Stantec Consulting Ltd.
300 - 1331 Clyde Avenue, Ottawa ON K2C 3G4

March 4, 2024
File: 121625708

Attention: Natasha Buehlow, BTY Administrative Coordinator
St. Patrick's Home of Ottawa
2865 Riverside Drive
Ottawa ON K1V 6M7

Reference: Geotechnical review of the proposed Grading Plan and Landscaping Plan (regarding the City of Ottawa Tree Planting in Sensitive Marine Clay Soils policy) for the Proposed St. Patrick's Home of Ottawa Building

Stantec prepared a Geotechnical Investigation Report for the Proposed St. Patrick's Home of Ottawa building, dated November 2022. BTY received feedback from the City of Ottawa on the Site Plan Control Phase 3 Pre-Consultation application for the St. Patrick's Home project. The feedback below was received regarding the Geotechnical Investigation Report which requires responses from Stantec:

- Provide geotechnical sign-off on the proposed grading plan.
- Provide confirmation that the proposed tree plantings will not negatively impact the building's foundation (note the trees in sensitive soils planting policy).

We have reviewed the proposed Grading Plan (dated 2024-01-23 and issued by WSP for site plan control review) and Landscaping Plan (dated 01/23/2024 and issued by James B. Lennox & Associates Inc. for SPA) from the perspective of the City of Ottawa Tree Planting in Sensitive Marine Clay Soils policy. This letter summarizes our review with our understanding that it will be submitted to the City of Ottawa.

Limitations associated with this letter report and its contents are provided in the Statement of General Conditions included in Appendix A.

Proposed Grading Plan - Grade Raise Restriction

Based on the geotechnical investigation report prepared by Stantec, the site is underlain by a compressible Champlain Sea clay deposit that is approximately 1.5 to 3.8 m thick and a maximum grade raise restriction of 2 m was recommended for the development due to the compressible soils encountered at the site.

Based on a review of the Grading Plan, the proposed grade raise across the site is significantly less than 2 m and is acceptable from a geotechnical perspective to limit ground surface settlements at the site.

Proposed Tree Plantings - Trees in Sensitive Soils Planting Policy

Based on the geotechnical investigation report prepared by Stantec, the site is underlain by a compressible Champlain Sea clay deposit. The results of Atterberg limits testing carried out on representative samples of this material are summarized in the following table.

Reference: **Geotechnical review of the proposed Grading Plan and Landscaping Plan (regarding the City of Ottawa Tree Planting in Sensitive Marine Clay Soils policy) for the Proposed St. Patrick's Home of Ottawa Building**

Table 1: Atterberg Limits Test Results on Champlain Sea Clay Samples

Borehole	Sample	Depth (m)	Moisture Content, W_n (%)	Liquid Limit, LL	Plastic Limit, PL	Plasticity Index, PI	Shrinkage Potential Index	Volume Change Potential Based on	
								Plasticity Index	Shrinkage Potential Index
BH22-1	SS5	5.6	28	34	18	16	16	Low	Low
BH22-3	SS6	4.9	23	28	17	11	11	Low	Low
BH22-7	SS4	3.4	24	41	17	24	24	Medium	medium

Note: PI = (LL-PL)

When planting trees on City property where sensitive marine clay soils are known to exist, the tree must be planted at a distance from a building foundation or structure equivalent to the full mature height of the tree.

Based on *City of Ottawa Tree Planting in Sensitive Marine Clay Soils - 2017 Guidelines* where Sensitive Marine Clay (SMC) soils have been identified, the tree to foundation setbacks may be reduced to 4.5 m for small (mature tree height up to 7.5 m) and medium size trees (mature tree height 7.5 m to 14 m) provided certain conditions are met. Validity of these conditions at the site is discussed in the following table.

Table 2: Conditions to Reduce the Tree to Foundation Setbacks

Conditions to Reduce the Tree to Foundation Setbacks	Validity Of the Condition at Site
1. The modified plasticity index of the soil between the underside of footing (USF) and a depth of 3.5 m generally does not exceed 40%. This corresponds to soils with low/medium potential for soil volume change.	The plasticity indices of the tested samples are between 11 and 24. Therefore, the modified plasticity index of the clay soils will not exceed 40%.
2. The USF is 2.1 m or greater below the lowest finished grade. Note: this footing level must be satisfied for footings within 10 m of the tree, as measured from the centre of the tree trunk.	The lowest proposed exterior grade near the building perimeter is 81.1 m. Therefore, **the underside of footing within 10 m of the trees should be at or below 79.0 m for this condition to be met.**
3. A small size tree must be provided with a minimum of 25 m^3 of available soil volume, as determined by a Landscape Architect. A medium-size tree must be provided with a minimum of 30 m^3 of available soil volume, as determined by a Landscape Architect. The developer will ensure the soil is generally uncompacted when backfilling in street tree planting locations.	All trees are provided with more than 35 m^3 of available soil volume with the exception of two Multi-stem Gray Birch (Betula populifolia 'Multi-stem'), which each have 29 m^3 of available soil volume. **Considering Multi-stem Gray Birch as a medium-size tree, the available soil volume for each tree should be increased to 30 m^3.**
4. The tree species is to be of very low to moderate Potential Subsistence Risk, as listed in the Street Tree Manual for Greenfield Neighbourhoods, in order to reduce the risk of negative impacts on SMC soils.	The proposed tree species in the landscaping plan all fall under very low to moderate category for potential subsidence risk with the exception of Quercus rubra (Red Oak). The proposed Quercus rubra (Red Oak) trees should be replaced with a tree with very low to moderate potential subsidence risk, as listed in the Street Tree

Reference: **Geotechnical review of the proposed Grading Plan and Landscaping Plan (regarding the City of Ottawa Tree Planting in Sensitive Marine Clay Soils policy) for the Proposed St. Patrick's Home of Ottawa Building**

Conditions to Reduce the Tree to Foundation Setbacks	Validity Of the Condition at Site
	Manual for Greenfield Neighbourhoods, in order to reduce the risk of negative impacts on SMC soils. It is noted that recent studies on various oak species have reported them as being more drought tolerant in part because of their ability to carry water and nutrients from the roots to the leaves even during severe droughts, while for most other trees the water flow is obstructed by air bubbles forming when the capillary tensions become too great. This would indicate that during extreme droughts (such as experienced in 2021) oak trees would continue to extract water from the matrices of the clays, while less tolerant trees would become dormant. **In view of the recent severe droughts that have occurred in the area, Stantec's geotechnical engineers recommend that a *foundation setback reduction* should not be considered applicable the red oak, or to other oak trees.**
5. The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall) to provide ductility as described in the Geotechnical Report.	It is Stantec's understanding that the foundation walls for the St.-Patrick's home building will be constructed with steel-reinforced concrete.
6. Grading surrounding the tree must promote draining to the tree root zone (in such a manner as not to be detrimental to the tree), as noted on the subdivision Grading Plan.	**The landscape architect should review the site grading plan to confirm that this objective is satisfied in areas where the *foundation setback reduction* is being applied.**

Large trees (mature height over 14 m) can be planted in areas of SMC soils provided a tree to foundation setback equal to the full mature height of the tree can be provided.

Reference: **Geotechnical review of the proposed Grading Plan and Landscaping Plan (regarding the City of Ottawa Tree Planting in Sensitive Marine Clay Soils policy) for the Proposed St. Patrick's Home of Ottawa Building**

CLOSURE

We trust that this proposal meets with your requirements and encourage you to call should you have any questions or comments with regards to our proposal.

Respectfully submitted,

STANTEC CONSULTING LTD.

Ramin Ghassemi, P. Eng., Ph.D.
Geotechnical Engineer

Raymond Haché, M.Sc., P.Eng.
Senior Principal, Geotechnical Engineering

Attachment: Statement of General Conditions

v:\01216\active\1216242xx\121624271 - st patricks home\05_report_deliv\deliverables\report\scope change\geotechnical review_st patrick's home of ottawa_20240304.docx

STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.