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REPORT ON

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
342, 344, 346, and 348 QUEEN MARY STREET
OTTAWA, ONTARIO

Project # 250031

Submitted to:

NCTL Investments Inc.
65 Shirley's Brook Drive
Kanata, ON
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February 24, 2025

TABLE OF CONTENTS

Attachments: Record of Boreholes
List of Abbreviations
Key Plan, Figure 1
Site Plan, Figure 2
Attachment A – Laboratory Test Results for Physical Properties of Soils
Attachment B - Laboratory Test Results for Chemical Properties
Attachment C - National Building Code Seismic Hazard Calculation

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RE: GEOTECHNICAL INVESTIGATION
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OTTAWA, ONTARIO

1.0 INTRODUCTION

This report presents the results of a geotechnical investigation carried out for a proposed residential development to be located at 342, 344, 346, and 348 Queen Mary Street, Ottawa, Ontario (see Key Plan, Figure 1).

The purpose of the investigation was to:

- Identify the subsurface conditions at the site by means of a limited number of boreholes;
- Based on the factual information obtained, provide recommendations and guidelines on the geotechnical engineering aspects of the project design; including bearing capacity and other construction considerations, which could influence design decisions.

2.0 BACKGROUND INFORMATION AND SITE GEOLOGY

2.1 Existing Conditions and Site Geology

For the purposes of this report, Queen Mary Street is considered to be oriented along an east-west axis.

The subject site for this assessment consists of a four legal properties located at civic addresses 342, 344, 346, and 348 Queen Mary Street, in the City of Ottawa, Ontario (see Key Plan, Figure 1). Each property is approximately 0.03 hectares (280 square meters) in size. The subject site consists of about 0.11 hectares (0.28 acres) of land located on the south side of Queen Mary Street, 30 metres west of the intersection of Queen Mary Street and Naughton Street, Ottawa, Ontario.

Currently, the properties are occupied by two townhouse buildings (342/344 and 346/348 Queen Mary Street) The buildings are serviced with an asphaltic surfaced laneway and accessed from Queen Mary Street. The buildings are serviced by natural gas, hydro and by municipal sewer and water. It is understood the buildings will be demolished at a later date.

Surrounding land use is currently residential development. The site is bordered on the north by Queen Mary Street followed by residential development, on the east, west and south by residential development.

The ground surface is mostly flat lying. Drainage is directed to catch basins located on Queen Mary Street. The regional topography is relatively flat lying at the subject site.

Based on a review of surficial geology maps for the site area, it is expected that the site is generally underlain by alluvial deposits consisting of medium grained stratified sand with some silt. A review of the bedrock geology map indicates that the bedrock underlying the site consists of shale with minor limestone of the Billings Formation.

2.2 Proposed Development

Plans are being prepared to construct a three-storey, 24-unit residential building at the site. Architectural drawings indicate that the proposed building will have a fully finished basement containing 8 residential units. The proposed underside of footing elevation has been set at approximately 1.8 metres below the finished ground surface to facilitate the basement entrances and window wells. It is understood that the footprint of the building will be approximately 527 square metres (5672 square feet).

It is understood that the building will be founded on a conventional cast-in-place concrete foundation supported by strip footings. The proposed building will be serviced by municipal sewer and water.

It is understood that the existing drainage patterns, including the existing catch basins and storm sewers, are to be retained to service the proposed development. As such significant grade changes are not expected.

3.0 PROCEDURE

The field work for this investigation was carried out on January 30, 2025, at which time two boreholes numbered BH1 and BH2 were put down at the site using a truck mounted drill rig equipped with a hollow stem auger owned and operated by Limitless Drilling of Renfrew, Ontario. The boreholes were put down within or immediately adjacent to the proposed building footprint.

Sampling of the overburden materials encountered at the borehole locations were carried out at regular 0.75 metre depth intervals using a 50 millimetre diameter drive open conventional split spoon sampler in conjunction with standard penetration testing (ASTM D-1586 – Penetration Test and Split Barrel Sampling of Soils). Boreholes BH1 and BH2 were advanced to depths of about 5.1 and 5.4 metres, below the existing ground surface, respectively, using 200 mm hollow stem augers.

The subsurface soil conditions encountered at the boreholes were classified based on visual and tactile examination of the samples recovered (ASTM D2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), standard penetration and laboratory test results on select samples. In-situ vane shear testing was not carried out as softer cohesive materials were not encountered within the boreholes. The soils were classified using the Unified Soil Classification System. Groundwater conditions at the boreholes were noted at the time of drilling. The boreholes were loosely backfilled with the auger cuttings upon completion of drilling.

One soil sample (BH2 – SS5 – 3.8 – 4.4 m) was submitted for Hydrometer and moisture content (ASTM D7928). One sample of soil (BH1 – SS3 – 2.3 – 2.9 m) was also delivered to a laboratory for chemical testing to determine an indication of the potential for soil sulphate attack and soil corrosion on buried concrete and steel. The samples were selected based on depth and tactile examination to be representative of the various soil conditions encountered at the site.

A total of 10 soil samples recovered from the boreholes were also tested for moisture content (ASTM D2216).

The field work was supervised throughout by a member of our engineering staff who located the boreholes in the field, logged the boreholes and cared for the samples obtained. A description of the subsurface conditions encountered at the boreholes is given in the attached Record of Borehole Sheets. The results of the laboratory testing of the soil samples are presented in Attachment A and B following the text in this report. The approximate location of the boreholes is shown on the attached Site Plan, Figure 2.

4.0 SUBSURFACE CONDITIONS

4.1 General

As previously indicated, a description of the subsurface conditions encountered at the boreholes is provided in the attached Record of Borehole Sheets following the text of this report. The borehole logs indicate the subsurface conditions at the specific drill locations only. Boundaries between zones on the logs are often not distinct, but rather are transitional and have been interpreted. Subsurface conditions at locations other than borehole locations may vary from the conditions encountered at the boreholes.

The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice.

Classification and identification of soil involves judgement and Kollaard Associates Inc. does not guarantee descriptions as exact, but infers accuracy to the extent that is common in current geotechnical practice.

The groundwater conditions described in this report refer only to those observed at the location and on the date the observations were noted in the report and on the borehole logs. Groundwater conditions may vary seasonally, or may be affected by construction activities on or in the vicinity of the site.

The following is a brief overview of the subsurface conditions encountered at the boreholes.

4.2 Fill Materials

Fill materials consisting of topsoil and yellow brown sand and gravel were encountered from the surface at boreholes BH1 and BH2. The fill materials extended to a depth of about 1.6 to 1.8 metres. The fill materials were fully penetrated where encountered.

4.3 Silt

A layer of grey brown silt was encountered beneath the fill materials in borehole BH1. The silt was encountered at a depth of about 1.8 metres below the existing ground surface. The results of the standard penetration testing carried out in the silt materials ranged from 7 to 8 indicating a loose state of packing. The measured moisture content of the silt ranged from 8 to 19 percent. The silt materials were fully penetrated in borehole BH1, and had a thickness of about 0.6 metres.

4.4 Silty Sand

Grey brown silty sand was encountered beneath the fill materials in borehole BH2. The results of the standard penetration testing carried out in the sand materials was about 8 indicating a loose state of packing. The measured moisture content of the silty sand was about 18 percent. The sand materials were fully penetrated in borehole BH2, and had a thickness of about 0.4 metres.

4.5 Glacial Till

Grey black to black glacial till was encountered beneath the silt and silty sand in boreholes BH1 and BH2. The glacial till consisted of silty sand with some gravel, cobbles, large boulders and a trace of clay. The results of blow counts within the glacial till ranged from 8 to 49 or greater blows per 0.3 metres, indicating a loose to dense state of compaction.

The results of one hydrometer (ASTM D7928) on a sample of soil (BH2 – SS5 – 3.8 – 4.4 m) indicates the sample has the following:

Sample	Depth(metres)	% Gravel	% Sand	% Silt	% Clay
BH2 – SS5	3.8 – 4.4	8.8	25.0	40.2	26.0

4.6 Potential Bedrock

Borehole BH1 and BH2 were terminated with practical refusal at the base of the glacial till on bedrock or large boulders, at a depth of about 5.1 and 5.4 metres below the existing ground surface, respectively.

4.7 Moisture Contents

A total of 10 soil samples recovered from the boreholes were also tested for moisture content (ASTM D2216). The calculated moisture contents of the soil samples ranged from about 15 to 19 percent in the fill materials, about 8 to 19 percent in the silt, about 18 percent in the silty sand, and from about 10 to 13 percent in the glacial till. The results of the moisture content are located on the Record of Borehole sheets following the text of this report.

4.8 Groundwater

Some groundwater was observed at the time of drilling, January 30, 2025 in boreholes BH1 and BH2 at depths of about 1.8 and 2.2 meters below the existing ground surface. Groundwater was measured in a standpipe installed within borehole BH1 at a depth of about 2.3 metres below the existing ground surface on February 10, 2025. It should be noted that the groundwater levels may be higher during wet periods of the year such as the early spring.

4.9 Corrosivity on Reinforcement and Sulphate Attack on Portland Cement

The results of the laboratory testing of a soil sample (BH1 – SS3 – 2.3 – 2.9 m) submitted for chemistry testing related to corrosivity is summarized in the following table.

Item	Threshold of Concern	Test Result	Comment
Chlorides (Cl)	Cl > 0.04 %	0.00224	Negligible
pH	pH < 5.5	7.73	Negligible concern
Resistivity	R < 20,000 ohm-cm	3150	Corrosive
Sulphates (SO_4)	SO_4 > 0.1%	0.0146	Negligible concern

The results of the laboratory testing of a soil sample for sulphate gave a percent sulphate of 0.0146. The National Research Council of Canada (NRC) recognizes four categories of potential sulphate attack of buried concrete based on percent sulphate in soil as follows:

Sulphate in Soil (%)	Sulphate Rating
0 to 0.10	negligible
0.10 to 0.20	mild
0.20 to 0.50	considerable
>0.50	severe

Based on the above, the soils are considered to have a negligible potential for sulphate attack on buried concrete materials and accordingly, conventional GU or MS Portland cement may be used in the construction of the proposed concrete elements.

The pH value for the soil sample was reported to be at 7.73, indicating a durable condition against corrosion. This value was evaluated using Table 2 of Building Research Establishment (BRE) Digest 362 (July 1991).The pH is greater than 5.5 indicating the concrete will not be exposed to attack from acids.

The chloride content of the sample was also compared with the threshold level and present negligible concrete corrosion potential.

Corrosivity Rating for soils ranges from extremely corrosive to non-corrosive as follows:

Soil Resistivity (ohm-cm)	Corrosivity Rating
> 20,000	non- corrosive
10,000 to 20,000	mildly corrosive
5,000 to 10,000	moderately corrosive
3,000 to 5,000	corrosive
1,000 to 3,000	highly corrosive
< 1,000	extremely corrosive

The soil resistivity was found to be 3150 ohm-cm for the sample analyzed making the soil corrosive for buried steel within below grade concrete walls. Increasing the specified strength and/or adding air entrainment into any reinforced concrete in contact with the soil is recommended. Consideration should also be given to increasing the minimum concrete cover over reinforcing steel. Alternatively, a glass fiber reinforced polymer (GFRP) product could be used in place of steel reinforcing in below grade applications.

Based on the chemical test results, Type GU General Use Hydraulic Cement may be used for this proposed development. The laboratory results are presented at the end of this report.

5.0 GEOTECHNICAL GUIDELINES AND RECOMMENDATIONS

5.1 General

This section of the report provides engineering guidelines on the geotechnical design aspects of the project based on our interpretation of the information from the test holes and the project requirements. It is stressed that the information in the following sections is provided for the guidance of the designers and is intended for this project only. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety and equipment capabilities.

The professional services for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface contamination resulting from previous uses or activities at this site or adjacent properties, and/or resulting from the introduction onto the site of materials from offsite sources are outside the terms of reference for this report.

5.2 Foundation for Proposed Residential Building

The subsurface conditions at the site encountered at the boreholes advanced during the investigation consisted of fill materials (topsoil and sand and gravel) over silt (BH1) or silty sand (BH2), followed by glacial till. With the exception of the fill materials, silt and silty sand the subsurface conditions encountered at the test holes advanced during the investigation are suitable for the support of the proposed building placed on a native glacial till subgrade or on engineered fill placed on the native glacial till subgrade.

The information provided indicates the development consists of a three-storey, 24-unit residential building. It is understood that the foundation for the proposed building is to consist of a conventional cast-in-place concrete foundation supported by conventional spread footings with a basement. The proposed footings will bear below the depth of seasonal frost penetration.

5.3 Subsurface Conditions at the Underside of Footing Level

With the exception of the fill materials, and any debris associated with the existing residential dwellings, the subsurface conditions encountered at the test holes advanced during the investigation are suitable for the support of the proposed residential building on conventional spread footing foundation placed on a native subgrade or on engineered fill placed on the native subgrade.

It is expected that the subgrade immediately below the proposed footing level will consist of grey brown loose to dense glacial till. Once the excavation for the foundation is complete, the exposed subgrade should be inspected by a qualified geotechnical person. Any loose glacial till if encountered should also be removed.

5.4 Conventional Spread Footing Foundations

Based on the blow counts within the glacial till deposits, the glacial till has a loose to dense consistency and is suitable to support the loads from the proposed foundation footings and adjacent grade raise fill. The allowable bearing pressure for any footings depends on the depth of the footings below original ground surface, the width of the footings, the height above the original ground surface of any grade raise adjacent to the foundations and the thickness of the soils deposit beneath the footings.

Strip and pad footings, a minimum 0.5 metres in width bearing, at a founding depth of up to 1.8 metres below the existing ground, on the native undisturbed loose to dense glacial till or on a suitably constructed engineering pad placed on the native glacial till may be designed using a maximum allowable bearing pressure of 100 kilopascals for serviceability limit states and 200 kilopascals for the factored ultimate bearing resistance.

The above allowable bearing pressure is subject to a maximum grade raise of 2.5 metres above the existing ground surface and to maximum strip footing width of 1.0 metres.

Provided that any loose and/or disturbed soil is removed from the bearing surfaces prior to pouring concrete, the total and differential settlement of the footings should be less than 25 millimetres and 20 millimetres, respectively.

5.5 Engineered Fill

Any fill required to raise the footings for the proposed building to founding level should consist of imported granular material (engineered fill). The engineered fill should consist of granular material meeting Ontario Provincial Standards Specifications (OPSS) requirements for Granular A or

Granular B Type II and should be compacted in maximum 300 millimetre thick loose lifts to at least 95 percent of the standard Proctor maximum dry density. It is considered that the engineered fill should be compacted using dynamic compaction with a large diameter vibratory steel drum roller or diesel plate compactor. If a diesel plate compactor is used, the lift thickness may need to be restricted to less than 300 mm to achieve proper compaction. Compaction should be verified by a suitable field compaction test method.

To allow the spread of load beneath the footings, the engineered fill should extend out 0.5 metres horizontally from the edges of the footing then down and out at 1 horizontal to 1 vertical, or flatter. The excavations for the structure should be sized to accommodate this fill placement.

The first lift of engineered fill material should have a thickness of 300 millimetres in order to protect the subgrade during compaction. It is considered that the placement of a geotextile fabric between the engineered fill and the subgrade is not necessary where granular materials meeting the grading requirements for OPSS Granular B Type I or Type II are placed on a glacial subgrade above the normal ground water level. It is recommended that trucks are not used to place the engineered fill on the subgrade. The fill should be dumped at the edge of the excavation and moved into place with a tracked bulldozer or excavator.

The native soils at this site will be sensitive to disturbance from construction operations and from rainwater or snowmelt, and frost. In order to minimize disturbance, construction traffic operating directly on the subgrade should be kept to an absolute minimum and the subgrade should be protected from below freezing temperatures.

5.6 Foundation Excavation

Any excavation for the proposed residential building will likely be carried out through a layer of fill materials (topsoil, sand and gravel fill), any demolition debris, silt and silty sand to bear within the native glacial till subgrade. The sides of the excavations should be sloped in accordance with the requirements of Ontario Regulation 213/91, s. 226 under the Occupational Health and Safety Act. According to the Act, the native soils at the site can be classified as Type 3 soil, however this classification should be confirmed by qualified individuals as the site is excavated and if necessary, adjusted.

Based on the expected depths of excavation for the foundations, It is expected that the side slopes of the excavation will be stable provided the walls are sloped at 1H:1V to 1.2 metres or less from the bottom of excavation and provided no excavated materials are stockpiled within 2 metres of the top of the excavations.

5.7 Ground Water in Excavation and Construction Dewatering

Groundwater inflow from the native soils into the excavations during construction, if any should be handled by pumping from sumps within the excavation.

Some groundwater was observed at the time of drilling, January 30, 2025 in borehole BH1 and BH2 at about 1.8 and 2.2 metres below the existing ground surface. Water was measured in a standpipe placed within borehole BH1 at about 2.3 metres below the existing ground surface on February 10, 2025. In addition, the moisture contents of the silt, silty sand and glacial till samples tested indicate that the silt, silty sand and glacial till remain unsaturated above the groundwater level. Based on the groundwater levels observed, it is considered that the excavation for the proposed building at the site should not extend below the ground water level. As such a permit to take water will not be required prior to excavation.

5.8 Frost Protection Requirements for Spread Footing Foundations

In general, all exterior foundation elements and those in any unheated parts of the proposed building should be provided with at least 1.5 metres of earth cover for frost protection purposes. Isolated, unheated foundation elements adjacent to surfaces, which are cleared of snow cover during winter months should be provided with a minimum 1.8 metres of earth cover for frost protection purposes.

It is understood that the basement units will be accessed from basement level entry porches. It is understood that it is intended that these porches will have a cast in place concrete floor slab at the basement floor level slightly above the top of the foundation footings. As such, there will not be sufficient cover over the footings for frost protection purposes immediately adjacent to the basement entry. A review of the Architectural drawings provided indicates that the intent is to provide frost protection using rigid insulation. The rigid insulation should consist of a minimum thickness of 3 inches of extruded polystyrene insulation having a minimum compressive resistance of 275 kPa at 10% deformation (Dow HI 40 or equivalent). The rigid insulation should extend continuously from the inside edge of the footing of the interior foundation (main foundation) to 4 ft beyond the exterior edge of the exterior foundation (stairwell and entrance foundations).

There will also be insufficient cover for frost protection at each window well. Frost protection could be provided by stepping the footings or by the use of rigid insulation. The rigid insulation should consist of a minimum thickness of 2 inches of Dow HI 40 or equivalent and should extend from the inside edge of the footing to 2 feet beyond the outside edge of the window well opening.

5.9 Foundation Wall Backfill and Drainage

To prevent possible foundation frost jacking due to frost adhesion, the backfill against the foundation walls should consist of free draining, non-frost susceptible material. If imported material is required, it should consist of sand or sand and gravel meeting OPSS Granular B Type I grading requirements. Alternatively, foundations could be backfilled with native material in conjunction with the use of an approved proprietary drainage layer system such as "System Platon" against the foundation wall. It is pointed out that there is potential for possible frost jacking of the upper portion of some types of these drainage layer systems if frost susceptible material is used as backfill. This could be mitigated by backfilling the upper approximately 0.6 metres with non-frost susceptible granular material.

A conventional, perforated perimeter drain, with a 150 millimetre surround of 20 millimetre minus crushed stone, should be provided at the founding level for the cast-in-place concrete basement floor slab and should lead by gravity flow to the Storm Sewer or to a sump. If the perimeter drain tile is discharged by gravity to the Storm Sewer, a backup flow valve must be used. If a sump is used, the sump should be equipped with a backup pump and generator. The sump discharge should be equipped with a backup flow protector.

The basement foundation walls should be designed to resist the earth pressure, P, acting against the walls at any depth, h, calculated using the following equation.

$$\mathbf{P = k_0 (\gamma h + q)}$$

Where:

	P	=	the pressure, at any depth, h, below the finished ground surface
	k_0	=	earth pressure at-rest coefficient, 0.5
	γ	=	unit weight of soil to be retained, estimated at 22 kN/m^3

q	=	surcharge load (kPa) above backfill material
h	=	the depth, in metres, below the finished ground surface at which the pressure, P, is being computed

This expression assumes that the water table would be maintained at the founding level by the above mentioned foundation perimeter drainage and backfill requirements.

Where the backfill material will ultimately support a pavement structure or walkway, it is suggested that the foundation wall backfill material be compacted in 250 millimetre thick lifts to 95 percent of the standard Proctor dry density value. In that case any native material proposed for foundation backfill should be inspected and approved by the geotechnical engineer.

Groundwater inflow from the native soils into the basement excavation during construction, if any should be handled by pumping from sumps within the excavations.

5.10 Basement Floor Slab

As stated above, it is expected that the proposed building will be founded on native glacial till or on an engineered pad placed on the native subgrade. For predictable performance of the proposed concrete floor slab all existing fill material, and any otherwise deleterious material should be removed from below the proposed floor slab area. The exposed native subgrade surface should then be inspected and approved by geotechnical personnel. Any soft areas evident should be subexcavated and replaced with suitable engineered fill.

Engineered fill materials provided to support the concrete floor slabs should consist of a minimum of 150 millimetre thickness of crushed stone meeting OPSS Granular A immediately beneath the concrete floor slabs followed by sand, or sand and gravel meeting the OPSS for Granular B Type I, or crushed stone meeting OPSS grading requirements for Granular B Type II, or other material approved by the Geotechnical Engineer. The fill materials should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density.

Alternatively, clear stone could be used in place of OPSS Granular A and Granular B Type material beneath the concrete basement floor slab. In order to facilitate the clear stone, a minimum of 6 ounce per square yard nonwoven geotextile filter cloth should be placed on the native subgrade followed by a 200mm thick layer of 20mm stone. The clear crushed stone should be well compacted to prevent future consolidation using a minimum of three passes with a large diesel plate compactor.

The slabs should be structurally independent from walls and columns, which are supported by the foundations. This is to reduce any structural distress that may occur as a result of differential soil movement. If it is intended to place any internal non-load bearing partitions directly on the slab-on-grade, such walls should also be structurally independent from other elements of the building founded on the conventional foundation system so that some relative vertical movement between the floor slab and foundation can occur freely.

The concrete floor slabs should be saw cut at regular intervals to minimize random cracking of the slab due to shrinkage of the concrete. The saw cut depth should be about one quarter of the thickness of the slab. The crack control cuts should be placed at a grid spacing not exceeding the lesser of 25 times the slab thickness or 4.5 metres. The slabs should be cut as soon as it is possible to work on the slab without damaging the surface of the slab.

5.11 Seismic Design for the Proposed Residential Building

5.11.1 Seismic Site Classification

For seismic design purposes, in accordance with the 2012 OBC Section 4.1.8.4, Table 4.1.8.4.A., the site classification for seismic site response is Site Class C.

5.11.2 National Building Code Seismic Hazard Calculation

The design Peak Ground Acceleration (PGA) for the site was calculated as 0.285 with a 2% probability of exceedance in 50 years based on the interpolation of the 2015 National Building Code Seismic Hazard calculation.

5.11.3 Potential for Soil Liquefaction

As indicated above, the results of the boreholes and information from geological maps indicate that the native soils below the proposed founding level consist of loose to dense glacial till.

Consideration for the potential for soil liquefaction was determined by considering the ratio between the cyclic resistance ratio (CRR) and the cyclic stress ratio (CSR) for the soils between the proposed underside of footing level and the depth at which refusal to further advancement using standard penetration testing was attained. The CRR value was determined from a mathematical expression as determined by Rauch (1997) of the base curve obtained from Robertson and Fear (1996). The CSR was determined from Seed and Idriss (1971). It is considered that a soil with a normalized SPT of greater than 30 is non-liquefiable. It is also considered that a soil with a CRR/CSR ratio of greater than one is not liquefiable. The average CRR / CSR ratio for the materials encountered to the depth explored excluding the normalized SPT values above 30 is 23.8. As such, the underlying soils below the proposed foundations are not considered to be liquefiable.

Therefore, it is considered that no damage to the proposed building will occur due to liquefaction of the native subgrade under seismic conditions.

6.0 SITE SERVICES

6.1 Excavation

The excavations for the site services will be carried out through fill materials (topsoil, sand and gravel), native silt and/or silty sand into the native glacial till soils. For the purposes of Ontario Regulation 213/91 the soils at the site can be considered to be Type 3 soil. The sides of the excavations in overburden materials should be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Ontario Occupational Health and Safety Act. That is, open cut excavations with overburden deposits could be carried out with side slopes of 1 horizontal to 1 vertical to 1.2 metres from the bottom of the trench then vertical. Where space constraints dictate, the excavation and backfilling operations should be carried out within a tightly fitting, braced steel trench box.

Boreholes BH1 and BH2 encountered groundwater at about 1.8 and 2.2 metres below the existing ground surface at the time of drilling on January 30, 2025. Groundwater was measured in a standpipe installed within borehole BH1 at a depth of about 2.3 metres below the existing ground surface on February 10, 2025. As such, significant groundwater flow into any excavation is unlikely. Any groundwater inflow into the service trenches should be handled by pumping from sumps from within the excavations.

6.2 Pipe Bedding and Cover Materials

It is suggested that the service pipe bedding material consist of at least 150 millimetres of granular material meeting OPSS requirements for Granular A. A provisional allowance should, however, be made for sub-excavation of any existing fill or disturbed material encountered at sub-grade level. Granular material meeting OPSS specifications for Granular A could be used as a sub-bedding material. The use of clear crushed stone as bedding or sub-bedding material should not be permitted.

Cover material, from pipe spring line to at least 300 millimetres above the top of the pipe, should consist of granular material, such as OPSS Granular A. The sub-bedding, bedding and cover materials should be compacted in maximum 200 millimetre thick lifts to at least 95 percent of the standard Proctor maximum dry density using suitable vibratory compaction equipment.

6.3 Trench Backfill

The general backfilling procedures should be carried out in a manner that is compatible with the future use of the area above the service trenches.

In areas where the service trench will be located below or in close proximity to existing or future roadway areas, acceptable native materials should be used as backfill between the roadway sub-grade level and the depth of seasonal frost penetrations (i.e. 1.8 metres below finished grade) in order to reduce the potential for differential frost heaving between the area over the trench and the adjacent section of roadway.

Where native backfill is used, it should match the native materials exposed on the trench walls. Some of the native materials from the lower part of the trench excavations may be wet for optimum compaction. Depending on the weather conditions encountered during construction, some drying of materials and/or re-compaction may be required. Any wet materials that cannot be compacted to the required density should either be wasted from the site or should be used outside of existing or future roadway areas. Any boulders larger than 300 millimetres in size should not be used as service trench backfill. Backfill below the zone of seasonal frost penetration could consist of either acceptable native material or imported granular material conforming to OPSS Granular B Type I. If the native material is not suitable for backfill, imported granular material may have to be used. If imported granular materials are used, suitable frost tapers should be used in accordance with OPSD 802.013.

To minimize future settlement of the backfill and achieve an acceptable subgrade for the roadways, sidewalks, etc., the trench should be compacted in maximum 300 millimetre thick lifts to at least 95 percent of the Standard Proctor maximum dry density. The specified density may be reduced where the trench backfill is not located in close proximity to existing or future roadways, driveways, sidewalks, or any other type of permanent structure.

7.0 CONSTRUCTION CONSIDERATIONS

It is suggested that the final design drawings for the project, including the proposed site grading plan, be reviewed by the geotechnical engineer to ensure that the guidelines provided in this report have been interpreted as intended and to re-evaluate the guidelines provided in the report with respect to the actual project plans.

The engagement of the services of the geotechnical consultant during construction is recommended to confirm that the subsurface conditions throughout the proposed development do not materially differ from those given in the report and that the construction activities do not adversely affect the intent of the design.

All foundation areas and any engineered fill areas for the proposed building should be inspected by Kollaard Associates Inc. to ensure that a suitable subgrade has been reached and properly prepared. The placing and compaction of any granular materials beneath the foundations and floor slab should be inspected to ensure that the materials used conform to the grading and compaction specifications.

The native glacial till soils at this site will be sensitive to disturbance from construction operations, from rainwater or snow melt, and frost. In order to minimize disturbance, construction traffic operating directly on the subgrade should be kept to an absolute minimum and the subgrade should be protected from below freezing temperatures.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report or if we may be of further services to you, please do not hesitate to contact our office.

Regards,

Kollaard Associates Inc.

LICENSED PROFESSIONAL ENGINEER
Feb 24, 2025
I. S. BACON
100234009
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
Feb 24, 2025
S.E. deWit
100079612
PROVINCE OF ONTARIO

Isaac Bacon, P.Eng. Dean Tataryn, B.E.S., EP. Steven deWit, P.Eng.

BOREHOLE BH1

Kollaard Associates Engineers

PROJECT: Proposed Residential Development
CLIENT: NCTL Investments Inc
LOCATION: 342, 344, 346, and 348 Queen Mary Street, Ottawa, ON
PENETRATION TEST HAMMER: 63.5 kg, Drop, 0.76m

PROJECT NUMBER: 250031
DATE OF BORING: 2025-01-30
SHEET: 1 of 1
DATUM:

DEPTH SCALE (meters)	SOIL PROFILE: DESCRIPTION	DEPTH (m)	STRATA PLOT	ELEV. (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	UNDIST SHEAR STRENGTH x Cu. kPa x / REM SHEAR STRENGTH o Cu. kPa o (0 20 40 60 80 100)	DYNAMIC CONE PENETRATION TEST blows/300 mm (0 20 40 60 80 100)	MOISTURE CONTENT (%)	PIEZOMETER OR STANDPIPE INSTALLATION
	Topsoil (FILL)	0.00									
	Yellow brown sand and gravel (FILL)	0.20									
1.0					1	SS	16			12	
	Grey black silty sand, trace clay and gravel (FILL)	1.30									
					2	SS	7			19	
2.0	Grey brown SILT	1.83									
	Black silty sand, some gravel, cobbles, boulders, trace clay (GLACIAL TILL)	2.39			3	SS	8			8	
3.0					4	SS	9			10	
4.0					5	SS	25				
5.0					6	SS	49			11	
	Practical refusal on bedrock	5.05									

Some water was observed at about 1.8 metres below existing ground surface at time of drilling (Jan 30, 2025). Groundwater was measured in a standpipe at about 2.3 metres below ground surface (Feb 10, 2025)

DEPTH SCALE: 1 to 30
LOGGED: KH
BORING METHOD: Power Auger
AUGER TYPE: Hollow Stem
CHECKED: SD

BOREHOLE BH2

Kollaard Associates Engineers

PROJECT: Proposed Residential Development
CLIENT: NCTL Investments Inc
LOCATION: 342, 344, 346, and 348 Queen Mary Street, Ottawa, ON
PENETRATION TEST HAMMER: 63.5 kg, Drop, 0.76m

PROJECT NUMBER: 250031
DATE OF BORING: 2025-01-30
SHEET: 1 of 1
DATUM:

DESCRIPTION	DEPTH (m)	ELEV. (m)
Topsoil (FILL)	0.00	
Yellow brown sand and gravel (FILL)	0.15	
Grey brown SILTY SAND	1.60	
Grey black silty sand, some gravel, cobbles, boulders, trace clay (GLACIAL TILL)	1.98	
Black silty sand, some gravel, cobbles, boulders, trace clay (GLACIAL TILL)	2.28	
Practical refusal on bedrock	5.38	

SAMPLE NUMBER	TYPE	BLOWS/0.3m	MOISTURE CONTENT (%)
1	SS	7	15
2	SS	8	18
3	SS	27	
4	SS	16	10
5	SS	32	10
6	SS	41	13

UNDIST SHEAR STRENGTH x Cu. kPa x; REM SHEAR STRENGTH o Cu. kPa o (0 20 40 60 80 100)
DYNAMIC CONE PENETRATION TEST blows/300 mm (0 20 40 60 80 100)
PIEZOMETER OR STANDPIPE INSTALLATION

DEPTH SCALE (meters): 1.0, 2.0, 3.0, 4.0, 5.0

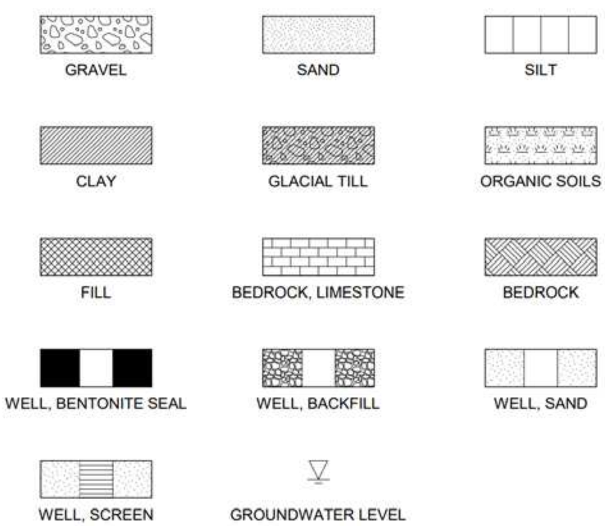
Some water was observed at about 2.2 metres below existing ground surface at time of drilling (Jan 30, 2025)

DEPTH SCALE: 1 to 30
LOGGED: KH
BORING METHOD: Power Auger
AUGER TYPE: Hollow Stem
CHECKED: SD

LIST OF ABBREVIATIONS AND TERMINOLOGY

SAMPLE TYPES	
AS	Auger Sample
CS	Chunk Sample
DO	Drive Open
MS	Manual Sample
RC	Rock Core
SS	Split Spoon Sample
TO	Thin-Walled Open Shelby Tube
WS	Wash Sample

PENETRATION RESISTANCE	
Standard Penetration Resistance (N) The number of blows by a 63.5 kg hammer dropped 760 millimeters required to drive a 50 mm drive open sampler for a distance of 300 mm.	
Dynamic Penetration Resistance The number of blows by a 63.5 kg hammer dropped 760 mm to drive a 50 mm diameter, 60° cone attached to 'A' size drill rods for a distance of 300 mm.	
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.



SOIL DESCRIPTIONS

Relative Density	'N' Value
Very Loose	0 – 4
Loose	4 – 10
Compact	10 – 30
Dense	30 – 50
Very Dense	>50

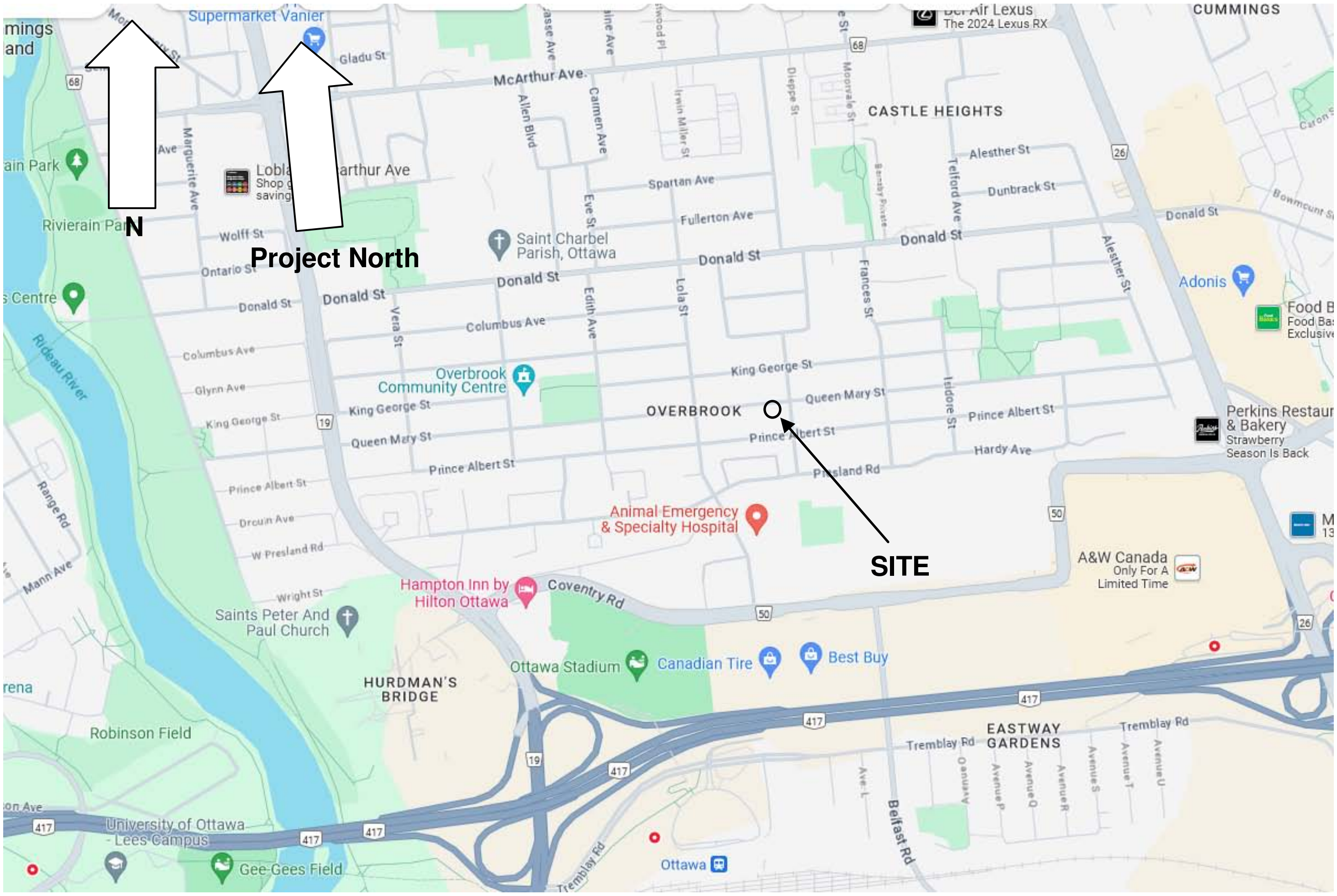
Consistency	Cu, kPa
Very Soft	0 – 12
Soft	12 – 25
Firm	25 – 50
Stiff	50 – 100
Very Stiff	>100

LIST OF COMMON SYMBOLS	
Cu	Undrained Shear Strength
e	Void Ratio
Cc	Compression Index
Cv	Coefficient of Consolidation
k	Coefficient of Permeability
PI	Plasticity Index
n	Porosity
u	Pore Pressure
W	Moisture Content
LL	Liquid Limit
PL	Plastic Limit
r	Unit Weight of Soil
y	Unit Weight of Submerged Soil
cr	Normal Stress

SOIL TESTS	
C	Consolidation Test
H	Hydrometer Analysis
M	Sieve Analysis
MH	Sieve and Hydrometer Analysis
U	Unconfined Compression Test
Q	Undrained Triaxial Test
VA	Field Vane, Undisturbed and Remolded Shear Strength

KEY PLAN

FIGURE 1



NOT TO SCALE

Kollaard Associates
Engineers

Project No. 250031

Date January 2025

DRAWING NUMBER:
SITE PLAN, FIGURE 2

LEGEND:

BH1 APPROXIMATE BOREHOLE LOCATION

REFERENCE: PLAN SUPPLIED BY COSINE

SPECIAL NOTE: THIS DRAWING TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REV.	NAME	DATE	DESCRIPTION

Kollaard Associates
Engineers
PO, BOX 189, 210 PRESCOTT ST
KEMPTVILLE ONTARIO
K0G 1J0 FAX (613) 258-0475
http://www.kollaard.ca
(613) 860-0923
info@kollaard.ca

CLIENT:
NCTL INVESTMENTS INC.

PROJECT:
GEOTECHNICAL INVESTIGATION FOR PROPOSED RESIDENTIAL DEVELOPMENT

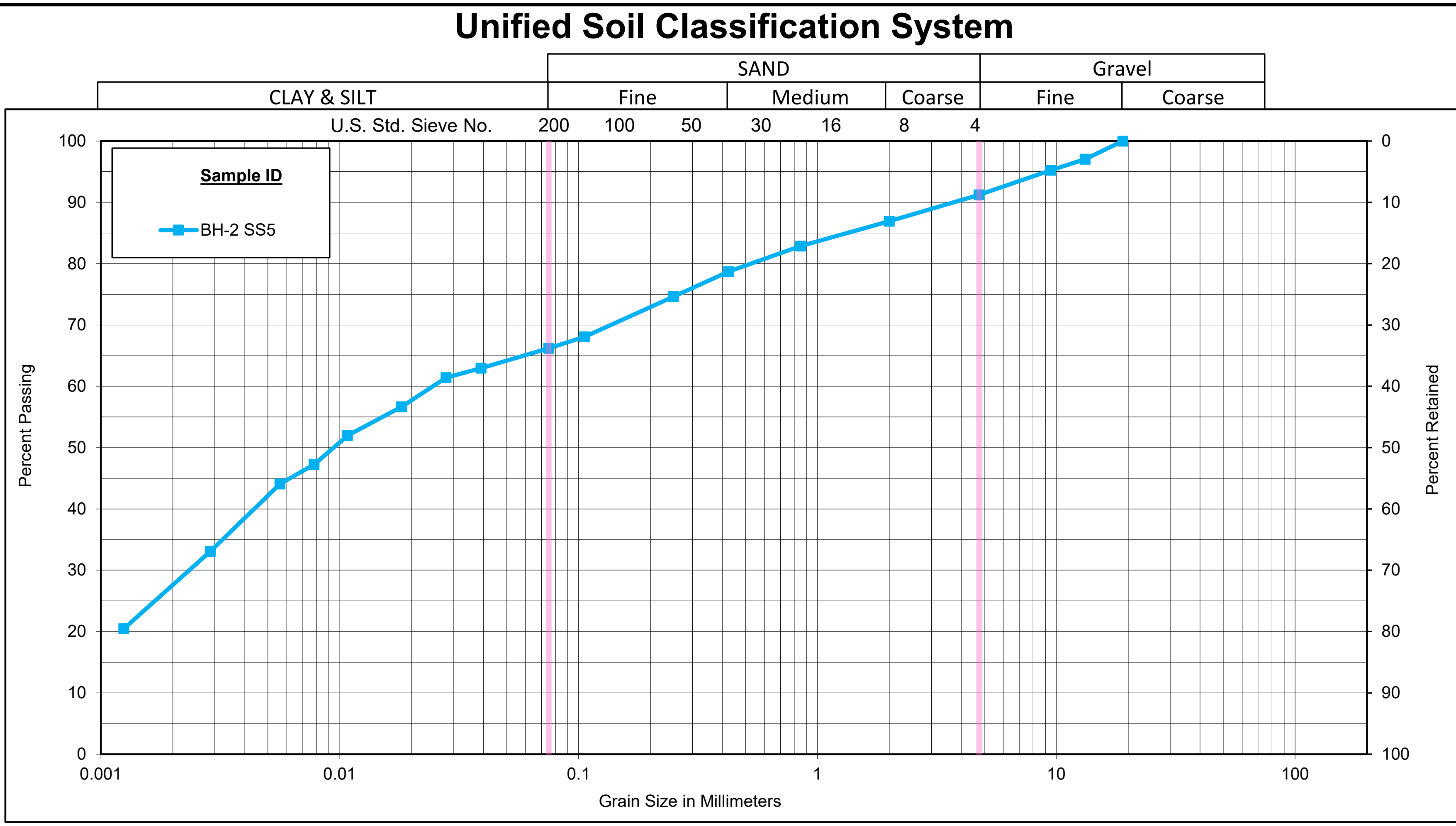
LOCATION:
342, 344, 346 & 348
QUEEN MARY STREET
OTTAWA, ONTARIO

DESIGNED BY:	DATE:
--	JAN 9, 2025
DRAWN BY: DT	SCALE: N.T.S

KOLLAARD FILE NUMBER:
250031

ATTACHMENT A

Laboratory Test Results for Physical Properties



Sample ID	Depth	% Gravel	% Sand	% Silt	% Clay
BH-2 SS5	12'6"-14'6"	8.8	25.0	40.2	26.0

Stantec

GRAIN SIZE DISTRIBUTION

Kollaard Associates, File #250031

342-350 Queen Mary St., Ottawa

Figure No.

Project No. 121625581

Stantec

Particle-Size Analysis of Soils

LS702

AASHTO T88

PROJECT DETAILS

Client:	**Kollaard Associates, File #250031**	Project No.:	**121625581**
Project:	**342-350 Queen Mary St., Ottawa**	Test Method:	**LS702**
Material Type:	**Soil**	Sampled By:	**Kollaard Associates**
Source:	**BH-2**	Date Sampled:	**January 30, 2025**
Sample No.:	**SS5**	Tested By:	**Brian Prevost**
Sample Depth	**12'6"-14'6"**	Date Tested:	**February 3, 2025**

WASH TEST DATA

Oven Dry Mass In Hydrometer Analysis (g)	54.02
Sample Weight after Hydrometer and Wash (g)	13.06
Percent Passing No. 200 Sieve (%)	**75.8**
Percent Passing Corrected (%)	**65.91**

PERCENT LOSS IN SIEVE

Sample Weight Before Sieve (g)	**790.10**
Sample Weight After Sieve (g)	**788.40**
Percent Loss in Sieve (%)	**0.22**

SOIL INFORMATION

Liquid Limit (LL)		
Plasticity Index (PI)		
Soil Classification		
Specific Gravity (G_s)	2.750	
Sg. Correction Factor (α)	0.978	
Mass of Dispersing Agent/Litre	40	g

CALCULATION OF DRY SOIL MASS

Oven Dried Mass (W_o), (g)	164.60
Air Dried Mass (W_a), (g)	164.99
Hygroscopic Corr. Factor ($F=W_o/W_a$)	0.9976
Air Dried Mass in Analysis (M_a), (g)	54.15
Oven Dried Mass in Analysis (M_o), (g)	54.02
Percent Passing 2.0 mm Sieve (P_{10}), (%)	86.93
Sample Represented (W), (g)	62.15

SIEVE ANALYSIS

Sieve Size mm	Cum. Wt. Retained	Percent Passing
75.0		100.0
63.0		100.0
53.0		100.0
37.5		100.0
26.5		100.0
19.0	0.0	100.0
13.2	23.5	97.0
9.5	37.6	95.2
4.75	69.4	91.2
2.00	103.3	86.9
Total (C + F)[1]	788.40	0.2
0.850	2.52	82.87
0.425	5.10	78.72
0.250	7.65	74.62
0.106	11.71	68.08
0.075	12.89	66.18
PAN	12.94	

Note 1: (C + F) = Coarse + Fine

HYDROMETER DETAILS

Volume of Bulb (V_B), (cm^3)	63.3
Length of Bulb (L_2), (cm)	14.2
Length from '0' Reading to Top of Bulb (L_1), (cm)	10.3
Scale Dimension (h_s), (cm/Div)	0.17
Cross-Sectional Area of Cylinder (A), (cm^2)	27.25
Meniscus Correction (H_m), (g/L)	1.0

START TIME 10:04 AM

HYDROMETER ANALYSIS

Date	Time	Elapsed Time T Mins	H_s Divisions g/L	H_c Divisions g/L	Temperature T_c °C	Corrected Reading $R = H_s - H_c$ g/L	Percent Passing P %	L cm	η Poise	K	Diameter D mm
03-Feb-25	10:05 AM	1	45.0	5.0	19.0	40.0	62.97	8.41798	10.34409	0.013452	0.03903
03-Feb-25	10:06 AM	2	44.0	5.0	19.0	39.0	61.40	8.58798	10.34409	0.013452	0.02788
03-Feb-25	10:09 AM	5	41.0	5.0	19.0	36.0	56.67	9.09798	10.34409	0.013452	0.01815
03-Feb-25	10:19 AM	15	38.0	5.0	19.0	33.0	51.95	9.60798	10.34409	0.013452	0.01077
03-Feb-25	10:34 AM	30	35.0	5.0	19.0	30.0	47.23	10.11798	10.34409	0.013452	0.00781
03-Feb-25	11:04 AM	60	33.0	5.0	19.0	28.0	44.08	10.45798	10.34409	0.013452	0.00562
03-Feb-25	2:14 PM	250	26.0	5.0	20.0	21.0	33.06	11.64798	10.09098	0.013286	0.00287
04-Feb-25	10:04 AM	1440	18.0	5.0	21.0	13.0	20.47	13.00798	9.84835	0.013126	0.00125

Remarks: **Moisture Content: 13.3%**

Reviewed By: Brian Prevost

Date: February 4, 2025

Moisture Content

LS - 701 / ASTM D 2216

PROJECT NO.: 250031	DATE SAMPLED: Jan 30, 2025	DATE TESTED: Feb 4, 2025
CLIENT: NCTL Investments Inc.	DATE RECEIVED:	TESTED BY: KH
LOCATION: 342-350 Queen Mary St	DATE REQUESTED:	FILE NO.:

METHOD A ■ METHOD B □

Water Content Recorded to +/- 1%			Water Content Recorded to +/- 0.1%		
Sieve Size, mm	Specimen Mass	Balance Readability, g	Sieve Size, mm	Specimen Mass	Balance Readability, g
75.0	5 kg	10	75.0	5 kg	10
37.5	1 kg	10	37.5	1 kg	10
19	250 g	0.1	19	250 g	0.1
9.5	50 g	0.1	9.5	50 g	0.1
4.75	20 g	0.1	4.75	20 g	0.1
2.00	20 g	0.1	2.00	20 g	0.1

ASTM D 2216 TABLE 1

Bore Hole:	BH2	BH2	BH2	BH2	BH2				
Sample No.:	SS1	SS2	SS3	SS4	SS6				
Depth:	2.5-4.5'	5-7'	7.5-9.5	10-12'	16-17'				
Tare No.:	28	27	27	25	32				
Tare +Wet Soil (gms)	80.38	87.92	111.25	117.99	98.93				
Tare + Dry Soil (gms)	74.18	77.25	104.55	109.25	91.20				
Mass of Water (gms)	6.20	10.67	6.70	8.74	7.73				
Mass of Tare (gms)	21.38	21.05	21.26	21.26	21.36				
Mass of Solids (gms)	52.80	56.20	83.29	87.99	69.84				
WATER CONTENT (%)	12	19	8	10	11				
Drying Tempterature (ºC), if other than 110 ±5ºC									

Bore Hole:	BH1	BH1	BH1	BH1	BH1				
Sample No.:	SS1	SS2	SS4	SS5	SS6				
Depth:	2.5-4.5'	5-7'	10-14'	12.4-14.5'	15-17'				
Tare No.:	31	30	29	36	35				
Tare +Wet Soil (gms)	83.21	131.44	98.81	117.99	118.55				
Tare + Dry Soil (gms)	75.22	114.37	91.74	109.55	107.19				
Mass of Water (gms)	7.99	17.07	7.07	8.44	11.36				
Mass of Tare (gms)	20.90	21.16	21.12	21.22	20.97				
Mass of Solids (gms)	54.32	93.21	70.62	88.33	86.22				
WATER CONTENT (%)	15	18	10	10	13				
Drying Tempterature (ºC), if other than 110 ±5ºC									

ATTACHMENT B

Laboratory Test Results for Chemical Properties

ALS Canada Ltd.

right solutions.
right partner.

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2501936**	Page	: 1 of 3
Client	: **Kollaard Associates Inc.**	Laboratory	: ALS Environmental - Waterloo
Contact	: Dean Tataryn	Account Manager	: Costas Farassoglou
Address	: 210 Prescott Street Unit 1 Kemptville ON Canada K0G1J0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 613 860 0923	Telephone	: 613 225 8279
Project	: 250031	Date Samples Received	: 31-Jan-2025 13:30
PO	: ----	Date Analysis Commenced	: 03-Feb-2025
C-O-C number	: ----	Issue Date	: 07-Feb-2025 17:55
Sampler	: ----		
Site	: ----		
Quote number	: SOA 2025		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Manager - Inorganics	Inorganics, Waterloo, Ontario
Josphin Masihi	Supervisor I	Centralized Prep, Waterloo, Ontario
Nik Perkio	Senior Analyst	Inorganics, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Inorganics, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non -infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
%	percent
µS/cm	microsiemens per centimetre
mg/kg	milligrams per kilogram
mV	millivolts
ohm cm	ohm centimetres (resistivity)
pH units	pH units

>: greater than.

<: less than.

Red shading is applied where the result or the LOR is greater than the Guideline Upper Limit (or lower than the Guideline Lower Limit, if applicable).

For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit .

Analytical Results

Sub-Matrix: **Soil**
(Matrix: **Soil/Solid**)

Analyte	Method/Lab	LOR	Unit	Client sample ID: BH1 - SS3 (7.5' TO 9.5') Sampling date/time: 30-Jan-2025 11:00 WT2501936-001	ON153/04 T6-ICC-C	ON153/04 T6-ICC-F	ON153/04 T6-RPI-C	ON153/04 T6-RPI-F	--	--
Physical Tests										
Conductivity (1:2 leachate)	E100-L/WT	5.00	µS/cm	317	**1400 µS/cm**	**1400 µS/cm**	**700 µS/cm**	**700 µS/cm**	--	--
Moisture	E144/WT	0.25	%	10.2	--	--	--	--	--	--
Oxidation-reduction potential [ORP]	E125/WT	0.10	mV	223	--	--	--	--	--	--
pH (1:2 soil:CaCl2-aq)	E108A/WT	0.10	pH units	7.73	--	--	--	--	--	--
Resistivity	EC100R/WT	100	ohm cm	3150	--	--	--	--	--	--
Inorganics										
Sulfides, acid volatile	E396-L/WT	0.20	mg/kg	<0.23	--	--	--	--	--	--
Leachable Anions & Nutrients										
Chloride, soluble ion content	E236.Cl/WT	5.0	mg/kg	22.4	--	--	--	--	--	--
Sulfate, soluble ion content	E236.SO4/WT	20	mg/kg	146	--	--	--	--	--	--

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

No Breaches Found

Key:

ON153/04 — Ontario Regulation 153/04 - April 15, 2011 Standards (JUL, 2011)

- T6-ICC-C — 153 T6-Soil-Ind/Com/Commu Property Use (Coarse)
- T6-ICC-F — 153 T6-Soil-Ind/Com/Commu Property Use (Fine)
- T6-RPI-C — 153 T6-Soil-Res/Park/Inst. Property Use (Coarse)
- T6-RPI-F — 153 T6-Soil-Res/Park/Inst. Property Use (Fine)

ALS Canada Ltd.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2501936**	Page	:
Client	: **Kollaard Associates Inc.**	Laboratory	: ALS Environmental - Waterloo
Contact	: Dean Tataryn	Account Manager	: Costas Farassoglou
Address	: 210 Prescott Street Unit 1 Kemptville ON Canada K0G1J0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 613 860 0923	Telephone	: 613 225 8279
Project	: 250031	Date Samples Received	: 31-Jan-2025 13:30
PO	: ----	Issue Date	: 07-Feb-2025 17:55
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: SOA 2025		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: ✖ = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation: Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis: Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Inorganics : Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)										
LDPE bag BH1 - SS3 (7.5' TO 9.5')	E396-L	30-Jan-2025	07-Feb-2025	0 hrs	197 hrs	✖ UCP	07-Feb-2025	0 hrs	197 hrs	✖ UCP
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
LDPE bag BH1 - SS3 (7.5' TO 9.5')	E236.Cl	30-Jan-2025	06-Feb-2025	30 days	7 days	✓	07-Feb-2025	28 days	1 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
LDPE bag BH1 - SS3 (7.5' TO 9.5')	E236.SO4	30-Jan-2025	06-Feb-2025	30 days	7 days	✓	07-Feb-2025	28 days	1 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
LDPE bag BH1 - SS3 (7.5' TO 9.5')	E100-L	30-Jan-2025	05-Feb-2025	30 days	7 days	✓	06-Feb-2025	30 days	7 days	✓
Physical Tests : Moisture Content by Gravimetry										
LDPE bag BH1 - SS3 (7.5' TO 9.5')	E144	30-Jan-2025	----	----	----		03-Feb-2025	----	4 days	
Physical Tests : ORP by Electrode										
LDPE bag BH1 - SS3 (7.5' TO 9.5')	E125	30-Jan-2025	04-Feb-2025	180 days	5 days	✓	05-Feb-2025	180 days	6 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
LDPE bag BH1 - SS3 (7.5' TO 9.5')	E108A	30-Jan-2025	05-Feb-2025	30 days	6 days	✓	07-Feb-2025	30 days	8 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	1862391	1	20	5.0	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	1864103	1	20	5.0	5.0	✓
ORP by Electrode	E125	1862204	1	18	5.5	5.0	✓
Moisture Content by Gravimetry	E144	1860919	1	20	5.0	5.0	✓
Water Extractable Chloride by IC	E236.Cl	1862393	1	20	5.0	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	1862392	1	20	5.0	5.0	✓
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L	1867212	1	1	100.0	4.7	✓
Laboratory Control Samples (LCS)							
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	1862391	2	20	10.0	10.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	1864103	1	20	5.0	5.0	✓
ORP by Electrode	E125	1862204	1	18	5.5	5.0	✓
Moisture Content by Gravimetry	E144	1860919	1	20	5.0	5.0	✓
Water Extractable Chloride by IC	E236.Cl	1862393	2	20	10.0	10.0	✓
Water Extractable Sulfate by IC	E236.SO4	1862392	2	20	10.0	10.0	✓
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L	1867212	1	1	100.0	4.7	✓
Method Blanks (MB)							
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	1862391	1	20	5.0	5.0	✓
Moisture Content by Gravimetry	E144	1860919	1	20	5.0	5.0	✓
Water Extractable Chloride by IC	E236.Cl	1862393	1	20	5.0	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	1862392	1	20	5.0	5.0	✓
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L	1867212	1	1	100.0	4.7	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by “mod”).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L ALS Environmental - Waterloo	Soil/Solid	CSSS Ch. 15 (mod)/APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Conductance is measured in the fluid that is observed in the upper layer.
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A ALS Environmental - Waterloo	Soil/Solid	MECP E3530	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C) and is carried out in accordance with procedures described in the Analytical Protocol (prescriptive method). A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling, or decanting and then analyzed using a pH meter and electrode. This method is equivalent to ASTM D4972 and is acceptable for topsoil analysis.
ORP by Electrode	E125 ALS Environmental - Waterloo	Soil/Solid	APHA 2580 (mod)	Oxidation Redution Potential (ORP) is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed in the analysis, measured in mV.
Moisture Content by Gravimetry	E144 ALS Environmental - Waterloo	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Water Extractable Chloride by IC	E236.Cl ALS Environmental - Waterloo	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.
Water Extractable Sulfate by IC	E236.SO4 ALS Environmental - Waterloo	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L ALS Environmental - Waterloo	Soil/Solid	APHA 4500S2J	This analysis is carried out in accordance with the method described in APHA 4500 S2-J. After extraction the Acid Volatile Sulphide is determined colourimetrically.
Resistivity Calculation for Soil Using E100-L	EC100R ALS Environmental - Waterloo	Soil/Solid	APHA 2510 B	Soil Resistivity (calculated) is determined as the inverse of the conductivity of a 2:1 water:soil leachate (dry weight). This method is intended as a rapid approximation for Soil Resistivity. Where high accuracy results are required, direct measurement of Soil Resistivity by the Wenner Four-Electrode Method (ASTM G57) is recommended.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 ALS Environmental - Waterloo	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Leach 1:2 Soil : 0.01CaCl2 - As Received for pH	EP108A ALS Environmental - Waterloo	Soil/Solid	MOEE E3137A	A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling or decanting and then analyzed using a pH meter and electrode.
Preparation of ORP by Electrode	EP125 ALS Environmental - Waterloo	Soil/Solid	APHA 2580 (mod)	Field-moist sample is extracted in a 1:2 ratio with DI water and then analyzed by ORP meter.
Anions Leach 1:10 Soil:Water (Dry)	EP236 ALS Environmental - Waterloo	Soil/Solid	EPA 300.1	5 grams of dried soil is mixed with 50 grams of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.
Distillation for Acid Volatile Sulfide in Soil	EP396-L ALS Environmental - Waterloo	Soil/Solid	APHA 4500S2J	Acid Volatile Sulfide is determined by colourimetric measurement on a sediment sample that has been treated with hydrochloric acid within a purge and trap system, where the evolved hydrogen sulfide gas is carried into a basic solution by argon gas for analysis.

ALS Canada Ltd.

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QUALITY CONTROL REPORT

Work Order	: **WT2501936**	Page	: 1 of 5
Client	: Kollaard Associates Inc.	Laboratory	: ALS Environmental - Waterloo
Contact	: Dean Tataryn	Account Manager	: Costas Farassoglou
Address	: 210 Prescott Street Unit 1 Kemptville ON Canada K0G1J0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 613 860 0923	Telephone	: 613 225 8279
Project	: 250031	Date Samples Received	: 31-Jan-2025 13:30
PO	: ----	Date Analysis Commenced	: 03-Feb-2025
C-O-C number	: ----	Issue Date	: 07-Feb-2025 17:55
Sampler	: ----		
Site	: ----		
Quote number	: SOA 2025		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Josphin Masihi	Supervisor I	Waterloo Centralized Prep, Waterloo, Ontario
Nik Perkio	Senior Analyst	Waterloo Inorganics, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 1860919)											
WP2501200-018	Anonymous	Moisture	----	E144	0.25	%	46.7	46.3	0.950%	20%	----
Physical Tests (QC Lot: 1862204)											
WT2501670-001	Anonymous	Oxidation-reduction potential [ORP]	----	E125	0.10	mV	240	231	3.82%	25%	----
Physical Tests (QC Lot: 1862391)											
EO2500794-021	Anonymous	Conductivity (1:2 leachate)	----	E100-L	5.00	μS/cm	97.6	97.0	0.617%	20%	----
Physical Tests (QC Lot: 1864103)											
EO2500794-021	Anonymous	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	7.86	7.89	0.381%	5%	----
Inorganics (QC Lot: 1867212)											
WT2501936-001	BH1 - SS3 (7.5' TO 9.5')	Sulfides, acid volatile	----	E396-L	0.23	mg/kg	<0.23	<0.23	0	Diff <2x LOR	----
Leachable Anions & Nutrients (QC Lot: 1862392)											
EO2500794-021	Anonymous	Sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	<20	<20	0	Diff <2x LOR	----
Leachable Anions & Nutrients (QC Lot: 1862393)											
EO2500794-021	Anonymous	Chloride, soluble ion content	16887-00-6	E236.Cl	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	*Result*	*Qualifier*
Physical Tests (QCLot: 1860919)						
Moisture	----	E144	0.25	%	<0.25	----
Physical Tests (QCLot: 1862391)						
Conductivity (1:2 leachate)	----	E100-L	5	μS/cm	<5.00	----
Inorganics (QCLot: 1867212)						
Sulfides, acid volatile	----	E396-L	0.2	mg/kg	<0.20	----
Leachable Anions & Nutrients (QCLot: 1862392)						
Sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	<20	----
Leachable Anions & Nutrients (QCLot: 1862393)						
Chloride, soluble ion content	16887-00-6	E236.Cl	5	mg/kg	<5.0	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Spike Target Concentration	Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Physical Tests (QCLot: 1860919)									
Moisture	----	E144	0.25	%	50 %	100	90.0	110	----
Physical Tests (QCLot: 1862391)									
Conductivity (1:2 leachate)	----	E100-L	5	µS/cm	1410 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 1864103)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	101	98.0	102	----
Inorganics (QCLot: 1867212)									
Sulfides, acid volatile	----	E396-L	0.2	mg/kg	100 mg/kg	82.0	70.0	130	----
Leachable Anions & Nutrients (QCLot: 1862392)									
Sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	1000 mg/kg	99.4	80.0	120	----
Leachable Anions & Nutrients (QCLot: 1862393)									
Chloride, soluble ion content	16887-00-6	E236.Cl	5	mg/kg	1000 mg/kg	101	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	RM Target Concentration	Recovery (%) RM	Recovery Limits (%) Low	Recovery Limits (%) High	Qualifier
Physical Tests (QCLot: 1862204)									
QC-1862204-001	RM	Oxidation-reduction potential [ORP]	----	E125	475 mV	101	90.0	110	----
Physical Tests (QCLot: 1862391)									
QC-1862391-003	RM	Conductivity (1:2 leachate)	----	E100-L	3260 µS/cm	103	70.0	130	----
Leachable Anions & Nutrients (QCLot: 1862392)									
QC-1862392-003	RM	Sulfate, soluble ion content	14808-79-8	E236.SO4	539 mg/kg	97.9	70.0	130	----
Leachable Anions & Nutrients (QCLot: 1862393)									
QC-1862393-003	RM	Chloride, soluble ion content	16887-00-6	E236.Cl	756 mg/kg	99.7	70.0	130	----

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

Environmental Division
Waterloo
Work Order Reference
WT2501936

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	Kollaard Associates (27196)
Contact:	Dean Tataryn
Phone:	613.860.0923, ext.230
	Company address below will appear on the final report
Street:	210 Prescott Street, Unit 1 P.O. Box 189
City/Province:	Kemptville, Ontario
Postal Code:	K0G 1J0
Invoice To	Same as Report To ☑ Y ☐ N
	Copy of Invoice with Report ☐ Y ☑ N
Company:	Kollaard Associates Inc.
Contact:	admin@kollaard.ca

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ Y ☐ N
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	dean@kollaard.ca
Email 2	
Email 3	
Invoice Distribution	
Select Invoice Distribution:	☐ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	admin@kollaard.ca
Email 2	

Select Service Level Below - C...	...s may apply)
Regular [R] ☑ Standard T...	
PRIORITY (Business Days) 4 day [P4-20%] ☐	
3 day [P3-25%] ☐	[E2 -200% ☐
2 day [P2-50%] ☐	
Date and Time Required for all E&P ...	
For tests that can not be performed according t...	

Project Information	
ALS Account # / Quote #:	Q71021
Job #:	250031
PO / AFE:	
LSD:	
ALS Lab Work Order # (lab use only):	mt

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Corrosivity	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
	BH1 - SS3 (7.5' to 9.5')	30-01-2025	11:00	Soil				

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ Y ☑ N	Ontario Regulation 153/04 - April 15, 2011 Standards
Are samples for human consumption/ use? ☐ Y ☑ N	Table 6, Potable, Full depth residential standards, coarse-grained soils

SAMPLE CONDITION AS RECEIVED (lab use only)		
Frozen ☐	SIF Observations Yes ☐	No ☐
Ice Packs ☐ Ice Cubes ☐	Custody seal intact Yes ☐	No ☐
Cooling Initiated ☐	None	
INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C	
10	6.1	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by: Steph	Date: 31 Jan 25	Time: 1:30	Received by: VM	Date: Feb 1	Time: 11:05

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

SEPT 2017 FRONT

ATTACHMENT C

National Building Code Seismic Hazard Calculation

2015 National Building Code Seismic Hazard Calculation

INFORMATION: **Eastern Canada English (613) 995-5548 français (613) 995-0600 Facsimile (613) 992-8836**
Western Canada English (250) 363-6500 Facsimile (250) 363-6565

Site: 45.425N 75.650W

2025-01-14 16:51 UT

Requested by: Kollaard Associates Inc

Probability of exceedance per annum	0.000404	0.001	0.0021	0.01
Probability of exceedance in 50 years	2 %	5 %	10 %	40 %
Sa (0.05)	0.454	0.252	0.151	0.045
Sa (0.1)	0.531	0.304	0.189	0.062
Sa (0.2)	0.445	0.258	0.163	0.055
Sa (0.3)	0.338	0.197	0.125	0.044
Sa (0.5)	0.240	0.140	0.089	0.031
Sa (1.0)	0.119	0.070	0.045	0.015
Sa (2.0)	0.056	0.033	0.021	0.006
Sa (5.0)	0.015	0.008	0.005	0.001
Sa (10.0)	0.005	0.003	0.002	0.001
PGA (g)	0.285	0.165	0.103	0.033
PGV (m/s)	0.199	0.112	0.068	0.021

Notes: Spectral (Sa(T), where T is the period in seconds) and peak ground acceleration (PGA) values are given in units of g (9.81 m/s^2). Peak ground velocity is given in m/s. Values are for "firm ground" (NBCC2015 Site Class C, average shear wave velocity 450 m/s). NBCC2015 and CSAS6-14 values are highlighted in yellow. Three additional periods are provided - their use is discussed in the NBCC2015 Commentary. Only 2 significant figures are to be used. **These values have been interpolated from a 10-km-spaced grid of points. Depending on the gradient of the nearby points, values at this location calculated directly from the hazard program may vary. More than 95 percent of interpolated values are within 2 percent of the directly calculated values.**

References

National Building Code of Canada 2015 NRCC no. 56190; Appendix C: Table C-3, Seismic Design Data for Selected Locations in Canada

Structural Commentaries (User's Guide - NBC 2015: Part 4 of Division B)
Commentary J: Design for Seismic Effects

Geological Survey of Canada Open File 7893 Fifth Generation Seismic Hazard Model for Canada: Grid values of mean hazard to be used with the 2015 National Building Code of Canada

See the websites www.EarthquakesCanada.ca and www.nationalcodes.ca for more information