SAFETY FACTOR ASSESSMENT
PERIODIC 5-YEAR REVIEW

CFR 257.73e

Bottom Ash Complex

John E. Amos Plant
Winfield, West Virginia

October, 2021

Prepared for: Appalachian Power Company

Prepared by: American Electric Power Service Corporation

1 Riverside Plaza

Columbus, OH 43215

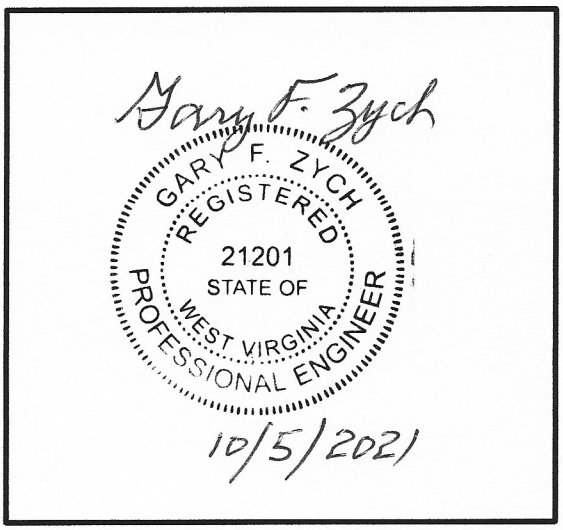
GERS-21-056

SAFETY FACTOR ASSESSMENT
PERIODIC 5-YEAR REVIEW
CFR 257.73(e)
JOHN E. AMOS PLANT
BOTTOM ASH COMPLEX

PREPARED BY _____ DATE 10/04/2021
Brian G. Palmer, P.E.

REVIEWED BY _____ DATE 10/05/2021
Mohammad A. Ajlouni, Ph.D., P.E.

APPROVED BY _____ DATE 10/5/2021
Gary F. Zych, P.E.
Section Manager – AEP Geotechnical Engineering



I certify to the best of my knowledge, information, and belief that the information contained in this safety factor assessment meets the requirements of 40 CFR § 257.73(e)

Table of CONTENTS

Attachment A: Geotechnical Engineering Report

1.0 OBJECTIVE

This report was prepared by AEP- Geotechnical Engineering Services (GES) section to fulfill requirements of CFR 257.73(e) for the safety factor assessment of CCR surface impoundments. This is the first periodic 5-year review of the safety factor assessment.

2.0 DESCRIPTION OF THE CCR UNIT

The John E. Amos Power Plant is located near Winfield, Putnam County, West Virginia.
It is owned and operated by Appalachian Power Company (APCO). The facility operates one surface impoundment for storing CCR called the Bottom Ash Complex.

The Bottom Ash Complex is comprised of diked embankments on the north, east, and west sides. The south side of the Bottom Ash Complex is incised. There are four main ponds within the Bottom Ash Complex as listed below.

List of Main Ponds within the Bottom Ash Complex
Bottom Ash Pond 1A
Bottom Ash Pond 1B
Reclaim Pond
Treatment/Clearwater Pond

The north dike is approximately 800 feet long and is the highest dike at about 29 feet with a design crest width of 10 feet. The dike is comprised of concrete blocks back-filled with compacted soil that transitions to an earthen embankment. The top of the dike is at elevation 588.0 feet with the natural ground surface beneath the dikes is at about elevation 559 feet.

The north dike is located across a small tributary to Bill's Creek. This portion of Bill's Creek is controlled by the backwaters of the Kanawha River. The side slopes of embankment fill are designed to be 3:H to 1:V that transition to design side slopes 2:H to 1:V.

3.0 SAFETY FACTOR ASSESSMENT 257.73(e)

The periodic 5-year review was conducted to evaluate if any physical changes have been made to the earthen dike and/or operating changes that could impact the loading on the structure. The assumptions, material properties and operating pools defined in the initial assessment were reviewed. The review concluded that there have been no changes that would impact the stability analyses that were previously conducted. Therefore, the previous report and analyses are still applicable to the current conditions of the facility. The results indicate that the calculated factors of safety meet or exceed the minimum values defined in Section 257.73(e).

ATTACHMENT A

Geotechnical Engineering Report

CCR RULES CERTIFICATION REPORT
JOHN AMOS PLANT - BOTTOM ASH COMPLEX
PUTNAM COUNTY, WEST VIRGINIA

Prepared For:

AEP Service Corporation
Geotechnical Engineering Group
1 Riverside Plaza
Columbus, OH 43215-2373

Prepared By:

Geo/Environmental Associates, Inc.
3502 Overlook Circle
Knoxville, TN 37909

GA Project No. 15055009
December 21, 2015

TABLE OF CONTENTS

APPENDICES

CCR RULES ASSESSMENT AND CERTIFICATION
JOHN AMOS PLANT - BOTTOM ASH COMPLEX
POCA, PUTNAM COUNTY, WEST VIRGINIA
DECEMBER 21, 2015

INTRODUCTION

Geo/Environmental Associates, Inc. (GA) has performed a site visit, conducted an engineering assessment, and prepared a certification statement for the John Amos Plant - Bottom Ash Complex. These services were performed to meet specific requirements set forth in the Environmental Protection Agency's CCR Rules (i.e., 40 CFR Parts 257 and 261, "Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals From Electric Utilities, Final Rule," dated April 17, 2015). Provided in this report is a discussion of GA's findings and a certification statement pertaining to the facility. Photographs, supplemental field and laboratory data, engineering analyses, and a drawing are included in the appendices.

REVIEW OF PREVIOUS ANALYSES AND SITE DESCRIPTION

The Amos Power Plant is situated in Putnam County, West Virginia within the physiographic province of the Appalachian Plateau. A more detailed description of the site geology is included in Appendix II. The Amos Power Plant primary and ancillary facilities are located along the southern bank of the Kanawha River along S.R. 35 approximately two miles northwest of Interstate I-64 at Scary, WV. The Bottom Ash Complex consists of two dams #1A WVA ID #07918 and #1B WVA ID #07919. The dams share a common earthen embankment across Bill's Creek with a series of splitter dikes to create four distinct cells referred to as Bottom Ash Pond No. 1A, Bottom Ash Pond No. 1B, Reclaim Water Pond and the Treatment Basin.

The earliest record available of the Bottom Ash Complex is dated June 28, 1970. There was an open channel that acted as the emergency spillway of an earthen dike structure on the northwest corner of the Bottom Ash Pond No. 1B.

Modifications to the site include: the 1977 construction of a road embankment on the northwest corner of the Bottom Ash Pond No. 1B, a sedimentation pond, and a splitter dike constructed on the southeast corner of the Bottom Ash Pond No. 1A for the sedimentation of pyrites (referred to as the Pyrites Pond). The construction of the roadway embankment effectively eliminated the northwest corner of the Bottom Ash Pond No. 1B from collecting additional bottom ash and from ponding water. An open channel spillway, that was part of the original construction, was abandoned prior to 1977.

Subsequent modifications, mostly associated with the operations of the ponds, have taken place since 1977. Perhaps the most relevant has been the elimination, from active use, of the sedimentation pond located along the west side of the Bottom Ash Pond No. 1B, illustrated on the 1977 drawing. In addition, higher than anticipated operating water levels could occur sporadically in the ponds during certain plant maintenance operations. Ash handling operations can also result in the localized accumulation of bottom ash at or above the operational water levels. The current configuration of the Bottom Ash Complex is shown on the drawings in Appendix VI.

Current operations of the ponds consist of sluicing bottom ash into ponds #1A or #1B, allowing the particles to settle and the overflow to circulate to the reclaim pond from where the majority of the water is pumped back to the plant and the remaining water is allowed to overflow into the treatment pond before it is released into the Kanawha River at outfall No. 003. During the course of the year, the Bottom Ash Ponds are alternately taken out of service to allow for the removal of the bottom ash for beneficial re-use. Thus, it is commonly expected that, at the same time bottom ash slurry is sluiced into one pond, the other pond is being excavated.

The Bottom Ash Pond Complex is inspected by Plant personnel on a monthly basis and, under the direct supervision of a professional engineer, it is inspected annually. Reports of the engineer's inspection are forwarded to the West Virginia DEP Dam Safety office with the frequency established in the regulations for Class II facilities.

The main dike of the facility is about 1350 feet long. We were provided with a copy of a report titled "Report on Dam Safety Inspection Amos Fly Ash Dam and Amos Bottom Ash Dikes" dated March 1981, prepared by Woodward-Clyde Consultants. According to that report, the maximum height of the main dike above natural ground is about 24 feet.

GA performed design and analysis services for the facility in 2005 and 2008. We provided two reports, "Responses to February 15, 2005 DEP Review Letter," dated December 5, 2005 and "Responses to May 12, 2008 DEP Review Letter," dated May 22, 2008. Our work involved addressing West Virginia DEP concerns and also raising the main dikes from a minimum crest elevation of about 584 feet with a minimum crest width of about 15 feet, to a minimum elevation of 588 feet. The increased dike elevation was needed to operate the pool levels in Ash Ponds 1A

and 1B and the Reclaim Pond as high as elevation 583 feet under certain operating conditions while providing adequate storm storage and routing and maintaining at least one foot of freeboard during the design storm. Our work at the time included hydrologic, hydraulic, and stability analyses. The facility previously had an open channel spillway with bottom elevation 581 feet through the main dike at the Reclaim Water Pond. In our design we proposed two 36-inch diameter polyethylene spillway pipes, both with inlet elevations of 583.5 feet.

In 2010, the main dikes were raised to the minimum proposed crest elevation of 588 feet. In addition to the main dike, the eastern side of the complex was raised to elevation 588 feet. In some areas the elevation 584 crest was wide enough such that it could be raised with 4 feet of soil fill and still maintain a minimum 10-foot-wide crest. In other areas that were too narrow to raise the crest with soil fill, a segmented retaining block system (Redi-rock) was used to achieve the elevation 588 feet crest. The drawings in Appendix VI show the areas where the block walls were constructed and a construction detail of the block wall system.

Field Investigation and Laboratory Testing

At the direction of AEPSC, eight borings were drilled through the main dike in August 2005 by H.C. Nutting Company of Charleston, West Virginia. The boring locations are shown on the drawings in Appendix VI. Boring logs are included in Appendix III. Standard Penetration Tests (SPT) were performed generally on 5-foot intervals. Relatively undisturbed samples were collected at selected locations using a thin walled sampler. Additionally, three standpipe piezometers were installed in the main dike during the drilling.

Borings B-1 through B-6 were drilled from the crest of the main dike. These borings generally encountered a stiff, lean clay, referred to as shale fill, from the ground surface to a depth of about 15 to 20 feet. Below the shale fill an interval of clayey gravel fill 8 to 10 feet thick was encountered. Below the clayey gravel, a 4 to 6-foot thick layer of soft clay and about a 20-foot thick layer of silty sand, both likely alluvial in origin, were encountered. Below the silty sand, residual weathered shale was encountered to the boring termination depths. Borings B-7 and B-8 were drilled on the downstream face of the main dike, near the water level of Bill's Creek. These two borings encountered strata consistent with borings B-1 through B-6.

Laboratory testing was performed by AEPSC on the SPT split-spoon samples and relatively undisturbed samples. Laboratory testing included moisture content, grain size analysis, classification, permeability, and strength testing. Laboratory test results are included in Appendix III. Laboratory test results are discussed in our comments regarding the stability of the dike.

SITE VISIT BY A PROFESSIONAL ENGINEER

At the request of AEPSC, GA personnel performed a site visit of the Bottom Ash Complex to observe and document the prevalent site conditions. Specifically, Seth W. Frank, P.E. (GA), performed a site inspection of the Bottom Ash Complex on August, 18, 2015. GA believes that the conditions observed, during the August 18, 2015, site visit, are representative of the conditions modeled in the assessment and analyses provided in this report. Pictures taken during the site visit are included in Appendix I.

HYDROLOGIC AND HYDRAULIC ANALYSES

GA's 2008 report included hydrologic and hydraulic analyses to meet WVDEP's design storm requirements for a Class II structure, which is one-half of the 6-hour Probable Maximum Precipitation (PMP) event (about 14 inches of rainfall in 6 hours). The spillway pipes, pool levels, and crest elevation were designed based on this event. GA used the U.S. Army Corps of Engineers HEC-1 computer program for the analyses. A summary of the results are shown in Table 1, and complete results are included in Appendix IV. As shown, the facility passes the design storm while maintaining adequate freeboard.

Table 1. Summary of Hydrologic Analyses

Pond	Crest Elev., ft	Normal Pool Elev., ft	Peak Pool Elev. During Storm, ft	Minimum Freeboard During Storm, ft
1A and Reclaim	588	583.2	585.43	2.57
1B	588	583.7	585.47	2.53

STABILITY ANALYSES AND ACTION VALUES

We have performed stability analyses in general accordance to EPA's CCR requirements.

The requirements specify the following stability assessments:

1. Static factor of safety under the long-term, maximum storage pool condition,
2. Static factor of safety under the maximum surcharge pool condition,
3. Seismic factor of safety,
4. Liquefaction factor of safety,
5. End-of-construction factor of safety,

Limit equilibrium stability analyses were performed on sections B-B and C-C to assess the stability of the embankment. The stability analyses were performed with *SLOPE/W*, a component of the *GeoStudio* software package. *SLOPE/W* is formulated in terms of moment and force equilibrium factor of safety equations. Specifically, the Morgenstern-Price method was used to calculate the factor of safety of each section.

Strength parameters for the various materials used in the analyses are listed in Table 2. The properties of the various materials that comprise the embankment were determined from laboratory tests where appropriate samples could be obtained for testing. The parameters for other materials are based on typical material properties and our experience with similar materials. The Redi-rock reinforced embankment was conservatively assumed to have the strength parameters of the shale fill.

Table 2. Summary of Strength Parameters

Material	Effective Strength Parameters	
	c′ (psf)	φ′ (°)
Bottom Ash [2]	0	28
Shale Fill [1]	370	27.2
Clayey Gravel Fill [1]	300	32
Clay (natural) [1]	150	35.2
Silty Sand (natural) [1]	0	36.8

(1) Estimated from laboratory tests (See Appendix III).
(2) Estimated based on material properties and experience with similar materials.

Stability analyses were performed with phreatic conditions at the maximum level measured in piezometers or during drilling. A summary of the safety factors is shown in Table 4. Stability analysis results are included in Appendix V.

Static Factor of Safety under the Long-Term Storage Pool Condition

The CCR regulations specify the factor of safety should meet or exceed 1.5 when the pool is at the maximum, long-term level (i.e., normal pool) and a steady state seepage condition has developed. GA selected two critical sections, designated as B-B and C-C, for the analyses. The sections and their locations are shown on the drawings in Appendix VI. GA determined the embankment material types and stratigraphy from the aforementioned drilling and laboratory testing performed by AEPSC.

Static Factor of Safety under the Maximum Surcharge Pool Condition

The CCR regulations specify the factor of safety should meet or exceed 1.4 when the pool is at the maximum surcharg pool condition. We performed the stability analyses with the pool at the peak level during the one-half PMP design storm event, discussed previously. As shown in Table 1, the peak level in either pond was elevation 585.5 feet. We used this level for the stability analyses of both B-B and C-C.

A summary of the safety factors, from the maximum surcharge stability analyses, is shown in Table 4. Stability analysis results are included in Appendix V.

Seismic Factor of Safety

The CCR regulations specify the factor of safety should meet or exceed 1.0 under seismic conditions. Furthermore, the recommended design earthquake event should have a 2% exceedance in 50 years (an approximate return period of 2,475 years). GA performed pseudo-static stability analyses on sections B-B and C-C with the elevation 583.5 normal pool level and steady state seepage conditions based on maximum, measured piezometric levels.

Based on the *2008 Interactive Deaggregations* website, provided online through the USGS Geologic Hazards Science Center, the Amos Bottom Ash Complex facility has a peak ground acceleration of 0.065g for a seismic loading event with a mean return time of 2,475 years. Conservatively assuming soft soil ground conditions above rock, translates to a peak horizontal ground surface acceleration of approximately 0.15g. Using a commonly applied factor of 0.5 times the peak horizontal acceleration yields the conservative horizontal seismic coefficient of 0.075 that was applied in the slope stability analyses.

A summary of the pseudo-static safety factors is shown in Table 4. Stability analysis results are included in Appendix V.

Liquefaction Assessment

The CCR regulations specify the liquefaction factor of safety should meet or exceed 1.2. This requirement applies to facilities with embankment materials that have been determined to contain soils susceptible to liquefaction.

We used the Standard Penetration Testing (SPT) results from the exploratory drilling program and laboratory testing results to determine the embankment soils' susceptibility to liquefaction. We used methods from Mine Safety and Health Administration's *Engineering and Design Manual for Coal Refuse Disposal Facilities* (2010) to make the determination. First, the SPT blow counts were corrected to $N_{1,60}$ values for each soil layer and a median value was calculated. Calculation spreadsheets are included in Appendix V, and the median values for embankment materials are in shown in Table 3.

Table 3. Corrected SPT Data and Soil Type

Soil	Median Corrected SPT Blow Count	Sand-like or Clay-like
Shale Fill	19.6	clay-like
Clayey Gravel	15.2	clay-like

MSHA manual guidelines state a clay-like soil can be susceptible to liquefaction if the corrected SPT value is less than 6. As shown in Table 3, using these guidelines, the shale fill and clayey gravel should not be susceptible to liquefaction. Because the embankment materials are not susceptible to liquefaction, no additional analyses were performed for this assessment. Note that this assessment does not extend to foundation materials, below the embankment.

End-of-construction Factor of Safety

The CCR regulations specify the factor of safety should meet or exceed 1.3 for the end-of-construction loading condition. End of construction factors of safety are typically calculated for new construction. Given that the facility has been in service for more than 40 years and is considered to be in its long-term condition, no additional analyses were performed.

Summary of Results

A summary of results from the slope stability analyses is provided in Table 4. *SLOPE/W* computer output, showing the modeled profiles, loading conditions, and critical failure surfaces are provided in Appendix V. As shown in the slope stability analysis results in Table 4, the factors of safety satisfy the requirements set forth in the CCR Rules.

Table 4. Summary of Slope Stability Analyses Results

Analysis Condition	Section B-B	Section C-C
Maximum Long Term Pool	2.1	2.2
Maximum Surcharge Pool	2.0	2.2
Pseudo Static (Downstream)	1.6	1.8
Pseudo Static (Upstream)	3.1	3.2

CERTIFICATION STATEMENT

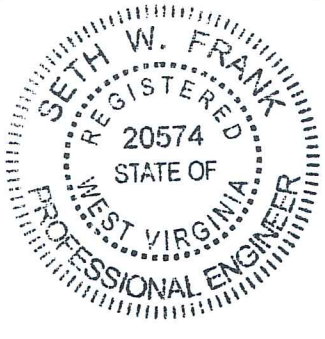
Based on the site visit, the results of the field and laboratory testing of the materials used in the embankment construction, and our review of the as-built embankment geometry; it is our opinion that the Amos Plant Bottom Ash Complex has slope stability factors of safety that meet or exceed the requirements in the CCR Rules. Furthermore, based on our review of the as-built embankment geometry, current operating pool levels, and the spillway system; we believe that the facility is capable of storing/routing the runoff from one-half of the 6-hour PMP design storm event.

Accordingly, I hereby certify that the John Amos Plant – Bottom Ash Complex meets the applicable requirements in the CCR Rules. It should be clearly noted that this certification is not a legal guarantee. This certification is merely a statement by a registered professional engineer that, to the best of his knowledge, the facility meets the applicable requirements set forth in the CCR Rules. No warranties, expressed or implied, are provided.

Seth W. Frank

Seth W. Frank, P.E.
West Virginia R.P.E. No. 20574

12-21-2015
Date



GA

APPENDIX I
SITE PHOTOGRAPHS

Photograph 1. Pond 1B Spillway Pipe and Downstream Slope

Photograph 2. Reclaim Pond Spillway Pipe and Downstream Slope.

Photograph 3. Downstream Slope and Bills Creek.

Photograph 4. Redi-rock Soil Reinforcement.

Photograph 5. Pond 1B and Upstream Slope.

Photograph 6. Reclaim Pond and Upstream Slope.

APPENDIX II
GEOLOGIC DESCRIPTION

Geologic Description

The Amos Power Plant is situated in Putnam County, West Virginia within the physiographic province of the Appalachian Plateau. The Amos Power Plant primary and ancillary facilities are located along the southern bank of the Kanawha River along S.R. 35 approximately two miles northwest of Interstate I-64 at Scary, WV. The plant facility and accompanying Bottom Ash Complex just to the west are situated on relatively level alluvium with surface drainage to towards the Kanawha River, located along the eastern and northern boundaries of the facility. The Kanawha flows westward into the Ohio River at Point Pleasant, West Virginia. Surface flow in the northwestern area of the site, where the Bottom Ash Complex is located, is northwestward towards Bill's Creek, a tributary of the Kanawha. The plant area is underlain by Quaternary age alluvium consisting of lenticular floodplain deposits of clay, silt and fine to coarse sand with some gravel lenses to a depth of about 50 feet (elevation of approximately 530 feet). Bedrock consists of Pennsylvanian age shale, coal, clay and very limited amounts of limestone. The Pennsylvanian deposits range from about 3,000 to 3,800 feet in thickness and are typically relatively horizontal to slightly folded.

In the upland areas of the Amos Power Plant property in the vicinity of the Fly Ash Reservoir and Quarrier Landfill, the hilltops are capped by nominal thickness of residual soils varying up to about six feet in occurrence underlain by low permeability Permian age Dunkard Formation strata. The Monongahela Formation underlies the hill slopes and valley bottoms and is, in turn, underlain by the Conemaugh Formation. The bedrock underlying the alluvial sediments in the power plant vicinity along the Kanawha River valley is the Pennsylvanian deposits of the Conemaugh Formation. Underlying the Pennsylvanian deposits are Mississippian aged sandstone and shale with minor amounts of limestone. Structurally the area is relatively quiescent with no faults having been identified within the study area of the Amos facility. Accordingly, there are no seismic impact zones within or near the plant area.

According to the 1968 geologic map of West Virginia produced by the Geologic and Economic Survey of West Virginia, there is no karst terrain underlying or within the site area.

There are no economically feasible coal deposits underlying the Amos facility either in the plant or upland areas to the south in the vicinity of the Fly Ash Reservoir. There are economic oil and gas deposits in Putnam County with wells having been installed on the Amos Plant property into the Berea Sandstone.

Groundwater in the plant area is near the pool level of the Kanawha River (about 566 feet) within the alluvial sediments underlying the facility while the upland areas are primarily stress relief fracture flow marked by secondary porosity resulting from fracturing. Groundwater flow in the upland areas tends to follow the stress relief fracture flow pattern that typically mimics surface topography while flow within the alluvium sediments underlying the plant is primarily towards the Kanawha River or Bill's Creek, as is the case with the western area of the plant site in the vicinity of the Bottom Ash Complex.

At the direction of AEP, eight borings were drilled through the main dike of the Bottom Ash

Complex in August 2005 by H.C. Nutting Company of Charleston, West Virginia. The boring locations are shown on the drawings in Appendix IX. Boring logs are included in Appendix II. Standard Penetration Tests (SPT) were performed generally on 5-foot intervals and relatively undisturbed samples were collected at selected locations using a thin walled sampler.

Below the fill materials, a 4 to 6-foot thick layer of soft clay and about a 20-foot thick layer of silty sand, both likely alluvial in origin, were encountered in each of the borings. Below the silty sand, residual weathered shale was encountered to the boring termination depths. The natural materials encountered in the borings are consistent with the general geology description included herein.

References:

GAI Consultants , Inc., (2004), FGD Landfill Siting Study, JE Amos Power Plant, West Virginia.

Ehlke, T.A., Runner, G.S. And Downs, S.C., 1982 Hydrology of Area 9, Eastern Coal Province, West Virginia Geological Survey Water-Resources Investigations Open-File Report 81-803.

White, I.C., and Krebs, C.E. (1911) West Virginia Geological Survey; Jackson, Mason and Putnam Counties, Wheeling, WV; Wheeling News Litho. Company.

White, I.C., and Krebs, C.E. and Tetts, D.D. (1914) West Virginia Geological Survey; Kanawha County Jackson, Wheeling News Litho. Company

B. M. Wilmouth, Movement of Ground Water in the Kanawha River Alluvium in West Virginia, (Abstract - Geology and Mining), Proceedings of the West Virginia Academy of Sciences, 1961, Volume 33.

B. M. Wilmouth, Hydrology of the Kanawha Valley, Proceedings of the West Virginia Academy of Sciences, 1968, Volume 40.

Geology and Economic Resources of the Ohio River Valley in West Virginia, West Virginia Geologic Survey, Volume XXII, 1956.

APPENDIX III
BORING LOGS AND LABORATORY TESTING

BORING LOGS

COPY

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER
871 LUNKEN PARK DRIVE
CINCINNATI, OH 45226
(513) 321-5816
FAX (513) 321-0294

CENTRAL OHIO REGION
793 MORRISON ROAD
COLUMBUS, OH 43230
(614) 863-3113
FAX (614) 863-0475

INDIANA REGION
349 WALNUT STREET, STE 9
LAWRENCEBURG, IN 47025
(812) 539-4900
FAX (812) 539-4901

BLUEGRASS REGION
470-B CONWAY CT., STE B-4
LEXINGTON, KY 40511
(859) 455-9530
FAX (859) 455-9630

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-1
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/8/2005
Boring Location		Date Completed	8/8/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))	SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
583.00	0.0												
582.60	0.4	0.4 Topsoil with organics	1	SS	0.0-1.5	7-9-9 (18)	40						
581.00	2.0	1.6 FILL: Brownish gray, silty sand with gravel (SM) nonplastic, dry, medium dense											
		FILL: Reddish brown and gray, lean clay (CL) (shale fill), dry - very moist, stiff - medium stiff	2	SS	5.0-6.5	5-6-5 (11)	100						
		- some semi-durable shale fragments at 6.0'											
		13.0	3	SS	10.0-11.5	1-4-4 (8)	80						2.0
		- little sandy shale fragments at 11.0'											
		- very moist from 11.0'	1	ST	11.5-13.5		85						
568.00	15.0												
		FILL: Reddish brown, blueish gray, and yellowish gray, clayey gravel with sand (GC) (gravel=sandstone fragments), moist - very moist, loose - dense	4	SS	15.0-16.5	3-4-4 (8)	73						
		9.0	2	ST	17.5-19.5		80						
			5	SS	20.0-21.5	3-17-22 (39)	60						
559.00	24.0		6	SS	22.5-24.0	5-10-8 (18)	100						
		FILL: Reddish brown, lean clay (CL) (shale fill), wet, soft	7	SS	24.0-25.5	1-2-1 (3)	100						
		3.5 - abundant non-durable to semidurable shale fragments											
555.50	27.5												
		Gray, LEAN CLAY with SAND (CL), wet, very soft	8	SS	27.5-29.0	WOH-WOH-WOH	100						0.25
		4.0 - trace organics (wood and peat)											
551.50	31.5		3	ST	29.5-31.5		100						
		Gray, SILTY SAND (SM) low plasticity to non-plastic, wet, very loose - loose	9	SS	31.5-33.0	1-2-2 (4)	100						
		4.5											

General Notes

Driller	HCN
Rig No.	J. Johnson
Rig Type	ATV
Method	SS/ST
Inspector	NG

Remarks

Located boring 1' off edge of Rd. (approx. 7' off Rd. CL) on natural side of dam. Water at completion measured through the augers. Boring caved at 34' after 24 hrs. Installed MW with screen from 28' to 38' in hole 7' east of B-1.

Water Level Observations

Immediate	24.0			ft. ▽
At Completion	24.2			ft. ▽
After	24	Hrs.	33.0	ft. ▼
Water used in drilling	31.5			ft.

BF = BACKFILLED NW = NO WATER
(Measured from ground surface)

TEST BORING ASH DAM.GPJ HC NUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
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FAX (614) 863-0475

INDIANA REGION
340 WALNUT STREET, STE 9
LAWRENCEBURG, IN 47025
(812) 539-4300
FAX (812) 539-4301

BLUEGRASS REGION
470-B CONWAY CT., STE B-8
LEXINGTON, KY 40511
(859) 455-5530
FAX (859) 455-5539

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-1
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/8/2005
Boring Location		Date Completed	8/8/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))	SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
547.00	36.0	- little organics (wood framents) throughout - clayey seams	10	SS	35.0-36.5	4-8-6 (14)	100						
542.50	40.5	Gray, SILTY SAND with GRAVEL (SM) (gravel=sandstone fragments) non-plastic, wet, medium dense - loose - cobbles at 38.0' to 39.0'	11	SS	40.0-41.5	2-2-3 (5)	67						
538.00	45.0	- trace organics (peat) Gray, SILTY SAND (SM) non-plastic, wet, loose - trace coal fragments and organics (peat)	12	SS	45.0-46.5	3-3-2 (5)	100						
529.50	53.5	Gray, POORLY GRADED SAND with SILT (SP-SM), wet, loose - trace organics (peat) - little gravel (sandy shale fragments) at 51.5'	13	SS	50.0-51.5	3-3-7 (10)	100						
524.50	58.5	Blueish gray and reddish brown, LEAN CLAY with SAND (residual SHALE), wet - moist, stiff - very hard	14	SS	55.0-56.5	5-10-26 (36)	100						
			15	SS	57.5-58.5	26-50/0.5	100						
		BORING COMPLETED @ 58.5'											

General Notes

Driller	HCN
Rig No.	J. Johnson
Rig Type	ATV
Method	SS/ST
Inspector	NG

Remarks

Located boring 1' off edge of Rd. (approx. 7' off Rd. CL) on natural side of dam. Water at completion measured through the augers. Boring caved at 34' after 24 hrs. Installed MW with screen from 28' to 38' in hole 7' east of B-1.

Water Level Observations

Immediate	24.0	ft. ▽		
At Completion	24.2	ft. ▽		
After	24	Hrs.	33.0	ft. ▼
Water used in drilling	31.5	ft.		

BF = BACKFILLED NW = NO WATER
(Measured from ground surface)

TEST BORING ASH DAM.GPJ HC NUTTING.GDT 8/14/06

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0621
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER
911 LUNKEN PARK DRIVE
CINCINNATI, OH 45226
(513) 321-5816
FAX (513) 321-0294

CENTRAL OHIO REGION
700 MORRISON ROAD
COLUMBUS, OH 43230
(614) 882-3113
FAX (614) 882-0479

INDIANA REGION
340 WALNUT STREET, STE B
LAWRENCEBURG, IN 47025
(812) 539-4300
FAX (812) 539-4301

BLUEGRASS REGION
470-B CONWAY CT., STE B-8
LEXINGTON, KY 40511
(859) 455-8530
FAX (859) 455-8530

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-2
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/1/2005
Boring Location		Date Completed	8/2/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))	SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
583.00	0.0	FILL: Brown, silty sand with gravel (SM) nonplastic, dry - moist, dense	1	SS	0.0-1.5	28-25-17 (42)	87						
577.50	5.5	FILL: Reddish brown, lean clay with sand (CL) (shale fill), dry - moist, stiff - very stiff	2	SS	5.0-6.5	7-6-7 (13)	67						
			1	ST	6.5-8.5		100						
		- little friable sandstone fragments at 10.0'	3	SS	10.0-11.5	5-6-10 (16)	100						
			2	ST	11.5-13.5		100						
562.00	21.0	- multi-colored, moist, and trace organics (grass/roots) at 16.0'	4	SS	15.0-16.5	4-11-8 (19)	100						
			3	ST	16.5-18.5		100						
		FILL: Reddish brown and gray, sandy lean clay with gravel (CL) (gravel=sandstone fragments) (SPT Ns likely overstated due to coarse gravel), moist - wet, medium stiff - stiff	5	SS	20.0-21.5	3-4-14 (18)							
		- very gravelly at 21.5'	4	ST	21.5-23.5		60						
			6	SS	25.0-26.5	8-10-7 (17)	80						
554.50	28.5	- wet from 26.5'	5	ST	26.5-28.5		90						
552.50	30.5	Gray, SANDY LEAN CLAY (CL), very moist - wet, soft											
		Gray, SILTY SAND (SM) nonplastic, wet, loose	7	SS	30.0-31.5	1-2-4 (6)	100						
548.00	35.0												

General Notes

Driller	HCN
Rig No.	D. Smith
Rig Type	ATV
Method	NQ2/SS/ST
Inspector	NG

Remarks

Located boring 2' off Rd. CL on natural dam side. No indication of void noted in NQ2 #2. Material probably washed out due to short run.

Water Level Observations

Immediate	26.5	ft. ▽
At Completion	16.0	ft. ▽
After 24 Hrs.	16.0	ft. ▼
Water used in drilling	35.0	ft.

BF = BACKFILLED NW = NO WATER
(Measured from ground surface)

TEST BORING ASH DAM GPJ HC NUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 26301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER 811 LUNKEN PARK DRIVE CINCINNATI, OH 45226 (513) 321-5816 FAX (513) 321-0294
CENTRAL OHIO REGION 780 MORRISON ROAD COLUMBUS, OH 43230 (614) 863-3113 FAX (614) 863-0475
INDIANA REGION 342 WALNUT STREET, STE 8 LAWRENCEBURG, IN 47025 (812) 539-4300 FAX (812) 539-4301
BLUEGRASS REGION 470-B CONWAY CT., STE B-8 LEXINGTON, KY 40511 (859) 455-8690 FAX (859) 455-8690

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-2
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/1/2005
Boring Location		Date Completed	8/2/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))	SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
		Gray, POORLY GRADED SAND with SILT (SP-SM), wet, very loose - loose	8	SS	35.0-36.5	2-2-2 (4)							
			9	SS	40.0-41.5	10-10-9 (19)	80						
	15.0		10	SS	45.0-46.5	3-2-4 (6)	67						
533.00	50.0												
		Gray, SILTY SAND with GRAVEL (SM) (gravel=sandstone fragments), nonplastic, wet, medium dense	11	SS	50.0-51.5	4-5-11 (16)	80						
529.00	54.0	4.0											
		Gray and brown, LEAN CLAY with SAND (CL) (residual sandy SHALE), wet, very stiff - hard	12	SS	55.0-56.0	26-50/0.5	90						
527.00	56.0	2.0											
526.60	56.4	0.4 Gray, sandy SHALE, completely to highly weathered, extremely soft - very soft	1	NQ2	56.0-60.4		98	0				0-1	
		4.6 Reddish brown, CLAYSTONE, completely to highly weathered, extremely soft - very soft											
522.00	61.0		2	NQ2	60.4-61.0		0	0				0-1	
		BORING COMPLETED @ 61.0'											

General Notes

Driller	HCN
Rig No.	D. Smith
Rig Type	ATV
Method	NQ2/SS/ST
Inspector	NG

Remarks

Located boring 2' off Rd. CL on natural dam side. No indication of void noted in NQ2 #2. Material probably washed out due to short run.

Water Level Observations

Immediate	28.5	ft.	▽	
At Completion	16.0	ft.	▽	
After	24 Hrs.	16.0	ft.	▼
Water used in drilling	35.0	ft.		

BF - BACKFILLED NW = NO WATER
(Measured from ground surface)

TEST BORING ASH DAM.GPJ HC NUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER
811 LUNKEN PARK DRIVE
CINCINNATI, OH 45226
(513) 321-5816
FAX (513) 321-0294

CENTRAL OHIO REGION
790 MORRISON ROAD
COLUMBUS, OH 43230
(614) 863-3113
FAX (614) 863-0475

INDIANA REGION
348 WALNUT STREET STE 6
LAWRENCEBURG, IN 47025
(812) 539-4500
FAX (812) 539-4501

BLUEGRASS REGION
476-B CONWAY CT., STE B-6
LEXINGTON, KY 40511
(859) 455-8830
FAX (859) 455-8830

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-3
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/7/2005
Boring Location		Date Completed	8/7/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))
583.00	0.0	
		FILL: Brown, silty sand with gravel (SM) non-plastic, dry - moist, medium dense
580.00	3.0	3.0
		FILL: Reddish brown and multi-colored, lean clay (CL) (shale fill), moist, medium stiff - very stiff
		13.5 - little sandstone/sandy shale fragments
566.50	16.5	
		FILL: Brown and gray, clayey gravel with sand (GC) (gravel=sandstone fragments), moist, medium dense
		5.5 - very gravelly at 20.0' - clay component very moist to wet and soft at 21.0' to 21.5'
561.00	22.0	
		FILL: Brown and gray, silty gravel with sand (GM) (gravel=sandstone fragments) non-plastic, very moist, medium dense - very dense
557.00 ▽	26.0	4.0 - thin clayey gravel seams
		FILL/DISTURBED Material: brown and greenish gray, clayey gravel with sand (GC) (gravel=sandstone fragments), wet - very moist, very loose
555.50	27.5	1.5
555.00	28.0	0.5
		FILL/DISTRUBED MATERIAL: gray, lean clay (CL), slight organic odor, wet, soft
553.00	30.0	2.0
		FILL/DISTRUBED MATERIAL: greenish gray, silty/clayey gravel with sand (GC/GM) (gravel=sandstone fragments), wet, very loose
550.50	32.5	2.5
		Gray, LEAN CLAY with SAND (CL), wet, very soft - soft

NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
1	SS	0.0-1.5	4-9-7 (16)	80						
2	SS	5.0-6.5	7-4-4 (8)	93						
1	ST	6.5-8.5		80						
3	SS	10.0-11.5	4-3-6 (9)	93						
2	ST	11.5-13.5		100						
4	SS	15.0-16.5	3-7-9 (16)	100						
3	ST	16.5-17.0		100						
4	ST	18.5-20.0		67						
5	SS	20.0-21.5	11-6-5 (11)	80						
6	SS	22.0-23.2	7-17-50/0.2	117						
7	SS	25.0-26.5	38-19-6 (25)	100						
8	SS	26.5-28.0	4-2-2 (4)	87						<0.25
9	SS	28.0-29.5	3-1-2 (3)	47						
5	ST	30.0-32.0		100						
10	SS	32.0-33.5	2-5-4 (9)	100						

General Notes

Driller	HCN
Rig No.	J. Johnson
Rig Type	ATV
Method	NQ2/SS/ST
Inspector	NG

Remarks

Located boring at edge of Rd. (approx. 6' off Rd. CL) on natural side of dam. ST#3 failed due to presence of gravel. ST#4 terminated at 20' due to presence of gravel. Installed MW with screen from 27.0' to 32.0' in hole 5' east of B-3.

Water Level Observations

Immediate	26.0			ft. ▽
At Completion	17.5			ft. ▽
After	24	Hrs.	20.5	ft. ▼
Water used in drilling	35.0			ft.

BF = BACKFILLED NW = NO WATER
(Measured from ground surface)

TEST BORING ASH DAM.GPJ HC NUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER 611 LUNKEN PARK DRIVE CINCINNATI, OH 45226 (513) 321-5816 FAX (513) 321-0294
CENTRAL OHIO REGION 730 MORRISON ROAD COLUMBUS, OH 43230 (614) 863-3113 FAX (614) 863-0475
INDIANA REGION 309 WALNUT STREET, STE 8 LAWRENCEBURG, IN 47025 (812) 533-4300 FAX (812) 539-4301
BLUEGRASS REGION 470-B CONWAY CT., STE B-8 LEXINGTON, KY 40511 (859) 455-8830 FAX (859) 455-8830

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-3
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/7/2005
Boring Location		Date Completed	8/7/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	80979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))	SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
		- trace wood and coal fragments at 34.0'	11	SS	35.0-36.5	3-4-2 (6)	100						
		Gray, SILTY SAND (SM) non-plastic, wet, loose *(LAYER CONTINUED DESCRIPTION REPEATED)*											
	12.5	- trace peat	12	SS	40.0-41.5	2-4-6 (10)	100						
538.00	45.0												
		Gray, POORLY GRADED SAND with SILT (SP-SM), wet, medium dense	13	SS	45.0-46.5	5-6-6 (12)	100						
	9.5	- trace coal fragments at 50.0'	14	SS	50.0-51.5	4-6-14 (20)	100						
528.50	54.5												
	3.8	Blueish gray to reddish brown, LEAN CLAY with SAND (CL) (residual SHALE), very stiff - very hard	15	SS	55.0-56.5	21-44-25 (69)	100						
524.70	58.3		16	SS	57.5-58.3	30-50/0.3	100						
	2.3	Reddish brown and blueish gray, CLAYSTONE, completely to highly weathered, extremely soft - very soft											
522.40	60.6		1	NQ2	58.3-63.3		100	26				0-3	
	2.7	Blueish gray, SANDY SILTSTONE, slightly weathered, soft - medium hard											
519.70	63.3												
		BORING COMPLETED @ 63.3'											

General Notes

Driller	HCN
Rig No.	J. Johnson
Rig Type	ATV
Method	NQ2/SS/ST
Inspector	NG

Remarks

Located boring at edge of Rd. (approx. 6' off Rd. CL) on natural side of dam. ST#3 failed due to presence of gravel. ST#4 terminated at 20' due to presence of gravel. Installed MW with screen from 27.0' to 32.0' in hole 5' east of B-3.

Water Level Observations

Immediate	26.0	ft. ▽
At Completion	17.5	ft. ▽
After 24 Hrs.	20.5	ft. ▼
Water used in drilling	35.0	ft.

BF = BACKFILLED NW = NO WATER
(Measured from ground surface)

TEST BORING ASH DAM.GPJ HC NUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER
811 LUNKEN PARK DRIVE
CINCINNATI, OH 45226
(513) 321-5816
FAX (513) 321-0294

CENTRAL OHIO REGION
700 MORRISON ROAD
COLUMBUS, OH 43230
(614) 863-3113
FAX (614) 863-3476

INDIANA REGION
549 WALNUT STREET, STE 8
LAWRENCEBURG, IN 47025
(812) 539-4300
FAX (812) 539-4301

BLUEGRASS REGION
470-B CONWAY CT., STE B-8
LEXINGTON, KY 40511
(859) 455-8800
FAX (359) 455-8930

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-4
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/2/2005
Boring Location		Date Completed	8/3/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))	SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
583.00	0.0												
		FILL: Brown and gray, silty sand with gravel (SM) nonplastic, moist, dense - medium dense	1	SS	0.0-1.5	14-12-13 (25)	100						
578.00	5.0	5.0											
		FILL: Brown, sandy lean clay (CL), moist, soft	2	SS	5.0-6.5	2-1-2 (3)	87						
575.00	8.0	3.0	1	ST	6.5-8.5		0						
		FILL: Brown, silty/clayey sand (SC/SM), moist, loose - very loose	3	SS	10.0-11.5	3-4-6 (10)	100						
566.50	16.5	8.5	4	SS	15.0-16.5	2-1-2 (3)	100						
		FILL/DISTURBED MATERIAL: Grayish brown, silty sand (SM), nonplastic, very moist - wet, very loose - loose - wet from 18.0'	5	SS	20.0-21.5	2-1-4 (5)	100						
		- trace coal fragments/peat at 21' 10.5											
556.00	27.0	- some gravel (sandstone fragments) at 27.0'	6	SS	25.0-26.5	2-3-2 (5)	0						
		Grayish brown, SILTY SAND (SM) nonplastic, wet, medium dense - trace peat	7	SS	26.5-28.0	9-8-3 (11)	67						
			8	SS	30.0-31.5	7-8-10 (18)	100						

General Notes

Driller	HCN
Rig No.	J. Johnson
Rig Type	ATV
Method	NQ2/SS/ST
Inspector	NG

Remarks

Located boring 4' off Rd. CL on natural dam side. NQ2 #1 56.4'-58.5' no indication of void noted. Material probably washed out due to extremely soft HCSI. Boring caved at 18' upon completion and caved at 19' after 24 hrs.

Water Level Observations

Immediate	18.0			ft. ▽
At Completion	17.0			ft. ▽
After	24	Hrs.	18.0	ft. ▼
Water used in drilling	25.0			ft.

BF = BACKFILLED NW = NO WATER
(Measured from ground surface)

TEST BORING ASH DAM.GPJ HC NUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER
811 LUNKEN PARK DRIVE
CINCINNATI, OH 45226
(513) 321-5816
FAX (513) 321-0294

CENTRAL OHIO REGION
700 MORRISON ROAD
COLUMBUS, OH 43230
(614) 863-3113
FAX (614) 863-0875

INDIANA REGION
348 WALNUT STREET, STE 8
LAWRENCEBURG, IN 47025
(812) 539-4300
FAX (812) 539-4301

BLUEGRASS REGION
470-B CONWAY CT., STE B-3
LEXINGTON, KY 40511
(859) 455-8530
FAX (859) 463-8530

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-4
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/2/2005
Boring Location		Date Completed	8/3/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))	SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
		16.0 Grayish brown, SILTY SAND (SM) nonplastic, wet, medium dense *(LAYER CONTINUED DESCRIPTION REPEATED)*	9	SS	35.0-36.5	6-8-5 (13)	100						
			10	SS	40.0-41.5	7-9-11 (20)	73						
		- little coal fragments and peat at 41.0'											
540.00	43.0												
		Gray, POORLY GRADED SAND with SILT (SP-SM), wet, medium dense											
		7.0 - trace coal fragments at 46.0'	11	SS	45.0-46.5	4-7-5 (12)	73						
533.00	50.0												
		Gray, POORLY GRADED SAND with SILT and GRAVEL (SP-SM)	12	SS	50.0-51.5	5-20-18 (38)	67						
		3.0 (gravel=sandstone fragments), wet, dense											
530.00	53.0												
		Reddish brown and gray, LEAN CLAY (CL) (residual SHALE), wet - moist,											
		3.4 stiff - hard	13	SS	55.0-56.4	10-27-50/0.4	100						
526.60	56.4												
		Reddish brown and gray, CLAYSTONE, completely to highly weathered, extremely soft	1	NQ2	56.4-61.5		69	0				0	
		5.1											
521.50	61.5												
		BORING COMPLETED @ 61.5'											

General Notes	
Driller	HCN
Rig No.	J. Johnson
Rig Type	ATV
Method	NQ2/SS/ST
Inspector	NG

Remarks

Located boring 4' off Rd. CL on natural dam side. NQ2 #1 56.4'-58.5' no indication of void noted. Material probably washed out due to extremely soft HCSI. Boring caved at 18' upon completion and caved at 19' after 24 hrs.

Water Level Observations

Immediate	18.0	ft.	▽
At Completion	17.0	ft.	▽
After	24 Hrs.	18.0	ft.	▼
Water used in drilling	25.0	ft.	

BF = BACKFILLED NW = NO WATER
(Measured from ground surface)

TEST BORING ASH DAM.GPJ HC NUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER
911 LUNKEN PARK DRIVE
CINCINNATI, OH 45226
(513) 321-5816
FAX (513) 321-0294

CENTRAL OHIO REGION
780 MORRISON ROAD
COLUMBUS, OH 43230
(614) 863-3113
FAX (614) 863-0476

INDIANA REGION
348 WALNUT STREET STE 6
LAWRENCEBURG, IN 47025
(812) 539-4500
FAX (812) 539-4501

BLUEGRASS REGION
470-B CONWAY CT., STE B-II
LEXINGTON, KY 40511
(859) 455-8630
FAX (859) 455-8630

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-5
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/3/2005
Boring Location		Date Completed	8/13/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))	SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
583.00	0.0												
		FILL: Brownish gray, silty sand with gravel (SM) nonplastic, moist, dense - medium dense	1	SS	0.0-1.5	10-15-15 (30)	100						
	5.5												
577.50	5.5	- trace coal fragments at 5.0'	2	SS	5.0-6.5	3-4-3 (7)	100						
		Fill: Brown, poorly graded sand (SP), dry - moist, loose											
	3.5	- uniform appearance											
574.00	9.0		3	SS	10.0-11.5	2-1-4 (5)	100						
		FILL: Brown, poorly graded sand with silt (SP-SM), moist, loose											
	6.5	- uniform appearance											
567.50	15.5		4	SS	15.0-16.5	4-3-2 (5)	100						
		FILL: Brown, silty/clayey sand (SC/SM), very moist - wet, loose											
	2.5	- wet from 16.0'											
565.00	18.0	- uniform appearance											
		FILL: Grayish brown, silty sand (SM), nonplastic to low plasticity, wet, loose											
	4.0		5	SS	20.0-21.5	1-2-4 (6)	100						
561.00	22.0												
		Brown and gray, SILTY SAND (SM), nonplastic to low plasticity, moist - wet, loose - medium dense	6	SS	25.0-26.5	5-5-9 (14)	73						
		- trace peat from 26.5'											
			7	SS	30.0-31.5	4-6-9 (15)	100						

General Notes		Remarks	Water Level Observations		
Driller	HCN	Located boring 3' off Rd. CL on natural dam side. Boring caved at 18'	Immediate	16.5	ft. ▽
Rig No.	J. Johnson	after 24 hrs.	At Completion	17.5	ft. ▼
Rig Type	ATV		After	24 Hrs. NW	ft.
Method	SS		Water used in drilling	20.0	ft.
Inspector	NG		BF = BACKFILLED NW = NO WATER (Measured from ground surface)		

TEST BORING ASHDAM.GPJ HCNUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER 811 LUNKEN PARK DRIVE CINCINNATI, OH 45226 (513) 321-5816 FAX (513) 321-0294
CENTRAL OHIO REGION 700 MORRISON ROAD COLUMBUS, OH 43230 (614) 863-3113 FAX (614) 863-0475
INDIANA REGION 340 WALNUT STREET, STE 8 LAWRENCEBURG, IN 47025 (812) 539-4900 FAX (812) 539-4901
BLUEGRASS REGION 470-B CONWAY CT., STE B-8 LEXINGTON, KY 40511 (859) 455-8330 FAX (859) 455-8030

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-5
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/3/2005
Boring Location		Date Completed	8/13/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted)	SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
		Brown and gray, SILTY SAND (SM), nonplastic to low plasticity, moist - wet, loose - medium dense *(LAYER CONTINUED DESCRIPTION REPEATED)*	8	SS	35.0-36.5	2-5-6 (11)	100						
	32.5	- clayey seam at 36.0'	9	SS	40.0-41.5	3-5-8 (13)	100						
			10	SS	45.0-46.5	6-8-8 (16)	100						
			11	SS	50.0-51.5	5-8-11 (19)	100						
528.50	54.5	- little gravel (sandstone fragments) at 51.0'											
527.20	55.8	1.3 Reddish brown and gray, LEAN CLAY (CL) (residual SHALE), moist, hard	12	SS	55.0-55.8	30-50/0.3	100						
		BORING COMPLETED @ 55.8'											

General Notes		Remarks	Water Level Observations		
Driller	HCN	Located boring 3' off Rd. CL on natural dam side. Boring caved at 18' after 24 hrs.	Immediate	16.5	ft. ▽
Rig No.	J. Johnson		At Completion	17.5	ft. ▼
Rig Type	ATV		After 24 Hrs.	NW	ft.
Method	SS		Water used in drilling	20.0	ft.
Inspector	NG		BF = BACKFILLED NW = NO WATER (Measured from ground surface)		

TEST BORING ASH DAM.GPJ HC NUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER 911 LUNKEN PARK DRIVE CINCINNATI, OH 45226 (513) 321-5816 FAX (513) 321-0294
CENTRAL OHIO REGION 780 MORRISON ROAD COLUMBUS, OH 43230 (614) 882-9113 FAX (614) 882-0475
INDIANA REGION 343 WALNUT STREET, STE 6 LAWRENCEBURG, IN 47025 (812) 539-4300 FAX (812) 938-4301
BLUEGRASS REGION 470-B CONWAY CT., STE B-3 LEXINGTON, KY 40511 (859) 455-8530 FAX (859) 455-8830

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-6
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/4/2005
Boring Location		Date Completed	8/5/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))
583.00	0.0	
582.50	0.5	0.5 Topsoil
582.00	1.0	0.5 FILL: Gray, silty sand (SM), nonplastic, dry - moist, loose
		FILL: Brown, sandy lean clay (CL), moist, stiff
		4.5
577.50	5.5	
		FILL: Reddish brown and multicolored, lean clay with gravel (CL) (gravel=sandstone fragments) (shale fill), moist, stiff
		5.0
572.50	10.5	
		Brown to light brown, sandy lean clay (CL), moist, stiff
		- uniform appearance
		8.0 - trace organics (hair roots)
564.50 ▽	18.5	
		FILL/DISTURBED MATERIAL, silty/clayey sand (SC/SM), wet, loose
		3.5
		- uniform appearance
561.00	22.0	
		Brown, LEAN CLAY with SAND (CL), wet, soft
		2.0 - logged from cuttings and ST
559.00	24.0	
		Brown, SILTY SAND (SM), nonplastic, wet, loose
		11.5

SAMPLE

NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
1	SS	0.0-1.5	3-5-4 (9)	100						
2	SS	5.0-6.5	2-5-5 (10)	87						
1	ST	6.5-8.5		85						
3	SS	10.0-11.5	4-8-7 (15)	100						
4	SS	15.0-16.5	3-4-6 (10)	100						4.5
2	ST	16.5-18.5		45						
5	SS	20.0-21.5	3-5-2 (7)	100						
3	ST	23.0-25.0		100						
6	SS	25.0-26.5	2-5-4 (9)	100						
7	SS	30.0-31.5	2-3-2 (5)	100						

General Notes

Driller	HCN
Rig No.	J. Johnson
Rig Type	ATV
Method	SS/ST
Inspector	NG

Remarks

Located boring 3' off Rd. edge (approx. 8' off Rd. CL) on natural dam side. Water level at completion measured through the augers. Installed MW with screen from 15.0' to 25.0' in hole 6' west of B-6.

Water Level Observations

Immediate	18.5		ft. ▽
At Completion	24.5		ft. ▽
After	24	Hrs. BF	ft.
Water used in drilling	25.0		ft.

BF = BACKFILLED NW = NO WATER
(Measured from ground surface)

TEST BORING ASH DAM.GPJ HC NUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 812 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER 511 LUNKEN PARK DRIVE CINCINNATI, OH 45226 (513) 321-5816 FAX (513) 321-0294
CENTRAL OHIO REGION 790 MORRISON ROAD COLUMBUS, OH 43230 (614) 863-3113 FAX (614) 863-0475
INDIANA REGION 340 WALNUT STREET, STE B LAWRENCEBURG, IN 47025 (812) 539-4500 FAX (812) 539-4391
BLUEGRASS REGION 470-B CONWAY CT., STE B-9 LEXINGTON, KY 40511 (859) 455-8553 FAX (859) 455-8630

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-6
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/4/2005
Boring Location		Date Completed	8/5/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))	SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
547.50	35.5	Gray, POORLY GRADED SAND with SILT (SP-SM), wet, medium dense	8	SS	35.0-36.5	6-6-6 (12)	80						
		- trace peat											
		10.5	9	SS	40.0-41.5	4-7-8 (15)	87						
537.00	46.0		10	SS	45.0-46.5	6-7-7 (14)	80						
		Gray, POORLY GRADED SAND with SILT and GRAVEL (SP-SM)											
		3.0 (gravel=sandstone fragments), wet, medium dense											
534.00	49.0												
		Gray, POORLY GRADED SAND (SP), wet, medium dense	11	SS	50.0-51.5	5-6-7 (13)	100						
		5.0											
529.00	54.0												
		Blueish gray, SANDY LEAN CLAY											
		1.8 (CL) (residual sandy SHALE), moist - dry, very stiff - very hard	12	SS	55.0-55.8	40-50/0.3	100						
527.20	55.8	BORING COMPLETED @ 55.8'											

General Notes		Remarks	Water Level Observations		
Driller	HCN	Located boring 3' off Rd. edge (approx. 8' off Rd. CL) on natural dam	Immediate	18.5	ft. ▽
Rig No.	J. Johnson	side. Water level at completion measured through the augers. Installed	At Completion	24.5	ft. ▼
Rig Type	ATV	MW with screen from 15.0' to 25.0' in hole 6' west of B-6.	After	24 Hrs. BF	ft.
Method	SS/ST		Water used in drilling	25.0	ft.
Inspector	NG		BF = BACKFILLED NW = NO WATER (Measured from ground surface)		

TEST BORING ASH DAM.GPJ HC_NUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER
611 LUNKEN PARK DRIVE
CINCINNATI, OH 45226
(513) 321-5816
FAX (513) 321-0294

CENTRAL OHIO REGION
720 MORRISON ROAD
COLUMBUS, OH 43230
(614) 863-3115
FAX (614) 863-0475

INDIANA REGION
348 WALNUT STREET STE 8
LAWRENCEBURG, IN 47025
(812) 539-4300
FAX (812) 539-4301

BLUEGRASS REGION
470-B CONWAY CT. STE B-8
LEXINGTON, KY 40511
(859) 455-8530
FAX (859) 455-8530

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-7
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/11/2005
Boring Location		Date Completed	8/11/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))
568.00	0.0	
567.70	0.3	0.3 Topsoil
		FILL: Reddish and yellowish brown, lean clay with sand (CL), dry, stiff
		3.7 - some semi-friable shale fragments
564.00 ▽	4.0	
		FILL: Gray, poorly graded gravel with silt and sand (GP-GM), wet, loose
		5.5
558.50	9.5	
		FILL/DISTURBED MATERIAL, gravelly lean clay (CL), wet, soft - very soft
556.00	12.0	2.5
		Gray, LEAN CLAY (CL), wet, very soft
		2.5
553.50	14.5	
		Gray, SILTY SAND (SM), wet, very loose - loose
		- trace organics (wood fragments) at 16'
		8.5
		- trace friable sandstone fragments and little coal fragments/peat at 21'
545.00	23.0	
		Gray, POORLY GRADED SAND with SILT (SP-SM), wet, loose
		- trace coal fragments/peat
		12.5

SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
1	SS	0.0-1.5	3-4-10 (14)	100						
2	SS	5.0-6.5	3-4-1 (5)	47						
3	SS	10.0-11.5	3-2-1 (3)	40						
1	ST	13.0-15.0		100						
4	SS	15.0-16.5	1-2-2 (4)	100						
5	SS	20.0-21.5	1-3-4 (7)	100						
6	SS	25.0-26.5	3-4-3 (7)	100						
7	SS	30.0-31.5	3-2-3 (5)	100						

General Notes	
Driller	HCN
Rig No.	J. Williams
Rig Type	Track
Method	NQ2/SS/ST
Inspector	NG

Remarks

Located boring at dam toe, appr. 3.5' above creek. Hay stick used for sediment control. Water level upon completion measured through the augers before NQ2. 24 hr. water level measured through the augers. Installed MW with screen from 40.9' to 30.9'.

Water Level Observations

Immediate	4.0			ft. ▽
At Completion	3.0			ft. ▽
After	24	Hrs.	3.0	ft. ▼
Water used in drilling	20.0			ft.

BF = BACKFILLED NW = NO WATER
(Measured from ground surface)

TEST BORING ASH DAM.GPJ HCNUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 812 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711

EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER
811 LUNKEN PARK DRIVE
CINCINNATI, OH 45226
(513) 321-5816
FAX (513) 321-0294

CENTRAL OHIO REGION
780 MORRISON ROAD
COLUMBUS, OH 43230
(614) 863-3113
FAX (614) 863-0475

INDIANA REGION
348 WALNUT STREET, STE 6
LAWRENCEBURG, IN 47025
(812) 539-4200
FAX (812) 539-0301

BLUEGRASS REGION
470-B CONWAY CT., STE B-6
LEXINGTON, KY 40511
(859) 455-3530
FAX (859) 455-8630

LOG OF TEST BORING

Client	American Electric Power	Boring No.	B-7
Project	Bottom Ash Dam Evaluation - Amos Plant, WV	Date Started	8/11/2005
Boring Location		Date Completed	8/11/2005
Elevation Ref.	AEP Boring Location Plan	Work Order No.	90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))	SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
532.50	35.5	Gray and multicolored, SILTY GRAVEL with SAND (GM) (gravel =sandstone fragments), nonplastic to low plasticity, wet, dense	8	SS	35.0-36.5	6-16-18 (34)	100						
530.00	38.0	2.5											
		Reddish brown and gray, LEAN CLAY with SAND (CL) (completely weathered sandy SHALE), moist - dry, very stiff - very hard											
527.10	40.9	2.9	9	SS	40.0-40.9	30-50/0.4	100						
		Reddish brown, CLAYSTONE, completely to highly weathered, extremely soft - very soft	1	NQ2	40.9-45.7		100	0				0-1	
522.30	45.7	4.8											
		BORING COMPLETED @ 45.7'											

General Notes		Remarks	Water Level Observations		
Driller	HCN	Located boring at dam toe, appr. 3.5' above creek. Hay stick used for	Immediate	4.0	ft. ▽
Rig No.	J. Williams	sediment control. Water level upon completion measured through the	At Completion	3.0	ft. ▽
Rig Type	Track	augers before NQ2. 24 hr. water level measured through the augers.	After	24 Hrs. 3.0	ft. ▼
Method	NQ2/SS/ST	Installed MW with screen from 40.9' to 30.9'.	Water used in drilling	20.0	ft.
Inspector	NG		BF = BACKFILLED NW = NO WATER (Measured from ground surface)		

TEST BORING ASH DAM.GPJ HCNUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER
611 LUMKEN PARK DRIVE
CINCINNATI, OH 45226
(513) 321-5816
FAX (513) 321-0294

CENTRAL OHIO REGION
780 MORRISON ROAD
COLUMBUS, OH 43230
(614) 863-3113
FAX (614) 863-0476

INDIANA REGION
548 WALNUT STREET, STE B
LAWRENCEBURG, IN 47025
(812) 539-4300
FAX (812) 539-4301

BLUEGRASS REGION
473-B CONWAY CT., STE B-8
LEXINGTON, KY 40511
(859) 455-8630
FAX (859) 455-8830

LOG OF TEST BORING

Client: American Electric Power
Project: Bottom Ash Dam Evaluation - Amos Plant, WV
Boring Location:
Elevation Ref.: AEP Boring Location Plan

Boring No.: B-8
Date Started: 8/12/2005
Date Completed: 8/12/2005
Work Order No.: 90979.059

ELEV. ft	DEPTH ft	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))
568.00	0.0	
567.70	0.3	0.3 Topsoil
567.10	0.9	0.6 FILL: Reddish brown, lean clay with sand (CL) (shale fill), moist, medium stiff
		FILL: Greenish brown and gray, sandy shale and sandstone COBBLES (drill pressure at 8.0': 800 psi)
		- some clayey-soft seams
		8.6
558.50	9.5	
		Dark gray, LEAN CLAY (CL) (mostly liquid), wet, very soft
		- trace organics (wood)
		7.0 - slight organic odor
551.50	16.5	
		Gray, SILTY SAND (SM), nonplastic, wet, loose
		- trace coal fragments at 21'
		16.0
		- trace wood, trace 0.25" coal fragments, and little gravel (sandstone fragments) at 30'
534.00	34.0	

SAMPLE

NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
1	SS	0.0-0.9	3-50/0.4	100						
2	SS	5.0-6.5	33-22-7 (29)	93						
3	SS	7.5-7.9	50/0.4	100						
4	SS	10.0-11.5	1-WOH-WOH	100						
1	ST	11.5-13.5		0						
5	SS	15.0-16.5	WOH-WOH-1	100						
2	ST	17.0-19.0		55						
6	SS	20.0-21.5	2-2-3 (5)	100						
7	SS	25.0-26.5	2-3-4 (7)	100						
8	SS	30.0-31.5	4-4-3 (7)	100						

General Notes

Driller	HCN
Rig No.	J. Williams
Rig Type	Track
Method	NQ2/SS/ST
Inspector	NG

Remarks

Located boring at dam toe, appr. 3.5' above creek. Hay stick used for sediment control. Water level upon completion measured through the augers before NQ2. Recovery of ST-1 failed due to very soft material.

Water Level Observations

Immediate	6.0	ft. ▽
At Completion	1.5	ft. ▼
After	24 Hrs.	NA ft.
Water used in drilling	30	ft.

BF = BACKFILLED NW = NO WATER
(Measured from ground surface)

TEST BORING ASH DAM.GPJ HC.NUTTING.GDT 8/14/05

H.C. NUTTING COMPANY
APPALACHIAN REGION - 912 MORRIS STREET
CHARLESTON, WV 25301 (304) 344-0821
FAX (304) 342-4711
EMPLOYEE OWNED
GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS SINCE 1921

CORPORATE CENTER 911 LUNKEN PARK DRIVE CINCINNATI, OH 45226 (513) 321-5816 FAX (513) 321-0294
CENTRAL OHIO REGION 700 MORRISON ROAD COLUMBUS, OH 43230 (614) 863-3113 FAX (614) 863-0475
INDIANA REGION 349 WALNUT STREET, STE 8 LAWRENCEBURG, IN 47025 (812) 539-4300 FAX (812) 539-4301
BLUEGRASS REGION 476-8 CONWAY CT., STE B-8 LEXINGTON, KY 40511 (859) 455-8630 FAX (859) 455-8630

LOG OF TEST BORING

Client: American Electric Power
Project: Bottom Ash Dam Evaluation - Amos Plant, WV
Boring Location:
Elevation Ref.: AEP Boring Location Plan

Boring No.: B-8
Date Started: 8/12/2005
Date Completed: 8/12/2005
Work Order No.: 90979.059

ELEV. ft.	DEPTH ft.	DESCRIPTION OF MATERIALS (color, material description, moisture, stiffness/density/hardness (visual classification unless otherwise noted))	SAMPLE NO.	TYPE	DEPTH ft.	BLOWS/6" (N Value)	REC. %	RQD %	W %	LL %	PI %	HCSI	PPR tsf
		3.5 Gray, SILTY GRAVEL with SAND (GM) (gravel=sandstone fragments), nonplastic, wet, medium dense - dense *(LAYER CONTINUED DESCRIPTION REPEATED)*	9	SS	35.0-36.5	6-16-25 (41)	100						
530.50	37.5												
		2.9 Gray and Reddish brown, LEAN CLAY with SAND (CL) (residual SHALE), moist - dry, hard - very hard	10	SS	40.0-40.4	50/0.4	100						
527.60	40.4												
		5.0 Reddish brown and gray, CLAYSTONE, completely to highly weathered, extremely soft - very soft	1	NQ2	40.4-45.4		100	0				0-1	
522.60	45.4	- bottom 2" residual soil											
		BORING COMPLETED @ 45.4'											

General Notes

Driller	HCN
Rig No.	J. Williams
Rig Type	Track
Method	NQ2/SS/ST
Inspector	NG

Remarks

Located boring at dam toe, appr. 3.5' above creek. Hay stick used for sediment control. Water level upon completion measured through the augers before NQ2. Recovery of ST-1 failed due to very soft material.

Water Level Observations

Immediate	6.0	ft. ▽		
At Completion	1.5	ft. ▼		
After	24	Hrs.	NA	ft.
Water used in drilling	30	ft.		

BF = BACKFILLED NW = NO WATER
(Measured from ground surface)

TEST BORING ASH DAM.GPJ HC NUTTING.GDT 8/14/05

PIEZOMETER P1

7 of 9

HCN W/O 90979-059

AEP/
PROJECT: BOTTOM ASH DAM EVALUATION PROJECT

SUMMARY ELEVATIONS (FLNVD)

COORDINATES: 7' east of

WELL NO. B-1 W

DATE INSTALLED: 08/09/05

REF. DATUM EL. 586

GRADE 583

NOTE: CASING PROTECTOR DETAILS NOT SHOWN SEE CDS-044C

TOP OF BENTONITE SEAL 24.0

TOP OF GRAVEL PACK 26.0

1 GROUT SEAL MATERIAL: Type I Portland Cement

2 BENTONITE SEAL MATERIAL: 3/8" Coated Tablets

3 SCREEN SIZE: 010 Slot

4 GRAVEL PACK MATERIAL: Quartz Sand

5 BOREHOLE DIAMETER: 6" MIN.

6 2" DIA. PVC CASING

TOP OF SCREEN 28.0'

BOTTOM OF SCREEN 38.0'

2" DIA.

BOTTOM OF BLANK 28.0'

BOTTOM OF GRAVEL PACK 38.0'

BOTTOM OF BOREHOLE 38.0'

2" DIA.

DRAFT

"No bentonite seal necessary" (KA, 08/09/05)

GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD		REVISION 0	OBSERVATION WELL
APP'D.	DR. J SCENE	CK. JSH	DATE 08/09/05
AMERICAN ELECTRIC POWER SERVICE CORP.			CDS — 044 A SH. 1

AMERICAN ELECTRIC POWER
BOTTOM ASH DAM EVALUATION PROJECT
KMOS POWER PLANT, WEST VIRGINIA

GEOLOGIST/ENGINEER: Nick Cahill

PIEZOMETER P3

HCN W.O 90979-059

AEP/
PROJECT: BOTTOM ASH DAM EVALUATION PROJECT

SUMMARY ELEVATIONS (ft. MSL)

COORDINATES: 5' east of B-3

WELL NO. B-3 U

DATE INSTALLED: 08/07/05

REF. DATUM ft. 586

GRADE 583

NOTE: CASING PROJECTION OUTARDS NOT SHOWN SEE CDS-044C

TOP OF BENTONITE SEAL 23.0

TOP OF GRAVEL PACK 25.0

1 GROUT SEAL MATERIAL: Type I Portland

2 BENTONITE SEAL MATERIAL: Aquagel Gold Seal 3/8" pellets

3 SCREEN SIZE: .010 Slot

4 GRAVEL PACK MATERIAL: Quartz Sand

5 BOREHOLE DIAMETER: 6" min.

6 1" dia. PVC CASING

TOP OF SCREEN 27.0

BOTTOM OF SCREEN 32.0

BOTTOM OF BLANK SEC. 27.0

BOTTOM OF GRAVEL PACK 34.0

BOTTOM OF BOREHOLE 36.0

DRAFT

GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD		REVISION 0	OBSERVATION WELL
APP'D.	DR. J. DEENS	CK. JMK	DATE JUL 6, 2005
AMERICAN ELECTRIC POWER SERVICE CORP.		CDS — 044 A	SK. 1

AMERICAN ELECTRIC POWER
BOTTOM ASH DAM EVALUATION PROJECT
AMOS POWER PLANT, WEST VIRGINIA

GEOLOGIST/ENGINEER:
Nils Guhl

PIEZOMETER PG

HCN W/O 90979-059

PROJECT: AEP/ Bottom Ash Dam Evaluation Project

COORDINATES: 6' west of B-6

DATE INSTALLED: 08/06/05

REF. DATUM ft: 586

NOTE: CASING PROTECTOR DETAILS NOT SHOWN SEE COS-044C

SUMMARY ELEVATIONS (ft above)

WELL NO: B-6 H

REF. DATUM ft:

GRADE: 583

TOP OF BENTONITE SEAL: 10.5'

TOP OF GRAVEL PACK: 13.0'

1 GROUT SEAL MATERIAL: Type I Portland Cement

2 BENTONITE SEAL MATERIAL: Aquagel Gold Seal (Type Pellets)

3 SCREEN SIZE: 010 Slot

4 GRAVEL PACK MATERIAL: Quartz Sand

5 BOREHOLE DIAMETER: 6" Min.

6 1" Dia. PVC CASING

TOP OF SCREEN: 15.0'

BOTTOM OF SCREEN: 25.0'

2" DIA.

BOTTOM OF BLANK SEC: 15.0'

BOTTOM OF GRAVEL PACK: 27.0'

BOTTOM OF BOREHOLE: 27.0'

1" DIA.

DRAFT

GEOTECHNICAL ENGINEERING SECTION CIVIL DESIGN STANDARD		REVISION 0	OBSERVATION WELL
APP'D.	SR. J. DEEMS	CK. JMK	DATE JUL 6, 2005
AMERICAN ELECTRIC POWER SERVICE CORP.			COS-044 SH. 1

AMERICAN ELECTRIC POWER
BOTTOM ASH DAM EVALUATION PROJECT
MOS POWER PLANT, WEST VIRGINIA

GEOLOGIST/ENGINEER: Nils Guhl

Top of Piezometer Elevations	
Piezometer	**Top Elevation, ft**
P1	585.94
P3	586.93
P6	587.66

LABORATORY TESTING RESULTS

PROJECT: AMOS BOTTOM ASH POND DIKES -
NUMBER:

SUMMARY OF MATERIAL PROPERTIES

Sample Number	Depth ft.	ASTM Description	ASTM Class.	Max. Dry Density pcf	Optimum Moisture %	Liquid Limit %	Plastic Limit %	Gravel %	Sand %	<#200 Sieve %	<.002 mm %	Sp.G	Prmblty cm/sec	Nat. Moist. %
B-1	10.0	GRAVELLY LEAN CLAY	CL			35.8	20.4	24.1	8.0	67.9	17.8			15.8
B-1	15.0	LEAN CLAY	CL			37.2	17.8	0.4	11.1	88.6	30.5			18.1
B-1	16.0	POORLY GRADED GRAVEL with SILT and SAND	GP-GM			NP	NP	66.5	26.8	6.7				8.2
B-1	24.5	CLAYEY GRAVEL	GC			29.1	18.9	53.6	7.7	38.7	4.3			15.8
B-1	27.5	LEAN CLAY with SAND	CL			32.7	21.8	0.0	17.6	82.4	18.6			30.6
B-1	29.5	SILTY SAND	SM			NP	NP	0.0	70.4	29.6		2.67	1.61E-05	
B-1	31.5							0.0	77.3	22.7	5.1			29.4
B-1	40.0							0.0	89.1	10.9				25.3
B-1	45.0							0.4	91.9	7.7				24.6
B-2	10.0	LEAN CLAY	CL			37.4	20.1	0.4	11.5	88.1	25.7			16.2
B-2	11.0	LEAN CLAY	CL			36.2	17.7	0.0	5.6	94.4	31.6			11.5
B-2	11.5											2.73	1.35E-08	
B-2	30.0	SANDY SILTY CLAY	CL-ML			24.9	17.9	0.0	33.6	66.4	14.2			22.9
B-2	31.0							0.0	88.5	11.5				28.4
B-2	35.0							0.0	94.8	5.2				27.4
B-2	45.0							0.0	90.7	9.3				23.3
B-3	5.0	GRAVELLY LEAN CLAY	CL			29.3	18.4	27.0	12.9	60.1	8.1			7.2
B-3	6.0	LEAN CLAY	CL			37.1	18.3	0.5	6.1	93.5	32.4			16.9
B-3	26.5							34.8	37.9	27.3	7.6			12.7
B-3	27.0	FAT CLAY	CH			55.9	29.0	0.0	5.2	94.8	37.9			66.4
B-3	28.0							57.7	25.8	16.5	3.9			16.1
B-3	30.0											2.69	6.14E-08	
B-3	32.0	CLAYEY SAND	SC			27.0	17.5	0.9	56.9	42.2	13.6			33.4
B-3	33.0							2.4	88.3	9.3				28.3
B-3	35.0							0.8	83.2	16.0	2.6			23.9
B-3	55.0	LEAN CLAY	CL			29.3	17.5	1.6	6.6	91.8	18.3			9.8
B-4	5.0	SANDY LEAN CLAY	CL			28.2	17.8	8.2	35.7	56.1	14.7			15.6
B-4	6.0	LEAN CLAY with SAND	CL			31.2	19.5	0.0	20.8	79.2	21.2			20.6
B-4	15.0	SILTY, CLAYEY SAND	SC-SM			22.9	17.3	0.0	53.4	46.6	12.6			18.4
B-4	16.0	SANDY SILTY CLAY	CL-ML			24.7	19.1	0.0	40.5	59.5	12.0			24.5
B-4	20.0	SILTY SAND	SM			NP	NP	0.0	64.4	35.6	6.6			24.6
B-4	21.0							0.1	92.0	7.9				24.2
B-4	45.0							0.8	92.5	6.7				24.4
B-5	10.0							0.0	91.2	8.8				9.8
B-5	15.0							0.6	92.6	6.8				9.2
B-5	16.0	SILTY CLAY with SAND	CL-ML			26.4	18.8	0.0	25.5	74.5	12.7			28.0
B-5	20.0	SILTY SAND	SM			NP	NP	0.0	78.8	21.2	2.7			26.8
B-6	10.0	SANDY LEAN CLAY with GRAVEL	CL			28.3	18.1	15.0	16.6	68.4	13.9			12.3
B-6	11.0	SANDY LEAN CLAY	CL			25.6	16.3	0.0	35.1	64.9	22.7			16.3
B-6	20.0	SANDY LEAN CLAY	CL			26.7	17.8	0.0	47.4	52.6	14.6			22.8
B-6	30.0							0.0	54.0	46.0	8.4			21.8
B-7	5.0							66.0	22.0	12.0	2.8			13.3
B-7	10.0	CLAYEY SAND	SC			28.6	16.7	9.8	40.4	49.8	16.0			37.9
B-7	15.0	SANDY SILTY CLAY	CL-ML			23.7	17.6	0.3	39.5	60.2	12.7			30.4
B-7	16.0	SILTY SAND	SM			NP	NP	0.0	84.2	15.8	3.7			31.3
B-7	30.0							0.4	90.9	8.7				26.6
B-8	5.0							72.6	18.3	9.1	1.3			5.4
B-8	10.0	LEAN CLAY with SAND	CL			44.2	26.3	0.0	19.8	80.2	25.8			56.1
B-8	15.0	SANDY LEAN CLAY	CL			30.3	19.8	0.9	35.7	63.4	16.8			46.8
B-8	25.0							0.0	92.9	7.1				27.0

JOB NO. _____ DATE: Oct 28, 05

PROJECT AMOS BOTTOM ASH POND DIKES

LOCATION: _____

"SILTY SAND"

SOURCE OF MATERIAL B-1 DEPTH 29.5 ft.

DESCRIPTION OF MATERIAL GRAY SILTY SAND

ASTM DESCRIPTION SILTY SAND SM

MAX. DRY DENSITY, pcf		OPTIMUM MOISTURE, %	
SPECIFIC GRAVITY	2.67		
SAMPLE HGT., mm	144.450	SAMPLE DIA., mm	73.300
CHAMBER PRESSURE, psi	80.0	BACK PRESSURE, psi	50.0
B-PARAMETER	1.00	EFFECTIVE PRESSURE, psi	30.0
INITIAL HEAD, mm	4494.4		

	BEFORE	AFTER
WATER CONTENT, %	22.9	21.2
WET DENSITY, pcf	125.7	
DRY DENSITY, pcf	102.3	
SATURATION, %	97.24	
VOID RATIO	0.6297	

PERMEABILITY COEFFICIENT K, cm/sec 1.61E-05

FLEXIBLE-MEMBRANE PERMEABILITY TEST

American Electric Power Service Corp.

Groveport, Ohio

AEP

JOB NO. _____ DATE: Oct 28, 05

PROJECT AMOS BOTTOM ASH POND DIKES

LOCATION: _____

"CLAY"

SOURCE OF MATERIAL B-3 DEPTH 30.0 ft.

DESCRIPTION OF MATERIAL SOFT GRAYISH BROWN CLAY

ASTM DESCRIPTION _____

MAX. DRY DENSITY, pcf		OPTIMUM MOISTURE, %	
SPECIFIC GRAVITY	2.69		
SAMPLE HGT., mm	145.430	SAMPLE DIA., mm	71.980
CHAMBER PRESSURE, psi	80.0	BACK PRESSURE, psi	50.0
B-PARAMETER	0.98	EFFECTIVE PRESSURE, psi	30.0
INITIAL HEAD, mm	4483.4		

	BEFORE	AFTER
WATER CONTENT, %	59.2	41.5
WET DENSITY, pcf	104.2	
DRY DENSITY, pcf	65.4	
SATURATION, %	101.64	
VOID RATIO	1.5667	

PERMEABILITY COEFFICIENT K, cm/sec 6.14E-08

FLEXIBLE-MEMBRANE PERMEABILITY TEST

American Electric Power Service Corp.

Groveport, Ohio

AEP

JOB NO. _____ DATE: Oct 28, 05

PROJECT AMOS BOTTOM ASH POND DIKES

LOCATION: _____

"SHALE FILL"

SOURCE OF MATERIAL B-2 DEPTH 11.5 ft.

DESCRIPTION OF MATERIAL STIFF RED CLAY w/ light brown mottling

ASTM DESCRIPTION _____

MAX. DRY DENSITY, pcf		OPTIMUM MOISTURE, %	
SPECIFIC GRAVITY	2.73		
SAMPLE HGT., mm	145.010	SAMPLE DIA., mm	73.080
CHAMBER PRESSURE, psi	90.0	BACK PRESSURE, psi	70.0
B-PARAMETER	0.97	EFFECTIVE PRESSURE, psi	20.0
INITIAL HEAD, mm	4625.0		

	BEFORE	AFTER
WATER CONTENT, %	14.2	15.7
WET DENSITY, pcf	140.8	
DRY DENSITY, pcf	123.3	
SATURATION, %	101.45	
VOID RATIO	0.3820	

PERMEABILITY COEFFICIENT K, cm/sec 1.35E-08

FLEXIBLE-MEMBRANE PERMEABILITY TEST

American Electric Power Service Corp.

Groveport, Ohio

AEP

CIVIL LABORATORY
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GROVEPORT, OHIO 43125
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AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9666**

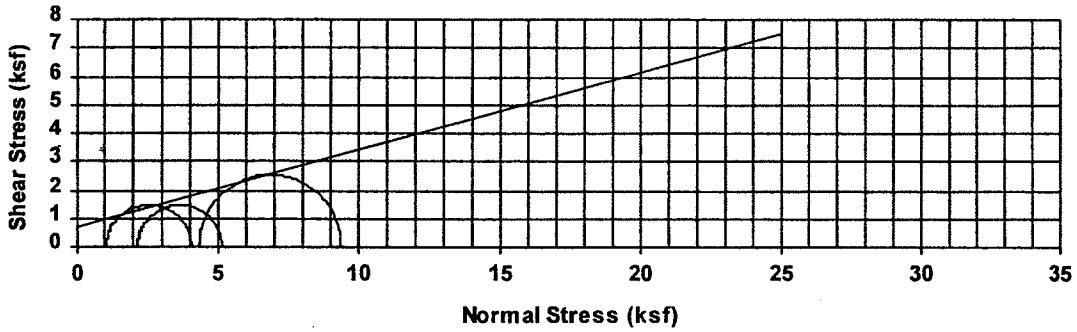
Material Description: GRAYISH BROWN CLAY - B-2, ST-5; 26.5'-28.5'

"CLAYEY GRAVEL"

Point Designation	Initial Conditions			Final Conditions			
	Water Content, %	Dry Density, pcf	Degree of Saturation	Water Content, %	Confining Stress, (ksf)	Deviator Stress	Induced Pore Pressure (ksf)
A	23.0%	104.1	100.9%	20.28%	1.08	2.97	0.43
B	29.1%	95.2	102.5%	26.3%	2.16	2.97	1.30
C	29.7%	95.2	104.4%	25.3%	4.32	5.07	2.65

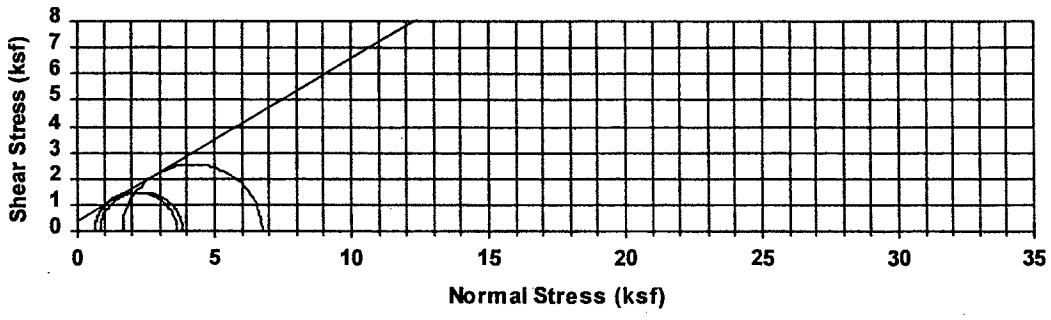
Point Designation	Axial Strain, %	q, (ksf)	Effective Stresses, (ksf)			Total Stresses, (ksf)		
			Major, (ksf)	Minor, (ksf)	p', (ksf)	Major, (ksf)	Minor, (ksf)	p, (ksf)
A	15.0%	1.49	3.62	0.65	2.13	4.05	1.08	2.57
B	15.0%	1.48	3.83	0.86	2.35	5.13	2.16	3.64
C	15.0%	2.53	6.74	1.67	4.20	9.39	4.32	6.85

Total Stress Envelope



ϕ: 15.2 °
c : 0.71 ksf

Effective Stress Envelope



ϕ ': 32.0 °
c' : 0.35 ksf

Report Date: Tuesday, November 08, 2005

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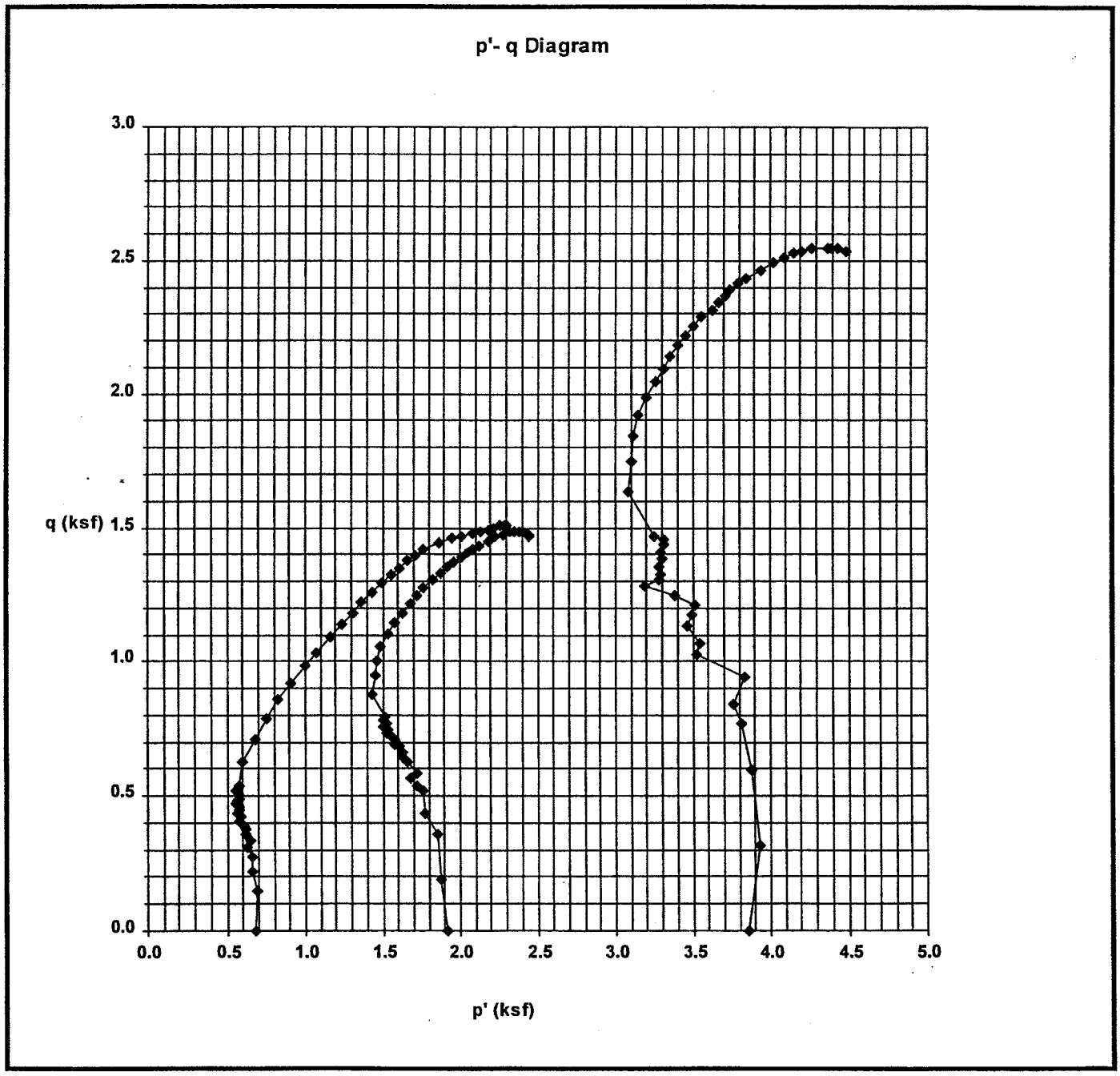
AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9666**



Report Date: Tuesday, November 08, 2005

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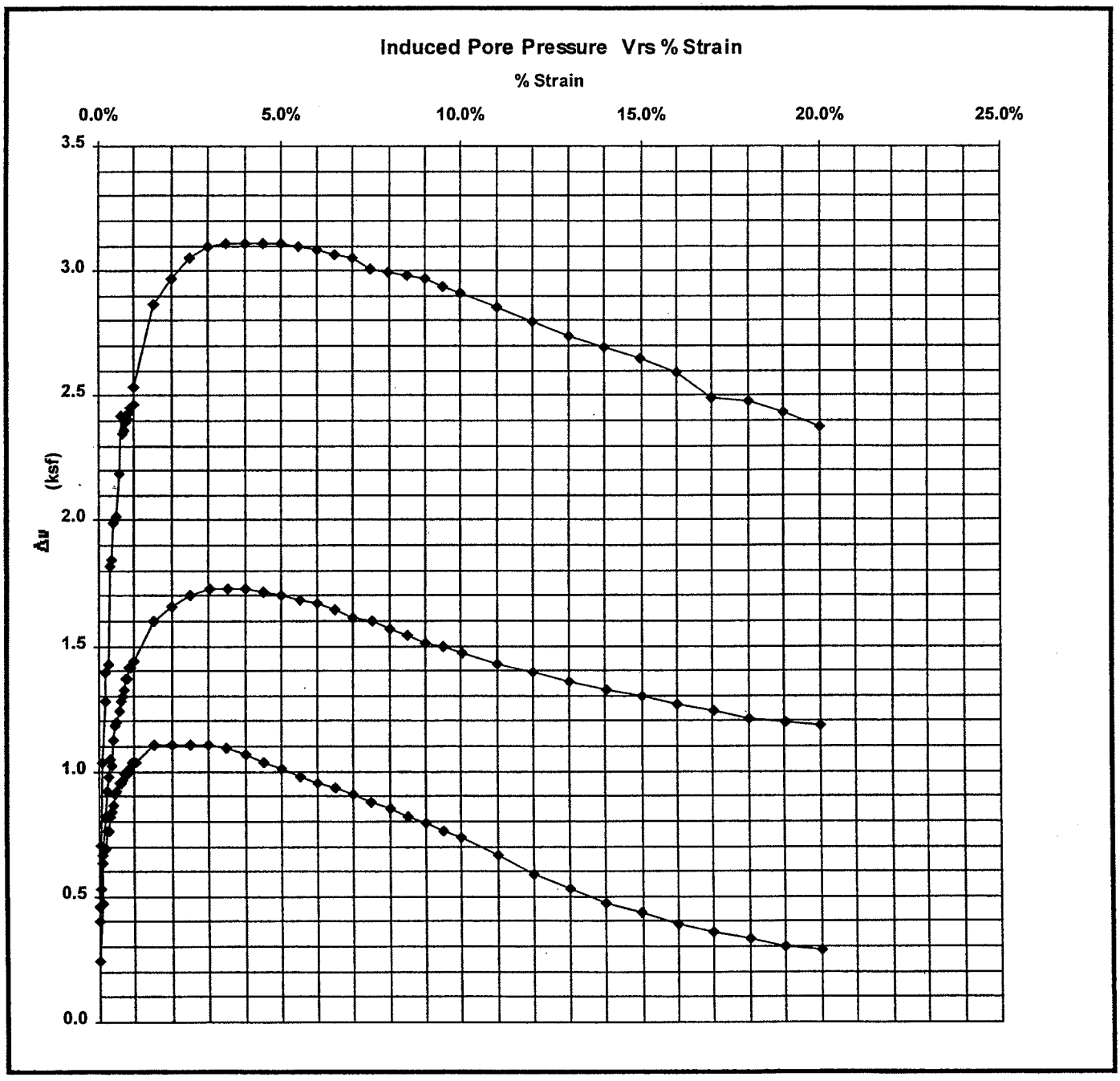
AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9666**



Report Date: Tuesday, November 08, 2005

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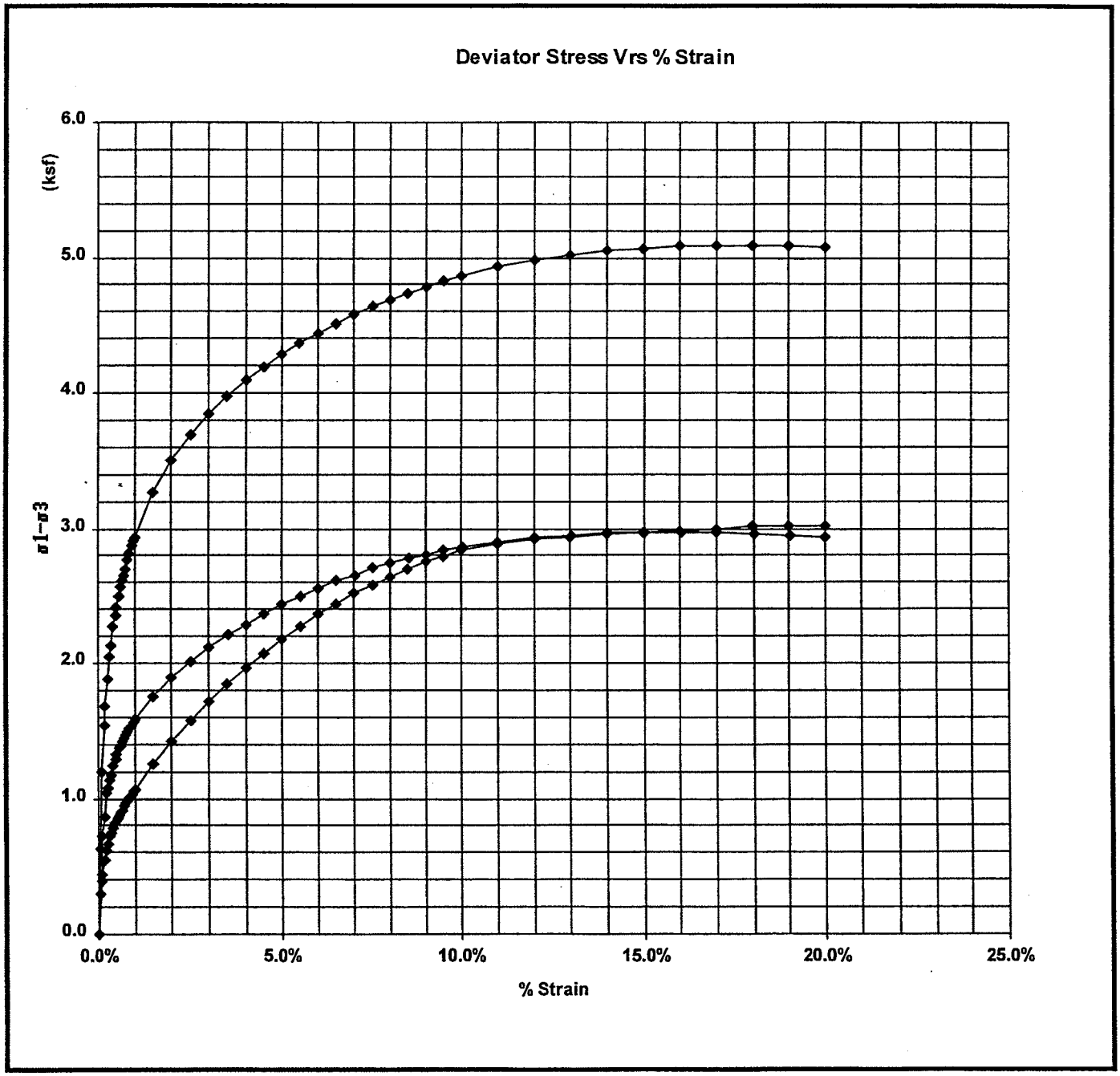
AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9666**



Report Date: Tuesday, November 08, 2005

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AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9661**

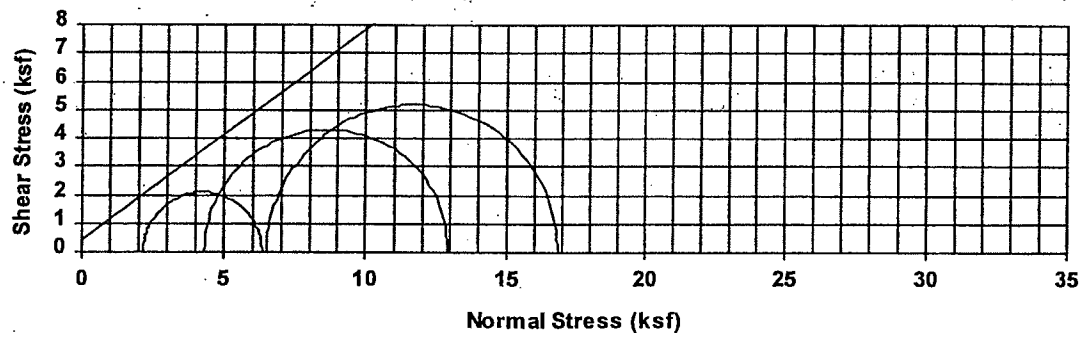
Material Description: GRAY SILTY SAND - B-1, ST-3; 29.5'-31.5'

"SILTY SAND"

Point Designation	Initial Conditions			Final Conditions			
	Water Content, %	Dry Density, pcf	Degree of Saturation	Water Content, %	Confining Stress, (ksf)	Deviator Stress	Induced Pore Pressure (ksf)
A	23.6%	103.5	103.4%	21.46%	2.16	4.17	0.79
B	22.9%	102.3	97.3%	21.2%	4.32	8.62	1.24
C	23.4%	102.2	99.2%	21.8%	6.48	10.37	3.14

Point Designation	Axial Strain, %	q, (ksf)	Effective Stresses, (ksf)			Total Stresses, (ksf)		
			Major, (ksf)	Minor, (ksf)	p', (ksf)	Major, (ksf)	Minor, (ksf)	p, (ksf)
A	15.0%	2.08	5.53	1.37	3.45	6.33	2.16	4.24
B	15.0%	4.31	11.71	3.08	7.39	12.94	4.32	8.63
C	15.0%	5.18	13.71	3.34	8.52	16.85	6.48	11.66

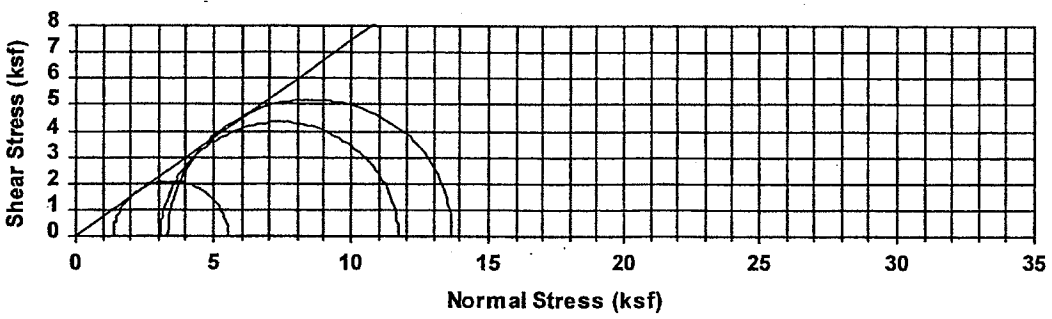
Total Stress Envelope



ϕ: 36.7°

c : 0.43 ksf

Effective Stress Envelope



ϕ ': 36.8°

c': 0.00 ksf

Report Date: Friday, October 28, 2005

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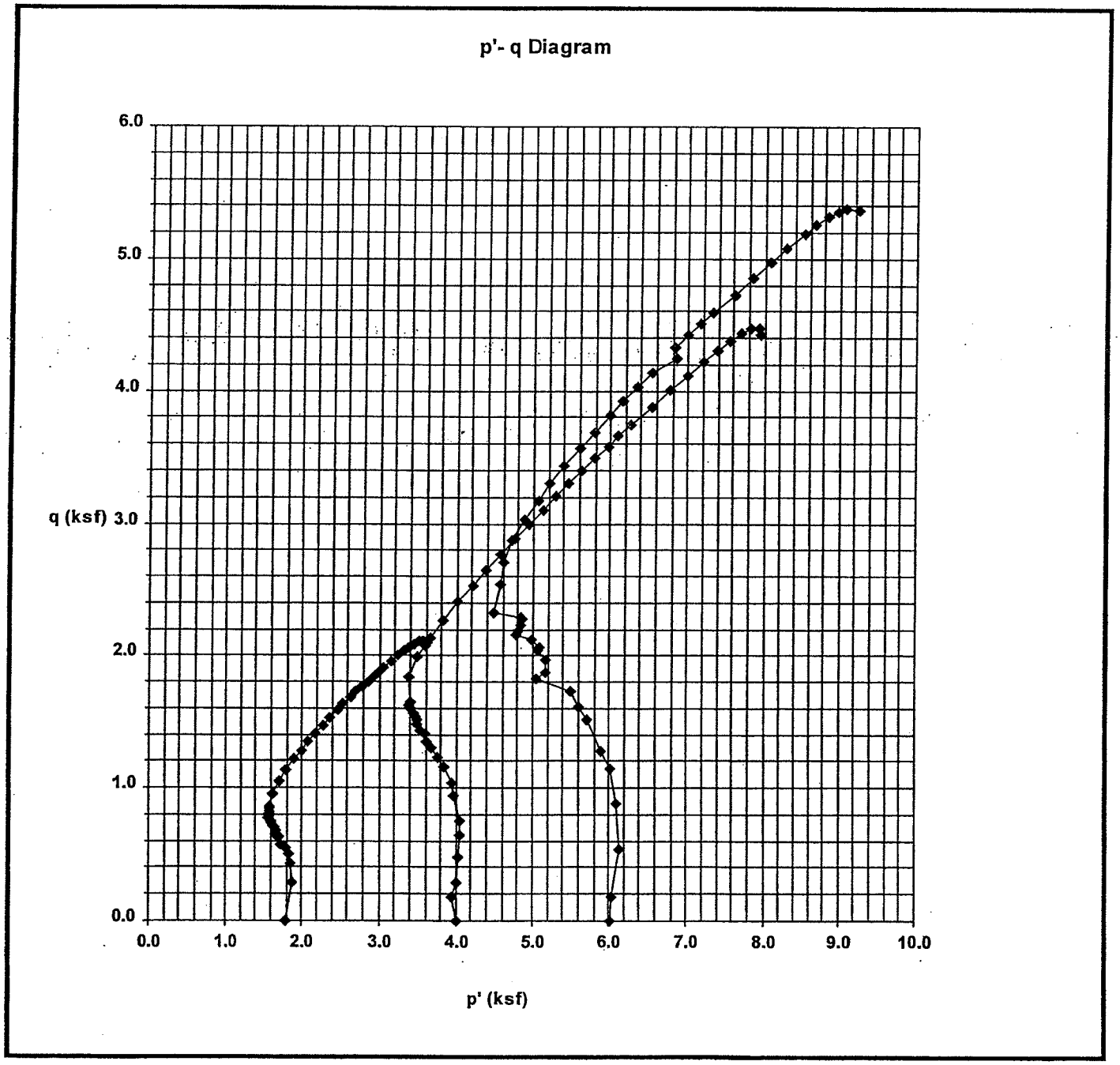
AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9661**



Report Date: Friday, October 28, 2005

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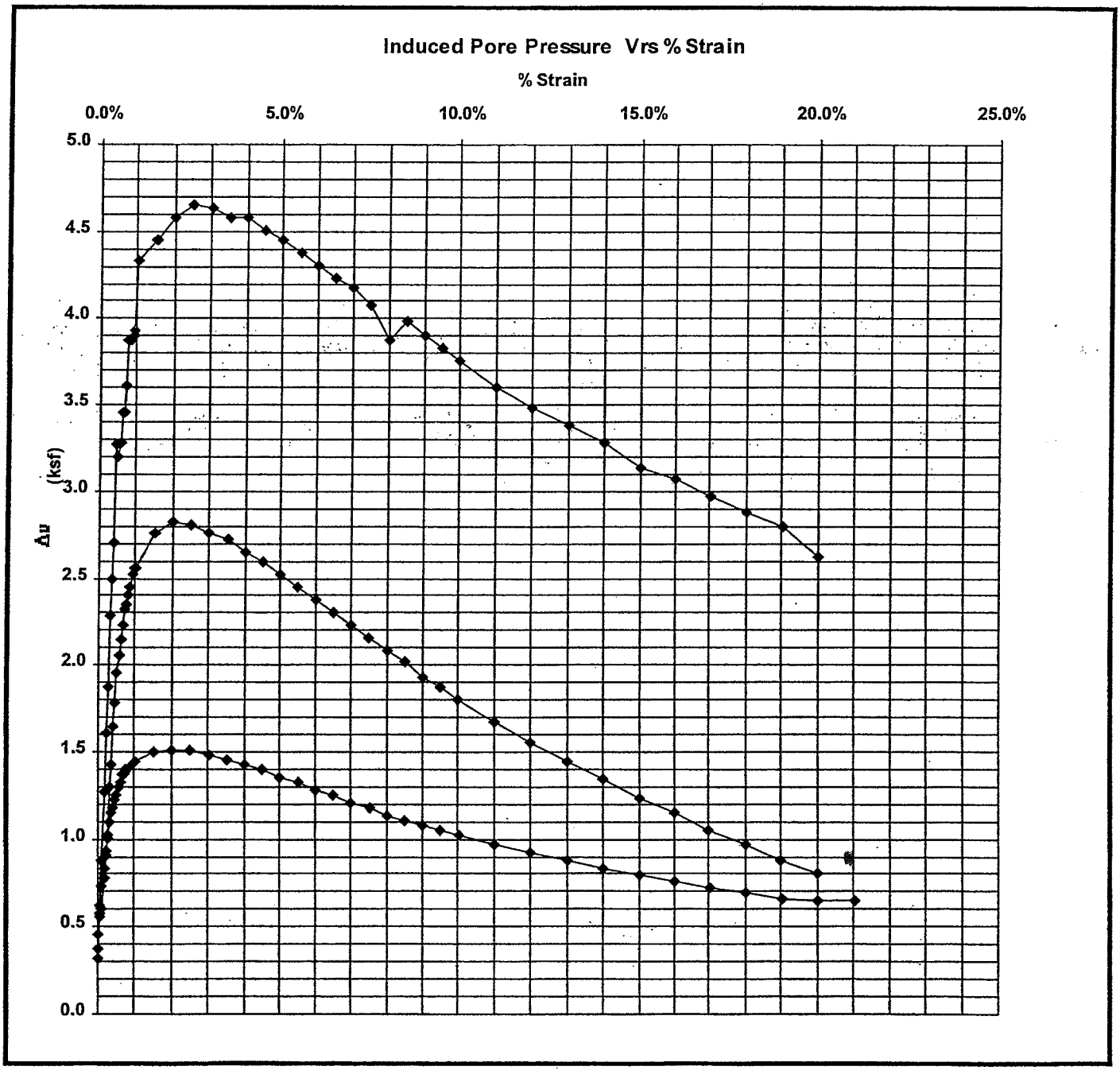
Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9661**



Report Date: Friday, October 28, 2005

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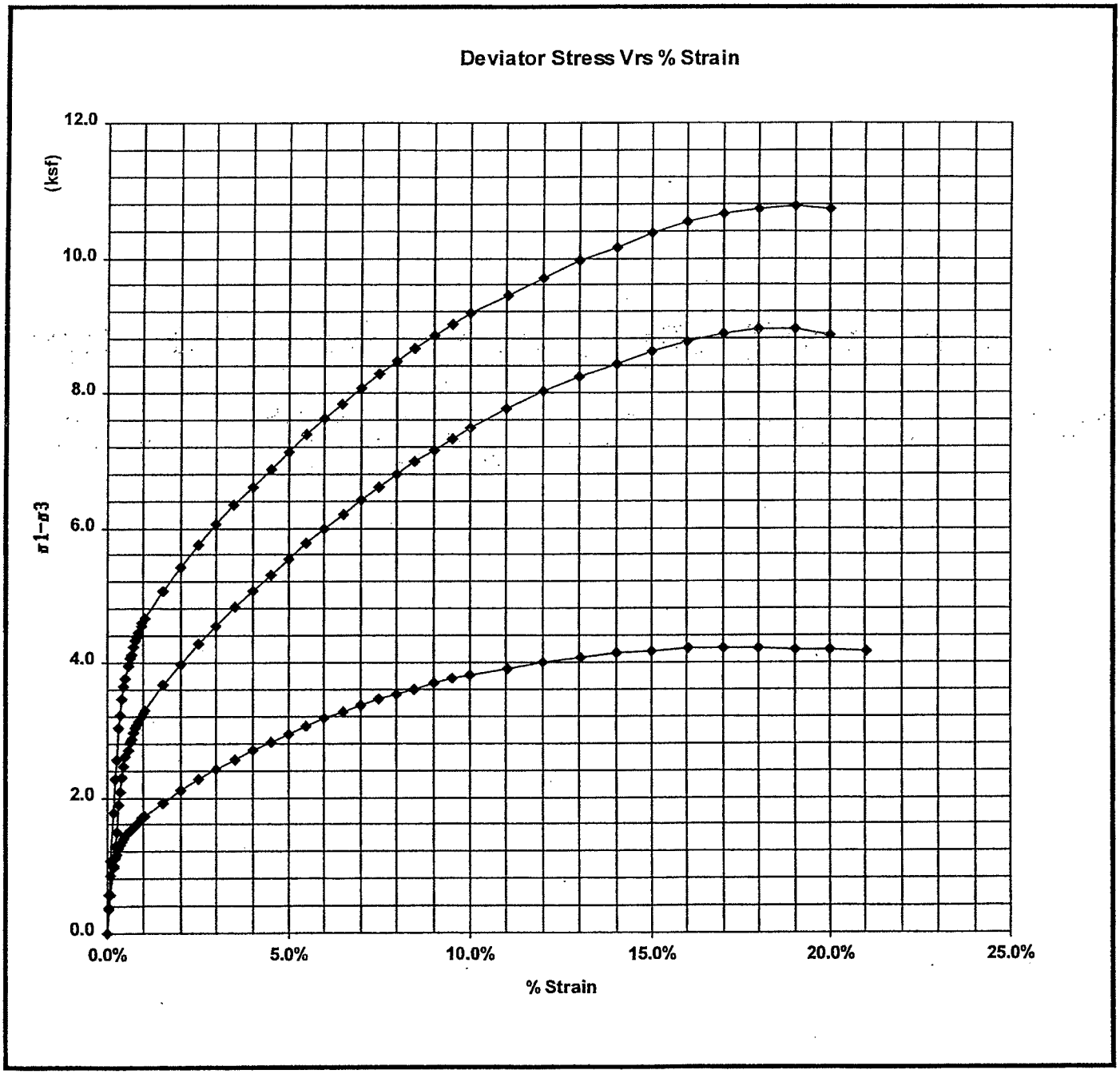
Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9661**



Report Date: Friday, October 28, 2005

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AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

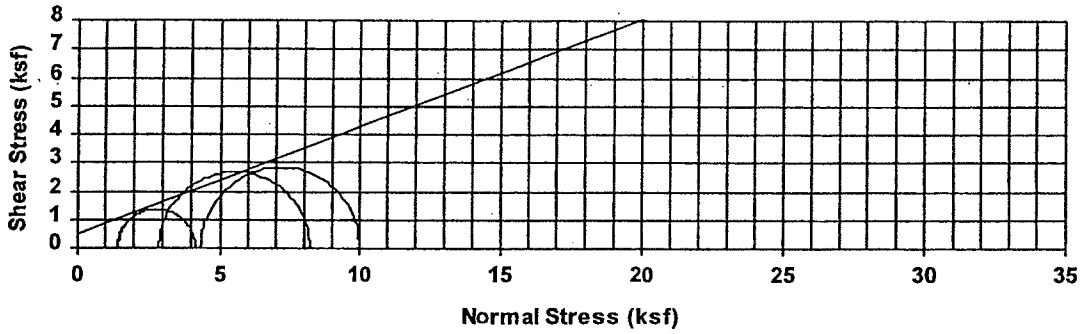
Sample No: **9659**

Material Description: STIFF RED CLAY w/ light brown mottling - B-2, ST-2; 11.5'-13.5' "SHALE FILL"

Point Designation	Initial Conditions			Final Conditions			
	Water Content, %	Dry Density, pcf	Degree of Saturation	Water Content, %	Confining Stress, (ksf)	Deviator Stress	Induced Pore Pressure (ksf)
A	15.3%	118.0	93.7%	19.69%	1.44	2.71	0.52
B	14.2%	123.4	101.6%	15.7%	2.88	5.33	0.12
C	14.5%	122.6	101.3%	16.0%	4.32	5.68	2.03

Point Designation	Axial Strain, %	q, (ksf)	Effective Stresses, (ksf)			Total Stresses, (ksf)		
			Major, (ksf)	Minor, (ksf)	p', (ksf)	Major, (ksf)	Minor, (ksf)	p, (ksf)
A	15.0%	1.35	3.63	0.92	2.28	4.15	1.44	2.79
B	15.0%	2.66	8.09	2.76	5.43	8.21	2.88	5.54
C	11.0%	2.84	7.97	2.29	5.13	10.00	4.32	7.16

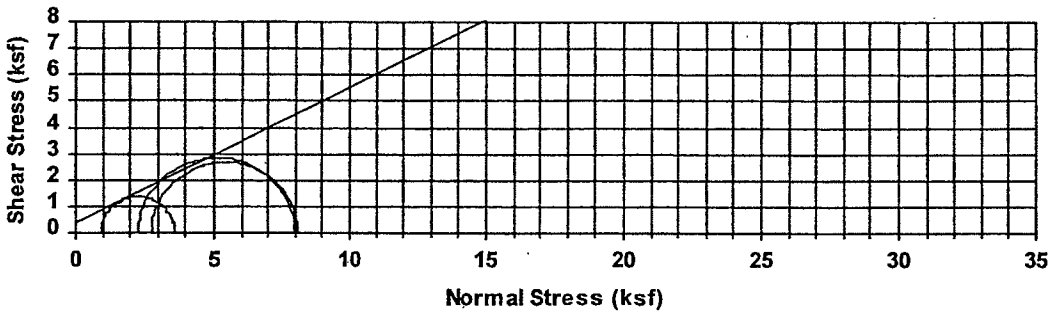
Total Stress Envelope



ϕ: 20.7 °

c : 0.48 ksf

Effective Stress Envelope



ϕ ': 27.2 °

c' : 0.37 ksf

Report Date: Friday, October 28, 2005

CIVIL LABORATORY
AMERICAN ELECTRIC POWER
4001 BIXBY ROAD
GROVEPORT, OHIO 43125
(614) 836-4205

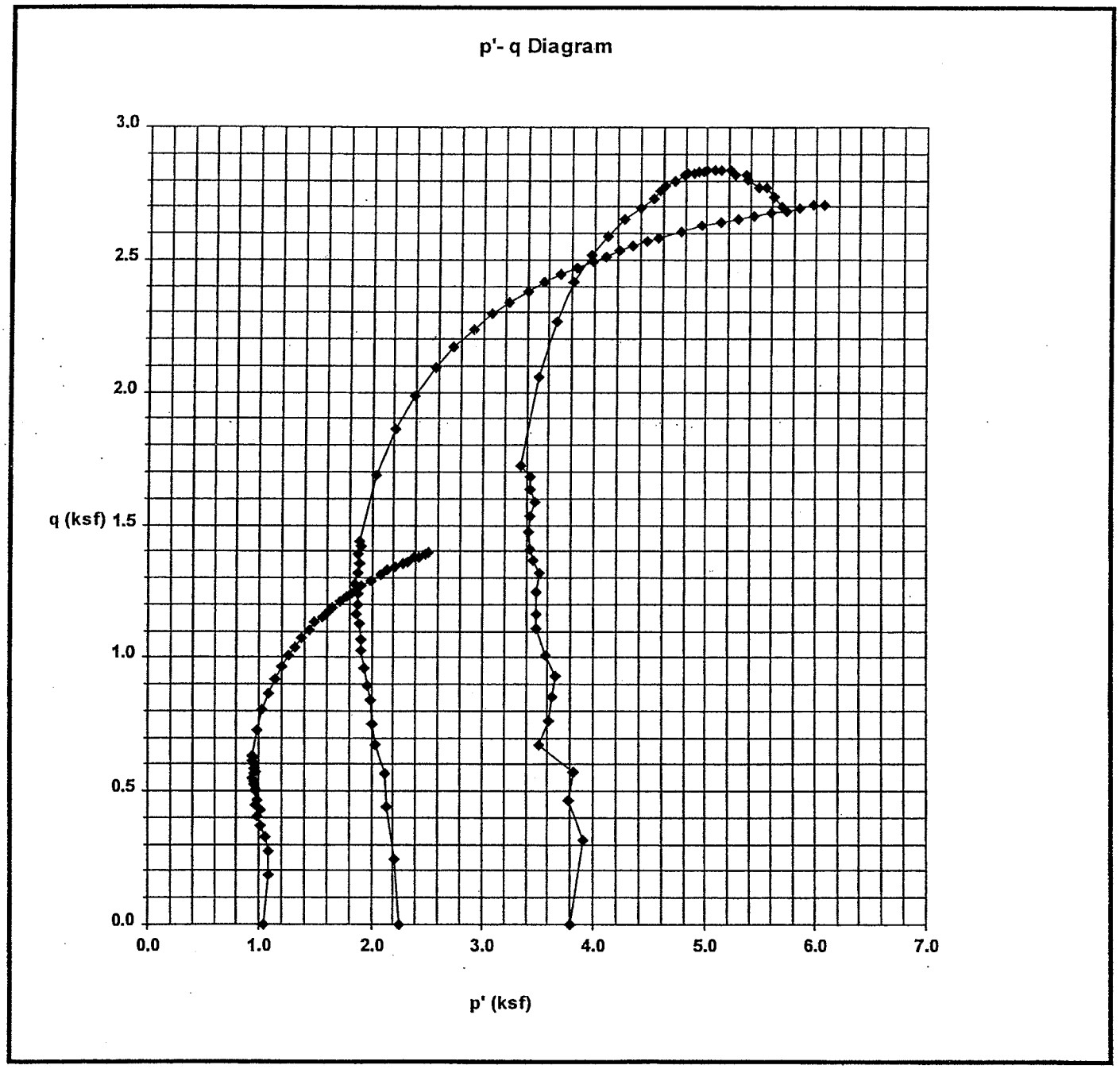
AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9659**



Report Date: Friday, October 28, 2005

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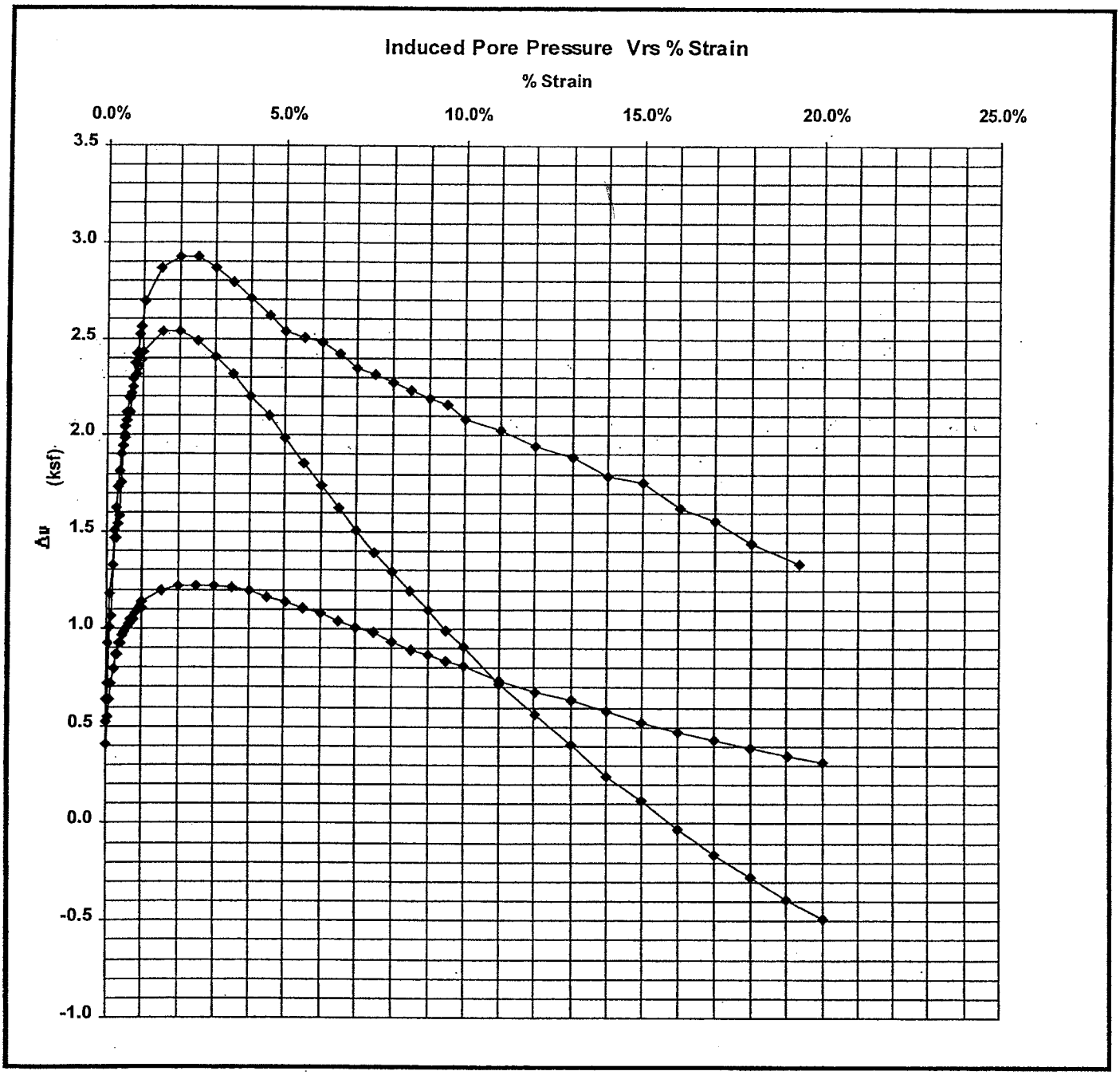
AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9659**



Report Date: Friday, October 28, 2005

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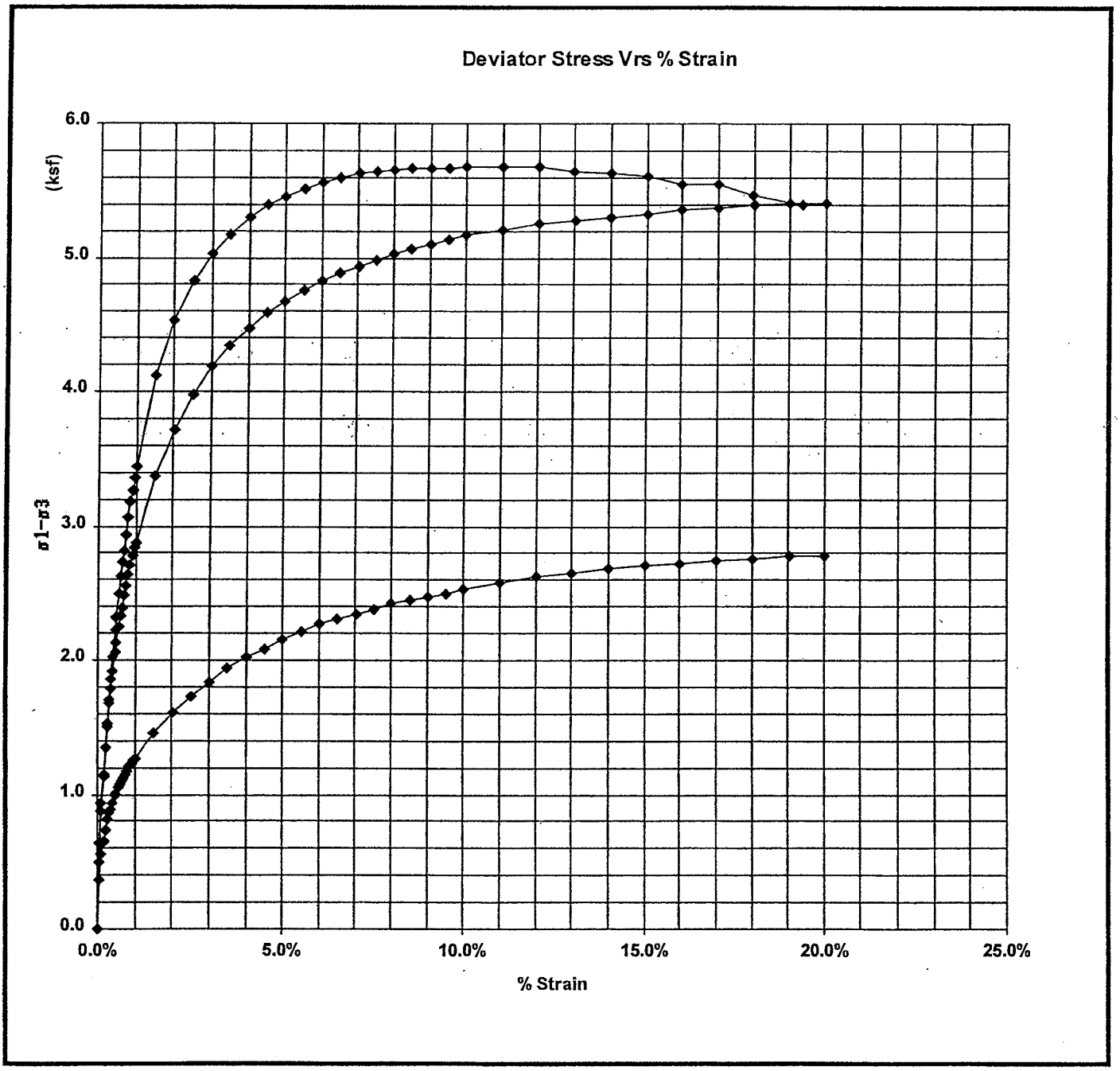
AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9659**



Report Date: Friday, October 28, 2005

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AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9660**

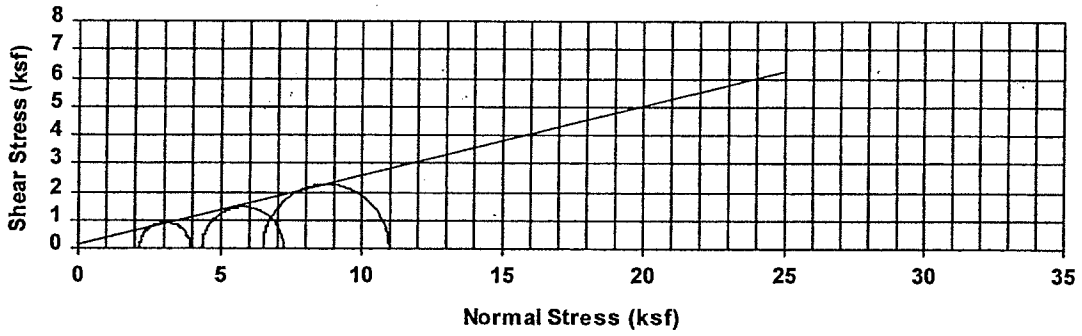
Material Description: GRAYISH BROWN CLAY - B-3, ST-5; 30.0'-32.0'

"CLAY"

Point Designation	Initial Conditions			Final Conditions			
	Water Content, %	Dry Density, pcf	Degree of Saturation	Water Content, %	Confining Stress, (ksf)	Deviator Stress	Induced Pore Pressure (ksf)
A	55.0%	68.9	103.0%	44.18%	2.16	1.80	1.74
B	59.2%	65.4	101.6%	41.5%	4.32	2.90	3.40
C	51.2%	71.3	101.8%	37.0%	6.48	4.49	5.07

Point Designation	Axial Strain, %	q, (ksf)	Effective Stresses, (ksf)			Total Stresses, (ksf)		
			Major, (ksf)	Minor, (ksf)	p', (ksf)	Major, (ksf)	Minor, (ksf)	p, (ksf)
A	15.0%	0.90	2.21	0.42	1.32	3.96	2.16	3.06
B	14.0%	1.45	3.82	0.92	2.37	7.22	4.32	5.77
C	15.0%	2.25	5.90	1.41	3.66	10.97	6.48	8.73

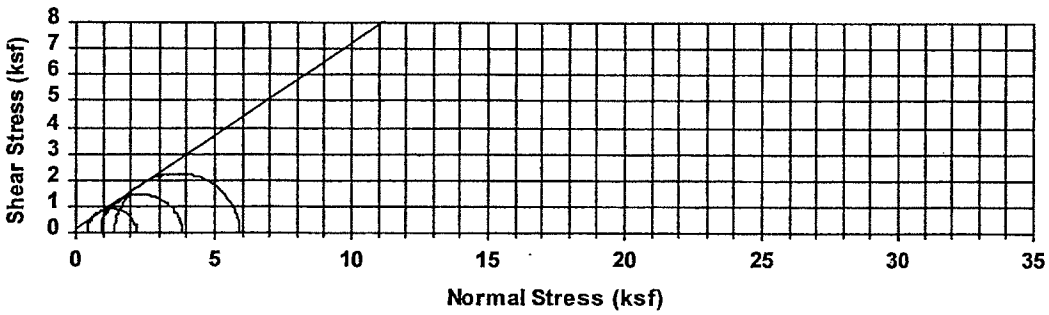
Total Stress Envelope



ϕ: 13.8 °

c : 0.14 ksf

Effective Stress Envelope



ϕ ': 35.2 °

c' : 0.15 ksf

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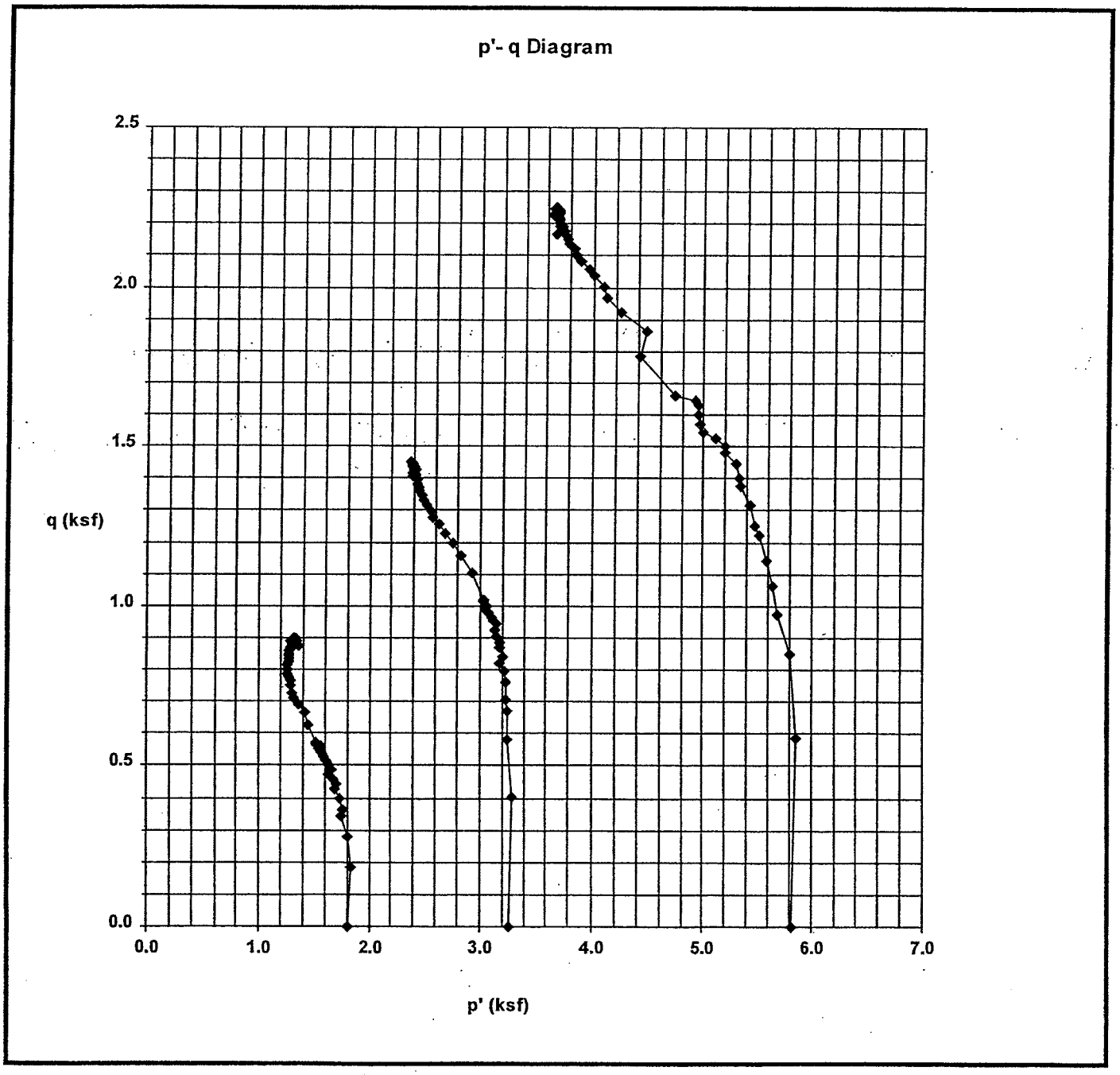
AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9660**



Report Date: Thursday, October 27, 2005

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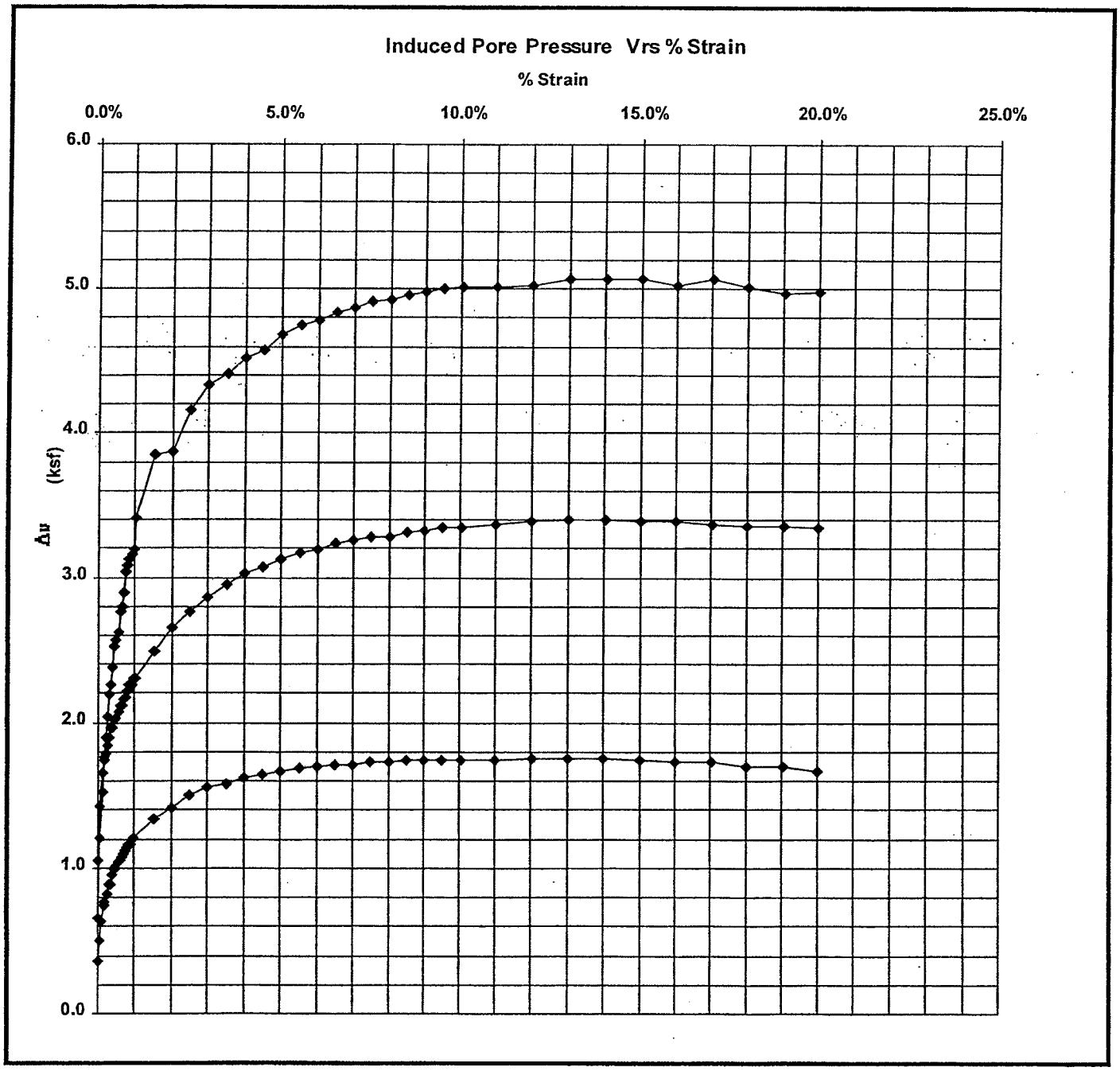
AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9660**



Report Date: Thursday, October 27, 2005

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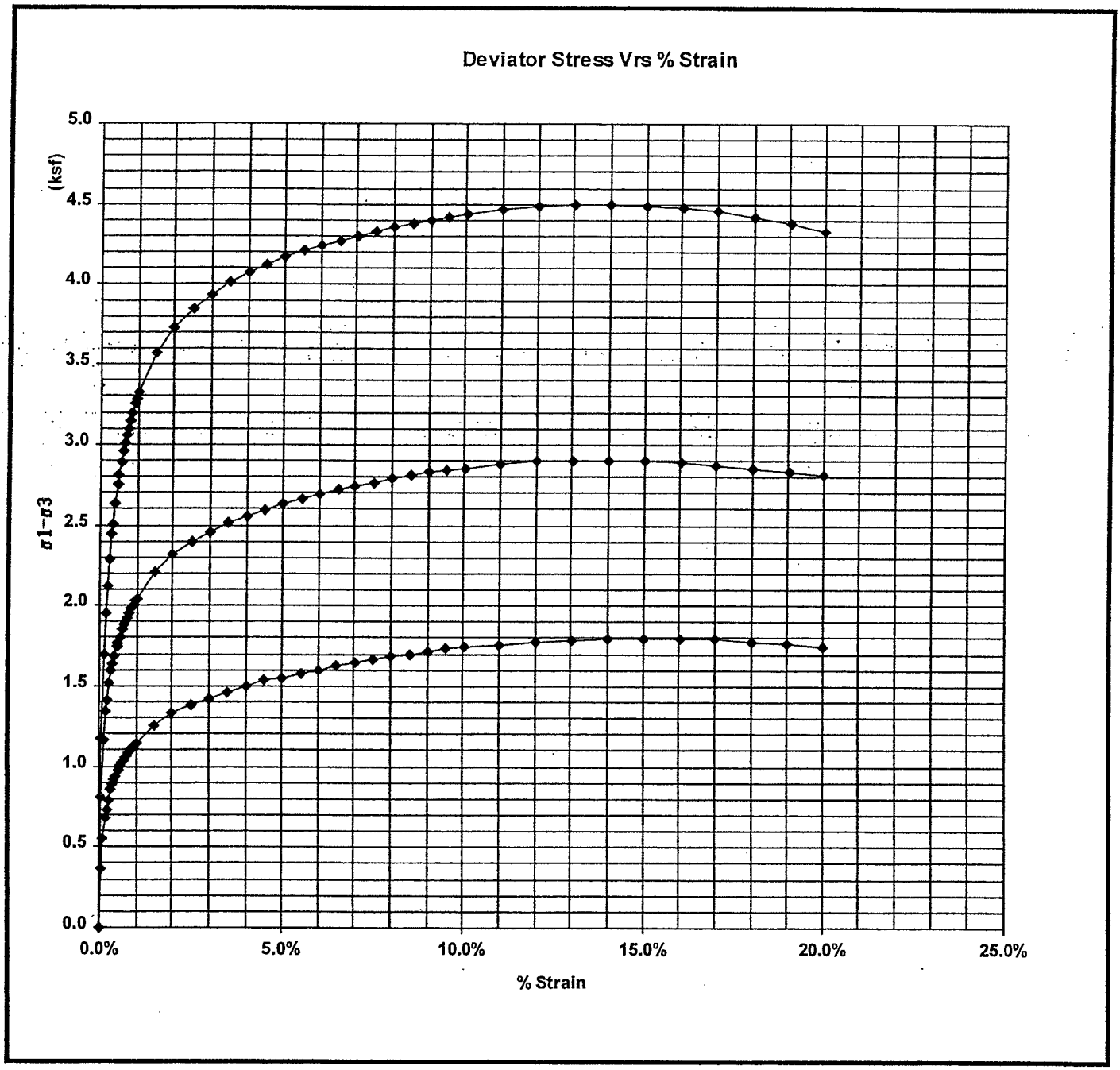
AMERICAN ELECTRIC POWER

Test Report for Consolidated-Undrained Triaxial Compresion Test - ASTM D 4767

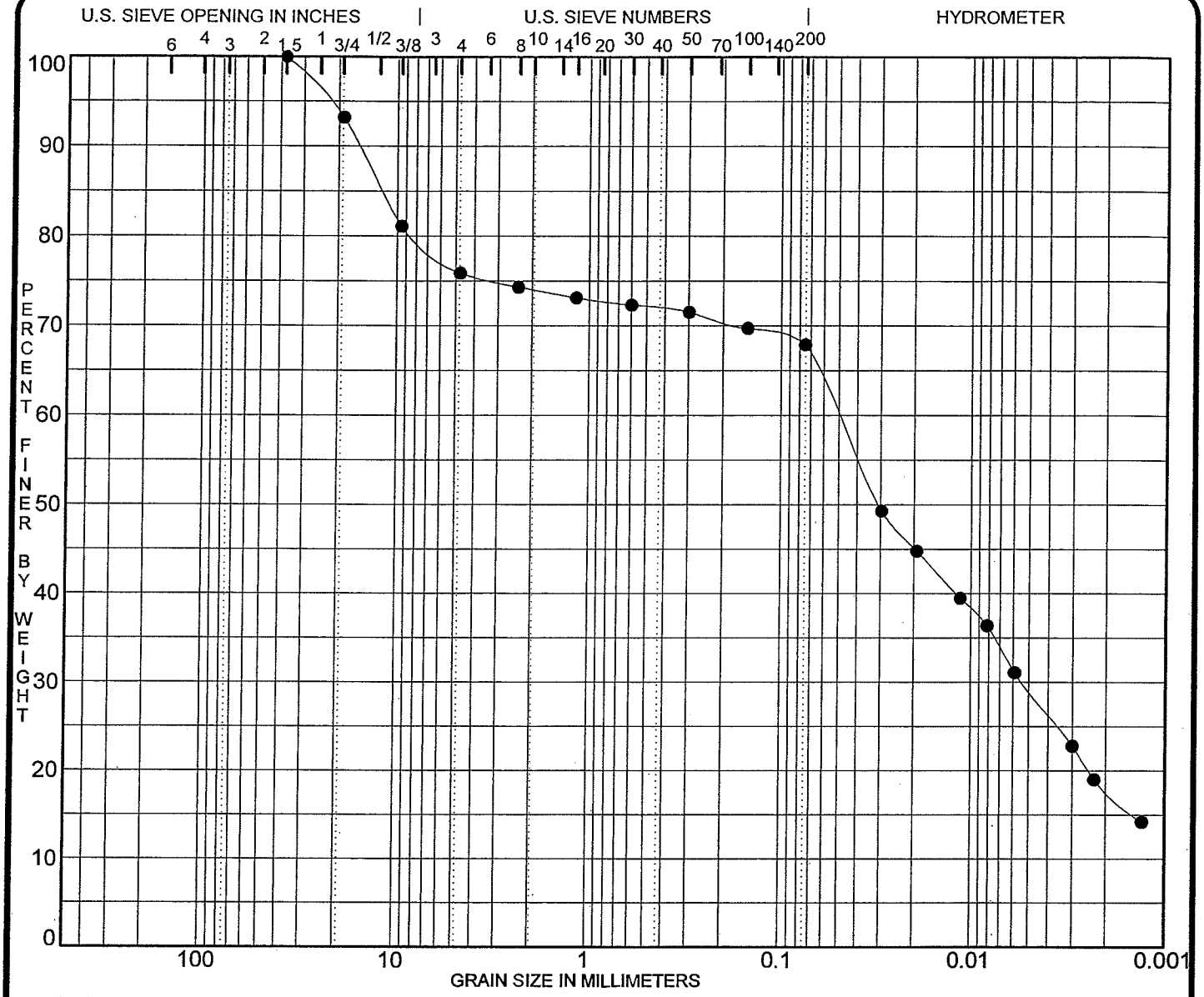
Company: **AEP**

Project: **Amos BA Pond Dikes**

Sample No: **9660**



Report Date: Thursday, October 27, 2005



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-1	10.0	GRAVELLY LEAN CLAY CL	15.8	35.8	20.4	15.3	

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-1	10.0	37.500	0.051	0.005		24.1	8.0	67.9	17.8

PROJECT **AMOS BOTTOM ASH POND DIKES -**

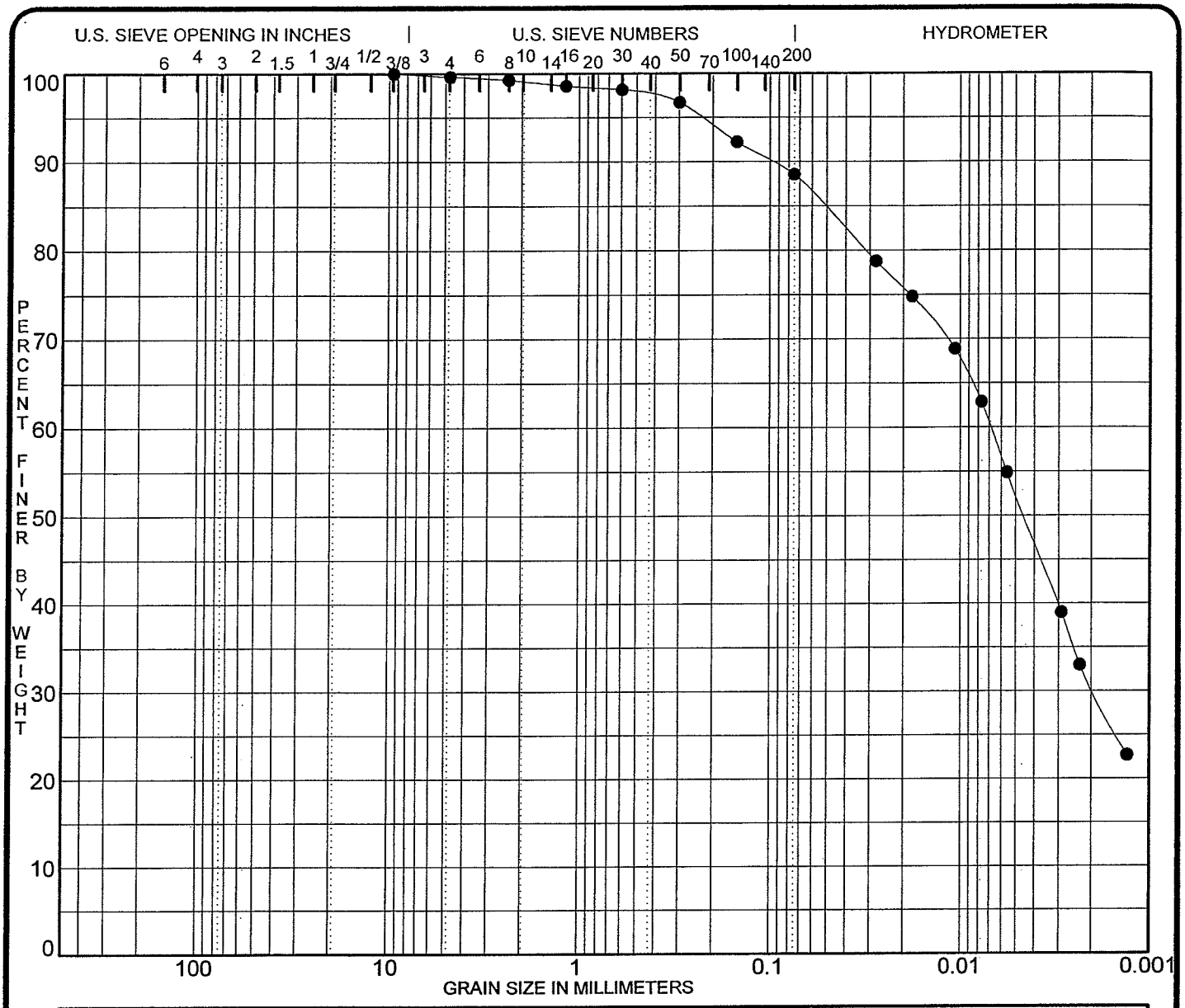
JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
●	B-1	15.0		18.1	37.2	17.8	19.4	
			LEAN CLAY CL					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
●	B-1	15.0	9.500	0.007	0.002		0.4	11.1	88.6	30.5

PROJECT **AMOS BOTTOM ASH POND DIKES -**

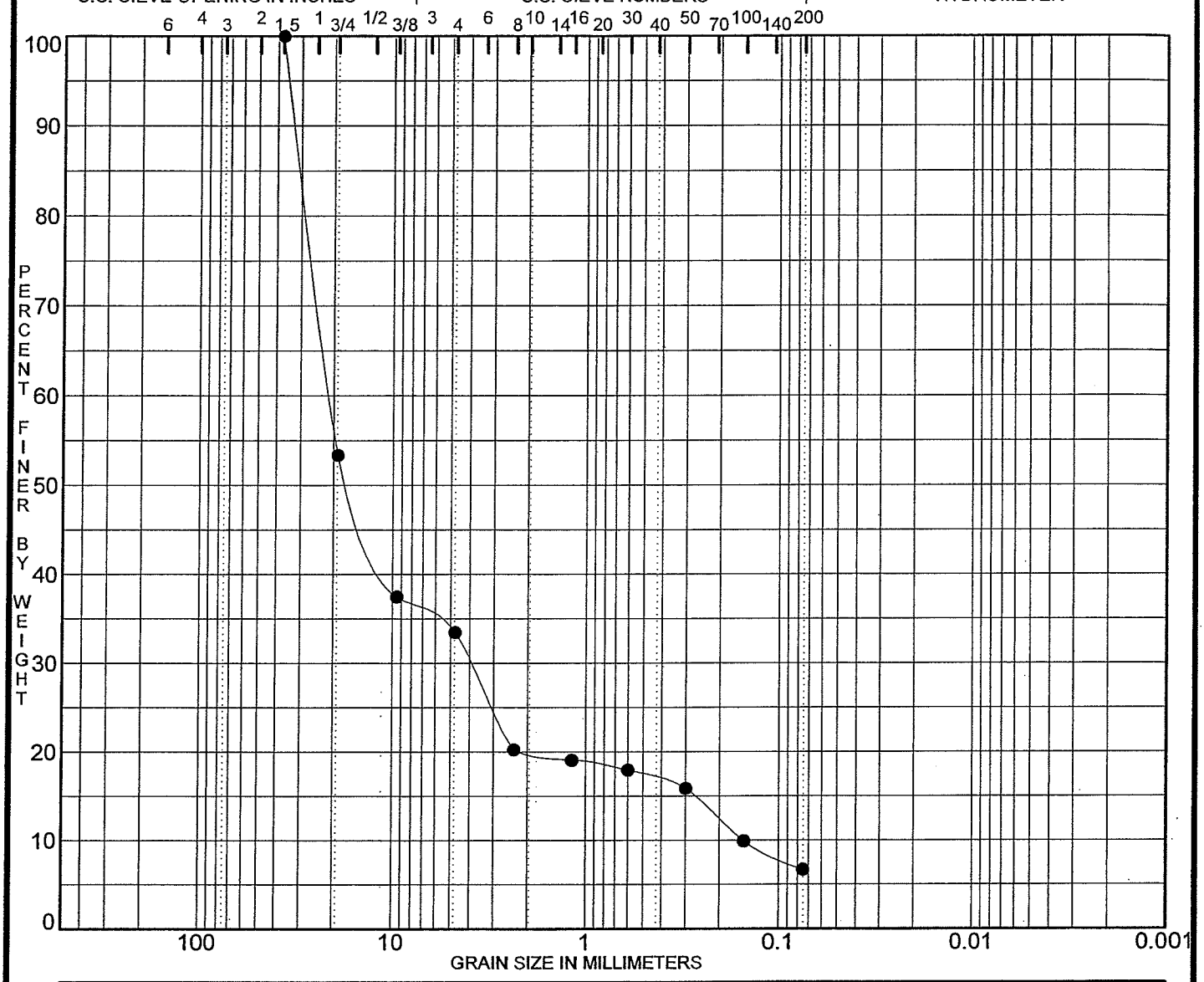
JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-1	16.0		8.2	NP	NP	NP	
		POORLY GRADED GRAVEL with SILT and SAND GP-GM					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-1	16.0	37.500	20.931	3.952	0.152	66.5	26.8	6.7	

PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

DATE **10/28/05**

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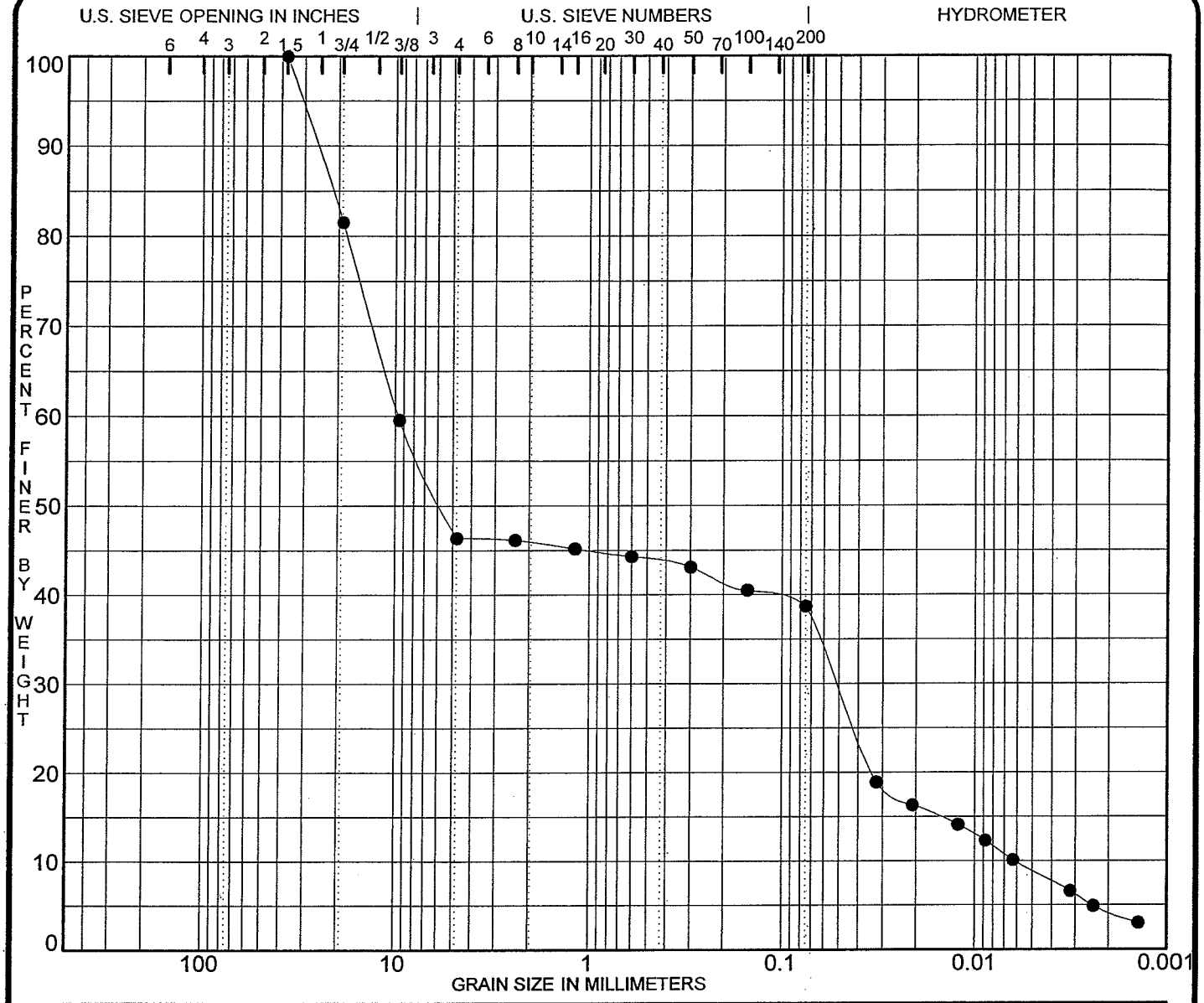
American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-1	24.5		15.8	29.1	18.9	10.2	
		CLAYEY GRAVEL GC					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-1	24.5	37.500	9.628	0.052	0.006	53.6	7.7	38.7	4.3

PROJECT AMOS BOTTOM ASH POND DIKES -

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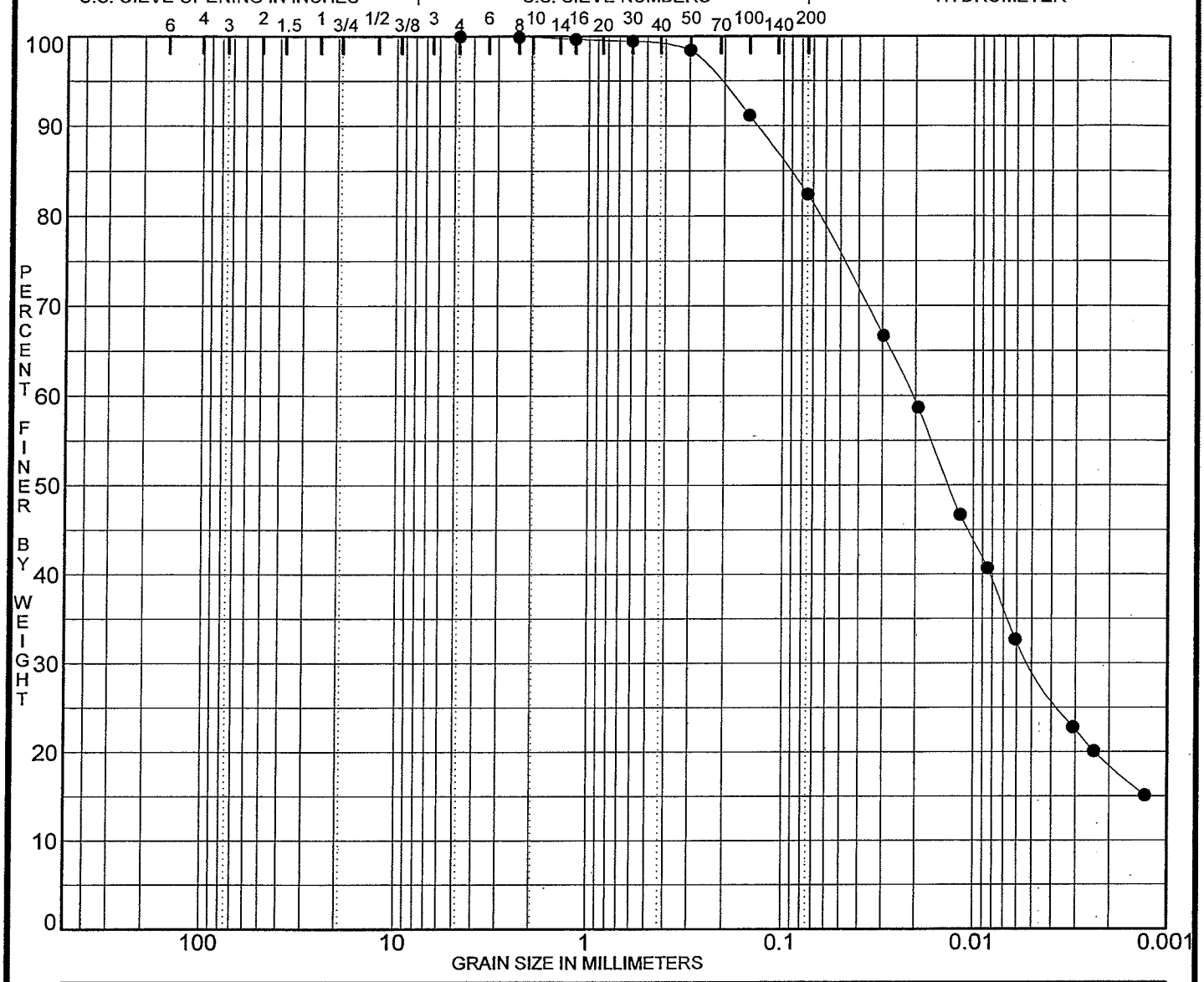

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-1	27.5		30.6	32.7	21.8	10.9	
		LEAN CLAY with SAND CL					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-1	27.5	4.750	0.021	0.005		0.0	17.6	82.4	18.6

PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

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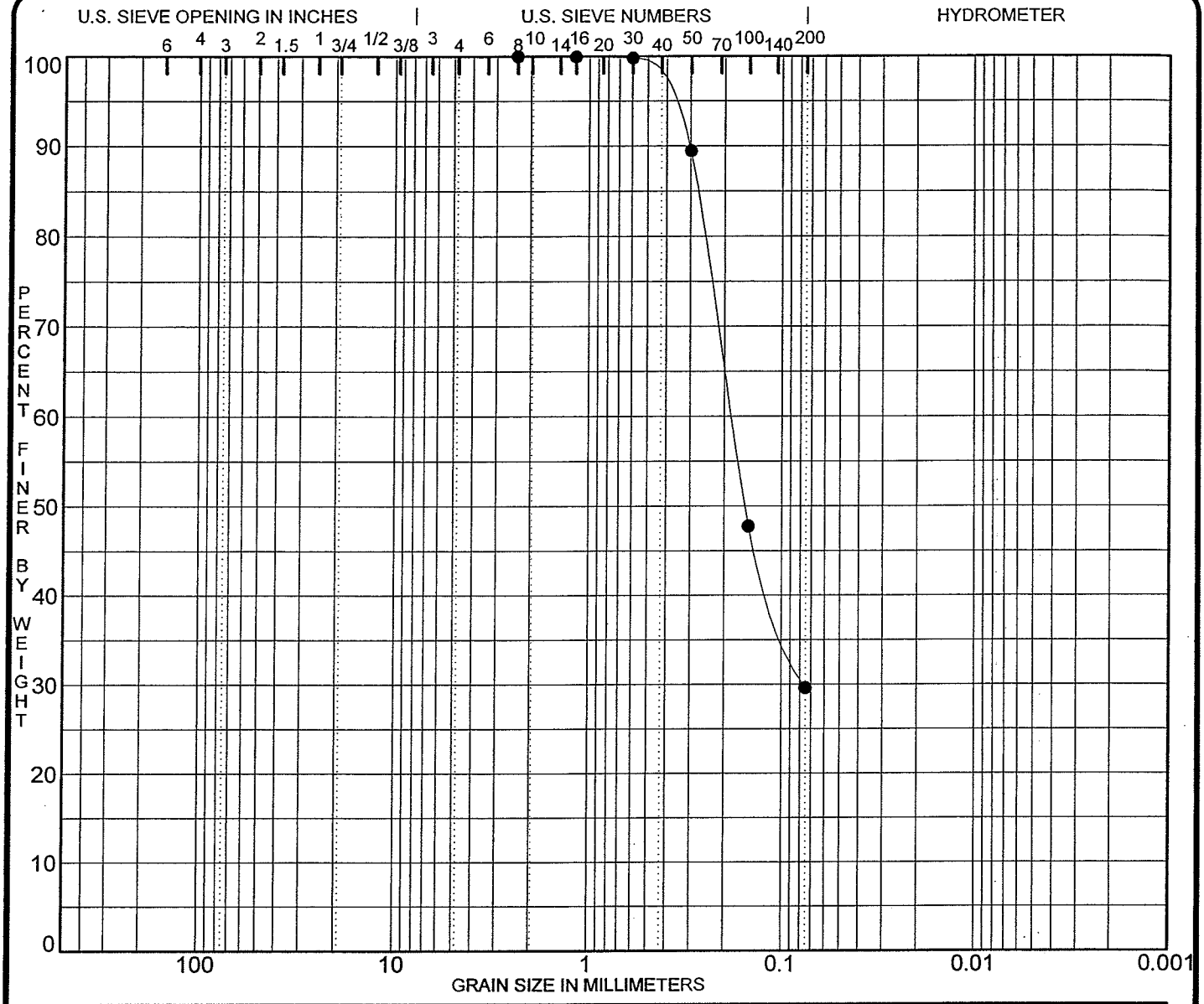

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
●	B-1	29.5			NP	NP	NP	2.67
			SILTY SAND SM					
			GRAY SILTY SAND					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
●	B-1	29.5	2.360	0.184	0.076		0.0	70.4	29.6	

PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

DATE **10/28/05**

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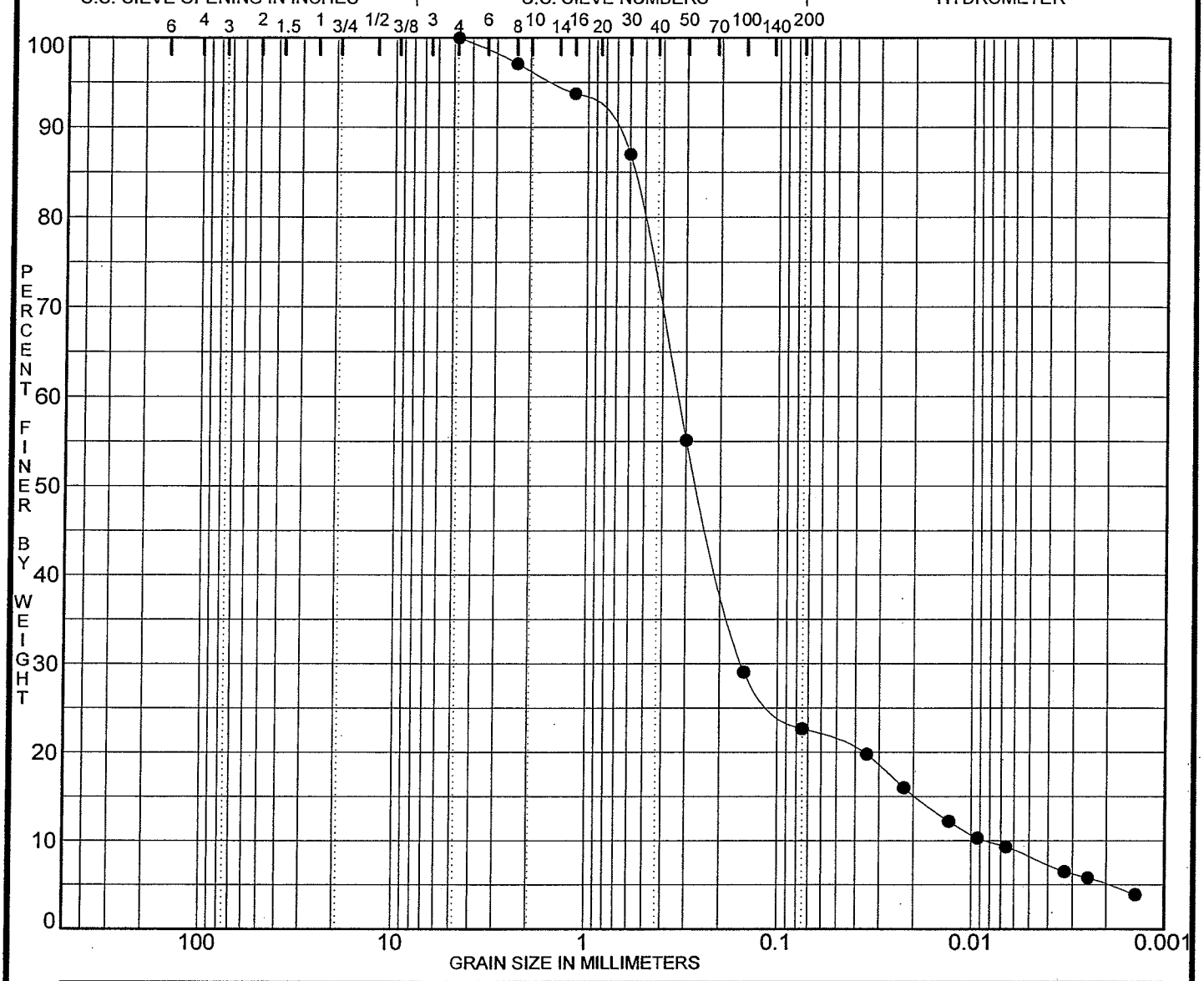

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-1	31.5		29.4				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-1	31.5	4.750	0.333	0.154	0.008	0.0	77.3	22.7	5.1

PROJECT **AMOS BOTTOM ASH POND DIKES -**

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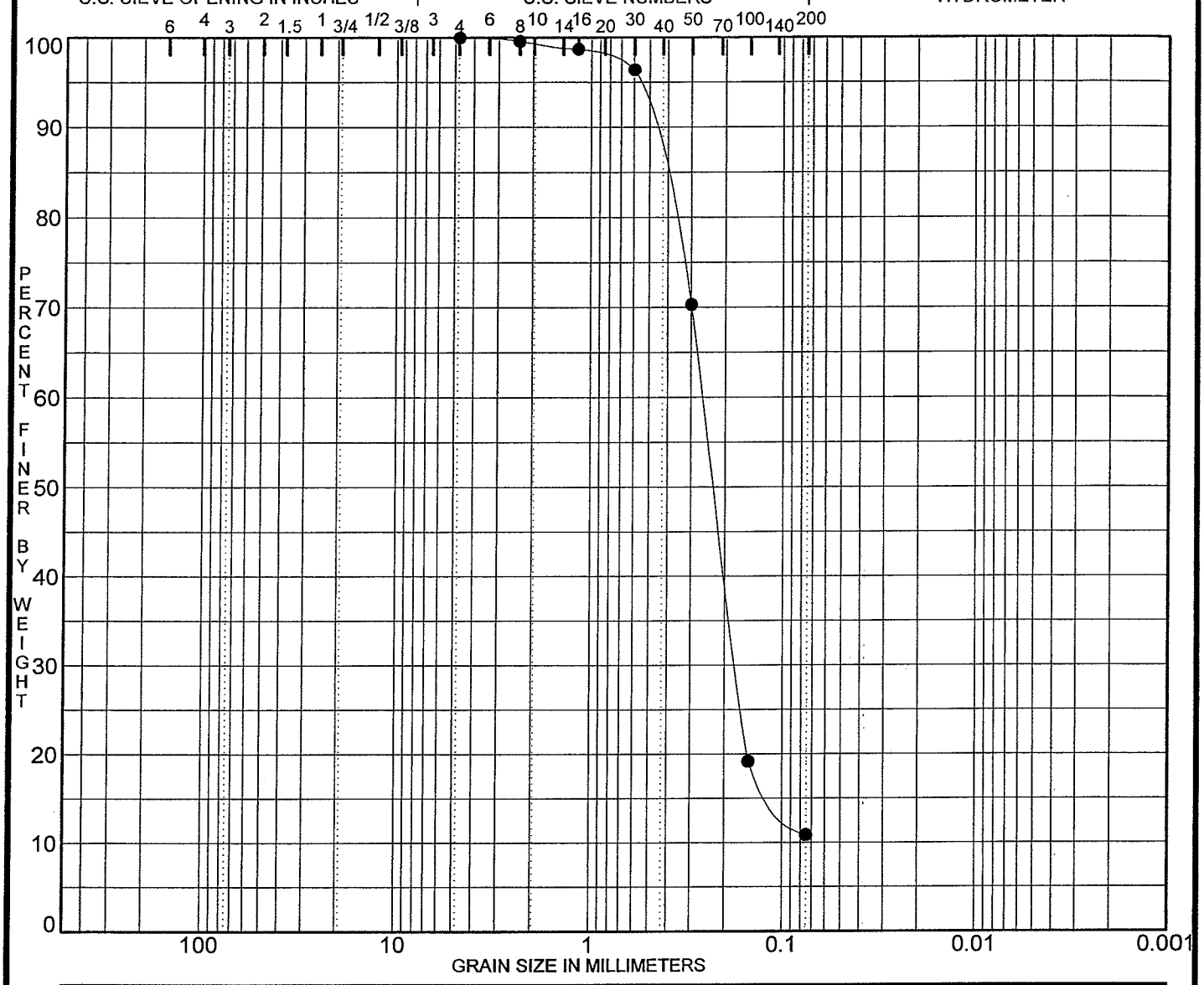

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-1	40.0		25.3				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-1	40.0	4.750	0.261	0.174		0.0	89.1	10.9	

PROJECT **AMOS BOTTOM ASH POND DIKES -**

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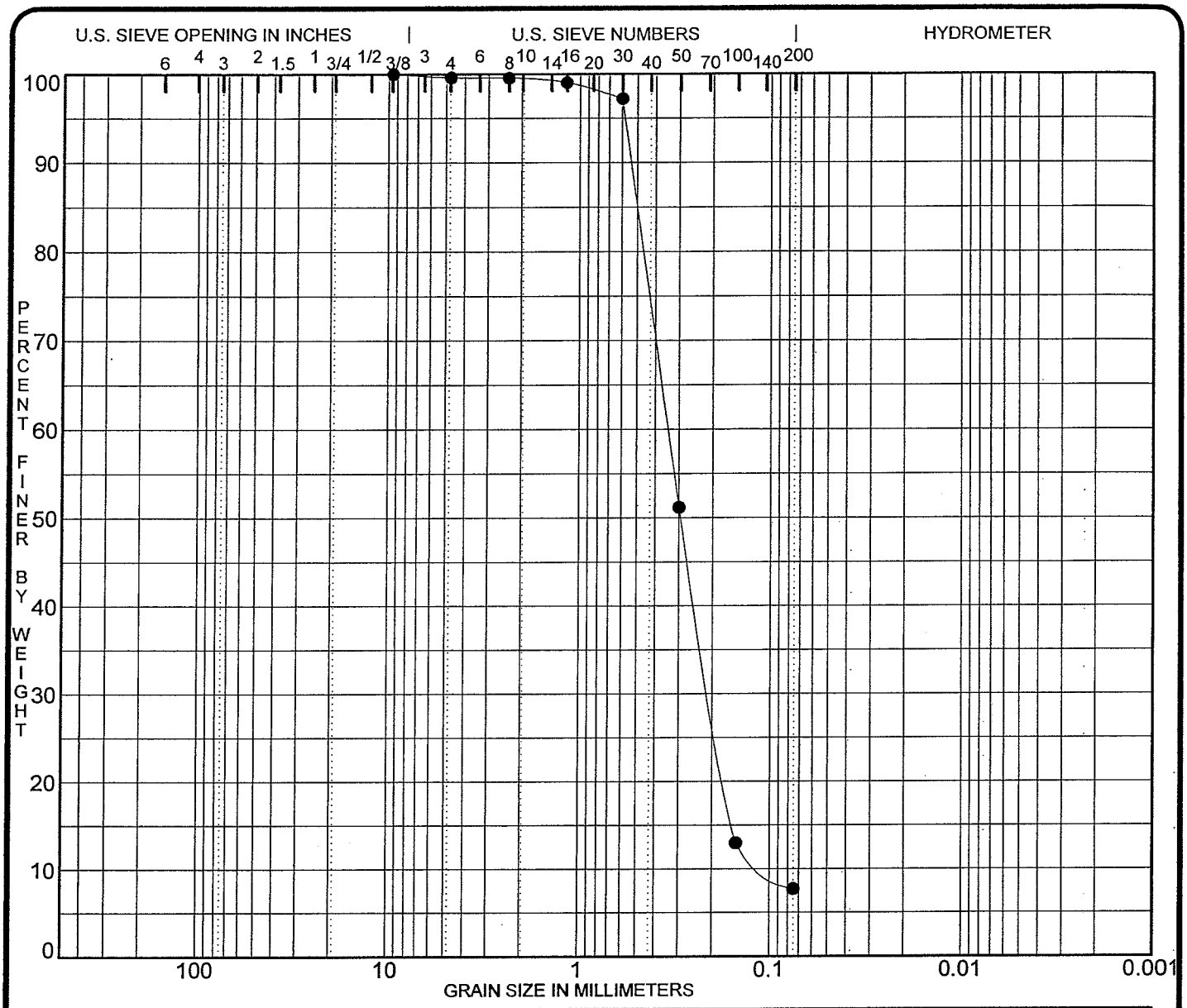

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
●	B-1	45.0		24.6				

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
●	B-1	45.0	9.500	0.343	0.204	0.101	0.4	91.9	7.7	

PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

DATE **10/28/05**

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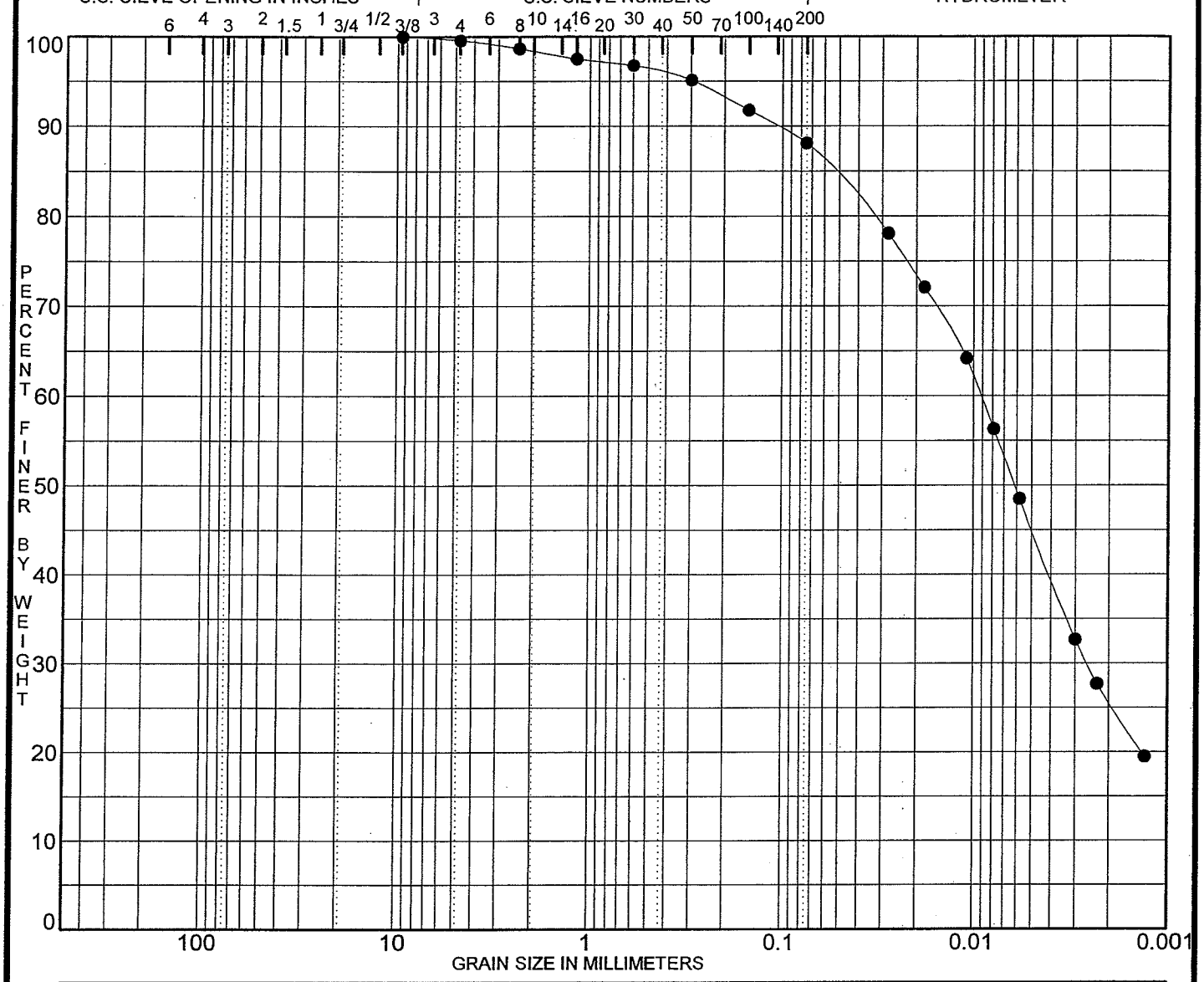

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-2	10.0		16.2	37.4	20.1	17.3	
		LEAN CLAY CL					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-2	10.0	9.500	0.009	0.003		0.4	11.5	88.1	25.7

PROJECT **AMOS BOTTOM ASH POND DIKES -**

JOB NO.

DATE **10/28/05**

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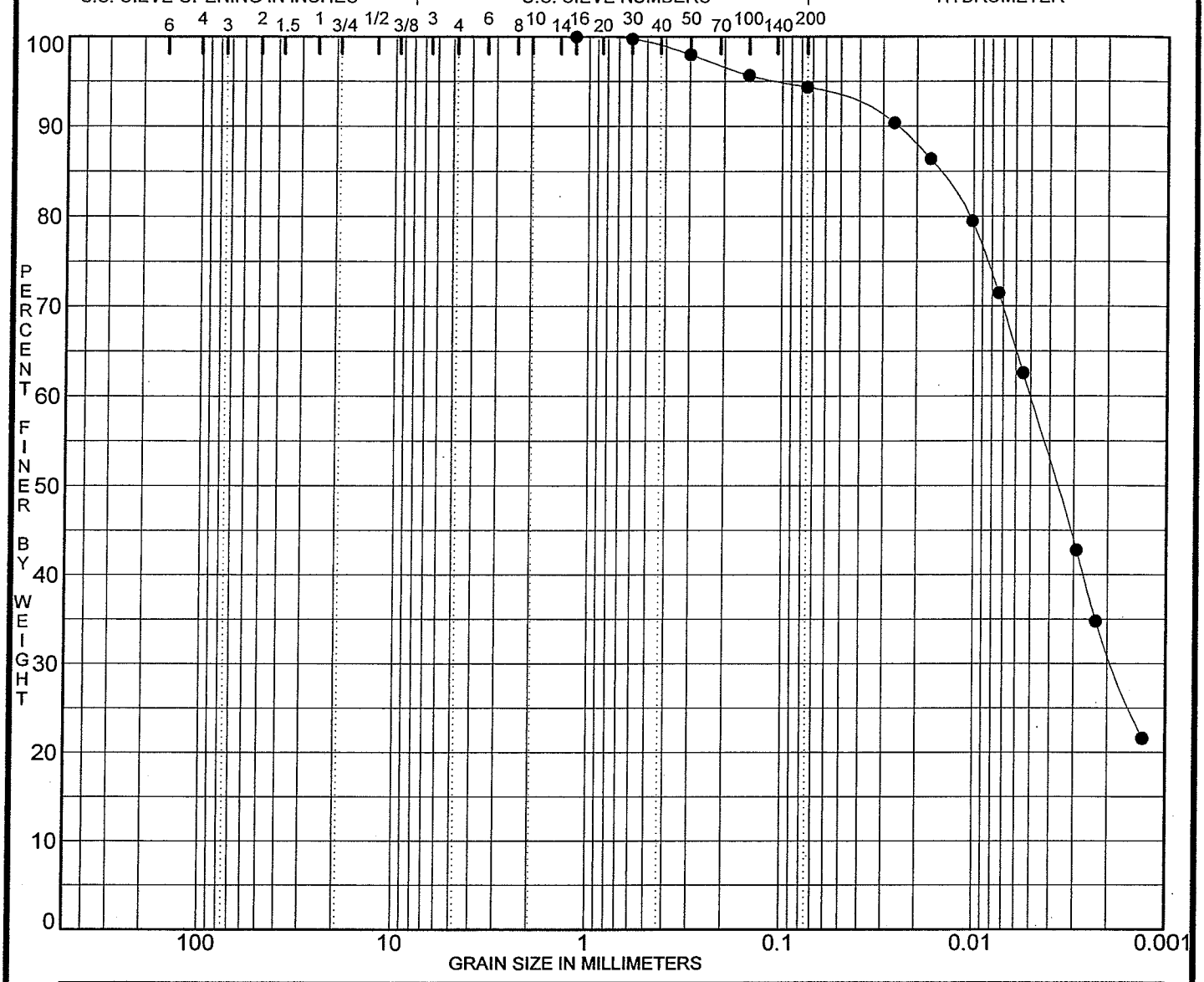

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
●	B-2	11.0		11.5	36.2	17.7	18.5	
			LEAN CLAY CL					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
●	B-2	11.0	1.180	0.005	0.002		0.0	5.6	94.4	31.6

PROJECT **AMOS BOTTOM ASH POND DIKES -**

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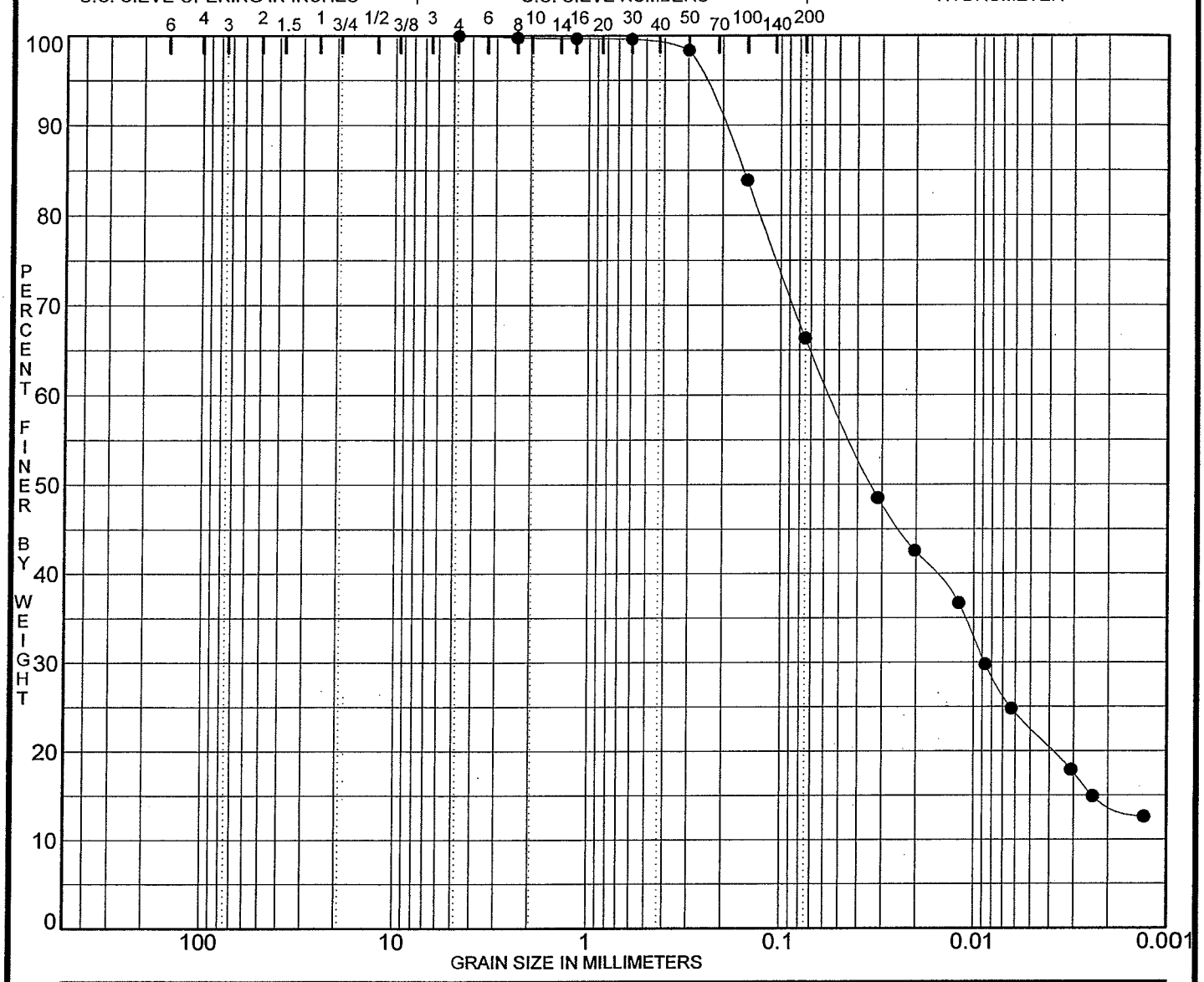

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-2	30.0		22.9	24.9	17.9	7.0	
		SANDY SILTY CLAY CL-ML					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-2	30.0	4.750	0.055	0.009		0.0	33.6	66.4	14.2

PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

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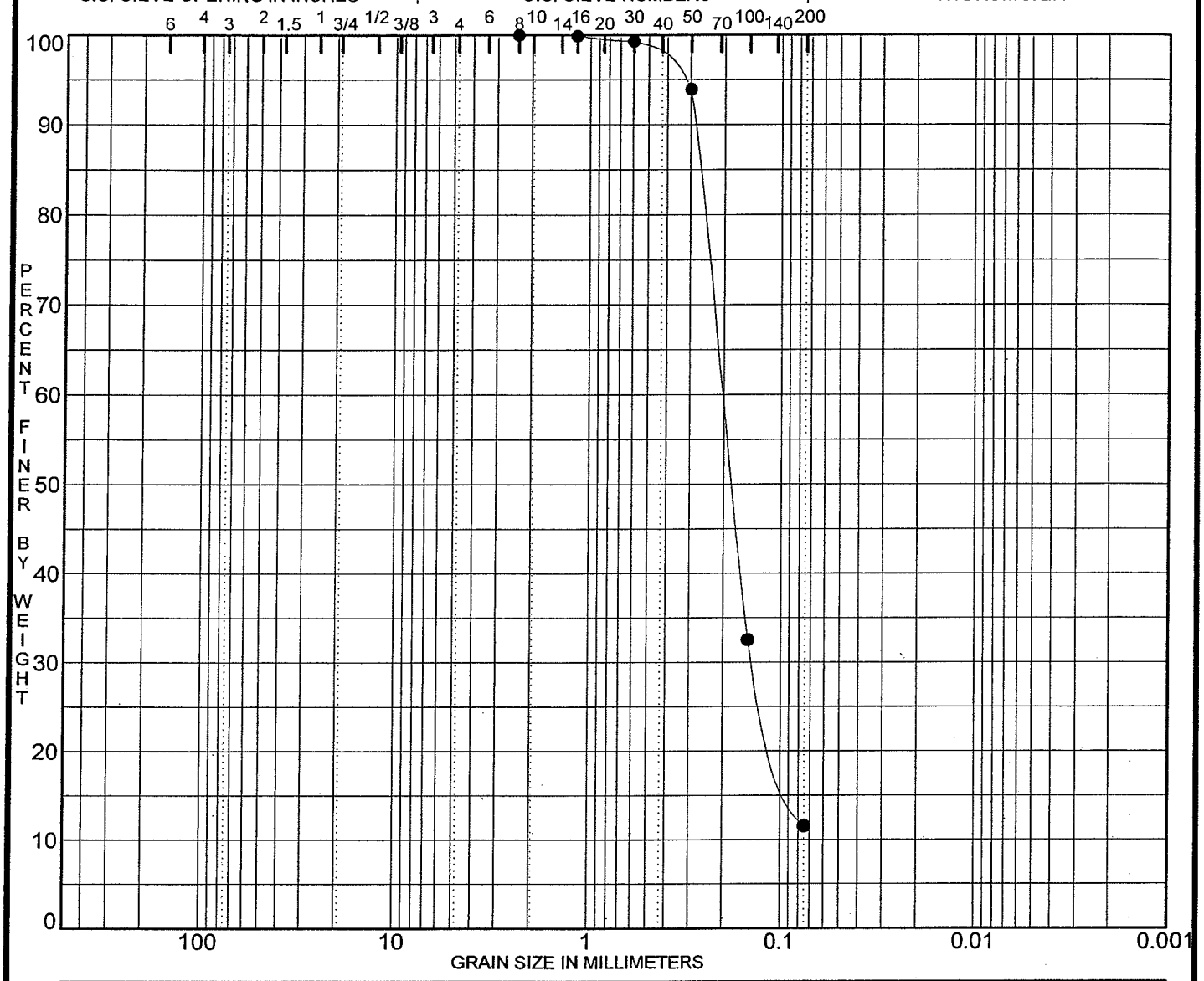

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-2	31.0		28.4				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-2	31.0	2.360	0.204	0.138		0.0	88.5	11.5	

PROJECT **AMOS BOTTOM ASH POND DIKES -**

JOB NO.

DATE **10/28/05**

GRADATION CURVES

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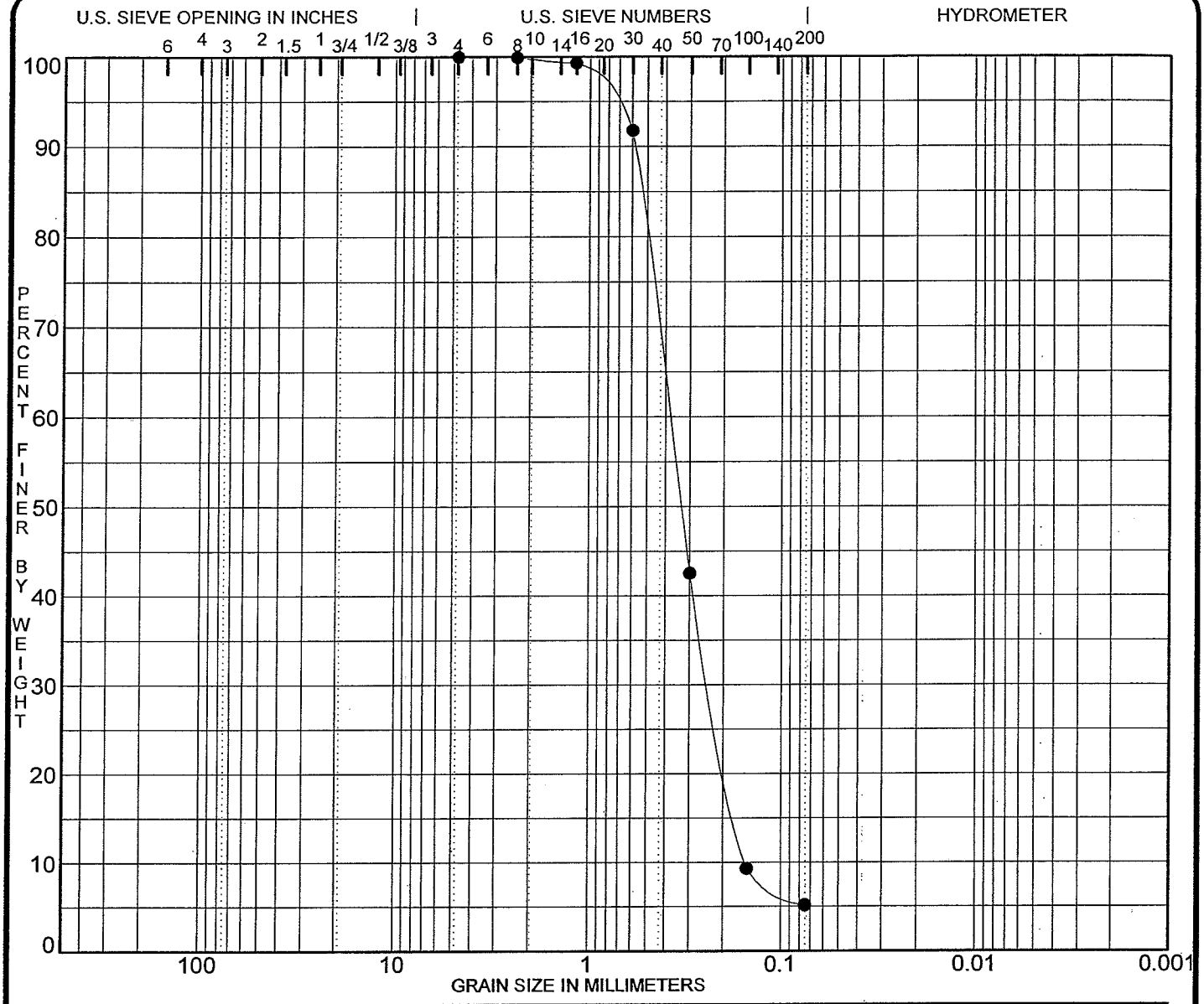
AEP



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-2	35.0		27.4				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-2	35.0	4.750	0.384	0.231	0.152	0.0	94.8	5.2	

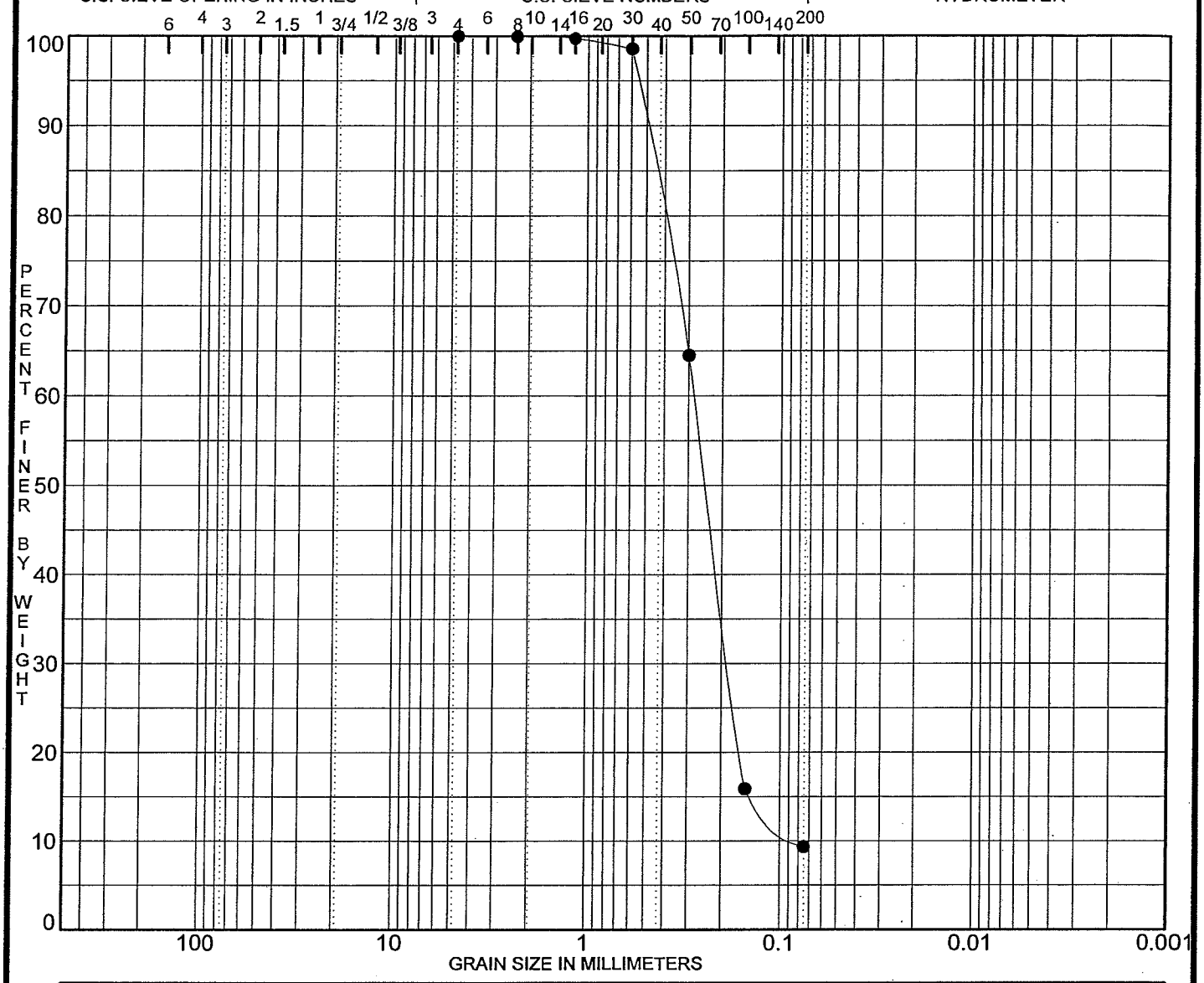
PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-2	45.0		23.3				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-2	45.0	4.750	0.281	0.183	0.080	0.0	90.7	9.3	

PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

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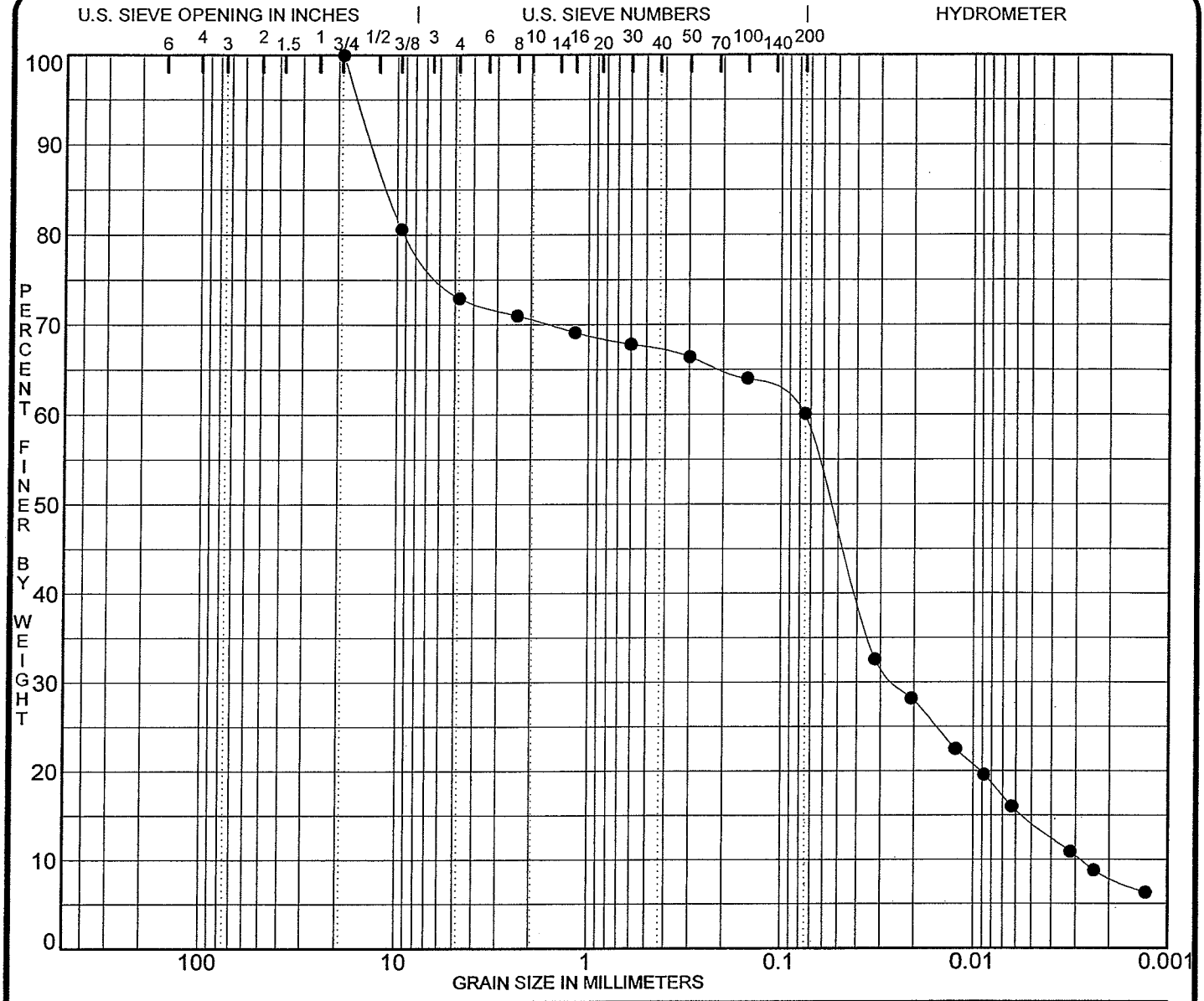
Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-3	5.0		7.2	29.3	18.4	10.9	
		GRAVELLY LEAN CLAY CL					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-3	5.0	19.000	0.075	0.025	0.003	27.0	12.9	60.1	8.1

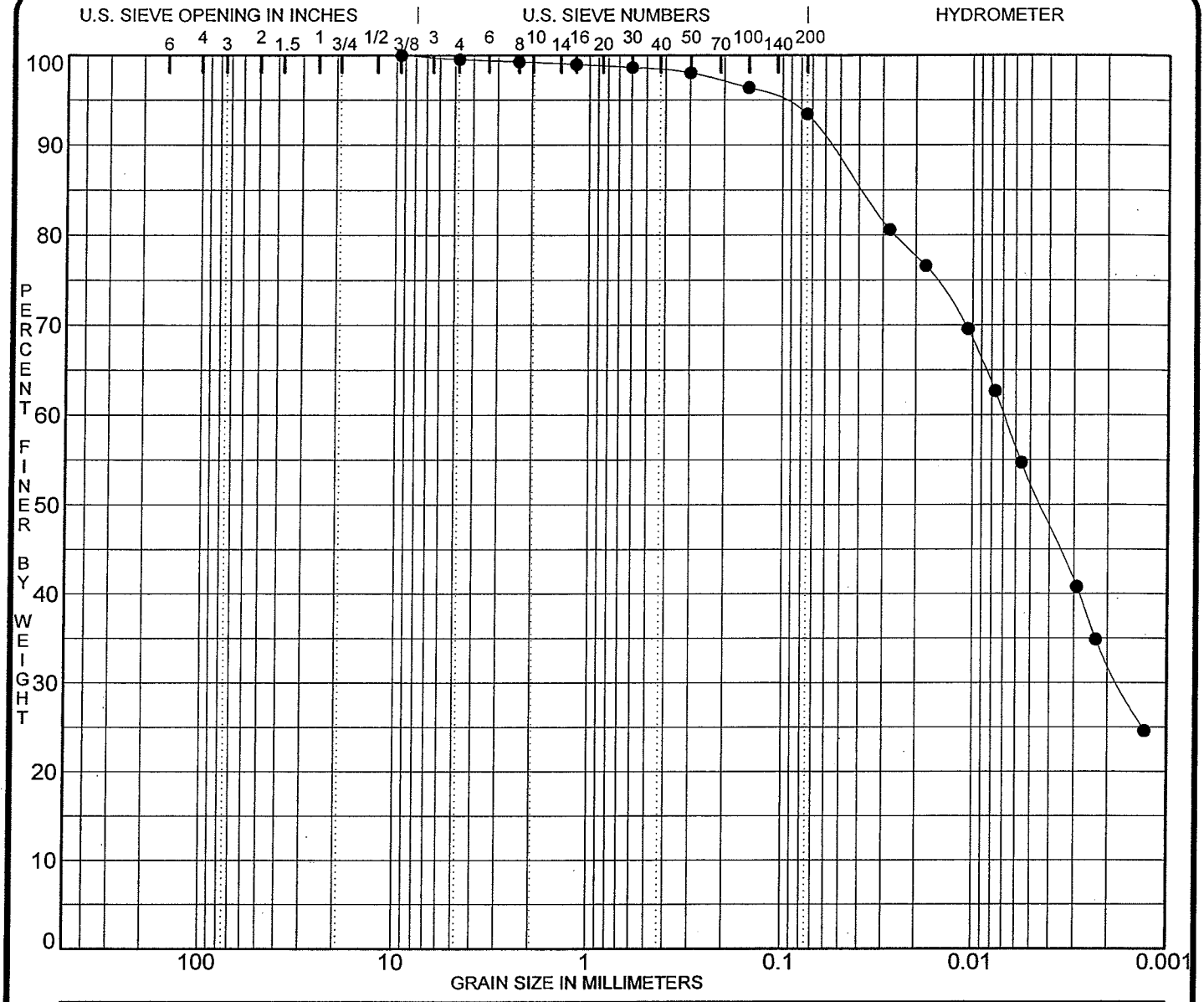
PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-3	6.0		16.9	37.1	18.3	18.7	
		LEAN CLAY CL					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-3	6.0	9.500	0.007	0.002		0.5	6.1	93.5	32.4

PROJECT **AMOS BOTTOM ASH POND DIKES -**

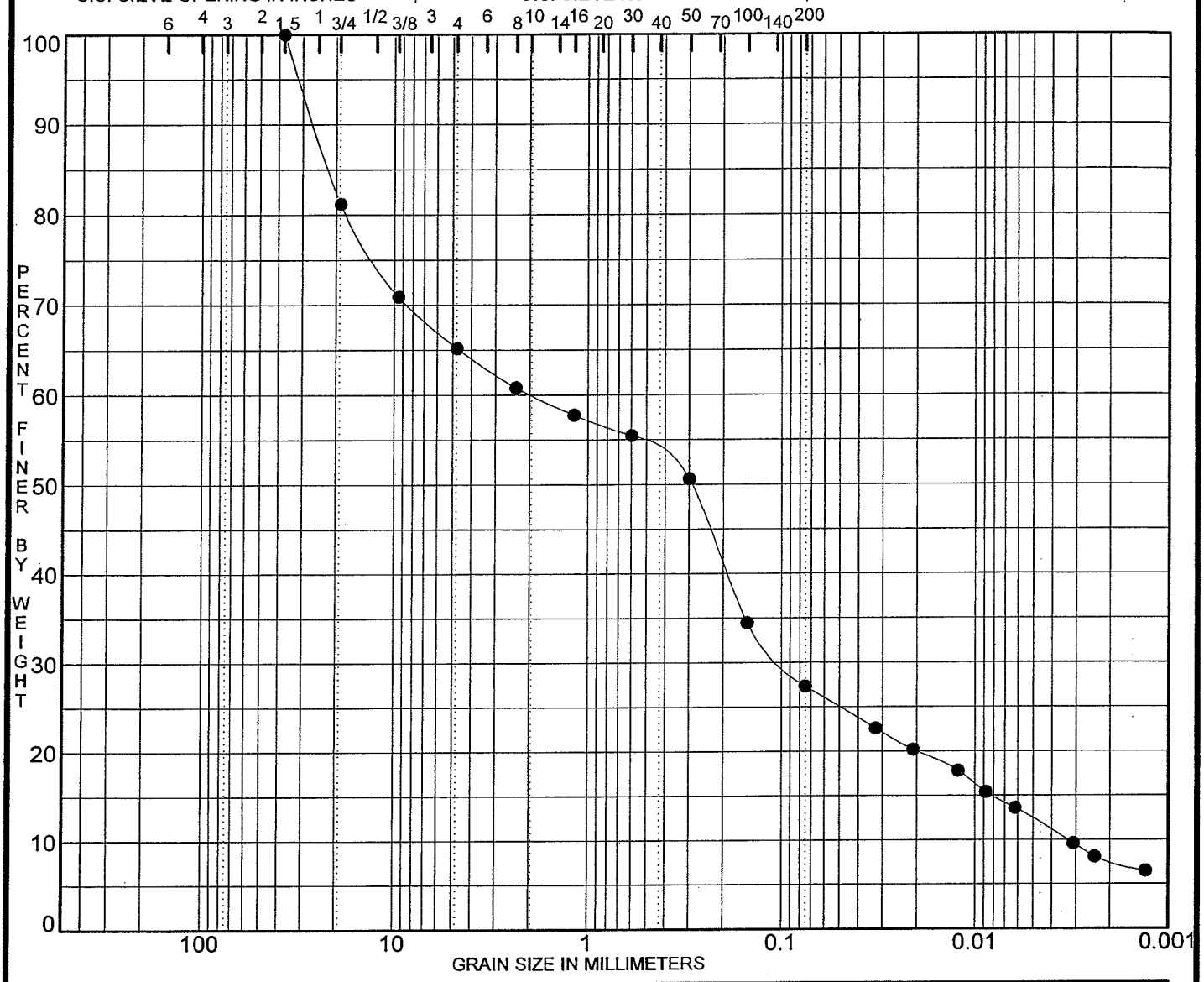
JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
●	B-3	26.5		12.7				

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
●	B-3	26.5	37.500	1.956	0.097	0.003	34.8	37.9	27.3	7.6

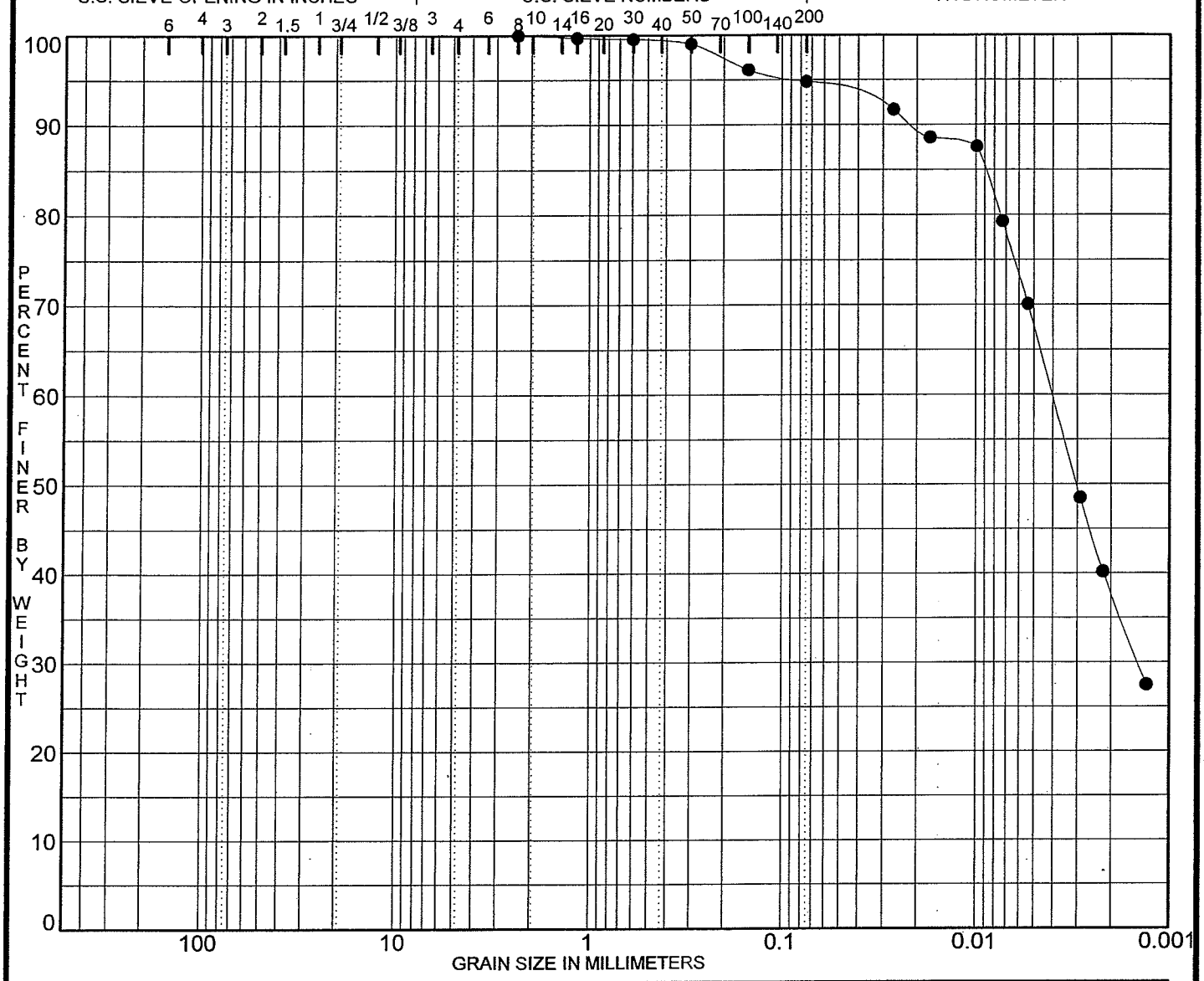
PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-3	27.0	FAT CLAY CH	66.4	55.9	29.0	26.8	

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-3	27.0	2.360	0.004	0.001		0.0	5.2	94.8	37.9

PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

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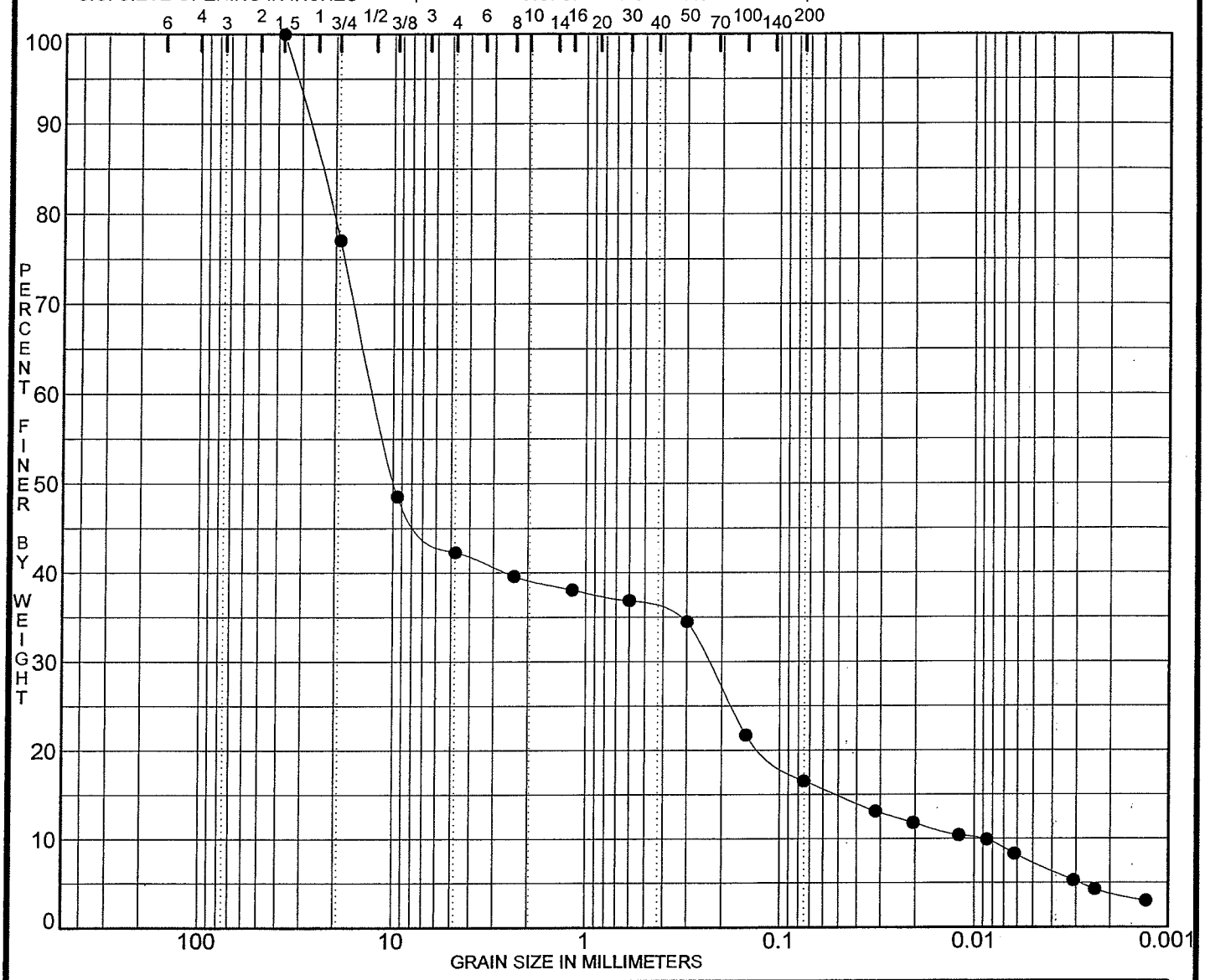
Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-3	28.0		16.1				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-3	28.0	37.500	12.545	0.235	0.009	57.7	25.8	16.5	3.9

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DATE **10/28/05**

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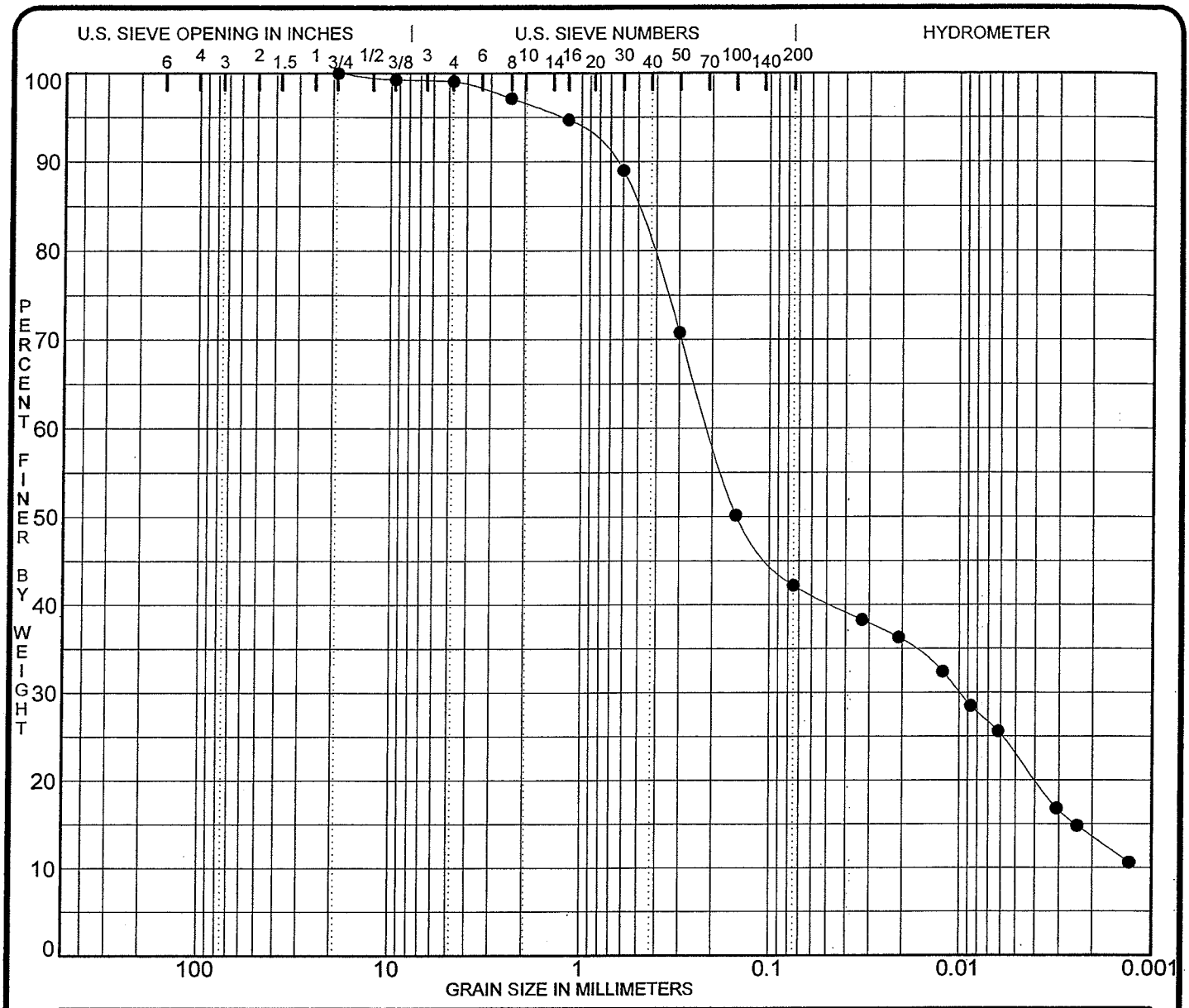
American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-3	32.0		33.4	27.0	17.5	9.6	
		CLAYEY SAND SC					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-3	32.0	19.000	0.209	0.010		0.9	56.9	42.2	13.6

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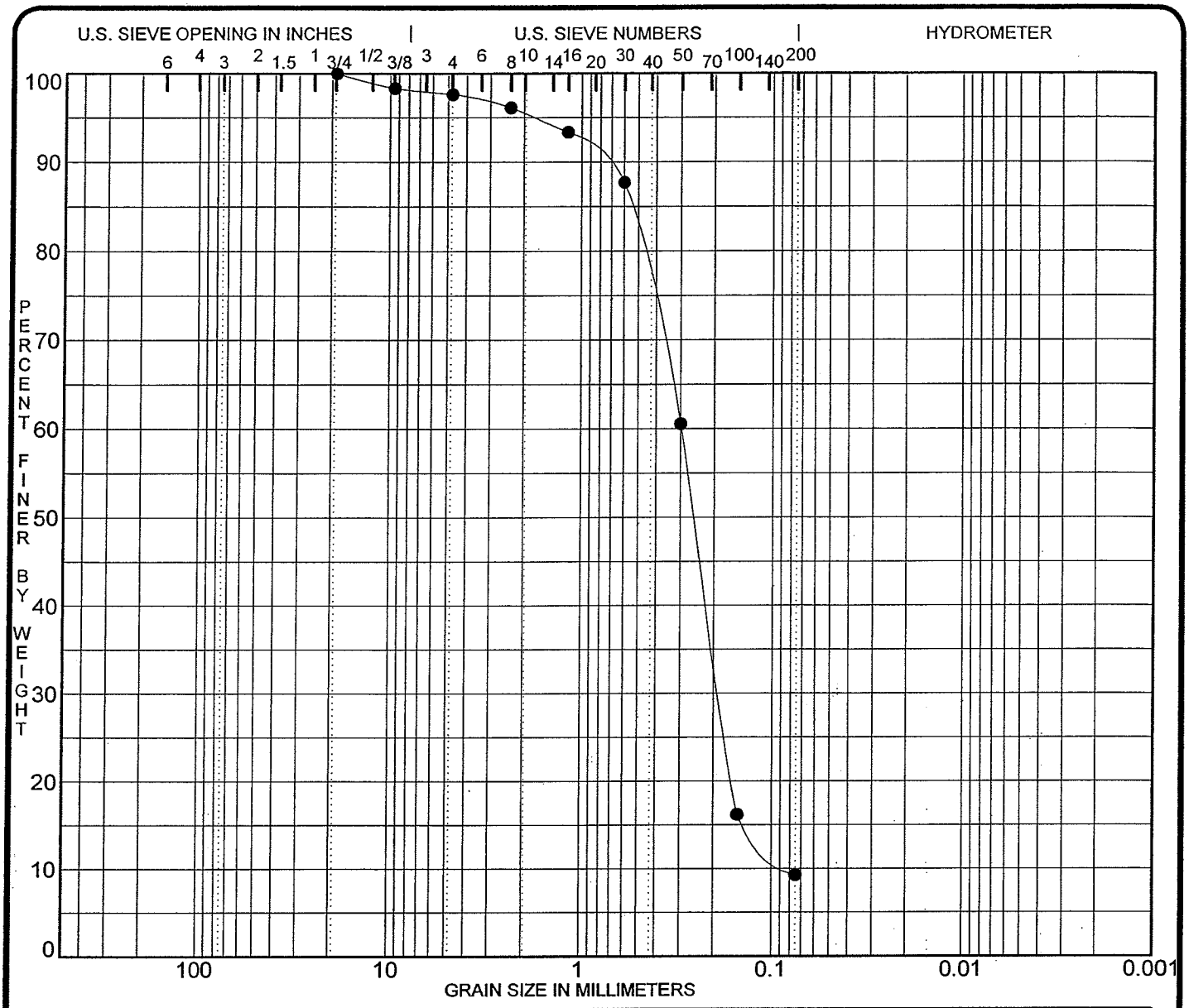

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-3	33.0		28.3				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-3	33.0	19.000	0.297	0.186	0.081	2.4	88.3	9.3	

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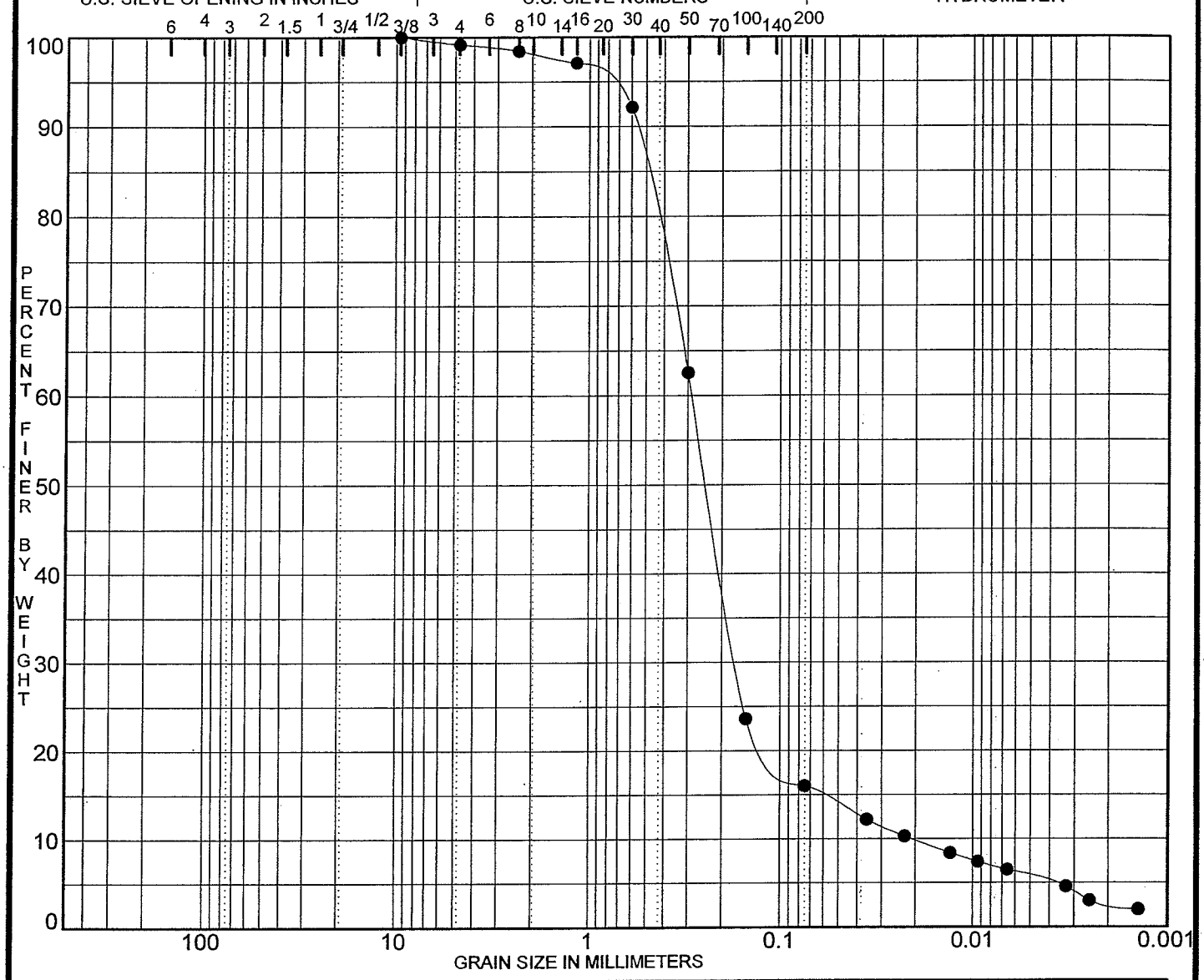

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-3	35.0		23.9				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-3	35.0	9.500	0.287	0.168	0.021	0.8	83.2	16.0	2.6

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JOB NO.

DATE **10/28/05**

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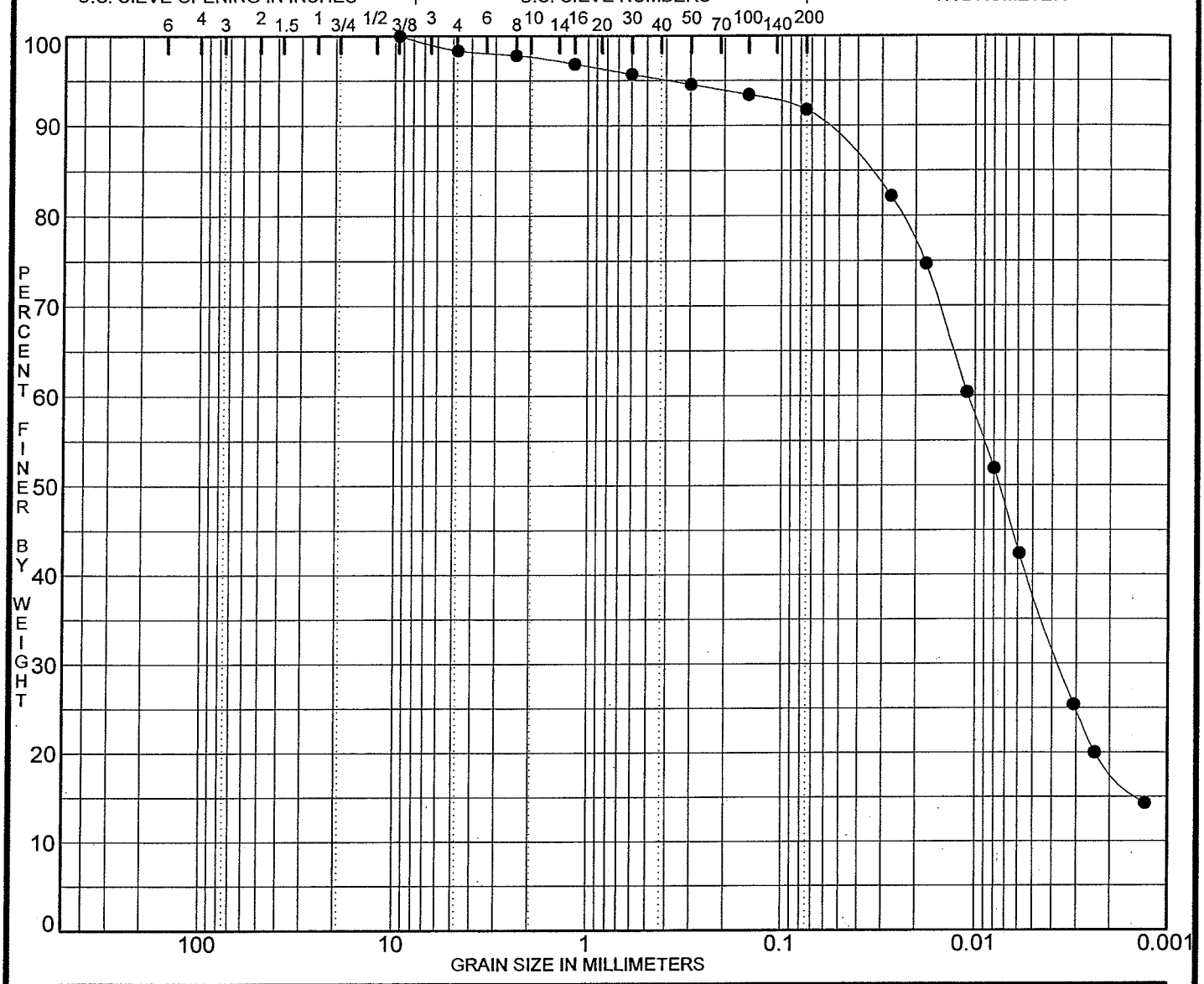

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-3	55.0		9.8	29.3	17.5	11.8	
		LEAN CLAY CL					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-3	55.0	9.500	0.011	0.004		1.6	6.6	91.8	18.3

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JOB NO.

DATE **10/28/05**

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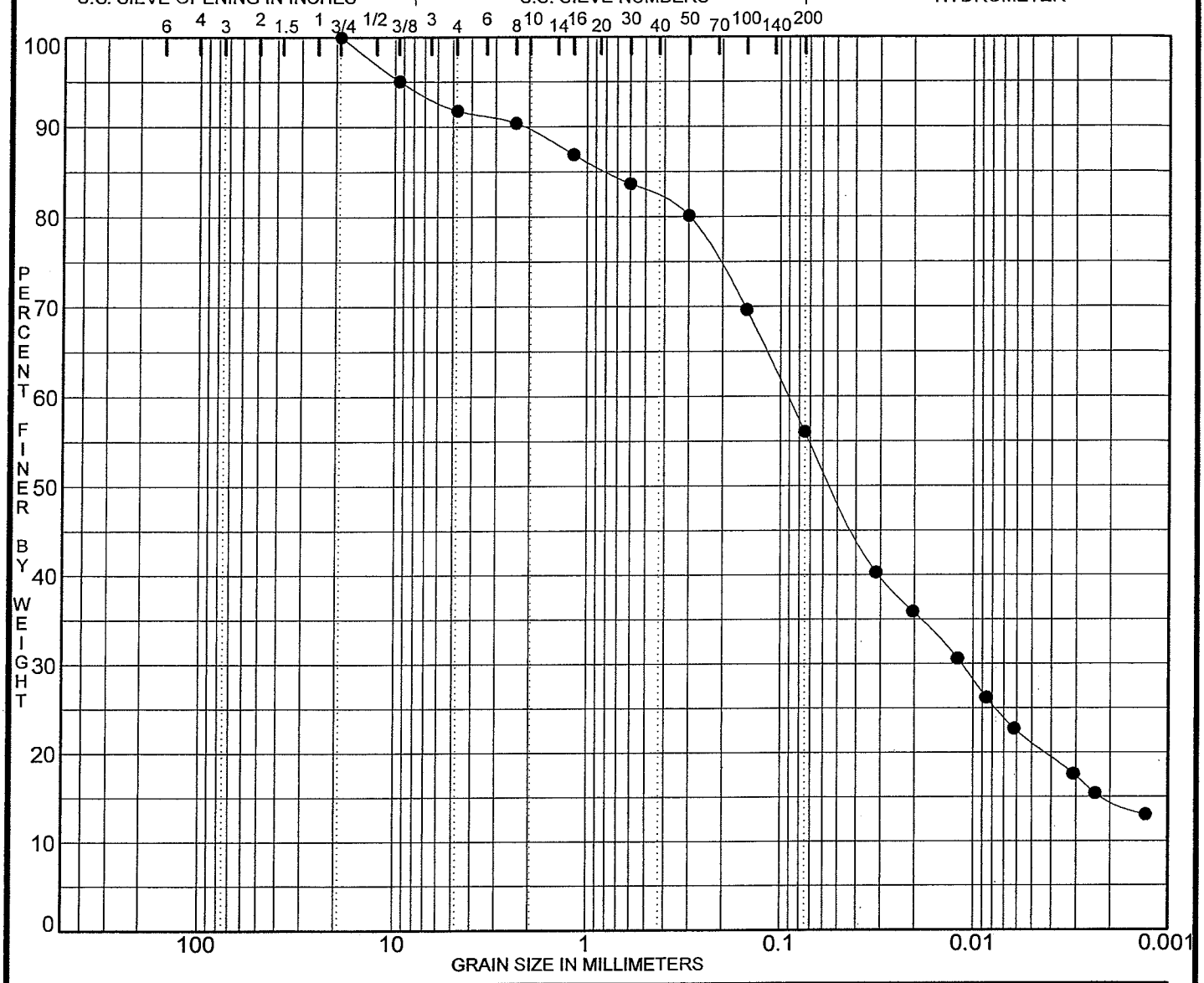

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-4	5.0		15.6	28.2	17.8	10.4	
		SANDY LEAN CLAY CL					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-4	5.0	19.000	0.092	0.011		8.2	35.7	56.1	14.7

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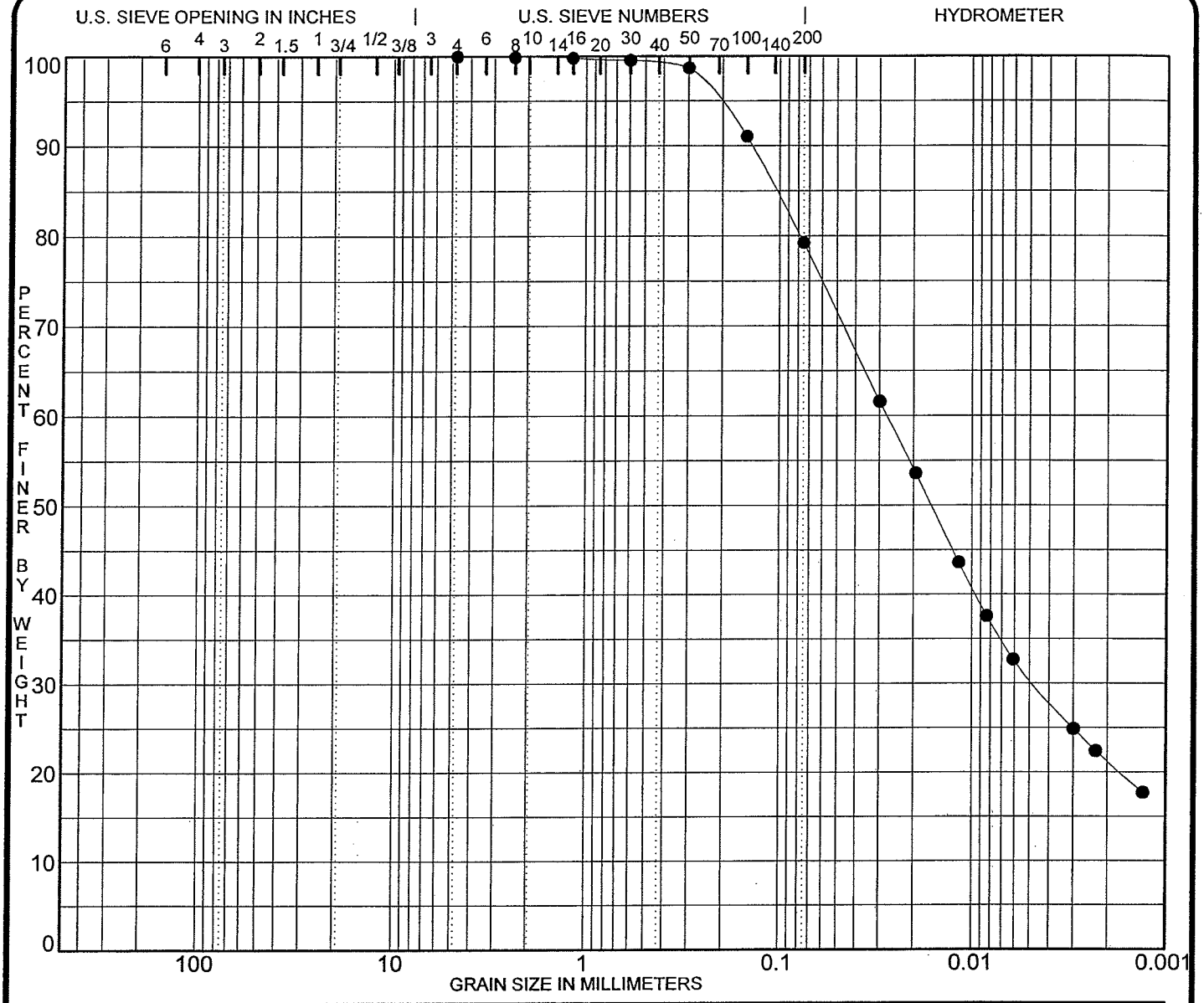

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-4	6.0		20.6	31.2	19.5	11.7	
		LEAN CLAY with SAND CL					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-4	6.0	4.750	0.027	0.005		0.0	20.8	79.2	21.2

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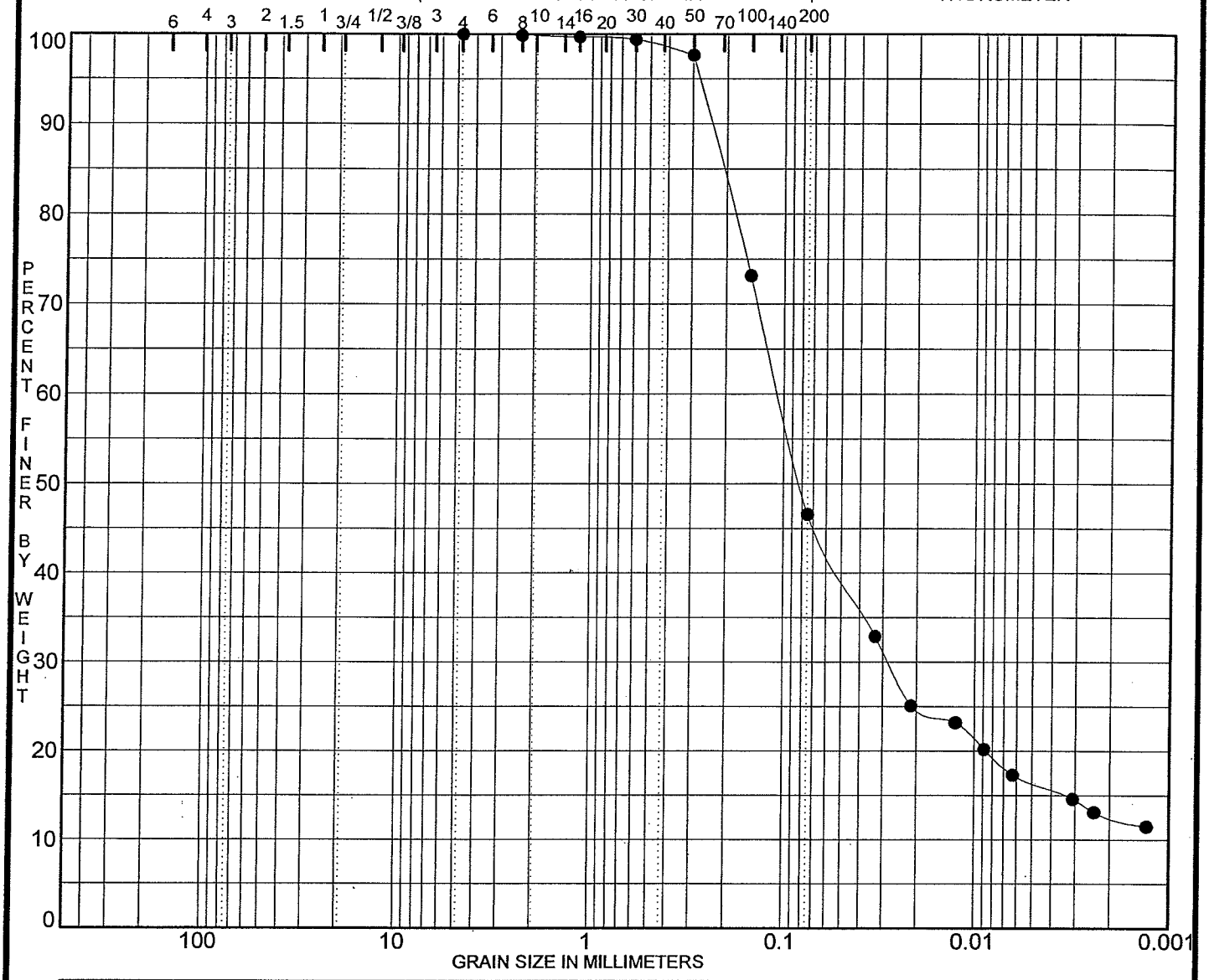

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-4	15.0		18.4	22.9	17.3	5.7	
		SILTY, CLAYEY SAND SC-SM					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-4	15.0	4.750	0.106	0.028		0.0	53.4	46.6	12.6

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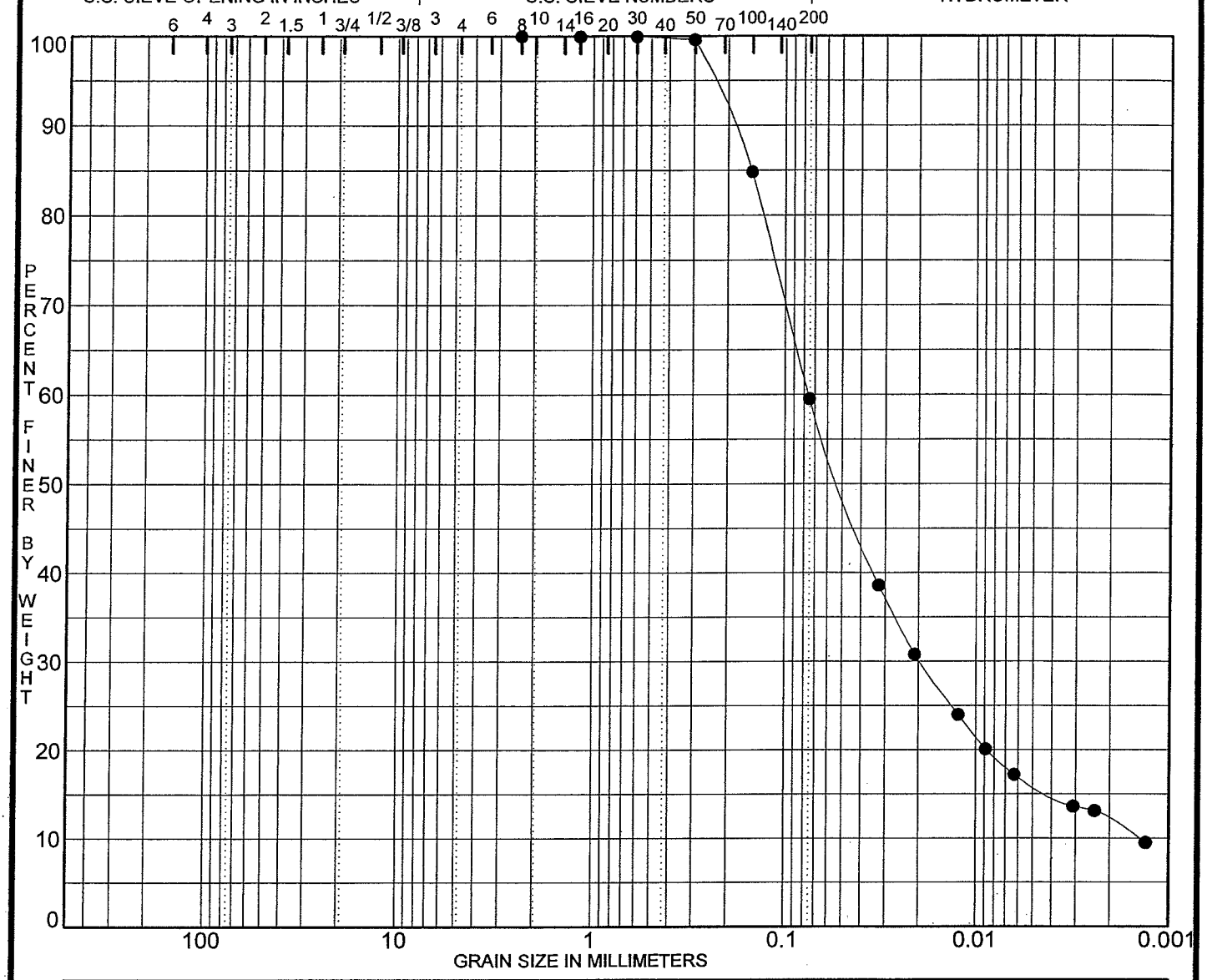

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-4	16.0	SANDY SILTY CLAY CL-ML	24.5	24.7	19.1	5.6	

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-4	16.0	2.360	0.076	0.020	0.001	0.0	40.5	59.5	12.0

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JOB NO.

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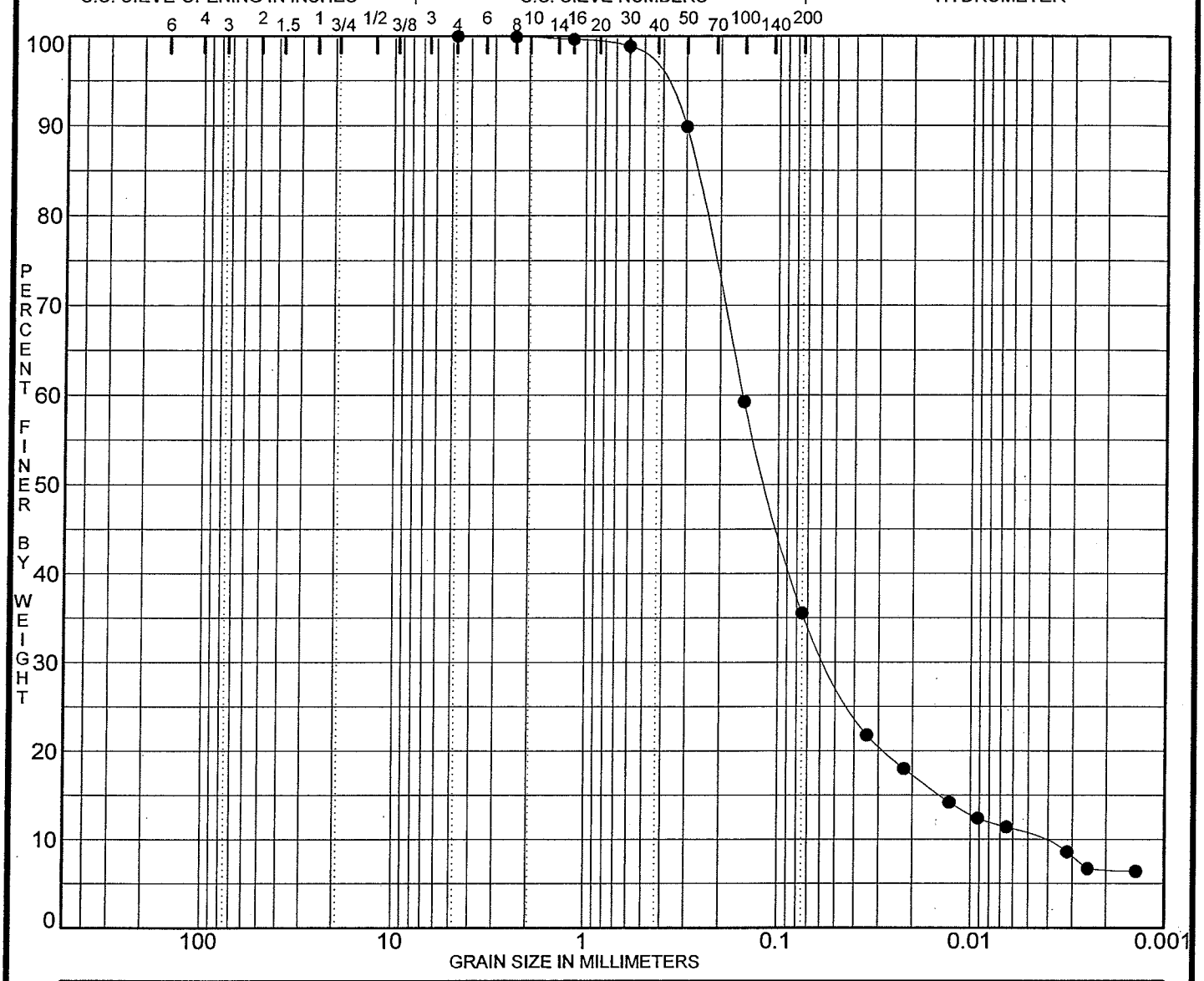

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-4	20.0		24.6	NP	NP	NP	
		SILTY SAND SM					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-4	20.0	4.750	0.152	0.055	0.005	0.0	64.4	35.6	6.6

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JOB NO.

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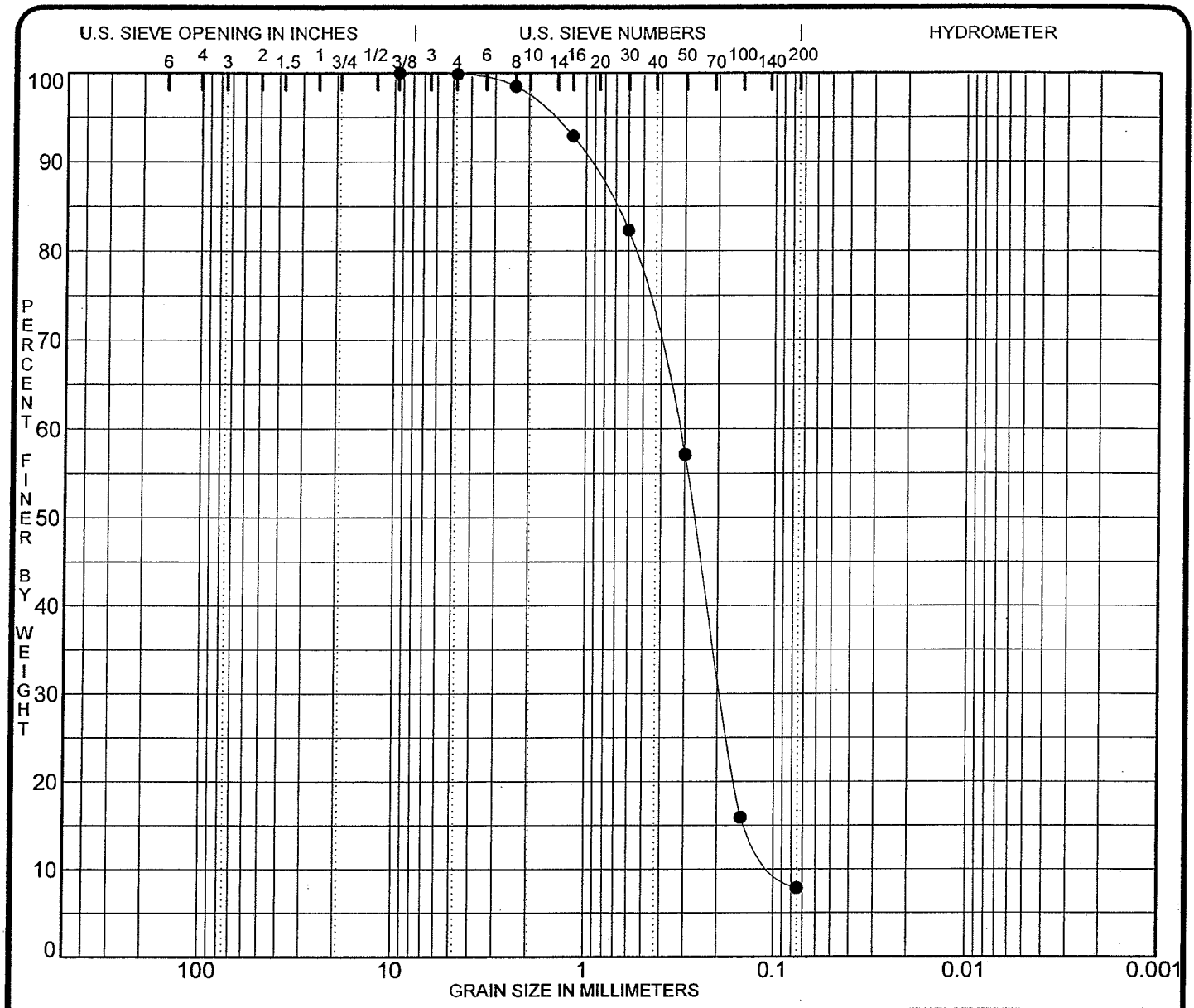
American Electric Power Service Corp.
Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-4	21.0		24.2				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-4	21.0	9.500	0.325	0.190	0.090	0.1	92.0	7.9	

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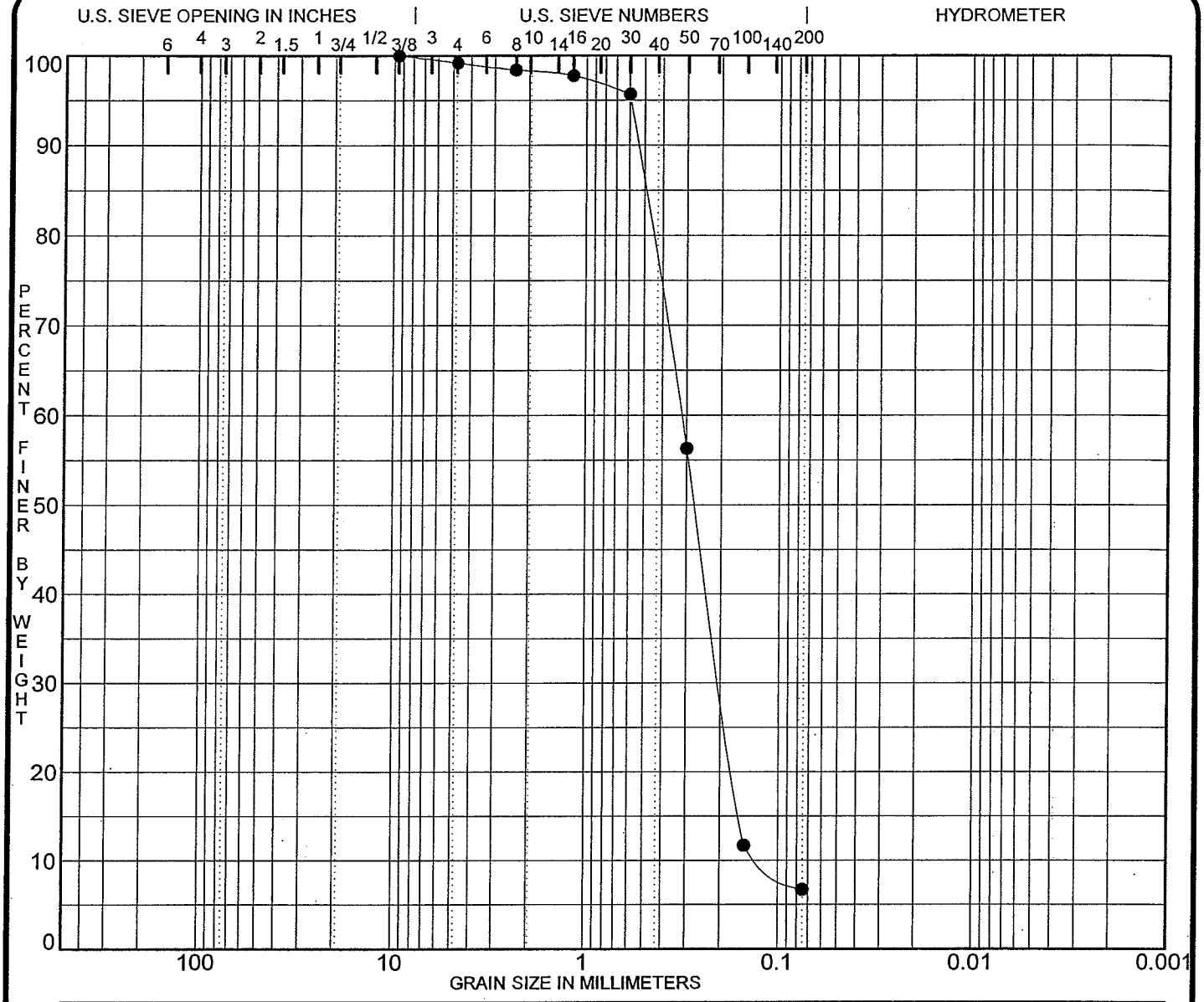

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-4	45.0		24.4				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-4	45.0	9.500	0.320	0.199	0.118	0.8	92.5	6.7	

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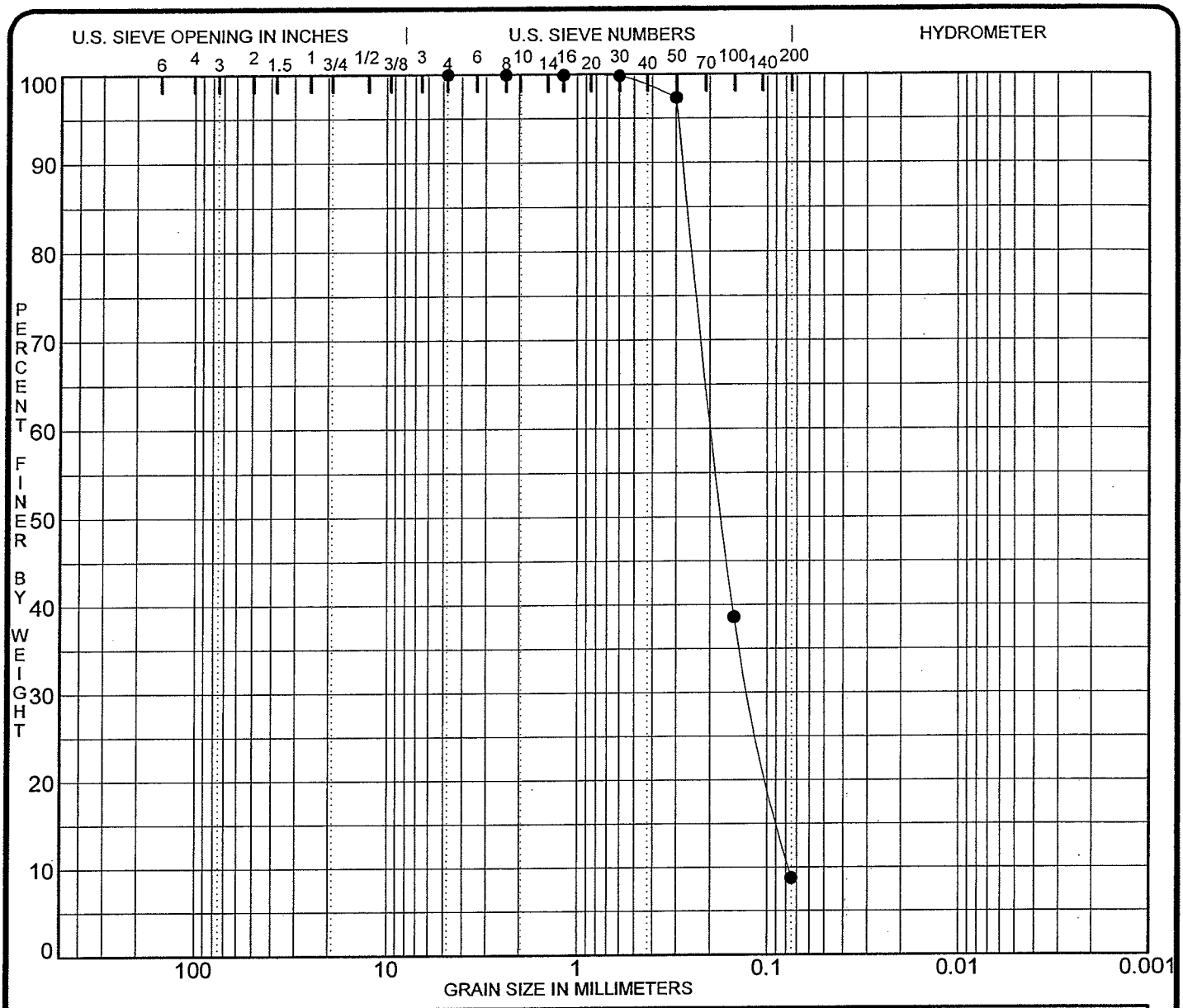

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-5	10.0		9.8				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-5	10.0	4.750	0.193	0.123	0.077	0.0	91.2	8.8	

PROJECT **AMOS BOTTOM ASH POND DIKES -**

JOB NO.

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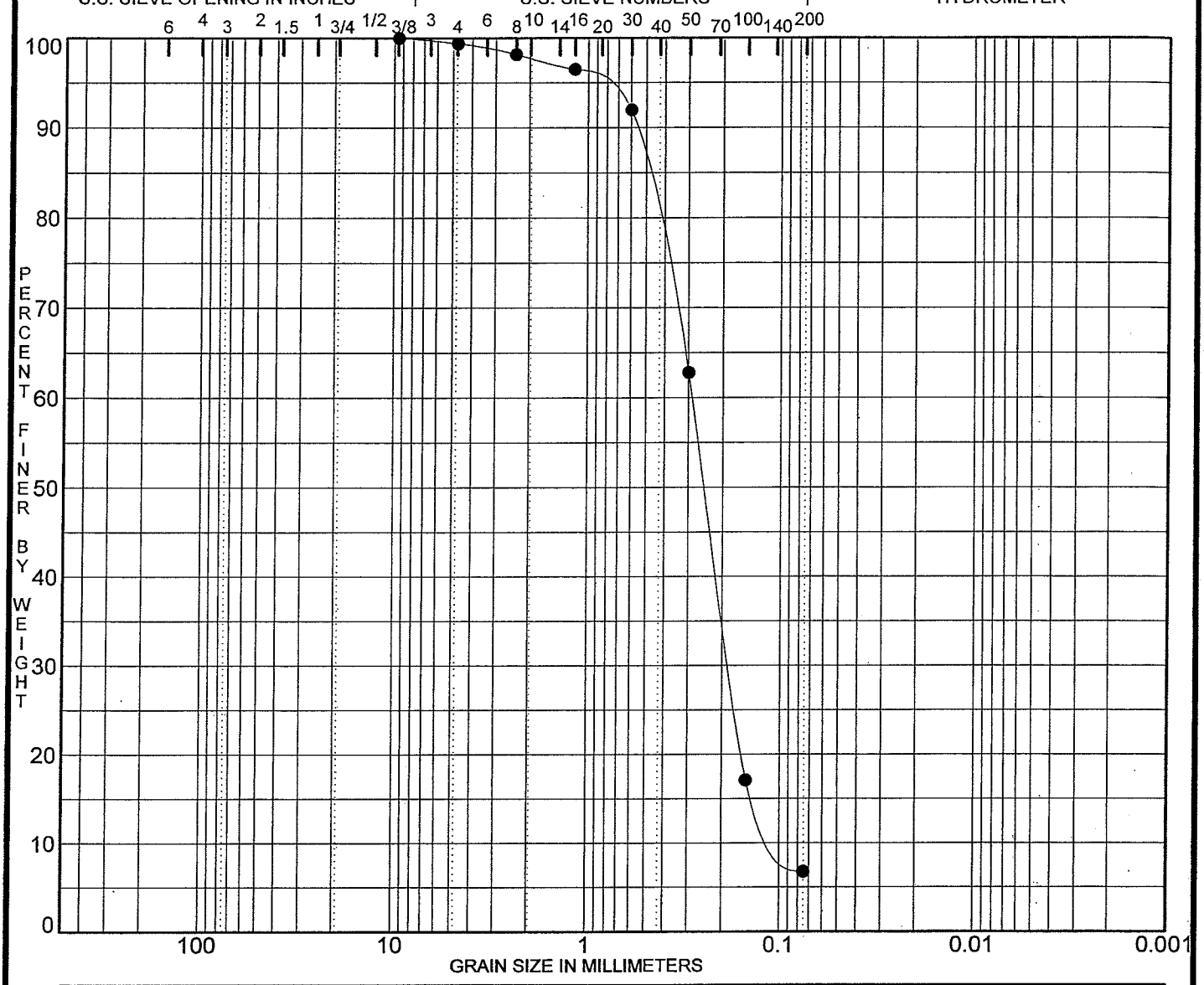

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-5	15.0		9.2				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-5	15.0	9.500	0.287	0.182	0.093	0.6	92.6	6.8	

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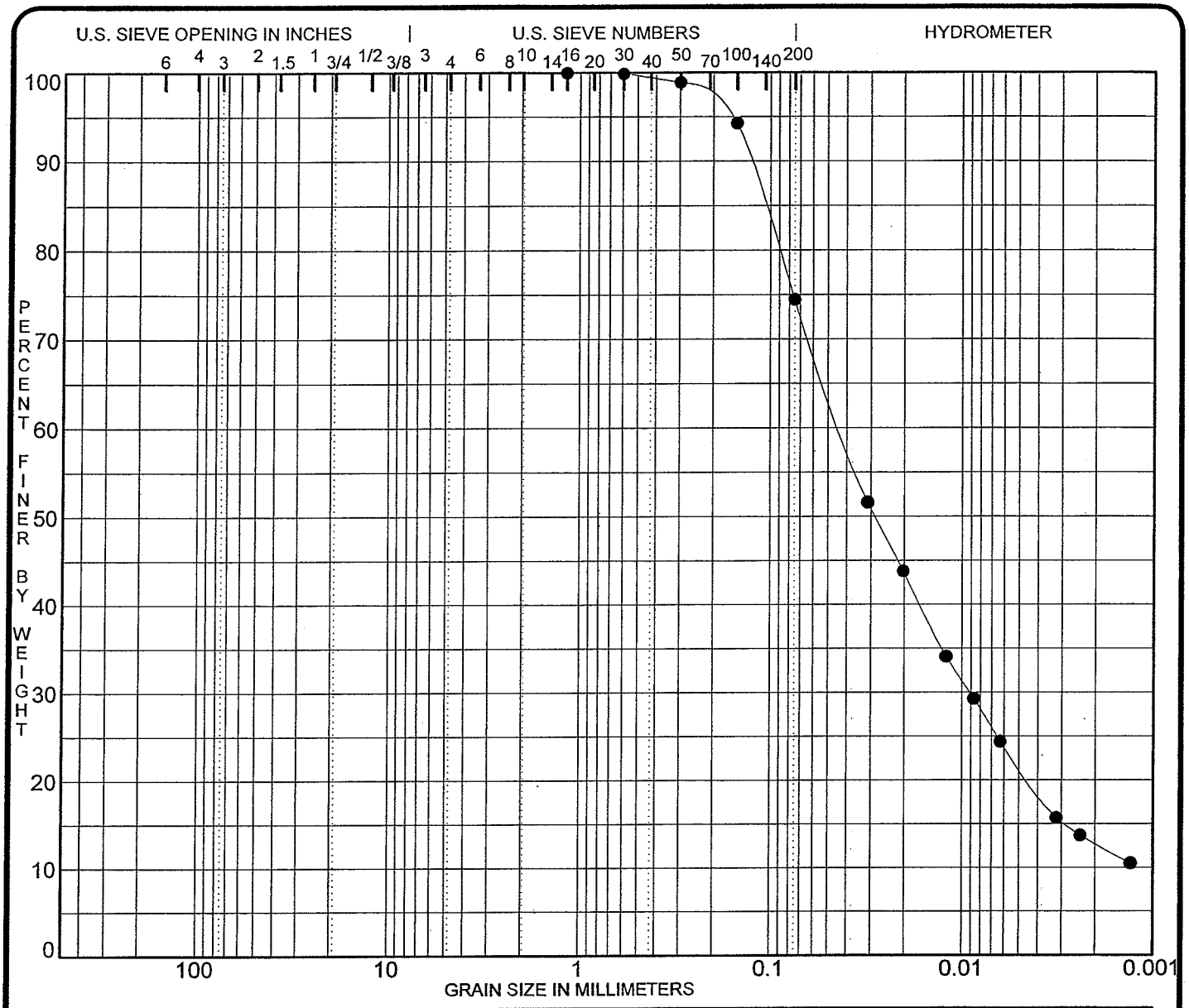

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-5	16.0		28.0	26.4	18.8	7.6	
		SILTY CLAY with SAND CL-ML					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-5	16.0	1.180	0.043	0.009		0.0	25.5	74.5	12.7

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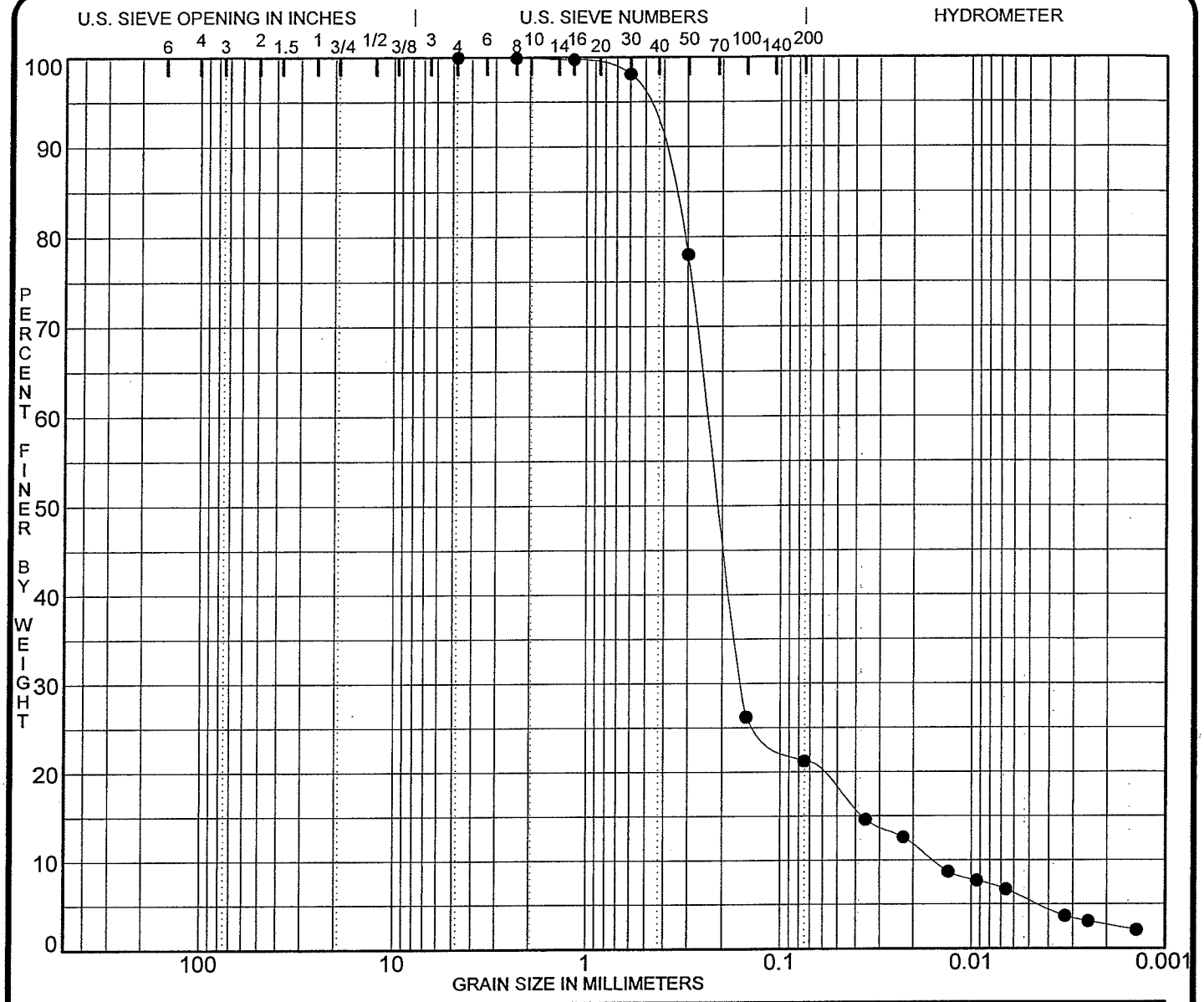

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-5	20.0		26.8	NP	NP	NP	
		SILTY SAND SM					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-5	20.0	4.750	0.236	0.158	0.016	0.0	78.8	21.2	2.7

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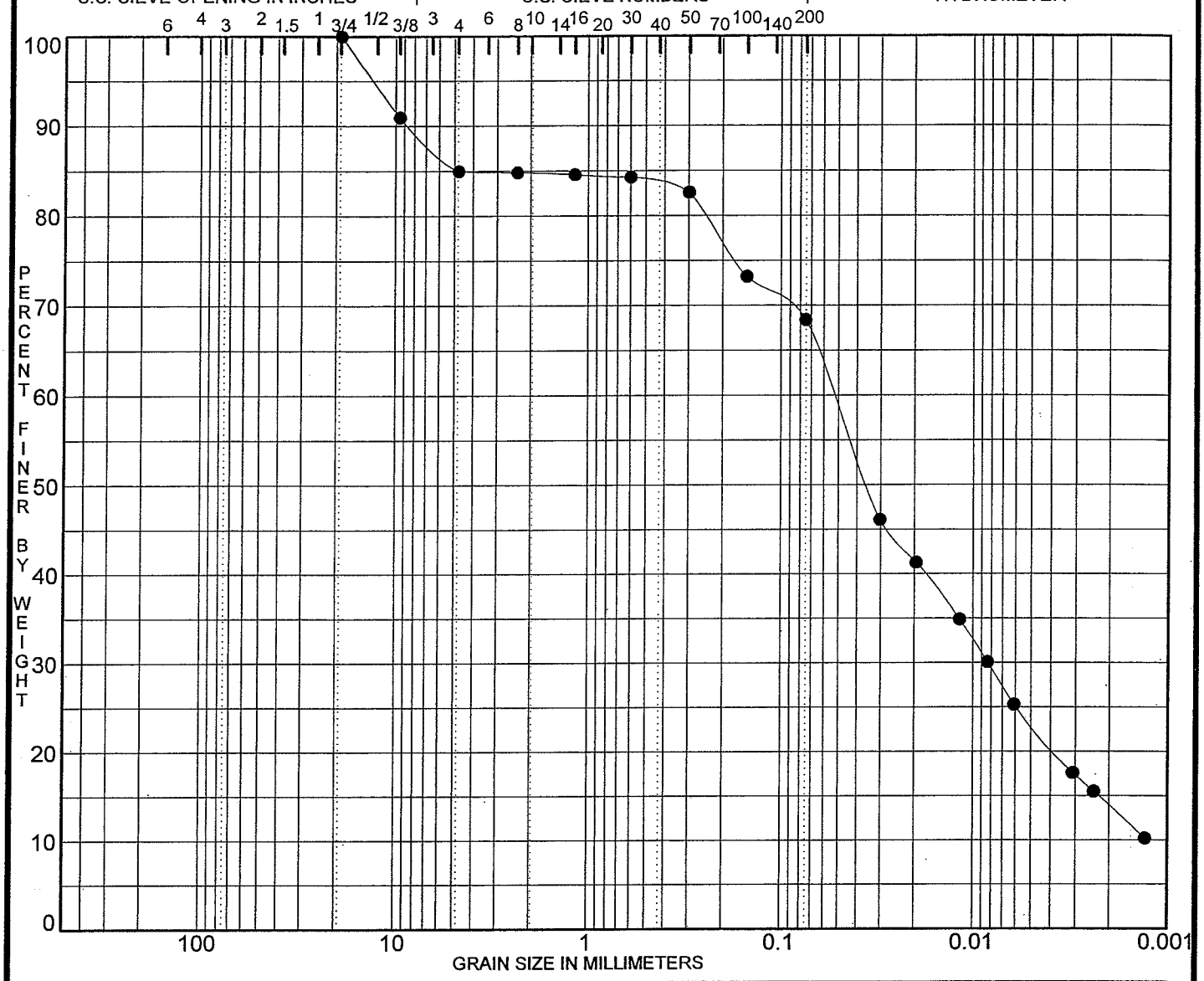

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-6	10.0		12.3	28.3	18.1	10.2	
		SANDY LEAN CLAY with GRAVEL CL					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-6	10.0	19.000	0.053	0.008		15.0	16.6	68.4	13.9

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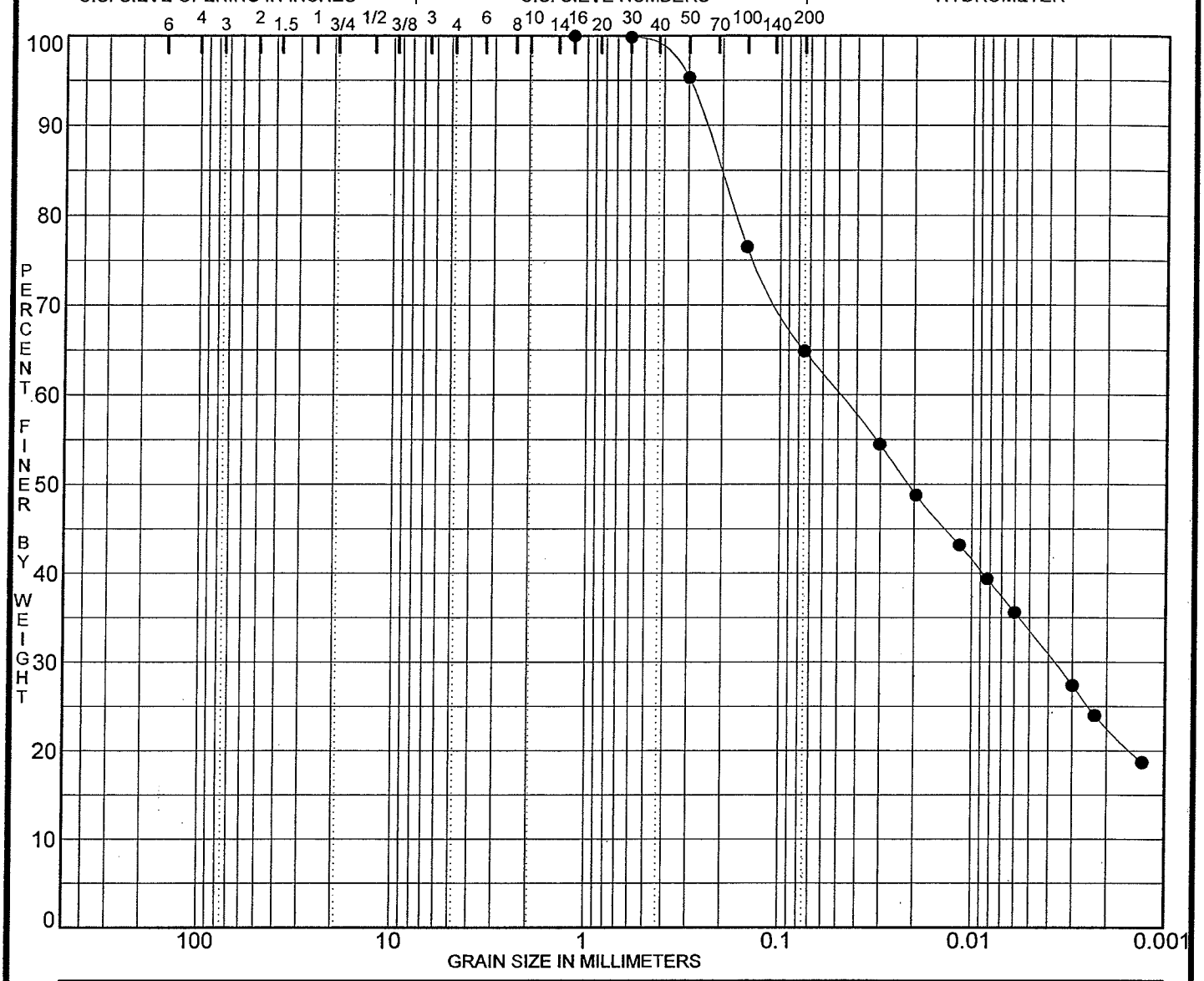

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-6	11.0		16.3	25.6	16.3	9.3	
		SANDY LEAN CLAY CL					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-6	11.0	1.180	0.049	0.004		0.0	35.1	64.9	22.7

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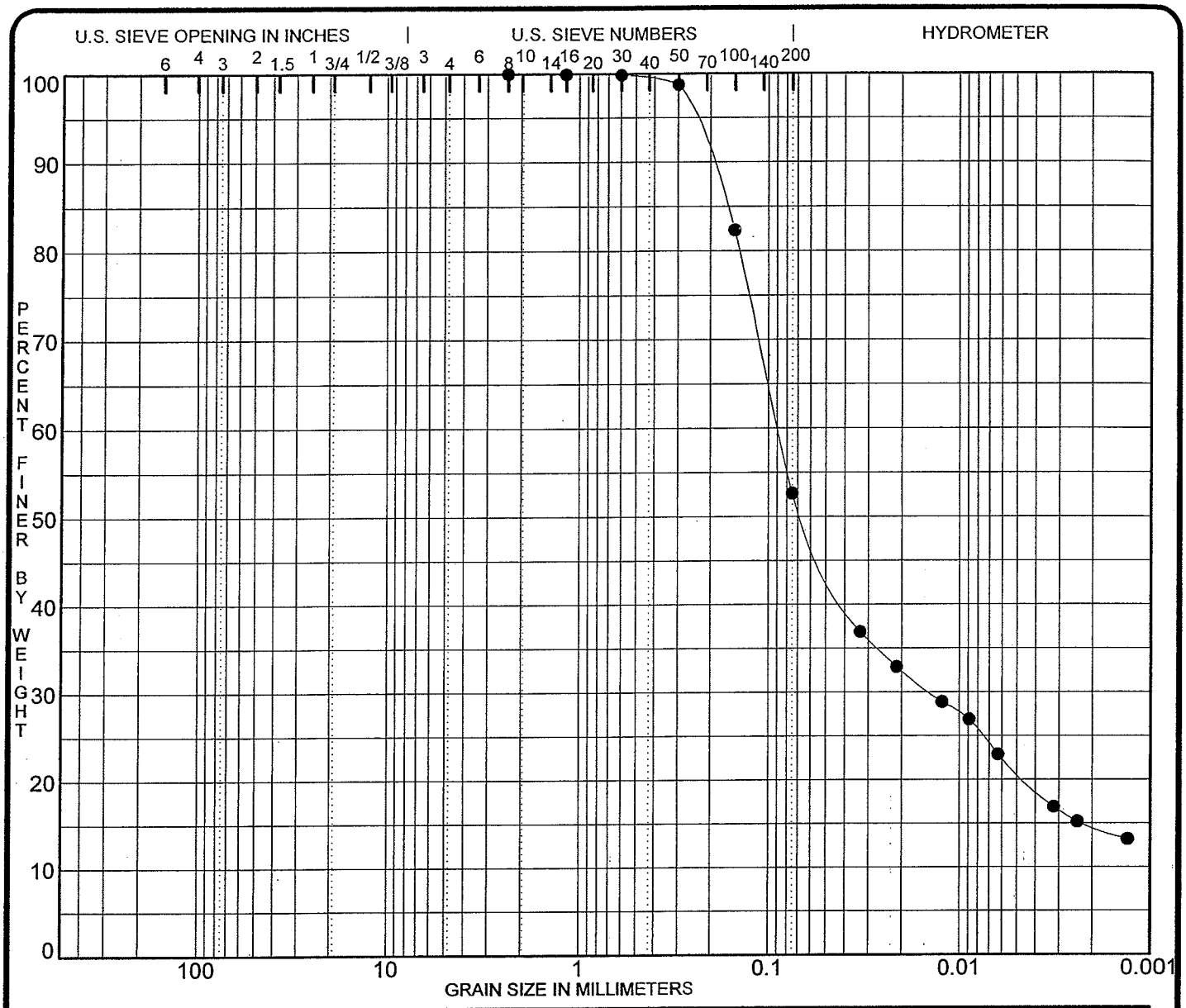

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-6	20.0		22.8	26.7	17.8	8.9	
		SANDY LEAN CLAY CL					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-6	20.0	2.360	0.089	0.014		0.0	47.4	52.6	14.6

PROJECT **AMOS BOTTOM ASH POND DIKES -**

JOB NO.

DATE **10/28/05**

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American Electric Power Service Corp.

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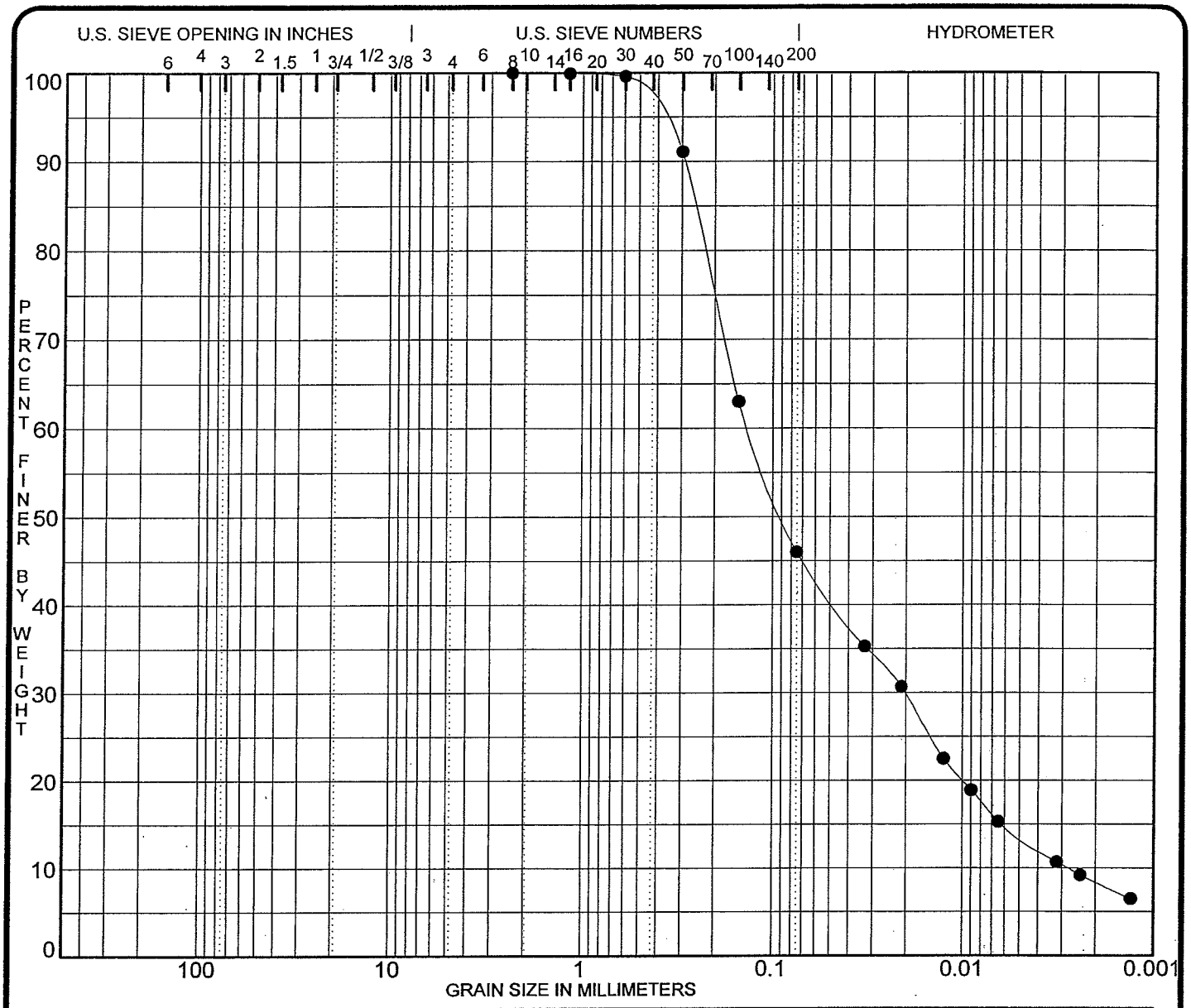


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
●	B-6	30.0		21.8				

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
●	B-6	30.0	2.360	0.133	0.020	0.003	0.0	54.0	46.0	8.4

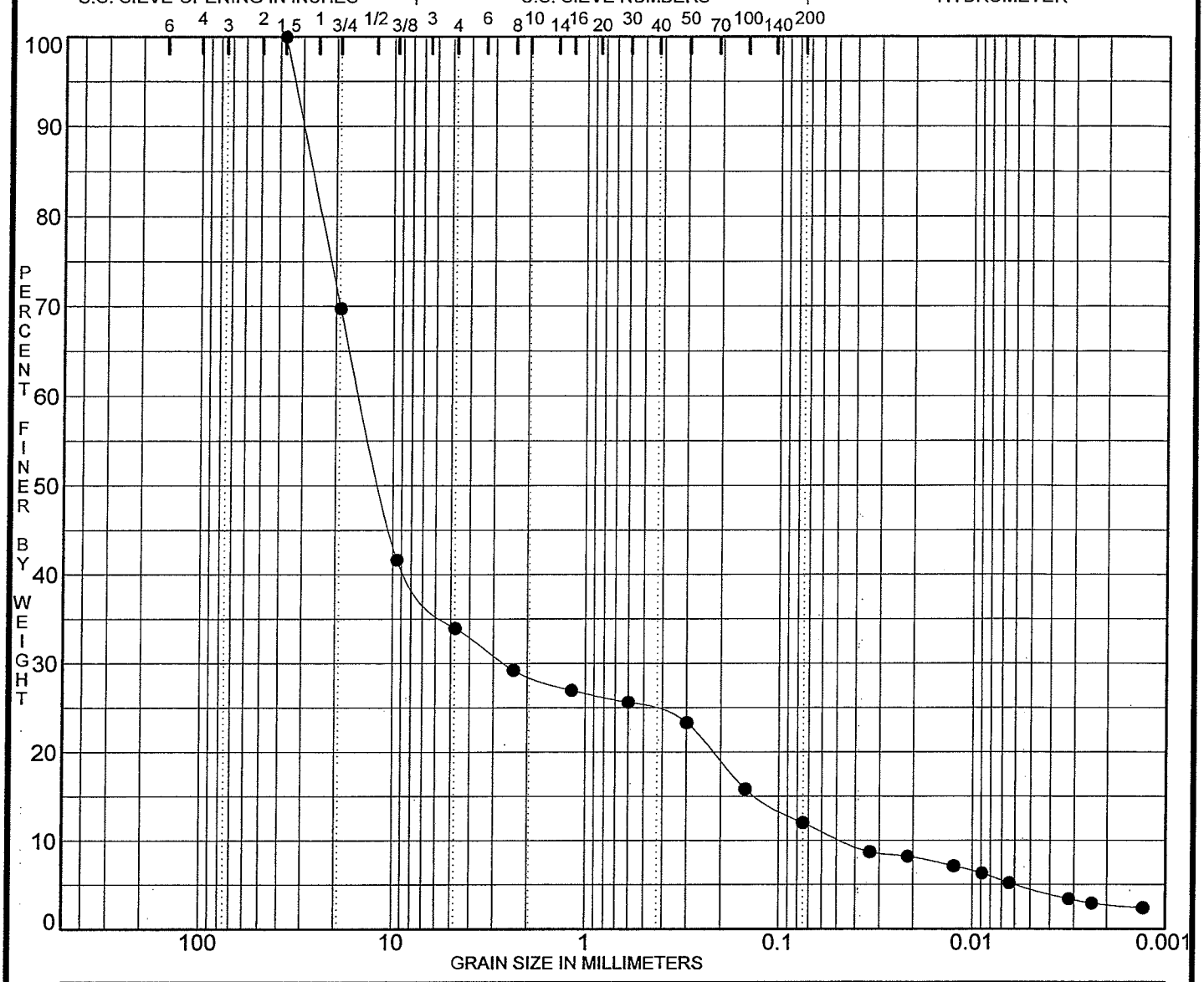
PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-7	5.0		13.3				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-7	5.0	37.500	14.930	2.638	0.046	66.0	22.0	12.0	2.8

PROJECT **AMOS BOTTOM ASH POND DIKES -**

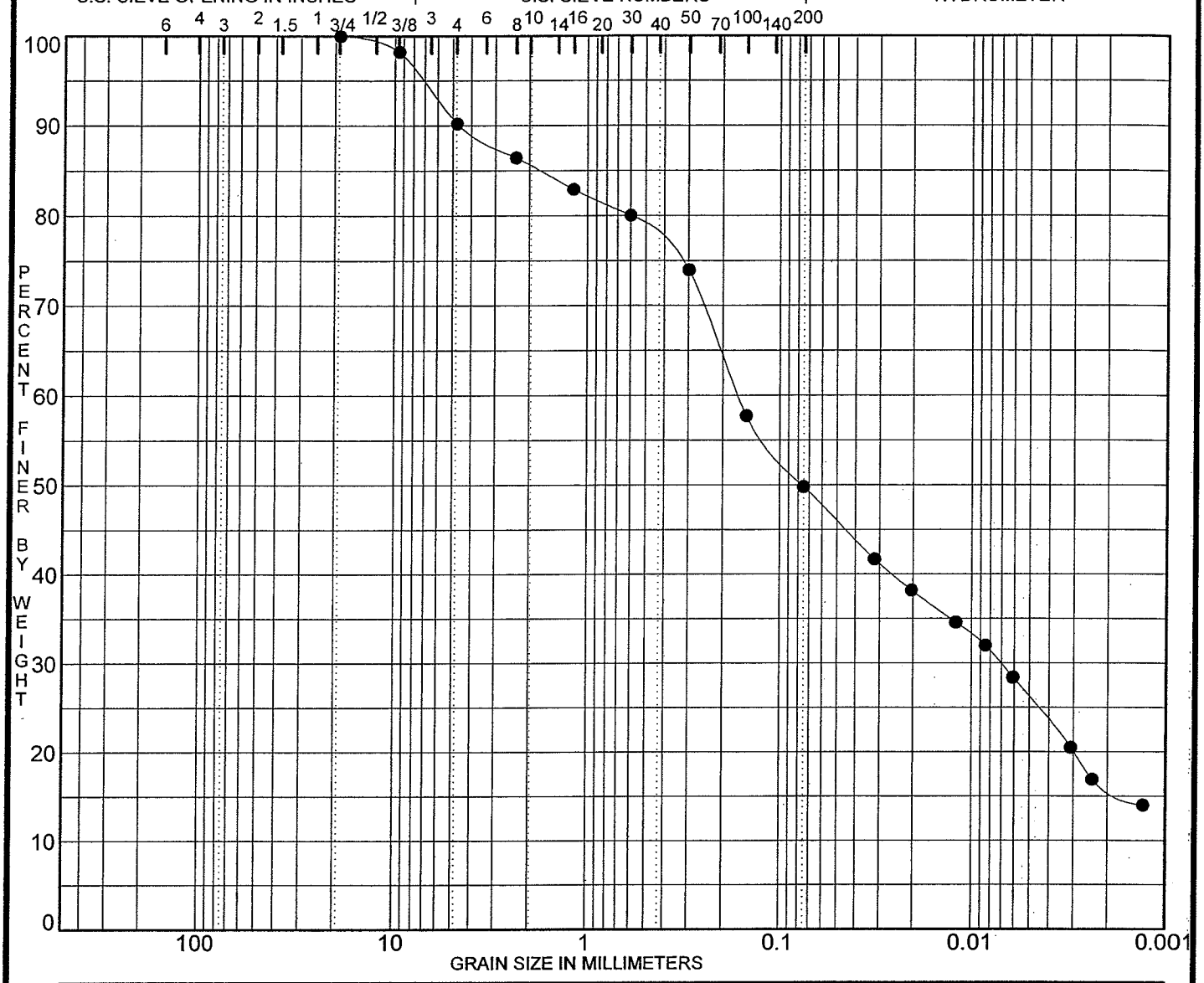
JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-7	10.0	CLAYEY SAND SC	37.9	28.6	16.7	11.9	

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-7	10.0	19.000	0.165	0.007		9.8	40.4	49.8	16.0

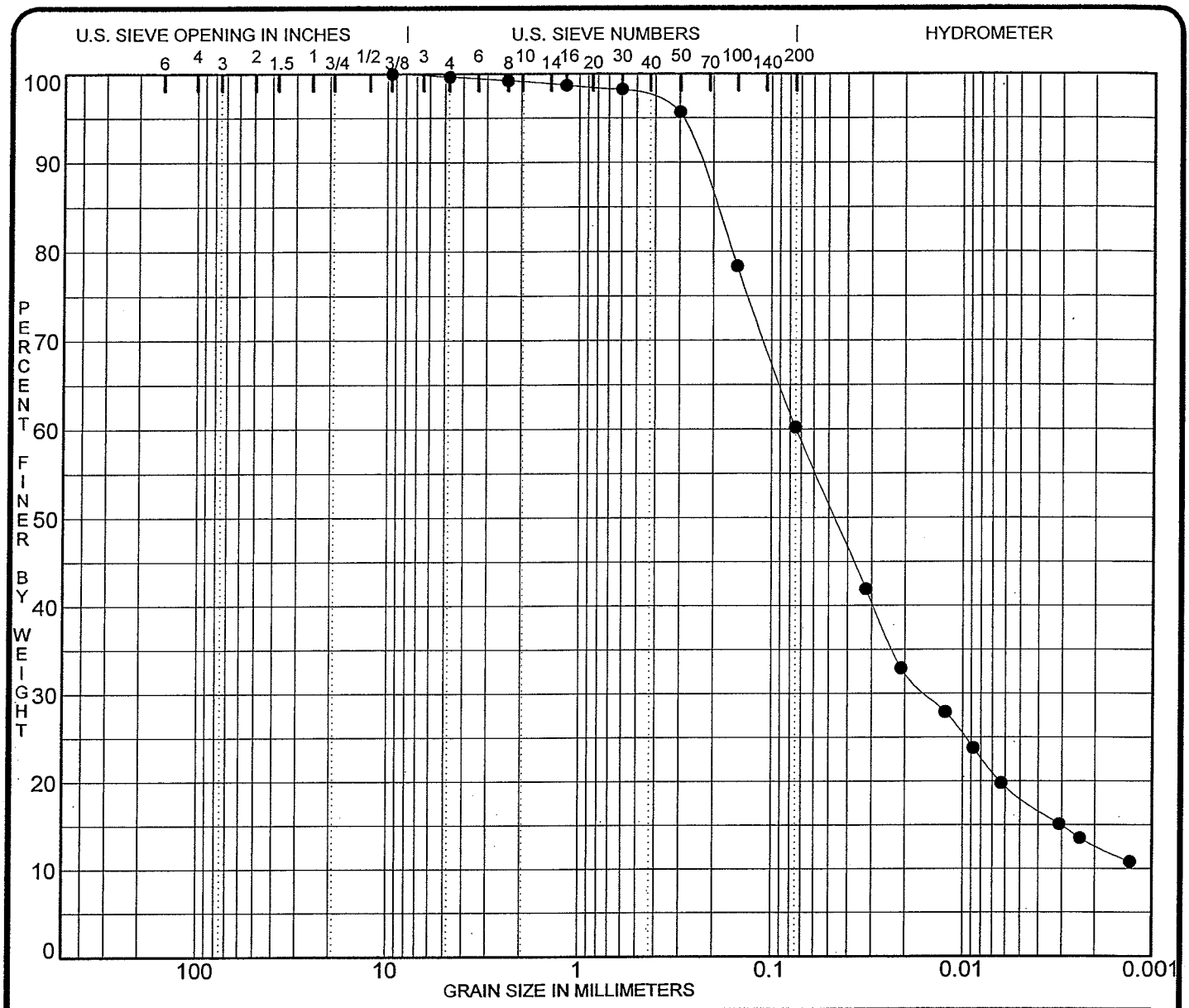
PROJECT **AMOS BOTTOM ASH POND DIKES -**

JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.
Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-7	15.0		30.4	23.7	17.6	6.1	
		SANDY SILTY CLAY CL-ML					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-7	15.0	9.500	0.074	0.015		0.3	39.5	60.2	12.7

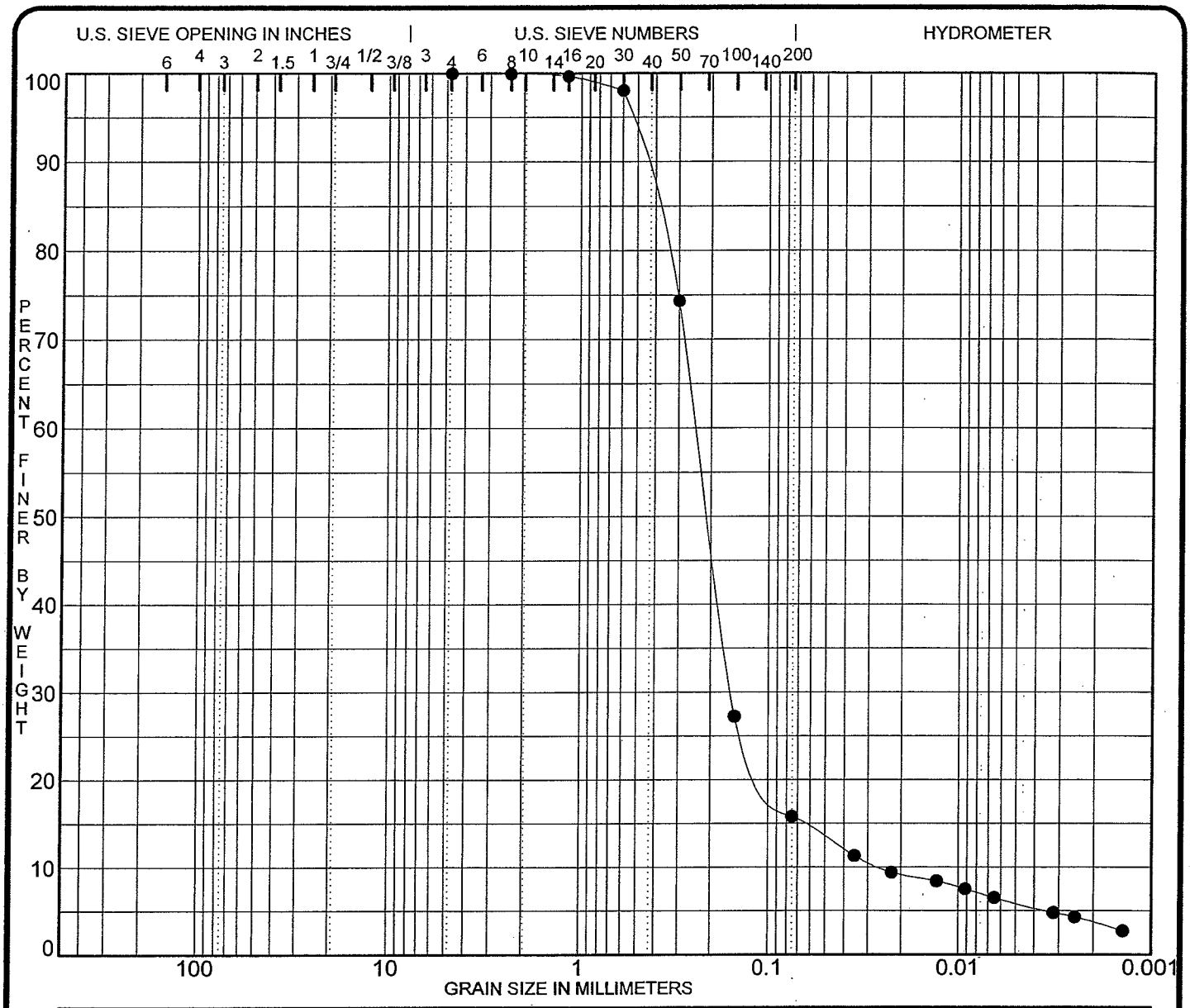
PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-7	16.0		31.3	NP	NP	NP	
		SILTY SAND SM					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-7	16.0	4.750	0.243	0.156	0.026	0.0	84.2	15.8	3.7

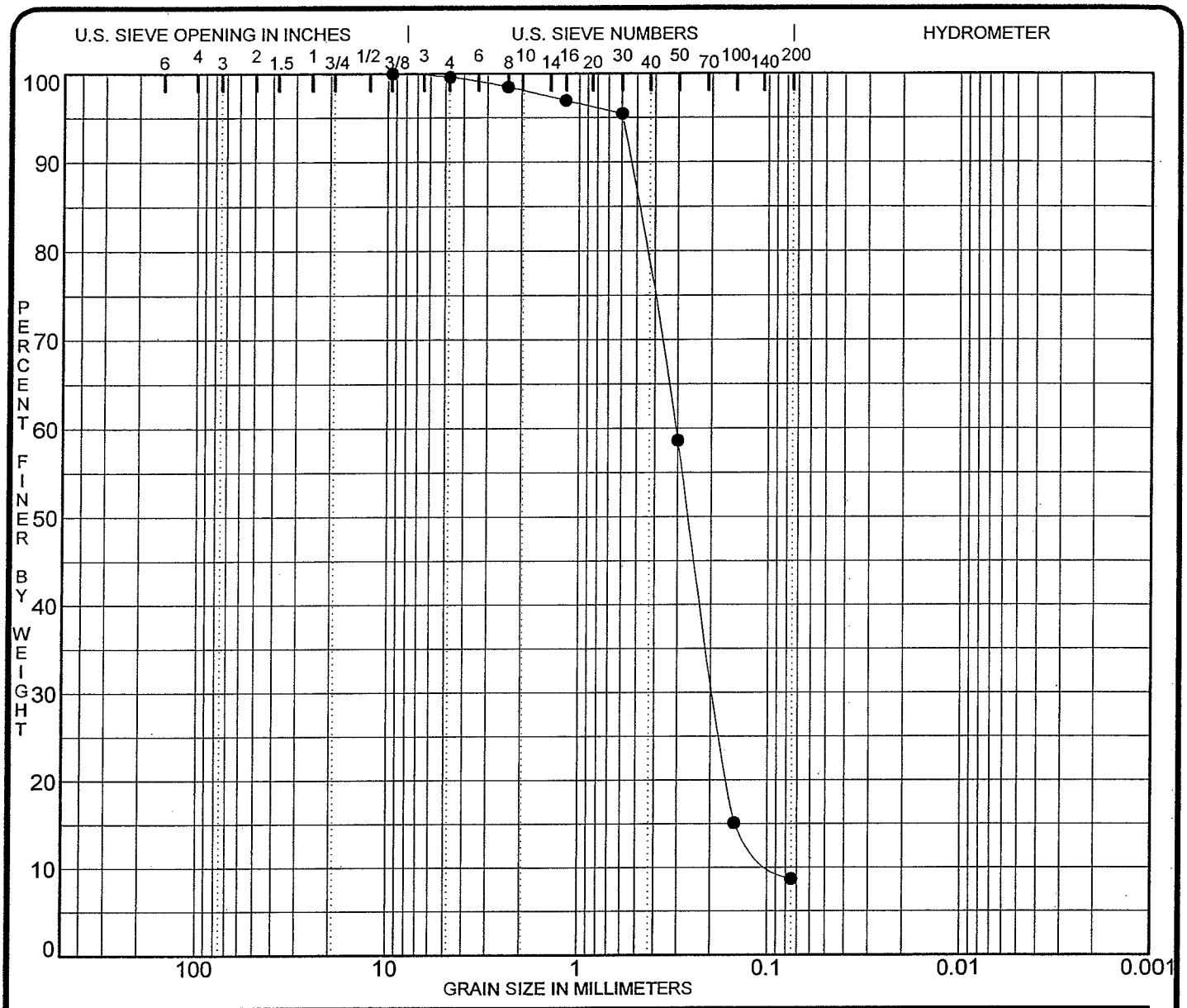
PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-7	30.0		26.6				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-7	30.0	9.500	0.308	0.190	0.086	0.4	90.9	8.7	

PROJECT **AMOS BOTTOM ASH POND DIKES -**

JOB NO.

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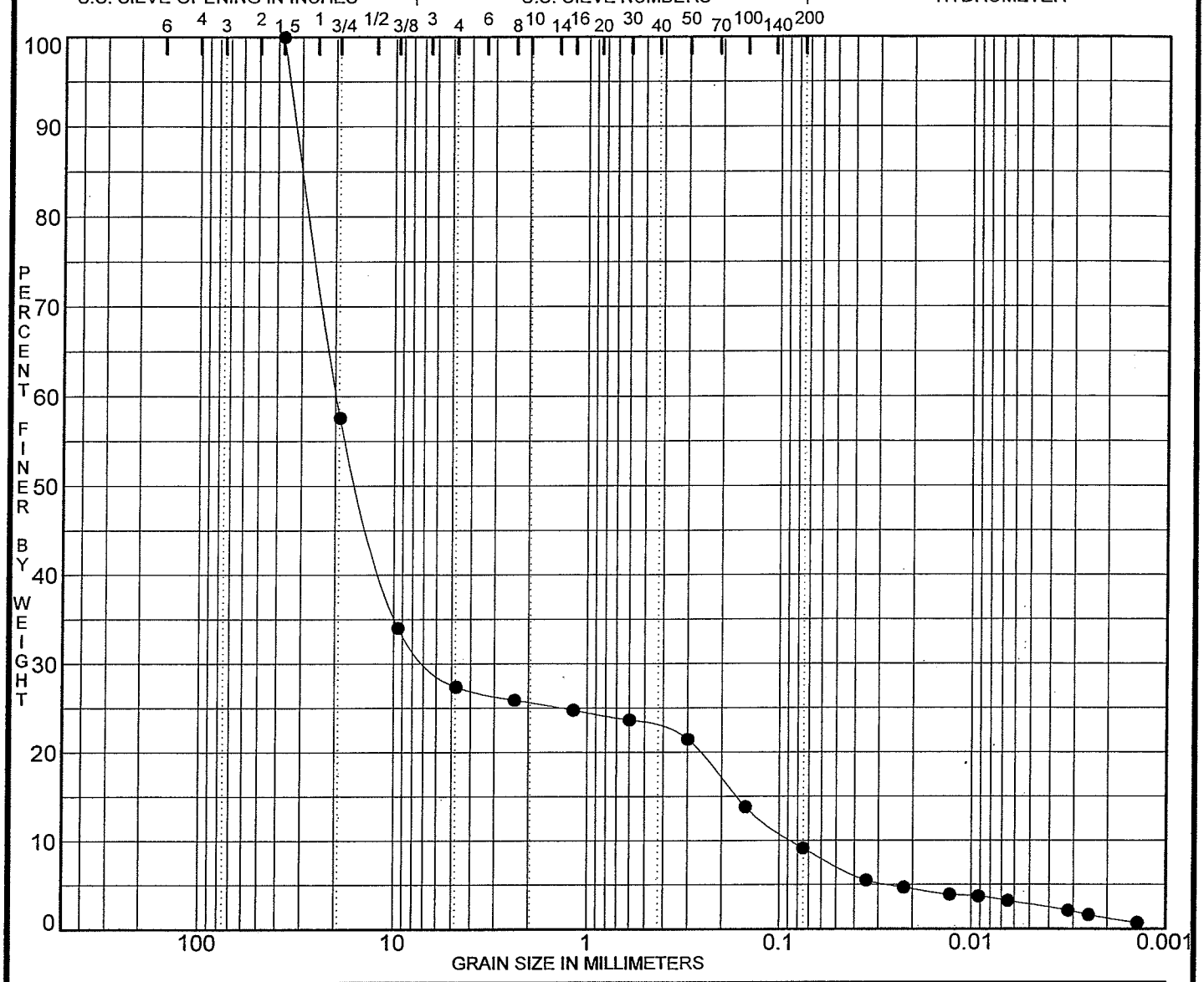

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-8	5.0		5.4				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-8	5.0	37.500	19.744	6.237	0.085	72.6	18.3	9.1	1.3

PROJECT **AMOS BOTTOM ASH POND DIKES -**

JOB NO.

DATE **10/28/05**

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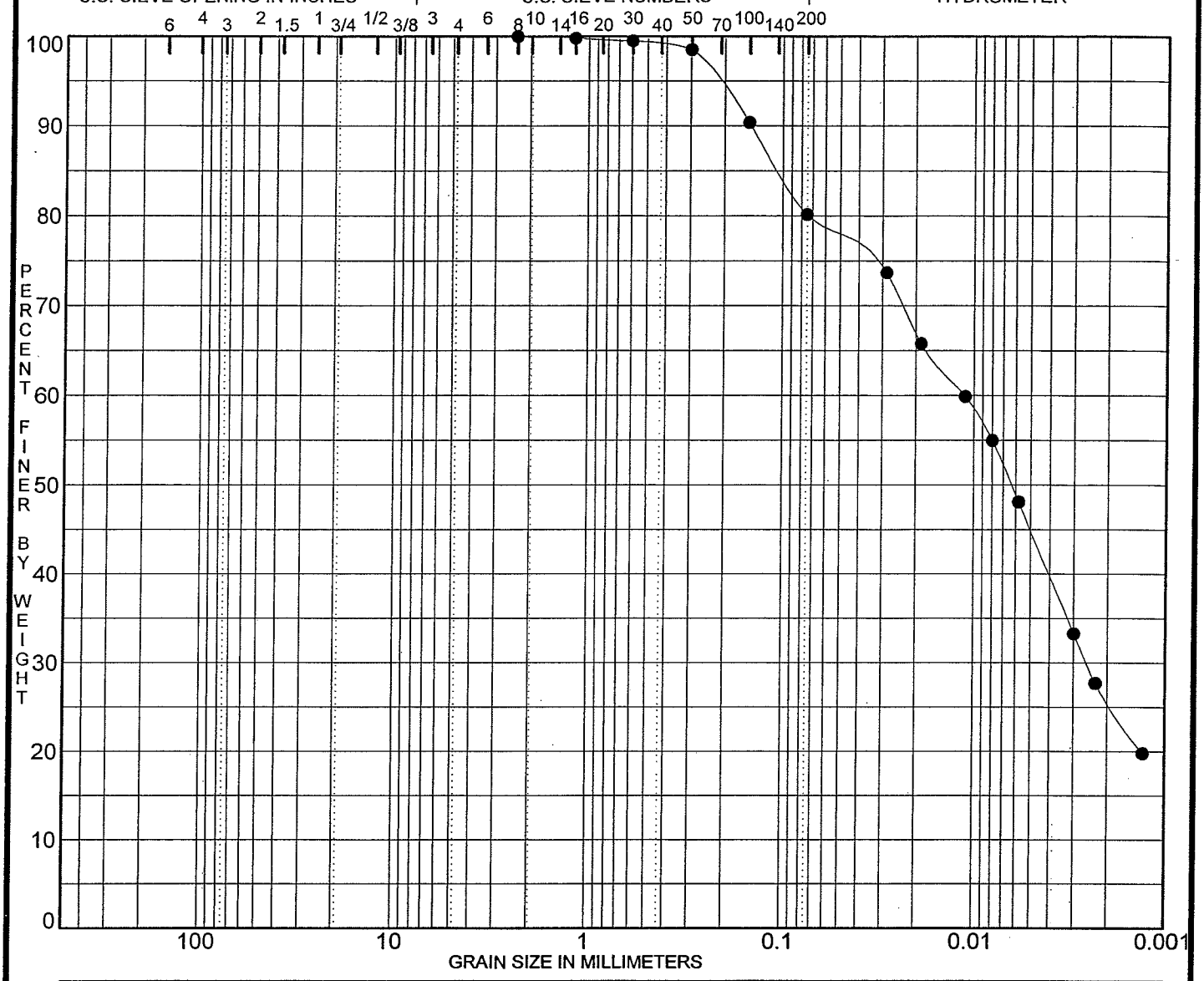
American Electric Power Service Corp.
Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
●	B-8	10.0	LEAN CLAY with SAND CL	56.1	44.2	26.3	17.9	

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
●	B-8	10.0	2.360	0.011	0.003		0.0	19.8	80.2	25.8

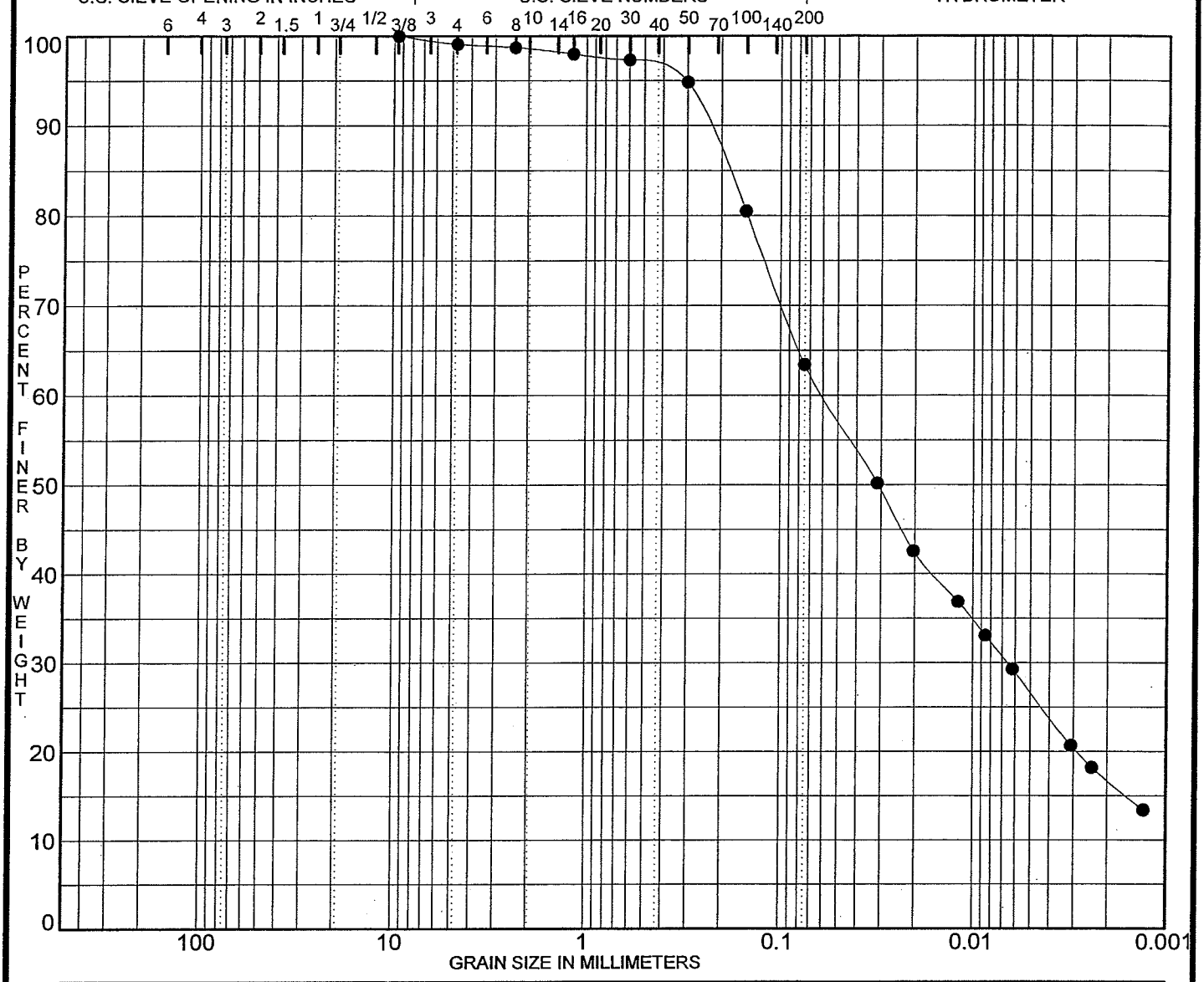
PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.

Groveport, OH 43125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-8	15.0	SANDY LEAN CLAY CL	46.8	30.3	19.8	10.5	

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-8	15.0	9.500	0.060	0.007		0.9	35.7	63.4	16.8

PROJECT **AMOS BOTTOM ASH POND DIKES -**

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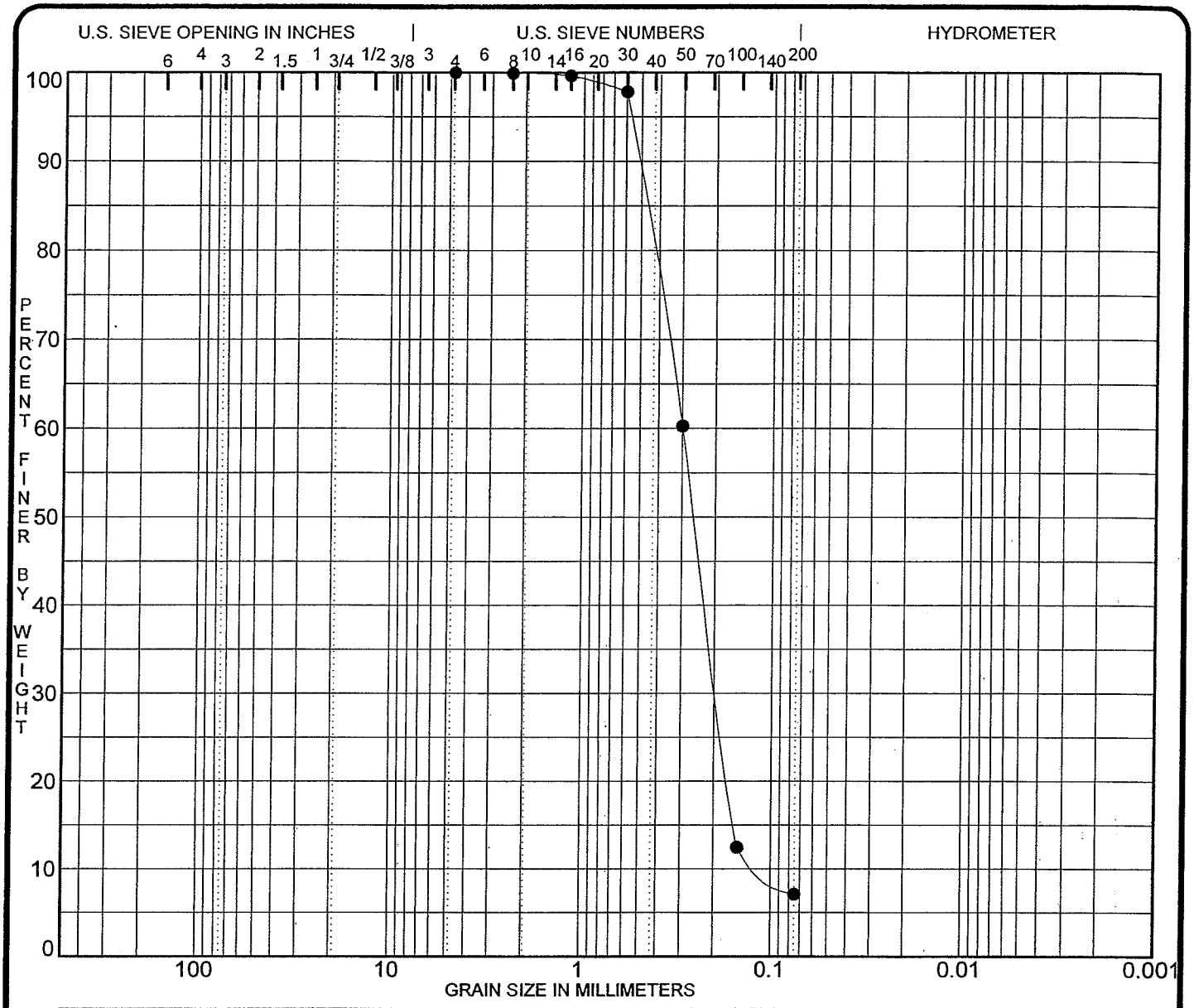

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Sp.Gr.
● B-8	25.0		27.0				

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Fines	%<.002
● B-8	25.0	4.750	0.299	0.193	0.109	0.0	92.9	7.1	

PROJECT **AMOS BOTTOM ASH POND DIKES -** JOB NO.

DATE **10/28/05**

GRADATION CURVES

American Electric Power Service Corp.

Groveport, OH 43125

APPENDIX IV
HYDROLOGIC AND HYDRAULIC ANALYSES

COMPUTATION OF INFLOW HYDROGRAPH (1/2 6-Hour PMP)
AND FLOOD ROUTING THROUGH THE
PROPOSED PIPE SPILLWAY

Pond 1A

Crest Elevation	=	588 ft
Pipe Spillway Invert Elevation	=	583.2 ft
Normal Pool Elevation used for Routing	=	583.2 ft
Peak Inflow During Design Storm	=	242.86 cfs
Peak Outflow During Design Storm	=	18.91 cfs
Maximum Pool Elevation During Design Storm	=	585.43 ft
Minimum Freeboard During Design Storm	=	2.57 ft
Peak Storage Volume	=	24.43 ac-ft
Days to Decant 90% of Peak Storage Volume	=	1.44 days

POND 1A SPILLWAY PIPE

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
31.51	50.00	26.00	0.0100	583.20	0.90	0.00

Detailed Discharge Table

Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
581.00	0.000	0.000
581.50	0.000	0.000
582.00	0.000	0.000
582.50	0.000	0.000
583.00	0.000	0.000
583.20	0.000	0.000
583.50	(3)>0.929	0.929
584.00	(3)>3.997	3.997
584.50	(3)>8.280	8.280
585.00	(3)>13.485	13.485
585.50	(3)>19.484	19.484
586.00	(3)>26.165	26.165
586.50	(5)>32.642	32.642
587.00	(5)>38.091	38.091

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *            SEPTEMBER 1990             *
 *             VERSION 4.0               *
 *                                       *
 *  RUN DATE  12/10/2015  TIME  11:22:48 *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
          LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 *** FREE ***
              1          ID  ********************************************************************************
              2          ID  *                                                                              *
              3          ID  *      AEP Amos Plant Hydraulic Assessment   File: 6HRPMPA1.inp               *
              4          ID  *      Flood Routing for Ash Pond 1A and Reclaim Pond                          *
              5          ID  *      1/2 6 Hour PMP  36" Pipe Invert Elev. 583.2'                            *
              6          ID  *      GA Project No. 05-361                                                   *
              7          ID  *                                                                              *
              8          ID  *      Analyses by: Geo/Environmental Associates                               *
              9          ID  *                   Knoxville, TN                                              *
             10          ID  *                   December 12, 2015                                          *
             11          ID  *                                                                              *
             12          ID  ********************************************************************************
             13          IT      15       0       0     300
             14          IO       3
             15          JR    FLOW     0.5
             16          VS   BASIN     IMP     IMP     IMP
             17          VV    2.11    2.11    6.11    7.11
             18          IN      15

             19          KK   BASIN
             20          KM   PRECIPITATION
             21          PB       0
             22          PI   0.287   0.373   0.445   0.502   0.545   0.573   0.653   0.834   0.825   0.980
             23          PI   2.322   4.564   4.922   3.344   1.264   0.834   0.864   0.763   0.581   0.560
             24          PI   0.525   0.475   0.411   0.332
             25          BA   0.040
             26          LU       0    0.05      60
             27          UD     0.0

             28          KK     IMP
             29          KM   ROUTE COMPUTED HYDROGRAPH THROUGH IMPOUNDMENT
             30          RS       1    ELEV   583.2
             31          SA    6.01    6.25   17.65   19.97   22.28
             32          SQ       0    4.00   13.48   26.16   38.09
             33          SE   583.2     584     585     586     587
             34          ZZ
```

```
1****************************************                                  ****************************************
 *                                      *                                  *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                  *    U.S. ARMY CORPS OF ENGINEERS      *
 *            SEPTEMBER 1990            *                                  *    HYDROLOGIC ENGINEERING CENTER     *
 *             VERSION 4.0              *                                  *          609 SECOND STREET           *
 *                                      *                                  *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE  12/10/2015  TIME  11:22:48 *                                  *           (916) 756-1104             *
 *                                      *                                  *                                      *
 ****************************************                                  ****************************************

                        ********************************************************************************
                        *                                                                              *
                        *      AEP Amos Plant Hydraulic Assessment   File: 6HRPMPA1.inp                *
                        *      Flood Routing for Ash Pond 1A and Reclaim Pond                          *
                        *      1/2 6 Hour PMP  36" Pipe Invert Elev. 583.2'                            *
                        *      GA Project No. 05-361                                                   *
                        *                                                                              *
                        *      Analyses by: Geo/Environmental Associates                               *
                        *                   Knoxville, TN                                              *
                        *                   December 12, 2015                                          *
                        *                                                                              *
                        ********************************************************************************

  14 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN          15  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      4    0  ENDING DATE
                     NDTIME        0245  ENDING TIME
                     ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .25 HOURS
                        TOTAL TIME BASE   74.75 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

                 USER-DEFINED OUTPUT SPECIFICATIONS

         TABLE 1
     VS       STATION     BASIN       IMP       IMP       IMP
     VV VARIABLE CODE      2.11      2.11      6.11      7.11       .00       .00       .00       .00       .00       .00

     JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF RUNOFF
                     .50



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


               **************
               *            *
  19 KK        *     BASIN  *
               *            *
               **************
                          PRECIPITATION

  18 IN          TIME DATA FOR INPUT TIME SERIES
                       JXMIN          15  TIME INTERVAL IN MINUTES
                      JXDATE      1    0  STARTING DATE
```

```
                    JXTIME           0  STARTING TIME

               SUBBASIN RUNOFF DATA

   25 BA         SUBBASIN CHARACTERISTICS
                       TAREA         .04  SUBBASIN AREA

                 PRECIPITATION DATA

   21 PB               STORM       27.78  BASIN TOTAL PRECIPITATION

   22 PI           INCREMENTAL PRECIPITATION PATTERN
                       .29       .37       .45       .50       .54       .57       .65       .83       .82       .98
                      2.32      4.56      4.92      3.34      1.26       .83       .86       .76       .58       .56
                       .52       .48       .41       .33

   26 LU         UNIFORM LOSS RATE
                       STRTL         .00  INITIAL LOSS
                       CNSTL         .05  UNIFORM LOSS RATE
                       RTIMP       60.00  PERCENT IMPERVIOUS AREA

   27 UD         SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .00  LAG

                                                        ***

                                                   UNIT HYDROGRAPH
                                                 5 END-OF-PERIOD ORDINATES
               77.       21.        4.        1.        0.

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    BASIN
                          FOR PLAN 1, RATIO =  .50

    TOTAL RAINFALL =   27.78, TOTAL LOSS =     .12, TOTAL EXCESS =   27.66

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     74.75-HR
+   (CFS)       (HR)
                         (CFS)
+     486.      3.25                 118.         30.         10.          10.
                         (INCHES)    27.490      27.658      27.658       27.658
                         (AC-FT)       59.         59.         59.          59.

                        CUMULATIVE AREA =     .04 SQ MI


      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    BASIN
                          FOR PLAN 1, RATIO =  .50

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     74.75-HR
+   (CFS)       (HR)
                         (CFS)
+     243.      3.25                  59.         15.          5.           5.
                         (INCHES)    13.745      13.829      13.829       13.829
                         (AC-FT)       29.         30.         30.          30.

                        CUMULATIVE AREA =     .04 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
   28 KK   *       IMP  *
           *            *
           **************
                        ROUTE COMPUTED HYDROGRAPH THROUGH IMPOUNDMENT

              HYDROGRAPH ROUTING DATA

   30 RS         STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
```

RSVRIC 583.20 INITIAL CONDITION
X .00 WORKING R AND D COEFFICIENT

31	SA	AREA	6.0	6.3	17.6	20.0	22.3
32	SQ	DISCHARGE	0.	4.	13.	26.	38.
33	SE	ELEVATION	583.20	584.00	585.00	586.00	587.00

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	4.90	16.37	35.17	56.28
ELEVATION	583.20	584.00	585.00	586.00	587.00

*** *** *** *** ***

HYDROGRAPH AT STATION IMP
FOR PLAN 1, RATIO = .50

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	74.75-HR
+ (CFS)	(HR)					
		(CFS)				
+ 19.	6.00		18.	12.	5.	5.
		(INCHES)	4.099	10.751	13.695	13.716
		(AC-FT)	9.	23.	29.	29.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	74.75-HR
+ (AC-FT)	(HR)				
24.	6.00	23.	14.	6.	6.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	74.75-HR
+ (FEET)	(HR)				
585.43	6.00	585.33	584.77	583.93	583.91

CUMULATIVE AREA = .04 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO FLOWS RATIO 1 .50
HYDROGRAPH AT					
+	BASIN	.04	1	FLOW	243.
				TIME	3.25
ROUTED TO					
+	IMP	.04	1	FLOW	19.
				TIME	6.00
			** PEAK STAGES IN FEET **		
			1	STAGE	585.43
				TIME	6.00

1TABLE 1 STATION

			BASIN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE	
		PLAN	1	1	1	1	
		RATIO	.50	.50	.50	.50	
PER	DAY	MON HRMN					
1	1	0000	.00	.00	.00	583.20	
2	1	0015	10.82	.09	.11	583.22	
3	1	0030	17.14	.32	.40	583.26	
4	1	0045	21.42	.64	.78	583.33	
5	1	0100	24.68	1.01	1.24	583.40	
6	1	0115	27.13	1.43	1.75	583.49	
7	1	0130	28.82	1.87	2.30	583.57	
8	1	0145	32.30	2.35	2.88	583.67	
9	1	0200	40.18	2.92	3.58	583.78	
10	1	0215	41.96	3.56	4.36	583.91	
11	1	0230	48.23	4.25	5.21	584.03	
12	1	0245	101.42	5.45	6.66	584.15	
13	1	0300	202.15	7.93	9.66	584.41	
14	1	0315	242.86	11.56	14.05	584.80	
15	1	0330	191.47	14.76	18.27	585.10	
16	1	0345	96.45	16.55	20.92	585.24	
17	1	0400	54.44	17.36	22.13	585.31	
18	1	0415	45.92	17.82	22.80	585.34	
19	1	0430	40.58	18.17	23.32	585.37	
20	1	0445	32.40	18.42	23.70	585.39	
21	1	0500	29.43	18.59	23.95	585.40	
22	1	0515	27.44	18.73	24.15	585.41	
23	1	0530	25.03	18.83	24.31	585.42	
24	1	0545	21.95	18.90	24.40	585.43	
25	1	0600	18.11	18.91	**24.43**	**585.43**	← **Maximum Stage/Storage 6.0 Hours after onset of event**
26	1	0615	4.57	18.81	24.27	585.42	
27	1	0630	.86	18.59	23.94	585.40	
28	1	0645	.14	18.34	23.57	585.38	
29	1	0700	.00	18.08	23.20	585.36	
30	1	0715	.00	17.83	22.82	585.34	
31	1	0730	.00	17.59	22.46	585.32	
32	1	0745	.00	17.34	22.10	585.30	
33	1	0800	.00	17.10	21.74	585.29	
34	1	0815	.00	16.87	21.39	585.27	
35	1	0830	.00	16.63	21.05	585.25	
36	1	0845	.00	16.40	20.70	585.23	
37	1	0900	.00	16.18	20.37	585.21	
38	1	0915	.00	15.95	20.04	585.19	
39	1	0930	.00	15.73	19.71	585.18	
40	1	0945	.00	15.51	19.39	585.16	
41	1	1000	.00	15.30	19.07	585.14	
42	1	1015	.00	15.09	18.75	585.13	
43	1	1030	.00	14.88	18.44	585.11	
44	1	1045	.00	14.67	18.14	585.09	
45	1	1100	.00	14.47	17.84	585.08	
46	1	1115	.00	14.27	17.54	585.06	
47	1	1130	.00	14.07	17.25	585.05	
48	1	1145	.00	13.88	16.96	585.03	
49	1	1200	.00	13.68	16.67	585.02	
50	1	1215	.00	13.50	16.39	585.00	

1TABLE 1 (CONT.)

STATION		BASIN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
	PLAN	1	1	1	1
	RATIO	.50	.50	.50	.50
PER	DAY MON HRMN				
51	1 1230	.00	13.27	16.12	584.98
52	1 1245	.00	13.05	15.85	584.95
53	1 1300	.00	12.82	15.58	584.93
54	1 1315	.00	12.61	15.32	584.91
55	1 1330	.00	12.39	15.06	584.89
56	1 1345	.00	12.18	14.80	584.86
57	1 1400	.00	11.98	14.55	584.84
58	1 1415	.00	11.77	14.31	584.82
59	1 1430	.00	11.58	14.07	584.80
60	1 1445	.00	11.38	13.83	584.78
61	1 1500	.00	11.19	13.60	584.76
62	1 1515	.00	11.00	13.37	584.74
63	1 1530	.00	10.81	13.14	584.72
64	1 1545	.00	10.63	12.92	584.70
65	1 1600	.00	10.45	12.70	584.68
66	1 1615	.00	10.27	12.49	584.66
67	1 1630	.00	10.10	12.28	584.64
68	1 1645	.00	9.93	12.07	584.63
69	1 1700	.00	9.76	11.87	584.61
70	1 1715	.00	9.59	11.67	584.59
71	1 1730	.00	9.43	11.47	584.57
72	1 1745	.00	9.27	11.28	584.56
73	1 1800	.00	9.11	11.09	584.54
74	1 1815	.00	8.96	10.90	584.52
75	1 1830	.00	8.81	10.72	584.51
76	1 1845	.00	8.66	10.54	584.49
77	1 1900	.00	8.51	10.36	584.48
78	1 1915	.00	8.37	10.19	584.46
79	1 1930	.00	8.23	10.02	584.45
80	1 1945	.00	8.09	9.85	584.43
81	1 2000	.00	7.95	9.68	584.42
82	1 2015	.00	7.81	9.52	584.40
83	1 2030	.00	7.68	9.36	584.39
84	1 2045	.00	7.55	9.20	584.37
85	1 2100	.00	7.42	9.05	584.36
86	1 2115	.00	7.30	8.89	584.35
87	1 2130	.00	7.17	8.74	584.33
88	1 2145	.00	7.05	8.60	584.32
89	1 2200	.00	6.93	8.45	584.31
90	1 2215	.00	6.82	8.31	584.30
91	1 2230	.00	6.70	8.17	584.28
92	1 2245	.00	6.59	8.03	584.27
93	1 2300	.00	6.48	7.90	584.26
94	1 2315	.00	6.37	7.77	584.25
95	1 2330	.00	6.26	7.64	584.24
96	1 2345	.00	6.15	7.51	584.23
97	2 0000	.00	6.05	7.38	584.22
98	2 0015	.00	5.95	7.26	584.21
99	2 0030	.00	5.85	7.14	584.19
100	2 0045	.00	5.75	7.02	584.18

1TABLE 1 (CONT.) STATION

				BASIN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
			PLAN	1	1	1	1
			RATIO	.50	.50	.50	.50
PER	DAY	MON	HRMN				
101	2		0100	.00	5.65	6.90	584.17
102	2		0115	.00	5.55	6.78	584.16
103	2		0130	.00	5.46	6.67	584.15
104	2		0145	.00	5.37	6.56	584.14
105	2		0200	.00	5.28	6.45	584.13
106	2		0215	.00	5.19	6.34	584.13
107	2		0230	.00	5.10	6.23	584.12
108	2		0245	.00	5.01	6.13	584.11
109	2		0300	.00	4.93	6.03	584.10
110	2		0315	.00	4.84	5.92	584.09
111	2		0330	.00	4.76	5.83	584.08
112	2		0345	.00	4.68	5.73	584.07
113	2		0400	.00	4.60	5.63	584.06
114	2		0415	.00	4.52	5.54	584.06
115	2		0430	.00	4.45	5.44	584.05
116	2		0445	.00	4.37	5.35	584.04
117	2		0500	.00	4.30	5.26	584.03
118	2		0515	.00	4.23	5.18	584.02
119	2		0530	.00	4.15	5.09	584.02
120	2		0545	.00	4.08	5.00	584.01
121	2		0600	.00	4.01	4.92	584.00
122	2		0615	.00	3.95	4.84	583.99
123	2		0630	.00	3.88	4.76	583.98
124	2		0645	.00	3.82	4.68	583.96
125	2		0700	.00	3.75	4.60	583.95
126	2		0715	.00	3.69	4.52	583.94
127	2		0730	.00	3.63	4.45	583.93
128	2		0745	.00	3.57	4.37	583.91
129	2		0800	.00	3.51	4.30	583.90
130	2		0815	.00	3.45	4.23	583.89
131	2		0830	.00	3.39	4.16	583.88
132	2		0845	.00	3.33	4.09	583.87
133	2		0900	.00	3.28	4.02	583.86
134	2		0915	.00	3.22	3.95	583.84
135	2		0930	.00	3.17	3.89	583.83
136	2		0945	.00	3.12	3.82	583.82
137	2		1000	.00	3.07	3.76	583.81
138	2		1015	.00	3.01	3.69	583.80
139	2		1030	.00	2.96	3.63	583.79
140	2		1045	.00	2.91	3.57	583.78
141	2		1100	.00	2.87	3.51	583.77
142	2		1115	.00	2.82	3.45	583.76
143	2		1130	.00	2.77	3.40	583.75
144	2		1145	.00	2.72	3.34	583.74
145	2		1200	.00	2.68	3.28	583.74
146	2		1215	.00	2.63	3.23	583.73
147	2		1230	.00	2.59	3.17	583.72
148	2		1245	.00	2.55	3.12	583.71
149	2		1300	.00	2.50	3.07	583.70
150	2		1315	.00	2.46	3.02	583.69

1TABLE 1 (CONT.)

STATION		BASIN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE	
PLAN		1	1	1	1	
RATIO		.50	.50	.50	.50	
PER	DAY MON HRMN					
151	2 1330	.00	2.42	2.97	583.68	
152	2 1345	.00	2.38	2.92	583.68	
153	2 1400	.00	2.34	2.87	583.67	
154	2 1415	.00	2.30	2.82	583.66	
155	2 1430	.00	2.26	2.77	583.65	
156	2 1445	.00	2.23	2.73	583.65	
157	2 1500	.00	2.19	2.68	583.64	
158	2 1515	.00	2.15	2.64	583.63	
159	2 1530	.00	2.12	2.59	583.62	
160	2 1545	.00	2.08	2.55	583.62	
161	2 1600	.00	2.05	2.51	583.61	
162	2 1615	.00	2.01	2.47	583.60	
163	**2 1630**	**.00**	**1.98**	**2.42**	**583.60**	**← Time to decant 90% maximum storage = 34.5 hours (1.44 days)**
164	2 1645	.00	1.94	2.38	583.59	
165	2 1700	.00	1.91	2.34	583.58	
166	2 1715	.00	1.88	2.30	583.58	
167	2 1730	.00	1.85	2.27	583.57	
168	2 1745	.00	1.82	2.23	583.56	
169	2 1800	.00	1.79	2.19	583.56	
170	2 1815	.00	1.76	2.15	583.55	
171	2 1830	.00	1.73	2.12	583.55	
172	2 1845	.00	1.70	2.08	583.54	
173	2 1900	.00	1.67	2.05	583.53	
174	2 1915	.00	1.64	2.01	583.53	
175	2 1930	.00	1.62	1.98	583.52	
176	2 1945	.00	1.59	1.95	583.52	
177	2 2000	.00	1.56	1.91	583.51	
178	2 2015	.00	1.54	1.88	583.51	
179	2 2030	.00	1.51	1.85	583.50	
180	2 2045	.00	1.49	1.82	583.50	
181	2 2100	.00	1.46	1.79	583.49	
182	2 2115	.00	1.44	1.76	583.49	
183	2 2130	.00	1.41	1.73	583.48	
184	2 2145	.00	1.39	1.70	583.48	
185	2 2200	.00	1.36	1.67	583.47	
186	2 2215	.00	1.34	1.65	583.47	
187	2 2230	.00	1.32	1.62	583.46	
188	2 2245	.00	1.30	1.59	583.46	
189	2 2300	.00	1.28	1.56	583.46	
190	2 2315	.00	1.25	1.54	583.45	
191	2 2330	.00	1.23	1.51	583.45	
192	2 2345	.00	1.21	1.49	583.44	
193	3 0000	.00	1.19	1.46	583.44	
194	3 0015	.00	1.17	1.44	583.43	
195	3 0030	.00	1.15	1.41	583.43	
196	3 0045	.00	1.13	1.39	583.43	
197	3 0100	.00	1.12	1.37	583.42	
198	3 0115	.00	1.10	1.34	583.42	
199	3 0130	.00	1.08	1.32	583.42	
200	3 0145	.00	1.06	1.30	583.41	

1TABLE 1 (CONT.)

STATION	BASIN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
PLAN	1	1	1	1
RATIO	.50	.50	.50	.50

PER	DAY	MON	HRMN				
201	3		0200	.00	1.04	1.28	583.41
202	3		0215	.00	1.02	1.26	583.40
203	3		0230	.00	1.01	1.24	583.40
204	3		0245	.00	.99	1.21	583.40
205	3		0300	.00	.97	1.19	583.39
206	3		0315	.00	.96	1.17	583.39
207	3		0330	.00	.94	1.15	583.39
208	3		0345	.00	.93	1.14	583.39
209	3		0400	.00	.91	1.12	583.38
210	3		0415	.00	.90	1.10	583.38
211	3		0430	.00	.88	1.08	583.38
212	3		0445	.00	.87	1.06	583.37
213	3		0500	.00	.85	1.04	583.37
214	3		0515	.00	.84	1.03	583.37
215	3		0530	.00	.82	1.01	583.36
216	3		0545	.00	.81	.99	583.36
217	3		0600	.00	.80	.98	583.36
218	3		0615	.00	.78	.96	583.36
219	3		0630	.00	.77	.94	583.35
220	3		0645	.00	.76	.93	583.35
221	3		0700	.00	.74	.91	583.35
222	3		0715	.00	.73	.90	583.35
223	3		0730	.00	.72	.88	583.34
224	3		0745	.00	.71	.87	583.34
225	3		0800	.00	.70	.85	583.34
226	3		0815	.00	.68	.84	583.34
227	3		0830	.00	.67	.82	583.33
228	3		0845	.00	.66	.81	583.33
229	3		0900	.00	.65	.80	583.33
230	3		0915	.00	.64	.78	583.33
231	3		0930	.00	.63	.77	583.33
232	3		0945	.00	.62	.76	583.32
233	3		1000	.00	.61	.75	583.32
234	3		1015	.00	.60	.73	583.32
235	3		1030	.00	.59	.72	583.32
236	3		1045	.00	.58	.71	583.32
237	3		1100	.00	.57	.70	583.31
238	3		1115	.00	.56	.68	583.31
239	3		1130	.00	.55	.67	583.31
240	3		1145	.00	.54	.66	583.31
241	3		1200	.00	.53	.65	583.31
242	3		1215	.00	.52	.64	583.30
243	3		1230	.00	.51	.63	583.30
244	3		1245	.00	.50	.62	583.30
245	3		1300	.00	.50	.61	583.30
246	3		1315	.00	.49	.60	583.30
247	3		1330	.00	.48	.59	583.30
248	3		1345	.00	.47	.58	583.29
249	3		1400	.00	.46	.57	583.29
250	3		1415	.00	.46	.56	583.29

1TABLE 1 (CONT.)

	STATION	BASIN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
	PLAN	1	1	1	1
	RATIO	.50	.50	.50	.50
PER	DAY MON HRMN				
251	3 1430	.00	.45	.55	583.29
252	3 1445	.00	.44	.54	583.29
253	3 1500	.00	.43	.53	583.29
254	3 1515	.00	.43	.52	583.29
255	3 1530	.00	.42	.51	583.28
256	3 1545	.00	.41	.51	583.28
257	3 1600	.00	.41	.50	583.28
258	3 1615	.00	.40	.49	583.28
259	3 1630	.00	.39	.48	583.28
260	3 1645	.00	.39	.47	583.28
261	3 1700	.00	.38	.46	583.28
262	3 1715	.00	.37	.46	583.27
263	3 1730	.00	.37	.45	583.27
264	3 1745	.00	.36	.44	583.27
265	3 1800	.00	.35	.43	583.27
266	3 1815	.00	.35	.43	583.27
267	3 1830	.00	.34	.42	583.27
268	3 1845	.00	.34	.41	583.27
269	3 1900	.00	.33	.41	583.27
270	3 1915	.00	.33	.40	583.27
271	3 1930	.00	.32	.39	583.26
272	3 1945	.00	.32	.39	583.26
273	3 2000	.00	.31	.38	583.26
274	3 2015	.00	.30	.37	583.26
275	3 2030	.00	.30	.37	583.26
276	3 2045	.00	.29	.36	583.26
277	3 2100	.00	.29	.35	583.26
278	3 2115	.00	.28	.35	583.26
279	3 2130	.00	.28	.34	583.26
280	3 2145	.00	.28	.34	583.26
281	3 2200	.00	.27	.33	583.25
282	3 2215	.00	.27	.33	583.25
283	3 2230	.00	.26	.32	583.25
284	3 2245	.00	.26	.32	583.25
285	3 2300	.00	.25	.31	583.25
286	3 2315	.00	.25	.30	583.25
287	3 2330	.00	.24	.30	583.25
288	3 2345	.00	.24	.29	583.25
289	4 0000	.00	.24	.29	583.25
290	4 0015	.00	.23	.29	583.25
291	4 0030	.00	.23	.28	583.25
292	4 0045	.00	.22	.28	583.24
293	4 0100	.00	.22	.27	583.24
294	4 0115	.00	.22	.27	583.24
295	4 0130	.00	.21	.26	583.24
296	4 0145	.00	.21	.26	583.24
297	4 0200	.00	.21	.25	583.24
298	4 0215	.00	.20	.25	583.24
299	4 0230	.00	.20	.24	583.24
300	4 0245	.00	.20	.24	583.24
	MAX	242.86	18.91	24.43	585.43
	MIN	.00	.00	.00	583.20
	AVE	4.76	4.72	5.85	583.90

*** NORMAL END OF HEC-1 ***

COMPUTATION OF INFLOW HYDROGRAPH (1/2 6-Hour PMP)
AND FLOOD ROUTING THROUGH THE
PROPOSED PIPE SPILLWAY

POND 1B

Crest Elevation	=	588 ft
Pipe Spillway Invert Elevation	=	583.7 ft
Normal Pool Elevation used for Routing	=	583.7 ft
Peak Inflow During Design Storm	=	224.68 cfs
Peak Outflow During Design Storm	=	13.51 cfs
Maximum Pool Elevation During Design Storm	=	585.47 ft
Minimum Freeboard During Design Storm	=	2.53 ft
Peak Storage Volume	=	25.05 ac-ft
Days to Decant 90% of Peak Storage Volume	=	3.25 days

POND 1B SPILLWAY PIPE

Straight Pipe

Barrel Diameter (in)	Barrel Length (ft)	Barrel Slope (%)	Manning's n	Spillway Elev (ft)	Entrance Loss Coefficient	Tailwater Depth (ft)
31.51	55.00	18.00	0.0100	583.70	0.90	0.00

Detailed Discharge Table

Elevation (ft)	Straight Pipe (cfs)	Combined Total Discharge (cfs)
581.00	0.000	0.000
581.50	0.000	0.000
582.00	0.000	0.000
582.50	0.000	0.000
583.00	0.000	0.000
583.50	0.000	0.000
583.70	0.000	0.000
584.00	(3)>0.929	0.929
584.50	(3)>3.997	3.997
585.00	(3)>8.280	8.280
585.50	(3)>13.485	13.485
586.00	(3)>19.484	19.484
586.50	(3)>26.165	26.165
587.00	(5)>32.642	32.642

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *            SEPTEMBER 1990             *
 *             VERSION 4.0               *
 *                                       *
 *  RUN DATE  12/10/2015  TIME  11:52:36 *
 *                                       *
 *****************************************
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*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
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```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
          LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

 *** FREE ***
              1          ID  ********************************************************************************
              2          ID  *                                                                              *
              3          ID  *      AEP Amos Plant Hydraulic Assessment   File: 6HRPMPB1.inp               *
              4          ID  *      Flood Routing for Ash Pond 1A and Reclaim Pond                          *
              5          ID  *      1/2 6 Hour PMP  36" Pipe Invert Elev. 583.7'                           *
              6          ID  *      GA Project No. 05-361                                                  *
              7          ID  *                                                                              *
              8          ID  *      Analyses by: Geo/Environmental Associates                              *
              9          ID  *                   Knoxville, TN                                             *
             10          ID  *                   December 12, 2015                                         *
             11          ID  *                                                                              *
             12          ID  ********************************************************************************
             13          IT      15       0       0     300
             14          IO       3
             15          JR    FLOW     0.5
             16          VS   BASIN     IMP     IMP     IMP
             17          VV    2.11    2.11    6.11    7.11
             18          IN      15

             19          KK   BASIN
             20          KM   PRECIPITATION
             21          PB       0
             22          PI   0.287   0.373   0.445   0.502   0.545   0.573   0.653   0.834   0.825   0.980
             23          PI   2.322   4.564   4.922   3.344   1.264   0.834   0.864   0.763   0.581   0.560
             24          PI   0.525   0.475   0.411   0.332
             25          BA   0.037
             26          LU       0    0.05      66
             27          UD     0.0

             28          KK     IMP
             29          KM   ROUTE COMPUTED HYDROGRAPH THROUGH IMPOUNDMENT
             30          RS       1    ELEV   583.7
             31          SA   12.75   13.00   13.93   14.87   15.80
             32          SQ       0    0.93    8.28   19.48   32.64
             33          SE   583.7     584     585     586     587
             34          ZZ
```

```
1*****************************************                                  *****************************************
 *                                       *                                  *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                  *    U.S. ARMY CORPS OF ENGINEERS       *
 *            SEPTEMBER 1990             *                                  *    HYDROLOGIC ENGINEERING CENTER      *
 *             VERSION 4.0               *                                  *          609 SECOND STREET            *
 *                                       *                                  *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE  12/10/2015  TIME  11:52:36 *                                  *           (916) 756-1104              *
 *                                       *                                  *                                       *
 *****************************************                                  *****************************************

                        ***************************************************************************
                        *                                                                         *
                        *      AEP Amos Plant Hydraulic Assessment   File: 6HRPMPB1.inp           *
                        *      Flood Routing for Ash Pond 1A and Reclaim Pond                      *
                        *      1/2 6 Hour PMP  36" Pipe Invert Elev. 583.7'                       *
                        *      GA Project No. 05-361                                              *
                        *                                                                         *
                        *      Analyses by: Geo/Environmental Associates                          *
                        *                   Knoxville, TN                                         *
                        *                   December 12, 2015                                     *
                        *                                                                         *
                        ***************************************************************************

  14 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                       NMIN          15  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME        0000  STARTING TIME
                         NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      4    0  ENDING DATE
                     NDTIME        0245  ENDING TIME
                     ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .25 HOURS
                        TOTAL TIME BASE   74.75 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

                 USER-DEFINED OUTPUT SPECIFICATIONS

         TABLE 1
     VS       STATION     BASIN       IMP       IMP       IMP
     VV VARIABLE CODE      2.11      2.11      6.11      7.11       .00       .00       .00       .00       .00       .00

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF RUNOFF
                     .50



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  19 KK     *     BASIN  *
            *            *
            **************
                           PRECIPITATION

  18 IN          TIME DATA FOR INPUT TIME SERIES
                       JXMIN          15  TIME INTERVAL IN MINUTES
                      JXDATE      1    0  STARTING DATE
```

```
                    JXTIME           0  STARTING TIME

               SUBBASIN RUNOFF DATA

   25 BA         SUBBASIN CHARACTERISTICS
                       TAREA         .04  SUBBASIN AREA

                 PRECIPITATION DATA

   21 PB               STORM       27.78  BASIN TOTAL PRECIPITATION

   22 PI           INCREMENTAL PRECIPITATION PATTERN
                       .29       .37       .45       .50       .54       .57       .65       .83       .82       .98
                      2.32      4.56      4.92      3.34      1.26       .83       .86       .76       .58       .56
                       .52       .48       .41       .33

   26 LU         UNIFORM LOSS RATE
                       STRTL         .00  INITIAL LOSS
                       CNSTL         .05  UNIFORM LOSS RATE
                       RTIMP       66.00  PERCENT IMPERVIOUS AREA

   27 UD         SCS DIMENSIONLESS UNITGRAPH
                        TLAG         .00  LAG

                                                          ***

                                                    UNIT HYDROGRAPH
                                                  5 END-OF-PERIOD ORDINATES
                71.       20.        4.        1.        0.

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    BASIN
                          FOR PLAN 1, RATIO =  .50

    TOTAL RAINFALL =   27.78, TOTAL LOSS =     .10, TOTAL EXCESS =   27.68

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     74.75-HR
+   (CFS)       (HR)
                    (CFS)
+     449.      3.25                 109.         28.          9.           9.
                  (INCHES)    27.507      27.676      27.676       27.676
                  (AC-FT)       54.         55.         55.          55.

                        CUMULATIVE AREA =     .04 SQ MI


      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    BASIN
                          FOR PLAN 1, RATIO =  .50

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     74.75-HR
+   (CFS)       (HR)
                    (CFS)
+     225.      3.25                  55.         14.          5.           4.
                  (INCHES)    13.754      13.838      13.838       13.838
                  (AC-FT)       27.         27.         27.          27.

                        CUMULATIVE AREA =     .04 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           **************
           *            *
   28 KK   *       IMP  *
           *            *
           **************
                        ROUTE COMPUTED HYDROGRAPH THROUGH IMPOUNDMENT

              HYDROGRAPH ROUTING DATA

   30 RS         STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                        ITYP        ELEV  TYPE OF INITIAL CONDITION
```

```
                    RSVRIC      583.70  INITIAL CONDITION
                         X         .00 WORKING R AND D COEFFICIENT

   31 SA              AREA        12.8      13.0      13.9      14.9      15.8

   32 SQ         DISCHARGE          0.        1.        8.       19.       33.

   33 SE         ELEVATION      583.70    584.00    585.00    586.00    587.00

                                                                ***

                                                 COMPUTED STORAGE-ELEVATION DATA

           STORAGE        .00      3.86     17.32     31.72     47.05
         ELEVATION     583.70    584.00    585.00    586.00    587.00

       ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION      IMP
                          FOR PLAN 1, RATIO =  .50

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     74.75-HR
+   (CFS)       (HR)
                          (CFS)
+      14.      6.00                  12.          8.          4.           4.
                         (INCHES)     3.095       8.391      12.260       12.310
                         (AC-FT)        6.         17.         24.          24.

 PEAK STORAGE   TIME                        MAXIMUM AVERAGE STORAGE
                                      6-HR       24-HR       72-HR     74.75-HR
+  (AC-FT)      (HR)
       24.      6.00                  23.         17.          9.           9.

  PEAK STAGE    TIME                         MAXIMUM AVERAGE STAGE
                                      6-HR       24-HR       72-HR     74.75-HR
+   (FEET)      (HR)
    585.47      6.00                585.36      584.95      584.40       584.38

                       CUMULATIVE AREA =     .04 SQ MI
```

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO FLOWS RATIO 1 .50
HYDROGRAPH AT					
+	BASIN	.04	1	FLOW	225.
				TIME	3.25
ROUTED TO					
+	IMP	.04	1	FLOW	14.
				TIME	6.00
			** PEAK STAGES IN FEET **		
			1	STAGE	585.47
				TIME	6.00

1TABLE 1 STATION

	BASIN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
PLAN	1	1	1	1
RATIO	.50	.50	.50	.50

PER	DAY	MON	HRMN					
1	1		0000	.00	.00	.00	583.70	
2	1		0015	10.03	.02	.10	583.71	
3	1		0030	15.89	.09	.37	583.73	
4	1		0045	19.85	.18	.74	583.76	
5	1		0100	22.87	.28	1.17	583.79	
6	1		0115	25.13	.40	1.66	583.83	
7	1		0130	26.69	.53	2.19	583.87	
8	1		0145	29.92	.66	2.76	583.91	
9	1		0200	37.20	.83	3.44	583.97	
10	1		0215	38.85	1.12	4.20	584.03	
11	1		0230	44.64	1.57	5.04	584.09	
12	1		0245	93.85	2.33	6.43	584.19	
13	1		0300	187.02	3.88	9.27	584.40	
14	1		0315	224.68	6.15	13.42	584.71	
15	1		0330	177.15	8.35	17.42	585.01	
16	1		0345	89.25	10.34	19.98	585.18	
17	1		0400	50.39	11.29	21.20	585.27	
18	1		0415	42.51	11.85	21.92	585.32	
19	1		0430	37.57	12.30	22.49	585.36	
20	1		0445	30.00	12.64	22.93	585.39	
21	1		0500	27.26	12.90	23.26	585.41	
22	1		0515	25.42	13.11	23.54	585.43	
23	1		0530	23.18	13.29	23.77	585.45	
24	1		0545	20.34	13.43	23.94	585.46	
25	1		0600	16.79	13.51	**24.05**	**585.47**	← **Maximum Stage/Storage 6 hours after onset of event**
26	1		0615	4.23	13.46	23.98	585.46	
27	1		0630	.80	13.29	23.76	585.45	
28	1		0645	.13	13.08	23.50	585.43	
29	1		0700	.00	12.87	23.23	585.41	
30	1		0715	.00	12.67	22.97	585.39	
31	1		0730	.00	12.47	22.71	585.37	
32	1		0745	.00	12.27	22.45	585.36	
33	1		0800	.00	12.07	22.20	585.34	
34	1		0815	.00	11.88	21.95	585.32	
35	1		0830	.00	11.69	21.71	585.30	
36	1		0845	.00	11.50	21.47	585.29	
37	1		0900	.00	11.32	21.23	585.27	
38	1		0915	.00	11.14	21.00	585.26	
39	1		0930	.00	10.96	20.77	585.24	
40	1		0945	.00	10.79	20.55	585.22	
41	1		1000	.00	10.62	20.33	585.21	
42	1		1015	.00	10.45	20.11	585.19	
43	1		1030	.00	10.28	19.90	585.18	
44	1		1045	.00	10.12	19.68	585.16	
45	1		1100	.00	9.95	19.48	585.15	
46	1		1115	.00	9.80	19.27	585.14	
47	1		1130	.00	9.64	19.07	585.12	
48	1		1145	.00	9.49	18.87	585.11	
49	1		1200	.00	9.33	18.68	585.09	
50	1		1215	.00	9.19	18.49	585.08	

1TABLE 1 (CONT.) STATION

			BASIN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
		PLAN	1	1	1	1
		RATIO	.50	.50	.50	.50
PER	DAY	MON HRMN				
51	1	1230	.00	9.04	18.30	585.07
52	1	1245	.00	8.90	18.12	585.05
53	1	1300	.00	8.75	17.93	585.04
54	1	1315	.00	8.61	17.75	585.03
55	1	1330	.00	8.48	17.58	585.02
56	1	1345	.00	8.34	17.40	585.01
57	1	1400	.00	8.23	17.23	584.99
58	1	1415	.00	8.14	17.06	584.98
59	1	1430	.00	8.05	16.90	584.97
60	1	1445	.00	7.96	16.73	584.96
61	1	1500	.00	7.87	16.57	584.94
62	1	1515	.00	7.78	16.41	584.93
63	1	1530	.00	7.69	16.25	584.92
64	1	1545	.00	7.60	16.09	584.91
65	1	1600	.00	7.52	15.93	584.90
66	1	1615	.00	7.44	15.78	584.89
67	1	1630	.00	7.35	15.62	584.87
68	1	1645	.00	7.27	15.47	584.86
69	1	1700	.00	7.19	15.32	584.85
70	1	1715	.00	7.11	15.18	584.84
71	1	1730	.00	7.03	15.03	584.83
72	1	1745	.00	6.95	14.89	584.82
73	1	1800	.00	6.87	14.74	584.81
74	1	1815	.00	6.79	14.60	584.80
75	1	1830	.00	6.72	14.46	584.79
76	1	1845	.00	6.64	14.32	584.78
77	1	1900	.00	6.57	14.19	584.77
78	1	1915	.00	6.49	14.05	584.76
79	1	1930	.00	6.42	13.92	584.75
80	1	1945	.00	6.35	13.79	584.74
81	1	2000	.00	6.28	13.66	584.73
82	1	2015	.00	6.21	13.53	584.72
83	1	2030	.00	6.14	13.40	584.71
84	1	2045	.00	6.07	13.27	584.70
85	1	2100	.00	6.00	13.15	584.69
86	1	2115	.00	5.93	13.03	584.68
87	1	2130	.00	5.87	12.90	584.67
88	1	2145	.00	5.80	12.78	584.66
89	1	2200	.00	5.74	12.67	584.65
90	1	2215	.00	5.67	12.55	584.65
91	1	2230	.00	5.61	12.43	584.64
92	1	2245	.00	5.55	12.32	584.63
93	1	2300	.00	5.48	12.20	584.62
94	1	2315	.00	5.42	12.09	584.61
95	1	2330	.00	5.36	11.98	584.60
96	1	2345	.00	5.30	11.87	584.59
97	2	0000	.00	5.24	11.76	584.59
98	2	0015	.00	5.18	11.65	584.58
99	2	0030	.00	5.12	11.54	584.57
100	2	0045	.00	5.07	11.44	584.56

1TABLE 1 (CONT.) STATION

				BASIN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
			PLAN	1	1	1	1
			RATIO	.50	.50	.50	.50
PER	DAY	MON	HRMN				
101	2		0100	.00	5.01	11.33	584.56
102	2		0115	.00	4.95	11.23	584.55
103	2		0130	.00	4.90	11.13	584.54
104	2		0145	.00	4.84	11.03	584.53
105	2		0200	.00	4.79	10.93	584.53
106	2		0215	.00	4.74	10.83	584.52
107	2		0230	.00	4.68	10.73	584.51
108	2		0245	.00	4.63	10.64	584.50
109	2		0300	.00	4.58	10.54	584.50
110	2		0315	.00	4.53	10.45	584.49
111	2		0330	.00	4.48	10.36	584.48
112	2		0345	.00	4.43	10.26	584.48
113	2		0400	.00	4.38	10.17	584.47
114	2		0415	.00	4.33	10.08	584.46
115	2		0430	.00	4.28	9.99	584.46
116	2		0445	.00	4.23	9.91	584.45
117	2		0500	.00	4.18	9.82	584.44
118	2		0515	.00	4.14	9.73	584.44
119	2		0530	.00	4.09	9.65	584.43
120	2		0545	.00	4.04	9.56	584.42
121	2		0600	.00	4.00	9.48	584.42
122	2		0615	.00	3.95	9.40	584.41
123	2		0630	.00	3.91	9.32	584.41
124	2		0645	.00	3.86	9.24	584.40
125	2		0700	.00	3.82	9.16	584.39
126	2		0715	.00	3.78	9.08	584.39
127	2		0730	.00	3.74	9.00	584.38
128	2		0745	.00	3.69	8.93	584.38
129	2		0800	.00	3.65	8.85	584.37
130	2		0815	.00	3.61	8.77	584.36
131	2		0830	.00	3.57	8.70	584.36
132	2		0845	.00	3.53	8.63	584.35
133	2		0900	.00	3.49	8.55	584.35
134	2		0915	.00	3.45	8.48	584.34
135	2		0930	.00	3.41	8.41	584.34
136	2		0945	.00	3.38	8.34	584.33
137	2		1000	.00	3.34	8.27	584.33
138	2		1015	.00	3.30	8.20	584.32
139	2		1030	.00	3.26	8.14	584.32
140	2		1045	.00	3.23	8.07	584.31
141	2		1100	.00	3.19	8.00	584.31
142	2		1115	.00	3.15	7.94	584.30
143	2		1130	.00	3.12	7.87	584.30
144	2		1145	.00	3.08	7.81	584.29
145	2		1200	.00	3.05	7.74	584.29
146	2		1215	.00	3.02	7.68	584.28
147	2		1230	.00	2.98	7.62	584.28
148	2		1245	.00	2.95	7.56	584.27
149	2		1300	.00	2.92	7.50	584.27
150	2		1315	.00	2.88	7.44	584.27

1TABLE 1 (CONT.) STATION

			BASIN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
		PLAN	1	1	1	1
		RATIO	.50	.50	.50	.50
PER	DAY	MON HRMN				
151	2	1330	.00	2.85	7.38	584.26
152	2	1345	.00	2.82	7.32	584.26
153	2	1400	.00	2.79	7.26	584.25
154	2	1415	.00	2.76	7.21	584.25
155	2	1430	.00	2.72	7.15	584.24
156	2	1445	.00	2.69	7.09	584.24
157	2	1500	.00	2.66	7.04	584.24
158	2	1515	.00	2.63	6.98	584.23
159	2	1530	.00	2.60	6.93	584.23
160	2	1545	.00	2.58	6.88	584.22
161	2	1600	.00	2.55	6.82	584.22
162	2	1615	.00	2.52	6.77	584.22
163	2	1630	.00	2.49	6.72	584.21
164	2	1645	.00	2.46	6.67	584.21
165	2	1700	.00	2.43	6.62	584.20
166	2	1715	.00	2.41	6.57	584.20
167	2	1730	.00	2.38	6.52	584.20
168	2	1745	.00	2.35	6.47	584.19
169	2	1800	.00	2.33	6.42	584.19
170	2	1815	.00	2.30	6.37	584.19
171	2	1830	.00	2.27	6.32	584.18
172	2	1845	.00	2.25	6.28	584.18
173	2	1900	.00	2.22	6.23	584.18
174	2	1915	.00	2.20	6.19	584.17
175	2	1930	.00	2.17	6.14	584.17
176	2	1945	.00	2.15	6.10	584.17
177	2	2000	.00	2.13	6.05	584.16
178	2	2015	.00	2.10	6.01	584.16
179	2	2030	.00	2.08	5.97	584.16
180	2	2045	.00	2.05	5.92	584.15
181	2	2100	.00	2.03	5.88	584.15
182	2	2115	.00	2.01	5.84	584.15
183	2	2130	.00	1.99	5.80	584.14
184	2	2145	.00	1.96	5.76	584.14
185	2	2200	.00	1.94	5.72	584.14
186	2	2215	.00	1.92	5.68	584.13
187	2	2230	.00	1.90	5.64	584.13
188	2	2245	.00	1.88	5.60	584.13
189	2	2300	.00	1.86	5.56	584.13
190	2	2315	.00	1.84	5.52	584.12
191	2	2330	.00	1.82	5.48	584.12
192	2	2345	.00	1.79	5.45	584.12
193	3	0000	.00	1.77	5.41	584.11
194	3	0015	.00	1.75	5.37	584.11
195	3	0030	.00	1.74	5.34	584.11
196	3	0045	.00	1.72	5.30	584.11
197	3	0100	.00	1.70	5.27	584.10
198	3	0115	.00	1.68	5.23	584.10
199	3	0130	.00	1.66	5.20	584.10
200	3	0145	.00	1.64	5.16	584.10

1TABLE 1 (CONT.) STATION

				BASIN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
			PLAN	1	1	1	1
			RATIO	.50	.50	.50	.50
PER	DAY	MON	HRMN				
201	3		0200	.00	1.62	5.13	584.09
202	3		0215	.00	1.60	5.10	584.09
203	3		0230	.00	1.59	5.06	584.09
204	3		0245	.00	1.57	5.03	584.09
205	3		0300	.00	1.55	5.00	584.08
206	3		0315	.00	1.53	4.97	584.08
207	3		0330	.00	1.52	4.93	584.08
208	3		0345	.00	1.50	4.90	584.08
209	3		0400	.00	1.48	4.87	584.08
210	3		0415	.00	1.46	4.84	584.07
211	3		0430	.00	1.45	4.81	584.07
212	3		0445	.00	1.43	4.78	584.07
213	3		0500	.00	1.42	4.75	584.07
214	3		0515	.00	1.40	4.72	584.06
215	3		0530	.00	1.38	4.69	584.06
216	3		0545	.00	1.37	4.67	584.06
217	3		0600	.00	1.35	4.64	584.06
218	3		0615	.00	1.34	4.61	584.06
219	3		0630	.00	1.32	4.58	584.05
220	3		0645	.00	1.31	4.56	584.05
221	3		0700	.00	1.29	4.53	584.05
222	3		0715	.00	1.28	4.50	584.05
223	3		0730	.00	1.27	4.48	584.05
224	3		0745	.00	1.25	4.45	584.04
225	3		0800	.00	1.24	4.42	584.04
226	3		0815	.00	1.22	4.40	584.04
227	3		0830	.00	1.21	4.37	584.04
228	3		0845	.00	1.20	4.35	584.04
229	3		0900	.00	1.18	4.32	584.03
230	3		0915	.00	1.17	4.30	584.03
231	3		0930	.00	1.16	4.28	584.03
232	3		0945	.00	1.14	4.25	584.03
233	3		1000	.00	1.13	4.23	584.03
234	3		1015	.00	1.12	4.21	584.03
235	3		1030	.00	1.10	4.18	584.02
236	3		1045	.00	1.09	4.16	584.02
237	3		1100	.00	1.08	4.14	584.02
238	3		1115	.00	1.07	4.12	584.02
239	3		1130	.00	1.06	4.09	584.02
240	3		1145	.00	1.04	4.07	584.02
241	3		1200	.00	1.03	4.05	584.01
242	3		1215	.00	1.02	4.03	584.01
243	3		1230	.00	1.01	4.01	584.01
244	3		1245	.00	1.00	3.99	584.01
245	3		1300	.00	.99	3.97	584.01
246	3		1315	.00	.98	3.95	584.01
247	3		1330	.00	.97	3.93	584.00
248	3		1345	.00	.95	3.91	584.00
249	3		1400	.00	.94	3.89	584.00
250	3		1415	.00	.93	3.87	584.00

1TABLE 1 (CONT.)

	STATION	BASIN FLOW	IMP FLOW	IMP STORAGE	IMP STAGE
	PLAN	1	1	1	1
	RATIO	.50	.50	.50	.50
PER	DAY MON HRMN				
251	3 1430	.00	.93	3.85	584.00
252	3 1445	.00	.92	3.83	584.00
253	3 1500	.00	.92	3.81	584.00
254	3 1515	.00	.91	3.79	583.99
255	3 1530	.00	.91	3.77	583.99
256	3 1545	.00	.90	3.75	583.99
257	3 1600	.00	.90	3.74	583.99
258	3 1615	.00	.89	3.72	583.99
259	3 1630	.00	.89	3.70	583.99
260	3 1645	.00	.89	3.68	583.99
261	3 1700	.00	.88	3.66	583.98
262	3 1715	.00	.88	3.64	583.98
263	3 1730	.00	.87	3.63	583.98
264	3 1745	.00	.87	3.61	583.98
265	3 1800	.00	.86	3.59	583.98
266	3 1815	.00	.86	3.57	583.98
267	3 1830	.00	.86	3.55	583.98
268	3 1845	.00	.85	3.54	583.97
269	3 1900	.00	.85	3.52	583.97
270	3 1915	.00	.84	3.50	583.97
271	3 1930	.00	.84	3.48	583.97
272	3 1945	.00	.83	3.47	583.97
273	3 2000	.00	.83	3.45	583.97
274	3 2015	.00	.83	3.43	583.97
275	3 2030	.00	.82	3.42	583.97
276	3 2045	.00	.82	3.40	583.96
277	3 2100	.00	.81	3.38	583.96
278	3 2115	.00	.81	3.36	583.96
279	3 2130	.00	.81	3.35	583.96
280	3 2145	.00	.80	3.33	583.96
281	3 2200	.00	.80	3.31	583.96
282	3 2215	.00	.79	3.30	583.96
283	3 2230	.00	.79	3.28	583.95
284	3 2245	.00	.79	3.27	583.95
285	3 2300	.00	.78	3.25	583.95
286	3 2315	.00	.78	3.23	583.95
287	3 2330	.00	.77	3.22	583.95
288	3 2345	.00	.77	3.20	583.95
289	4 0000	.00	.77	3.19	583.95
290	4 0015	.00	.76	3.17	583.95
291	4 0030	.00	.76	3.15	583.95
292	4 0045	.00	.76	3.14	583.94
293	4 0100	.00	.75	3.12	583.94
294	4 0115	.00	.75	3.11	583.94
295	4 0130	.00	.74	3.09	583.94
296	4 0145	.00	.74	3.08	583.94
297	4 0200	.00	.74	3.06	583.94
298	4 0215	.00	.73	3.05	583.94
299	4 0230	.00	.73	3.03	583.94
300	4 0245	.00	.73	**3.02**	**583.93** ← **Stage/Storage 68.75 Hours after maximum stage/storage**
	MAX	224.68	13.51	24.05	585.47
	MIN	.00	.00	.00	583.70
	AVE	4.41	3.92	9.04	584.38

*** NORMAL END OF HEC-1 ***

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *            SEPTEMBER 1990             *
 *             VERSION 4.0               *
 *                                       *
 *  RUN DATE  12/10/2015  TIME  12:41:06 *
 *                                       *
 *****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
X     X  XXXXXXX   XXXXX           X
X     X  X        X     X         XX
X     X  X        X                X
XXXXXXX  XXXX     X        XXXXX   X
X     X  X        X                X
X     X  X        X     X          X
X     X  XXXXXXX   XXXXX          XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 *** FREE ***
              1          ID  ********************************************************************************
              2          ID  *                                                                              *
              3          ID  *      AEP Amos Plant Bottom Ash Complex     File: PMPB1DD.inp                 *
              4          ID  *      Flood Routing for Ash Pond 1A and Reclaim Pond                          *
              5          ID  *      1/2 6 Hour PMP Storm Drawdown   36" Pipe Invert Elev 583.2'              *
              6          ID  *      GA Project No. 15055009.01                                              *
              7          ID  *                                                                              *
              8          ID  *      Analyses by: Geo/Environmental Associates                               *
              9          ID  *                   Knoxville, TN                                              *
             10          ID  *                   October 2015                                               *
             11          ID  *                                                                              *
             12          ID  ********************************************************************************
             13          IT      15       0       0      50
             14          IO       3
             15          VS     IMP     IMP     IMP
             16          VV    2.11    6.11    7.11

             17          KK     IMP
             18          KM   continue drawdown 68.75 hours after peak
             19          RS       1    ELEV  583.93
             20          SA    6.01    6.25   17.65   19.97   22.28
             21          SQ       0    4.00   13.48   26.16   38.09
             22          SE   583.2     584     585     586     587
             23          ZZ
```

```
1*****************************************                    *****************************************
 *                                       *                    *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF ENGINEERS       *
 *            SEPTEMBER 1990             *                    *    HYDROLOGIC ENGINEERING CENTER      *
 *             VERSION 4.0               *                    *          609 SECOND STREET            *
 *                                       *                    *       DAVIS, CALIFORNIA 95616         *
 *  RUN DATE  12/10/2015  TIME  12:41:06 *                    *           (916) 756-1104              *
 *                                       *                    *                                       *
 *****************************************                    *****************************************

                        ***************************************************************************
                        *                                                                         *
                        *      AEP Amos Plant Bottom Ash Complex     File: PMPB1DD.inp            *
                        *      Flood Routing for Ash Pond 1A and Reclaim Pond                     *
                        *      1/2 6 Hour PMP Storm Drawdown   36" Pipe Invert Elev 583.2'         *
                        *      GA Project No. 15055009.01                                         *
                        *                                                                         *
                        *      Analyses by: Geo/Environmental Associates                          *
                        *                   Knoxville, TN                                         *
                        *                   October 2015                                          *
                        *                                                                         *
                        ***************************************************************************

  14 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          3  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL         0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN         15  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         50  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      1    0  ENDING DATE
                      NDTIME        1215  ENDING TIME
                      ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL     .25 HOURS
                         TOTAL TIME BASE   12.25 HOURS

          ENGLISH UNITS
               DRAINAGE AREA         SQUARE MILES
               PRECIPITATION DEPTH   INCHES
               LENGTH, ELEVATION     FEET
               FLOW                  CUBIC FEET PER SECOND
               STORAGE VOLUME        ACRE-FEET
               SURFACE AREA          ACRES
               TEMPERATURE           DEGREES FAHRENHEIT

                 USER-DEFINED OUTPUT SPECIFICATIONS

         TABLE 1
     VS       STATION       IMP       IMP       IMP
     VV VARIABLE CODE      2.11      6.11      7.11       .00       .00       .00       .00       .00       .00       .00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


            **************
            *            *
  17 KK     *       IMP  *
            *            *
            **************
                          continue drawdown 68.75 hours after peak

               HYDROGRAPH ROUTING DATA

  19 RS          STORAGE ROUTING
                       NSTPS           1  NUMBER OF SUBREACHES
                         ITYP        ELEV  TYPE OF INITIAL CONDITION
                       RSVRIC      583.93  INITIAL CONDITION
                            X         .00 WORKING R AND D COEFFICIENT

  20 SA               AREA         6.0       6.3      17.6      20.0      22.3
```

21 SQ	DISCHARGE	0.	4.	13.	26.	38.
22 SE	ELEVATION	583.20	584.00	585.00	586.00	587.00

***

COMPUTED STORAGE-ELEVATION DATA

STORAGE	.00	4.90	16.37	35.17	56.28
ELEVATION	583.20	584.00	585.00	586.00	587.00

*** *** *** *** ***

HYDROGRAPH AT STATION IMP

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	12.25-HR
+ (CFS)	(HR)					
		(CFS)				
+ 4.	.25		3.	2.	2.	2.
		(INCHES)	.000	.000	.000	.000
		(AC-FT)	1.	3.	3.	3.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	12.25-HR
+ (AC-FT)	(HR)				
4.	.25	4.	3.	3.	3.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	12.25-HR
+ (FEET)	(HR)				
583.93	.00	583.80	583.70	583.70	583.70

CUMULATIVE AREA = .00 SQ MI

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
	ROUTED TO									
+		IMP	4.	.25	3.	2.	2.	.00		
+									583.93	.00

1TABLE 1 STATION

PER	DAY	MON	HRMN	IMP FLOW	IMP STORAGE	IMP STAGE	
1	1		0000	3.65	4.47	583.93	
2	1		0015	3.58	4.39	583.92	
3	1		0030	3.52	4.32	583.90	
4	1		0045	3.46	4.25	583.89	
5	1		0100	3.41	4.18	583.88	
6	1		0115	3.35	4.11	583.87	
7	1		0130	3.29	4.04	583.86	
8	1		0145	3.24	3.97	583.85	
9	1		0200	3.18	3.90	583.84	
10	1		0215	3.13	3.84	583.83	
11	1		0230	3.08	3.77	583.82	
12	1		0245	3.03	3.71	583.81	
13	1		0300	2.98	3.65	583.80	
14	1		0315	2.93	3.59	583.79	
15	1		0330	2.88	3.53	583.78	
16	1		0345	2.83	3.47	583.77	
17	1		0400	2.78	3.41	583.76	
18	1		0415	2.74	3.35	583.75	
19	1		0430	2.69	3.30	583.74	
20	1		0445	2.65	3.24	583.73	
21	1		0500	2.60	3.19	583.72	
22	1		0515	2.56	3.14	583.71	
23	1		0530	2.51	3.08	583.70	
24	1		0545	2.47	3.03	583.69	
25	1		0600	2.43	2.98	583.69	
26	1		0615	2.39	2.93	583.68	
27	1		0630	2.35	2.88	583.67	
28	1		0645	2.31	2.83	583.66	
29	1		0700	2.27	2.79	583.65	
30	1		0715	2.23	2.74	583.65	
31	1		0730	2.20	2.69	583.64	
32	1		0745	2.16	2.65	583.63	
33	1		0800	2.12	2.60	583.62	
34	1		0815	2.09	2.56	583.62	
35	1		0830	2.05	2.52	583.61	
36	1		0845	2.02	2.48	583.60	
37	1		0900	1.99	2.43	583.60	
38	1		**0915**	**1.95**	**2.39**	**583.59**	← **Time to decant 90% maximum storage = 78.0 hours (3.25 days)**
39	1		0930	1.92	2.35	583.58	
40	1		0945	1.89	2.31	583.58	
41	1		1000	1.86	2.28	583.57	
42	1		1015	1.83	2.24	583.57	
43	1		1030	1.80	2.20	583.56	
44	1		1045	1.77	2.16	583.55	
45	1		1100	1.74	2.13	583.55	
46	1		1115	1.71	2.09	583.54	
47	1		1130	1.68	2.06	583.54	
48	1		1145	1.65	2.02	583.53	
49	1		1200	1.62	1.99	583.52	
50	1		1215	1.60	1.96	583.52	
			MAX	3.65	4.47	583.93	
			MIN	1.60	1.96	583.52	
			AVE	2.48	3.04	583.70	

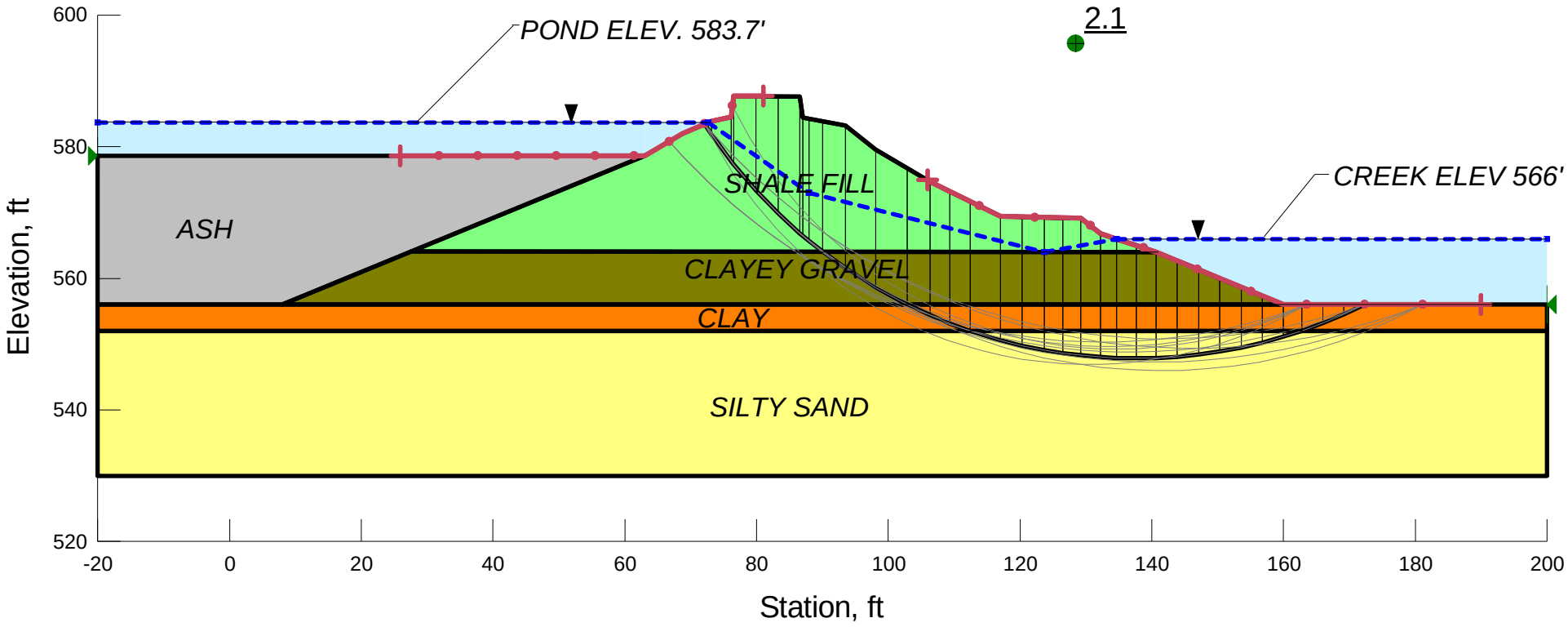
*** NORMAL END OF HEC-1 ***

APPENDIX V
STABILITY ANALYSES

STATIC FACTOR OF SAFETY
LONG TERM STORAGE POOL

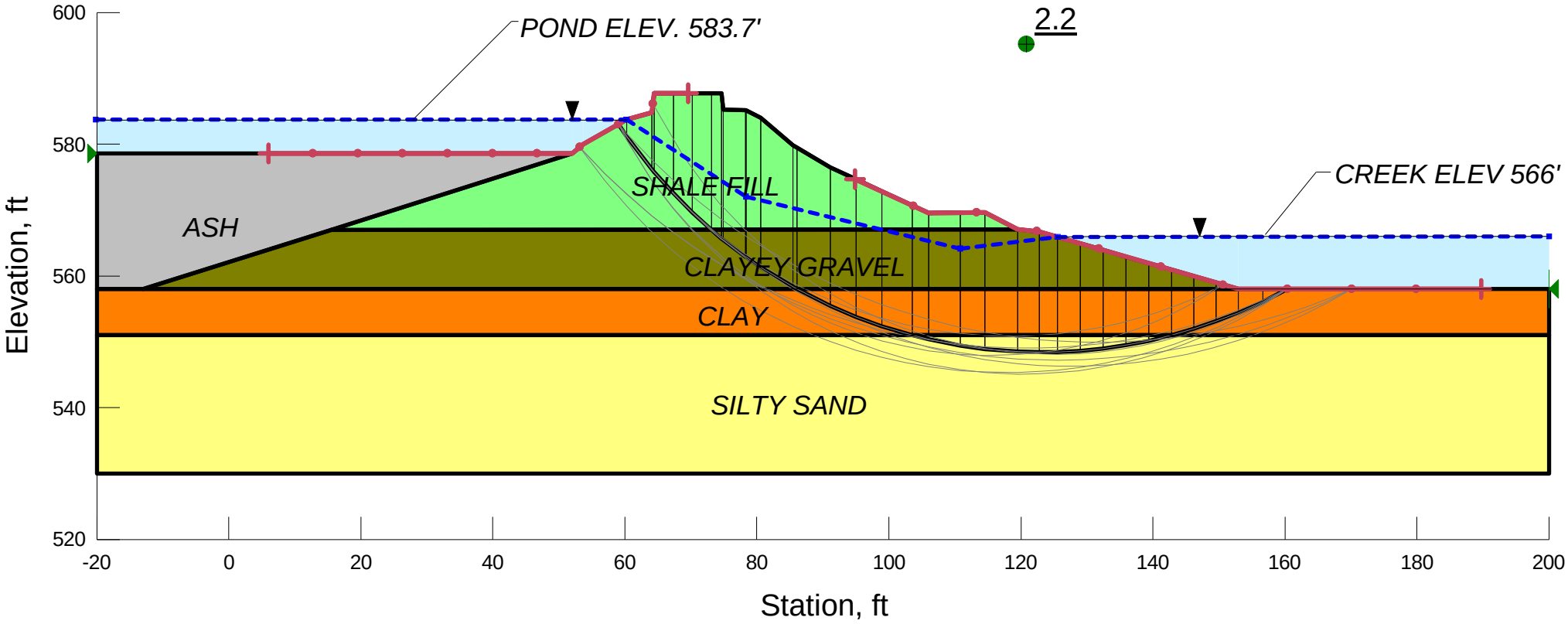
Title: AMOS PLANT SECTION B-B
Name: Measured Phreatic
File Name: section bb rev static np.gsz
Date: 10/22/2015 Time: 10:04:08 AM
Analysis Kind: SLOPE/W
Method: Morgenstern-Price

Name: Shale Fill Unit Weight: 135 pcf Unit Wt. Above Water Table: 125 pcf Cohesion: 370 psf Phi: 27.2 °
Name: Ash Unit Weight: 95 pcf Unit Wt. Above Water Table: 90 pcf Cohesion: 0 psf Phi: 28 °
Name: Clayey Gravel Unit Weight: 135 pcf Unit Wt. Above Water Table: 130 pcf Cohesion: 300 psf Phi: 32 °
Name: Clay Unit Weight: 115 pcf Unit Wt. Above Water Table: 105 pcf Cohesion: 150 psf Phi: 35.2 °
Name: Silty Sand Unit Weight: 130 pcf Unit Wt. Above Water Table: 120 pcf Cohesion: 0 psf Phi: 36.8 °



Title: AMOS PLANT SECTION C-C
Name: section cc rev static np.gsz
Date: 10/22/2015 Time: 10:38:55 AM
Analysis Kind: SLOPE/W
Method: Morgenstern-Price
View: 2D

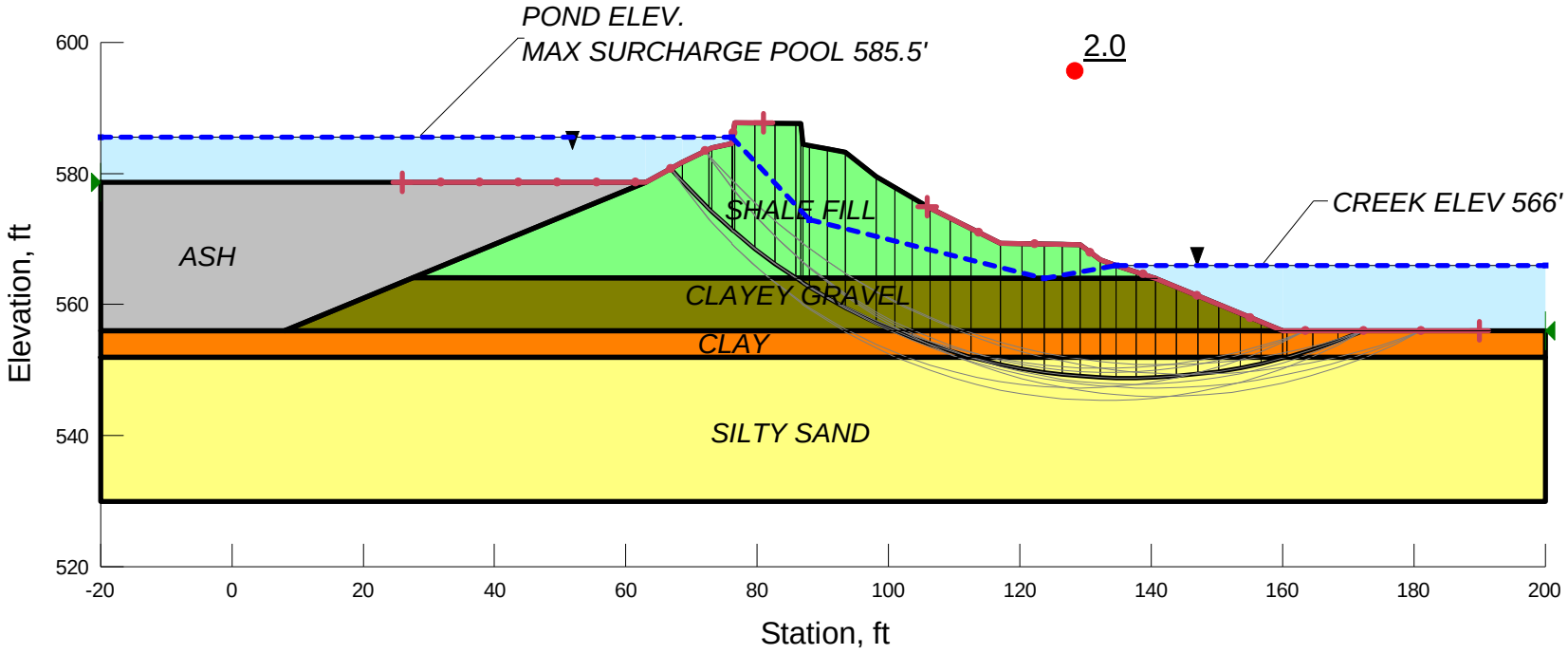
Name: Ash Unit Weight: 95 pcf Unit Wt. Above Water Table: 90 pcf Cohesion: 0 psf Phi: 28 °
Name: Shale Fill Unit Weight: 135 pcf Unit Wt. Above Water Table: 125 pcf Cohesion: 370 psf Phi: 27.2 °
Name: Clayey Gravel Unit Weight: 135 pcf Unit Wt. Above Water Table: 130 pcf Cohesion: 300 psf Phi: 32 °
Name: Clay Unit Weight: 115 pcf Unit Wt. Above Water Table: 105 pcf Cohesion: 150 psf Phi: 35.2 °
Name: Silty Sand Unit Weight: 130 pcf Unit Wt. Above Water Table: 120 pcf Cohesion: 0 psf Phi: 36.8 °



STATIC FACTOR OF SAFETY
MAXIMUM SURCHARGE POOL

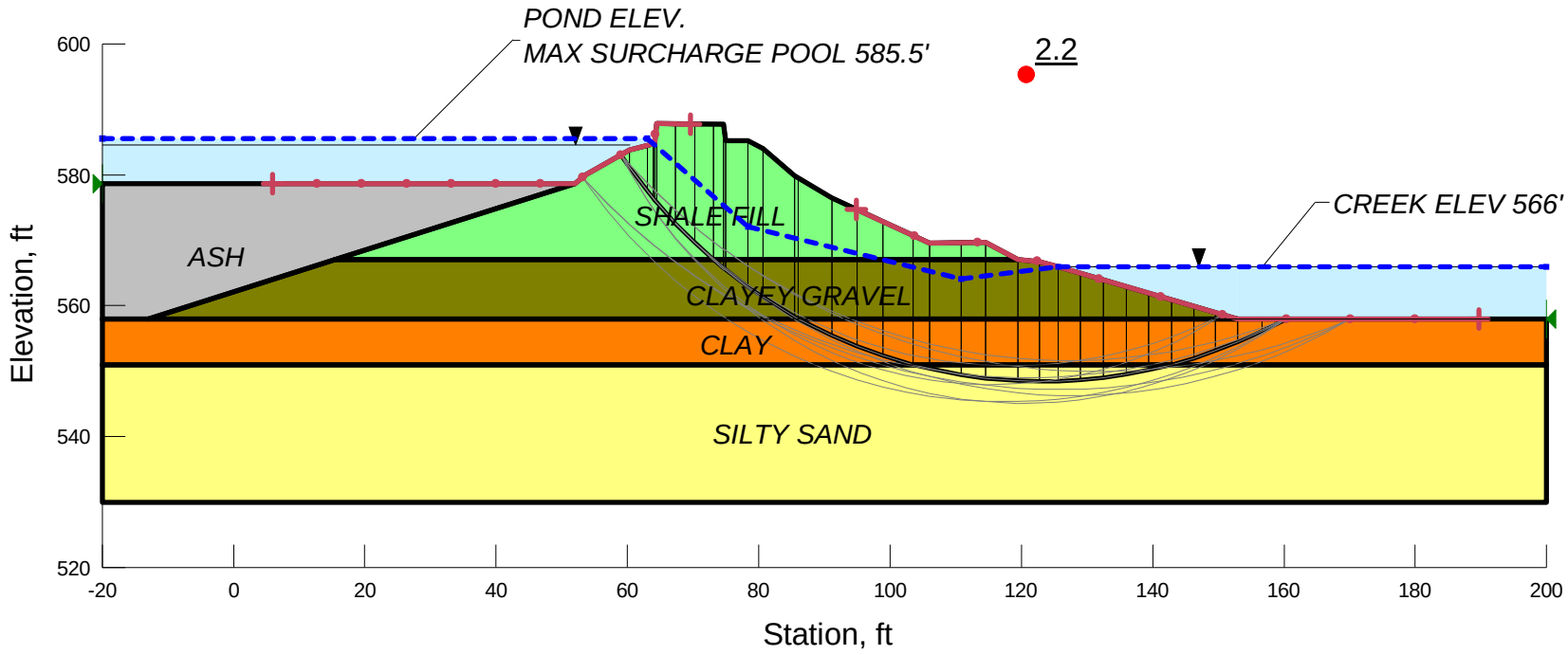
Title: AMOS PLANT SECTION B-B
Comments: Maximum Surcharge Pool
Name: Measured Phreatic
File Name: section bb rev static max pool revised.gsz
Date: 12/10/2015 Time: 2:19:19 PM
Analysis Kind: SLOPE/W
Method: Morgenstern-Price

Name: Shale Fill Unit Weight: 135 pcf Cohesion': 370 psf Phi': 27.2 ° Constant Unit Wt. Above Water Table: 125 pcf
Name: Ash Unit Weight: 95 pcf Cohesion': 0 psf Phi': 28 ° Constant Unit Wt. Above Water Table: 90 pcf
Name: Clayey Gravel Unit Weight: 135 pcf Cohesion': 300 psf Phi': 32 ° Constant Unit Wt. Above Water Table: 130 pcf
Name: Clay Unit Weight: 115 pcf Cohesion': 150 psf Phi': 35.2 ° Constant Unit Wt. Above Water Table: 105 pcf
Name: Silty Sand Unit Weight: 130 pcf Cohesion': 0 psf Phi': 36.8 ° Constant Unit Wt. Above Water Table: 120 pcf



Title: AMOS PLANT SECTION C-C
Comments: Maximum Surcharge Pool
Name: Measured Phreatic Level
Name: section cc rev static max pool revised.gsz
Date: 12/10/2015 Time: 2:31:43 PM
Analysis Kind: SLOPE/W
Method: Morgenstern-Price

Name: Ash Unit Weight: 95 pcf Cohesion': 0 psf Phi': 28 ° Constant Unit Wt. Above Water Table: 90 pcf Piezometric Line: 1
Name: Shale Fill Unit Weight: 135 pcf Cohesion': 370 psf Phi': 27.2 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 1
Name: Clayey Gravel Unit Weight: 135 pcf Cohesion': 300 psf Phi': 32 ° Constant Unit Wt. Above Water Table: 130 pcf Piezometric Line
Name: Clay Unit Weight: 115 pcf Cohesion': 150 psf Phi': 35.2 ° Constant Unit Wt. Above Water Table: 105 pcf Piezometric Line: 1
Name: Silty Sand Unit Weight: 130 pcf Cohesion': 0 psf Phi': 36.8 ° Constant Unit Wt. Above Water Table: 120 pcf Piezometric Line: 1

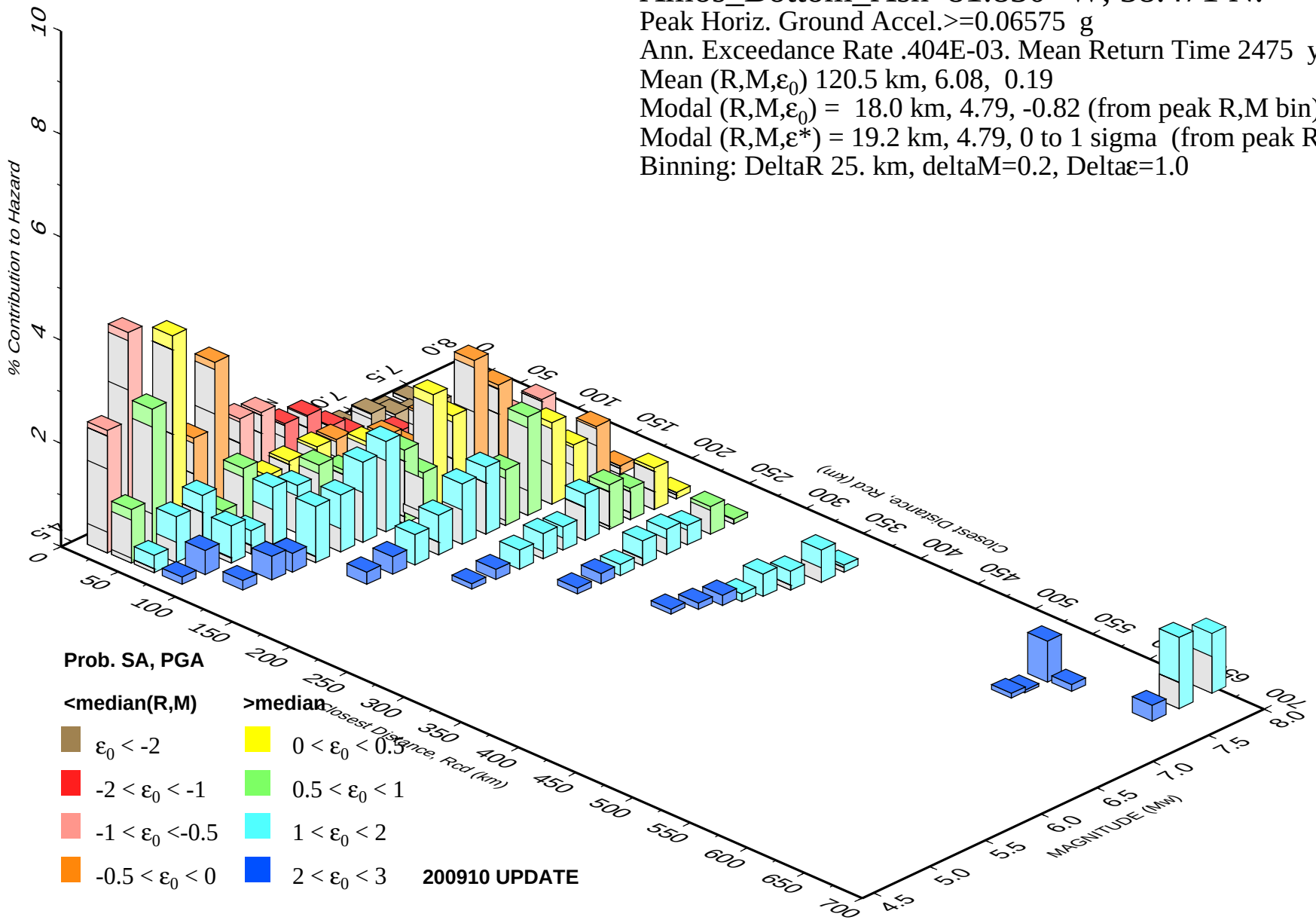


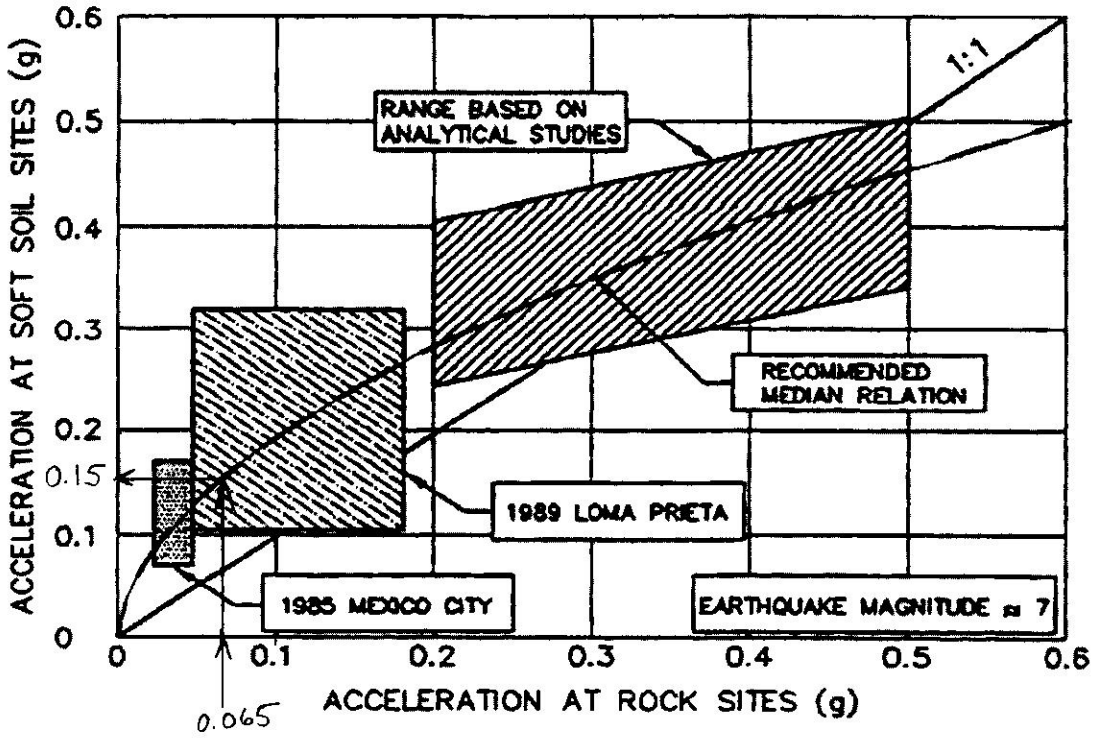
SEISMIC FACTOR OF SAFETY

USGS PSH DEAGGREGATION

PSH Deaggregation on NEHRP BC rock
Amos_Bottom_Ash 81.830º W, 38.471 N.

Peak Horiz. Ground Accel.>=0.06575 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 years
Mean (R,M,ε_0) 120.5 km, 6.08, 0.19
Modal (R,M,ε_0) = 18.0 km, 4.79, -0.82 (from peak R,M bin)
Modal (R,M,ε*) = 19.2 km, 4.79, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR 25. km, deltaM=0.2, Deltaε=1.0





From Idriss, I.M. (1990), "Response of Soft Soil Sites During Earthquakes," Proc. Memorial Symposium to Honor Professor H.B. Seed, Berkeley, California.

PGA at rock = 0.065 g from USGS
PGA at soil = 0.15 g from Idriss

Acceleration used in pseudostatic analysis, $a = K_h \cdot PGA$

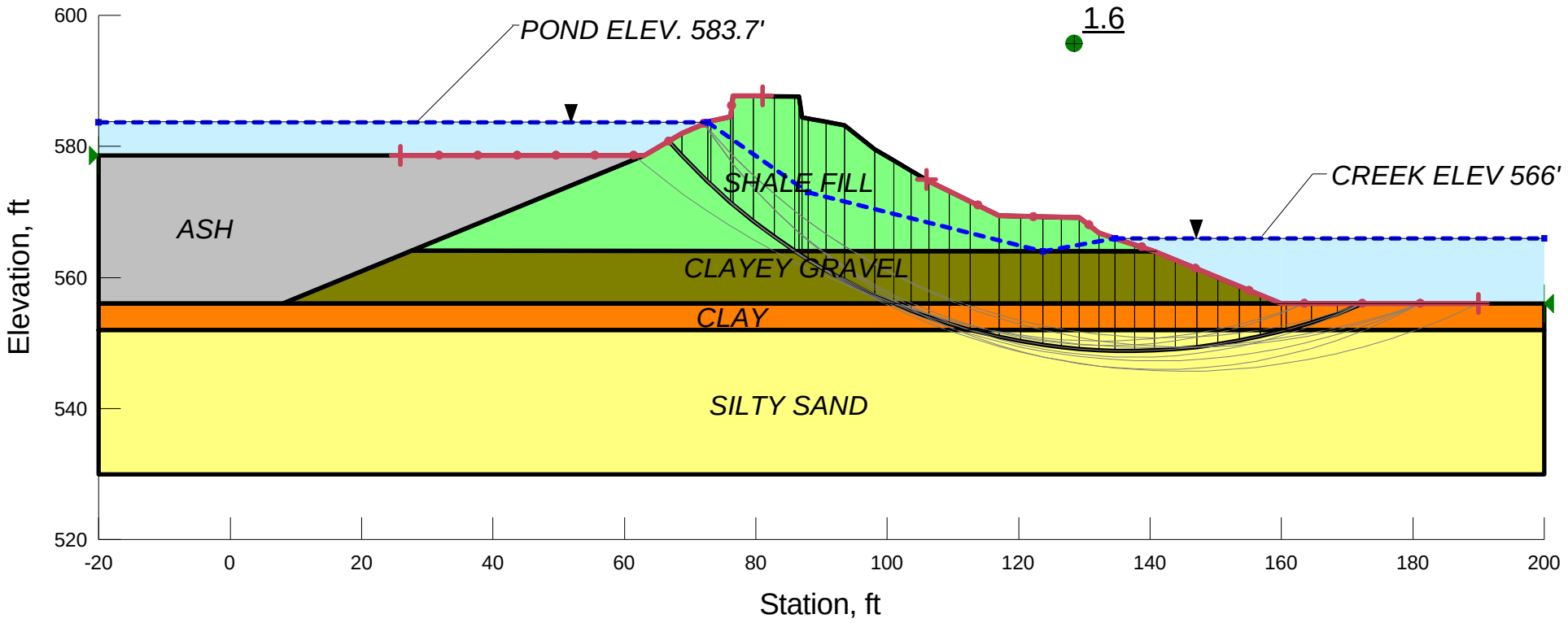
- use $K_h = 0.5$ based on information in Geotechnical Earthquake Engineering Handbook (2002) Day, R.W.

$\Rightarrow a = 0.5\ (0.15g) = 0.075g$

STABILITY ANALYSES

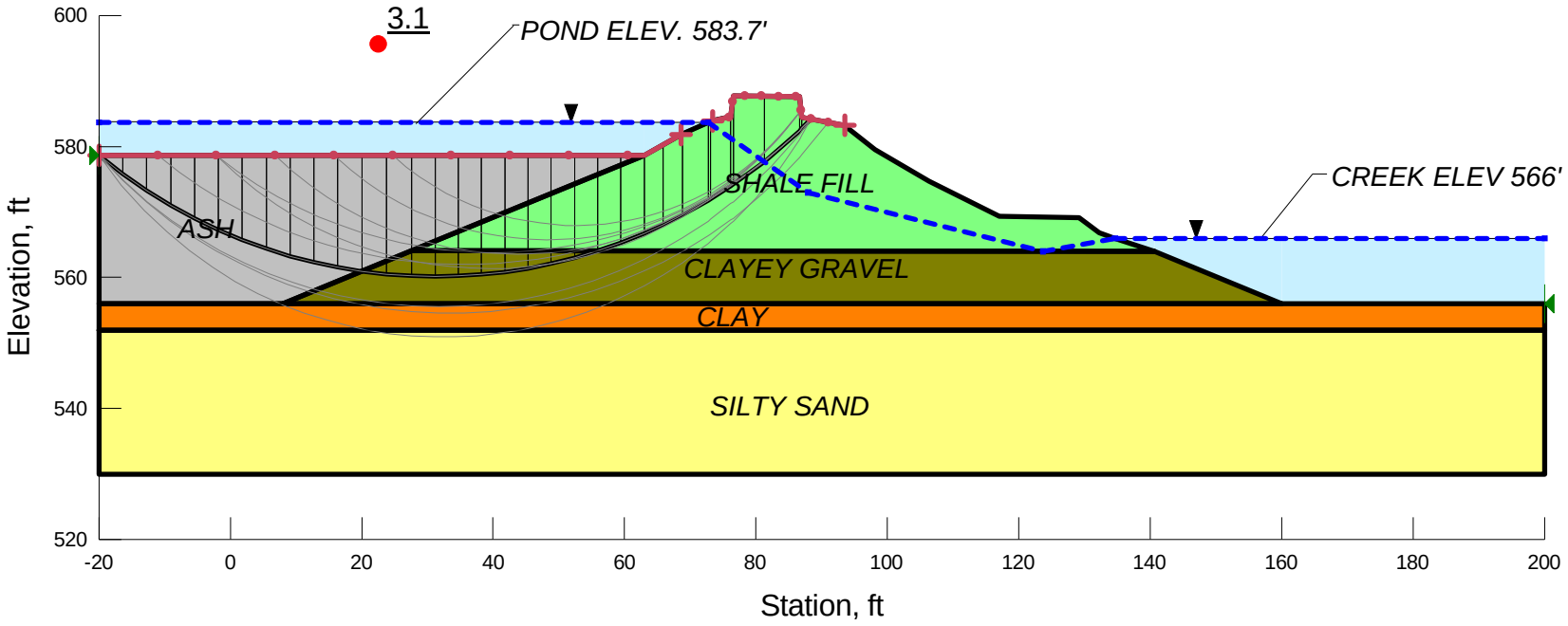
Title: AMOS PLANT SECTION B-B
Name: Measured Phreatic
File Name: section bb rev pseudostatic np.gsz
Date: 11/13/2015 Time: 2:00:31 PM
Analysis Kind: SLOPE/W
Method: Morgenstern-Price
Horz Seismic Load: 0.075

Name: Shale Fill Unit Weight: 135 pcf Unit Wt. Above Water Table: 125 pcf Cohesion: 370 psf Phi: 27.2 °
Name: Ash Unit Weight: 95 pcf Unit Wt. Above Water Table: 90 pcf Cohesion: 0 psf Phi: 28 °
Name: Clayey Gravel Unit Weight: 135 pcf Unit Wt. Above Water Table: 130 pcf Cohesion: 300 psf Phi: 32 °
Name: Clay Unit Weight: 115 pcf Unit Wt. Above Water Table: 105 pcf Cohesion: 150 psf Phi: 35.2 °
Name: Silty Sand Unit Weight: 130 pcf Unit Wt. Above Water Table: 120 pcf Cohesion: 0 psf Phi: 36.8 °



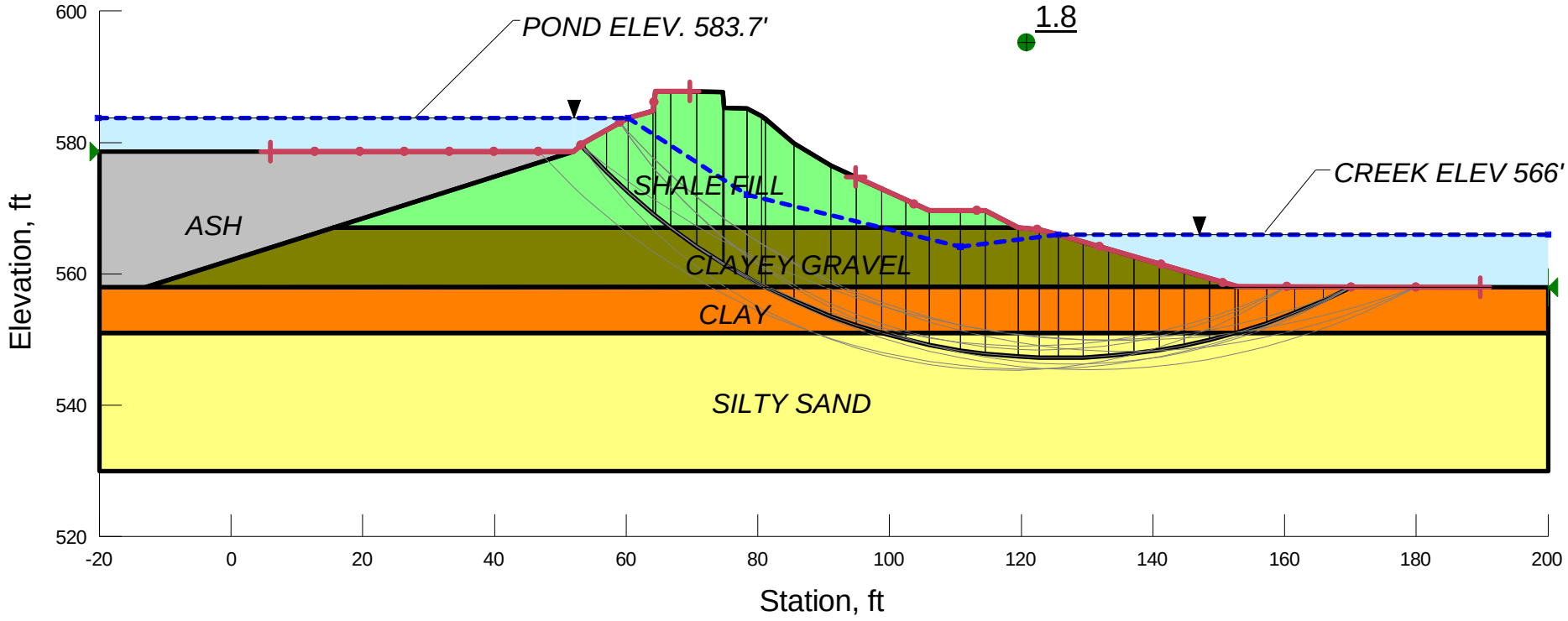
Title: AMOS PLANT SECTION B-B
Name: Measured Phreatic
File Name: section bb rev US pseudostatic np.gsz
Date: 12/21/2015 Time: 4:08:37 PM
Analysis Kind: SLOPE/W
Method: Morgenstern-Price
Horz Seismic Load: 0.075

Name: Shale Fill Unit Weight: 135 pcf Cohesion': 370 psf Phi': 27.2 ° Constant Unit Wt. Above Water Table: 125 pcf
Name: Ash Unit Weight: 95 pcf Cohesion': 0 psf Phi': 28 ° Constant Unit Wt. Above Water Table: 90 pcf
Name: Clayey Gravel Unit Weight: 135 pcf Cohesion': 300 psf Phi': 32 ° Constant Unit Wt. Above Water Table: 130 pcf
Name: Clay Unit Weight: 115 pcf Cohesion': 150 psf Phi': 35.2 ° Constant Unit Wt. Above Water Table: 105 pcf
Name: Silty Sand Unit Weight: 130 pcf Cohesion': 0 psf Phi': 36.8 ° Constant Unit Wt. Above Water Table: 120 pcf



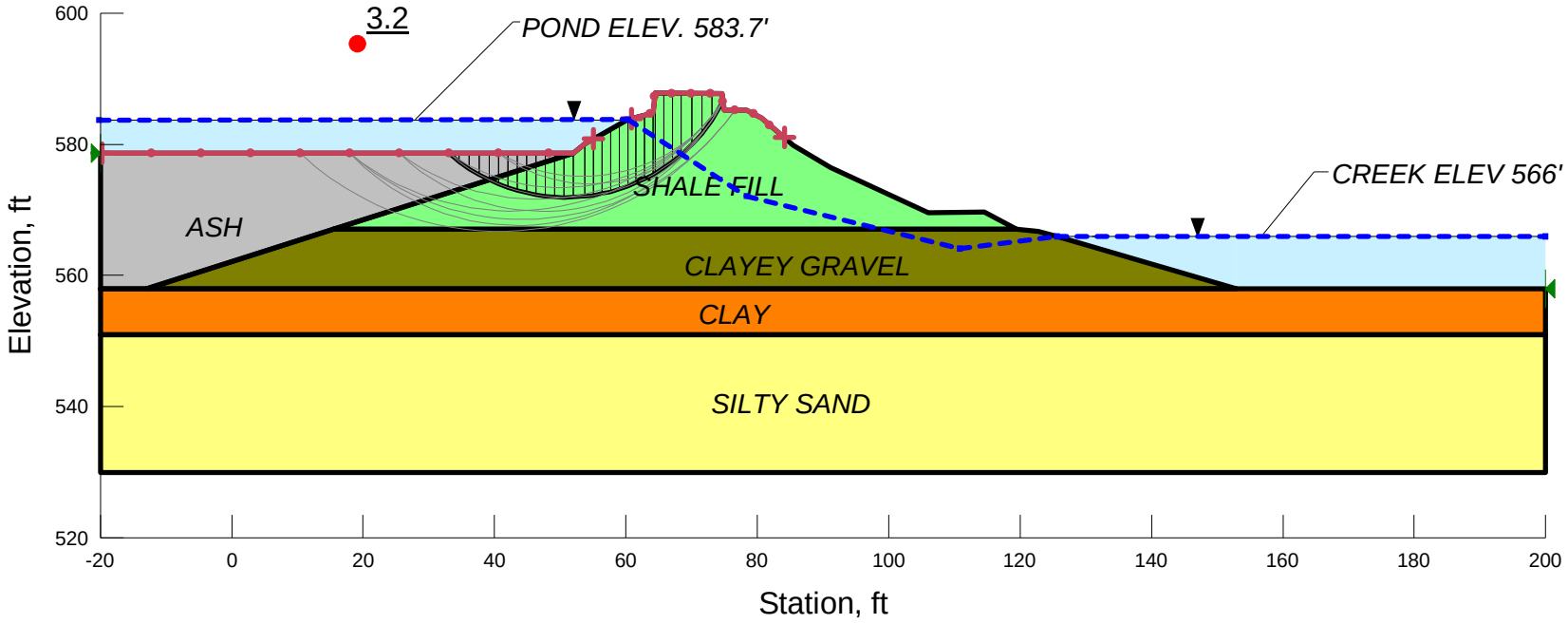
Title: AMOS PLANT SECTION C-C
Name: Measured Phreatic Level
Name: section cc rev pseudostatic np.gsz
Date: 11/13/2015 Time: 2:06:40 PM
Analysis Kind: SLOPE/W
Method: Morgenstern-Price
View: 2D
Horz Seismic Load: 0.075

Name: Ash Unit Weight: 95 pcf Unit Wt. Above Water Table: 90 pcf Cohesion: 0 psf Phi: 28 °
Name: Shale Fill Unit Weight: 135 pcf Unit Wt. Above Water Table: 125 pcf Cohesion: 370 psf Phi: 27.2 °
Name: Clayey Gravel Unit Weight: 135 pcf Unit Wt. Above Water Table: 130 pcf Cohesion: 300 psf Phi: 32 °
Name: Clay Unit Weight: 115 pcf Unit Wt. Above Water Table: 105 pcf Cohesion: 150 psf Phi: 35.2 °
Name: Silty Sand Unit Weight: 130 pcf Unit Wt. Above Water Table: 120 pcf Cohesion: 0 psf Phi: 36.8 °



AMOS PLANT SECTION C-C
section cc rev US pseudostatic np.gsz
12/21/2015 4:12:35 PM
SLOPE/W
Morgenstern-Price
0.075

Name: Ash Unit Weight: 95 pcf Cohesion': 0 psf Phi': 28 ° Constant Unit Wt. Above Water Table: 90 pcf
Name: Shale Fill Unit Weight: 135 pcf Cohesion': 370 psf Phi': 27.2 ° Constant Unit Wt. Above Water Table: 125 pcf
Name: Clayey Gravel Unit Weight: 135 pcf Cohesion': 300 psf Phi': 32 ° Constant Unit Wt. Above Water Table: 130 pcf
Name: Clay Unit Weight: 115 pcf Cohesion': 150 psf Phi': 35.2 ° Constant Unit Wt. Above Water Table: 105 pcf
Name: Silty Sand Unit Weight: 130 pcf Cohesion': 0 psf Phi': 36.8 ° Constant Unit Wt. Above Water Table: 120 pcf



LIQUEFACTION ASSESSMENT

SPT BLOW COUNT CORRECTIONS

Geo/Environmental Associates, Inc.

Job: Amos BAC
Title: SPT Correction
Performed By: SMA
G.A. Job Number: 15055009
Date: 10/23/2015

Unit Weights: Overburden= 125 pcf

Boring	Sample No	Depth	Uncorrected N	Depth to Water (ft)	Thickness of Moist Soil (ft)	Thickness of Sat Soil (ft)	Effective Stress (psf)	N Correction	Corrected N
Soil 2 - Clayey Gravel									
B-1	5	21	39	33	21.0	0.0	2,625	0.89	34.8
B-1	6	23.5	18	33	23.5	0.0	2,938	0.84	15.2
B-2	5	21	18	16	16.0	5.0	2,313	0.95	17.1
B-2	6	26	17	16	16.0	10.0	2,626	0.89	15.2
B-3	5	21	11	20.5	20.5	0.5	2,594	0.90	9.9
B-3	6	23	50	20.5	20.5	2.5	2,719	0.88	43.8
B-4	1	1	25	18	1.0	0.0	125	1.70	42.5
B-5	2	6	7	17.5	6.0	0.0	750	1.67	11.7
B-5	3	11	5	17.5	11.0	0.0	1,375	1.23	6.2
B-5	4	16	5	17.5	16.0	0.0	2,000	1.02	5.1
B-6	2	6	10	24.5	6.0	0.0	750	1.67	16.7
B-7	2	6	5	3	3.0	3.0	563	1.70	8.5
B-7	3	11	3	3	3.0	8.0	876	1.54	4.6
B-8	2	6	29	6	6.0	0.0	750	1.67	48.4
B-8	3	7.4	50	6	6.0	1.4	838	1.58	79.0
								MEDIAN =	15.2

Geo/Environmental Associates, Inc.

Job: Amos BAC
Title: SPT Correction
Performed By: SMA
G.A. Job Number: 15055009
Date: 10/23/2015

Unit Weights: Overburden= 125 pcf

Boring	Sample No	Depth	Uncorrected N	Depth to Water (ft)	Thickness of Moist Soil (ft)	Thickness of Sat Soil (ft)	Effective Stress (psf)	N Correction	Corrected N
Soil 1 - Shale Fill									
B-1	1	1	18	33	1.0	0.0	125	1.70	30.6
B-1	2	6	11	33	6.0	0.0	750	1.67	18.4
B-1	3	11	8	33	11.0	0.0	1,375	1.23	9.9
B-1	4	16	8	33	16.0	0.0	2,000	1.02	8.2
B-2	1	1	42	16	1.0	0.0	125	1.70	71.4
B-2	2	6	13	16	6.0	0.0	750	1.67	21.7
B-2	3	11	16	16	11.0	0.0	1,375	1.23	19.7
B-2	4	16	19	16	16.0	0.0	2,000	1.02	19.4
B-3	1	1	16	20.5	1.0	0.0	125	1.70	27.2
B-3	2	6	8	20.5	6.0	0.0	750	1.67	13.4
B-3	3	11	9	20.5	11.0	0.0	1,375	1.23	11.1
B-3	4	16	16	20.5	16.0	0.0	2,000	1.02	16.4
B-5	1	1	30	17.5	1.0	0.0	125	1.70	51.0
B-6	1	1	9	24.5	1.0	0.0	125	1.70	15.3
B-7	1	1	14	3	1.0	0.0	125	1.70	23.8
B-8	1	1	50	6	1.0	0.0	125	1.70	85.0
								MEDIAN =	19.6

Geo/Environmental Associates, Inc.

Job: Amos BAC
Title: SPT Correction
Performed By: SMA
G.A. Job Number: 15055009
Date: 8/28/15

Unit Weights: Overburden= 125 pcf

Boring	Sample No	Depth	Uncorrected N	Depth to Water (ft)	Thickness of Moist Soil (ft)	Thickness of Sat Soil (ft)	Effective Stress (psf)	N Correction	Corrected N
Soil 4 - Silty Sand									
B-1	9	32.5	4	33	32.5	0.0	4,063	0.72	2.9
B-1	10	36	14	33	33.0	3.0	4,313	0.70	9.7
B-1	11	41	5	33	33.0	8.0	4,626	0.67	3.4
B-1	12	46	5	33	33.0	13.0	4,939	0.65	3.3
B-1	13	51	10	33	33.0	18.0	5,252	0.63	6.3
B-2	8	36	4	16	16.0	20.0	3,252	0.80	3.2
B-2	9	41	19	16	16.0	25.0	3,565	0.77	14.5
B-2	10	56	6	16	16.0	40.0	4,504	0.68	4.1
B-2	11	51	16	16	16.0	35.0	4,191	0.71	11.3
B-3	10	33	9	20.5	20.5	12.5	3,345	0.79	7.1
B-3	11	36	6	20.5	20.5	15.5	3,533	0.77	4.6
B-3	12	41	10	20.5	20.5	20.5	3,846	0.74	7.4
B-3	13	46	12	20.5	20.5	25.5	4,159	0.71	8.5
B-3	14	51	20	20.5	20.5	30.5	4,472	0.68	13.7
B-4	8	31	18	18	18.0	13.0	3,064	0.83	14.9
B-4	9	36	13	18	18.0	18.0	3,377	0.79	10.2
B-4	10	41	20	18	18.0	23.0	3,690	0.75	15.1
B-4	11	46	12	18	18.0	28.0	4,003	0.72	8.7
B-4	12	51	38	18	18.0	33.0	4,316	0.70	26.4
B-5	6	30	10	17.5	17.5	12.5	2,970	0.84	8.4
B-5	7	35	43	17.5	17.5	17.5	3,283	0.80	34.3
B-5	8	40	10	17.5	17.5	22.5	3,596	0.76	7.6
B-5	9	45	14	17.5	17.5	27.5	3,909	0.73	10.2
B-5	10	46	16	17.5	17.5	28.5	3,972	0.73	11.6
B-5	11	51	19	17.5	17.5	33.5	4,285	0.70	13.3
B-6	6	26	9	24.5	24.5	1.5	3,156	0.81	7.3
B-6	7	31	5	24.5	24.5	6.5	3,469	0.78	3.9
B-6	8	36	12	24.5	24.5	11.5	3,782	0.74	8.9
B-6	9	41	15	24.5	24.5	16.5	4,095	0.71	10.7
B-6	10	46	14	24.5	24.5	21.5	4,408	0.69	9.6
B-6	11	51	13	24.5	24.5	26.5	4,721	0.67	8.6
B-7	5	21	7	3	3.0	18.0	1,502	1.18	8.3
B-7	6	26	7	3	3.0	23.0	1,815	1.07	7.5
B-7	7	31	5	3	3.0	28.0	2,128	0.99	5.0
B-7	8	36	34	3	3.0	33.0	2,441	0.93	31.5
B-8	6	21	5	6	6.0	15.0	1,689	1.11	5.6
B-8	7	26	7	6	6.0	20.0	2,002	1.02	7.2
B-8	8	31	7	6	6.0	25.0	2,315	0.95	6.7
B-8	9	36	41	6	6.0	30.0	2,628	1	36.6
								MEDIAN =	8.5

Geo/Environmental Associates, Inc.

Job: Amos BAC
Title: SPT Correction
Performed By: SMA
G.A. Job Number: 15055009
Date: 10/23/2015

Unit Weights: Overburden= 125 pcf

Boring	Sample No	Depth	Uncorrected N	Depth to Water (ft)	Thickness of Moist Soil (ft)	Thickness of Sat Soil (ft)	Effective Stress (psf)	N Correction	Corrected N
Soil 3 - Soft Clay									
B-1	7	25	3	33	25.0	0.0	3,125	0.82	2.5
B-1	8	28.5	0	33	28.5	0.0	3,563	0.77	0.0
B-2	7	31	6	16	16.0	15.0	2,939	0.84	5.1
B-3	7	26	25	20.5	20.5	5.5	2,907	0.85	21.2
B-3	8	27.5	4	20.5	20.5	7.0	3,001	0.83	3.3
B-3	9	29	3	20.5	20.5	8.5	3,095	0.82	2.5
B-4	2	6	3	18	6.0	0.0	750	1.67	5.0
B-4	3	11	10	18	11.0	0.0	1,375	1.23	12.3
B-4	4	16	3	18	16.0	0.0	2,000	1.02	3.1
B-4	5	21	5	18	18.0	3.0	2,438	0.93	4.6
B-4	6	26	5	18	18.0	8.0	2,751	0.87	4.4
B-4	7	27.5	11	18	18.0	9.5	2,845	0.86	9.4
B-5	5	21	6	17.5	17.5	3.5	2,407	0.93	5.6
B-6	3	11	15	18.5	11.0	0.0	1,375	1.23	18.5
B-6	4	16	10	18.5	16.0	0.0	2,000	1.02	10.2
B-6	5	21	7	18.5	18.5	2.5	2,469	0.92	6.4
B-7	4	16	4	3	3.0	13.0	1,189	1.33	5.3
B-8	4	11	0	6	6.0	5.0	1,063	1.40	0.0
B-8	5	16	1	6	6.0	10.0	1,376	1.23	1.2
								MEDIAN =	5.0

APPENDIX VI
DRAWINGS

NOTES

1. BASE MAP PROVIDED BY AEP SERVICE CORPORATION. AERIAL PHOTOGRAPHY DATED APRL 15, 2001.
2. SEE DRAWING SHEET 2 FOR SECTIONS, SPILLWAY PIPE PROFILES, AND DETAILS.
3. PREVIOUSLY PLACED FILL AND CONCRETE LINING SHALL BE REMOVED FROM THE OPEN CHANNEL SPILLWAY AND REPLACED WITH ENGINEERED FILL AS DESCRIBED IN THE ACCOMPANYING REPORT.

LEGEND

- BORING LOCATION
- PIEZOMETER LOCATION

BILL'S CREEK

AREAS WHERE SOIL REINFORCEMENT/SLOPE PROTECTION WAS NEEDED TO RAISE DIKE

TOP OF DIKE ELEV. 588'

APPROXIMATE LOCATION OF FILLED OPEN CHANNEL SPILLWAY (SEE NOTE 3)

RIPRAP SPLASH PAD (TYP)

TREATMENT POND

RECLAIM WATER POND SPILLWAY PIPE INVERT ELEV. 583.2' 36" ø SDR-17 HDPE

RECLAIM WATER POND

ASH POND 1B SPILLWAY PIPE INVERT ELEV. 583.7' 36" ø SDR-17 HDPE

ASH POND 1B

OPERATING POOL ELEV. 583' (TYP)

ASH POND 1A

ID: 402
E: 2992508
N: 538823.20
ELEV: 598.95

ID: 401
E: 1731625.57
N: 540342.40
ELEV. 583.04

WATERSHED BOUNDARY

GRAPHIC SCALE
100' 0 100' 200'

THESE DRAWINGS ARE PART OF A SET OF DESIGN DOCUMENTS WHICH ALSO CONTAINS A WRITTEN TEXT. THAT TEXT EXPLAINS SOME OF THE DETAILS SHOWN HEREIN AND THEREFORE THESE DRAWINGS SHOULD ONLY BE USED IN CONJUNCTION WITH THE TEXT.

DATE	REVISIONS	BY

PLAN VIEW

BOTTOM ASH COMPLEX
JOHN AMOS PLANT
PUTNAM COUNTY, WEST VIRGINIA

SCALE: AS SHOWN	DR: RAR	CHK: SMA	REV: RWC

PREPARED FOR:
AEP SERVICE CORPORATION

PREPARED BY:
GAI Geo/Environmental Associates, Inc.
9502 OVERLOOK CIRCLE • KNOXVILLE, TENNESSEE 37909 • (865) 584-0544

PROJ: 05-361 | DATE: 12-21-15 | SHEET 1 OF 2

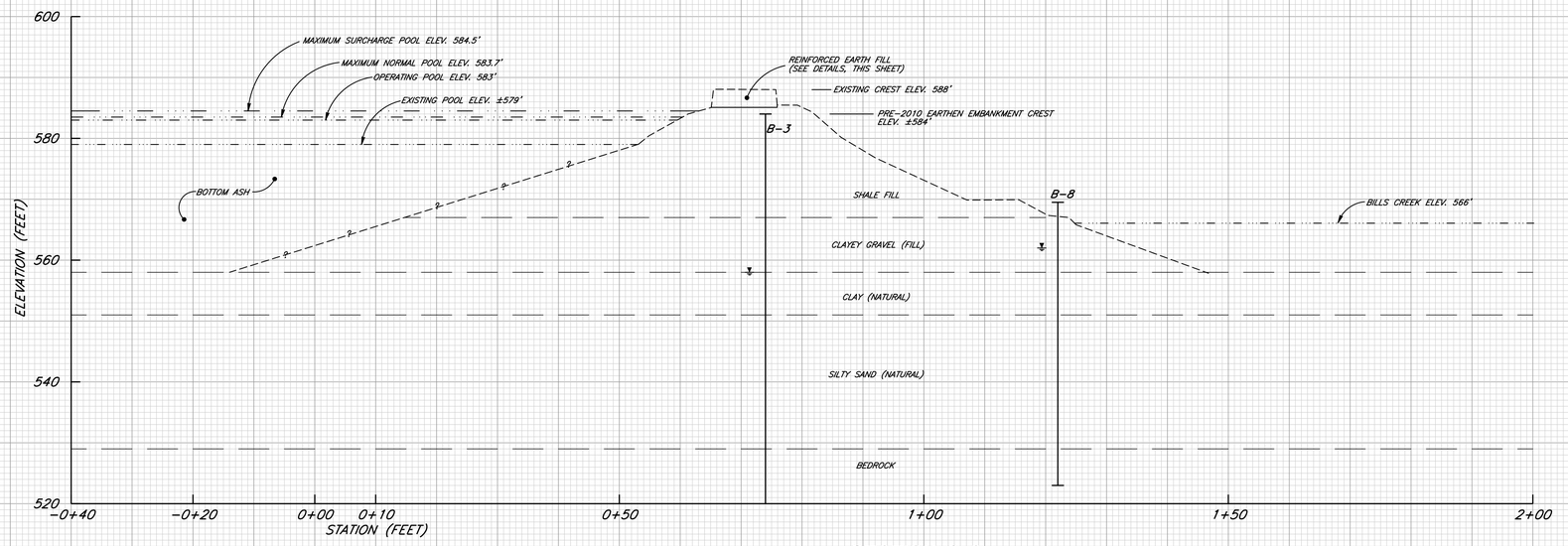
"I, the undersigned, hereby certify that this map is correct and shows, to the best of my knowledge and belief, all the information required by the surface mining laws of the State of West Virginia."

ROGER W. CECIL, R.P.E. No. 14367

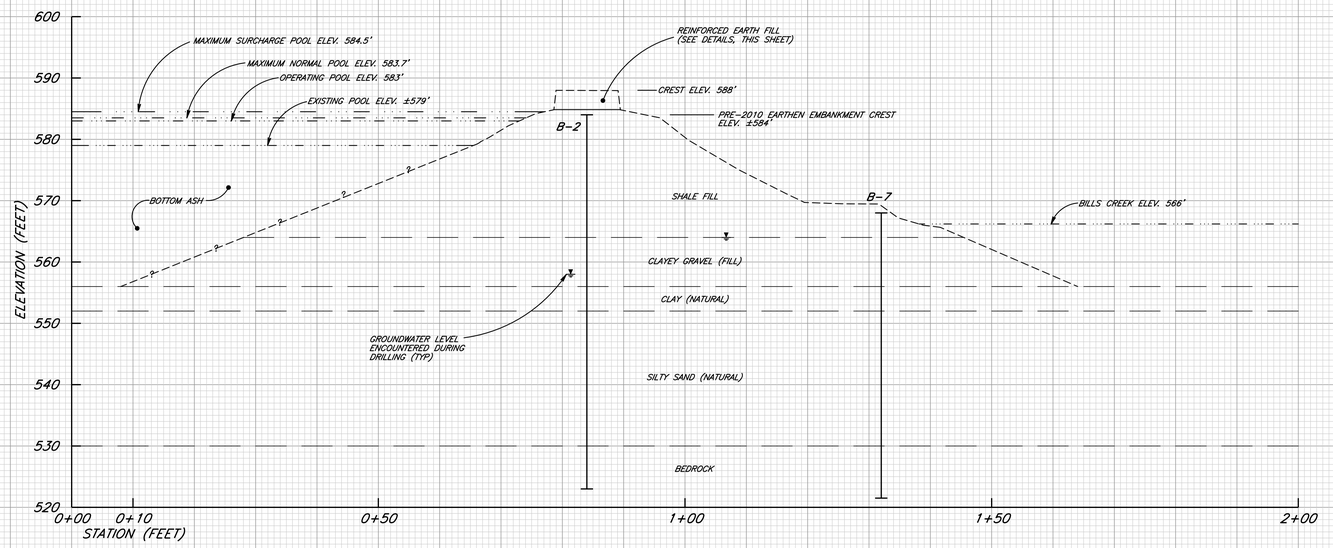
State of Tennessee, County of Knox, taken, subscribed, and sworn to before me this _____ day of _____, _____.

Notary Public

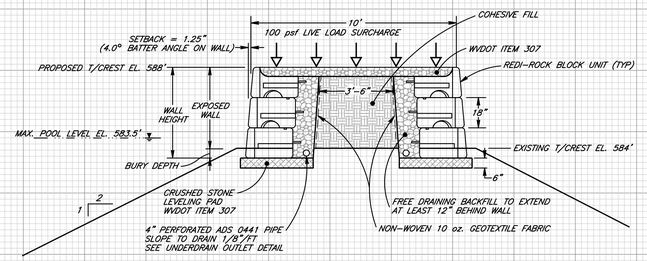
My Commission Expires _____



SECTION C-C



SECTION B-B



NOTE: WALL IS DESIGNED FOR A HEIGHT OF NO MORE THAN (3) BLOCKS. OWNER MUST BE NOTIFIED IF ACTUAL GRADE IS LOWER THAN ANTICIPATED EXISTING GRADE

DETAIL - REINFORCED EARTH FILL TYPICAL SECTION

NOT TO SCALE

(EXCERPT FROM "BOTTOM ASH STORAGE AREA MODIFICATIONS 2010 DIKE RAISING, SECTIONS AND DETAILS" PREPARED BY: AMERICAN ELECTRIC POWER, DATED 2/26/10 REV 6/16/11

NOTES: 1. SEE SHEET 1 OF 2 FOR SECTION LOCATIONS.
2. EXISTING GROUND SURFACE FROM SURVEY DATA DATED 9/9/15 PROVIDED BY AEP.

"I, the undersigned, hereby certify that this map is correct and shows, to the best of my knowledge and belief, all the information required by the surface mining laws of the State of West Virginia."

ROGER W. CECIL, R.P.E. No.: 14367

State of Tennessee, County of Knox, taken, subscribed, and sworn to before me this _____ day of _____, _____.

Notary Public

My Commission Expires _____

THESE DRAWINGS ARE PART OF A SET OF DESIGN DOCUMENTS WHICH ALSO CONTAINS A WRITTEN TEXT. THAT TEXT EXPLAINS SOME OF THE DETAILS SHOWN HEREIN AND THEREFORE THESE DRAWINGS SHOULD ONLY BE USED IN CONJUNCTION WITH THE TEXT.

DATE	REVISIONS	BY

EMBANKMENT SECTIONS AND DETAILS

BOTTOM ASH COMPLEX
JOHN AMOS PLANT
PUTNAM COUNTY, WEST VIRGINIA

SCALE: AS SHOWN	DR RAR	CHK SMA	REV RWC

PREPARED FOR:

AEP SERVICE CORPORATION

PREPARED BY:

GA Geo/Environmental Associates, Inc.
3502 OVERLOOK CIRCLE • KNOXVILLE, TENNESSEE 37909 • (865) 584-0344

PROJ: 15055009	DATE: 12-21-15	SHEET 2 OF 2