

BLDs	COBBLES	GRAVEL		SAND			SILT & CLAY	
		coarse	fine	coarse	medium	fine	SILT	CLAY

Specimen	Depth (m)	Description	W%	%Gravel	%Sand	%Silt	%Clay	>75µ
● MW5-14-(D)	3.8	Silty SAND, some gravel, little clay	5	21	46	24	9	67
■ MW5-14-(D)	4.6	Silty SAND, some clay, little gravel	6	11	52	24	13	63
▲ MW5-14-(D)	8.4	Silty SAND, some gravel, some clay	4	16	38	29	17	54
★ MW5-14-(D)	13.4	Clayey, silty SAND, little gravel	5	12	39	28	21	51
✕ MW5-14-(D)	25.0	Silty SAND, some gravel, some clay	4	18	37	28	17	55

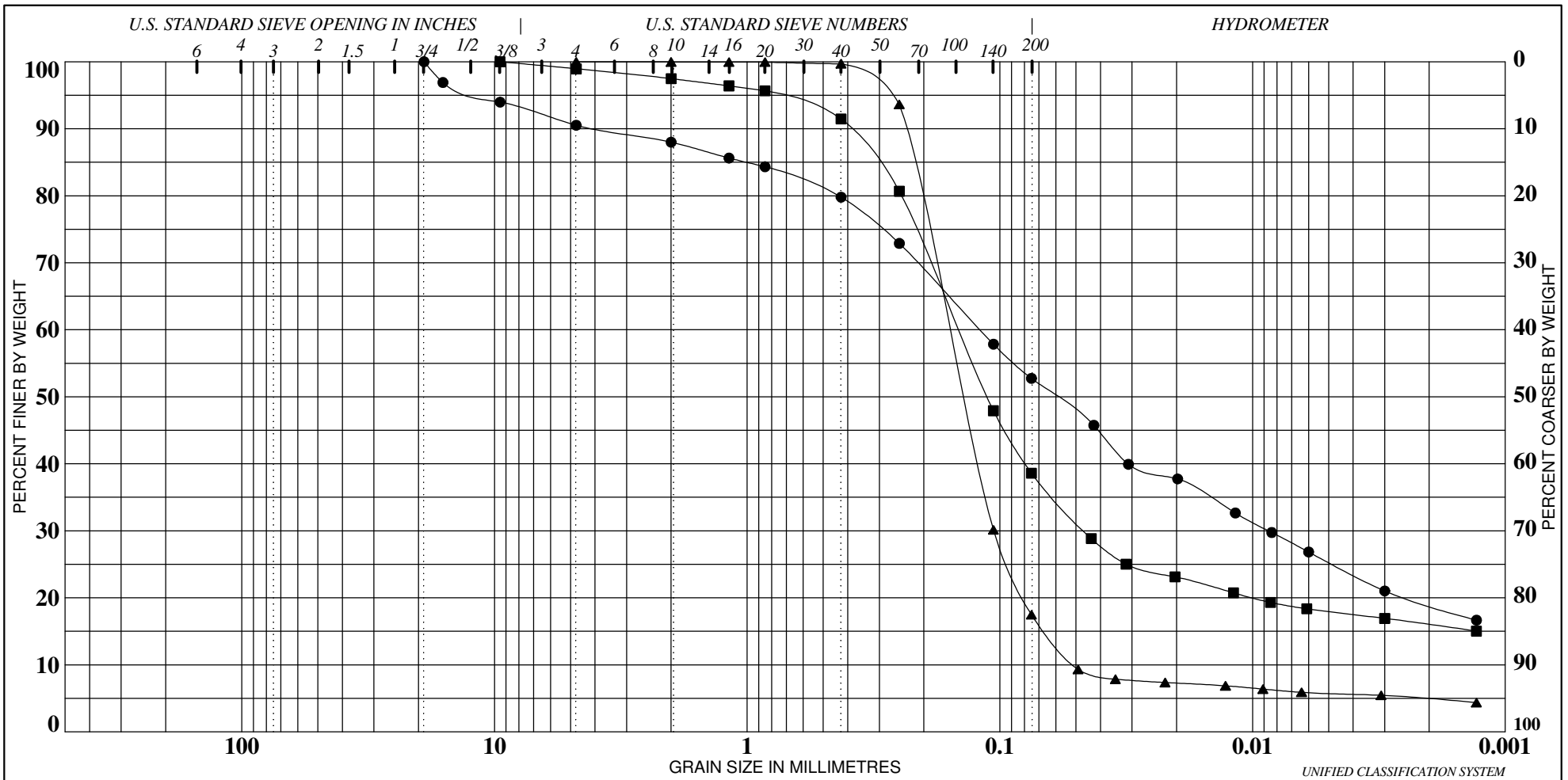


**Project:** Clarington Transformer Station  
**Location:** Clarington, ON  
**Project No.:** 160900764

**GRADATION CURVE (ASTM D422)**


**Figure:** C1-1

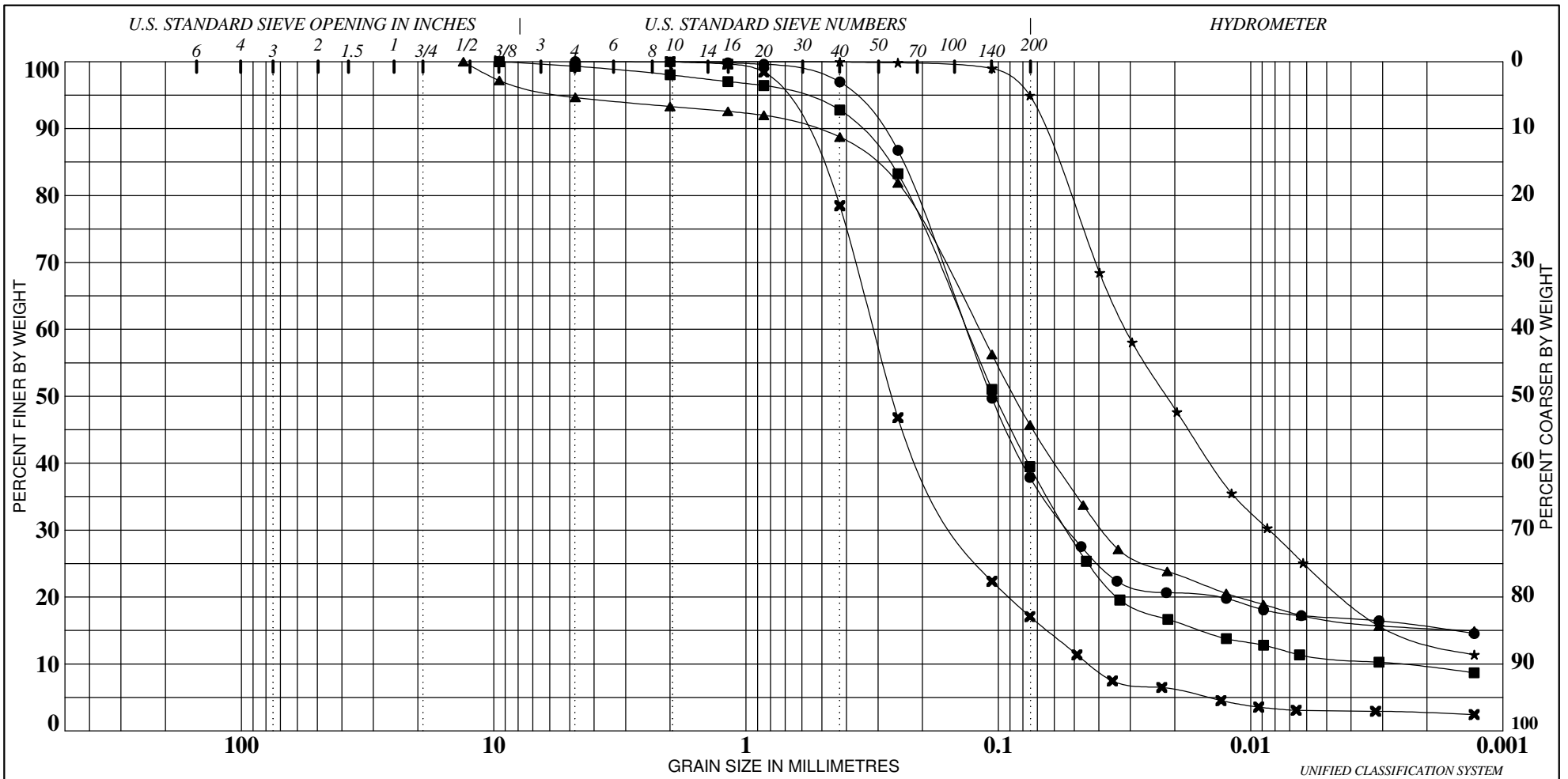
**Remarks:** Grain size descriptions are based on CFEM, 1992.



BLDs	COBBLES	GRAVEL		SAND			SILT & CLAY		
		coarse	fine	coarse	medium	fine	SILT		CLAY

Specimen	Depth (m)	Description	W%	%Gravel	%Sand	%Silt	%Clay	>75µ
● MW5-14-(D)	38.9	SAND with SILT, some clay, little	6	9	38	34	19	47
■ MW5-14-(D)	49.6	gravel Silty SAND, some clay,	9	1	60	23	16	61
▲ MW5-14-(D)	52.5	trace gravel Silty SAND, trace clay	13	0	82	13	5	82

	<b>Project:</b> Clarington Transformer Station <b>Location:</b> Clarington, ON <b>Project No.:</b> 160900764	<b>GRADATION CURVE (ASTM D422)</b> <b>Figure:</b> C1-2 <b>Remarks:</b> Grain size descriptions are based on CFEM, 1992.
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BLDs	COBBLES	GRAVEL		SAND			SILT & CLAY	
		coarse	fine	coarse	medium	fine	SILT	CLAY

Specimen	Depth (m)	Description	W%	%Gravel	%Sand	%Silt	%Clay	>75µ
●	MW5-14-(D2) 52.6	Silty SAND, some clay	13	0	63	22	15	63
■	MW5-14-(D2) 62.0	Silty SAND, little clay	9	1	60	30	9	61
▲	MW5-14-(D2) 71.0	Silty SAND, some clay, trace gravel	7	5	50	30	15	55
★	MW5-14-(D2) 78.0	SILT, some clay, little sand	14	0	6	81	13	6
✕	MW5-14-(D2) 83.1	SAND, some silt, trace clay	12	0	83	14	3	83

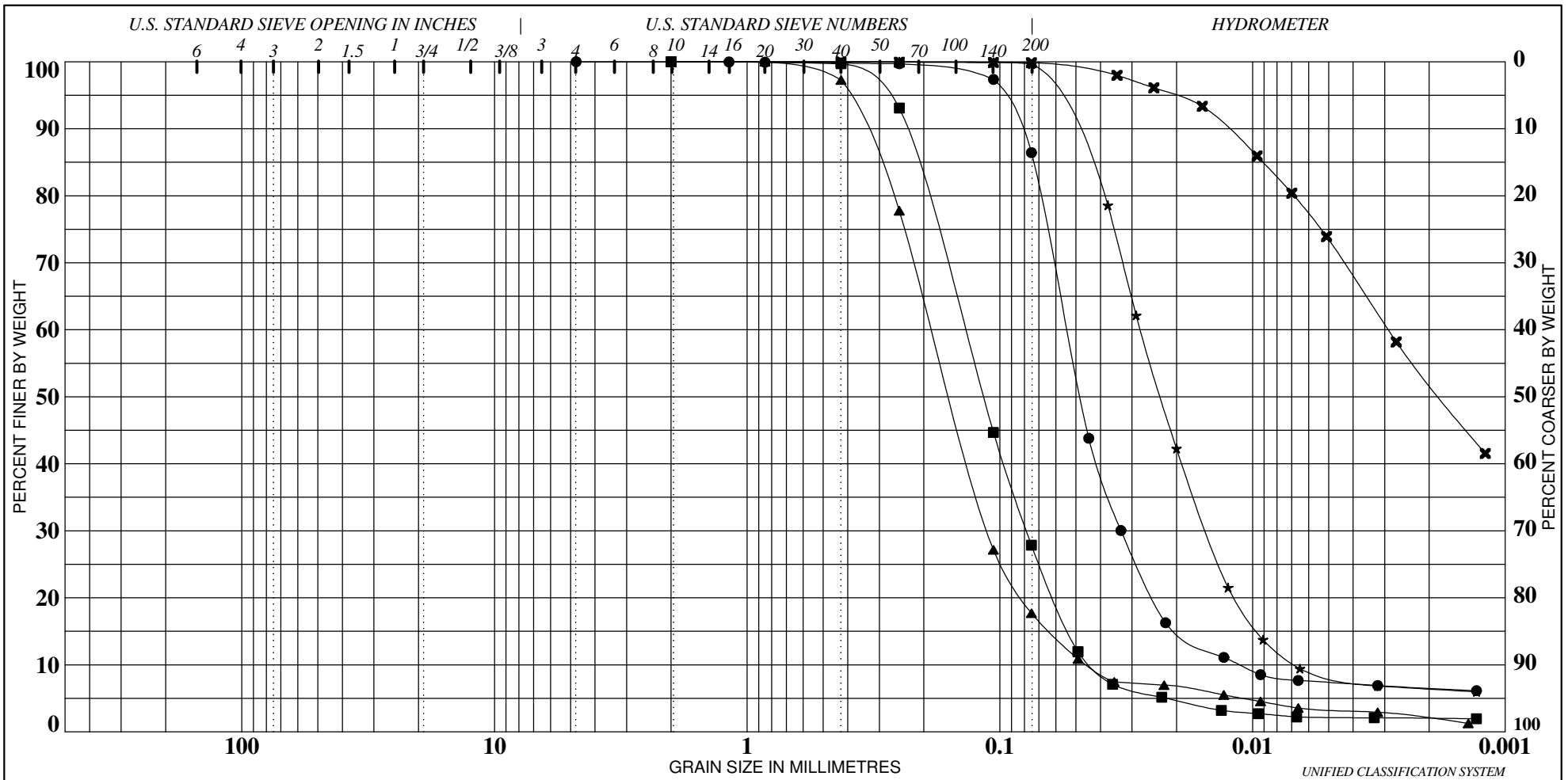


**Project:** Clarington Transformer Station  
**Location:** Clarington, ON  
**Project No.:** 160900764

**GRADATION CURVE (ASTM D422)**

**Figure:** C2-1

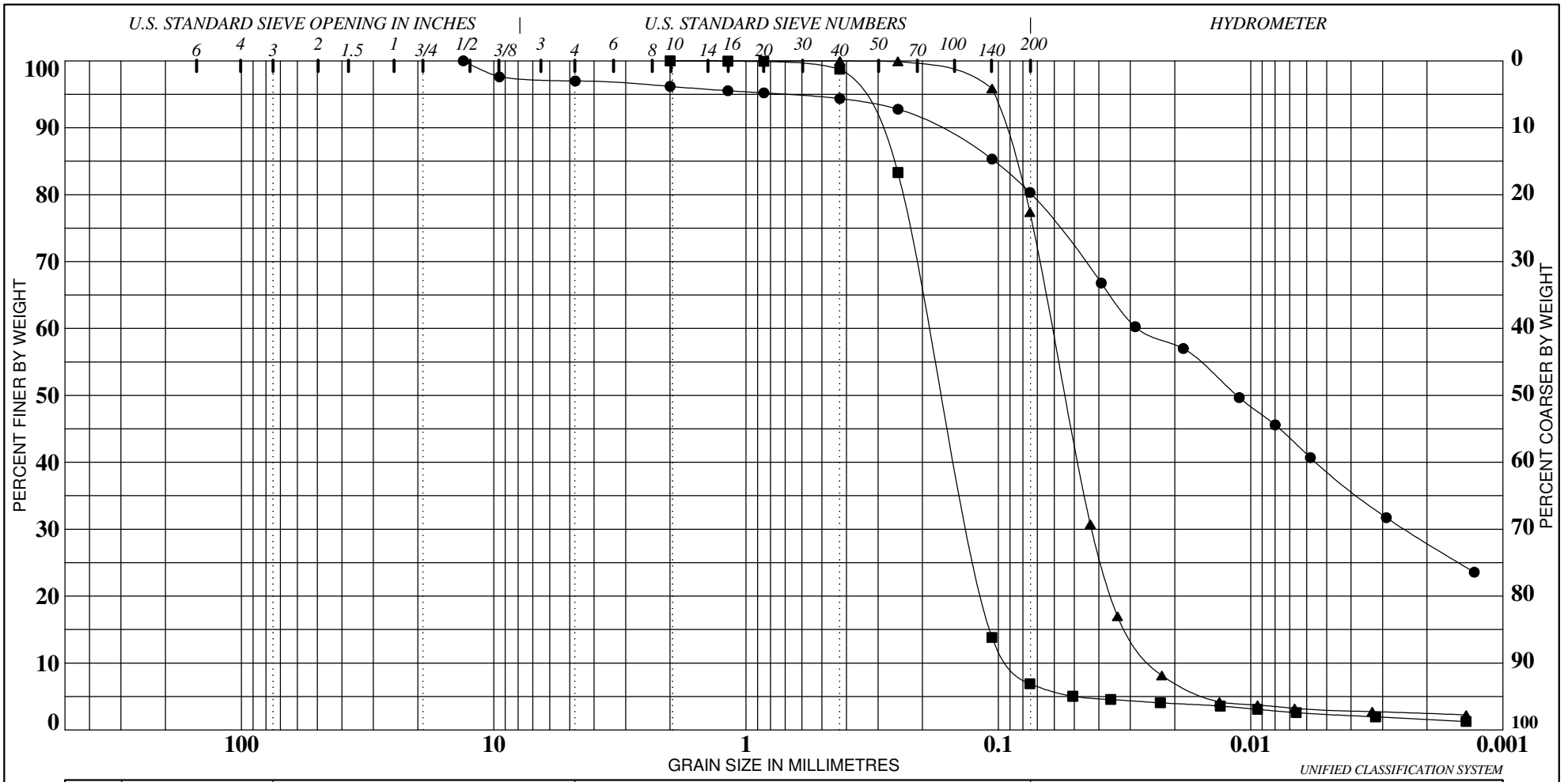
**Remarks:** Grain size descriptions are based on CFEM, 1992.



BLDs	COBBLES	GRAVEL		SAND			SILT & CLAY	
		coarse	fine	coarse	medium	fine	SILT	CLAY

Specimen	Depth (m)	Description	W%	%Gravel	%Sand	%Silt	%Clay	>75µ
●	MW5-14-(D2) 86.4	SILT, some sand, little clay	20	0	13	80	7	13
■	MW5-14-(D2) 90.7	Silty SAND, trace clay	16	0	72	26	2	72
▲	MW5-14-(D2) 96.8	SAND, some silt, trace clay	16	0	82	16	2	82
★	MW5-14-(D2) 100.4	SILT, little clay, trace sand	21	0	1	93	6	1
✕	MW5-14-(D2) 105.8	CLAY and SILT	16	0	0	48	52	0

	<b>Project:</b> Clarington Transformer Station <b>Location:</b> Clarington, ON <b>Project No.:</b> 160900764	<b>GRADATION CURVE (ASTM D422)</b> <b>Figure:</b> C2-2 <b>Remarks:</b> Grain size descriptions are based on CFEM, 1992.
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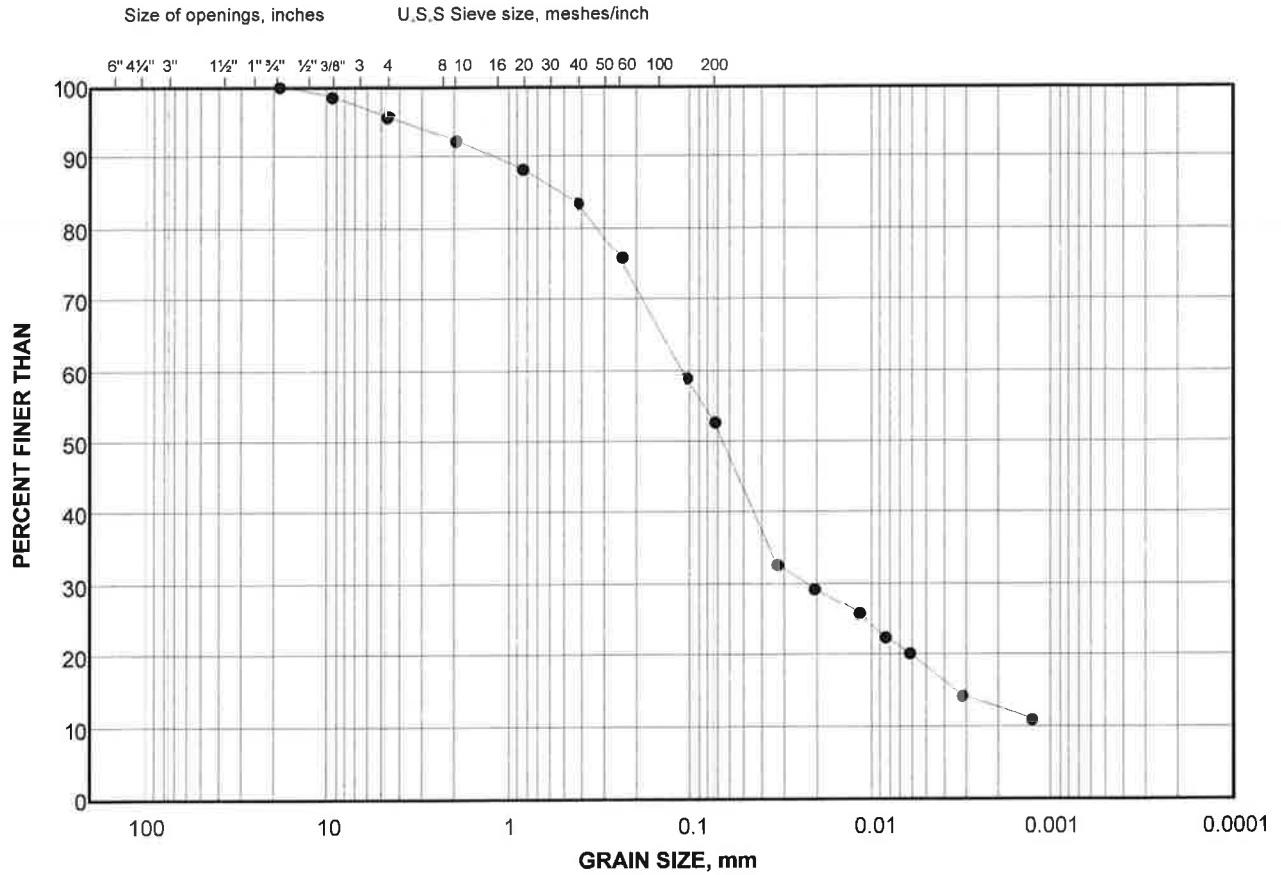
BLDs	COBBLES	GRAVEL		SAND			SILT & CLAY	
		coarse	fine	coarse	medium	fine	SILT	CLAY

Specimen	Depth (m)	Description	W%	%Gravel	%Sand	%Silt	%Clay	>75µ
●	MW5-14-(D2)12.0	Clayey SILT, some sand, trace gravel	9	3	17	52	28	20
■	MW5-14-(D2)13.2	SAND, trace silt, trace clay	18	0	93	5	2	93
▲	MW5-14-(D2)13.7	Sandy SILT, trace clay	20	0	23	75	2	23

	<b>Project:</b> Clarington Transformer Station <b>Location:</b> Clarington, ON <b>Project No.:</b> 160900764	<b>GRADATION CURVE (ASTM D422)</b> <b>Figure:</b> C2-3 <b>Remarks:</b> Grain size descriptions are based on CFEM, 1992.
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# GRAIN SIZE DISTRIBUTION

C3-1



<b>COBBLE</b>	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY SIZES
	<b>GRAVEL SIZE</b>		<b>SAND SIZE</b>			<b>FINE GRAINED</b>

**LEGEND**

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	MW8-15	15	3.71 - 4.32

Project Number: 1521702(1000)

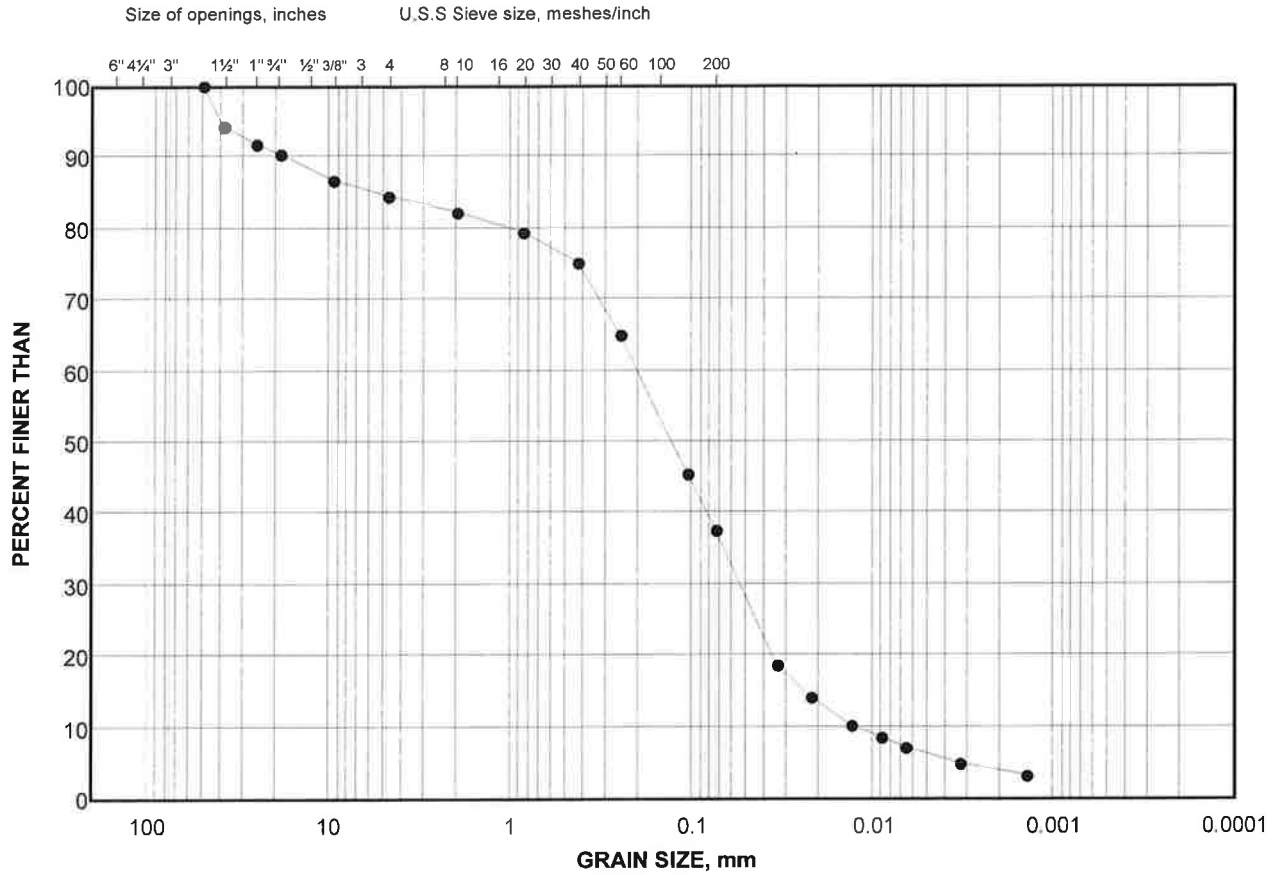
Checked By: \_\_\_\_\_ *Po*

**Golder Associates**

Date: 02-Feb-15

# GRAIN SIZE DISTRIBUTION

C3-2



COBBLE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY SIZES
	GRAVEL SIZE		SAND SIZE			

## LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
•	MW8-15	15	8.33 - 8.94

Project Number: 15217021000)

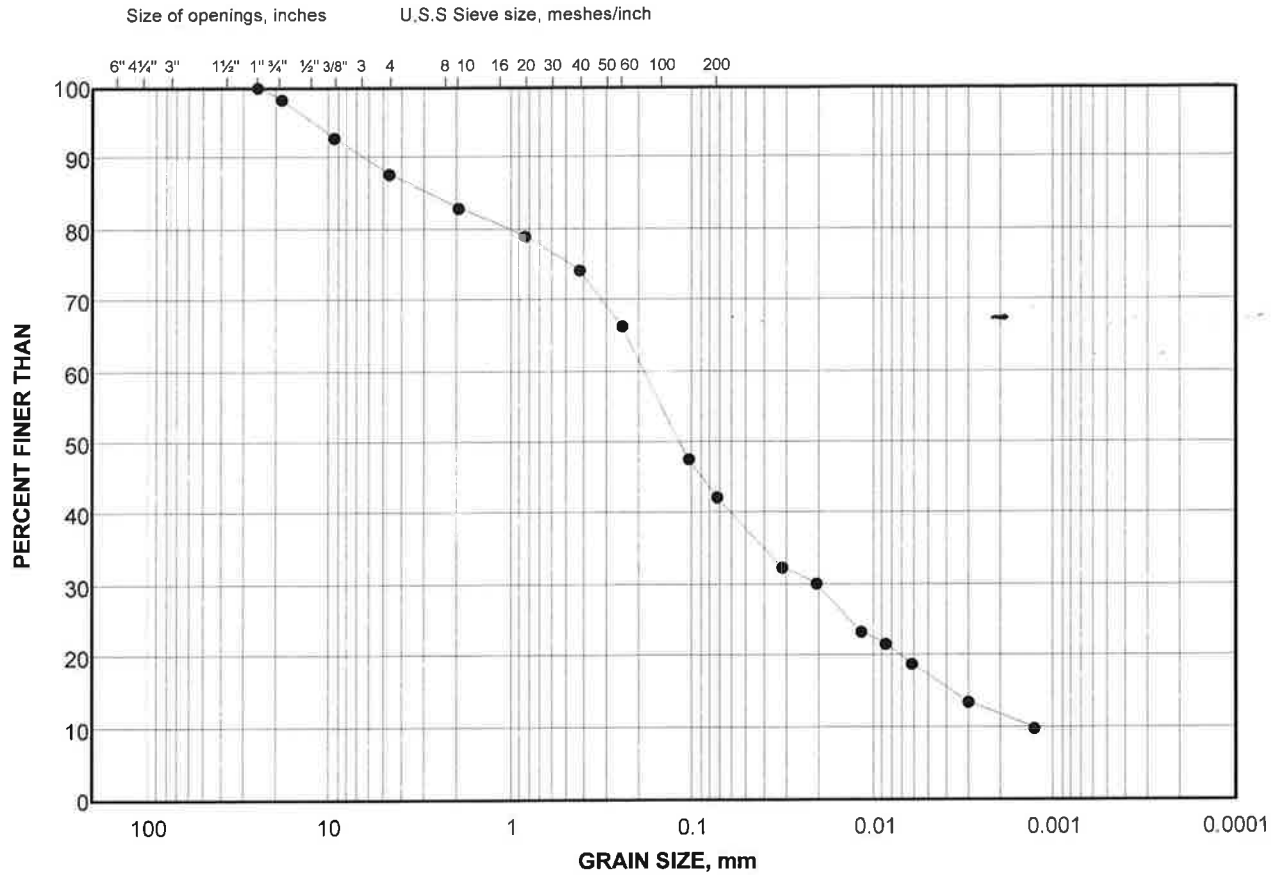
Checked By: Ro

**Golder Associates**

Date: 02-Feb-15

# GRAIN SIZE DISTRIBUTION

C3-3



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY SIZES
	GRAVEL SIZE		SAND SIZE			

## LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	MW8-15	15	16.29 - 16.49

Project Number: 1521702(1000)

Checked By: Ro

**Golder Associates**

Date: 02-Feb-15



**HYDRAULIC CONDUCTIVITY TEST**

**ASTM D 5084 (CONSTANT HEAD)**

**SAMPLE IDENTIFICATION**

PROJECT NUMBER	1521702	SAMPLE	15
PROJECT TITLE		SAMPLE DEPTH, m	4.01-4.32
BOREHOLE NUMBER	MW8-15	DATE, mm/dd/yyyy	2/02/2015

**SPECIMEN PROPERTIES AND DIMENSIONS (INITIAL)**

SAMPLE HEIGHT, cm	6.14	UNIT WEIGHT, kN/m <sup>3</sup>	22.62
SAMPLE DIAMETER, cm	8.43	DRY UNIT WEIGHT, kN/m <sup>3</sup>	20.61
SAMPLE AREA, cm <sup>2</sup>	55.79	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm <sup>3</sup>	342.31	VOLUME OF SOLIDS, cm <sup>3</sup>	266.42
TOTAL MASS, g	789.60	VOLUME OF VOIDS, cm <sup>3</sup>	75.90
DRY MASS, g	719.33	VOID RATIO	0.28
WATER CONTENT, %	9.8		

**SATURATION STAGE**

CELL PRESSURE, kPa	350	EFFECTIVE CONSOLIDATION STRESS, kPa	5
HEAD PRESSURE, kPa	345	DURATION, min	8,460
BACK PRESSURE, kPa	345	B COEFFICIENT	0.96

**CONSOLIDATION STAGE**

CELL PRESSURE, kPa	441	EFFECTIVE CONSOLIDATION STRESS, kPa	96
HEAD PRESSURE, kPa	345	DURATION, min	360
BACK PRESSURE, kPa	345	VOLUME CHANGE, cm <sup>3</sup>	5.1
		DRAINAGE	Top and Bottom

**SPECIMEN PROPERTIES AND DIMENSIONS (AFTER CONSOLIDATION)**

SAMPLE HEIGHT, cm	6.11	SAMPLE AREA, cm <sup>2</sup>	55.23
SAMPLE DIAMETER, cm	8.39	SAMPLE VOLUME, cm <sup>3</sup>	337.23

**HYDRAULIC CONDUCTIVITY STAGE**

CELL PRESSURE, kPa	453	EFFECTIVE CONSOLIDATION STRESS, kPa	96
HEAD PRESSURE, kPa	357	DURATION, min	1189
BACK PRESSURE, kPa	345	HYDRAULIC GRADIENT, <i>i</i>	20

**SPECIMEN PROPERTIES AND DIMENSIONS (FINAL)**

SAMPLE HEIGHT, cm	6.11	UNIT WEIGHT, kN/m <sup>3</sup>	23.02
SAMPLE DIAMETER, cm	8.39	DRY UNIT WEIGHT, kN/m <sup>3</sup>	20.92
SAMPLE AREA, cm <sup>2</sup>	55.23	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm <sup>3</sup>	337.23	VOLUME OF SOLIDS, cm <sup>3</sup>	266.42
TOTAL MASS, g	791.73	VOLUME OF VOIDS, cm <sup>3</sup>	70.81
DRY MASS, g	719.33	VOID RATIO	0.27
WATER CONTENT, %	10.1		

**TEST RESULTS**

ELAPSED TIME TO STEADY STATE FLOW (min)	8.0
DURATION OF STEADY STATE FLOW (min)	1181
INFLOW VOLUME UNDER STEADY STATE FLOW (cm <sup>3</sup> )	30.4
OUTFLOW VOLUME UNDER STEADY STATE FLOW (cm <sup>3</sup> )	29.4
OUTFLOW TO INFLOW RATIO	1.0
HYDRAULIC CONDUCTIVITY (INFLOW) (cm/s)	3.88E-07
HYDRAULIC CONDUCTIVITY (OUTFLOW) (cm/s)	3.75E-07
HYDRAULIC CONDUCTIVITY, K, cm/s	3.81E-07
HYDRAULIC CONDUCTIVITY AT STANDARD TEMPERATURE, K <sub>20</sub> , cm/s	3.55E-07

**NOTES:**

Effective consolidation stress assigned by the client

PERMEANT FLUID

Deaired tap water

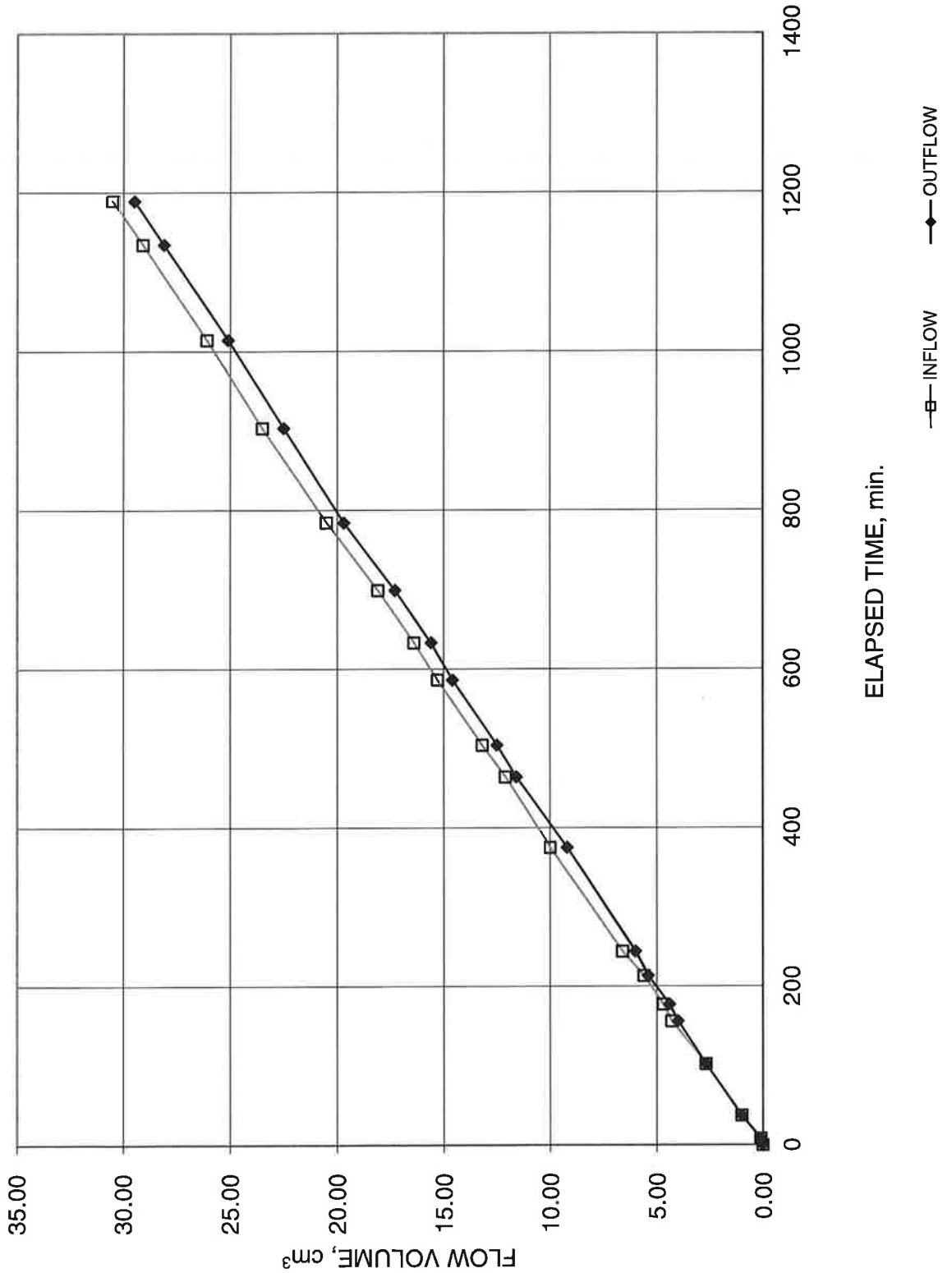
AVERAGE TEST TEMPERATURE

23.0 °C

# HYDRAULIC CONDUCTIVITY TEST

C3-4

BH MW8-15 SA 15 DEPTH, m 4.01-4.32



**HYDRAULIC CONDUCTIVITY TEST**  
**ASTM D 5084 (CONSTANT HEAD)**

**SAMPLE IDENTIFICATION**

PROJECT NUMBER	1521702	SAMPLE	15
PROJECT TITLE		SAMPLE DEPTH, m	8.33-8.94
BOREHOLE NUMBER	MW8-15	DATE, mm/dd/yyyy	2/02/2015

**SPECIMEN PROPERTIES AND DIMENSIONS (INITIAL)**

SAMPLE HEIGHT, cm	8.61	UNIT WEIGHT, kN/m <sup>3</sup>	23.53
SAMPLE DIAMETER, cm	8.19	DRY UNIT WEIGHT, kN/m <sup>3</sup>	21.95
SAMPLE AREA, cm <sup>2</sup>	52.66	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm <sup>3</sup>	453.21	VOLUME OF SOLIDS, cm <sup>3</sup>	375.67
TOTAL MASS, g	1087.40	VOLUME OF VOIDS, cm <sup>3</sup>	77.54
DRY MASS, g	1014.30	VOID RATIO	0.21
WATER CONTENT, %	7.2		

**SATURATION STAGE**

CELL PRESSURE, kPa	280	EFFECTIVE CONSOLIDATION STRESS, kPa	5
HEAD PRESSURE, kPa	275	DURATION, min	7,170
BACK PRESSURE, kPa	275	B COEFFICIENT	0.96

**CONSOLIDATION STAGE**

CELL PRESSURE, kPa	452	EFFECTIVE CONSOLIDAITON STRESS, kPa	177
HEAD PRESSURE, kPa	275	DURATION, min	1,500
BACK PRESSURE, kPa	275	VOLUME CHANGE, cm <sup>3</sup>	10.1
		DRAINAGE	Top and Bottom

**SPECIMEN PROPERTIES AND DIMENSIONS (AFTER CONSOLIDATION)**

SAMPLE HEIGHT, cm	8.54	SAMPLE AREA, cm <sup>2</sup>	51.87
SAMPLE DIAMETER, cm	8.13	SAMPLE VOLUME, cm <sup>3</sup>	443.16

**HYDRAULIC CONDUCTIVITY STAGE**

CELL PRESSURE, kPa	460	EFFECTIVE CONSOLIDATION STRESS, kPa	177
HEAD PRESSURE, kPa	283	DURATION, min	815
BACK PRESSURE, kPa	275	HYDRAULIC GRADIENT, <i>i</i>	10

**SPECIMEN PROPERTIES AND DIMENSIONS (FINAL)**

SAMPLE HEIGHT, cm	8.54	UNIT WEIGHT, kN/m <sup>3</sup>	24.05
SAMPLE DIAMETER, cm	8.13	DRY UNIT WEIGHT, kN/m <sup>3</sup>	22.45
SAMPLE AREA, cm <sup>2</sup>	51.87	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm <sup>3</sup>	443.16	VOLUME OF SOLIDS, cm <sup>3</sup>	375.67
TOTAL MASS, g	1086.60	VOLUME OF VOIDS, cm <sup>3</sup>	67.49
DRY MASS, g	1014.30	VOID RATIO	0.18
WATER CONTENT, %	7.1		

**TEST RESULTS**

ELAPSED TIME TO STEADY STATE FLOW (min)		0.0
DURATION OF STEADY STATE FLOW (min)		815
INFLOW VOLUME UNDER STEADY STATE FLOW (cm <sup>3</sup> )		47.6
OUTFLOW VOLUME UNDER STEADY STATE FLOW (cm <sup>3</sup> )		46.3
OUTFLOW TO INFLOW RATIO		1.0
HYDRAULIC CONDUCTIVITY (INFLOW) (cm/s)		1.97E-06
HYDRAULIC CONDUCTIVITY (OUTFLOW) (cm/s)		1.91E-06
HYDRAULIC CONDUCTIVITY, K, cm/s		1.94E-06
HYDRAULIC CONDUCTIVITY AT STANDARD TEMPERATURE, K <sub>20</sub> , cm/s		1.80E-06

**NOTES:**

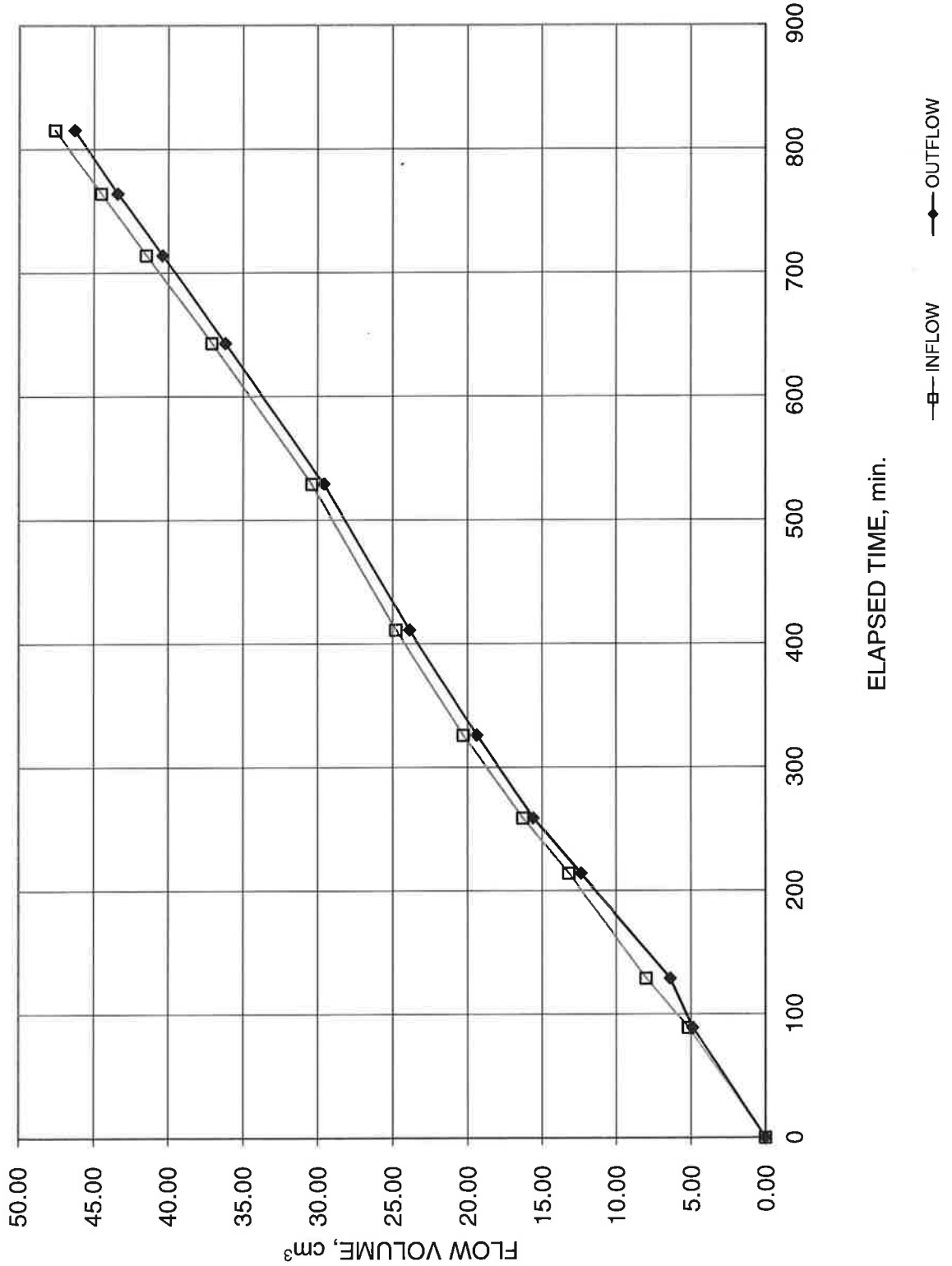
Effective consolidation stress assigned by the client

PERMEANT FLUID Deaired tap water  
AVERAGE TEST TEMPERATURE 23.0 °C

# HYDRAULIC CONDUCTIVITY TEST

C3-5

BH MW8-15 SA 15 DEPTH, m 8.33-8.94 (i=10)



**HYDRAULIC CONDUCTIVITY TEST**  
**ASTM D 5084 (CONSTANT HEAD)**

**SAMPLE IDENTIFICATION**

PROJECT NUMBER	1521702	SAMPLE	15
PROJECT TITLE		SAMPLE DEPTH, m	8.33-8.94
BOREHOLE NUMBER	MW8-15	DATE, mm/dd/yyyy	2/02/2015

**SPECIMEN PROPERTIES AND DIMENSIONS (INITIAL)**

SAMPLE HEIGHT, cm	8.61	UNIT WEIGHT, kN/m <sup>3</sup>	23.53
SAMPLE DIAMETER, cm	8.19	DRY UNIT WEIGHT, kN/m <sup>3</sup>	21.95
SAMPLE AREA, cm <sup>2</sup>	52.66	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm <sup>3</sup>	453.21	VOLUME OF SOLIDS, cm <sup>3</sup>	375.67
TOTAL MASS, g	1087.40	VOLUME OF VOIDS, cm <sup>3</sup>	77.54
DRY MASS, g	1014.30	VOID RATIO	0.21
WATER CONTENT, %	7.2		

**SATURATION STAGE**

CELL PRESSURE, kPa	280	EFFECTIVE CONSOLIDATION STRESS, kPa	5
HEAD PRESSURE, kPa	275	DURATION, min	7,170
BACK PRESSURE, kPa	275	B COEFFICIENT	0.96

**CONSOLIDATION STAGE**

CELL PRESSURE, kPa	452	EFFECTIVE CONSOLIDATION STRESS, kPa	177
HEAD PRESSURE, kPa	275	DURATION, min	1,500
BACK PRESSURE, kPa	275	VOLUME CHANGE, cm <sup>3</sup>	10.1
		DRAINAGE	Top and Bottom

**SPECIMEN PROPERTIES AND DIMENSIONS (AFTER CONSOLIDATION)**

SAMPLE HEIGHT, cm	8.54	SAMPLE AREA, cm <sup>2</sup>	51.87
SAMPLE DIAMETER, cm	8.13	SAMPLE VOLUME, cm <sup>3</sup>	443.16

**HYDRAULIC CONDUCTIVITY STAGE**

CELL PRESSURE, kPa	469	EFFECTIVE CONSOLIDATION STRESS, kPa	177
HEAD PRESSURE, kPa	292	DURATION, min	455
BACK PRESSURE, kPa	275	HYDRAULIC GRADIENT, $\frac{h}{L}$	20

**SPECIMEN PROPERTIES AND DIMENSIONS (FINAL)**

SAMPLE HEIGHT, cm	8.54	UNIT WEIGHT, kN/m <sup>3</sup>	24.05
SAMPLE DIAMETER, cm	8.13	DRY UNIT WEIGHT, kN/m <sup>3</sup>	22.45
SAMPLE AREA, cm <sup>2</sup>	51.87	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm <sup>3</sup>	443.16	VOLUME OF SOLIDS, cm <sup>3</sup>	375.67
TOTAL MASS, g	1086.60	VOLUME OF VOIDS, cm <sup>3</sup>	67.49
DRY MASS, g	1014.30	VOID RATIO	0.18
WATER CONTENT, %	7.1		

**TEST RESULTS**

ELAPSED TIME TO STEADY STATE FLOW (min)	0.0
DURATION OF STEADY STATE FLOW (min)	455
INFLOW VOLUME UNDER STEADY STATE FLOW (cm <sup>3</sup> )	49.9
OUTFLOW VOLUME UNDER STEADY STATE FLOW (cm <sup>3</sup> )	48.1
OUTFLOW TO INFLOW RATIO	1.0
HYDRAULIC CONDUCTIVITY (INFLOW) (cm/s)	1.74E-06
HYDRAULIC CONDUCTIVITY (OUTFLOW) (cm/s)	1.67E-06
HYDRAULIC CONDUCTIVITY, K, cm/s	1.71E-06
<b>HYDRAULIC CONDUCTIVITY AT STANDARD TEMPERATURE, K<sub>20</sub>, cm/s</b>	<b>1.59E-06</b>

**NOTES:**

Effective consolidation stress assigned by the client

PERMEANT FLUID

Deaired tap water

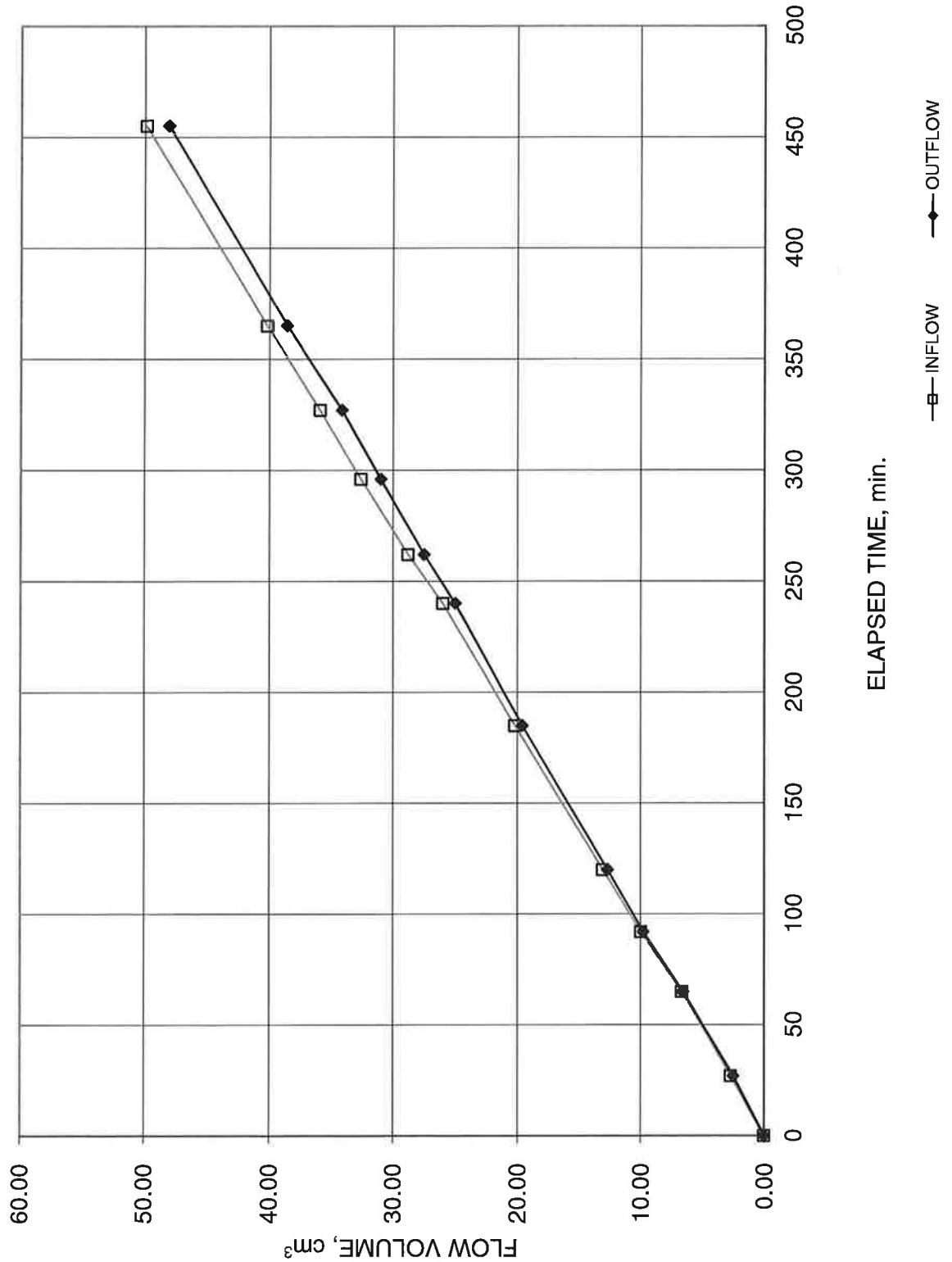
AVERAGE TEST TEMPERATURE

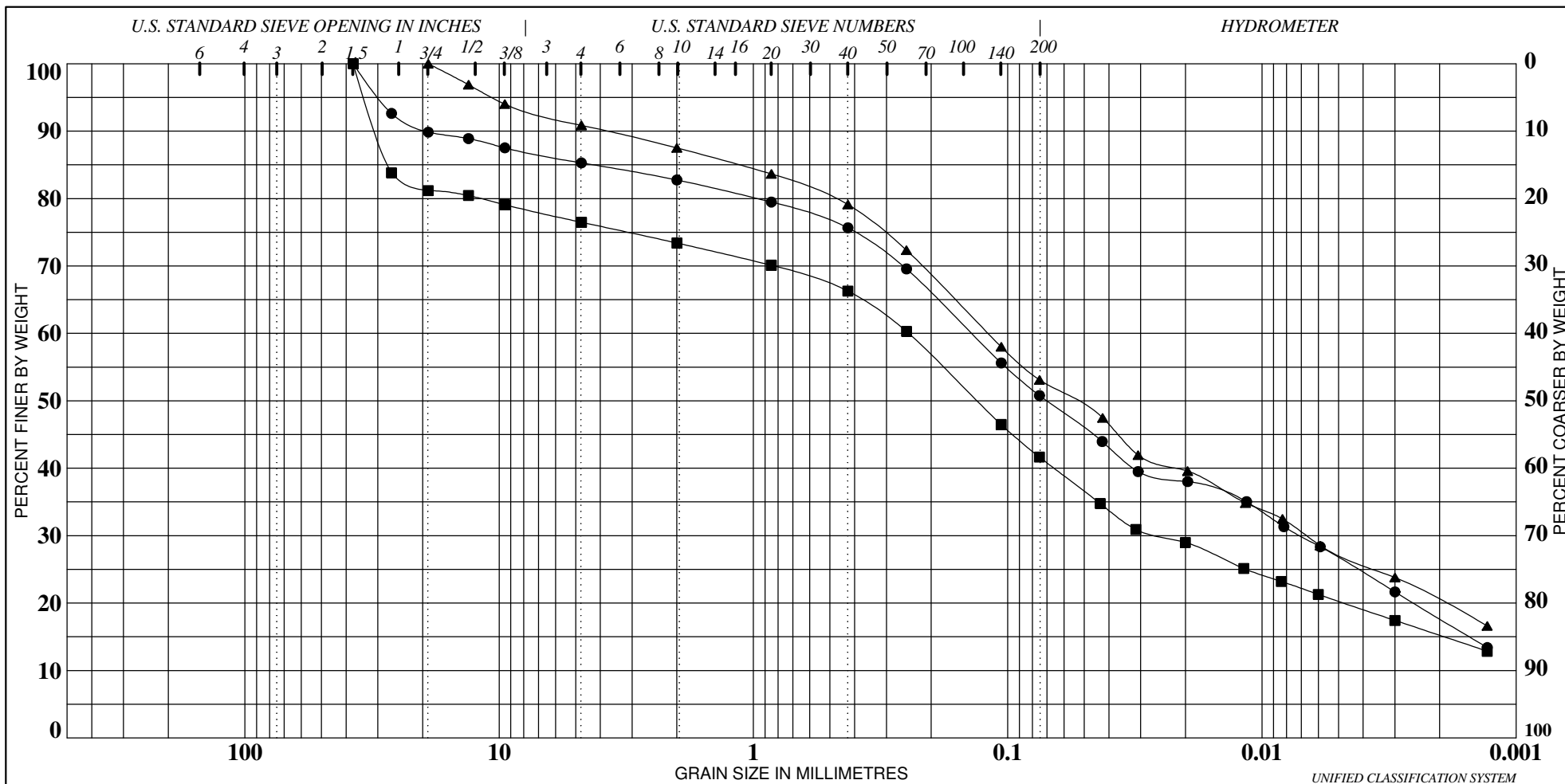
23.0 °C

# HYDRAULIC CONDUCTIVITY TEST

C3-6


BH MW8-15 SA 15 DEPTH, m 8.33-8.94 (i=20)





BLDs	COBBLES	GRAVEL		SAND			SILT & CLAY	
		coarse	fine	coarse	medium	fine	SILT	CLAY

Specimen	Depth (m)	Description	W%	%Gravel	%Sand	%Silt	%Clay	>75µ
● BH9-15	3.9	Silty SAND, some clay, some gravel	10	15	34	33	18	49
■ BH9-15	7.2	Silty, gravelly SAND, some clay	5	24	35	26	15	59
▲ BH9-15	10.5	Silty SAND, some clay, little gravel	6	9	38	33	20	47

	<b>Project:</b> Clarington Transformer Station <b>Location:</b> Clarington, ON <b>Project No.:</b> 160900764	<b>GRADATION CURVE (ASTM D422)</b> <b>Figure:</b> C4 <b>Remarks:</b> Grain size descriptions are based on CFEM, 1992.
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