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Abdulla Real Estate Holdings Inc.

Box 819
Manotick, ON
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Attention: Nicole Chilton-Jones

**Subject: Global Stability Analysis – Proposed Medical Building
5580 Manotick Main Street
Ottawa, Ontario**

Pursuant to your request, LRL Associates Ltd. (LRL) was retained to carry out a Global Stability Analysis on the proposed gabion stone retaining wall at the above referenced location. The purpose of this analysis was to evaluate the proposed construction of the wall, and to ensure the construction will not negatively affect the site stability in short term (undrained), long term (drained), and seismic condition.

1 SITE AND PROJECT DESCRIPTION

The site under investigation is located at 5580 Manotick Main Street, Ottawa, ON. Currently the site has an abandoned single-family dwelling, with multiple “shed-like” structures. The site is bound by Manotick Main Street to the east, 5576 Manotick Main Street to the north, 5582 Manotick Main Street to the south, and 1160 Beaverwood Road to the west. The topography of the site is sloping downwards from front to rear. The site is accessible from Manotick Main Street. The site location is presented in Figure 1 included in Appendix A.

At the time of generating this report, it is understood the development will consist of demolition of all structures onsite, and construction of a two-storey medical office building, with on-grade parking.

2 SUBSURFACE CONDITIONS

A review of local surficial geology maps provided by the Department of Energy, Mines and Resources Canada suggest that the surficial geology for this area consists of till material. The till consists of a heterogeneous mixture of material ranging from clay to large boulders, generally sandy, grades downwards into unmodified till.

The boreholes drilled onsite for the Geotechnical Investigation indicate the site is comprised of a loose to very dense glacial till material.



Groundwater was found to be at 1.9 m below ground surface.

3 SLOPE STABILITY ANALYSES

The slope modelling program, Slide 5.0 (Rocscience), was used to implement the Bishop simplified method of slices. The cross-section chosen to be ran in the modelling was considered to be the worst-case scenario (ie: the location with the highest retaining wall) obtained from a cross-section from the project's "Grading and Drainage Plan", generated by LRL. The approximate location of the cross-section (labelled A-A) that was taken and ran in the modelling is shown on the above-mentioned drawing, attached to this report. The profile was analyzed under the undrained (short-term), drained (long-term), and seismic condition. However, it shall be noted that the drained and undrained parameters for the soil encountered on this site are the same. Therefore, the drained and undrained conditions are considered to be equivalent.

The seismic analysis was performed by incorporating the seismic coefficient (k_h) into the modelling. The peak ground acceleration (PGA) for this area is equal to 0.28 for the 2% in 50 year probability of exceedance as per the NBC 2015. The value for k_h was taken as 50% of the PGA, which equates to 0.14.

The field measurements from the borehole drilling in conjunction with known published data of the materials within the region were used for selection of appropriate soil modelling parameters in the slope stability analyses.

The results of the analyses are potentially dependent on the assumption of groundwater conditions. As a conservative approach the analysis was completed assuming full saturation.

The following soil parameters were used as part of the analyses.

Soil Type	Effective cohesion (c') - KPa	Angle of internal friction (ϕ') - degrees	Bulk unit weight (γ_B) - KN/m ³
Drained/Undrained Parameters (Long/Short Term)			
Pavement Structure	1	36	22.0
Backfill Material	1	35	21.0
Glacial Till	1	37	21.5
Retaining Wall	-	-	24.0

The Factor of Safety (FoS) against slope failure for the proposed profile was determined to be 1.54. A FoS of 1.50 or greater is considered to be safe with regards to slope stability.

The FoS in the seismic condition was determined to be 1.10. The minimum FoS with regards to seismic condition is 1.10.

These results indicate that the proposed construction will not negatively affect the slope, and it will remain stable in the long and short term, and in the event of any seismic activity.

The model results are attached for your reference.

4 GENERAL COMMENTS AND LIMITATIONS OF REPORT

The conclusion and recommendations are provided in this report are based on subsoil properties at the boreholes' locations. The material reflected in this report are best judgement in

light of information obtained from localized auger holes and information available with LRL at the time of report preparation.

This report is prepared for and is intended solely for its client and authorized engineers. Unless otherwise agreed in writing, no portion of this report, or any part thereof may be used for decisions made based on it by separate entity, are the responsibility of such entity. LRL accepts no responsibility for damage, if any, suffered by any separate entity as a result of decisions made or suffered from illegal use of this report. The findings are relevant for the date of the site investigation and any changes on the ground profile or subsurface condition at later date, LRL should be retained to review and for further recommendations.

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.

Yours truly,

LRL Associates Ltd.



Brad Johnson, P. Eng.
Geotechnical Engineer



Encl. Slope Stability Analysis Results
Cross-section Location





