patersongroup **memorandum**

consulting engineers

re: **Geotechnical Review**
Proposed Stormwater Management Pond (SWMP)
Kanata North - March Road - Ottawa

to: Minto Communities - **Ms. Beth Henderson** - bhenderson@minto.com

date: April 24, 2020

file: PG4554-MEMO.06

As requested, Paterson Group (Paterson) has completed a geotechnical review of the proposed stormwater management pond (SWMP) to be constructed within the aforementioned site.

The following drawings prepared by David Schaeffer Engineering Limited (DSEL) were provided and reviewed by Paterson from a geotechnical perspective:

- ❏ SWM Pond - Minto Kanata North - Figure 7 - Project No. 17-982, April 2020.
- ❏ SWM Pond Drainage Area - Minto Kanata North - Figure 9 - Project No. 17-982, April 2020.
- ❏ Conceptual Grading Plan - Minto Kanata North - Drawing No. 1 - Project No.17-982, April 2020.
- ❏ Storm Servicing Appendix Minto Kanata North - Drawing No. 2 - Project No. 17-982, April 2020.

1.0 Proposed Stormwater Management Pond Details

Based on the reviewed drawings, it is understood that the proposed SWMP will consist of the following:

- ❏ Pond bottom elevation . . . . . 63.30 m
- ❏ Permanent pond elevation . . . . . 64.80 m
- ❏ 2 year water elevation . . . . . 64.98 m
- ❏ 100 year water elevation . . . . . 66.56 m

2.0 Subsurface Soil Profile

Two (2) boreholes were drilled within close proximity of the proposed SWMP. The boreholes were advanced to a maximum depth of 6.7 m below existing ground surface. The location of the test holes are shown on Drawing PG4554-1 - Test Hole Location Plan, Revision 4, appended to this memorandum as well as the borehole logs.

Generally, the subsoil conditions at the borehole locations consisted of a thin layer of topsoil, overlying a very stiff brown silty clay crust. Very stiff grey silty clay was encountered at a depth of approximately 1.8 m below existing ground surface. Furthermore, a glacial till deposit was encountered underlaying the silty clay at approximate depths of 3.8 m and 4.5 m below the existing ground surface, consisting of grey silty clay with sand, gravel, cobbles and boulders.

Reference should be made to the Soil Profile and Test Data sheets and Test Hole Location Plan appended to this report for specific details of the soil profiles encountered at each test hole location.

At the time of the field investigation, groundwater levels were measured in the standpipes installed in the boreholes and results are noted in the attached Soil Profile and Test Data Sheets. It is important to note that groundwater level readings could be influenced by surface water infiltrating the backfilled borehole. The groundwater level can also be estimated based on moisture levels and colour of the recovered soil samples. Based on these observations at the borehole locations, the long-term groundwater table is expected at elevations between 64.5 to 65.5 m. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.

3.0 Geotechnical Assessment

From a geotechnical perspective, the construction of the proposed SWMP is suitable based on the details provided in the construction drawings. The main areas of concern will be:

- ❏ the groundwater infiltration rate within the excavation side slopes and along the bottom of the pond
- ❏ the permeability of the subsoil materials
- ❏ the stability of the excavation side slopes
- ❏ Bearing capacity below structures

Groundwater Infiltration Rate

Based on our observations, the long term groundwater level is expected to be at an approximate elevation between 64.5 to 65.5 m. The groundwater infiltration rates are anticipated to be low to moderate through the very stiff clay and should be managed during the construction program. The groundwater infiltration rate will be negligible after the pond is constructed and in operation.

The proposed SWMP will be located in an area where water infiltration will be important to manage during the construction phase. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

A temporary Ministry of Environment Conservation and Parks(MECP) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MECP.

For typical ground or surface water volumes, being pumped during the construction phase, between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application.

Excavation Side Slope Stability

The long term performance of the proposed SWMP will depend on the stability of its excavation side slopes. Based on the available drawings, it appears that the excavation side slopes are between 3H:1V to 4H:1V. From a geotechnical perspective, the sidewall slopes are considered to be stable in the long term and are adequate for the SWMP construction at the subject site.

Based on the available drawings and subsoil information, the base of the pond will consist of very stiff brown silty clay. Based on the groundwater observations during the geotechnical investigations noted above, the existing clay within the base of the pond is acceptable from a geotechnical perspective. It is recommended that Paterson be contacted during the excavation period to conduct site inspections to verify the groundwater conditions at the time of construction.

Bearing Resistance Values

The proposed concrete structures associated with the SWMP can be founded within the stiff silty clay and/or glacial till. The following allowable bearing capacities are provided for design purposes and based on undisturbed conditions. Conditions should be confirmed in the field prior to placing concrete:

- ❑ Stiff Silty Clay . . . . . 150 kPa
- ❑ Compact to Dense Glacial Till. . . . . 150 kPa

Stockpiled excavated silty clay can be placed as general fill where settlement of the ground surface is of minor concern (landscape, pond grading, etc). The site generated fill should be spread in maximum 300 mm loose lifts and compacted using a sheepsfoot roller making several passes and approved by the geotechnical consultant.

Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications & Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa.

A minimum of 150 mm of OPSS Granular A should be placed for bedding for inlet and outlet pipe structures when placed on soil subgrade. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to a minimum of 300 mm above the overt of the pipe should consist of OPSS Granular A. The bedding and cover materials should be placed in maximum 225 mm thick lifts and compacted to 95% of the SPMDD.

Asphalt Pavement and Reinforced Grass Roadway Structure

Topsoil and deleterious fill, such as those containing organic materials, should be stripped from under the asphalt and reinforced grass service roads prior to the placement of the recommended pavement structure. The recommended service roadway pavement structure is presented in Table 1 below.

Table 1 - Asphalt Service Road Pavement Structure	
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
Subgrade - Either in situ soils, acceptable fill or approved granular fill placed over in situ soil.	

It is expected that the silty clay subgrade will be significantly rutted during placement of the granular base layers for the proposed pavement structure. Consideration should be taken to utilizing the cow-path technique for the temporary haul road by increasing the thickness of the Granular B Type II at areas where loading is increased, such as truck turning areas.

For the long-term performance of the temporary haul road and service road, heavy wheel loading from construction traffic should be limited until the full design thickness of the temporary haul road is placed and compacted as recommended. It is expected that the temporary haul road will require regular maintenance during the construction process to minimize tire rutting.

It is expected that the upper 100 mm of Granular B Type II used to build-up the temporary haul road will be contaminated during the construction phase. Therefore, the upper contaminated portion of the Granular B Type II layer will have to be removed before placement of the Granular A crushed stone base layer for the proposed pavement structure. Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project. 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 equipment.

4.0 Recommendations

It is recommended that periodic inspections of bearing surfaces, excavation slopes and compaction testing be completed by the geotechnical consultant during construction. It is further recommended to limit finished topsoil placement until the SWMP side slopes have allowed trapped surficial water to drain. Also, an erosion control blanket should be placed over the finished topsoil surface to reduce surficial erosion until vegetation can establish.

Upon request, a report confirming that these works have been conducted in general accordance with our recommendations could be issued following the completion of a satisfactory materials testing and observation program by the geotechnical consultant.

We trust that this information satisfies your immediate requirements.

Best Regards,

Paterson Group Inc.

Hian De Freitas, M.A.Sc.

David J. Gilbert, P.Eng.

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 936 March Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

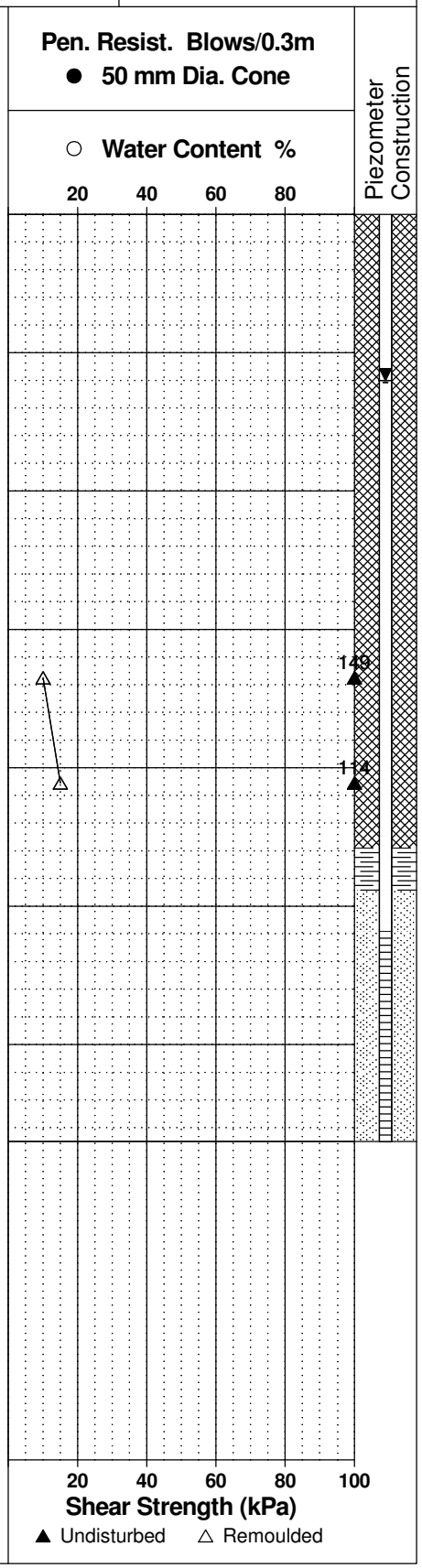
FILE NO. PG4554

REMARKS

HOLE NO. BH12

BORINGS BY CME 55 Power Auger **DATE** July 3, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	67.58
TOPSOIL 0.28		AU	1				
Loose, brown **SILTY SAND** 0.76		SS	2	96	7	1	66.58
Very stiff, brown **SILTY CLAY**		SS	3	96	7	2	65.58
- grey by 2.3m depth		SS	4		6	3	64.58
4.57						4	63.58
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders		SS	5	12	10	5	62.58
		SS	6	75	25	6	61.58
6.70							
End of Borehole							
(GWL @ 1.20m - July 12, 2018)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 936 March Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

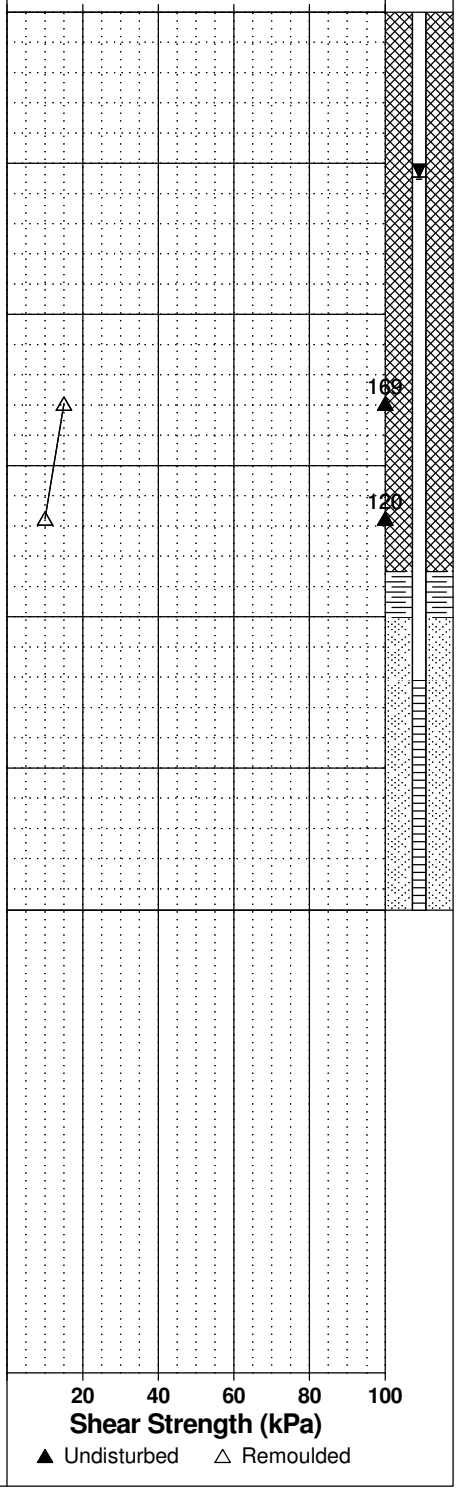
FILE NO. PG4554

REMARKS

HOLE NO. BH13

BORINGS BY CME 55 Power Auger **DATE** July 2, 2018

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	65.95
TOPSOIL 0.15		AU	1				
Very stiff, brown **SILTY CLAY**		SS	2	88	8	1	64.95
- grey by 1.8m depth		SS	3	96	4	2	63.95
3.81						3	62.95
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders		SS	4	69	9	4	61.95
		SS	5	88	12	5	60.95
		SS	6	62	18		
5.94							
End of Borehole							
(GWL @ 1.09m - July 12, 2018)							



LEGEND:

- TEST PIT LOCATION
- BOREHOLE LOCATION
- BOREHOLE WITH MONITORING WELL LOCATION
- 68.69 GROUND SURFACE ELEVATION (m)
- (63.58) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- [71.77] BEDROCK SURFACE ELEVATION (m)

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS PROVIDED BY STANTEC GEOMATICS LIMITED.

SURVEY PLAN PROVIDED BY STANTEC GEOMATICS.

SCALE: 1:400

0 5 10 15 20 25m

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NO.	REVISIONS	DATE	INITIAL
5	BASE PLAN UPDATED	23/04/2020	DJG
4	BASE PLAN UPDATED	19/07/2019	SD
3	BASE PLAN UPDATED + TEST PIT 2019	13/05/2019	JV
2	BASE PLAN UPDATED	23/11/2018	SD
1	BASE PLAN UPDATED	30/08/2018	SD

MINTO COMMUNITIES / 2559688 ONTARIO INC.

GEOTECHNICAL INVESTIGATION
PROPOSED DEVELOPMENT - 936 MARCH ROAD

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:4000	Date: 07/2018
Drawn by: RCG	Report No.: PG4554-1
Checked by: SD	Dwg. No.: PG4554-1
Approved by: SD	Revision No.: 5

<unsaved drawing>