Geotechnical Investigation
Proposed Industrial Development
12071 & 12155 Coleraine Drive
Bolton, Ontario

Prepared For:

Wheelwright Group Inc.

Project No: 24-317-100
Date: September 10, 2024

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1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by Wheelwright Group Inc. to undertake a geotechnical investigation for the proposed development located at 12071 and 12155 Coleraine Drive in Bolton, Ontario, including the property located to the east of the future Simpson Road extension.

It is understood that the proposed development at 12071 Coleraine Drive will consist of a 2-storey office building and truck maintenance shop with truck trailer and car parking located behind the building.

It is understood that the proposed development at 12155 Coleraine Drive will consist of a 2-storey truck maintenance shop with truck trailer parking located behind the building. A 2-storey building will also be constructed on the east side of the future Simpsons Road with associated truck trailer and car parking.

The proposed buildings will have slab on grade construction, i.e. without a basement. Finished floor elevations of the proposed buildings are not available to us at the time of writing this report.

The purpose of this geotechnical investigation was to determine the subsurface conditions at the borehole locations and from the findings at the boreholes make geotechnical recommendations for the following:

1. Foundations
2. Floor slabs and permanent drainage
3. Excavations and groundwater control
4. Earth pressures
5. Earthquake considerations
6. Pavements
7. Underground Utilities

This report is provided on the basis of the terms of reference presented above and, on the assumption, that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations can cater to the changed design.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most

part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for Wheelwright Group Inc. and its architect and designers. Use of this report by third party without DS Consultants Ltd. consent is prohibited.

2. FIELD AND LABORATORY WORK

A total of twenty-two (22) boreholes (BH24-1 to BH24-22, see **Drawing 1** for borehole locations) were drilled to depths varying from 2.3 to 8.2 m. Twelve boreholes (BH24-1 to BH24-12) were drilled on property located at 12155 Coleraine Drive and ten boreholes (BH24-13 to BH24-22) were drilled on property located at 12071 Coleraine Drive.

Boreholes were drilled with solid stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of DS personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the DS laboratory for detailed examination by the project engineer and for laboratory testing.

As well as visual examination in the laboratory, all the soil samples were tested for moisture contents and results are presented on the respective borehole logs. Selected five (5) soil samples were subjected to grain size analyses and Atterberg Limits testing. Gradation curves for the grain size analyses are provided on **Drawing 26 and** Atterberg Limits test results are presented on **Drawing 27.**

Water level observations were made during drilling and in the open boreholes at the completion of the drilling operations. Monitoring wells were installed at three (3) borehole locations (BH24-1, BH24-8, and BH24-13) for long-term groundwater table monitoring.

The elevation surveying of the borehole locations was untaken by DS personnel, using the differential GPS unit. It should be noted that the elevations at the as-drilled borehole/well locations were not provided by a professional surveyor and should be considered approximate. Contractors performing any work referenced to the borehole elevations should confirm the borehole elevations for their work.

3. SITE AND SUBSURFACE CONDITIONS

The borehole location plan is shown on **Drawing 1**. General notes on sample description are provided on **Drawing 1A**. The subsurface conditions in the boreholes are presented in the individual borehole logs presented on **Drawings 2 to 23**. Generalized sub-surface profiles are presented on **Drawings 24 and 25**.

3.1 Soil Conditions

Pavement, Recycled Asphaltic Concrete and Fill Materials: A pavement structure consisting of 130 to 230mm of asphalt, overlying granular base and sub-base materials was found in boreholes BH24-3 and BH24-4. A layer of recycled asphaltic concrete was encountered at the surface of all boreholes, except for BH24-3 and BH24-4, extending to depths of 0.3 to 1.5m below the existing grade, underlain by fill materials or native soils.

Fill materials consisting silty clay were found in majority of the boreholes (except BH24-5, BH24-8, BH24-12, BH24-13, and BH24-18) below the recycled asphalt layer, extending to depths of 1.0 to 2.3m below the existing grade. Silty clay fill contained organics/topsoil in varying proportions and was generally present in a firm to very stiff consistency, with measured SPT 'N' values ranging from 6 to 26 blows per 300mm of spoon penetration. A layer of sand and gravel fill material was encountered in borehole BH24-5 below the recycled asphalt, underlain by native soils.

Silty Clay Till: Below the fill materials, upper native soils consisting of silty clay till deposits were encountered in all the boreholes, extending to the maximum explored depths of the boreholes or overlying cohesionless sandy soils of sandy silt to silty sand deposits in BH24-1, BH24-8, BH24-13, BH24-14, BH24-18 and BH24-19. SPT 'N' values measured in the cohesive silty clay till deposits ranged from 11 to 61 blows per 300mm of spoon penetration indicating a stiff to hard consistency of silty clay till.

Grain size analyses of five (5) soil samples from silty clay till (BH24-1/SS4, BH24-4/SS4, BH24-10/SS4, BH24-18/SS3, and BH24-21/SS3) were conducted and the results are presented on **Drawing 24**, with the following fractions:

Clay:	30 to 37 %
Silt:	46 to 49 %
Sand:	15 to 20 %
Gravel:	1 to 4 %

Atterberg Limits test of the same five (5) soil samples from silty clay till ((BH24-1/SS4, BH24-4/SS4, BH24-10/SS4, BH24-18/SS3, and BH24-21/SS3) were conducted and the results are presented on respective borehole logs and on Drawing 25, as summarized below:

Liquid Limit:	33 to 35 %
Plastic Limit:	14 to 15 %
Plastic Index:	18 to 20

Cohesionless Deposits of Sandy Silt to Silty Sand: Below the upper silty clay till deposits, cohesionless sandy soils of sandy silt to silty sand deposits were encountered in BH24-1, BH24-8, BH24-13, BH24-14, BH24-18 and BH24-19 below depths ranging from 5.8m to 7.3m and extended to the maximum explored depths of these boreholes, ie 7.9 to 8.2m. The cohesionless sandy soils

were generally wet and present in a compact to dense state, as indicated with the measured SPT 'N' values ranging from 18 to over 50 blows per 300 mm of spoon penetration.

3.2 Groundwater Conditions

During drilling, short-term (unstabilized) groundwater table was found in some boreholes at depths of 4m to 6m below the existing grade. Perched water within the fill materials was also found in some boreholes during drilling. Groundwater levels measured in the monitoring wells installed at three (3) borehole locations (BH24-1, BH24-8 and BH24-13) were at depths of 1.8 to 4.3m below the existing grade, corresponding to Elevation 228.4 to 230.8 m, as listed on Table 1:

Table 1: Groundwater Levels Observed in Monitoring Wells

Monitoring Well No.	Ground Surface Elevation (m)	Date of Observation	Groundwater Depth (mbgs)	Elevation of Groundwater (m)
BH24-1	233.5	Aug. 30, 2024	2.7	230.8
BH24-8	232.7	Aug. 30, 2024	4.3	228.4
BH24-13	232.1	Aug. 30, 2024	1.8	230.3

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events. Further monitoring of groundwater levels in the monitoring wells is recommended.

4. SITE GRADING AND ENGINEERED FILL

It is understood that the proposed development at 12071 Coleraine Drive will consist of a 2-storey office building and truck maintenance shop at the front near the road with truck trailer and car parking located behind the proposed building.

It is understood that the proposed development at 12155 Coleraine Drive will consist of a 2-storey truck maintenance shop at the front near the road with truck trailer parking located behind the building. A 2-storey building will also be constructed on the east side of the future Simpsons Road.

The proposed buildings will have slab on grade construction, i.e. without a basement. Finished floor elevations of the proposed buildings are not available to us at the time of writing this report.

Depending upon the finished floor elevation of the proposed buildings, site grading may require construction of engineered fill at site.

Fill materials were encountered in all boreholes, extending to depths varying from 0.8 to 2.3m below the existing grade. Prior to placement of engineered fill, all existing fill materials and weathered/disturbed native soils should be stripped to expose the inorganic competent native subgrade.

The exposed subgrade should then be proof rolled with a heavy sheepsfoot roller to identify weak areas. Any weak or excessively wet zones identified during proof-rolling should be sub-excavated and replaced with compacted competent material to establish stable and uniform conditions. Prior to placement of engineered fill, the subgrade should be inspected and approved by a geotechnical engineer.

General guidelines for the placement and preparation of engineered fill are presented on **Appendix A**. To reduce the risk of improperly placed engineered compacted fill, full-time supervision of the contractor is essential.

The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months.

5. FOUNDATIONS

Based on the borehole information, the proposed building can be supported on conventional footings founded on undisturbed native soils and/or engineered fill.

5.1 Footings Founded on Native Soils

The proposed buildings can be supported by spread and strip footings founded on undisturbed native silty clay till for bearing capacity values of 250kPa at SLS (Serviceability Limit States), and for a factored geotechnical resistance of 325kPa at ULS (Ultimate Limit States). The bearing values and the corresponding founding elevations at the borehole locations are summarized on Table 2.

Table 2: Bearing Values and Founding Levels of Spread Footings

Building	BH No.	Material	Bearing Capacity at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)	Minimum Depth below Existing Ground (m)	Founding Level At or Below Elevation (m)
12155 Coleraine Dr.	BH24-1	Silty Clay Till	250	325	1.8	231.7
	BH24-3	Silty Clay Till	250	325	3.0	230.5
	BH24-4	Silty Clay Till	250	325	1.5	231.4
	BH24-5	Silty Clay Till	250	325	1.5	231.3
Building East of future Simpsons Rd.	BH24-8	Silty Clay Till	250	325	1.2	231.5
	BH24-9	Silty Clay Till	250	325	1.5	231.2
12071 Coleraine Dr.	BH24-13	Silty Clay Till	250	325	1.5	230.6
	BH24-14	Silty Clay Till	250	325	1.7	230.6
	BH24-18	Silty Clay Till	250	325	1.1	230.8
	BH24-19	Silty Clay Till	250	325	1.7	229.9

5.2 Footings Founded on Engineered Fill

Alternatively, the proposed building can be supported by spread and strip footings founded on engineered fill for a bearing capacity of 150 kPa at the Serviceability Limit States (SLS) and for a factored geotechnical resistance of 225 kPa at the Ultimate Limit States (ULS), provided all requirements in Section 4 and on Appendix **A** are adhered to.

5.3 Other Comments on Foundations

Foundations designed to the specified bearing capacity at the serviceability limit states (SLS) are expected to settle less than 25 mm total and 19 mm differential.

All footings exposed to seasonal freezing conditions must have at least 1.4 metres of soil cover for frost protection.

Where it is necessary to place footings at different levels, the upper footing must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

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

6. FLOOR SLAB AND PERMANENT DRAINAGE

The floor slab can be supported on grade provided all existing fill material, and surficially softened native soils are removed and the base thoroughly proof rolled. The fill required to raise the grade can consist of inorganic soil, placed in shallow lifts and compacted to 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

If engineered fill is used to support the foundations, the floor slab can also be supported by engineered fill.

A moisture barrier consisting of at least 200 mm of 19 mm clear crushed stone should be installed under the floor slab.

If the floor slab is more than 300 mm higher than the exterior grade, then perimeter drainage is not considered to be necessary. If the floor is lower, then the perimeter drainage system shown on **Drawing 28** is recommended.

7. EARTH PRESSURES

The lateral earth pressures acting on basement walls may be calculated from the following expression:

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

where p = Lateral earth pressure in kPa acting at depth h

K = Earth pressure coefficient equal to 0.40 for vertical walls and horizontal backfill used for permanent construction. Water pressure must be considered, if continuous wall drains are not used.

γ = Unit weight of backfill, a value of 21.0 kN/m^3 may be assumed

h = Depth to point of interest in metres

q = Equivalent value of surcharge on the ground surface in kPa

The above expression assumes that the perimeter drainage system prevents the buildup of any hydrostatic pressure behind the wall.

8. EXCAVATION AND GROUNDWATER CONTROL

Excavations can be carried out with hydraulic backhoe. No major problems with groundwater are anticipated for excavation for foundations to a depth of about 3.5m below the existing grade. It is expected that any seepage, which occurs during wet periods or perched water in fill materials can be removed by pumping from sumps. Any deep excavation (if any) in the sandy silt to silty sand deposits below the groundwater table will require positive dewatering.

It should be noted that the till is a non-sorted sediment and therefore may contain boulders. Possible large obstructions such as buried concrete pieces are also anticipated in the fill material. Provisions must be made in the excavation contract for the removal of possible boulders in the till or obstructions in the fill material.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill materials can be classified as Type 3 Soil above the groundwater table and as Type 4 Soil below the groundwater table or in perched water condition. Stiff to hard silty clay till can be classified as Type 2 Soil above the groundwater table and Type 3 Soil below the groundwater table. Cohesionless sandy soils (sandy silt to silty sand) can be classified as Type 3 Soil above the groundwater table and Type 4 Soil below the groundwater table.

Based on the borehole information, the native soils free from topsoil/organics can be re-used as backfill material, provided their moisture contents are within two percent (2%) of optimum moisture content. Loose lifts of soil, which are to be compacted, should not exceed 200 mm.

Imported granular fill, which can be compacted with handheld equipment, should be used in confined areas.

The excavated soils are not considered to be free draining. Where free draining backfill is required, imported granular fill such as OPSS Granular B should be used.

9. EARTHQUAKE CONSIDERATIONS

Based on the existing borehole information and according to Table 4.1.8.4.A of OBC 2012, the subject site for the proposed building can be classified as "Class D" for seismic site response. It may be possible to classify the site as "Class C", provided the field shear wave velocity testing is completed to confirm the site classification as "Class C", when the design finished floor elevations are available.

10. PAVEMENTS

It is understood that the addressed properties at Coleraine Drive will require a new paved light duty parking lot, access driveways and majority of the area for parking of truck trailers.

The subgrade soils are expected to consist of fill materials consisting silty clay extending to depths of 1.0 to 2.3m. Below the fill materials, upper native soils consisting of silty clay till deposits were encountered in all the boreholes. The subgrade soils are slight to severely susceptible to frost action. The recommended resilient modulus M_R for this type of material would range from 20 to 25 MPa for fair subgrade conditions.

10.1 Pavement Design

In order to determine the pavement structure for the new construction, the following pavement design methodologies and data were used:

- American Association of State and Highway Transportation Officials (AASHTO) Guide for Design of Pavement Structure, 1993 (AASHTO 1993);
- MTO MI-183 Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions.
- Development Standards Manual 2019 – Town of Caledon

In the absence of actual traffic data for the proposed development, an average annual daily traffic of 100 vehicles per day consisting of cars and delivery vehicles and 250 vehicles per day for the tractor trailers using the access road and parking areas has been assumed. A functional design life

of fifteen years has been used to establish the pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. If required, a more refined pavement structure design can be performed based on specific traffic data and design life requirements and will involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils, as well as specific data input from the client.

10.2 Pavement Structure Recommendations

Using the appropriate AASHTO parameters and the traffic loading over a period of 15-year service life in terms of Equivalent Single Axle Loads (ESALs), the 1993 AASHTO Pavement Design requires the following pavement structures as provided in **Table 3** for the various pavement types to meet the structural requirements. The recommended pavement structures are based upon an estimate of the subgrade soil properties determined from visual examination and textural classification of the soil samples, frost depth considerations, as well as assumed traffic based on the use of the facility by heavy commercial vehicles (tractor trailers).

Table 3: Pavement Structure Recommendations

Pavement Layers	Thickness (mm)	
	Light Duty Parking Areas (Cars and Vans)	Truck Access Lanes/Fire Route/Heavy Duty Parking
Asphalt Concrete* HL-3 (for light duty areas) HL-3 HS (for heavy duty parking and access lanes)	40	40
Asphalt Concrete* HL-8 (for light duty areas) HDBC (for heavy duty parking and access lanes)	60	110 (in 2 lifts of 55 mm each)
OPSS Granular A or 20mm Crusher Run Limestone Base	150	150
OPSS Granular B Type II or 50mm Crusher Run Limestone Subbase	300	450
Geogrid (Tensar NX750 or similar), if required		Over prepared subgrade after proof roll and inspection and according to manufacturer's guidelines for placement

* To reduce the type of mixes, HL-3 can be replaced with HL-3 HS and HL-8 with HDBC for light-duty parking areas.

The following additional recommendations are to be applied:

- Asphalt Concrete shall be compacted to 92.0% to 96.5% of Maximum Relative Density (MRD).
- The HL-3 and HL-3 HS hot-mix asphalt surface course and HL-8 and HDBC (High Density Base Course) hot-mix asphalt base course should be produced and constructed in accordance with OPSS 1150 and 310 requirements.
- Tack coat is to be applied between various asphalt concrete lifts.
- Granular Base and Subbase material shall be compacted to 100% Standard Proctor Maximum Dry Density (SPMDD). Gradation requirements will follow relevant OPS specifications.
- PGAC 58-28 asphalt grade is recommended for asphalt surface and base course mixes for the light duty parking areas whereas PGAC 64-28 grade asphalt is recommended for the asphalt surface course and base course mixes for the truck access lanes and tractor-trailer parking areas.
- Aramid fibers (optional) can be used in both mixes to reduce rutting and cracking.
- The subgrade must be compacted to 98% SPMDD for at least the upper 300 mm unless accepted by DS Consultants Ltd.
- To minimize problems of differential movement between the pavement and catch basins/manholes due to frost action, the backfill around the catch basin structures should consist of free draining granular.

10.3 Miscellaneous Considerations

Additional considerations on the construction of parking areas and access roadways are as follows:

- The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. As part of the subgrade preparation, proposed parking areas and access roadways should be stripped of topsoil and other obvious objectionable material. Fill required to raise the grades to design elevations should conform to backfill requirements outlined in previous sections of this report. The subgrade should be properly shaped, crowned then proof-rolled in the full-time presence of a representative of this office. Soft or spongy subgrade areas should be sub-excavated and properly replaced with suitable approved backfill compacted to 98% SPMDD and/or the use of geogrids if the areas are large.

- Surface water should not be allowed to pond adjacent to the outside edges or in central pavement areas. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage toward catch basins.
- In addition, subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening. This is particularly important in heavy-duty pavement areas. The locations and extent of sub-drainage required within the paved areas should be reviewed by this office in conjunction with the proposed lot grading. Assuming that satisfactory crossfalls in the order of two percent have been provided, subdrains extending from and between catch basins may be satisfactory. The subdrains are to be provided as per Type B of Town of Caledon Standard No. 218.
- The most severe loading conditions on light-duty pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted access lanes, half-loads during paving, etc., may be required, especially if construction is carried out during unfavorable weather.
- It is recommended that DS Consultants Ltd. be retained to review the final pavement structure designs and drainage plans prior to construction to ensure that they are consistent with the recommendations of this report.

11. UNDERGROUND SERVICES

Excavations for the installation of services may be carried out to a greater depth. No major problems with groundwater are anticipated for the installation of services up to a depth of ±3.5m. Positive dewatering and/or depressurization of cohesionless sandy soils will be required prior to excavation deeper than 3.5m, otherwise it will result in an unstable base and flowing sides.

Section 8 of the report provides additional comments on excavation, dewatering and groundwater control.

Class B bedding should be suitable to support the pipes. The minimum bedding thickness should be 150mm, but this should be increased to 200mm where the subgrade is wet or dilatant. Should fill be encountered below the invert level, it should be removed and replaced with compacted suitable granular material.

The bedding material should conform to Town of Caledon bedding stone gradation requirements. Where the bedding falls below the anticipated water table, the bedding stone must be surrounded with a geotextile filter cloth.

Based on the borehole information, the native soils free from topsoil/organics can be re-used as backfill material, provided their moisture contents are within two percent (2%) of optimum moisture content. Loose lifts of soil, which are to be compacted, should not exceed 200 mm.

Granular B material should be used as backfill for trenches located under slab on grade or paved areas. Compaction of the granular soils should be carried out with vibratory compactors and loose lifts not exceeding about 200 mm.

Trench backfill should be compacted to at least 95 percent (SPMDD) to 1m below the top of the subgrade. In the upper 1m of the subgrade, the degree of compaction should be increased 98 percent (SPMDD).

12. GENERAL COMMENTS AND LIMITATIONS OF REPORT

DS Consultants Ltd. (DS) should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, DS will assume no responsibility for interpretation of the recommendations in the report. The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to DS at the time of preparation. Unless otherwise agreed in writing by DS, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the

subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

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. DS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

DS CONSULTANTS LTD.

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Drawings

J:\2024 Projects\24-317-100 Geo - Truck maintenance facilities, 12125-12155 Coleraine Drive, Bolton, ON\Geotechnical\QGIS\1-QGIS\Drawing 1 Borehole Location Plan.qgs Sep-03

Legend

- Approx Site Boundary
- Borehole
- Monitoring Well

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Client: WHEELWRIGHT GROUP INC.

Project: GEOTECHNICAL INVESTIGATION
12071-12155 Coleraine Drive, Bolton, ON

Title: **BOREHOLE LOCATION PLAN**

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Size:	Approved By:	Drawn By:	Date:
8.5 x 11	A.S	K.T	September 2024
Rev: 0	Scale: As Shown	Project No.: 24-317-100	Drawing No.: 1

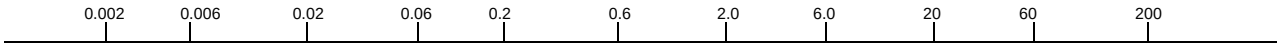
Image/Map Source: *Google Satellite Image*

Drawing 1A: Notes On Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by DS also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH24-1

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855197.844 E 603733.243

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/20/2024

REF. NO.: 24-317-100
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
233.5												
0.0 / 232.6	**FILL:** recycled asphalt, dark grey, moist, very dense		1	SS	40		233		○			
0.9 / 232.0	**FILL:** silty clay, trace gravel, brown, moist, firm		2	SS	7				○			
1.5	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff		3	SS	21		232		○			Wet Spoon
			4	SS	25	▽	231		○——○			2 17 48 34
			5	SS	27	W. L. 230.8 m Aug 30, 2024	230		○			
	brownish grey at 4.6m		6	SS	25		229		○			
	grey below 6.1m		7	SS	28		228		○			
226.2							227					
7.3 / 225.6	**SANDY SILT:** trace clay, trace gravel, grey, wet, very dense		8	SS	50/ 20mm		226		○			
7.9	**END OF BOREHOLE**											

Notes:
1) 50mm dia. monitoring well (MW) was installed upon completion.
2) Water level Readings:

Date:	W.L. Depth (mbgs):
August 30, 2024	2.7

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH24-2

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855284.611 E 603818.133

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/19/2024

REF. NO.: 24-317-100
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
233.5												
0.0	**FILL:** recycled asphalt, dark grey, moist to wet, compact to very dense		1	SS	71		233		○			
232.5												
1.0	**FILL:** silty clay, trace asphalt pieces, trace gravel, brown, moist, very stiff		2	SS	16				○			
232.0							232					
1.5	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff to hard		3	SS	21				○			
230.6			4	SS	32		231		○			
2.9	**END OF BOREHOLE:**											

Notes:
1) Water encountered at 0.9m during drilling.

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-3

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855207.526 E 603759.57

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/19/2024

REF. NO.: 24-317-100
ENCL NO.: 4

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
233.5 / 0.0	**ASPHALT:** 130mm											
233.4 / 0.1	**GRANULAR BASE:** crusher run limestone, 180mm		1	SS	74		233					
233.2 / 0.3	**GRANULAR SUBBASE:** sand and gravel, 700mm											
232.5 / 1.0	**FILL:** silty clay, some organics, trace sand, trace gravel, greyish brown to grey, moist, firm to stiff		2	SS	7		232					
			3	SS	8							
231.2 / 2.3	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, stiff to hard		4	SS	11		231					
			5	SS	33		230					
			6	SS	25		229					
							228					
226.8 / 6.7	**END OF BOREHOLE:** Notes: 1) Borehole wet at bottom upon completion.		7	SS	20		227					

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

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LOG OF BOREHOLE BH24-4

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855155.529 E 603763.863

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/19/2024

REF. NO.: 24-317-100
ENCL NO.: 5

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH (kPa)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
232.9												
232.7 0.0	**ASPHALT:** 230mm											
232.4 0.2	**GRANULAR BASE:** sand and gravel, 250mm		1	SS	20							
231.9 0.5	**FILL:** silty clay, trace sand, brown, moist, stiff to very stiff		2	SS	14		232					
1.0	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, stiff to hard		3	SS	23		231					
2			4	SS	25							1 15 47 37
3			5	SS	40		230					
4							229					
5	grey below 4.6m		6	SS	26		228					
6							227					
7			7	SS	28							
8 224.7							226					
8.2	**END OF BOREHOLE:** Notes: 1) Borehole dry upon completion.		8	SS	49		225					

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-5

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855168.143 E 603793.362

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/19/2024

REF. NO.: 24-317-100
ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
232.8							
0.0	**FILL:** recycled asphalt, dark grey, moist, dense		1	SS	43		
232.0							
0.8	**FILL:** sand and gravel mixed with brick pieces, dark brown, moist, loose		2	SS	9		232
231.6							
1.2	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, stiff to hard		3	SS	20		231
			4	SS	30		230
			5	SS	42		229
	greyish brown at 4.6m		6	SS	26		228
	grey below 6.1m		7	SS	13		227
226.1							
6.7	**END OF BOREHOLE:** Notes: 1) Borehole wet at bottom upon completion.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

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LOG OF BOREHOLE BH24-6

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855278.06 E 603845.93

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/20/2024

REF. NO.: 24-317-100
ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
233.0												
0.0 / 232.2	**FILL:** recycled asphalt, dark grey, moist, very dense		1	SS	71				○			
232.0 / 1.0	**FILL:** silty clay, trace sand, trace gravel, dark brown, moist, stiff		2	SS	12		232			○		
	SILTY CLAY TILL: some sand, occasional cobble / boulder, trace gravel, brown, moist, stiff to very stiff		3	SS	12		231			○		
230.1			4	SS	16					○		
2.9	**END OF BOREHOLE:** Notes: 1) Borehole dry upon compleion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

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LOG OF BOREHOLE BH24-7

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855355.972 E 603912.927

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/19/2024

REF. NO.: 24-317-100
ENCL NO.: 8

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
232.2												
0.0	**FILL:** recycled asphalt, dark grey, moist to wet, very dense		1	SS	85		232					
231.4												
1 0.8	**FILL:** silty clay, some organics, trace sand, trace gravel, dark brown to grey, moist, stiff		2	SS	10							
230.7							231					
1.5	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff to hard		3	SS	28							
2							230					
229.3			4	SS	44							
2.9	**END OF BOREHOLE:**											

Notes:
1) Water encountered at 0.6m during drilling.

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-8

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855486.897 E 603999.233

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/20/2024

REF. NO.: 24-317-100
ENCL NO.: 9

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
232.7							
0.0	**FILL:** recycled asphalt, dark grey, moist, very dense		1	SS	65		
231.9							232
0.8	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff to hard		2	SS	15		
			3	SS	18		231
			4	SS	18		230
			5	SS	37		229
	brownish grey at 4.6m		6	SS	23	W. L. 228.4 m Aug 30, 2024	228
	grey, sand seams below 6.1m		7	SS	15		227
225.4							226
7.3	**SILTY SAND:** trace clay, trace gravel, brown, wet, dense		8	SS	31		225
224.5							
8.2	**END OF BOREHOLE**						

Notes:
1) 50mm dia. monitoring well (MW) was installed upon completion.
2) Water level Readings:

Date:	W.L. Depth (mbgs):
August 30, 2024	4.3

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-9

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855501.415 E 604012.554

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/20/2024

REF. NO.: 24-317-100
ENCL NO.: 10

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
232.7							
0.0 / 231.9	**FILL:** recycled asphalt mixed with wood pieces, dark grey, moist, very dense		1	SS	57		232
0.8 / 231.5	**FILL:** silty clay, trace sand, trace gravel, brown, moist, stiff		2	SS	10		
1.2	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, stiff to hard		3	SS	16		231
			4	SS	33		230
			5	SS	31		229
			6	SS	28		228
	grey below 6.1m		7	SS	26		227
226.0							
6.7	**END OF BOREHOLE:** Notes: 1) Borehole dry upon completion.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

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LOG OF BOREHOLE BH24-10

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855553.051 E 604023.341

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/19/2024

REF. NO.: 24-317-100
ENCL NO.: 11

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
233.8											
0.0 / 233.5	**FILL:** recycled asphalt, dark grey, moist, compact		1	SS	28						
0.3	**FILL:** silty clay, trace brick pieces, trace organics, trace gravel, brown, moist, stiff to very stiff		2	SS	8		233				
1 / 232.3											
1.5	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff to hard		3	SS	20		232				
2			4	SS	34		231				4 20 46 30
230.9 / 2.9	**END OF BOREHOLE:**										

Notes:
1) Borehole dry upon completion.

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-11

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855606.307 E 604081.402

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/19/2024

REF. NO.: 24-317-100
ENCL NO.: 12

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
233.6												
0.0 / 232.7	**FILL:** recycled asphalt, dark grey, moist, compact to very dense		1	SS	52		233	○	○			
0.9 / 232.1	**FILL:** silty clay, trace sand, trace gravel, brown, moist, very stiff		2	SS	18			○	○			
1.5 / 230.7	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff to hard		3	SS	27		232	○	○			
			4	SS	35		231	○	○			
2.9	**END OF BOREHOLE:**											

Notes:
1) Borehole dry upon completion.

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-12

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855641.424 E 604121.088

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/19/2024

REF. NO.: 24-317-100
ENCL NO.: 13

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
233.5												
0.0	**FILL:** recycled asphalt, dark grey, moist to wet, compact to very dense		1	SS	57		233		○			
1 232.3			2	SS	15				○			
1.2	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff to hard		3	SS	25		232		○			
2 230.6			4	SS	42		231		○			
2.9	**END OF BOREHOLE:** Notes: 1) Water level at 2.4m upon completion of drilling.											

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-13

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855038.861 E 603854.601

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/20/2024

REF. NO.: 24-317-100
ENCL NO.: 14

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
232.1												
0.0 / 231.3	**FILL:** recycled asphalt, dark grey, moist, dense		1	SS	33		232					
0.8 / 226.3	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, stiff to very stiff		2	SS	14		231					
			3	SS	27	▽ W. L. 230.3 m Aug 30, 2024						
			4	SS	21		229					
			5	SS	29		228					
			6	SS	14		227					
5.8 / 223.9	**SILTY SAND:** trace clay, trace gravel, brown, wet, dense		7	SS	47		226					
			8	SS	30		225					
8.2	**END OF BOREHOLE**						224					

Notes:
1) 50mm dia. monitoring well (MW) was installed upon completion.
2) Water level Readings:

Date:	W.L. Depth (mbgs):
August 30, 2024	1.8

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

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LOG OF BOREHOLE BH24-14

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855067.021 E 603881.815

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/20/2024

REF. NO.: 24-317-100
ENCL NO.: 15

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
232.0							
0.0 / 231.2	**FILL:** recycled asphalt, dark grey, moist, very dense		1	SS	50		
0.8 / 230.5	**FILL:** silty clay mixed with organics, trace sand, dark brown, moist, stiff		2	SS	9		231
1.5	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff to hard		3	SS	17		230
			4	SS	17		229
			5	SS	34		228
	brownish grey at 4.6m		6	SS	25		227
225.9							226
6.1	**SILTY SAND:** trace clay, grey, wet, compact		7	SS	18		225
223.8			8	SS	23		224
8.2	**END OF BOREHOLE:** Notes: 1) Water encountered at 4.6m during drilling.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH24-15

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855123.5 E 603929.193

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/21/2024

REF. NO.: 24-317-100
ENCL NO.: 16

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
231.7												
0.0 / 230.9	**FILL:** recycled asphalt, dark grey, moist, very dense		1	SS	61		231		○			
0.8 / 230.2	**FILL:** silty clay mixed with organics, trace sand, trace gravel, dark brown to brown, moist, firm		2	SS	6				○			
1.5	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff		3	SS	19		230		○			
228.8			4	SS	22		229		○			
2.9	**END OF BOREHOLE:** Notes: 1) Borehole dry upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

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LOG OF BOREHOLE BH24-16

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855178.888 E 603979.04

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/21/2024

REF. NO.: 24-317-100
ENCL NO.: 17

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
232.2												
0.0 / 231.4	**FILL:** recycled asphalt, dark grey, moist, very dense		1	SS	63		232		○			
0.8 / 230.7	**FILL:** silty clay mixed with organics, trace gravel, greyish brown, moist, stiff		2	SS	11		231		○			
1.5 / 229.3	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff		3	SS	15		230		○			
			4	SS	22				○			
2.9	**END OF BOREHOLE:** Notes: 1) Borehole dry upon completion.											

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-17

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855271.069 E 604052.446

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/21/2024

REF. NO.: 24-317-100
ENCL NO.: 18

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
231.4												
0.0 / 230.9	**FILL:** recycled asphalt, dark grey, moist, dense		1	SS	31		231					
0.5 / 230.4	**FILL:** silty clay mixed with organics, trace sand, trace gravel, dark brown, moist, stiff to hard											
1.0	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, stiff to very stiff		2	SS	11							
			3	SS	24		230					
228.5			4	SS	23		229					
2.9	**END OF BOREHOLE:** Notes: 1) Borehole dry upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BH24-18

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855000.737 E 603893.212

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/21/2024

REF. NO.: 24-317-100
ENCL NO.: 19

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
231.9												
0.0	**FILL:** recycled asphalt, dark grey, moist, compact		1	SS	27							
231.1												
1 0.8	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff to hard		2	SS	21		231					
			3	SS	22		230					3 17 48 32
2			4	SS	37		229					
3			5	SS	35		228					
4	grey below 4.6m		6	SS	27		227					
5							226					
6	wet, silt interbeds at 6.1m		7	SS	61		225					
7 224.6												
7.3	**SANDY SILT:** trace clay, grey, wet, compact		8	SS	29		224					
8 223.7												
8.2	**END OF BOREHOLE:** Notes: 1) Water encountered at 6.1m during drilling.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

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LOG OF BOREHOLE BH24-19

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855034.236 E 603932.821

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/21/2024

REF. NO.: 24-317-100
ENCL NO.: 20

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
231.6												
0.0 / 230.8	**FILL:** recycled asphalt, dark grey, moist, dense		1	SS	41		231					
0.8 / 230.1	**FILL:** silty clay mixed with organics, trace asphalt pieces, trace sand, trace gravel, grey to dark grey, moist, firm		2	SS	7							
1.5	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff to hard		3	SS	19		230					
			4	SS	30		229					
			5	SS	40		228					
	grey below 4.6m		6	SS	15		227					
225.8							226					
5.8	**SILTY SAND:** trace clay, grey, wet, compact		7	SS	26		225					
223.4			8	SS	19		224					
8.2	**END OF BOREHOLE:** Notes: 1) Water encountered at 4.6m during drilling.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

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LOG OF BOREHOLE BH24-20

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855059.846 E 604007.706

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/21/2024

REF. NO.: 24-317-100
ENCL NO.: 21

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
231.0												
0.0	**FILL:** recycled asphalt, dark grey, moist, dense		1	SS	44							
230.2												
1 0.8	**FILL:** silty clay mixed with organics, trace sand, trace gravel, brown, very moist, firm		2	SS	7		230					
229.5												
1.5	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff		3	SS	22		229					
2												
228.1			4	SS	24							
2.9	**END OF BOREHOLE:** Notes: 1) Borehole dry upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

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Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

LOG OF BOREHOLE BH24-21

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855116.193 E 604059.261

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/21/2024

REF. NO.: 24-317-100
ENCL NO.: 22

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
231.2												
0.0 / 230.5	**FILL:** recycled asphalt, dark grey, moist, dense		1	SS	30		231					
0.7 / 229.7	**FILL:** silty clay, some organics, trace gravel, grey, moist, stiff		2	SS	10		230					
1.5 / 228.3	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff to hard		3	SS	22		229					2 19 49 31
			4	SS	31							
2.9	**END OF BOREHOLE:** Notes: 1) Borehole dry upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG-2021-FINAL 24-317-100 GEO.GPJ DS.GDT 9/10/24

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LOG OF BOREHOLE BH24-22

PROJECT: Geotechnical Investigation
CLIENT: Wheelwright Group Inc.
PROJECT LOCATION: 12071-12155 Coleraine Drive, Bolton, ON
DATUM: Geodetic
BH LOCATION: See Drawing 1 N 4855206.977 E 604117.812

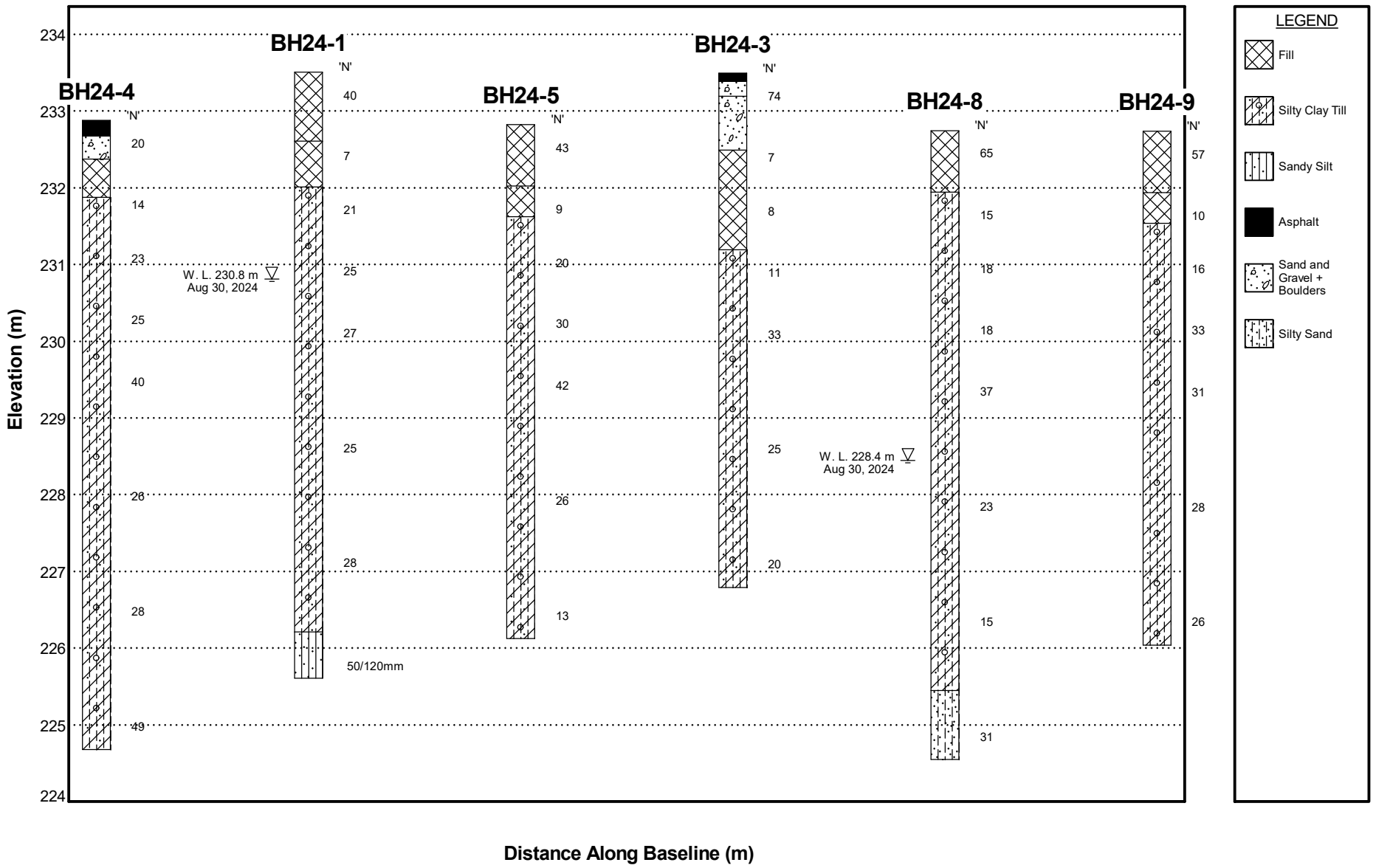
DRILLING DATA
Method: Solid Stem Auger
Diameter: 150mm
Date: Aug/21/2024

REF. NO.: 24-317-100
ENCL NO.: 23

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
231.3												
0.0	**FILL:** recycled asphalt, dark grey, moist to wet, compact to very dense		1	SS	53		231					
1			2	SS	19							
229.8							230					
1.5	**FILL:** silty clay mixed with organics, trace gravel, dark grey, moist, firm		3	SS	7							
2												
229.0							229					
2.3	**SILTY CLAY TILL:** some sand, occasional cobble / boulder, trace gravel, brown, moist, very stiff to hard		4	SS	19							
3												
227.6			5	SS	41		228					
3.7	**END OF BOREHOLE:** Notes: 1) Borehole dry upon completion.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure



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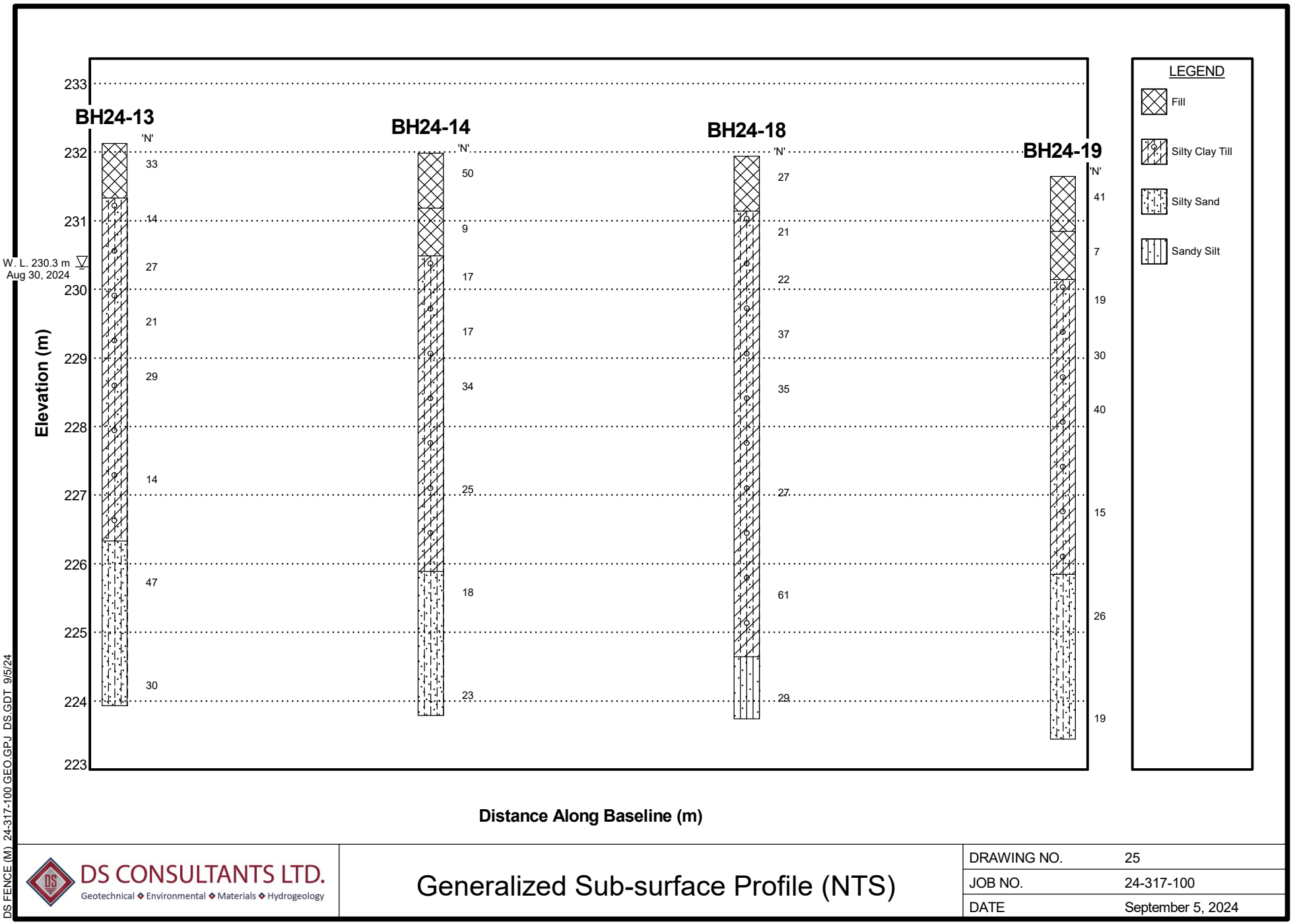
Generalized Sub-surface Profile (NTS)

DRAWING NO.	24
JOB NO.	24-317-100
DATE	September 5, 2024

DS FENCE (M) 24-317-100 GEO.GPJ DS.GDT 9/5/24



DS FENCE (M) 24-317-100 GEO.GPJ DS.GDT 9/5/24

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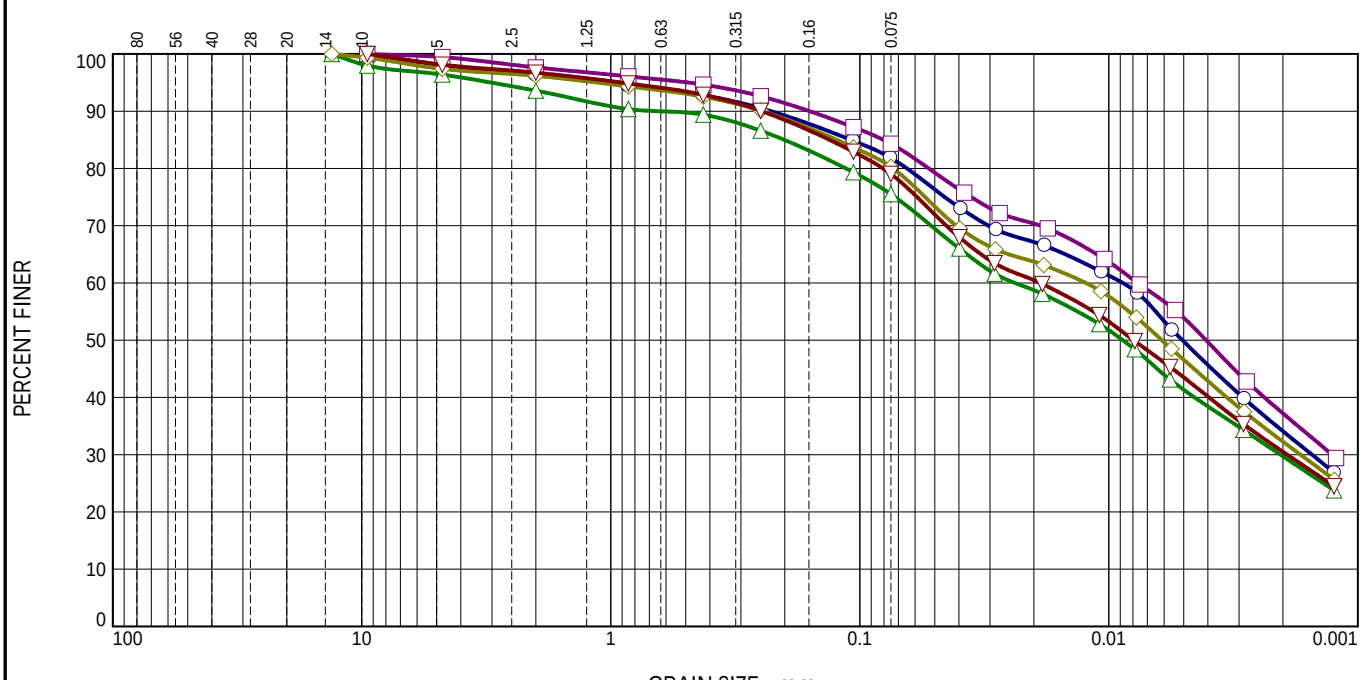
Generalized Sub-surface Profile (NTS)

DRAWING NO.	25
JOB NO.	24-317-100
DATE	September 5, 2024

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.9	1.8	3.5	11.0	47.7	34.1
□	0.0	0.0	0.5	1.9	3.0	10.3	47.1	37.2
△	0.0	0.0	3.6	2.8	4.2	13.9	45.8	29.7
◇	0.0	0.0	2.6	1.2	3.7	12.2	48.0	32.3
▽	0.0	0.0	1.9	1.4	3.8	13.9	48.5	30.5

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	33	14	0.1086	0.0088	0.0051	0.0015				
□	35	15	0.0803	0.0077	0.0041	0.0013				
△	33	14	0.2013	0.0238	0.0088	0.0020				
◇	33	15	0.1237	0.0124	0.0061	0.0017				
▽	33	14	0.1323	0.0189	0.0080	0.0019				

	Material Description	USCS	AASHTO
○	Silty clay till, some sand, trace gravel	CL	A-6(14)
□	Silty clay till, some sand, trace gravel	CL	A-6(15)
△	Silty clay till, sandy, trace gravel	CL	A-6(12)
◇	Silty clay till, some sand, trace gravel	CL	A-6(13)
▽	Silty clay till, some sand, trace gravel	CL	A-6(13)

Project No. 24-317-100 Client: Wheelwright Group Inc

Project: 12125-12155 Coleraine Drive, Bolton, ON

○ Location: BH24-1 SS4 Sample Number: VM-5840

□ Location: BH24-4 SS4 Sample Number: VM-5840

△ Location: BH24-10 SS4 Sample Number: VM-5840

◇ Location: BH24-18 SS3 Sample Number: VM-5840

▽ Location: BH24-21 SS3 Sample Number: VM-5840

Remarks:

○ F.M.=0.38

□ F.M.=0.27

△ F.M.=0.60

◇ F.M.=0.41

▽ F.M.=0.38

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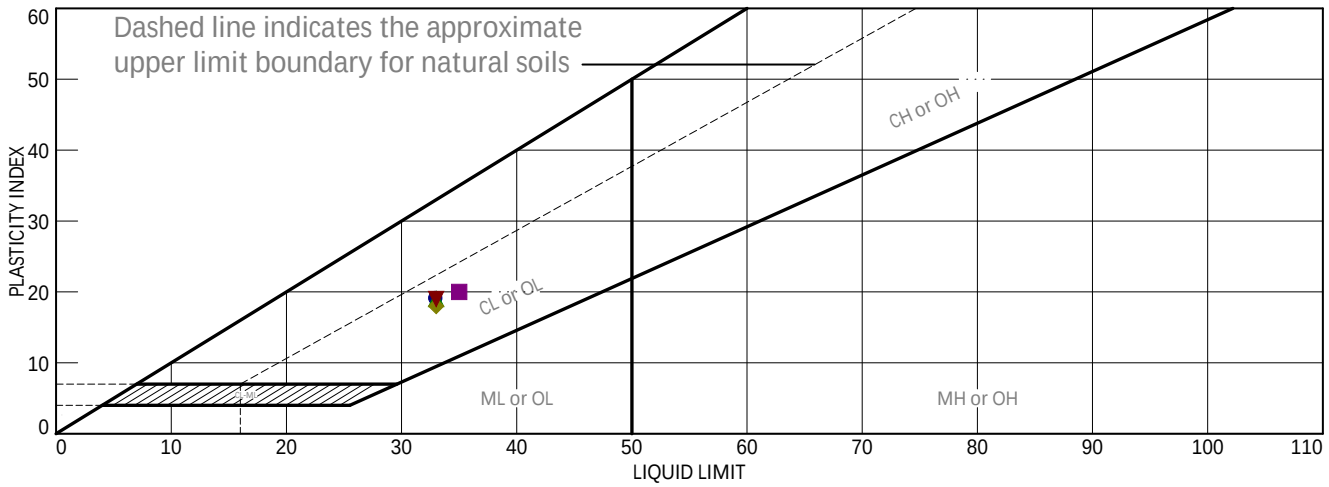
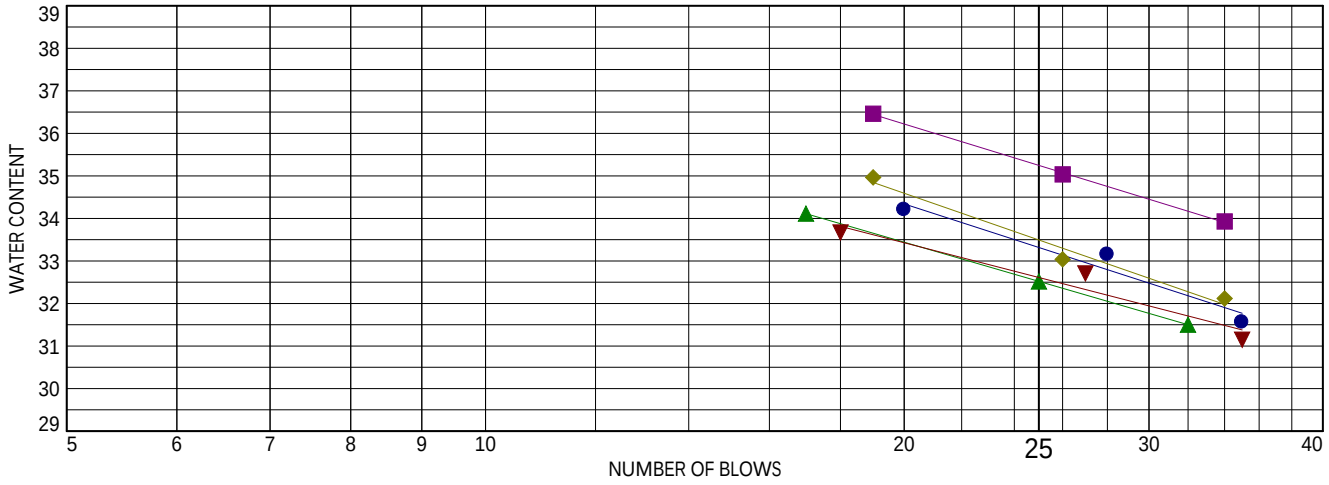
CCIL

Figure : **26**

Tested By: Helen/Nisha Checked By: Kirupa

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty clay till, some sand, trace gravel	33	14	19	92.8	81.8	CL
■	Silty clay till, some sand, trace gravel	35	15	20	94.6	84.3	CL
▲	Silty clay till, sandy, trace gravel	33	14	19	89.4	75.5	CL
◆	Silty clay till, some sand, trace gravel	33	15	18	92.5	80.3	CL
▼	Silty clay till, some sand, trace gravel	33	14	19	92.9	79.0	CL

Project No. 24-317-100 Client: Wheelwright Group Inc

Project: 12125-12155 Coleraine Drive, Bolton, ON

● Location: BH24-1 SS4 Sample Number: VM-5840

■ Location: BH24-4 SS4 Sample Number: VM-5840

▲ Location: BH24-10 SS4 Sample Number: VM-5840

◆ Location: BH24-18 SS3 Sample Number: VM-5840

▼ Location: BH24-21 SS3 Sample Number: VM-5840

DS CONSULTANTS LTD.

Geotechnical ❖ Environmental ❖ Materials ❖ Hydrogeology

CCIL

Remarks:

● Sampled on August 20, 2024

■ Sampled on August 19, 2024

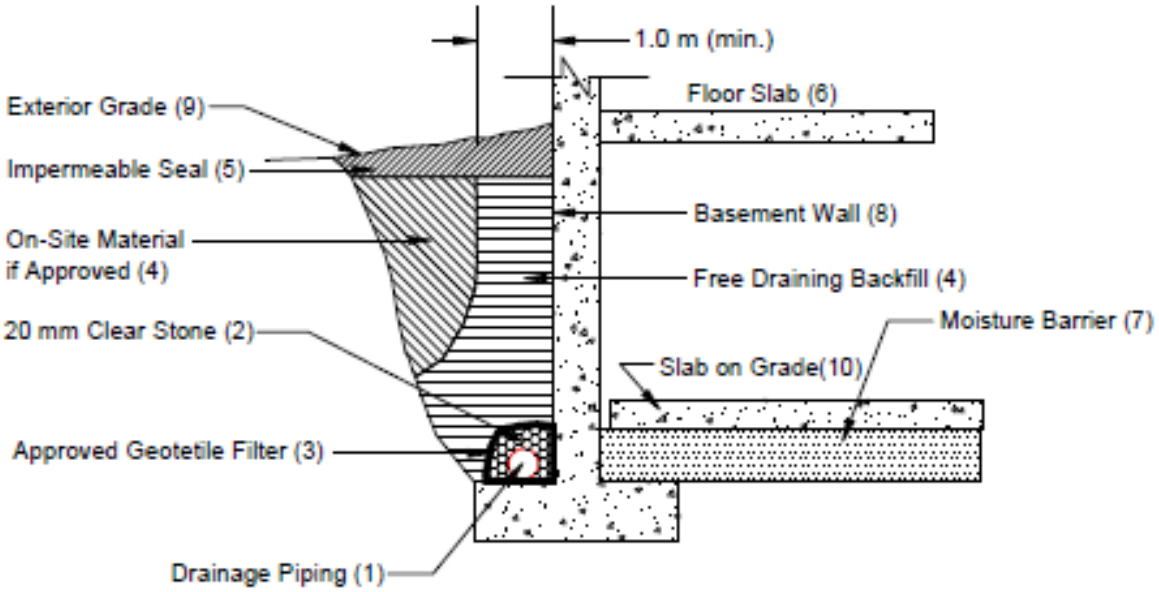
▲ Sampled on August 19, 2024

◆ Sampled on August 21, 2024

▼ Sampled on August 21, 2024

Figure:27

Tested By: Nisha Checked By: Kirupa



EXTERIOR FOOTING

Notes

1. Drainage piping to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved geotextile filter fabric (Terrafix 270R or equivalent).
4. Free Draining backfill - OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm (18") of the wall. Use hand controlled light compaction equipment within 1.8 m (6') of wall. The minimum width of the Granular 'B' backfill must be 1.0 m.
5. Impermeable backfill seal - compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted. Maximum thickness of seal to be 0.5 m.
6. Do not backfill until wall is supported by basement floor slabs or adequate bracing.
7. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
8. Basement wall to be damp proofed /water proofedas per OBC requirements.
9. Exterior grade to slope away from building min 2%.
10. Slab on grade should not be structurally connected to the wall or footing.
11. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
12. Drainage piping placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
13. The entire subgrade to be covered with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
14. Do not connect the underfloor drains to perimeter drains.
15. Review the geotechnical report for specific details.

DRAINAGE AND BACKFILL RECOMMENDATIONS - DAMP - PROOFING

(not to scale)

Appendix A
Engineered Fill Guidelines

GENERAL REQUIREMENTS FOR ENGINEERED FILL

Compacted imported soil that meets specific engineering requirements and is free of organics and debris and that has been continually monitored on a full-time basis by a qualified geotechnical representative is classified as engineered fill. Engineered fill that meets these requirements and is bearing on suitable native subsoil can be used for the support of foundations.

Imported soil used as engineered fill can be removed from other portions of a site or can be brought in from other sites. In general, most of Ontario soils are too wet to achieve the 100% Standard Proctor Maximum Dry Density (SPMDD) and will require drying and careful site management if they are to be considered for engineered fill. Imported non-cohesive granular soil is preferred for all engineered fill. For engineered fill, we recommend use of OPSS Granular 'B' sand and gravel fill material.

Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

The location of the foundations on the engineered fill pad is critical and certification by a qualified surveyor that the foundations are within the stipulated boundaries is mandatory. Since layout stakes are often damaged or removed during fill placement, offset stakes must be installed and maintained by the surveyors during the course of fill placement so that the contractor and engineering staff are continually aware of where the engineered fill limits lie. Excavations within the engineered fill pad must be backfilled with the same conditions and quality control as the original pad.

To perform satisfactorily, engineered fill requires the cooperation of the designers, engineers, contractors and all parties must be aware of the requirements. The minimum requirements are as follows; however, the geotechnical report must be reviewed for specific information and requirements.

1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained from and samples must be provided to the geotechnical engineer for review, and approval before filling begins.

2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.

3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and DS Consultants Ltd (DSCL). Without this confirmation no responsibility for the performance of the structure can be accepted by DSCL. Survey drawing of the pre and post fill location and elevations will also be required.

4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by a DSCL engineer prior to placement of fill.

5. The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months. Engineered fill compacted to 100% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur and should be evaluated prior to placing the fill.

6. Full-time geotechnical inspection by DSCL during placement of engineered fill is required. Work cannot commence or continue without the presence of the DSCL representative.

7. The fill must be placed such that the specified geometry is achieved. Refer to the attached sketches for minimum requirements. Take careful note that the projection of the compacted pad beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.

8. A bearing capacity of 150 kPa at SLS (225 kPa at ULS) can be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.

9. All excavations must be done in accordance with the Occupational Health and Safety Regulations of Ontario.

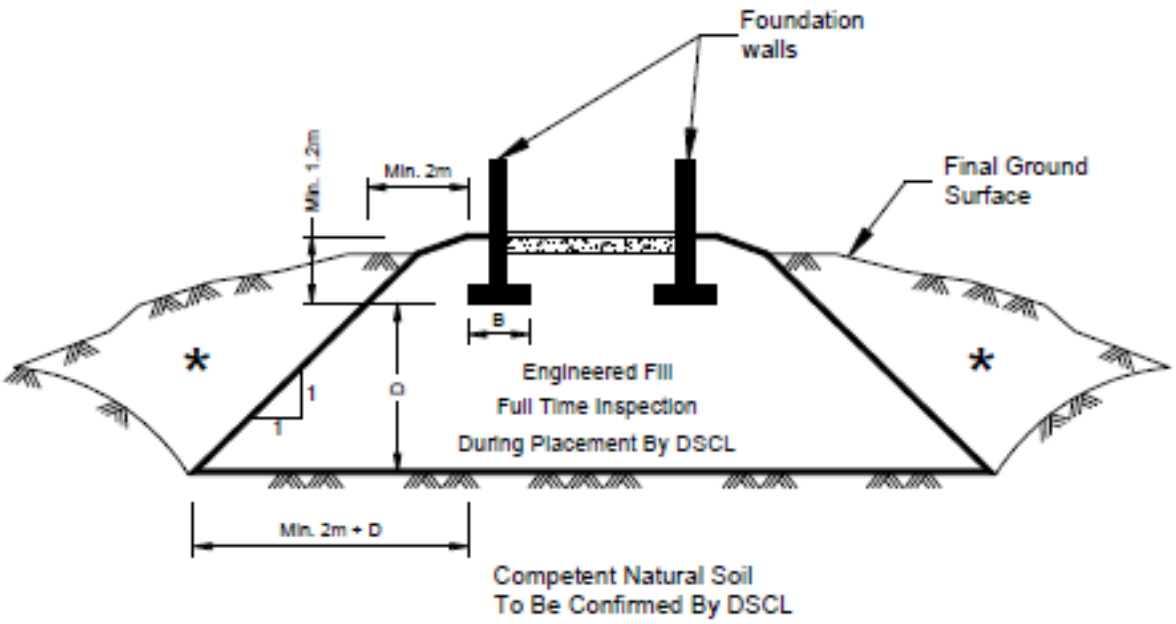
10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from DSCL prior to footing concrete placements. All excavations must be backfilled under full time supervision by DSCL to the same degree as the engineered fill pad. Surface water cannot be allowed to pond in excavations or to be trapped in clear stone backfill. Clear stone backfill can only be used with the approval of DSCL.

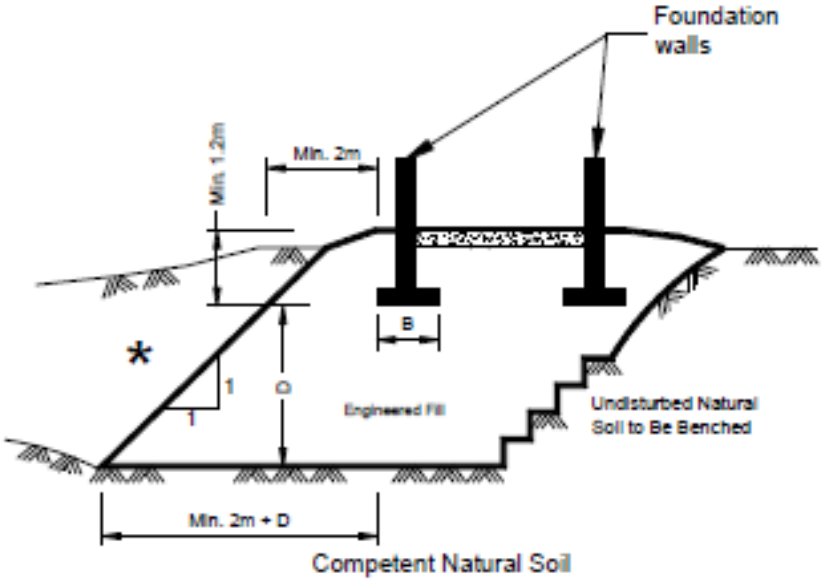
11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any stoppage in work in order to promote rapid runoff of rainwater and to avoid any ponding surface water. Any stockpiles of fill intended for use as engineered fill must also be smooth-bladed to promote runoff and/or protected from excessive moisture take up.

12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.

13. The geometry of the engineered fill as illustrated in these General Requirements is general in nature. Each project will have its own unique requirements. For example, if perimeter sidewalks are to be constructed around the building, then the projection of the engineered fill beyond the foundation wall may need to be greater.

14. These guidelines are to be read in conjunction with DS Consultants Ltd report attached.





* Backfill in this area to be as per the DSCL report.