0.104 | 0.0583 | 0.0258 | 0.00589 | 0.00187 | 0.064 | 0.0581 |

The log-log interpolated 10%/50 year $S_a(4.0, X_D)$ value is : **0.0084**

Download CSV

← Go back to the seismic hazard calculator form

**Date modified:** 2021-04-06


GHD