PATERSON GROUP

memorandum

re: **Geotechnical Response to Review Comments**
Proposed Residential Development
3317 Navan Road - Ottawa, Ontario

to: Renfroe Land Management – **Mr. David Renfroe** –davidrenfroe@outlook.com

date: October 17, 2023

file: PG6582-MEMO.02

Further to your request, Paterson Group (Paterson) prepared the following memorandum to provide geotechnical tree planting restriction recommendations. The present memorandum should be read in conjunction with Paterson Group Report PG6582-1 dated April 12, 2023

Landscaping and Exterior Structure Considerations

Tree Planting Restrictions

Paterson completed a soils review of the subject development and neighboring development to determine applicable tree planting setbacks, in accordance with the City of Ottawa Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines). Atterberg limits testing was completed for recovered silty clay samples during the historical geotechnical investigations. Grain size distribution analysis was also completed on 1 soil sample. The above-noted test results were completed on samples taken at depths between the anticipated design underside of footing elevation and 3.5 m depth below the anticipated finished grade. The soil profiles are presented on the Soil Profile and Test Data Sheet attached to this memorandum. The locations of test holes are shown on Drawing PG2444-5 - Test Hole Location Plan included in this memorandum. The results of our testing are presented in Tables 1 and 2.

Table 1 – Atterberg Limits Results

Test Hole	Sample	Depth (m)	Liquid Limit (%)	Plastic Limit (%)	Plastic Index (%)	Moisture Content (%)	Classification
BH 13-22	SS3	1.8	69	19	50	58	CL
BH 1-14	TW3	2.6	77	26	52	82	CH

Notes: CL: Inorganic Clay of Low Plasticity; CH: Inorganic Clay of High Plasticity

Table 2 – Summary of Grain Size Distribution

Test Hole	Sample	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH 13-22	SS4	2.6	0.0	14.4	39.1	46.5

A medium to high sensitivity clay soil was encountered between the anticipated underside of footing elevations and 3.5 m below the preliminary finished grade as per City Guidelines at the subject site. Based on our Atterberg Limits' test results, the modified plasticity limits generally exceed 40% for the majority of the boreholes across the subject site. Therefore, the following tree planting setbacks are recommended for the medium to high sensitivity area.

Large trees (mature height over 14 m) can be planted within this area provided a tree to foundation setback equal to the full mature height of the tree can be provided (e.g. in a park or other green space). A tree planting setback limit of **7.5 m** is applicable for small (mature tree height up to 7.5m) and medium size trees (mature tree height 7.5 m to 14 m) provided that the following conditions are met:

- ❑ The underside of footing (USF) is 2.1 m or greater below the lowest finished grade must be satisfied for footings within 10 m from the tree, as measured from the centre of the tree trunk and verified by means of the Grading Plan as indicated procedural changes below. **It should be noted that where the footings are proposed at a shallower depth, a combination of engineered fill and/or root barrier system can be designed to accommodate a reduced footing depths which can be discussed in a separate report upon completion of the design grading plans.**

- ❑ A small tree must be provided with a minimum of 25 m^3 of available soil volume while a medium tree must be provided with a minimum of 30 m^3 of available soil volume, as determined by the Landscape Architect. The developer is to ensure that the soil is generally un-compacted when backfilling in street tree planting locations.

- ❑ The tree species must be small (mature tree height up to 7.5 m) to medium size (mature tree height 7.5 m to 14 m) as confirmed by the Landscape Architect.

- ❑ The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall).

- ❑ Grading surrounding the tree must promote drainage to the tree root zone (in such a manner as not to be detrimental to the tree), as noted on the subdivision Grading Plan.

We trust that this information satisfies your immediate requirements.

Best Regards,

Paterson Group Inc.

Balaji Nirmala, M.Eng

Joey R. Villeneuve, M.A.Sc., P.Eng., ing.

patersongroup

Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Dev.-Eastboro Phase 2-Navan Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Annis, O'Sullivan, Vollebekk Limited.

FILE NO. PG2444

REMARKS

HOLE NO. BH 1-14

BORINGS BY CME 55 Power Auger **DATE** June 17, 2014

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	87.74		
Loose, brown **SILTY SAND**		AU	1						
		SS	2	67	4	1	86.74		
1.37									
						2	85.74		
Soft to firm, brown **SILTY CLAY**		TW	3	100					
						3	84.74		
- grey by 3.0m depth									
		TW	4	100		4	83.74		
						5	82.74		
						6	81.74		
						7	80.74		
						8	79.74		
						9	78.74		
9.60									
End of Borehole									
(GWL @ 0.8m depth based on field observations)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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9 Auriga Drive, Ottawa, Ontario K2E 7T9

SOIL PROFILE AND TEST DATA

Supplemental Geotechnical Investigation
Prop. Residential Development - Eastboro Phase 2
Navan Road, Ottawa, Ontario

DATUM Geodetic

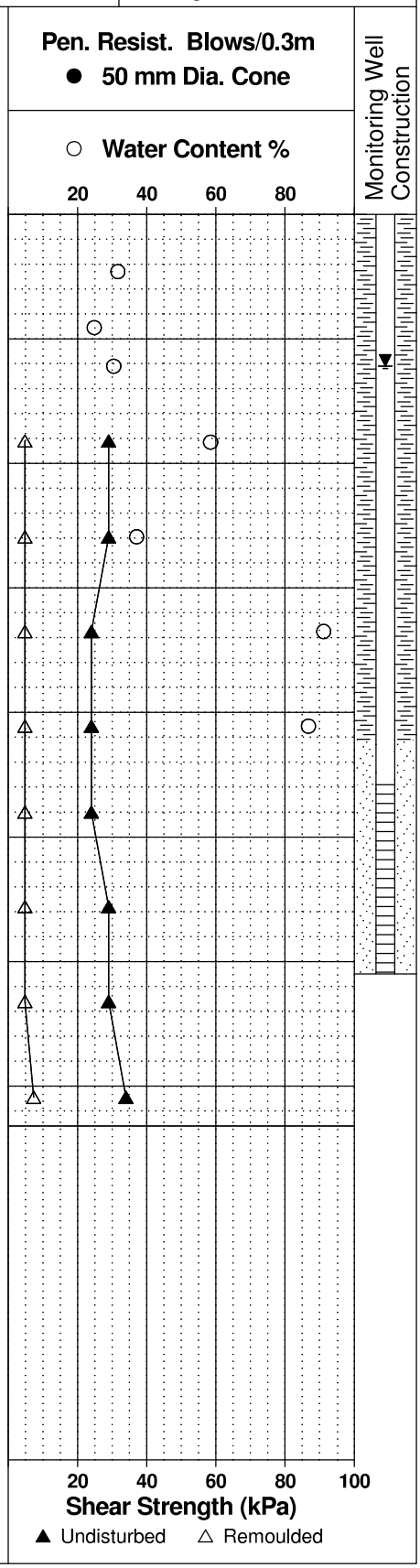
REMARKS

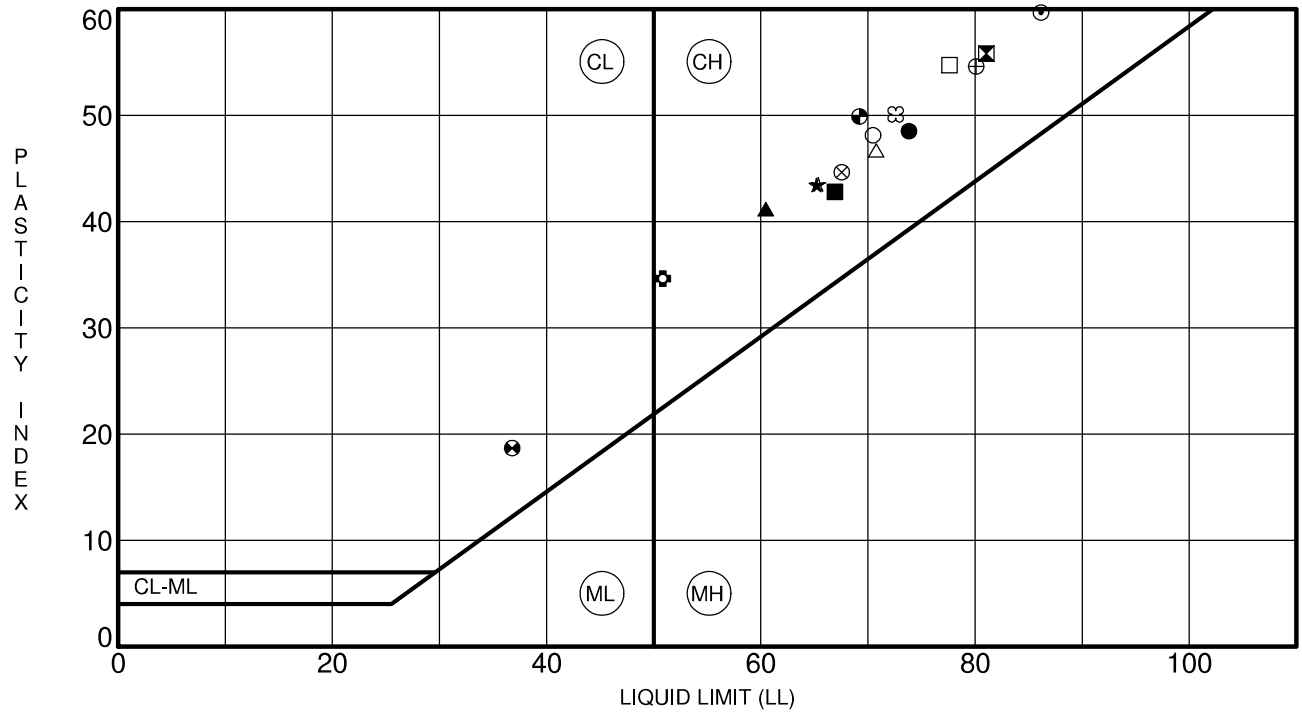
BORINGS BY Track-Mount Power Auger **DATE** May 24, 2022

FILE NO. PG2444

HOLE NO. BH13-22

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	85.94
Loose to compact, brown **SILTY SAND**		AU	1				
- grey by 0.9m depth		SS	2	50	10	1	84.94
1.52							
		SS	3	100		2	83.94
		SS	4	58			
		SS	5	100		3	82.94
		SS	6	100		4	81.94
Soft to firm, grey **SILTY CLAY**						5	80.94
						6	79.94
						7	78.94
7.32							
End of Borehole							
(GWL @ 1.22m - June 17, 2022)							





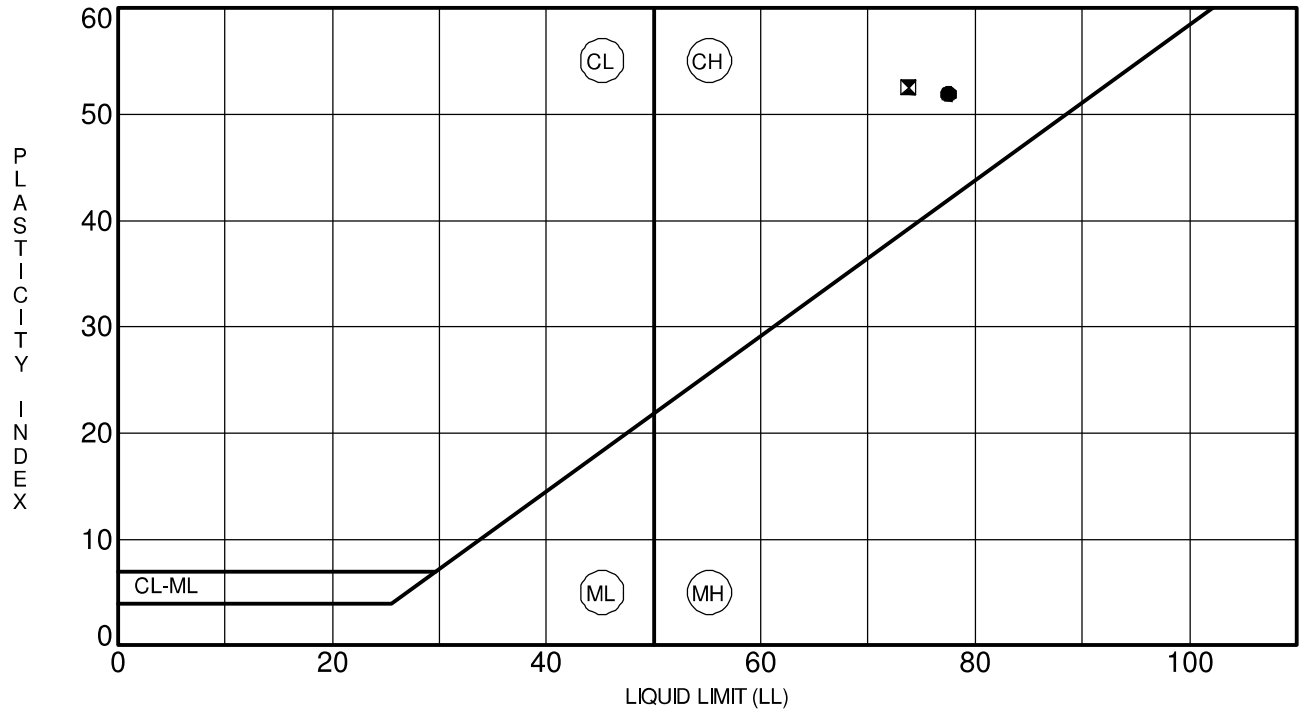
Specimen Identification			LL	PL	PI	Fines	Classification
●	BH 1-22	SS4	74	25	49		CH - Inorganic clays of high plasticity
⊠	BH 2-22	SS3	81	25	56		CH - Inorganic clays of high plasticity
▲	BH 3-22	SS2	60	19	41		CH - Inorganic clays of high plasticity
★	BH 4-22	SS4	65	22	43		CH - Inorganic clays of high plasticity
⊙	BH 5-22	SS5	86	26	60		CH - Inorganic clays of high plasticity
✿	BH 6-22	SS3	51	16	35		CH - Inorganic clays of high plasticity
○	BH 7-22	SS5	70	22	48		CH - Inorganic clays of high plasticity
△	BH 8-22	SS3	71	24	47		CH - Inorganic clays of high plasticity
⊗	BH 9-22	SS3	68	23	45		CH - Inorganic clays of high plasticity
⊕	BH10-22	SS3	80	25	55		CH - Inorganic clays of high plasticity
□	BH11-22	SS3	78	23	55		CH - Inorganic clays of high plasticity
⊛	BH12-22	SS4	37	18	19		CL - Inorganic clays of low plasticity
◕	BH13-22	SS3	69	19	50		CH - Inorganic clays of high plasticity
☆	BH14-22	SS7	65	22	44		CH - Inorganic clays of high plasticity
⊠	BH15-22	SS4	73	22	50		CH - Inorganic clays of high plasticity
■	BH16-22	SS2	67	24	43		CH - Inorganic clays of high plasticity

CLIENT **Ashcroft Homes** FILE NO. **PG2444**

PROJECT **Supplemental Geotechnical Investigation - Prop. Residential Development - Eastboro Phase 2** DATE **25 May 22**

patersongroup Consulting Engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

ATTERBERG LIMITS' RESULTS



Specimen Identification			LL	PL	PI	Fines	Classification
●	BH 1-14	TW 3	77	26	52		CH - High plasticity inorganic clay
⊠	BH 4-14	TW 2	74	21	53		CH - High plasticity inorganic clay

CLIENT	**Ashcroft Homes**	FILE NO.	**PG2444**
PROJECT	**Geotechnical Investigation - Prop. Residential**	DATE	**13 Jun 14**
	Dev.-Eastboro Phase 2-Navan Road		

patersongroup Consulting Engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

ATTERBERG LIMITS' RESULTS

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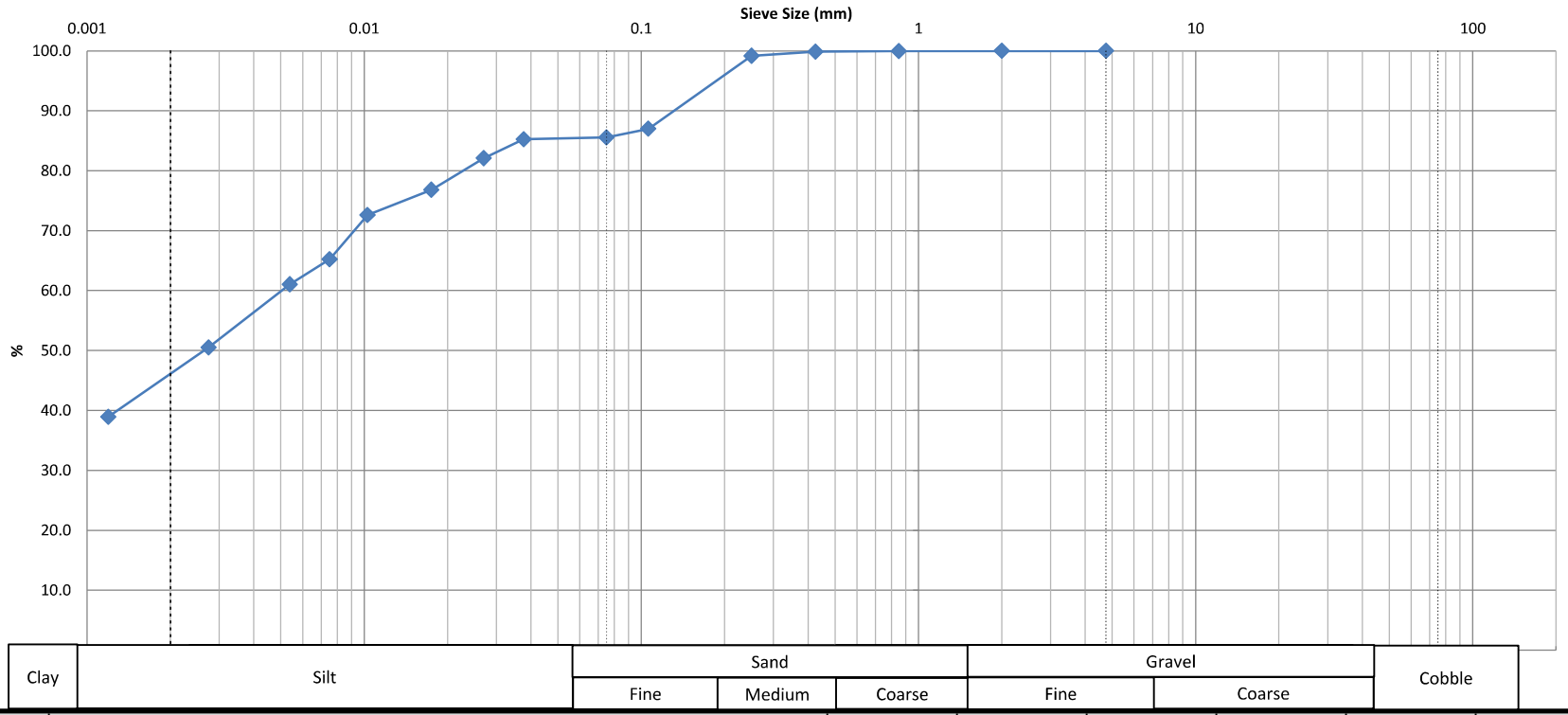
SIEVE ANALYSIS
ASTM C136

CLIENT:	Ashcroft Homes	DEPTH:	7'-6" to 9'-6"	FILE NO:	PG2444
CONTRACT NO.:		BH OR TP No.:	BH13-22-PH2 SS4	LAB NO:	34115
PROJECT:	Eastboro - Phase 2			DATE RECEIVED:	30-May-22
				DATE TESTED:	31-May-22
DATE SAMPLED:	May 19-25			DATE REPORTED:	10-Jun-22
SAMPLED BY:	N.S			TESTED BY:	DK/CS



Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						46.6					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	14.4		39.1		46.5	

Comments:

REVIEWED BY:	Curtis Beadow	Joe Forsyth, P. Eng.

patersongroup
consulting engineers

HYDROMETER
LS-702 ASTM-422

CLIENT:	Ashcroft Homes	DEPTH:	7'-6" to 9'-6"	FILE NO.:	PG2444
PROJECT:	Eastboro - Phase 2	BH OR TP No.:	BH13-22-PH2 SS4	DATE SAMPLED	May 19-25
LAB No. :	34115	TESTED BY:	DK/CS	DATE RECEIVED	30-May-22
SAMPLED BY:	N.S	DATE REPT'D:	10-Jun-22	DATE TESTED:	31-May-22

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
114.6	2.700

INITIAL WEIGHT	50.00	**HYGROSCOPIC MOISTURE**		
WEIGHT CORRECTED	33.38	TARE WEIGHT	50.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	7.29	AIR DRY	127.90	77.90
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	102.00	52.00
		CORRECTED	0.668	

GRAIN SIZE ANALYSIS

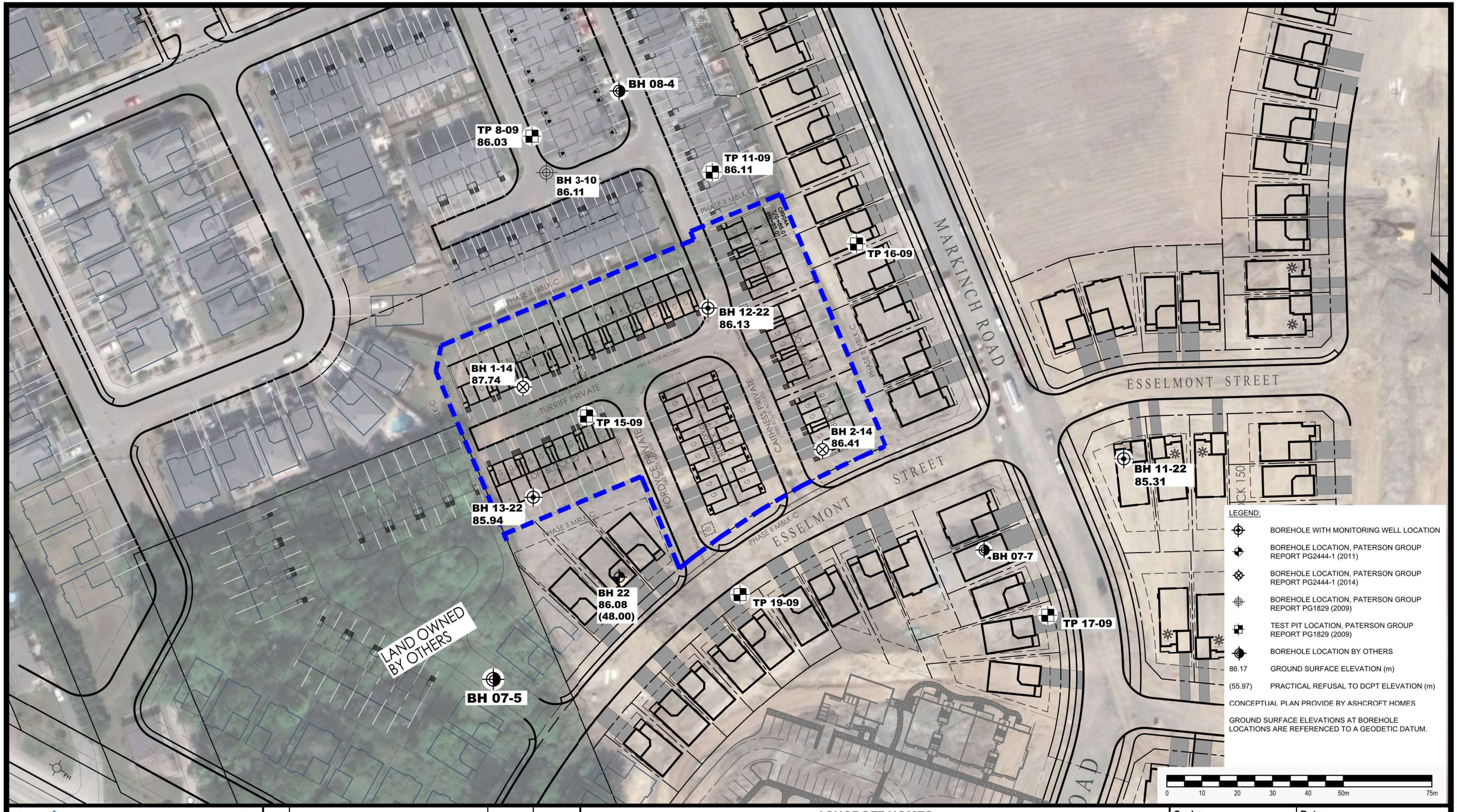
SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5			
19			
13.2			
9.5			
4.75	**0.00**	0.0	**100.0**
2.0	**0.00**	0.0	**100.0**
Pan	**102.00**		
0.850	**0.01**	0.0	**100.0**
0.425	**0.06**	0.1	**99.9**
0.250	**0.41**	0.8	**99.2**
0.106	**6.49**	13.0	**87.0**
0.075	**7.22**	14.4	**85.6**
Pan	**7.29**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	8:30	46.5	6.0	23.0	0.0376	85.2	**85.2**
2	8:31	45.0	6.0	23.0	0.0270	82.1	**82.1**
5	8:34	42.5	6.0	23.0	0.0175	76.8	**76.8**
15	8:44	40.5	6.0	23.0	0.0103	72.6	**72.6**
30	8:59	37.0	6.0	23.0	0.0075	65.2	**65.2**
60	9:29	35.0	6.0	23.0	0.0054	61.0	**61.0**
250	12:39	30.0	6.0	23.0	0.0028	50.5	**50.5**
1440	8:29	24.5	6.0	23.0	0.0012	38.9	**38.9**

Moisture = 46.6%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.



PATERSON GROUP
SOLUTION ORIENTED ENGINEERING

NO.	REVISIONS	DATE	INITIAL
1	2022 BOREHOLES ADDED AND BASEPLAN UPDATED	06/07/2022	KP

ASHCROFT HOMES
GEOTECHNICAL INVESTIGATION
EASTBORO RESIDENTIAL DEVELOPMENT
MULTIBLOCK C
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:1000	Date: 06/2021
Drawn by: YA	Report No.: PG2444-3
Checked by: YT	Dwg. No.: PG2444-5
Approved by: FA	Revision No.: 1

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