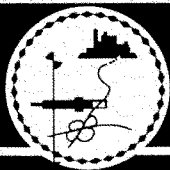


**PRELIMINARY GEOTECHNICAL
STUDY
MEADOWVILLE TECHNOLOGY
PARK - HEAVY INDUSTRIAL
PARCELS
CHESTERFIELD COUNTY, VIRGINIA**

Prepared for: Chesterfield County Department of Economic Development
Chesterfield, Virginia

October 6, 1997



TIMMONS

Founded
1953

**Engineers • Architects • Surveyors • Planners • Landscape Architects
Environmental Scientists • Geographic Information Systems Consultants • Construction Managers
711 N. Courthouse Road • Richmond, Va. 23236-4099**

**PRELIMINARY GEOTECHNICAL STUDY
MEADOWVILLE TECHNOLOGY PARK - HEAVY INDUSTRIAL
PARCELS
CHESTERFIELD COUNTY, VIRGINIA**

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PRELIMINARY GEOTECHNICAL STUDY MEADOWVILLE TECHNOLOGY PARK - HEAVY INDUSTRIAL PARCELS CHESTERFIELD COUNTY, VIRGINIA

1.0 Project Introduction and Scope of Work:

TIMMONS has completed the preliminary geotechnical study for the referenced project site. The purposes of this study were to develop professional opinions regarding conditions of the two (2) potential industry parcels on the site, provide preliminary recommendations regarding earthwork, and provide basic information regarding foundation designs with respect to deep foundations, vibration sensitive structures, and groundwater impacts. Our preliminary findings and recommendations are based on a limited test boring exploration program, limited site reconnaissance, laboratory test data, and engineering analysis.

We understand that the proposed heavy industrial buildings are anticipated to house vibration sensitive processes. Deep foundations, as suggested in the initial report prepared by Atlantic Geotechnical Services, Inc., were the system of support estimated to be necessary for this type of structure. Specific details regarding loads anticipated on individual columns and walls, as well as site grading, were not available to us at the time this report was prepared. Assumptions were made regarding the loadings which are consistent with these types of structures (masonry, steel, concrete).

2.0 General Summary of Site Conditions:

Underlying approximately six (6) inches of topsoil at all locations, the properties in question consists of primarily two (2) basic soil stratum; 1) sandy clays with traces of gravel and mica, and low to moderate plasticity occurring at various elevations, and 2) silty and clayey sands with traces of gravel and mica occurring at various elevations. Shallow bearing capacity of the soil appears to be generally favorable, with an estimated unconfined compressive strength of approximately 3.5 tons per square foot (tsf). In general, the water table lessens the bearing capacity at approximately 25 to 30 feet, however, a greater bearing capacity is achieved at the terminal depth of 40 feet.

Analyzing the field and laboratory data indicates that the site conditions are favorable for the proposed development. Preliminary results indicate that foundations for these structures will need to extend approximately 40 feet or more into the dense, coarse silty sands and gravels encountered. Most soils encountered should develop enough skin friction to incorporate in all foundation calculations. Further investigation and testing should be performed to determine the extent of its involvement.

3.0 History and Existing Site Conditions:

The proposed industrial parcels are located to the north of Bermuda Hundred Road (State Route 697), to the east of Interstate 295, to the west of Enon Church Road (State Route 746), and south of the James River, encompassing approximately 595 acres. Access to the sites is off of Meadowville Road, which divides the 595 acres into the two (2) distinct parcels that are the focus of this study. The approximate site location (in Chesterfield County, Virginia) is shown on the Site Vicinity Map in the Appendix of this study.

The site is geologically located in the Atlantic Coastal Plain Physiographic Province. According to available geologic literature and conditions encountered in the field, the site was determined to be underlain by marine, marginal marine, and fluvial deposits. Specifically, Bacons Castle Formation, the Chesapeake Group, the Potomac Formation and Alluvial Deposits are all located across this property. Most consist of sands, gravels, silts, and clays in varying amounts and are colored in hues consistent with riverine basin geology. These soils were deposited by the action of the James River, as well as ancient ocean tidal movement. (Geologic Map of Virginia - expanded explanation - 1993)

Existing conditions of the site show the site to be generally wooded, covered with deciduous trees and pines, briar and brush. Several cleared fields were encountered, mostly used for agricultural purposes. Also, Johnson Creek traverses the middle of the site and flows south. Existing grades appear to range from a high at the western side of the site near the proposed cloverleaf on I-295 and Meadowville Road, (high elevation of approximately 115.0) and gradually sloping downwards in a northerly direction to a low (elevation approximately 10.0) at the James River. Surface drainage appears to be fair to poor with several wetlands already located. Existing elevations were estimated by our engineer in the field using the site plan produced by TIMMONS.

As stated earlier, these industrial sites are being developed for heavy manufacturing utilizing vibration sensitive processes. There are a few vibration producing sources located in the general area, such as Richmond International Airport (approximately 12 miles to the north), Interstate 295 (adjacent to the property), and a minor geologic fault (approximately 2 miles to the west). The fault, while deep and not large enough for recognizable earthquake action, may produce geologic vibration that will need to be taken into consideration in the design stage.

4.0 Field Exploration and Testing Program:

Drilling and soil sampling were conducted in accordance with the procedures generally recognized and accepted as standardized methods of investigation of subsurface conditions related to earthwork and foundation engineering projects. Representative soil samples were obtained by means of the split-barrel sampling procedures in general accordance with ASTM D-1586, utilizing continuous flight, hollow stem augers.

Eight (8) test borings were drilled at the locations shown on the boring location diagram included in the Appendix. Borings were extended below existing elevations to depths of 40 feet. Also, four (4) locations (specifically B-1, B-4, B-5, and B-7) were developed into groundwater monitoring wells by installing PVC screen and filter sand. These borings and wells, although limited in number, were located in such a way to investigate the site as completely as possible. The drilling of the test borings was subcontracted to Ayers and Ayers of Powhatan, Virginia, and continuously monitored in the field by a member of our technical staff. Upon completion of the investigation, the holes remained open to check applicable ground water elevations and cave-in depths. Detailed visual soil descriptions are shown by the test boring logs in the Appendix.

Upon completion of the exploration, all SPT jar and bulk samples obtained were transported to our laboratory and visually classified. Four (4) large bulk samples were tested for their moisture - density relationship (Standard Proctor). Grain-size analysis, Atterberg limits tests, and natural moisture contents were all checked on various jar samples which were estimated to be representative of some of the different soil types encountered on-site.

5.0 Subsoil and Groundwater Conditions:

The site was almost completely covered by six (6) inches of topsoil and organically contaminated soil. Underlying these surficial strata, the site is generally comprised of two (2) basic soil stratifications, which are described as follows:

5.1 Stratum I

Encountered at varying depths at all test locations, this stratum consists mainly of brown and gray sandy clays (CL-CH) with traces of gravel and mica. Plasticity of this stratum can be described as low to moderate, and the stratum is generally moist to wet, depending on the depth at which it was encountered. Material conditions can be described as soft to hard, with an unconfined compressive strength of 1.5 tsf (N values of 4 to 27) at potential deep foundation terminal depths (approximately 25 to 30 feet).

5.2 Stratum II

Also encountered at varying depths at all test locations, this stratum is generally comprised of brown and gray mottled silty sands (SM) with traces of gravel and mica. Plasticity of this stratum can be described as low, and the stratum is generally moist to wet. The material generally contains more and coarser sand and gravel with increased depth, with an estimated unconfined compressive strength of 3.5 tsf (N values of 5 to 81) at potential deep foundation terminal depths (approximately 35 to 40 feet).

Groundwater, commonly termed as "Water Table," was encountered at test locations B-1, B-3, B-4, B-5, B-6, B-7 and B-8 during the subsurface exploration ranging from 14.0 to 36.0 feet below existing surface elevations. As stated earlier, test locations B-1, B-4, B-5, and B-7 were developed into groundwater monitoring wells to determine its effect on deep foundation systems. The wells were constructed using PVC well screen, a filter sand pack, bentonite seal (on permanent wells B-4, B-5, and B-7), and PVC riser pipe. This allows a more thorough analysis of groundwater levels. As of October 1, 1997, minimal change was noticed in the wells from the September 24, 1997 installation date. They are scheduled to be checked every two weeks for fluctuations.

Since water table elevations are influenced by the intensity of precipitation, evaporation and other extraneous conditions, substantial fluctuations can be anticipated, especially during wet seasons.

6.0 Recommendations:

6.1 Site Preparation and Grading -

The following recommendations are made for the satisfactory performance of the earthwork that may be involved to attain the planned grades within the building areas and the paved surface parking areas.

- Areas to support the building slabs and pavements for parking lots shall be completely stripped of trees and vegetation, topsoil, organic contaminated soil, uncontrolled manmade fills, and soft on-site soils. The depth of this excavation is estimated to be approximately eight (8) inches across the entire construction area, except when removing the root mat of mature trees and some low-lying areas, where the depth of excavation may be greater.
- After stripping and excavation of all unsuitable materials, the subgrade should be checked by a soils engineer. This includes checking for proper stripping and preparation for receiving fill, as well as proofrolling. Proofrolling entails passing over stripped areas at least twice with a fully loaded tandem axle dump truck or similar pneumatic tired equipment. All noticeably unstable material should be undercut and replaced with compacted engineered fill.
- The area within the building limits and extending on all sides to a minimum distance of ten (10) feet or depth of fill, whichever is greater, should be prepared by excavation or by placing controlled fill to an elevation 8 inches below the proposed finished floor levels. All footings should be excavated after the building areas have been properly prepared.

- Material satisfactory for controlled fill should include clean sandy soil or bank run sand and gravel (GW, GC, GM, SM) but exclude highly plastic clays (MH, CH).

CL, ML, and SC material may be used subject to the following limitations:

Liquid Limit (%)	< 40
Plasticity Index	< 20
Maximum Dry Density (PCF)	> 105

- The fill materials should be free from topsoil, organic contaminated soil, and rock fragments having major dimensions greater than 3 inches.
- Fill placement should be on horizontal layers, 6 to 8 inches in loose thickness, compacted uniformly with heavy duty equipment.
- Fill required to support the footings, the slabs on grade, and the pavements for surface parking areas should be compacted to dry density of not less than ninety-five percent (95%) of Maximum Dry Density as per ASTM D-698 specifications.
- Moisture contents for fill material should be within twenty percent (20%) of the optimum moisture content value for coarse grained soils, classified as sands and gravels; while it should be restricted to within two (2) percentage points of the optimum moisture content for fine grained soils, classified as silts and clays.
- For proper site preparation assurance, all operations should be performed under the guidance of and to the satisfaction of the "Geotechnical Engineer of Record."

6.2 Foundations-

- Deep Foundations - deep foundations (precast concrete pile or auger cast piles), located in virgin soil are considered adequate for the support of the heavy industrial structures.
- Approximate Depth of Piles - The location of all piles (driving depth) will be governed by ultimate bearing capacities (end bearing and frictional resistance). An estimated internal angle of friction for the soils encountered on-site is approximately 24 degrees, and end bearing capacities of 5,000 psf or more are possible.

- Because of possible variations in subsurface conditions and related bearing capacity, all pile cap excavations and trenches should be inspected and approved by a soils engineer. Water and possibly some loose soil may collect in the footing excavations as a result of surface precipitation and near ground surface seepage.
- Water, loose soil and soil softened by water should be removed from the bottom of the pile cap excavations before placing concrete.
- Pile cap excavations should not be left open for long periods. If the concrete can not be placed due to inclement weather conditions or any other unforeseen circumstances, the bottom of the footing excavations and trenches should be protected by undercutting 3 inches and placing 3 inches of a lean-mix concrete slab (mud-mat) immediately upon approval and before reinforcing steel is placed.
- Backfill around and above the pile caps should satisfy the controlled fill requirements described in the previous section, Site Preparation and Grading.

6.3 Slab On Grade -

The following recommendations are made for the placement of the slab on grade for the industrial buildings.

- Floor slab excavation should be proofrolled and prepared as described under site preparation and grading. Silty clays - clayey silts (LL>40, PI>20), if encountered at or below the subgrade elevations of the slab on grade, should be excavated to a minimum depth of 3 feet and replaced with approved fill material, to minimize vibration effects.
- A free draining granular blanket of crushed stone or gravel should be placed under the floor slab for lateral drainage and as a capillary barrier. The thickness of this blanket should be at least 4 inches.
- The column points and periphery walls may be isolated from the floor slab in order to minimize the possibility of the floor slab cracking due to relative displacement, and vibration effects.
- The floor slab may be designed on the basis of modulus of subgrade reaction "K" of not more than 250 psi/inch.

6.4 Utility Trenches -

- The excavations for utility trenches should be made with 1H:1V or flatter gradients and should be adequately protected against sudden cave-in or sloughing by using steel trench boxes.
- The backfill in utility trenches should conform to the requirements of the County of Chesterfield, in addition to the recommendations for Site Preparation and Grading.
- The subsoil formation is suitable for providing support to the underground utilities. Excavations with normal earth-moving equipment are feasible.
- Silts and clays (LL>40, PI>20) should not be used to backfill the trenches.

6.5 Backfill Against Manholes -

- The backfill against manhole structures should conform to the requirements stated under Site Preparation and Grading. The fill material should not have rock fragments larger than 3 inches and each lift should be compacted as specified.

6.6 Construction Quality Control and Inspection -

To ensure that the soil conditions in-situ, or those developed during the construction are as envisioned during the design stage, construction control, continuous observation, and testing are recommended as follows:

- Controlled fill placement should be monitored by the soils technician under the overall guidance of the "Geotechnical Engineer of Record."
- All footing and floor slab excavations, preparation of subgrade, placement of aggregate base course, etc., should be carried out under the supervision of a soils engineer.

Also, all development and construction work should be performed under the full-time inspection of the geotechnical engineer.

7.0 Closing Remarks:

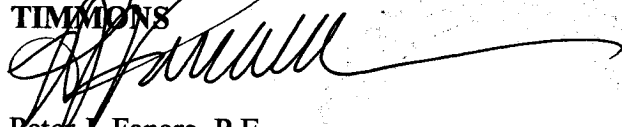
The preliminary recommendations contained in this report are made on the basis of the site information made available to us and the surface and subsurface data, developed at individual test locations.

The test borings were spaced and the soil profiles of intermediate locations extrapolated in accordance with normally accepted geotechnical engineering practices, with the assumption that the limited number of test borings are representative of the subsoil and ground water conditions, both in the vertical and horizontal directions. Taking the limited number of borings into consideration, it is highly recommended that more in-depth geotechnical investigations be performed to better develop foundation and pavement requirements and parameters.

We sincerely appreciate your confidence in our services. Please do not hesitate to contact us, should you have any questions or if we can be of further assistance to you.

Respectfully Submitted,

TIMMONS

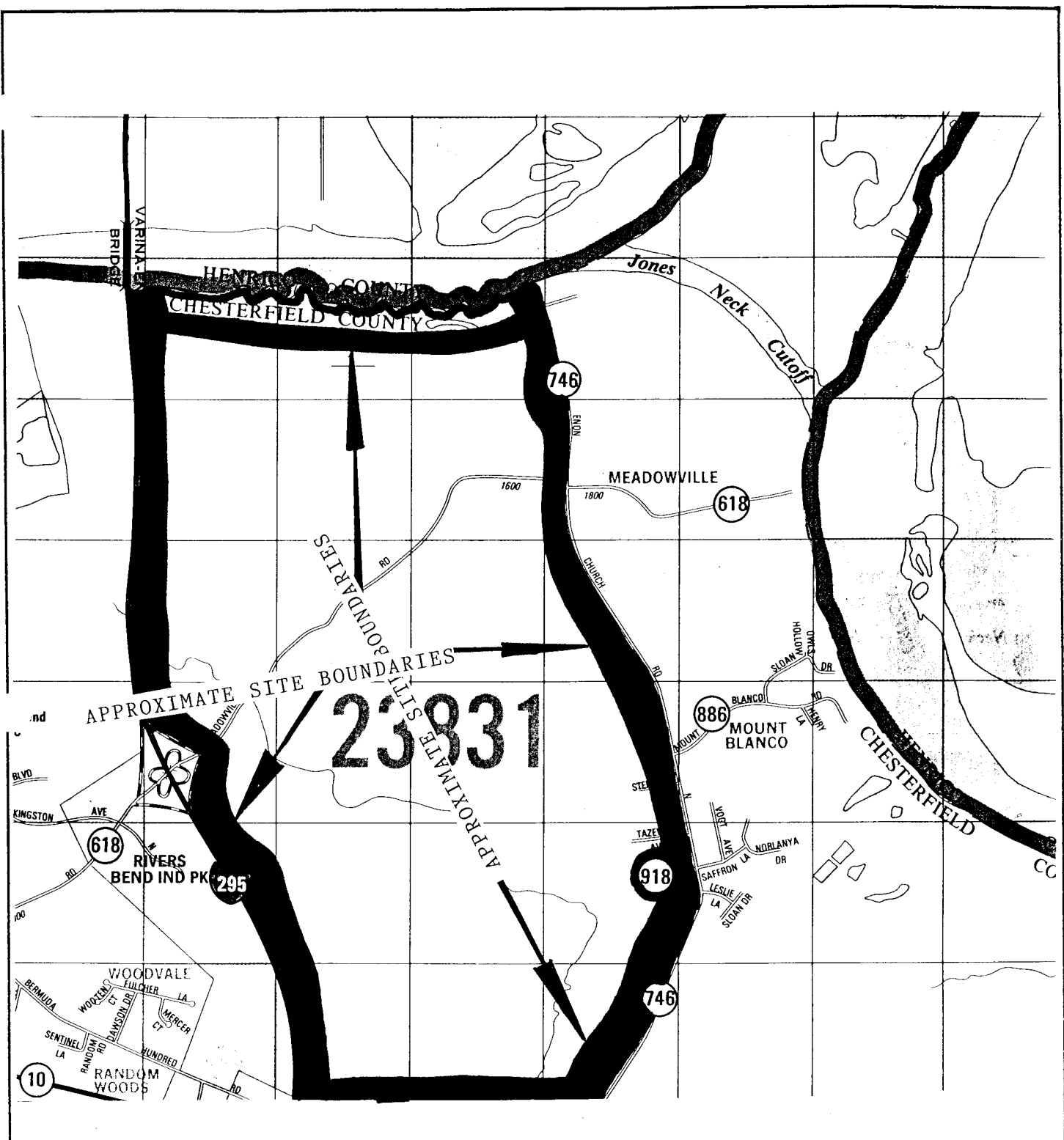


Peter J. Fanara, P.E.
Geotechnical Engineer



Gene W. Hatcher, P.E.
Department Manager

APPENDIX



TIMMONS
ENGINEERS * ARCHITECTS * SURVEYORS

711 N. COURTHOUSE RD. RICHMOND, VA
 8803 STAPLES MILL RD. HENRICO CO., VA
 4411 CROSSINGS BLVD. PRINCE GEORGE, VA.
 6501 MECHANICSVILLE TNPK. MECHANICSVILLE, VA.

Meadowville Technology Park-Site
 DATE: 10-6-97 SCALENTS Vicinit
 DRAWN BY: PJF CHECKED BY:
 JOB NO.: 17443-04

DRILL HOLE LOG

BORING NO.: B-1

PROJECT: MEADOWVILLE TECHNOLOGY PARK
 CLIENT: CHESTERFIELD COUNTY ECONOMIC DEVELOPMENT
 LOCATION: SEE BORING LOCATION PLAN
 DRILLER: AYERS AND AYERS
 DRILL RIG: CME 45 ATV
 DEPTH TO WATER > INITIAL ∇ : 25.0

PROJECT NO.: 17443-04
 DATE: SEPT. 22, 1997
 ELEVATION:
 LOGGED BY: W.S. DAVIS

AT COMPLETION ∇ : 28.0

ELEVATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
0		SM	TOPSOIL, ORGANICALLY CONTAMINATED SOIL				0'-1'6"	24	10 30 50
			BROWN, REDDISH BROWN AND GRAY SILTY FINE SANDS W/ TRACES OF CLAY AND GRAVEL PRESENT THROUGHOUT, MOIST TO WET, MEDIUM DENSE TO VERY DENSE				2'-3'6"	41	
							4'-5'6"	36	
							7'-8'6"	24	
							9'-10'6"	16	
							14'-15'6"	37	
							19'-20'	50	
							24'-25'6"	32	
							29'-30'6"	9	
				27.0			34'-35'6"	5	

ST BORING TERMINATED AT 40.0 FEET.
 TEMPORARY WELL INSTALLED AT THIS LOCATION.

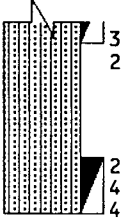
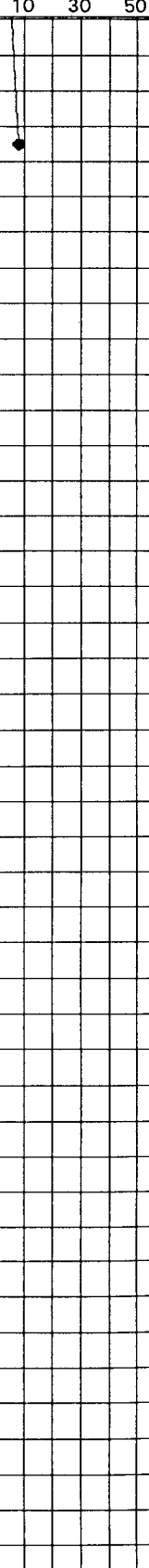
This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG

BORING NO.: B-1

PROJECT: MEADOWVILLE TECHNOLOGY PARK

PROJECT NO.: 17443-04

VATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
35 40 45 50 55 60 65 70 75							38'6"-40' 8	10 30 50 	

DRILL HOLE LOG

BORING NO.: B-2

PROJECT: MEADOWVILLE TECHNOLOGY PARK
 CLIENT: CHESTERFIELD COUNTY ECONOMIC DEVELOPMENT
 LOCATION: SEE BORING LOCATION PLAN
 DRILLER: AYERS AND AYERS
 DRILL RIG: CME 45 ATV
 DEPTH TO WATER > INITIAL ∇ : 29.0

PROJECT NO.: 17443-04
 DATE: SEPT. 22, 1997
 ELEVATION:
 LOGGED BY: W.S. DAVIS

AT COMPLETION ∇ :

ELEVATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
0			TOPSOIL, ORGANICALLY CONTAMINATED SOIL				0'-1'6"	39	10 30 50
		SM	BROWN, REDDISH BROWN AND GRAY SILTY FINE SANDS W/ TRACES OF CLAY AND GRAVEL PRESENT THROUGHOUT, MOIST TO WET, MEDIUM DENSE TO VERY DENSE				2'-3'6"	34	
							4'-5'6"	47	
							7'-8'6"	44	
							9'-10'6"	30	
							14'-15'6"	62	62
		CL-ML	BROWN AND GRAY MOTTLED SILTY CLAYS AND CLAYEY SILTS W/ TRACES OF SAND, MOIST, STIFF TO FIRM				19'-20'6"	27	
							24'-25'6"	16	
		SM	BROWN, REDDISH BROWN AND GRAY SILTY FINE SAND W/ TRACES OF CLAY, MOIST TO WET, MEDIUM DENSE	31.8			29'-30'6"	4	
							34'-35'6"	5	

TEST BORING TERMINATED AT 40.0 FEET.
 CAVE-IN AT 3.5 FEET.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG

BORING NO.: B-3

PROJECT: MEADOWVILLE TECHNOLOGY PARK
 CLIENT: CHESTERFIELD COUNTY ECONOMIC DEVELOPMENT
 LOCATION: SEE BORING LOCATION PLAN
 DRILLER: AYERS AND AYERS
 DRILL RIG: CME 45 ATV
 DEPTH TO WATER > INITIAL ∇ : 16.0

PROJECT NO.: 17443-04
 DATE: SEPT. 23, 1997
 ELEVATION:
 LOGGED BY: W.S. DAVIS

AT COMPLETION ∇ :

ELEVATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST					
							DEPTH	N	CURVE			
0												
	6 6 12 6 12 14 6 10 14	SM	TOPSOIL, ORGANICALLY CONTAMINATED SOIL	17.1		109.8	0'-1'6"	18	10 30 50			
	8 10 12		BROWN, REDDISH BROWN AND GRAY SILTY FINE SANDS W/ TRACES OF CLAY, MICA, AND GRAVEL PRESENT THROUGHOUT, MOIST TO WET, MEDIUM DENSE TO VERY DENSE				2'-3'6"	26				
5	9 10 10						4'-5'6"	24				
	5 8 7						7'-8'6"	22				
10	8 13 17		CL-ML				BROWN, REDDISH BROWN, AND GRAY MOTTLED SILTY CLAYS AND CLAYEY SILTS W/ TRACES OF SAND, MOIST, STIFF TO FIRM	30.8		9'-10'6"	20	
	8 13 17									14'-15'6"	15	
15	8 13 17			19'-20'6"	30							
	12 15 19			24'-25'6"	30							
20	8			29'-30'6"	34							
25	8		34'-35'6"	27								

ST BORING TERMINATED AT 40.0 FEET.
 CAVE-IN AT 22.0 FEET.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG

BORING NO.: B-4

PROJECT: MEADOWVILLE TECHNOLOGY PARK
 CLIENT: CHESTERFIELD COUNTY ECONOMIC DEVELOPMENT
 LOCATION: SEE BORING LOCATION PLAN
 DRILLER: AYERS AND AYERS
 DRILL RIG: CME 45 ATV
 DEPTH TO WATER > INITIAL ∇ : 14.0

PROJECT NO.: 17443-04
 DATE: SEPT. 23, 1997
 ELEVATION:
 LOGGED BY: W.S. DAVIS

AT COMPLETION ∇ :

ELEVATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
0									
	5 13 20	SM	TOPSOIL, ORGANICALLY CONTAMINATED SOIL	17.6		106.7	0'-1'6"	33	10 30 50
	10 15 18		BROWN, REDDISH BROWN AND GRAY SILTY FINE SANDS W/ TRACES OF CLAY AND GRAVEL PRESENT THROUGHOUT, MOIST TO WET, MEDIUM DENSE TO VERY DENSE				2'-3'6"	33	
	7 13 26						4'-5'6"	39	
	13 22 30						7'-8'6"	52	
	10 12 19						9'-10'6"	31	
	6 6 11	CL-ML	BROWN AND GRAY MOTTLED SILTY CLAYS AND CLAYEY SILTS W/ TRACES OF SAND, MOIST, FIRM TO STIFF	20.3			14'-15'6"	17	
	5 8 10						19'-20'6"	18	
	75/6"	SM	BROWN AND GRAY SILTY SANDS W/ TRACES OF GRAVEL, MOIST TO VERY MOIST, DENSE TO VERY DENSE				24'-24'6"	75	75
	7 11 15						29'-30'6"	26	
	12						34'-35'6"	51	

*TEST BORING TERMINATED AT 40.0 FEET.
 PERMANENT WELL INSTALLED AT THIS LOCATION.*

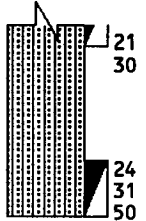
This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG

BORING NO.: B-4

PROJECT: MEADOWVILLE TECHNOLOGY PARK

PROJECT NO.: 17443-04

VATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
									10 30 50
35									
40							38'6"-40'	81	81
45									
50									
55									
60									
65									
70									
75									

DRILL HOLE LOG

BORING NO.: B-5

PROJECT: MEADOWVILLE TECHNOLOGY PARK
 CLIENT: CHESTERFIELD COUNTY ECONOMIC DEVELOPMENT
 LOCATION: SEE BORING LOCATION PLAN
 DRILLER: AYERS AND AYERS
 DRILL RIG: CME 45 ATV
 DEPTH TO WATER > INITIAL ∇ : 25.0

PROJECT NO.: 17443-04
 DATE: SEPT. 23, 1997
 ELEVATION:
 LOGGED BY: W.S. DAVIS

AT COMPLETION ∇ :

ELEVATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
0									
	10 18 25	SM	TOPSOIL, ORGANICALLY CONTAMINATED SOIL	7.0		122.8	0'-1'6"	43	
	7 18 30						2'-3'6"	48	
	35 47 36						4'-5'6"	83	83
	32 52 48						7'-8'6"	100	100
	16 17 30						9'-10'6"	47	
	2 3 3						14'-15'6"	6	
15		CL-ML	BROWN AND GRAY MOTTLED SILTY CLAYS AND CLAYEY SILTS W/ TRACES OF SAND, MOIST, FIRM TO STIFF				19'-20'6"	4	
	2 2 2						24'-25'6"	6	
	3 3 3						29'-30'6"	7	
	3 3 4						34'-35'6"	10	
	3								
25									
30									

*TEST BORING TERMINATED AT 40.0 FEET.
 PERMANENT WELL INSTALLED AT THIS LOCATION.*

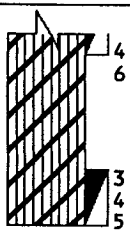
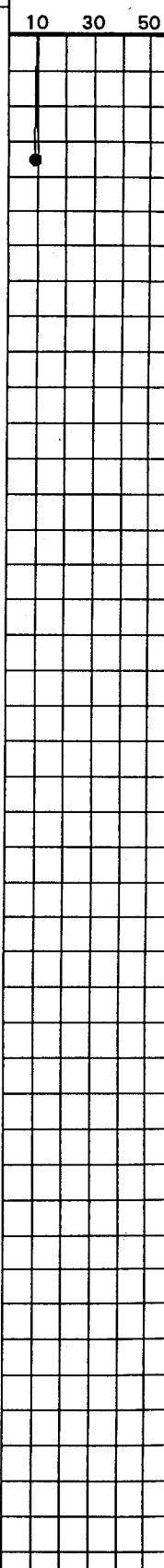
This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG

BORING NO.: B-5

PROJECT: MEADOWVILLE TECHNOLOGY PARK

PROJECT NO.: 17443-04

ELEVATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
35 40 45 50 55 60 65 70 75							38'6"-40'	9	

DRILL HOLE LOG

BORING NO.: B-6

PROJECT: MEADOWVILLE TECHNOLOGY PARK
 CLIENT: CHESTERFIELD COUNTY ECONOMIC DEVELOPMENT
 LOCATION: SEE BORING LOCATION PLAN
 DRILLER: AYERS AND AYERS
 DRILL RIG: CME 45 ATV
 DEPTH TO WATER > INITIAL ∇ : 35.5

PROJECT NO.: 17443-04
 DATE: SEPT. 24, 1997
 ELEVATION:
 LOGGED BY: W.S. DAVIS

AT COMPLETION ∇ :

ELEVATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
0									10 30 50
0'-1'6"	12	SM	TOPSOIL, ORGANICALLY CONTAMINATED SOIL					22	
2'-3'6"	10 12 8 8 13		BROWN, REDDISH BROWN AND GRAY SILTY FINE SANDS W/ TRACES OF CLAY, MICA, AND GRAVEL PRESENT THROUGHOUT,					21	
4'-5'6"	4 5 6	CL-ML	MOIST TO WET, MEDIUM DENSE TO VERY DENSE					11	
7'-8'6"	6 7 10		BROWN, REDDISH BROWN, AND GRAY MOTTLED SILTY CLAYS AND CLAYEY SILTS W/ TRACES OF SAND, MOIST, STIFF TO FIRM	28.3				17	
9'-10'6"	4 6 8							14	
14'-15'6"	6 6 9							15	
19'-20'6"	6 7 8	SM	BROWN AND GRAY MOTTLED SILTY FINE SANDS W/ TRACES OF GRAVEL, CLAY AND MICA, MOIST TO WET, MEDIUM DENSE TO DENSE					15	
24'-25'6"	6 9 11							20	
29'-30'6"	7 10 12							22	
34'-35'6"	6							16	

LAST BORING TERMINATED AT 40.0 FEET.
 CAVE-IN AT 5.0 FEET.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG

BORING NO.: B-6

PROJECT: MEADOWVILLE TECHNOLOGY PARK

PROJECT NO.: 17443-04

VATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>35</p><p>40</p><p>45</p><p>50</p><p>55</p><p>60</p><p>65</p><p>70</p><p>75</p> </div> </div>							<p>38'6"-40'</p>	<p>8</p>	<p>10 30 50</p>

DRILL HOLE LOG

BORING NO.: B-7

PROJECT: MEADOWVILLE TECHNOLOGY PARK
 CLIENT: CHESTERFIELD COUNTY ECONOMIC DEVELOPMENT
 LOCATION: SEE BORING LOCATION PLAN
 DRILLER: AYERS AND AYERS
 DRILL RIG: CME 45 ATV
 DEPTH TO WATER > INITIAL ∇ : 14.0

PROJECT NO.: 17443-04
 DATE: SEPT. 24, 1997
 ELEVATION:
 LOGGED BY: W.S. DAVIS

AT COMPLETION ∇ :

ELEVATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
0									
0'-1'6"	7 19 14	SM	TOPSOIL, ORGANICALLY CONTAMINATED SOIL				0'-1'6"	33	10 30 50
2'-3'6"	7 11 12		BROWN, REDDISH BROWN AND GRAY SILTY FINE SANDS W/ TRACES OF CLAY, MICA, AND GRAVEL PRESENT THROUGHOUT, MOIST TO WET, MEDIUM DENSE TO VERY DENSE				2'-3'6"	23	
4'-5'6"	7 11 20						4'-5'6"	31	
7'-8'6"	14 19 30						7'-8'6"	49	
9'-10'6"	8 8 14						9'-10'6"	22	
14'-15'6"	3 4 4	CL-ML	BROWN AND GRAY MOTTLED SILTY CLAYS AND CLAYEY SILTS W/ TRACES OF SAND, MOIST, FIRM TO STIFF				14'-15'6"	8	
19'-20'6"	4 3 4						19'-20'6"	7	
24'-25'6"	3 3 3						24'-25'6"	6	
29'-30'6"	11 17 28	SM	BROWN AND GRAY MOTTLED SILTY SANDS W/ TRACES OF GRAVEL, MOIST TO WET, DENSE TO VERY DENSE				29'-30'6"	45	
34'-35'6"	11						34'-35'6"	55	

ST BORING TERMINATED AT 40.0 FEET.
 PERMANENT WELL INSTALLED AT THIS LOCATION.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG

BORING NO.: B-7

PROJECT: MEADOWVILLE TECHNOLOGY PARK

PROJECT NO.: 17443-04

VARIATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
									10 30 50
35									
40							38'6"-40'	62	62
45									
50									
55									
60									
65									
70									
75									

DRILL HOLE LOG

BORING NO.: B-8

PROJECT: MEADOWVILLE TECHNOLOGY PARK
 CLIENT: CHESTERFIELD COUNTY ECONOMIC DEVELOPMENT
 LOCATION: SEE BORING LOCATION PLAN
 DRILLER: AYERS AND AYERS
 DRILL RIG: CME 45 ATV
 DEPTH TO WATER > INITIAL ∇ : 29.5

PROJECT NO.: 17443-04
 DATE: SEPT. 24, 1997
 ELEVATION:
 LOGGED BY: W.S. DAVIS

AT COMPLETION ∇ : 9.5

ELEVATION/ DEPTH	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	LL, PI	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
0									10 30 50
0'-1'6"		SM	TOPSOIL, ORGANICALLY CONTAMINATED SOIL	12.5		116.1		16	
2'-3'6"			BROWN, REDDISH BROWN AND GRAY SILTY FINE SANDS W/ TRACES OF CLAY, MICA, AND GRAVEL PRESENT THROUGHOUT, MOIST TO WET, MEDIUM DENSE TO VERY DENSE	21.8				16	
4'-5'6"		CL-ML						23	
7'-8'6"		SM	BROWN, REDDISH BROWN, AND GRAY MOTTLED SILTY CLAYS AND CLAYEY SILTS W/ TRACES OF SAND, MOIST, STIFF TO FIRM					12	
9'-10'6"			BROWN AND GRAY MOTTLED SILTY FINE SANDS W/ TRACES OF GRAVEL, CLAY AND MICA, MOIST TO WET, MEDIUM DENSE TO DENSE					11	
14'-15'6"								48	
19'-20'6"								28	
24'-25'6"								9	
29'-30'6"								71	71
34'-35'6"								39	

ST BORING TERMINATED AT 40.0 FEET.
 SAVE-IN AT 10.0 FEET.

This information pertains only to this boring and should not be interpreted as being indicative of the site.

KEY TO SYMBOLS

Symbol Description

Symbol Description

Strata symbols

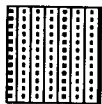
Soil Samplers



Topsoil



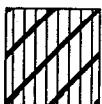
Standard penetration test



Silty sand



Bulk/Grab sample



Silty low plasticity
clay

Misc. Symbols



Water table during
drilling



Water table at
boring completion



Water table during
drilling



Water table at
boring completion



Boring continues

NOTES TO BORING LOGS

These notes refer to and are a part of the accompanying boring logs.

1. The borings were made by a boring contractor under the continuous observation of an engineer of TIMMONS. These boring logs were compiled from TIMMONS field logs and the results of visual examination of the soil samples in our laboratory.
2. The logs of the boring apply only at the specific boring locations and at the dates indicated. They are not warranted to be representative of subsurface conditions at other locations and times.
3. The depth of the indicated boundaries between soil or rock strata is approximate. The transition between the strata may be gradual.
4. The groundwater levels shown on the boring logs represent average or typical values observed during the period of the boring operation or shortly after completion of a boring. These observations do not reflect seasonal changes in the water table or the effects of intense rainfall or runoff. In any excavation, trickling flow or seepage may be encountered from perched water which is at levels above the water table observed in the borings.
5. Soil samples recovered from the borings and which remained after laboratory testing have been stored at our main office in Richmond, Virginia and are available for inspection by appointment. The soil samples will be discarded sixty days after completion of the borings unless a request is received to retain them for a longer period.
6. The location of the borings, and existing elevations at the locations were estimated or referenced by our engineers in the field. The locations and elevations of the borings should be considered accurate only to the degree implied by the method used.

PROCTOR TEST REPORT

Curve No.:

Project No.: 17443-04

Date: 10-06-97

Project: MEADOWVILLE TECHNOLOGY PARK

Location: B-3, 0.5'-5.5', BAG SAMPLE

Elev/Depth:

Remarks:

LOG BOOK NO.: 17443-A

MATERIAL DESCRIPTION

Description: LT. BROWN SILTY AND CLAYEY SAND

Classifications: USCS:

AASHTO:

Nat. Moist. = 17.1%

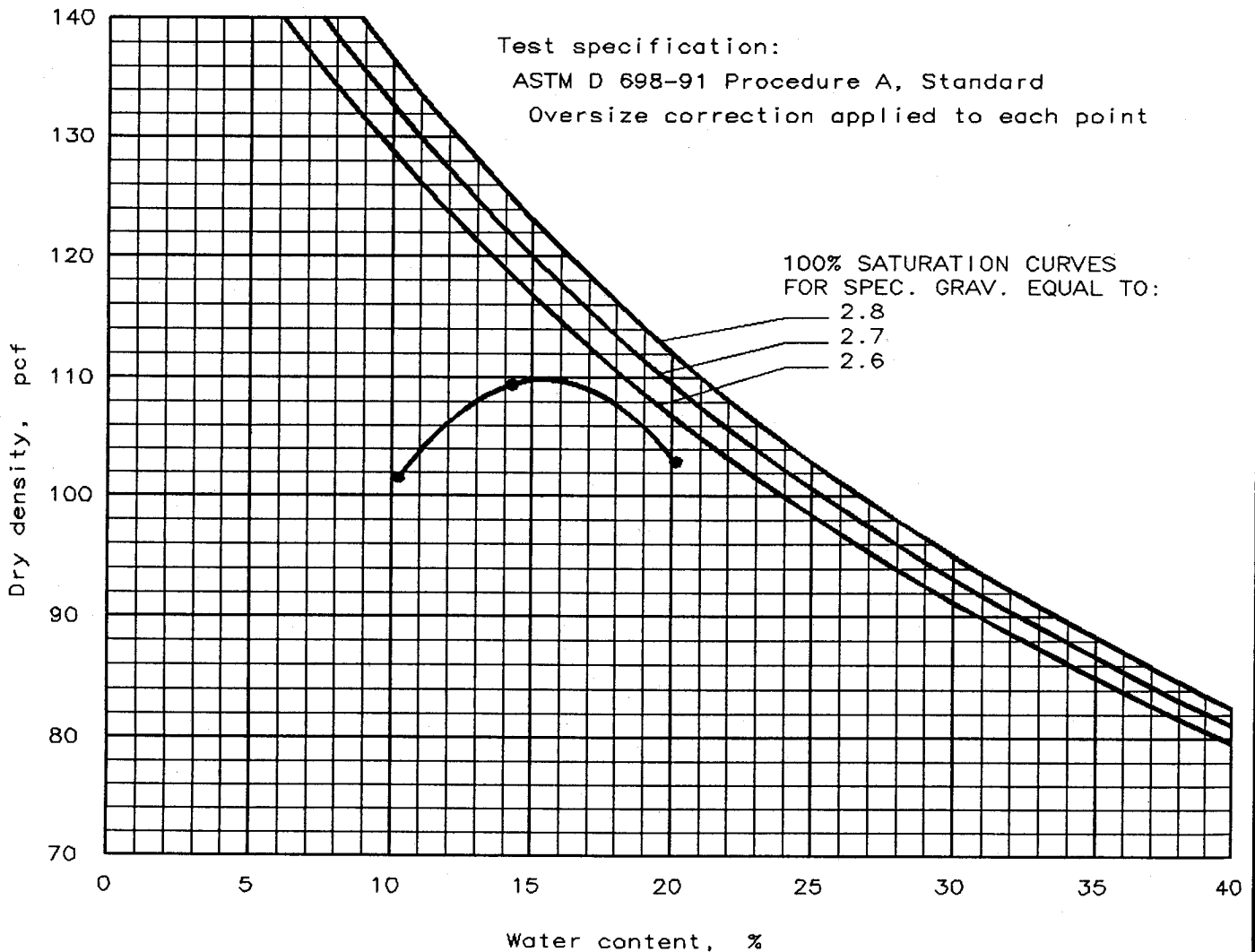
Sp.G. = 2.70

Liquid Limit =

Plasticity Index =

% > No.4 = 0.0%

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 109.8 pcf	109.8 pcf
Optimum moisture = 15.4 %	15.4 %



PROCTOR TEST REPORT

Curve No.:

Project No.: 17443-04

Date: 10-06-97

Project: MEADOWVILLE TECHNOLOGY PARK

Location: B-4, 1.0'-7.0', BAG SAMPLE

Elev/Depth:

Remarks:

LOG BOOK NO.: 17443-B

MATERIAL DESCRIPTION

Description: REDDISH BROWN SILTY AND CLAYEY SAND

Classifications: USCS:

AASHTO:

Nat. Moist. = 17.6%

Sp.G. = 2.70

Liquid Limit =

Plasticity Index =

% > No. 4 = 0.0%

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 106.7 pcf	106.7 pcf
Optimum moisture = 17.9 %	17.9 %

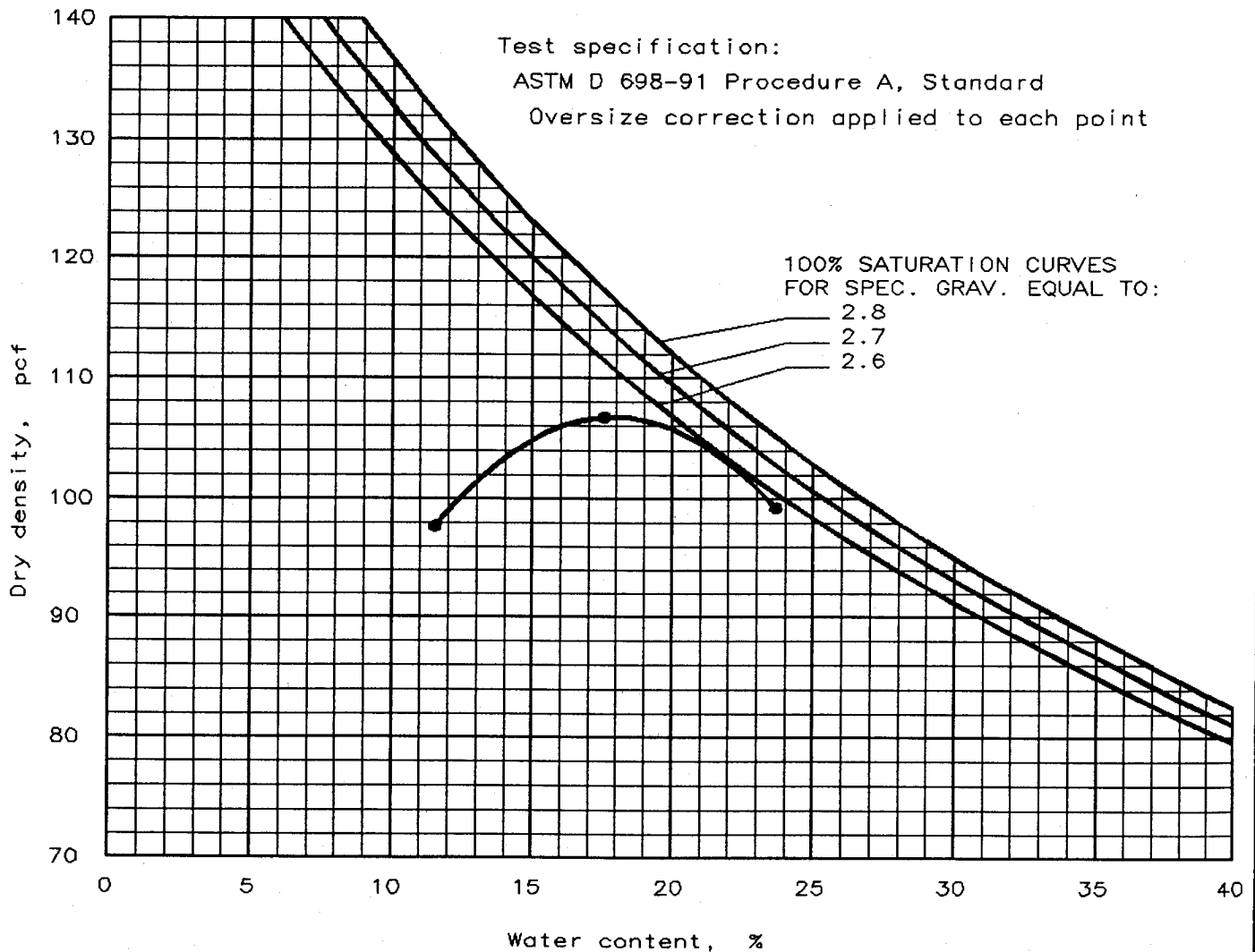


Plate No. _____

TIMMONS

PROCTOR TEST REPORT

Curve No.:

Project No.: 17443-04

Date: 10-06-97

Project: MEADOWVILLE TECHNOLOGY PARK

Location: B-5, 1.0'-6.5', BAG SAMPLE

Elev/Depth:

Remarks:

LOG BOOK NO.: 17443-C

MATERIAL DESCRIPTION

Description: REDDISH BROWN AND GRAY SILTY SAND W/ TR GRAVEL

Classifications: USCS:

AASHTO:

Nat. Moist. = 7.6%

Sp.G. = 2.70

Liquid Limit =

Plasticity Index =

% > No.4 = 7.0%

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 122.8 pcf	120.3 pcf
Optimum moisture = 11.2 %	11.9 %

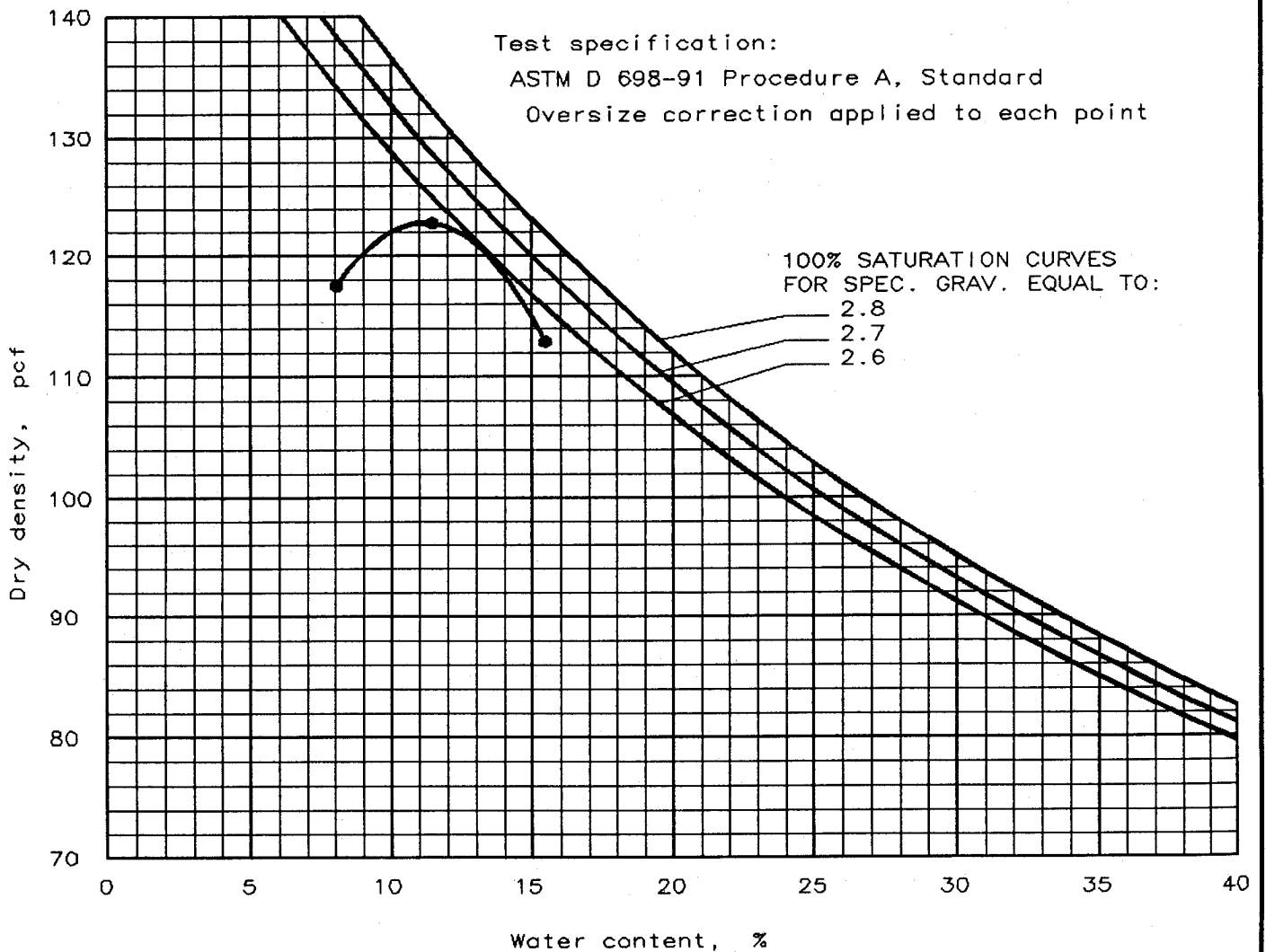


Plate No. _____

PROCTOR TEST REPORT

Curve No.:

Project No.: 17443-04

Date: 10-06-97

Project: MEADOWVILLE TECHNOLOGY PARK

Location: B-8, 1.0'-6.0', BAG SAMPLE

Elev/Depth:

Remarks:

LOG BOOK NO.: 17443-D

MATERIAL DESCRIPTION

Description: LT. BROWN SILTY SAND W/ TRACE GRAVEL

Classifications: USCS:

AASHTO:

Nat. Moist. = 12.5%

Sp.G. = 2.70

Liquid Limit =

Plasticity Index =

% > No.4 = 6.7%

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 116.1 pcf	113.5 pcf
Optimum moisture = 13.2 %	14.0 %

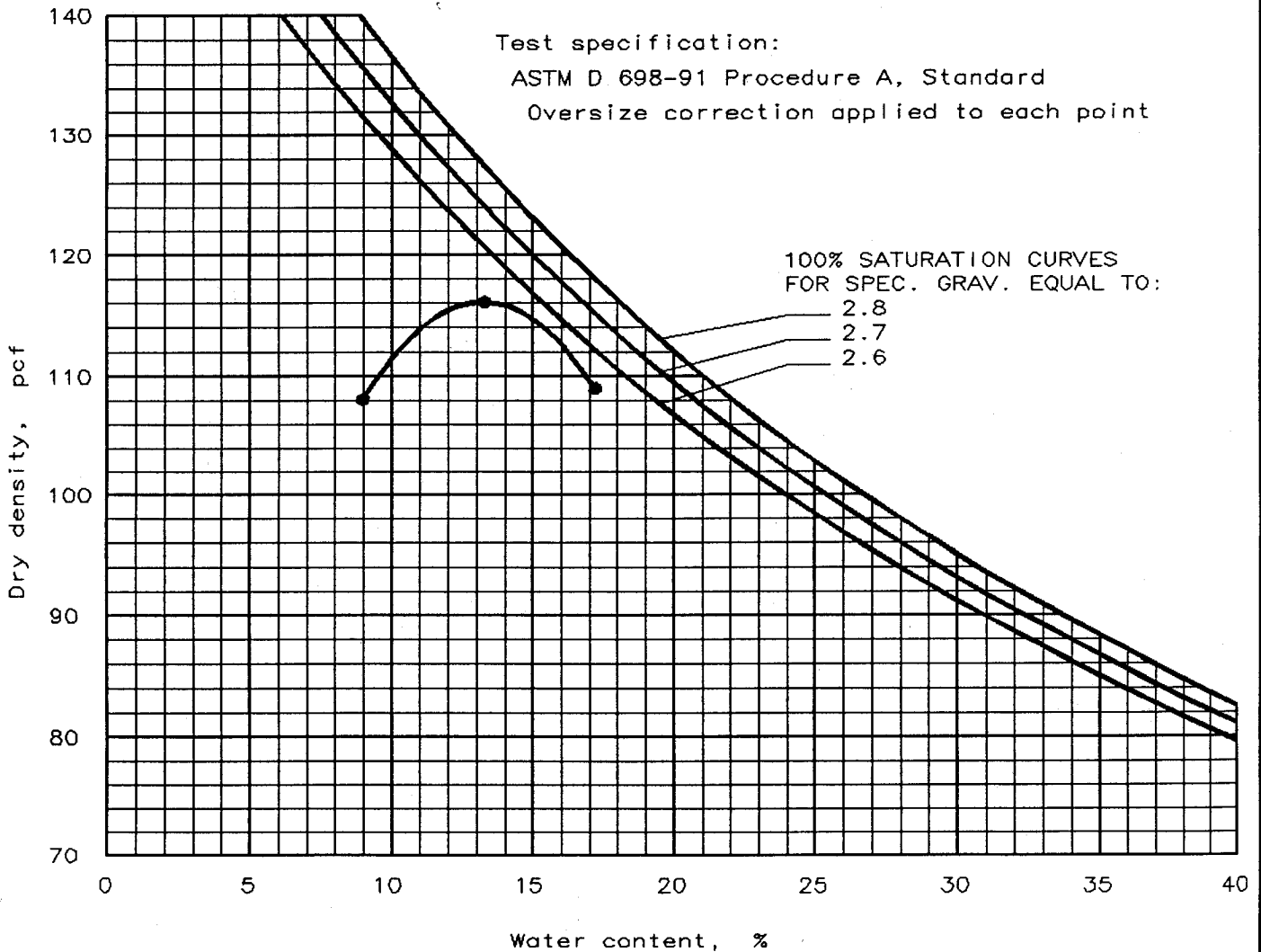
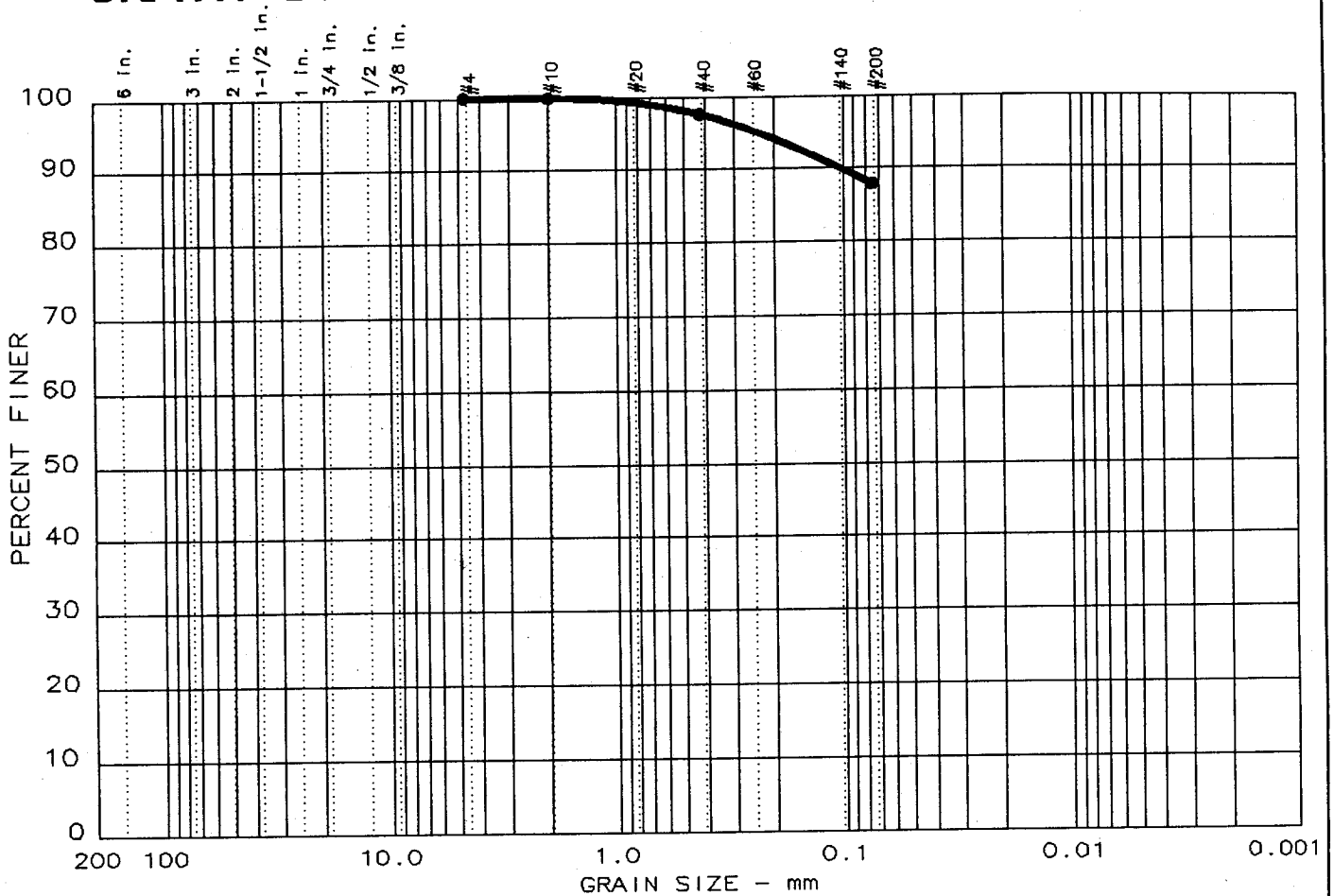


Plate No. _____

GRAIN SIZE DISTRIBUTION TEST REPORT



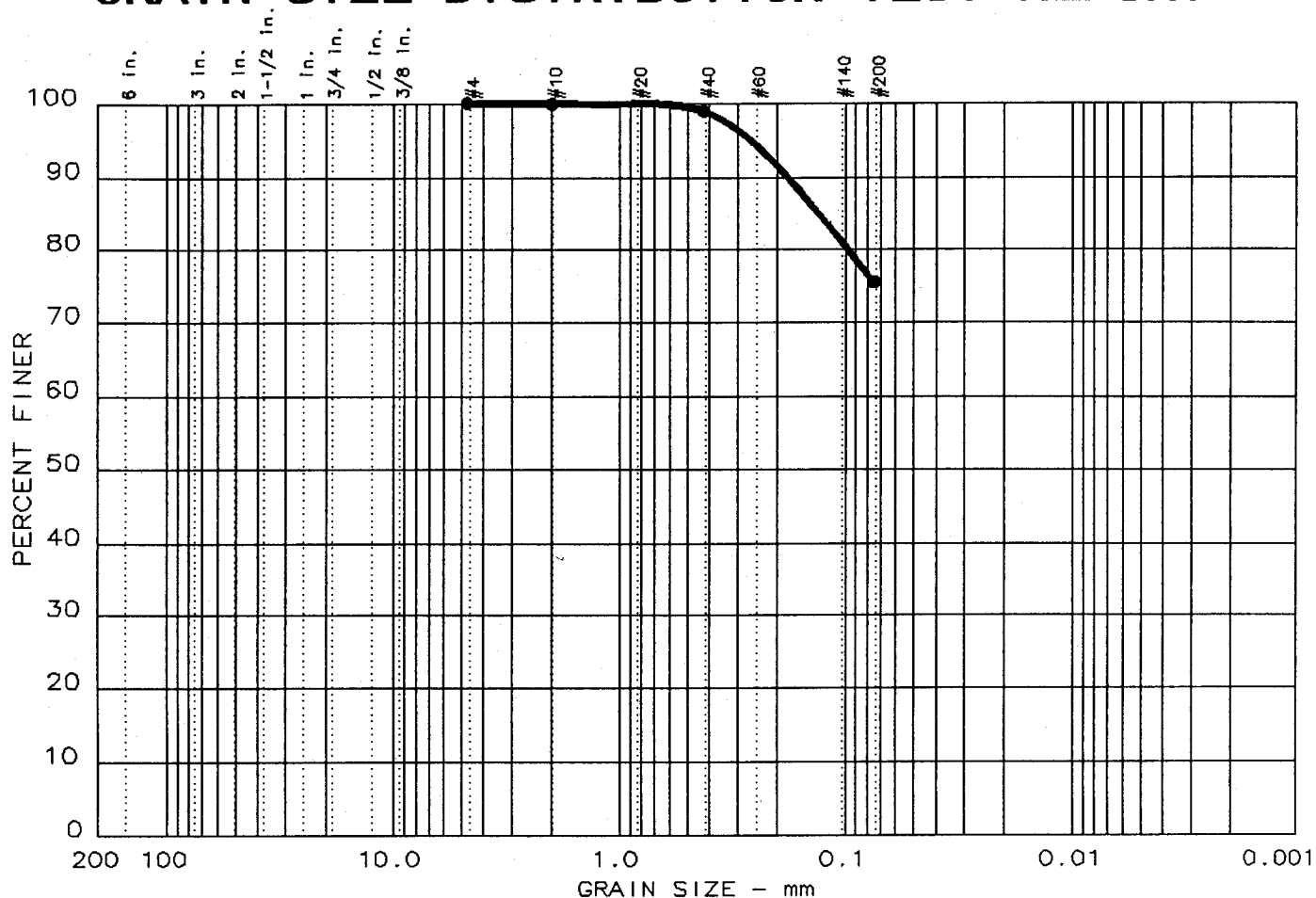
Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 1	0.0	0.0	12.3	87.7	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
● 50	30								

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SILTY CLAY W/ SOME SAND	CL	A-7-6(27.9)

<p>Project No.: 17443-04 Project: MEADOWVILLE TECHNOLOGY PARK ● Location: B-8, 2.0'-3.5', SPT SAMPLE</p> <p>Date: 10-06-97</p> <p style="text-align: center;">GRAIN SIZE DISTRIBUTION TEST REPORT TIMMONS</p>	<p>Remarks: LOG BOOK NO.: 17443-SPT</p> <p>NMC 21.8%</p> <p>Figure No. _____</p>
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GRAIN SIZE DISTRIBUTION TEST REPORT



Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 2	0.0	0.0	24.6	75.4	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
● 29	10	0.129							

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN AND GRAY SANDY CLAY	CL	A-4(5.8)

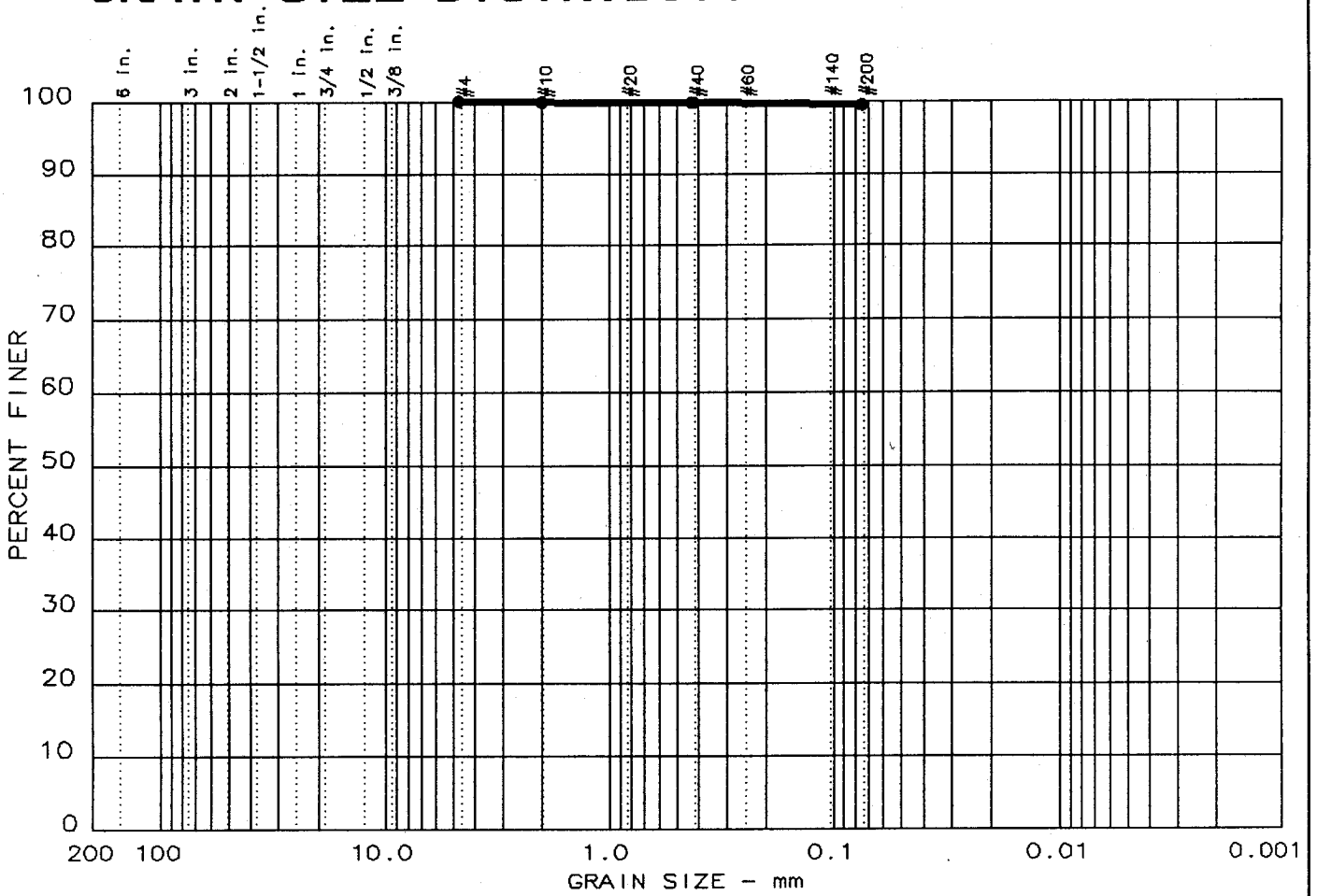
Project No.: 17443-04
 Project: MEADOWVILLE TECHNOLOGY PARK
 ● Location: B-4, 14.0'-15.5', SPT SAMPLE

Date: 10-06-97

Remarks:
 LOG BOOK NO.: 17443-SPT

NMC 20.3%

GRAIN SIZE DISTRIBUTION TEST REPORT



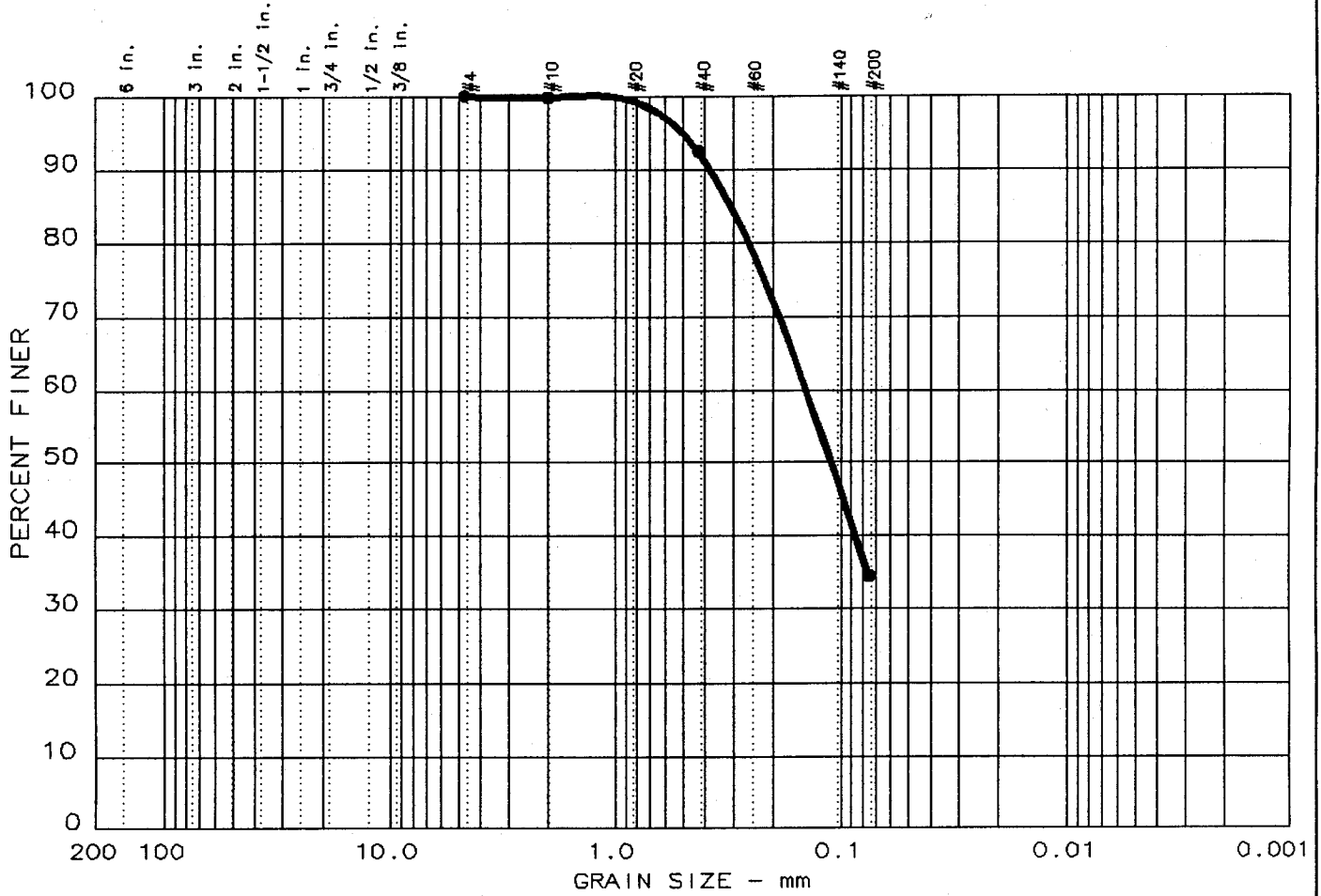
Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 3	0.0	0.0	0.6	99.4	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
● 47	13								

MATERIAL DESCRIPTION	USCS	AASHTO
● GRAY CLAYEY SILT W/ TRACE SAND	ML	A-7-5(17.6)

<p>Project No.: 17443-04 Project: MEADOWVILLE TECHNOLOGY PARK ● Location: B-3, 19.0'-20.5', SPT SAMPLE</p> <p>Date: 10-06-97</p> <p style="text-align: center;">GRAIN SIZE DISTRIBUTION TEST REPORT TIMMONS</p>	<p>Remarks: LOG BOOK NO.: 17443-SPT</p> <p>NMC 30.8%</p> <p>Figure No. _____</p>
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GRAIN SIZE DISTRIBUTION TEST REPORT



Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 4	0.0	0.0	65.5	34.5	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
	N/P	0.305	0.142	0.110					

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN SILTY FINE SAND	SM	A-2-4(0.0)

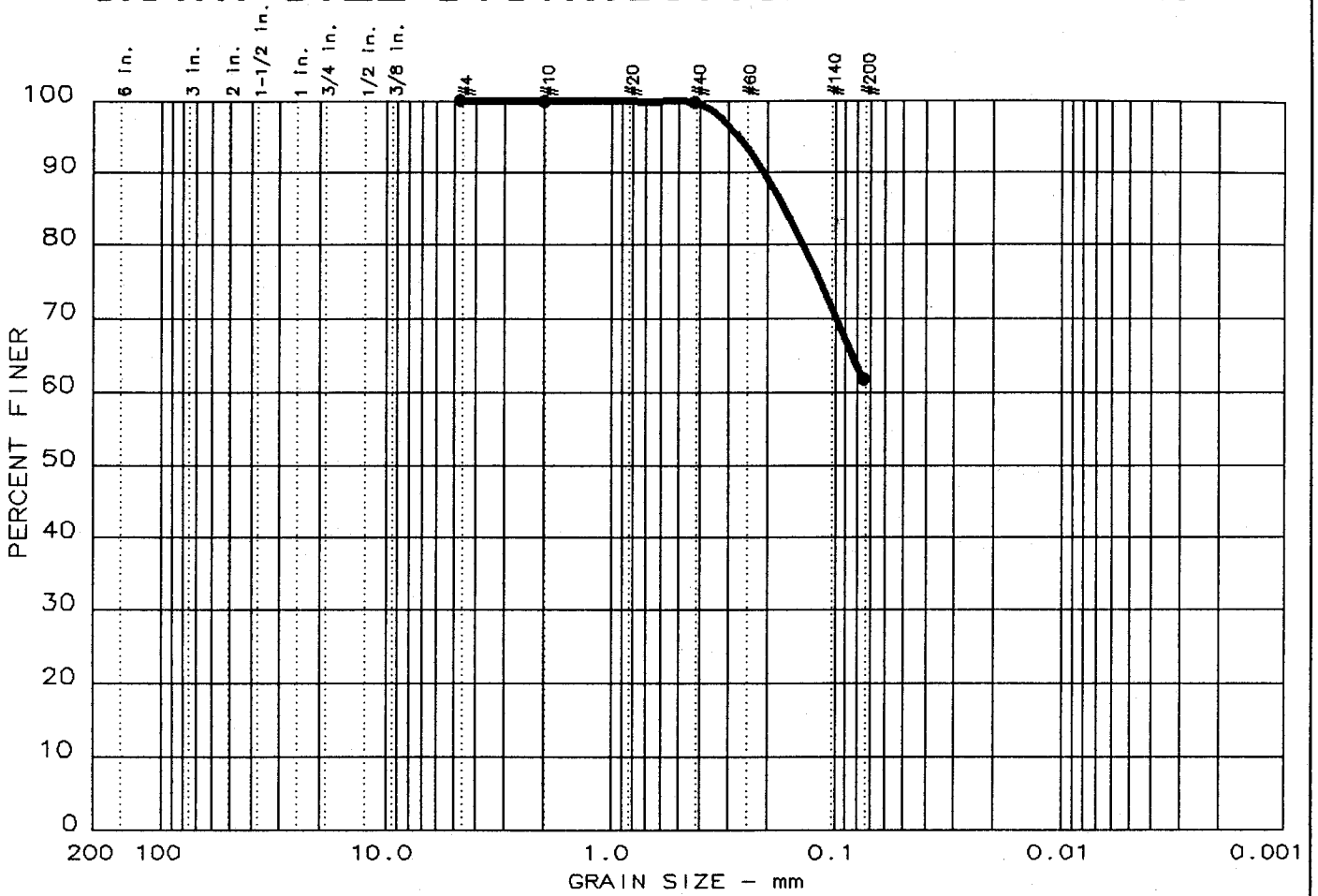
Project No.: 17443-04
 Project: MEADOWVILLE TECHNOLOGY PARK
 ● Location: B-1, 34.0'-35.5', SPT SAMPLE

Date: 10-06-97

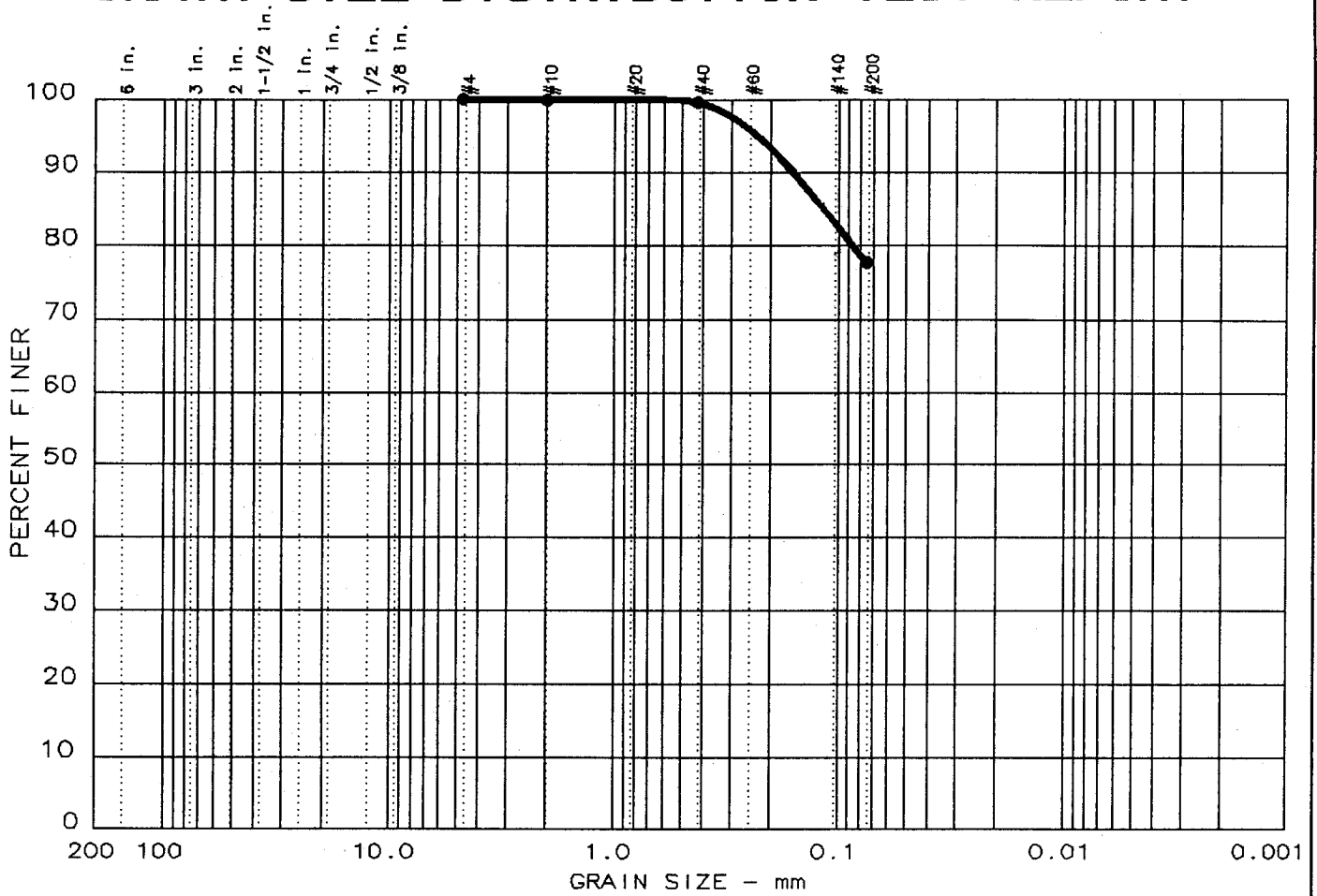
Remarks:
 LOG BOOK NO.: 17443-SPT

NMC 27.0%

GRAIN SIZE DISTRIBUTION TEST REPORT



GRAIN SIZE DISTRIBUTION TEST REPORT



Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 6	0.0	0.0	22.4	77.6	

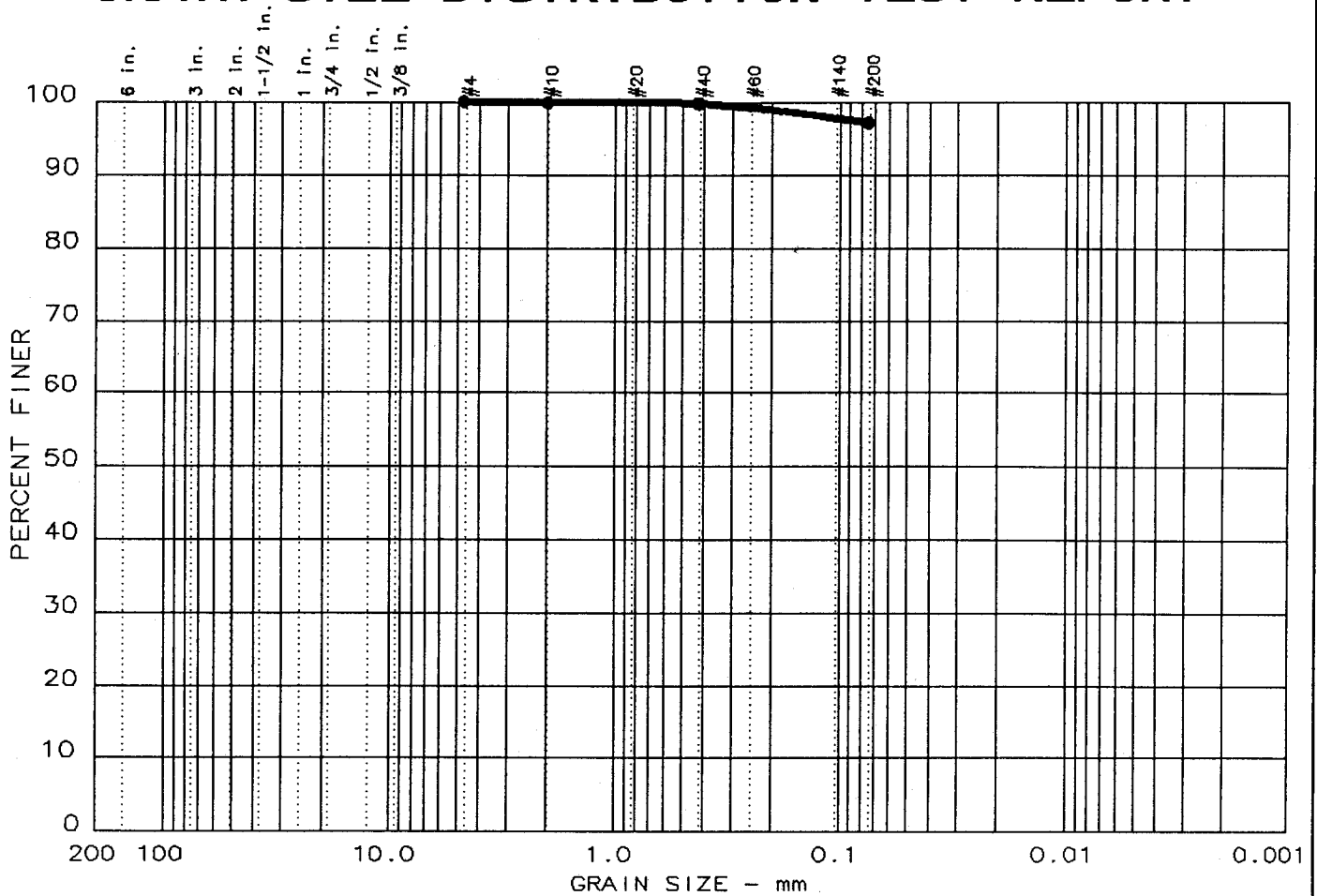
LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
● 32	14	0.115							

MATERIAL DESCRIPTION	USCS	AASHTO
● GRAY FINE SANDY CLAY	CL	A-6(9.4)

Project No.: 17443-04
 Project: MEADOWVILLE TECHNOLOGY PARK
 ● Location: B-5, 29.0'-30.5', SPT SAMPLE
 Date: 10-06-97

Remarks:
 LOG BOOK NO.: 17443-SPT
 NMC 38.0%

GRAIN SIZE DISTRIBUTION TEST REPORT



Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 20	0.0	0.0	2.9	97.1	

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
● 39	15								

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN AND GRAY MOTTLED SILTY CLAY	CL	A-6(16.2)

Project No.: 17443-04 Project: MEADOWVILLE TECHNOLOGY PARK ● Location: B-6, 7.0'-8.5', SPT SAMPLE Date: 10-06-97	Remarks: LOG BOOK NO.: 17443-SPT NMC 28.3% Figure No. _____
GRAIN SIZE DISTRIBUTION TEST REPORT TIMMONS	