APPENDIX C

SOIL GRAIN SIZE, MOISTURE CONTENT, AND ATTERBERG LIMITS DATA

This information taken from "Report of Geotechnical Exploration – Ash Disposal Area – Kingston Fossil Plant, Kingston, Tennessee," MACTEC Engineering and Consulting, Inc., May 4, 2004.

LABORATORY TEST PROCEDURES

Moisture Content

The moisture content in a given mass of soil is the ratio, expressed as a percentage, of the weight of the water to the weight of the solid particles. This test was conducted in accordance with ASTM D 2216.

Unit Weights

The moist or dry unit weight of a given soil mass is obtained by dividing the weight of the soil mass by the volume. Selected portions of the 3-inch split spoon and Shelby tube samples obtained during the exploration were measured and weighed in our laboratory to determine sample unit weights.

Specific Gravity of Soil Solids

The specific gravity of soil solids is the ratio of the mass of a unit volume of a soil solid to the mass of the same volume of gas-free distilled water at 20C. The test method for determining the specific gravity of soil solids that passes the 4.75-mm (No. 4) sieve using a water pycnometer is described in ASTM D 854, Method B, and "Test Methods for Specific Gravity of Soil Solids by Water Pycnometer".

Atterberg Limits

Originally, the Atterberg Limits consisted of seven "limits of consistency" of fine-grained soils. In current engineering usage, the term usually refers only to the liquid limit (LL) and plastic limit (PL). The LL (between the liquid and plastic states) is the water content at which a trapezoidal groove of specified shape, cut in moist soil held in a special cup, is closed after 25 taps on a hard rubber plate. The PL (between plastic and semi-solid states) is the water content at which the soil crumbles when rolled into threads of 1/8 inch in diameter.

The LL has been found to be proportional to the compressibility of the normally consolidated soil. The PI is the calculated difference in water contents between the LL and the PL. Together the LL and PI are used to classify silts and clays according to the Unified Soil Classification System

(ASTM D 2487). The PI is used to predict the potential for volume changes in confined soils beneath foundations or grade slabs. The LL, PL, and PI are determined in accordance with ASTM D 4318.

Grain Size Distribution

Grain Size Tests are performed to aid in determining the soil classification and the grain size distribution. The soil samples are prepared for testing according to ASTM D 421 (dry preparation) or ASTM D 2217 (wet preparation). If only the grain size distribution of soils coarser than a number 200 sieve (0.074-mm opening) is desired, the grain size distribution is determined by washing the sample over a number 200 sieve and, after drying, passing the samples through a standard set of nested sieves. If the grain size distribution of the soils finer than the number 200 sieve is also desired, the grain size distribution of the soils coarser than the number 10 sieve is determined by passing the sample through a set of nested sieves. Materials passing the number 10 sieve are dispersed with a dispersing agent and suspended in water, and the grain size distribution calculated from the measured settlement rate of the particles. These tests are conducted in accordance with ASTM D 422.

Triaxial Shear Tests

Triaxial shear tests are used to determine the strength characteristics and friction angle of a given soil sample. Triaxial tests are also used to determine the elastic properties of the soil specimen.

Triaxial shear tests are performed on several sections of a relatively undisturbed sample extruded from the sampling tube. The samples are trimmed into cylinders 1.4 to 2.8 inches in diameter and encased in rubber membranes. Each is then placed in a compression chamber and confined by all-around air pressure. The test results are presented in the form of stress-strain curves and Mohr envelopes, or p-q plots on the accompanying Triaxial Shear Test Sheets.

One of three types of triaxial tests is normally performed, the most suitable type being determined by the loading conditions imposed on the soil in the field and the soil characteristics.

1. Consolidated-Undrained (Designated as a CU or R Test)
2. Consolidated-Drained (designated as a CD or S Test)
3. Unconsolidated-Undrained (designated as a UU or Q Test)

Consolidation Test

Consolidation tests are conducted on representative soil samples to determine the change in height of the sample with increasing load. The results of these tests are used to estimate the amount and rate of settlement of structures constructed on similar soils.

A consolidation test is conducted according to ASTM D-2435 on a single section of an undisturbed sample extruded from a sample tube. The sample is trimmed into a disc 2.0 or 2.5 inches in diameter and 1 inch thick. The disc is confined in a steel ring and sandwiched between porous plates. Depending on the conditions in the field, the test may be conducted with a sample either at its natural moisture content or saturated. It is then subjected to incrementally increasing vertical loads, and the resulting deformations are measured with a micrometer dial gauge. Void ratios are then calculated from these deformation readings. The test results are presented in the form of pressure-versus-void-ratio curves on the accompanying Consolidation Test Sheet.

Falling Head Permeability Test

The test sample was taken from the bottom of the undisturbed sample. The physical dimensions and weight were obtained and the sample was encased in a rubber membrane and placed in a triaxial chamber. The sample was then back-pressure saturated until a B value of 0.95 or greater was reached. After saturation was obtained, the sample was consolidated under 10-psi confining stress. Upon completion of consolidation, a falling head permeability test was performed. The test was conducted in accordance with ASTM D 5084.

TABLE 3
NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS LABORATORY TEST RESULTS

Boring Number	Sample Number	Sample Type	Sample Description/ Origin	Sample Depth (Feet)	Moisture Content (%)	Atterberg Limits		
						Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)
B-1	UD-1	UD	ASH	4-4.5	19	NT	NT	NT
B-1	UD-2	UD	Alluvium	65-67	20	NV	NP	NP
B-2	UD-4	UD	Alluvium	70-72	17	NV	NP	NP
B-3	1	SPT	ASH	0-1.5	24	NT	NT	NT
B-3	2	SPT	ASH	5-6.5	20	NT	NT	NT
B-3	3	SPT	ASH	10-11.5	16	NT	NT	NT
B-3	4	SPT	ASH	15-16.5	17	NT	NT	NT
B-3	5	SPT	ASH	20-21.5	39	NT	NT	NT
B-3	6	SPT	ASH	25-26.5	40	NT	NT	NT
B-3	7	SPT	ASH	30-31.5	34	NT	NT	NT
B-3	8	SPT	ASH	35-36.5	22	NT	NT	NT
B-3	9	SPT	ASH	40-41.5	22	NT	NT	NT
B-3	10	SPT	ASH	45-46.5	31	NT	NT	NT
B-3	11	SPT	ASH	50-51.5	39	NT	NT	NT
B-3	12	SPT	ASH	55-56.5	43	NT	NT	NT
B-3	13	SPT	FILL/ASH	60-61.5	30	NT	NT	NT
B-3	14	SPT	ASH	65-66.5	16	NT	NT	NT
B-4A	UD-1	UD	ASH	15-17	37	NT	NT	NT
B-4A	UD-3	UD	ASH	25-27	38	NT	NT	NT
B-5	1	SPT	ASH	0-1.5	22	NT	NT	NT
B-5	2	SPT	ASH	5-6.5	39	NT	NT	NT
B-5	3	SPT	ASH	10-11.5	25	NT	NT	NT
B-5	4	SPT	ASH	15-16.5	32	NT	NT	NT
B-5	5	SPT	ASH	20-21.5	30	NT	NT	NT
B-5	6	SPT	ASH	25-26.5	39	NT	NT	NT
B-5	7	SPT	ASH	30-31.5	41	NT	NT	NT
B-5	8	SPT	ASH	35-36.5	29	NT	NT	NT
B-5	9	SPT	ASH	40-41.5	34	NT	NT	NT
B-8	1	SPT	ASH	0-1.5	25	NT	NT	NT
B-8	2	SPT	ASH	5.8-7.3	20	NT	NT	NT
B-8	UD-2	UD	ASH	10-12	19	NT	NT	NT
B-8	3	SPT	ASH	12-13.5	22	NT	NT	NT
B-8	4	SPT	ASH	15-16.5	45	NT	NT	NT
B-8	UD-3	UD	ASH	20-22	32	NT	NT	NT

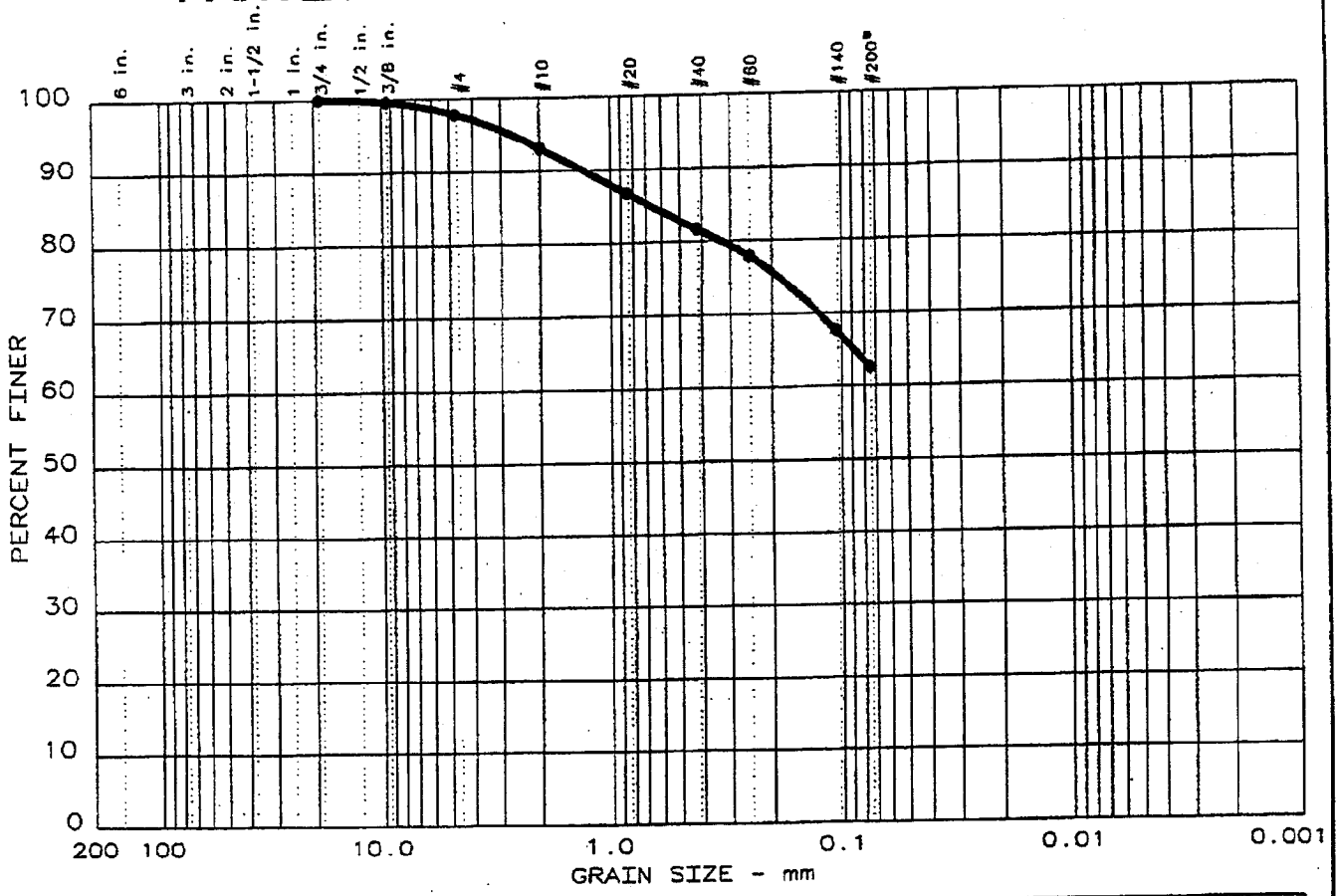
TABLE 3
NATURAL MOISTURE CONTENT AND
ATTERBERG LIMITS LABORATORY TEST RESULTS

Boring Number	Sample Number	Sample Type	Sample Description/ Origin	Sample Depth (Feet)	Moisture Content (%)	Atterberg Limits		
						Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)
B-8	5	SPT	ASH	22-23.5	43	NT	NT	NT
B-8	6	SPT	ASH	25.6-27.1	27	NT	NT	NT
B-8	7	SPT	ASH	30-31.5	25	NT	NT	NT
B-8A	1	SPT	ASH	35-36.5	37	NT	NT	NT
B-8A	2	SPT	ASH	40-41.5	47	NT	NT	NT
B-8A	3	SPT	ASH	45-46.5	37	NT	NT	NT
B-8A	4	SPT	ASH	50-51.5	36	NT	NT	NT
B-8A	5	SPT	Alluvium	57-58.5	24	26	15	11
B-8A	6	SPT	Alluvium	62-63.5	24			
B-8A	UD-2	UD	Alluvium	60-62	22	26	16	10
B-8A	7	SPT	Alluvium	65-66.5	27	NV	NP	NP
B-8A	8	SPT	Alluvium	70-70.9	17			
B-10	1	SPT	ASH	0-1.5	18	NT	NT	NT
B-10	UD-1	UD	ASH	5-7	25	NT	NT	NT
B-10	2	SPT	ASH	7-8.5	28	NT	NT	NT
B-10	UD-2	UD	ASH	10-12	25	NT	NT	NT
B-10	3	SPT	ASH	12-13.5	30	NT	NT	NT
B-10	UD-3	UD	ASH	15-17	38	NT	NT	NT
B-10	4	SPT	ASH	17-18.5	45	NT	NT	NT
B-10	UD-4	UD	ASH	20-22	37	NT	NT	NT
B-10	5	SPT	ASH	22-23.5	32	NT	NT	NT
B-10	6	SPT	ASH	25-26.5	48	NT	NT	NT
B-10	7	SPT	Alluvium	30-31.5	25	NT	NT	NT
B-10	UD-5	UD	Alluvium	35-37	22	NV	NP	NP
B-10	8	SPT	Alluvium	37-38.5	20	NT	NT	NT

NT - Not Tested
NV – Non-Viscous
NP - Non-Plastic
SPT - Standard Penetration Test

Prepared By CTJ Date 5/4/04 Checked By MBH Date 5/4/04

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	15	0.0	2.2	35.3	62.5	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.668							

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Bottom Ash with Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-1A & B Bulk @ 0'-5'

Date: 04-19-04

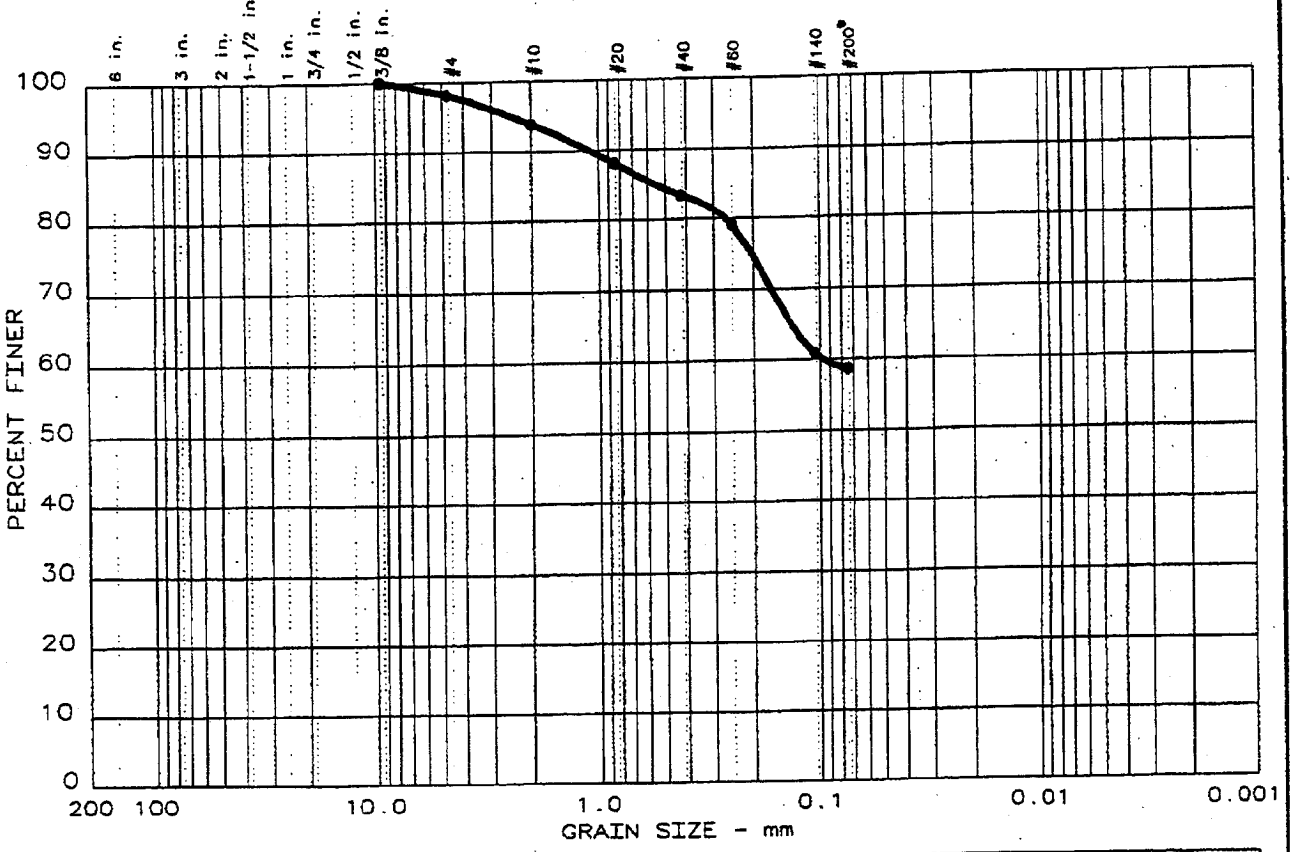
Remarks:
Specific Gravity: 2.35

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	6	0.0	1.8	39.4	58.8	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.550	0.0966						

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash with Bottom Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-1 UD @ 4'-4.5'

Date: 04-19-04

Remarks:
Moisture Content: 19.0%

PARTICLE SIZE ANALYSIS REPORT
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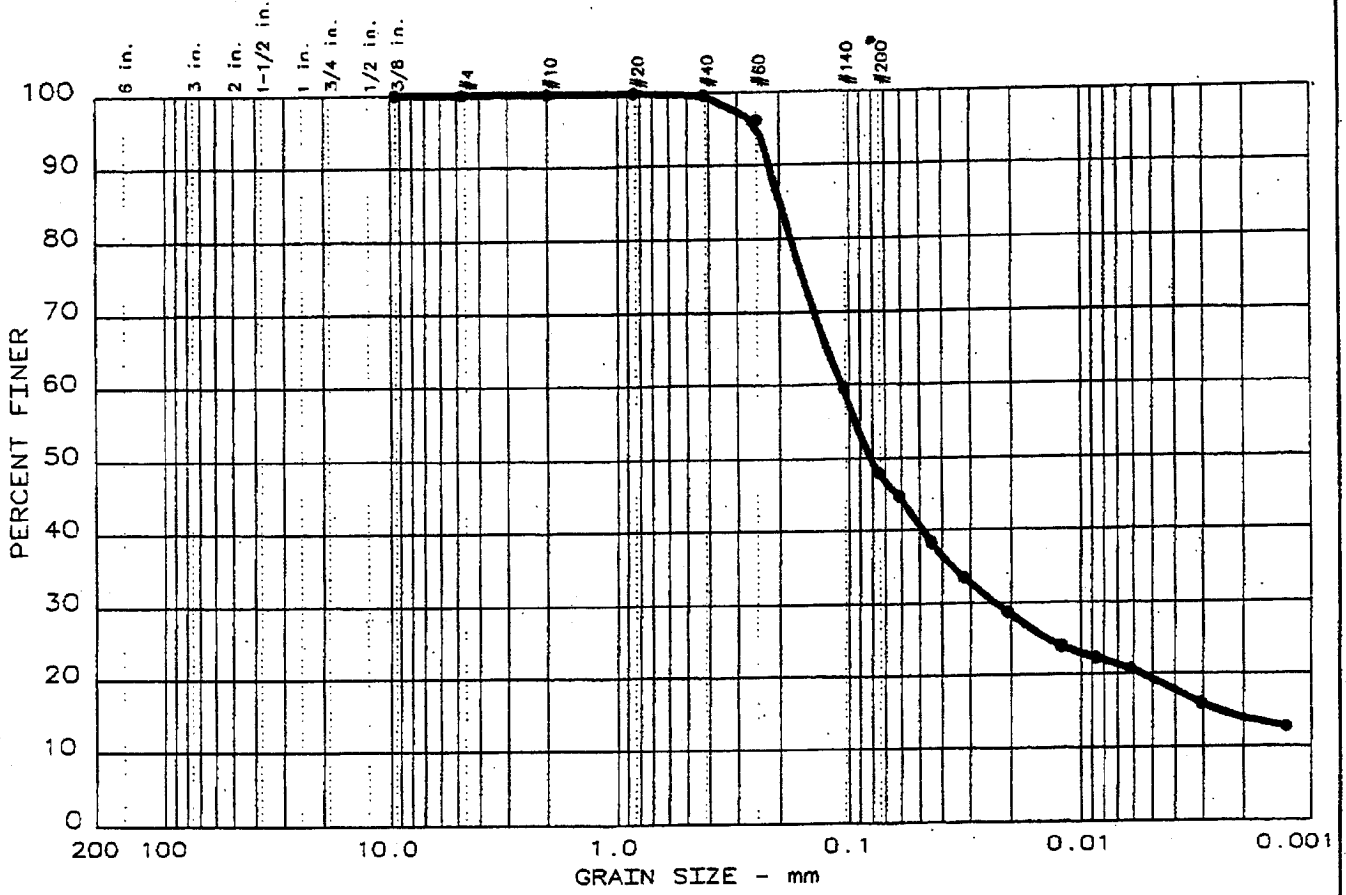
Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	5	0.0	0.0	52.1	28.6	19.3

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.198	0.107	0.0814	0.0235	0.0026			

MATERIAL DESCRIPTION	USCS	AASHTO
● Orange-Grey Silty Fine Sand	SM	

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-1 UD @ 65'-67'

Date: 04-19-04

Remarks:

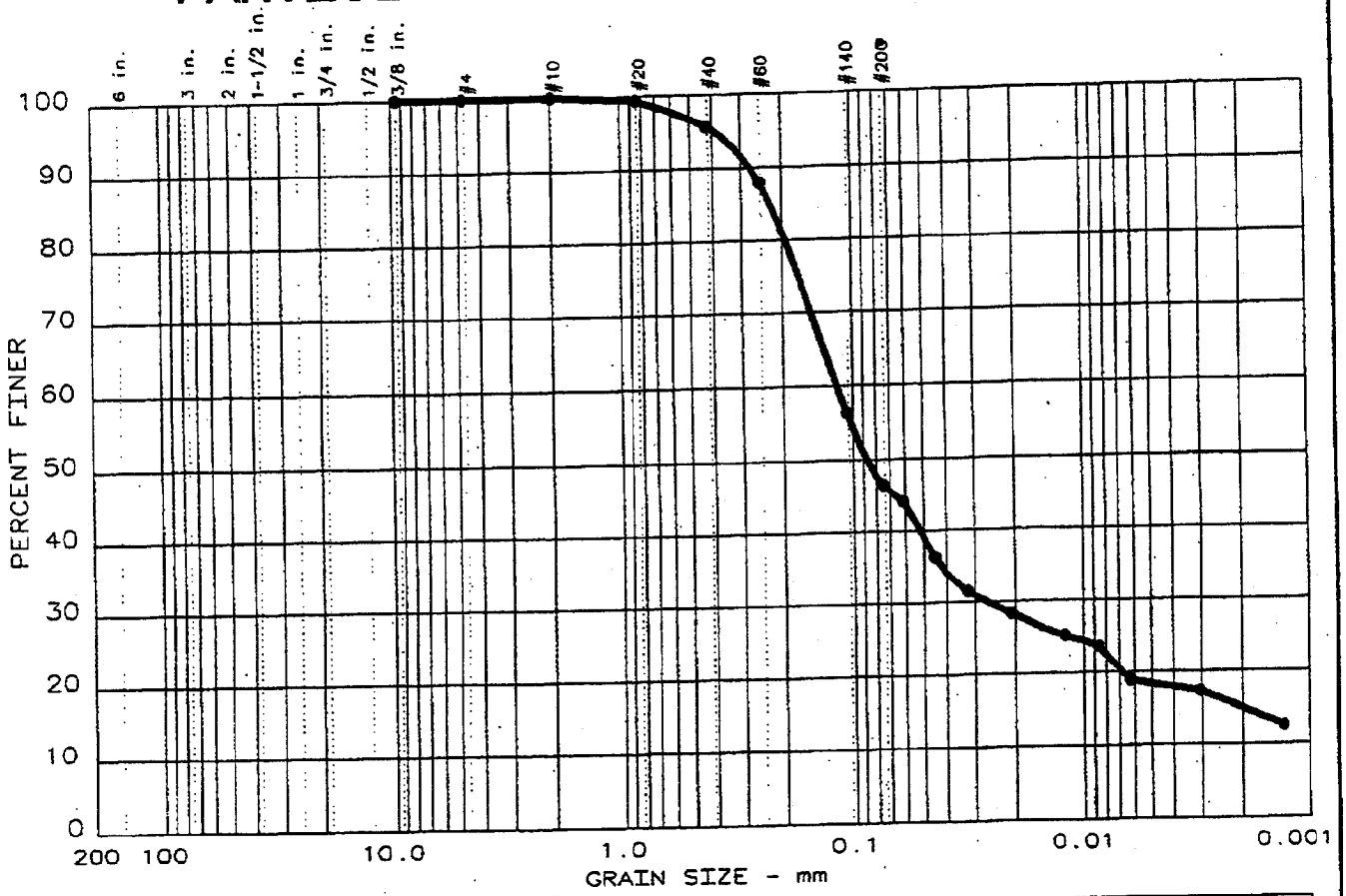
Moisture Content: 20.0%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	2	0.0	0.0	53.5	28.1	18.4

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.224	0.116	0.0878	0.0265	0.0020			

MATERIAL DESCRIPTION	USCS	AASHTO
● Orange-Brown Silty Fine Sand	SM	

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-2 UD @ 70'-72'

Date: 04-19-04

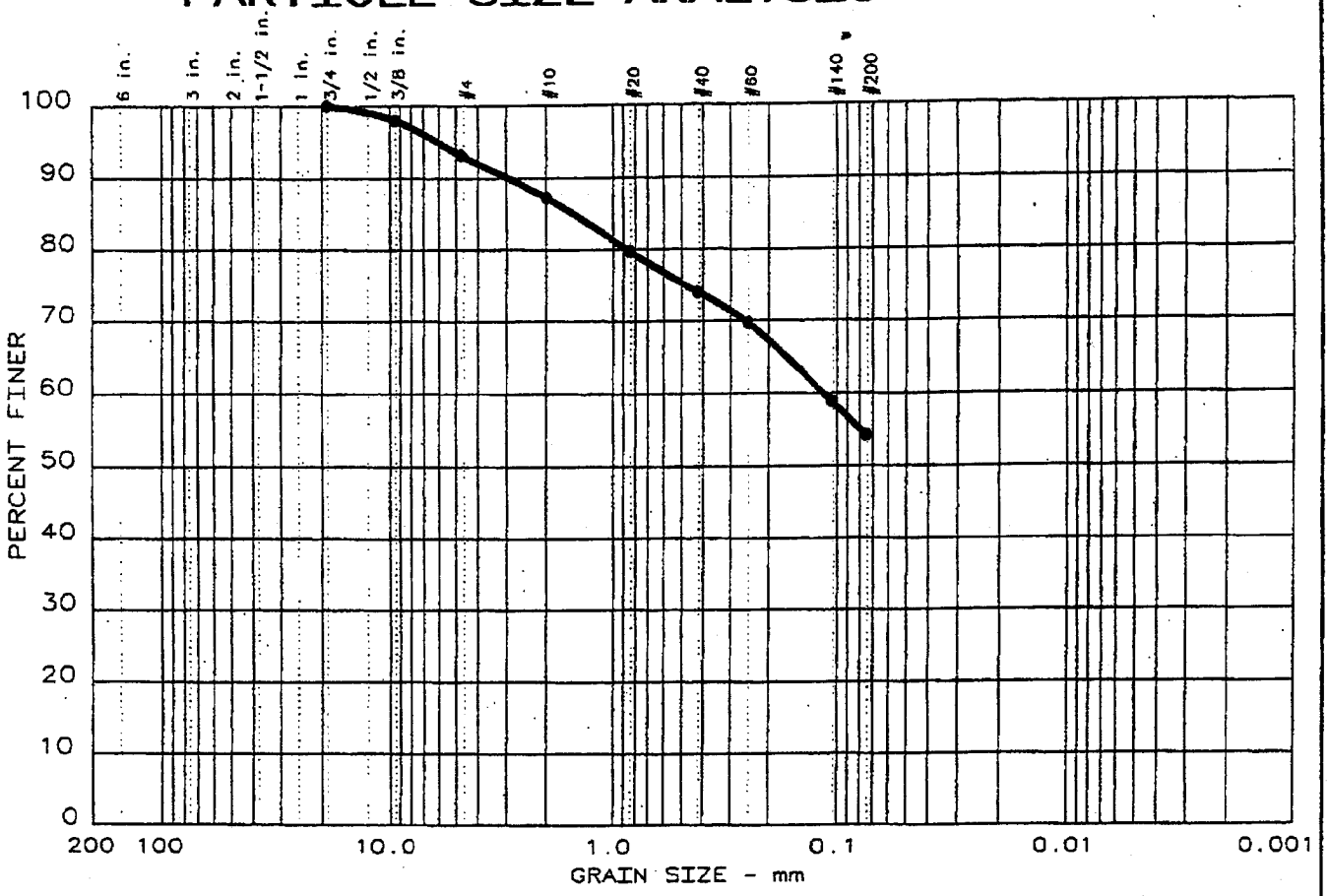
Remarks:
Moisture Content: 16.8%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	16	0.0	6.8	38.9	54.3	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	1.51	0.114						

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Bottom Ash with Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-2A Bulk @ 0'-5'

Date: 04-19-04

Remarks:

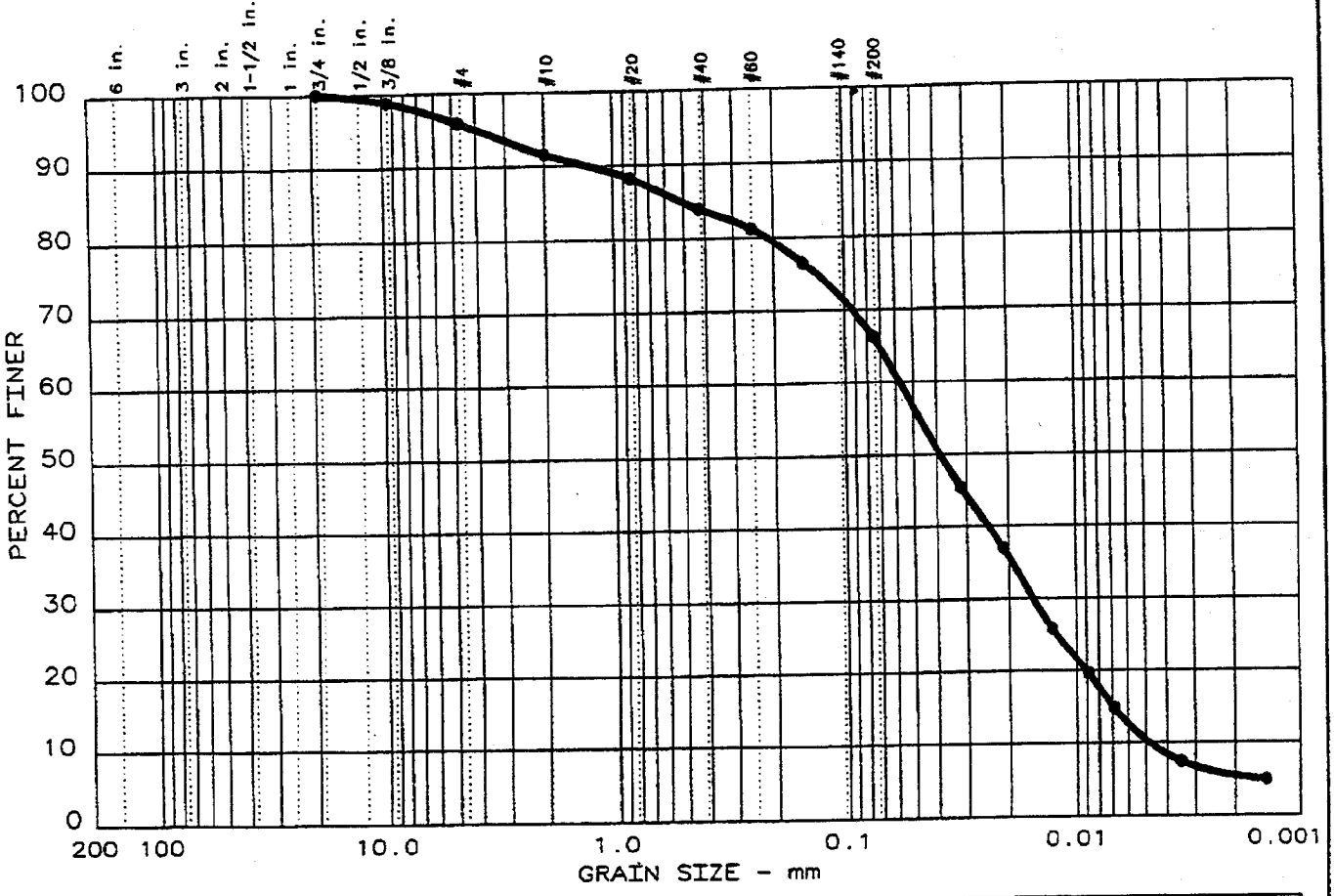
Specific Gravity: 2.40

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: _____

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	4	0.0	4.0	29.7	56.0	10.3	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	98.8		
	GRAIN SIZE		
D_{60}	0.0569		
D_{30}			
D_{10}	0.0048		
	COEFFICIENTS		
C_c	0.89		
C_u	11.8		

SIEVE number size	PERCENT FINER ●		
4	96.0		
10	91.6		
20	88.3		
40	84.0		
60	81.3		
100	76.5		
200	66.3		

Sample information:
● B-3, 5-6.5' & 10-11.5'
Gray ash
SPT Samples

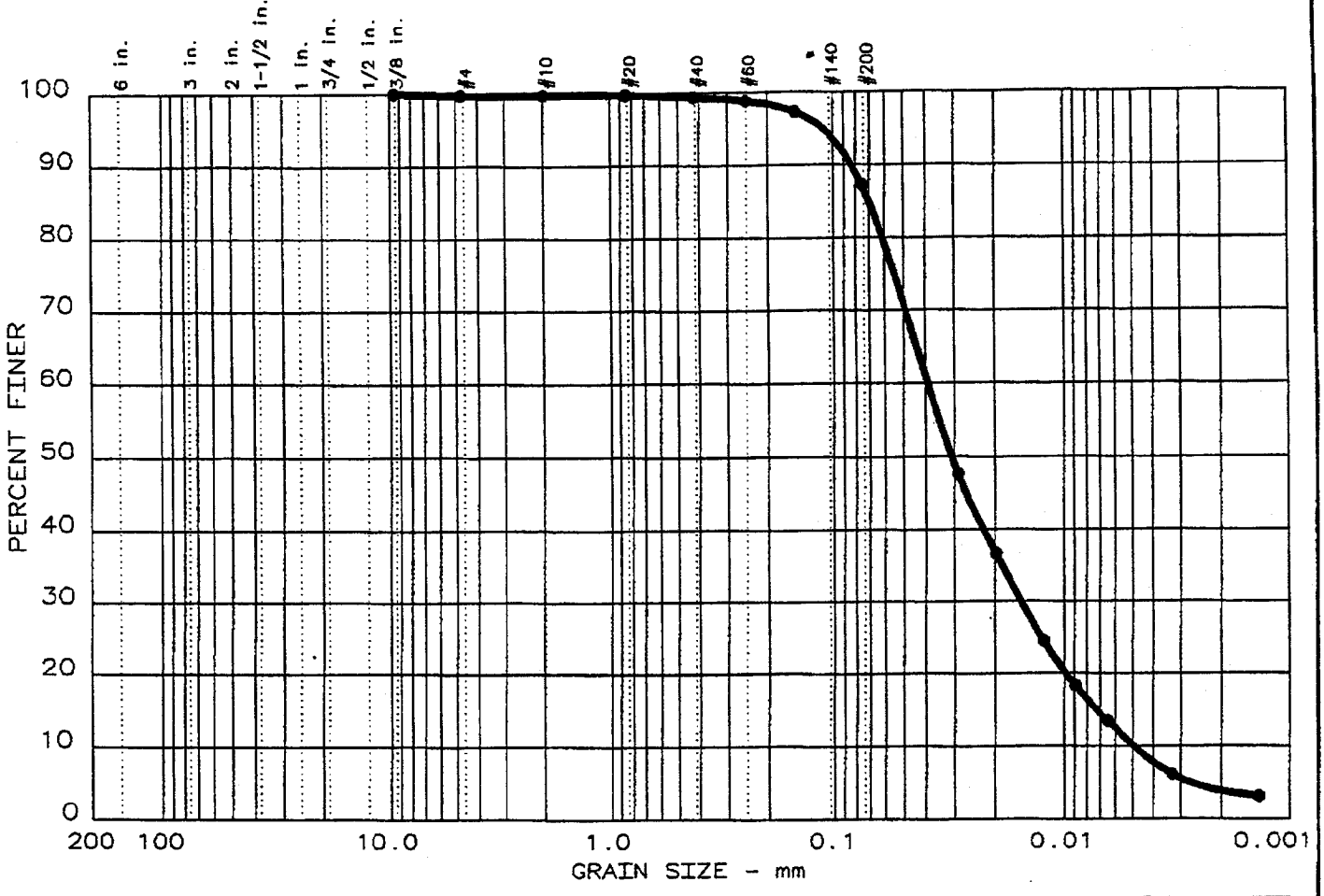
Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.40

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash

Date: April 21, 2004 Fig. No.: B3

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	5	0.0	0.2	12.6	77.1	10.1	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.375	100.0		
	GRAIN SIZE		
D_{60}	0.0391		
D_{30}			
D_{10}	0.0049		
	COEFFICIENTS		
C_c	1.23		
C_u	8.0		

SIEVE number size	PERCENT FINER ●		
4	99.8		
10	99.7		
20	99.7		
40	99.4		
60	98.9		
100	97.3		
200	87.2		

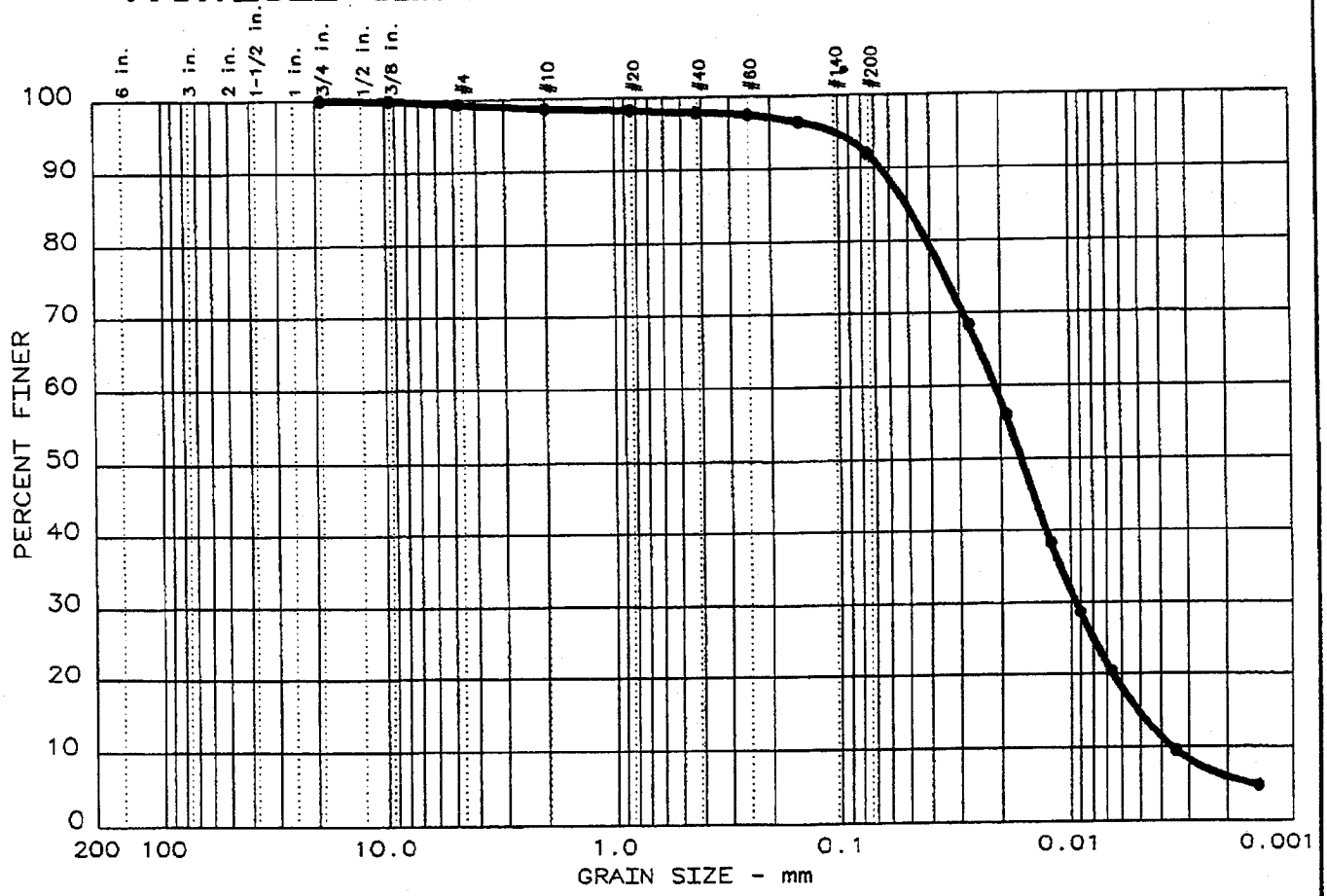
Sample information:
● B-3, 15-16.5' & 20-21.5'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.58

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: 83

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	6	0.0	0.7	7.3	77.4	14.6	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	99.9		
	GRAIN SIZE		
D_{60}	0.0211		
D_{30}			
D_{10}	0.0036		
	COEFFICIENTS		
C_c	1.20		
C_u	5.9		

SIEVE number size	PERCENT FINER ●		
4	99.3		
10	98.6		
20	98.3		
40	97.9		
60	97.5		
100	96.4		
200	92.0		

Sample information:
● B-3, 25-26.5' & 30-31.5'
Gray ash
SPT Samples

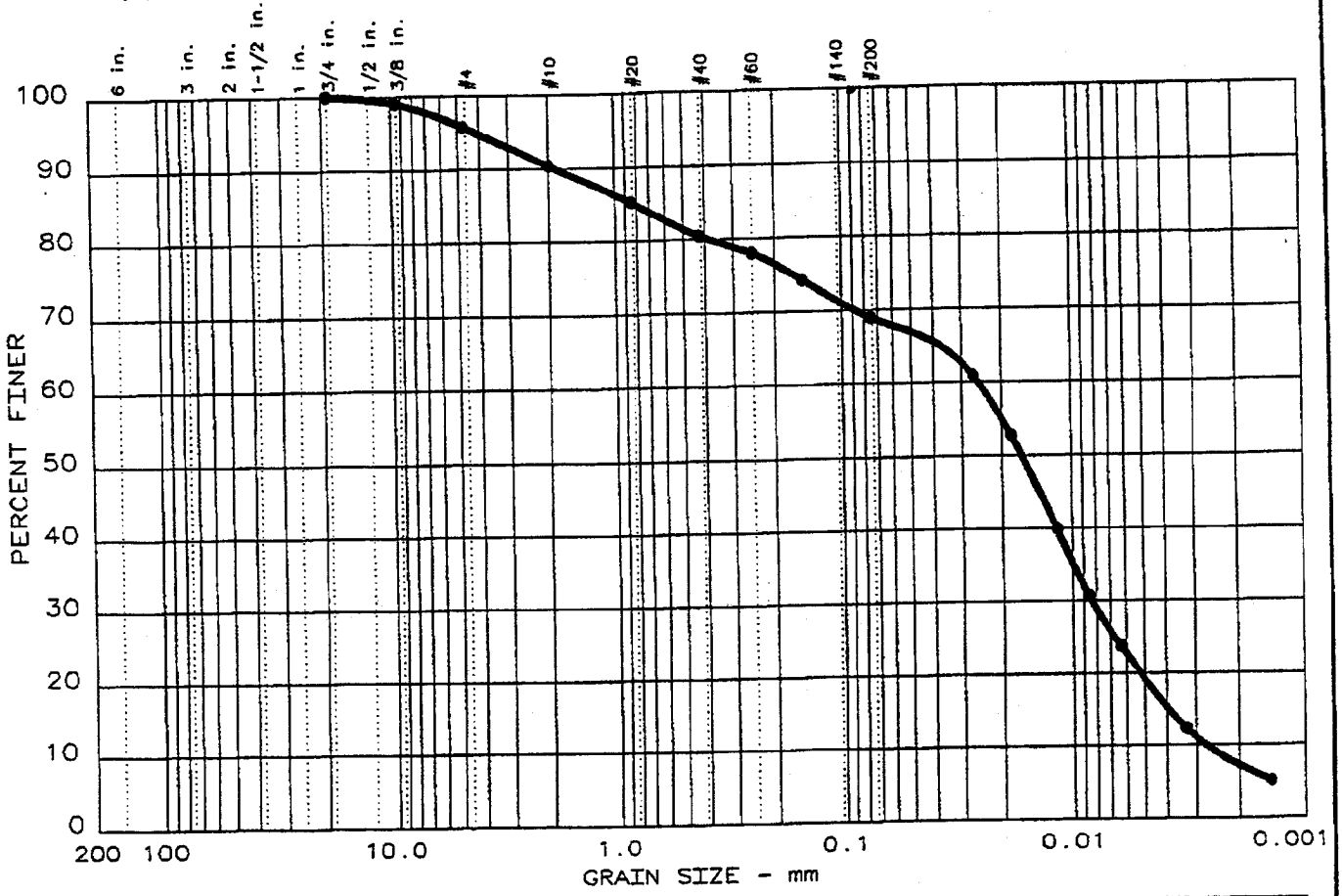
Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.42

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash

Date: April 21, 2004 Fig. No.: B3

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	7	0.0	4.2	26.8	49.7	19.3	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	99.0		
	GRAIN SIZE		
D_{60}	0.0251		
D_{30}			
D_{10}	0.0027		
	COEFFICIENTS		
C_c	1.01		
C_u	9.2		

SIEVE number size	PERCENT FINER ●		
4	95.8		
10	90.4		
20	85.2		
40	80.5		
60	78.0		
100	74.3		
200	69.0		

Sample information:
● B-3,40-41.5' & 45-46.5'
Gray ash
SPT Samples

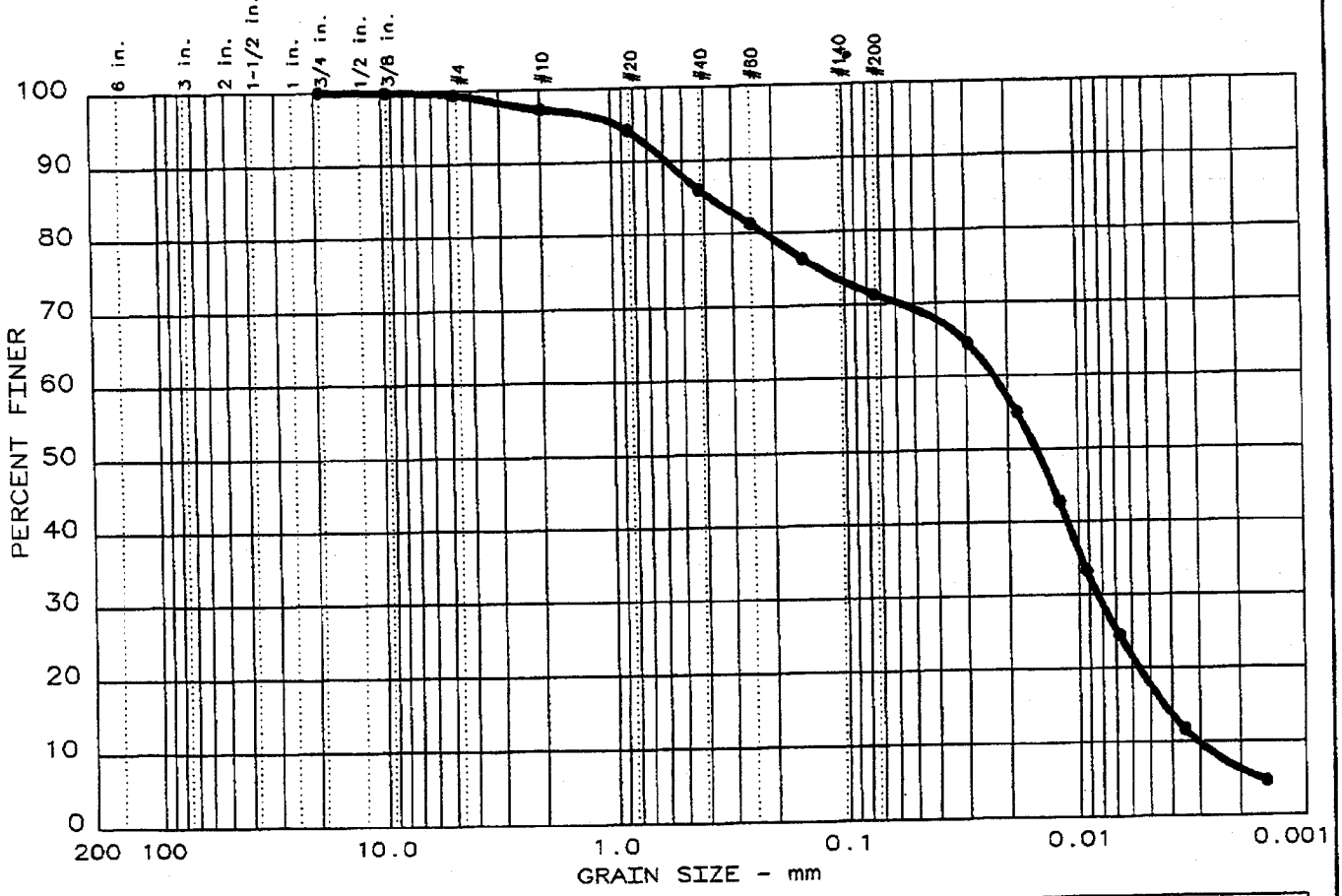
Remarks:
Methods: Particle Size: ASTM D 422-63(2002): Specific Gravity of Portion < No. 10: 2.40

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash

Date: April 21, 2004 Fig. No.: B3

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	11	0.0	0.7	27.9	53.6	17.8	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	99.8		

	GRAIN SIZE		
D_{60}	0.0226		
D_{30}			
D_{10}	0.0031		

	COEFFICIENTS		
C_C	1.01		
C_U	7.4		

SIEVE number size	PERCENT FINER ●		
4	99.3		
10	97.3		
20	94.3		
40	86.0		
60	81.3		
100	76.4		
200	71.4		

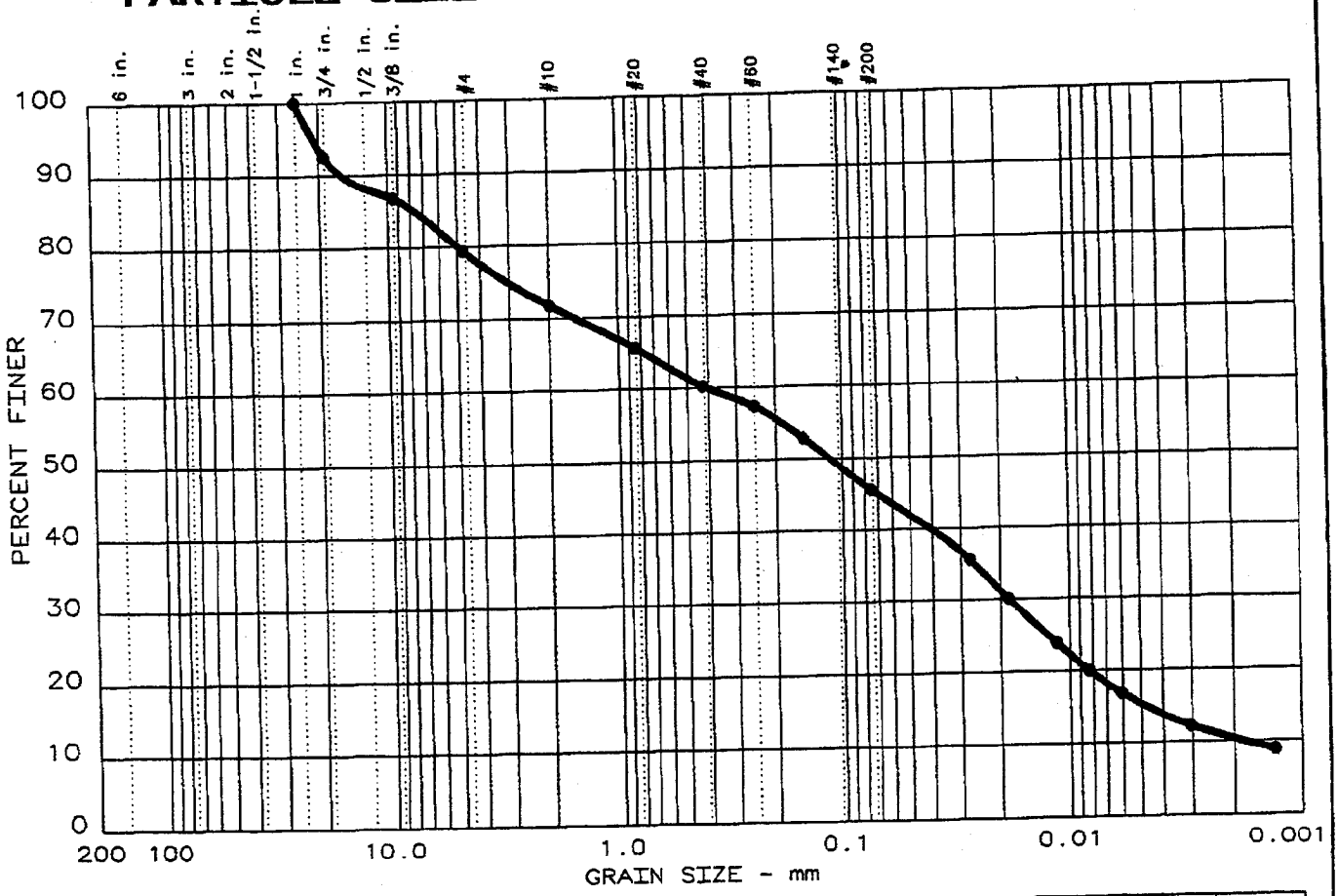
Sample information:
● B-3,50-51.5. & 55-56.5'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.27

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 15, 2004
Fig. No.: B3

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	8	0.0	20.6	33.8	30.3	15.3	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
1	100.0		
0.75	92.5		
0.375	86.8		

	GRAIN SIZE		
D_{60}	0.403		
D_{30}			
D_{10}	0.0017		

	COEFFICIENTS		
C_c	0.48		
C_u	234.4		

SIEVE number size	PERCENT FINER ●		
4	79.4		
10	71.8		
20	65.7		
40	60.3		
60	57.4		
100	52.8		
200	45.6		

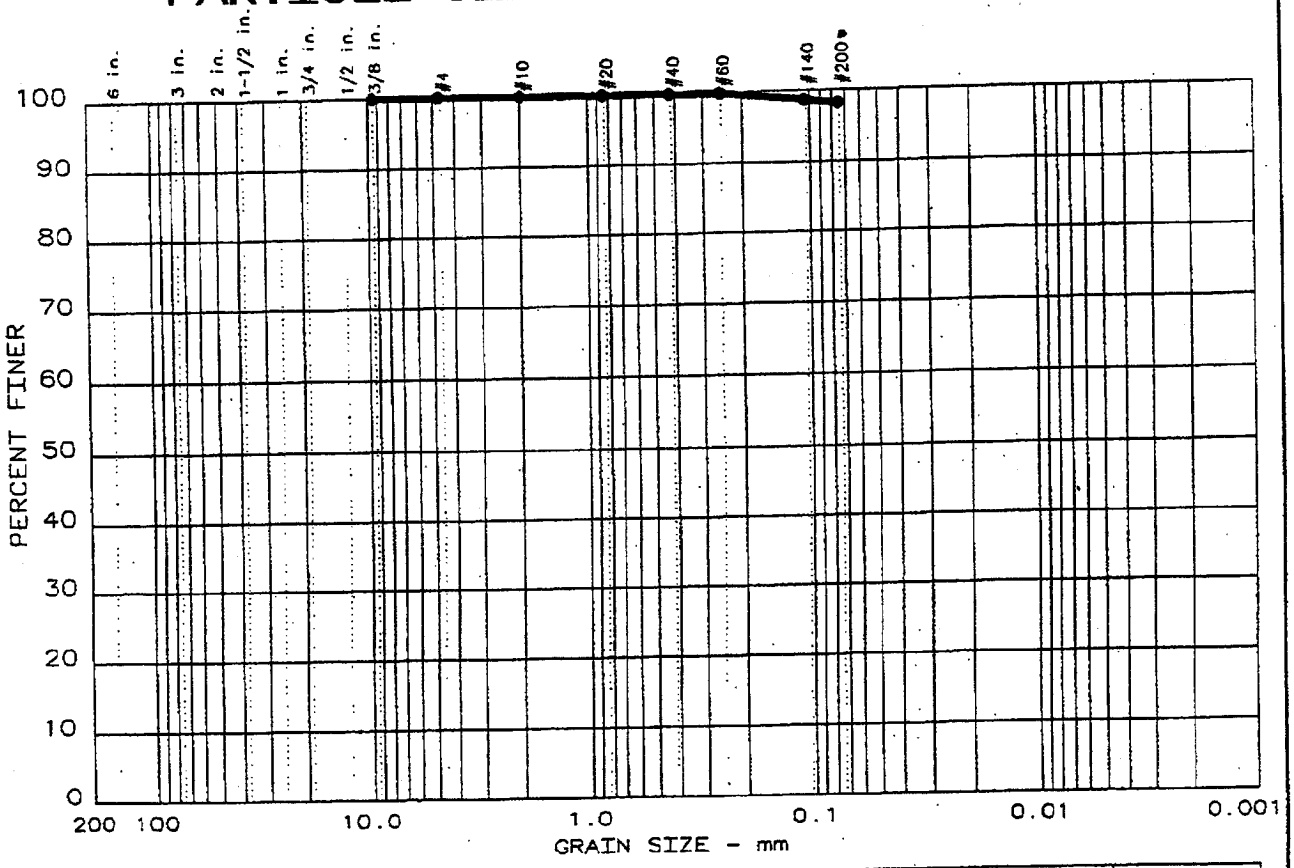
Sample information:
● B-3, 60-61.5' & 65-66.5'
Gray and brown ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.54

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B3

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	7	0.0	0.0	1.8	98.2	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP								

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-4A UD @ 15'-17'

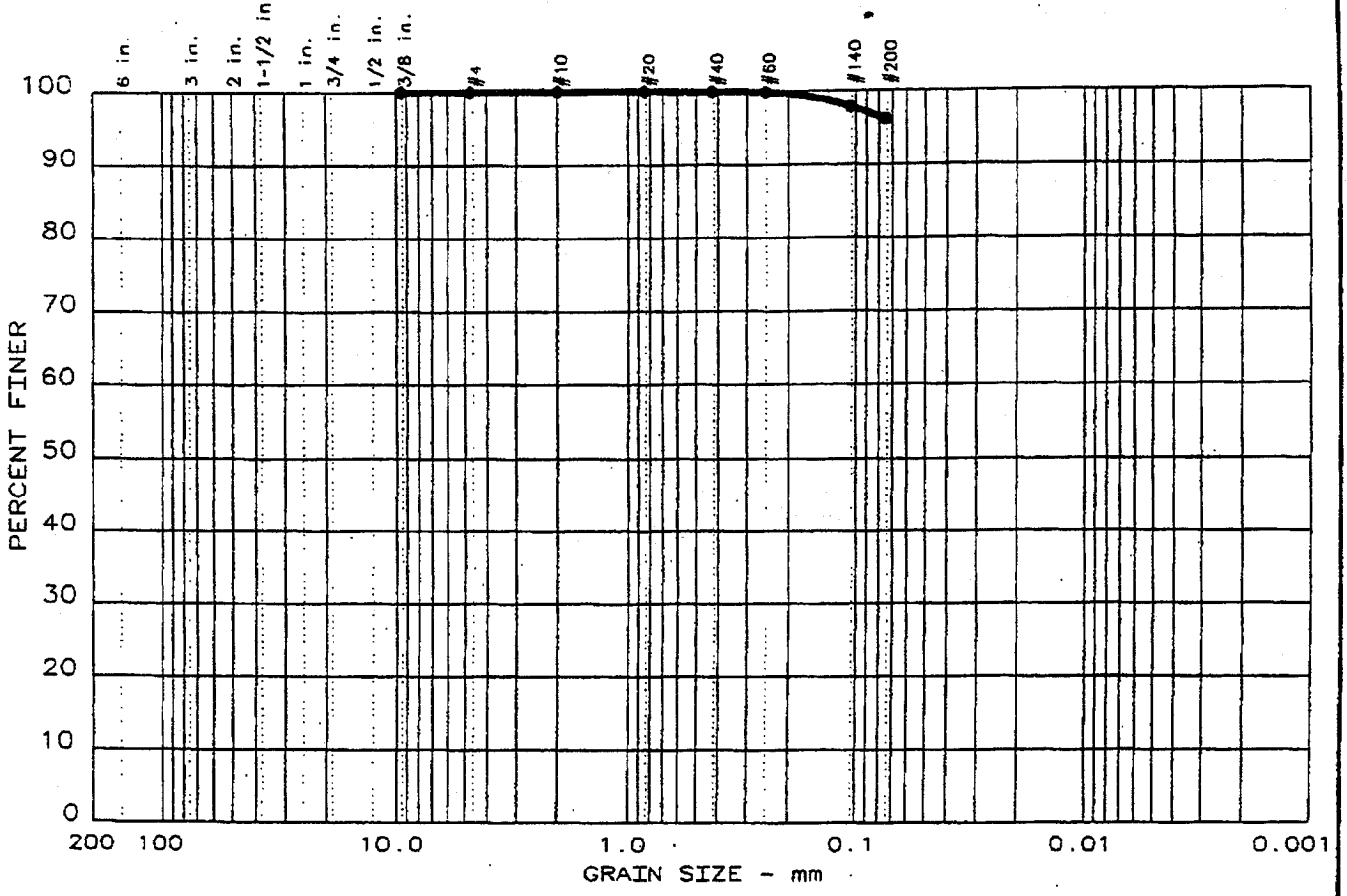
Date: 04-19-04

Remarks:
Moisture Content: 37.2%

PARTICLE SIZE ANALYSIS REPORT
LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	8	0.0	0.0	3.8	96.2	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP								

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-4A UD @ 25'-27'

Date: 04-19-04

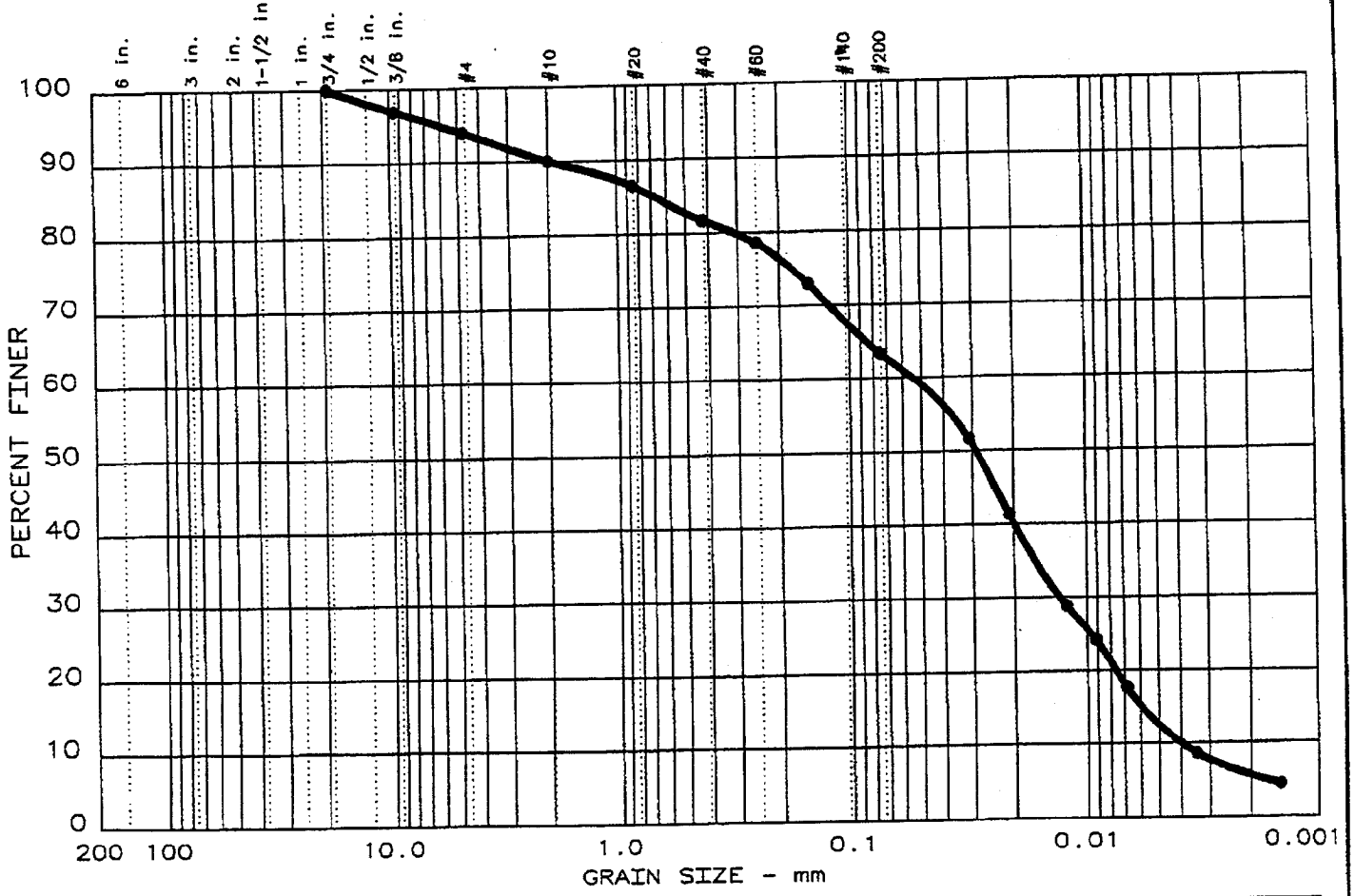
Remarks:
Moisture Content: 32.0%
Specific Gravity: 2.32

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: _____

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	9	0.0	6.0	30.6	51.0	12.4	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	97.0		
	GRAIN SIZE		
D_{60}	0.0543		
D_{30}			
D_{10}	0.0040		
	COEFFICIENTS		
C_c	0.77		
C_u	13.6		

SIEVE number size	PERCENT FINER ●		
4	94.0		
10	90.0		
20	86.5		
40	81.7		
60	78.6		
100	73.0		
200	63.4		

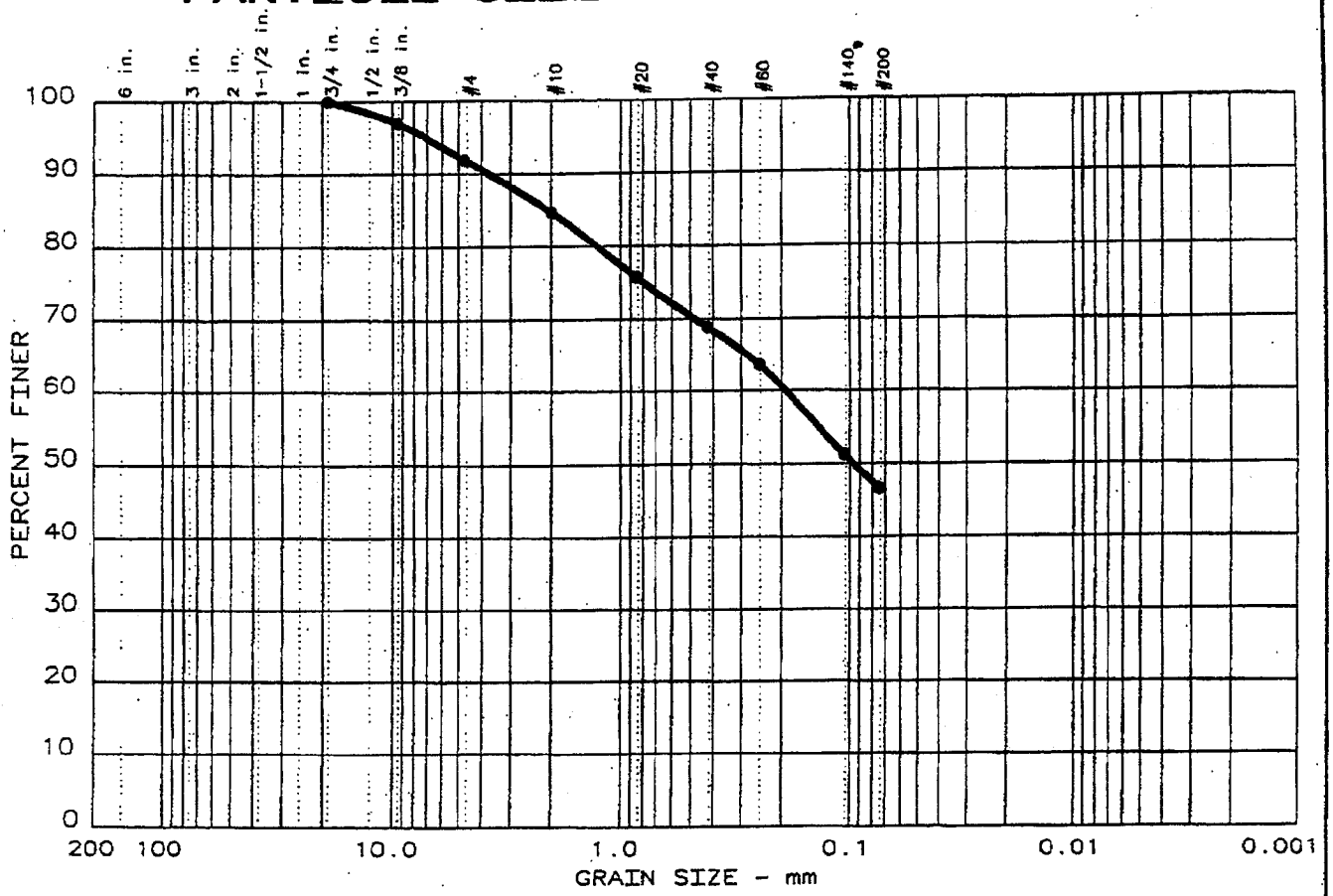
Sample information:
● B-8, 0-1.5' & 5.8-7.3'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.35

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	9	0.0	8.1	45.3	46.6	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	2.07	0.188	0.0966					

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Bottom Ash with Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-8 UD @ 10'-12'

Date: 04-19-04

Remarks:

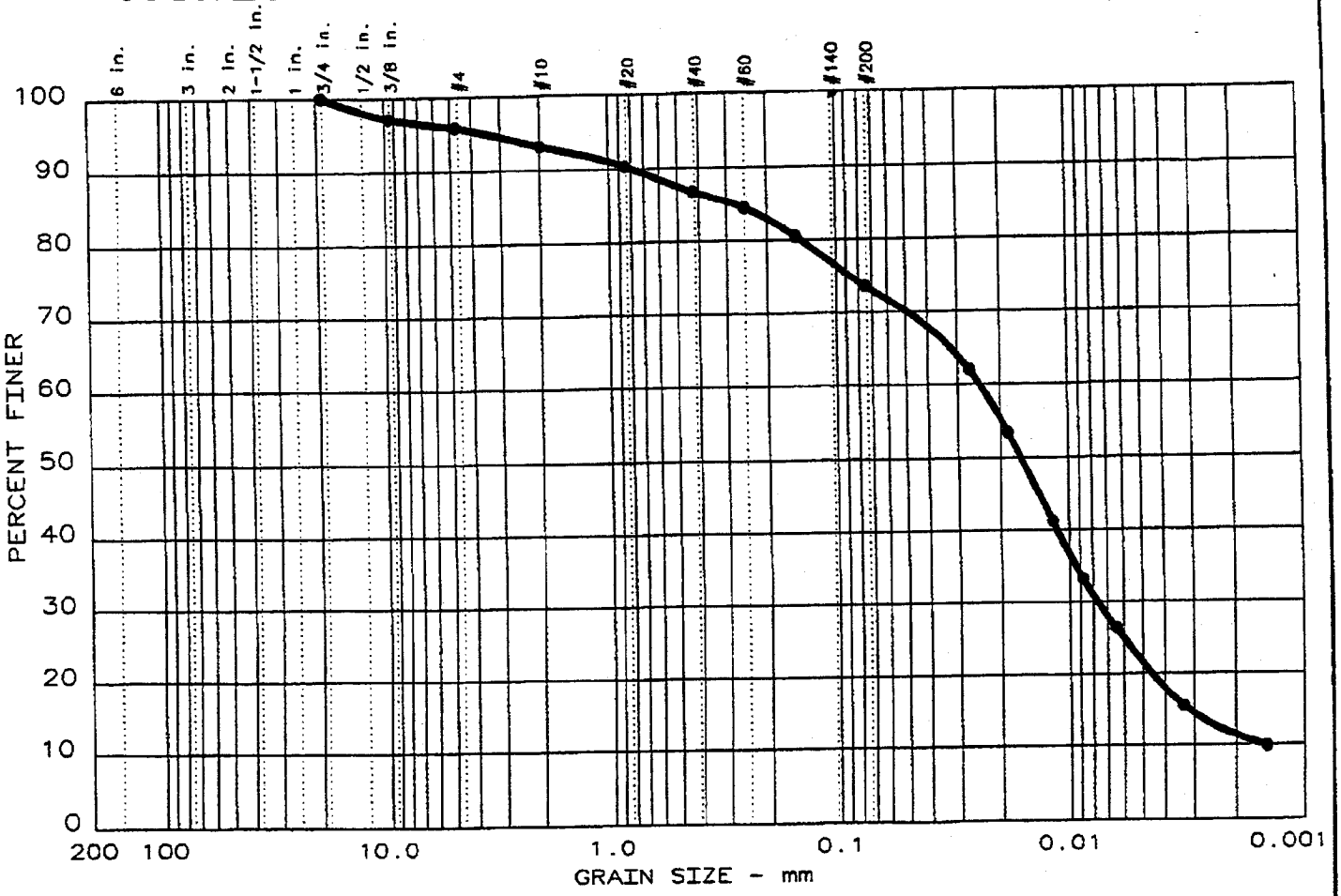
Moisture Content: 19.4%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: _____

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	12	0.0	4.1	22.3	52.0	21.6	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	97.2		
	GRAIN SIZE		
D_{60}	0.0243		
D_{30}			
D_{10}	0.0015		
	COEFFICIENTS		
C_c	1.62		
C_u	16.2		

SIEVE number size	PERCENT FINER ●		
4	95.9		
10	93.2		
20	90.3		
40	86.7		
60	84.5		
100	80.5		
200	73.6		

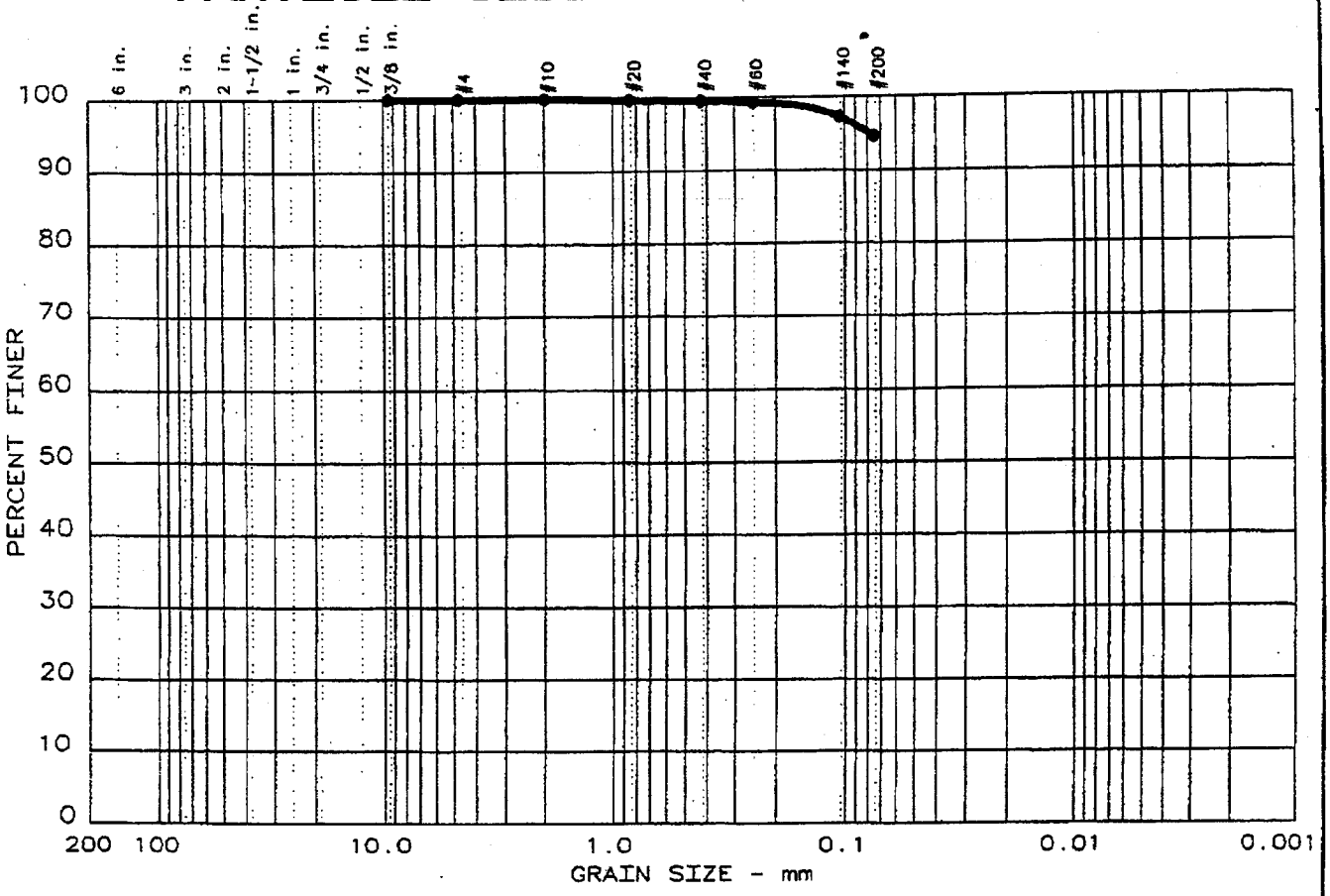
Sample information:
● B-8, 12-13.5' & 15-16.5'
Gray brown ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.38.

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	10	0.0	0.0	5.3	94.7	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP								

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-8 UD @ 20'-22'

Date: 04-19-04

Remarks:

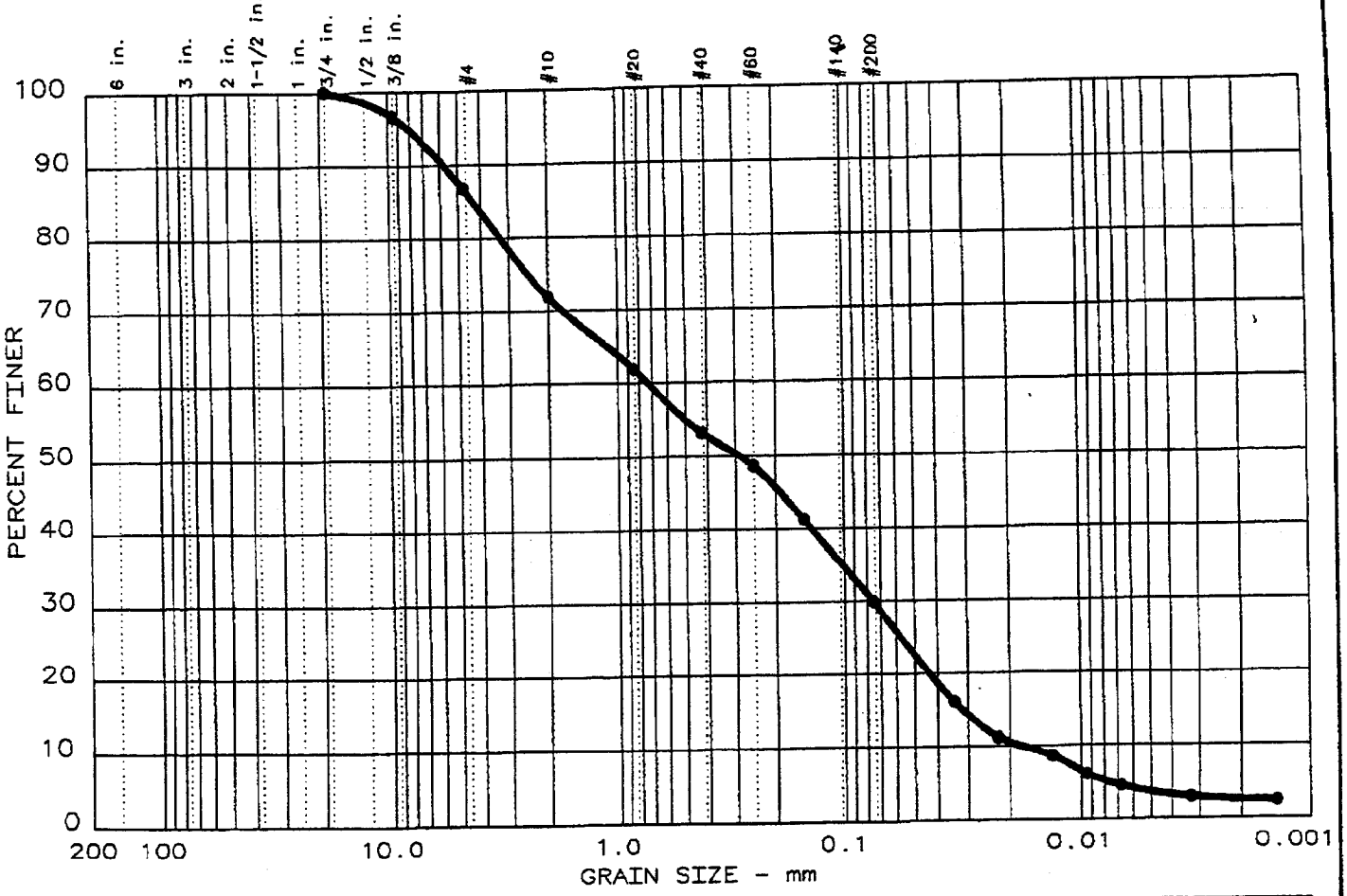
Moisture Content: 32.2%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: _____

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	10	0.0	13.2	56.9	26.2	3.7	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	96.7		
	GRAIN SIZE		
D_{60}	0.733		
D_{30}			
D_{10}	0.0178		
	COEFFICIENTS		
C_c	0.43		
C_u	41.2		

SIEVE number size	PERCENT FINER ●		
4	86.8		
10	71.9		
20	61.9		
40	53.2		
60	48.7		
100	41.2		
200	29.9		

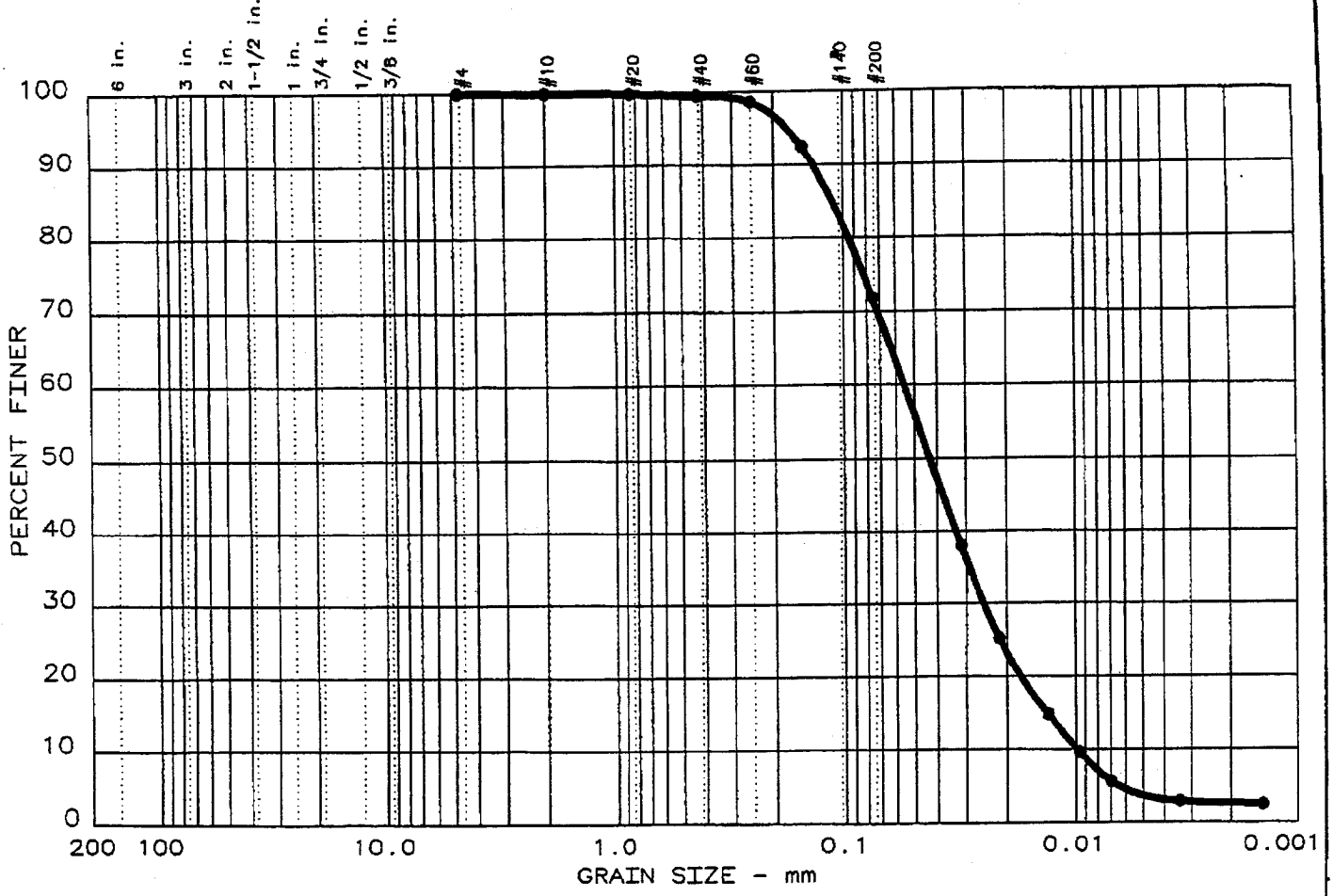
Sample information:
● B-8, 25.6-27.1' & 30-31.5'
Gray ash
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.49

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	13	0.0	0.0	28.2	68.2	3.6	NT	NT	NT

SIEVE inches size	PERCENT FINER ●		
GRAIN SIZE			
D_{60}	0.0550		
D_{30}			
D_{10}	0.0098		
COEFFICIENTS			
C_c	1.18		
C_u	5.6		

SIEVE number size	PERCENT FINER ●
4	100.0
10	99.9
20	99.8
40	99.5
60	98.6
100	92.4
200	71.8

Sample information:
● B-8A, 40-41.5' & 45-46.5'
Dark gray ash
SPT Samples

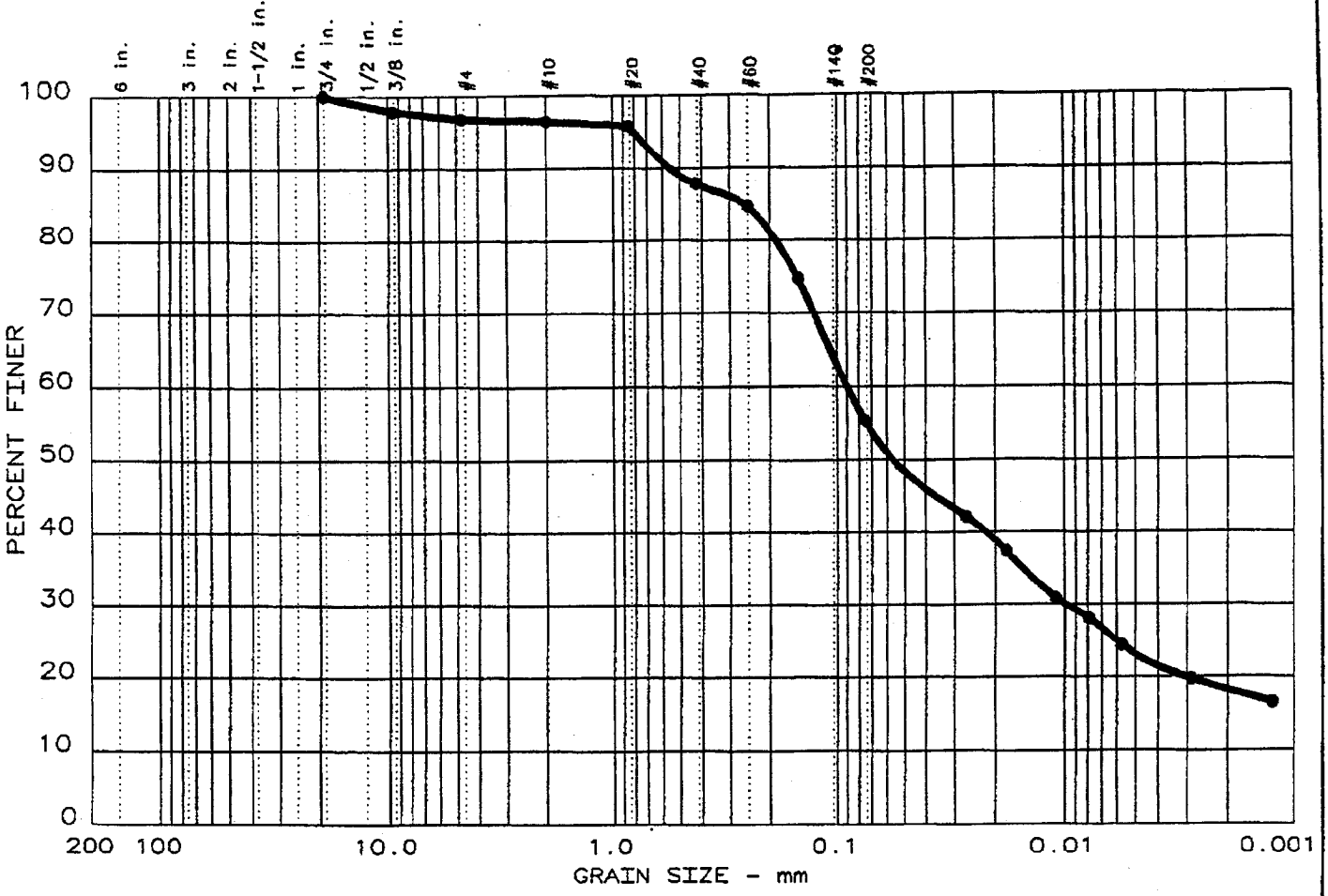
Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 10: 2.52

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash

Date: April 21, 2004 Fig. No.: B8A

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	15	0.0	3.2	41.4	32.4	23.0	CL	25	11

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	97.9		
	GRAIN SIZE		
D_{60}	0.0901		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ●
4	96.8
10	96.4
20	95.8
40	87.9
60	84.7
100	74.7
200	55.4

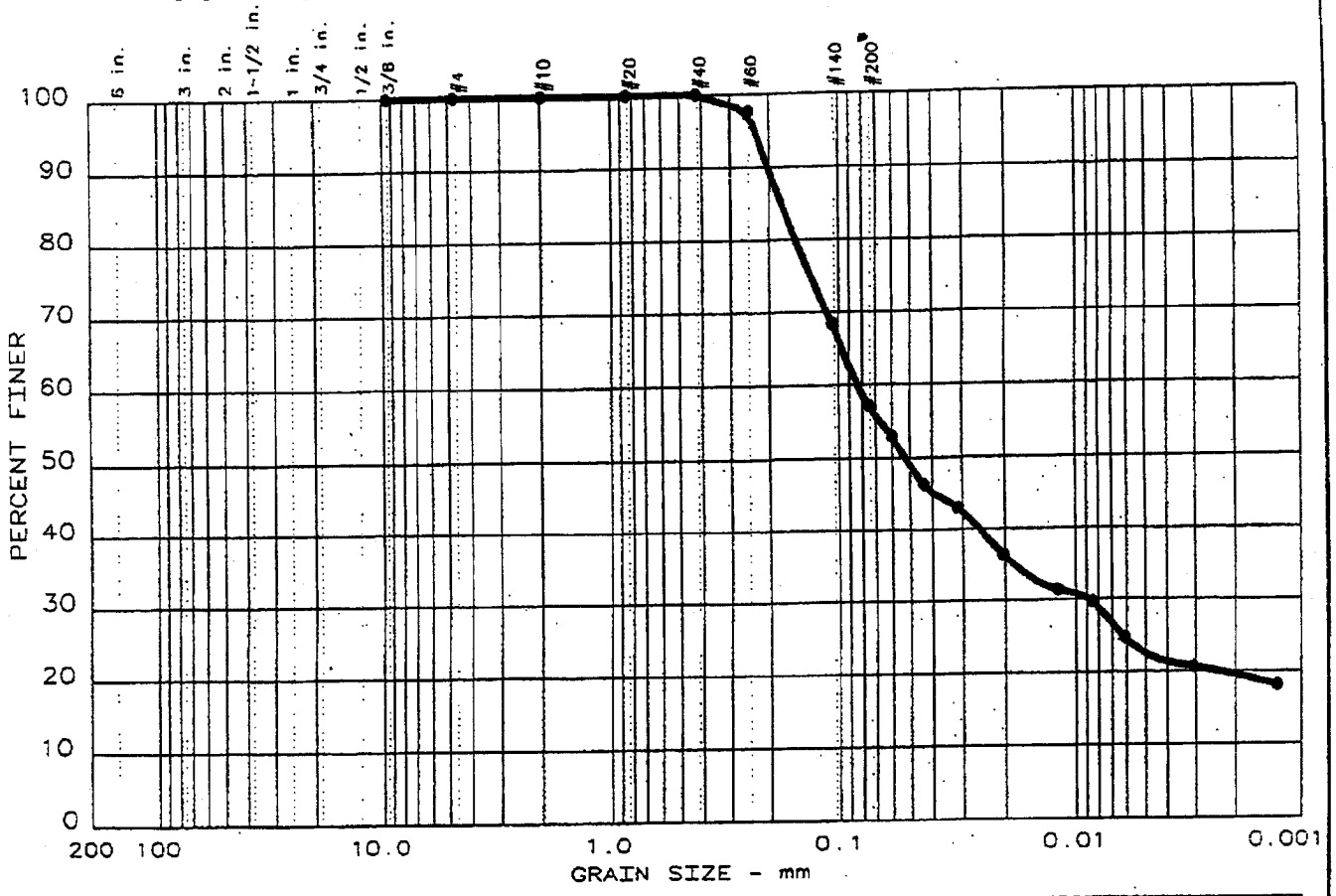
Sample information:
● B-8A, 57-58.5' & 62-63.5'
Tan sandy lean clay
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 40: 2.68

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004 Fig. No.: B8A

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	0.0	42.8	34.7	22.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	26	10	0.176	0.0832	0.0524	0.0088				

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey-Brown Sandy Lean Clay	CL	

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-8A UD @ 60'-62'

Date: 04-19-04

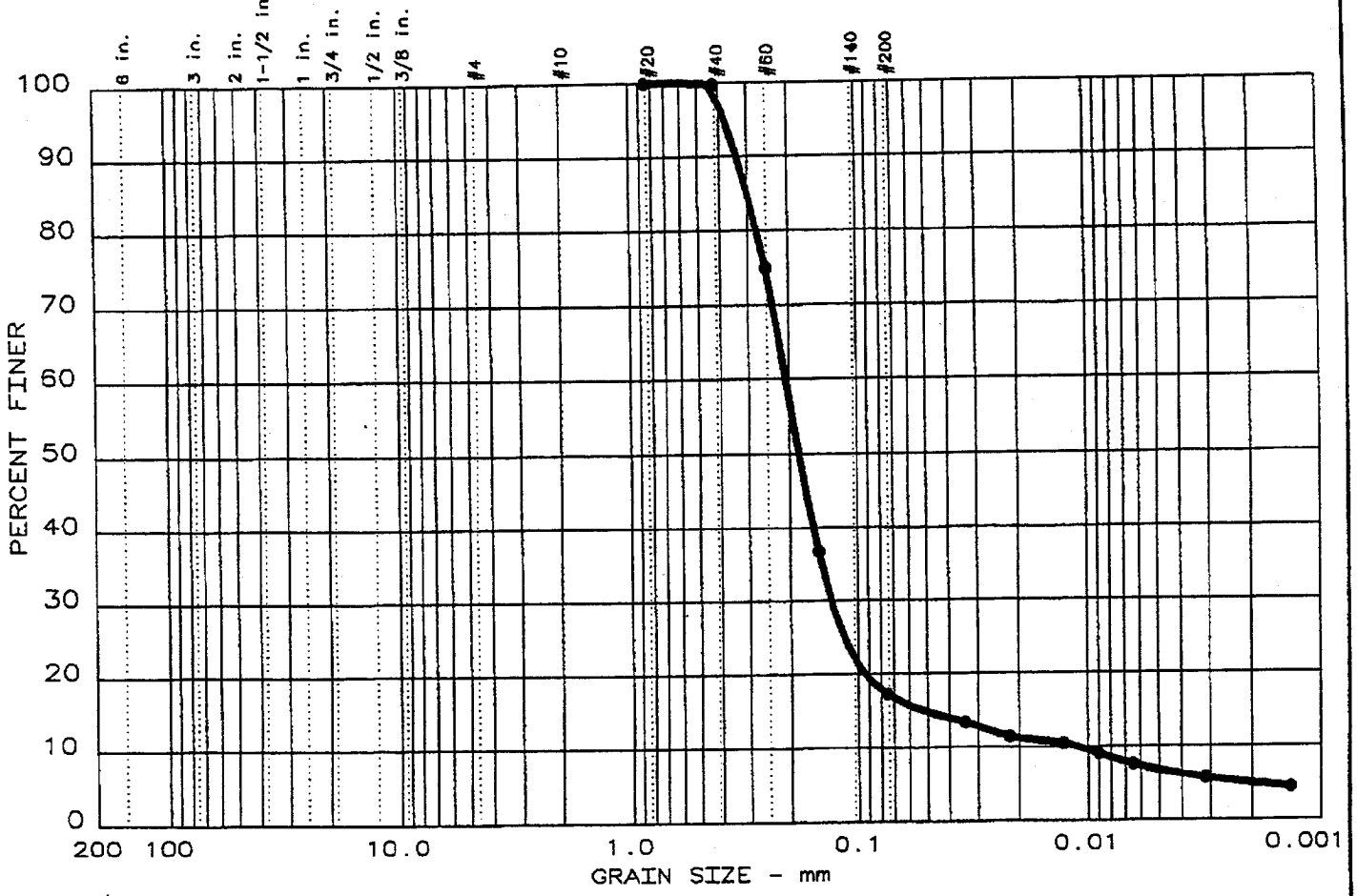
Remarks:
Moisture Content: 21.9%
Specific Gravity: 2.67

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: _____

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	14	0.0	0.0	82.7	10.5	6.8	SM	NP	NP

SIEVE inches size	PERCENT FINER ●		
	GRAIN SIZE		
D_{60}	0.206		
D_{30}			
D_{10}	0.0111		
	COEFFICIENTS		
C_C	7.62		
C_U	18.5		

SIEVE number size	PERCENT FINER ●
20	100.0
40	99.7
60	75.0
100	36.7
200	17.3

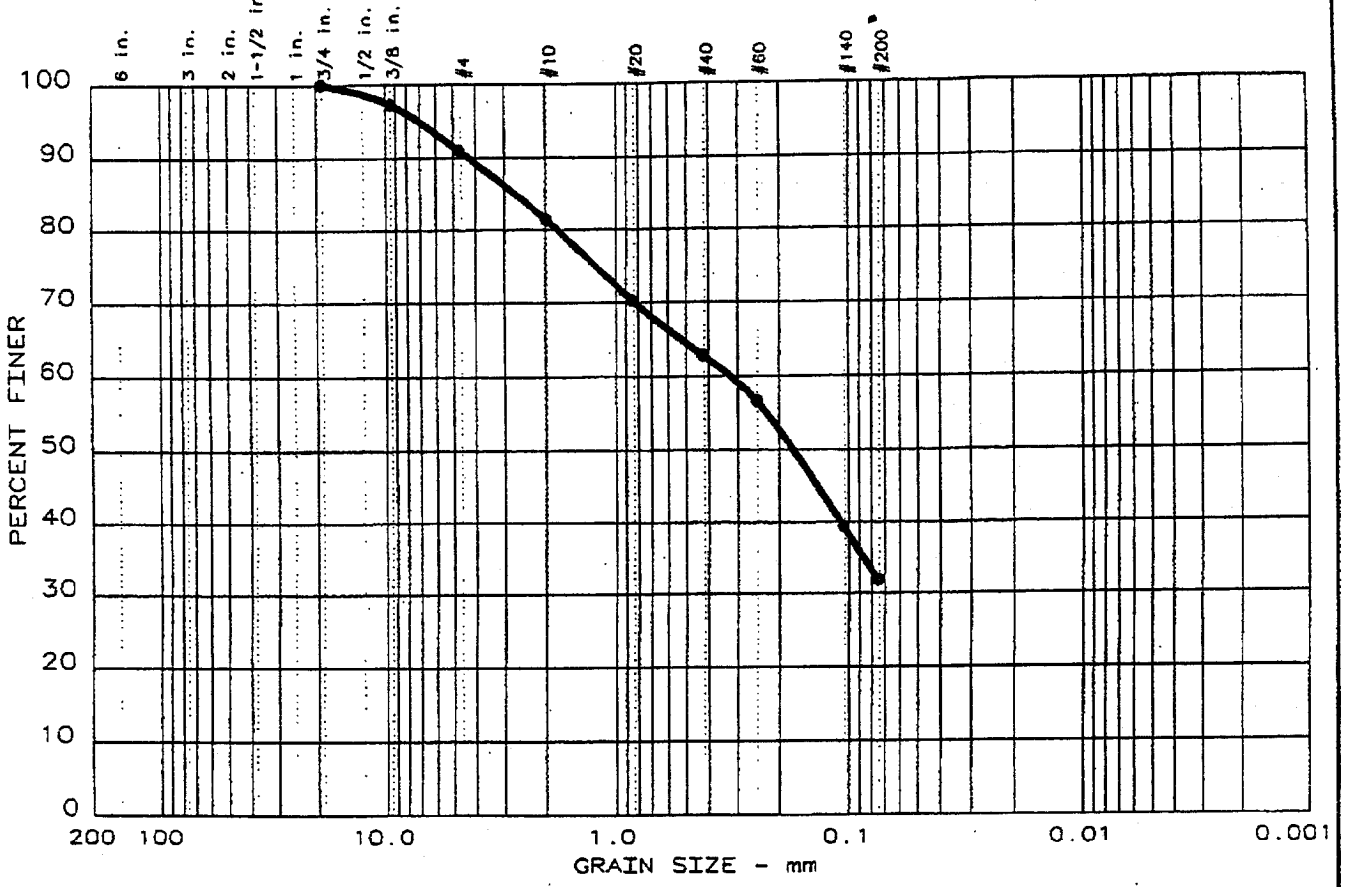
Sample information:
● B-8A, 65-66.5' & 70-70.9'
Gray brown silty sand
SPT Samples

Remarks:
Methods: Particle Size: ASTM D 422-63(2002); Specific Gravity of Portion < No. 40: 2.67

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Project No.: 3043041009.0001
Project: TVA Kingston Ash
Date: April 21, 2004
Fig. No.: B8A

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	11	0.0	9.0	59.1	31.9	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	2.66	0.320	0.172					

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash with Bottom Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 5'-7'

Date: 04-19-04

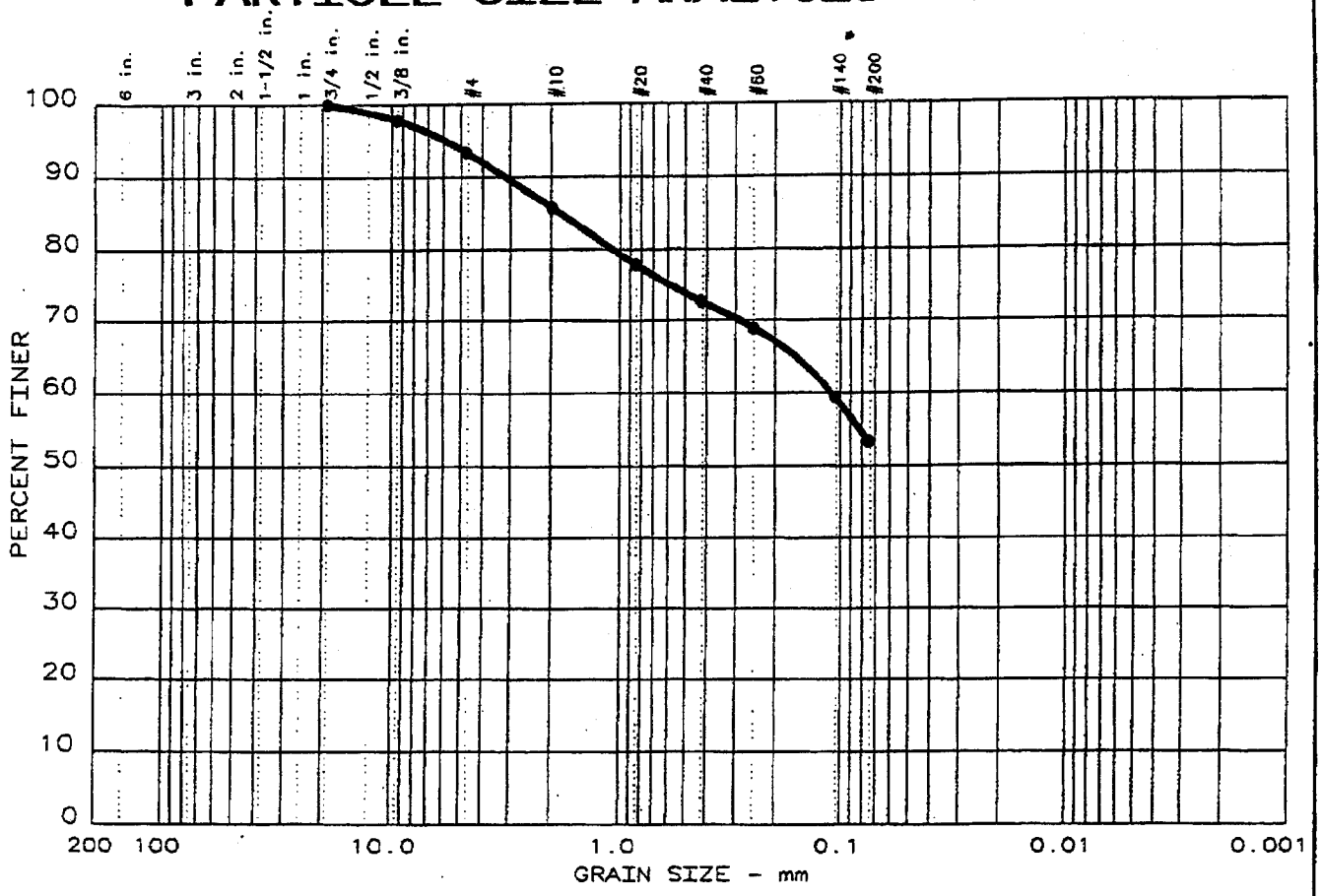
Remarks:
Moisture Content: 24.7%
Specific Gravity: 2.29

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	12	0.0	6.6	40.0	53.4	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	1.82	0.110						

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash with Bottom Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 10'-12'

Date: 04-19-04

Remarks:

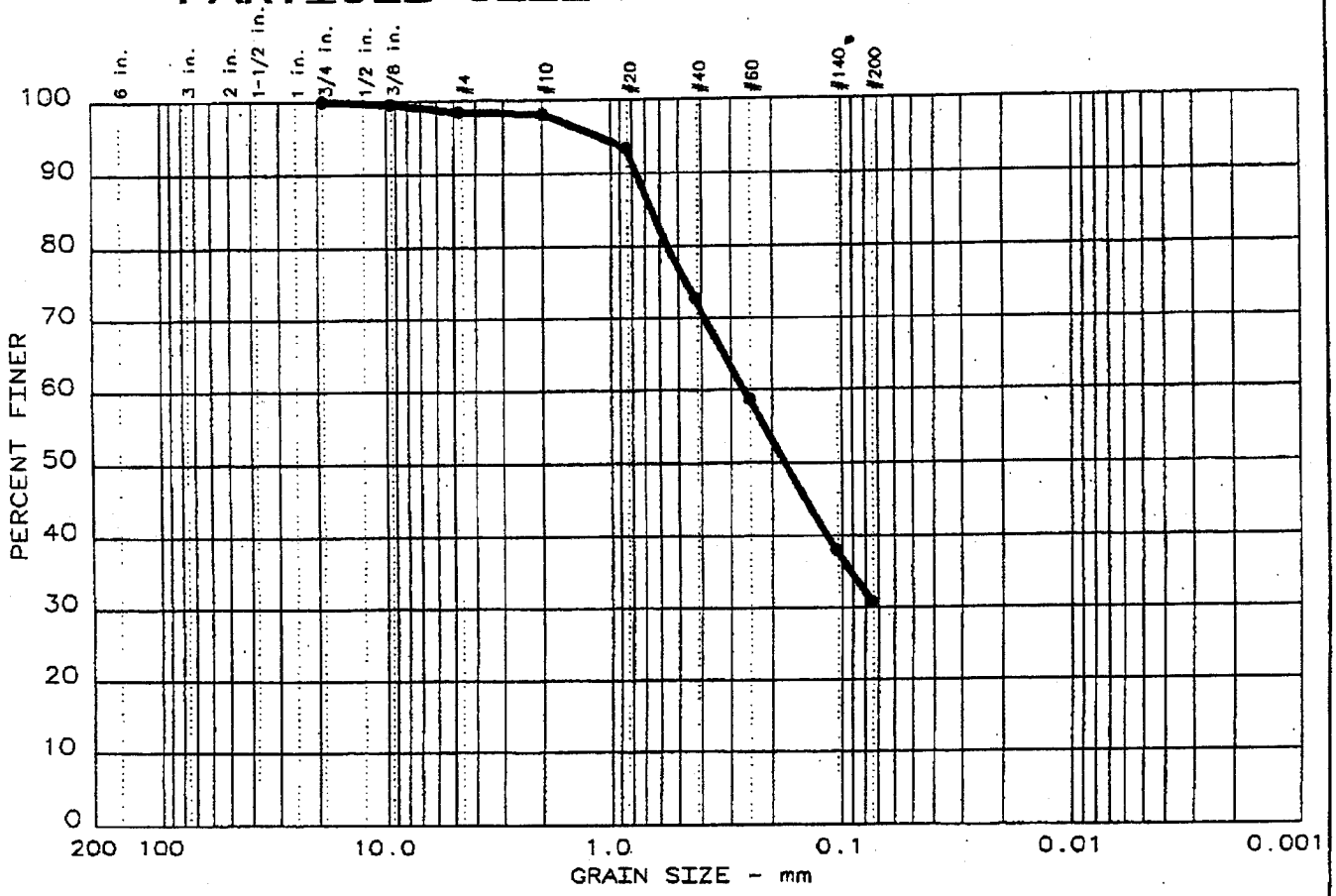
Moisture Content: 24.5%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: _____

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	13	0.0	1.5	67.6	30.9	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.653	0.263	0.176					

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash with Bottom Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 15'-17'

Date: 04-19-04

Remarks:

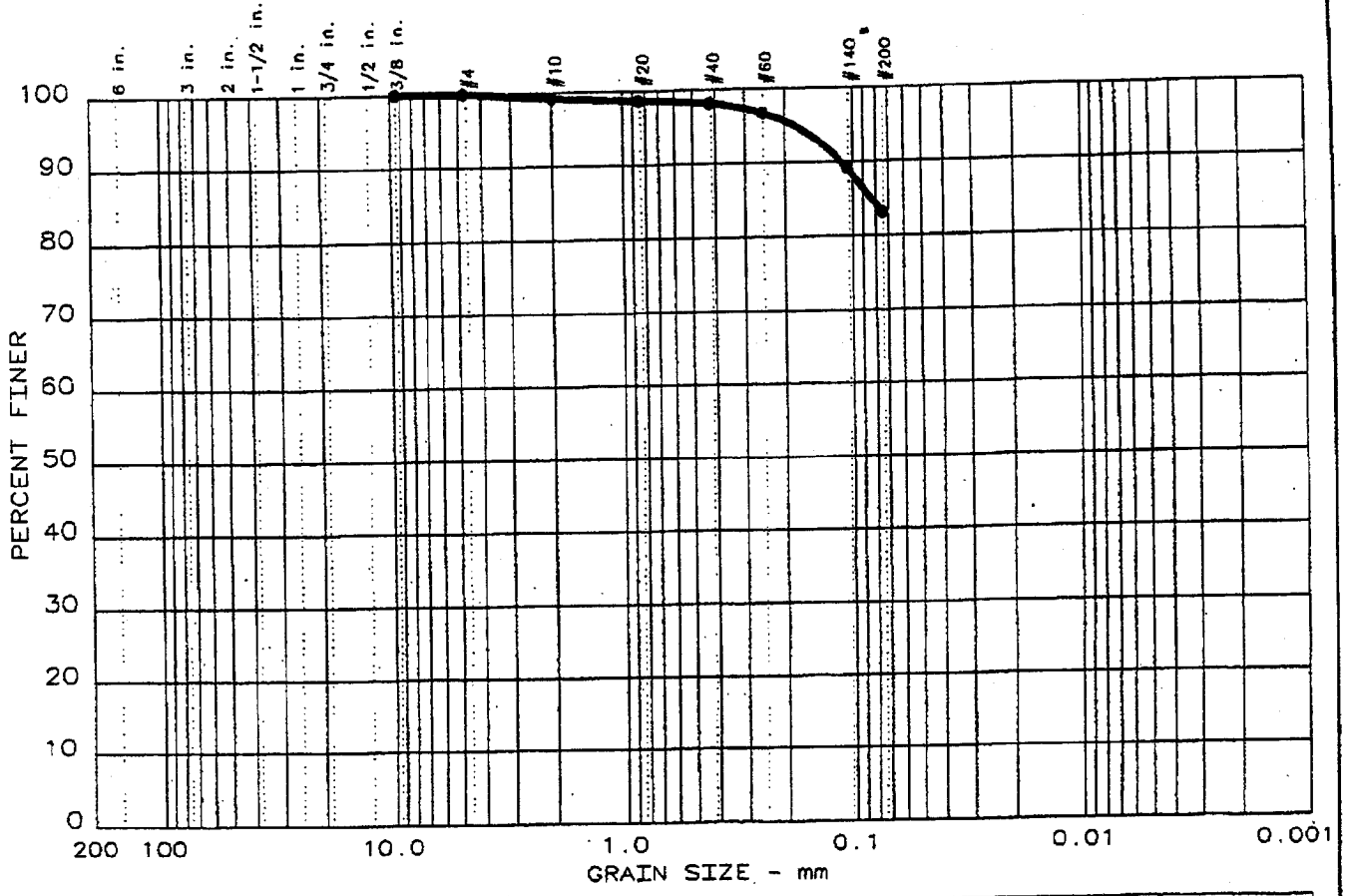
Moisture Content: 38.1%

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: _____

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	14	0.0	0.0	16.9	83.1	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.0832							

MATERIAL DESCRIPTION	USCS	AASHTO
● Grey Fly Ash		

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 20'-22'

Date: 04-19-04

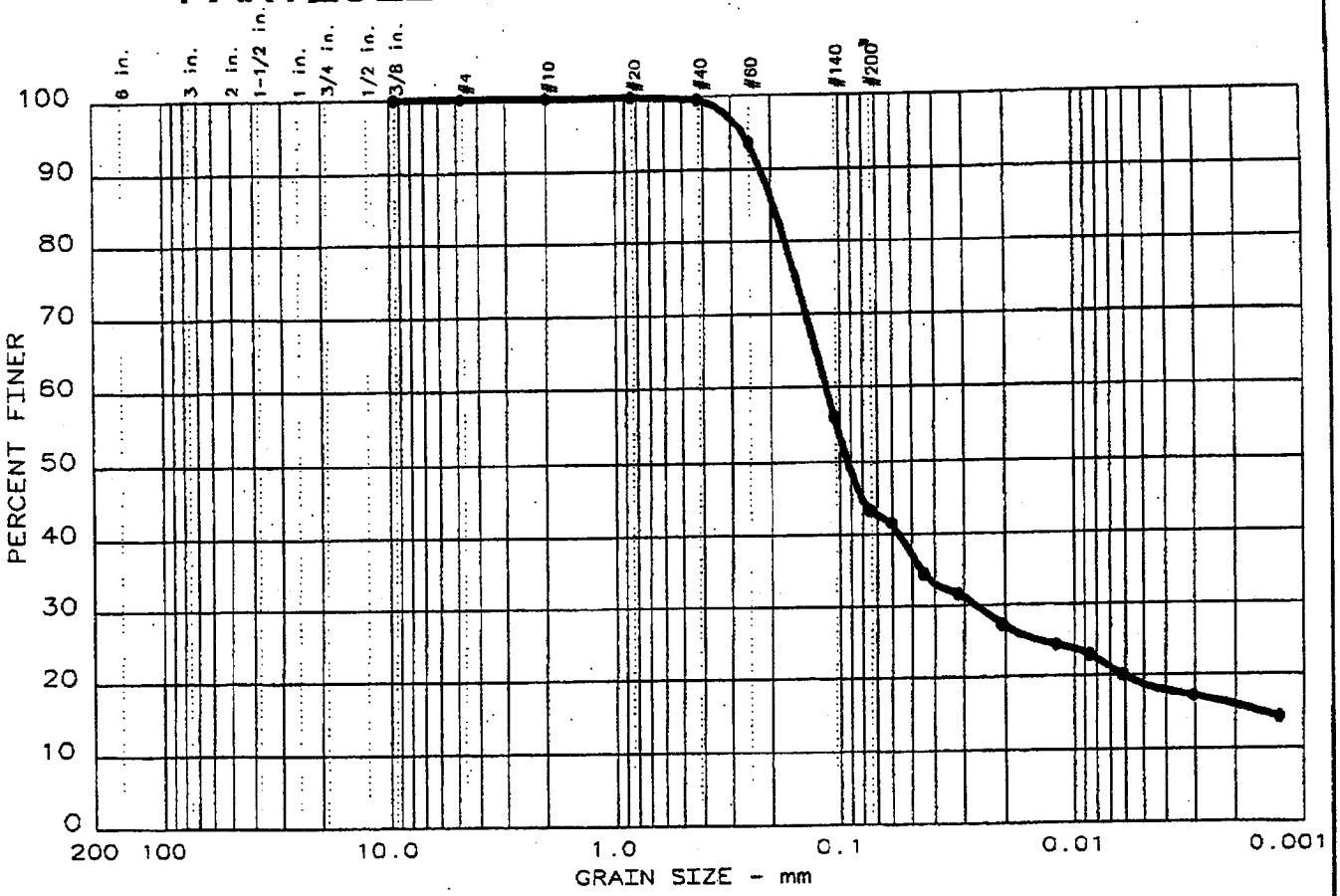
Remarks:
Moisture Content: 36.5%
Specific Gravity: 2.28

PARTICLE SIZE ANALYSIS REPORT

LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

PARTICLE SIZE ANALYSIS REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	3	0.0	0.0	56.7	24.6	18.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	NV	NP	0.193	0.115	0.0931	0.0265	0.0015			

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan-Brown Silty Fine Sand	SM	

Project No.: 3043-04-1009.0001
Project: TVA Kingston Ash Disposal Area
● Location: B-10 UD @ 35'-37'

Date: 04-19-04

Remarks:
Moisture Content: 21.9%

PARTICLE SIZE ANALYSIS REPORT
LAW ENGINEERING AND ENVIRONMENTAL SERVICES

Fig. No.: ———

This information taken from "Kingston Fossil Plant – Dredge Cells/Closure Soil Investigation," Singleton Laboratories Report 015-672-142A, September 29, 1994.

LABORATORY TESTING

All split-spoon samples obtained were visually classified and tested for moisture content in accordance with ASTM D 2216, while Atterberg limits, grain-size analysis, and specific gravity tests were performed on representative SPT soil samples in accordance with ASTM D 4318, and D 422, and D 854, respectively. Test results are shown in the field logs. Individual test data sheets are enclosed in Appendix C.

All twenty-five (25) undisturbed soil samples obtained from the dike areas were tested for moisture content, classification, grain-size, Atterberg limits, specific gravity, and unit weight in accordance with ASTM D 2216, D 2488, D 422, D 4318, D 854, and SLP-2, respectively. Unconsolidated-undrained triaxial (Q) and consolidated-undrained triaxial (R) with pore water pressure measurements were performed on five (5) selected undisturbed soil samples in accordance with ASTM D 4767 and D 5084, respectively. Test results are also summarized in Table 1. Individual test data sheets are enclosed in Appendix D. Under Q test conditions, angles of internal friction ranged from zero (with 1.85 tsf cohesion) to 37.4 degrees, and cohesions varied from zero to 1.85 tsf. Under R test conditions, apparent angles of internal friction and cohesions ranged from 4.4 to 35.8 degrees and from 0.32 to 3.65 tsf, respectively, and effective angles of internal friction and cohesions varied from 9.2 to 37.5 degrees and from zero to 2.91 tsf, respectively.

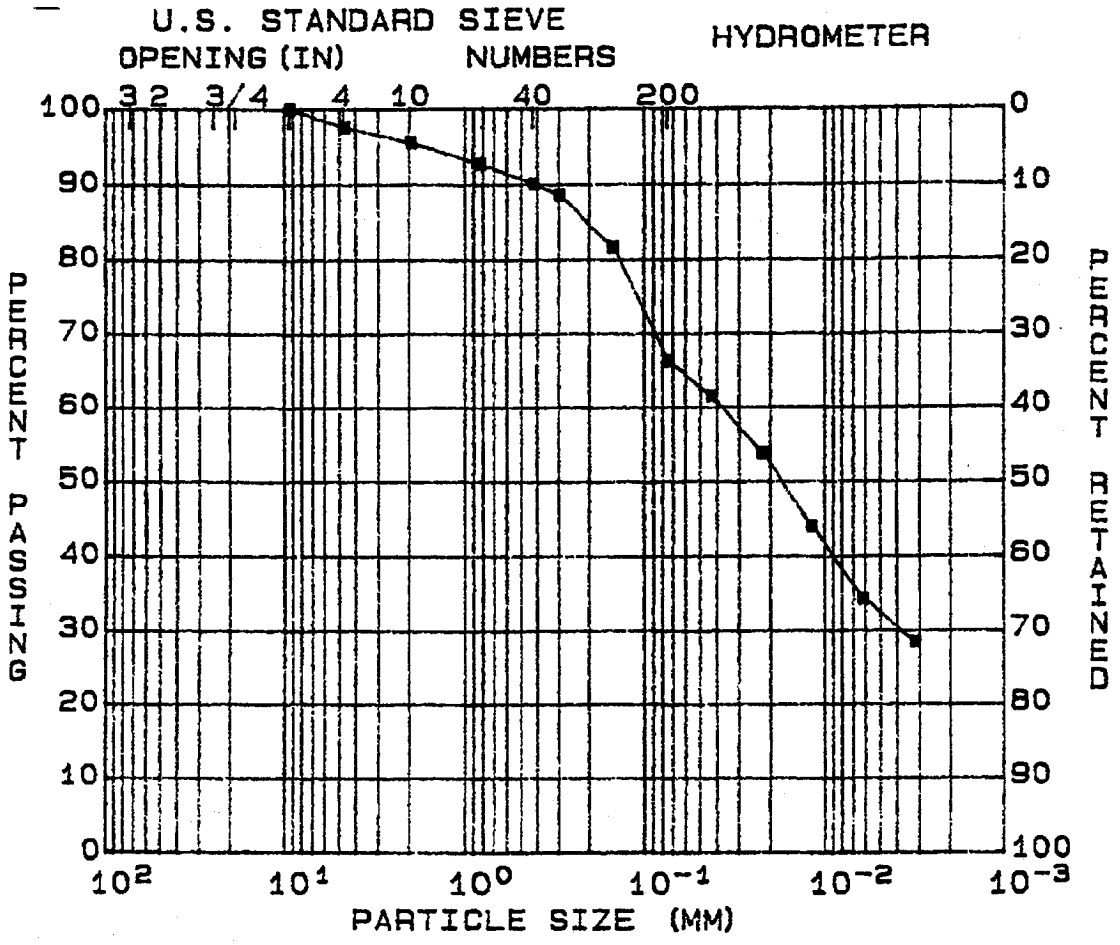
All bulk soil samples obtained from the Dredge Cell 2 were visually classified as a gray silty sand (fly ash) and tested for moisture content on representative samples. Natural moisture contents ranged from 34.5 to 39.9 percent with an average of 37.6 percent. Two (2) soil classes were identified from all the bulk samples. Compaction tests were performed in accordance with ASTM D 698 Method A. Optimum moisture contents and maximum dry densities were determined to be 25.4 percent and 79.8 pcf, respectively for soil Class I, and 24.5 percent and 79.9 pcf, respectively for soil Class II. As indicated from the test results, Soil Classes I and II are very similar. A family of compaction curves was established for each soil class and the compaction curves are enclosed. For each soil class, classification tests including grain-size analysis, specific gravity, and Atterberg Limits were performed. Test results are summarized in Table 2 and also shown in the attached compaction curves. Individual test data sheets and compaction curves are enclosed in Appendix E.

Unconsolidated-undrained triaxial (Q) and consolidated-undrained triaxial (R) with pore water pressure measurements tests were performed on the soil samples remolded to the optimum moisture content with 95 and 100 percent maximum dry density. Test results are also summarized in Table 2. Individual test data sheets are also enclosed in Appendix E. Under Q test conditions, angles of internal friction ranged from 23.7 to 24.0 degrees and cohesions varied from 1.04 to 1.10 tsf. Under R test conditions, apparent angles of internal friction and cohesions ranged from 17.9 to 17.9 degrees and from 0.19 to 0.21 tsf, respectively, and effective angles of internal friction and cohesions varied from 28.3 to 38.3 degrees and from 0.06 to 0.27 tsf, respectively.

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 1
DATE : 09-29-94



GRAVEL (%) =	2	D10 (MM)	= --
SAND (%) =	32	D30 (MM)	= --
SILT (%) =	34	D60 (MM)	= --
CLAY (%) =	32	COEF UNIF	= --

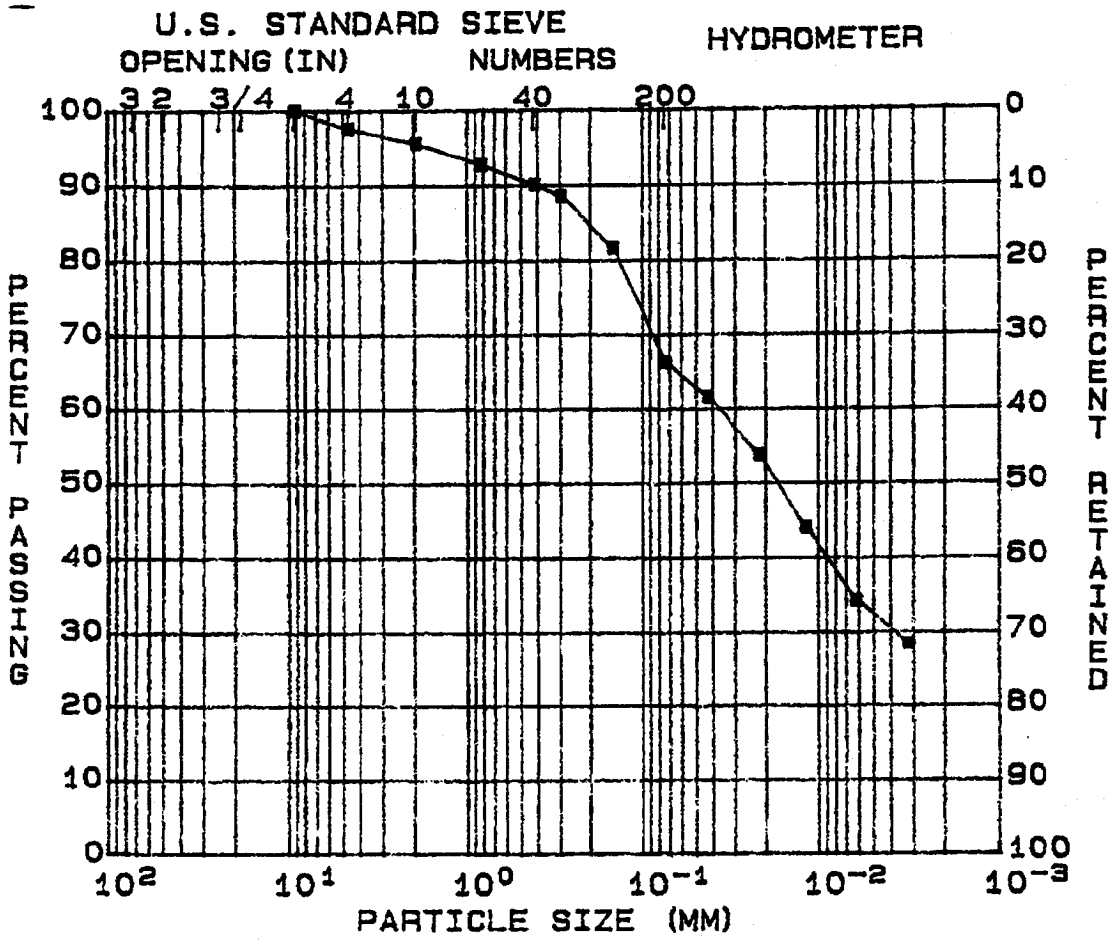
SOIL SYMBOL= CL-ML L.L. (%) = 26 DENSITY (pcf) = --
MOISTURE (%) = P.I. (%) = 4 SATURATION (%) = --
SP. GR. = 2.65 VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 1
DATE : 09-29-94



GRAVEL (%)	= 2	D10 (MM)	= --
SAND (%)	= 32	D30 (MM)	= --
SILT (%)	= 34	D60 (MM)	= --
CLAY (%)	= 32	COEF UNIF	= --

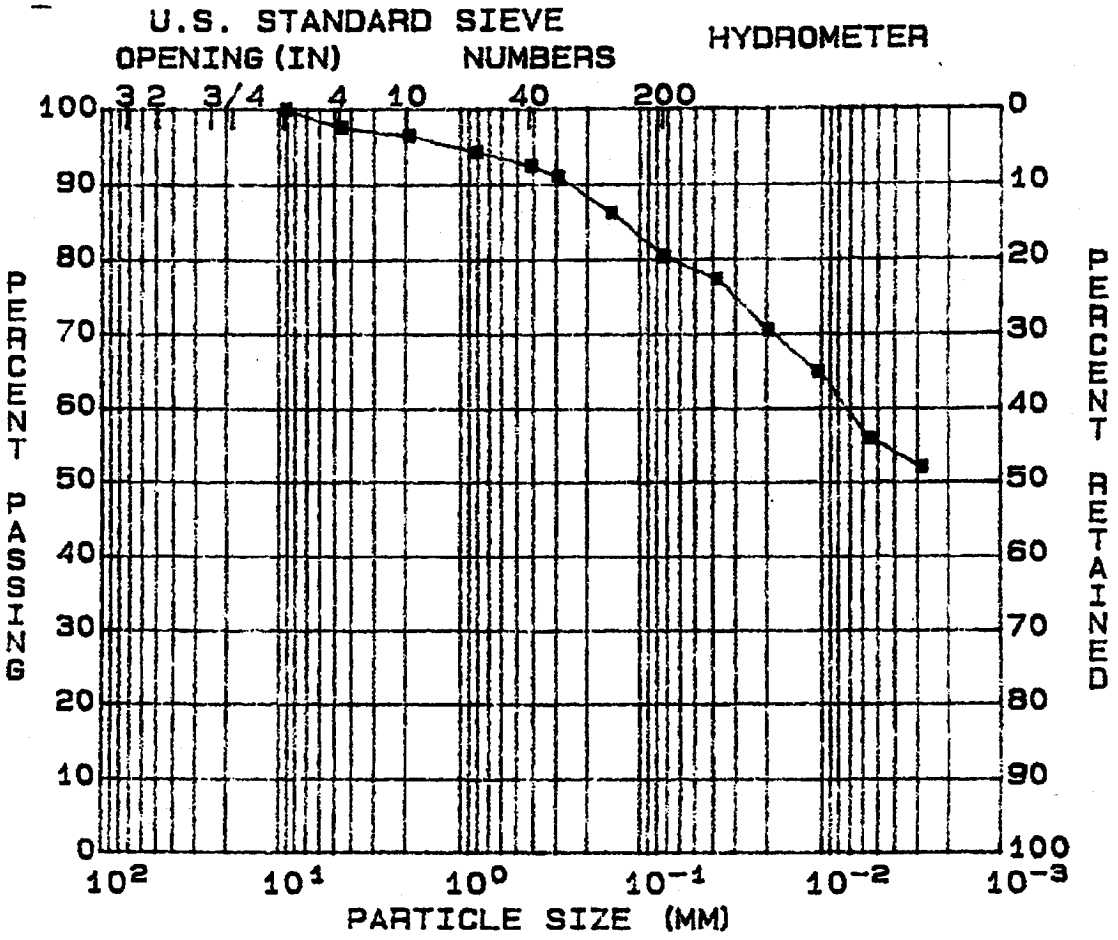
SOIL SYMBOL	= CL-ML	L.L. (%)	= 25	DENSITY (pcf)	= --
MOISTURE (%)	=	P.I. (%)	= 4	SATURATION (%)	= --
SP. GR.	= 2.65			VOID RATIO	= --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 2
DATE : 09-29-94



GRAVEL (%)	= 1	D10 (MM)	= ---
SAND (%)	= 18	D30 (MM)	= ---
SILT (%)	= 25	D60 (MM)	= ---
CLAY (%)	= 56	COEF UNIF	= ---

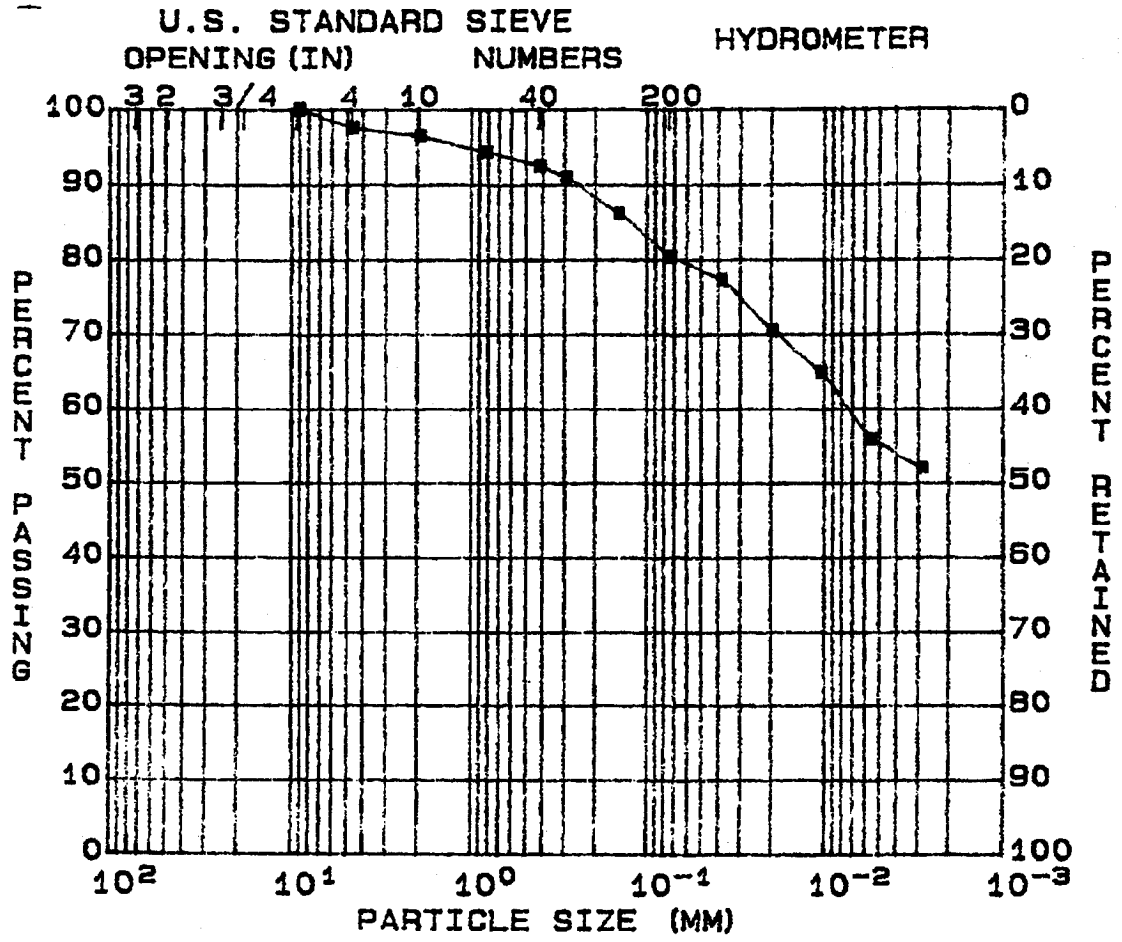
SOIL SYMBOL	= MH/CH	L.L. (%)	= 59	DENSITY (pcf)	= ---
MOISTURE (%)	=	P.I. (%)	= 28	SATURATION (%)	= ---
SP. GR.	= 2.73			VOID RATIO	= ---

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 2
DATE : 09-29-94



GRAVEL (%)	= 1	D10 (MM)	= ---
SAND (%)	= 18	D30 (MM)	= ---
SILT (%)	= 25	D60 (MM)	= ---
CLAY (%)	= 56	COEF UNIF	= ---

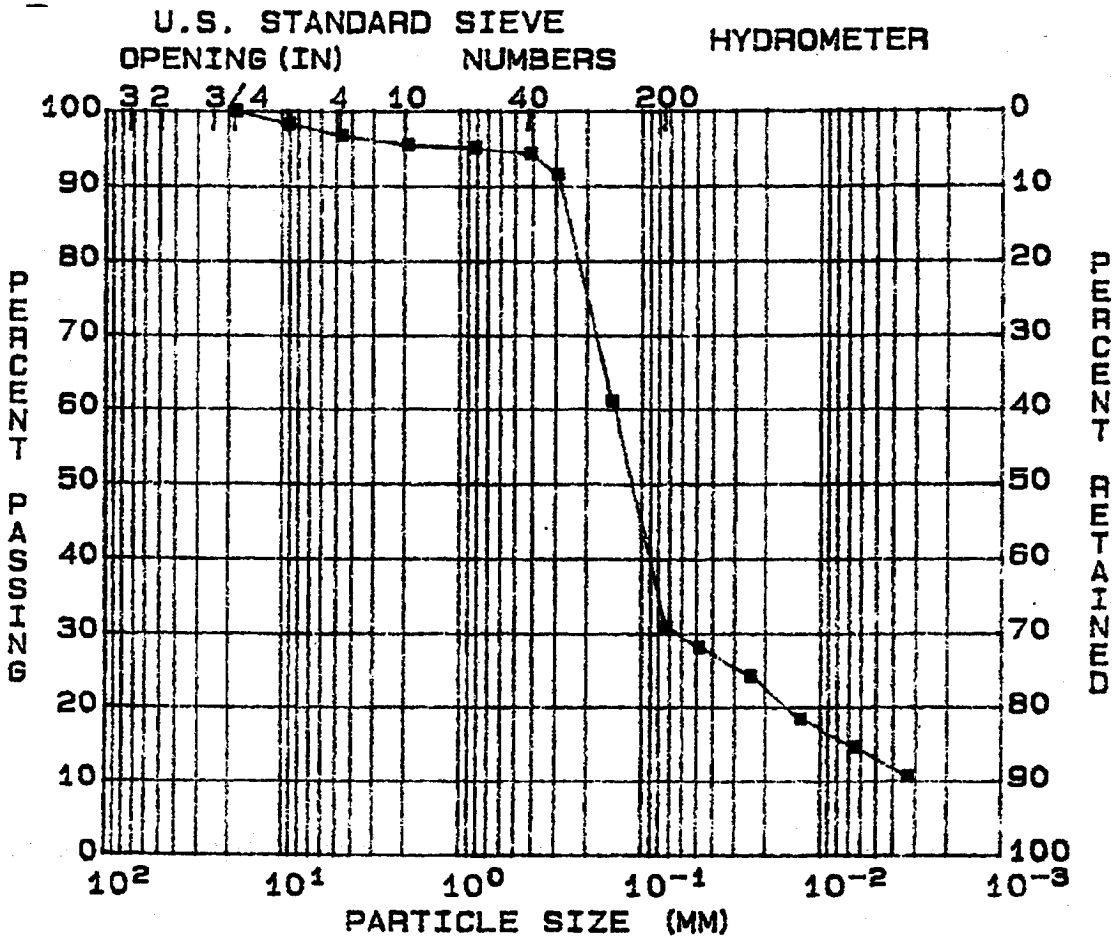
SOIL SYMBOL	= MH/CH	L.L. (%)	= 59	DENSITY (pcf)	= ---
MOISTURE (%)	=	P.I. (%)	= 27	SATURATION (%)	= ---
SP. GR.	= 2.73			VOID RATIO	= ---

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 3
DATE : 09-29-94



GRAVEL (%)	= 3	D10 (MM)	= 0.0029
SAND (%)	= 66	D30 (MM)	= 0.0648
SILT (%)	= 18	D60 (MM)	= 0.1456
CLAY (%)	= 13	COEF UNIF	=49.4

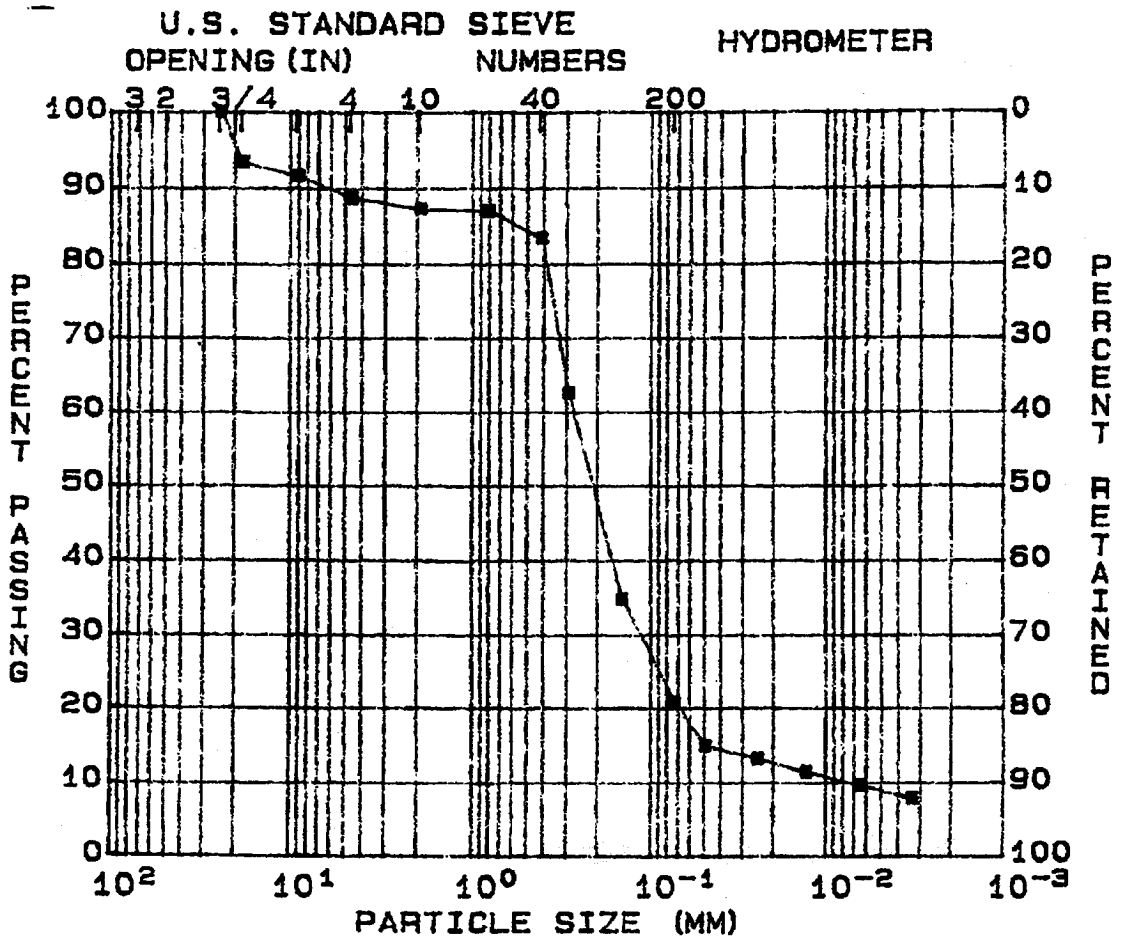
SOIL SYMBOL	= SM	L.L. (%)	= NP	DENSITY (pcf)	= ---
MOISTURE (%)	=	P.I. (%)	= NP	SATURATION (%)	= ---
SP. GR.	= 2.64			VOID RATIO	= ---

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 4
DATE : 09-29-94



GRAVEL (%)	= 11	D10 (MM)	= 0.0076
SAND (%)	= 68	D30 (MM)	= 0.1176
SILT (%)	= 12	D60 (MM)	= 0.2804
CLAY (%)	= 9	COEF UNIF	=37.1

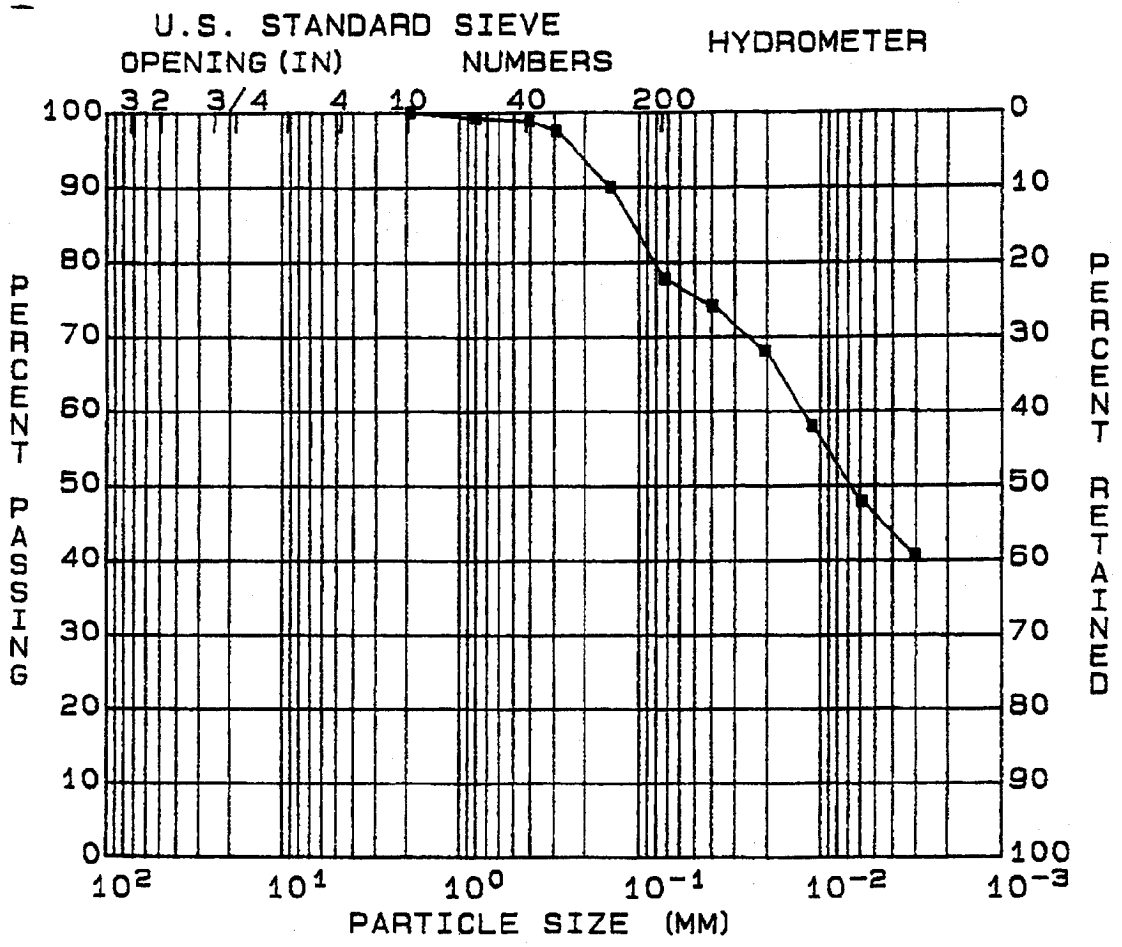
SOIL SYMBOL	= SC/SM	L.L. (%)	= NP	DENSITY (pcf)	= ---
MOISTURE (%)	=	P.I. (%)	= NP	SATURATION (%)	= ---
SP. GR.	= 2.66			VOID RATIO	= ---

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 5
DATE : 09-29-94



GRAVEL (%)	= 0	D10 (MM)	= --
SAND (%)	= 22	D30 (MM)	= --
SILT (%)	= 32	D60 (MM)	= --
CLAY (%)	= 46	COEF UNIF	= --

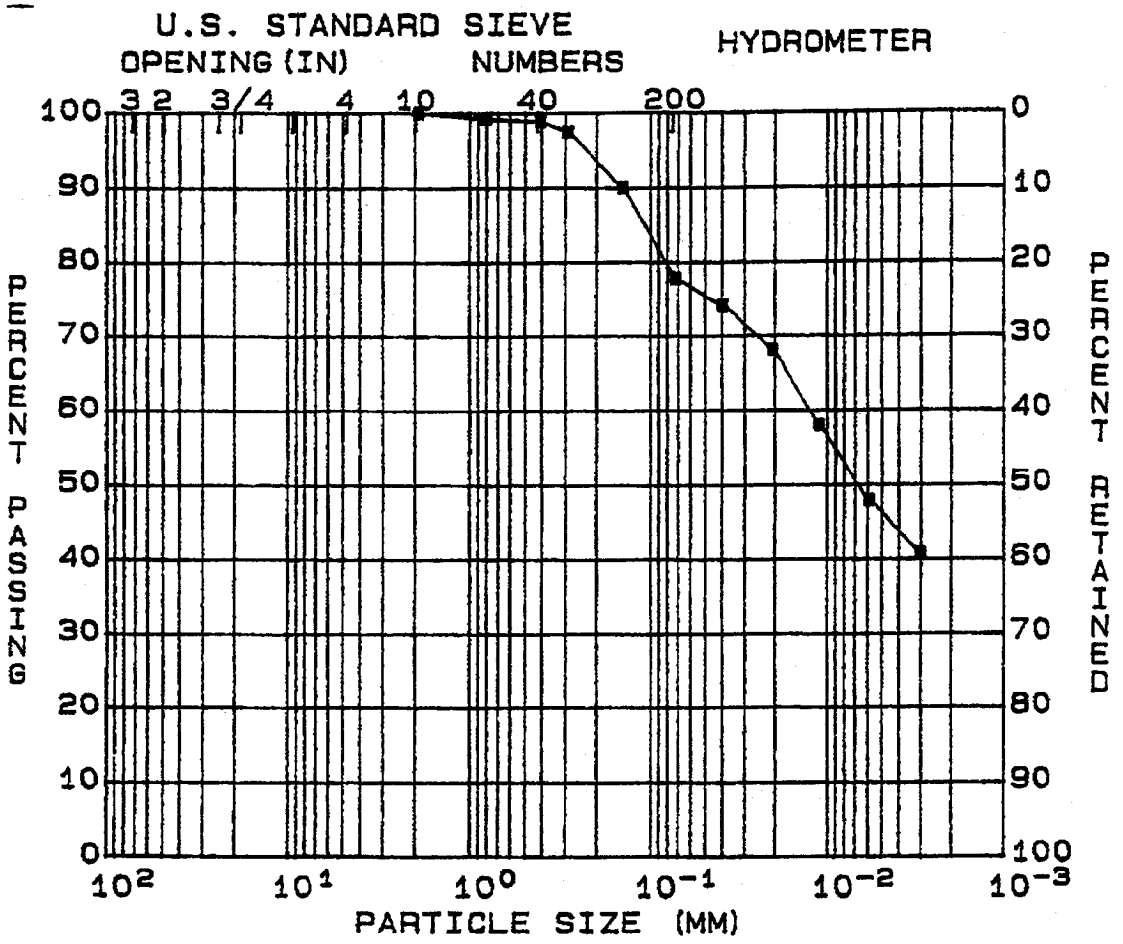
SOIL SYMBOL	= CL	L.L. (%)	= 31	DENSITY (pcf)	= --
MOISTURE (%)	=	P.I. (%)	= 12	SATURATION (%)	= --
SP. GR.	= 2.66			VOID RATIO	= --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 5
DATE : 09-29-94



GRAVEL (%)	= 0	D10 (MM)	= --
SAND (%)	= 22	D30 (MM)	= --
SILT (%)	= 32	D60 (MM)	= --
CLAY (%)	= 46	COEF UNIF	= --

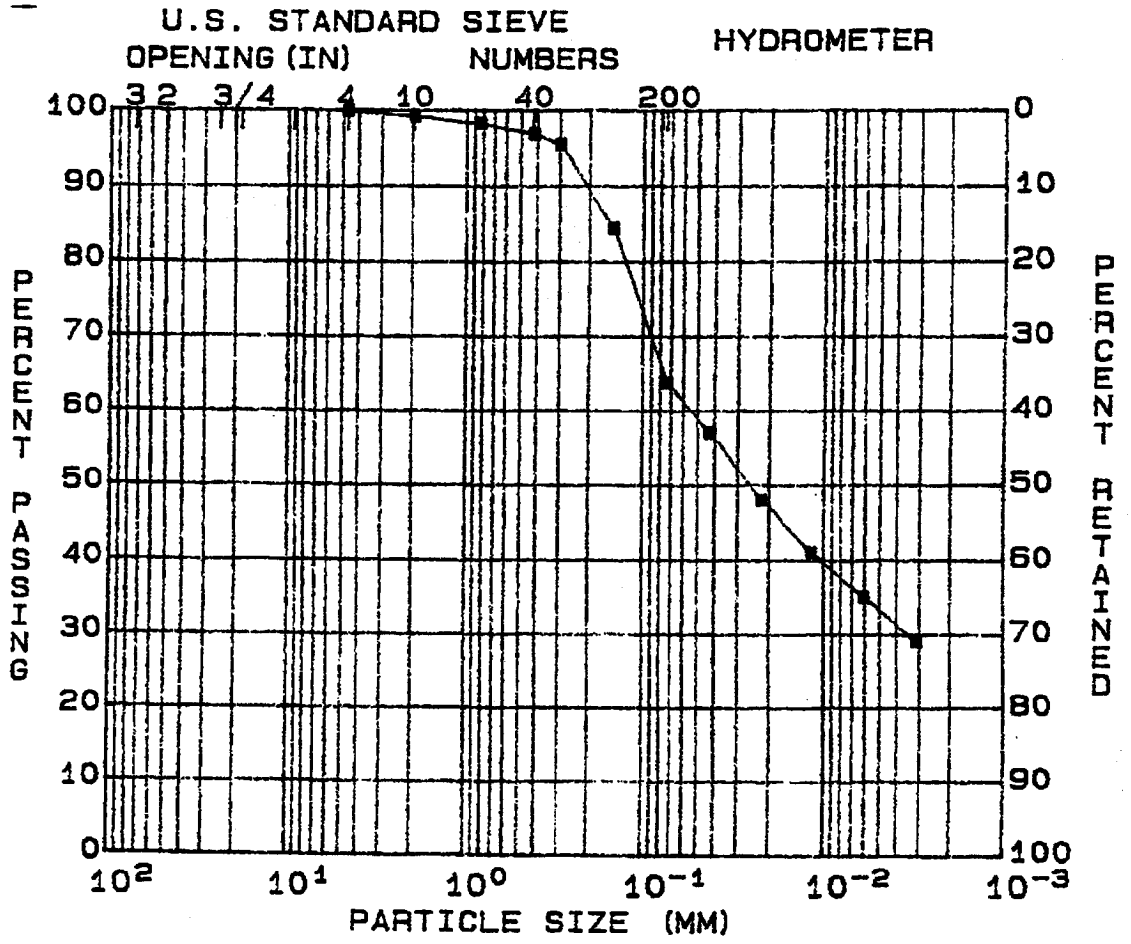
SOIL SYMBOL	= CL	L.L. (%)	= 30	DENSITY (pcf)	= --
MOISTURE (%)	=	P.I. (%)	= 11	SATURATION (%)	= --
SP. GR.	= 2.66			VOID RATIO	= --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 6
DATE : 09-29-94



GRAVEL (%)	= 0	D10 (MM)	= --
SAND (%)	= 36	D30 (MM)	= --
SILT (%)	= 30	D60 (MM)	= --
CLAY (%)	= 34	COEF UNIF	= --

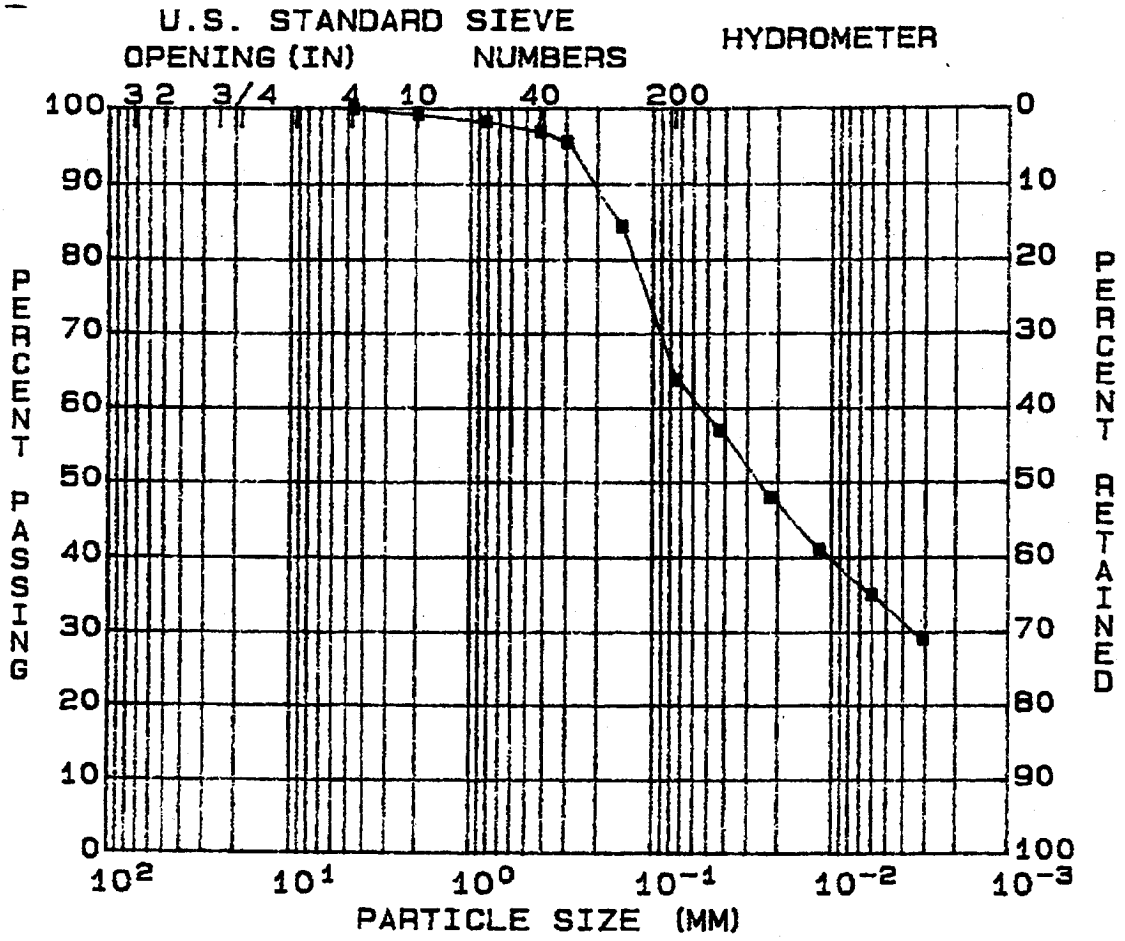
SOIL SYMBOL	= CL	L.L. (%) = 26	DENSITY (pcf) = --
MOISTURE (%)	=	P.I. (%) = 8	SATURATION (%) = --
SP. GR.	= 2.71		VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 6
DATE : 09-29-94



GRAVEL (%)	= 0	D10 (MM)	= --
SAND (%)	= 36	D30 (MM)	= --
SILT (%)	= 30	D60 (MM)	= --
CLAY (%)	= 34	COEF UNIF	= --

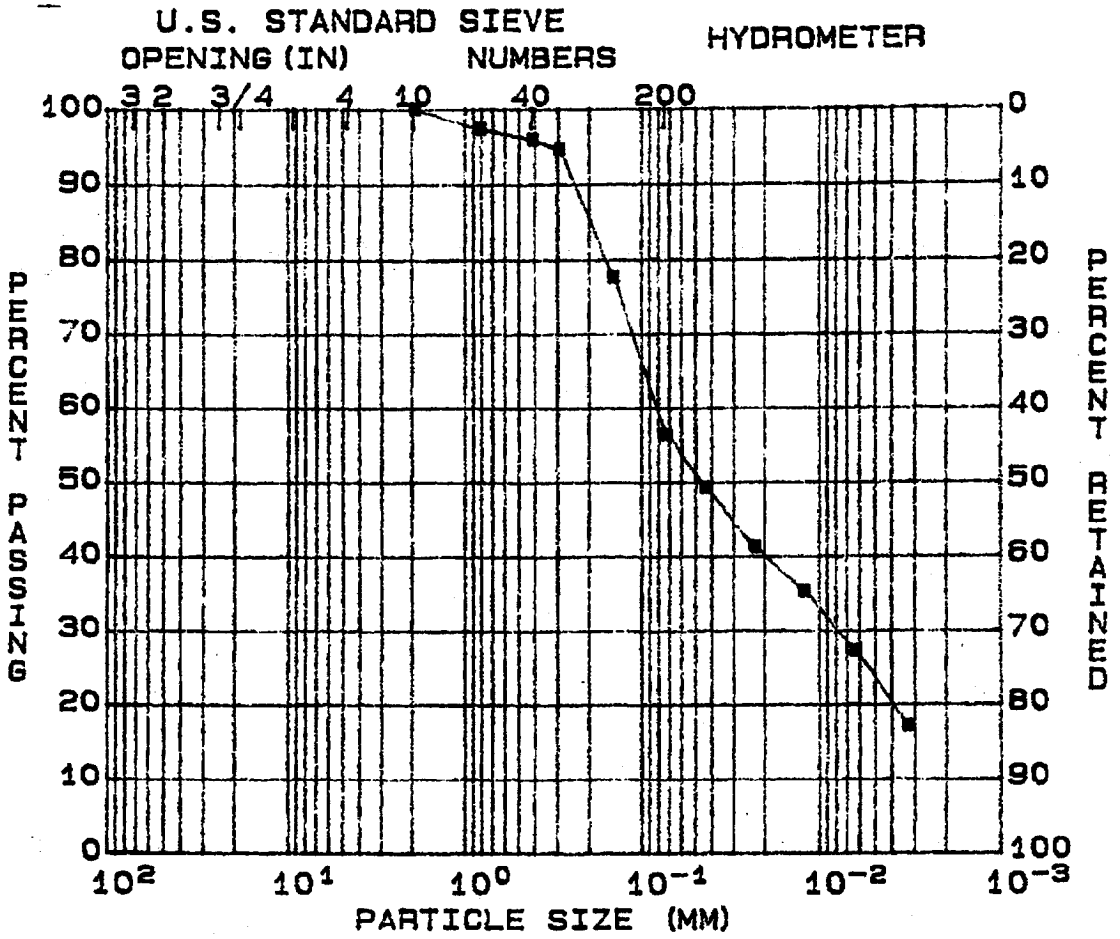
SOIL SYMBOL	= CL	L.L. (%) = 26	DENSITY (pcf) = --
MOISTURE (%)	=	P.I. (%) = 8	SATURATION (%) = --
SP. GR.	= 2.71		VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 7
DATE : 09-29-94



GRAVEL (%)	= 0	D10 (MM)	= ---
SAND (%)	= 43	D30 (MM)	= ---
SILT (%)	= 33	D60 (MM)	= ---
CLAY (%)	= 24	COEF UNIF	= ---

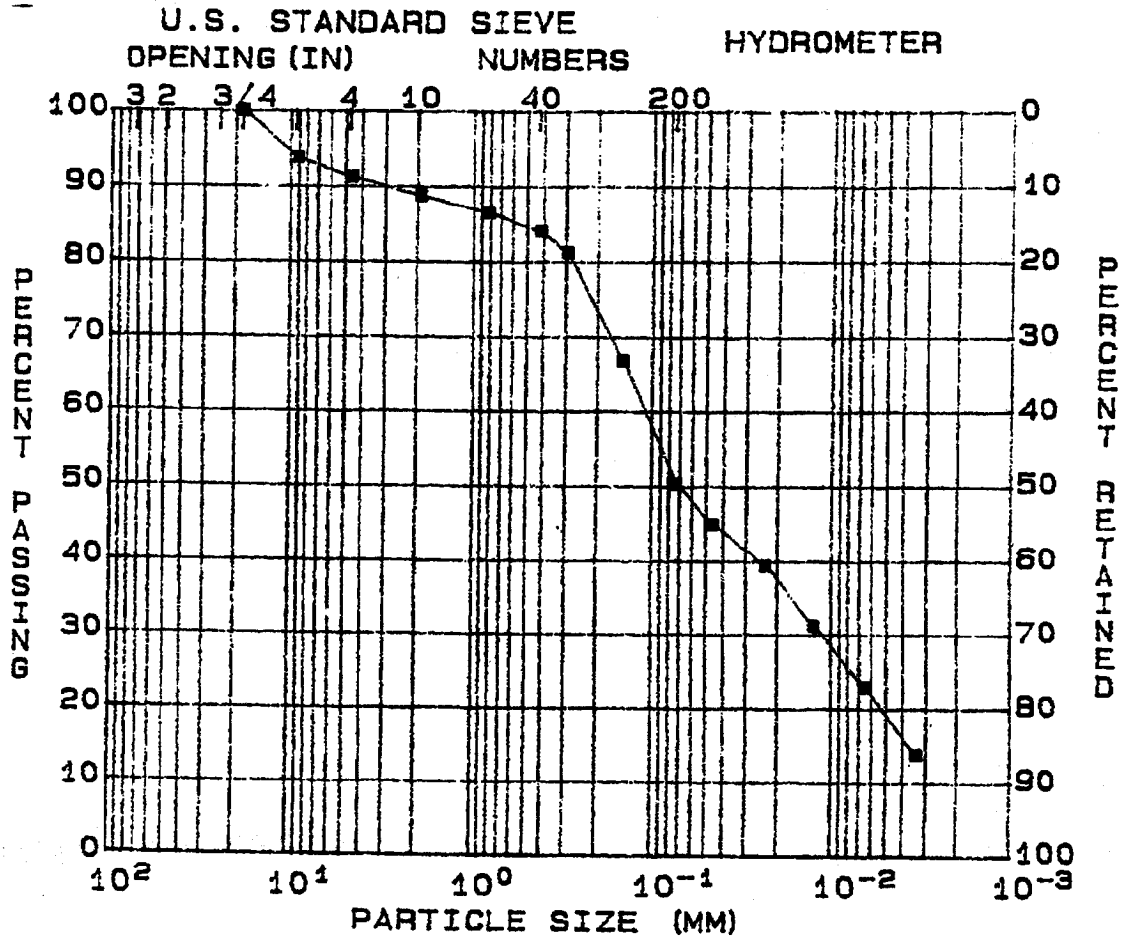
SOIL SYMBOL	= ML	L.L. (%)	= NP	DENSITY (pcf)	= ---
MOISTURE (%)	=	P.I. (%)	= NP	SATURATION (%)	= ---
SP. GR.	= 2.65			VOID RATIO	= ---

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 8
DATE : 09-29-94



GRAVEL (%)	= 8	D10 (MM)	= --
SAND (%)	= 41	D30 (MM)	= --
SILT (%)	= 31	D60 (MM)	= --
CLAY (%)	= 20	COEF UNIF	= --

SOIL SYMBOL	= ML	L.L. (%)	= NP
MOISTURE (%)	=	P.I. (%)	= NP
SP. GR.	= 2.56		

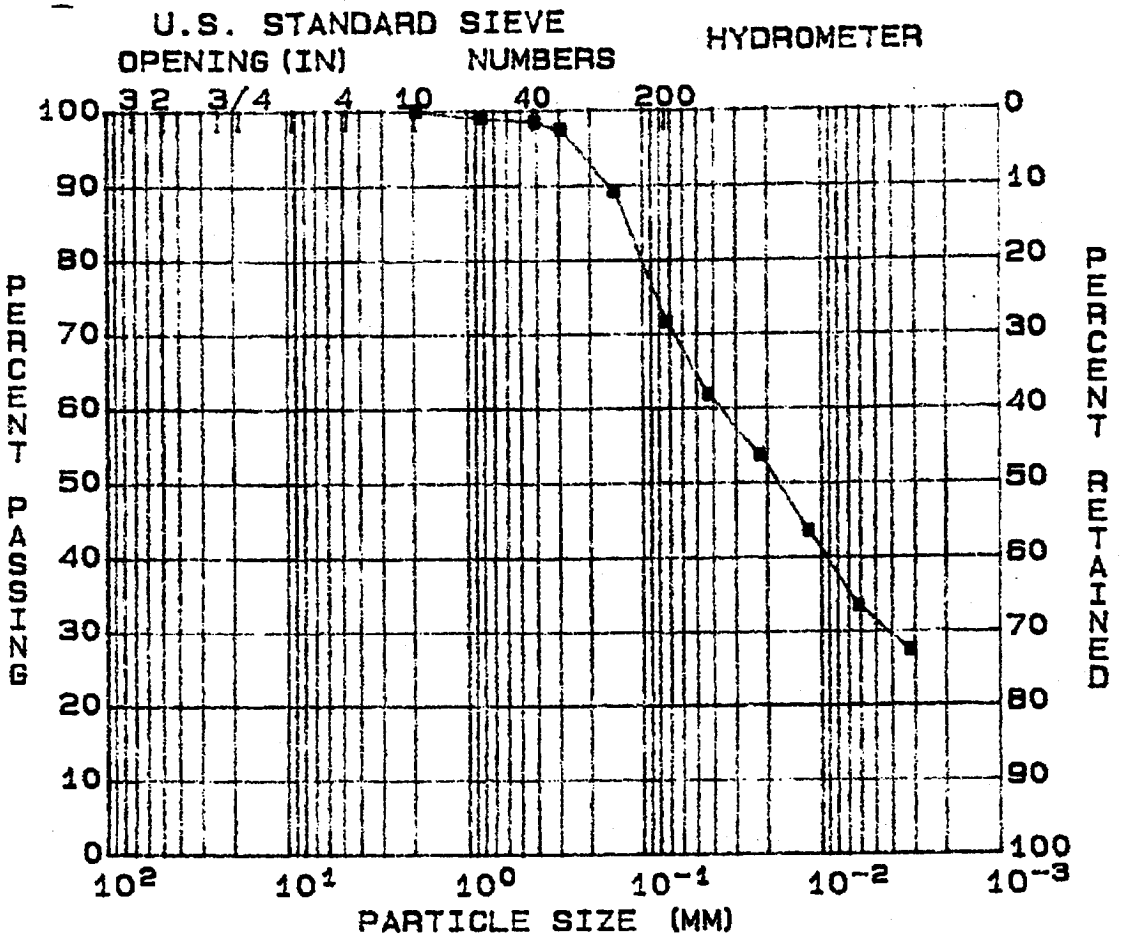
DENSITY (pcf) = --
SATURATION (%) = --
VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 9
DATE : 09-29-94



GRAVEL (%)	= 0	D10 (MM)	= ---
SAND (%)	= 28	D30 (MM)	= ---
SILT (%)	= 40	D60 (MM)	= ---
CLAY (%)	= 32	COEF UNIF	= ---

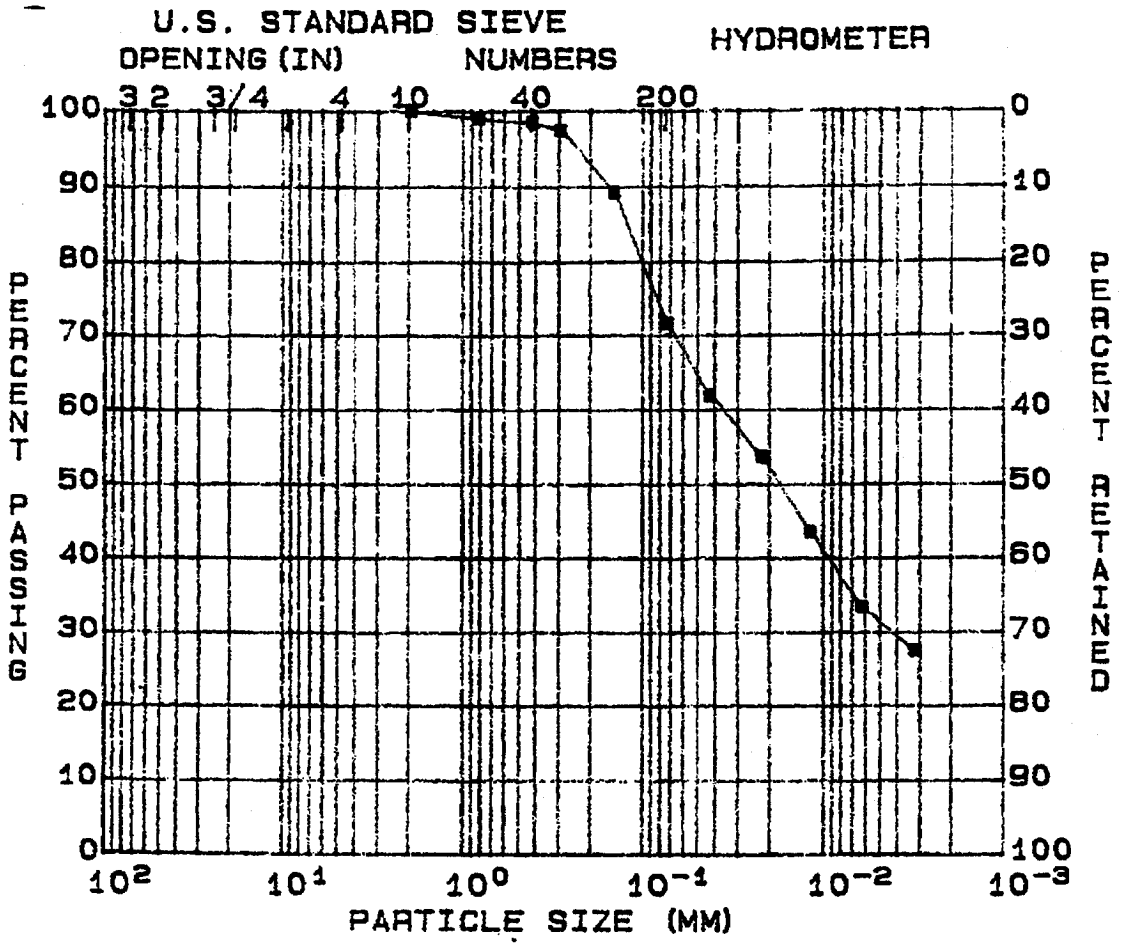
SOIL SYMBOL	= CL	L.L. (%)	= 26	DENSITY (pcf)	= ---
MOISTURE (%)	=	P.I. (%)	= 8	SATURATION (%)	= ---
SP. GR.	= 2.64			VOID RATIO	= ---

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 9
DATE : 09-29-94



GRAVEL (%)	= 0	D10 (MM)	= ---
SAND (%)	= 28	D30 (MM)	= ---
SILT (%)	= 40	D60 (MM)	= ---
CLAY (%)	= 32	COEF UNIF	= ---

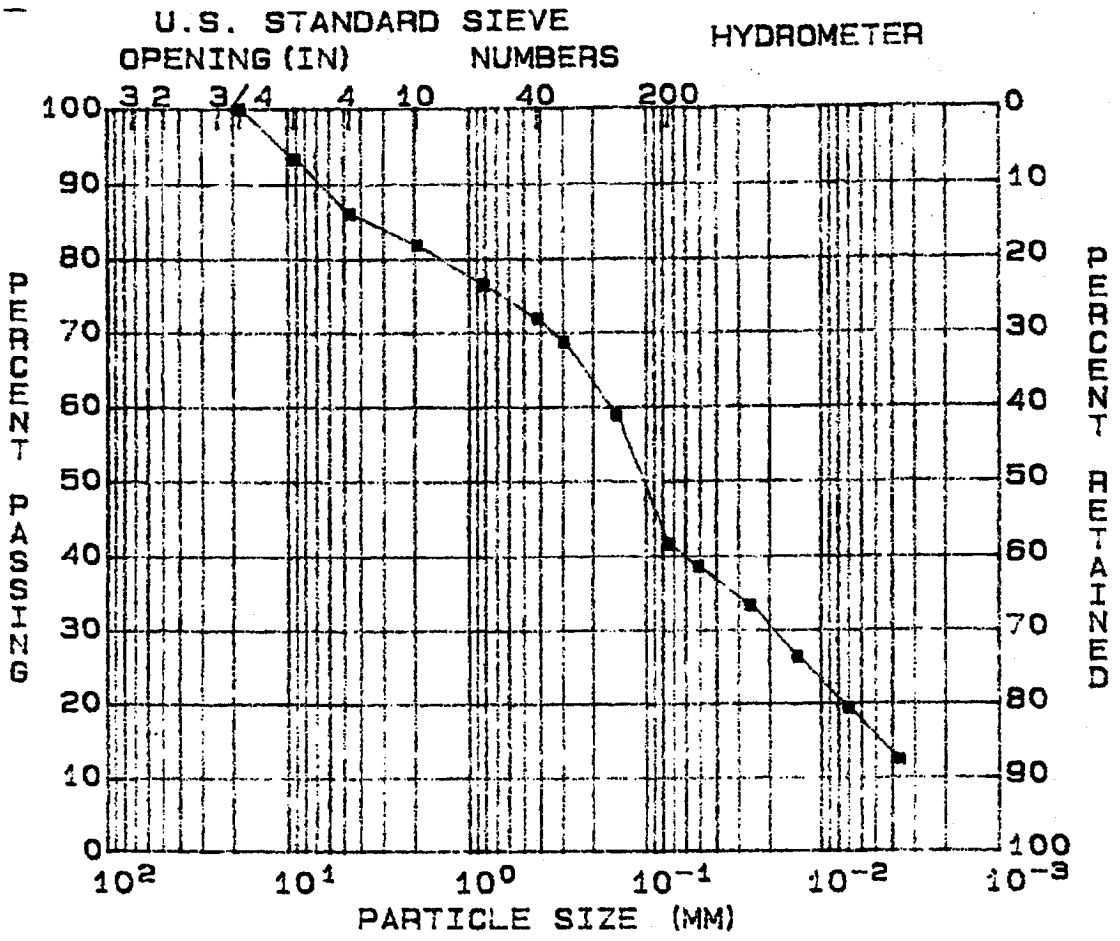
SOIL SYMBOL= CL	L.L. (%) = 26	DENSITY (pcf) = ---
MOISTURE (%) =	P.I. (%) = 8	SATURATION (%) = ---
SP. GR. = 2.64		VOID RATIO = ---

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 10
DATE : 09-29-94



GRAVEL (%)	= 13	D10 (MM)	= 0.0029
SAND (%)	= 45	D30 (MM)	= 0.0185
SILT (%)	= 26	D60 (MM)	= 0.1552
CLAY (%)	= 16	COEF UNIF	=54.2

SOIL SYMBOL	= SM	L.L. (%)	= NP
MOISTURE (%)	=	P.I. (%)	= NP
SP. GR.	= 2.40		

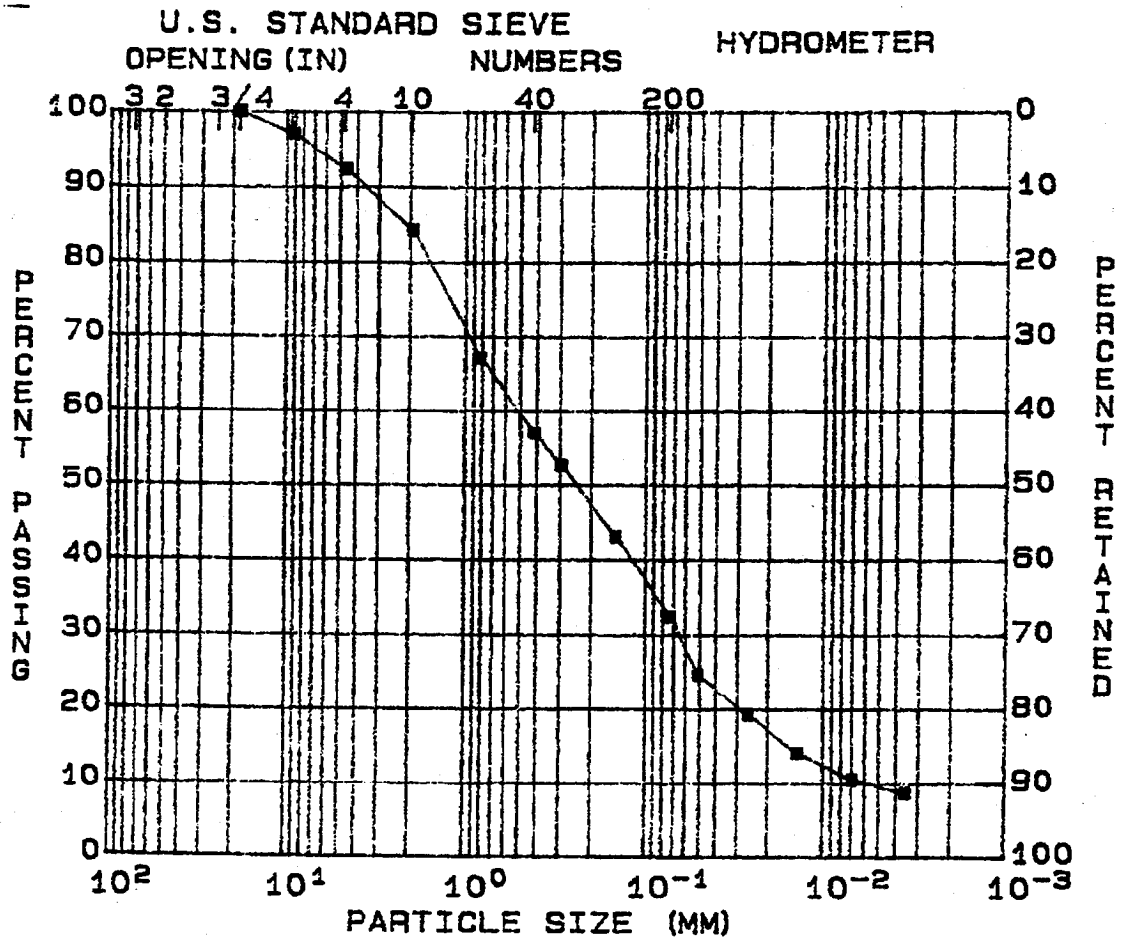
DENSITY (pcf) = ---
SATURATION (%) = ---
VOID RATIO = ---

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 11
DATE : 09-29-94



GRAVEL (%)	= 7	D10 (MM)	= 0.0056
SAND (%)	= 61	D30 (MM)	= 0.0662
SILT (%)	= 23	D60 (MM)	= 0.5022
CLAY (%)	= 9	COEF UNIF	=90.5

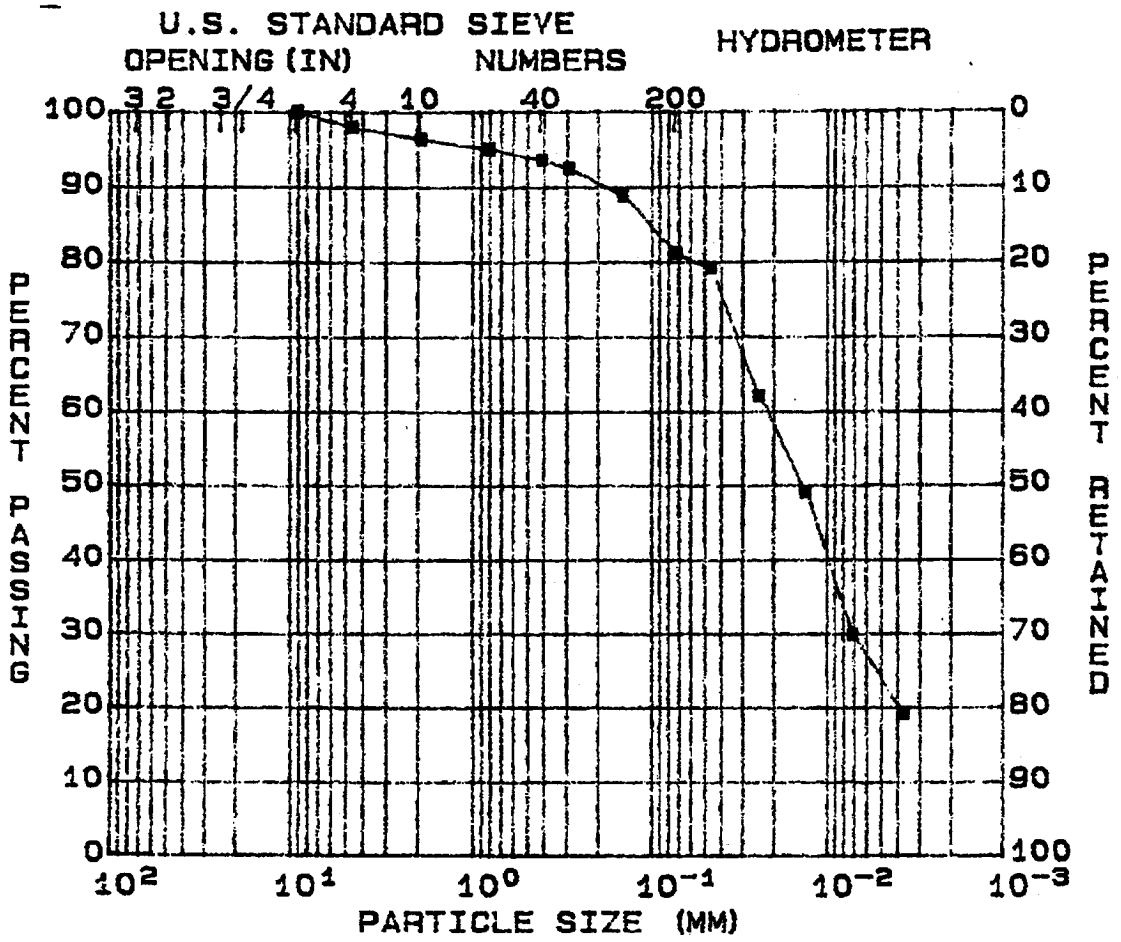
SOIL SYMBOL= SM	L.L. (%)	= NP	DENSITY (pcf) = --
MOISTURE (%) =	P.I. (%)	= NP	SATURATION (%) = --
SP. GR. = 2.51			VOID RATIO = --

REMARKS:

SINGLETON LABORATORIES
PARTICLE SIZE ANALYSIS

PROJECT: TVA/KINGSTON FP
FEATURE: DREDGE CELLS/CLOSURE
STATION:
RANGE :
PART :

BORING: SS-1 thru SS-10
EL. :
SAMPLE: Gr 12
DATE : 09-29-94



GRAVEL (%)	= 1	D10 (MM)	= ---
SAND (%)	= 17	D30 (MM)	= ---
SILT (%)	= 57	D60 (MM)	= ---
CLAY (%)	= 25	COEF UNIF	= ---

SOIL SYMBOL	= ML	L.L. (%)	= NP	DENSITY (pcf)	= ---
MOISTURE (%)	=	P.I. (%)	= NP	SATURATION (%)	= ---
SP. GR.	= 2.31			VOID RATIO	= ---

REMARKS:

This information taken from "Report of Soil Borings, Monitoring Well Installation and Soil Laboratory Testing – Tennessee Valley Authority – Watts Bar and Kingston Facilities," Law Engineering, November 30, 1988.

LABORATORY TESTING PROCEDURES

ATTERBERG LIMITS

The Atterberg Limits consist of moisture contents of soils which produce specified consistencies. The Atterberg Limits consist of the Liquid Limit (LL), Plastic Limit (PL) and Shrinkage Limit (SL). The LL (between the liquid and plastic states) is the water content at which a trapazoidal groove of specified shape, cut in moist soil held in a special cup, is closed after 25 taps on a hard rubber plate. The PL (between the semi-solid and solid states) is the maximum water content at which a reduction in water content will not cause a decrease in the volume of the soil mass.

The LL has been found to be proportional to the compressibility of the normally consolidated soil. The Plasticity Index (PI) is the calculated difference in water contents between the LL and PL. Together the LL and PI are used to classify silts at clays according to the Unified System Classification of Soils (ASTM D-2487). The PI is used to predict the potential for volume changes in confined soils beneath foundations or grade slabs. Should the PI indicate the potential for soil volume change, Shrinkage Limit (SL) testing can be performed to estimate the amount of volume changes in confined soils beneath foundations or grade slabs.

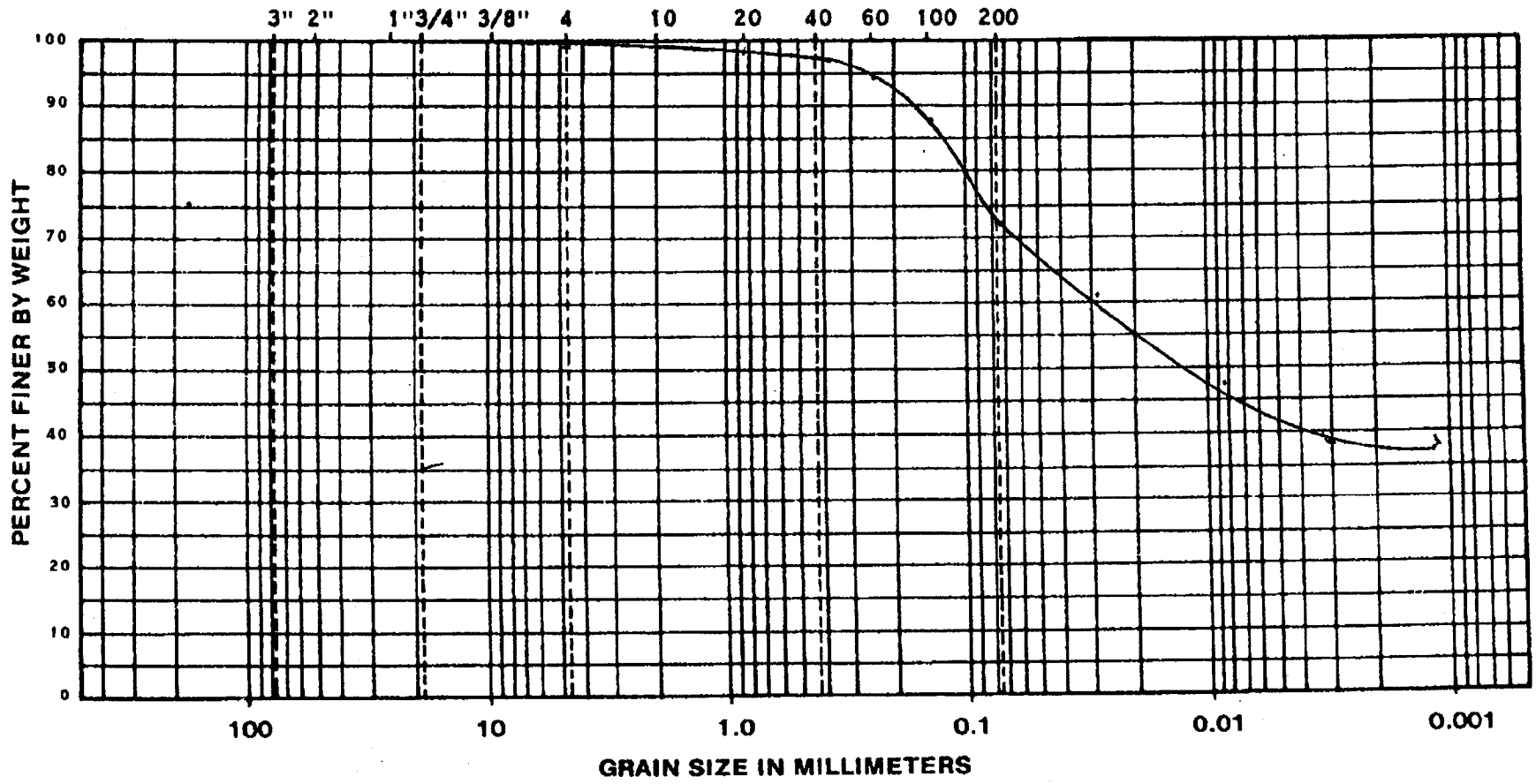
The LL, (PL and PI) and SL are determined in accordance with ASTM's D-423, D-424 and D-427, respectively.

GRAIN SIZE DISTRIBUTION

Grain Size Tests are performed to aid in determining the soil classification and the grain size distribution. The soil samples are prepared for testing according to ASTM D-421 (dry preparation) or ASTM D-2217 (wet preparation). If only the grain size distribution of soils coarser than a number 200 sieve (o.074 mm opening) is desired, the grain size distribution is determined by washing the sample over a #200 sieve and after drying passing the samples through a standard set of nested sieves. If the

grain size distribution of the soils finer than the #200 sieve is also desired, the grain size distribution of the soils coarser than the #10 sieve is determined by passing the sample through a set of nested sieves. Materials passing the number 10 sieve are dispersed with a dispersing agent and suspended in water and the grain size distribution calculated from the measured settlement rate of the particles. These tests are conducted in accordance with ASTM D-422.

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

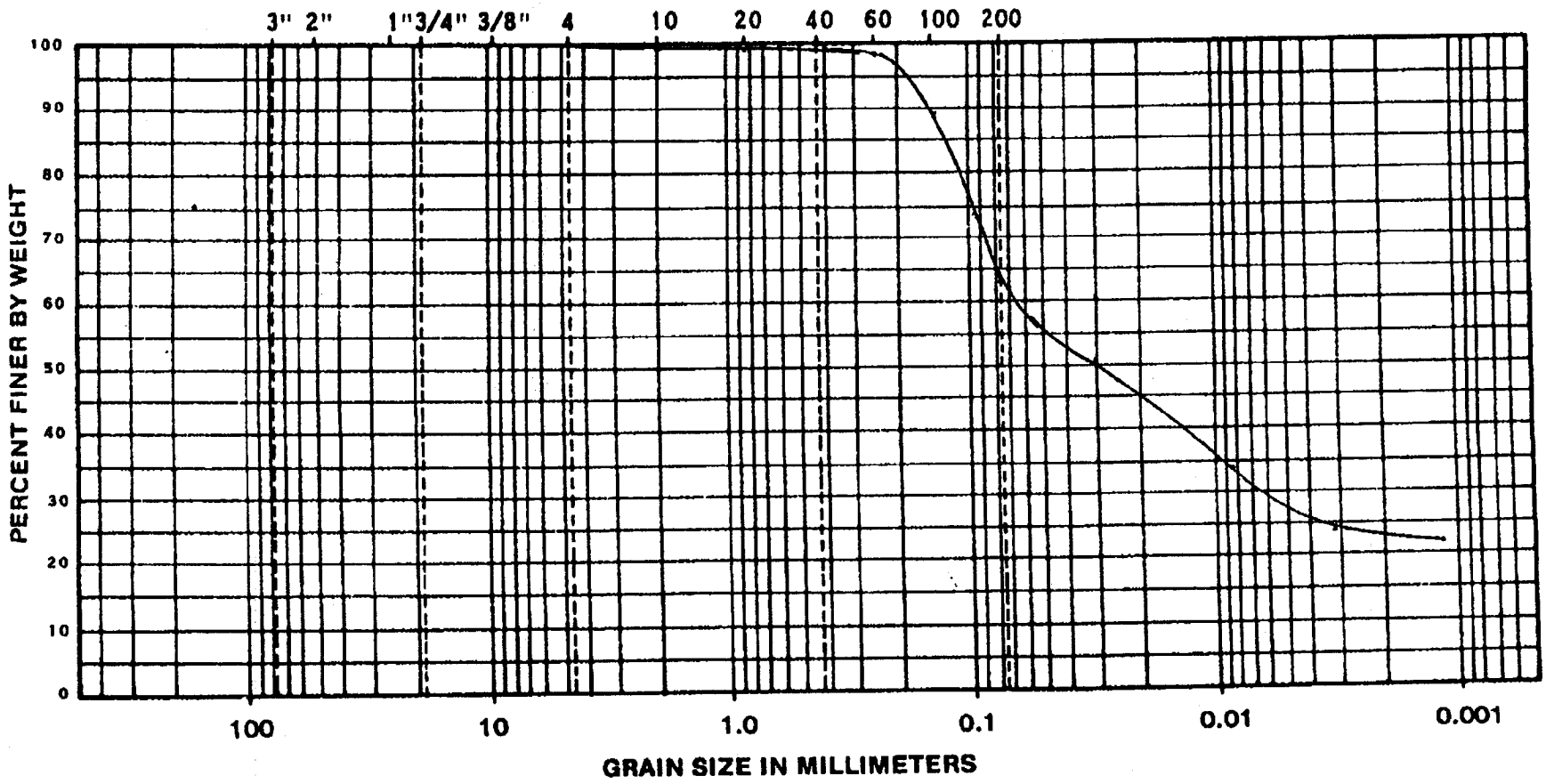
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
WB-1	4 TO 5.5 FEET	16.6%	41	20	21	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

AF 36

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

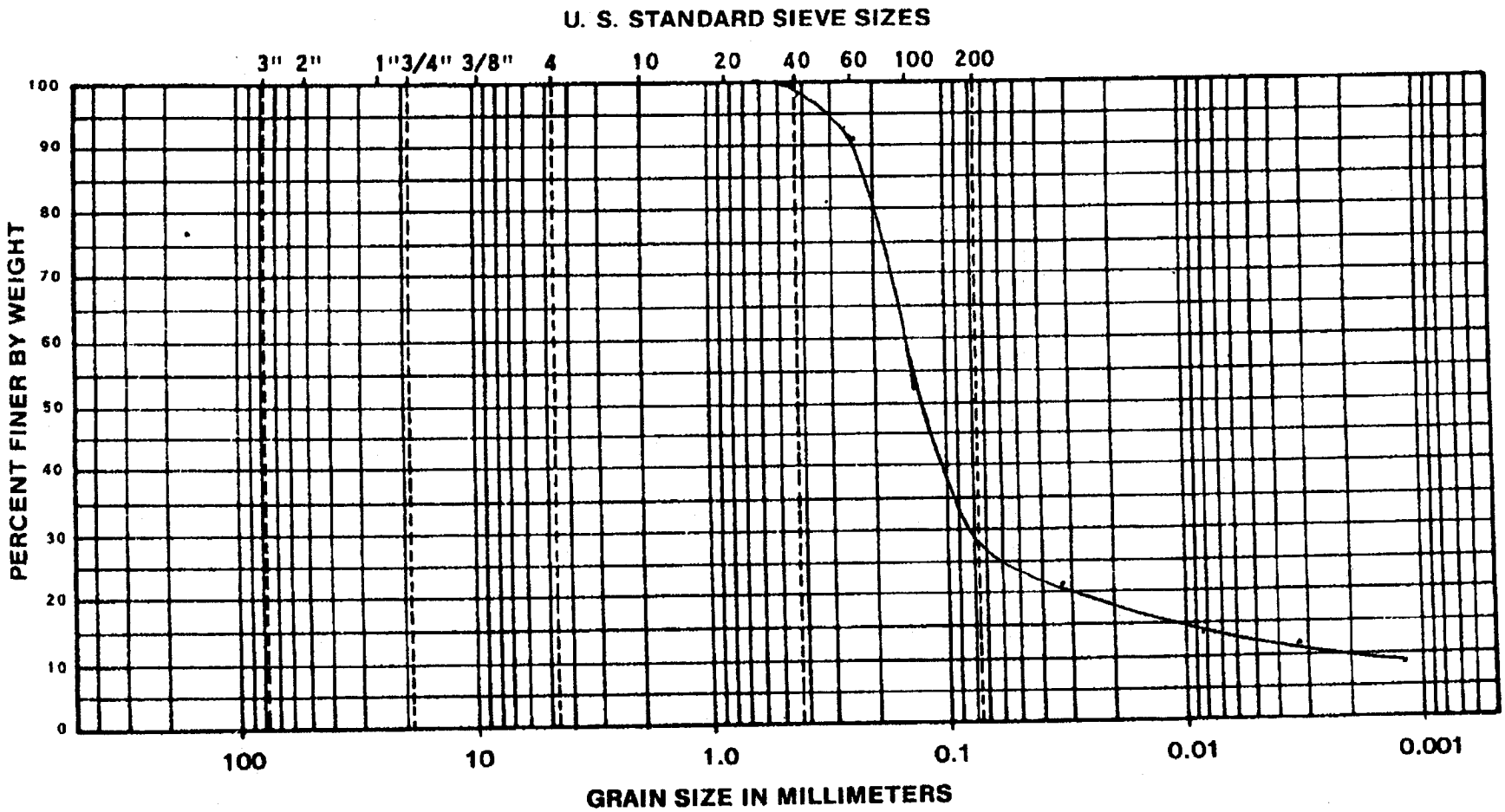
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
WB-1	19 TO 20.5 FEET	19.1%	27	17	10	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

AF 3b

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



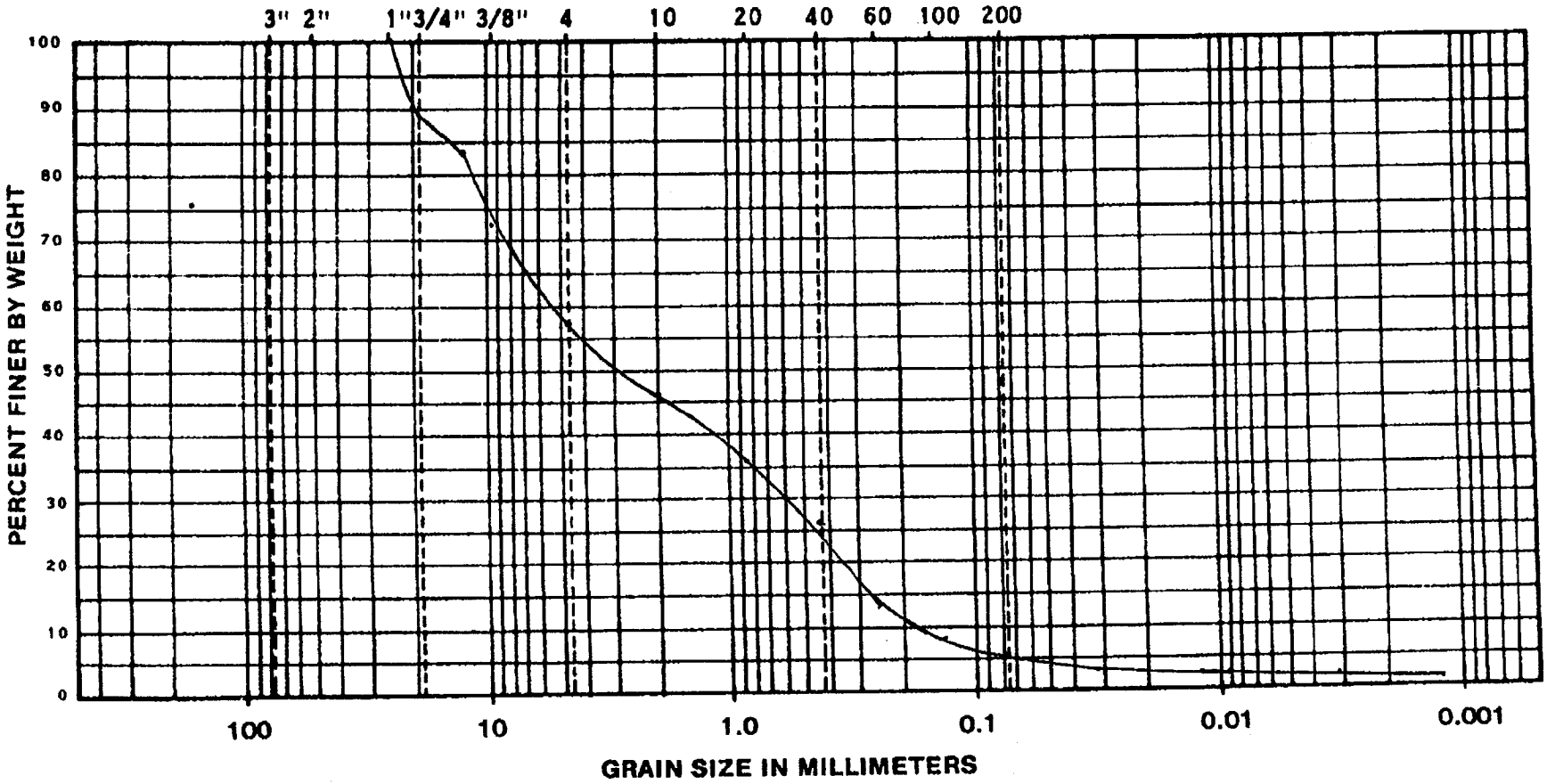
Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
WB-1	34 TO 35.5 FEET	26.3%	23	20	3	SM - SILTY SANDS, SANDY-SILT MIXTURE
JOB NO. K-88195						

AF 3.

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



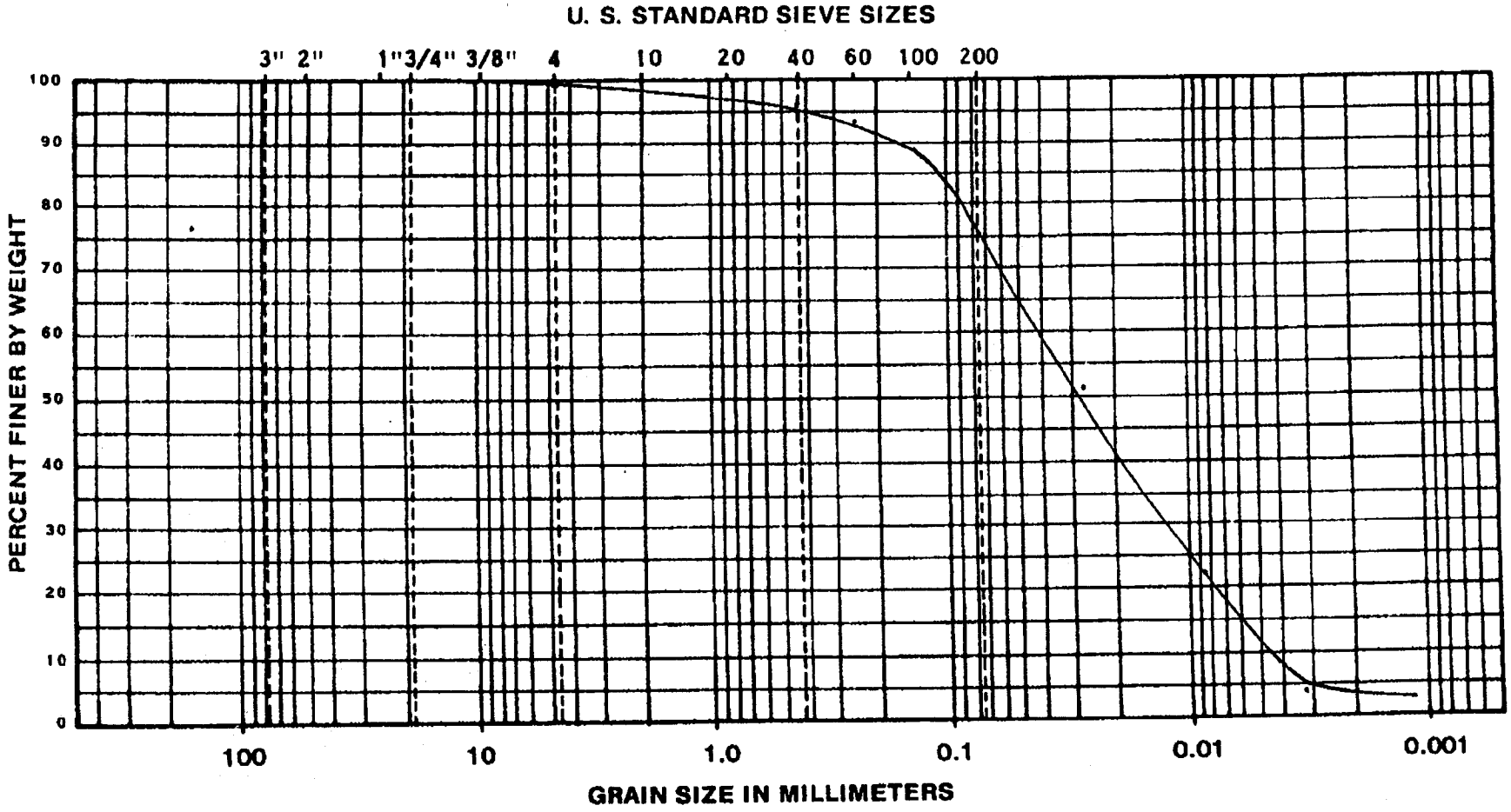
Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
WB-1	44 TO 45.5 FEET	10.3%	NON-PLASTIC			SP-SM - POORLY GRADED SANDS TO SILTY SANDS
JOB NO. K-88195						

AF 36

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

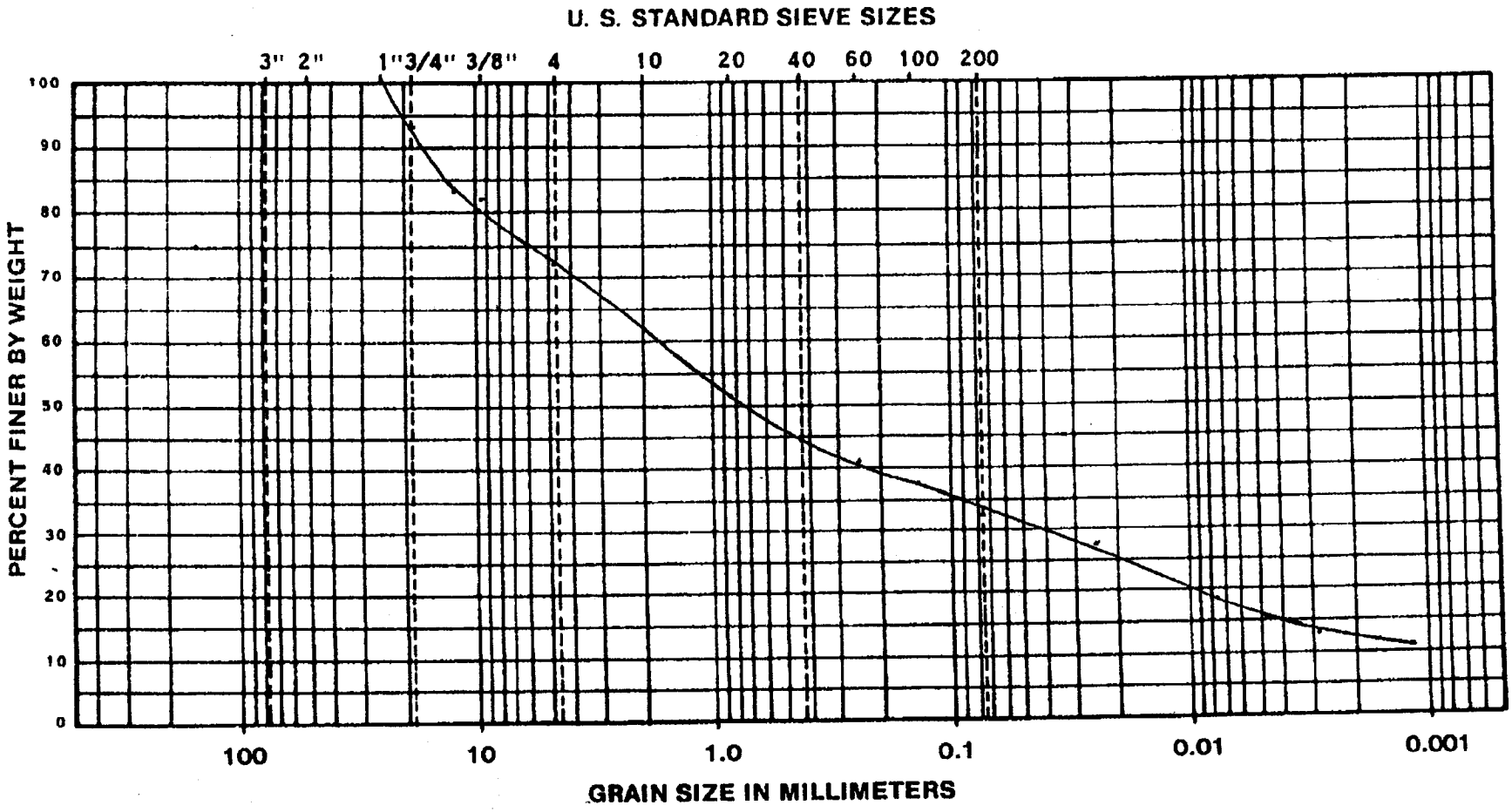
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-9A	9 TO 10.5 FEET	23.5%	NON-PLASTIC SOIL			ML - INORGANIC SILTS AND FINE SANDS

JOB NO. K-88195

AF 36

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



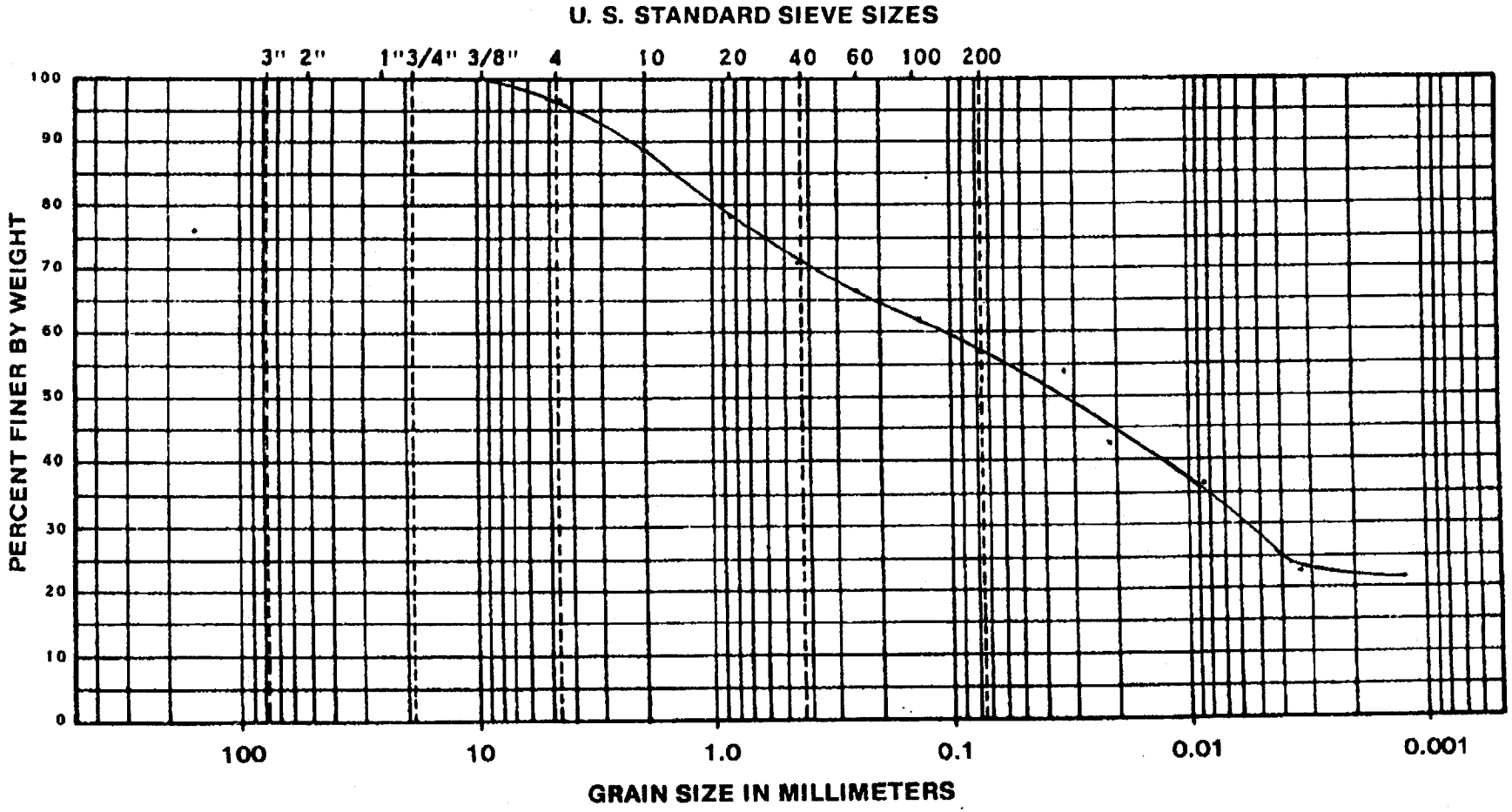
Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-10B	4.0 TO 5.5 FEET	11.4%				SAMPLE NOT LARGE ENOUGH TO PERFORM PLASTICITY TESTS
JOB NO. K-88195						

AF 96

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-10B	14 TO 15.5 FEET	24.8%	38	24	14	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY
JOB NO. K-88195						

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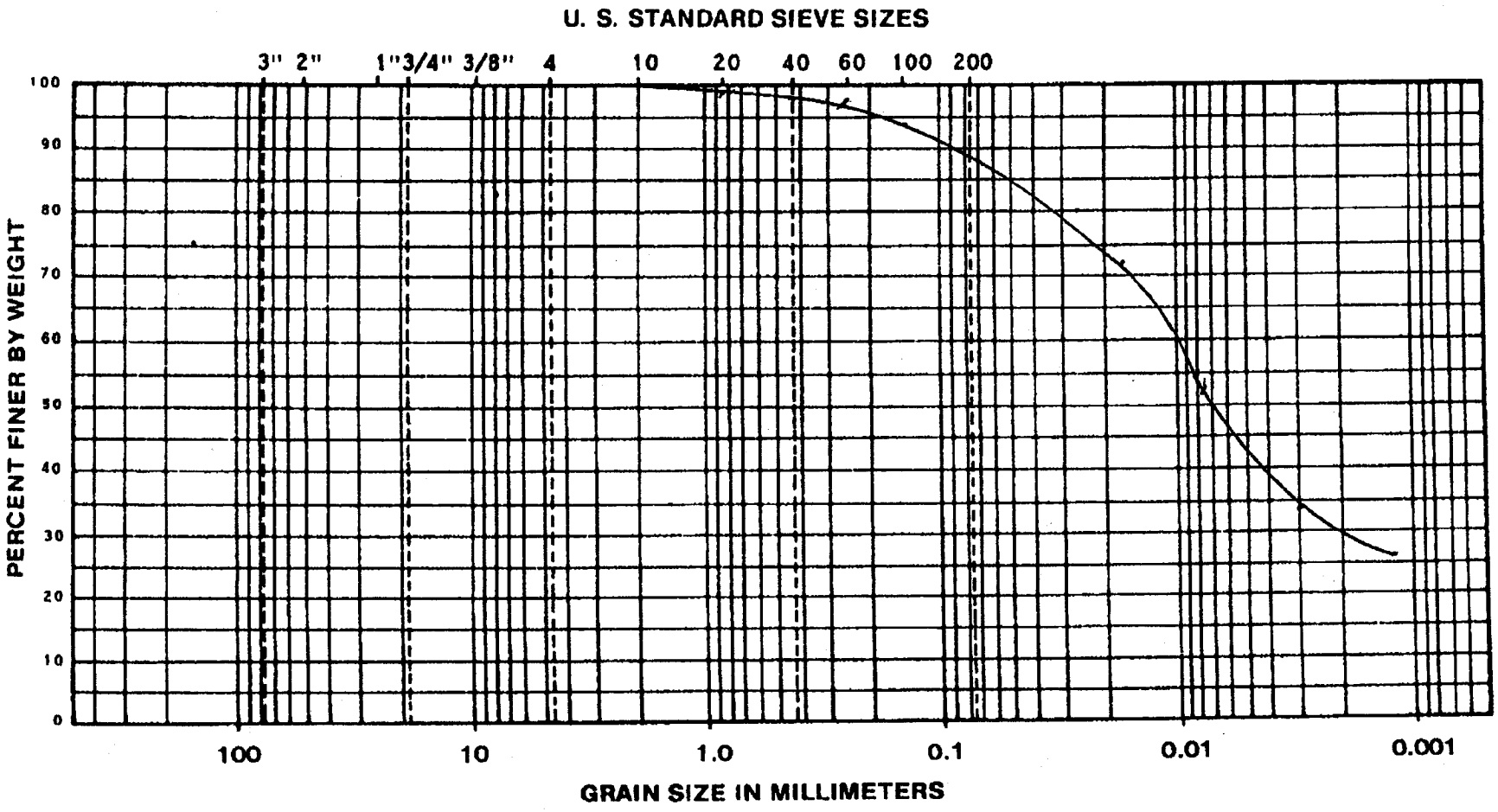
BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

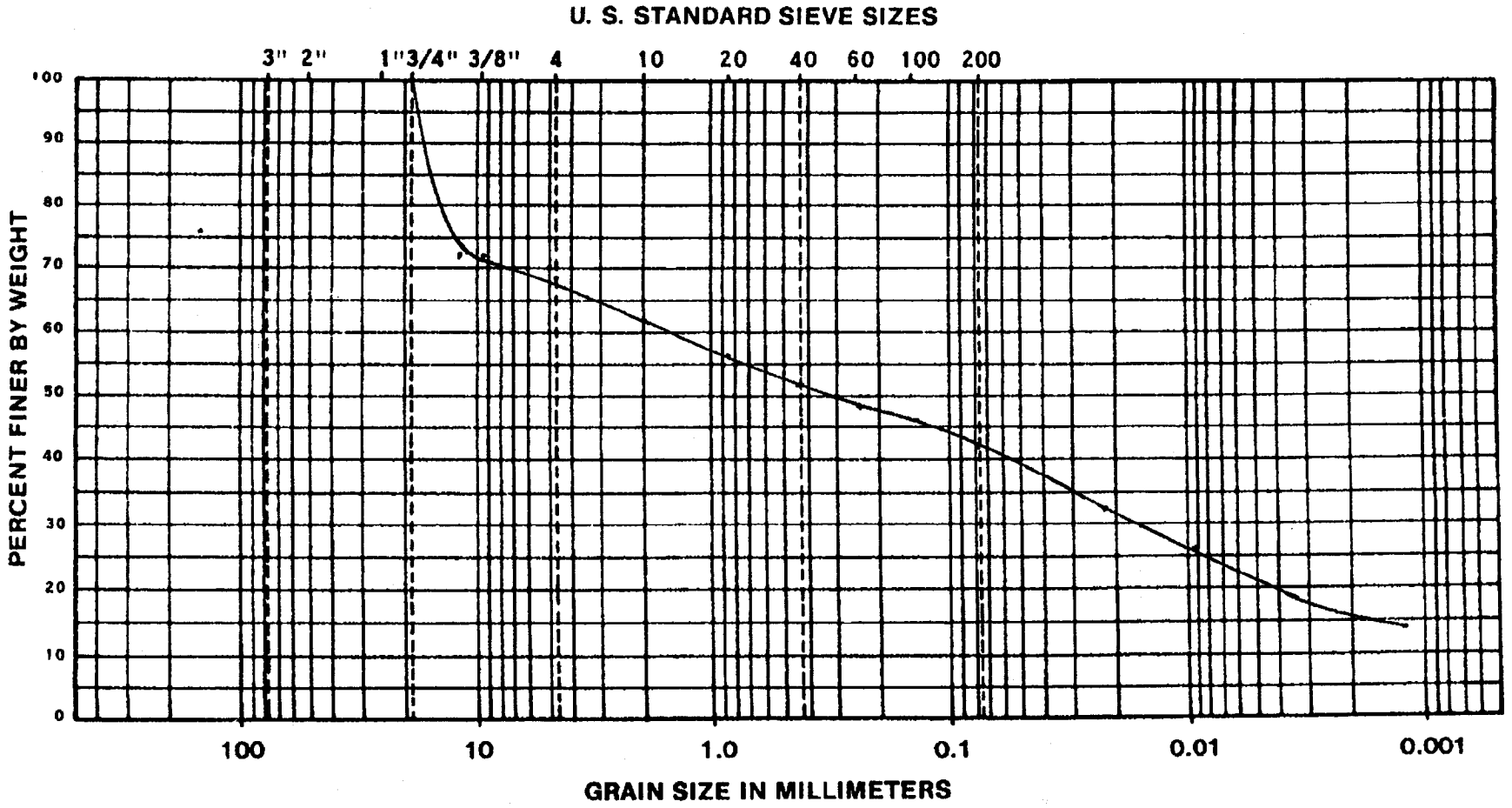
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-11B	4 TO 5.5 FEET	12.5%	37	23	14	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

AF 36

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

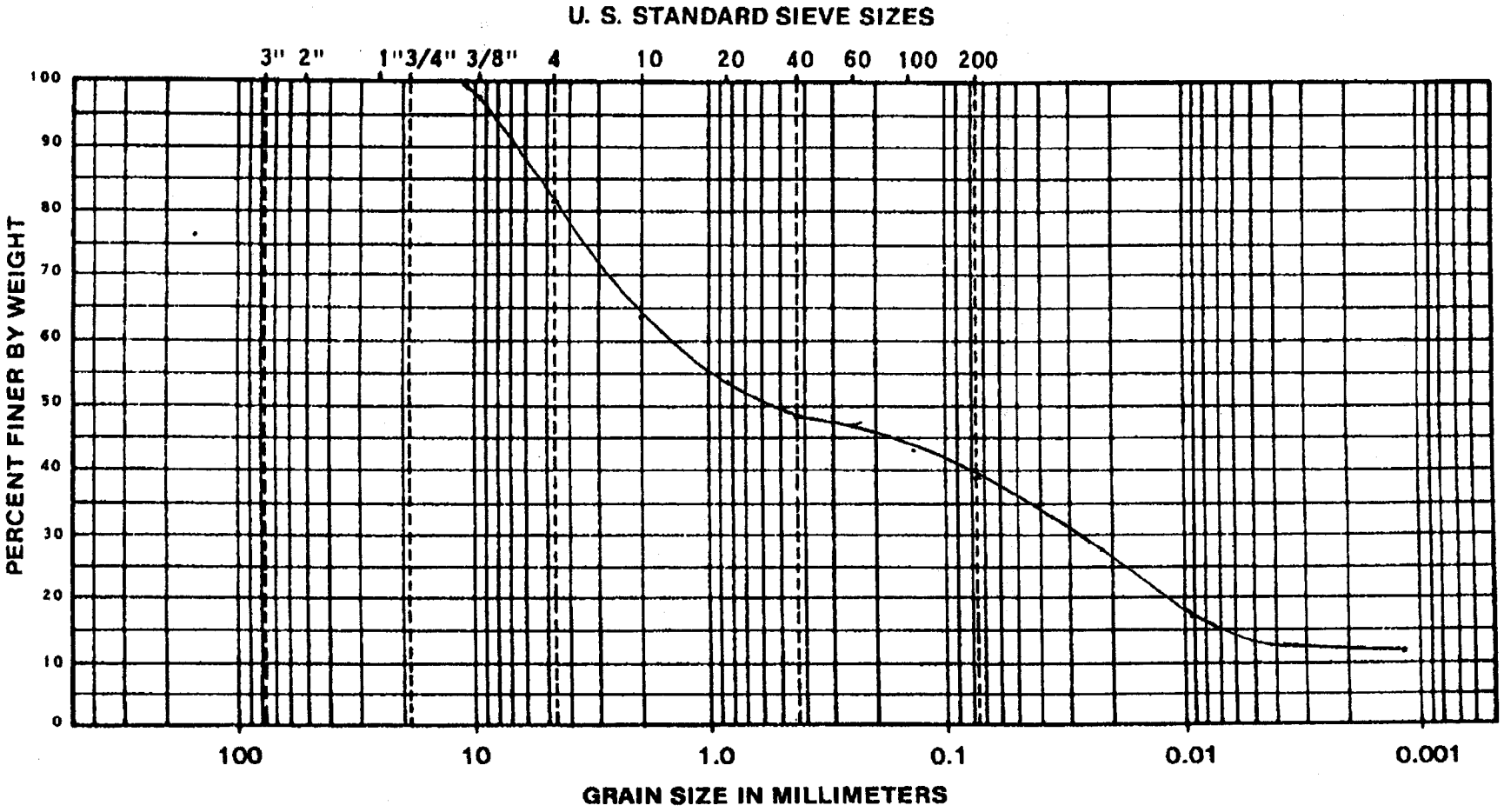
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-12A	14 TO 15.5 FEET	21.3%	36	21	15	GC - CLAYEY GRAVELS, GRAVEL - SAND-CLAY MIXTURE

JOB NO. K-88195

AF 36

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



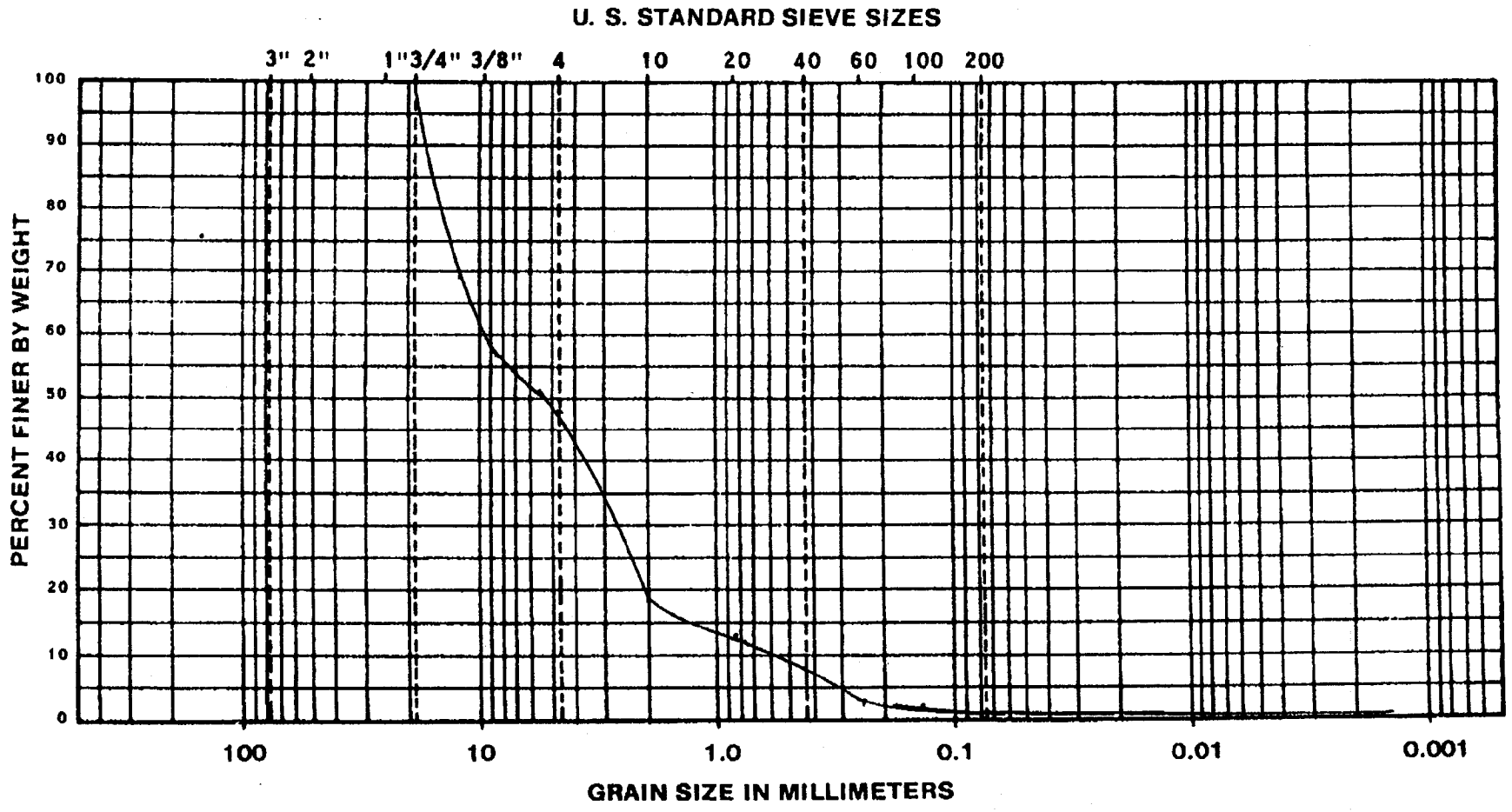
Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-12A	24 TO 25.5 FEET	13.4%	30	20	10	SC - CLAYEY SANDS, SANDY-CLAY MIXTURE
JOB NO. K-88195						

AF 36

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

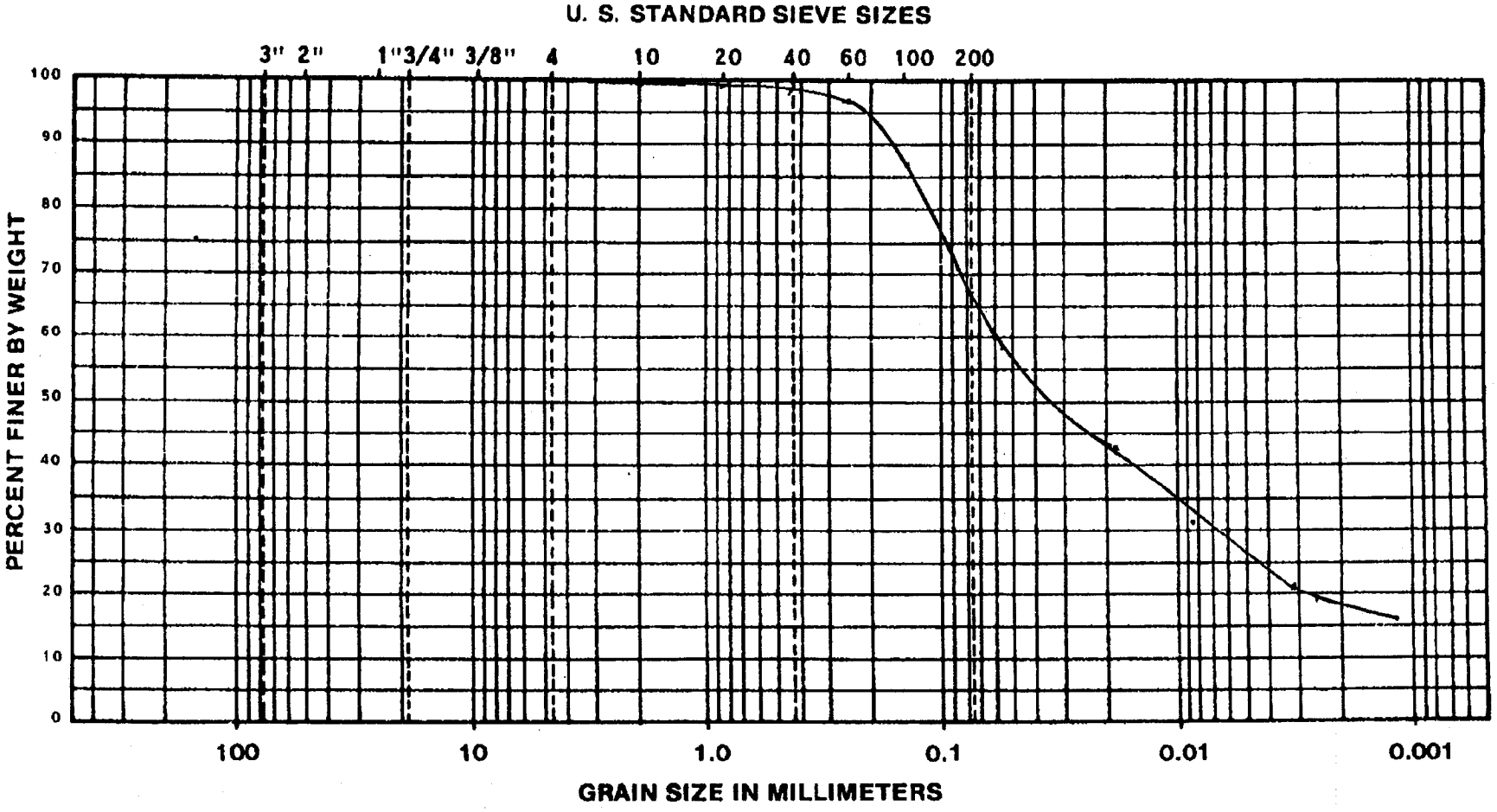


Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-13 A	49 TO 50.5 FEET	17.2%	NON-PLASTIC			GW - WELL GRADED GRAVEL, GRAVEL SAND MIXTURES, LITTLE TO NO FINES
JOB NO. K-88195						

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

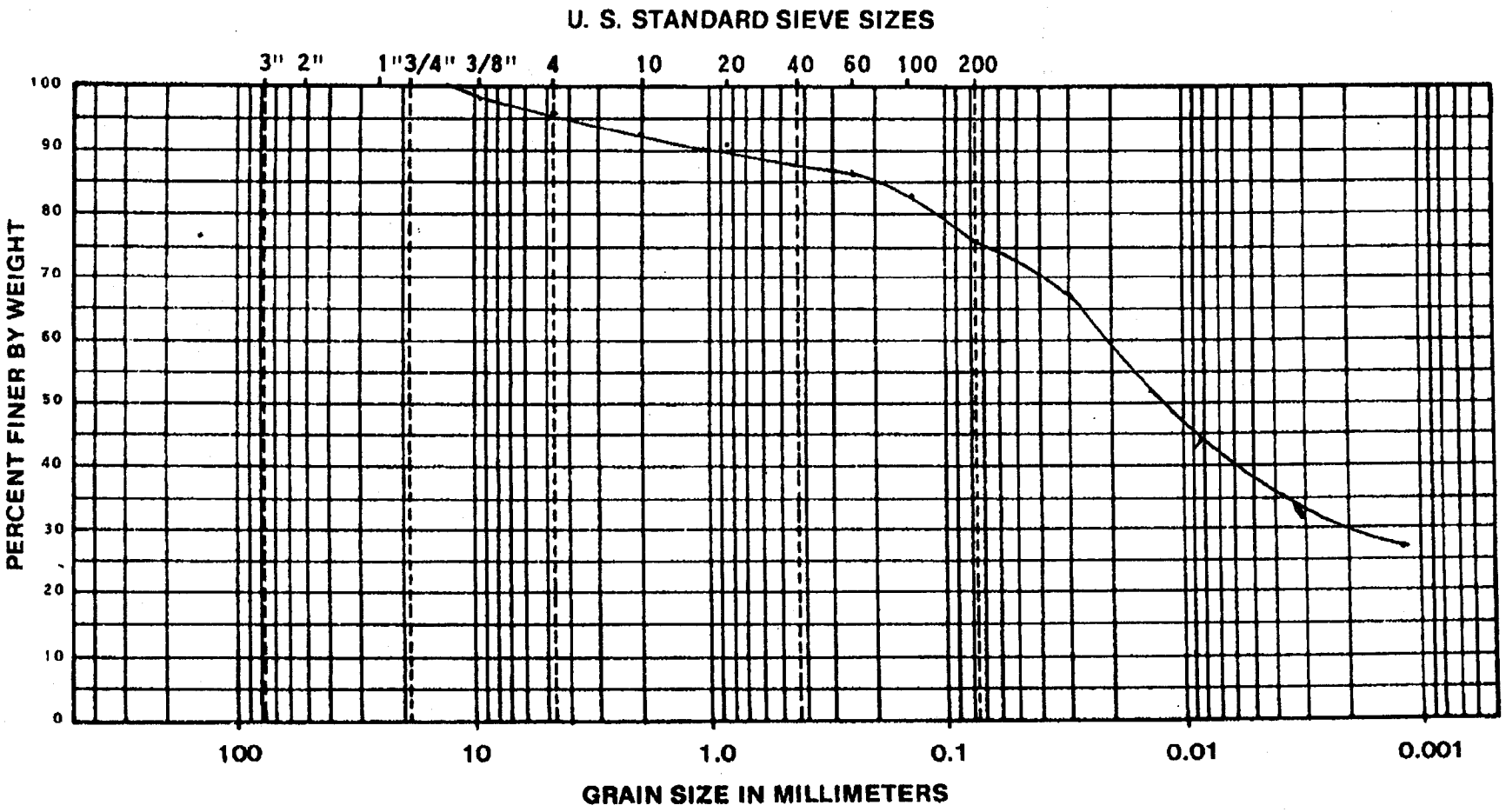
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-13 A	54 TO 55.5 FEET	29.3%	27	17	10	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

AF 36

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-14	9 TO 10.5 FEET	17.8%	28	14	14	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

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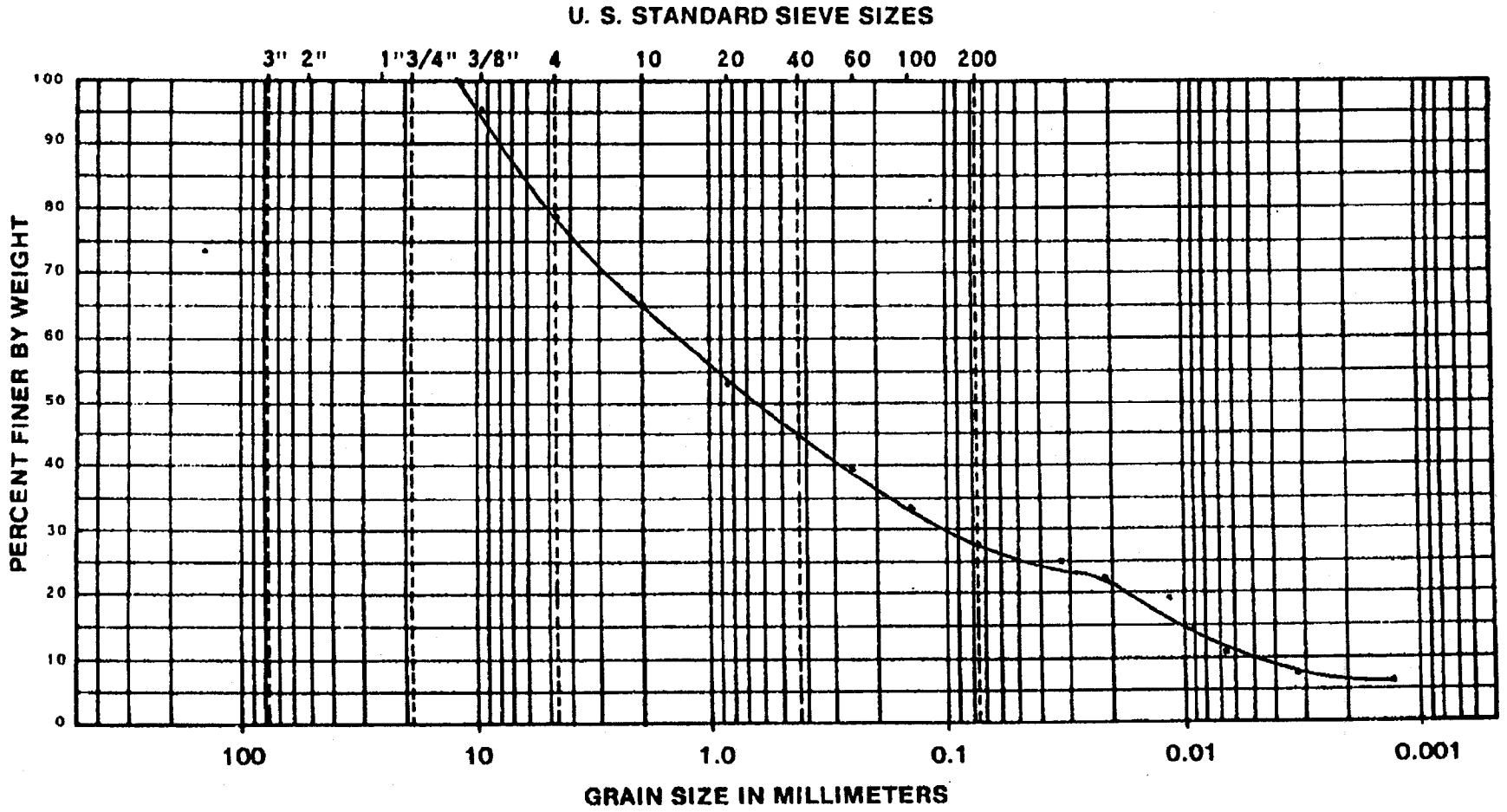
BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

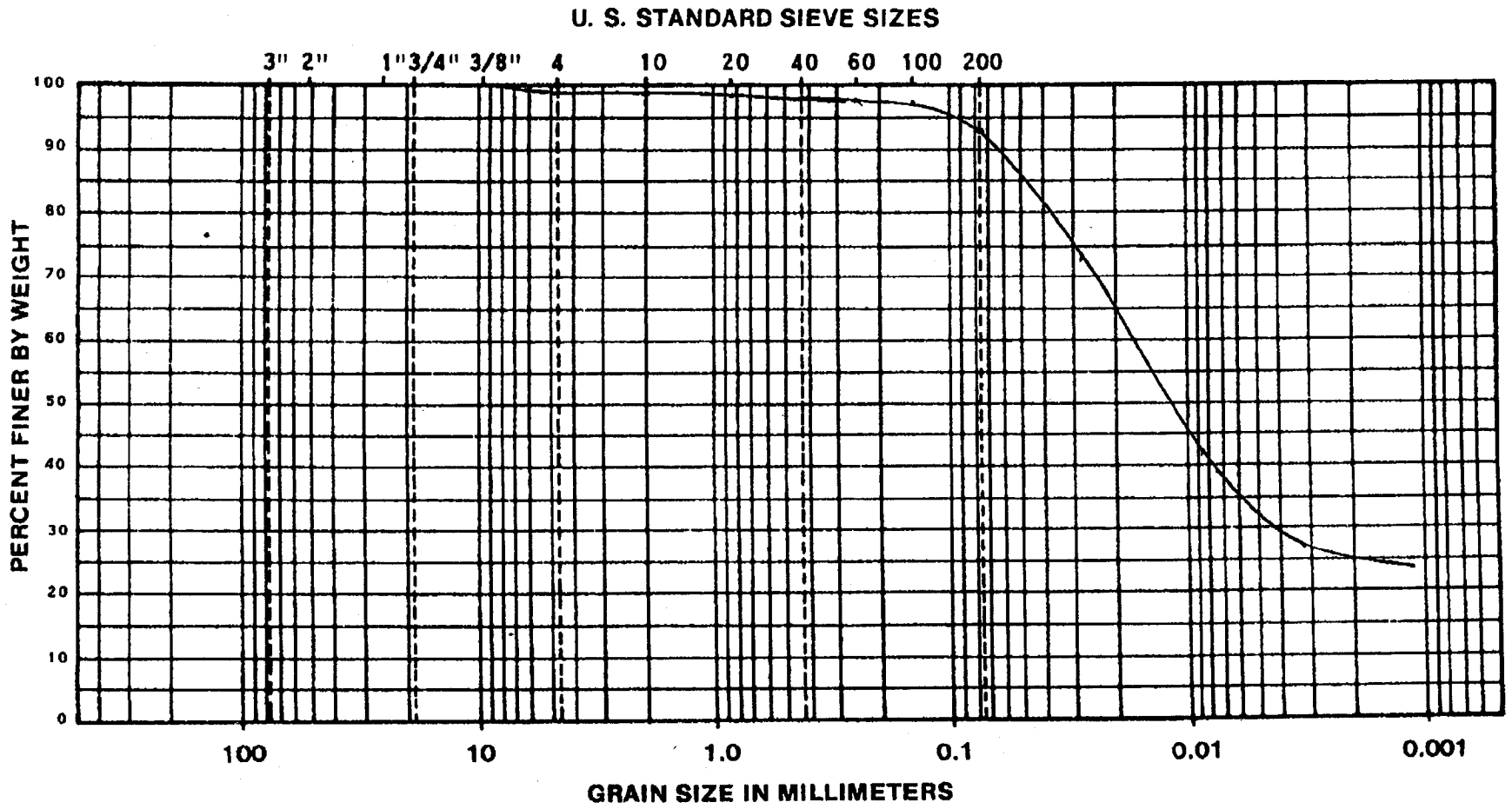
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-14	11.5 TO 13.0 FEET	25.1%	NON-PLASTIC			SM - SILTY SANDS, SAND-SILT MIXTURE

JOB NO. K-88195

AF 36

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

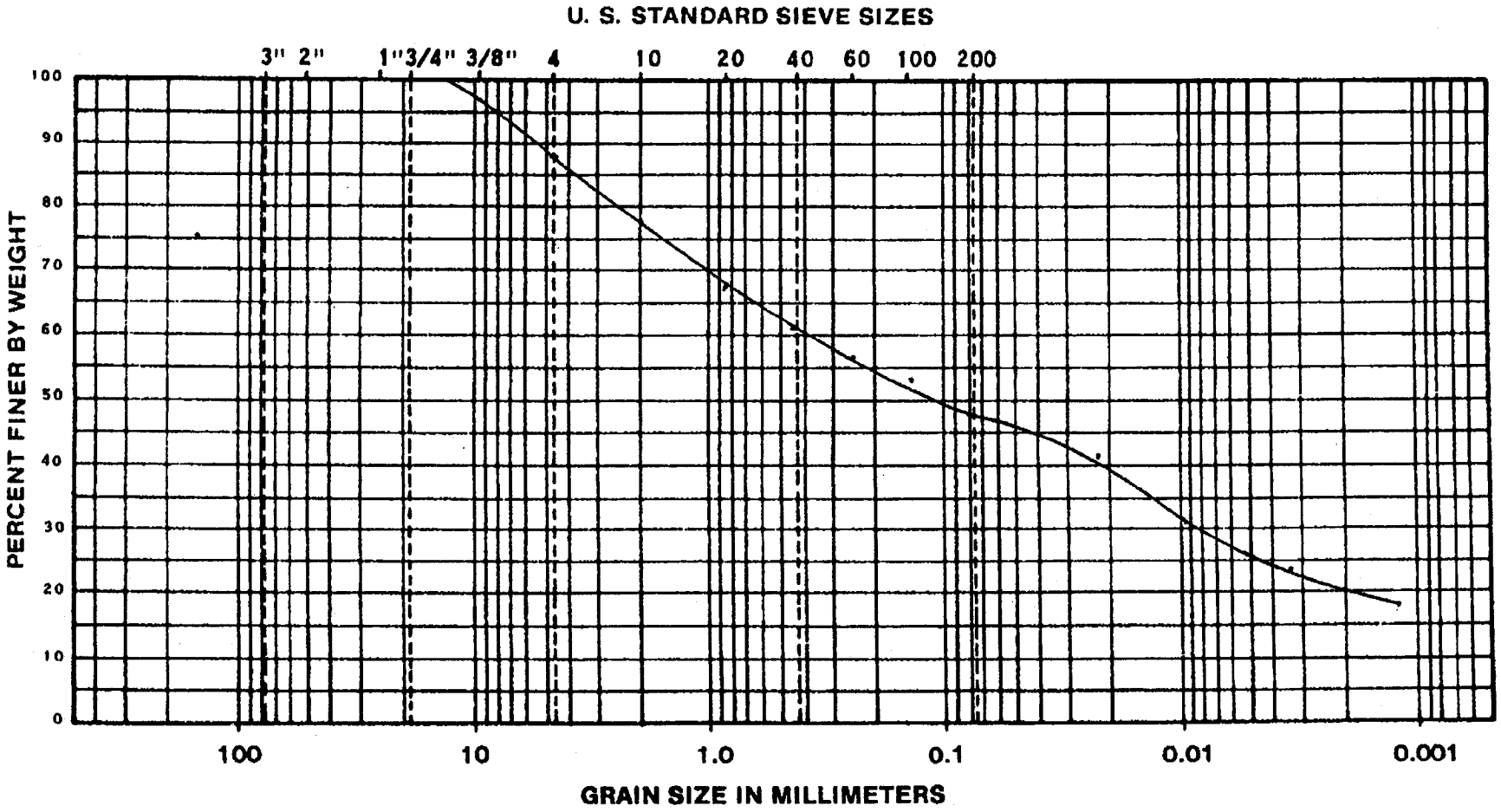
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-14	29 TO 30.5 FEET	22.8%	30	19	11	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

AF 3

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

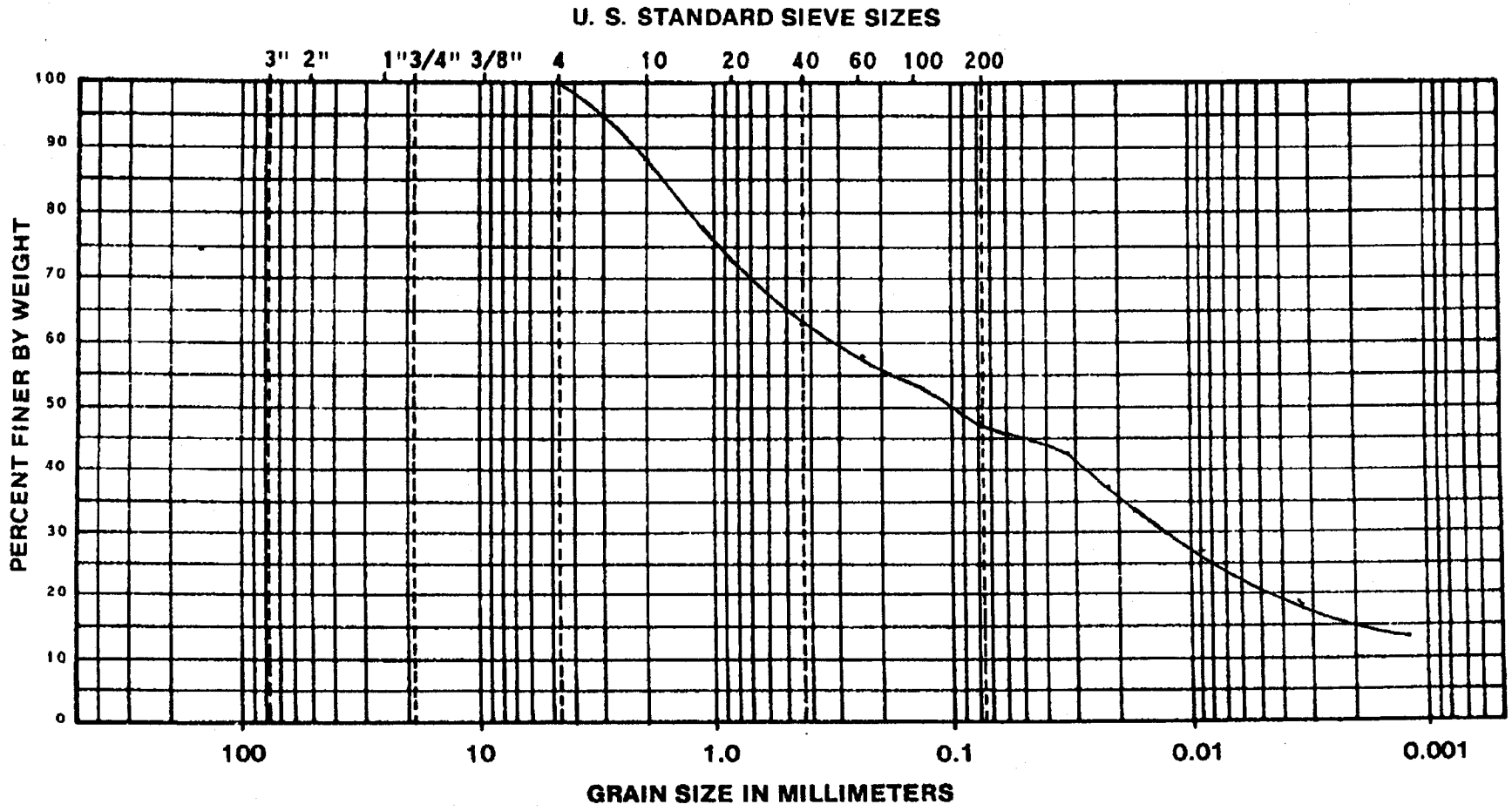
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-15	4.0 TO 5.5 FEET	16.2%	29	17	12	SC - CLAYEY SANDS, SANDY-CLAY MIXTURE

JOB NO. K-88195

AF 3(

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

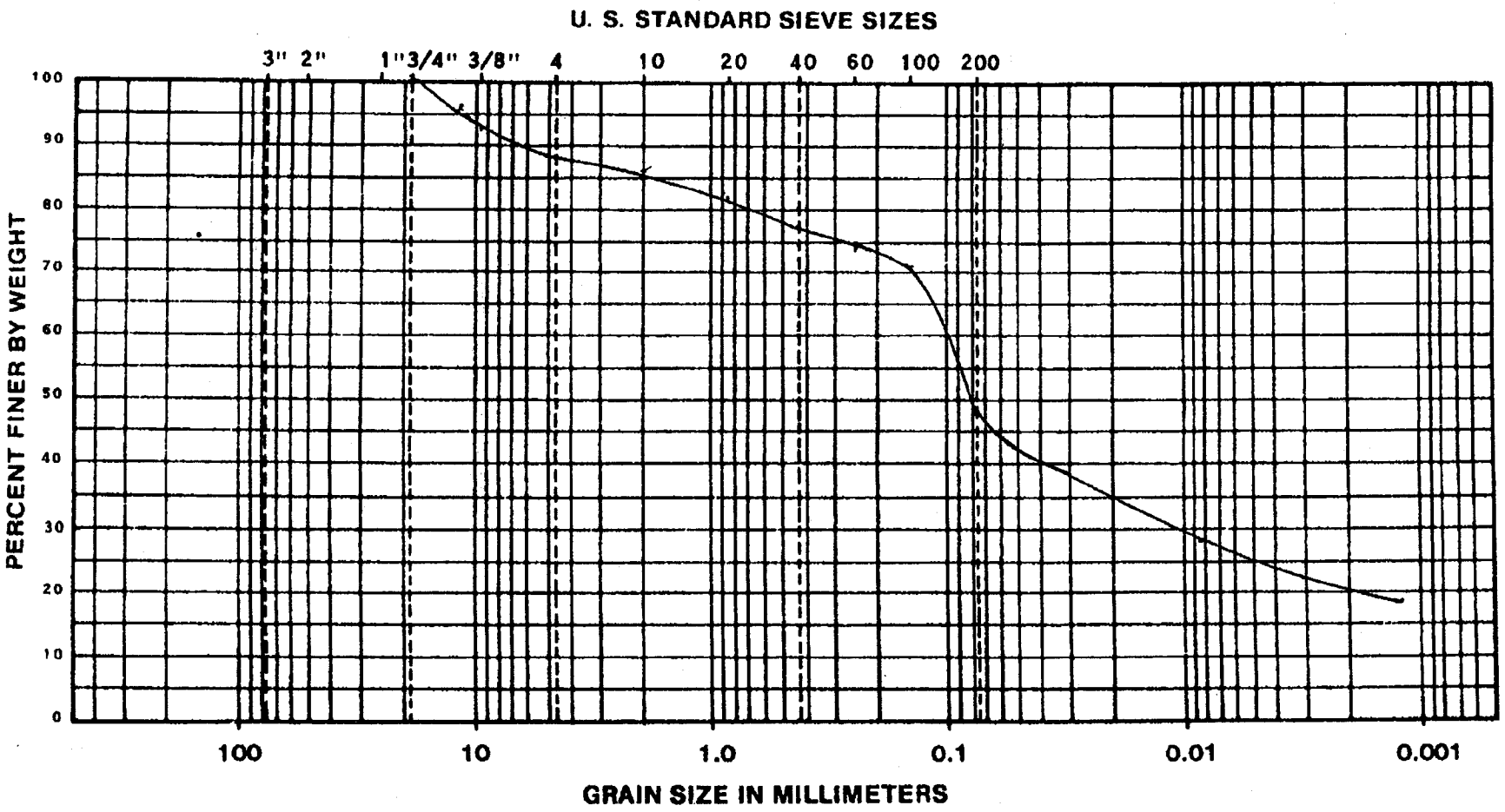
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-15	9 TO 10.5 FEET	12.3%	33	22	11	SC - CLAYEY SANDS, SANDY-CLAY MIXTURE

JOB NO. K-88195

AF 3

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



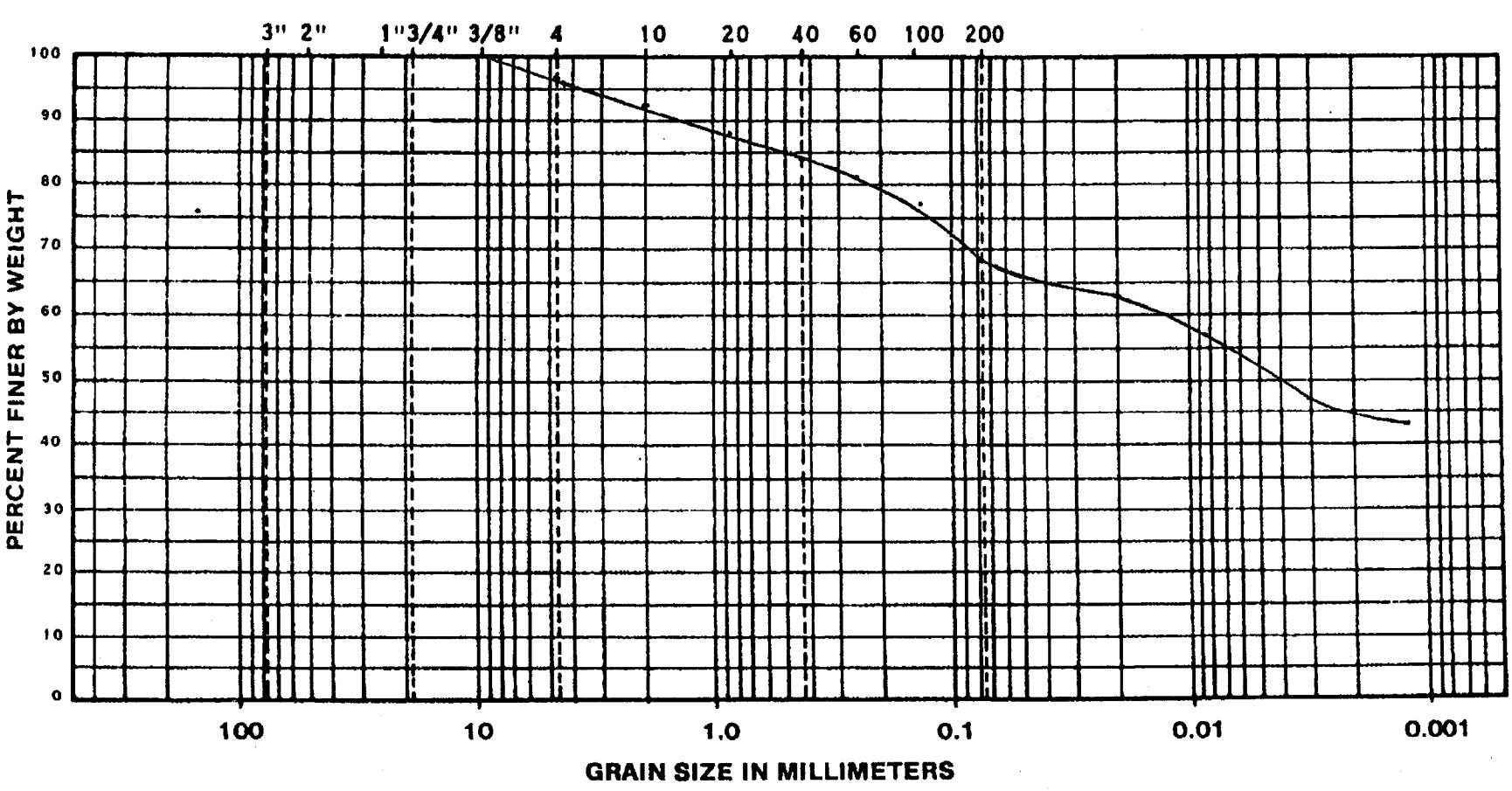
Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-16A	19 TO 20.5 FEET	29.6%	28	17	11	SC - CLAYEY SAND, SANDY CLAY MIXTURE
JOB NO. K-88195						

AF 36

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-16A	9 TO 10.5 FEET	21.8%	45	20	25	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

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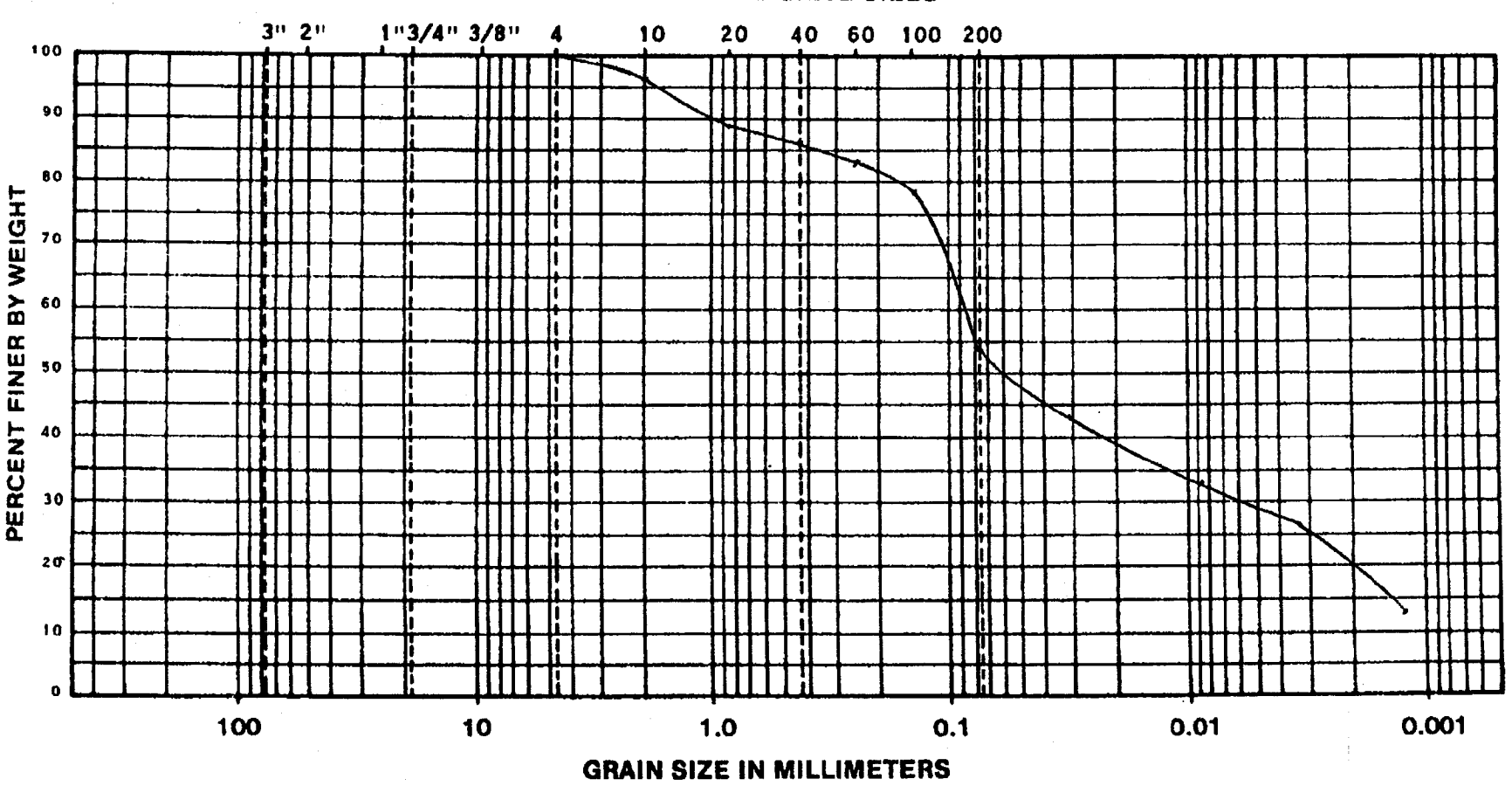
BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

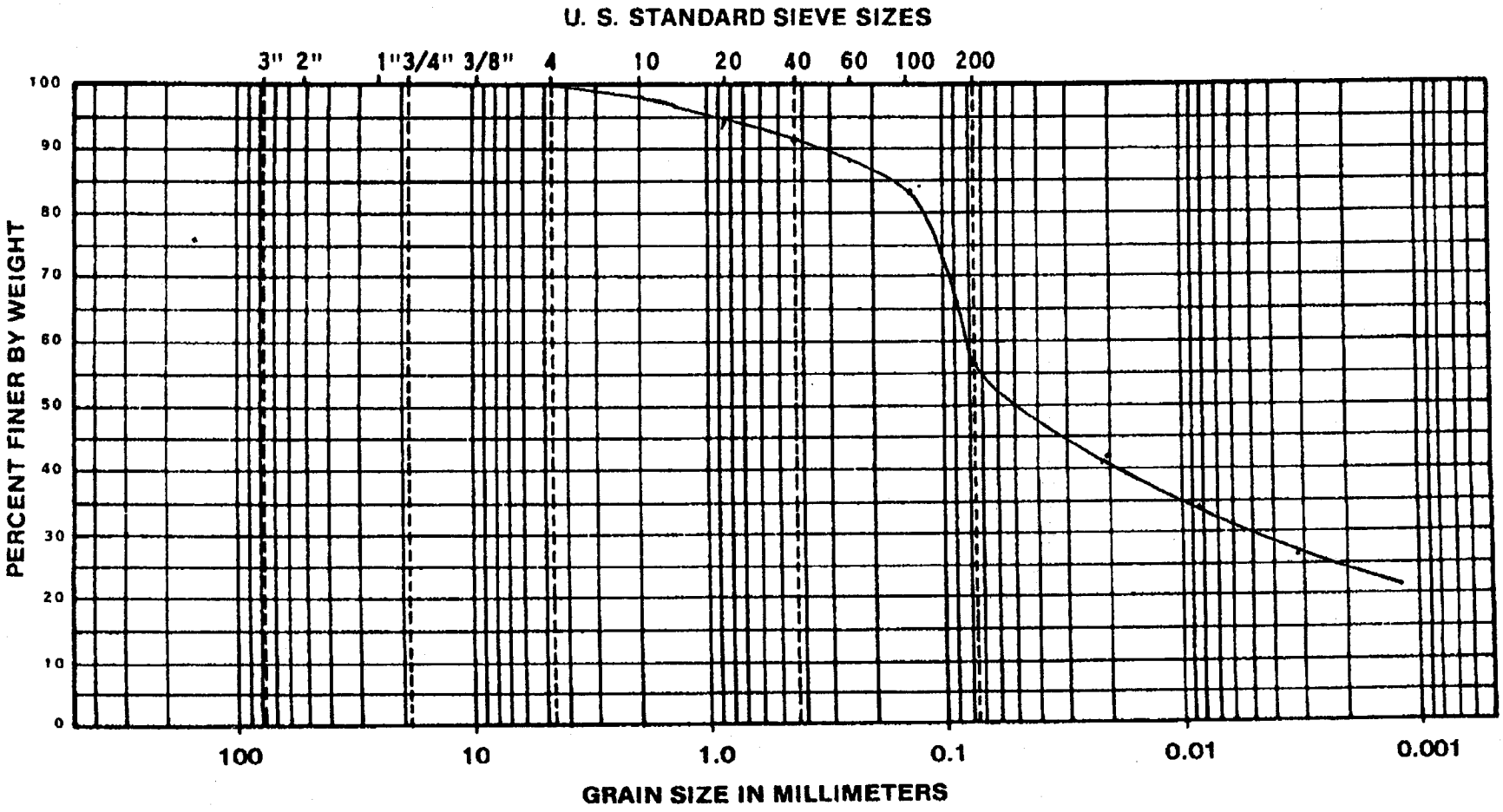
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-16A	39 TO 40.5 FEET	47.8%	29	13	16	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

AF 3

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

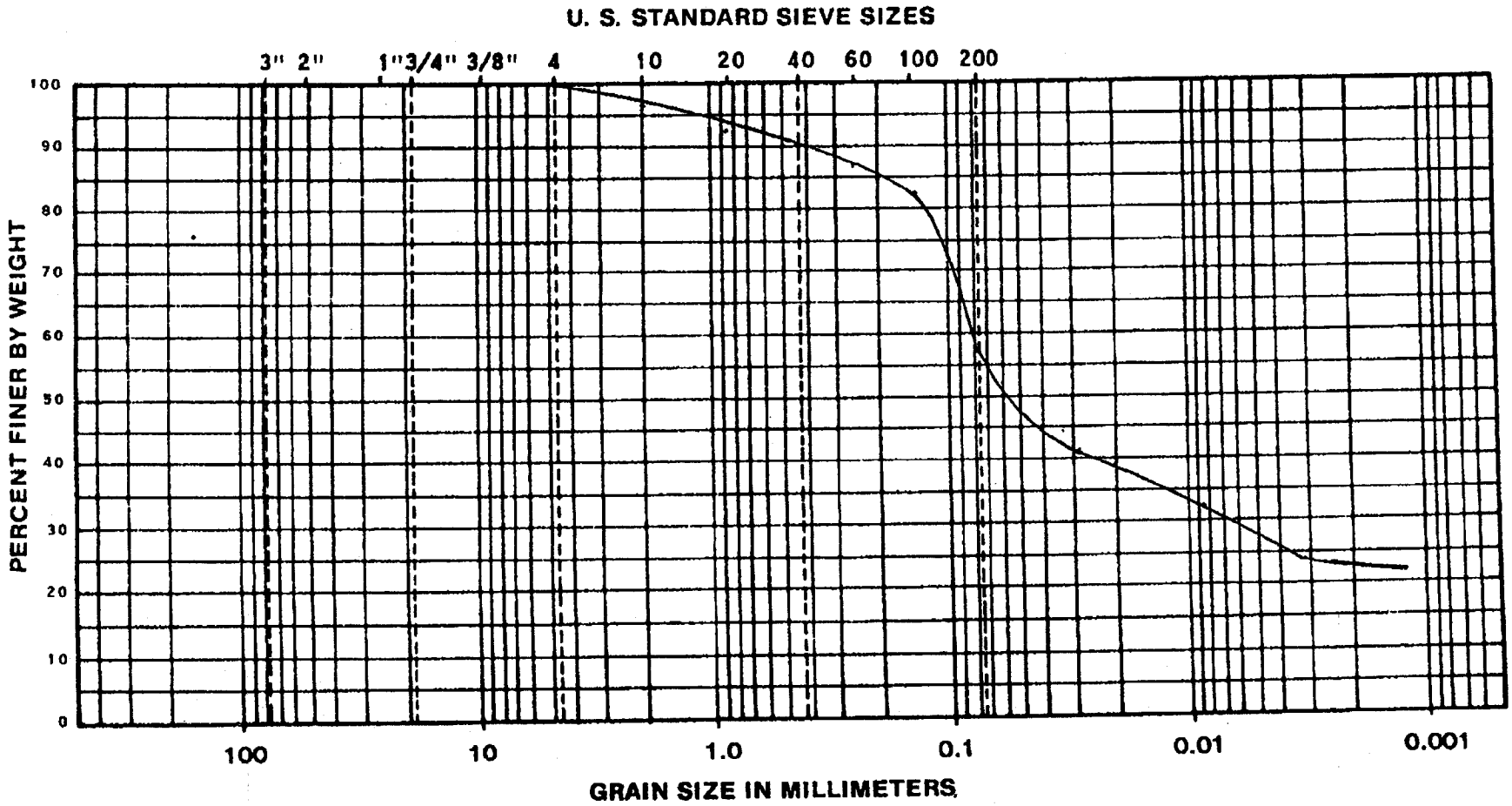
Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-16A	44.0 TO 45.5 FEET	60.0%	26	16	10	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. K-88195

AF 364

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering Testing Company

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
J-16A	54.0 TO 55.5 FEET	50.5%	26	16	10	CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY

JOB NO. J-88195