Van Harten
SURVEYING INC.
LAND SURVEYORS and ENGINEERS

March 3, 2017
24457-17

Muslim Association of Canada
510 Erbsville Road
Waterloo, Ontario
N2J 3Z4

Attention: Emad Abu-Ewimer

Dear Sir:

Re: Sewage System Consultation and Capacity Analysis
Zoning Application for Proposed
Islamic Centre of Waterloo – 2-16-03
510 Erbsville Road
Waterloo, Ontario

1.0 Introduction

Van Harten is pleased to submit this report in support of the above-noted rezoning application. The site is located on the northeast side of Erbsville Road between Columbia Street West and Laurelwood Drive as indicated on the attached Key Map. This work was authorized by Mr. Emad Abu-Ewimer of the Muslim Association of Canada.

The project involves rezoning of the property to Institutional use to facilitate the renovation of a former privately serviced single family dwelling into a facility to support commencement of faith related gatherings on the property. As municipal sewer services are not currently available to the property, the renovated dwelling will need to continue to be serviced by a private sewage system. A future Mosque will be serviced by an extension of existing municipal sewer services.

The purpose of this engineering task is to conduct a site investigation to identify the subsurface conditions at the subject property, carry out an assessment of the existing sewage system and provide preliminary recommendations for future sewage disposal and capacity suitable to support the zone change application.

2.0 Site Investigation

An engineering site investigation was carried out by a representative from Van Harten on February 10, 2017. The purpose of the investigation was to locate water supply wells in the vicinity of the site, identify surface drainage characteristics of the property and to carry out a subsurface investigation in the area of the existing sewage system.

A mini-excavator was utilized to uncover portions of the existing sewage system and excavate three test pits to a maximum depth of 2.10 m below the existing grade at the approximate locations shown on the attached plan. Samples were retained from the test pits for visual examination of the density, colour, moisture content, plasticity, and gradation. Groundwater observations in the test pits were also noted at the time of the fieldwork.

A sample of the predominant native soil relevant to this assessment was retained and later submitted to CMT Engineering Inc. for particle size distribution analysis and the laboratory test results are presented in Appendix A of this report.

3.0 Summarized Conditions

The subject property covers approximately 1.3 ha and is located on the northeast side of Erbsville Road between Columbia Street West and Laurelwood Drive. The site is currently comprised of one privately serviced residential building, a garage and a shed. The site generally grades to the northeast towards an area regulated by the Grand River Conservation Authority.

Upon arrival on-site, the contractor revealed what appeared to be a round single chamber septic tank adjacent to the former dwelling. A clay tile exiting the tank was found to convert to a black bitumen pipe. A second black bitumen pipe was found extending north and east towards the rear of the property at an estimated slope of about 6%. The line was uncovered the entire length and was found to terminate approximately 9 to 12 m away from the dwelling. The line was not bedded in stone nor was it covered in filter fabric. Please refer to Drawing 1 for the approximate location of existing system components revealed during the site investigation.

Please refer to Table 1 for a detailed summary of the soil and groundwater conditions recorded by Van Harten at the time of the site investigation and to Appendix A for the resulting particle size distribution analysis of the submitted soil sample. Test Pit 1 was open upon arrival on-site and revealed a deposit of fine sand fill. Test Pits 2 and 3 both revealed surficial topsoil overlying a native deposit of silt till. A particle size analysis carried out by CMT Engineering Inc. on a sample of silt till submitted to their soil laboratory reveals that the sample contains 13% gravel, 27% sand, 29% silt and 31% clay. No free groundwater was encountered in the test pits, dug to a maximum depth of 2.10 m.

4.0 Sewage System Design

The project involves rezoning of the property to Institutional use to facilitate the renovation of a former privately serviced single family dwelling into a facility to support commencement of faith related gatherings on the property. The long term plan for the property is to construct a Mosque that will be serviced by an extension of existing municipal sewer services.

In accordance with Part 11 of the Ontario Building Code (OBC), the proposed changes to the zoning and use of the dwelling trigger an assessment of the existing sewage system. This assessment must demonstrate that the *performance level* of the existing dwelling is not reduced by the proposed changes. Where the *performance level* is found to be reduced, compensating construction must provide a sewage system that complies with Part 8 of the OBC. The purpose of this investigation is to conduct an investigation and provide preliminary recommendations for servicing of the renovated dwelling to accompany the noted zone change application.

Sewage system designs are primarily dependent on the percolation rate (T) of the underlying soil (measured in minutes per centimetre or min/cm) and the peak daily sewage flow (Q) of the facilities being serviced (measured in Litres per day or L/day). The following paragraphs of this report provide a summary of the design parameters and recommendations for disposal.

The percolation time of the predominant soil deposit has been assessed based on soil characteristics recorded by Van Harten Surveying Inc. at the time of the site investigation and the results of laboratory testing carried out by CMT Engineering Inc. Referring to Supplementary Standard SB-6 of the 2012 OBC, Table 1 of the current report, and the results of the particle size distribution analysis presented in Appendix B, the predominant soil is classified as "ML" under the Unified Soil Classification System with a percolation rate ranging from T = 20 to 50 min/cm. A percolation rate of T = 40 min/cm is chosen for this sewage system assessment.

In accordance with Table 8.2.1.3.A, the peak daily sewage flow of the former three bedroom single family dwelling is Q = 1,600 L/day. The proposed use of the building is primarily for prayer where various groups of people totaling sixty-five (65) will visit the building between 6:00 am and 9:30 pm. There will be no showers, no food service provided and no-one will be living on-site. The peak daily sewage flow calculated in accordance with Table 8.2.1.3.B under the Category of – 'Assembly Hall' or 'Churches and Similar Places of Worship' with no food service is Q = 65 @ 8 L = 520 L/day.

Typically with these soil conditions, a sewage system would be constructed as a septic tank discharging to a raised leaching bed constructed in sand fill. A raised leaching bed for a three bedroom dwelling will often cover 300 to 400 m^2. While the native soils are not ideal for inground trenches, minimum sewage flows combined with conservation regulatory restrictions and planned abandonment of the system upon the construction of the Mosque, a septic tank with an inground trench leaching bed is considered the most viable alternative for this site.

While the existing system is considered to be a septic tank system with an inground trench leaching bed, the existing single chamber tank and observed method of leaching bed construction does not comply with many current OBC requirements. Given a percolation rate of T = 40 min/cm and a design peak flow of Q = 520 L/day, a conventional septic tank system with an inground trench leaching bed will comprise a minimum 3,600 L two-compartment septic tank and 104 m of trench at 1.6 m minimum spacing. Given the topography of the site, I suggest that the trenches run parallel to the slope at the back of the existing garage. While gravity flow to the leaching bed can be easily attained, consideration to installing an oversized pump chamber with an effluent pump controlled by a timer to dose the leaching bed will provide a way to attenuate any peak events and is recommended. Please refer to the attached drawing for conceptual layout of the proposed system.

5.0 Water Supply

The water supply for the renovated dwelling will be provided by a municipal water supply. There are no known wells in the immediate vicinity of the proposed sewage system.

6.0 Approval and Construction Requirements

Any technical questions arising from the review of this report should be directed to Van Harten.

Upon approval of the zone change, a detailed sewage system design drawing with cross-sections and details will be required for review by the City of Waterloo Building Department. Van Harten will be pleased to provide this service. The completed design will also be suitable to submit to various licensed contractors to obtain cost estimates to install the proposed sewage system.

7.0 Closure

The completed sewage system assessment is specific to the subject property and cannot be applied to different properties. The conclusions of this report are based on the findings at the site and use of the property as described by the landowner.

I trust that this work has been completed within our terms of reference and is suitable for your present requirements. Please contact our office if you have any questions or require further consultation.

Van Harten Surveying Inc.

John Duffy, P. Eng.
Consulting Engineer

Encl. Table 1 – Test Pit Logs
Encl. Drawing – Preliminary Sewage System Layout
Encl. Appendix A – Laboratory Test Results

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TABLE 1 – TEST PIT LOGS

510 Erbsville Road
City of Waterloo
Van Harten Surveying Inc., Project #24457-17

Test Pit 1 **February 10, 2017**

Depth (m)	Sample	Soil Description
0-0.20		**FILL:** dark brown silt (topsoil), moist
0.20-1.50		• Brown silty fine sand, moist
Groundwater Observations: Test pit open upon arrival on-site. No free groundwater observed.		

Test Pit 2 **February 10, 2017**

Depth (m)	Sample	Soil Description
0-0.30		**TOPSOIL:** dark brown silt, moist
0.30-2.10	1	**SILT TILL:** brown sandy, clayey silt, some gravel, moist to very moist
Groundwater Observations: Test pit sidewalls stable upon completion. No free groundwater observed.		

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TABLE 1 – TEST PIT LOGS

510 Erbsville Road
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Test Pit 3 **February 10, 2017**

Depth (m)	Sample	Soil Description
0-0.30		**TOPSOIL:** dark brown silt, moist
0.30-1.50		**SILT TILL:** brown sandy, clayey silt, some gravel, moist to very moist
Groundwater Observations: Test pit sidewalls stable upon completion. No free groundwater observed.		

APPENDIX A
LABORATORY TEST RESULTS

Particle Size Distribution Report

	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	1.8	11.7	1.4	3.7	21.5	29.1	30.8

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	24457-17	N/A	N/A	silty, sandy clay, some gravel	ML
	510 Erbsville			Tested by JH of CMT Engineering Inc., February 24, 2017	
	Road,				
	Waterloo				

CMT Engineering Inc.

St. Clements, ON

Client: Van Harten Surveying Inc.

Project: Miscellaneous Lab Testing

Project No.: 05-095

Figure 5