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Geotechnical Investigation
Proposed Commercial Development
1508 Thomas Argue Road
Ottawa, Ontario

GEMTEC Project: 102638.002

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Submitted to:

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TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 BACKGROUND 1

2.1 Project Description 1
2.2 Site Geology 2
2.3 Previous Investigations 2

3.0 METHODOLOGY 2

4.0 SUBSURFACE CONDITIONS 3

4.1 General 3
4.2 Topsoil 3
4.3 Fill Material 3
4.4 Silty Clay 4
4.5 Glacial Till 6
4.6 Groundwater Levels 6
4.7 Chemistry Relating to Corrosion 7

5.0 GEOTECHNICAL GUIDELINES AND RECOMMENDATIONS 7

5.1 Site Grade Raise 7
5.2 Excavation 8
5.3 Groundwater Management 9
5.4 Office Structure 9
5.4.1 Foundation Design 9
5.4.2 Frost Protection 10
5.4.3 Backfill and Drainage 10

5.5 Mini Storage and Stacked Shipping Containers 11
5.5.1 Option 1 – Full Excavation and Replacement of Fill Material 11
5.5.2 Option 2 – Minimal Excavation and Replacement of Fill Material 12
5.5.3 Effects of Loading from Mini Storage and Stacked Shipping Containers 13

5.6 Seismic Site Class and Liquefaction Potential 13
5.7 Roadway Recommendations 13
5.7.1 Subgrade Preparation 14
5.7.2 Pavement Design 14
5.7.3 Effects of Subgrade Disturbance 15
5.7.4 Granular Material Placement 15
5.7.5 Pavement Drainage 15

5.8 Corrosion of Buried Concrete and Steel 15
5.9 Sensitive Marine Clay – Effects on Trees 16

6.0 ADDITIONAL CONSIDERATIONS 17
6.1 Effects of Construction Induced Vibration 17
6.2 Winter Construction 17
6.3 Excess Soil Management Plan 17
6.4 Abandonment of Monitoring Wells 17
7.0 CLOSURE 18

LIST OF TABLES

Table 4.1 – Summary of Grain Size Distribution Test (Weathered Crust) 4
Table 4.2 – Summary of Atterberg Limit Testing (Weathered Crust) 5
Table 4.3 – Summary of Atterberg Limit Testing (Silty Clay) 5
Table 4.4 – Summary of Grain Size Distribution Test (Glacial Till) 6
Table 4.5 – Summary of Groundwater Levels 6
Table 4.6 – Summary of Corrosion Testing 7
Table 5.1 – Preliminary Grade Raise 8

LIST OF FIGURES

Figure 1 – Site Plan

LIST OF APPENDICES

Appendix A Record of Borehole Logs
Appendix B Laboratory Test Results
Appendix C Chemical Analysis of Soil Sample

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1.0 INTRODUCTION

This report presents the results of a geotechnical investigation carried out by GEMTEC Consulting Engineers and Scientists (GEMTEC) for the proposed commercial development to be located at 1508 Thomas Argue Road in Ottawa, Ontario.

The purpose of the investigation was to identify the general subsurface and groundwater conditions at the site based on a limited number of boreholes and monitoring wells, and to provide engineering guidelines and recommendations on the geotechnical design aspects of the project, including construction considerations that could influence design decisions.

This report is subject to the Conditions and Limitations of This Report, which follows the text of the report and which are considered an integral part of the report.

2.0 BACKGROUND

2.1 Project Description

Plans are being prepared for a proposed commercial development to be located at 1508 Thomas Argue Road in Ottawa, Ontario. The site is located on the east side of Thomas Argue Road north of the intersection of Wingover Private at 1508 Thomas Argue Road. The following is known about the site and project:

- The site is approximately rectangular in shape with plan dimensions of about 100 metres by 140 metres. Based on satellite imagery the site is currently undeveloped with a gravel roadway through the northern portion and two small buildings on the northeast perimeter of the site (which have been demolished at the time of preparing this report);
- Based on drawings prepared by Egis Group, the proposed development will consist of an office building, mini-storage area, as well as stacked shipping containers.
- It is understood that the office will be constructed using shipping containers, not more than one high, and supported with shallow foundations (i.e., no basement level).
- The mini-storage area will consist of shipping containers, stacked not more than one high placed directly on the ground surface (i.e. without foundations). These will remain in place once installed.
- Additional storage will be located around the site with shipping containers placed directly on the ground surface (i.e. without foundations) and stacked up to 3 containers high. These are considered to be temporary, i.e. may be moved in the future;
- Gravel surfaced driving lanes and parking spaces will be constructed at the site.

Based on discussions with BigSteelBox, the shipping containers for the mini storage will have plan dimensions of about 2.4 by 6.0 metres, with a weight of about 2,270 kilograms, and a storage capacity of about 4,530 kilograms i.e., a total 6,800 kilograms each.

2.2 Site Geology

Published geology maps indicate the subsurface conditions at the site are composed of thick deposits of silty clay. Bedrock geology maps indicate the bedrock beneath these soils consists of limestone and shale of the Verulam Formation. Drift thickness mapping indicates that the bedrock is expected at depths ranging from about 10 to 25 metres, sloping down to the southeast.

2.3 Previous Investigations

A previous hydrogeological investigation was carried out at the site, the results were provided in the following report:

- Report to West Capital Developments titled “Hydrogeological Investigation & Terrain Analysis, Proposed Lot Severance, Borden Lot, 1500 Thomas Argue Road, Carp, Ontario” dated June 15, 2023 (Report No. 100011.062).

As part of that investigation, four test pits and one test well were advanced at the site. The test pits generally encountered topsoil over grey brown to brown clayey silt with trace sand to depths of up to about 3.2 metres below the existing ground surface.

Additionally, GEMTEC has carried out a Phase One and Phase Two Environmental Site Assessment, which are provided under separate covers.

3.0 METHODOLOGY

The fieldwork for this investigation was carried out in in November 2023 and February 2024, as follows:

- 6 boreholes (numbered 23-01 to 23-06, inclusive) were advanced on November 20 and 21, 2023, using a track mounted hollow stem auger drill rig supplied and operated by CCC Group of Ottawa, Ontario.
- 13 boreholes (numbered 24-101 to 24-113, inclusive) were advanced on February 27, 2024, using a rubber track mounted Geoprobe drill rig supplied and operated by Strata Drilling Group of Ottawa, Ontario.

Boreholes 23-01, 14-101 and 24-102 were advanced for the proposed geotechnical investigation, and boreholes 23-02 to 23-06, and 24-102 to 24-113, inclusive, were advanced as part of the environmental investigation. The boreholes were advanced to depths ranging from about 1.0 to 15.9 metres below the existing ground surface.

Standard penetration tests were carried out in boreholes 23-01 to 23-03 and samples of the soils encountered were recovered using a 50-millimetre diameter split spoon sampler. In situ vane shear testing was carried out in borehole 23-01, where possible, to measure the undrained shear

strength of the silty clay. In boreholes 24-101 to 24-113, samples of the soils encountered were recovered using drive open sampling equipment.

A well screen was installed in the overburden in each of boreholes 23-01, 23-02, and 23-03 to measure the groundwater level. The groundwater levels were measured on November 21 and December 5, 2023, and on February 27, 2024.

The fieldwork was supervised throughout by a member of our engineering staff who directed the drilling operations, logged the borehole samples and carried out the in-situ testing. Following the fieldwork, the soil samples were returned to our laboratory for examination by a geotechnical engineer. Selected samples of soil were tested for water content, Atterberg Limit, grain size distribution, and shrinkage limit testing.

One sample of the soil from the borehole was sent to an accredited laboratory for basic chemical testing relating to corrosion of buried concrete and steel.

The borehole locations were positioned in the field and subsequently surveyed by GEMTEC personnel using high precision GPS surveying equipment. The elevations are referenced to geodetic datum.

4.0 SUBSURFACE CONDITIONS

4.1 General

Descriptions of the subsurface conditions logged in the boreholes are provided on the Record of Borehole Sheets in Appendix A. The results of the laboratory classification testing are provided on the Record of Borehole Sheets and in Appendix B. The results of the chemical analysis are provided in Appendix C. The borehole locations are shown on Figure 1 following the text of this report.

The following sections provide a description of the subsurface conditions encountered in the boreholes advanced as part of this investigation.

4.2 Topsoil

A layer of topsoil was encountered at the ground surface at the borehole locations with thicknesses ranging from about 50 to 60 millimetres.

4.3 Fill Material

Layers of fill material were encountered below the topsoil in the boreholes. The fill material is variable in composition but generally consists of silty sand, with varying amounts of clay to sandy silt with trace clay, to silty clay. The fill material also contains rootles.

The fill material, where fully penetrated, extends to depths ranging from about 0.6 to 1.5 metres below the existing ground surface. However, in borehole 23-05 and 24-108, the fill material was not fully penetrated, but was proven to depths of about 1.8 and 1.0 metres below the existing ground surface, respectively. The fill material may extend below these depths.

Practical auger and casing refusal was encountered within the fill material at a depth of about 1.8 and 1.0 metres below the existing ground surface in boreholes 23-05 and 24-108, respectively. The refusal likely represents cobbles and/or boulders within the fill material, or obstructions from the previous buildings on site or other hard material.

4.4 Silty Clay

Native deposits of silty clay were encountered below the topsoil and fill material in all of the boreholes with the exception of 23-05 and 24-108 (where shallow refusal occurred). Where fully penetrated in borehole 23-01 the silty clay extends to a depth of about 15.2 metres below the existing ground surface.

The upper portion of the silty clay deposit has been weathered to a grey brown crust. In the borehole 23-01 the silty crust extends to a depth of about 3.1 metres below the existing ground surface. At boreholes 23-02 and 23-03 the weathered crust was inferred to depths of 2.4 to 3.1 metres. At the remaining boreholes the thickness of the weathered crust was not established.

Standard penetration tests carried out in the weathered crust gave N values ranging from weight of hammer to 3 blows per 0.3 metres of penetration, which reflect a firm to stiff relative density.

The results of one grain size distribution test carried out on one sample of the weathered silty clay crust are provided in Appendix B and summarized in Table 4.1.

Table 4.1 – Summary of Grain Size Distribution Test (Weathered Crust)

Borehole ID	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
23-01	2	1.5 to 2.1	0	11.1	73.3	15.6

The results of Atterberg Limit testing carried out on four samples of the weathered silty clay crust are provided on the Plasticity Charts in Appendix B and are summarized in Table 4.2, below. The calculated modified plasticity index values for each Atterberg Limit test are also provided in Table 4.2, below. The results of the Atterberg Limit testing indicates a silty clay of low plasticity. The measured water content of samples of the weathered silty clay crust range is about 24 to 40 percent. The modified plasticity index (PI_m) was also calculated for samples of the weathered

crust and unweathered silty clay using the following formula and the results of the Atterberg limits and grain size distribution testing described previously:

PI_m = PI x (% passing the 425 micrometre sieve / 100).

Table 4.2 – Summary of Atterberg Limit Testing (Weathered Crust)

Borehole ID	Sample Number	Sample Depth (metres)	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Modified Plasticity Index
23-01	3	2.3 to 2.9	34	26	15	11	11
24-101	1-3	0.7 to 0.9	29	29	19	10	10
24-102	2-1	1.5 to 2.1	34	30	18	12	12
24-110	2-1	1.5 to 2.1	31	28	18	10	10

Standard penetration test carried out in the grey silty clay below the weathered crust gave N values of weight of the hammer per 0.3 metres of penetration. The results of in situ vane testing gave undrained shear strengths ranging from about 40 to 72 kilopascals, which reflects a firm to stiff consistency.

The results of Atterberg Limit testing carried out on one sample of the unweathered silty clay are provided on the Plasticity Charts in Appendix B and are summarized in Table 4.3 below an indicates a silty clay of low plasticity. The measured water content of eight samples of the silty clay ranges from about 30 to 59 percent.

One sample of the silty clay was tested in our laboratory to determine the Shrinkage limits of the silty clay at the site. The testing was performed in general accordance with ASTM D4943 (which was discontinued in 2017 by the ASTM Sponsoring Committee responsible for the standard). The shrinkage limit was measured to be about 18 percent.

Table 4.3 – Summary of Atterberg Limit Testing (Silty Clay)

Borehole ID	Sample Number	Sample Depth (metres)	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index
23-01	06	6.10 – 6.70	40	30	17	13

4.5 Glacial Till

A native deposit of glacial till was encountered below the silty clay in borehole 23-01. The glacial till was not fully penetrated in the borehole but was proven to a depth of about 15.9 metres below the existing ground surface.

The glacial till is a heterogeneous mixture of all grain sizes, which at this site can be described as silty sand, with some gravel, some clay. Although not directly encountered in the borehole, the glacial till is known to contain cobbles and boulders.

One standard penetration test carried out in the glacial till gave an N value of 14 blows per 0.3 metres of penetration, which indicates a compact relative density.

The results of one grain size distribution test carried out on a sample of the glacial till are provided in Appendix B and summarized in Table 4.4. The measured water content of one sample of the glacial till is about 13 percent.

Table 4.4 – Summary of Grain Size Distribution Test (Glacial Till)

Borehole ID	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
23-01	12	15.2 to 15.9	20	45	21	14

4.6 Groundwater Levels

A monitoring well was installed in overburden in boreholes 23-01, 23-02, and 23-03 to measure the groundwater levels. The groundwater levels were measured in the monitoring wells on November 21 and December 5, 2023 and February 27, 2024, and are summarized in Table 4.5.

Table 4.5 – Summary of Groundwater Levels

Borehole ID	Groundwater Depth (metres)	Groundwater Elevation (metres)	Date of Reading
23-01	5.7	105.3	December 5, 2023
	-0.3	111.3	February 27, 2024
23-02	0.8	110.6	November 21, 2023
	0.5	110.9	February 27, 2024
23-03	0.7	110.5	November 21, 2023
	0.5	110.7	February 27, 2024

It should be noted that the negative groundwater level reading was measured above the existing ground surface in borehole 23-01 on February 27, 2024. The monitoring well was installed at the bottom of the silty clay deposit; however, the measured groundwater level may be influenced by the underlying glacial till.

The groundwater level may be higher during wet periods of the year such as the early spring or following periods of precipitation.

4.7 Chemistry Relating to Corrosion

One sample of soil obtained from borehole 23-01 was sent to Paracel Laboratories for basic chemical testing relating to corrosion of buried concrete and steel. The results are provided in Appendix C and are summarized in Table 4.6.

Table 4.6 – Summary of Corrosion Testing

Parameter	Borehole 23-01 Sample 2
Conductivity (µS/cm)	145
Resistivity (Ohm.m)	69.0
pH	7.28
Chloride Content (µg/g)	<10
Sulphate Content (µg/g)	31

5.0 GEOTECHNICAL GUIDELINES AND RECOMMENDATIONS

5.1 Site Grade Raise

The site is underlain by deposits of sensitive silty clay, which has a limited capacity to support loads imposed by grade raise fill material, foundations, and storage containers. The placement of fill material on this site must therefore be carefully planned and controlled so that the stress imposed by the fill material does not result in excessive consolidation of the silty clay deposit. Concrete slabs, granular base materials, overall grade raise and pavement structures are considered grade raise filling. Groundwater lowering also results in a stress increase on the underlying sensitive silty clay deposit.

According to the Preliminary Grading Figure, prepared by Egis Group (Project No. CCO-24-2505, drawing No. C101) the preliminary grades at the site have been summarized as presented Table 5.1 below.

Table 5.1 – Preliminary Grade Raise

Assessment Area	Maximum Preliminary Grade Raise (metres)
Office and Mini Storage	1.3
Mini Storage	1.5
Areas with stacked storage containers	1.0

For design purposes, we have made the following assumptions:

- The groundwater lowering due to the development at this site will be at most 0.5 metres below the underside of footing level;
- The unit weight of the grade raise material used at the site will not be greater than 22.0 kilonewtons per cubic metre; and,
- The grade raise fill material used below the structures, where required, will be composed of compacted granular material having a compacted unit weight of 22.0 kilonewtons per cubic metre.

The proposed grade raise is considered acceptable from a geotechnical point of view. If heavier grade raise fill material is used, or the maximum grade raise is increased, additional assessments may be required.

5.2 Excavation

Excavations will likely be carried out through the existing fill material and into the native weathered silty clay crust.

The sides of the excavations should be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Occupational Health and Safety Act.

According to the Act, the fill material present below the groundwater level can be classified as Type 4 soil, and an allowance should be made for excavation side slopes of 3 horizontal to 1 vertical, or flatter through these soils. Groundwater inflow from the sandy fill material could cause sloughing of the sides of the excavation and disturbance to the soils at the bottom of the excavation. The shallow native overburden deposits can be classified as Type 3 and, accordingly, allowance should be made for excavation side slopes of 1 horizontal to 1 vertical extending upwards from the base of the excavation. It should be noted that where more than one soil Type is encountered in an excavation the higher value applies to the trench excavation.

The silty clay deposit is sensitive to disturbance from ponded water, vibration and construction traffic. As such, care should be taken when excavating to avoid disturbance to the silty clay deposit, and it is suggested that final trimming to subgrade level be carried out using a hydraulic shovel equipped with a flat blade bucket. An allowance should be made to remove and replace any disturbed silty clay with compacted sand and gravel, such as that meeting Ontario Provincial Standards Specifications (OPSS) Granular A or Granular B Type II, where required.

5.3 Groundwater Management

Based on the results of the investigation, it is anticipated that the groundwater inflow into excavations could be handled by pumping from within the excavations. It is not expected that short term pumping during excavation will have a significant effect on nearby structures and services. Suitable detention and filtration will be required before discharging water. The contractor should be required to submit an excavation and groundwater management plan for review.

It is noted that the water level was measured at depths ranging from about 0.5 to 5.7 metres below the existing ground surface. One groundwater level measurement of about 0.5 metres above the ground surface was measured, however, this was recorded in a deep monitoring well, and may not be representative of the groundwater level in the shallow silty clay deposits. Depending on the depths of foundations and groundwater levels at the time of construction, an Environmental Activity and Sector Registry (EASR) in accordance with Environmental Protection Act Part II may be required.

5.4 Office Structure

5.4.1 Foundation Design

The fill material is not considered suitable for the support of the proposed office foundations. Therefore, any fill or deleterious material, if encountered, should be removed from the proposed office footprint.

Based on the subsurface conditions which were encountered during the investigation, it is considered that the office could be founded on shallow spread footings bearing on or within the native weathered silty clay crust.

For exterior strip footings founded on or within native, undisturbed deposits of weathered silty clay crust, or on a pad of compacted engineered fill above native, undisturbed soil should be sized using a geotechnical reaction at Serviceability Limit State (SLS) of 75 kilopascals and a factored geotechnical resistance at Ultimate Limit State (ULS) of 150 kilopascals.

In areas where the underside of footing level is above the level of the native soil or where subexcavation of soil is required, the grade below the proposed office could be raised as discussed in Section 5.1, above.

Provided that the subgrade surface and engineered fill are prepared as described in this report, the post construction total and differential settlement of the footings at SLS should be less than 25 and 15 millimetres, respectively.

5.4.2 Frost Protection

For the proposed office supported on shallow spread footings all exterior footings, adjacent to heated areas should be provided with at least 1.5 metres of earth cover for frost protection purposes. Isolated, unheated exterior footings should be provided with at least 1.8 metres of earth cover for frost protection purposes.

The required depth of frost protection can be reduced by the thickness of any engineered fill beneath the foundations. Alternatively, the required frost protection could be provided by means of a combination of earth cover and extruded polystyrene insulation. Further details regarding the insulation of foundations could be provided, if necessary.

5.4.3 Backfill and Drainage

The native deposits at this site are frost susceptible and should not be used as backfill against foundations for the proposed office. To avoid frost adhesion and possible heaving, the foundations should be backfilled with imported, free-draining, non-frost susceptible granular material such as that meeting the requirements of OPSS Granular A, or Granular B Type I or II.

Where the backfill will ultimately support areas of hard surfacing (i.e., pavement, sidewalks, or other similar surfaces), the backfill should be placed in maximum 200 millimetre thick lifts and should be compacted to at least 95 percent of the material's standard Proctor maximum dry density value using suitable vibratory compaction equipment. Light walk behind compaction equipment should be used next to the foundation walls to avoid excessive compaction induced stress on the foundation walls.

Where areas of hard surfacing (i.e., pavement, sidewalks, or other similar surfaces) abut the proposed office, a gradual transition should be provided between those areas of hard surfacing underlain by non-frost susceptible granular wall backfill and those areas underlain by existing frost susceptible fill material to reduce the effects of differential frost heaving. It is suggested that granular frost tapers be constructed from 1.5 metres below finished grade to the underside of the granular subbase material for the hard surfaced areas. The frost tapers should be sloped at 1 horizontal to 1 vertical, or flatter. Further, we recommend that downspouts outlet in such a way as to prevent saturation of soils below hard surfaced areas.

Perimeter foundation drainage is not considered necessary for the proposed office provided that the floor level is above the finished exterior ground surface level.

5.5 Mini Storage and Stacked Shipping Containers

The ground investigation has identified several geohazards which may impact the future performance of the mini storage and stacked shipping containers. These include the following:

- The presence of uncontrolled fill material below a surficial topsoil layer,
- The presence of frost susceptible soils within the anticipated depth of frost penetration,
- The presence of marine deposited soils (silty clay) which have potential for large settlement if loaded excessively.

Of these geohazards, the risks presented by the first two can be managed by excavation and replacement of the problematic or hazardous soils, or in the case of frost actions by the use of insulation. A number of construction options can be considered for the mini storage and stacked shipping containers which would address these two geohazards to a greater or lesser extent. Two possible options are provided in this report for the consideration of BigSteelBox Corporation. These are listed below and discussed in greater detail Sections 5.5.1 and 5.5.2 of this report.

- Option 1 – Full excavation and replacement of problematic soils
- Option 2 – Minimal excavation and replacement of problematic soils in combination with some relevelling of the storage units and containers (which may need to be repeated several times during the operation of the facility).

Option 1 takes the most robust approach to actively mitigating the potential risks of future settlement and ground movement of the containers but is likely to be most costly. The choice of which option is the most suitable one should be taken by BigSteelBox Corporation, based on a comprehensive assessment of important factors including costs, construction schedule, and any other stakeholder considerations which may be of importance.

The risk presented by the last of the geohazards identified above can be addressed through management of the applied loading at surface (i.e. bearing pressures and configuration of the structure). This is discussed in more detail in Section 5.5.3 of this report.

5.5.1 Option 1 – Full Excavation and Replacement of Fill Material

Option 1 includes the removal of all fill and topsoil layers and any otherwise deleterious material from the footprint of the proposed mini storage and stacked shipping containers and replacement with suitable granular material, i.e. engineered fill material.

The engineered fill should consist of granular material meeting OPSS requirements for Granular B Type II and should be compacted in maximum 300 millimetre thick lifts to at least 98 percent of the material's standard Proctor maximum dry density using suitably sized vibratory compaction equipment. To provide adequate spread of load beneath the shipping containers, the engineered fill should extend horizontally at least 0.3 metres beyond the edge of the foundations/shipping

containers and then down and out from this point at 1 horizontal to 1 vertical, or flatter. The containers for the mini storage and stacked containers could then be supported on a granular base consisting of at least 150 millimetres of OPSS Granular A.

All granular material should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the material's standard Proctor maximum dry density, using suitably sized, vibratory compaction equipment. The use of non-vibratory compaction initially may be required to avoid disturbance to the subgrade surface in wet conditions.

Based on plans provided, the proposed stacked shipping containers will be partially or fully located within the footprint of the demolished buildings on site. Refusal was encountered in boreholes 23-05 and 24-108, at depths of about 1.8 and 1.0 metres below the existing ground surface, respectively. The fill material surrounding the demolished building likely contains material associated with the construction of the demolished buildings and should be expected to a depth of up to about 2.0 metres below ground surface at the time the structures were in place (which is typical of foundation depths).

In the area of the mini storage and the stacked shipping containers, the native overburden soils at the site are considered frost susceptible. Thermal protection of the soils below the containers is required in areas that will remain unheated during the winter period to avoid ground movement associated with freezing temperatures. An insulation detail can be provided if requested (this would not be required if the depth of non-frost susceptible material below the containers was greater than about 1.8 metres).

5.5.2 Option 2 – Minimal Excavation and Replacement of Fill Material

Option 2 includes the minimal excavation and replacement of problematic soils in combination with some relevelling of the containers at future dates.

The excavation for this option will consist of removal of the surficial topsoil. The exposed subgrade surface should be proof rolled under dry conditions using an 8 tonne smooth drum roller using vibratory compaction means under the inspection of a geotechnical specialist. Any soft areas that are evident from the proof rolling should be sub-excavated and replaced with compacted engineered fill or earth borrow material that is frost compatible with the existing materials that are exposed around the area of sub-excavation. Compaction of the underlying soils to normally acceptable levels (i.e. 95 percent of maximum dry density of the fill material) is unlikely to be achieved.

The containers for the mini storage and stacked containers could then be supported on a granular base made up of a minimum of 300 millimetres of OPSS Granular A material. Any additional fill material required should also be made up with imported OPSS Granular B Type II. A combined geogrid and geotextile such as Terrafix Combigrid or equivalent should be placed within the base as an additional measure to reduce the potential for differential settlement. All seams in the

material should overlap by at least 0.3 metres, or the minimum required by the geotextile fabricators.

The mini storage and sacked containers will remain susceptible to continuing settlements associated with the condition of the existing fill material, and movements associated with freezing temperatures. The potential for continuing settlements arising from the fill material could be reduced by increasing the depth of excavation of the fill material. To provide thermal protection a layer of DOW SM or equivalent insulations could be placed over the subgrade surface between the exposed subgrade and new granular pad. The insulation should extend outwards from the edge of the pad a minimum of 0.3 metres, but the final projection should be confirmed according to the excavation depths. An insulation detail can be provided if requested.

5.5.3 Effects of Loading from Mini Storage and Stacked Shipping Containers

Based on the fully loaded weight of the containers and dimensions it is assumed that an additional loading of no more than about 25 kilopascals will be applied where the storage containers are placed on ground surface and stacked to a maximum height of 3 containers. This loading is in addition to the proposed grade raise fill as described in Section 5.1, above. The loading is considered acceptable from a geotechnical perspective and there is not expected to be any significant settlement of the shipping containers after placement on the ground surface as a result of the surficial loading provided the anticipated 25 kilopascals is not exceeded. The actual loading should be reviewed by a structural engineer to accurately determine the loading. Should the assumed 25 kilopascals be exceeded, GEMTEC should be notified to reassess if additional measures are required.

Please note that ground movement from the surficial loading are in addition to any loading from compression of the existing fill material, and any movements associated with frost/freezing temperatures.

5.6 Seismic Site Class and Liquefaction Potential

Based on Table 4.1.8.4.A. of the 2012 Ontario Building Code, the seismic site class can be determined based on the Average Standard Penetration Resistance or the Soil Undrained Shear Strength. Based on the results of the standard penetration carried out as part of this investigation, it is recommended that seismic Site Class D be used for the design of structures in the industrial development.

There is no potential for liquefaction of the overburden deposits at this site.

5.7 Roadway Recommendations

The details of the proposed roadways and parking areas at the site were not known by GEMTEC at the time of preparing this report. However, it is understood that the site will be fully surfaced

with gravel roadways and parking areas. The guidelines are therefore considered preliminary and to be confirmed as the design progresses.

5.7.1 Subgrade Preparation

In preparation for construction of access roadways and parking areas, any soft, wet, or deleterious material should be removed from the subgrade surface.

Fill material is likely to be encountered in the roadway areas, with portions of which may have been placed over soils which are compressible or prone to long term settlement. It may not be necessary to remove all the fill material from within the pavement areas provided that some future settlement of the surface can be tolerated. It is, however, suggested that any exposed fill material which contains an abundance of organic material or otherwise deleterious material be subexcavated and replaced with suitable earth borrow. Prior to placing granular fill for the pavement area, the exposed subgrade should be heavily proof rolled with a large (10 tonne) vibratory steel drum roller under dry conditions. Any soft areas evident from the proof rolling should be subexcavated and replaced with suitable, compacted earth borrow.

If needed, the grade below the pavement areas could then be raised with compacted granular material such as that meeting OPSS specifications for OPSS Select Subgrade Material (SSM), Granular B Type I or Type II. Grade raise fill material placed below the roadway should be placed in maximum 300 millimetre thick lifts and compacted to at least 95 percent of the material's standard Proctor maximum dry density value using suitable vibratory compaction equipment.

In areas where abrupt changes in the frost susceptibility of the subgrade materials are encountered, frost tapers and/or some subexcavation of materials may be required to avoid future localized differential frost heaving of the pavement structure. The frost taper and subexcavation requirements should be assessed at the time of construction by geotechnical personnel.

The pavement area subgrade surface should be made smooth and crowned or sloped prior to placing the granular materials to promote drainage of the base and subbase materials.

5.7.2 Pavement Design

A preliminary granular pavement structure for light traffic and parking areas is provided as follows:

- 150 millimetres of OPSS Granular A, over
- 400 millimetres of OPSS Granular B Type II.

A preliminary granular pavement structure for heavy truck traffic is provided as follows:

- 300 millimetres of OPSS Granular A; over
- 500 millimetres of OPSS Granular B Type II.

The details of the proposed roadways were not available to GEMTEC at the time of this report and the provided pavement structure should be re-evaluated as the design progresses.

The granular pavement structure will require periodic maintenance to regrade the surface. An OPSS Granular M may be used instead of a Granular A surfacing material to reduce the frequency of required maintenance and minimize dust clouds caused by passing vehicles.

5.7.3 Effects of Subgrade Disturbance

If the roadway subgrade surface becomes disturbed or wetted due to construction operations or precipitation, or the granular pavement materials are to be used by construction traffic, the Granular B Type II thicknesses provided above may not be adequate and it may need to be increased. The contractor should be responsible for providing suitable access for construction equipment.

The required thickness of the subbase materials will depend on a number of factors, including contractor workmanship and schedule, contractor methodology, soil types and weather conditions, and should be assessed by geotechnical personnel at the time of construction. In our opinion, the preferred approach from a geotechnical point of view is to:

- Proof roll the subgrade conditions at the time of construction under the supervision of experienced geotechnical personnel; and,
- Adjust the thickness of the subbase material and /or include a woven geotextile separator, as required. Unit rate allowances should be made in the contract for subexcavation and replacement with OPSS Granular B Type I.

5.7.4 Granular Material Placement

All imported granular materials should be placed in maximum 200 millimetre thick lifts and should be compacted to at least 99 percent of the material's standard Proctor maximum dry density value using suitable vibratory compaction equipment.

5.7.5 Pavement Drainage

Adequate drainage of the pavement granular materials and subgrade is important for the long-term performance of the pavement at this site.

We recommend that swales or ditches be implemented to promote drainage around the gravel surfaced areas. The granular base and subbase materials should be crowned and extend horizontally to the ditches or swales.

5.8 Corrosion of Buried Concrete and Steel

The measured sulphate concentration in the sample of the weathered silty clay crust recovered from borehole 23-01 was 31 micrograms per gram. According to the Canadian Standards

Association “Concrete Materials and Methods of Concrete Construction” (CSA A23.1:19 Table 3), the degree of sulphate exposure stemming from the soils is negligible (less than 0.10 percent). Therefore, any concrete in contact with the soil at this site could be batched with General Use (GU) cement. However, the effects of freeze thaw in the presence of de-icing chemicals (sodium chloride) use on the roadway should be considered in selecting the air entrainment and the concrete mix proportions for any concrete.

Based on the resistivity and pH of the tested soil samples, the weathered silty clay crust can be classified as nonaggressive towards unprotected steel. The manufacturer of any buried steel elements that will be in contact with the soil and groundwater should be consulted to ensure that the durability of the intended product is appropriate. It is noted that the corrosivity of the soil and groundwater could vary throughout the year due to the application of sodium chloride for de-icing.

5.9 Sensitive Marine Clay – Effects on Trees

The site is underlain by silty clay, a material which is known to be susceptible to shrinkage with a change/reduction in moisture content. Research by the Institute for Research in Construction (formerly the Division of Building Research) of the National Research Council of Canada has shown that trees can cause a reduction of moisture content in the silty clays in the Ottawa area, which can result in significant settlement/damage to nearby buildings supported on shallow foundations, or hard surfaced areas. Therefore, deciduous tree planting should be carried in accordance with the guidelines identified in the City of Ottawa document titled: “Tree Planting in Sensitive Marine Clay Soils – 2017 Guidelines”.

The City of Ottawa Tree Planting Guidelines indicates that sensitive marine clay soils with a modified plasticity index of less than 40 percent are considered to have a low/medium potential for soil volume change. Clay soils with a modified plasticity index that exceeds 40 percent are considered to have a high potential for soil volume change.

The modified plasticity index of three samples tested ranges from about 10 to 12 percent. As such, the potential for soil volume change, as defined by the City of Ottawa, is considered to be low/.

In accordance with the City of Ottawa Tree Planting Guidelines, tree planting restrictions apply where clay soils with low/medium potential for volume change are present between the underside of footing and a depth of 3.5 metres below finished grade (refer to the City of Ottawa document titled: “Tree Planting in Sensitive Marine Soils - 2017 Guidelines”), as is likely the case at this site.

Further information and recommendations on planting trees near foundations are provided in the City of Ottawa Tree Planting in Sensitive Marine Clay Soils – 2017 Guidelines.

6.0 ADDITIONAL CONSIDERATIONS

6.1 Effects of Construction Induced Vibration

Some of the construction operations (such as granular material compaction, excavation, etc.) will cause ground vibration on and off the site. The vibrations will attenuate with distance from the source but may be felt at nearby structures. Assuming that any excavating is carried out in accordance with the guidelines in this report, the magnitude of the vibrations will be much less than that required to cause damage to the nearby structures or services in good condition. Precondition surveys of the adjacent structures should be considered.

6.2 Winter Construction

Most of the soils at this site are highly frost susceptible and prone to significant ice lensing. In order to carry out the work during freezing temperatures, the excavation should be opened for as short a time as practicable and the excavations should be carried out only in lengths that allow all of the construction operations, including backfilling, to be fully completed in one working day. The materials on the sides of the trenches should not be allowed to freeze. In addition, the backfill should be excavated, stored, and replaced without being disturbed by frost or contaminated by snow or ice.

6.3 Excess Soil Management Plan

This report does not constitute an excess soil management plan. The disposal requirements for excess soil from the site have not been assessed. Consultation on this matter can be provided upon request.

6.4 Abandonment of Monitoring Wells

All monitoring wells installed as part of this investigation should be decommissioned by a licensed well technician in accordance with Ontario Regulation 903, as amended by Ontario Regulation 128/03. The well abandonment could be carried out in advance of or during construction.

7.0 CLOSURE

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.



For: Alex Meacoe, P.Eng.
Senior Geotechnical Engineer

Daire Cummins, M.Sc.

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GEOTECHNICAL REPORT CONDITIONS & LIMITATIONS

STANDARD OF CARE: GEMTEC has prepared this report in a manner consistent with generally accepted engineering or environmental consulting practice in the jurisdiction in which the services are provided at the time of the report. No other warranty, expressed or implied is made.

COPYRIGHT: The contents of this report are subject to copyright owned by GEMTEC, save to the extent that copyright has been legally assigned by us to another party or is used by GEMTEC under license. To the extent that GEMTEC owns the copyright in this report, it may not be copied without our prior written agreement for any purpose other than the purpose indicated in this report. The methodology (if any) contained in this report is provided to the Client in confidence and must not be disclosed or copied to third parties without the prior written agreement of GEMTEC. Disclosure of that information may constitute an actionable breach of confidence or may otherwise prejudice our commercial interests.

COMPLETE REPORT: This report is of a summary nature and is not intended to stand alone without reference to the instructions given to GEMTEC by the Client, communications between GEMTEC and the Client and to any other reports prepared by GEMTEC for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. GEMTEC can not be responsible for use of portions of the report without reference to the entire report.

BASIS OF REPORT: This Report has been prepared for the specific site, development, design objectives and purposes that were described to GEMTEC by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document, subject to the limitations provided herein, are only valid to the extent that this report expressly addresses the proposed development, design objectives and purposes. Any change of site conditions, purpose or development plans may alter the validity of the report and GEMTEC cannot be responsible for use of this report, or portions thereof, unless GEMTEC is requested to review any changes and, if necessary, revise the report.

TIME DEPENDENCE: If the proposed project is not undertaken by the Client within 18 months following the issuance of this report, or within the timeframe understood by GEMTEC to be contemplated by the Client, the guidance and recommendations within the report should not be considered valid unless reviewed and amended or validated by GEMTEC in writing.

USE OF THIS REPORT: The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without GEMTEC's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, GEMTEC may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

NO LEGAL REPRESENTATIONS: GEMTEC makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

DECREASE IN PROPERTY VALUE: GEMTEC shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.

RELIANCE ON PROVIDED INFORMATION: The evaluation and conclusions contained in this report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations. information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of misstatements, omissions, misrepresentations. or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

INVESTIGATION LIMITATIONS: Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions but even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions.

The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. Accordingly, GEMTEC does not warrant or guarantee the exactness of the subsurface descriptions.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination-or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

In addition, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

SAMPLE DISPOSAL: GEMTEC will dispose of all uncontaminated soil and/or rock samples 60 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

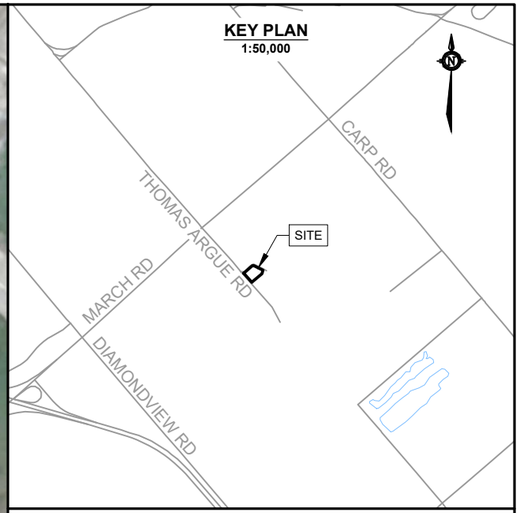
FOLLOW-UP AND CONSTRUCTION SERVICES: All details of the design were not known at the time of submission of GEMTEC's report. GEMTEC should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of GEMTEC's report.

During construction, GEMTEC should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of GEMTEC's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in GEMTEC's report. Adequate field review, observation and testing during construction are necessary for GEMTEC to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, GEMTEC's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

CHANGED CONDITIONS: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEMTEC be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that GEMTEC be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

DRAINAGE: Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. GEMTEC takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.





LEGEND

BH #	BOREHOLE ID
XX.XX	GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM
	BOREHOLE (current geotechnical investigation by GEMTEC)
	APPROXIMATE SITE BOUNDARY

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM ZONE 18N
2. Distances, elevations, and coordinates are shown in metres unless denoted otherwise.
2. All boundaries and dimensions are approximate and should not be taken as a substitute for a legal survey.
3. Contains information licensed under the Open Government Licence - Ontario.
4. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies.

SCALE

1:750

0 15 30 45m

DRAWING

SITE PLAN

CLIENT

BIGSTEELBOX CORPORATION

PROJECT

GEOTECHNICAL INVESTIGATION
1508 THOMAS ARGUE ROAD
CARP, ONTARIO

DRAWN BY	CHECKED BY
S.L.	W.A.M
PROJECT NO.	REVISION NO.
102638.002	0
DATE	FIGURE NO.
MAY 2024	FIGURE 1

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ottawa@gemtec.ca

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APPENDIX A

Record of Borehole Logs
List of Abbreviations and Symbols
Boreholes 23-01 to 23-06 and 24-101 to 24-113

ABBREVIATIONS AND TERMINOLOGY USED ON RECORDS OF BOREHOLES AND TEST PITS

SAMPLE TYPES	
AS	Auger sample
CA	Casing sample
CS	Chunk sample
BS	Borros piston sample
GS	Grab sample
MS	Manual sample
RC	Rock core
SS	Split spoon sampler
ST	Slotted tube
TO	Thin-walled open shelby tube
TP	Thin-walled piston shelby tube
WS	Wash sample

SOIL TESTS	
w	Water content
PL, w_p	Plastic limit
LL, w_L	Liquid limit
C	Consolidation (oedometer) test
D_R	Relative density
DS	Direct shear test
G_S	Specific gravity
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	Organic content test
UC	Unconfined compression test
γ	Unit weight

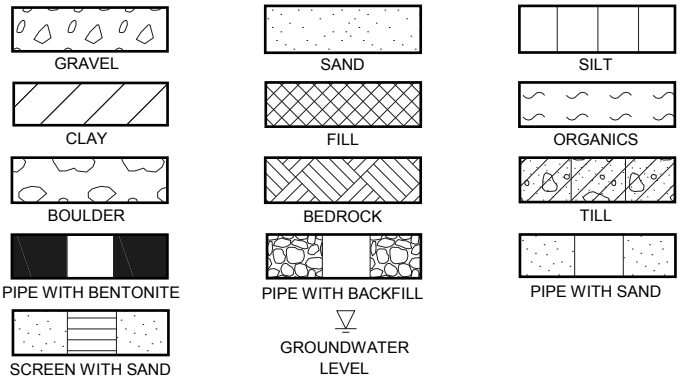
PENETRATION RESISTANCE

Standard Penetration Resistance, N
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 millimetres (30 in.) required to drive a 50 mm split spoon sampler for a distance of 300 mm (12 in.). For split spoon samples where less than 300 mm of penetration was achieved, the number of blows is reported over the sampler penetration in mm.

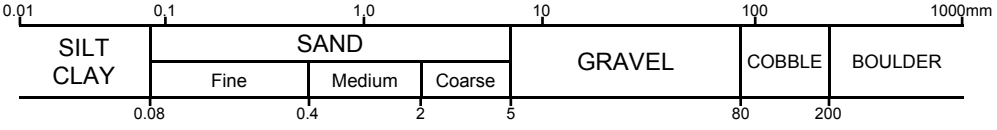
Dynamic Penetration Resistance
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive a 50 mm (2 in.) diameter 60° cone attached to 'A' size drill rods for a distance of 300 mm (12 in.).

WH	Sampler advanced by static weight of hammer and drill rods
WR	Sampler advanced by static weight of drill rods
PH	Sampler advanced by hydraulic pressure from drill rig
PM	Sampler advanced by manual pressure

COHESIONLESS SOIL Compactness		COHESIVE SOIL Consistency	
SPT N-Values	**Description**	**Cu, kPa**	**Description**
0-4	Very Loose	0-12	Very Soft
4-10	Loose	12-25	Soft
10-30	Compact	25-50	Firm
30-50	Dense	50-100	Stiff
>50	Very Dense	100-200	Very Stiff
		>200	Hard

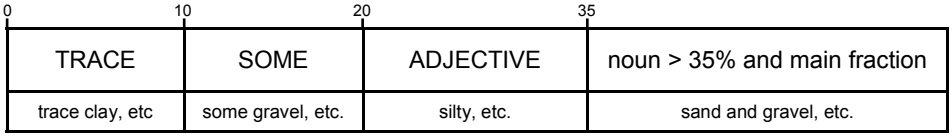


GRAIN SIZE



DESCRIPTIVE TERMINOLOGY

(Based on the CANFEM 4th Edition)



RECORD OF BOREHOLE 23-01

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 2
DATUM: CGVD28
BORING DATE: Nov 20 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		111.01						
0		TOPSOIL		0.06						Bentonite seal
		Brown silty sand, some clay (FILL MATERIAL)		110.25						
		Firm to stiff, grey brown SILTY CLAY, trace sand (WEATHERED CRUST)		0.76	1	SS	533	3		
1										
					2	SS	559	WH	MH	
2										
					3	SS	610	WH		
3				107.96						
		Firm, grey SILTY CLAY		3.05	4	SS	483	WH		
4										
					5	SS	610	WH		Soil cuttings
5	Power Auger									
	Hollow Stem Auger (210mm OD)									
6					6	SS	610	WH		
7										
					7	SS	610	WH		
8		Firm to stiff, grey SILTY CLAY		102.78 8.23						
9					8	SS	610	WH		
10				101.01						

SOIL PROFILE / SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, % — W_P W W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.W.
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 23-01

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 2 OF 2
DATUM: CGVD28
BORING DATE: Nov 20 2023

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10	Power Auger Hollow Stem Auger (210mm OD)	Firm to stiff, grey SILTY CLAY		10.00						Soil cuttings
11					9	SS	610	WH		
12					10	SS	610	WH		Bentonite seal
13										Filter sand
14					11	SS	610	WH		
15				95.77						Filter sand, 50 millimetre diameter well screen
		Compact, grey SILTY SAND, some gravel, some clay, with cobbles and boulders (GLACIAL TILL)		15.24	12	SS	254	14	MH	
16		End of Borehole		95.16 15.85						
17										
18										
19										
20										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
23/12/05	5.7	105.3
24/02/27	-0.3	111.3

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.W.
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 23-02

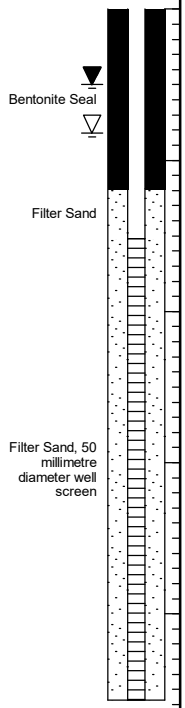
CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 21 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface		111.41					
		TOPSOIL		0.05					
		Dark brown silty sand, some clay, with rootlets (FILL MATERIAL)			1	SS		-	
				110.49	2	SS		-	
1		Grey brown SILTY CLAY, trace sand (WEATHERED CRUST)		0.92	3	SS		-	
2					4	SS		-	
					5	SS		-	
3				108.36					
		Probable grey SILTY CLAY		3.05					
4									
				106.84					
		End of Borehole		4.57					
5									
6									
7									
8									
9									
10									

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
23/11/21	0.8 ▽	110.6
24/02/27	0.5 ▼	110.9

GEMTEC
Consulting Engineers and Scientists

LOGGED: AW
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 23-03

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 21 2023

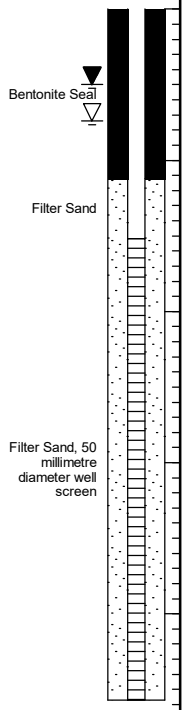
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		111.21				
0	Power Auger Hollow Stem Auger (210mm OD)	TOPSOIL		0.05				
		Dark brown silty sand, trace clay, with rootlets (FILL MATERIAL)		110.60	1	SS		-
		Grey brown SILTY CLAY (WEATHERED CRUST)		0.61	2	SS		-
1					3	SS		-
2					4	SS		-
		Grey SILTY CLAY		108.77 2.44	5	SS		-
3					6	GS		-
4					7	GS		-
		Probable grey SILTY CLAY		106.94 4.27				
		End of Borehole		106.64 4.57				
5								
6								
7								
8								
9								
10								

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
23/11/21	0.7 ▽	110.5
24/02/27	0.5 ▼	110.7

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LOGGED: AW
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 23-04

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 20 2023

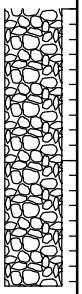
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface		111.11				
		TOPSOIL		0.05				
		Dark brown silty sand, trace clay, with rootlets (FILL MATERIAL)		110.50	1	SS		-
1		Grey brown SILTY CLAY (WEATHERED CRUST)		0.61	2	SS		-
					3	SS		-
2		End of Borehole		109.28 1.83				
3								
4								
5								
6								
7								
8								
9								
10								

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



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LOGGED: AW
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 23-05

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 20 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface		111.28							
		TOPSOIL		0.05							
		Brown silty sand, some clay (FILL MATERIAL)			1	SS		-			Backfilled with auger cuttings
1					2	SS		-			
				110.06							
		Brown sandy silt, trace clay (FILL MATERIAL)		1.22	3	SS		-			
				109.45							
2		End of Borehole Auger Refusal		1.83							
3											
4											
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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Consulting Engineers and Scientists

LOGGED: AW
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 23-06

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Nov 20 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface		111.43							
		TOPSOIL		0.05							
		Dark brown silty sand, trace clay (FILL MATERIAL)			1	SS		-			Backfilled with auger cuttings
1					2	SS		-			
		Brown SILTY CLAY, some sand (WEATHERED CRUST)		110.21 1.22	3	SS		-			
		End of Borehole		109.60 1.83							
2											
3											
4											
5											
6											
7											
8											
9											
10											

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Consulting Engineers and Scientists

LOGGED: AW
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 24-101

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA NATURAL REMOULDED / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Direct Push Casing (57mm OD)	Ground Surface		111.19							
		TOPSOIL		0.06							
		Dark brown silty sand, with rootlets (FILL MATERIAL)		110.86							
		Grey brown silty clay (FILL MATERIAL)		0.33							
		Grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		110.58							
1				0.61	1	D.O	965	-			
2					2	D.O	1320	-			Bentonite seal
3		End of Borehole		108.14 3.05							
4											
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

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Consulting Engineers and Scientists

LOGGED: CC
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 24-102

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Direct Push Casing (57mm OD)	Ground Surface		111.27							
		TOPSOIL		0.06							
		Dark brown silty sand, with rootlets (FILL MATERIAL)		110.71							
1		Grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		0.56	1	D.O	815	-			Bentonite seal
2					2	D.O	1475	-			
3		End of Borehole		108.22 3.05							
4											
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

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Consulting Engineers and Scientists

LOGGED: CC
CHECKED: W.A.M

RECORD OF BOREHOLE 24-103

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, mm	SAMPLES BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Direct Push Casing (57mm OD)	Ground Surface		111.57						
		TOPSOIL		0.06						
		Dark brown silty sand, trace clay, with rootlets (FILL MATERIAL)			1	D.O	1270	-		
1				110.66						
		Grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		0.91						Bentonite seal
2					2	D.O	1520	-		
3				108.52						
		End of Borehole		3.05						
4										
5										
6										
7										
8										
9										
10										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

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LOGGED: CC
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 24-104

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Direct Push Casing (57mm OD)	Ground Surface		111.60							
		TOPSOIL		0.06							
		Dark brown silty sand, trace to some gravel, with rootlets (FILL MATERIAL)		110.84	1	D.O	1020	-			
1		Grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		0.76							
2					2	D.O	1520	-			Bentonite seal
3		End of Borehole		108.55 3.05							
4											
5											
6											
7											
8											
9											
10											

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Consulting Engineers and Scientists

LOGGED: CC
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 24-105

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Direct Push Casing (57mm OD)	Ground Surface		111.57							
		TOPSOIL		0.06							
		Dark brown silty sand, with rootlets (FILL MATERIAL)			1	D.O	1520	-			
1				110.63							
		Grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		0.94							
2					2	D.O	1520	-			
3				108.52							
		End of Borehole		3.05							
4											
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

Bentonite seal

GEMTEC
Consulting Engineers and Scientists

LOGGED: CC
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 24-106

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		111.39							
		TOPSOIL		0.06							
		Dark brown silty sand, with rootlets (FILL MATERIAL)		110.68							
1	Direct Push Casing (57mm OD)	Grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		0.71	1	D.O	1170	-			
2					2	D.O	1520	-			Bentonite seal
3				108.34							
		End of Borehole		3.05							
4											
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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Consulting Engineers and Scientists

LOGGED: CC
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 24-107

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, mm	SAMPLES BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		111.32							
		TOPSOIL		0.06							
		Dark brown silty sand, with rootlets (FILL MATERIAL)			1	D.O	1270	-			
1	Direct Push Casing (57mm OD)	Grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		110.41 0.91							
		Probable grey brown SILTY CLAY (WEATHERED CRUST)		109.80 1.52	2	D.O	0	-			Bentonite seal
2											
3		End of Borehole		108.27 3.05							
4											
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

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LOGGED: CC
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 24-108

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		111.35							
0	Direct Push Casing (57mm OD)	TOPSOIL Dark brown silty sand, trace clay (FILL MATERIAL)		0.06	1	D.O	760	-			Bentonite seal
				110.33							
1		End of Borehole Casing Refusal		1.02							
2											
3											
4											
5											
6											
7											
8											
9											
10											

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Consulting Engineers and Scientists

LOGGED: CC
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 24-109

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, mm	SAMPLES BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		111.34							
0	Direct Push Casing (57mm OD)	TOPSOIL		0.06							
		Dark brown silty sand, with rootlets (FILL MATERIAL)		110.68							
1		Grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		0.66	1	D.O	875	-			Bentonite seal
2					2	D.O	1520	-			
3		End of Borehole		108.29 3.05							
4											
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: CC
CHECKED: W.A.M

RECORD OF BOREHOLE 24-110

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, mm	SAMPLES BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Direct Push Casing (57mm OD)	Ground Surface		111.35							
		TOPSOIL		0.06							
		Dark brown silty sand, some clay, with rootlets (FILL MATERIAL)		110.74							
1		Grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		0.61	1	D.O	1520	-			Bentonite seal
2					2	D.O	1520	-			
3		End of Borehole		108.30 3.05							
4											
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, % W_P W W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: CC
CHECKED: W.A.M

RECORD OF BOREHOLE 24-111

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, mm	SAMPLES: BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Direct Push, Casing (57mm OD)	Ground Surface		111.35						
		TOPSOIL		0.06						
		Dark brown silty sand, with rootlets (FILL MATERIAL)			1	D.O	1520	-		
1				110.44						
		Grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		0.91						
2					2	D.O	1270	-		
3				108.30						
		End of Borehole		3.05						
4										
5										
6										
7										
8										
9										
10										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

Bentonite seal

GEMTEC
Consulting Engineers and Scientists

LOGGED: CC
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 24-112

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		111.36							
		TOPSOIL		0.06							
		Dark brown silty sand, trace to some clay, with rootlets (FILL MATERIAL)		110.75							
1	Direct Push Casing (57mm OD)	Grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		0.61	1	D.O	1170	-			Bentonite seal
2					2	D.O	1520	-			
3				108.31							
		End of Borehole		3.05							
4											
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

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LOGGED: CC
CHECKED: W.A.M

GEO - BOREHOLE LOG 102638.002_BH LOGS_2024-03-01_GEO.GPJ GEMTEC 2018.GDT 5/29/24

RECORD OF BOREHOLE 24-113

CLIENT: BigSteelBox Corporation
PROJECT: Geotechnical Investigation, Proposed Commercial Development, 1508 Thomas Argue Road, Ottawa, Ontario
JOB#: 102638.002
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 27 2024

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA / WATER CONTENT, %	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		111.33							
		TOPSOIL		0.06							
		Dark brown silty sand, trace clay, with rootlets (FILL MATERIAL)		110.72							
1	Direct Push Casing (57mm OD)	Dark brown silty sand, some gravel (FILL MATERIAL)		0.61	1	D.O	1270	-			
				109.81							
2		Probable grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		1.52	2	D.O	0	-			Bentonite seal
3				108.28							
		End of Borehole		3.05							
4											
5											
6											
7											
8											
9											
10											

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

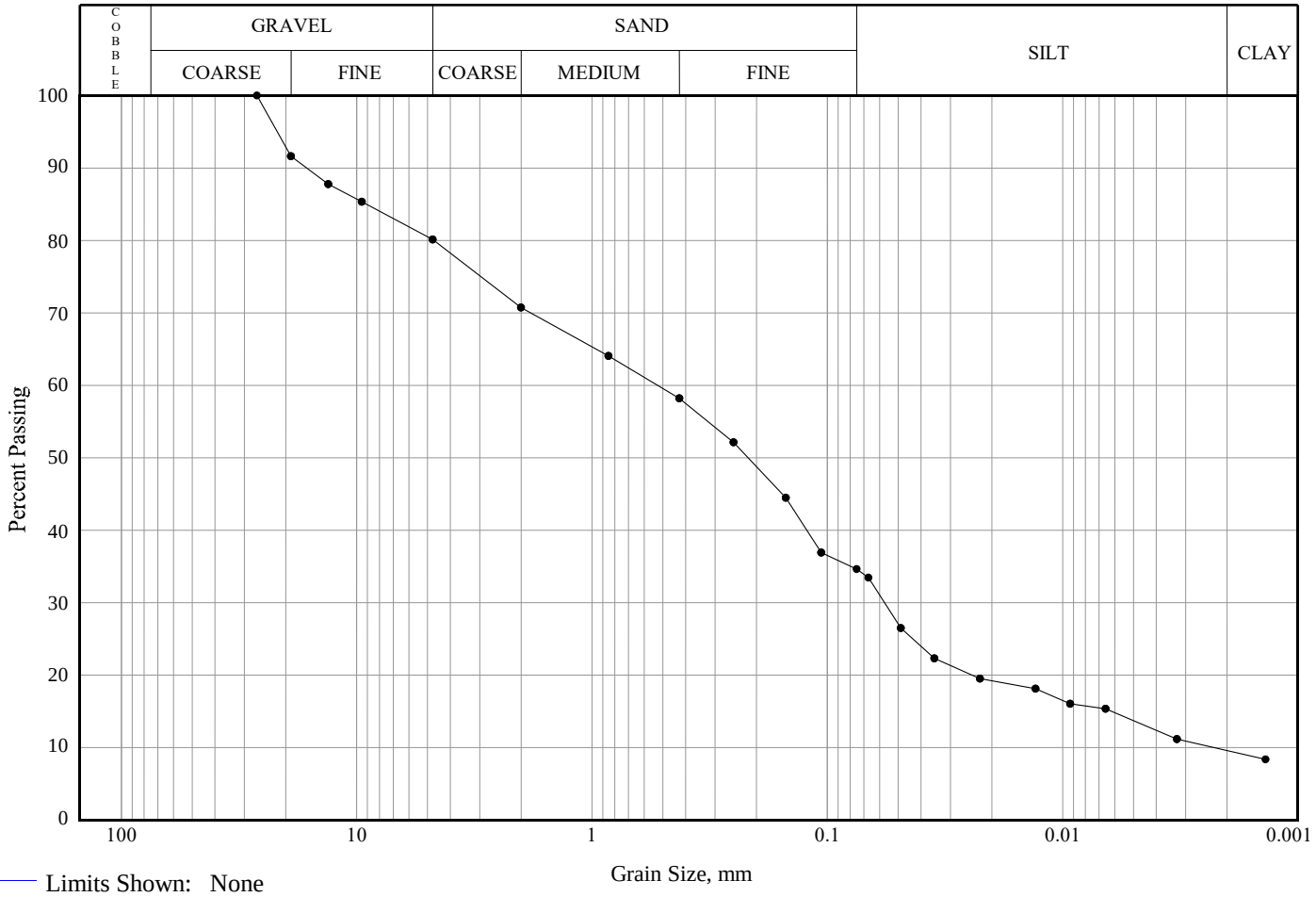
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LOGGED: CC
CHECKED: W.A.M

APPENDIX B

Laboratory Test Results

GEMTEC Consulting Engineers and Scientists	Client: BigSteelBox Corporation Project: Phase One Environmental Site Assessment for 1508 Tho Project #: 102638002	Soils Grading Chart (LS-702/ ASTM D-422)



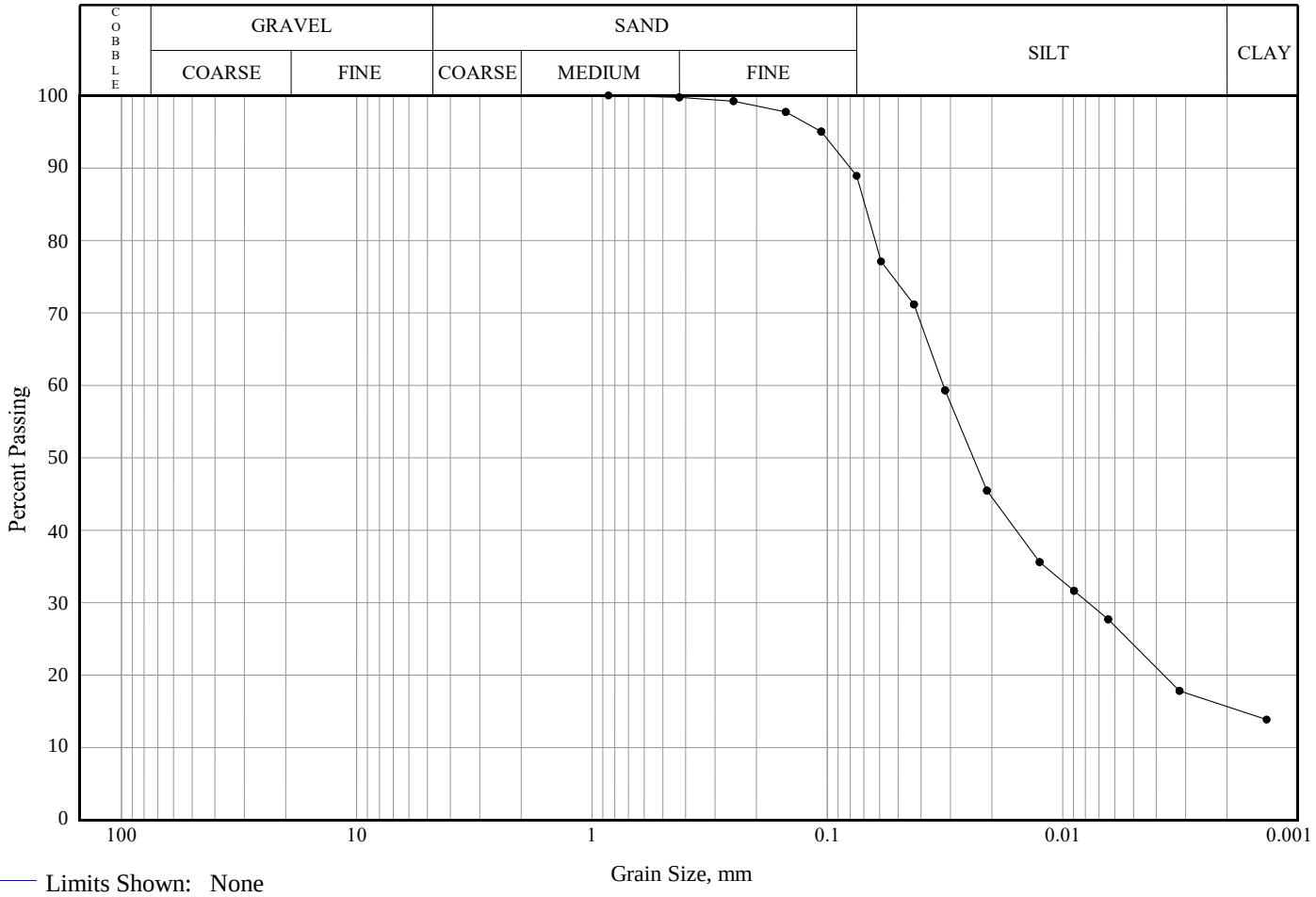
Limits Shown: None

Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
—●—	GLACIAL TILL	23-01	12	15.24-15.85	19.9	45.5	25.1	9.6

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
—●—	Silty sand , some gravel , trace clay	N/A	0.002	0.006	0.06	0.22	0.53	9.10	25.1

Note: More information available upon request

GEMTEC Consulting Engineers and Scientists	Client: BigSteelBox Corporation	Soils Grading Chart (LS-702/ ASTM D-422)
	Project: Phase One Environmental Site Assessment for 1508 Tho	
	Project #: 102638002	



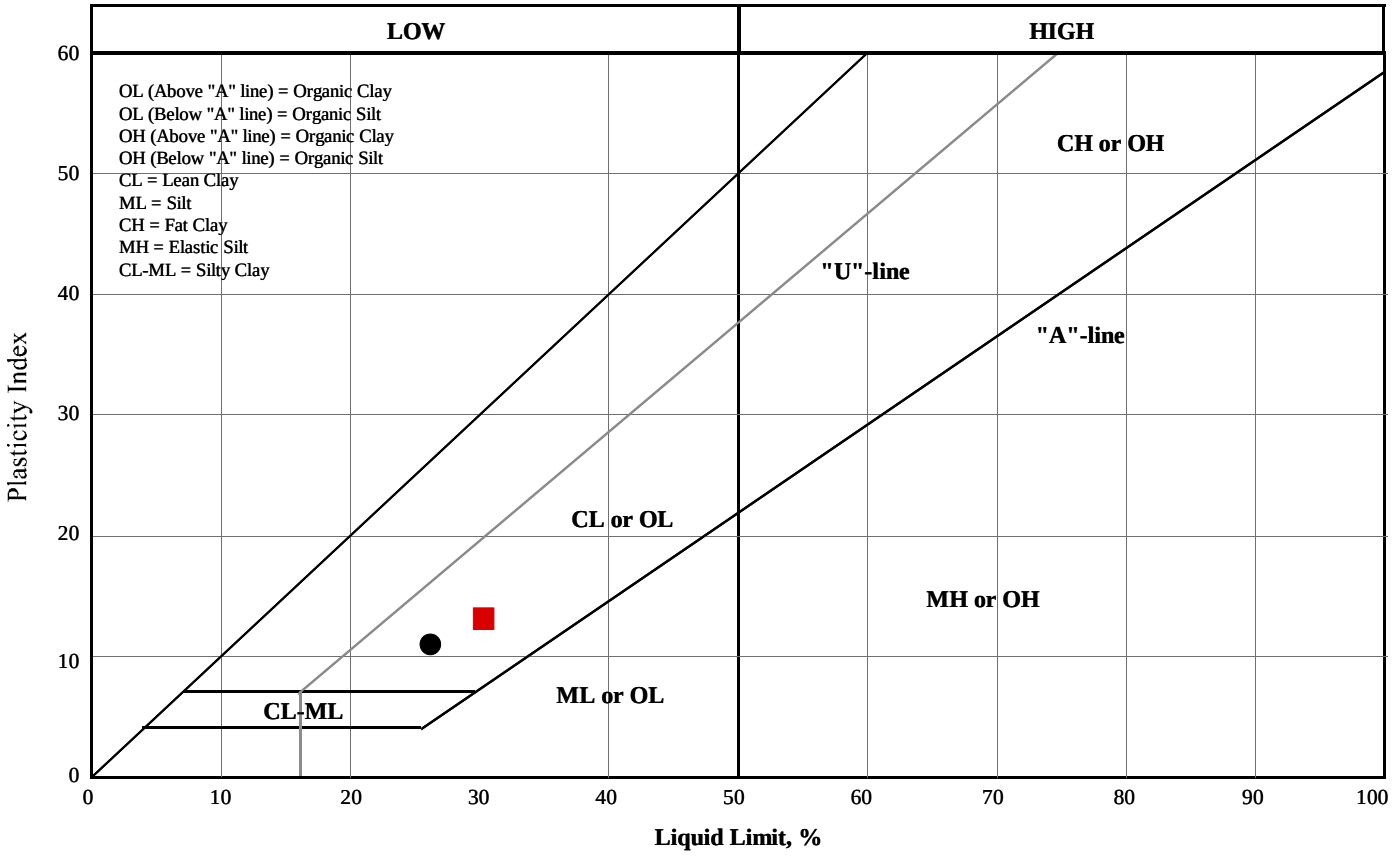
Limits Shown: None

Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
—●—	WEATHERED CRUST	23-01	02	1.52-2.13	0.0	11.1	73.3	15.6

Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
—●—	Silt , some sand, some clay	N/A	---	0.002	0.01	0.02	0.03	0.07	73.3

Note: More information available upon request

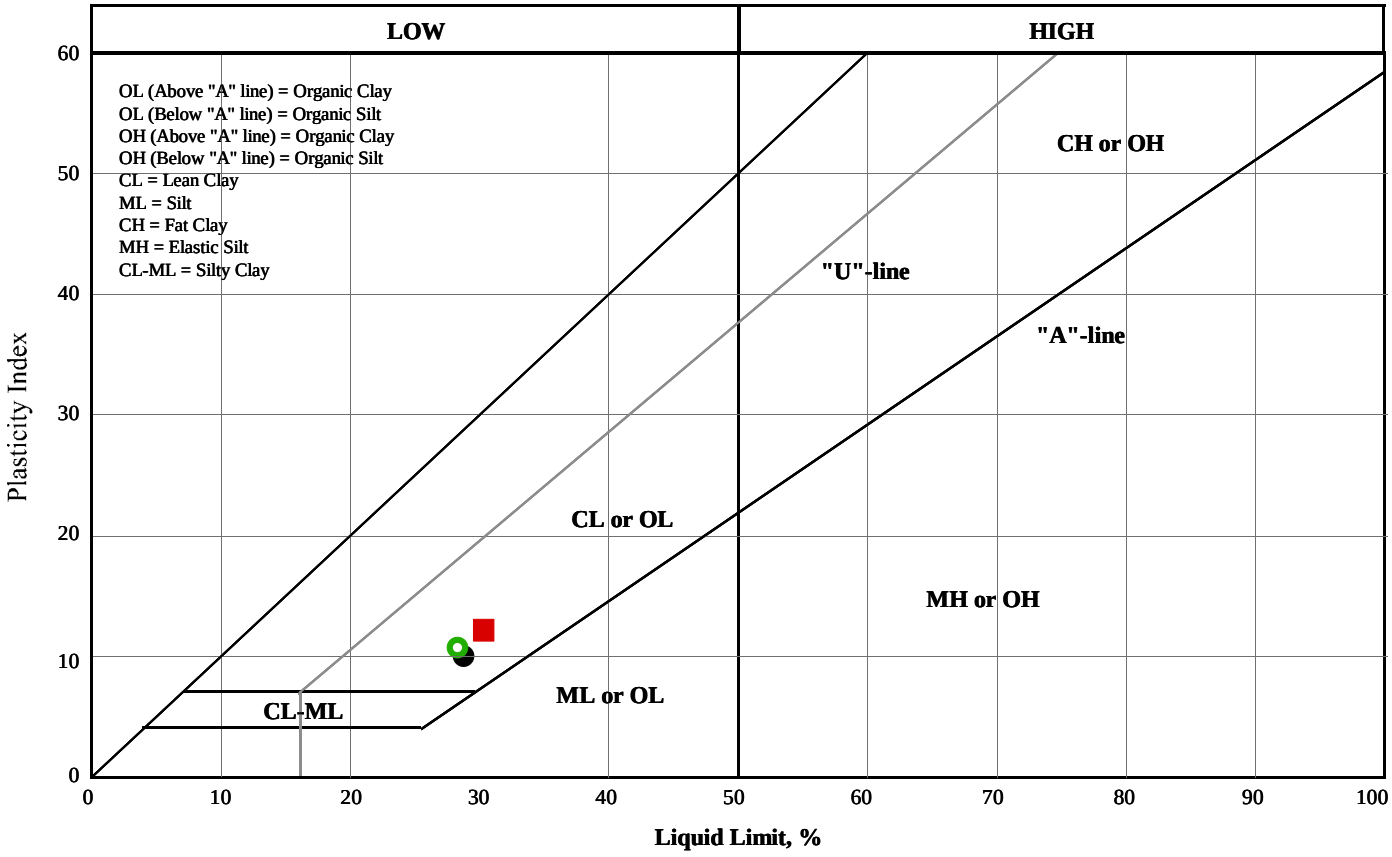
GEMTEC Consulting Engineers and Scientists	Client: BigSteelBox Corportation	Plasticity Chart (D4318)
	Project: Phase One Environmental Site Assessment for 1508 Tho	
	Project #: 102638002	



Symbol	Borehole /Test Pit	Sample Number	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Non-Plastic	Moisture Content, %
●	23-01	03	2.28-2.89	26.2	15.2	11.0	☐	33.81
■	23-01	06	6.10-6.70	30.3	17.2	13.1	☐	39.97

Note: More information available upon request

GEMTEC Consulting Engineers and Scientists Ottawa, ON	Client: BigSteelBox Corportation	Plasticity Chart (ASTM D4318)
	Project: Phase One Environmental Site Assessment for 1508 Tho	
	Project #: 102638002	



Symbol	Borehole /Test Pit	Sample Number	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Non-Plastic	Moisture Content, %
●	24-101	1-3	0.66-0.93	28.8	18.7	10	N/A	28.9
■	24-102	2-1	1.52-2.13	30.3	18.2	12	N/A	34.2
○	24-110	2-1	1.52-2.13	28.3	17.6	11	N/A	31.2

Note: More information available upon request

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Shrinkage Limit

ASTM D4943

Volume of Shrinkage Dish	
Mass of Glass Plate (g):	**37.33**
Mass of Shrinkage Dish (g) (m):	**20.70**
Mass of Shrinkage Dish, Plate, Grease and Water (g):	**75.40**
Mass of Water (g):	**17.37**
Volume of Shrinkage Dish:	**17.0**

Test Specimen	
Specimen No:	**1**
Mass of Shrinakge Dish, m (g):	**20.83**
Mass of Shrinkage Dish and Wet Soil, m_w (g):	**55.25**
Mass of Shrinkage Dish and Dry Soil, m_d (g):	**46.76**
Mass of Wax-Coated Soil in Air, m_{sxa} (g):	**26.48**
Mass of Wax-Coated Soil in Water, m_{sxw} (g):	**12.7**

Calculated Shrinkage Limit	
Specimen No:	**1**
Mass of Dry Soil, m_s (g):	**25.93**
Water Content of Soil when Placed in Dish, w (%):	**32.74**
Mass of Water Displaced by Wax-Coated Soil, m_{wsx} (g):	**13.78**
Volume of Dry Soil and Wax, V_{dx} (cm^3):	**13.78**
Mass of Wax, m_x (g):	**0.55**
Volume of Wax, V_x (cm^3):	**0.61**
Volume of Dry Soil, V_d (cm^3):	**13.17**
Shrinkage Limit, SL	**17.97**

Specific Gravity of Wax = 0.908 at15.5°C

Specific Gravity of Wax = 0.900 at 20°C

Density of Water (g/cm^3) = 1.000 (g/cm^3)

Project No: 102638.002	**Tested By: J.Kaur**
Project Name: 1508 Thomas Argue Road, Ottawa, ON	**Checked By: K.Smith**
Date Tested: March 5, 2024	**Sample No: 23-01 SA 02**
Sample Date: Feb 29, 2024	**Source: N/A**
Remarks:	**Depth: 1.52-2.13**

APPENDIX C

Chemical Analysis of Soil Sample
Sample Relating to Corrosion
(Paracel Laboratories Ltd. Order No. 2349109)

Certificate of Analysis

Report Date: 11-Dec-2023

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 4-Dec-2023

Client PO:

Project Description: 102638.002

	Client ID:	BH23-01 SA2 5'-7'	-	-	-		
	Sample Date:	20-Nov-23 09:30	-	-	-	-	-
	Sample ID:	2349109-01	-	-	-		
	Matrix:	Soil	-	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	71.8	-	-	-	-	-
General Inorganics							
Conductivity	5 uS/cm	145	-	-	-	-	-
pH	0.05 pH Units	7.28	-	-	-	-	-
Resistivity	0.1 Ohm.m	69.0	-	-	-	-	-
Anions							
Chloride	10 ug/g	<10	-	-	-	-	-
Sulphate	10 ug/g	31	-	-	-	-	-

experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnement
structural	structures
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

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