GEOTECHNICAL ASSESSMENT REPORT

Proposed Commercial Development
3145 Conroy Road
Ottawa, Ontario

CO1004.02

FINAL REPORT

March 18, 2026

Prepared for:

WO MW REALTY LTD.

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APPENDICES

1.0 INTRODUCTION

Terrapex Environmental Ltd. (Terrapex) has been retained by WO MW Realty Ltd. to prepare a geotechnical assessment for the proposed development at the property located at 3145 Conroy Road in Ottawa, Ontario (the "Site"). Authorization to proceed with this study was given by Ms. Christine Yee of WO MW Realty Ltd.

The Site is located on the east side of Conroy Road, approximately 1.2 km northwest of intersection of Hunt Club Road and Conroy Road in Ottawa, Ontario.

The existing parcel is an undeveloped property with an area of 4.86 ha. The majority of the site is vegetated. There is an existing entrance from Conroy Road, along with remnants of former recreational uses, including an old go-kart track and an outdoor mini-putt area located within the western portion of the site.

According to the latest development plans (Deimling Architecture & Interior Design, November 13, 2025, and Egis, November 14, 2025) provided by the Client to Terrapex, it is understood that the proposed development consists of a 3,020 m² industrial/commercial building (slab-on-grade, no basement level) which will consist of a two-storey office building, one-storey maintenance garage and one-storey tarp building with associated parking, proposed loading spaces and some landscaping features.

The locations of the proposed development are shown on **Figure 1** "Site Plan – Proposed" attached in **Appendix B** of this report.

Pinchin Ltd. conducted a preliminary geotechnical investigation within the western portion of the subject site in support of the initial development plans in 2024. Their investigation included drilling of five (5) boreholes advanced 6.7 m to 12.8 m below the existing ground surface (mbgs). A copy of the above report was provided to Terrapex. In support of the latest development plan, Terrapex referred to Pinchin's borehole data and laboratory test results to prepare the current geotechnical assessment report.

The purpose of this investigation was to characterize the underlying soil and groundwater conditions, to determine the relevant geotechnical properties of encountered ground conditions and to provide geotechnical engineering recommendations pertaining to the proposed development.

This report presents the results of the investigation performed in accordance with the general terms of reference outlined above and is intended for the guidance of the owner and the design architects or engineers only. It is assumed that the design will be in accordance with the applicable building codes and standards.

2.0 PAST FIELDWORK

The fieldwork for this investigation was carried out by Pinchin during the period between July 15 and 16, 2024. It consisted of five (5) boreholes advanced by Strata Drilling Group. The boreholes were advanced at the locations shown on the borehole Location Plan in **Appendix C**.

The boreholes designated as BH1 though BH5 were advanced to depths ranging from 6.7 m to 12.8 m below ground surface (mbgs).

Standard penetration tests were carried out in the course of advancing the boreholes through the overburden to take representative soil samples and to measure penetration index values (N-values) to characterize the condition of the various soil materials. The number of blows of the striking hammer required to drive the split spoon sampler to 300 mm depth was recorded and these are presented on the logs as penetration index values. Boreholes BH3 and BH5 were supplemented with dynamic cone penetration test (DCPT) soundings ranging from 9.1 to 11.3 below ground surface, where spoon refusal was encountered.

Field vane shear testing (FVST) was conducted to measure the in-situ undrained shear strength of the soil in the relatively firm to stiff clay layer that was encountered in the boreholes.

Results of SPT and FVST are shown on the borehole log sheets in **Appendix D** of this report.

A monitoring well was installed in Borehole BH2 to allow for groundwater measurement and to perform in-situ hydraulic conductivity testing. Groundwater measurements were made in the monitoring well by Pinchin on July 25 and August 7, 2024. The results of the groundwater measurements are discussed in **Section 4.5** of this report.

Groundwater level observations were made by Pinchin in the open boreholes during their advancement and upon completion of drilling.

The borehole locations were surveyed by Pinchin. The positions and ground surface elevations at the borehole locations were referenced to the provided Geodetic benchmark shown on Topographic Detail of 3145 Conroy Road – City of Ottawa – Prepared by J.D. Barnes Limited – Reference No. 24-10-029-00, and dated May 01, 2024. The elevations are referenced to Geodetic datum (CGVD28).

The fieldwork for this project was carried out under the supervision of Pinchin's staff who effected the drilling, sampling and in situ testing, observed groundwater conditions, and prepared field borehole log sheets.

Terrapex cannot guarantee the accuracy of work carried out by others. Any comment based on work carried out by others is subject to the accuracy of the information provided to Terrapex.

3.0 PAST LABORATORY TESTS

The soil samples retained from the boreholes were visually classified by Pinchin. The results of the classification and Standard Penetration tests are presented on the borehole log sheets attached in **Appendix D** of this report

Grain-size and hydrometer analyses and water content determinations were carried out on five (5) soil samples (BH1-SS4, BH2-SS2, BH3-SS3, BH4-SS7 and BH5-SS3). Four (4) samples (BH1-SS4, BH2-SS2, BH3-SS3 and BH5-SS3) were subjected to Atterberg Limits tests. The results of these tests are enclosed in **Appendix E**.

In addition, one (1) soil sample (BH2 sample SS3) was submitted to SGS Laboratory for determination of pH and sulphate content and its potential for sulphate attack on buried concrete. The results of these tests are enclosed in **Appendix F**; discussed in **Section 5.15** of this report.

4.0 SITE AND SUBSURFACE CONDITIONS

Full details of the subsurface soil and groundwater conditions at the site are given on the Borehole Log Sheets attached in **Appendix D** of this report.

The following paragraphs present a description of the site and a commentary on the engineering properties of the various soil materials contacted in the boreholes.

The borehole investigation carried out by Pinchin was within the western portion of the site.

It should be noted that the boundaries of soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design, and therefore, should not be construed as exact planes of geological change.

4.1 SITE DESCRIPTION

The Site is located on the east of Conroy Road accessed from a driveway from Conroy Road along the southern portion of the property. The majority of the site is vegetated. There is an existing entrance from Conroy Road, along with remnants of former recreational uses, including an old go-kart track and an outdoor mini-putt area located within the western portion of the site.

The site is generally flat. The ground surface elevations at the locations of the boreholes ranged from 83.35 m at Borehole BH2 to 84.10 m at Borehole BH1.

4.2 SURFACE COVER

It should be noted that an organic surface cover consisting of approximately 75 mm to 100 mm thick layer is present in all boreholes except in Borehole BH5.

It should be noted that the surficial organic thickness will vary across the Site, and thicker topsoil than that found in the boreholes may be present in the surrounding places. This renders it difficult to estimate the quantity of topsoil to be stripped based on the findings at the borehole location.

4.3 FILL MATERIAL

Fill material was present at the surface cover in Borehole BH5. It extends to a depth of approximately 0.6 mbgs. The fill material consists of sand and gravel with trace silt.

The fill is grey in colour and wet in appearance.

SPT in the fill material provided N-values of 18 blows for 300 mm of penetration, indicating a compact condition.

4.4 NATIVE SOIL

The native soils below the organics and fill material consist of layers of fat clay, sand and silty sand till.

4.4.1 Fat Clay

A deposit of fat clay with trace of sand was encountered beneath the surficial organics and fill layer in all boreholes, extended to depths ranging from 6.1 m to 7.6 m below ground surface in boreholes BH1 and BH4. The other three boreholes were not sampled beyond the fat clay layer.

Fat clay is grey in colour and the water content of the samples obtained from Boreholes BH1, BH2, BH3 and BH5 ranged from 36% to 68% by weight, very moist to wet in appearance.

SPT testing in the fat clay layer yielded N-values ranging from 0 to 8 blows for 300 mm of penetration, indicating a very soft to firm consistency. In-situ field vane shear tests conducted in the fat clay measured undrained shear strengths between 42 to 199 kPa, indicating that the fat clay consists of firm to very stiff consistency. Moreover, the remoulded shear strengths of the material ranged from 12 to 105 kPa, resulting in a sensitivity of 2.0 to 4.0 indicating a medium sensitivity.

Grain size, hydrometer and Atterberg Limits tests were carried out on four (4) representative samples of fat clay obtained from borehole BH1, BH2, BH3 and BH5. The test results are enclosed in **Appendix E** and summarized in the following table.

Sample No. and Depth	Sample Description (According to CFEM, 4th Edition)	Gravel %	Sand %	Silt %	Clay %	Plastic Limit	Liquid Limit	Soil Classification (According to USCS)
BH1 Sample 4	SILTY CLAY trace sand	-	2.7	20.3	77.0	37	80	CH
BH2 Sample 2	SILTY CLAY trace sand	-	0.9	24.6	74.5	33	75	CH
BH3 Sample 3	SILTY CLAY trace sand	-	3.4	19.6	77.0	35	79	CH
BH5 Sample 3	SILTY CLAY few sand	-	5.4	24.1	70.5	35	78	CH

4.4.2 Sand

A deposit of sand with some silt and trace gravel was encountered beneath the fat clay layer in borehole BH1, extended to a depth of approximately 10.8 mbgs.

Sand is grey and black in colour and moist to wet in appearance.

SPT testing in the sand layer yielded N-values ranging from 10 to 17 blows for 300 mm of penetration, indicating a compact condition.

4.4.3 Silty Sand Till

A deposit of sandy silt till is present below the fat clay layer in Borehole BH4, extending to the explored depth of the borehole.

The silty sand till is a glacial deposit consisting of a random mixture of soil particles ranging from clay to gravel.

Silty sand till is grey in colour and the water content of the sample obtained from BH4 is 8.9% weight, moist in appearance.

SPT carried out in the sandy silt till deposit provided N-values ranging from 9 to 45 blows of 300 mm penetration, indicating a loose to dense compactness condition.

Pinchin conducted two dynamic cone penetration tests (DCPT) at the boreholes BH3 and BH5 below the fat clay layer and the material retrieved from the boreholes were identical to the material encountered in Borehole BH4. The DCPT values varied from 4 blows to 30 blows for 300 mm penetration, indicating a loose to dense compactness condition.

Grain size, hydrometer and Atterberg Limits tests were carried out on one (1) representative sample of silty sand till obtained from borehole BH4. The test results are enclosed in **Appendix E** and summarized in the following table.

Sample No. and Depth	Sample Description (According to CFEM, 4th Edition)	Gravel %	Sand %	Silt %	Clay %	Plastic Limit	Liquid Limit	Soil Classification (According to USCS)
BH4 Sample 7	SILTY SAND with gravel, few clay	20.4	46.0	24.1	9.5	-	-	SM

4.4.4 Bedrock

Inferred bedrock was encountered through auger and spoon refusal at depths of 11.1 mbg to 12.8 mbg in Boreholes BH1, BH4 and BH5, corresponding to geodetic elevations varying from 71.2 m to 72.7m. In general, auger/cone refusal may indicate the bedrock surface; however, it could also represent cobbles and/or boulders within or on the surface of glacial till layer (silty sand till). Rock coring was not carried out in the drilled boreholes. According to the Bedrock Geology of Ontario map, published by Ontario Geological Survey, the bedrock is expected to be *Shale, limestone, dolostone, siltstone, Georgian Bay Formation; Blue Mountain Formation; Billings Formation; Collingwood Member; Eastview Member.*

4.5 GROUNDWATER

Groundwater observations were made during drilling of the boreholes and upon completion of advancement of the borehole. At the completion of drilling, groundwater level was measured in the open boreholes at depths ranging from approximately 2.3 mbgs to 4.5 mbgs.

Pinchin carried out two (2) rounds of the groundwater level measurements on July 25 and August 7, 2024, in the monitoring well installed in BH2.

The groundwater levels measured in the monitoring well are summarized in the following table.

Borehole No.	Ground Surface Eelevation (m)	Date	Groundwater Depth (mbgs)	Groundwater Elevation (m)
BH2	83.35	July 25, 2024	3.9	79.45
BH2	83.35	August 7, 2024	3.8	79.55

It should be noted that groundwater levels are subject to seasonal fluctuations. A higher groundwater level condition may also develop following significant rainfall events.

5.0 DISCUSSION AND RECOMMENDATIONS

The following discussions and recommendations are based on the factual data obtained from the boreholes advanced at the site by **Pinchin** and are intended for use by the client and design architects and engineers only.

It is our understood that the Client plans to redevelop the property with civic address 3145 Conroy Road in Ottawa. It is understood that the proposed development consists of a 3,020 m² industrial/commercial building (slab-on-grade, no basement level) which will consist of a two-storey office building, one-storey maintenance garage and one-storey tarp building with associated parking, proposed loading spaces and some landscaping features.

The construction methods described in this report are not specifications or recommendations to the contractors or as the only suitable methods. The collected data and the interpretation presented in this report may not be sufficient to assess all the factors that may influence the construction. Contractors bidding on this project or conducting work associated with this project should make their own interpretation of the factual data and/or carry out their own investigations as they might deem necessary. The contractor should also select the method of construction, equipment and sequence based on their previous experience on similar projects.

5.1 EXCAVATION

Based on the field results, excavations for foundations and utility trenches are not expected to pose any unusual difficulty in the overburden. Excavation of the overburden materials can be carried out with hydraulic excavators. Provisions must be made in the excavation and foundation installation contracts for the removal of possible obstructions such as concrete and construction debris associated with former structures at the site.

All excavations must be carried out in accordance with the latest Occupational Health and Safety Act (OHSA). With respect to the latest OHSA, the fill material and native soils are expected to conform to Type 3 Soil above groundwater level and Type 4 Soil below groundwater level.

Temporary excavation sidewalls in Type 3 soils should not exceed 1.0 horizontal to 1.0 vertical. Excavation extended below the water table must be sloped at a maximum inclination of 3.0 horizontal to 1.0 vertical (Type 4 soil in accordance with the OHSA) will be required.

In the event very loose and/or soft soils are encountered at shallow depths or within zones of persistent seepage, it will be necessary to flatten the side slopes as necessary to achieve stable conditions.

For excavations through multiple soil types, the side slope geometry is governed by the soil with the highest number designation. Excavation side-slopes should not be unduly left exposed to inclement weather.

Where workers must enter excavations extending deeper than 1.2 m below grade, the excavation sidewalls must be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavations shall be undertaken in a manner to prevent damage to adjacent property, existing structures, utilities, roads, and sidewalks. During excavations, adjacent existing structures and public right of way, if present, must be protected by proper shoring or sloping. General guidelines for underpinning in soil and excavation support are presented in **Appendix G**.

5.2 GROUNDWATER CONTROL

Based on the borehole information, the clay soil possesses low permeability coefficient; the groundwater yield from this soil is expected to be small. It is anticipated that adequate control of the groundwater can be achieved by pumping from filtered sumps in the base of the excavations within the fill and silty clay soils.

The underlying native sandy silt till and sand soils are expected to have a moderate to high permeabilities, respectively. Excavation into these layers may require positive dewatering to avoid flowing sides and base instability.

Surface water should be directed away from open excavations.

5.3 SITE GRADING

Based on the proposed *“Site Grading, Drainage, Erosion and Sediment Control Plan” Drawing Number C101, prepared by egis dated November 14, 2025, and the “Site Plan” drawings prepared by Deimling Architecture & Interior Design, dated November 13, 2025*, provided to Terrapex by the Client, it is understood that the parking areas will cover the majority of the site except the soft landscaping and the buildings. The proposed grading within the paved areas varies from 83.9 masl to 85.00 masl. The topographic survey of the site was not provided to Terrapex. According to the elevations established/surveyed by Pinchin at the borehole locations, the existing topographic elevation within the above area varies from 83.35 masl to 84.10 masl. As such, the proposed grade raise is expected to be as high as 1.7 m.

The site is generally underlain by a very soft to firm/stiff fat clay layer that is prone to settlement when subjected to additional loads. It is recommended that the site grade be kept at approximately the current elevations to avoid long-term settlement.

No laboratory oedometer (consolidation) tests were completed to directly calculate the potential ground settlement. However, based on empirical correlations, a maximum site grade raise of approximately 1.7 m is expected to induce a long-term settlement of 30 mm across the site. A detailed settlement analysis will be carried out during the detailed design stage.

5.4 Engineered Fill

The following recommendations regarding construction of engineered fill should be adhered to during the construction stage:

- All surface vegetation, organic materials, loose or soft fill soils, and softened and/or disturbed soils must be removed, and the exposed subgrade soils proof-rolled under the supervision of the Geotechnical Engineer prior to placement of new fill.
- If the engineered fill will be used to support structures, the existing fill must be removed in its entirety prior to placement of new fill.
- Soils used as engineered fill should be free of organics and/or other unsuitable material. The engineered fill must be placed in lifts not exceeding 200 mm in thickness and compacted to at least 98% Standard Proctor maximum Dry Density (SPMDD).
- Engineered fill operations should be monitored, and compaction tests should be performed on a full-time basis by a qualified engineering technician supervised by the project engineer.
- The boundaries of the engineered fill must be clearly and accurately laid out in the field by qualified surveyors prior to the commencement of engineered fill construction. The top of the engineered fill should extend a minimum of 2.5 m beyond the envelope of the proposed structures. Where the depth of engineered fill exceeds 1.5 m, this horizontal distance of 2.5 m beyond the perimeter of the structure should be increased by at least 1 m for each 1.5 m depth of fill.
- The engineered fill operation should take place in favorable climatic conditions. If the work is carried out in months where freezing temperatures may occur, all frost affected material must be removed prior to the placement of frost-free fill.
- If unusual soil conditions become apparent during construction, due to subsurface groundwater influences, our office should be contacted in order to assess the conditions and recommend appropriate remedial measures.

5.5 Reuse of On-Site Excavated Soil

On-site excavated inorganic soils are considered suitable for reuse as backfill material or engineering fill, provided their water content is within 2% of their optimum water content (OWC) as determined by Standard Proctor test, and the materials are effectively compacted with a suitably sized compactor. The compactors must be of sufficient size and energy to break down the lumps and to knead the soil into a homogeneous mass as water and compaction effort is applied. If the equipment does not have sufficient energy to break down the lumps, there is a tendency to bridging and post construction settlements.

The soils excavated from below the groundwater level are expected to be too wet to be re-used. The moisture content of the soils and the lift thickness for compaction must be properly controlled and monitored by a qualified field engineer/geotechnical inspector during backfilling. Alternatively, suitable imported material can be used.

On-site soils that are wetter than their OWC should be dried sufficiently prior to use as backfill in order to achieve the specified degree of compaction. The native fat clay soil is considered to be very wet, unsuitable for use as engineered fill.

In areas of narrow trenches or confined spaces such as around manholes, the use of aggregate fill such as Granular 'B' (OPSS 1010) is required if there is to be post-construction grade integrity.

5.6 SERVICES TRENCHES

Based on the *"Site Servicing Plan" Drawing Number C102, prepared by egis, dated November 14, 2025*, provided to Terrapex by the Client, we understand that based on the assumed site grades, sewer pipes and water mains are anticipated to be supported on undisturbed native deposits, which are considered suitable.

Installation and construction of the services trenching should meet municipal and OPS standards.

If unsuitable bedding conditions occur, careful preparation and strengthening of the trench bases prior to pipe installation will be required.

The type of bedding depends mainly on the strength of the subgrade immediately below the invert levels.

Normal Class 'B' bedding is recommended for underground utilities. Granular 'A' or 19 mm crusher-run limestone can be used as bedding material; all granular materials should meet OPS 1010 specifications. The bedding material should be compacted to a minimum of 95% SPMDD. Bedding details should follow the applicable governing design detail. Trenches dug for these purposes should not be unduly left exposed to inclement weather.

Pipe bedding and backfill for flexible pipes should be undertaken in accordance with OPSD 802.010.

If unsuitable bedding conditions occur, careful preparation and strengthening of the trench bases prior to sewer installation will be required. The subgrade may be strengthened by placing a thick mat consisting of 50 mm crusher-run limestone. Field conditions will determine the depth of stone required. Geotextiles and/or geogrids may be helpful, and these options should be reviewed by Terrapex on a case-by-case basis.

Sand cover material should be placed as backfill to at least 300 mm above the top of pipes. Placement of additional granular material (thickness dictated by the type of compaction equipment) as required or use of smaller compaction equipment for the first few lifts of native material above the pipe will probably be necessary to prevent damage to the pipe during the trench backfill compaction.

It is recommended that service trenches be backfilled with on-site native materials such that at least 95% of Standard Proctor Maximum Dry Density (SPMDD) is obtained in the lower zone of the trench and 98% of SPMDD for the upper 1 m.

In areas of narrow trenches or confined spaces such as around manholes, catch basins, etc., the use of aggregate fill such as Granular "B" Type I (OPSS 1010) is required if there is to be post-construction grade integrity.

5.7 FOUNDATION DESIGN

We understand that the proposed office/industrial buildings will be lightly loaded single to two-storey structures.

It is understood that the proposed structure will consist of above grade building with no basement. Shallow conventional spread and strip footing foundations may be used to support the proposed structure on the existing fat clay soil and/or improved ground or supported by deep foundations.

5.7.1 Shallow Footings

Based on the soil stratigraphy observed in BH1 through BH5, conventional spread or strip footings may be used to support the proposed buildings.

Foundations founded on the undisturbed native fat clay soil below a frost depth of 1.8 m may be designed based on a bearing resistance of 100 kPa at Serviceability Limit States (SLS) and factored geotechnical bearing resistance at Ultimate Limit States (ULS) of 120 kPa.

The total and differential settlements of spread footings designed in accordance with the recommendations provided above should not exceed the conventional limits of 25 mm and 19 mm respectively.

Due to variations in the consistency of the founding soils and/or loosening caused by excavating disturbance and/or seasonal frost effects, all footing subgrades must be evaluated by the Geotechnical Engineer prior to placing formwork and foundation concrete to ensure that the soil exposed at the excavation base is consistent with the design geotechnical bearing resistance.

In the event necessary, the stepping of the footings at different elevations should be carried out at an angle no steeper than 2 horizontals (clear horizontal distance between footings) to 1 vertical (difference in elevation) and no individual footing step should be greater than 0.60 m.

Rainwater or groundwater seepage entering the foundation excavations must be pumped away (not allowed to pond). The foundation subgrade soils should be protected from freezing, inundation, and equipment traffic. If unstable subgrade conditions develop, Terrapex should be contacted to assess the conditions and make appropriate recommendations.

All exterior footings and footings in unheated areas should be provided by at least 1.8 m of soil cover or equivalent artificial thermal insulation for frost protection purposes. If construction proceeds during freezing weather conditions, adequate temporary frost protection for the footing bases and concrete must be provided.

5.7.2 Ground Improvement

Based on the soil stratigraphy observed in BH3 and BH5, situated within the footprints or close proximity of the proposed buildings, Ground Improvement techniques, such as Controlled Modulus Columns (CMC) or Geopiers could be used to improve the condition of the native soils. CMCs consist of thin concrete columns, and Geopiers consist of rammed aggregate piers installed throughout the footprints of the buildings. For preliminary design purposes, the composite of the native fat clay (silty clay) and ground improvement system could provide bearing resistances ranging to 250 kPa at SLS. The spread and strip footings for the building would be constructed using conventional methods, supported on a granular load transfer platform overlying the ground improvement system.

The ground improvement system should be designed, installed, and certified by a specialist ground improvement contractor.

5.7.3 Deep Foundations

Caissons may also be considered for support of the proposed buildings. Caissons socketed 1 m into sound bedrock may be designed based on an end bearing resistance of 1 MPa at ULS. Higher bearing resistance may be adopted if rock coring is carried out to confirm the quality and competence of the bedrock. The bedrock surface and bearing conditions should be verified by a geotechnical engineer during construction.

Temporary liners will be required at the site due to the presence of soft clay and wet sands to prevent caving of the sides of the drilled holes. The installation of the caissons must be inspected by a qualified geotechnical engineer to ensure that the caissons are constructed on bedrock in accordance with the design intent. The contractor must take into consideration the excavation method to be used through the loose and water bearing soils (continuous liners, mud drilling, etc.) and the concreting technique for installing caissons in accordance with good construction practice.

The hole base should be cleaned using the auger and observed and approved by the Geotechnical Engineer.

Concrete should be placed to a minimum thickness of 600 mm in the caisson hole and mixed with the auger. The concrete should then be extracted from the caisson hole and disposed. Concrete placement for the caisson foundation may then proceed.

In the event that more than 150 mm of water is present in the base of the hole, it will be necessary to place concrete using the tremie method to ensure proper placement of the concrete in water

5.8 FLOOR SLAB

It is assumed and anticipated that the subgrade below the floor slabs of the proposed buildings will consist of engineered fill or native undisturbed soils which are considered to be adequate to support a slab-on-grade construction.

Subgrade preparation should include the removal of all organic soil, debris and any wet, weak, loose materials and disturbed native soils. After removal of all unsuitable materials, the subgrade should be proof rolled with a fully loaded tandem axle dump truck. The proof rolled operation should be witnessed by the Geotechnical Engineer. Any soft or wet subgrade areas which deflect significantly should be sub-excavated and replaced with suitable approved fill; placed in maximum lifts of 200 mm thickness and compacted to at least 98% of SPMDD.

It is recommended that a combined moisture barrier and a levelling course, having a minimum thickness of 150 mm and comprised of free draining material such as Granular “A” be provided as a base for the slab-on-grade. The base material should be compacted to minimum 98 % of its SPMDD or 19 mm clear stone may be used and compacted by vibration to a dense condition, with filter fabric separating the clear stone and the subgrade.

Perimeter drainage at the foundation level is not required provided the finished floor surface is above the prevailing grade and the surrounding surfaces slope away from the buildings.

5.9 LATERAL EARTH PRESSURE

Parameters used in the determination of earth pressure acting on structures subject to unbalanced pressure are defined below.

Parameter	Definition	Units
Φ'	Angle of Internal Friction	degrees
γ	Bulk Density	kN/m^3
K_a	active earth pressure coefficient (Rankine)	dimensionless
K_o	at-rest earth pressure coefficient (Rankine)	dimensionless
K_p	*passive earth pressure coefficient (Rankine)*	dimensionless

The appropriate un-factored values for use in the design of structures subject to unbalanced earth pressures at this site are tabulated as follows:

SOIL PARAMETER VALUES

Soil	Parameter				
	Φ'	γ	Ka	Kp	Ko
Fill	28°	20	0.36	2.77	*0.53*
Silty Clay	27°	18.0	0.39	2.66	*0.54*
Sand	30°	19	0.33	3.00	*0.50*
Silty Sand Till	32°	21	0.31	3.25	*0.47*
Sound Bedrock	*45°*	*26*	*0.17*	*5.83*	*0.29*

1. *Passive and sliding resistance within the zone subject to frost action (i.e. within 1.8 m below finished grade) should be disregarded in the lateral resistance computations.*
2. *Temporary and/or permanent surcharges at the ground surface should be considered in accordance with the applicable Soil Mechanics methods.*

The design earth pressures in compacted backfill should be augmented with the dynamic effects of the compaction efforts, which typically are taken as a uniform 12 kPa pressure over the entire depth below grade where the calculated earth pressure based on the above earth pressure factors is less than 12 kPa.

Walls or bracings subject to unbalanced earth pressures must be designed to resist a pressure that can be calculated based on the following formula:

$$\mathbf{P = K(\gamma h + q)}$$

where **P** = lateral pressure in kPa acting at a depth h (m) below ground surface
K = applicable lateral earth pressure coefficient
γ = bulk unit weight of backfill (kN/m3)
h = height at any point along the interface (m)

q = the complete surcharge loading (kPa)

This equation assumes that free draining backfills and positive drainage is provided behind the foundation walls to ensure that there is no hydrostatic pressure acting in conjunction with the earth pressure.

Resistance to sliding of earth retaining structures is developed by friction between the base of the footing and the soil. This friction (R) depends on the normal load on the soil contact (N) and the frictional resistance of the soil (tan Φ') expressed as: R = N tan Φ'. This is an ultimate resistance value and does not contain a factor of safety.

5.10 PAVEMENT DESIGN

Based on the existing topography of the subject site and the data collected during the field investigation, it is anticipated that the sub-grade for the asphaltic concrete pavement will generally consist of fill material. Given the frost susceptibility and drainage characteristics of the subgrade soils, the following pavement structure design is recommended for the Site:

RECOMMENDED ASPHALTIC CONCRETE PAVEMENT STRUCTURE DESIGN
(MINIMUM COMPONENT THICKNESSES)

Pavement Layer	Compaction Requirements	Thickness and Material (Light Duty Pavement)	Thickness and Material (Heavy Duty Pavement)
Surface Course Asphaltic Concrete	97% Marshall Density	40 mm Hot-Laid HL3	50 mm Hot-Laid HL3
Binder Course Asphaltic Concrete	97% Marshall Density	50 mm Hot-Laid HL8	70 mm Hot-Laid HL8
Granular Base	100% SPMDD	150 mm compacted depth OPSS Granular A	150 mm compacted depth Granular A
Granular Sub-Base	100% SPMDD	300 mm compacted depth Granular B	600 mm compacted depth Granular B

** SPMDD - Standard Proctor maximum dry density (ASTM-D698)*

Subgrade preparation should include the removal of weak and softened soils. After removal of all unsuitable materials, the subgrade should be proof rolled with heavy rubber-tired equipment and adjudged as satisfactory before preparing the granular base course. The proof-rolling operation should be witnessed by the Geotechnical Engineer. Any soft or unsuitable subgrade areas which deflect significantly should be sub-excavated and replaced with suitable engineered fill material compacted to at least 98% of SPMDD.

The granular pavement structure materials should be placed in lifts not exceeding 150 mm thick and be compacted to a minimum of 100% SPMDD. Asphaltic concrete materials should be rolled and compacted per OPSS 310. The granular and asphaltic concrete pavement materials and their placement should conform to OPSS 310, 501, 1010 and 1150, and the pertinent Municipality specifications. Further, it is recommended that the Municipality's specifications should be referred to for use of higher grades of asphalt cement for asphaltic concrete where applicable.

The long-term performance of the proposed pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be crowned and sloped to provide effective drainage. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Sub-drains must be provided to facilitate effective and assured drainage of the pavement structures as required to intercept excess subsurface moisture and minimize subgrade softening. The invert of sub-drains should be maintained at least 0.3 m below subgrade level.

As part of the subgrade preparation, proposed pavement areas should be stripped of unsuitable earth fill and other obvious objectionable material. Fill required to raise the grades to design elevations should be free of organic material and at a water content which will permit compaction to the specified densities. Soft or spongy subgrade areas should be sub-excavated and properly replaced with suitable approved backfill compacted to 98% SPMDD. For fine-grained clay soils as encountered at the site, the degree of compaction specification alone cannot ensure distress free subgrade. Proof-rolling of the roadway subgrade must be carried out and witnessed by Terrapex personnel for final recommendations of sub-base thickness.

Additional comments on the construction of pavement areas are as follows:

- As part of the subgrade preparation, the proposed pavement areas should be stripped of vegetation, topsoil, unsuitable earth fill and other obvious objectionable material. The subgrade should be properly shaped and sloped as required, and then proof rolled. Loose/soft or spongy subgrade areas should be sub-excavated and replaced with suitable approved material compacted to at least 98% of SPMDD.
- Where new fill is needed to increase the grade or replace disturbed portions of the subgrade, excavated inorganic soils or similar clean imported fill materials may be used, provided their moisture content is maintained within 2 % of the soil's optimum moisture content. All fill must be placed and compacted to not less than 98% of SPMDD.
- For fine-grained soils, as encountered at the site, the degree of compaction specification alone cannot ensure distress free subgrade. Proof-rolling must be carried out and witnessed by Terrapex personnel for final recommendations of sub-base thicknesses.
- In the event that pavement construction takes place in the spring thaw, the late fall, or following periods of significant rainfall, it should be anticipated that an increase in thickness of the granular sub-base layer will be required to compensate for reduced subgrade strength.

5.11 Landscaping

Terrapex was provided the Landscape Plan prepared by Studio Red Landscape Architecture Inc. – 3145 Conroy Road – Project No.24-151 – Drawings Sheet Nos. L-1 & L-2 – Dated November 13, 2025.

According to the geotechnical report, the subsurface conditions at the site generally consist of surficial organics or fill overlying a fat clay layer, underlain by sand, silty clayey sand till, and inferred bedrock to depths of approximately 12.8 m below ground surface. Laboratory test results indicate that the fat clay contains 1 to 5% sand, 20 to 25% silt, and 71 to 77% clay, with a liquid limit of 75 to 80%, a plastic limit of 33 to 37%, and a natural moisture content ranging from 36 to 38%.

Based on the above, planting of trees should be in accordance with the City of Ottawa Tree Planting in Sensitive Clay Soils – 2017 Guidelines. This recommendation establishes that clay soils that exceed the 40% plasticity index are considered to have high potential for soil volume change. For these worst-case soils, the setbacks and tree planting restrictions remain unchanged from the 2005 Clay Soils Policy where tree setback must equal the mature height of the tree – i.e. 7.5 m setback from small trees.

According to the Plan, the proposed landscaping is primarily located within a 3-m strip along the north, south, and east property boundaries, and within a 10 to 14-m strip along the west boundary. The landscaping plan maintains a minimum separation distance of 7.5 m between tree trunks and the proposed structures. Therefore, the proposed tree plantings are not expected to impact the building foundations and are not in areas of the site where they would be restricted.

5.12 Frost Protection

The presence of frost-susceptible soils within the frost protection depth will require that isolated, unheated exterior footings adjacent to surfaces which are cleared of snow cover during the winter months be provided with minimum of 1.8 m of earth cover or equivalent insulation. For fully heated structures, this depth can be reduced to 1.5 m.

Where an adequate depth of soil cover cannot be provided, an equivalent insulation detail should be designed or approved by a geotechnical Engineer; this will need to be designed or pre-approved prior to placement of any foundations or underground utilities.

5.13 EARTHQUAKE DESIGN PARAMETERS

The 2024 Ontario Building Code (OBC) stipulates the methodology for earthquake design analysis, as set out in Subsection 4.1.8.7. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration and the site classification.

The parameters for determination of the Site Classification for Seismic Site Response are set out in Table 4.1.8.4.-B of the 2024 OBC. The classification is based on the determination of the average shear wave velocity in the top 30 metres of the site stratigraphy, where shear wave velocity (vs) measurements have been taken. In the absence of such measurements, the classification is estimated on the basis of empirical analysis of undrained shear strength or penetration resistance.

Based on the results of Pinchin's borehole information, in-situ testing, laboratory test results and the subsurface stratigraphy comprises surficial topsoil and underlain by fill material, followed by various native soils consisting of typically having a very soft consistency to between firm to stiff consistency fat clay (silty clay), and compact sand, underlain by a loose to dense silty sand till. Based on the above, the site designation for seismic analysis is estimated to be Class X_D according to Table 4.1.8.4.-B from the quoted code.

If the building foundations are supported on improved ground, the site designation should be confirmed by the designer of the ground improvement system.

5.14 LIQUEFACTION POTENTIAL

The surficial geology at the site consists of firm to very stiff clay with an approximate thickness of 6.1 to 7.6 m. A layer of potentially liquifiable compact sand was observed in BH1, extending from 6.1 m to 10.7 m, below which the soil becomes very dense. The clay layer in BH4 was underlain by a layer of compact to dense silty clayey sand till, which is not considered liquifiable.

Given that there is a 6.1 m to 7.6 m thick clay cap at the site, and assuming a PGA=0.37, surface manifestation of liquefaction and liquefaction-induced settlement are not expected. It should also be noted that the sand layer was only reported in one borehole.

5.15 CHEMICAL CHARACTERIZATION OF SUBSURFACE SOIL

One (1) soil sample obtained from Borehole BH2 sample SS3 was submitted to SGS Laboratories for pH index test and water-soluble sulphate content to determine the potential of attacking the subsurface concrete. The Certificate of Analysis provided by the analytical chemical testing laboratory is contained in **Appendix F** of this report.

The test result revealed that the pH index of the soil sample is 8.21, indicating a slight alkalinity.

The water-soluble sulphate content of the tested sample is <0.01%. The concentration of water-soluble sulphate content of the tested samples is below the CSA Standard of 0.1% water-soluble sulphate (Table 12 of CSA A23.1, Requirements for Concrete Subjected to Sulphate Attack). Special concrete mixes against sulphate attack are therefore not required for the sub-surface concrete of the proposed structure.

5.16 CONSTRUCTION INSPECTION AND MONITORING

The recommendations presented in this report are based on the assumption that adequate and satisfactory inspections and monitoring during construction by qualified geotechnical personnel will be provided. This will include:

- Review and approval of all subgrade and footing base inspections by geotechnical staff;
- Part time compaction testing of bedding, and cover soils;
- Periodic testing of concrete

6.0 LIMITATIONS OF REPORT

The Limitations of Report, as quoted in **Appendix 'A'**, are an integral part of this report.

Yours respectfully,
TERRAPEX ENVIRONMENTAL LTD.

Yacouba Doro, MBA, PMP®, P.Eng. Senior Geotechnical Project Manager	Meysam Najari, Ph.D., P.Eng. Vice President – Geotechnical Services

APPENDIX A
LIMITATIONS OF REPORT

LIMITATIONS OF REPORT

This report has been completed in accordance with the terms of reference for this project as agreed upon by **WO MW Realty Ltd** and Terrapex Environmental Ltd. (Terrapex) and generally accepted engineering consulting practices in this area.

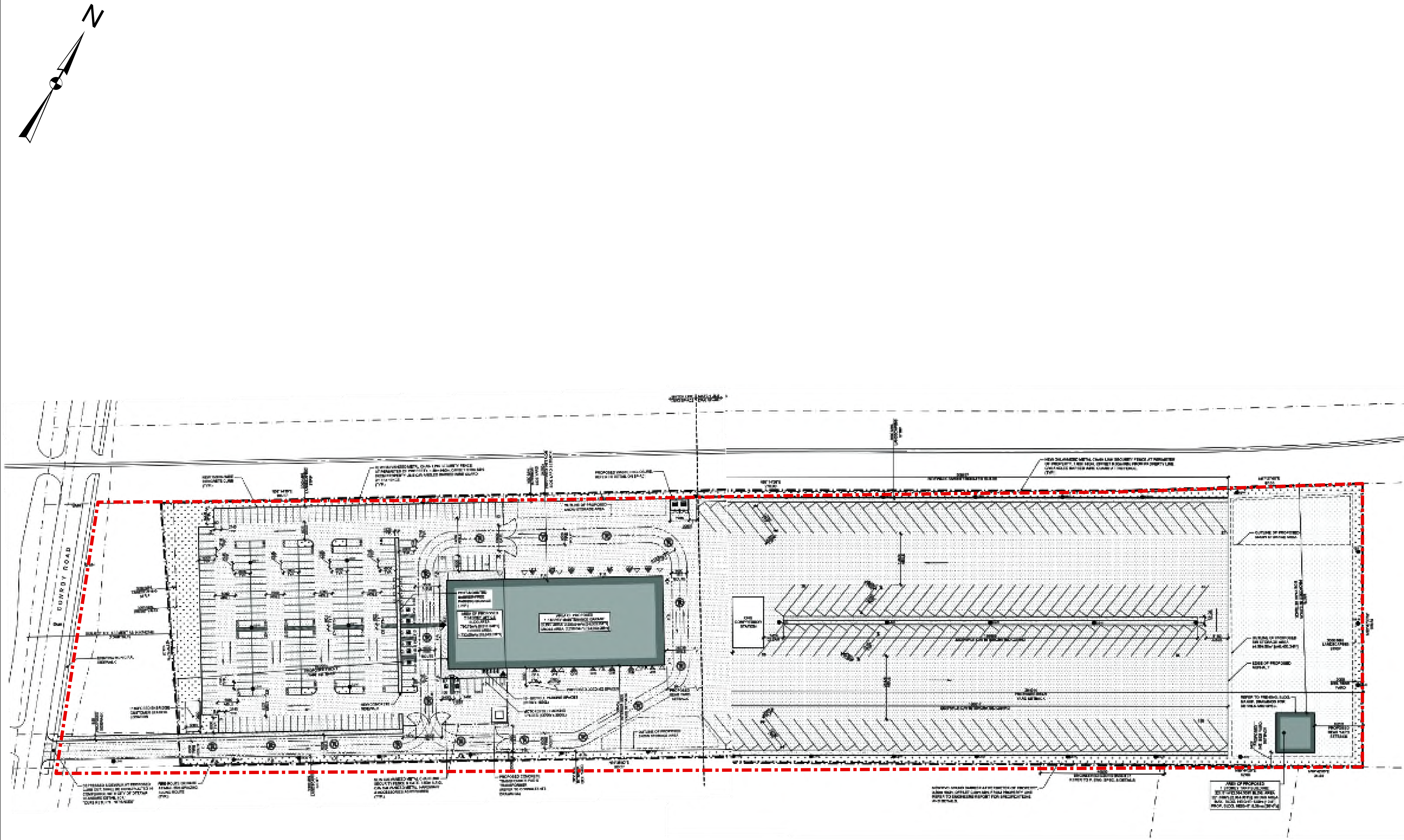
The conclusion and recommendations in this report are based on information determined at the inspection locations. Soil and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the soil investigation. If new or different information is identified, Terrapex should be requested to re-evaluate its conclusions and recommendations and amend the report as appropriate.

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 details of alignment and elevations stated in the report. Since all details of the design may not be known to us, in our analysis certain assumptions had to be made as set out in this report. The actual conditions may, however, vary from those assumed, in which case changes and modifications may be required to our recommendations.

This report was prepared for the sole use of **WO MW Realty Ltd**. Terrapex accepts no liability for claims arising from the use of this report, or from actions taken or decisions made as a result of this report, by parties other than **WO MW Realty Ltd**. The material herein reflects Terrapex's judgement in light of the information available to it at the time of preparation. We recommend, therefore, that we be retained during the final design stage to review the design drawings and to verify that they are consistent with our recommendations, or the assumptions made in our analysis. We also recommend that we be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the test holes. In cases where these recommendations are not followed, Terrapex's responsibility is limited to accurately interpreting the conditions encountered at the test holes, only.

The comments given in this report on potential construction problems and possible methods are intended for the guidance of the design engineer, only. The number of inspection locations may not be sufficient to determine all the factors that may affect construction methods and costs. 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.

APPENDIX B
SITE PLAN



LEGEND

SITE BOUNDARY

0 25 50 75 100
Metres

DATA SOURCE: PROPOSED SITE PLAN PROVIDED BY CLIENT
MAP PROJECTION: NAD 1983 UTM ZONE 18N

CLIENT:
WHITE OWL FAMILY PROPERTIES LIMITED

SITE LOCATION:
3145 CONROY ROAD
OTTAWA, ONTARIO

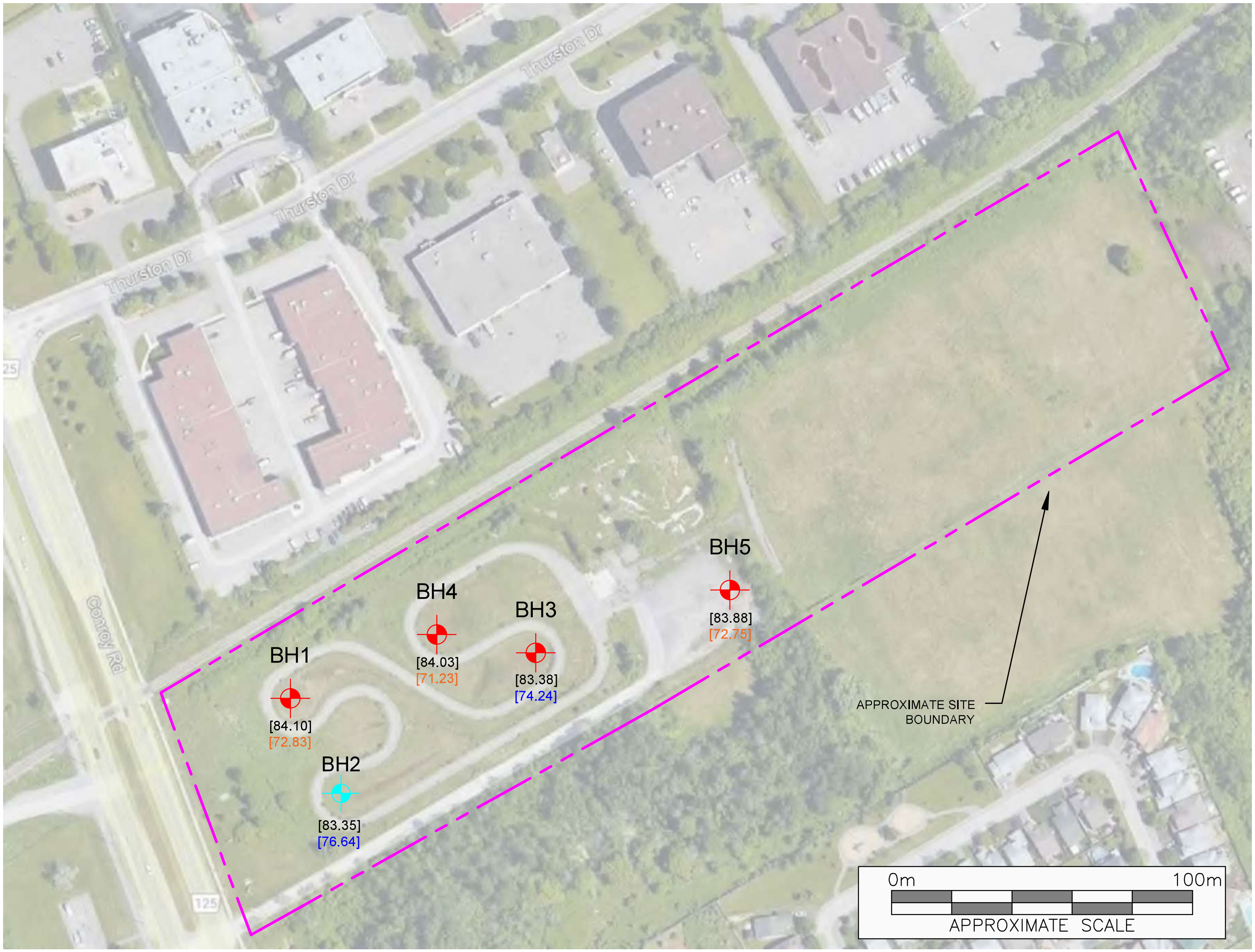
TERRAPEX

TITLE:
PROPOSED SITE PLAN

DRAWN BY:	PROJECT NO.:	CHECKED BY:
JS	CO1004.02	YD
REVISION: 00	DATE: FEBRUARY 2026	FIGURE: 1

JSerroul \C:\Users\JSerroul\OneDrive - Terrapex Environmental Ltd\PROJECTS\Ottawa\CO1000\CO1004.02 3145 Conroy Road\CO1004.02.aprx

APPENDIX C
BOREHOLE LOCATION PLAN BY PINCHIN



LEGEND

- BOREHOLE LOCATION
- MONITORING WELL LOCATION
- [xx.xx] GEODETIC GROUND SURFACE ELEVATION (m)
- [xx.xx] GEODETIC APPROXIMATE GROUND TERMINATION ELEVATION (m)
- [xx.xx] GEODETIC APPROXIMATE GROUND REFUSAL ELEVATION (m)

PINCHIN

PROJECT NAME
PRELIMINARY GEOTECHNICAL INVESTIGATION

CLIENT NAME
WO MW REALTY LIMITED

PROJECT LOCATION
3145 CONROY ROAD, OTTAWA, ONTARIO

FIGURE NAME
BOREHOLE/MONITORING WELL LOCATION PLAN

APPROXIMATE SCALE	PROJECT NO.
AS SHOWN	339662.003
DATE	FIGURE NO.
SEPTEMBER 2024	2

APPENDIX D
BOREHOLE LOG SHEETS BY PINCHIN

Log of Borehole: BH1

Project #: 339662.003 **Logged By:** MK

Project: Preliminary Geotechnical Investigation

Client: WO MW Reality Limited

Location: 3145 Conroy Road, Ottawa, Ontario

Drill Date: July 15, 2024 **Project Manager:** MK

SUBSURFACE PROFILE

Depth (m)	Description	Elevation (m)	Monitoring Well Details
	Ground Surface	84.10	
0	**Organics** Organics - 100 mm	0.00	No Monitoring Well Installed
	Fat Clay Fat clay, grey, firm, APL to WTPL		
3.81	Very stiff	80.29 3.81	
6.10	**Sand** Grey/black sand, some silt, compact, moist to wet	78.01 6.10	
7.62	Trace gravel, wet	76.48 7.62	
10.67	Bedrock fragments, very dense	73.44 10.67	
11.28	End of Borehole	72.83 11.28	

Borehole was terminated at 11.3 mbgs, upon sampler refusal at inferred bedrock. At drilling completion water was encountered at 2.3 mbgs in the open borehole.

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value	Shear Strength (kPa)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
SS	1	70	2					
SS	2	80	4					
SS	3	100	2					
SS	4	100	1		64.5			Hyd., MC. Att. Lim.
FVT		42	NA					
SS	5	100	0					
FVT		199	NA					
SS	6	100	11					
SS	7	100	17					
SS	8	100	10					
SS	9	100	57					

Contractor: Strata Drilling Group **Grade Elevation:** 84.10 m

Drilling Method: Direct Push / Split Spoon Sampler **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH2

Project #: 339662.003 **Logged By:** MK

Project: Preliminary Geotechnical Investigation

Client: WO MW Reality Limited

Location: 3145 Conroy Road, Ottawa, Ontario

Drill Date: July 15, 2024 **Project Manager:** MK

SUBSURFACE PROFILE

Depth (m)	Description	Elevation (m)
0	Ground Surface	83.35 / 0.00
0.00	**Organics** Organics - 100 mm	
0.10	**Fat Clay** Fat clay, grey, very stiff, DTPL	
2.29	DTPL to APL	81.06 / 2.29
3.05	Stiff, WTPL	80.30 / 3.05
6.71	End of Borehole	76.64 / 6.71

Borehole was terminated at 6.7 mbgs. At drilling completion water was encountered at 3.0 mbgs in the open borehole.

Monitoring Well Details: Riser, Bentonite, Screen, Silica Sand

Groundwater level = 3.82 mbgs, as measured on Aug. 7, 2024.

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value	Shear Strength (kPa)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
SS	1	70	2					
SS	2	80	5		36.0			Hyd., MC. Att. Lim.
FVT		147						
SS	3	100	2					
SS	4	100	0					
FVT		73						

Standard Penetration N-Value: 20 40 60

Shear Strength △ kPa △: 100 200

Contractor: Strata Drilling Group **Grade Elevation:** 83.35 m

Drilling Method: Direct Push / Split Spoon Sampler **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH3

Project #: 339662.003 ***Logged By:*** MK

Project: Preliminary Geotechnical Investigation

Client: WO MW Reality Limited

Location: 3145 Conroy Road, Ottawa, Ontario

Drill Date: July 15, 2024 ***Project Manager:*** MK

SUBSURFACE PROFILE

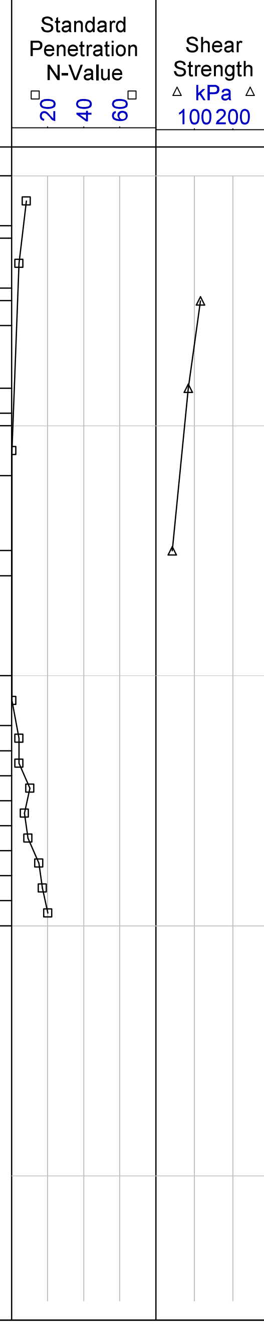
Depth (m)	Description	Elevation (m)
0	Ground Surface	83.38 / 0.00
0–0.075	***Organics*** Organics - 75 mm	
0.075–3.05	***Fat Clay*** Fat clay, grey, very stiff to stiff, DTPL	
3.05–6.71	Firm, APL	80.33 / 3.05
6.71–9.14	***Dynamic Cone Pentration Test (DCPT)*** Unsampled	76.67 / 6.71
9.14	End of Borehole	74.24 / 9.14

Borehole was terminated at 9.1 mbgs.

Monitoring Well Details: No Monitoring Well Installed

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
SS	1	20	8				
SS	2	100	4				
FVT		115					
FVT		84					
SS	3	100	0	68.0			Hyd., MC. Att. Lim.
FVT		42					
SS	4	100	0				
DCP		NA	4				
DCP		NA	4				
DCP		NA	10				
DCP		NA	7				
DCP		NA	9				
DCP		NA	15				
DCP		NA	17				
DCP		NA	20				



Contractor: Strata Drilling Group ***Grade Elevation:*** 83.38 m

Drilling Method: Direct Push / Split Spoon Sampler ***Top of Casing Elevation:*** NA

Well Casing Size: NA ***Sheet:*** 1 of 1

Log of Borehole: BH4

Project #: 339662.003 **Logged By:** MK

Project: Preliminary Geotechnical Investigation

Client: WO MW Reality Limited

Location: 3145 Conroy Road, Ottawa, Ontario

Drill Date: July 16, 2024 **Project Manager:** MK

SUBSURFACE PROFILE / SAMPLE

Depth (m)	Description	Elevation (m)	Monitoring Well Details	Sample Type	Sampler #	Recovery (%)	SPT N-Value	Shear Strength (kPa)	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
	Ground Surface	84.03										
0.00	**Organics** Organics - 75 mm	0.00	No Monitoring Well Installed	SS	1	30	5					
	Fat Clay Fat clay, grey, very stiff, DTPL			SS	2	100	3					
				FVT		115						
2.29	Firm to stiff, APL to WTPL	81.74		SS	3	100	1					
				FVT		42						
				FVT		52						
4.57	WTPL	79.46		SS	4	100	0					
6.40	Very stiff	77.63		FVT		126						
7.62	**Till** Grey silty clayey sand with gravel, compact, wet	76.41		SS	5	30	11					
9.14	Loose	74.88		SS	6	20	9					
				SS	7	60	44		8.9			Hyd., MC.
				SS	8	30	45					
12.80	End of Borehole	71.23										

Borehole was terminated at 12.8 mbgs, upon sampler refusal on inferred bedrock.

Contractor: Strata Drilling Group **Grade Elevation:** 84.03 m

Drilling Method: Direct Push / Split Spoon Sampler **Top of Casing Elevation:** NA

Well Casing Size: NA **Sheet:** 1 of 1

Log of Borehole: BH5

Project #: 339662.003 **Logged By:** MK

Project: Preliminary Geotechnical Investigation

Client: WO MW Reality Limited

Location: 3145 Conroy Road, Ottawa, Ontario

Drill Date: July 16, 2024 **Project Manager:** MK

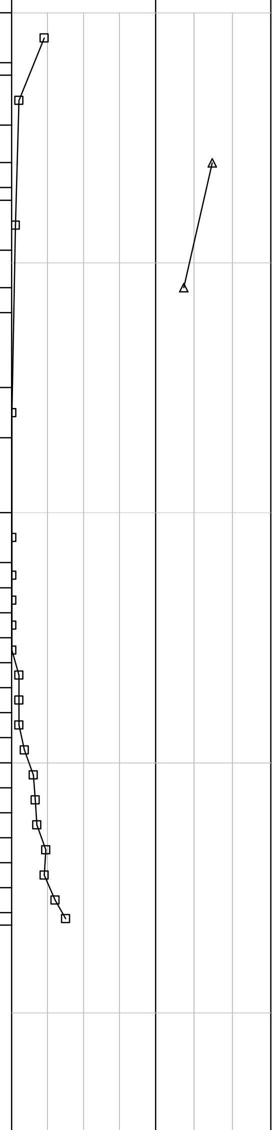
SUBSURFACE PROFILE

Depth (m)	Description	Elevation (m)	Monitoring Well Details
0	Ground Surface	83.88 0.00	No Monitoring Well Installed
0.00–0.61	**Fill** Grey sand and gravel, trace silt, compact, wet	83.27 0.61	
0.61–6.71	**Fat Clay** Fat clay, grey, very stiff to stiff, WTPL	77.17 6.71	
6.71–11.13	**Dyanmic Cone Penetration Test (DCPT)** Unsampled	72.75 11.13	
11.13	End of Borehole Borehole was terminated at 11.1 mbgs, upon sampler refusal on inferred bedrock.		

SAMPLE

Sample Type	Sampler #	Recovery (%)	SPT N-Value	Water Content (%)	Sample ID	Soil Vapour Concentration (ppm)	Laboratory Analysis
SS	1	30	18				
SS	2	100	4				
FVT		147					
SS	3	100	2	56.4			Hyd., MC. Att. Lim.
FVT		73					
SS	4	100	0				
SS	5	30	0				
DCP		NA	0				
DCP		NA	0				
DCP		NA	0				
DCP		NA	0				
DCP		NA	4				
DCP		NA	4				
DCP		NA	4				
DCP		NA	7				
DCP		NA	12				
DCP		NA	13				
DCP		NA	14				
DCP		NA	19				
DCP		NA	18				
DCP		NA	24				
			30				

Standard Penetration N-Value (20, 40, 60) / Shear Strength kPa (100, 200)



Contractor: Strata Drilling Group **Grade Elevation:** 83.88 m

Drilling Method: Direct Push / Split Spoon Sampler **Top of Casing Elevation:** NA

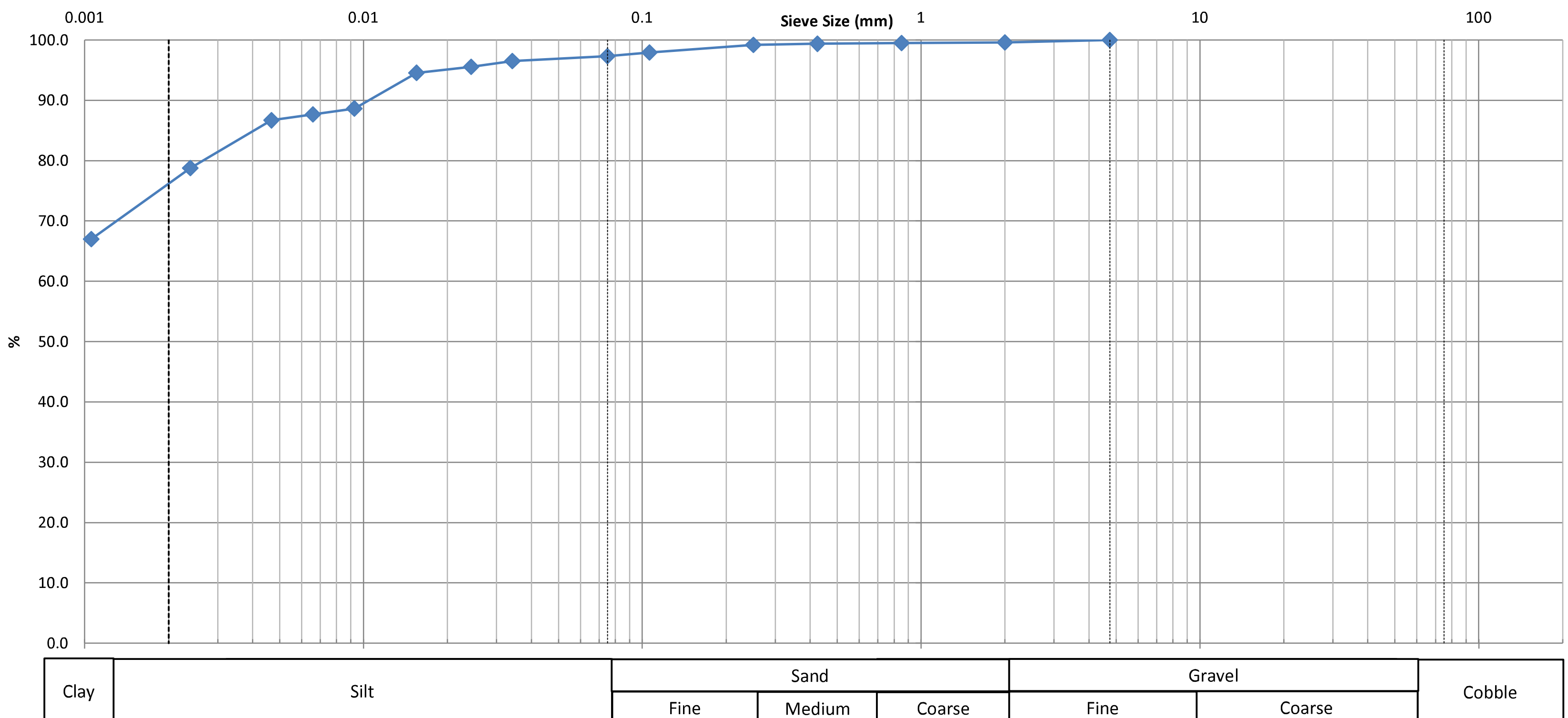
Well Casing Size: NA **Sheet:** 1 of 1

APPENDIX E
GEOTECHNICAL LABORATORY TEST RESULTS BY PINCHIN

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Pinchin	DEPTH:	7'6" - 9'6"	FILE NO:	PM4184
CONTRACT NO.:		BH OR TP No.:	BH1 SS4	LAB NO:	54859
PROJECT:	339662.003			DATE RECEIVED:	8-Aug-24
				DATE TESTED:	12-Aug-24
DATE SAMPLED:	-			DATE REPORTED:	15-Aug-24
SAMPLED BY:	-			TESTED BY:	D.K



Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					64.5%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)		
					0.0	2.7	20.3	77.0		

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

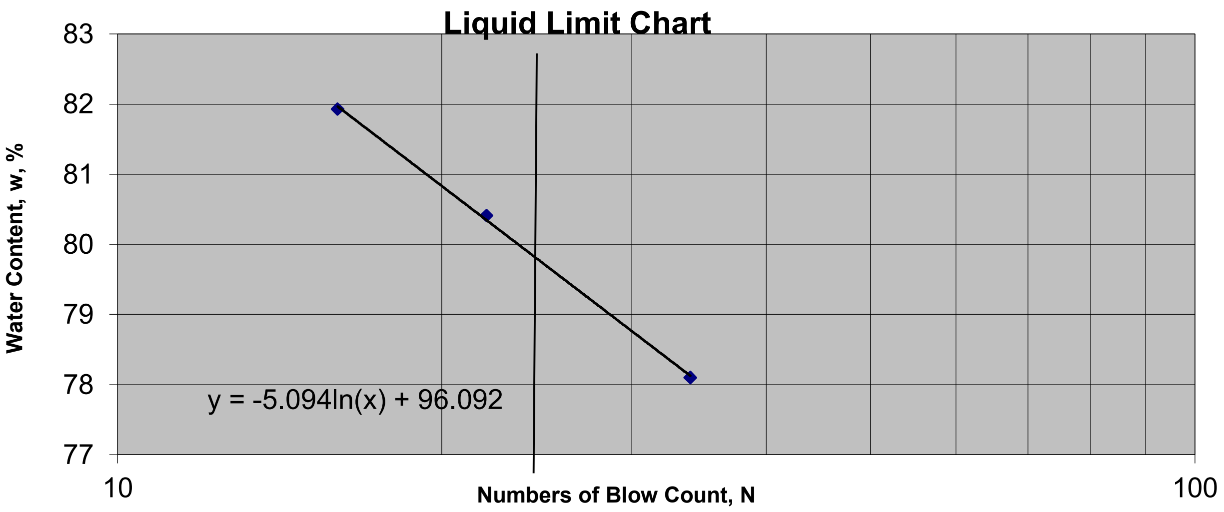
ATTERBERG LIMITS
LS-703/704

CLIENT:	Pinchin	FILE NO.:	PM4184
PROJECT:	339662.003	DATE SAMPLED:	15-Jul
LOCATION:	BH1 SS4 @ 7'6"-9'6"	DATE REPORTED:	14-Aug

CAN NO.	2	3	13				
WT. OF CAN	8.72	8.73	8.71				
WT. OF SOIL & CAN	18.69	20.06	16.76				
WT. OF DRY SOIL & CAN	14.20	15.01	13.23				
WT. OF MOISTURE	4.49	5.05	3.53				
WT. OF DRY SOIL & CAN	5.48	6.28	4.52				
WATER CONTENT, w, %	**81.93**	**80.41**	**78.1**				
NO. OF BLOWS, N	16	22	34				

CAN NO.	14	15
WT. OF CAN	19.95	19.91
WT. OF SOIL & CAN	26.98	26.71
WT. OF DRY SOIL & CAN	25.08	24.85
WT. OF MOISTURE	1.9	1.86
WT. OF DRY SOIL & CAN	5.13	4.94
WATER CONTENT, w, %	**37.04**	**37.65**

RESULTS	
LIQUID LIMIT	**80**
PLASTIC LIMIT	**37**
PLASTICITY INDEX	**43**

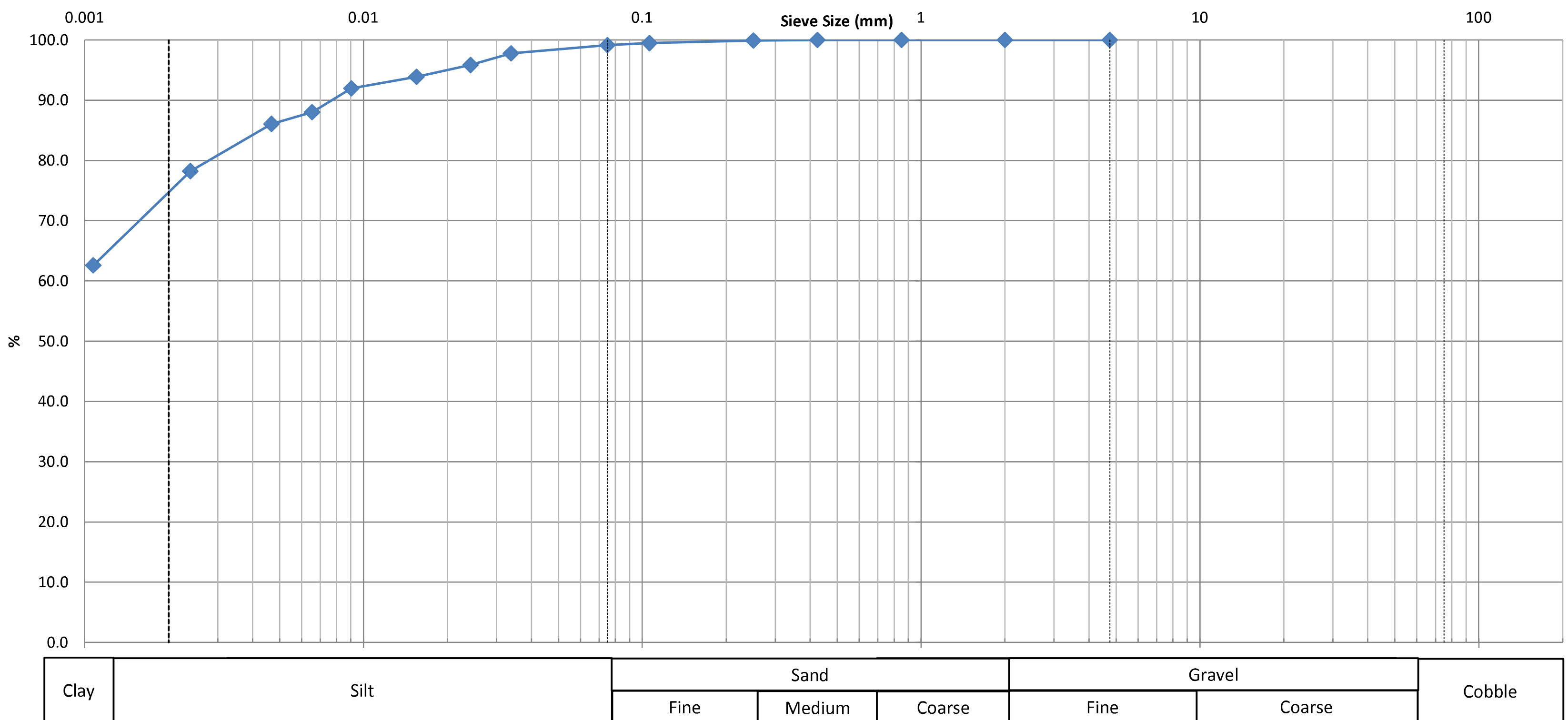


TECHNICIAN: CP	REVIEWED BY:	C. Beadow	J. Forsyth, P. Eng.
		[signature]	[signature]

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Pinchin	DEPTH:	2'6" - 4'6"	FILE NO:	PM4184
CONTRACT NO.:		BH OR TP No.:	BH2 SS2	LAB NO:	54855
PROJECT:	339662.003			DATE RECEIVED:	8-Aug-24
				DATE TESTED:	12-Aug-24
DATE SAMPLED:	-			DATE REPORTED:	15-Aug-24
SAMPLED BY:	-			TESTED BY:	D.K



Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					36.0%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)		
					0.0	0.9	24.6	74.5		

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

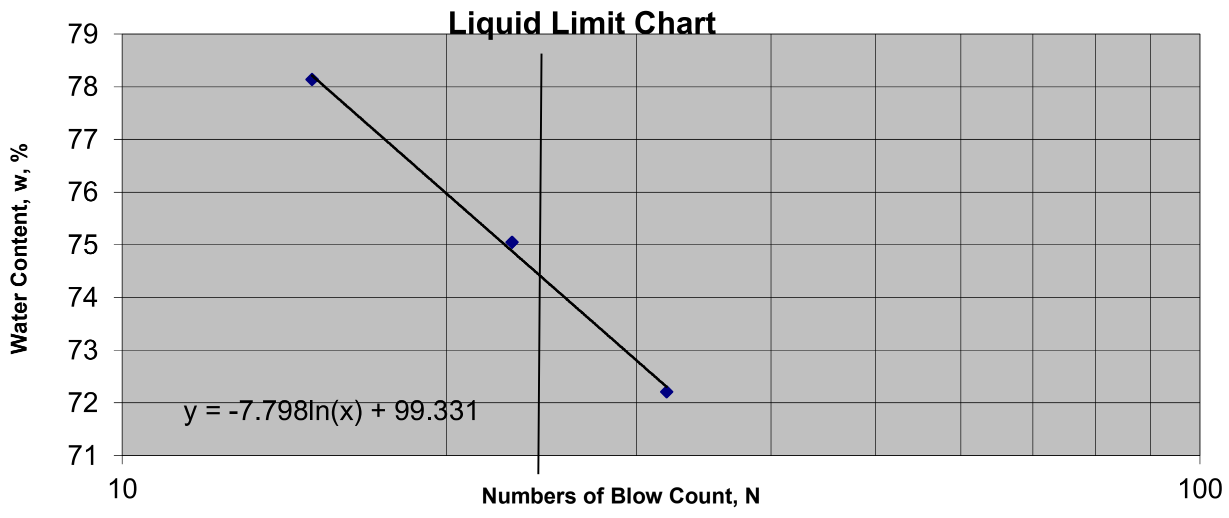
PATERSON GROUP	**ATTERBERG LIMITS** **LS-703/704**

CLIENT:	Pinchin	FILE NO.:	PM4184
PROJECT:	339662.003	DATE SAMPLED:	15-Jul
LOCATION:	BH2 SS2 @ 5'6"-4'6"	DATE REPORTED:	14-Aug

CAN NO.	**30**	**31**	**32**				
WT. OF CAN	4.32	4.32	4.36				
WT. OF SOIL & CAN	15.4	12.46	12.54				
WT. OF DRY SOIL & CAN	10.54	8.97	9.11				
WT. OF MOISTURE	4.86	3.49	3.43				
WT. OF DRY SOIL & CAN	6.22	4.65	4.75				
WATER CONTENT, w, %	**78.14**	**75.05**	**72.21**				
NO. OF BLOWS, N	15	23	32				

CAN NO.	**9**	**10**
WT. OF CAN	19.37	19.79
WT. OF SOIL & CAN	27.33	27.94
WT. OF DRY SOIL & CAN	25.35	25.90
WT. OF MOISTURE	1.98	2.04
WT. OF DRY SOIL & CAN	5.98	6.11
WATER CONTENT, w, %	**33.11**	**33.39**

RESULTS	
LIQUID LIMIT	**75**
PLASTIC LIMIT	**33**
PLASTICITY INDEX	**42**

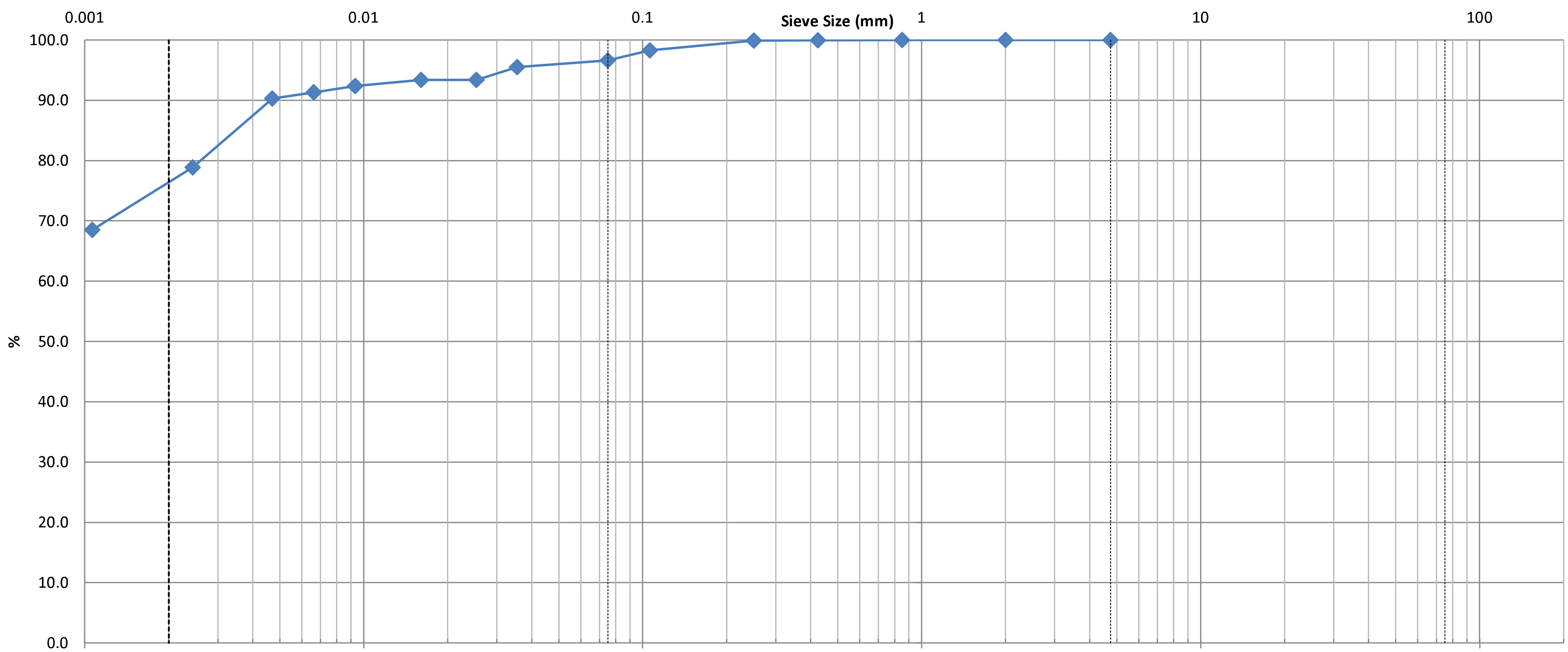


TECHNICIAN: CP	**REVIEWED BY:**	**C. Beadow**	**J. Forsyth, P. Eng.**

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Pinchin	DEPTH:	10' - 12'	FILE NO:	PM4184
CONTRACT NO.:		BH OR TP No.:	BH2 SS2	LAB NO:	54856
PROJECT:	339662.003			DATE RECEIVED:	8-Aug-24
				DATE TESTED:	12-Aug-24
DATE SAMPLED:	-			DATE REPORTED:	15-Aug-24
SAMPLED BY:	-			TESTED BY:	D.K



Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					68.0%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)		
					0.0	3.4	19.6	77.0		

Comments:

REVIEWED BY: **Curtis Beadow** **Joe Forsyth, P. Eng.**

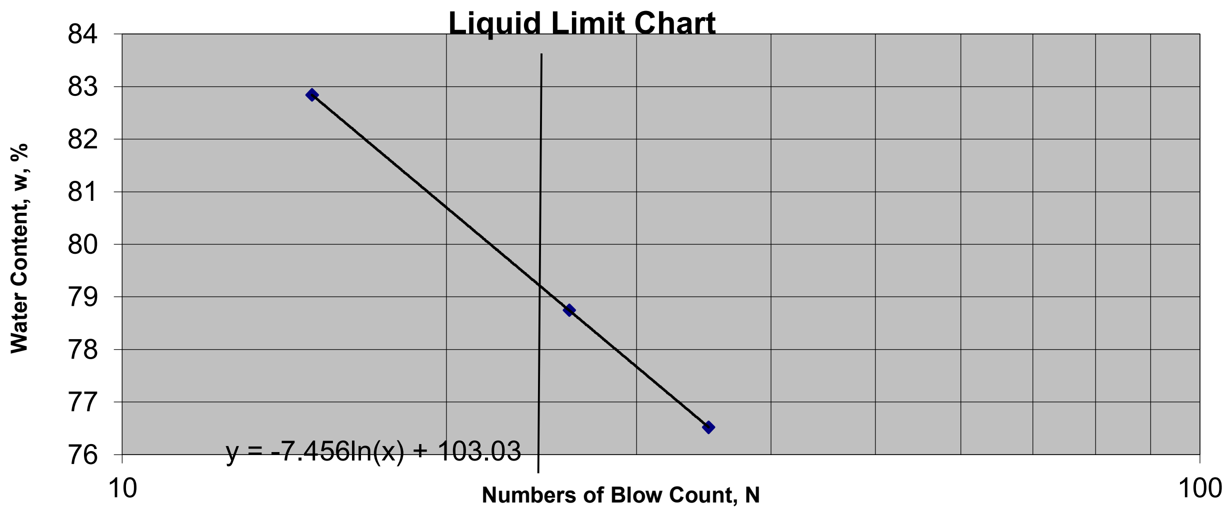
ATTERBERG LIMITS
LS-703/704

CLIENT:	Pinchin	FILE NO.:	PM4184
PROJECT:	339662.003	DATE SAMPLED:	15-Jul
LOCATION:	BH3 SS3 @ 10'-12'	DATE REPORTED:	14-Aug

CAN NO.	**33**	**34**	**35**				
WT. OF CAN	4.30	4.31	4.35				
WT. OF SOIL & CAN	13.57	12.05	12.17				
WT. OF DRY SOIL & CAN	9.37	8.64	8.78				
WT. OF MOISTURE	4.2	3.41	3.39				
WT. OF DRY SOIL & CAN	5.07	4.33	4.43				
WATER CONTENT, w, %	**82.84**	**78.75**	**76.52**				
NO. OF BLOWS, N	15	26	35				

CAN NO.	**11**	**12**
WT. OF CAN	19.98	16.74
WT. OF SOIL & CAN	26.02	23.26
WT. OF DRY SOIL & CAN	24.44	21.58
WT. OF MOISTURE	1.58	1.68
WT. OF DRY SOIL & CAN	4.46	4.84
WATER CONTENT, w, %	**35.43**	**34.71**

RESULTS	
LIQUID LIMIT	**79**
PLASTIC LIMIT	**35**
PLASTICITY INDEX	**44**

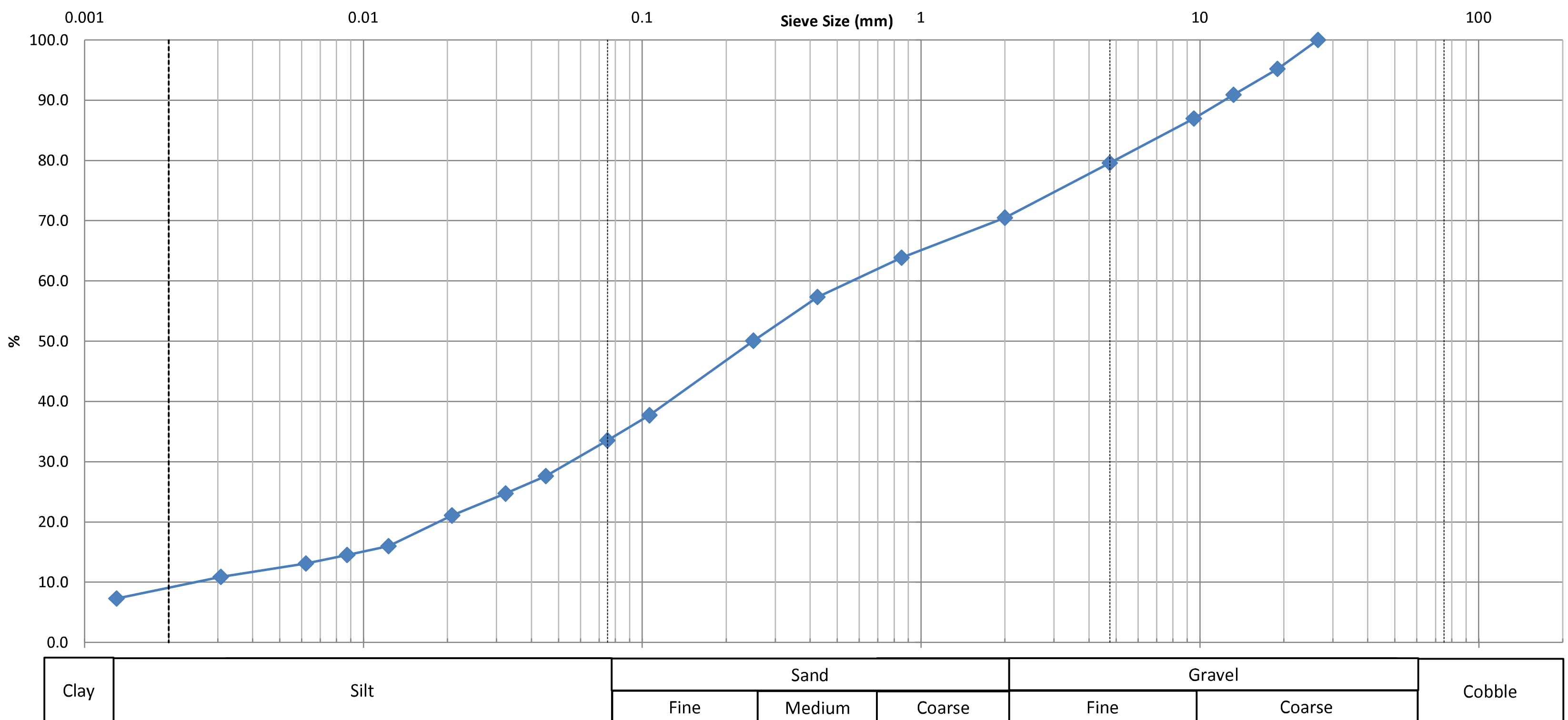


TECHNICIAN: CP	**REVIEWED BY:**	**C. Beadow**	**J. Forsyth, P. Eng.**

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Pinchin	DEPTH:	35' - 37'	FILE NO:	PM4184
CONTRACT NO.:		BH OR TP No.:	BH4 SS7	LAB NO:	54858
PROJECT:	339662.003			DATE RECEIVED:	8-Aug-24
				DATE TESTED:	12-Aug-24
DATE SAMPLED:	-			DATE REPORTED:	15-Aug-24
SAMPLED BY:	-			TESTED BY:	D.K



Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					8.9%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)		
					20.4	46.0	24.1	9.5		

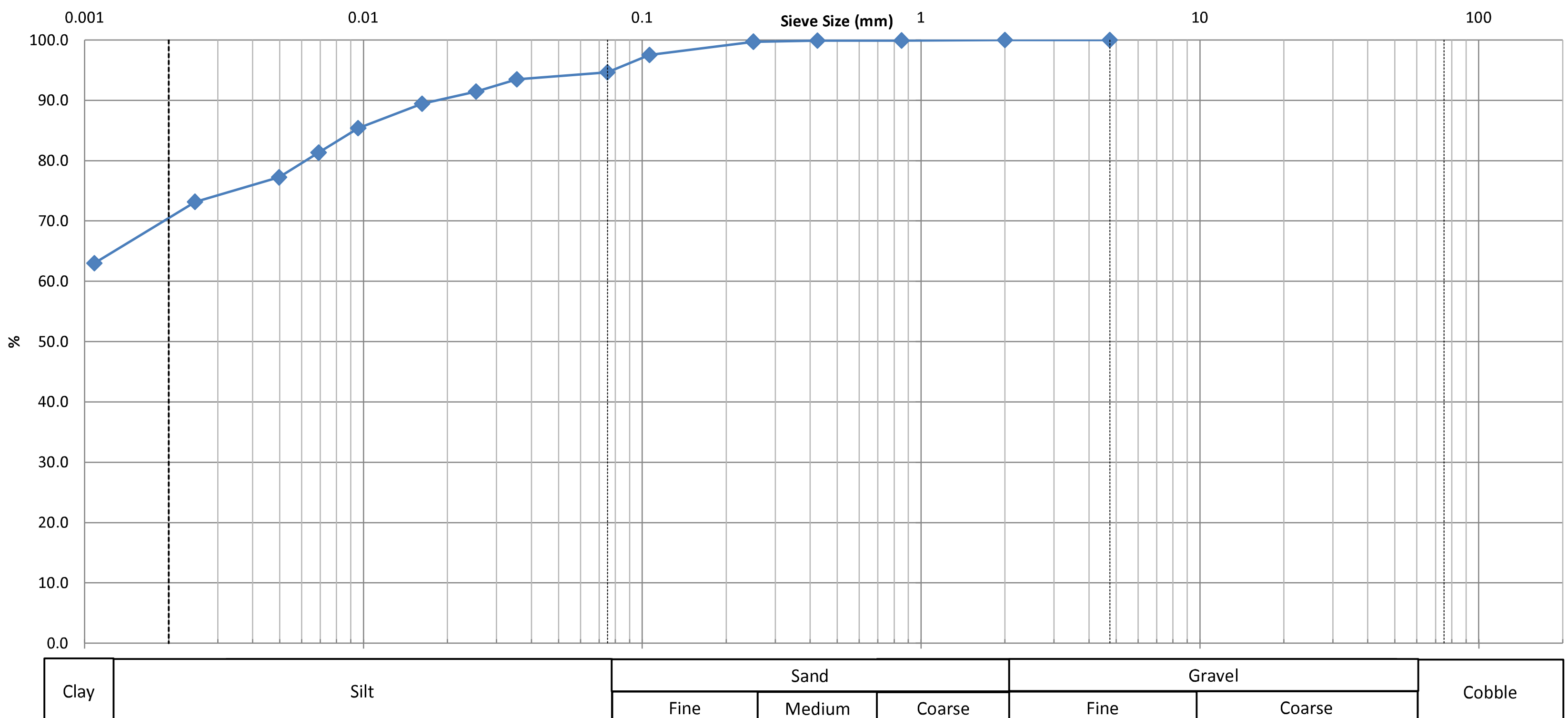
Comments:

REVIEWED BY:	**Curtis Beadow**	**Joe Forsyth, P. Eng.**

PATERSON GROUP

SIEVE ANALYSIS
ASTM C136

CLIENT:	Pinchin	DEPTH:	7'6" - 9'6"	FILE NO:	PM4184
CONTRACT NO.:		BH OR TP No.:	BH5 SS3	LAB NO:	54860
PROJECT:	339662.003			DATE RECEIVED:	8-Aug-24
				DATE TESTED:	12-Aug-24
DATE SAMPLED:	-			DATE REPORTED:	15-Aug-24
SAMPLED BY:	-			TESTED BY:	D.K



Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					56.4%					
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)		
					0.0	5.4	24.1	70.5		

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

PATERSON GROUP

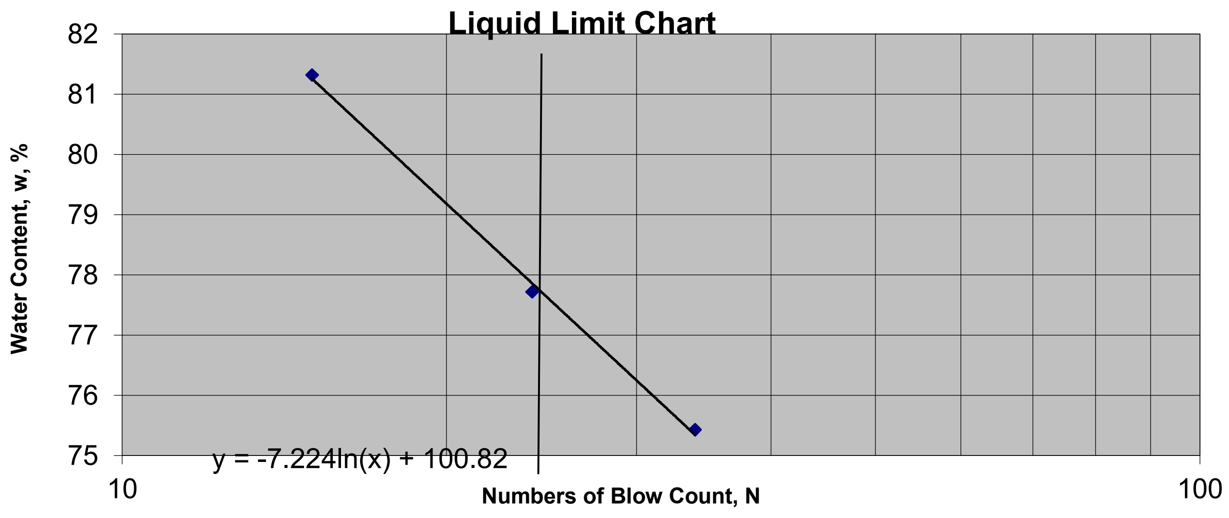
ATTERBERG LIMITS
LS-703/704

CLIENT:	Pinchin	FILE NO.:	PM4184
PROJECT:	339662.003	DATE SAMPLED:	15-Jul
LOCATION:	BH5 SS3 @ 7'6"-9'6"	DATE REPORTED:	14-Aug

CAN NO.	2	3	13				
WT. OF CAN	8.72	8.65	8.73				
WT. OF SOIL & CAN	20.27	18.30	16.87				
WT. OF DRY SOIL & CAN	15.09	14.08	13.37				
WT. OF MOISTURE	5.18	4.22	3.50				
WT. OF DRY SOIL & CAN	6.37	5.43	4.64				
WATER CONTENT, w, %	**81.32**	**77.72**	**75.43**				
NO. OF BLOWS, N	15	24	34				

CAN NO.	1	2
WT. OF CAN	19.88	19.94
WT. OF SOIL & CAN	26.93	27.36
WT. OF DRY SOIL & CAN	25.12	25.43
WT. OF MOISTURE	1.81	1.93
WT. OF DRY SOIL & CAN	5.24	5.49
WATER CONTENT, w, %	**34.54**	**35.15**

RESULTS	
LIQUID LIMIT	**78**
PLASTIC LIMIT	**35**
PLASTICITY INDEX	**43**



TECHNICIAN: CP	REVIEWED BY:	C. Beadow	J. Forsyth, P. Eng.

APPENDIX F

CERTIFICATE OF CHEMICAL ANALYSIS RESULTS BY PINCHIN

FINAL REPORT

CA15676-AUG24 R1

339662.003

Prepared for

Pinchin Ltd

FINAL REPORT

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	Pinchin Ltd	Project Specialist	Jill Campbell, B.Sc.,GISAS
		Laboratory	SGS Canada Inc.
Address	1 Hines Road, Suite 200 Kanata, ON K2K 3C7. Canada	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Megan Keon	Telephone	2165
Telephone	613-608-5350	Facsimile	705-652-6365
Facsimile		Email	jill.campbell@sgs.com
Email	mkeon@Pinchin.com	SGS Reference	CA15676-AUG24
Project	339662.003	Received	08/09/2024
Order Number		Approved	08/16/2024
Samples	Soil (1)	Report Number	CA15676-AUG24 R1
		Date Reported	08/16/2024

COMMENTS

Temperature of Sample upon Receipt: 20 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: N/A

Corrosivity Index is based on the American Water Works Corrosivity Scale according to AWWA C-105. An index greater than 10 indicates the soil matrix may be corrosive to cast iron alloys.

SIGNATORIES

Jill Campbell, B.Sc.,GISAS

Jill Campbell

TABLE OF CONTENTS

FINAL REPORT

Client: Pinchin Ltd
Project: 339662.003
Project Manager: Megan Keon
Samplers: Megan Keon

MATRIX: SOIL

Sample Number	5
Sample Name	BH2 SS3 7.5-9.5 Ft
Sample Matrix	Soil
Sample Date	01/08/2024

Parameter	Units	RL		Result
Corrosivity Index				
Corrosivity Index	none	1		2
Soil Redox Potential	mV	no		157
Sulphide (Na2CO3)	%	0.01		< 0.01
pH	pH Units	0.05		8.21
Resistivity (calculated)	ohms.cm	-9999		3530
General Chemistry				
Conductivity	uS/cm	2		283
Metals and Inorganics				
Moisture Content	%	0.1		38.4
Sulphate	µg/g	0.4		52
Other (ORP)				
Chloride	µg/g	0.4		3.0

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 I Internal ref.: ME-CA-[ENV]IC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
Chloride	DIO0252-AUG24	µg/g	0.4	<0.4	24	35	102	80	120	100	75	125
Sulphate	DIO0252-AUG24	µg/g	0.4	<0.4	2	35	92	80	120	92	75	125

Carbon/Sulphur

Method: ASTM E1915-07A I Internal ref.: ME-CA-[ENV]ARD-LAK-AN-020

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
Sulphide (Na2CO3)	ECS0029-AUG24	%	0.01	< 0.01								

Conductivity

Method: SM 2510 I Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
Conductivity	EWL0261-AUG24	uS/cm	2	3	2	20	99	90	110	NA		

QC SUMMARY

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0261-AUG24	pH Units	0.05	NA	0		100			NA		

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.
RL Reporting Limit.
↑ Reporting limit raised.
↓ Reporting limit lowered.
NA The sample was not analysed for this analyte
ND Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

SGS

Request for Laboratory Services and CHAIN OF CUSTODY (Mining)

SGS Environmental Services - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Toll Free: 877-747-7658 Fax: 705-652-6365 Web: www.ca.sgs.com {4}

SGS Environmental Services - London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361 Web: www.ca.sgs.com {4}

Laboratory Information Section

Received Date (mm/dd/yyyy): AUG 0 9 2024

Skid # (if applicable):

Temperature Upon Receipt (°C): 2 0 2 1

LAB LIMS #: CA-15676-Aug24 NP

Billing & Reporting Information

Invoice/Receipt to {3}:	
Company:	Pinchin Ltd.
Attention:	Megan Keon
Address:	1 Hines Rd, Suite 200 Kanata, ON
Email:	mKeon@pinchin.com / ap@pinchin.com
Project Name/Number:	339662.003
P.O. #:	

Quote #: 2024-066

Attached Parameter List: ☐ YES ☐ NO

Turnaround Time

Is *Rush Turnaround Time Required? ☐ YES ☑ NO

Specify:

* Rush TA Requests Require Lab Approval

Client Information/Report To:

Client Lab #:

Company Name:	Pinchin Ltd.	**Phone Number:**	613-608-5350.
Contact Name:	Megan Keon	**Fax Number:**	
Address:	1 Hines Rd, Suite 200, Kanata, ON	**E-mail:**	MKeon@pinchin.com
Copy to:			

Samples will be sent to paid storage after 3 months unless otherwise requested. Additional storage and shipping costs will be charged to the client. If the samples should be returned, please provide courier account information.

After analysis samples are to be:	Disposed ☑	Stored (At client's cost) *Default ☐	Multi-phase project (Automatic storage) ☐
Returned to client ☐	Return courier:	Acct:	

IMPORTANT: If samples contain known Hazards, please label accordingly and identify below:

☐ **NORM (Normally Occuring Radioactive Material)** ☐ **Asbestos** ☐ **Other:**

Special Instructions : ☐ **See Attached or:**

Sample Information

	Sample Identifier	Date Sampled (mm/dd/yy)	Time Sampled	# of Containers	pH	Conductivity	resistivity	Redox potential	sulphide	chloride	sulphate	
20	BH1 SS3 7.5-9.5Ft	08/01/24	Am	1								

Analysis Requested (please enter the analysis required below and check off which analysis applies to each sample)

Sampled By {1}:	(Name) Megan Keon	(Signature) Megan Keon	Date:	08/01/24	(mm/dd/yy)
Relinquished by {2}:	(Name) Megan Keon	(Signature) Megan Keon	Date:	08/08/24	(mm/dd/yy)

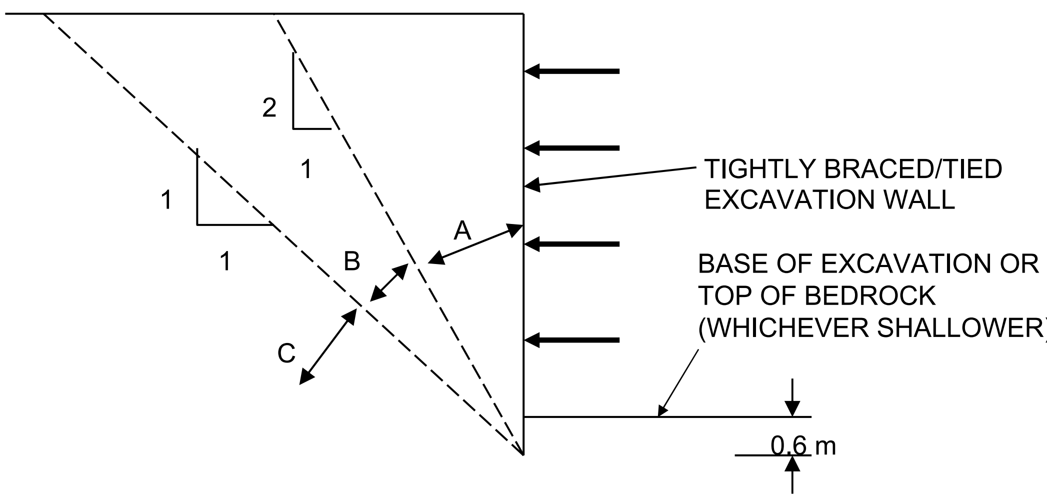
Note: {1} Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. {2} Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). {3} Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. {4} Completion of work may require the subcontracting of samples between the London and Lakefield laboratories.

3348593615 22
PP NP 09:45

APPENDIX G
GUIDELINES FOR EXCAVATION SUPPORT

Guidelines for Underpinning in Soil and Excavation Support

Existing foundations located within Zone A normally require underpinning, especially for heavy structures. For some foundations in Zone A, it may be possible to eliminate underpinning and control foundation movement by tightly braced excavation walls, such as caisson walls.



Zone A Foundations located within this zone normally require underpinning. Horizontal and vertical pressures on the excavation wall of non-underpinned foundations must be considered

Zone B Foundations located within this zone normally do not require underpinning. Horizontal and vertical pressures on the excavation wall of non-underpinned foundations must be considered

Zone C Underpinning to structures is normally founded in this zone. Lateral pressure from underpinning is not normally considered

(Reference: Figure 26.27 from Canadian Foundation Engineering Manual, 4th Edition)