RED

GEOTECHNICAL INVESTIGATION

PROPOSED CHICK-FIL-A RESTAURANT #30042; ORLEANS INNES RD FSU

4270 Innes Road, Orleans, Ontario

Project No. 0208-001.02

August 22, 2024

Prepared for:

Chick-fil-A Canada ULC

5200 Buffington Road
Atlanta, GA 30349

Attn: Austin Whitley

Prepared by:

BlueFrog
Environmental Consulting Inc.
Suite 100 - 208 Wyecroft Road
Oakville, ON L6K 3T8
bluefrogconsulting.ca

Table of Contents

Tables (within text)

Figures

Appendices

1.0 Introduction and Objectives

Chick-fil-A Canada ULC (Chick-fil-A) retained BlueFrog Environmental Consulting Inc. (BlueFrog) to complete a Geotechnical Investigation of the subject property located at 4270 Innes Road, Orleans, Ontario (hereinafter referred to as the Site). A site map is provided as **Figure 1**.

The purpose of the geotechnical investigation was to obtain information about the subsurface conditions at the Site and based on our interpretation of the data obtained, provide recommendations on the geotechnical aspects of the proposed development.

The subject work was performed in accordance with the *General Agreement for Professional Services* between BlueFrog Environmental Consulting Inc. and Chick-fil-A, dated November 18, 2022. This report has been prepared based on fieldwork and/or review of information conducted by BlueFrog and others, for the sole benefit and use by Chick-fil-A. In performing the work, BlueFrog has relied in good faith on information provided by others and has assumed that the information provided is both complete and accurate. The work was performed to current industry practice for similar geotechnical work, within the same regulatory jurisdiction. The findings presented herein should be considered in the context of the scope of work; further, the findings are considered valid only at the time the report was produced. The information presented herein shall not be construed as legal advice.

The conclusions, recommendations, and/or opinions presented in this report are based upon engineering and/or geoscience judgement and experience within the context of Chick-fil-A's objectives and the applicable guidelines, regulations, and legislation existing at the time the report was produced.

1.1 Background and Site Description

A Site plan is presented as **Figure 2**.

4270 Innes Road is a 6.44-hectare retail commercial property, developed circa 2005 from agricultural land, and occupied by Real Canadian Superstore on the southern portion and a Mobil retail fuel outlet on the northwest corner. The proposed Chick-fil-A Site is approximately 4400 m^2, located on the northeast portion and is currently utilized as asphalt parking surface for the adjacent retail commercial stores.

1.2 Proposed Development

Chick-fil-A is considering developing the northeast portion of 4270 Innes Road. The development is proposed to include the construction of a single-storey, slab-on-grade commercial restaurant building with a total area of 452.4 m^2 with a drive thru, outdoor dining area, garbage storage area and associated parking.

2.0 Scope of Work

The scope of the geotechnical work was to perform the following main activities:

- Obtain underground utility clearances prior to completing subsurface work.
- Advance eight boreholes on-Site to depths ranging from 2.1 metres below ground surface (mbgs) to the bottom of the clay deposit (found at 41.2 mbgs).
    - Sample the soils at regular depth intervals in the boreholes. Samples were collected with a split spoon sampler used to obtain N-values.
    - In situ shear vane tests were carried out within the clay at regular intervals.
    - Collect soil samples for geotechnical laboratory testing consisting of moisture contents and Atterberg Limits determinations.
- Install a monitoring well in one of the geotechnical boreholes at the southwest corner of the proposed building location.

- Collect a composite sample of soil cuttings for Toxicity Characteristic Leaching Procedure (TCLP) analysis.
- Prepare a factual report documenting the field activities and results.

3.0 Methodology

3.1 Drilling

Public and private utility locates were completed prior to the initiation of the drilling program.

BlueFrog staff supervised the drilling of the boreholes. The assessment locations are presented on **Figure 2** and a summary of the drilling is provided in **Table i**.

Table i Drilling Details

Item	Comments
Drilling Dates	May 10 to 12, 2023
Drilling Contractor	George Downing Estate Drilling Ltd.
Drill Rig	Truck mount drill rig (CME 75) equipped with hollow-stem augers and split spoon samplers
Assessment locations completed as boreholes	BH1 to BH6 and BH8
Assessment locations completed as monitoring wells	MW7
Assessment depth	2.1 to 41.2 mbgs

Soil samples were obtained by employing the Standard Penetration Test, in accordance with ASTM D1586. The Standard Penetration Test consists of freely dropping a 63.5 kilogram hammer a vertical distance of 0.76 m to drive a 51 mm outside diameter split-barrel (split spoon) sampler into the ground. The number of blows of the hammer required to drive the sampler into the relatively undisturbed ground by a vertical distance of 0.30 m was recorded and is denoted as 'N'-values. These recorded 'N'-values give an indication of the consistency of cohesive soils or compactness of non-cohesive of the soils and are recorded on the Record of Borehole sheets in **Appendix A**.

In situ shear vane tests were carried out within the clay at regular intervals. The results are recorded on the Record of Borehole logs in **Appendix A**.

A composite soil sample was collected for laboratory analysis of waste classification parameters (TCLP) to facilitate off-site disposal.

3.2 Geotechnical Laboratory Testing

The soil samples were stored in airtight containers to minimize moisture loss and transported to our office for further examination and classification. The samples were visually inspected and logged for classification purposes. A laboratory testing programme consisting of natural moisture content determinations and four Atterberg Limits determinations were performed on representative soil samples. The results of the laboratory testing are presented on the Record of Borehole sheet attached in **Appendix A**.

3.3 Survey

All boreholes and wells were surveyed by BlueFrog staff. Each location was geo-referenced vertically to a local benchmark located on top of the existing fire hydrant on Innes Road. The results are presented on the Record of Borehole Sheets in **Appendix A**.

4.0 Subsurface Conditions

Descriptions of the sub-surface conditions encountered in the boreholes advanced in this investigation are presented on the Record of Borehole sheet in **Appendix A**. The following report sections are intended to supplement and complement this data.

4.1 Ground Cover and Fill

The boreholes encountered 8 to 12 cm of asphalt at ground surface. The asphalt was underlain by a grey sand fill with silt and trace crushed gravel to depths of about 0.6 to 0.8 mbgs.

Measured 'N'-values ranged from 10 to 28 blows per 0.3 m within the fill indicating a compactness of "compact".

Measured moisture contents range from 4 to 7%.

4.2 Silty Clay to Clay

Below the pavement structure, a brown to grey glaciomarine silty clay to clay deposit was encountered. BH1 to BH7 were terminated within the silty clay to clay at depths of 2.1 to 5.2 mbgs. BH8 encountered the bottom of the clay at a depth of about 40.8 mbgs. The silty clay to clay contains random trace shells and organics below a depth of about 30.0 mbgs.

Measured 'N'-values ranged from 0 to 12 blows per 0.3 m, but typically 0 blows per 0.3 m below 3.0 mbgs. Pocket penetrometer measurements indicate an undrained shear strength in the order of 25 to 125 kPa. In situ shear vane test results range from 9 to greater than 113 kPa (limit of measuring equipment), but typically 9 to 50 kPa below a depth of 3.0 mbgs. Vane sensitivities ranged from 1.0 to 2.7. These results indicate a stiff silty clay to clay to a depth of about 2.2 to 2.5 mbgs, underlain by very soft to soft silty clay to clay to a depth of about 15 mbgs, firm silty clay to clay to a depth of about 33.0 mbgs, and stiff silty clay to clay to a depth of about 40.8 mbgs.

Measured moisture contents ranged from 31 to 44% to a depth of about 2.1 mbgs, and 51 to 85% below this depth. Four Atterberg Limits determinations were carried out on representative samples of the clay. The results are presented in **Appendix A** and **Appendix B**. The results indicate a plastic limit of 24 to 30%, liquid limit of 45 to 60% and plasticity index of 19 to 32%. These results indicate a low to high plasticity clay with high compressibility.

4.3 Silty Sand Glacial Till

Below the silty clay to clays in BH8, a grey silty sand glacial till was encountered at a depth of about 40.8 mbgs. The glacial till is a heterogeneous mixture of a silty sand matrix with varying amounts of clay and gravel. Cobbles and boulders are anticipated within this deposit. The borehole was terminated within this deposit at a depth of 41.2 mbgs.

A measured 'N'-value within the glacial till of 98 blows per 0.3 m was obtained indicating a very dense compactness.

A measured moisture content of 10% was obtained within the glacial till.

4.4 Site Hydrogeology

Groundwater was encountered in BH5 to BH8 during drilling at depths of about 2.3 mbgs. One monitoring well was installed at the Site in BH7. However, the well was dry at the time of our Site work. The monitoring well installed by Patterson Group (BH4) was monitored for water levels. The groundwater levels are presented below.

Table ii Summary of Groundwater Levels

Monitoring Well	Depth to Groundwater Level	Well Screen Stratigraphy
MW7	Dry	Silty Clay to Clay
BH4 (Patterson Group)	3.27 mbgs	Silty Clay

It should be noted that the groundwater table and perched water could fluctuate seasonally and in response to severe weather events.

4.5 Analytical Results

The soil sample collected for the analysis of waste classification was compared to the O.Reg. 347/90 Schedule 4 leachate quality criteria as amended by Regulation 558/00 (September 2000). The drill cutting soil would be considered as non-hazardous. The laboratory certificates of analysis are present as **Appendix C**.

5.0 Discussion and Recommendations

The following recommendations and comments are based on factual information and are intended only for use by the design engineers. The number of boreholes may not be sufficient to determine all the factors that may affect construction methods and costs. Subsurface soil, rock and groundwater conditions between and beyond the boreholes may differ from those encountered at the borehole location, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation.

The anticipated construction conditions are also discussed, but only to the extent that they may influence design decisions. Construction methods discussed express our opinion only and are not intended to direct the contractors on how to carry out the construction. Contractors should also be aware that the data and their interpretation presented in this report may not be sufficient to assess all the factors that may have an effect upon the construction.

5.1 Foundations

The subsurface conditions encountered at the proposed single storey structure consists of a pavement structure over a stiff silty clay to clay to a depth of about 2.2 mbgs, underlain by very soft to soft silty clay to clay to a depth of about 15.0 mbgs, a firm silty clay to clay to a depth of about 33.0 mbgs and a stiff silty clay to clay to a depth of about 40.8 mbgs. The clays are underlain by a very dense silty sand glacial till deposit. The recommended design long term groundwater table is 2.5 mbgs.

Shallow Foundations

Shallow spread and strip footing foundations are feasible for the proposed building structure; however, due to the weak compressible clays geotechnical resistance and geotechnical reaction will be very low. Footing widths must be restricted to a maximum of 1.0 m, founded at a depth of 1.8 mbgs on the stiff silty clay to clay in order

to limit settlements to acceptable values. Larger size footings will settle more than 25 mm which may not be acceptable. **Table iii** below provides the factored geotechnical resistance at Ultimate Limit State (ULS) and the geotechnical reaction at Serviceability Limit State (SLS) for foundations founded on the undisturbed native soils and provided the minimum soil cover for frost protection.

Table iii Spread Footing Geotechnical Resistances and Reactions

Foundation Depth	Foundation Type	Net Geotechnical Reaction at SLS (net)	Net Factored Geotechnical Resistance ULS (net)
1.8 mbgs	maximum 1.0 m wide	25 kPa	75 kPa

The above factored ULS values incorporate a geotechnical resistance of 0.5. The SLS values are based on total settlement of 25 mm and differential up to 20 mm. Settlements will be time dependent and take decades to complete. Slightly higher geotechnical reaction at SLS and geotechnical resistance at ULS may be possible if additional piezocone penetration testing is carried out to further characterize the silty clay to clay soil.

Higher ULS and SLS values are available for maximum 1.0 m wide footings founded at a depth of 1.0 mbgs provided 75 mm thick rigid polystyrene is placed on a 300 mm thick Granular 'B' Type II layer compacted to 98% Standard Proctor Maximum Dry Density (SPMDD), extending 2.4 m from the edge of the footing. This would result in a geotechnical reaction at SLS of 30 kPa and geotechnical resistance at ULS of 110 kPa. For maximum 0.6 m wide footings, the geotechnical reaction at SLS of 40 kPa and geotechnical resistance of ULS of 125 kPa can be used for design purposes.

The founding subgrade is prone to disturbance from construction foot traffic. Therefore, after evaluation by geotechnical personnel, a skim coat of concrete (minimum 50 mm thickness) should be placed on the native soils to ensure the soil maintains its integrity.

Minimum footing sizes, thickness and other footing requirements should be designed in accordance with the latest sections of the Ontario Building Code (OBC).

An unfactored horizontal resistance against sliding between concrete and the undisturbed native soils can be calculated using a friction factor of 0.28. For ULS design a geotechnical resistance factor of 0.8 should be applied.

The footing subgrade should be inspected and evaluated by a Geotechnical Engineer prior to concreting to ensure that the footings are founded on competent undisturbed soil capable of supporting the recommended geotechnical resistances and reactions.

All exterior footings should have at least 1.8 m of earth cover or synthetic insulation for frost protection.

Deep Foundations

The structure must be supported on deep foundations. Ground improvement is not feasible due to the thickness of the weak clays. Driven piles are not recommended due to noise and settlement induced vibration issues. Caissons are not recommended in these weak clays as mud drilling would be required to stabilize the caisson base during spoil removal. Helical piles are recommended, such as CHANCE helical piles, which will not disturb the founding subgrade at these locations. The geotechnical reaction at SLS and factored geotechnical resistance at ULS will vary depending on the depth, diameter and number of helices. This technique is vibration free and does not require dewatering for installation. The following helical pile configurations are proposed for factored geotechnical resistance at ULS and geotechnical reaction at SLS founded on the silty sand glacial till at about 40.8 mbgs. It should be noted that the glacial till will vary in depth across the site.

Table iv Deep Foundation Geotechnical Resistances and Reactions – Helical Piles

Helical Pile	Net Geotechnical Reaction at SLS (net) in Compression	Net Factored Geotechnical Resistance ULS (net) in Compression	Net Factored Geotechnical Resistance ULS (net) in Tension
0.35 m diameter helix at 40.8 mbgs on the glacial till	n/a	780 kN	17 kN

The above ULS value incorporates a geotechnical resistance factor of 0.6 in compression, 0.4 in tension, assuming that torque measurements will be carried out for all piles and correlated to geotechnical resistance. The SLS values are not provided as the ULS will govern the design. Elastic compression of the helical piles must be considered by the Structural Engineer.

All footings should have at least 1.8 m of earth cover or equivalent synthetic insulation for frost protection.

Various helix configurations and diameters can be used to adjust the ULS values noted above. Helices should be separated by three diameters. Further details can be provided if required. Galvanized piles and helices are recommended to resist long term corrosion.

All helical piles should be torqued to a minimum determined value to confirm that the required resistance has been achieved. The pile installation should be conducted in the presence of the Geotechnical Engineer to confirm that the piers have been locked in at the appropriate load.

The minimum recommended pile spacing (centre to centre) is three times the diameter of the largest helix, unless a reduction for closer spacing is applied. Inclined piles can be used to increase geotechnical resistance at ULS in tension.

It is recommended that the helical piles be designed and installed by experienced specialist contractors. The pile resistance proposed above should also be further confirmed based on the contractor selected system and the specific helical pile configuration to be used.

The pile stability, pile resistance to buckling and pile cap details should be designed and checked by an experienced Structural Engineer. The installation of the piles should be supervised by a Professional Geotechnical Engineer. The diameter of the piles can be increased by using a pull-down grout layer or a larger diameter pile.

Deep Foundation Group Lateral Effects

Lateral Resistance

Pile foundations have relatively slender shafts that offer limited resistance to lateral loads for vertically installed shafts. The ultimate lateral capacity of piles can be determined using Broms' Method. The soil parameters noted in **Table v** can be assumed for the soils below the site. This method should be considered approximate and will only provide a rough estimation of lateral resistance.

Table v Soil Parameters –Lateral Design

Soil Type and Depth	Bulk Unit Weight (kN/m^3)	Effective Friction Angle	Undrained Shear Strength (kPa)	Strain Factor
CLAY				
1.8 to 2.2 mbgs	16.5	-	50	0.007
2.2 to 15.0 mbgs	15.5	-	15	0.02
15.0 to 33.0 mbgs	16.0	-	30	0.01
33.0 to 40.8 mbgs	16.5	-	50	0.007
SILTY SAND TILL				
40.8 mbgs+	22.0	38^0	-	-

A geotechnical resistance of 0.5 should be applied to the above analysis to obtain the factored lateral pile geotechnical resistance at ULS. The above bulk unit weight and undrained shear strength values may be better defined with additional on-site piezocone penetration testing.

The following equation may be used to estimate the coefficient of horizontal subgrade reaction for lateral deflection calculations in cohesive soils:

$$k_s = 67\ C_u/d$$

where: k_s = coefficient of horizontal subgrade reaction
C_u = undrained shear strength (see **Table v**)
d = pile diameter (m)

The resistance in the upper 1.8 m of the soil should be ignored in the design due to frost effects. In order to provide a more accurate estimate of the horizontal deformation of the pole foundations finite element software using p-y curves, such as LPILE, is recommended. Additional piezocone penetration testing will also refine the design undrained shear strength values.

Group Effects

Axial Resistance

Group reduction effects should be considered with the proposed piles. The following table provides reductions for pile group effects based on published literature:

Table vi Pile Group Effect – Axial Resistance

Centre to Centre Pile Spacing (B = Pile Diameter)	Axial Efficiency Reduction
≤ 3B	0.7
Between 3B and 6B	Linear interpolation from 0.7 to 1.0
≥ 6B	1.0

Lateral Resistance

The nature of the pile-soil-pile interaction is complex but may be broken into the following main components:

- Alteration of the soil state due to pile installation and potential overlap of the alterations when nearby piles are installed; and,
- Superposition of strains and alterations of the soil failure zones when nearby piles are simultaneously loaded.

Studies (Reese, Isenhower and Wang, 2006) have reported the following lateral resistance reduction between single piles or caissons and groups.

Table vii Pile Group Effect – Lateral Resistance – Lateral Load is Parallel to Pile/Caisson Spacing

Pile/Caisson Spacing	Trailing Pile/Caisson Group Efficiency, e_T	Lead Pile/Caisson Group Efficiency, e_L
7d	1.0	1.0
4d	0.8	1.0
3d	0.7	0.9
2d	0.6	0.8

Table viii Pile Group Effect – Lateral Resistance – Lateral Load is Perpendicular to Pile/Caisson Spacing

Pile/Caisson Spacing	Pile/Caisson Group Efficiency, e_P
4d	1.0
3d	0.75
2d	0.7

The reduction factor applied to a pile or caisson is the product of the efficiencies of all of the interactions of the piles/caissons within that group.

5.2 Floor Slab

For a properly constructed concrete slab-on-grade and a uniform loading of about 4 kPa on a 37.0 m long by 12.0 m wide area, ground settlements could be in the order of 15 to 25 mm. Settlements would be time dependent and would take decades to occur. This settlement may not be acceptable to the Structural Engineer and will need to be confirmed with the designer.

A concrete slab-on-grade may be built on properly prepared and graded inorganic subgrade. Any disturbed or excessively wet zones should be sub-excavated and replaced with the existing sand fill or imported Granular 'A' fill to establish stable and uniform conditions. The subgrade should be inspected and approved by a geotechnical engineer. All new fill should be placed in maximum 200 mm thick loose lifts within $\pm$ 2% of its optimum moisture content, and each lift compacted with suitable equipment to minimum 98% SPMDD, before placing the next lift.

Underneath the slab, a 300 mm thick base course, consisting of 19 mm size clear stone, should be placed to improve the support for the floor slab and function as a moisture break. This base course should be compacted with vibratory equipment to a uniform high density.

The slab on grade can be designed for a vertical subgrade modulus of 0.3 MPa/m.

Alternatively, the floor slab can be a constructed as a structural slab supported on deep foundations.

5.3 Seismic Site Classifications

Based on the Ontario Building Code of 2012, the classification of soils for seismic design should be based on the average properties of the top 30 m of the subsurface profile. Based on the results of the boreholes, the Site is classified as Site Class 'F' under the site classification for seismic site response of OBC 2012 due to the thickness of the soft to firm clays being greater than 30 m. This will require a seismic piezocone penetration test to be carried out on site and a Site Class F analysis to determine the seismic spectral acceleration for

different periods at a probability of 2%/50 years at the site so that the Structural Engineer can calculate the seismic coefficients Fa and Fv to support the design of the structure and foundations.

5.4 Excavation

The proposed foundation constructions and site services may require excavation in the overburden soils up to about 3.0 mbgs. Excavation below the groundwater table is not anticipated. Excavations must be carried out as per the *Occupational Health and Safety Act and Regulations for Construction Projects*. Minimum support system requirements for steeper excavations are indicated in Sections 235 through 238 and 241 of the Act and Regulations. Based on the Act current at the time of this report was prepared, the soils can be classified as indicated in **Table ix**.

Table ix Soil Types for Excavations

Soil Type	Soil Description	Temporary Stable Excavation Slopes From the Base of Excavation
3	Stiff CLAY and Sand FILL	1H to 1V
4	Very soft to firm CLAY	3H to 1V

The groundwater table may be encountered below a depth of about 2.5 mbgs.

The side slopes should be regularly inspected for instability and flattened if there are signs of erosion or instability. The founding subgrade must also be protected against frost during winter conditions.

Stockpiles of excavated materials should be kept at least 6.0 m or more from the edge of the excavation to avoid slope instability. Care should also be taken to avoid overloading of any underground services/structures by stockpiles.

Conventional excavation equipment will be suitable for excavation purposes.

It should be noted that the very soft to firm clays at a depth of about 3.0 mbgs may not support construction foot traffic or equipment without placement of a 50 mm mud mat for temporary support. Excavations deeper than 3.0 mbgs will require geotechnical analysis to assess basal stability due to the weak clays.

5.5 Lateral Earth Pressures

Based on the drawings provided retaining walls or loading docks are not proposed at the site. However above grade retaining walls may be considered. The lateral earth pressure for retaining wall design should be calculated using soil parameters in **Table x** below.

Table x Lateral Earth Pressures

Soil Type	Bulk Unit Weight	Undrained Shear Strength	Lateral Earth Pressure Coefficients		
			Ka	Ko	Kp
Granular 'B'	20 kN/m^3	-	0.33	0.50	3.00
Silty Clay to Clay					-
Stiff	16.5 kN/m^3	50kPa	-	-	
Soft	15.5 kN/m^3	15kPa			

The design groundwater table is 2.5 mbgs.

Although the location or details of any proposed retaining walls have not been provided, the following recommendations are general recommendations. Retaining walls should be backfilled with granular material (such as Granular 'B' Type I or II) placed in 125 mm thick loose lifts that can be compacted with light equipment to minimum 95% SPMDD to avoid damaging the retaining wall. Heavy compaction equipment should not be operated along the walls, and the backfill should not be over-compacted to avoid damage to the walls. Due to its high permeability, the granular material will permit quick drainage of water to perimeter drains, but in order to reduce the quantity of water percolating into the backfill, the uppermost 0.5 m of the backfill should consist of clayey soils. Subsurface drainage pipes should be incorporated into the design of the retaining walls to relieve hydrostatic pressure forces.

Due to their rigidity and unyielding character, walls should be designed for the at-rest earth pressure condition calculated in accordance with the latest edition of the Canadian Foundation Engineering Manual.

The Site should be graded for drainage away from foundations. A minimum cross fall of three percent (3%) immediately adjacent to foundations is recommended to allow for some settlement and promote good surface drainage.

5.6 Groundwater Control

We assume open cut excavations may be extended up to about 3.0 mbgs for site services. Dewatering for the proposed foundation excavations are not anticipated and the design groundwater table at the Site is about 2.5 mbgs. Dewatering within trenches for the proposed site services should be manageable using temporary sumps and pumps at the base of the excavation. Temporary lowering of the groundwater table up to 0.5 m may cause immediate settlements in the order of 5 to 10 mm around the trench. All settlements are time dependent. An Environmental Activity and Sector Registry application or Permit To Take Water from the Ministry of Environment, Conservation and Parks will not be required.

Surface run-off during rainfall events should be reduced with Site grading to create a positive slope away from the construction excavations.

5.7 Backfilling and Suitability of On-Site Soils for Reuse

Based on visual and tactile examination of the soil samples and the results of the laboratory testing programme, the on-site excavated inorganic pavement fill can be reused on site. The existing clays are not recommended for reuse on site due to the high moisture content of the soils. Any weak or excessively wet zones identified during compaction should be sub-excavated and replaced with compacted competent material (such as existing sand fill or imported Granular 'B' Type II fill) to establish stable and uniform conditions. The backfill should be placed in maximum 200 mm thick loose layers at or near (± 2%) their optimum moisture content, and each layer should be compacted to at least 95% Standard Proctor Maximum Dry Density (SPMDD). This value should be increased to at least 98% SPMDD within 0.6 m of the road subgrade surface.

The excavated soils may require reconditioning (e.g., wetting or drying) prior to reuse. The on-site excavated sand fills can be used in confined areas (e.g., around catch-basins and laterals under roadways). Unsuitable materials such as organic soils, boulders, cobbles, frozen material, etc., should not be used for backfilling. Clear stone and high-performance bedding should not be used as backfill material.

5.8 Site Services

We assume underground services will not be more than 3.0 mbgs.

Trenching

Trench excavations should be carried out as per the Safety Regulations of the Province of Ontario. The soils are classified in **Section 5.4** in accordance with the Ontario Health and Safety Regulations.

Stockpiles of excavated materials should be kept at least 6.0 m or more from the edge of the excavation to avoid slope instability. Care should also be taken to avoid overloading of any underground services/structures by stockpiles.

Normal excavation equipment should be suitable for excavating trenches within soils in which the proposed underground services will be installed. The terms describing the compactness (compact) or consistency (very soft, soft, firm, stiff) of soil strata give an indication of the effort needed for excavation.

Bedding

The boreholes show that the service pipes may be laid within the soft to stiff clays. Granular 'A' shall be used as bedding and cover material. The recommended minimum thickness of granular bedding for normal Class 'B' Type of bedding (i.e., compacted granular bedding material – as per OPSD 802.031 for rigid pipe up to 2.2 mbgs and OPSD 802.032 below a depth of 2.2 mbgs, and OPSD 802.010 for flexible pipe) below the invert is 150 mm. The thickness of the bedding may, however, have to be increased depending on the pipe diameter or if wet or weak subgrade conditions are encountered. Clear stone and high-performance bedding should not be used as bedding material. It should be noted that a mud mat will be required on the exposed founding subgrade below a depth of 2.2 mbgs as the subgrade may not support construction foot traffic or equipment.

Backfill

Based on visual and tactile examination of the soil samples and the results of the laboratory testing programme, the on-site excavated inorganic pavement fill can be reused on site. The existing clays are not recommended for reuse on site due to the high moisture content of the soils. Any weak or excessively wet zones identified during compaction should be sub-excavated and replaced with compacted competent material (such as existing sand fill or imported Granular 'B' Type II fill) to establish stable and uniform conditions. The backfill should be placed in maximum 200 mm thick loose layers at or near (± 2%) their optimum moisture content, and each layer should be compacted to at least 95% SPMDD. This value should be increased to at least 98% SPMDD within 0.6 m of the road subgrade surface.

The excavated soils may require reconditioning (e.g., wetting or drying) prior to reuse. The on-site excavated sand fills can be used in confined areas (e.g., around catch-basins and laterals under roadways). Unsuitable materials such as organic soils, boulders, cobbles, frozen material, etc., should not be used for backfilling. Clear stone and high-performance bedding should not be used as backfill material.

A clay trench plug is recommended along service trenches to block groundwater flow around the pipes that could lead to migration of fines from the trench walls/base and erosion of the pipe bedding. The trench plug should be at least 1.0 m away from a pipe joint. The trench plug should consist of bentonite clay or unshrinkable fill, minimum 1.0 m thick, and extend at least 600 mm above the pipe and minimum 300 mm into undisturbed ground along the trench walls and base.

5.9 Pavement Design

A visual inspection of the existing pavement was carried out for the site. The pavement appears to be in fair to good condition with occasional construction joint cracks and some longitudinal cracking. The pavement should have a remaining service life of at least 10 years provided routine maintenance is carried out. Existing cracks should be rout and sealed to ensure service life is maintained.

The existing inorganic soils are considered acceptable as the pavement subgrade and sub-base. Using good engineering and construction practice, the following minimum pavement structure may be used for the Site:

Table xi Pavement Design

Pavement Structure	Compaction	Parking Area	Heavy Duty	Rigid
Concrete	n/a	-	-	225mm
HL-3 surface course HL-4 binder course	97% Marshall Density	40mm 40mm	40mm 60mm	- -
Granular 'A' Granular 'B' Type II	100% SPMDD 100% SPMDD	150mm 450mm	150mm 450mm	150mm 400mm

To ensure the longevity of the pavement, the subgrade should be graded with a 2% slope and the roadbed should be well drained at all times. We recommend that full-length perforated sub-drainpipes of 150 mm diameter be installed on all four sides of catch basins and especially at low points to ensure effective drainage. The sub-drainpipes should be surrounded by 19 mm size clear stone drainage zone of minimum 150 mm thickness, which should have non-woven geotextile (non-woven geotextile, with FOS of 75 – 150 µm) wraparound to minimize infiltration of fines in pipes which would reduce their effectiveness. All subdrains should be provided with a frost-free outlet.

The placing, spreading and rolling of the asphalt should be in accordance with OPSS Form 310, or equivalent.

The subgrade should be adequately prepared to receive the sub-base course. Any disturbed and wet subgrade materials should be removed, and the top of the subgrade should then be inspected and approved, by proof-rolling, by qualified geotechnical personnel. Cavities created by the removal of unsuitable materials should be backfilled with approved, inorganic fill materials similar to the existing subgrade material. All new fill should be placed in maximum 200 mm thick loose lifts within $\pm$ 2 % of its optimum moisture content, and each lift compacted with suitable equipment to minimum 95 % SPMDD, before placing the next lift.

The uppermost zones of the road fill, within 600 mm of the roadbed, should be compacted to minimum 98 % SPMDD. If construction of the road fill is carried out in wet weather, the thickness of the Granular 'A' base layer may need to be increased.

Special attention should be paid to proper grading of the subgrade surface. Depressions and undulations should be eliminated and, to permit quick drainage, the subgrade surface should be sloped towards perimeter sub-drains and catch-basins.

For new pavement to existing pavement, a stepped joint should be constructed. The existing pavement should be grinded to a depth of 40 mm over a distance of 600 mm to accommodate the new surface course.

5.10 Trees

The underlying silty clay to clay soils may be sensitive to water depletion by trees of high-water demand during period of dry weather. This may cause the soil to shrink resulting in settlement of adjacent structures. The zone of influence of a tree is considered to be approximately equal to the mature height of the tree. Trees with a high-water demand should not be planted closer to structures than the ultimate height of the trees.

5.11 Construction Monitoring

It is recommended that a programme of geotechnical/material inspection and testing be carried out during the construction phase of the project to confirm that the conditions exposed in the excavations are consistent with those encountered in the boreholes, verify the design assumptions, and confirm that the various project specifications and materials requirements are being met.

6.0 Closure

We trust that the above information meets your present needs. Statement of qualifications for the undersigned are available on request. Please do not hesitate to contact us if you have any questions or comments.

Sincerely,

BlueFrog Environmental Consulting Inc.

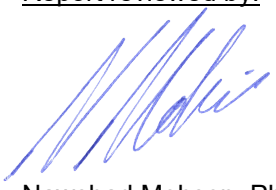
Report prepared by:
Downunder Geotechnical Limited

Andrew Drevininkas, P.Eng.
Geotechnical Engineer

Report reviewed by:
Downunder Geotechnical Limited

Geoffrey Creer, P.Eng.
Geotechnical Engineer

Report reviewed by:



Nawshad Mohsen, Ph.D., P.Eng.
Senior Engineer

STATEMENT OF LIMITATIONS

This Report has been prepared by BlueFrog, based on fieldwork conducted by BlueFrog and others, for sole benefit and use by Chick-fil-A In performing this Work, BlueFrog has relied in good faith on information provided by others, and has assumed that the information provided by those individuals is both complete and accurate. This Work was performed to current industry standard practice for similar geotechnical work, within the relevant jurisdiction and same locale. The findings presented herein should be considered within the context of the scope of work and project terms of reference; further, the findings are time sensitive and are considered valid only at the time the Report was produced. The conclusions and recommendations contained in this Report are based upon the applicable guidelines, regulations, and legislation existing at the time the Report was produced; any changes in the regulatory regime may alter the conclusions and/or recommendations.

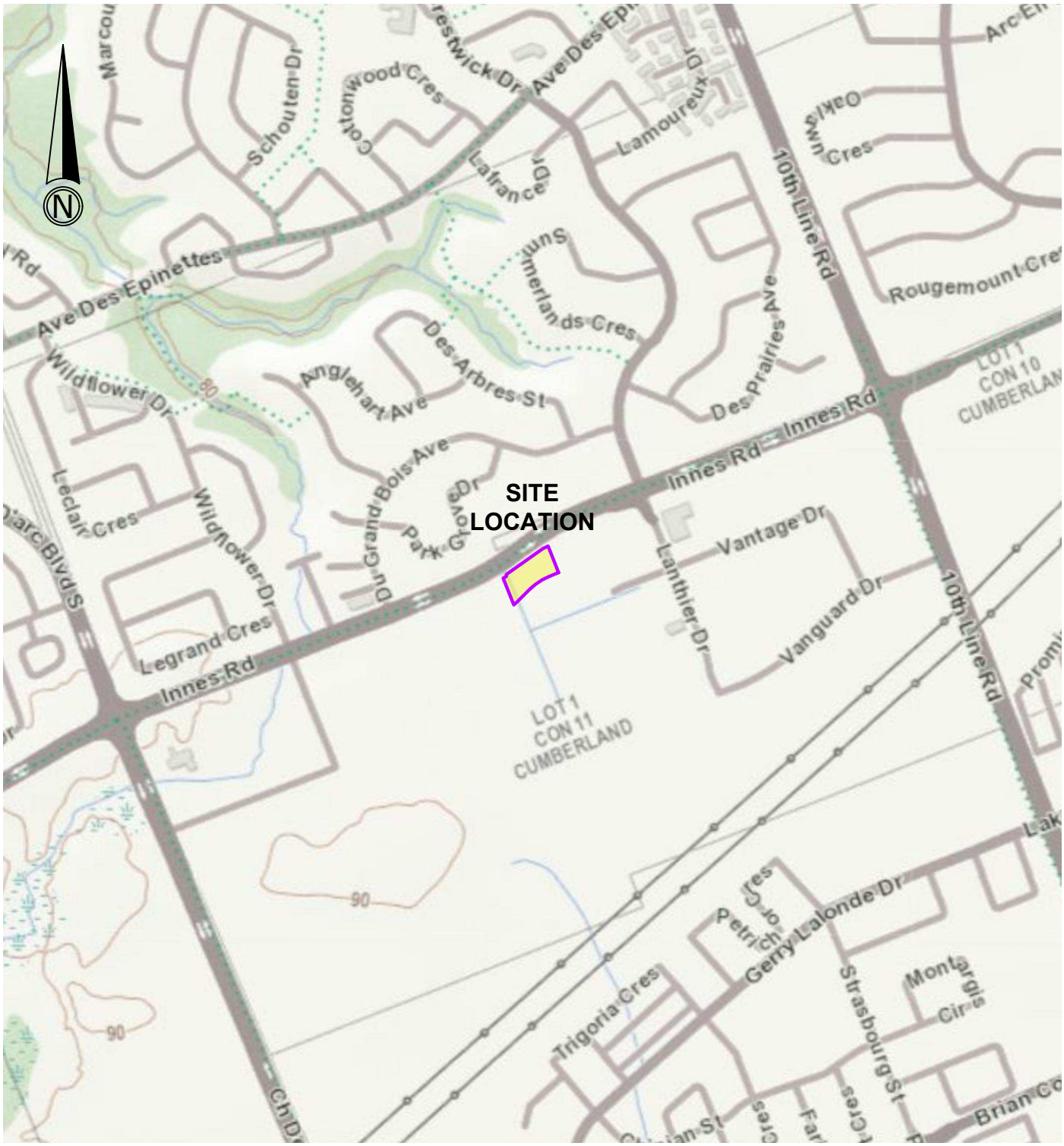
The conclusions and recommendations given in this report are based on information determined at a specific test hole locations. Subsurface soil and groundwater conditions beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Geotechnical Engineer be retained during the construction to confirm that the subsurface conditions across the site do not deviate materially from those encountered in the test holes.

The design recommendations 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. Since all details of the design may not be known, we recommend that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

The comments made in this report relating to potential construction problems and possible methods of construction are intended only for the guidance of the designers. 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 fill 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. No other warranty is expressed or implied.

FIGURES

File: 0208-001.02_23SITA.dwg Date: May 16, 2023 4:12:44 PM



MAP REFERENCE: Ontario Ministry of Natural Resources and Forestry

0 100 200 400m

Scale 1 : 10 000

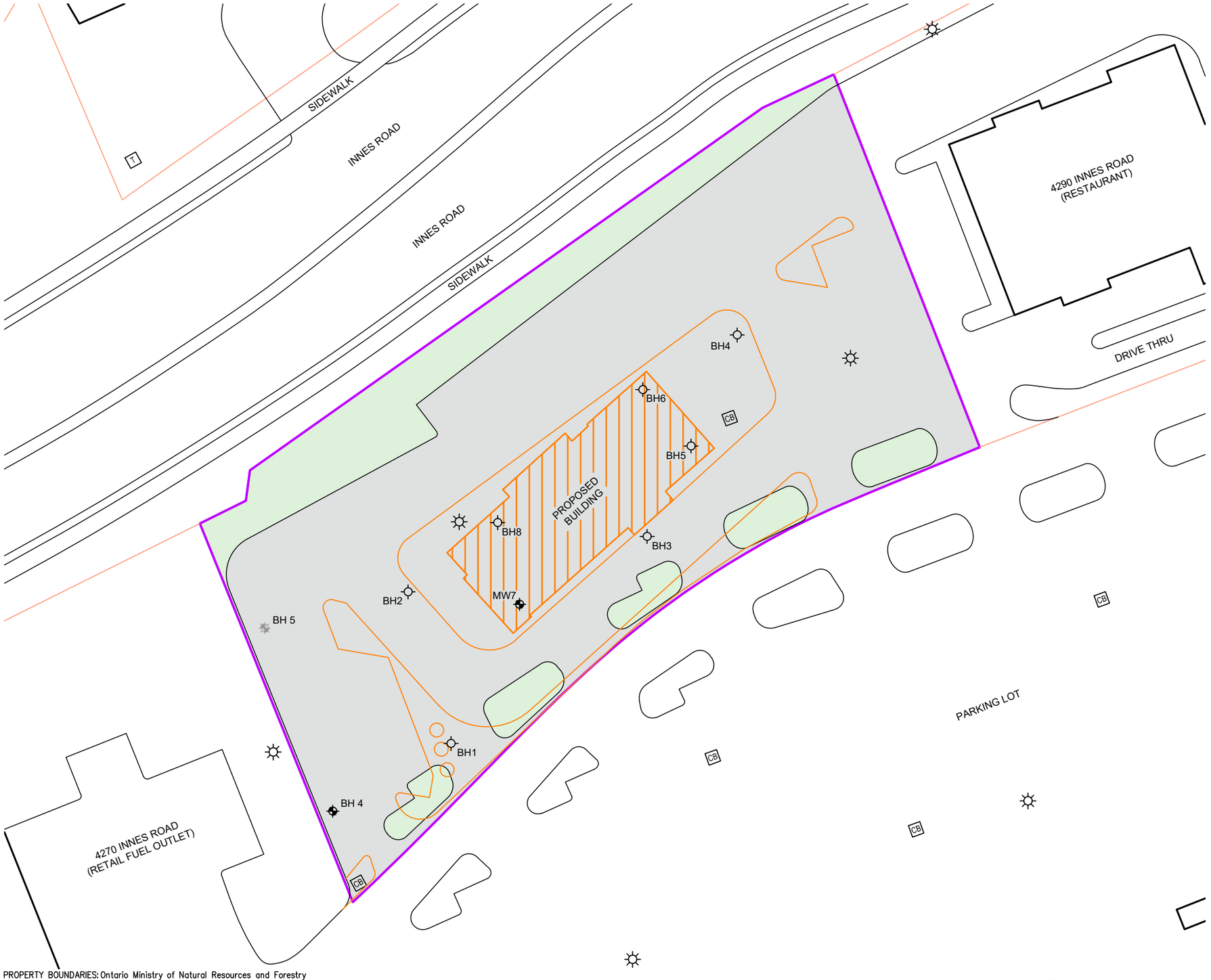
BlueFrog Environmental Consulting Inc.

SITE LOCATION MAP

PART OF 4270 INNES ROAD, ORLEANS, ONTARIO

0208-001.02	MAY 2023	FIGURE 1

File: 0208-001.02_2307A.dwg Date: May 23, 2023 11:56:47 AM By: Chris



PROPERTY BOUNDARIES: Ontario Ministry of Natural Resources and Forestry

DRAWING SHOULD BE PRINTED ON 11x17 PAPER FOR ACCURATE SCALING.

N

0 5 10 20m

Scale 1 : 500

LEGEND

- SITE BOUNDARY
- PROPERTY BOUNDARY
- BUILDING FOOTPRINT
- BOREHOLE
  - BH1 TO BH6 AND BH8 ADVANCED BY BLUEFROG (2023)
- MONITORING WELL
  - MW7 INSTALLED BY BLUEFROG (2023)
  - BH 4 INSTALLED BY PATERSON GROUP (2017)
- MONITORING WELL (DESTROYED)
  - BH 5 INSTALLED BY PATERSON GROUP (2017)
- PROPOSED CONSTRUCTION
- CATCH BASIN
- LAMP POST
- FIRE HYDRANT
- TRANSFORMER
- ASPHALT
- LANDSCAPED

NOTES:

LOCATIONS ARE APPROXIMATE.

BlueFrog Environmental Consulting Inc.

SITE PLAN

PART OF 4270 INNES ROAD, ORLEANS, ONTARIO

0208-001.02	MAY 2023	FIGURE 2

APPENDIX A

Record of Borehole Sheets

Explanation of Terms Used in the Record of Borehole Sheets

Classification of Soils

As per Unified Soil Classification System
ASTM D 2487-06

Consistency (Cohesive Soils)

Consistency	Undrained Shear Strength (kPa)	N-value
Very soft	**<12**	**0-2**
Soft	**12-25**	**2-4**
Firm	**25-50**	**4-8**
Stiff	**50-100**	**8-15**
Very stiff	**100-200**	**15-30**
hard	**>200**	**>30**

Compactness (Cohesionless Soils)

Compactness	N-value
Very loose	**<4**
Loose	**4-10**
Compact	**10-30**
Dense	**30-50**
Very dense	**>50**

Sample Types

DP **Direct Push sample**
SS **Split Spoon sample**
RC **Rock Core sample**
AS **Auger sample**

Soil Boundaries

The boundaries of the soil strata encountered are presented on the borehole logs as dashed and solid lines. Dashed lines represent an assumed boundary between soil strata, while a solid line represents an observed transition between soil strata within the recovered soil samples.

Cobbles and Boulders

Cobbles and boulders may be encountered within the soil deposits, which cannot be sampled in their boreholes. Glacial till is known to contain cobbles and boulders due to the nature of their formation/deposition and should be expected in any excavations within the soil.

Fill

It should be noted that fill is heterogeneous in nature and has a variable compactness, consistency, or degree of compaction. The fill description is based solely on the soil sample retrieved and may not be representative of the entire layer. All fills should be expected to contain variable materials, including possible obstructions, such as wood, concrete, etc. which may not have been encountered within the boreholes. The depth of fill may also be variable and cannot be detected solely on the results of the boreholes. Testpits are recommended to confirm the variability of the material and depth of the fill.

RECORD OF BOREHOLE No BH1

Project No.:0208-001.02

Drilling Date:5/10/23

Project: Geotechnical Investigation

Drilling Method: Hollow Stem Augering

Location: 4270 Innes Road, Orleans, Ontario

Hole Diameter: 210mm

Client: Chick-fil-a

DATUM: Local

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 / SHEAR STRENGTH kPa 50 100 150 200 (● UCS, ▲ Pocket Penetrometer, + In situ Shear Vane)	UNIT WEIGHT γ kN/m³	PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L / WATER CONTENT (%) 20 40 60 80	SAMPLES NUMBER	TYPE	"N" VALUES	RECOVERY	STRAT PLOT	SOIL DESCRIPTION	ELEVATION SCALE	DEPTH (m)	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
								GROUND SURFACE 99.41m				
		5						10cm ASPHALT				
			1	SS	10			compact — grey Sand FILL with Silt, trace Gravel — damp	99			
	16.9	31	2	SS	9			stiff — brown SILTY CLAY to CLAY — moist		1		
+ >113									98			
	15.8	36	3	SS	7					2		
1.8 +								END OF BOREHOLE AT 2.1m				

LOGGED BY BR

BlueFrog Environmental Consulting Inc.

RECORD OF BOREHOLE No BH2

Project No.:0208-001.02

Drilling Date:5/10/23

Project: Geotechnical Investigation

Drilling Method: Hollow Stem Augering

Location: 4270 Innes Road, Orleans, Ontario

Hole Diameter: 210mm

Client: Chick-fil-a

DATUM: Local

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 / SHEAR STRENGTH kPa 50 100 150 200 (● UCS, ▲ Pocket Penetrometer, + In situ Shear Vane)	UNIT WEIGHT γ kN/m³	PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L / WATER CONTENT (%) 20 40 60 80	SAMPLES NUMBER	TYPE	"N" VALUES	RECOVERY	STRAT PLOT	SOIL DESCRIPTION	ELEVATION SCALE	DEPTH (m)	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
								GROUND SURFACE 99.44m				
		5						10cm ASPHALT				
			1	SS	13			compact — grey Sand FILL with Silt, trace Gravel — damp	99			
▲	16.3	33	2	SS	12			stiff — brown SILTY CLAY to CLAY — moist		1		
▲	16.5	31	3	SS	9				98			
+ >113										2		
								END OF BOREHOLE AT 2.1m				

LOGGED BY BR

BlueFrog Environmental Consulting Inc.

RECORD OF BOREHOLE No BH3

Project No.:0208-001.02

Drilling Date:5/10/23

Project: Geotechnical Investigation

Drilling Method: Hollow Stem Augering

Location: 4270 Innes Road, Orleans, Ontario

Hole Diameter: 210mm

Client: Chick-fil-a

DATUM: Local

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 / SHEAR STRENGTH kPa 50 100 150 200 (● UCS, ▲ Pocket Penetrometer, + In situ Shear Vane)	UNIT WEIGHT γ kN/m³	PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L / WATER CONTENT (%) 20 40 60 80	SAMPLES NUMBER	TYPE	"N" VALUES	RECOVERY	SOIL PROFILE STRAT PLOT	SOIL DESCRIPTION	ELEVATION SCALE	DEPTH (m)	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
								GROUND SURFACE 99.36m				
								12cm ASPHALT				
		4	1	SS	23			compact — grey Sand FILL with Silt, trace Gravel — damp	99			
▲	16.5	31	2	SS	11			stiff — brown SILTY CLAY to CLAY — moist		1		
▲	16.3	38	3	SS	7				98			
1.9+										2		
								END OF BOREHOLE AT 2.1m				

LOGGED BY BR

BlueFrog Environmental Consulting Inc.

RECORD OF BOREHOLE No BH4

Project No.:0208-001.02

Drilling Date:5/10/23

Project: Geotechnical Investigation

Drilling Method: Hollow Stem Augering

Location: 4270 Innes Road, Orleans, Ontario

Hole Diameter: 210mm

Client: Chick-fil-a

DATUM: Local

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 / SHEAR STRENGTH kPa 50 100 150 200 (● UCS, ▲ Pocket Penetrometer, + In situ Shear Vane)	UNIT WEIGHT γ kN/m³	PLASTIC LIMIT W_P — NATURAL MOISTURE CONTENT W — LIQUID LIMIT W_L / WATER CONTENT (%) 20 40 60 80	SAMPLES NUMBER	TYPE	"N" VALUES	RECOVERY	STRAT PLOT	SOIL PROFILE SOIL DESCRIPTION	ELEVATION SCALE	DEPTH (m)	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
								GROUND SURFACE 99.24m				
								10cm ASPHALT				
		4	1	SS	24			compact — grey Sand FILL with Silt, trace Gravel — damp	99			
	16.4	33	2	SS	10			stiff — brown SILTY CLAY to CLAY — moist		1		
	15.7	44	3	SS	8				98			
>113										2		
								END OF BOREHOLE AT 2.1m				

LOGGED BY BR

BlueFrog Environmental Consulting Inc.

RECORD OF BOREHOLE No BH5

Project No.:0208-001.02

Drilling Date:5/10/23

Project: Geotechnical Investigation

Drilling Method: Hollow Stem Augering

Location: 4270 Innes Road, Orleans, Ontario

Hole Diameter: 210mm

Client: Chick-fil-a

DATUM: Local

NUMBER	TYPE	"N" VALUES	RECOVERY	UNIT WEIGHT γ kN/m^3	SOIL DESCRIPTION	ELEVATION SCALE	DEPTH (m)
					GROUND SURFACE 99.18m		
					10cm ASPHALT		
1	SS	27			compact; grey Sand FILL with Silt, trace Gravel; damp	99	
2	SS	9		16.4	stiff; brown SILTY CLAY to CLAY; moist	98	1
3	SS	7		16.1			
4	SS	3			firm	97	2
5	SS	0			soft; grey; wet	96	3
6	SS	0			very soft	95	4
7	SS	0				94	5
					END OF BOREHOLE AT 5.2m		

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80

SHEAR STRENGTH kPa: 50 100 150 200

- UCS
- Pocket Penetrometer
- In situ Shear Vane

PLASTIC LIMIT W_P | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W_L

WATER CONTENT (%): 20 40 60 80

GROUND WATER CONDITIONS

REMARKS & GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

LOGGED BY BR

BlueFrog Environmental Consulting Inc.

RECORD OF BOREHOLE No BH6

Project No.:0208-001.02

Drilling Date:5/10/23

Project: Geotechnical Investigation

Drilling Method: Hollow Stem Augering

Location: 4270 Innes Road, Orleans, Ontario

Hole Diameter: 210mm

Client: Chick-fil-a

DATUM: Local

NUMBER	TYPE	"N" VALUES	RECOVERY	STRAT PLOT	SOIL DESCRIPTION	ELEVATION SCALE	DEPTH (m)	GROUND WATER CONDITIONS	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
					GROUND SURFACE 99.24m				
					8cm ASPHALT				
1	SS	17			compact; grey Sand FILL with Silt, trace Gravel; damp	99			
2	SS	12			stiff; brown SILTY CLAY to CLAY; moist	98	1		
3	SS	9							
4	SS	3			firm; grey; wet	97	2		
5	SS	0			soft	96	3		
6	SS	0			very soft	95	4		
7	SS	0			soft		5		
					END OF BOREHOLE AT 5.2m				

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80

SHEAR STRENGTH kPa: UCS; Pocket Penetrometer; In situ Shear Vane; 50 100 150 200

UNIT WEIGHT γ kN/m^3: 15.8

PLASTIC LIMIT W_P | NATURAL MOISTURE CONTENT W | LIQUID LIMIT W_L

WATER CONTENT (%): 20 40 60 80

Plotted values: 5, 34, 31, 62, 68, 67, 71

2.4+ 1.2+ 1.3+ 2.0+

LOGGED BY BR

BlueFrog Environmental Consulting Inc.

RECORD OF BOREHOLE No BH7

Project No.:0208-001.02

Drilling Date:5/10-11/23

Project: Geotechnical Investigation

Drilling Method: Hollow Stem Augering

Location: 4270 Innes Road, Orleans, Ontario

Hole Diameter: 210mm

Client: Chick-fil-a

DATUM: Local

NUMBER	TYPE	"N" VALUES	RECOVERY	UNIT WEIGHT kN/m³	SOIL DESCRIPTION	ELEVATION SCALE	DEPTH (m)
					GROUND SURFACE 99.47m		
					10cm ASPHALT		
1	SS	28			compact — grey Sand FILL with Silt, trace Gravel — damp	99	
2	SS	12		15.8	stiff — brown SILTY CLAY to CLAY — moist		1
					grey	98	
3	SS	8					2
4	SS	3		16.1	firm	97	
					wet		3
5	SS	0			soft	96	
6	SS	0			very soft		4
7	SS	0			soft	95	5
					END OF BOREHOLE AT 5.2m		

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80

SHEAR STRENGTH kPa: 50 100 150 200 — UCS; Pocket Penetrometer; In situ Shear Vane

PLASTIC LIMIT (W_P) — NATURAL MOISTURE CONTENT (W) — LIQUID LIMIT (W_L)

WATER CONTENT (%): 20 40 60 80

Pocket Penetrometer readings: 1.6, 1.7, 2.0, 1.3, 2.2

Moisture content values: 5, 38, 33, 52, 61, 62, 73

GROUND WATER CONDITIONS

REMARKS & GRAIN SIZE DISTRIBUTION (%) — GR SA SI CL

LOGGED BY BR

BlueFrog Environmental Consulting Inc.

RECORD OF BOREHOLE No BH8

Project No.:0208-001.02

Drilling Date:5/11-12/23

Project: Geotechnical Investigation

Drilling Method: Hollow Stem Augering

Location: 4270 Innes Road, Orleans, Ontario

Hole Diameter: 210mm

Client: Chick-fil-a

DATUM: Local

NUMBER	TYPE	"N" VALUES	RECOVERY	UNIT WEIGHT kN/m³	WATER CONTENT (%)	SOIL DESCRIPTION	ELEVATION SCALE	DEPTH (m)
						GROUND SURFACE 99.42m		
1	SS	25			7	11cm ASPHALT	99	1
2	SS	9			32	grey Sand FILL with Silt, trace Gravel; compact, damp	98	2
3	SS	7		15.4	42	brown SILTY CLAY to CLAY; stiff, moist	97	3
4	SS	2		15.7	51	soft	96	4
5	SS	0		15.1	58	grey; wet	95	5
6	SS	0			58		94	6
7	SS	0			59		93	7
8	SS	0			79		92	8
9	SS	0			85		91	9
10	SS	0			73		90	10
11	SS	0			79		89	11
12	SS	0			83		88	12
13	SS	2					87	13
14	SS	0			76		86	14
15	SS	0			70	firm	85	15
16	SS	0			71		84	16
17	SS	0			71		83	17
18	SS	0			81		82	18
19	SS	0			71		81	19
20	SS	0			68		80	20
21	SS	0			69		79	21
22	SS	0			75		78	22
23	SS	3			68	trace Organics, shell fragments	77	23
24	SS	7			66		76	24
25	SS	0		15.1	67		75	25
26	SS	0		16.6	63		74	26
							73	27
							72	28
							71	29
							70	30
							69	31
							68	32
							67	33
							66	34
							65	35
							64	36
							63	37
							62	38
						stiff	61	39
							60	40
27	SS	98			10 53	very dense; grey; wet	59	41
						SILTY SAND GLACIAL TILL trace Gravel		
						END OF BOREHOLE AT 41.2m		

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80

SHEAR STRENGTH kPa: 50 100 150 200

● UCS ▲ Pocket Penetrometer + In situ Shear Vane

PLASTIC LIMIT (W_P) NATURAL MOISTURE CONTENT (W) LIQUID LIMIT (W_L)

WATER CONTENT (%): 20 40 60 80

GROUND WATER CONDITIONS

REMARKS & GRAIN SIZE DISTRIBUTION (%)

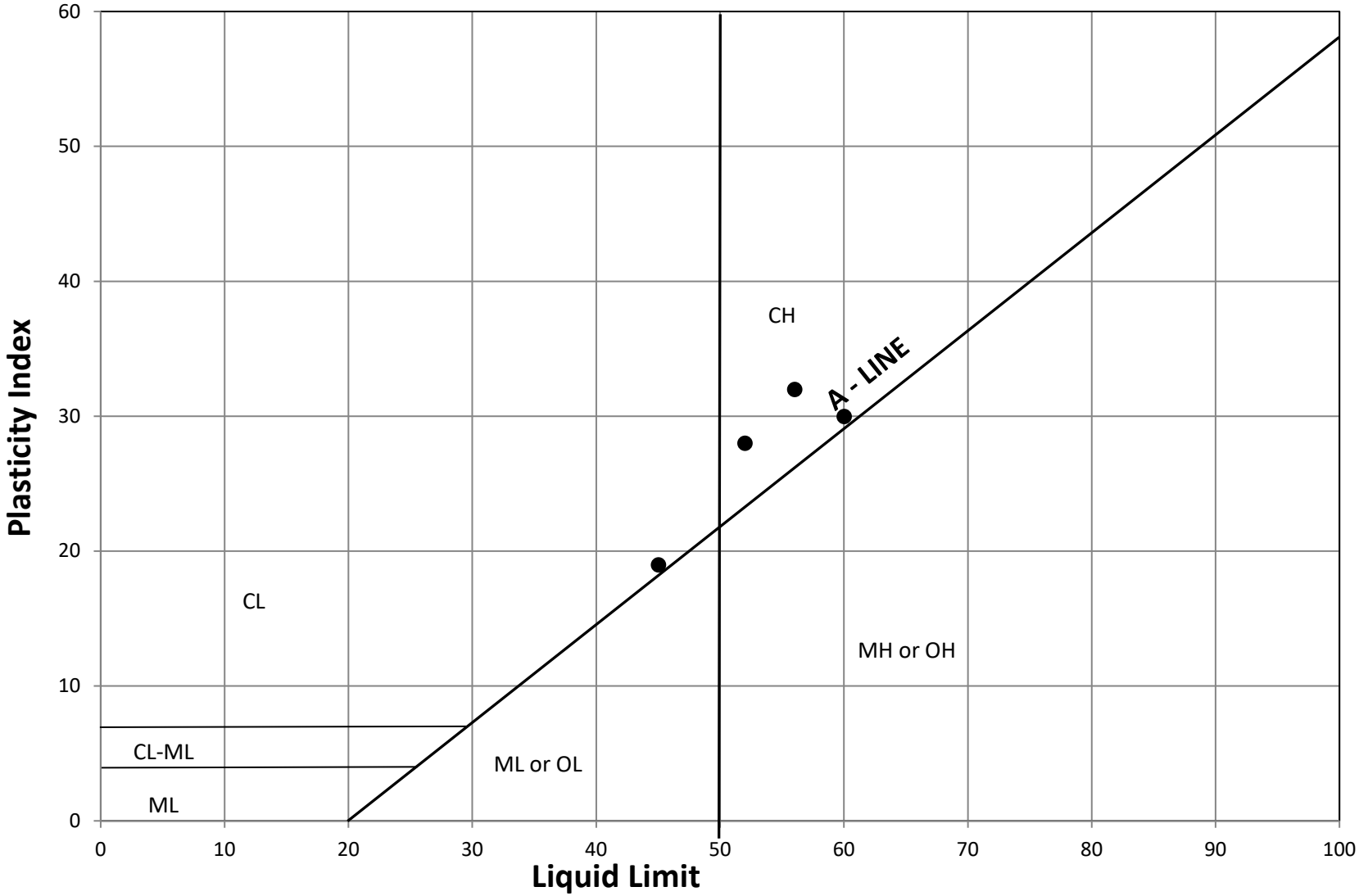
GR SA SI CL

LOGGED BY BR

BlueFrog Environmental Consulting Inc.

APPENDIX B

Geotechnical Laboratory Test Results



	PLASTICITY CHART	**Project No:** D23131
Date: May 2023	SILTY CLAY to CLAY	**Project:** 4270 Innes Road Orleans, Ontario
Checked: AD		

APPENDIX C

CERTIFICATES OF ANALYSIS

Your P.O. #: 0208-001.02
Your Project #: 0208-001.02
Site Location: 4270 INNES ROAD
Your C.O.C. #: PAGE 1 OF 1

Attention: Nawshad Mohsin

BLUEFROG ENVIRONMENTAL CONSULTING INC.
SUITE 100-208 WYECROFT ROAD
OAKVILLE, ON
CANADA L6K 3T8

Report Date: 2023/05/25
Report #: R7643096
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3D9036
Received: 2023/05/16, 13:24

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Cyanide (WAD) in Leachates	1	N/A	2023/05/23	CAM SOP-00457	OMOE 3015 m
Fluoride by ISE in Leachates	1	2023/05/23	2023/05/24	CAM SOP-00449	SM 23 4500-F- C m
Total Metals in TCLP Leachate by ICPMS	1	2023/05/23	2023/05/23	CAM SOP-00447	EPA 6020B m
Nitrate& Nitrite as Nitrogen in Leachate	1	N/A	2023/05/23	CAM SOP-00440	SM 23 4500-NO3I/NO2B
TCLP - % Solids	1	2023/05/19	2023/05/20	CAM SOP-00401	EPA 1311 Update I m
TCLP - Extraction Fluid	1	N/A	2023/05/20	CAM SOP-00401	EPA 1311 Update I m
TCLP - Initial and final pH	1	N/A	2023/05/20	CAM SOP-00401	EPA 1311 Update I m
TCLP Zero Headspace Extraction	1	2023/05/23	2023/05/24	CAM SOP-00430	EPA 1311 m
VOCs in ZHE Leachates	1	2023/05/24	2023/05/24	CAM SOP-00228	EPA 8260D

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your P.O. #: 0208-001.02
Your Project #: 0208-001.02
Site Location: 4270 INNES ROAD
Your C.O.C. #: PAGE 1 OF 1

Attention: Nawshad Mohsin

BLUEFROG ENVIRONMENTAL CONSULTING INC.
SUITE 100-208 WYECROFT ROAD
OAKVILLE, ON
CANADA L6K 3T8

Report Date: 2023/05/25
Report #: R7643096
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3D9036
Received: 2023/05/16, 13:24

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Deepthi Shaji, Project Manager
Email: Deepthi.Shaji@bureauveritas.com
Phone# (905)817-5700 Ext:7065843

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Bureau Veritas Job #: C3D9036
Report Date: 2023/05/25

BLUEFROG ENVIRONMENTAL CONSULTING INC.
Client Project #: 0208-001.02
Site Location: 4270 INNES ROAD
Your P.O. #: 0208-001.02
Sampler Initials: BR

O.REG 558 TCLP INORGANICS PACKAGE (SOIL)

Bureau Veritas ID		VVB487		
Sampling Date		2023/05/12 15:45		
COC Number		PAGE 1 OF 1		
	UNITS	WC1	RDL	QC Batch
Inorganics				
Leachable Fluoride (F-)	mg/L	0.38	0.10	8678857
Leachable WAD Cyanide (Free)	mg/L	<0.010	0.010	8678868
Leachable Nitrite (N)	mg/L	<0.10	0.10	8678867
Leachable Nitrate (N)	mg/L	<1.0	1.0	8678867
Leachable Nitrate + Nitrite (N)	mg/L	<1.0	1.0	8678867
Metals				
Leachable Arsenic (As)	mg/L	<0.2	0.2	8678898
Leachable Barium (Ba)	mg/L	0.4	0.2	8678898
Leachable Boron (B)	mg/L	0.5	0.1	8678898
Leachable Cadmium (Cd)	mg/L	<0.05	0.05	8678898
Leachable Chromium (Cr)	mg/L	<0.1	0.1	8678898
Leachable Lead (Pb)	mg/L	<0.1	0.1	8678898
Leachable Mercury (Hg)	mg/L	<0.001	0.001	8678898
Leachable Selenium (Se)	mg/L	<0.1	0.1	8678898
Leachable Silver (Ag)	mg/L	<0.01	0.01	8678898
Leachable Uranium (U)	mg/L	<0.01	0.01	8678898

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Bureau Veritas Job #: C3D9036
Report Date: 2023/05/25

BLUEFROG ENVIRONMENTAL CONSULTING INC.
Client Project #: 0208-001.02
Site Location: 4270 INNES ROAD
Your P.O. #: 0208-001.02
Sampler Initials: BR

TCLP LEACHATE PREPARATION (SOIL)

Bureau Veritas ID		VVB487		
Sampling Date		2023/05/12 15:45		
COC Number		PAGE 1 OF 1		
	UNITS	**WC1**	**RDL**	**QC Batch**
Inorganics				
Final pH	pH	5.66		8677434
Initial pH	pH	9.45		8677434
TCLP - % Solids	%	100	0.2	8675135
TCLP Extraction Fluid	N/A	FLUID 1		8677431

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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BLUEFROG ENVIRONMENTAL CONSULTING INC.
Client Project #: 0208-001.02
Site Location: 4270 INNES ROAD
Your P.O. #: 0208-001.02
Sampler Initials: BR

O.REG 558 TCLP VOCS BY HS (SOIL)

Bureau Veritas ID		VVB487		
Sampling Date		2023/05/12 15:45		
COC Number		PAGE 1 OF 1		
	UNITS	WC1	RDL	QC Batch
Charge/Prep Analysis				
Amount Extracted (Wet Weight) (g)	N/A	25	N/A	8679168
Volatile Organics				
Leachable Benzene	mg/L	<0.020	0.020	8681262
Leachable Carbon Tetrachloride	mg/L	<0.020	0.020	8681262
Leachable Chlorobenzene	mg/L	<0.020	0.020	8681262
Leachable Chloroform	mg/L	<0.020	0.020	8681262
Leachable 1,2-Dichlorobenzene	mg/L	<0.050	0.050	8681262
Leachable 1,4-Dichlorobenzene	mg/L	<0.050	0.050	8681262
Leachable 1,2-Dichloroethane	mg/L	<0.050	0.050	8681262
Leachable 1,1-Dichloroethylene	mg/L	<0.020	0.020	8681262
Leachable Methylene Chloride(Dichloromethane)	mg/L	<0.20	0.20	8681262
Leachable Methyl Ethyl Ketone (2-Butanone)	mg/L	<1.0	1.0	8681262
Leachable Tetrachloroethylene	mg/L	<0.020	0.020	8681262
Leachable Trichloroethylene	mg/L	<0.020	0.020	8681262
Leachable Vinyl Chloride	mg/L	<0.020	0.020	8681262
Surrogate Recovery (%)				
Leachable 4-Bromofluorobenzene	%	105		8681262
Leachable D4-1,2-Dichloroethane	%	111		8681262
Leachable D8-Toluene	%	83		8681262

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

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Bureau Veritas Job #: C3D9036
Report Date: 2023/05/25

BLUEFROG ENVIRONMENTAL CONSULTING INC.
Client Project #: 0208-001.02
Site Location: 4270 INNES ROAD
Your P.O. #: 0208-001.02
Sampler Initials: BR

TEST SUMMARY

Bureau Veritas ID: VVB487
Sample ID: WC1
Matrix: Soil

Collected: 2023/05/12
Shipped:
Received: 2023/05/16

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Cyanide (WAD) in Leachates	SKAL/CN	8678868	N/A	2023/05/23	Prgya Panchal
Fluoride by ISE in Leachates	ISE	8678857	2023/05/23	2023/05/24	Kien Tran
Total Metals in TCLP Leachate by ICPMS	ICP1/MS	8678898	2023/05/23	2023/05/23	Prempal Bhatti
Nitrate& Nitrite as Nitrogen in Leachate	LACH	8678867	N/A	2023/05/23	Chandra Nandlal
TCLP - % Solids	BAL	8675135	2023/05/19	2023/05/20	Jian (Ken) Wang
TCLP - Extraction Fluid		8677431	N/A	2023/05/20	Jian (Ken) Wang
TCLP - Initial and final pH	PH	8677434	N/A	2023/05/20	Dave Adriel Gunawan
TCLP Zero Headspace Extraction		8679168	2023/05/23	2023/05/24	Abdul Rahman Mohammed
VOCs in ZHE Leachates	GC/MS	8681262	2023/05/24	2023/05/24	Narayan Ghimire

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Client Project #: 0208-001.02
Site Location: 4270 INNES ROAD
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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	1.3°C

Results relate only to the items tested.

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Bureau Veritas Job #: C3D9036
Report Date: 2023/05/25

BLUEFROG ENVIRONMENTAL CONSULTING INC.
Client Project #: 0208-001.02
Site Location: 4270 INNES ROAD
Your P.O. #: 0208-001.02
Sampler Initials: BR

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8678857	KIT	Matrix Spike	Leachable Fluoride (F-)	2023/05/24		98	%	80 - 120
8678857	KIT	Leachate Blank	Leachable Fluoride (F-)	2023/05/24	<0.10		mg/L	
8678857	KIT	Spiked Blank	Leachable Fluoride (F-)	2023/05/24		99	%	80 - 120
8678857	KIT	Method Blank	Leachable Fluoride (F-)	2023/05/24	<0.10		mg/L	
8678857	KIT	RPD	Leachable Fluoride (F-)	2023/05/24	1.5		%	25
8678867	C_N	Matrix Spike	Leachable Nitrite (N)	2023/05/23		113	%	80 - 120
			Leachable Nitrate (N)	2023/05/23		100	%	80 - 120
			Leachable Nitrate + Nitrite (N)	2023/05/23		103	%	80 - 120
8678867	C_N	Leachate Blank	Leachable Nitrite (N)	2023/05/23	<0.10		mg/L	
			Leachable Nitrate (N)	2023/05/23	<1.0		mg/L	
			Leachable Nitrate + Nitrite (N)	2023/05/23	<1.0		mg/L	
8678867	C_N	Spiked Blank	Leachable Nitrite (N)	2023/05/23		106	%	80 - 120
			Leachable Nitrate (N)	2023/05/23		100	%	80 - 120
			Leachable Nitrate + Nitrite (N)	2023/05/23		101	%	80 - 120
8678867	C_N	Method Blank	Leachable Nitrite (N)	2023/05/23	<0.10		mg/L	
			Leachable Nitrate (N)	2023/05/23	<1.0		mg/L	
			Leachable Nitrate + Nitrite (N)	2023/05/23	<1.0		mg/L	
8678867	C_N	RPD	Leachable Nitrite (N)	2023/05/23	NC		%	20
			Leachable Nitrate (N)	2023/05/23	NC		%	20
			Leachable Nitrate + Nitrite (N)	2023/05/23	NC		%	20
8678868	GYA	Matrix Spike	Leachable WAD Cyanide (Free)	2023/05/23		97	%	80 - 120
8678868	GYA	Leachate Blank	Leachable WAD Cyanide (Free)	2023/05/23	<0.010		mg/L	
8678868	GYA	Spiked Blank	Leachable WAD Cyanide (Free)	2023/05/23		102	%	80 - 120
8678868	GYA	Method Blank	Leachable WAD Cyanide (Free)	2023/05/23	<0.0020		mg/L	
8678868	GYA	RPD	Leachable WAD Cyanide (Free)	2023/05/23	NC		%	20
8678898	PBA	Matrix Spike	Leachable Arsenic (As)	2023/05/23		99	%	80 - 120
			Leachable Barium (Ba)	2023/05/23		100	%	80 - 120
			Leachable Boron (B)	2023/05/23		102	%	80 - 120
			Leachable Cadmium (Cd)	2023/05/23		99	%	80 - 120
			Leachable Chromium (Cr)	2023/05/23		99	%	80 - 120
			Leachable Lead (Pb)	2023/05/23		92	%	80 - 120
			Leachable Mercury (Hg)	2023/05/23		97	%	80 - 120
			Leachable Selenium (Se)	2023/05/23		103	%	80 - 120
			Leachable Silver (Ag)	2023/05/23		95	%	80 - 120
			Leachable Uranium (U)	2023/05/23		96	%	80 - 120
8678898	PBA	Leachate Blank	Leachable Arsenic (As)	2023/05/23	<0.2		mg/L	
			Leachable Barium (Ba)	2023/05/23	<0.2		mg/L	
			Leachable Boron (B)	2023/05/23	<0.1		mg/L	
			Leachable Cadmium (Cd)	2023/05/23	<0.05		mg/L	
			Leachable Chromium (Cr)	2023/05/23	<0.1		mg/L	
			Leachable Lead (Pb)	2023/05/23	<0.1		mg/L	
			Leachable Mercury (Hg)	2023/05/23	<0.001		mg/L	
			Leachable Selenium (Se)	2023/05/23	<0.1		mg/L	
			Leachable Silver (Ag)	2023/05/23	<0.01		mg/L	
			Leachable Uranium (U)	2023/05/23	<0.01		mg/L	
8678898	PBA	Spiked Blank	Leachable Arsenic (As)	2023/05/23		101	%	80 - 120
			Leachable Barium (Ba)	2023/05/23		100	%	80 - 120
			Leachable Boron (B)	2023/05/23		99	%	80 - 120
			Leachable Cadmium (Cd)	2023/05/23		97	%	80 - 120
			Leachable Chromium (Cr)	2023/05/23		100	%	80 - 120

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Leachable Lead (Pb)	2023/05/23		96	%	80 - 120
			Leachable Mercury (Hg)	2023/05/23		99	%	80 - 120
			Leachable Selenium (Se)	2023/05/23		101	%	80 - 120
			Leachable Silver (Ag)	2023/05/23		95	%	80 - 120
			Leachable Uranium (U)	2023/05/23		96	%	80 - 120
8678898	PBA	Method Blank	Leachable Arsenic (As)	2023/05/23	<0.2		mg/L	
			Leachable Barium (Ba)	2023/05/23	<0.2		mg/L	
			Leachable Boron (B)	2023/05/23	<0.1		mg/L	
			Leachable Cadmium (Cd)	2023/05/23	<0.05		mg/L	
			Leachable Chromium (Cr)	2023/05/23	<0.1		mg/L	
			Leachable Lead (Pb)	2023/05/23	<0.1		mg/L	
			Leachable Mercury (Hg)	2023/05/23	<0.001		mg/L	
			Leachable Selenium (Se)	2023/05/23	<0.1		mg/L	
			Leachable Silver (Ag)	2023/05/23	<0.01		mg/L	
			Leachable Uranium (U)	2023/05/23	<0.01		mg/L	
8678898	PBA	RPD	Leachable Arsenic (As)	2023/05/23	NC		%	35
			Leachable Barium (Ba)	2023/05/23	4.2		%	35
			Leachable Boron (B)	2023/05/23	0.85		%	35
			Leachable Cadmium (Cd)	2023/05/23	NC		%	35
			Leachable Chromium (Cr)	2023/05/23	NC		%	35
			Leachable Lead (Pb)	2023/05/23	NC		%	35
			Leachable Mercury (Hg)	2023/05/23	NC		%	35
			Leachable Selenium (Se)	2023/05/23	NC		%	35
			Leachable Silver (Ag)	2023/05/23	NC		%	35
			Leachable Uranium (U)	2023/05/23	NC		%	35
8681262	NGH	Matrix Spike	Leachable 4-Bromofluorobenzene	2023/05/24		111	%	70 - 130
			Leachable D4-1,2-Dichloroethane	2023/05/24		101	%	70 - 130
			Leachable D8-Toluene	2023/05/24		102	%	70 - 130
			Leachable Benzene	2023/05/24		87	%	70 - 130
			Leachable Carbon Tetrachloride	2023/05/24		101	%	70 - 130
			Leachable Chlorobenzene	2023/05/24		92	%	70 - 130
			Leachable Chloroform	2023/05/24		95	%	70 - 130
			Leachable 1,2-Dichlorobenzene	2023/05/24		91	%	70 - 130
			Leachable 1,4-Dichlorobenzene	2023/05/24		103	%	70 - 130
			Leachable 1,2-Dichloroethane	2023/05/24		92	%	70 - 130
			Leachable 1,1-Dichloroethylene	2023/05/24		87	%	70 - 130
			Leachable Methylene Chloride(Dichloromethan	2023/05/24		111	%	70 - 130
			Leachable Methyl Ethyl Ketone (2-Butanone)	2023/05/24		95	%	60 - 140
			Leachable Tetrachloroethylene	2023/05/24		92	%	70 - 130
			Leachable Trichloroethylene	2023/05/24		107	%	70 - 130
			Leachable Vinyl Chloride	2023/05/24		86	%	70 - 130
8681262	NGH	Spiked Blank	Leachable 4-Bromofluorobenzene	2023/05/24		111	%	70 - 130
			Leachable D4-1,2-Dichloroethane	2023/05/24		103	%	70 - 130
			Leachable D8-Toluene	2023/05/24		102	%	70 - 130
			Leachable Benzene	2023/05/24		87	%	70 - 130
			Leachable Carbon Tetrachloride	2023/05/24		99	%	70 - 130
			Leachable Chlorobenzene	2023/05/24		94	%	70 - 130
			Leachable Chloroform	2023/05/24		95	%	70 - 130
			Leachable 1,2-Dichlorobenzene	2023/05/24		93	%	70 - 130
			Leachable 1,4-Dichlorobenzene	2023/05/24		106	%	70 - 130

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Leachable 1,2-Dichloroethane	2023/05/24		93	%	70 - 130
			Leachable 1,1-Dichloroethylene	2023/05/24		86	%	70 - 130
			Leachable Methylene Chloride(Dichloromethan	2023/05/24		110	%	70 - 130
			Leachable Methyl Ethyl Ketone (2-Butanone)	2023/05/24		98	%	60 - 140
			Leachable Tetrachloroethylene	2023/05/24		91	%	70 - 130
			Leachable Trichloroethylene	2023/05/24		106	%	70 - 130
			Leachable Vinyl Chloride	2023/05/24		84	%	70 - 130
8681262	NGH	Method Blank	Leachable 4-Bromofluorobenzene	2023/05/24		106	%	70 - 130
			Leachable D4-1,2-Dichloroethane	2023/05/24		111	%	70 - 130
			Leachable D8-Toluene	2023/05/24		82	%	70 - 130
			Leachable Benzene	2023/05/24	<0.020		mg/L	
			Leachable Carbon Tetrachloride	2023/05/24	<0.020		mg/L	
			Leachable Chlorobenzene	2023/05/24	<0.020		mg/L	
			Leachable Chloroform	2023/05/24	<0.020		mg/L	
			Leachable 1,2-Dichlorobenzene	2023/05/24	<0.050		mg/L	
			Leachable 1,4-Dichlorobenzene	2023/05/24	<0.050		mg/L	
			Leachable 1,2-Dichloroethane	2023/05/24	<0.050		mg/L	
			Leachable 1,1-Dichloroethylene	2023/05/24	<0.020		mg/L	
			Leachable Methylene Chloride(Dichloromethan	2023/05/24	<0.20		mg/L	
			Leachable Methyl Ethyl Ketone (2-Butanone)	2023/05/24	<1.0		mg/L	
			Leachable Tetrachloroethylene	2023/05/24	<0.020		mg/L	
			Leachable Trichloroethylene	2023/05/24	<0.020		mg/L	
			Leachable Vinyl Chloride	2023/05/24	<0.020		mg/L	
8681262	NGH	RPD	Leachable Benzene	2023/05/24	NC		%	30
			Leachable Carbon Tetrachloride	2023/05/24	NC		%	30
			Leachable Chlorobenzene	2023/05/24	NC		%	30
			Leachable Chloroform	2023/05/24	NC		%	30
			Leachable 1,2-Dichlorobenzene	2023/05/24	NC		%	30
			Leachable 1,4-Dichlorobenzene	2023/05/24	NC		%	30
			Leachable 1,2-Dichloroethane	2023/05/24	NC		%	30
			Leachable 1,1-Dichloroethylene	2023/05/24	NC		%	30
			Leachable Methylene Chloride(Dichloromethan	2023/05/24	NC		%	30
			Leachable Methyl Ethyl Ketone (2-Butanone)	2023/05/24	NC		%	30
			Leachable Tetrachloroethylene	2023/05/24	NC		%	30
			Leachable Trichloroethylene	2023/05/24	NC		%	30
			Leachable Vinyl Chloride	2023/05/24	NC		%	30

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Leachate Blank: A blank matrix containing all reagents used in the leaching procedure. Used to determine any process contamination.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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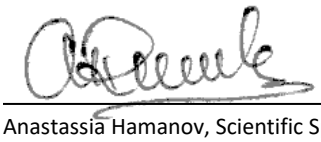
Bureau Veritas Job #: C3D9036
Report Date: 2023/05/25

BLUEFROG ENVIRONMENTAL CONSULTING INC.
Client Project #: 0208-001.02
Site Location: 4270 INNES ROAD
Your P.O. #: 0208-001.02
Sampler Initials: BR

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



Anastassia Hamanov, Scientific Specialist

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Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266

CHAIN OF CUSTODY RECORD

ENV COC - 00014v3

Invoice Information	Invoice to (requires report) ☐	Report Information (if differs from invoice)		Project Information	
Company:	Blue Frog	Company:		Quotation #:	
Contact Name:	Navshad Mohsin	Contact Name:		P.O. #/ AFE#:	0208-001.02
Street Address:	208 Wyecroft Road	Street Address:		Project #:	0208-001.02
City:	Oakville Prov: ON Postal Code:	City: Prov: Postal Code:		Site #:	
Phone:	647-989-4297	Phone:		Site Location:	4276 Innes Road
Email:	nmohsin@blueFrogConsulting.ca	Email:		Site Location Province:	ON
Copies:		Copies:	brobbin@bluefrogconsulting.ca	Sampled By:	Brett Robbin

Mont-05-241

Regulatory Criteria

REG 153: ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ____ ☐ Res/Park ☐ Ind/Comm ☐ Agri/other ☐ Med/Fine ☐ Course ☐ For RSC

OTHER: ☐ CCME ☒ Reg 558* ☐ MISA ☐ PWQO ☐ Reg 406, Table: ____ ☐ Sanitary Sewer Bylaw ☐ Storm Sewer Bylaw Municipality ____ ☐ Other:

*min 3 day TAT

Include Criteria on Certificate of Analysis (check if yes): ☐

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

Regular Turnaround Time (TAT)

☒ 5 to 7 Day ☐ 10 Day

Rush Turnaround Time (TAT) Surcharges apply

☐ Same Day ☐ 1 Day ☐ 2 Day ☐ 3 Day ☐ 4 Day

Date Required: YY MM DD

Comments

	Sample Identification	Date Sampled YY	MM	DD	Time (24hr) HH	MM	Matrix	1 FIELD FILTERED	2 FIELD PRESERVED	3 LAB FILTRATION REQUIRED	4 BTEX/ F1	5 F2 - F4	6 VOCs	7 Reg 153 metals and inorganics	8 Reg 153 ICPMS metals	9 Reg 153 metals (Hg, Cr VI, ICPMS metals, HWS - B)	10 TCLP Metals & inorganics	11 TCLP VOC	12	13	14	15	16	17	18	19	20	21 # OF CONTAINERS SUBMITTED	22 HOLD - DO NOT ANALYZE
1	WC1	23	05	12	15	45	Soil										X	X										2	
2																													
3																													
4																													
5																													
6																													
7																													
8																													
9																													
10																													
11																													
12																													

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present	✓					
Seal intact	✓					
Cooling media present	✓					

LAB USE ONLY	Yes	No	°C	1	2	3
Seal present						
Seal intact						
Cooling media present						

LAB USE ONLY	Yes	No	°C	1	2	3	Temperature reading by:
Seal present							
Seal intact							
Cooling media present							

Relinquished by: (Signature/ Print)	Date YY	MM	DD	Time HH	MM	Received by: (Signature/ Print)	Date YY	MM	DD	Time HH	MM	Special Instructions
1 Brett Robbin Brett Robbin	2023	05	15	15	20	1 ADM	23	05	16	13	24	
2						2						

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