

TECHNICAL MEMORANDUM

DATE November 27, 2020 20140347-3000

TO Christa Jones
Lioness Developments Inc.

CC Jacob Bolduc; Fotenn Planning + Design

FROM Ali Ghirian, P.Eng. **EMAIL** Ali_Ghirian@golder.com

TREE SETBACK RECOMMENDATIONS PROPOSED RESIDENTIAL DEVELOPMENT KANATA WEST LANDS 130 HUNTMAR DRIVE, OTTAWA, ONTARIO

This technical memorandum presents tree setback recommendations for the Kanata West Lands residential development located at 130 Huntmar Drive in Ottawa, Ontario.

Background

Golder Associates carried out a geotechnical investigation for the proposed residential development and the results were provided in the following report and addendum:

- Report to Lioness Developments Inc. titled “Geotechnical Investigation, Proposed Residential Development, Kanata West Lands, 130 Huntmar Drive, Ottawa, Ontario”, dated January 2016 (report number 1406416).
- Addendum No. 1 titled “Geotechnical Investigation, Proposed Residential Development, Kanata West Lands, 130 Huntmar Drive, Ottawa, Ontario”, dated March 4, 2020 (document number 20140347)

As per the current City of Ottawa tree planting guideline, one Atterberg Limits test and one water content test are required on samples collected between the underside of footing (USF) and a depth of 3.5 m and at approximately 150 m spacing where clay soils are encountered within a planned subdivision. One grain size distribution test for every four test holes and one Shrinkage Limit test per subdivision are also required under the guideline.

The investigation previously completed in 2014 for this subdivision pre-dates the current City tree planting guideline and plasticity and shrinkage limit testing of the clay soils was not completed within the required depths noted above. An additional investigation to meet the guideline requirements was therefore requested by Lioness Developments and the results of that investigation are provided herein.

Geotechnical Investigation

The fieldwork for the current geotechnical investigation carried out on October 29 and 30, 2020. At that time, 12 auger holes (numbered 20-01 to 20-12, inclusive) were advanced at the approximate locations shown on the Site Plan, Figure 1. The auger hole locations were chosen to cover the entire site and maintain an approximate spacing of 150 m. The target depths of soil sampling were selected based on the anticipated grade raise of about 0.5 to 1.5 m at this site based on the preliminary grading plan provided to us (i.e., Macro Grading Plan, Drawing No. 191002-GRM, dated January 2020, prepared by Atriel Engineering Ltd.).

The auger holes were advanced using a Dutch hand auger to collect disturbed clay samples. The auger holes were advanced to depths ranging from about 1.5 to 1.7 m below the existing ground surface.

The soil samples retrieved from the hand auger sampler were classified by visual and tactile examination. The groundwater seepage conditions were observed in the open holes and the auger holes were backfilled upon completion of excavating and sampling.

On completion of the field work, samples of the soils obtained from the auger holes were transported to our laboratory for examination by the project engineer and laboratory testing. Geotechnical index and classification tests, consisting of water content determinations, Atterberg Limit tests, grain size distribution tests and Shrinkage Limit test were carried out on select soil samples.

RESULTS

The auger hole records are provided in Table 1 (attached). In general, the subsurface conditions encountered consist of a thin layer of sandy silt topsoil overlying weathered silty clay to clay extending to the depth of the auger holes. Groundwater seepage, where encountered, was present at depths ranging from about 1.1 to 1.5 m below ground surface.

The results of grain size distribution testing on four samples of the silty clay are provided on Figures 2 to 5. The grain size distribution test results indicate that the percentage of the soil particles finer than 0.475 mm in diameter is 100%. The results of Atterberg limit testing carried out on 12 samples of the silty clay gave modified plasticity index values ranging from about 21 to 45%, and liquid limit values ranging from about 40 to 68%. The results of the grain size distribution and Atterberg limit testing indicate that the soil is a silty clay of medium to high plasticity, as shown on the Plasticity Chart (see Figure 6).

The results of the shrinkage test are provided in Table 2 and indicate that the silty clay at this site has a shrinkage limit of about 15% and a shrinkage ratio of about 1.8.

The Atterberg limit testing on the 12 samples of the silty clay from the current investigation are provided in the table below:

Auger hole / Sample Number	Sample Depth (m)	Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Modified Plasticity Index (%)
20-01 / 1	1.1 – 1.5	36	44	21	23
20-02 / 1	1.2 – 1.7	48	56	22	34
20-03 / 1	1.2 – 1.5	47	68	23	45
20-04 / 1	1.4 – 1.7	50	66	24	42
20-05 / 1	1.4 – 1.7	40	41	18	23
20-06 / 1	1.2 – 1.5	42	46	20	26
20-07 / 1	1.2 – 1.5	34	44	18	26
20-08 / 1	1.2 – 1.5	34	42	19	23
20-09 / 1	1.2 – 1.5	33	40	19	21
20-10 / 1	1.2 – 1.5	35	46	19	27
20-11 / 1	1.2 – 1.5	38	45	19	26
20-12 / 1	1.2 – 1.5	38	48	19	29

Based on the results of the laboratory testing, the modified plasticity index values (PI) of the clay soil encountered at all auger hole locations are generally less than 40%, with the exception of 20-03 and 20-04 where the PI values were greater than 40%. The areas with PI values of greater than 40% are identified on Figure 1 (see "Area 1").

For the areas with PI values less than 40% (i.e., Area 2), it should be acceptable to reduce the setback distances for small size (mature tree height up to 7.5 m) and medium size (mature tree height 7.5 to 14 m) trees to 4.5 m from the foundations within the residential development. However, in accordance with current City Planting guidelines (2017), the following conditions must also be met:

- The underside of footing elevation must be 2.1 m or greater below the lowest finished grade.
- Available soil volume must be provided for small and medium trees as per the guidelines.
- Tree species must be very low to moderate Potential Subsistence Risk.
- The foundation walls should be reinforced at least nominally, to provide ductility.
- The grading must promote drainage towards the tree root zone.


For the areas within "Area 1" with PI values greater than 40%, a minimum 7.5 m setback should be maintained from the foundations for both small and medium sizes trees.

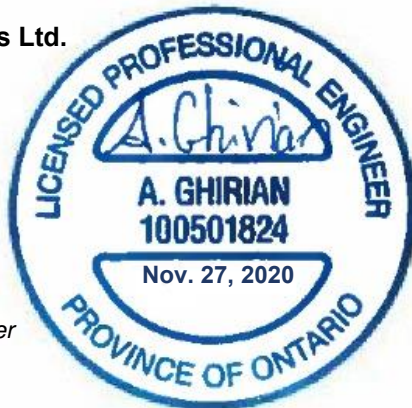
CLOSURE

We trust that this memo provides sufficient information for your present requirements. If you have any questions concerning this memo, please do not hesitate to contact us.

Yours truly,

Golder Associates Ltd.


Ali Ghirian, P.Eng.
Geotechnical Engineer




Bill Cavers, P.Eng.
Associate, Senior Geotechnical Engineer

AG/WC/hdw

Attachments: Table 1 – Record of Auger Holes
Table 2 – Shrinkage Limit Determination
Figure 1 – Site Plan
Figures 2 to 5 – Grain Size Distribution Results
Figure 6 – Plasticity Chart

TABLE 1
RECORD OF AUGER HOLES

<u>Auger Hole Number</u>	<u>Depth (metres)</u>	<u>Description</u>						
AH 20-01	0.0 – 0.3	TOPSOIL (ML) Sandy SILT, contains organic matter and rootlets; dark brown; non-cohesive, moist						
(427519.789, 5015933.228)	0.3 – 1.7	(CL/CH) SILTY CLAY to CLAY; grey-brown, contains red-brown mottling (WEATHERED CRUST); cohesive, w>PL						
	1.7	END OF AUGER HOLE						
		Note: minor water seepage at about 1.2 m						
		<table border="1"> <thead> <tr> <th><u>Sample</u></th> <th><u>Depth (m)</u></th> <th><u>Lab Testing</u></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.1 – 1.5</td> <td>LL=44% PL=21% PI=23% W=36%</td> </tr> </tbody> </table>	<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>	1	1.1 – 1.5	LL=44% PL=21% PI=23% W=36%
<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>						
1	1.1 – 1.5	LL=44% PL=21% PI=23% W=36%						

<u>Auger Hole Number</u>	<u>Depth (metres)</u>	<u>Description</u>						
AH 20-02	0.0 – 0.3	TOPSOIL (ML) Sandy SILT, contains organic matter and rootlets; dark brown; non-cohesive, moist						
(427634.219, 5016031.769)	0.3 – 1.7	(CL/CH) SILTY CLAY to CLAY; grey-brown, contains red-brown mottling (WEATHERED CRUST); cohesive, w>PL						
	1.7	END OF AUGER HOLE						
		Note: minor water seepage at about 1.1 m						
		<table border="1"> <thead> <tr> <th><u>Sample</u></th> <th><u>Depth (m)</u></th> <th><u>Lab Testing</u></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.2 – 1.7</td> <td>LL=56% PL=22% PI=34% W=48%</td> </tr> </tbody> </table>	<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>	1	1.2 – 1.7	LL=56% PL=22% PI=34% W=48%
<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>						
1	1.2 – 1.7	LL=56% PL=22% PI=34% W=48%						

TABLE 1
RECORD OF AUGER HOLES

<u>Auger Hole Number</u>	<u>Depth (metres)</u>	<u>Description</u>						
AH 20-03	0.0 – 0.2	TOPSOIL (ML) Sandy SILT, contains organic matter and rootlets; dark brown; non-cohesive, moist						
(427739.908, 5016123.435)	0.2 – 1.5	(CL/CH) SILTY CLAY to CLAY; grey-brown, contains red-brown mottling (WEATHERED CRUST); cohesive, w>PL						
	1.5	END OF AUGER HOLE						
		Note: minor water seepage at about 1.4 m						
		<table border="1"> <thead> <tr> <th><u>Sample</u></th> <th><u>Depth (m)</u></th> <th><u>Lab Testing</u></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.2 – 1.5</td> <td>LL=68% PL=23% PI=45% W=47%</td> </tr> </tbody> </table>	<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>	1	1.2 – 1.5	LL=68% PL=23% PI=45% W=47%
<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>						
1	1.2 – 1.5	LL=68% PL=23% PI=45% W=47%						

<u>Auger Hole Number</u>	<u>Depth (metres)</u>	<u>Description</u>						
AH 20-04	0.0 – 0.2	TOPSOIL (ML) Sandy SILT, contains organic matter and rootlets; dark brown; non-cohesive, moist						
(427843.554, 5015999.246)	0.2 – 1.7	(CL/CH) SILTY CLAY to CLAY; grey-brown, contains red-brown mottling (WEATHERED CRUST); cohesive, w>PL						
	1.7	END OF AUGER HOLE						
		Note: minor water seepage at about 1.4 m						
		<table border="1"> <thead> <tr> <th><u>Sample</u></th> <th><u>Depth (m)</u></th> <th><u>Lab Testing</u></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.4 – 1.7</td> <td>LL=66% PL=25% PI=41% W=50%</td> </tr> </tbody> </table>	<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>	1	1.4 – 1.7	LL=66% PL=25% PI=41% W=50%
<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>						
1	1.4 – 1.7	LL=66% PL=25% PI=41% W=50%						

TABLE 1
RECORD OF AUGER HOLES

<u>Auger Hole Number</u>	<u>Depth (metres)</u>	<u>Description</u>						
AH 20-05	0.0 – 0.4	TOPSOIL (ML) Sandy SILT, contains organic matter and rootlets; dark brown; non-cohesive, moist						
(427746.079, 5015910.766)	0.4 – 1.7	(CL/CH) SILTY CLAY to CLAY; grey-brown, contains red-brown mottling (WEATHERED CRUST); cohesive, w>PL						
	1.7	END OF AUGER HOLE						
		Note: minor water seepage at about 1.5 m						
		<table border="1"> <thead> <tr> <th><u>Sample</u></th> <th><u>Depth (m)</u></th> <th><u>Lab Testing</u></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.4 – 1.7</td> <td>LL=41% PL=18% PI=23% SL=15% W=40%</td> </tr> </tbody> </table>	<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>	1	1.4 – 1.7	LL=41% PL=18% PI=23% SL=15% W=40%
<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>						
1	1.4 – 1.7	LL=41% PL=18% PI=23% SL=15% W=40%						

<u>Auger Hole Number</u>	<u>Depth (metres)</u>	<u>Description</u>						
AH 20-06	0.0 – 0.2	TOPSOIL (ML) Sandy SILT, contains organic matter and rootlets; dark brown; non-cohesive, moist						
(427630.956, 5015803.247)	0.2 – 1.5	(CL/CH) SILTY CLAY to CLAY; grey-brown, contains red-brown mottling (WEATHERED CRUST); cohesive, w>PL						
	1.5	END OF AUGER HOLE						
		Note: minor water seepage at about 1.1 m						
		<table border="1"> <thead> <tr> <th><u>Sample</u></th> <th><u>Depth (m)</u></th> <th><u>Lab Testing</u></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.2 – 1.5</td> <td>LL=46% PL=20% PI=26% W=42%</td> </tr> </tbody> </table>	<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>	1	1.2 – 1.5	LL=46% PL=20% PI=26% W=42%
<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>						
1	1.2 – 1.5	LL=46% PL=20% PI=26% W=42%						

TABLE 1
RECORD OF AUGER HOLES

<u>Auger Hole Number</u>	<u>Depth (metres)</u>	<u>Description</u>
AH 20-07	0.0 – 0.2	TOPSOIL (ML) Sandy SILT, contains organic matter and rootlets; dark brown; non-cohesive, moist
(427744.615, 5015677.946)	0.2 – 1.5	(CL/CH) SILTY CLAY to CLAY; grey-brown, contains red-brown mottling (WEATHERED CRUST); cohesive, w>PL (Trace of sand pockets observed in the upper 0.6 m)
	1.5	END OF AUGER HOLE
		Note: minor water seepage at about 1.1 m
	<u>Sample</u>	<u>Depth (m)</u>
	1	1.2 – 1.5
		<u>Lab Testing</u> LL=44% PL=18% PI=26% W=34%

<u>Auger Hole Number</u>	<u>Depth (metres)</u>	<u>Description</u>
AH 20-08	0.0 – 0.2	TOPSOIL (ML) Sandy SILT, contains organic matter and rootlets; dark brown; non-cohesive, moist
(427863.487, 5015772.923)	0.2 – 1.5	(CL/CH) SILTY CLAY to CLAY; grey-brown, contains red-brown mottling (WEATHERED CRUST); cohesive, w>PL
	1.5	END OF AUGER HOLE
		Note: No water seepage
	<u>Sample</u>	<u>Depth (m)</u>
	1	1.2 – 1.5
		<u>Lab Testing</u> LL=42% PL=19% PI=22% W=34%

TABLE 1
RECORD OF AUGER HOLES

<u>Auger Hole Number</u>	<u>Depth (metres)</u>	<u>Description</u>						
AH 20-09	0.0 – 0.2	TOPSOIL (ML) Sandy SILT, contains organic matter and rootlets; dark brown; non-cohesive, moist						
(427964.282, 5015867.916)	0.2 – 1.5	(CL/CH) SILTY CLAY to CLAY; grey-brown, contains red-brown mottling (WEATHERED CRUST); cohesive, w>PL (Trace of sand pockets observed in the upper 0.6 m)						
	1.5	END OF AUGER HOLE						
		Note: No water seepage						
		<table border="1"> <thead> <tr> <th><u>Sample</u></th> <th><u>Depth (m)</u></th> <th><u>Lab Testing</u></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.2 – 1.5</td> <td>LL=40% PL=19% PI=21% W=33%</td> </tr> </tbody> </table>	<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>	1	1.2 – 1.5	LL=40% PL=19% PI=21% W=33%
<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>						
1	1.2 – 1.5	LL=40% PL=19% PI=21% W=33%						

<u>Auger Hole Number</u>	<u>Depth (metres)</u>	<u>Description</u>						
AH 20-10	0.0 – 0.3	TOPSOIL (ML) Sandy SILT, contains organic matter and rootlets; dark brown; non-cohesive, moist						
(428062.276, 5015755.384)	0.3 – 1.5	(CL/CH) SILTY CLAY to CLAY; grey-brown, contains red-brown mottling (WEATHERED CRUST); cohesive, w>PL (Trace of sand pockets observed in the upper 0.6 m)						
	1.5	END OF AUGER HOLE						
		Note: No water seepage						
		<table border="1"> <thead> <tr> <th><u>Sample</u></th> <th><u>Depth (m)</u></th> <th><u>Lab Testing</u></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.2 – 1.5</td> <td>LL=46% PL19% PI=27% W=35%</td> </tr> </tbody> </table>	<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>	1	1.2 – 1.5	LL=46% PL19% PI=27% W=35%
<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>						
1	1.2 – 1.5	LL=46% PL19% PI=27% W=35%						

**TABLE 1
RECORD OF AUGER HOLES**

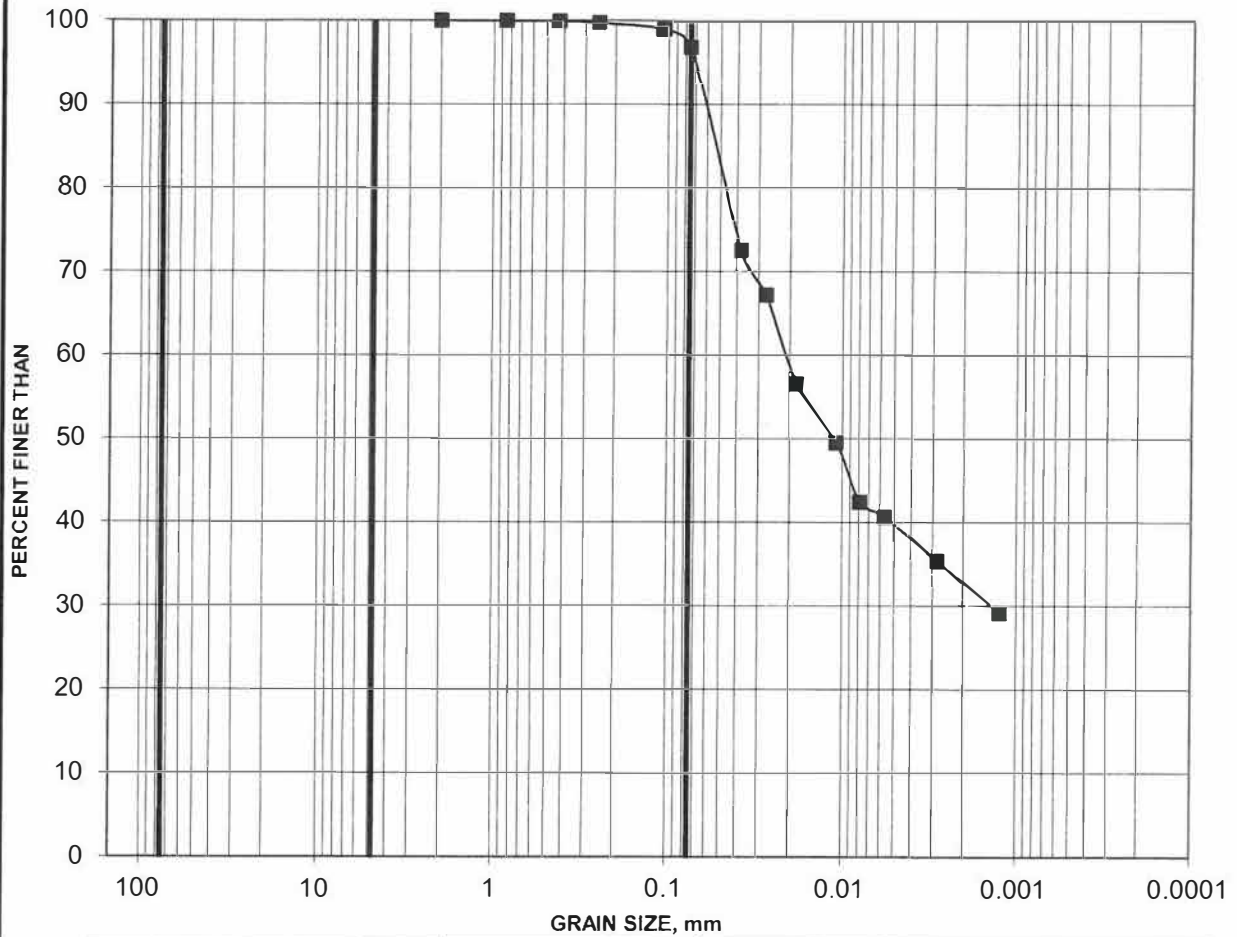
<u>Auger Hole Number</u>	<u>Depth (metres)</u>	<u>Description</u>						
AH 20-11	0.0 – 0.3	TOPSOIL (ML) Sandy SILT, contains organic matter and rootlets; dark brown; non-cohesive, moist						
(427964.375, 5015666.515)	0.3 – 1.5	(CL/CH) SILTY CLAY to CLAY; grey-brown, contains red-brown mottling (WEATHERED CRUST); cohesive, w>PL (Trace of sand pockets observed in the upper 0.6 m)						
	1.5	END OF AUGER HOLE						
		Note: No water seepage						
		<table border="1"> <thead> <tr> <th><u>Sample</u></th> <th><u>Depth (m)</u></th> <th><u>Lab Testing</u></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.2 – 1.5</td> <td>LL=45% PL=19% PI=26% W=38%</td> </tr> </tbody> </table>	<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>	1	1.2 – 1.5	LL=45% PL=19% PI=26% W=38%
<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>						
1	1.2 – 1.5	LL=45% PL=19% PI=26% W=38%						

<u>Auger Hole Number</u>	<u>Depth (metres)</u>	<u>Description</u>						
AH 20-12	0.0 – 0.3	TOPSOIL (ML) Sandy SILT, contains organic matter and rootlets; dark brown; non-cohesive, moist						
(427843.659, 5015557.577)	0.3 – 1.5	(CL/CH) SILTY CLAY to CLAY; grey-brown, contains red-brown mottling (WEATHERED CRUST); cohesive, w>PL (Trace of sand pockets observed in the upper 0.6 m)						
	1.5	END OF AUGER HOLE						
		Note: No water seepage						
		<table border="1"> <thead> <tr> <th><u>Sample</u></th> <th><u>Depth (m)</u></th> <th><u>Lab Testing</u></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1.2 – 1.5</td> <td>LL=48% PL=19% PI=29% W=38%</td> </tr> </tbody> </table>	<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>	1	1.2 – 1.5	LL=48% PL=19% PI=29% W=38%
<u>Sample</u>	<u>Depth (m)</u>	<u>Lab Testing</u>						
1	1.2 – 1.5	LL=48% PL=19% PI=29% W=38%						

GRAIN SIZE DISTRIBUTION

FIGURE 2

SILTY CLAY



COBBLE SIZE	COARSE	FINE	COARSE	MEDIU	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

Augerhole	Sample	Depth (m)	Constituents (%)			
			Gravel	Sand	Silt	Clay
■ 20-01	1	1.07-1.52	0	3	64	33

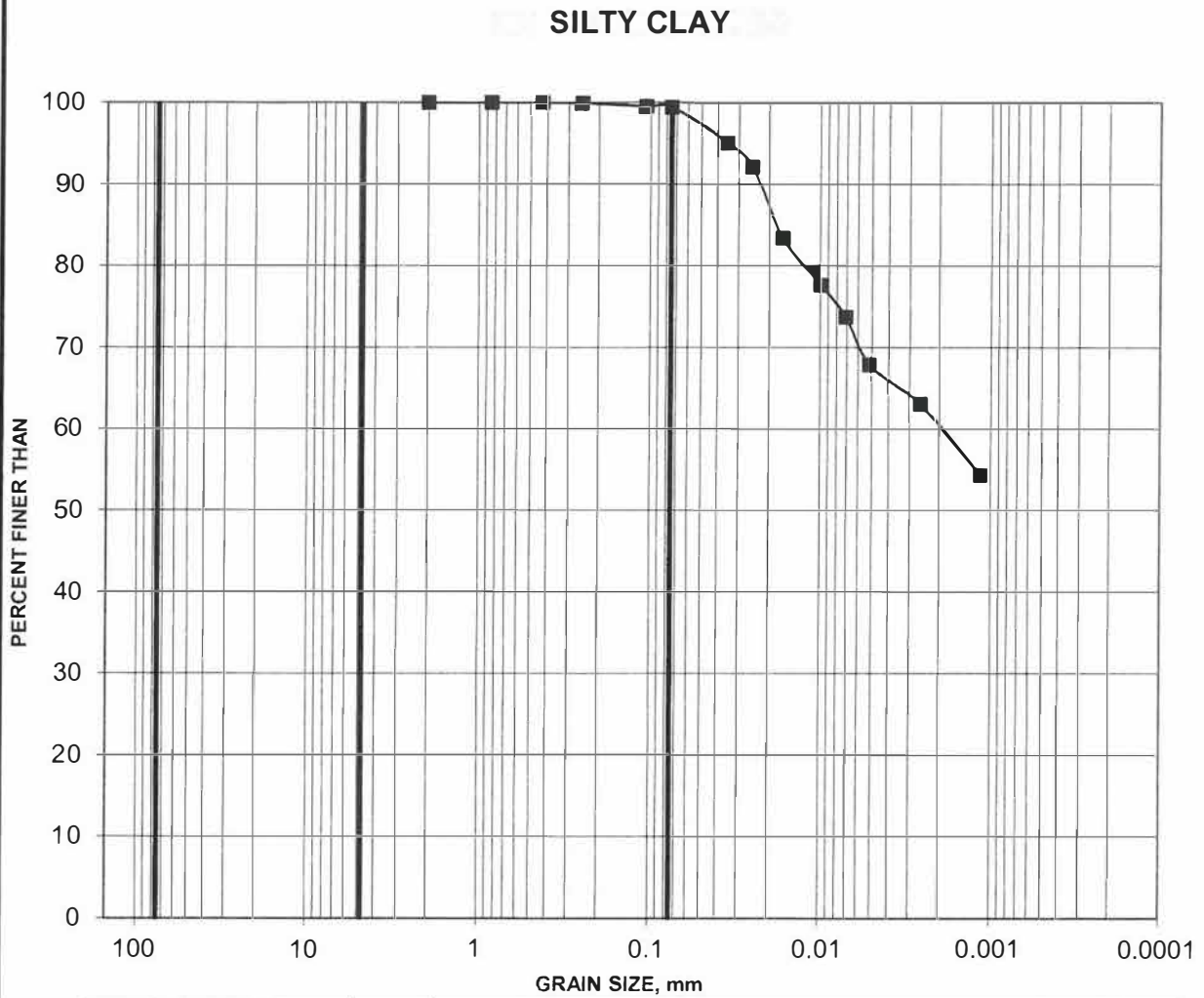
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GRAIN SIZE DISTRIBUTION

FIGURE 3



COBBLE SIZE	COARSE	FINE	COARSE	MEDIU	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

Augerhole	Sample	Depth (m)	Constituents (%)			
			Gravel	Sand	Silt	Clay
■ 20-04	1	1.37-1.68	0	1	39	60

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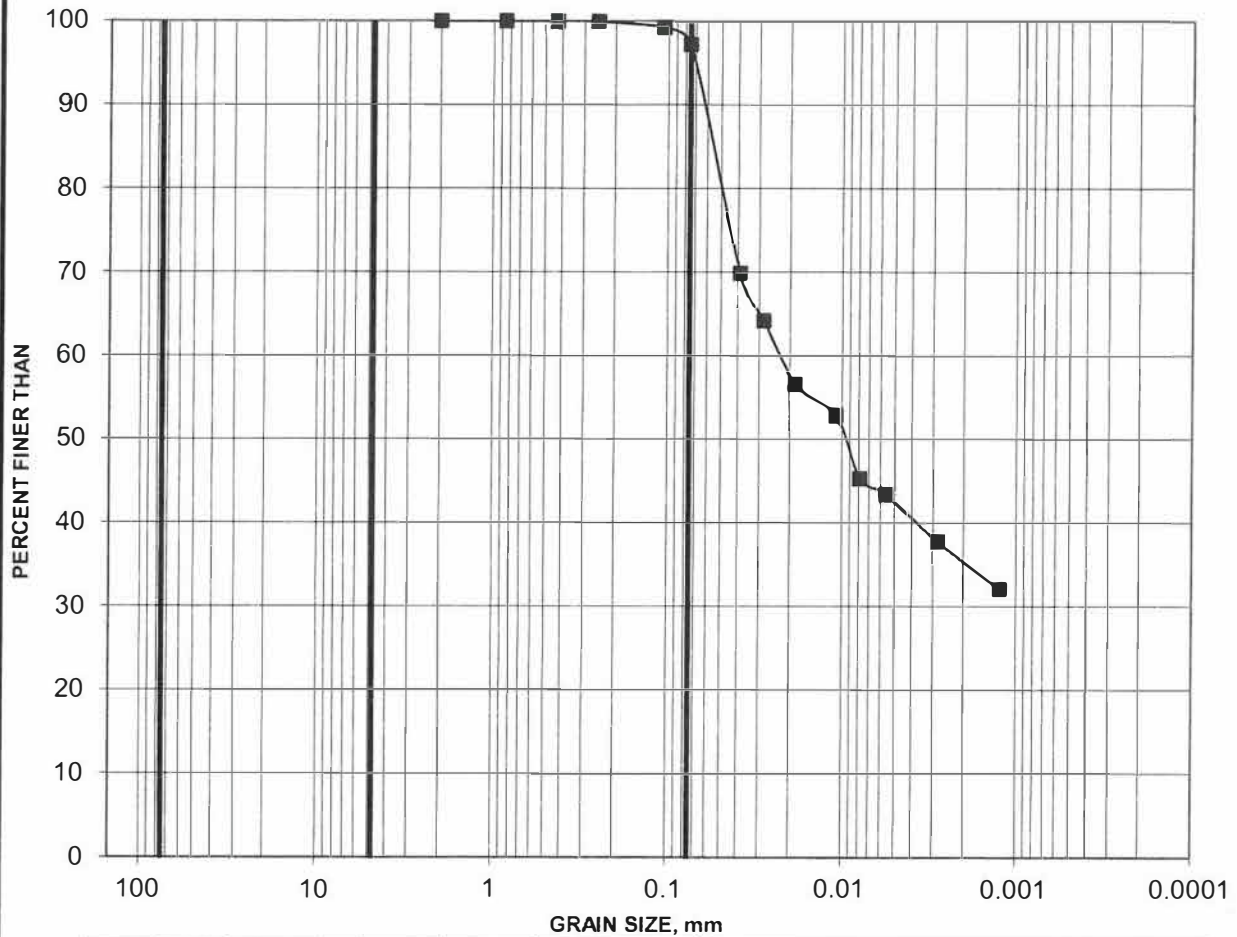


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GRAIN SIZE DISTRIBUTION

FIGURE 5

SILTY CLAY



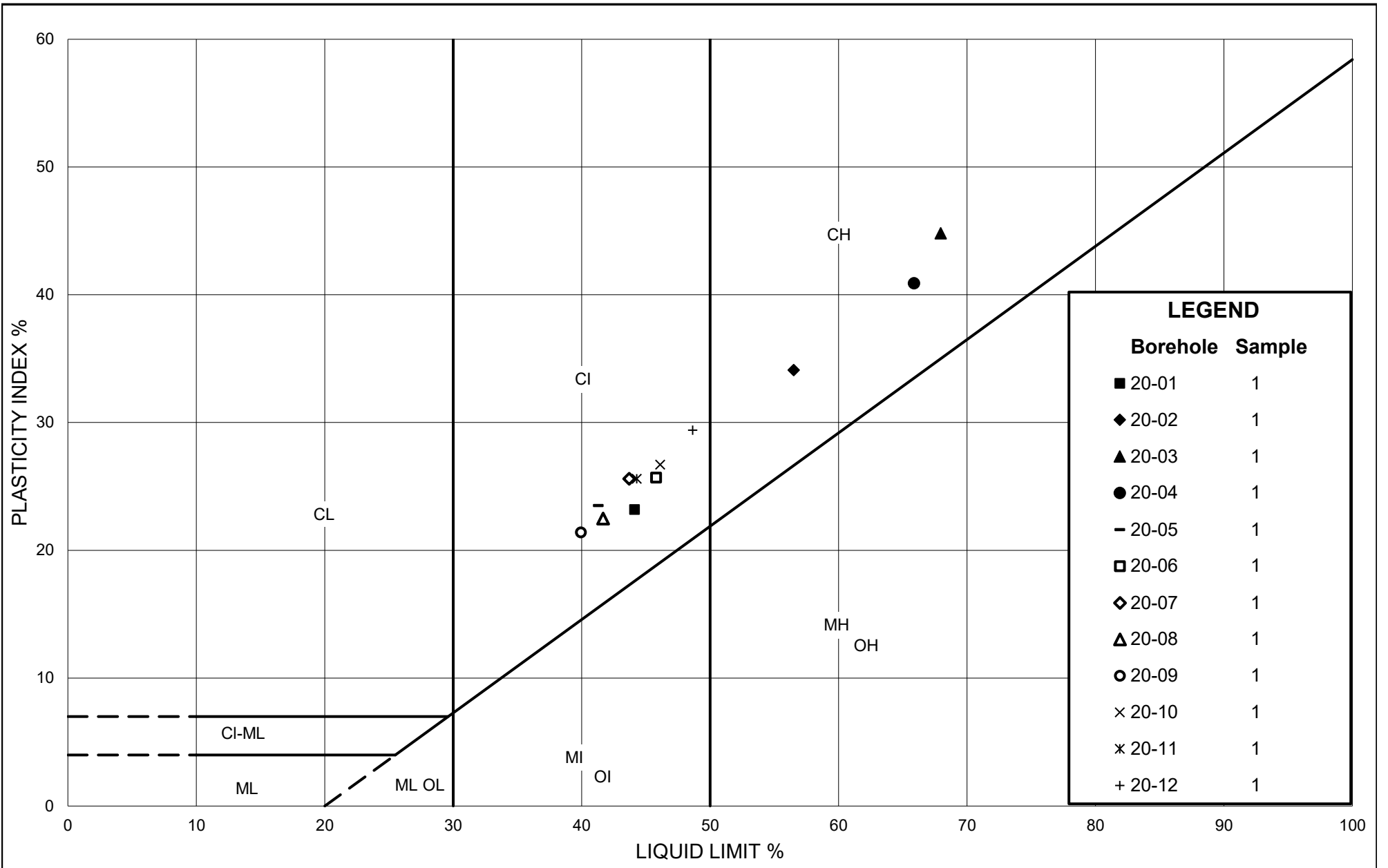
COBBLE SIZE	COARSE	FINE	COARSE	MEDIU	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

Augerhole	Sample	Depth (m)	Constituents (%)			
			Gravel	Sand	Silt	Clay
■ 20-10	1	1.22-1.52	0	3	62	35

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PLASTICITY CHART

Figure:
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