patersongroup **memorandum**

consulting engineers

re: **Geotechnical Recommendations - Proposed Park Parcel**
Proposed Multi-Storey Redevelopment
1354 to 1376 Carling Avenue, Ottawa, ON

to: Holloway Lodging Corp. - **Mr. Sam Zentner** - szentner@hlcorp.ca

date: October 1, 2021

file: PG3736-MEMO.15

Further to your request, Paterson Group (Paterson) prepared the following memorandum to provide geotechnical design and construction recommendations for the proposed city park parcel to be included as part of the proposed re-development at the aforementioned site. The present memorandum should be read in conjunction with the Geotechnical Investigation Report (Paterson Group Report PG3736-1 Revision 3 dated April 12, 2018).

Background

Paterson reviewed the following plans prepared by Geiger Huot Architects for the aforementioned park parcel:

- ❑ Carling, Phase 2 - Site Plan PH1/2 - Sheet No. 9 dated August 18, 2021
- ❑ Carling, Phase 2 - Ground Floor Plan D - Sheet No. 20 dated August 18, 2021

It is understood that the future park is to be constructed as part of Phase 2 of the development and will be located within the southwest corner of the subject site. Detailed drawings were unavailable at the time of reporting, however, it is anticipated that the proposed park may include the following structures:

- ❑ Asphalt paved pathways
- ❑ Shade Structures
- ❑ Play Structures

Field Investigations

Field investigations at the subject site were completed from October 26 to November 1, 2016, and consisted of advancing a total of 13 boreholes (BH 1 to BH 13) to a maximum depth of 10.1 m below the existing ground surface. A supplemental investigation was carried out from August 15 to 16, 2017. At that time, a total of 5 boreholes (BH 1-17 to BH 5-17) were advanced to a maximum depths of 14.8 m.

Boreholes BH 6 and BH 2-17 were completed within the proposed park parcel. The Soil Profile and Test data sheets for the test holes located within the proposed park parcel have been appended to the current memorandum.

Subsurface Profile

The subsurface profile within the proposed park parcel was generally observed to consist of asphaltic concrete overlying a 1.1 to 2.2 m thick fill layer, which is further underlain by silty clay and/or glacial till. The fill material was generally observed to consist of crushed stone with silt and sand, transitioning to a silty sand with trace amounts of gravel and cobbles at approximate depths of 1.1 and 0.2 m at boreholes BH 6 and BH 2-17, respectively. However, it should be noted that the fill material is generally considered to consist of re-worked native soils.

A brown silty clay layer was encountered underlying the fill material at borehole BH 2-17 and extended to a depth of 2.3 m below the existing ground surface.

A glacial till deposit was observed underlying the fill and/or silty clay layer in all test holes within the area of the proposed park parcel. The glacial till was generally observed to consist of a grey silty clay to clayey silt matrix with sand and varying amounts of gravel, cobbles and boulders. The silty clay matrix was observed to transition to a sandy silt matrix at an approximate depth of 4.7 m in borehole BH 6.

Practical refusal to augering was encountered at an approximate depth of 6.2 m at boreholes BH 6 and BH 2-17. The bedrock was cored to a depth of 10.2 m at borehole BH 2-17 and was observed to consist of grey limestone with interbedded shale and, based on the RQDs of the recovered bedrock core, was weathered and of poor quality to an approximate depth of 7.2 m, becoming fair to excellent in quality with depth.

Groundwater

Groundwater was measured at approximate depths of 2.6 and 2.8 m below the existing ground surface at the time of the field investigations at boreholes BH 6 and BH 2-17, respectively. However, the long-term groundwater table can be expected at an approximate depth of 4 m based on the observed colour, consistency and moisture levels of the recovered soil samples.

Geotechnical Recommendations

The subject site is considered suitable for the anticipated structures and pavement structures. It is recommended that structures, such as shade structures, be supported on shallow foundations such as conventional spread footings or thickened edge slabs.

Based on the boreholes completed within the park parcel (BH 6 and BH 2-17), only a thin layer of stiff silty clay is present in this portion of the site. Therefore, there is no permissible grade raise restriction for the proposed park parcel, from a geotechnical perspective.

As the fill at this site is considered to consist of re-worked native soils, analytical testing of the fill material is not considered to be required.

Further details are provided on the following pages.

Site Grading and Preparation

It is anticipated that the existing fill, free of deleterious materials and topsoil can be left in place below the proposed park and pavement structures. However, it is recommended that the existing fill layer be thoroughly proof-rolled under dry conditions and in above freezing temperatures, using several passes of a vibratory drum roller and approved by the geotechnical consultant at the time of construction. Any poor performing areas noted during the proof-rolling operation should be removed and replaced with approved fill material, such as Ontario Provincial Standard Specifications (OPSS) Granular B, Type II.

Fill Placement

Fill placed for grading beneath the structures should consist, unless otherwise specified, of clean imported granular fill, such as OPSS Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site. The fill should be placed in maximum 300 mm thick lifts and compacted to 98% of the material's standard Proctor maximum dry density (SPMDD) for granular pads below settlement sensitive structures.

Bearing Resistance Values

Thickened edge concrete slabs or footings supported on the proof-rolled and approved existing fill or compact silty sand/sandy silt can be designed using a bearing resistance value at serviceability limit states (SLS) of **50 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **75 kPa**, provided that the bearing surface is inspected and approved by the geotechnical consultant at the time of construction.

Where the existing fill material is encountered at the foundation subgrade, the existing fill shall be proof-rolled under dry conditions and above freezing temperatures, using a vibratory drum roller making several passes and approved by the geotechnical consultant at the time of construction. Any poor performing areas noted during the proof-rolling operation should be removed and replaced with approved fill material, such as OPSS Granular B, Type II.

Where topsoil is encountered at the foundation subgrade, it should be sub-excavated to the native brown silty clay and/or glacial till and replaced with engineered fill, such as OPSS Granular A or Granular B Type II.

Thickened edge concrete slabs or footings supported on an undisturbed, stiff silty clay bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **275 kPa**, provided that the bearing surface is inspected and approved by the geotechnical consultant at the time of construction.

Thickened edge concrete slabs or footings supported an undisturbed, compact glacial till bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **200 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **350 kPa**, provided that the bearing surface is inspected and approved by the geotechnical consultant at the time of construction.

An undisturbed soil bearing surface consists of a surface from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Footings designed using the bearing resistance values at SLS given above will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively. A geotechnical resistance factor of 0.5 was applied to the above noted bearing resistance value at ULS.

The bearing medium under thickened edge concrete slab supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to a silty clay, glacial till or engineered fill above the groundwater table when a plane extending horizontally and vertically from the underside of the foundation at a minimum of 1.5H:1V passing through in situ soil of the same or higher bearing capacity as the bearing medium soil.

Slab-on-Grade Recommendations

With the removal of all topsoil and fill, containing significant amounts of deleterious or organic materials, the existing fill or native soil subgrade approved by the geotechnical consultant at the time of excavation will be considered an acceptable subgrade surface on which to commence backfilling for slab-on-grade construction. Where the subgrade consists of existing fill, a vibratory drum roller should complete several passes over the subgrade surface as a proof-rolling program. Any poor performing areas should be removed and reinstated with an engineered fill such as OPSS Granular B Type II.

It is recommended the upper 400 mm of sub-floor fill consist of OPSS Granular A crushed stone. All backfill material required to raise grade within the footprint of settlement sensitive structures should be placed in maximum 300 mm thick loose layers and compacted to at least 98% of its SPMDD.

Pavement Structure

The following flexible pavement structures presented below are recommended for the design of pathways. It is anticipated that repeated heavy vehicle traffic during construction will heavily rut the fill subgrade surface. Cow-pathing granular layers, use of smaller excavation equipment and placement of a woven geotextile liner over the subgrade surface may be required where significant rutting is occurring during pathway construction. Site specific recommendations will be provided during our site inspections based on site conditions encountered at that time.

Table 1 - Recommended Pavement Structure - Asphalt Paved Pathways	
Thickness (mm)	**Material Description**
50	**Wear Course** - HL-3 or Superpave 12.5 Asphaltic Concrete
300	**BASE** - OPSS Granular A Crushed stone
SUBGRADE - OPSS Granular B Type II crushed stone placed over in situ soil	

Table 2 - Recommended Pavement Structure - Vehicle Access Pathways	
Thickness (mm)	**Material Description**
50	**Wear Course** - HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed stone
300	**SUBBASE** - OPSS Granular B Type II Crushed stone
SUBGRADE - OPSS Granular B Type II crushed stone placed over in situ soil	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type I or II material. Weak subgrade conditions may be experienced as a result of the existing fill material encountered at subgrade level. This may require the use of a geotextile, thicker subbase or other measures that can be recommended at the time of construction as part of the field observation program.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 98% of the material's SPMDD using suitable vibratory equipment.

Protection Against Frost Action

It is expected that the majority of the proposed park structures are not designed to tolerate differential frost heave. It is recommended that structures founded on a thickened edge concrete slab or conventional shallow footings be protected from frost action by incorporating a combination of non-frost susceptible crushed stone granular fill and/or a layer of rigid insulation. Considering that these structures will not be snow-cleared, a reduced frost protection system is suitable as compared to typical non-heated structures.

For structures founded on a thickened edge concrete slab, a minimum 400 mm thick layer of granular fill, consisting of OPSS Granular A and/or Granular B Type II crushed stone compacted to at least 98% of its SPMDD, is recommended to be placed immediately below the concrete slab and overlying a 50 mm thick layer of HI-40 XPS rigid insulation. The rigid insulation layer should be placed over a thin bedding layer of granular fill which overlies a subgrade surface approved by the geotechnical consultant at the time of construction. The rigid insulation should extend at least 1.2 m horizontally beyond the perimeter of the slab.

We trust that this information satisfies your immediate requirements.

Best Regards,

Paterson Group Inc.

Kevin A. Pickard, EIT

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