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January 10, 2019
File: PG0538-LET.05

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Geological Engineering
Materials Testing
Building Science
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Attention: **Mr. Curtiss Scarlett, P.Eng.**

www.patersongroup.ca

Subject: **Tree Planting Setback Recommendations
Stages 3, 4 and 5 - Arcadia Residential Development - Ottawa**

Dear Sir,

In accordance with the City of Ottawa Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines), Paterson completed a soils review of the site to determine applicable tree planting setbacks.

The current letter should be read in conjunction with Report PG0538-5 dated May 10, 2017 and should be considered to supersede Subsection 7.7 - Landscaping Considerations.

From October 12 to 18, 2018, a total of fifty three (53) test pits were completed by Paterson Group (Paterson) to provide general coverage of the subject site. The test pits were excavated using a hydraulic excavator to the required depths and representative soils samples were recovered from the sidewalls of the open excavation. The test hole locations are shown on Drawing PG0538-17 - Test Hole Location Plan, attached to the current report.

Atterberg limits and moisture contents were tested on fifteen (15) of the recovered silty clay samples at selected locations throughout the subject site. Grain size distribution (sieve analysis) testing was also completed on four (4) selected soil samples, and one (1) additional soil sample was submitted for shrinkage testing. The abovenoted test results were completed on soil samples collected at depths between estimated underside of footing elevation and 3.5 m below proposed finished grade. The results of our testing are presented below in Tables 1 and 2 and attached to the current report.

Table 1 - Summary of Atterberg Limits Tests					
Sample	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Classification
TP1-18 - G4	21.7	49	20	29	CL
TP6-18 - G2	26.8	76	29	47	CH
TP7-18 - G3	21.2	52	22	30	CH
TP12-18 - G1	19.6	52	21	31	CH
TP16-18 - G3	23.8	56	21	35	CH
TP21-18 - G1	25.2	63	23	40	CH
TP23-18 - G4	18.2	50	22	28	CH
TP26-18 - G2	16.3	47	20	27	CL
TP27-18 - G2	21.2	48	21	27	CL
TP28-18 - G1	21.7	52	20	32	CH
TP33-18 - G1	19.2	47	18	28	CL
TP34-18 - G2	16.8	48	20	28	CL
TP36-18 - G1	13.8	30	17	13	CL
TP38-18 - G3	23.5	55	27	28	CH
TP40-18 - G1	20.6	60	23	37	CH

Table 2 - Grain Size Distribution				
Test Hole	Sample	Gravel (%)	Sand (%)	Silt and Clay (%)
TP6-18*	G2	0	2.9	97.1
TP23-18 *	G4	0	4.3	95.7
TP27-18*	G2	0	9.2	90.8
TP40-18 *	G2	1.6	4.6	93.8
Notes * - denotes soil sample submitted for hydrometer testing in conjunction with grain size distribution testing				

The results of the shrinkage testing of TP23-18 - G4 resulted in a shrinkage limit of **16%** with a shrinkage ratio of **1.92**.

The following conceptual grading plan prepared by J. L. Richards was reviewed to determine design underside of footing elevations for our tree planting soils review:

- ❑ Project No. 26299.01 - Drawing CG7 - Conceptual Grading Plan - Revision 2 dated January 26, 2018.

Based on the results of the representative soil samples, the subject site is considered as a **low/medium** sensitivity area for tree planting according to the City of Ottawa Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines)

Since the modified plasticity limit (PI) generally does not exceed 40%, large trees (mature height over 14 m) can be planted at the subject site 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).

Tree planting setback limits may be reduced to 4.5 m 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.
- ❑ A small tree must be provided with a minimum of 25 m³ of available soil volume while a medium tree must be provided with a minimum of 30 m³ 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 surround the tree must promote drainage to the tree root zone (in such a manner as not to be detrimental to the tree).

Mr. Curtiss Scarlett
Page 4
Report: PG0538-LET.05

We trust that this information satisfies your present requirements.

Best Regards,

Paterson Group Inc.



Nathan F. S. Christie, P.Eng.



David J. Gilbert, P.Eng.

Attachments:

- ☐ Summary of Grades and Profiles at Test Pits
- ☐ Atterberg Limits' Testing Results
- ☐ Grain Size Distribution Analysis
- ☐ Drawing PG0538-17 -Test Hole Location Plan

TABLE 2: SUMMARY OF GRADES AND PROFILES AT TEST PITS - ARCADIA STAGES 3 AND 4

Test Pit No.	Ground El. (m)	Depth (m)		Elevation (m)		Layer Thickness (m)	Material Description
		From	To	From	To		
South -Fill Area 1A and 2013 Extensions:							
TP 1	98.60	0.00	1.20	98.60	97.40	1.20	FILL: Loose to compact brown silty sand, trace gravel, cobbles, clay
		1.20	3.80	97.40	94.80	2.60	FILL: Stiff brown silty clay, some sand, trace gravel (EF≥ 95.0 m)
TP 2	98.92	0.00	1.20	98.92	97.72	1.20	FILL: Loose to compact brown silty sand, some clay, gravel, cobbles, boulders
		1.20	4.00	97.72	94.92	2.80	FILL: Stiff brown silty clay, some sand, gravel, cobbles (EF≥ 95.0 m)
TP 3	100.41	0.00	1.30	100.41	99.11	1.30	FILL: Loose brown silty sand, some clay, gravel, cobbles, boulders
		1.30	5.20	99.11	95.21	3.90	FILL: Stiff brown silty clay, some sand, trace gravel, cobbles (EF≥ 95.0 m)
TP 4	100.52	0.00	1.10	100.52	99.42	1.10	FILL: Loose brown silty sand, some clay, gravel, cobbles, boulders
		1.10	5.40	99.42	95.12	4.30	FILL: Stiff brown silty clay, some sand, trace gravel, cobbles (EF≥ 95.0 m)
TP 5	100.86	0.00	1.60	100.86	99.26	1.60	FILL: Loose brown silty sand, some clay, gravel, cobbles, boulders
		1.60	5.50	99.26	95.36	3.90	FILL: Stiff brown silty clay, trace sand, gravel, cobbles (EF≥ 95.0 m)
TP 6	98.86	0.00	2.30	98.86	96.56	2.30	FILL: Stiff brown silty clay, trace sand
		2.30	3.10	96.56	95.76	0.80	FILL: Very stiff brown silty clay, trace sand (EF≥ 95.0 m)
TP 7	100.45	0.00	1.20	100.45	99.25	1.20	FILL: Loose brown sand, gravel, cobbles, boulders, organics
		1.20	4.90	99.25	95.55	3.70	FILL: Stiff brown silty clay, trace sand, gravel, cobbles
		4.90	5.30	95.55	95.15	0.40	FILL: Very stiff brown silty clay, some sand, trace gravel, cobbles (EF≥ 95.0 m)
TP 8	99.41	0.00	1.90	99.41	97.51	1.90	FILL: Stiff brown silty clay, trace sand
		1.90	3.40	97.51	96.01	1.50	FILL: Stiff to very stiff brown silty clay, trace sand, boulder (EF≥ 95.0 m)
TP 9	98.96	0.00	2.60	98.96	96.36	2.60	FILL: Stiff brown silty clay, trace sand
		2.60	3.00	96.36	95.96	0.40	FILL: Stiff brown silty clay, trace sand (EF≥ 95.0 m)
TP 10	100.13	0.00	3.00	100.13	97.13	3.00	FILL: Firm to stiff brown silty clay, trace sand, gravel, cobbles
		3.00	4.50	97.13	95.63	1.50	FILL: Organic-rich stiff brown silty clay, trace sand - organic odour
		4.50	5.60	95.63	94.53	1.10	FILL: Very stiff brown silty clay, some sand, trace gravel, cobbles (EF≥ 95.0 m)
TP 11	99.52	0.00	1.10	99.52	98.42	1.10	FILL: Loose to compact sandy silt, gravel, cobbles, precambrian boulders
		1.10	4.70	98.42	94.82	3.60	FILL: Very stiff brown silty clay, some sand, trace gravel, cobbles (EF≥ 95.0 m)
TP 12	98.96	0.00	0.30	98.96	98.66	0.30	FILL: Loose/firm brown silty clay, trace sand
		0.30	3.30	98.66	95.66	3.00	FILL: Very stiff brown silty clay, trace sand (EF≥ 95.0 m)
TP 13	99.34	0.00	1.60	99.34	97.74	1.60	FILL: Compact/stiff brown silty clay/clayey silt
		1.60	4.80	97.74	94.54	3.20	FILL: Stiff brown silty clay, trace sand
		4.80	5.10	94.54	94.24	0.30	ENG. FILL: Very stiff brown silty clay (PG 4.8 m el. 94.54 m; EF≥ 94.9 m)
TP 14	99.12	0.00	3.80	99.12	95.32	3.80	FILL: Firm to stiff brown silty clay, trace sand
		3.80	4.90	95.32	94.22	1.10	FILL: Very stiff brown silty clay, trace sand (EF≥ 95.65 m)
TP 15	98.83	0.00	2.30	98.83	96.53	2.30	FILL: Firm to stiff brown silty clay, trace sand
		2.30	3.30	96.53	95.53	1.00	FILL: Very stiff brown silty clay, trace sand (EF≥ 94.80 m)
TP 16	99.30	0.00	4.00	99.30	95.30	4.00	FILL: Firm to stiff brown silty clay, trace sand
		4.00	5.00	95.30	94.30	1.00	FILL: Very stiff brown silty clay, trace sand (EF≥ 94.95 m)
TP 17	98.75	0.00	3.20	98.75	95.55	3.20	FILL: Firm to stiff brown silty clay, trace sand
		3.20	4.50	95.55	94.25	1.30	FILL: Very stiff brown silty clay, trace sand (EF≥ 95.0 m)

TABLE 2: SUMMARY OF GRADES AND PROFILES AT TEST PITS - ARCADIA STAGES 3 AND 4

Test Pit No.	Ground El. (m)	Depth (m)		Elevation (m)		Layer Thickness (m)	Material Description
		From	To	From	To		
TP 18	98.46	0.00	1.30	98.46	97.16	1.30	FILL: Firm to stiff brown silty clay, some sand and gravel
		1.30	2.70	97.16	95.76	1.40	FILL: Organic-rich stiff brown silty clay, trace sand - organic odour
		2.70	3.00	95.76	95.46	0.30	FILL: Very stiff brown silty clay, trace sand (EF _≥ 94.85 m)
TP 19	98.05	0.00	1.10	98.05	96.95	1.10	FILL: Firm to stiff brown silty clay, some sand and gravel
		1.10	2.30	96.95	95.75	1.20	FILL: Organic-rich stiff brown silty clay, trace sand - organic odour
		2.30	2.60	95.75	95.45	0.30	FILL: Very stiff brown silty clay, trace sand (EF _≥ 94.7 m)
TP 20	98.47	0.00	1.40	98.47	97.07	1.40	FILL: Compact/stiff brown silty clay/clayey silt
		1.40	3.50	97.07	94.97	2.10	FILL: Stiff brown silty clay, trace sand
		3.50	4.40	94.97	94.07	0.90	FILL: Very stiff brown silty clay, trace sand (EF _≥ 94.7 m)
TP 21	98.64	0.00	2.00	98.64	96.64	2.00	FILL: Stiff brown silty clay, trace sand
		2.00	3.20	96.64	95.44	1.20	FILL: Stiff to very stiff brown silty clay, trace sand
		3.20	3.40	95.44	95.24	0.20	ENG. FILL: Very stiff brown silty clay (PG 3.2 m el. 95.44 m; EF _≥ 94.85 m)
TP 22	98.96	0.00	1.00	98.96	97.96	1.00	FILL: Compact/stiff brown silty clay/clayey silt
		1.00	3.10	97.96	95.86	2.10	FILL: Stiff brown silty clay, some sand, trace gravel, cobbles
		3.10	3.50	95.86	95.46	0.40	FILL: Very stiff brown silty clay, some sand
		3.50	4.40	95.46	94.56	0.90	ENG. FILL: Very stiff brown silty clay (PG 3.5 m el. 95.46 m; EF _≥ 95.0 m)
TP 23	99.53	0.00	1.10	99.53	98.43	1.10	FILL: Firm to stiff brown silty clay, some sand and gravel
		1.10	3.50	98.43	96.03	2.40	FILL: Compact/stiff brown silty clay, some sand & gravel, const. debris
		3.50	4.90	96.03	94.63	1.40	ENG. FILL: Very stiff brown silty clay, trace sand (PG 3.5 m el. 96.03 m; EF _≥ 95.1 m)
		4.90	5.30	94.63	94.23	0.40	Native very stiff silty clay (crust)
TP 24	98.94	0.00	2.30	98.94	96.64	2.30	FILL: Stiff brown silty clay, trace sand - NOT TOPSOIL ZONE
		2.30	2.80	96.64	96.14	0.50	ENG. FILL: Very stiff brown silty clay, trace sand (PG 2.3 m el. 96.64 m; EF _≥ 95.1 m)
TP 25	98.55	0.00	1.60	98.55	96.95	1.60	FILL: Firm to stiff brown silty clay, some sand
		1.60	3.20	96.95	95.35	1.60	FILL: Stiff brown/grey silty clay, trace organics
		3.20	4.00	95.35	94.55	0.80	ENG. FILL: Very stiff brown silty clay, trace sand (PG 3.2 m el. 95.35 m; EF _≥ 95.05 m)
		4.00	4.45	94.55	94.10	0.45	DRAIN. FILL: Filter sand drainage layer
		4.45	4.60	94.10	93.95	0.15	Native very stiff silty clay (crust)
TP 26	99.30	0.00	1.20	99.30	98.10	1.20	FILL: Compact/stiff brown silty clay/clayey silt
		1.20	2.80	98.10	96.50	1.60	FILL: Very stiff brown silty clay, trace sand (EF _≥ 95.25 m)
TP 27	99.84	0.00	1.50	99.84	98.34	1.50	FILL: Topsoil/strippings brown loam
		1.50	4.50	98.34	95.34	3.00	FILL: Stiff brown silty clay, some organics
		4.50	4.60	95.34	95.24	0.10	ENG. FILL: Very stiff brown silty clay, trace sand (PG 4.5 m el. 95.34 m; EF _≥ 95.3 m)
TP 28A	100.17	0.00	2.00	100.17	98.17	2.00	FILL: Topsoil/strippings brown loam (side of pile)
	was 96.9	2.00	3.00	98.17	97.17	1.00	FILL: Topsoil/strippings and silty clay (EF _≥ 95.05 m)
TP 29	97.00	0.00	0.90	97.00	96.10	0.90	FILL: Topsoil/strippings brown loam
		0.90	2.00	96.10	95.00	1.10	FILL: Brown silty clay trace sand & organics (EF _≥ 95.35 m)
TP 29A	100.50	0.00	3.50	100.50	97.00	3.50	FILL: Topsoil/strippings brown loam (side of pile) Located 10 m east of TP 29.

TABLE 2: SUMMARY OF GRADES AND PROFILES AT TEST PITS - ARCADIA STAGES 3 AND 4

Test Pit No.	Ground El. (m)	Depth (m)		Elevation (m)		Layer Thickness (m)	Material Description
		From	To	From	To		
TP 30	100.14	0.00	1.75	100.14	98.39	1.75	FILL: Topsoil/strippings brown loam
		1.75	3.50	98.39	96.64	1.75	FILL: Topsoil/strippings and silty clay
		3.50	3.90	96.64	96.24	0.40	FILL: Brown silty clay trace sand, gravel & organics (EF \geq 95.25 m)
TP 31	99.60	0.00	1.40	99.60	98.20	1.40	FILL: Topsoil/strippings brown loam
		1.40	3.00	98.20	96.60	1.60	FILL: Topsoil/strippings and silty clay
		3.00	3.50	96.60	96.10	0.50	FILL: Brown silty clay trace sand, gravel & organics (EF \geq 95.5 m)
TP 32	99.32	0.00	1.50	99.32	97.82	1.50	FILL: Topsoil/strippings brown loam
		1.50	3.30	97.82	96.02	1.80	FILL: Brown silty clay trace sand, gravel & organics
		3.30	4.50	96.02	94.82	1.20	ENG. FILL: Very stiff brown silty clay, trace sand (PG 3.3 m el. 96.02 m; EF \geq 95.4 m)
		4.50	5.15	94.82	94.17	0.65	DRAIN. FILL: Filter sand drainage layer
		5.15	5.40	94.17	93.92	0.25	Native very stiff silty clay (crust)
TP 33	99.60	0.00	0.90	99.60	98.70	0.90	FILL: Compact brown silty clay some sand, gravel, cobbles, organic pockets
		0.90	2.00	98.70	97.60	1.10	FILL: Firm grey silty clay/clayey silt with organics
		2.00	3.60	97.60	96.00	1.60	FILL: Soft to firm grey silty clay/clayey silt with sand pockets
		3.60	4.60	96.00	95.00	1.00	ENG. FILL: Very stiff brown silty clay, trace sand (PG 3.6 m el. 96.0 m; EF \geq 95.65 m)
		4.60	4.90	95.00	94.70	0.30	DRAIN. FILL: Filter sand drainage layer
		4.90	5.10	94.70	94.50	0.20	Native very stiff silty clay (crust)
North - Fill Area 1B:							
TP 34	98.54	0.00	1.90	98.54	96.64	1.90	FILL: Crushed stone with clay, silt, sand, gravel and cobbles
		1.90	2.20	96.64	96.34	0.30	FILL: Firm to stiff brown/grey silty clay, some stone
		2.20	4.05	96.34	94.49	1.85	FILL: Grey/brown stone with silty clay trace organics
		4.05	4.40	94.49	94.14	0.35	ENG. FILL: Very stiff brown silty clay (PG 4.05 m el. 94.5 m; EF \geq 94.8 m)
TP 35	97.94	0.00	0.90	97.94	97.04	0.90	FILL: Loose brown silty clay some sand and gravel
		0.90	1.90	97.04	96.04	1.00	FILL: Firm brown silty clay, some sand, gravel and boulders
		1.90	2.80	96.04	95.14	0.90	FILL: Dense/stiff brown silty clay with sand, gravel, cobbles and boulders
		2.80	4.00	95.14	93.94	1.20	ENG. FILL: V. stiff brown silty clay trace sand and gravel (PG 2.8 m el. 95.14 m; EF \geq 94.9 m)
TP 36	98.54	0.00	1.00	98.54	97.54	1.00	FILL: Loose brown clayey silt some sand, gravel and cobbles
		1.00	2.60	97.54	95.94	1.60	FILL: Stiff brown/grey silty clay, some sand, gravel, cobbles
		2.60	3.10	95.94	95.44	0.50	FILL: Dense crushed stone with sand and silty clay
		3.10	4.15	95.44	94.39	1.05	FILL: Dense crushed stone with sand and silty clay and boulders/blast rock
		4.15	4.30	94.39	94.24	0.15	ENG. FILL: Very stiff brown silty clay (PG 4.15 m el. 94.4 m; EF \geq 95.1 m)
TP 37	98.94	0.00	1.20	98.94	97.74	1.20	FILL: Firm/stiff brown silty clay, some sand, gravel, cobbles & const. debris
		1.20	2.30	97.74	96.64	1.10	FILL: Firm brown silty clay, some sand, gravel and boulders
		2.30	3.40	96.64	95.54	1.10	FILL: Very stiff brown/grey silty clay trace sand, gravel & cobbles
		3.40	4.00	95.54	94.94	0.60	ENG. FILL: Very stiff brown silty clay (PG 3.4 m el. 95.54 m; EF \geq 95.0 m)
TP 38	100.08	1.00	1.60	99.08	98.48	0.60	FILL: Topsoil loose brown clayey sandy silt loam
		1.60	3.60	98.48	96.48	2.00	FILL: Stiff brown/grey silty clay some sand, gravel & cobbles
		3.60	5.50	96.48	94.58	1.90	FILL: Very stiff brown/grey silty clay, some sand, gravel, cobbles, topsoil chunks (EF \geq 95.0 m)

TABLE 2: SUMMARY OF GRADES AND PROFILES AT TEST PITS - ARCADIA STAGES 3 AND 4

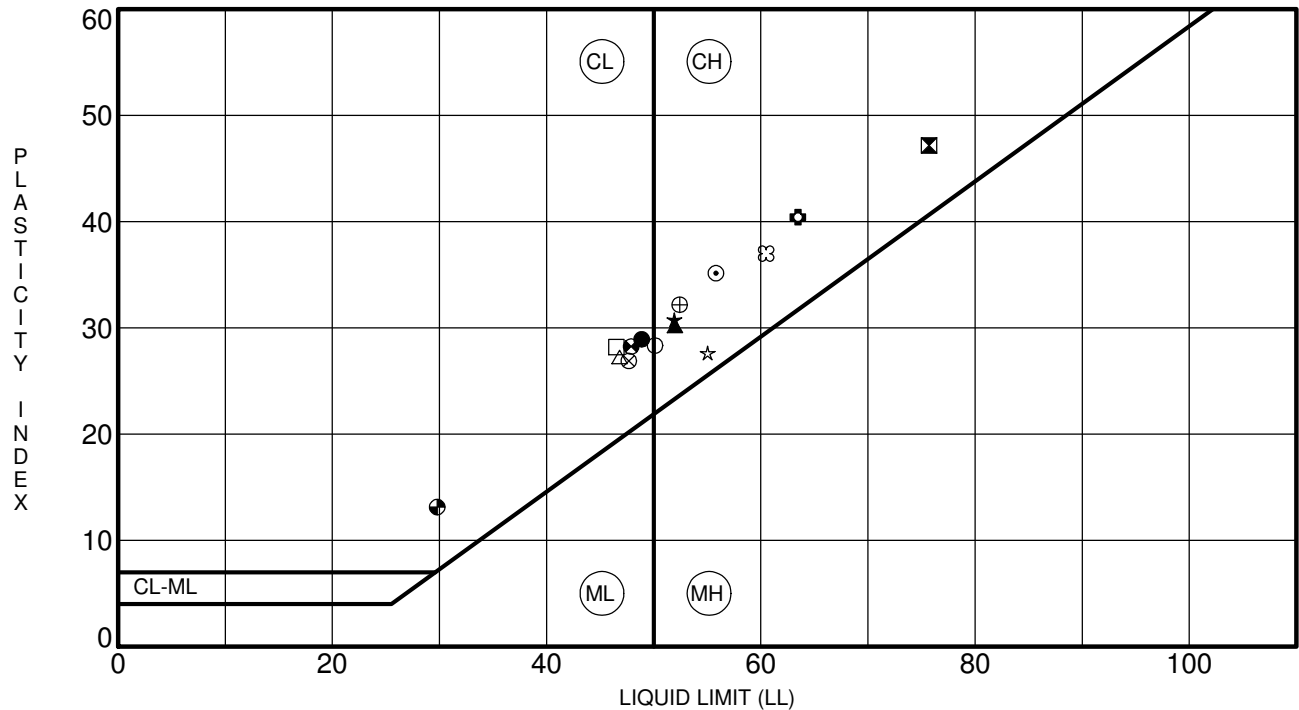
Test Pit No.	Ground El. (m)	Depth (m)		Elevation (m)		Layer Thickness (m)	Material Description
		From	To	From	To		
TP 39	98.41	0.00	1.90	98.41	96.51	1.90	FILL: Compact crushed stone with silty clay, sand, gravel, cobbles & const. debris
		1.90	2.60	96.51	95.81	0.70	FILL: Soft/firm grey silty clay, some sand and gravel
		2.60	3.70	95.81	94.71	1.10	FILL: Compact/stiff dark grey stone with silty clay, sand, gravel, trace organics
		3.70	4.10	94.71	94.31	0.40	ENG. FILL: Very stiff brown silty clay (PG 3.7 m el. 94.7 m; EF _≥ 94.8 m)
TP 40	98.38	0.00	1.50	98.38	96.88	1.50	FILL: Topsoil-like loose/compact brown clayey sandy silt some const. debris
		1.50	2.70	96.88	95.68	1.20	FILL: Stiff brown/grey silty clay some sand, gravel & cobbles
		2.70	3.30	95.68	95.08	0.60	FILL: Compact brown/grey crushed stone with silty clay, sand
		3.30	4.10	95.08	94.28	0.80	ENG. FILL: Very stiff brown silty clay (PG 3.3 m el. 95.1 m; EF _≥ 94.9 m)
TP 41	98.66	0.00	0.40	98.66	98.26	0.40	FILL: Loose brown clayey sandy silt, some gravel, cobbles & const. debris
		0.40	2.00	98.26	96.66	1.60	FILL: Stiff brown/grey silty clay some sand, gravel & cobbles
		2.00	3.50	96.66	95.16	1.50	FILL: Firm to stiff grey silty clay some sand, gravel & sandy pockets
		3.50	3.90	95.16	94.76	0.40	ENG. FILL: V. stiff brown silty clay, sand and gravel (PG 3.5 m el. 95.16 m; EF _≥ 95.05 m)
TP 42	101.13	0.00	2.50	101.13	98.63	2.50	FILL: Topsoil-like loose/compact brown clayey sandy silt loam - Mound of fill
		2.50	4.60	98.63	96.53	2.10	FILL: Stiff brown/grey silty clay, some sand, gravel, cobbles & const. debris brick, blocks
		4.60	6.30	96.53	94.83	1.70	FILL: Dense/stiff grey silty clay with crushed stone some const. debris
		6.30	7.00	94.83	94.13	0.70	ENG. FILL: V. stiff brown silty clay with crushed stone (PG 6.3 m el. 94.8 m; EF _≥ 95.05 m)
TP 43	98.85	0.00	0.50	98.85	98.35	0.50	FILL: Topsoil-like loose brown clayey sandy silt loam with gravel and cobbles
		0.50	2.10	98.35	96.75	1.60	FILL: Stiff/compact brown silty clay, some crushed stone
		2.10	3.40	96.75	95.45	1.30	FILL: Stiff/compact grey silty clay, some sand and crushed stone
		3.40	3.90	95.45	94.95	0.50	FILL: Compact brown/grey sand with silty clay and crushed stone
		3.90	4.20	94.95	94.65	0.30	ENG. FILL: V. stiff brown silty clay, sand and gravel (PG 3.9 m el. 94.95 m; EF _≥ 95.2 m)
TP 44	100.73	0.00	1.90	100.73	98.83	1.90	FILL: Topsoil loose brown clayey sandy silt loam
		1.90	5.70	98.83	95.03	3.80	FILL: Topsoil/strippings loose/firm brown silty clay loam with gravel with logs and roots
		5.70	6.30	95.03	94.43	0.60	FILL: Compact/dense crushed stone with silt, sand, cobbles
		6.30	6.60	94.43	94.13	0.30	ENG. FILL: Very stiff brown silty clay (PG 6.3 m el. 94.43 m; EF _≥ 95.2 m)
TP 45	99.58	0.00	1.80	99.58	97.78	1.80	FILL: Topsoil-like compact brown clayey sandy silt loam with gravel and cobbles
		1.80	4.30	97.78	95.28	2.50	FILL: Stiff brown/grey silty clay, some sand, gravel, cobbles & organics
		4.30	5.20	95.28	94.38	0.90	FILL: Dense blast-rock with silt and clay trace brick (No eng. fill obvious; EF _≥ 95.4 m)
TP 46	99.00	0.00	0.60	99.00	98.40	0.60	FILL: Loose brown silty clay and blast-rock, some const. debris brick and blocks
		0.60	1.80	98.40	97.20	1.20	FILL: Loose/firm brown silty clay with sand and gravel
		1.80	4.30	97.20	94.70	2.50	FILL: Compact to dense/stiff brown silty clay containing sand, gravel and blast rock
		4.30	4.60	94.70	94.40	0.30	ENG. FILL: Very stiff brown silty clay (PG 4.3 m el. 94.7 m; EF _≥ 95.15 m)
TP 47	98.40	0.00	1.00	98.40	97.40	1.00	FILL: Loose to compact/firm to stiff brown silty clay with sand and gravel
		1.00	1.90	97.40	96.50	0.90	FILL: Stiff blocky brown silty clay some sand and gravel
		1.90	3.70	96.50	94.70	1.80	FILL: Soft to firm brown/grey silty clay, some sand and gravel
		3.70	4.00	94.70	94.40	0.30	ENG. FILL: Very stiff brown silty clay (PG 3.7 m el. 94.7 m; EF _≥ 94.8 m)

TABLE 2: SUMMARY OF GRADES AND PROFILES AT TEST PITS - ARCADIA STAGES 3 AND 4

Test Pit No.	Ground El. (m)	Depth (m)		Elevation (m)		Layer Thickness (m)	Material Description
		From	To	From	To		
TP 48	98.56	0.00	2.00	98.56	96.56	2.00	FILL: Loose/firm brown silty clay with sand, gravel, cobbles and const. debris
		2.00	3.90	96.56	94.66	1.90	FILL: Firm to stiff grey/brown silty clay some sand and gravel
		3.90	4.10	94.66	94.46	0.20	ENG. FILL: Very stiff brown silty clay (PG 3.9 m el. 94.66 m; EF _≥ 94.8 m)
TP 49	98.85	0.00	1.20	98.85	97.65	1.20	FILL: Loose/firm brown silty clay with sand, gravel, cobbles and const. debris
		1.20	1.50	97.65	97.35	0.30	FILL: Firm to stiff grey/brown silty clay
		1.50	2.00	97.35	96.85	0.50	FILL: Dense crushed stone to blast-rock. Rapid groundwater at 1.7 m el. 97.15 m (EF _≥ 95.1 m)
TP49A							Test pit 15 m west. GW influx at el. 96.95 m - Silty clay under blast-rock
							The groundwater encountered is expected to be localized (trapped) and temporary issue
TP 50	99.19	0.00	1.70	99.19	97.49	1.70	FILL: Compact to loose/firm to soft brown to grey silty clay with sand and gravel
		1.70	3.70	97.49	95.49	2.00	FILL: Compact crushed stone with sand, cobbles, silty clay and const debris
		3.70	4.00	95.49	95.19	0.30	ENG. FILL: V. stiff brown silty clay, sand and gravel (PG 3.7 m el. 95.5 m; EF _≥ 95.55 m)
TP 51	99.73	0.00	1.20	99.73	98.53	1.20	FILL: Topsoil loose to compact brown clayey sandy silt loam
		1.20	4.00	98.53	95.73	2.80	FILL: Firm grey silty clay some sand, gravel and cobbles
		4.00	4.40	95.73	95.33	0.40	Very stiff brown silty clay - prob. native (PG 4.0 m el. 95.73 m; EF _≥ 95.75 m)
TP 52	99.25	0.00	0.50	99.25	98.75	0.50	FILL: Topsoil loose brown clayey sandy silt loam
		0.50	2.50	98.75	96.75	2.00	FILL: Firm/compact brown silty clay some sand and gravel, pockets of grey clay
		2.50	3.00	96.75	96.25	0.50	FILL: Stiff brown/grey silty clay with sand, gravel, crushed stone, cobbles
		3.00	3.90	96.25	95.35	0.90	FILL: Compact grey crushed stone with silty clay
		3.90	4.40	95.35	94.85	0.50	ENG. FILL: V. stiff brown silty clay, sand and gravel (PG 3.9 m el. 95.35 m; EF _≥ 95.35 m)
TP 53	98.69	0.00	1.20	98.69	97.49	1.20	FILL: Loose/firm brown silty clay, some sand and gravel
		1.20	2.10	97.49	96.59	0.90	FILL: Soft grey silty clay
		2.10	4.20	96.59	94.49	2.10	FILL: Firm to stiff grey/brown silty clay some sand, gravel, cobbles and boulders
		4.20	4.70	94.49	93.99	0.50	ENG. FILL: V. stiff brown silty clay, sand and gravel (PG 4.2 m el. 94.5 m; EF _≥ 94.95 m)
Notes:							

Notes:

- | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Engineered fill or native soil are suitable bearing media for the support of housing. The interpreted lowest engineered fill or native soil level, accounting for surcharge fill settlement, is indicated for each test pit location as "EF", and should be used where test pit PG information was not confirmed. |
| 2. ENG. FILL: is the description used where material that is obviously engineered fill has been encountered and the depth and elevation are identified as "PG" for pre-engineered grade. |
| 3. The "engineered fill" or native soil level is encountered above the SUF (shallowest underside of footing) grade, in all locations, as per Table 1. |
| 4. The relatively recently placed 1.2m +/- thick surficial layer in the southeast quadrant of Fill Area 1A contains construction debris. Not all of the test pits in that area were within the surficial fill. |
| 5. Refer to Soil Profile and Test Data sheets for the subsurface profiles for the test pits in the Campeau and Paine SWM Ponds. |
| 6. Refer to Drawing No. PG0538-17 - Test Hole Location Plan for the locations of the test pits and several other site characteristics, including area referred to in Note 4. |



Specimen Identification	LL	PL	PI	Fines	Classification
● TP 1 G 4	49	20	29		CL - Inorganic clays of low plasticity
⊠ TP 6 G 2	76	29	47		CH - Inorganic clays of high plasticity
▲ TP 7 G 3	52	22	30		CH - Inorganic clays of high plasticity
★ TP12 G 1	52	21	31		CH - Inorganic clays of high plasticity
⊙ TP16 G 3	56	21	35		CH - Inorganic clays of high plasticity
⊕ TP21 G 1	63	23	40		CH - Inorganic clays of high plasticity
○ TP23 G 4	50	22	28		CH - Inorganic clays of high plasticity
△ TP26 G 2	47	20	27		CL - Inorganic clays of low plasticity
⊗ TP27 G 2	48	21	27		CL - Inorganic clays of low plasticity
⊕ TP28 G 1	52	20	32		CH - Inorganic clays of high plasticity
□ TP33 G 2	47	18	28		CL - Inorganic clays of low plasticity
⊕ TP34 G 3	48	20	28		CL - Inorganic clays of low plasticity
⊕ TP36 G 1	30	17	13		CL - Inorganic clays of low plasticity
☆ TP38 G 3	55	27	28		CH - Inorganic clays of high plasticity
⊗ TP40 G 1	60	23	37		CH - Inorganic clays of high plasticity

CLIENT Minto Communities Inc.

PROJECT Supplemental Geotechnical Investigation -
Arcadia Development - Huntmar Road

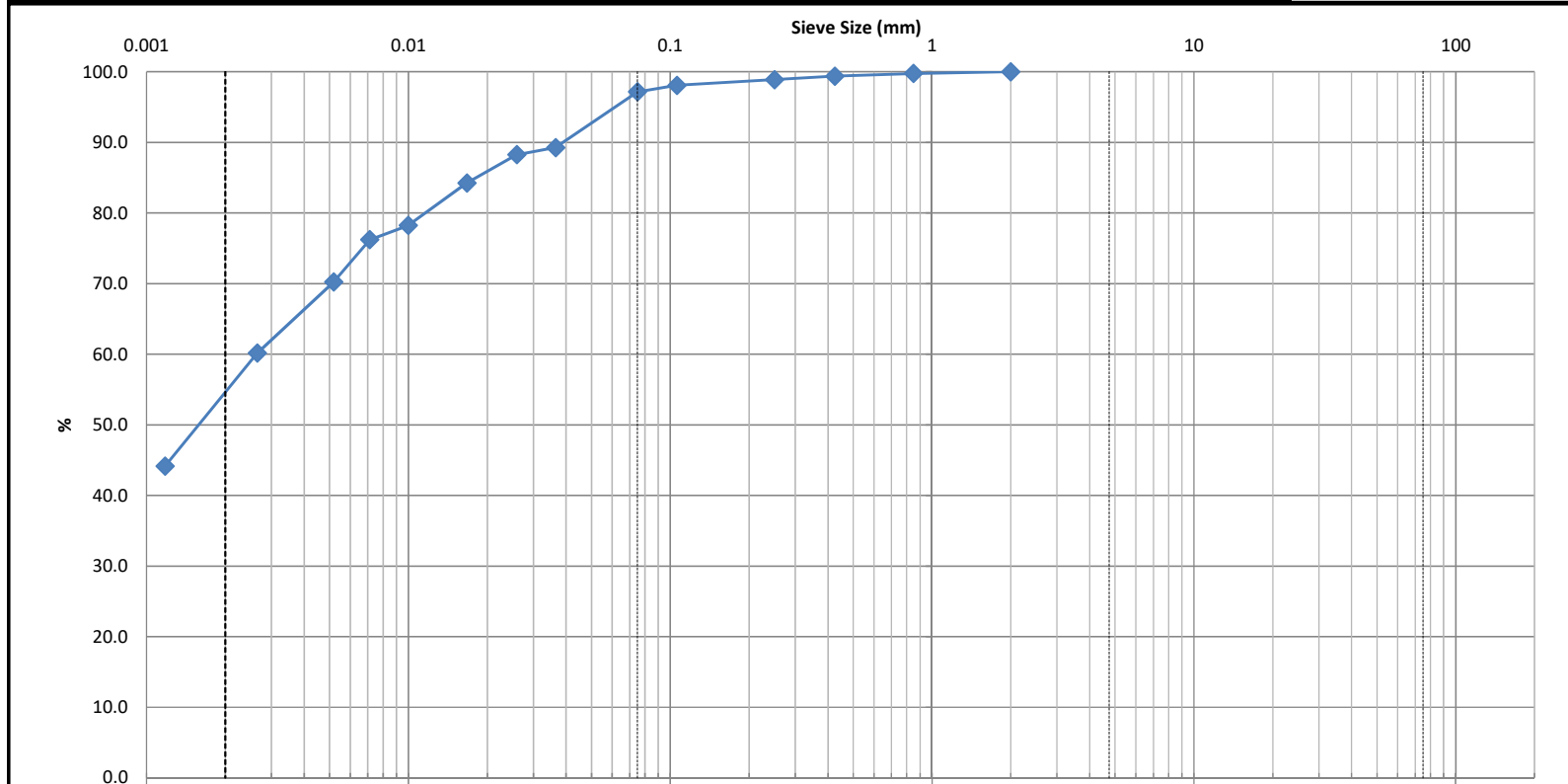
FILE NO. PG0538

DATE 18 Oct 18

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

**ATTERBERG LIMITS'
RESULTS**

CLIENT:	Minto	DEPTH:	-	FILE NO:	PG0538
CONTRACT NO.:		BH OR TP No.:	TP6 - GR2	LAB NO:	06587
PROJECT:	Arcadia			DATE RECEIVED:	13-Dec-18
				DATE TESTED:	17-Dec-18
DATE SAMPLED:	15-Oct-18			DATE REPORTED:	21-Dec-18
SAMPLED BY:	E. Ardley			TESTED BY:	D. Bertrand



	Clay	Silt				Sand			Gravel			Cobble	
						Fine	Medium	Coarse	Fine		Coarse		
Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu		
						25.3							
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)			
					0.0	2.9		42.6		54.5			
Comments													

Low Risk

jest

CLIENT:	Minto	DEPTH:	-	FILE NO.:	PG0538
PROJECT:	Arcadia	BH OR TP No.:	TP6 - GR2	DATE SAMPLED:	15-Oct-18
LAB No. :	06587	TESTED BY:	D. Bertrand	DATE RECEIVED:	13-Dec-18
SAMPLED BY:	E. Ardley	DATE REPT'D:	21-Dec-18	DATE TESTED:	17-Dec-18


SAMPLE INFORMATION			
SAMPLE MASS	116.1	50.00	
SPECIFIC GRAVITY (Gs)	2.700	REMARKS	
HYGROSCOPIC MOISTURE	Tare No.		
TARE Wt.	50.00		
AIR DRY (Wa)	150.00		
OVEN DRY (Wo)	148.60		
F=(Wo/Wa)	0.986		
INITIAL Wt. (Ma)	50.00		
Wt. CORRECTED	49.30		
Wt. AFTER WASH BACK SIEVE	1.52		
SOLUTION CONCENTRATION	40 g / L		

GRAIN SIZE ANALYSIS			
SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
63.0			
53.0			
37.5			
26.5			
19.0			
16.0			
13.2			
9.5			
4.75			
2.0	0.0	0.0	100.0
Pan	116.1		
0.850	0.13	0.3	99.7
0.425	0.32	0.6	99.4
0.250	0.56	1.1	98.9
0.106	0.97	1.9	98.1
0.075	1.43	2.9	97.1
Pan	1.52		
SIEVE CHECK	0.0	MAX = 0.3%	

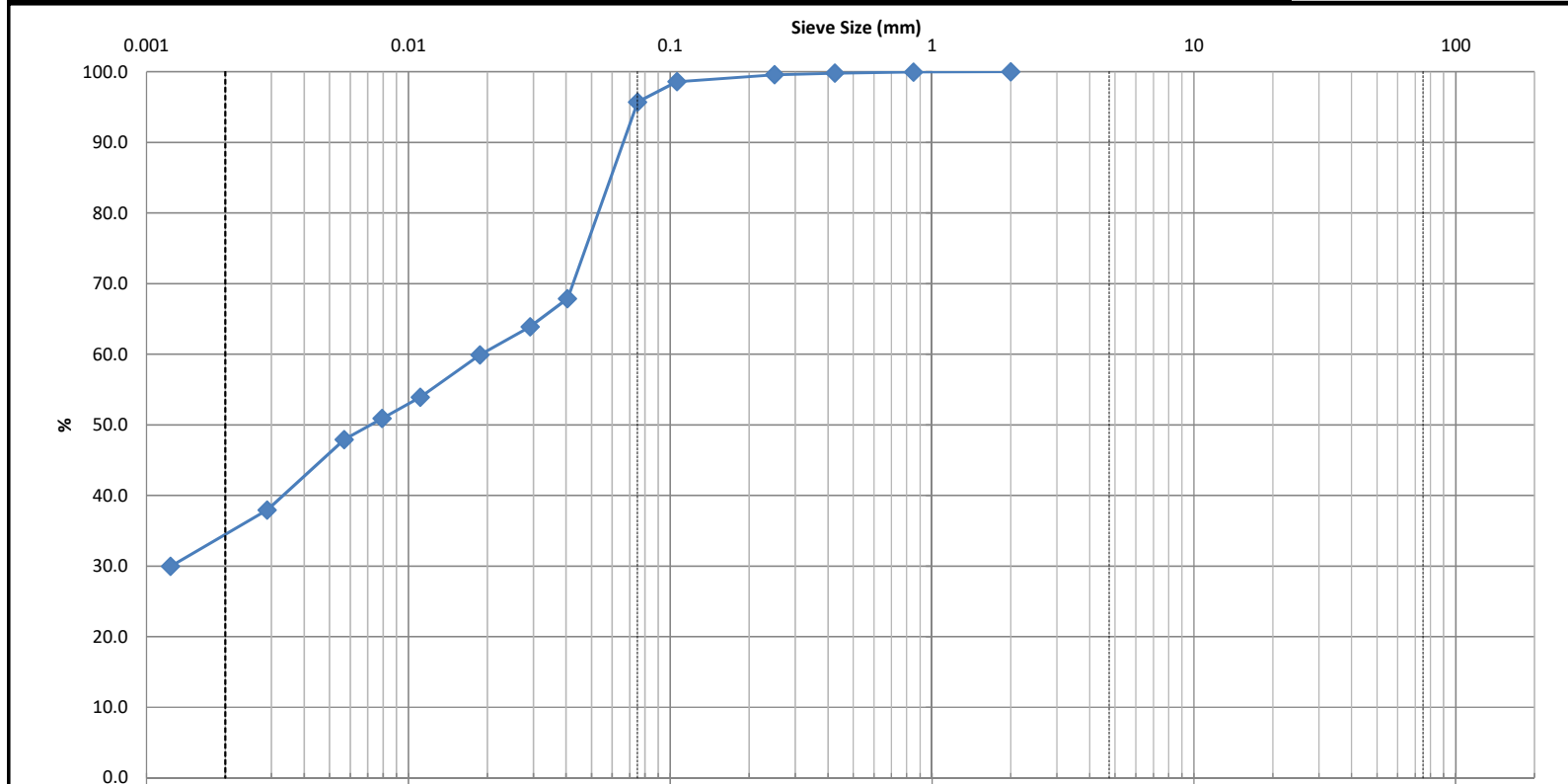
HYDROMETER DATA							
ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	9:36	50.5	6.0	22.0	0.0365	89.3	89.3
2	9:37	50.0	6.0	22.0	0.0260	88.2	88.2
5	9:40	48.0	6.0	22.0	0.0168	84.2	84.2
15	9:50	45.0	6.0	22.0	0.0100	78.2	78.2
30	10:05	44.0	6.0	22.0	0.0071	76.2	76.2
60	10:35	41.0	6.0	22.0	0.0052	70.2	70.2
250	13:45	36.0	6.0	22.0	0.0027	60.2	60.2
1440	9:35	28.0	6.0	22.0	0.0012	44.1	44.1

COMMENTS

Moisture Content = 25.3%

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

CLIENT:	Minto	DEPTH:	-	FILE NO:	PG0538
CONTRACT NO.:		BH OR TP No.:	TP23 - GR4	LAB NO:	06588
PROJECT:	Arcadia			DATE RECEIVED:	13-Dec-18
				DATE TESTED:	17-Dec-18
DATE SAMPLED:	15-Oct-18			DATE REPORTED:	21-Dec-18
SAMPLED BY:	E. Ardley			TESTED BY:	D. Bertrand



	Clay	Silt				Sand			Gravel			Cobble	
						Fine	Medium	Coarse	Fine	Coarse			
Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu		
						17.5							
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)			
					0.0	4.3		61.7		34.0			
Comments													

Low Risk

Tested

CLIENT:	Minto	DEPTH:	-	FILE NO.:	PG0538
PROJECT:	Arcadia	BH OR TP No.:	TP23 - GR4	DATE SAMPLED:	15-Oct-18
LAB No. :	06588	TESTED BY:	D. Bertrand	DATE RECEIVED:	13-Dec-18
SAMPLED BY:	E. Ardley	DATE REPT'D:	21-Dec-18	DATE TESTED:	17-Dec-18


SAMPLE INFORMATION			
SAMPLE MASS	126.3	50.00	
SPECIFIC GRAVITY (Gs)	2.700	REMARKS	
HYGROSCOPIC MOISTURE	Tare No.		
TARE Wt.	50.00		
AIR DRY (Wa)	150.00		
OVEN DRY (Wo)	149.10		
F=(Wo/Wa)	0.991		
INITIAL Wt. (Ma)	50.00		
Wt. CORRECTED	49.55		
Wt. AFTER WASH BACK SIEVE	2.32		
SOLUTION CONCENTRATION	40 g / L		

GRAIN SIZE ANALYSIS			
SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
63.0			
53.0			
37.5			
26.5			
19.0			
16.0			
13.2			
9.5			
4.75			
2.0	0.0	0.0	100.0
Pan	126.3		
0.850	0.03	0.1	99.9
0.425	0.11	0.2	99.8
0.250	0.22	0.4	99.6
0.106	0.71	1.4	98.6
0.075	2.15	4.3	95.7
Pan	2.32		
SIEVE CHECK	0.0	MAX = 0.3%	

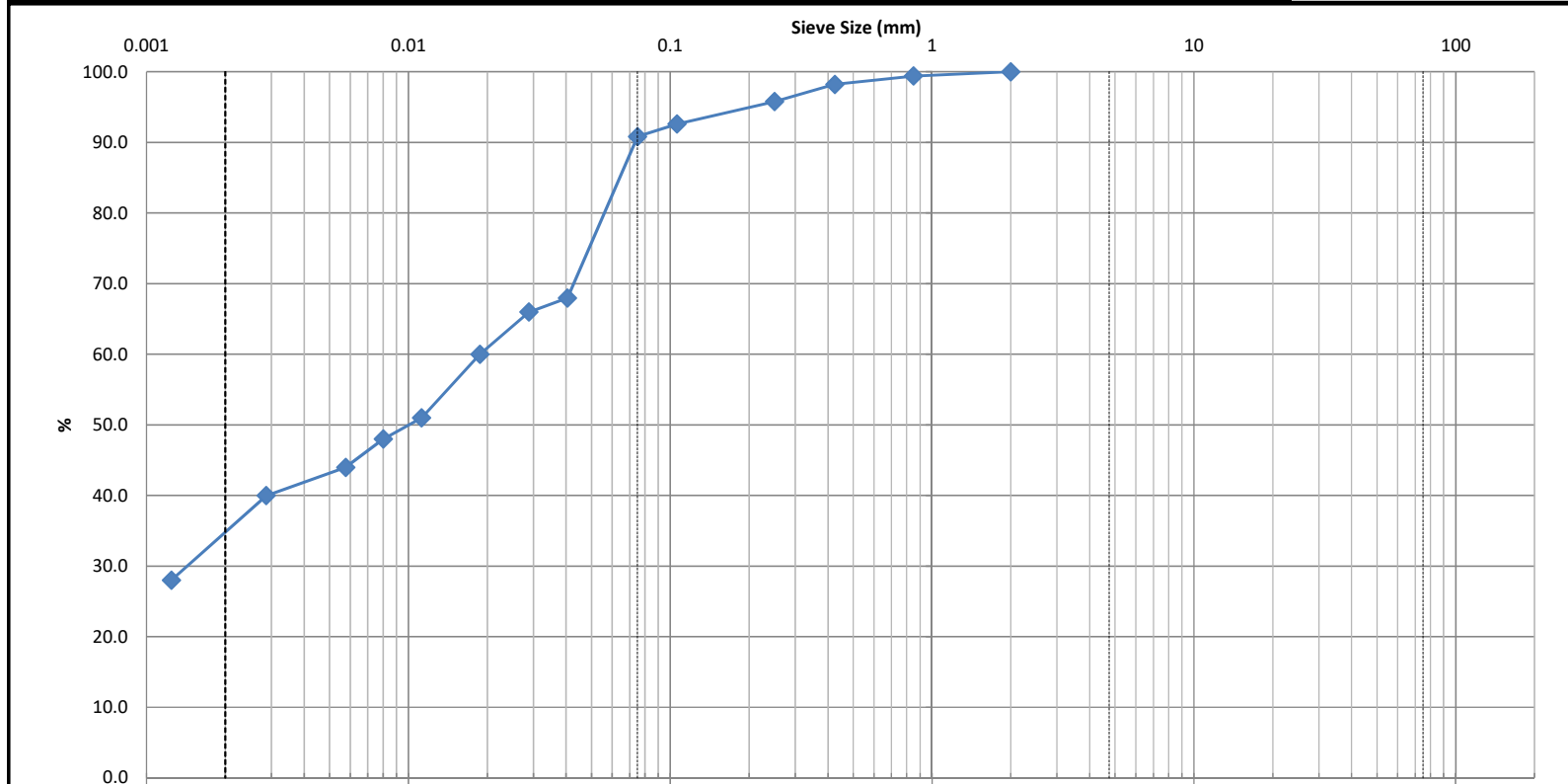
HYDROMETER DATA							
ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	9:47	40.0	6.0	22.0	0.0405	67.8	67.8
2	9:48	38.0	6.0	22.0	0.0292	63.9	63.9
5	9:51	36.0	6.0	22.0	0.0188	59.9	59.9
15	10:01	33.0	6.0	22.0	0.0111	53.9	53.9
30	10:16	31.5	6.0	22.0	0.0079	50.9	50.9
60	10:46	30.0	6.0	22.0	0.0057	47.9	47.9
250	13:56	25.0	6.0	22.0	0.0029	37.9	37.9
1440	9:46	21.0	6.0	22.0	0.0012	29.9	29.9

COMMENTS

Moisture Content = 17.5%

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




CLIENT:	Minto	DEPTH:	-	FILE NO:	PG0538
CONTRACT NO.:		BH OR TP No.:	TP27 - GR2	LAB NO:	06589
PROJECT:	Arcadia			DATE RECEIVED:	13-Dec-18
				DATE TESTED:	17-Dec-18
DATE SAMPLED:	15-Oct-18			DATE REPORTED:	21-Dec-18
SAMPLED BY:	E. Ardley			TESTED BY:	D. Bertrand



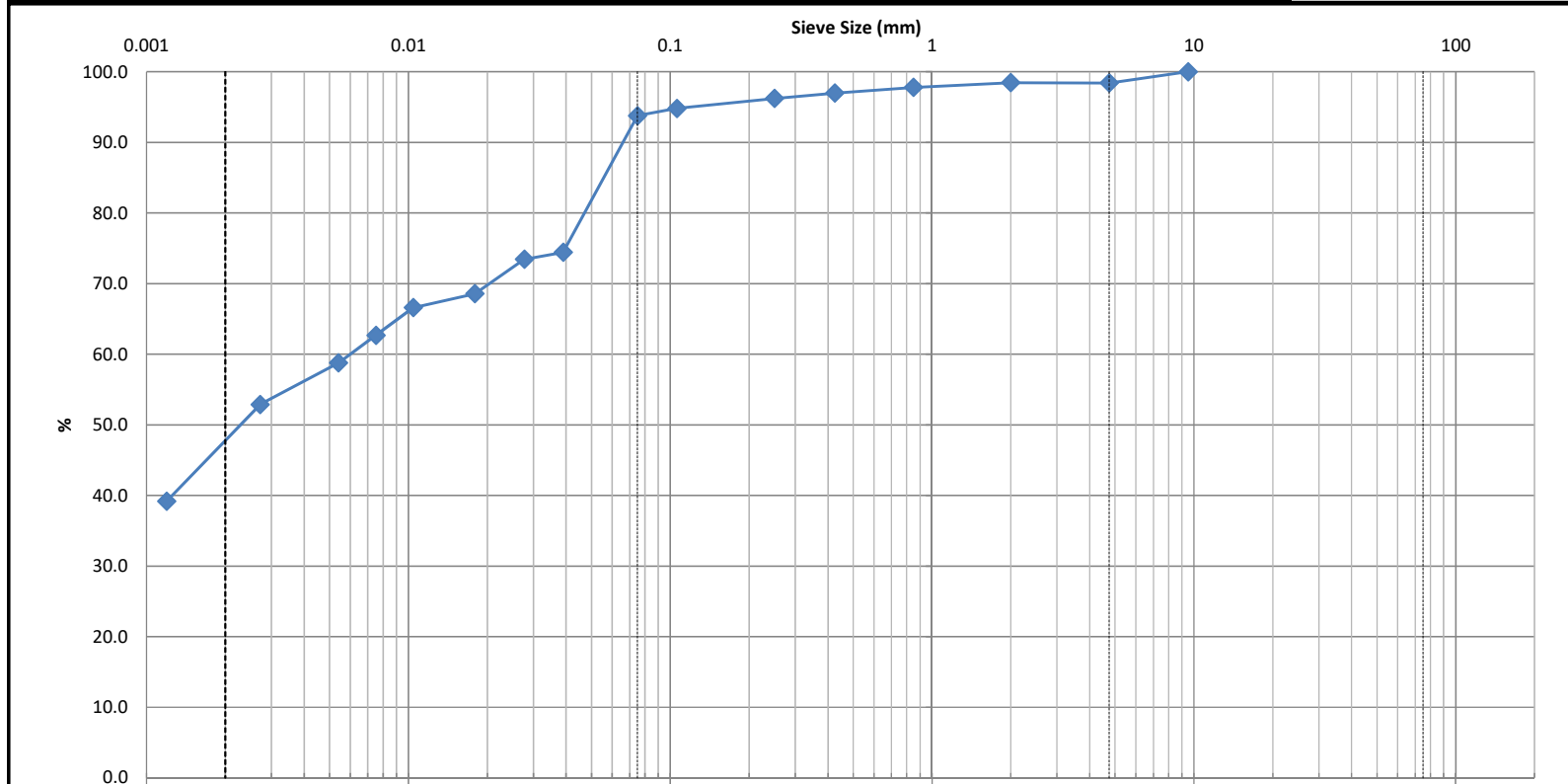
	Clay	Silt				Sand			Gravel			Cobble	
						Fine	Medium	Coarse	Fine	Coarse			
Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu		
						17.8							
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)			
					0.0	9.2		55.8		35.0			
Comments													

Low Risk

Tested

				HYDROMETER LS-702 ASTM-422			
CLIENT:		Minto		DEPTH:		-	
PROJECT:		Arcadia		BH OR TP No.:		TP27 - GR2	
LAB No. :		06589		TESTED BY:		D. Bertrand	
SAMPLED BY:		E. Ardley		DATE REPT'D:		21-Dec-18	
				FILE NO.:		PG0538	
				DATE SAMPLED:		15-Oct-18	
				DATE RECEIVED:		13-Dec-18	
				DATE TESTED:		17-Dec-18	
SAMPLE INFORMATION							
SAMPLE MASS		126.4		50.00			
SPECIFIC GRAVITY (Gs)		2.700		REMARKS			
HYGROSCOPIC MOISTURE		Tare No.					
TARE Wt.		50.00					
AIR DRY (Wa)		150.00					
OVEN DRY (Wo)		148.95					
F=(Wo/Wa)		0.990					
INITIAL Wt. (Ma)		50.00					
Wt. CORRECTED		49.48					
Wt. AFTER WASH BACK SIEVE		4.83					
SOLUTION CONCENTRATION		40 g / L					
GRAIN SIZE ANALYSIS							
SIEVE DIAMETER (mm)		WEIGHT RETAINED (g)		PERCENT RETAINED		PERCENT PASSING	
63.0							
53.0							
37.5							
26.5							
19.0							
16.0							
13.2							
9.5							
4.75							
2.0		0.0		0.0		100.0	
Pan		126.4					
0.850		0.30		0.6		99.4	
0.425		0.90		1.8		98.2	
0.250		2.12		4.2		95.8	
0.106		3.71		7.4		92.6	
0.075		4.59		9.2		90.8	
Pan		4.83					
SIEVE CHECK		0.0		MAX = 0.3%			
HYDROMETER DATA							
ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	10:02	40.0	6.0	22.0	0.0405	68.0	68.0
2	10:03	39.0	6.0	22.0	0.0289	66.0	66.0
5	10:06	36.0	6.0	22.0	0.0188	60.0	60.0
15	10:16	31.5	6.0	22.0	0.0112	51.0	51.0
30	10:31	30.0	6.0	22.0	0.0080	48.0	48.0
60	11:01	28.0	6.0	22.0	0.0058	44.0	44.0
250	14:11	26.0	6.0	22.0	0.0029	40.0	40.0
1440	10:01	20.0	6.0	22.0	0.0012	28.0	28.0
COMMENTS							
Moisture Content = 17.8%							
REVIEWED BY:	Curtis Beadow			APPROVED BY:	Joe Forsyth, P. Eng.		
							


CLIENT:	Minto	DEPTH:	-	FILE NO:	PG0538
CONTRACT NO.:		BH OR TP No.:	TP40 - GR1	LAB NO:	06590
PROJECT:	Arcadia			DATE RECEIVED:	13-Dec-18
				DATE TESTED:	17-Dec-18
DATE SAMPLED:	15-Oct-18			DATE REPORTED:	21-Dec-18
SAMPLED BY:	E. Ardley			TESTED BY:	D. Bertrand



	Clay	Silt				Sand			Gravel			Cobble	
						Fine	Medium	Coarse	Fine		Coarse		
Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu		
						20.5							
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)			
					1.6	4.6		45.3		48.5			
Comments													

Low Risk

Just

				HYDROMETER LS-702 ASTM-422				
CLIENT:	Minto			DEPTH:	-		FILE NO.:	PG0538
PROJECT:	Arcadia			BH OR TP No.:	TP40 - GR1		DATE SAMPLED:	15-Oct-18
LAB No. :	06590			TESTED BY:	D. Bertrand		DATE RECEIVED:	13-Dec-18
SAMPLED BY:	E. Ardley			DATE REPT'D:	21-Dec-18		DATE TESTED:	17-Dec-18
SAMPLE INFORMATION								
SAMPLE MASS	121.6			50.00		REMARKS		
SPECIFIC GRAVITY (Gs)	2.700							
HYGROSCOPIC MOISTURE	Tare No.							
TARE Wt.	50.00	ACTUAL Wt.						
AIR DRY (Wa)	150.00	100.00						
OVEN DRY (Wo)	149.40	99.40						
F=(Wo/Wa)	0.994							
INITIAL Wt. (Ma)	50.00							
Wt. CORRECTED	49.70							
Wt. AFTER WASH BACK SIEVE	2.4							
SOLUTION CONCENTRATION	40 g / L							
GRAIN SIZE ANALYSIS								
SIEVE DIAMETER (mm)			WEIGHT RETAINED (g)		PERCENT RETAINED		PERCENT PASSING	
63.0								
53.0								
37.5								
26.5								
19.0								
16.0								
13.2								
9.5			0.0		0.0		100.0	
4.75			1.9		1.6		98.4	
2.0			1.9		1.6		98.4	
Pan			119.7					
0.850			0.34		2.2		97.8	
0.425			0.74		3.0		97.0	
0.250			1.13		3.8		96.2	
0.106			1.85		5.2		94.8	
0.075			2.37		6.2		93.8	
Pan			2.40					
SIEVE CHECK			0.0		MAX = 0.3%			
HYDROMETER DATA								
ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING	
1	10:14	44.0	6.0	22.0	0.0390	75.6	74.4	
2	10:15	43.5	6.0	22.0	0.0277	74.6	73.4	
5	10:18	41.0	6.0	22.0	0.0180	69.6	68.5	
15	10:28	40.0	6.0	22.0	0.0105	67.6	66.6	
30	10:43	38.0	6.0	22.0	0.0075	63.7	62.7	
60	11:13	36.0	6.0	22.0	0.0054	59.7	58.8	
250	14:23	33.0	6.0	22.0	0.0027	53.7	52.9	
1440	10:13	26.0	6.0	22.0	0.0012	39.8	39.2	
COMMENTS								
Moisture Content = 20.5%								
REVIEWED BY:	Curtis Beadow			APPROVED BY:		Joe Forsyth, P. Eng.		
	