GEOFIRMA ENGINEERING LTD.

PROPOSED WILD BIRD CARE CENTRE

8520 McArton Road

Ottawa, Ontario

January 10, 2020

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1.0 INTRODUCTION

Terrapex Environmental Ltd. (Terrapex) has been retained by Geofirma Engineering Ltd. to carry out a geotechnical investigation for the proposed Wild Bird Care Centre development located at 8520 McArton Road, in Ottawa, Ontario (the Site). For the purpose of this report, McArton Road is considered to be oriented in an east-west direction and the Site is situated on the south side of the Road.

Authorization to proceed with this study was given by Mr. Sean Sterling of Geofirma Engineering Ltd.

We understand that it is proposed to develop the Site with a single storey above grade building, with associated asphaltic concrete driveways and parking lot located to the north east of the proposed building.

The location of the proposed development is shown on Figure 1: Borehole Location Plan attached to this report. The base drawing was provided for our use by Geofirma Engineering Ltd.; attached in Appendix V.

Based on information contained on Drawing ES-1; Erosion and Sediment Control Plan, dated August 15, 2019, the proposed building will be a single storey structure with an area of 623.25 m^2. The finish floor elevation (FFE) of the building will be 135.45 m. Based on this site plan, the existing ground surface elevations at the site range from about 132 m at the southeast corner of the site to about 133.5 m near the northwest corner of the site.

The purpose of this investigation was to characterize the subsurface soil and groundwater conditions, to determine the engineering properties of the various soil deposits underlying the site, 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 client 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 FIELDWORK

The fieldwork for this investigation was carried out on December 16 and 17, 2019. It consisted of six (6) boreholes, advanced by a drilling contractor commissioned by **Terrapex**. The locations of the boreholes were chosen by **Terrapex** to provide general coverage of the Site; shown on Figure1: Borehole Location Plan attached to this report.

The boreholes designated as BH101, BH102, BH104 and BH105, were extended to the top of inferred bedrock encountered at approximate depths ranging from 0.4 to 2.4 m below ground

surface (mbgs). The bedrock in Boreholes BH103 and BH106 was cored to depths ranging from 3.4 to 4.5 mbgs.

During the drilling program, where auger refusal was encountered at shallow depths (Borehole BH101, BH102 and BH104), a second borehole was advanced about 1.0 m away from the original location to confirm the bedrock.

Groundwater level observations were made in the boreholes during and on completion of each of their advancement. The results of the groundwater measurements are discussed in Section 4.6 of this report.

The ground surface elevations at the locations of the boreholes were established by **Terrapex** using a Topcon RL-H5A Horizontal Self-Leveling Rotary Laser. The south edge of the asphaltic concrete on McArton Road located at the "gravel" site entrance was used as the bench mark; with an elevation of 134.32 m; obtained from the CAD drawings provided by Geofirma Engineering Ltd, and attached in Appendix V.

Standard penetration tests were carried out within the overburden in the course of advancing the boreholes 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.

The bedrock at BH103 and BH106 was cored using a diamond drill bit and NQ size core to determine its quality, and continuity. Results of SPT and rock core measurements are shown on the borehole log sheets in Appendix I, of this report and photo logs of the rock cores are provided in Appendix III.

The fieldwork for this project was carried out under the supervision of an experienced technician from this office who laid out the positions of the boreholes in the field; arranged locates of buried services; effected the drilling, sampling and in situ testing; observed groundwater conditions; and prepared field borehole log sheets.

3.0 LABORATORY TESTS

The soil samples retained from the split spoon sampler were properly sealed, labelled and brought to our laboratory along with the rock cores. They were visually classified and water content tests were conducted on soil samples retained from Boreholes BH101, BH102, BH103, BH105 and BH106. The results of the classification, water contents, SPT and rock core measurements are presented on the borehole log sheets attached in Appendix I of this report.

Grain-size analyses were carried out on three (3) soil samples, the result of these tests are presented as Figures 2, 3 and 4 provided in Appendix II.

In addition, one (1) soil sample was submitted to an analytical laboratory for chemical analyses for pH and soluble sulphate test. The results of this test is enclosed in Appendix IV; discussed in Section 5.8 of this report.

4.0 SITE AND SUBSURFACE CONDITIONS

Full details of the subsurface soil, bedrock and groundwater conditions at the site are given on the borehole log sheets provided in Appendix I of this report.

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

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 approximately 140 m west of the southwest corner of the intersection at McArton Road and Upper Dwyer Hill Road in Ottawa. It is currently vacant and used for agricultural purposes, it is rectangular in shape and occupies approximately 2.1 Hectares. It is bordered by McArton road to the north, a residential property to the east, and wooded areas to the west and south.

The ground surface within the Site slopes down towards the south east corner of the Site. The land has a rough surface resulting from farming activities. The ground surface elevations at the borehole locations ranges between 133.5 m at Borehole BH101 and 132.6 m at Borehole BH104.

4.2 TOPSOIL

An approximately 200 mm thick layer of topsoil is present at Borehole BH101. It should be noted that the topsoil thickness varies across the site. Thicker topsoil than that found in the borehole may be present in places.

4.3 REMOLDED NATIVE MATERIAL

Remolded native soil consisting of silt and sand to silty sand, trace to some organics, and trace gravel is present below the topsoil at BH101 and at the surface in all remaining boreholes. . It extends to approximate depths ranging from 0.4 to 0.5 mbgs.

Standard penetration resistance in the remolded native material provided N-values ranging from 1 to 4, indicating very loose to loose compactness condition.

4.4 GLACIAL TILL

Glacial till is present in all boreholes below the remoulded material with varying constituents ranging from gravelly sand and silt to silty sand some gravel, to gravel and sand trace silt. The till is a glacial deposit and consists of a random mixture of soil particles ranging from silt to gravel, with the silt, sand, and gravel being the predominant fractions. Cobbles and boulders are probably present but would not be representatively sampled with the equipment used in this investigation.

The glacial till is generally light brown mottled light grey in color, with occasional oxidized fissures. The water content of the tested samples of the till from Boreholes BH101, BH102, BH103, BH105 and BH106 ranges from approximately 7 to 16% by weight; generally being moist to wet in appearance with increasing depth.

SPT carried out in the glacial till provided N-values ranging from 11 to 55, indicating compact to very dense compactness condition; generally being dense.

The till extends to bedrock encountered at depths ranging from 0.4 to 2.4 mbgs; between elevations 130.5 and 132.8 m.

Grain size analyses were carried out on three soil samples from boreholes BH102 and BH105. The test results are enclosed in Appendix II as Figures 2 through 4 and summarized below.

Borehole Number	Sample Depth and No.	Sample Description	Gravel %	Sand %	Silt %	Clay %
BH102	0.76-0.9 m (2)	Gravelly Sand and Silt, trace clay	30	34	30	6
BH105	0.76-1.4 m (2)	Silty Sand, some gravel, trace clay	18	58	20	4
BH105	1.5-2.1 m (3)	Gravel and Sand, trace silt	50	42	8	

Based on the results of the grain size analyses, the hydraulic conductivity (K value) of the gravelly sand and silt to silty sand some gravel, to gravel and sand trace silt (till) is estimated to be 10^{-2} to 10^{-4} cm/sec, corresponding to permeable to medium permeability depending on amount of silt.

4.5 LIMESTONE BEDROCK

Bedrock was contacted at depths ranging from 0.4 to 2.4 mbgs at all Borehole locations and the bedrock at boreholes BH103 and BH106 was cored to approximate depths of 4.5 m and 3.4 m in Boreholes BH103 and BH106 respectively.

The rock consists of light grey to blackish grey Limestone of the Ottawa Group; Simcoe Group; Shadow Lake Formation (Ontario Geological Survey, 2011, 1:250 000)[1]. Based on number of

[1] • Ontario Geological Survey 1:250,000 scale map entitled Bedrock Geology of Ontario (2011)

rock hammer blows, the hardness of the rock is considered to be moderately hard.

The rock core at borehole BH103 is intensely fractured with an average of six (6) fractures per foot, with core recovered mostly in lengths of 0.03 to 0.1 m. The rock is considered to be moderately weathered with discoloration throughout. Total Core Recovery (TCR) ranged between 92% and 95%. The Rock Quality Designation (RQD) value ranged from 0% to 9%; very poor condition.

The rock core at borehole BH106 is moderately fractured with an average of four (4) fractures per foot, with core recovered mostly in lengths of 0.1 to 0.3 m, with most lengths greater than 0.2 m. The rock is considered to be moderately weathered within the top 0.5 m to slightly weathered with depth. Total Core Recovery (TCR) ranged between 96% and 98%. The Rock Quality Designation (RQD) value ranged from 0% to 78%; which indicates a very poor to good condition.

Based on Table 3.10 of the Canadian Foundation Engineering Manual (CFEM) 4th Edition, the upper sub-unit of the bedrock is classified as “very poor” quality.

Photos of the rock cores are provided in Appendix III.

4.6 GROUNDWATER

Groundwater level and cave-in of the unlined sidewalls of the boreholes were measured upon completion of the boreholes; shown on the individual borehole logs and presented in the table below:

Borehole No.	Borehole Depth (m)	Groundwater Depth (m)	Cave-in Level (mbgs)
BH101	0.5	Dry	Open
BH102	0.9	Dry	0.5
BH103	4.5	1.2	4.5
BH104	0.4	Dry	Open
BH105	2.4	1.0	1.3
BH106	3.4	0.9	1.2

Based on the water content of the soil samples retrieved from the split spoon sampler and observations made in the field it is predicted that the water table is located in the glacial till material above the limestone bedrock.

It should be noted that groundwater levels are subject to seasonal fluctuations. A higher groundwater level condition will likely develop in the spring and 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 **Terrapex** and are intended for use by the client and design architects and engineers only.

We understand that it is proposed to develop the Site with a single storey above grade building, with associated asphaltic concrete driveways and parking lot. The proposed building will occupy an area of 623.5 m^2.

Based on existing grades and proposed FFE of the building, it will be necessary to raise the site grades by approximately 2 m. Given the absence of soft clay and shallow bedrock at the Site, the required grade raise will not cause any settlement of the subsoil.

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.

5.1 EXCAVATION

Excavation of the overburden soils at this site can be carried out using standard hydraulic excavators. We note that cobbles/boulders may be encountered within the native glacial till layer. Removal of the cobbles/boulders may be required if they are interfering with foundation construction at subgrade level. It is anticipated that the remolded native materials, glacial till and upper highly to moderately weathered limestone bedrock can be effectively excavated with a hydraulic shovel. The lower portion of the limestone bedrock is moderately to slightly weathered and fractured below depths of 1.8 m in Borehole BH106 and will likely require rock teeth capable of excavating rock with strengths of 14 to 30 MPa.

Using parameters of degree of weathering, rock strength, joint and bedding spacing, and the diggability index rating developed by Scoble and Muftuoglu, it is anticipated that the bedrock materials should conform to the following.

Stratigraphic Unit	Class	Ease of Digging	Typical Plant Fitted with Rock Teeth and Ripper which may be used without blasting
Highly Weathered, Weak shale	I and II	Very Easy to Easy	Hydraulic shovel, eg. CAT 235
Slightly Weathered Medium Strong to Strong Shale	III	Moderate	Hydraulic shovel eg. CAT 245
Limestone	IV and V	Difficult to Very Difficult	Hydraulic shovel, eg. Hitachi EX1200-5

Scoble, M.J. and Mufluglu, Y.V. (1984) "Derivation of a Diggability Index for Surface Mine Equipment Selection", Mining Science and Technology No. 1, pp. 305-322.

All excavations must be carried out in accordance with Occupational Health and Safety Act (OHSA). With respect to OHSA, the remolded native material is expected to conform to Type 3 soil; the compact to dense glacial till should conform to Type 2 soil.

Temporary excavations for slopes in Type 3 soil should not exceed 1.0 horizontal to 1.0 vertical or flatter. Locally, where loose or soft soil is encountered at shallow depths or within zones of persistent seepage, it may be necessary to flatten the side slopes as necessary to achieve stable conditions. Excavations in Type 2 soil may be cut with vertical side-walls within the lower 1.2 m height of excavation and 1.0 horizontal to 1.0 vertical above this height. Excavation side walls constructed within the bedrock stratum may be vertical, subject to confirmation by geotechnical staff.

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 side-walls must be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act and Regulation for Construction Projects.

Provisions must be made in the excavation and foundation installation contracts for the removal of possible boulders.

5.2 REUSE OF ON-SITE EXCAVATED SOIL AND ENGINEERED FILL

On-site excavated inorganic soils are considered suitable for reuse as backfill material or engineered fill, provided their water content is within 2% of their optimum water contents (OWC) as determined by Standard Proctor test, and the materials are effectively compacted with a heavy sheep foot compaction rollers.

While the quality of the native soils are considered suitable for backfilling; the moisture content of the soils and the lift thickness for compaction must be properly controlled during the backfilling. Alternatively, imported suitable material should be used.

Measured water content within the native soils ranges from approximately 7 to 16%; generally being on the wet side of the material's OWC. 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 following recommendations regarding construction of engineered fill should be adhered to during the construction stage:

- All surface vegetation, organic materials, softened and disturbed soils must be removed, and the exposed subgrade soils proof-rolled with an inspection by the Geotechnical Engineer prior to any fill placement.
- 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 by a qualified engineering technician supervised by the project engineer.
- The top of the engineered fill should extend a minimum of 2.5 m beyond the envelope of

the proposed structure. 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 edges of the engineered fill should be sloped at a maximum of 3 horizontal to 1 vertical in order to avoid weakening of the engineered fill edges due to slope movement.

- 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.

5.3 GROUNDWATER CONTROL

The native gravelly sand and silt to silty sand with some gravel, to gravel and sand trace silt (till) soils are expected to have a moderate to high permeability coefficients; the groundwater yield from these soils is expected to be moderate. The groundwater level must be maintained a minimum of 300 mm below the bases of excavations at all times.

Surface water should be directed away from open excavations.

5.4 FOUNDATION DESIGN

The FFE of the proposed building will be 135.45 m. Footings constructed in unheated areas of the building, such as those along the exterior walls of the building will have to be founded below approximate elevation 133.5 m; at least 1.8 m below exterior grade to provide protection to the foundation soil from freezing temperatures.,

The existing ground surface elevations within the footprint of the proposed building at the site range from about 132.6 to 133.2 m. Based on the borehole findings, the indications are that the near surface very loose to loose soils throughout the footprint of the proposed building above approximate elevation 132.3 m will have to be removed prior to placement of engineered fill required to raise the Site grades to proposed.

It will be possible to utilize conventional shallow spread and strip footing foundations to support the proposed building.

Foundations may be constructed on engineered fill provided that the disturbed native material is removed in its entirety and the engineered fill is constructed in accordance with recommendations provided in Section 5.2 of this report.

Foundations installed on certified engineered fill or on the underlying native soil may be designed based on bearing resistance of 150 kPa at Serviceability Limit States (SLS), and factored geotechnical bearing resistances at Ultimate Limit States (ULS) of 225 kPa.

The geotechnical bearing resistance recommended above is for vertical loads (no inclination) and no eccentricity. The total and differential settlements of spread footing foundations founded on the native soil designed in accordance with the recommendations provided in this report should not exceed the conventional limits of 25 mm and 19 mm respectively.

In the event that higher resistances are required, the foundations may be extended deeper into the sandy silt till or the underlying bedrock. However, given that the building will be a single storey structure, all indications are that it should not be necessary to extend the foundations deeper.

Due to variations in the consistency of the founding soils and/or loosening caused by to excavating disturbance and/or seasonal frost effects, all footing subgrade 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 horizontal (clear horizontal distance between footings) to 1 vertical (difference in elevation) in soil and 1 horizontal to 1 vertical in the bedrock. No individual footing step should be greater than 0.6 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 at all times. If unstable subgrade conditions develop, **Terrapex** should be contacted in order to assess the conditions and make appropriate recommendations.

5.5 CONCRETE SLAB-ON-GRADE

The subgrade supporting the ground floor slab will in general consist of engineered fill soil which is adequate to support a slab-on-grade construction.

Subgrade preparation should include the removal of surface vegetation, organic materials, weak and softened soils. After removal of all unsuitable materials, the subgrade should then 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.

Where new fill is required, recommendations provided in Section 5.2 of this report should be followed for placement and compaction of the fill.

It is recommended that a combined moisture barrier and a levelling course, having a minimum thickness of 200 mm and comprised of Granular ‘A’ compacted to a minimum of 100% of its SPMDD or free draining material such as 20 mm clear stone (OPSS 1004) compacted by vibration to a dense state be placed under the floor slab.

Provided the subgrade, under-floor fill and granular base are prepared in accordance with the

above recommendations, the Modulus of Subgrade Reaction (ks) for floor slab design will be 25,000 kPa/m.

Perimeter drainage at the foundation level is not required provided the finished floor surface is at least 150 mm above the prevailing grade and the surrounding surfaces slope away from the buildings.

The soils at the site are susceptible to frost effects which would have the potential to deform hard landscaping adjacent to the building. At locations where the new structures are expected to have flush entrances, care must be taken in detailing the exterior slabs/sidewalks, providing insulation/drainage/ non-frost susceptible backfill to maintain the flush threshold during freezing weather conditions.

5.6 PAVEMENT DESIGN

Based on the existing topography of the site and proposed grades, re-grading of the subgrade will be required, and the sub-grade material for the pavement will generally comprise of engineered fill.

The subgrade should be thoroughly proof-rolled and re-compacted to ensure uniformity in strength and support.

The following pavement thickness design is recommended to provide support for cars and light trucks and occasional delivery vehicles.

Recommended Asphaltic Concrete Pavement Structure Design
(Minimum Component Thicknesses)

Pavement Layer	Compaction Requirements	Pavement Structure
Surface Course	as per OPSS 310	40 mm Superpave 12.5 Level B Asphalt (PG58-34)
Binder Course	as per OPSS 310	50 mm Superpave 19 mm Level B Asphalt (PG58-34)
Granular Base	100% SPMDD	150 mm Granular 'A' (OPSS 1010) Pit Run or 19 mm Crusher Run Limestone
Granular Sub-Base	100% SPMDD	300 mm Granular 'B' Type II (OPSS 1010)

The subgrade must be compacted to at least 98% of SPMDD. The granular base and sub-base materials should be compacted to a minimum of 100% SPMDD.

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 as much as practically possible when fill is placed and that the subgrade is not disturbed and weakened after it is exposed.

Control of surface water is a significant factor in achieving good pavement life. Grading adjacent to the pavement areas must be designed so that water is not allowed to pond adjacent to the outside edges of the pavement or curb. 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 may 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.

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.
- 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.

5.7 EARTHQUAKE DESIGN PARAMETERS

The 2012 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.A of the 2012 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. The applicable penetration resistance is that which has been corrected to a rod energy efficiency of 60% of the theoretical maximum or the (N_{60}) value.

Based on the borehole information, the subsurface stratigraphy generally comprises surficial disturbed native material followed by glacier till underlain by limestone bedrock. Based on the above, the site designation for seismic analysis is Class C according to Table 4.1.8.4.A from the OBC..

The site specific 5% damped spectral acceleration coefficients, and the peak ground acceleration factors are provided in the 2012 Ontario Building Code - Supplementary Standards SB-1 (September 14, 2012), Table 1.2, location Ottawa, Ontario.

5.8 CHEMICAL CHARACTERIZATION OF SUBSURFACE SOIL

One (1) soil sample obtained from Borehole BH105 was submitted to AGAT Laboratories for pH index test and water-soluble sulphate content to determine the potential of attacking the subsurface concrete. The test results are summarized below:

Soil Parameter	BH105: 0.76 mbgs (Sample 2)
pH	8.19
Water-soluble Sulphate %	< 0.0002

The pH of the tested sample indicates a slight alkalinity. 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 that protect against sulphate attack are therefore not required for the sub-surface concrete of the proposed building.

The Certificate of Analysis provided by the analytical chemical testing laboratory is contained in Appendix IV of this report.

6.0 CLOSURE

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.

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 Geofirma Engineering Ltd. by **Terrapex Environmental Ltd**. The material in it reflects **Terrapex Environmental Ltd.** judgement in light of the information available

to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions which the Third Party may make based on it, are the sole responsibility of such Third Parties.

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 recommend also 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 when these recommendations are not followed, the company'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.

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.

Respectfully submitted,

TERRAPEX ENVIRONMENTAL LTD.

Rachel Herzog, C.E.T.
Geotechnical Project Coordinator

Vic Nersesian, P. Eng.
Vice President, Geotechnical Services

FIGURE 1

BOREHOLE LOCATION PLAN

TERRAPEX

BOREHOLE LOCATION PLAN

8520 MCARTON ROAD
OTTAWA, ONTARIO

CLIENT

GEOFIRMA ENGINEERING LTD.

LEGEND

BOREHOLE

0 50m 100m
(APPROXIMATE)

SOURCE: VU MAP FIRST BASE SOLUTIONS, 2019. SITE PLAN PROVIDED BY CLIENT

PROJECT #	CO752.00
SCALE	AS SHOWN
DATE	DECEMBER 2019
DRAWN	SW
CHECKED	
DRAWING #	FIGURE 1

APPENDIX I

BOREHOLE LOG SHEETS

CLIENT: Geofirma Engineering Ltd.	METHOD: Hollow Stem Augers/Split Spoon		**BH No.: BH101**
PROJECT: 8520 McArton Road	PROJECT ENGINEER: VN	ELEV. (m) 133.51	
LOCATION: Ottawa, ON	NORTHING: 5006298	EASTING: 417329	PROJECT NO.: CO752.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) ● 40 80 120 160 / N-Value (Blows/300mm) ▲ 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		200 mm TOPSOIL	0	133.5		44	1A				Borehole was open and dry on completion.
		compact, damp, light brown GRAVELLY SAND and SILT trace limestone fragments	0.3	133.2	26 ▲	7 ●	1B		26		Repositioned drill rig 1 m N to confirm bedrock depth.
		END OF BOREHOLE									Auger refusal on inferred bedrock at 0.5 mbgs.

	LOGGED BY: TH	DRILLING DATE: December 17, 2019
	REVIEWED BY: VN	Page 1 of 1

CLIENT: Geofirma Engineering Ltd.	METHOD: Hollow Stem Auger, Spilt spoon sampler		**BH No.: BH102**
PROJECT: 8520 McArton Road	PROJECT ENGINEER: VN	ELEV. (m) 132.7	
LOCATION: Ottawa, ON	NORTHING: 5006302	EASTING: 417356	PROJECT NO.: CO752.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		loose, moist, dark brown and brown sand and silt, trace gravel, trace organics (remolded)	0	132.6	3		1		3		Borehole caved in at 0.5 mbgs and was dry. Repositioned drill rig 1 m N to confirm bedrock depth.
		very dense, damp, brown GRAVELLY SAND and SILT trace limestone fragments (TILL)	0.3	132.3							
			0.6	132	50/76mm	9	2		50/76mm		Auger refusal on inferred bedrock at 0.9 mbgs.
		END OF BOREHOLE	0.9								

Shear Strength (kPa): 40 80 120 160
N-Value (Blows/300mm): 20 40 60 80
Water Content (%): 20 40 60 80

LOGGED BY: RH	DRILLING DATE: December 17, 2019
REVIEWED BY: VN	Page 1 of 1

CLIENT: Geofirma Engineering Ltd.	METHOD: Hollow Stem Augers, NQ Casing		**BH No.: BH103**
PROJECT: 8520 McArton Road	PROJECT ENGINEER: VN	ELEV. (m) 133.2	
LOCATION: Ottawa, ON	NORTHING: 5006262	EASTING: 417335	PROJECT NO.: CO752.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
	very loose, moist, dark brown and brown sand and silt, some organics, trace gravel (remolded)	0	133.2	2		1		2		Borehole caved in at 4.5 mbgs, water was measured at 1.2 mbgs.
		0.3	132.9							
		0.6	132.6							
	compact, moist, light brown GRAVELLY SAND and SILT occassional oxidization (TILL)	0.9	132.3	29	11	2		29		
▼		1.2	132							
	----- very dense	1.5	131.7	50/150	13	3		50/150		
	Highly fractured Limestone Bedrock parted by occassional clay seams; moderatley weathered occassional oxidization' RQD = 0% TCR = 92% fracture/foot=6	1.8	131.4							
		2.1	131.1							
		2.4	130.8			4				
		2.7	130.5							
		3	130.2							
	RQD = 9% TCR = 95% fracture/foot= 6 trace oxidization	3.3	129.9							
		3.6	129.6							
		3.9	129.3			5				
		4.2	129							
	END OF BOREHOLE	4.5	128.7							

LOGGED BY: RH | DRILLING DATE: December 16, 2019

REVIEWED BY: VN | Page 1 of 1

CLIENT: Geofirma Engineering Ltd.	METHOD: Hollow Stem Augers/ NQ Casing	**BH No.: BH104**
PROJECT: 8520 McArton Road	PROJECT ENGINEER: VN	ELEV. (m) 132.6
LOCATION: Ottawa, ON	NORTHING: 5006262	EASTING: 417355
		PROJECT NO.: CO752.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		very loose moist, brown gravelly sand and silt trace organics (remolded) ----- very dense	0 0.3	132.6 132.3	50/76mm		1		50/ 76mm		Borehole open and dry on completion. Auger refusal on inferred bedrock at 0.4 mbgs. Repositioned drill rig 1 m N to confirm bedrock depth.
		END OF BOREHOLE									

LOGGED BY: RH	DRILLING DATE: December 17, 2019
REVIEWED BY: VN	Page 1 of 1

CLIENT: Geofirma Engineering Ltd.	METHOD: Hollow Stem Augers, split spoon		**BH No.: BH105**
PROJECT: 8520 McArton Road	PROJECT ENGINEER: VN	ELEV. (m) 132.9	
LOCATION: Ottawa, ON	NORTHING: 5006244	EASTING: 417351	PROJECT NO.: CO752.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SAMPLE NO.	SPT(N)	REMARKS
	very loose, moist, dark brown and brown silty sand, trace organics, trace gravel (remolded)	0	132.9			Borehole caved in at 1.3 mbgs, water was measured at 1.0 mbgs.
		0.3	132.6	1	4	
		0.6	132.3			Auger refusal on inferred bedrock at 2.4 mbgs.
▼		0.9	132			
	compact; light brown SILTY SAND some gravel occassional oxidization (TILL); moist	1.2	131.7	2	18	
	very dense; wet	1.8	131.1	3	55	
	coarse angular gravel trace limestone	2.1	130.8	4	50/10mm	
	END OF BOREHOLE					

Shear Strength (kPa) 40 80 120 160; N-Value (Blows/300mm) ▲ 20 40 60 80: 4, 18, 55, 50/10mm

Water Content (%) PL W.C. LL 20 40 60 80: 15, 9

LOGGED BY: RH	DRILLING DATE: December 17, 2019
REVIEWED BY: VN	Page 1 of 1

CLIENT: Geofirma Engineering Ltd.	METHOD: Hollow Stem Augers, NQ Casing		**BH No.: BH106**
PROJECT: 8520 McArton Road	PROJECT ENGINEER: VN	ELEV. (m) 132.7	
LOCATION: Ottawa, ON	NORTHING: 5006244	EASTING: 417371	PROJECT NO.: CO752.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

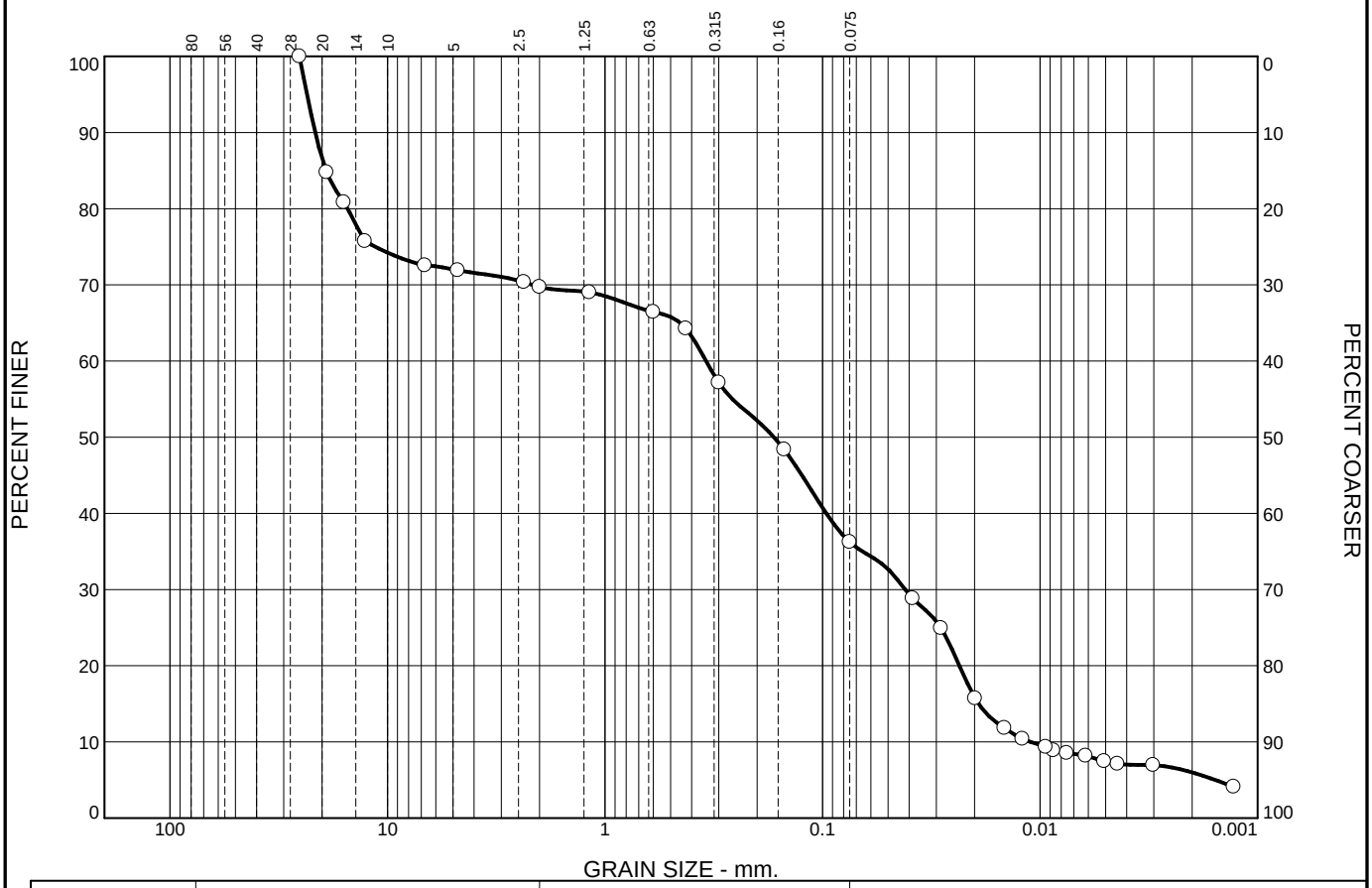
GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
▼	very loose, moist, dark brown and brown silty sand some organics, trace gravel (remolded)	0 – 0.3	132.6 – 132.3	1		1		1		Borehole caved in at 1.2 mbgs, water was measured at 0.9 mbgs.
	compact, moist to wet, light brown SILTY SAND trace to some gravel occassional oxidization (TILL)	0.6 – 0.9	132 – 131.7	16	16	2		16		
	highly fractured ----- moderately fractured: Limestone Bedrock occassional oxidization RQD = 0% TCR = 96% fractures/foot= 4	1.2 – 1.5	131.4 – 131.1			3				
	moderately fractured Limestone Bedrock RQD = 78% TCR = 98% fractures/foot= 4	1.8 – 2.1 – 2.4 – 2.7	130.8 – 130.5 – 130.2 – 129.9			4				
	END OF BOREHOLE	3 – 3.3	129.6							

	LOGGED BY: RH	DRILLING DATE: December 16. 2019
	REVIEWED BY: VN	Page 1 of 1

APPENDIX II

LABORATORY TEST RESULTS

Grain Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	30	6	28	30	6

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			19.1793	0.3433	0.1674	0.0417	0.0192	0.0111	0.46	31.05

Material Description	USCS	AASHTO
○ GRAVELLY SAND AND SILT		

Project No. CO752.00 **Client:** Geofirma Engineering Ltd.

Project: 8520 McArton Road

○ **Sample Number:** BH102-2

Remarks:

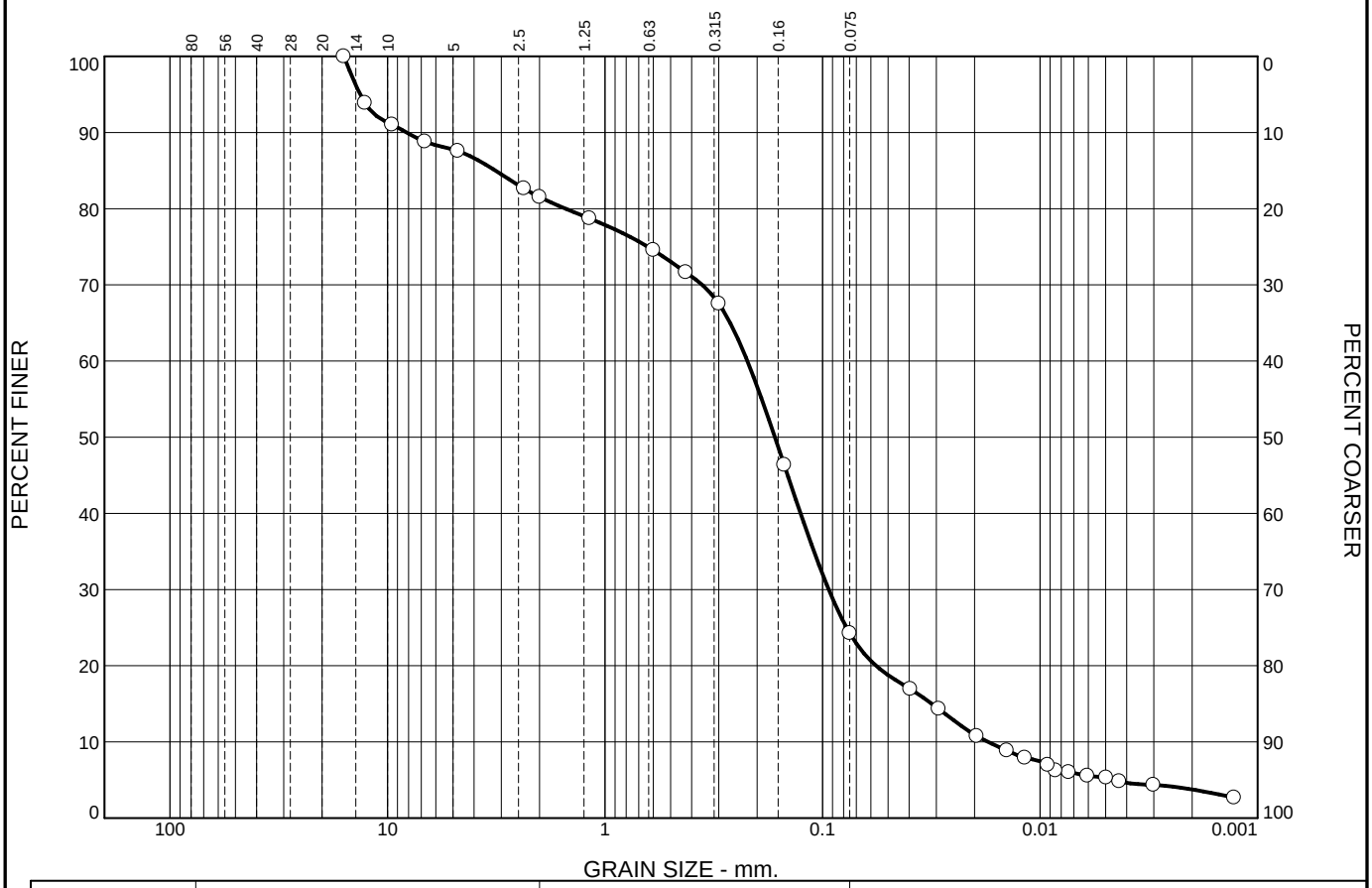
○* Tested on December 17, 2019

Terrapex

Figure 2

Tested By: RH **Checked By:** VN

Grain Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	18	10	48	20	4

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			3.1893	0.2218	0.1656	0.0937	0.0314	0.0174	2.28	12.77

Material Description	USCS	AASHTO
○ SILTY SAND some gravel		

Project No. CO752.00 **Client:** Geofirma Engineering Ltd.

Project: 8520 McArton Road

○ **Sample Number:** BH105-2

Remarks:

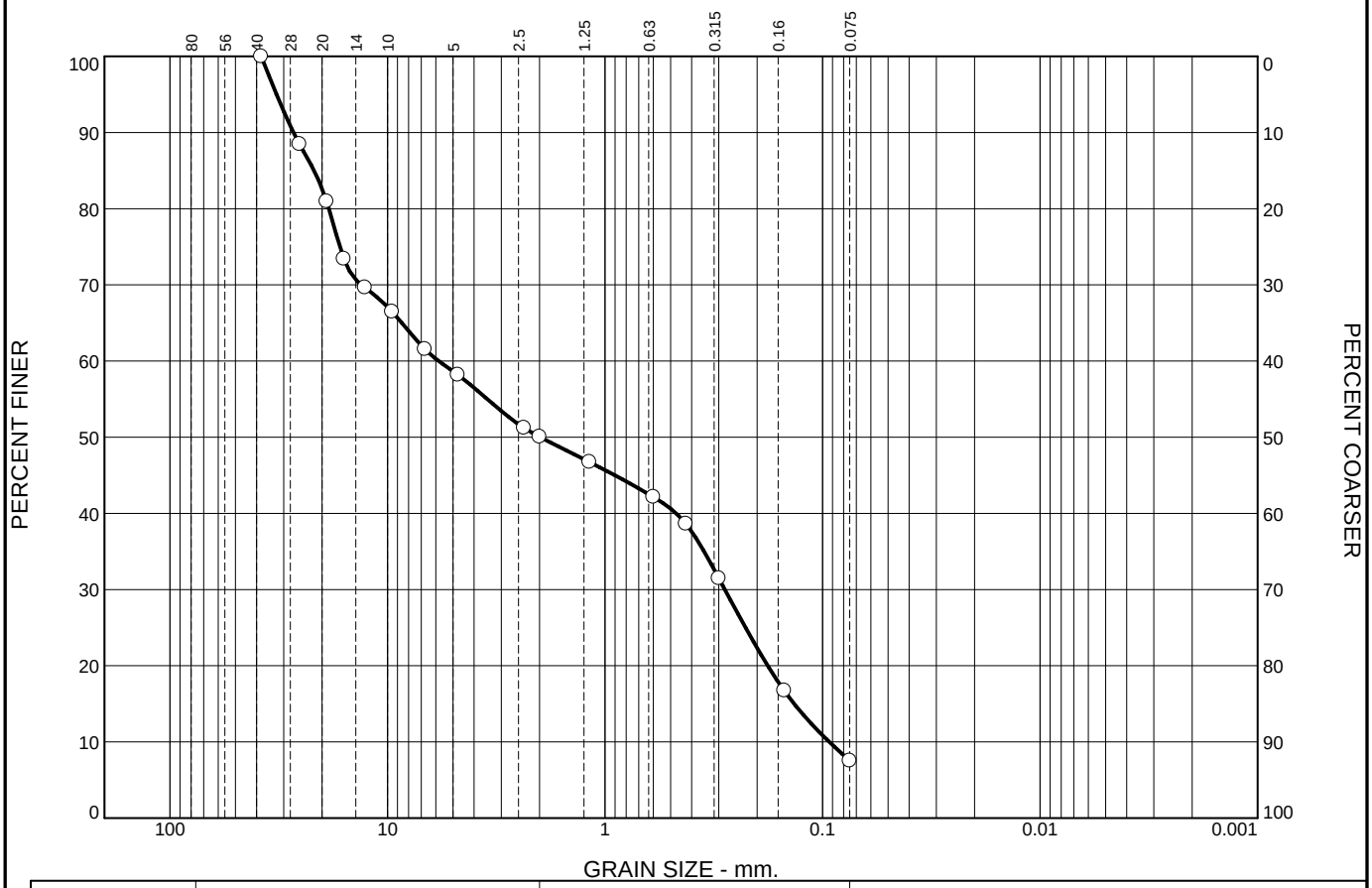
○*Tested on December 17, 2019

Terrapex

Figure 3

Tested By: RH **Checked By:** VN

Grain Size Distribution Report



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
○	0	50	11	31	8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			21.7439	5.8149	1.9829	0.2814	0.1351	0.0931	0.15	62.44

Material Description	USCS	AASHTO
○ GRAVEL AND SAND, trace silt		

Project No. CO752.00 **Client:** Geofirma Engineering Ltd.

Project: 8520 McArton Road

○ **Sample Number:** BH105-3

Remarks:

○* Tested on December 17, 2019

Terrapex

Figure 4

Tested By: RH **Checked By:** VN

APPENDIX III

ROCK CORE PHOTOGRAPHS

TERRAPEX	PHOTOGRAPHIC LOG Page 1 of 1		
Client: Geofirma Engineering ltd.	**Site Location**:	8520 McArton Road, Ottawa, ON	**Project No**: CO752.00

Photo No: 1 **Date:** December 16, 2019 **Viewing Direction:** Read core log from left to right **Description:** BH103 Rock Core.	

Photo No: 2 **Date:** December 16, 2019 **Viewing Direction:** Read core log from left to right **Description:** BH106 Rock Core.	

APPENDIX IV

CERTIFICATE OF CHEMICAL ANALYSIS

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED
2700 LANCASTER RD, UNIT 100
OTTAWA, ON K1B4T7
(613) 552-5208

ATTENTION TO: RACHAEL HERZOG

PROJECT: CO752.00

AGAT WORK ORDER: 19Z556868

SOIL ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Dec 20, 2019

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19Z556868

PROJECT: CO752.00

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

ATTENTION TO: RACHAEL HERZOG

SAMPLING SITE:8520 McArton Rd, Ottawa, ON

SAMPLED BY:RH

Inorganic Chemistry (Soil)

DATE RECEIVED: 2019-12-17

DATE REPORTED: 2019-12-20

				SAMPLE DESCRIPTION:	BH105-2
				SAMPLE TYPE:	Soil
				DATE SAMPLED:	2019-12-17 08:30
Parameter	Unit	G / S	RDL		808112
Sulphate (2:1)	µg/g		2		<2
pH (2:1)	pH Units		NA		8.19

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

808112 pH and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil).

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

AGAT WORK ORDER: 19Z556868

PROJECT: CO752.00

ATTENTION TO: RACHAEL HERZOG

SAMPLING SITE:8520 McArton Rd, Ottawa, ON

SAMPLED BY:RH

Soil Analysis

RPT Date: Dec 20, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Soil)															
Sulphate (2:1)	797276		3430	3420	0.2%	< 2	104%	80%	120%	106%	80%	120%	101%	70%	130%
pH (2:1)	770878		7.88	7.90	0.3%	NA	101%	90%	110%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: 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
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Certified By: Iris Verástegui

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Time Markers

AGAT WORK ORDER: 19Z556868

PROJECT: CO752.00

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

ATTENTION TO: RACHAEL HERZOG

Sample ID	Sample Description	Sample Type	Date Sampled	Date Received
808112	BH105-2	Soil	17-DEC-2019	17-DEC-2019

Inorganic Chemistry (Soil)

Parameter	Date Prepared	Date Analyzed	Initials
Sulphate (2:1)	19-DEC-2019	19-DEC-2019	LC
pH (2:1)	20-DEC-2019	20-DEC-2019	MM

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

AGAT WORK ORDER: 19Z556868

PROJECT: CO752.00

ATTENTION TO: RACHAEL HERZOG

SAMPLING SITE:8520 McArton Rd, Ottawa, ON

SAMPLED BY:RH

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Sulphate (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	MSA part 3 & SM 4500-H+ B	PH METER

AGAT Laboratories RUSH!

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use **Drinking Water Chain of Custody Form** (potable water intended for human consumption)

Laboratory Use Only
Work Order #: 19755686 8

Cooler Quantity: ONE - ICC pack
Arrival Temperatures: 6.1 | 6.6 | 8.2
LT - 6.4 | 5.8 | 5.8
Custody Seal Intact: ☐Yes ☐No ☐N/A
Notes:

Report Information:
Company: Terrapex Environmental Ltd.
Contact: ~~Craig Beaton~~ RACHEL HERZOG
Address: 1-20 Gurdwara Road
Ottawa, ON K2E 8B3
Phone: 613-745-6471 Fax: 613-745-0796
Reports to be sent to:
1. Email: ~~C.Beaton@terrapex.com~~ R.HERZOG@TERRAPEX.COM
2. Email:

Regulatory Requirements:
☒ No Regulatory Requirement
(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One): ☐Ind/Com ☐Res/Park ☐Agriculture
Soil Texture (Check One): ☐Coarse ☐Fine

☐ Sewer Use
☐Sanitary ☐Storm
Region (Indicate One)

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Is this submission for a Record of Site Condition? ☐ Yes ☒ No

Report Guideline on Certificate of Analysis ☐ Yes ☒ No

Turnaround Time (TAT) Required:
Regular TAT ☐ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☒ 2 Business Days ☐ 1 Business Day
OR Date Required (Rush Surcharges May Apply): Dec 20, 2019
Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Project Information:
Project: ~~C0652.02~~ C0752.00
Site Location: ~~100 Dufferin Street, Perth ON~~ 8520 McARTON RD, OTTAWA, ON
Outlet #: ~~SWPT~~
Sampled By: RH
AGAT Quote #: ~~19608~~ PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:
Bill To Same: Yes ☑ No ☐
Company: ~~Suncor Energy Products Partnership (15847-12)~~
Contact: ~~Holly Insinger~~
Address:
Email: ~~HInsinger@suncor.com~~ accounts.payable@terrapex.com

Activity
Assessement (circle one)
☐A1 ☐A2 ☐AR ☐AV

Remediation (circle one)
☐RE ☐RX ☐RI ☐RA

Contaminant Management (circle one)
☐MW ☐MV

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI Y/N	O. Reg 153: Metals and Inorganics	O. Reg 153: All Metals ☐ 153 Metals (exc. Hydrides)	O. Reg 153: Hydride Metals ☐ 153 Metals (Incl. Hydrides)	O. Reg 153: ORPs: ☐ B-HWS ☐ Cl ☐ CN	O. Reg 153: ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg	O. Reg 153: ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN	☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☒ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	pH + Soluble Sulphates					Potentially Hazardous or High Concentration (Y/N)
BH 105-2	Dec 17, 2019	8:30am	2	~~S~~ S	corrosivity package	–																			✓					

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time	# jars used and not returned:
RACHEL HERZOG / RH	Dec 17, 2019	14:50	[illegible]	19-12-17	14h50	
[illegible] totalex	19-12-17	16h00				Page 1 of 1
			Shanmin	Dec 18/19	11:10 am	N°:

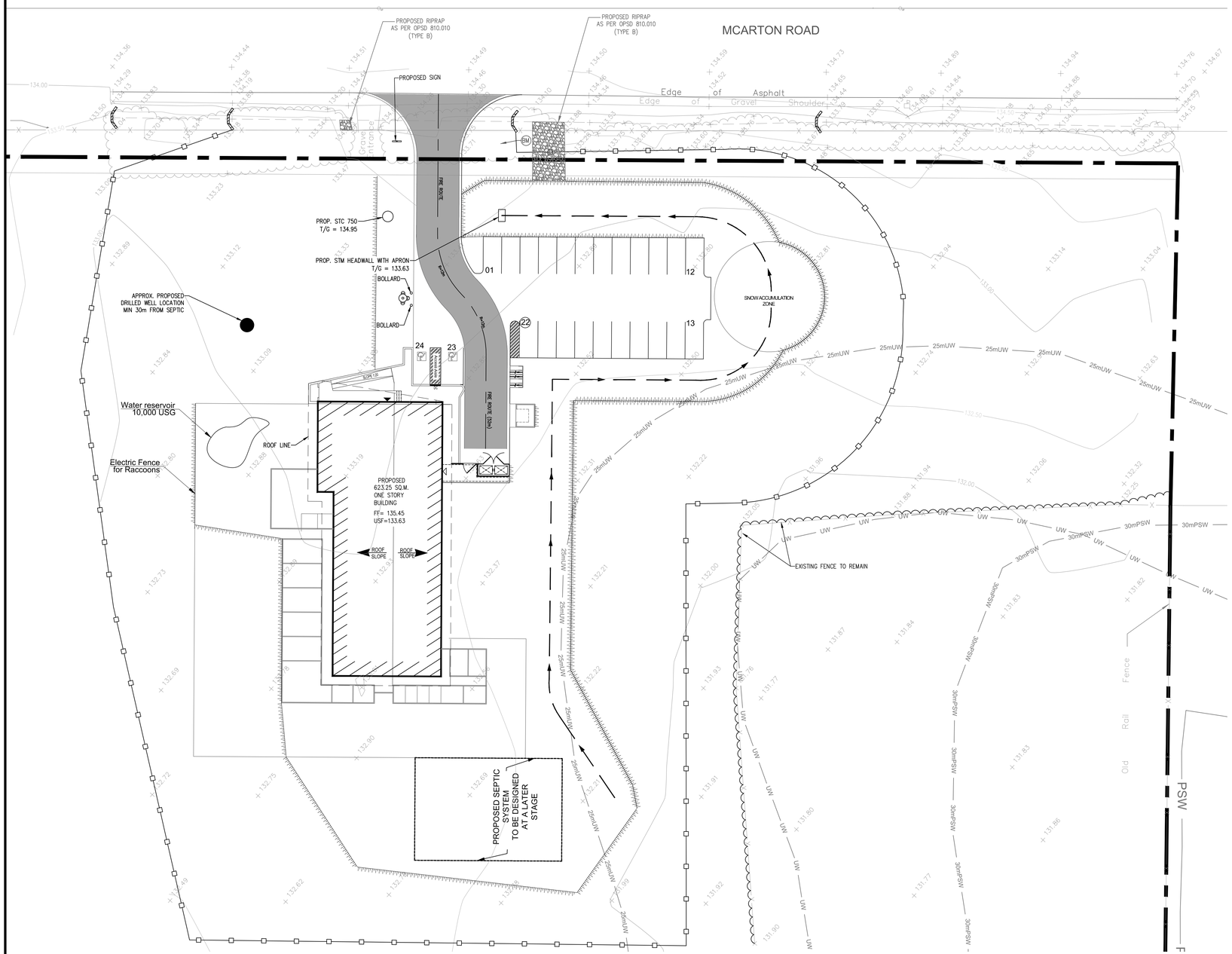
Document ID: DIV-78-1511.012

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

Date Issued: July 13, 2016

APPENDIX V

CLIENT PROVIDED DRAWINGS



GENERAL NOTES:

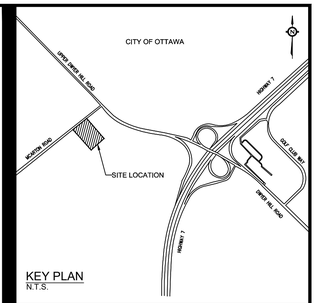
1. ALL WORK TO CONFORM TO THE LATEST MUNICIPAL STANDARDS, THE PROVINCIAL STANDARD DRAWINGS AND SPECIFICATIONS (OPSD AND OPSS), AND WHERE APPLICABLE / REQUIRED, LOCAL UTILITY STANDARDS AND THE ONTARIO MINISTRY OF TRANSPORTATION STANDARDS WILL APPLY.
2. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE "ONTARIO OCCUPATIONAL HEALTH AND SAFETY ACT" AND ITS LATEST AMENDMENTS. THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
3. SHOULD DEEPLY BURIED ARCHEOLOGICAL REMAINS BE FOUND ON THE PROPERTY DURING CONSTRUCTION ACTIVITIES THE HERITAGE OPERATIONS UNIT OF THE ONTARIO MINISTRY OF CULTURE MUST BE NOTIFIED IMMEDIATELY (416-314-7148). IN THE EVENT THAT HUMAN REMAINS ARE ENCOUNTERED DURING SOIL STRIPPING ACTIVITIES, BOTH THE ONTARIO MINISTRY OF CULTURE, AND THE REGISTRAR OR DEPUTY REGISTRAR OF THE CEMETERIES REGULATION UNIT OF THE MINISTRY OF CONSUMER AND COMMERCIAL RELATIONS (416-326-8392), SHOULD BE NOTIFIED IMMEDIATELY AS WELL AS THE LOCAL POLICE.
4. ALL TEMPORARY TRAFFIC CONTROL AND SIGNAGE DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH CURRENT ONTARIO TRAFFIC MANUAL – BOOK 7 – TEMPORARY CONDITIONS (LATEST EDITION).
5. THE CONTRACTOR SHALL RECTIFY ANY DISTURBED AREAS TO ITS ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE GOVERNING AUTHORITIES.
6. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL DRAWINGS, REPORTS AND SPECIFICATIONS THAT RELATE TO THIS PROJECT.
7. FOR LEGAL SURVEY AND TOPOGRAPHIC INFORMATION REFER TO PLAN PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. – DATED APRIL 9, 2019.
8. ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION.
9. THE CONTRACTOR IS TO REPORT ALL DISCOVERIES OF ERRORS, OMISSIONS OR DISCREPANCIES TO THE ENGINEER AS APPLICABLE. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO: 1) CONFIRM UTILITY LOCATIONS, AND 2) NOTIFY THE ENGINEER OF POSSIBLE CONFLICTS, PRIOR TO CONSTRUCTION, WILL BE TO THE CONTRACTOR'S PERIL AND EXPENSE.
10. THE CONTRACTOR SHALL CONFIRM THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE SITE AND ADJACENT WORK AREAS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES TO THE SATISFACTION OF THE GOVERNING AUTHORITY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OR REPLACEMENT OF ANY SERVICES OR UTILITIES DISTURBED DURING CONSTRUCTION, TO THE SATISFACTION OF THE GOVERNING AUTHORITY.
11. ALL DIMENSIONS ARE IN METRES UNLESS SPECIFIED OTHERWISE.
12. THERE WILL BE NO SUBSTITUTION OF MATERIALS OR SPECIFIED PRODUCTS UNLESS PRIOR WRITTEN APPROVAL IS RECEIVED FROM THE ENGINEER.
13. ALL CONSTRUCTION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE RECOMMENDATIONS MADE IN THE LATEST GEOTECHNICAL REPORT, SITE SERVICING REPORT AS WELL AS THE STORMWATER MANAGEMENT REPORT FOR THIS SITE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN THE LATEST COPIES OF SAID REPORTS.
14. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING, AND BEARING THE COSTS OF, ALL REQUIRED PERMITS, UNLESS SPECIFIED OTHERWISE.
15. ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR. THE CONTRACTOR MUST OBTAIN APPROVAL FROM THE CONTRACT ADMINISTRATOR AND/OR THE MUNICIPALITY PRIOR TO ANY TREE CUTTING / REMOVAL.
16. THE CONTRACTOR SHALL PROVIDE THE ENGINEER PERTINENT AS-BUILT MEASUREMENTS, NOTES AND MARK-UPS TO ENABLE THE ENGINEER TO REVIEW AND PREPARE AS-BUILT GRADING AND SITE SERVICING PLANS.
17. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THAT THE SITE BENCHMARK(S) HAS NOT BEEN ALTERED OR DISTURBED AND THAT IT'S RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION DEPICTED ON THIS PLAN.
18. ANY EXISTING OR DISCOVERED WELLS OR MONITORING WELLS FOUND ON THE PROPERTY WILL NEED TO BE PROPERLY ABANDONED IN ACCORDANCE WITH O. REG. 903 AND ITS AMENDMENTS.

EROSION & SEDIMENT CONTROL NOTES:

1. CONTRACTOR TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES AS IDENTIFIED IN THE EROSION AND SEDIMENT CONTROL PLAN, AS PER OPSS 805, TO THE SATISFACTION OF THE GOVERNING AUTHORITY, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.).
2. DURING ALL PHASES OF THE SITE PREPARATION AND CONSTRUCTION, THE EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE MAINTAINED TO THE SATISFACTION OF THE ENGINEER AND GOVERNING AUTHORITY IN ACCORDANCE WITH THE BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL.
3. CONTRACTOR WILL MONITOR THE WATER CLARITY DOWNSTREAM OF THE WORK SITE THROUGHTOUT THE DAY AND DURING RAIN EVENTS. NO TURBID WATER IS PERMITTED TO LEAVE THE WORK AREA. CONTRACTOR WILL INSTALL ADDITIONAL MEASURES AS REQUIRED IN ORDER TO ENSURE AND PREVENT TRANSPORATION OF SEDIMENT DOWNSTREAM.
4. SHOULD ANY ADDITIONAL MEASURES BE REQUIRED TO ADDRESS FIELD CONDITIONS THEY SHALL BE INSTALLED AS DIRECTED BY THE ENGINEER OR THE GOVERNING AUTHORITY. MINIMUM MEASURES WILL CONSIST, WITHOUT BEING LIMITED TO, THE INSTALLATION OF FILTER CLOTHS ACROSS MANHOLE AND CATCHBASIN LIDS TO PREVENT SEDIMENT FROM ENTERING THE STRUCTURE, PLACEMENT OF RIP RAP TO REDUCE THE MOVEMENT OF LOOSE SOIL, AND THE INSTALLATION OF A LIGHT-DUTY SILT FENCE BARRIER (OPSD 219.110) AROUND ANY DISTURBED AREAS, AS REQUIRED. IT IS NOTED THAT HEAVY DUTY SILT FENCE BARRIER (OPSD 219.130) WILL BE REQUIRED BETWEEN ANY DISTURBED AREA (WITHIN 30M OF A WATERCOURSE) AND THE WATERCOURSE OR SENSITIVE NATURAL FEATURE. SEDIMENT FENCING WILL NOT BE REMOVED UNTIL THE TERRESTRIAL VEGETATION HAS BECOME RE-ESTABLISHED.
5. ANY STOCKPILES OF SOIL OR FILL MATERIAL SHALL BE STORED AT LEAST 30M FROM THE WATERCOURSE AND SHALL BE PROTECTED BY SILT FENCING.
6. ALL EQUIPMENT WORKING WITHIN 30M OF THE WATERCOURSE SHALL BE WELL MAINTAINED, CLEAN AND FREE OF LEAKS.

SPILL CONTROL NOTES:

1. NO CONSTRUCTION EQUIPMENT SHALL BE RE-FUELLED, MAINTAINED AND STORED WITHIN 30M OF WATERCOURSES, STREAMS, CREEKS, WOODLOTS AND ANY ENVIRONMENTALLY SENSITIVE AREAS OR AS OTHERWISE SPECIFIED.
2. THE CONTRACTOR MUST IMPLEMENT ALL NECESSARY MEASURES IN ORDER TO PREVENT LEAKS, DISCHARGES OR SPILLS OF POLLUTANTS, DELETERIOUS MATERIALS OR OTHER SUCH MATERIALS OR SUBSTANCES WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT.
3. EMERGENCY SPILL KITS SHALL BE LOCATED ON SITE. CONTRACTOR SHALL BE FULLY TRAINED ON THE USE OF CLEAN-UP MATERIALS IN ORDER TO MINIMIZE IMPACTS OF ANY ACCIDENTAL SPILLS.
4. THE WORK AREA SHALL BE CONTINUOUSLY MONITORED FOR LEAKAGE AND IN THE EVENT OF A LEAK, DISCHARGE OR SPILL OF A POLLUTANT, DELETERIOUS MATERIAL OR OTHER SUCH MATERIAL OR SUBSTANCE WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT, THE CONTRACTOR SHALL:
   - 4.1. IMMEDIATELY HALT THE ACTIVITY CAUSING THE LEAK, DISCHARGE OR SPILL.
   - 4.2. IMMEDIATELY NOTIFY THE APPROPRIATE GOVERNING AUTHORITIES OF THE INCIDENT IN ACCORDANCE WITH CURRENT BY-LAWS, PERMITS, APPROVALS, LEGISLATION, ETC. ANY SPILLS SHALL BE IMMEDIATELY REPORTED TO THE MOECC SPILLS ACTION CENTRE (1-800-268-6060).
   - 4.3. TAKE IMMEDIATE ACTION TO CONTAIN THE MATERIAL OR SUBSTANCE AND TO TAKE SUCH MEASURES TO MITIGATE ANY ADVERSE IMPACTS TO THE NATURAL ENVIRONMENT.
   - 4.4. RESTORE THE AFFECTED AREA TO THE ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITIES HAVING JURISDICTION.



KEY PLAN
N.T.S.

Wellington West Development

5m 2 0 5 10m
SCALE: 1:300

No.	REVISION	BY	MMM DD, YYYY
01	ISSUED FOR APPROVAL	W.B.	AUG 15, 2019
00	ISSUED FOR CLIENT REVIEW - 40% COMPLETION	Y.A.	JUN 21, 2019

LICENSED PROFESSIONAL ENGINEER
W. BALL
100192508
AUG 15, 2019
PROVINCE OF ONTARIO

North

CLIENT:
OTTAWA VALLEY WILD BIRD CARE CENTRE
KASTONE CONSTRUCTION MANAGEMENT

PROJECT:
WILD BIRD HOSPITAL / REHABILITATION CENTRE
8520 MCARTON ROAD
OTTAWA, ONTARIO

DRAWING TITLE:
EROSION AND SEDIMENT CONTROL PLAN
PAGE 2 OF 5

DRAWN BY: Y.A.
DESIGNED BY: Y.A.
CHECKED BY: W.B.
REV: 01

PROJECT No.: WW-190003
DRAWING No.: ES-1