McINTOSH PERRY

MEMORANDUM

To:	Ottawa Septic System Office
From:	Patrick Leblanc, P.Eng., Senior Environmental Engineer
Date:	May 3, 2022
Re:	City of Ottawa - Corkery Community Centre Expansion - Sewage System Assessment Update 3447 Old Almonte Road, Carp, ON

The firm of McIntosh Perry Consulting Engineers Ltd. (McIntosh Perry) was originally retained by the City of Ottawa to complete an on-site sewage system assessment at the above-noted property in 2019. The purpose of the inspection was to assess the physical condition of the existing sewage system and determine the size and location of the components. A capacity assessment of the existing system was also conducted to the determine the maximum capacity of the system in the event there are future expansions associated with the existing building.

Based on our field investigation, the existing building is serviced by a Class IV sewage system consisting of a two compartment 10,870 L (+/-) concrete septic tank and associated absorption trench leaching bed. Using hand operated equipment, our probe holes and test holes revealed a leaching bed comprised of approximately 8 runs each with a length of 18.5 m, for a total of 148 linear metres of distribution piping.

It should be noted that the findings of the initial assessment regarding the existing underlying native soils in the vicinity of the Class 4 leaching bed have been updated based on a supplementary field investigation conducted by McIntosh Perry in 2021, along with the review of the Geotechnical Investigation (exp., July 2021) conducted to support of the proposed Corkery Community Centre expansion.

1.0 SITE ASSESSMENT

As part of the initial assessment, McIntosh Perry completed two site inspections of the above-noted property on November 29, 2019 and again on January 9, 2020 to assess the existing on-site sewage system. As part of the 2021 assessment update, McIntosh Perry completed an additional site visit on December 22, 2021 after identifying discrepancies between the findings of the initial native soils assessment (2019) and the newly available Geotechnical Investigation (exp., July 2021).

1.1 SEPTIC TANK

The observed existing concrete septic tank appeared to have a working capacity of approximately 10,870 L, based on internal and external measurements. The areas of the concrete tank that were visible (i.e. above the water level) generally appeared to be in good condition. The original concrete lids have been replaced with steel manholes risers and lids which have been extended to the ground surface. No root intrusion or ground water infiltration were evident within the visible areas of the septic tank. Rigid insulation boards have been placed within the riser openings. The interior concrete centre wall was in place and appeared to be functioning

as per design; solids and floatables in the first compartment, and liquid effluent in the second compartment. The interior PVC inlet and outlet baffles were in place and appeared to be functioning. It should noted that although the septic tank was installed with outlet baffle, it was not outfitted with an effluent filter as is currently required by the OBC.

The applicable minimum horizontal clearances from the septic tank are as follows (Ontario Building Code (OBC) Table 8.2.1.6.A.):

- 1.5 m from a structure;
- 15 m from a drilled well;
- 30 m from a dug well;
- 15 m from a Lake, and
- 3 m from a property line.

The minimum setbacks for the septic tank were met, however, it should ne noted that the septic tank was measured to be at the minimum separation distance of 15m.

1.2 LEACHING BED

The location of the leaching bed was located through probe holes and hand dug test pits, and the extent was estimated based on the local topography and the known location of the septic tank and other site features. Two test pits (TP1 and TP2) were advanced as part of the initial assessment within the leaching bed area and exposed the distribution pipe, stone surrounding the pipe, and native soil. An additional test pit (TP3) was advanced beyond the partially raised portion of the sewage system in the expected direction of subsurface flow as part of the 2021 assessment update to confirm the native soil description (see Figure 1). No ponded water was observed around the distribution pipe in any of the test hole locations.

The leaching bed is comprised of 8 runs of approximately 18.5 m each in length, spaced at 1.6 m, centre to centre. The absorption trenches consisted of a stone layer averaging in 0.35 m in thickness, overlain by approximately 0.3 m to 0.6 m of cover material, based on the observations made at both test hole locations advanced in the leaching bed. The stone layer is underlain by sand material which was observed to a depth of 0.9 m below the stone layer. The absorption trenches appeared to meet the requirements of OBC 8.7.3.2.(1). The clear stone trenches were clearly defined and overlain with a non-woven geotextile. OBC Clause 8.7.3.3(5) states that the stone layer must be comprised of washed septic stone, free of fine material, with gradation conforming to OBC Table 8.7.3.3, be not less than 0.5 m in width, extend not less than 0.15 m below the distribution pipe, and extend not less than 0.05 m above the distribution pipe. Therefore, the stone around the distribution pipes located in test pits met the OBC requirements for the stone layer. OBC Clause 8.7.3.3(2) states that the stone layer must be protected to prevent soil from entering the stone by covering it with untreated building paper or a permeable geo-textile fabric. The stone layer was protected by permeable geo-textile as per OBC requirements.

A percolation rate of approximately 8 min/cm was determined to be appropriate for the imported sand material present below the clear stone layer using OBC's Supplementary Standard SB-6 for Percolation Time and Soil Descriptions.

No anaerobic biomat or ponded effluent was observed within the clear stone layer or the sand in both test hole locations which presents itself as a black sludge coating the sand and the clear stone. TP1 was put down towards the header (nearest the building), on the south west side of the leaching bed. TP2 was put down towards the footer and north east side of the leaching bed. Typically, as the leaching bed starts aging, the anaerobic biomat will start forming towards the header and centre of the leaching bed, since this is where the effluent travels first.

No visible signs of failure were observed at the time of this inspection. Visible signs of sewage disposal system failure can include strong odours, spongy soil, excessive grass growth, effluent breakout, and excessive algae growth in downstream water bodies. Visual observation of the ground surface near the leaching bed did not uncover signs of strong odours, unusual vegetation growth, or effluent breakout. No spongy soil was observed on the surface of the leaching bed.

The applicable minimum horizontal clearances from the distribution piping are as follows (OBC Table 8.2.1.6.B.):

- 5 m from a structure;
- 15 m from a well with a watertight casing to a depth of at least 6 m;
- 30 m from any other well;
- 15 m from a Lake, and
- 3 m from a property line.

However, as per OBC 8.7.4.2.(11), the horizontal clearance distances from the distribution piping shall be increased by twice the height that the leaching bed is raised above the original grade. Based on our field observations, this system was most likely installed as a partially raised leaching bed, as such, an increased separation distance of up to 1.5 m should be required given that the system appears raised approximately 0.75m above surrounding grade. The applicable minimum horizontal clearances from the distribution piping are as follows:

- 6.5 m from a structure;
- 16.5 m from a well with a watertight casing to a depth of at least 6 m;
- 16.5 m from a Lake; and,
- 4.5 m from a property line.

The distribution piping meets all applicable minimum horizontal clearances.

2.0 CAPACITY ASSESSMENT

No existing documentation was available to us prior to our site visit, as such, the information gathered during the field investigation was relied upon to calculate the existing capacity of the existing system based on the

Ontario Building Code (OBC) guidelines. Two file searches were submitted to the Ottawa Septic System Office (OSSO). The file search was originally performed by the OSSO for the property at civic address 3449 Old Almonte Road provided sewage system information related to the Fire Station 84, as such, a secondary file search was submitted for 3447 Old Almonte Road; there were not results from either of the searches.

The following information was reviewed as part of this capacity assessment:

- Findings from the Sewage System Assessment by McIntosh Perry;
- Email correspondence with City of Ottawa project team outlining current and proposed building information (e.g. size and fixtures) and occupancy, and
- Google Earth imagery (aerial photography and street view).
- Geotechnical Investigation – Corkery Community Centre Expansion (exp., July 2021)

2.1 Existing Conditions

As no permit was available for review, there was no record of the existing daily sewage system design flow used for design. Based on information provided to McIntosh Perry, the building was originally serviced by a holding tank and a leaching bed was added around 2001. As indicated in the physical assessment of the sewage system, the property is currently serviced by a conventional Class IV septic system. The system consists of a 10,870 L +/- concrete tank and the associated leaching bed.

The existing building is approximately 120 m² and has a kitchen with a double sink. The building also has a male and female washroom each with two water closet fixtures and a sink. It is our understanding that there are no washing machines or dishwashers located in the existing building. As part of the proposed building expansion, the existing kitchen will be relocated to the proposed expansion and will include an additional sink, a utility sink/pan will be installed within the new janitor's room, and a new single additional universal washroom will installed within the existing building in addition to the male and female washrooms. To determine the maximum capacity of the system, three components were examined with regards to sizing. The total contact area, septic tank sizing, and total length of distribution piping. Using these restrictions, it is possible to review different scenarios to justify a design flow. These theoretical design flows are discussed further in section 2.2 of this memorandum.

Using the current OBC guidelines for minimum contact area required for the current building use (OBC Clause 8.7.4.1), the contact area has been provided using native soils (dense silty gravel with sand (GM)/silt sand with gravel (SM)) with an estimated T-time between 12 min/cm to 20 min/cm as per OBC's Supplementary Standard SB-6 for Percolation Time and Soil Descriptions. Please refer to the attached Geotechnical Investigation (exp., July 2021) for a copy of soil sieve analysis for the overburden material encountered immediately north of the existing sewage system and that is in accordance with findings of TP3 advanced by McIntosh Perry immediately beyond the raise portion of the sewage system. As such, the associated maximum total daily design flow would not be restricted by the available contact area as the native SM/GM soils are expected to extend significantly beyond the edge of the raised portion of the leaching bed and provide more than the minimum contact area of 370 m^2 (10 L/m^2/day for soil with T-time ≤ 20 min/cm) for the theoretical leaching bed capacity of 3,700 L/day.

Using the current OBC guidelines for minimum septic tank size for the current building use (OBC Clause 8.2.2.3.(1)), the minimum required tank size is 3 times the design flow for commercial/institutional use, therefore, a 10,870L septic tank would permit a maximum total daily design flow of 3,600L/day.

Using the current OBC guidelines for calculating the required length of distribution pipe (OBC Clause 8.7.3.1.(2)), and using the T-time of 8 min/cm for the imported 900mm of sand below the absorption trenches, the total provided length of distribution pipe of 148m would be suitable to service up to 3,700L/day.

2.2 Proposed Conditions

Part of this review includes establishing a flow associated with a new 387.7 m^2 building expansion and the associated increase in occupancy. Ontario Building Code Part 11 Data Matrix completed by the project's architect lists the total assembly occupancy for the entire facility at 150 persons. By using current OBC guidelines, the flow associated with this occupancy can vary depending on the intended use of the building and has been broken down below into three options.

1. Assembly Hall, No food Service (8L/day/person) = 150 people x 8L/day = 1,200 L/day
2. Public Parks, With Toilets Only (20L/day/person) = 150 people x 20L/day = 3,000 L/day
3. Assembly Hall, Food Service Provided (36L/day/person) = 100 people x 36L/day = 3,600L/day

As per the options presented above to calculate the daily sanitary design flow, it is proposed that the capacity of the existing sewage system be rated at 3,600 L/day. This would be associated with an occupant load of 450 people for assembly hall with no food service, 180 people for public parks with toilets only, or 100 people for assembly hall occupancy with food service provided.

Please note that in consultation with the City of Ottawa's project manager for the proposed expansion project it was established that typical maximum daily occupancy for the building would be 75 people, with a peak of 125 people expected to only occur approximately once or twice a year. It was also clarified that for larger external events (such as soccer tournaments), portable toilets would be brought to site specifically for the event.

3.0 CONCLUSIONS

In summary, the existing sewage system appears to be hydraulically functioning and is not showing signs of significant impacts with would affect its performance at this time. The existing absorption trench leaching bed appears to have met the OBC installation requirements, but it is unknown what design daily flow was used for the original building. As a result, the sizing of the sewage system components has been assessed individually and the limiting design flow of 3,600L/day based on existing septic tanks sizing should be considered to be the minimum. Should a larger septic tank be installed, the existing sewage system based on the existing length of distribution pipes could be expected to support up to 3,700L/day.

Following a review of the available information, as well as an assessment of the physical condition of the sewage system, the subsequent conclusions were determined:

- It appears the OSSO has no records of the original holding tank and later addition of the distribution pipes that converted the sewage system from a Class 5 to a Class 4. The sewage system appears to be functioning hydraulically and distribution piping appears to have been installed to support up to 3,700L/day, however, it does appear that based on OBC requirements, the existing septic tank capacity is the limiting factor in establishing the system's actual daily design flow;
- Based on observations at the time of inspection, the leaching bed did not show any signs of physical failure that would warrant immediate remediation measures be implemented.
- Installation of an effluent filter on the outlet of the septic tank to comply with the requirements of the OBC should be considered regardless of a possible expansion of the facility, and
- The proposed building addition would likely trigger an OBC Part 8 review the regulator. It is recommended that a Part 10/11 renovation permit be obtained from the local Part OBC Part regulator (OSSO) to formalize the findings of this assessment and to ensure a permit is obtained for future reference. As part of the OSSO application, the only recommended change/upgrade to the sewage system will be to install an effluent filter as a retrofit on the septic tank's outlet.

If you have any questions regarding the above, please do not hesitate to contact the undersigned.

Regards,

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Memorandum - Corkery Community Centre - Sewage System Assessment Update.May.3.2022.docx

Attach.: Fig. 1 -Existing Sewage System Plan – Corkery Community Centre Sewage System Assessment (McIntosh Perry, Rev.1, May.3.2022)
Geotechnical Investigation – Corkery Community Centre Expansion (exp., July 2021)

TBM: TOP OF EXISTING DRILLED WELL
ASSUMED ELEVATION = 100.00m

No.	Revision/Issue	Date
1	REVISED/FOR OSSO SUBMISSION	MAY/3/2022
0	ISSUED FOR REVIEW	JAN/08/20

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Stamp:

Stamp:

Client:
CITY OF OTTAWA
100 CONSTELLATION DRIVE

Project:
CORKERY COMMUNITY CENTRE
SEWAGE SYSTEM ASSESSMENT
3447 OLD ALMONTE ROAD

Drawing Title:
EXISTING SEWAGE
SYSTEM PLAN

Scale: 1:250
Drawn by: BA
Checked By: PL
Designed By:
Date: DEC/20/19

Project Number: CM-19-0590/ CCO-21-3339

Drawing Number: FIG.1

Geotechnical Investigation

Client:
City of Ottawa
Design and Construction, Facilities – Unit 2
100 Constellation Drive, 6th Floor West, Ottawa, Ontario
Attn: Nupur Chakravorty

Type of Document:
Final Report

Project Name:
Geotechnical Investigation
Corkery Community Centre Expansion
3447 Old Almonte Road, Carp, Ontario

Project Number:
OTT-21010977-A0

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Date Submitted:
2021-07-20

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Executive Summary

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed for the proposed Corkery Community Centre Expansion located at 3447 Old Almonte Road, Carp, Ontario (Figure 1). EXP's terms of reference for this project was provided in our Proposal Number OTT-21010977-A0 dated May 21, 2021 and was authorized by the City of Ottawa via Standing Offer RFSO-30019-91842-S01 Category 4 via Purchase Order Number: xxxxx.

It is our understanding that the proposed development will consist of a 21.2 m by 24.6 m slab-on-grade addition to be constructed on the east side of the existing building. Grading & servicing plans were not available at the time of the submission of this report. However, it has been assumed that the elevation of the ground floor of the new addition will match the ground floor elevation of the existing building. The community centre is currently serviced by private domestic well and a septic bed system situated on the north and south sides of the existing building respectively. A storm drainage system (storm lines and catch-basin) was not observed at the site.

The fieldwork for this investigation was undertaken on June 17 and June 23, 2021 and consists of seven (7) test holes (boreholes and test pits) consisting of four (4) boreholes (Borehole Nos. 1 to 4) and three (3) test pits (Test Pit Nos. 1 to 3) located within the building envelope of the proposed addition. Test Pit No. 1 was located next to the exterior wall of the existing building at the northeast corner of the building. The purpose of this test pit is to establish the type and depth of the foundation supporting the existing building. Test Pit Nos. 2 and 3 are located within the footprint of the proposed building addition for the purpose of confirming the subsurface conditions encountered in the boreholes. The test pits were advanced to bucket refusal depths of 1.3 m to 1.7 m below existing grade. The boreholes were advanced to termination/refusal depths between 1.8 m to 3.3 m below existing grade. The fieldwork was supervised on a full-time basis by a representative from EXP.

The test hole information indicates that beneath the surficial topsoil and pavement structure, fill extends to the surface of the bedrock contacted at depths of 1.3 m to 2.0 m (Elev. 158.8 m to 158.3 m). The exception to this is Borehole No. 4 where the fill extends to the native silty sand to sandy silt contacted at a 1.5 m depth (Elevation 159.0 m). It is noted that a 100 mm thick concrete layer was contacted between the fill and the underlying bedrock in Borehole No. 3 at a 1.5 m depth (Elevation 158.5 m). Based on auger refusal in the boreholes and bucket refusal in the test pits, bedrock was contacted at depths ranging between 1.3 m and 2.1 m below existing grade (Elevation 158.8 m to Elevation 158.3 m). As previously indicated, a 100 mm thick concrete layer was contacted on top of the bedrock in Borehole No. 3 at a 1.5 m depth (Elevation 158.5 m). The origin of the concrete is not known. It is possible that the buried concrete may extend to other areas of the site. The groundwater level is at 1.6 m and 2.6 m depths (Elevation 158.6 m and Elevation 157.4 m).

Test pit No.1 excavated close to the northeast corner of the existing building indicated the existing building is likely supported by a thickened concrete slab type foundation founded on a 300 mm slab on grade/thickened slab foundation founded compacted granular material placed on the surface of the bedrock contacted at a depth of 1.6 m below grade. Based on a review of our observations of the 'as-built' details exposed in the test pit, it is recommended that the thickened concrete slab that appears to be supporting the existing building be confirmed by conducting additional test pits around the existing building. Based on the findings from the additional test pits, this report may need to be updated.

The site may be classified as **Class C** for seismic site response in accordance with the 2012 Ontario Building Code (as amended May 2, 2019). The subsurface soils are not considered to be liquefiable during a seismic event.

Significant grade raise is not expected at the site as part of the proposed building addition. Compressible soils were not encountered at the site and therefore, there is no restriction to site grade raise. However, for design purposes, a maximum grade raise of 1 m can be used.

The existing fill is not considered suitable to support the proposed building addition. Therefore, it is recommended that the proposed addition be founded on a thickened slab-type of foundation that is similar to the existing building and is constructed on an engineered fill pad placed on top of the native soil or bedrock.

The thickened concrete slab designed to bear on the properly prepared engineered fill pad constructed as noted above may be designed for a bearing pressure at Serviceability Limit State (SLS) of 150 kPa and factored geotechnical resistance at Ultimate Limit State (ULS) of 225 kPa. The factored geotechnical resistance at ULS includes a geotechnical resistance factor of 0.5. Settlements of the slab designed for the SLS bearing pressure recommended above and properly constructed are expected to be within the normally tolerated limits of 25 mm total and 19 mm differential movements. Adequate saw cuts should be provided in the floor slab to control cracking.

All excavations must be undertaken in accordance with the Occupational Health and Safety Act (OHSA), Ontario Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils on site are considered to be Type 3 and as such must be cut back at 1H:1V from the bottom of the excavation. Seepage of the surface and subsurface water into the excavations is anticipated. However, it should be possible to collect water entering the excavations at low points and to remove it by conventional sump pumping techniques.

It is anticipated that material required for the construction of the engineered fill pad and for backfilling purposes would have to be imported and should preferably conform to OPSS 1010 Granular B Type II. The on-site excavated material may be used for grading purposes in the landscaped areas.

The reinstated pavement structure for pedestrian pathways that may be affected by the construction of the new building addition should consist of 50 mm thick HL3F underlain by 300 mm thick OPSS Granular A base layer.

The above and other related considerations are discussed in greater detail in the main body of this report.

1. Introduction

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed for the proposed Corkery Community Centre Expansion located at 3447 Old Almonte Road, Carp, Ontario (Figure 1). EXP's terms of reference for this project was provided in our Proposal Number OTT-21010977-A0 dated May 21, 2021 and was authorized by the City of Ottawa via Standing Offer RFSO-30019-91842-S01 Category 4 via Purchase Order Number: xxxxx..

It is our understanding that the proposed development will consist of a 21.2 m by 24.6 m slab-on-grade addition to be constructed on the east side of the existing building. Grading and servicing plans were not available at the time of the submission of this report. However, it has been assumed that the elevation of the ground floor of the new addition will match the ground floor elevation of the existing building. The existing community centre is currently serviced by private domestic well and a septic bed system situated on the north and south sides of the existing building respectively. A storm drainage system (storm lines and catch-basin) was not observed at the site.

The geotechnical investigation was undertaken to:

a) Establish the subsurface soil and groundwater conditions at four (4) boreholes and three (3) test pits located within the envelope of the proposed new building addition;

b) Establish the 'as-built' detail of an exposed section of the foundation of the existing building in one (1) test pit located along the exterior wall of the existing building at the northeast corner of the building;

c) Classify the site for seismic site response in accordance with the requirements of the 2012 Ontario Building Code (as amended May 2, 2019) and assess the potential for liquefaction of the subsurface soils during a seismic event;

d) Comment on grade-raise restrictions;

e) Make recommendations regarding the most suitable type of foundations, founding depth and bearing pressure at serviceability limit state (SLS) and factored geotechnical resistance at ultimate limit state (ULS) of the founding strata and comment on the anticipated total and differential settlements of the recommended foundation type;

f) Comment on excavation conditions and de-watering requirements during construction; and

g) Discuss backfilling requirements and suitability of on-site soils for backfilling purposes.

The comments and recommendations given in this report are based on the assumption that the above-described design concepts will proceed into construction. If changes are made either in the design phase or during construction, this office must be retained to review these modifications. The result of this review may be a modification of our recommendations, or it may require additional field or laboratory work to check whether the changes are acceptable from a geotechnical viewpoint.

2. Procedure

The fieldwork for this investigation was undertaken on June 17 and June 23,2021 and consists of seven (7) test holes (boreholes and test pits) consisting of four (4) boreholes (Borehole Nos. 1 to 4) and three (3) test pits (Test Pit Nos. 1 to 3) located within the building envelope of the proposed addition. Test Pit No. 1 was located next to the exterior wall of the existing building at the northeast corner of the building. The purpose of this test pit is to establish the type and depth of the foundation supporting the existing building. Test Pit Nos. 2 and 3 are located within the footprint of the proposed building addition for the purpose of confirming the subsurface conditions encountered in the boreholes. The test pits were advanced to bucket refusal depths of 1.3 m to 1.7 m below existing grade. The boreholes were advanced to termination/refusal depths between 1.8 m and 3.3 m below existing grade. The fieldwork was supervised on a full-time basis by a representative from EXP.

Prior to the start of the fieldwork, the borehole and test pit locations were cleared of private and public underground services. The geodetic elevation of the test holes was determined by a survey crew from EXP who also determined the geodetic elevation of the floor slab of the existing building to be at Elevation 160.48 m (to be confirmed by a topographical survey prepared by an Ontario Land Surveyor). The borehole and test pit locations are shown in Figure No. 2.

The boreholes were drilled using a CME 45 track mount drill rig equipped with continuous flight hollow stem augers and soil sampling capabilities. Standard penetration tests (SPTs) were performed in the boreholes at 0.75 m and 1.5 depth intervals with soil samples retrieved by the split-barrel sampler. In Borehole No. 3, the presence of bedrock was proven by conventional wash-boring and coring technique. A field record of wash water return, colour of wash water and any sudden drop of the rods/core barrel were kept during rock coring operations.

A 19 mm diameter standpipe with slotted section was installed in Borehole Nos. 3 and 4 for long-term monitoring of the groundwater levels. The standpipes were installed in accordance with EXP standard practice and the installation configuration is documented on the respective borehole log. The boreholes were backfilled upon completion of the field work and the installation of the standpipes.

The test pits were excavated using a rubber-tired backhoe. A grab sample of the different soil types exposed in the test pits was taken from the side walls of the test pit during excavation. In Test Pit No. 1 located next to the existing building, the type of foundation and founding material were examined and recorded. Groundwater observations were also made in the open test pits. Upon completion of excavation, the test pits were backfilled and the backfill nominally packed in place with the backhoe bucket. The asphalt surface at the location of Test Pit No.1 was re-instated.

All the soil samples were visually examined in the field for textural classification, logged, preserved in plastic bags and identified. Similarly, all rock cores were visually examined, identified, and logged, and placed in core boxes for storage. On completion of the fieldwork, all soil samples and rock cores were transported to the EXP laboratory in Ottawa where they were visually examined by a geotechnical engineer and borehole/test pit logs prepared. A summary of the laboratory testing program conducted on the soil samples and rock cores is shown in Table I.

Table I: Summary of Laboratory Testing Program

Type of Test	Number of Tests Completed
Soil Samples	
Moisture Content Determination	19
Grain Size Analysis	2
Rock Cores	
Unit Weight Determination and Unconfined Compressive Strength Test	2

3. Subsurface Conditions and Groundwater Levels

A detailed description of the subsurface conditions and groundwater levels from the boreholes and test pits are given on the attached Borehole and Test Pit Logs, Figure Nos. 3 to 9. The borehole and test pit logs and related information depict subsurface conditions only at the specific locations and times indicated. Subsurface conditions and water levels at other locations may differ from conditions at the locations where sampling was conducted. The passage of time also may result in changes in the conditions interpreted to exist at the locations where sampling was conducted.

The boreholes and test pit were advanced to provide representation of subsurface conditions as part of a geotechnical exploration program and are not intended to provide evidence of potential environmental conditions.

It should be noted that the soil boundaries indicated on the borehole and test pit logs are inferred from non-continuous sampling and observations during drilling and excavating operations. These boundaries are intended to reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The "Note on Sample Descriptions" preceding the borehole and test pit logs form an integral part of this report and should be read in conjunction with this report.

The information obtained from the boreholes and test pits are provided in the following sections of this report.

A review of the borehole and test pit logs indicates the following subsurface conditions with depth and groundwater level measurements.

3.1 Topsoil

A 75 mm to 250 mm thick surficial topsoil layer was encountered at all boreholes and test pits except Test Pit No. 1.

3.2 Pavement Structure

Test Pit No. 1 is located in a paved area of the site. The pavement structure consists of a 75 mm thick asphaltic concrete layer underlain by a 210 mm thick base layer consisting of crusher run limestone granular fill.

3.3 Fill

Fill material was contacted beneath the topsoil layer and the pavement structure in all the boreholes and test pits. The fill extends to the surface of the bedrock contacted at depths of 1.3 m to 2.0 m (Elev. 158.8 m to 158.3 m). The exception to this is Borehole No. 4 where the fill extends to the native silty sand to sandy silt contacted at a 1.5 m depth (Elevation 159.0 m). It is noted that a 100 mm thick concrete layer was contacted between the fill and the underlying bedrock in Borehole No. 3 at a 1.5 m depth (Elevation 158.5 m).

The fill material is heterogeneous in composition ranging from a silty sand with gravel to sandy gravel with silt to silty gravel with sand. The fill material contains cobbles, boulders, topsoil inclusions, organic stains, plastic debris, and rootlets. The N values from the standard penetration test (SPT) range from 15 to 34 indicating the fill is in a compact to dense state. The natural moisture content of the fill material ranges from 3 percent to 15 percent.

The results of grain-size analysis conducted on two (2) selected samples of the fill are summarized in Table II and the grain-size distribution curves are shown in Figures 10 and 11.

Table II: Summary of Results from Grain-Size Analysis					
Borehole (BH) No. – Sample (SS) No.	Depth (m)	**Grain-Size Analysis (%)**			
		Gravel	Sand	Fines (Silt and Clay)	Soil Classification (USCS)
BH 2 – SS3	1.5 – 1.8	42	40	18	Silty Gravel with Sand (GM)
BH 4 – SS2	1.1 – 1.4	30	43	27	Silty Sand with Gravel (SM)

Based on a review of the results of the grain-size analysis, the fill may be classified as a silty gravel with sand (GM) and silty sand with gravel (SM) in accordance with the Unified Soil Classification System (USCS).

It is noted that the fill was contacted over the majority of the site. The fill extends to varying depths (elevations) below existing grade across the site. The type and quality of the fill material also varied across the site. The variable nature and depth (elevation) of the fill should be taken into consideration as part of the construction budget.

3.4 Silty Sand to Sandy Silt

As previously indicated, the fill in Borehole No.4 is underlain by compact native silty sand to sandy silt extending to the surface of the bedrock contacted at 2.1 m depth (Elevation 158.4 m). The natural moisture content of the silty sand to sandy silt is 8 percent.

3.5 Limestone Bedrock

Based on auger refusal in the boreholes and bucket refusal in the test pits, bedrock was contacted at depths ranging between 1.3 m and 2.1 m below existing grade (Elevation 158.8 m to Elevation 158.3 m). As previously indicated, a 100 mm thick concrete layer was contacted on top of the bedrock in Borehole No. 3 at a 1.5 m depth (Elevation 158.5 m). The origin of the concrete is not known. It is possible that the buried concrete may exist in other areas of the site.

Photographs of the bedrock cores are shown in Figure 12. Based on examination of the two (2) recovered bedrock cores, the bedrock is considered to be limestone bedrock. The total core recovery values (TCR) of the bedrock are 90 percent and 100 percent. The rock quality designation values (RQD) are 42 percent and 60 percent indicating the bedrock is of a poor and fair quality.

A total of two (2) rock core samples were selected for unit weight determination and unconfined compressive strength tests. The test results are presented in Table III.

Table III: Summary of Unit Weight Determination and Unconfined Compressive Tests on Rock Core Samples			
Borehole No. Run No.	**Depth (m)**	**Compressive Strength (MPa)**	**Unit Weight (kN/m^3)**
BH 3 – Run 1	1.7 - 1.9	200.8	24.9
BH 3 – Run 2	2.0 - 2.2	122.4	24.3

A review of the test results indicates a bedrock with compressive strength of the bedrock is 122 MPa and 201 MPa. Based on the compressive strength values, the rock can be classified with respect to intact strength as “very strong”(Canadian Foundation Engineering Manual, 4th Edition, 2006). The unit weight of the bedrock is 24.3 kN/m^{3}to 24.9 kN/m^3.

3.6 Groundwater Level Measurement

A summary of the groundwater level measurements taken in the boreholes 28 days following the completion of drilling and in the test pit upon completion of the excavation of the test pits is shown in Table IV.

Table IV: Summary of Groundwater Level Measurements

Borehole/Test Pit No. (BH/TP))	Ground Surface Elevation (m)	Date of Measurement (Elapsed Time in Days from Date of Installation)	Groundwater Depth Below Ground Surface(Elevation) m
BH 3	160.00	July 14, 2021 (28 days)	2.6 m (157.4)
BH 4	160.49	July 14, 2021 (28 days)	Dry
TP-3	160.24	June 23 (1 day)	1.6 m (158.6)

The groundwater level is at 1.6 m and 2.6 m depths (Elevation 158.6 m and Elevation 157.4 m).

Water levels were determined in the boreholes at the times and under the conditions stated above. Note that fluctuations in the level of groundwater may occur due to a seasonal variation such as precipitation, snowmelt, rainfall activities, and other factors not evident at the time of measurement and therefore may be at a higher level during wet weather periods.

3.7 Existing Foundation Information-

Test Pit No. 1 is located along the exterior wall at the northeast corner of the existing building. The purpose of the test pit is to establish the type and depth of the foundation supporting the existing building. The test pit was advanced to bucket refusal at a 1.6 m depth below grade (Elevation 158.8 m) on bedrock. As previously mentioned, the test pit revealed a pavement structure consisting of a 75 mm thick asphaltic concrete layer overlying a 210 mm thick granular base layer. The upper granular material is underlain by 400 mm thick sand and gravel fill which is further underlain by sandy gravel with cobbles that extend to the surface of the bedrock contacted at a 1.6 m depth (Elevation 158.8 m).

Examination of the existing exposed foundation revealed that the building is likely constructed on a 300 mm thickened or slab on grade foundation founded on compacted granular material placed on top of bedrock contacted at a depth of 1.6 m . Photographs of the exposed 'as-built' details are shown I Appendix A.

Based on a review of our observations of the 'as-built' details exposed in the test pit, it is recommended that the thickened concrete slab that appears to be supporting the existing building be confirmed by conducting additional test pits around the existing building. Based on the findings from the additional test pits, this report may need to be updated.

4. Site Classification for Seismic Site Response and Liquefaction Potential of Soils

4.1 Site Classification for Seismic Site Response

Based on the borehole information and Table 4.1.8.4.A of the 2012 Ontario Building Code (as amended May 2, 2019), the site classification for seismic site response is estimated to be Class C.

It is possible that a higher classification for seismic site response may be used by conducting a shear wave velocity sounding survey (seismic shear wave survey) of the site and provided that the thickness of overburden soil between the underside of the foundation for the proposed building addition and the surface of the bedrock is less than 3 m.

4.2 Liquefaction Potential of Soils

The subsurface soils are not considered to be liquefiable during a seismic event.

5. Grade Raise Restrictions

Significant grade raise is not expected at the site as part of the proposed building addition. Since the site underlain by cohesionless sandy soils, there is no restriction to site grade raise. However, for design purposes, a maximum grade raise of 1 m can be used.

6. Foundation Considerations

It is our understanding that the proposed development will consist of a 21.2 m by 24.6 m slab-on-grade addition to be constructed on the east side of the existing building. Grading and servicing plans were not available at the time of the submission of this report. However, it has been assumed that the elevation of the ground floor of the new addition will match the ground floor elevation of the existing building.

The borehole and test pit information indicates the subsurface conditions at the site to comprise of heterogeneous fill underlain by a localized area of native silty sand to sandy silt all underlain by limestone bedrock contacted at 1.3 m to 2.1 m depths below existing grade (Elevation 158.8 m to Elevation 158.3 m). The geotechnical investigation also revealed that the existing building is likely founded on thickened concrete slab-type foundation placed on a granular fill pad that has been engineered (engineered fill pad).

It is noted that the fill was contacted over the majority of the site and to varying depths (elevations) below existing grade. The type and quality of the fill material also varied across the site. The variable nature and depth (elevation) of the fill should be taken into consideration as part of the construction budget.

The existing fill is not considered suitable to support the proposed building addition. Therefore, it is recommended that the proposed addition be founded on a thickened slab-type foundation that is similar to the existing building and is constructed on an engineered fill pad that is placed on top of the native soil or bedrock.

As part of the preparation for the engineered fill pad, all topsoil, pavement structure and existing fill should be excavated and removed down to the surface of the bedrock or native soils. The excavation should extend a sufficient distance beyond the perimeter of the slab to accommodate a 0.6 m wide bench of engineered fill from the outer edge of the concrete slab on all sides which is thereafter sloped at an inclination of 1H:1V down to the native soil or bedrock.

As part of the construction of the engineered fill pad, the surface of the bedrock and native soil subgrade should be inspected by a geotechnician. Following approval of the subgrade surface, the engineered fill should be placed in 300 mm thick lifts and each lift compacted to 100 percent standard Proctor maximum dry density (SPMDD). The engineered fill may consist of Ontario Provincial Standard Specification (OPSS) Granular B Type II. The engineered fill should be placed under the full-time supervision of a geotechnician working under the direction of a geotechnical engineer. In-place density tests should be undertaken on each lift of the engineered fill to ensure that it is properly compacted prior to placement of the subsequent lift.

The thickened concrete slab foundation designed to bear on the properly prepared engineered fill pad constructed as noted above may be designed for a bearing pressure at Serviceability Limit State (SLS) of 150 kPa and factored geotechnical resistance at Ultimate Limit State (ULS) of 225 kPa. The factored geotechnical resistance at ULS includes a geotechnical resistance factor of 0.5. Settlements of the slab designed for the SLS bearing pressure recommended above and properly constructed are expected to be within the normally tolerated limits of 25 mm total and 19 mm differential movements. Adequate saw cuts should be provided in the floor slab to control cracking.

The surface of the engineered fill pad that the thickened concrete slab will be set upon should be examined by a geotechnical engineer to ensure the engineered fill founding surface is capable of supporting the design bearing pressure at SLS and that the engineered fill pad has been properly prepared.

The final grades should be sloped away from the slab to prevent ponding of surface water near the splash pad.

It is assumed the proposed building addition will be a heated structure. Frost protection for the thickened concrete-type slab foundation for a heated structure may be provided by rigid insulation in the form of extruded polystyrene rigid insulation board (such as Dow Chemical Canada Inc. Styrofoam Brand HI-60 or equivalent). The rigid insulation board should be 75 mm thick, placed directly on top of the surface of the approved engineered fill pad beneath the slab and extend 1.8 m horizontally beyond the outer edge of the concrete on all sides.

The recommended bearing pressure at SLS and factored geotechnical resistances at ULS have been calculated by EXP from the borehole and test pit information for the design stage only. The investigation and comments are necessarily on-going as new information of underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and test pits and the recommendations of this report must therefore be checked through field monitoring provided by an experienced geotechnical engineer to validate the information for use during the construction stage.

7. Excavation and De-Watering Requirements

7.1 Excess Soil Management

Ontario Regulation 406/19 made under the Environmental Protection Act (November 28, 2019) has been enacted as of January 1, 2021. The new regulation dictates the testing protocol required for the management and disposal of excess soils. As set forth in the regulation, specific analytical testing protocols need to be implemented and followed based on the volume of soil to be managed. The testing protocols are specific as to whether the soils are stockpiled or in situ. In either scenario, the testing protocols are far more onerous than have been historically carried out as part of standard industry practices. These decisions should be factored in and accounted for prior to the initiation of the project-defined scope of work. EXP would be pleased to assist with the implementation of a soil management and testing program that would satisfy the requirements of Ontario Regulation 406/19.

7.2 Excavation

Excavation for the construction of the proposed new building addition is anticipated to extend through the surficial topsoil layer and into the heterogenous fill and native soil. The excavations are anticipated to be above or slightly below the groundwater level.

It is anticipated that excavations may be undertaken using conventional equipment. All excavation work should be completed in accordance with the Occupational Health and Safety Act (OHSA), Ontario, Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils at the site are considered to be Type 3 soil. The excavations may be undertaken as open cut provided the excavation side walls are sloped back at 1H:1V from the bottom of the excavation as per OHSA. For excavations that extend below the groundwater level, the side slopes are expected to slough and eventually stabilize at 2H:1V to 3H:1V from the bottom of the excavation.

Extra care should be exercised during excavations close to the existing building and infrastructure to prevent the undermining of existing foundations and underground services and other existing settlement sensitive features.

Many geologic materials deteriorate rapidly upon exposure to meteorological elements. Unless otherwise specifically indicated in this report, walls and floors of excavations must be protected from moisture, desiccation, and frost action throughout the course of construction.

7.3 De-Watering Requirements

Seepage of the surface and subsurface water into the excavations is anticipated. However, it should be possible to collect water entering the excavations at low points and to remove it by conventional sump pumping techniques.

The excavations are anticipated to be above or slightly below the groundwater level. It is possible that groundwater may need to be removed from the excavations. It is noteworthy to mention that new legislation came into force in Ontario on March 29, 2016 to regulate groundwater takings for construction dewatering purposes. Prior to March 29, 2016, a Category 2 Permit to Take Water (PTTW) was required from the Ontario Ministry of the Environment and Climate Change (MOECC) for groundwater takings related to construction dewatering, where taking volumes in excess of 50 m^3/day, but less than 400 m^3/day, and the taking duration was no more than 30 consecutive days. The new legislation replaces the Category 2 PTTW for construction dewatering with a new process under the Environmental Activity and Sector Registry (EASR). The EASR is an on-line registry, which allows persons engaged in prescribed activities, such as water takings, to register with the MOECC instead of applying for a PTTW.

To be eligible for the new EASR process, the construction dewatering taking must be less than 400 m^3/day under normal conditions. The water taking can be groundwater, storm water, or a combination of both. It should be noted that the 30-consecutive day limit on the water taking under the old Category 2 PTTW process has been removed in the new EASR process.

Also, it should be noted that the EASR process requires two technical studies be prepared by a Qualified Person, prior to any water taking. These studies include a Water Taking Report, which provides assurance that the taking will not cause any unacceptable impacts, and a Discharge Plan, which provides assurance that the discharge will not result in any adverse impacts to the environment. EXP has qualified persons who can prepare these types of reports, if required. A significant advantage of the new EASR process over the former Category 2 PTTW process, is that the groundwater taking may begin immediately after completing the on-line registration of the taking and paying the applicable fee, assuming the accompanying technical studies have been completed. The former PTTW process typically took more than 90 days, which had the potential to impact construction schedules.

Although this investigation has estimated the groundwater levels at the time of the fieldwork, and commented on dewatering and general construction problems, conditions may be present which are difficult to establish from standard boring and excavating techniques and which may affect the type and nature of dewatering procedures used by the contractor in practice. These conditions include local and seasonal fluctuations in the groundwater table, erratic changes in the soil profile, thin layers of soil with large or small permeabilities compared with the soil mass, etc. Only carefully controlled tests using pumped wells and observation wells will yield the quantitative data on groundwater volumes and pressures that are necessary to adequately engineer construction dewatering systems.

8. Backfilling Requirements and Suitability of On-Site Soils for Backfilling Purposes

The on-site soils to be excavated are topsoil, fill and native silty sand to sandy silt. These soils are not considered suitable for re-use as material beneath structural elements and for backfilling purposes. However, they can be used for general grading purposes in landscaped areas.

It is anticipated that material required for the construction of the engineered fill pad and for backfilling purposes would have to be imported and should preferably conform to OPSS 1010 Granular B Type II.

9. Pavement Structure Reinstatement

The reinstated pavement structure for pedestrian pathways that may be affected by the construction of the new building addition should consist of 50 mm thick HL3F underlain by 300 mm thick OPSS Granular A base layer.

The asphaltic concrete should be compacted from 92 percent to 97 percent of the maximum relative density. The Granular A should be compacted to 100 percent SPMDD.

10. General Comments

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes and test pits required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for the design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

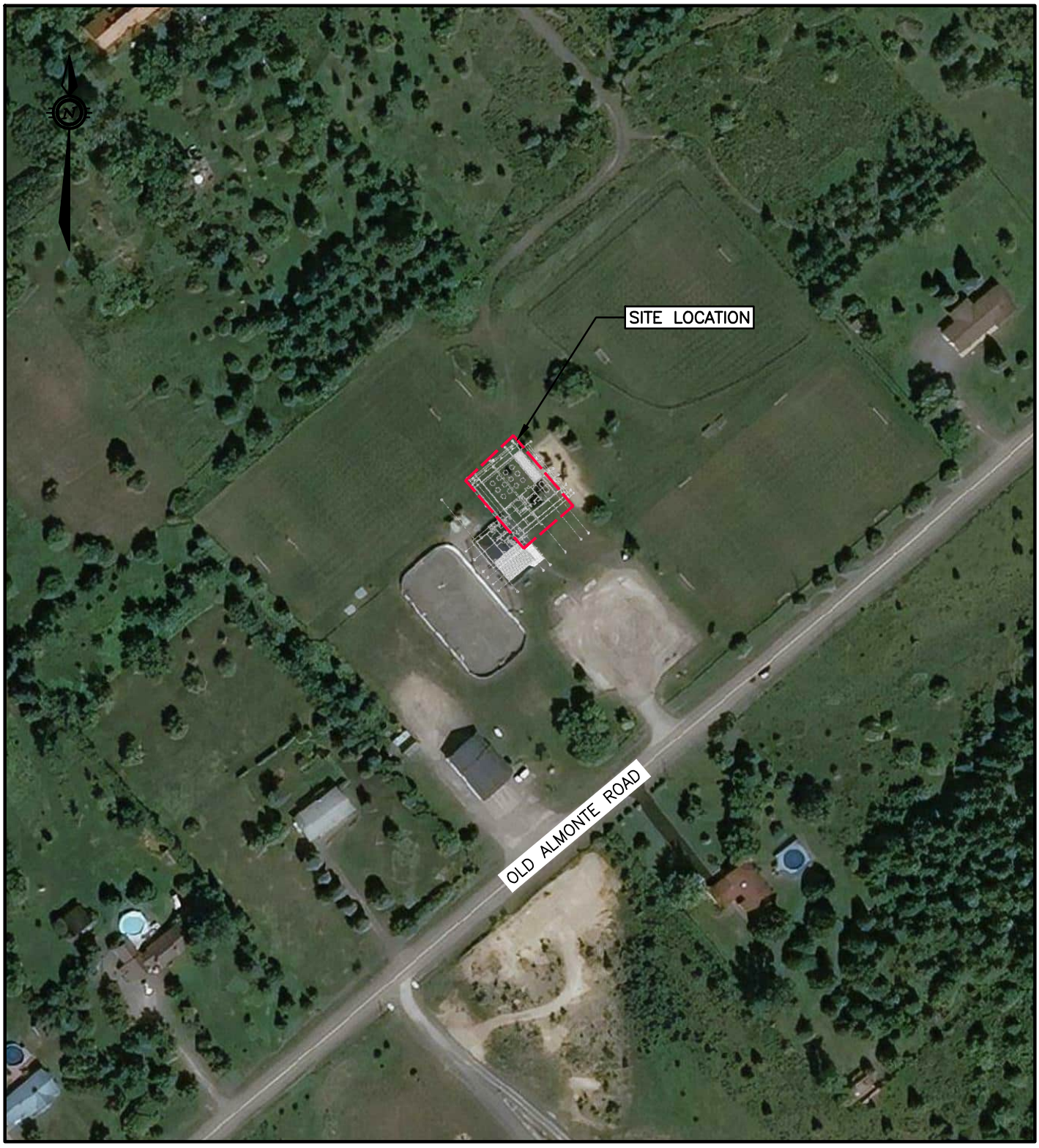
The information contained in this report is not intended to reflect on environmental aspects of the soils. Should specific information be required, including for example, the presence of pollutants, contaminants or other hazards in the soil, additional testing may be required.

We trust that the information contained in this report will be satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

Gary Cui
Engineer-in-Training, Geotechnical Services
Earth & Environment

Ismail Taki, P.Eng.
Manager, Geotechnical Services
Earth & Environment

Figures



0 20m 40m 80m

HORIZONTAL 1:2000

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DESIGN	I.T.
DRAWN	G.C.
DATE	JULY 2021
FILE NO	OTT-21010977-A0

GEOTECHNICAL INVESTIGATION
CORKERY COMMUNITY CENTRE EXPANISON
3447 OLD ALMONTE ROAD, CARP, ONTARIO

SITE LOCATION PLAN

SCALE 1:2000

SKETCH NO FIG 1

Filename: E:\OTT\OTT-21010977-A0\60 Execution\65 Drawings\21010977-A0 Figures.dwg
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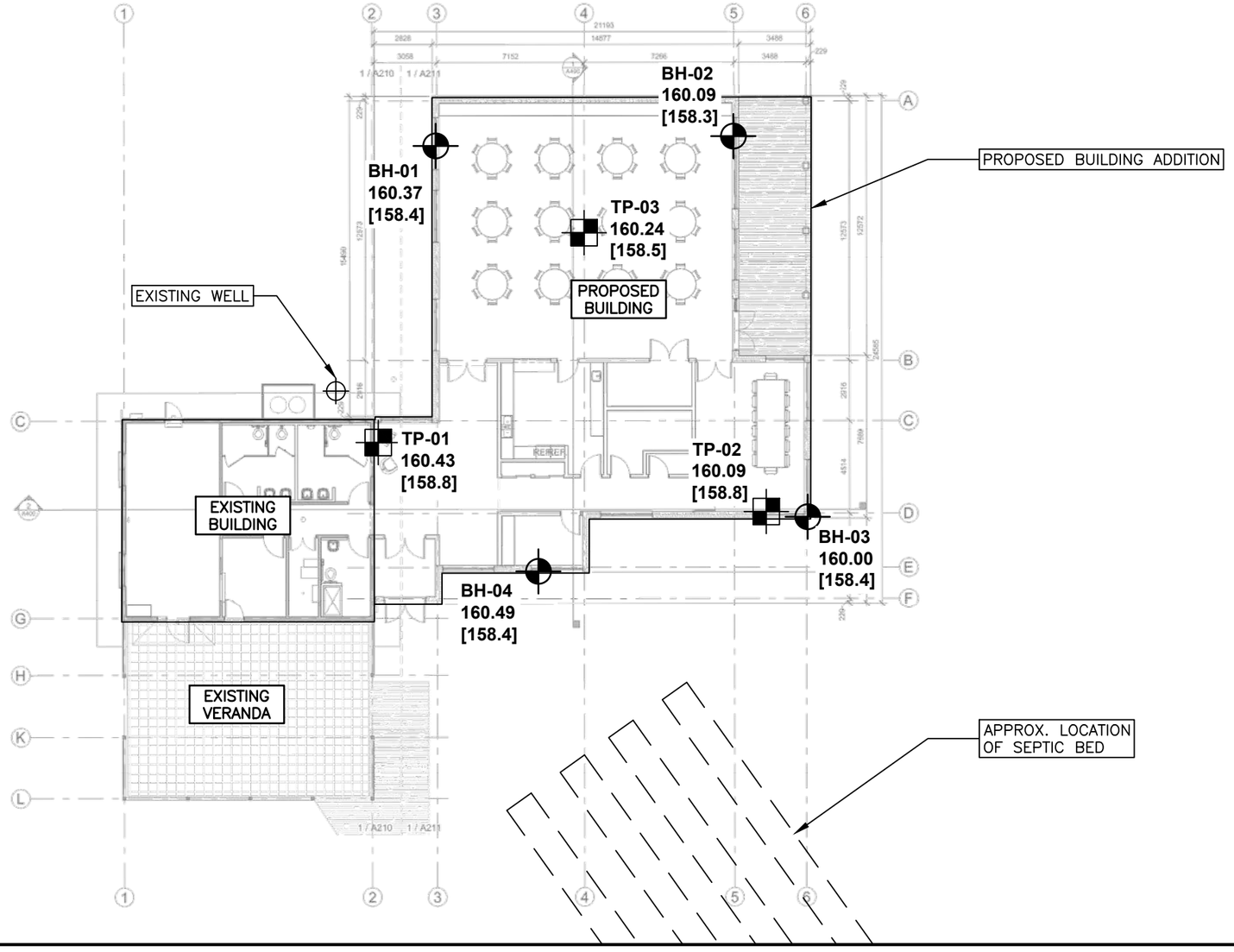

LEGEND

BH-01	BOREHOLE LOCATION	
160.37	GROUND SURFACE ELEVATION IN METERS	
[158.4]	BEDROCK ELEVATION IN METERS	
TP-01	TEST PIT LOCATION	
160.43	GROUND SURFACE ELEVATION IN METERS	
[158.8]	BEDROCK ELEVATION IN METERS	

0 2m 4m 10m
HORIZONTAL 1:250

NOTES:

1. THE BOUNDARIES AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT BOREHOLE AND TEST PIT LOCATIONS. BETWEEN BOREHOLE AND TEST PIT LOCATIONS THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR.
2. SOIL AND ROCK SAMPLES WILL BE RETAINED IN STORAGE FOR THREE MONTHS AND THEN DESTROYED UNLESS THE CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. TOPSOIL AND ASPHALT QUANTITIES SHOULD NOT BE ESTABLISHED FROM THE INFORMATION PROVIDED AT BOREHOLE AND TEST PIT LOCATIONS.
4. BOREHOLE AND TEST PIT ELEVATIONS SHOULD NOT BE USED TO DESIGN BUILDING(S) OR FLOOR SLABS OR PARKING LOT(S) GRADES.
5. THIS DRAWING FORMS PART OF THE REPORT PROJECT NUMBER AS REFERENCED AND SHOULD BE USED ONLY IN CONJUNCTION WITH THIS REPORT.
6. BASE DRAWING OBTAINED FROM CSV ARCHITECTS, "CORKERY COMMUNITY CENTRE – SITE PLAN", PROJ. NO. 2020–0640, DWG. NO. A100, REV. 1, DATED MAY 27, 2021

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DESIGN	I.T.
DRAWN	G.C.
DATE	JULY 2021
FILE NO	OTT–21010977–A0

GEOTECHNICAL INVESTIGATION
CORKERY COMMUNITY CENTRE EXPANSION
3447 OLD ALMONTE ROAD, CARP, ON

TEST HOLE LOCATION PLAN

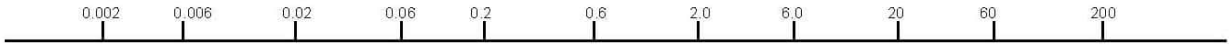
SCALE 1:250
SKETCH NO FIG 2

Notes On Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Societv for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by **exp** Services Inc. also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Log of Borehole BH-01

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 3

Page. 1 of 1

Date Drilled: 'June 17, 2021

Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test ——— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢○ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~100 mm thick	160.37	0				
		FILL Silty sand with gravel, rootlets, brown, moist, (compact)	160.3		15 ○	×	SS1	
		FILL Sandy gravel with silt, cobbles and boulders, light brown, damp, (compact)	159.7	1	20 ○	×	SS2	
					22 + 50 for 130 mm ○	×	SS3	
		Auger Refusal at 2.0 m Depth	158.4					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
'June 17, 2021	Dry	Open

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

Log of Borehole BH-02

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 4

Page. 1 of 1

Date Drilled: 'June 17, 2021

Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~100 mm thick	160.09	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
		160.0						
		FILL Silty sand and gravel, light brown, damp, (compact)			15	×	SS1	
				1	18	×	SS2	
		158.6						
		FILL Silty gravel with sand, cobbles and boulders, light brown, damp, (loose)			4 + 50 for 100 mm	×	SS3	
		158.3						
		Auger Refusal at 1.8 m Depth						

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'June 17, 2021	Dry	Open

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

Log of Borehole BH-03

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 5

Page. 1 of 1

Date Drilled: 'June 17, 2021

Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~75 mm thick	160	0				
		TOPSOIL ~75 mm thick	159.9					
		FILL Silty sand with gravel, with organic stains and topsoil inclusions, mottled brown to yellow brown, moist, (compact)			15	×	SS1	
		FILL Sandy gravel with silt, cobbles and boulders, piece of plastic polyethylene sheet, light brown, damp, (compact)	159.3	1	34	×	SS2	
					18 + 50/25 mm	×	SS3	
		CONCRETE Light grey, heavily fractured, heavily weathered, ~100 mm	158.5					
		LIMESTONE BEDROCK Moderately to lightly weathered, contains minor shaley laminations & turbidites, widely to moderately spaced wavy subhorizontal fractures, light grey	158.4	2	200.8 MPa ⊕		RUN 1	24.9
			157.4	3	122.4 MPa ⊕		RUN 2	24.3
		Borehole Terminated at 3.3 m Depth	156.7					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. 25 mm piezometer installed in borehole upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'June 17, 2021	Dry	Open
`July 14, 2021	2.6	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.5 - 2	90	60
2	2 - 3.3	100	42

LOG OF BOREHOLE BH LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

Log of Borehole BH-04

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 6

Page. 1 of 1

Date Drilled: 'June 17, 2021

Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—⊖
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~75 mm thick	160.49	0				
		FILL Silty sand with gravel, with topsoil inclusions and organic stains, brown, moist, (compact)	160.4		18 ○	×	SS1	
				1	18 ○	×	SS2	
		SILTY SAND TO SANDY SILT with gravel, brown, moist, (compact)	159.0					
				2	11 ○	×	SS3	
		Auger Refusal at 2.1 m Depth	158.4					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. 25 mm piezometer installed in borehole upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'June 17, 2021	Dry	Open
`July 14, 2021	Dry	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

Log of Borehole TP-01

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 7

Page. 1 of 1

Date Drilled: 'June 23, 2021

Drill Type: Caterpillar 415 Backhoe

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—⊖
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa (20 40 60 80 / 50 100 150 200)	Combustible Vapour Reading (ppm) 250 500 750 / Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60	SAMPLES	Natural Unit Wt. kN/m³
			160.43	0				
		ASPHALT ~75 mm thick	160.4					
		GRANULAR FILL crusher run limestone, ~210 mm thick	160.2			×	GS1	
		FILL Silty sand with gravel, brown, moist				×	GS2	
			159.8					
		FILL Sandy gravel with silt, numerous cobbles and boulders, light brown, damp		1		×	GS3	
			158.8					
		Bucket Refusal at 1.6 m Depth						

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Test pit backfilled upon completion of excavation.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'June 23, 2021	Dry	Open

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TP LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

Log of Borehole TP-02

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 8

Page. 1 of 1

Date Drilled: 'June 23, 2021

Drill Type: Caterpillar 415 Backhoe

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~250 mm thick	160.09	0	20 40 60 80 / 50 100 150 200 kPa	250 500 750 / 20 40 60		
			159.8					
		FILL Silty sand with gravel, with rootlets and topsoil inclusions, contains plastic debris, mottled brown to grey, moist				×	GS1	
		- changes to orange brown below 0.7 m depth	159.2			×	GS2	
		FILL Silty sand with gravel, numerous cobbles and boulders, light brown, damp		1		×	GS3	
			158.8					
		Bucket Refusal at 1.3 m Depth						

LOG OF BOREHOLE TP LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. Test pit backfilled upon completion of excavation.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
'June 23, 2021	Dry	Open

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole TP-03

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 9

Page. 1 of 1

Date Drilled: 'June 23, 2021

Drill Type: Caterpillar 415 Backhoe

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~200 mm thick	160.24	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
			160.0					
		FILL Silty sand with gravel, cobbles and boulders, light brown, damp				×	GS1	
▼				1				
			158.64					
		- wet below 1.6 m depth	158.5					
		Bucket Refusal at 1.7 m Depth						

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Test pit backfilled upon completion of excavation.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'June 23, 2021	1.6 m	Open

CORE DRILLING RECORD

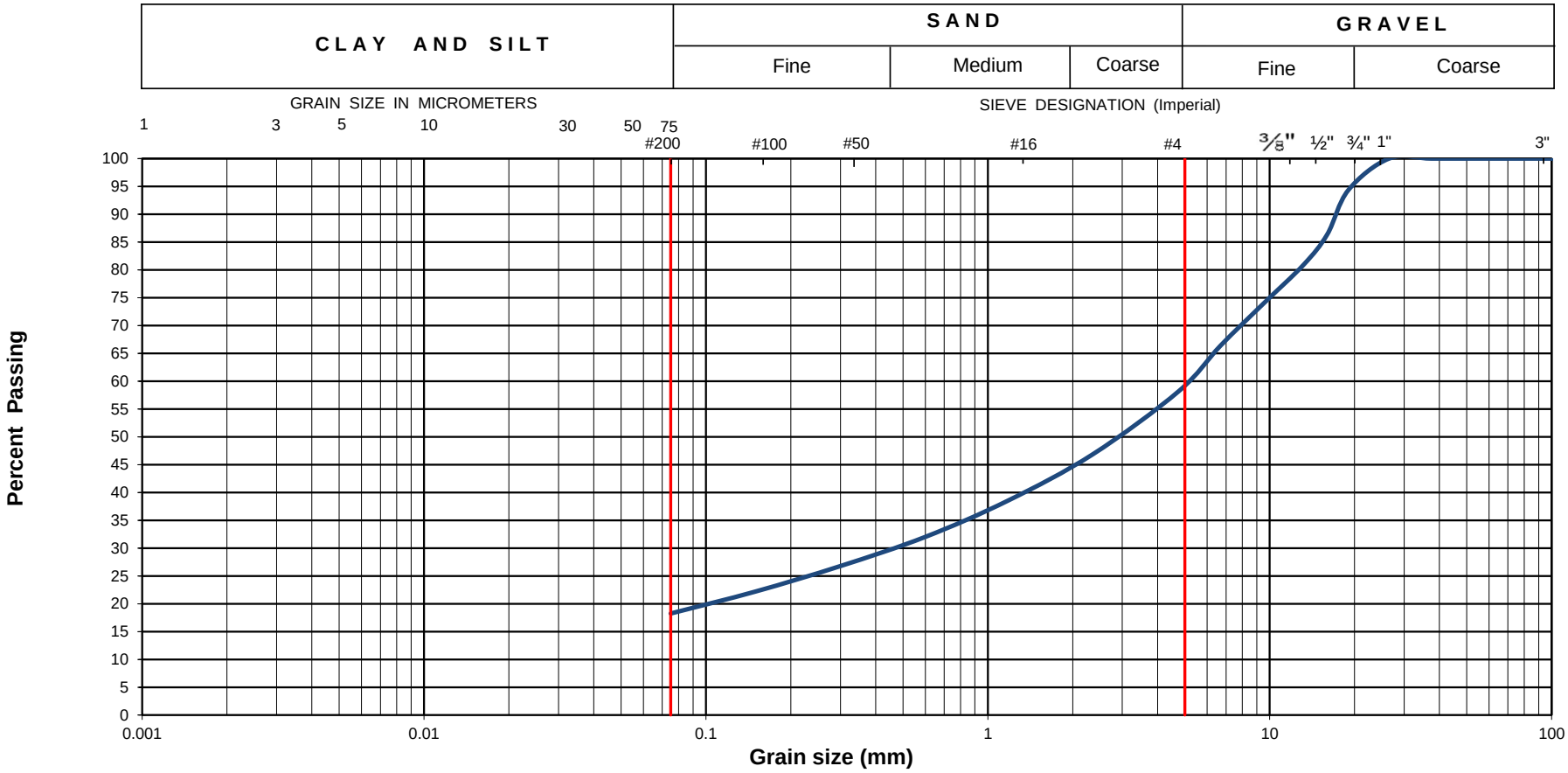
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TP LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

Unified Soil Classification System



EXP Project No.:	**OTT-21010977-A0**	**Project Name :**	**Corkery Community Centre Expansion**						
Client :	**City of Ottawa**	**Project Location :**	**3447 Old Almonte Road. Carp, Ottawa, ON**						
Date Sampled :	**June 17, 2021**	**Borehole No:**	**BH2**	**Sample:**	**SS3**	**Depth (m) :**	**1.5-1.8**		
Sample Composition :		**Gravel (%)**	**42**	**Sand (%)**	**40**	**Silt & Clay (%)**	**18**	**Figure :**	**10**
Sample Description :		**FILL: Silty Gravel with Sand (GM)**							

EXP Services Inc.
100-2650 Queensview Drive
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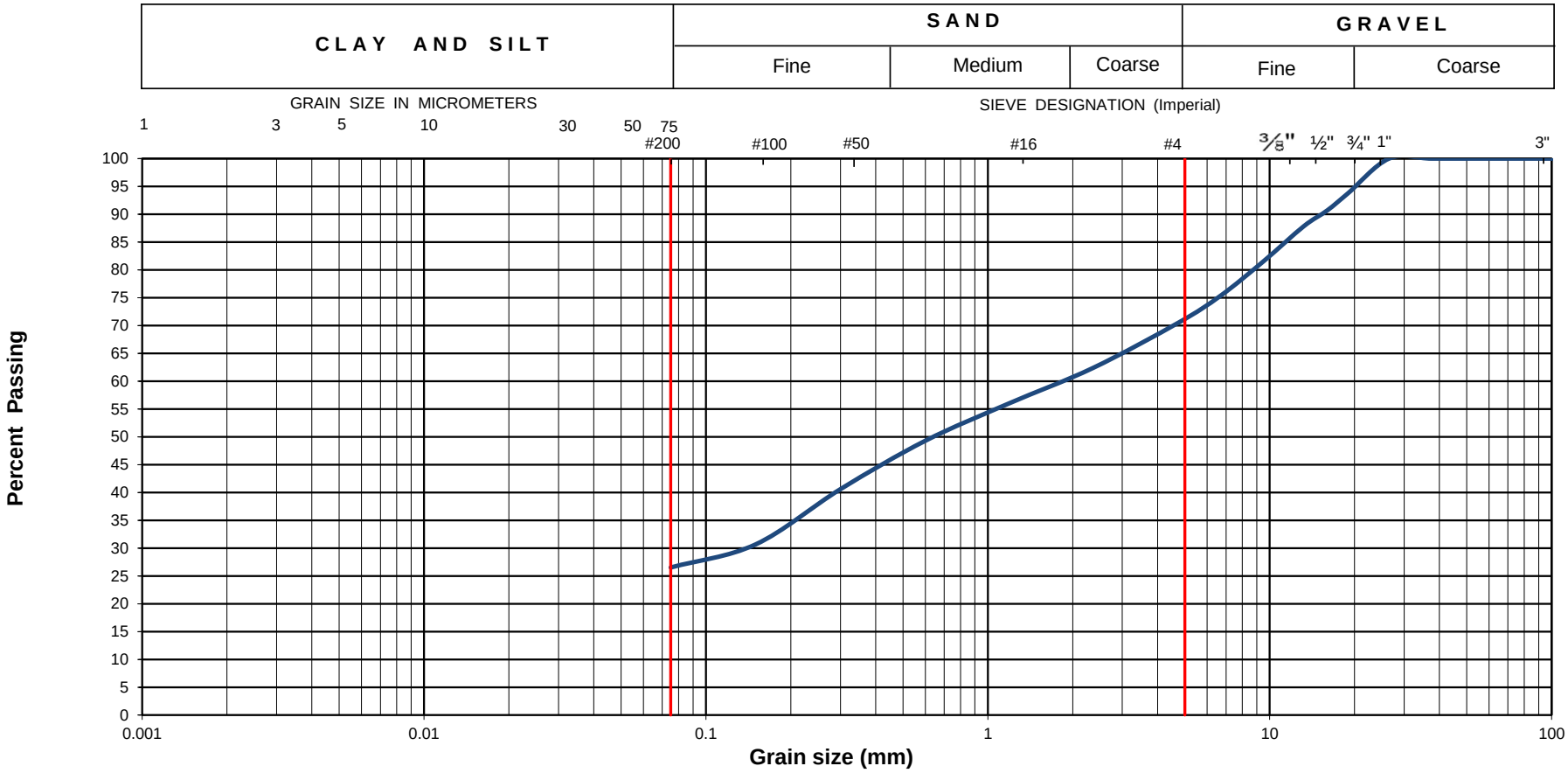
Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

Unified Soil Classification System



EXP Project No.:	**OTT-21010977-A0**	**Project Name :**	**Corkery Community Centre Expansion**						
Client :	**City of Ottawa**	**Project Location :**	**3447 Old Almonte Road. Carp, Ottawa, ON**						
Date Sampled :	**June 17, 2021**	**Borehole No:**	**BH4**	**Sample:**	**SS2**	**Depth (m) :**	**1.1 - 1.4**		
Sample Composition :		**Gravel (%)**	**30**	**Sand (%)**	**43**	**Silt & Clay (%)**	**27**	**Figure :**	**11**
Sample Description :		**FILL: Silty Sand with Gravel (SM)**							

Concrete

DRY BEDROCK CORES

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borehole no.	core runs	PROJECT	project no.
BH-03	Run 1: 1.5 m - 2.0 m Run 2: 2.0 m - 3.3 m	GEOTECHNICAL INVESTIGATION CORKERY COMMUNITY CENTRE EXPANSION 3447 OLD ALMONTE ROAD, CARP, ONTARIO	OTT-21010977-A0
date cored		ROCK CORE PHOTOGRAPHS	FIG 12
6/17/2021			

Appendix A – Test Pit Photographs

Photograph No. 1: Exposed subsurface soil conditions in Test Pit No. 1

Photograph No. 2: Detailed view of thickened structural slab and subbase materials in Test Pit No. 1

Photograph No. 3: Exposed subsurface soil conditions in Test Pit No. 3

Photograph No. 4: Reinstated pavement conditions at Test Pit No. 1 location

Legal Notification

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