GEOTECHNICAL EXPLORATION AND ENGINEERING EVALUATION OF LEVEE SYSTEM

FOR

THE LOWER RIO GRANDE FLOOD CONTROL PROJECT
FROM CAMERON COUNTY LINE OF DONNA PUMP TO BROWNSVILLE
LEVEE REACH TO ITS EASTMOST LIMIT

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Project No. AMA08-115-00
July 24, 2009

Ms. Sharlotte L. Teague, P.E., Deputy Project Manager
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McAllen, Texas 78504

RE: Geotechnical Exploration and Engineering Evaluation of Levee System
Final Technical Memorandum
The Lower Rio Grande Flood Control Project – From Cameron County Line of Donna Pump to Brownsville Levee Reach to its Eastmost Limit
USIBWC Task No. IBM08T0036
S&B Project No. U0450.405

Dear Ms. Teague:

Raba-Kistner Consultants, Inc. (R-K) is pleased to submit our Final Technical Memorandum for the geotechnical explorations and engineering evaluation of the levee system for The Lower Rio Grande Flood Control Project. This memorandum specifically addresses the levee segment from the Cameron County line of Donna Pump to the Brownsville Levee Reach to its Eastmost limit. These services were performed in accordance with the executed Subcontract for Consultant Services between S&B Infrastructure, Ltd. (CLIENT) and **R-K** for the above-referenced indefinite delivery - indefinite quantity contract (IDIQ) with the United States International Boundary and Water Commission (USIBWC). Written notice to proceed was received by our office via facsimile transmittal on October 1, 2008.

The purpose of this study was to drill borings along the existing alignment of the levee, to perform laboratory testing to classify and characterize subsurface conditions, and to prepare a technical memorandum presenting our geotechnical analyses of the levee in general accordance with the U.S. Army Corps of Engineers (USACE) document Engineering Manual (EM) 1110-2-1913 *Design and Construction of Levees* and the Federal Emergency Management Agency (FEMA) *Requirements for Mapping Levees* (44 CFR 65.10) as they pertain to geotechnical evaluations.

We appreciate the opportunity to be of service on this project, and look forward to working with you throughout the remaining phases. If you have any questions, please call.

Very truly yours,

RABA-KISTNER CONSULTANTS, INC.

for Russell L. Thomas, Jr., P.E.
Senior Project Manager

John A. Focht, III, P.E.
Chief Geotechnical Engineer

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Attachments

Copies Submitted: Above (4)

GEOTECHNICAL EXPLORATION AND ENGINEERING EVALUATION OF LEVEE SYSTEM THE LOWER RIO GRANDE FLOOD CONTROL PROJECT FROM CAMERON COUNTY LINE OF DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT CAMERON COUNTY, TEXAS USIBWC TASK NO. IBM08T0036

FINAL TECHNICAL MEMORANDUM

for

U.S. SECTION OF THE INTERNATIONAL BOUNDARY AND WATER COMMISSION (USIBWC)

Prepared for

S&B INFRASTRUCTURE, LTD.
McAllen, Texas

Prepared by

RABA-KISTNER CONSULTANTS, INC.
McAllen, Texas

PROJECT NO. AMA08-115-00
July 24, 2009

EXECUTIVE SUMMARY

The purpose of this study was to drill borings along the existing alignment of the Donna Pump to the Brownsville Levee Reach to the eastern limit of The Lower Rio Grande Flood Control Project levee system, to perform laboratory testing to classify and characterize subsurface conditions, and to prepare a technical memorandum presenting our geotechnical analyses of the levee in general accordance with the U.S. Army Corps of Engineers (USACE) document EM 1110-2-1913 *Design and Construction of Levees* and Federal Emergency Management Agency (FEMA) *Requirements for Mapping Levees* (44 CFR 65.10) as it pertains to geotechnical evaluations and to provide geotechnical engineering design recommendations with engineering solutions for the levee against the provided 100 year flood water surface elevations.

Subsurface conditions along The Lower Rio Grande Flood Control Project were evaluated by drilling 300 borings to a maximum depth of about 50 feet below the existing top of levee using truck-mounted drilling rigs. The borings were advanced using straight flight augers in combination with mud rotary drilling techniques and were backfilled with cement-grout following completion of each day's drilling operations.

The subsurface conditions observed in the borings performed for this study were relatively consistent along the entire length of levee. In general, fill materials associated with the existing levee were observed overlying naturally deposited soils common to the area. These fill soils were observed at thicknesses ranging from about 1 to 18 feet. The vast majority of the fill materials observed in the borings performed for this study consisted of lean clays (CL). The remaining the fill materials were comprised of fat clays (CH), sands (SP and SP-SM), and silts (ML).

Areas where sand and/or silt layers were observed within the existing fill soils are of particular concern. Non-cohesive soils have a much higher hydraulic conductivity than cohesive soils, which will allow water to flow through the earthen levee at higher rates within these non-cohesive layers than through cohesive soil layers. When observed, these sand and silt layers were about 2 to 4 feet in thickness.

Beneath the fill soils, naturally deposited cohesive soils with interbedded layers of sands and silts were observed. The naturally deposited soils vary over the length of the levee project in both depth and thickness. The native soils encountered in the borings conducted for this study were predominately comprised of cohesive soils, consisting of lean clays (CL) and fat clays (CH). Encountered in lesser extend were sandy fat clays and sandy lean clays. The amount of fat clays observed in the naturally deposited soils is significantly higher than that observed in the fill soils, where lean clays predominated. The native non-cohesive soils observed in our borings were predominately silty sands (SM), sands with silt (SP-SM), clayey sands (SC), sands (SP), sandy silts (ML), silts (ML), and clayey silts (ML).

A detailed description of the soil conditions observed at each boring location has been presented in the Boring Logs, Figures A-2 through A-301, of Appendix A. The lines designating the interfaces between strata on the boring logs represent approximate boundaries. Transitions between strata may be gradual.

The existing and modified levees should meet three important criteria: they should be resistant to the forces of erosion, should exhibit a suitable allowable factor of safety with respect to slope stability, and have an acceptable factor of safety against instability due to through- or under-seepage. The levee structure must meet these criteria so that the calculated risk of failure is consistent with criteria established by the USACE guidelines.

Portions of the existing levee will be raised and side slopes reconstructed to a 3:1 slope or flatter. If silts are observed on the river side of the levee, the silts should either be partially replaced with properly compacted clay fill sols or plated with at least 3 feet of properly compacted fill soils.

Underseepage is a major concern for a significant portion of the alignment. Based on the conditions observed in the soil borings drilled for this project, it appears that about one-eighth of the levee alignment may be at risk for this failure mode. After reviewing the soil profiles in the project borings along with the existing and proposed levee cross-sections, it appears that land side toe drains will provide adequate seepage control. This approach will result in a significant cost savings when compared to a full penetration cutoff wall or relief wells. A typical toe drain detail is presented on Figure 11 of the Appendix C.

This Executive Summary is intended for information purposes only, and should not be utilized separately from the entire Final Technical Memorandum. The following technical memorandum contains a more definitive explanation of the study performed and the results of our field and laboratory tests. In addition, the technical memorandum contains a greater discussion on failure mechanisms, the methods and results of our analyses, and our design considerations.

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INTRODUCTION

Raba-Kistner Consultants, Inc., (R-K), has completed the authorized subsurface exploration and engineering analyses for the proposed rehabilitation improvements to the Donna Pump to Brownsville Levee Reach of the Lower Rio Grande Flood Control Project (LRGFCP) of the U.S. Section of the International Boundary and Water Commission (USIBWC) in Cameron County, Texas. This technical memorandum briefly describes the procedures utilized during this study and presents our findings along with our geotechnical analyses of the levee, which was performed in general accordance with the USACE document EM 1110-2-1913 *Design and Construction of Levees* and FEMA *Requirements for Mapping Levees* (44 CFR 65.10) as it pertains to geotechnical evaluations.

PROJECT BACKGROUND

We understand that the USIBWC has recently conducted studies to assess the ability of the United States levees of the LRGFCP to safely contain flood flows in the Rio Grande. The LRGFCP extends from the Town of Peñitas, Texas, at its upstream end, to 28 miles above the Gulf of Mexico, a distance of about 158 river miles. The LRGFCP has two diversion dams, Anzalduas Dam and Retamal Dam, approximately 17 and 57 river miles below Peñitas, which divert portions of the flood flows into the Main Floodway and the Mexican Floodway, respectively. The LRGFCP was constructed to provide flood protection to urban, suburban, and irrigated lands in the Rio Grande delta in both the United States and Mexico. Each country designed and constructed the portion of the project located in its territory.

PROJECT DESCRIPTION

One of the reaches of the LRGFCP levees that was found to be in need of rehabilitation improvements was that labeled as the Donna Pump to Brownsville Levee System. The Donna Pump to Brownsville levee reach is approximately 64.5 miles, with 48.5 miles located within Cameron County and 16 miles located within Hidalgo County, Texas. This study pertains to the entire Cameron County portion of the Donna Pump to Brownsville levee reach, as well as a small portion (approximately 2.5 miles) of the Hidalgo County portion, just west of the Cameron County line, for a total 51 miles.

The USIBWC studies indicate that the existing levee in this reach is deficient in height from 1 to 3 feet. The proposed rehabilitation improvements consist of raising the top of levee elevation by the addition of earthen fill. The top elevation of these improvements will be as required to provide containment of design flood flows with a freeboard of 3 feet.

The scope of our study for the proposed rehabilitation improvements consists of performing a geotechnical investigation for the design of the proposed improvements along the existing levee alignment, including slope stability, levee settlement, slope stability evaluations, and seepage analyses.

RISK

The geotechnical engineering design recommendations contained in this memorandum are intended to provide S&B Infrastructure, Inc. and the U.S. Boundary and Water Commission with

design information. We have attempted to provide guidance regarding the impact of various design choices on calculated factors of safety with respect to calculated slope stability. The design factors of safety used for this study were taken from USACE EM 1110-2-1913 dated April 30, 2000. The selection of a given design factor of safety implicitly includes a decision regarding the level of acceptable risk for a project. This study did not include an independent evaluation of risk with respect to levee performance, and adopted the published USACE design factors of safety as the current performance standards for these types of structures. Levees are only designed to provide protection to a certain flood level; **R-K** did not determine the chosen design flood level, and the selection of this parameter is outside our area of expertise. We understand that USIBWC used the computer program FLO-2D to evaluate the water surface profile for the 100-year design flood in accordance with the current FEMA Levee Certification criteria. Furthermore, for the purposes of this memorandum, it has been assumed that the maximum time that the levee would be subjected to the design flood level is 7 days.

It is important to note that the levee systems are being designed to perform a required function (retain flood waters) under stated conditions (during a 100-year flood event) for a specified period of time (presently unknown.) The design may not be adequate for a different storm event or longer performance period, and unexpected damage to the levees may result in the need for repairs to the levee and/or levee improvements over time. Our conceptual design recommendations inherently assume that the levee will be properly maintained and regularly inspected by trained and qualified personnel. Our conceptual design recommendations also assume that any identified repairs will be made promptly, and the adequacy of the levee system will be regularly assessed, fully taking into account changes in weather, land use and evolving design and performance standards, with changes made as appropriate.

The geotechnical properties of the soils encountered in this study involve significant variability. This variability includes some spatial variability; however, the spatial variability appears to occur over relatively short distances. It is important to note that levees differ from other types of structures, such as drilled piers or driven piles, in that the performance of the levee involves local, not average, soil conditions.[1] The selection of design parameters for this project was based on a review of the available geotechnical data, our knowledge of the project area, design calculations using idealized geometries. The results of our analyses were then reviewed with respect to important trends and general design concepts, keeping these conditions and limitations in mind. Our conceptual recommendations are based on a conservative approach to design as is warranted for all levee structures. We believe that the combination of observed conditions and probable failure modes justifies this approach.

LIMITATIONS

This Final Technical Memorandum has been prepared in accordance with accepted Geotechnical Engineering practices in the region of South Texas for the use of S&B Infrastructure, Ltd. (CLIENT) and its representatives for design purposes. This memorandum may not contain sufficient information for purposes of other parties or other uses.

The recommendations submitted in this memorandum are based on the data obtained from 300 borings drilled along the alignment, our understanding of the project information provided to us,

[1] Focht, J.A. Jr. and Focht, J.A. III, "Factor of Safety and Reliability in Geotechnical Engineering, Discussion and Closure", ASCE JGGE Vol. 127 No. 8, pp.700-721, August 2001.

and the assumptions with regard to water elevations and durations that are discussed in greater detail in the following memorandum. If the project information described in this memorandum is incorrect, is altered, or if new information is available, we should be retained to review and modify our recommendations.

This memorandum may not reflect the actual variations of the subsurface conditions across the site. This is particularly true with regard to existing groundwater levels that are likely to be highly variable based on precipitation events and the percent of sands versus fine grained materials. The nature and extent of variations along the levee may not become evident until construction commences. The construction process itself may also alter subsurface conditions. If variations appear evident at the time of construction, it may be necessary to reevaluate our recommendations after performing on-site observations and tests to establish the engineering impact of the variations.

The scope of our current study does not include an environmental assessment of the air, soil, rock, or water conditions either on or adjacent to the site. No environmental opinions are presented in this memorandum.

If final added heights along the levee are significantly different from those provided by S&B Infrastructure (more than plus or minus 12-inches), our office should be informed about these changes. If needed and/or if desired, we will reexamine our analyses and make supplemental recommendations.

FIELD EXPLORATION

Subsurface conditions along the subject site were evaluated by 300 borings (designated as "DP-") drilled from October 14, 2008 through December 19, 2008, and January 15, 2009 through January 23, 2009, at the locations shown on the Boring Location Map, Figure A-1. Please note that drilling operations for the majority of the borings were terminated on December 19, 2008, and restarted when approval for the remaining borings was received by our office on Tuesday, January 13, 2009.

The boring locations shown on the Boring Location Map are approximate and are based on our review of an undated site plan titled "Lower Rio Grande Flood Control Project Donna Pump to Brownsville Levee", provided to us by the CLIENT via electronic-mail attachments on October 8, 2008, November 13, 2008, and January 14, 2009. The borings were drilled to a depth of about 50 feet each below the existing top of levee using truck-mounted drill rigs, with the borings located near the centerline of the levee cross-section to a depth equal to twice the expected final levee height. This depth of exploration is consistent with the USACE EM 1110-2-1913 *Design and Construction of Levees.* The borings were advanced using straight flight augers in combination with mud rotary drilling techniques and were backfilled with cement-grout following completion of each day's drilling operations. During drilling operations, the samples shown on the following table were collected:

Type of Sample	Number Collected
Split-Spoon (with Standard Penetration Test, SPT)	1881
Shelby Tubes	2006
Grab Samples	15
Bulk Samples for Proctor	24

The SPT and Shelby tube samples were performed in accordance with accepted standard practices. Selected portions of the samples were sealed in containers to reduce moisture loss, labeled, packaged, and transported to our laboratory for subsequent testing and classification.

LABORATORY TESTING

In the laboratory, each sample was evaluated and visually classified by a member of our Geotechnical Engineering staff in general accordance with the Unified Soil Classification System (USCS). The geotechnical engineering properties of the strata were evaluated by the laboratory tests tabulated in the following table:

Type of Test	Number Complete
Pocket Penetrometer	1688
Natural Moisture Content	2064
Atterberg Limits	1222
Percent Passing a No. 200 Sieve	1203
Grain Size Curves (Particle Size, Part I)	630
Hydrometer (Particle Size, Part II)	53
Specific Gravity	18
Unconfined Compressive Strength	71
Dry Unit Weight	344
Consolidated-Undrained (CU) Triaxial	42
Consolidated-Drained (CD) Triaxial	13
Direct Shear (DS)	31
One-Dimensional Consolidation	41
Hydraulic Conductivity (Permeability)	40
Moisture-Density Relationship (Proctor)	24
Crumb Tests	57

With the exception of the laboratory grain size curves (particle size, Part I), hydrometer (particle size, Part II) tests, specific gravities, hydraulic conductivity (permeability) tests, direct shear tests, one-dimensional consolidation tests, CU triaxial tests, CD triaxial tests, moisture-density relationship (Proctor) tests, and crumb tests, the results of the field and laboratory tests are presented in graphical or numerical form on the boring logs illustrated on Figures A-2 through

A-301. A key to the classification of terms and symbols used on the logs is presented on Figure A-302. The results of the laboratory and field testing are also tabulated on Figures A-303a through A-303wwww for ease of reference.

SPT results are noted as "blows per feet" on the boring logs and on Figures A-303a through A-303wwww, where "blows per foot" refers to the number of blows required for a falling 140-pound hammer to penetrate 12 inches into the subsurface materials. Where hard and/or very dense materials were encountered, the tests were terminated at 50 blows even if one foot of penetration had not been achieved.

Samples will be retained in our laboratory for 30 days after submittal of this memorandum. Other arrangements may be provided at the written request of the CLIENT.

STRENGTH TESTS

Shear strength parameters of selected samples were evaluated by several methods. Field tests for measuring these parameters included pocket penetrometer, hand-held Torvane, and standard penetration testing. Laboratory tests for measuring these parameters included unconfined compression, multi-stage consolidated undrained (CU) triaxial compression with pore pressure measurements, multi-stage consolidated drained (CD) triaxial compression, and single-stage direct shear (DS).

Results of the field tests as well as the unconfined compression tests are presented in both graphical and numerical form in both Appendix A (on the boring logs and the Results of Soil Sample Analyses) and Appendix B (where the stress-strain behavior of each unconfined compression test is presented). Results of the laboratory strength tests are presented in the following tables. Detailed summary sheets are presented both graphically and numerically in Appendix B for each test.

Multi-stage CU tests were used to determine both total and effective soil strength parameters. During CU testing, each stage was subjected to an effective consolidation pressure of about 1, 2, and 3 times the in-situ confining stress. When combined with the consolidation test results (discussed below) a SHANSEP-type data reduction was performed to determine appropriate soil strength parameters for modeling the planned slope improvements for this study.

The following table presents the results of our multi-stage CU tests.

Multi-Stage CU Test Results

Boring No.	Depth* feet	Principle Stress Difference ksf	Axial Strain %	Effective		Total		Effective Consolidation Pressure ksf
				Friction Angle, ϕ' deg	Cohesion, c' ksf	Friction Angle, ϕ deg	Cohesion, c ksf	
DP-8	8	1.6757	5.7	20.9	0.46	14.2	0.51	0.74
DP-8	8	2.2659	4.7	20.9	0.46	14.2	0.51	1.47
DP-8	8	4.4595	13.1	20.9	0.46	14.2	0.51	2.84
DP-10	15	3.1633	7.1	27.9	0.40	22.5	0.25	1.98
DP-10	15	5.6702	7.6	27.9	0.40	22.5	0.25	4.02

Multi-Stage CU Test Results

Boring No.	Depth* feet	Principle Stress Difference ksf	Axial Strain %	Effective		Total		Effective Consolidation Pressure ksf
				Friction Angle, ϕ' deg	Cohesion, c' ksf	Friction Angle, ϕ deg	Cohesion, c ksf	
DP-10	15	12.1082	6.2	27.9	0.40	22.5	0.25	6.62
DP-34	8	3.2784	7.0	23.4	0.55	18.5	0.80	1.13
DP-34	8	4.2583	7.6	23.4	0.55	18.5	0.80	2.31
DP-34	8	7.1146	10.2	23.4	0.55	18.5	0.80	3.53
DP-42	10	2.7636	7.0	25.0	0.44	18.0	0.70	1.37
DP-42	10	4.4239	8.0	25.0	0.44	18.0	0.70	2.80
DP-42	10	8.1883	8.7	25.0	0.44	18.0	0.70	4.21
DP-51	4	2.2713	6.0	25.5	0.40	24.0	0.35	0.81
DP-51	4	2.9543	5.5	25.5	0.40	24.0	0.35	1.56
DP-51	4	7.0769	11.0	25.5	0.40	24.0	0.35	2.88
DP-66	15	4.3985	7.0	20.1	0.91	13.0	1.20	2.18
DP-66	15	5.1997	7.6	20.1	0.91	13.0	1.20	3.96
DP-66	15	7.3290	5.7	20.1	0.91	13.0	1.20	5.16
DP-72	6	7.9693	7.0	30.6	0.64	27.0	1.85	1.09
DP-72	6	8.2095	0.4	30.6	0.64	27.0	1.85	2.03
DP-72	6	12.1501	7.0	30.6	0.64	27.0	1.85	2.85
DP-75	6	3.4443	7.0	24.6	0.32	20.0	0.60	1.40
DP-75	6	3.7945	7.6	24.6	0.32	20.0	0.60	2.02
DP-75	6	5.9254	10.8	24.6	0.32	20.0	0.60	2.95
DP-81	2	1.8275	5.9	26.0	0.35	24.0	0.11	0.80
DP-81	2	1.7564	6.3	26.0	0.35	24.0	0.11	1.48
DP-81	2	6.0599	14.8	26.0	0.35	24.0	0.11	2.93
DP-83	2	4.6600	7.0	15.7	1.27	10.3	1.54	2.04
DP-83	2	5.3406	7.6	15.7	1.27	10.3	1.54	3.82
DP-83	2	7.5169	11.8	15.7	1.27	10.3	1.54	5.82
DP-89	35	3.9224	7.0	7.0	1.53	3.9	1.58	1.98
DP-89	35	4.1908	1.3	7.0	1.53	3.9	1.58	5.21
DP-89	35	6.9142	6.6	7.0	1.53	3.9	1.58	7.64
DP-91	15	3.8327	7.0	19.7	0.70	13.0	0.90	2.04
DP-91	15	4.5926	7.6	19.7	0.70	13.0	0.90	4.02
DP-91	15	7.9210	5.5	19.7	0.70	13.0	0.90	6.04
DP-92	15	5.6096	7.0	24.0	0.90	20.0	1.23	2.03
DP-92	15	7.1776	7.6	24.0	0.90	20.0	1.23	4.05
DP-92	15	11.6716	11.5	24.0	0.90	20.0	1.23	5.66
DP-103	8	4.0448	7.0	25.0	0.40	17.0	0.80	1.28
DP-103	8	4.2357	7.6	25.0	0.40	17.0	0.80	2.49
DP-103	8	6.4351	11.5	25.0	0.40	17.0	0.80	3.60
DP-108	15	3.4142	7.3	19.8	0.69	14.8	0.76	2.10
DP-108	15	5.4127	7.7	19.8	0.69	14.8	0.76	4.48

Multi-Stage CU Test Results

Boring No.	Depth* feet	Principle Stress Difference ksf	Axial Strain %	Effective		Total		Effective Consolidation Pressure ksf
				Friction Angle, ϕ' deg	Cohesion, c' ksf	Friction Angle, ϕ deg	Cohesion, c ksf	
DP-108	15	9.2824	12.1	19.8	0.69	14.8	0.76	6.48
DP-113	30	2.9081	8.9	23.3	0.11	12.0	0.50	2.76
DP-113	30	3.9994	7.7	23.3	0.11	12.0	0.50	5.22
DP-113	30	7.5598	7.5	23.3	0.11	12.0	0.50	7.57
DP-126	15	5.4743	7.0	21.8	1.00	12.8	1.60	2.57
DP-126	15	7.3643	7.8	21.8	1.00	12.8	1.60	5.11
DP-126	15	10.7988	4.5	21.8	1.00	12.8	1.60	7.70
DP-128	30	3.8851	7.1	23.0	0.70	12.5	1.10	3.36
DP-128	30	4.1822	10.9	23.0	0.70	12.5	1.10	2.71
DP-128	30	7.0961	4.2	23.0	0.70	12.5	1.10	5.38
DP-144	25	4.5992	7.4	26.8	0.60	22.2	0.15	3.36
DP-144	25	9.8939	7.6	26.8	0.60	22.2	0.15	8.25
DP-144	25	19.0305	11.8	26.8	0.60	22.2	0.15	10.54
DP-152	40	4.2276	5.2	21.5	0.96	13.7	1.15	2.17
DP-152	40	6.0987	6.1	21.5	0.96	13.7	1.15	4.31
DP-152	40	12.0311	4.2	21.5	0.96	13.7	1.15	8.83
DP-156	30	3.5919	7.0	20.5	0.65	13.5	0.80	2.62
DP-156	30	5.0606	8.0	20.5	0.65	13.5	0.80	5.43
DP-156	30	10.2558	5.2	20.5	0.65	13.5	0.80	8.18
DP-161	6	4.0141	7.0	27.1	0.43	30.5	0.30	1.43
DP-161	6	4.8492	7.6	27.1	0.43	30.5	0.30	1.91
DP-161	6	9.0241	11.0	27.1	0.43	30.5	0.30	2.93
DP-171	15	4.1153	7.0	23.2	0.73	17.7	0.80	2.15
DP-171	15	5.8242	7.6	23.2	0.73	17.7	0.80	4.35
DP-171	15	10.8030	11.2	23.2	0.73	17.7	0.80	6.47
DP-178	20	3.5777	7.0	32.1	0.25	19.0	0.45	2.34
DP-178	20	6.4932	10.8	32.1	0.25	19.0	0.45	5.36
DP-178	20	16.6907	5.1	32.1	0.25	19.0	0.45	8.01
DP-182	4	3.8771	7.1	30.6	0.29	28.0	0.10	1.98
DP-182	4	6.7640	8.0	30.6	0.29	28.0	0.10	3.76
DP-182	4	14.5585	12.3	30.6	0.29	28.0	0.10	6.14
DP-187	15	3.9403	7.0	18.1	0.93	11.0	1.20	1.94
DP-187	15	5.1511	7.8	18.1	0.93	11.0	1.20	4.60
DP-187	15	8.6854	8.5	18.1	0.93	11.0	1.20	6.01
DP-195	30	2.3615	7.1	22.4	0.50	12.7	0.32	2.74
DP-195	30	3.7568	7.6	22.4	0.50	12.7	0.32	5.82
DP-195	30	9.1262	6.1	22.4	0.50	12.7	0.32	9.56
DP-198	20	4.5959	7.1	26.0	0.70	20.0	0.65	2.67
DP-198	20	7.3704	7.6	26.0	0.70	20.0	0.65	5.30

Multi-Stage CU Test Results

Boring No.	Depth* feet	Principle Stress Difference ksf	Axial Strain %	Effective		Total		Effective Consolidation Pressure ksf
				Friction Angle, ϕ' deg	Cohesion, c' ksf	Friction Angle, ϕ deg	Cohesion, c ksf	
DP-198	20	13.5152	7.1	26.0	0.70	20.0	0.65	7.90
DP-202	30	3.2708	7.1	12.7	0.93	7.5	1.10	2.54
DP-202	30	3.9836	7.7	12.7	0.93	7.5	1.10	5.27
DP-202	30	8.2075	12.2	12.7	0.93	7.5	1.10	8.05
DP-215	20	2.1936	5.7	30.0	0.25	20.5	0.25	1.28
DP-215	20	3.2518	6.1	30.0	0.25	20.5	0.25	2.53
DP-215	20	8.2969	12.4	30.0	0.25	20.5	0.25	5.15
DP-218	40	4.8103	7.1	22.0	0.59	14.2	0.45	3.35
DP-218	40	6.3146	7.6	22.0	0.59	14.2	0.45	7.90
DP-218	40	12.0712	6.8	22.0	0.59	14.2	0.45	11.73
DP-221	40	4.8533	7.0	27.5	0.40	21.0	0.13	3.89
DP-221	40	9.2930	7.6	27.5	0.40	21.0	0.13	7.98
DP-221	40	19.5810	8.5	27.5	0.40	21.0	0.13	11.97
DP-227	8	6.1887	7.0	22.0	0.98	14.0	1.80	2.58
DP-227	8	8.0135	7.6	22.0	0.98	14.0	1.80	5.25
DP-227	8	12.1376	10.8	22.0	0.98	14.0	1.80	7.66
DP-229	30	3.7814	7.0	16.0	1.02	15.0	0.60	2.50
DP-229	30	4.6853	7.6	16.0	1.02	15.0	0.60	4.70
DP-229	30	9.9966	11.8	16.0	1.02	15.0	0.60	7.20
DP-233	15	6.5722	7.0	22.0	0.83	18.0	1.30	2.76
DP-233	15	7.2494	7.6	22.0	0.83	18.0	1.30	4.22
DP-233	15	11.4984	9.7	22.0	0.83	18.0	1.30	6.24
DP-234	40	4.2867	7.0	22.0	0.63	17.0	0.61	2.64
DP-234	40	5.9259	7.6	22.0	0.63	17.0	0.61	5.12
DP-234	40	11.0639	7.1	22.0	0.63	17.0	0.61	7.78
DP-242	6	5.1908	7.0	14.2	1.41	7.0	1.99	2.68
DP-242	6	5.9166	7.6	14.2	1.41	7.0	1.99	5.23
DP-242	6	8.5867	11.0	14.2	1.41	7.0	1.99	7.43
DP-243	6	2.7539	7.0	12.1	0.71	5.2	1.07	1.98
DP-243	6	3.1003	7.6	12.1	0.71	5.2	1.07	3.82
DP-244	40	0.0000	0.0	21.5	0.35	7.0	0.85	0.00
DP-244	40	3.1175	7.1	21.5	0.35	7.0	0.85	4.97
DP-244	40	6.0546	5.1	21.5	0.35	7.0	0.85	7.71
DP-252	15	8.1384	7.0	31.5	0.42	27.0	1.40	2.18
DP-252	15	11.4970	7.6	31.5	0.42	27.0	1.40	4.26
DP-252	15	18.2401	8.8	31.5	0.42	27.0	1.40	6.30
DP-280	15	1.8957	5.7	27.0	0.34	21.0	0.24	1.45
DP-280	15	3.6563	4.9	27.0	0.34	21.0	0.24	2.25
DP-280	15	7.6182	12.1	27.0	0.34	21.0	0.24	4.31

Multi-Stage CU Test Results

Boring No.	Depth* feet	Principle Stress Difference ksf	Axial Strain %	Effective		Total		Effective Consolidation Pressure ksf
				Friction Angle, ϕ' deg	Cohesion, c' ksf	Friction Angle, ϕ deg	Cohesion, c ksf	
DP-292	10	3.6782	7.0	26.5	0.50	20.0	0.68	1.71
DP-292	10	6.0851	7.9	26.5	0.50	20.0	0.68	3.75

*Depth below the top of levee surface elevation existing at the time of our field study.

Multi-stage CD tests were used to determine total soil strength parameters. During CD testing, each stage was subjected to an effective consolidation pressure of about 1, 2, and 3 times the in-situ confining stress. The results of the multi-stage CD tests presented graphically and numerically in Appendix B, are also summarized in the table below.

Multi-Stage CD Test Results

Boring No.	Depth* feet	Principle Stress Difference ksf	Axial Strain %	Total		Effective Consolidation Pressure ksf
				Friction Angle, ϕ deg	Cohesion, c ksf	
DP-19	4	2.30	5.7	16.0	0.70	0.71
DP-19	4	2.24	6.0	16.0	0.70	1.46
DP-19	4	6.47	12.3	16.0	0.70	2.85
DP-34	4	0.75	6.3	19.8	0.00	0.71
DP-34	4	1.52	6.7	19.8	0.00	1.43
DP-34	4	5.15	14.0	19.8	0.00	2.87
DP-99	8	3.84	6.0	20.3	1.04	0.72
DP-99	8	3.94	6.3	20.3	1.04	1.46
DP-99	8	8.27	10.7	20.3	1.04	2.86
DP-100	8	3.82	5.0	24.0	0.90	0.71
DP-100	8	5.35	6.2	24.0	0.90	1.47
DP-100	8	8.94	10.4	24.0	0.90	2.89
DP-130	20	3.52	5.8	21.0	0.70	1.31
DP-130	20	5.61	5.3	21.0	0.70	2.88
DP-130	20	12.94	6.7	21.0	0.70	5.75
DP-137	15	3.15	5.2	19.0	0.72	1.17
DP-137	15	4.30	6.3	19.0	0.72	2.32
DP-137	15	8.46	16.7	19.0	0.72	3.88
DP-148	40	4.54	7.0	11.9	1.39	2.14
DP-148	40	5.35	7.8	11.9	1.39	4.32
DP-148	40	14.66	6.9	11.9	1.39	8.62
DP-189	20	2.91	6.0	29.0	0.23	1.33
DP-189	20	4.80	6.4	29.0	0.23	2.62
DP-189	20	13.60	16.5	29.0	0.23	5.23
DP-190	15	3.56	5.8	28.0	0.48	1.07

Multi-Stage CD Test Results

Boring No.	Depth* feet	Principle Stress Difference ksf	Axial Strain %	Total		Effective Consolidation Pressure ksf
				Friction Angle, ϕ deg	Cohesion, c ksf	
DP-190	15	6.22	4.9	28.0	0.48	2.15
DP-190	15	12.57	10.6	28.0	0.48	4.32
DP-199	20	3.66	6.0	27.0	0.45	1.28
DP-199	20	6.00	5.3	27.0	0.45	2.62
DP-199	20	13.93	11.5	27.0	0.45	5.14
DP-238	40	5.11	6.0	24.2	0.68	2.15
DP-238	40	8.83	7.6	24.2	0.68	4.35
DP-238	40	21.63	12.8	24.2	0.68	8.62
DP-249	30	3.47	5.7	11.5	1.05	1.83
DP-249	30	4.85	6.0	11.5	1.05	3.58
DP-249	30	11.84	15.8	11.5	1.05	7.29
DP-269	30	3.22	5.8	25.0	0.30	1.74
DP-269	30	5.90	6.1	25.0	0.30	3.69
DP-269	30	16.58	9.3	25.0	0.30	7.13

*Depth below the top of levee surface elevation existing at the time of our field study.

Direct shear tests have been completed on selected samples. These samples were subjected to various normal loads and sheared at a rate of 0.007 inches per minute. The results of the direct shear tests presented graphically and numerically in Appendix B, are also summarized in the table below.

Direct Shear Test Results

Boring No.	Depth* feet	Normal Stress psi	Max Shear Stress ksf	Cohesion Ksf	Friction Angle, ϕ deg	Visual Classification
DP-20	15	14.4	2.46	0	50.0	Silty Clay
DP-46	10	10.1	1.73	0	49.9	Silty Clay
DP-60	30	29.0	3.12	0	36.8	Silty Sand
DP-66	35	32.1	3.27	0	35.3	Clayey Sand
DP-71	8	8.3	1.30	0	47.2	Silty Sand
DP-80	10	8.3	0.81	0	33.8	Clayey Sand
DP-104	25	22.0	2.56	0	38.9	Clayey Sand
DP-120	20	19.4	2.43	0	41.0	Clayey Silt
DP-124	25	23.4	2.20	0	33.2	Silty Sand
DP-151	35	31.5	2.26	0	26.4	Silty Clay
DP-156	8	8.5	1.32	0	47.3	Silty Clay
DP-159	25	23.1	2.28	0	34.4	Clayey Sand
DP-169	8	12.6	2.35	0	52.3	Clayey Silt
DP-173	20	18.6	2.07	0	37.8	Silty Clay

Direct Shear Test Results

Boring No.	Depth* feet	Normal Stress psi	Max Shear Stress ksf	Cohesion Ksf	Friction Angle, ϕ deg	Visual Classification
DP-179	15	12.0	1.17	0	34.0	Clayey Sand
DP-181	16	14.7	1.37	0	32.8	Silty Clay
DP-189	10	10.0	1.68	0	49.4	Silty Clay
DP-190	10	10.0	1.24	0	40.7	Clayey Silt
DP-195	35	31.2	1.71	0	20.9	Silty Clay
DP-197	10	8.3	1.32	0	48.0	Silty Clay
DP-220	20	18.0	1.35	0	27.6	Silty Clay
DP-228	10	10.5	1.60	0	46.7	Clayey Silt
DP-229	25	23.7	2.28	0	33.8	Clayey Sand
DP-236	25	25.0	3.34	0	42.8	Clayey Silt
DP-239	40	40.5	4.42	0	37.1	Clayey Silt
DP-242	40	36.7	3.34	0	32.4	Silty Clay
DP-243	25	23.1	2.55	0	37.4	Silty Sand
DP-248	20	16.9	1.89	0	37.9	Clayey Silt
DP-250	25	18.6	1.73	0	32.8	Clayey Silt
DP-265	30	25.2	1.64	0	24.3	Silty Clay
DP-268	40	39.6	3.93	0	34.5	Clayey Sand

*Depth below the top of levee surface elevation existing at the time of our field study.

CONSOLIDATION TESTS

One-dimensional incremental consolidation tests were performed on selected samples to define the compressibility characteristics of both the existing fill soils and the bearing soils along the planned levee alignment. Results of the consolidation tests were also used to develop the SHANSEP parameters used in our stability analyses. Results of the consolidation tests are presented graphically and numerically in Appendix B and are also summarized in the following table.

Consolidation Test Results

Boring No.	Depth* feet	Initial γ_{dry} pcf	Initial γ_{total} pcf	P_o ksf	P_c ksf	OCR	$C_{c\varepsilon}$	$C_{r\varepsilon}$	Liquid Limit
DP-1	2	100.7	115.6	0.2	2.0	8.7	0.113	0.026	51
DP-9	6	93.1	119.6	0.7	1.6	2.2	0.108	0.012	47
DP-17	2	106.0	125.1	0.3			0.076	0.017	
DP-23	2	98.3	123.5	0.2	4.4	17.8	0.129	0.019	
DP-27	8	99.1	119.0	1.0			0.043	0.007	
DP-33	4	110.0	132.0	0.5	5.0	9.5	0.068		
DP-40	5	107.7	127.4	0.6	6.0	9.4	0.077	0.021	
DP-47	20	94.4	121.3	2.4	3.2	1.3	0.098	0.030	
DP-52	8	94.6	116.4	0.9	3.6	3.9	0.142	0.023	59
DP-62	1	105.3	125.9	0.1	4.0	31.8	0.060	0.018	

Consolidation Test Results

Boring No.	Depth* feet	Initial γ_{dry} pcf	Initial γ_{total} pcf	P_o ksf	P_c ksf	OCR	C_{ce}	C_{re}	Liquid Limit
DP-65	8	95.6	121.8	1.0	4.0	4.1	0.124	0.028	
DP-73	4	96.7	113.6	0.5	4.0	8.8	0.064	0.011	38
DP-81	8	97.6	116.1	0.9	4.0	4.3	0.112	0.007	37
DP-85	6	93.9	119.1	0.7	5.0	7.0	0.105	0.028	
DP-89	8	106.0	126.5	1.0	3.0	3.0	0.050	0.006	
DP-93	6	93.7	119.9	0.7	5.5	7.6	0.110	0.009	
DP-102	6	109.7	128.8	0.8	3.5	4.5	0.069	0.020	51
DP-107	2	100.9	125.3	0.3	4.0	16.0	0.076		
DP-115	8	103.4	123.5	1.0	4.2	4.3	0.115	0.022	40
DP-116	8	111.7	128.4	1.0	3.4	3.3	0.049	0.013	
DP-118	10	101.2	115.3	1.2	3.0	2.6	0.057	0.010	
DP-123	4	102.2	124.3	0.5	4.4	8.8	0.085	0.020	44
DP-128	6	104.4	122.3	0.7	3.3	4.5	0.088	0.033	
DP-141	4	105.5	126.8	0.5	4.2	8.3	0.063	0.023	
DP-152	6	108.4	125.0	0.8	3.0	4.0	0.062	0.011	35
DP-156	4	105.0	124.4	0.5	4.2	8.4	0.051	0.013	
DP-159	4	104.9	124.2	0.5	3.3	6.6	0.071	0.019	
DP-167	4	101.6	123.7	0.5	4.4	8.9	0.060	0.011	40
DP-170	2	101.6	125.6	0.3	7.0	27.9	0.077		
DP-175	6	103.1	127.9	0.8	6.0	7.8	0.072		
DP-181	2	101.5	124.4	0.2	5.2	20.9	0.086	0.021	
DP-187	10	99.2	122.1	1.2	4.0	3.3	0.114	0.018	48
DP-197	4	99.0	123.3	0.5	5.0	10.1	0.081	0.016	55
DP-204	10	91.4	117.7	1.2			0.118	0.015	
DP-215	8	105.6	127.6	1.0	3.0	2.9	0.078	0.013	41
DP-218	4	106.5	124.9	0.5	4.1	8.2	0.070	0.023	53
DP-221	8	88.1	117.2	0.9	4.4	4.7	0.233	0.040	76
DP-225	10	109.9	129.1	1.3	3.0	2.3	0.071	0.008	50
DP-231	4	104.1	116.7	0.5	2.0	4.3	0.080	0.008	
DP-244	10	97.1	122.2	1.2			0.129	0.021	
DP-270	10	90.5	118.3	1.2	1.8	1.5	0.102	0.006	37

Note: The compression and recompression indices shown are "modified" indices as described by Holtz and Kovacs, 1981. These indices were taken from a strain-log P curve, rather than an e-log P curve.
*Depth below the top of levee surface elevation existing at the time of our field study.

HYDRAULIC CONDUCTIVITY (PERMEABILITY) TESTS

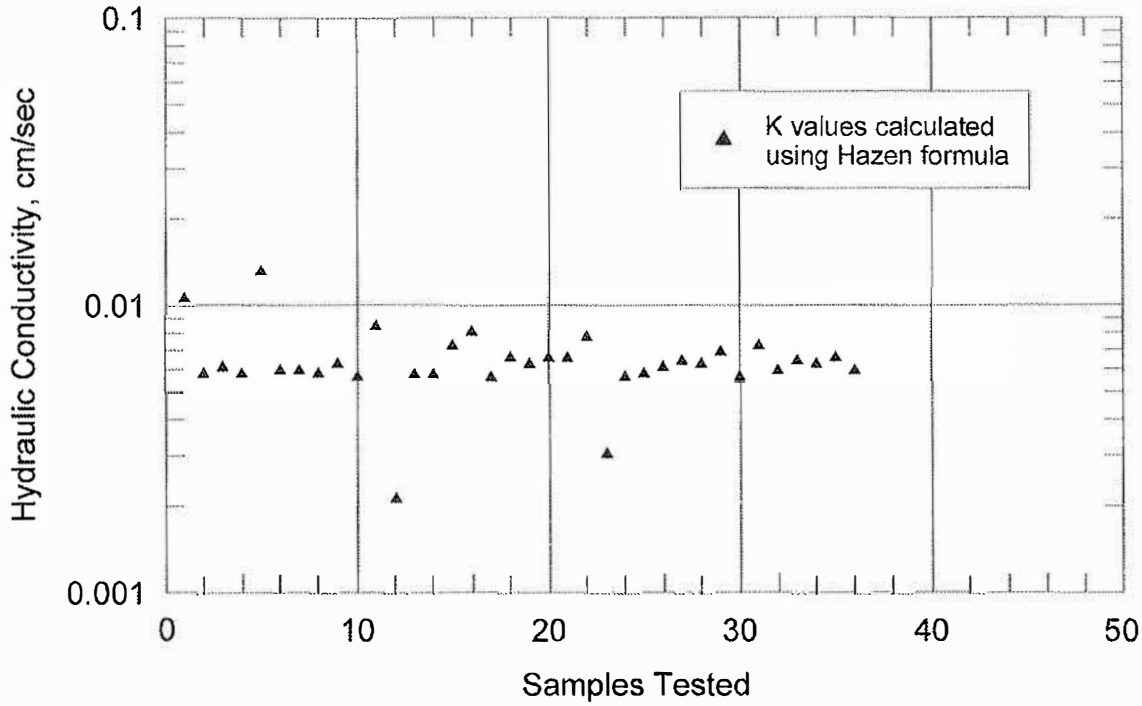
Hydraulic conductivity (permeability) tests were performed on relatively undisturbed Shelby tube samples obtained from 40 selected samples of cohesive-type soils. These cohesive soil samples were tested for vertical hydraulic conductivity to assess the seepage velocities of the embankment and cohesive subsurface soils. A calculation summary sheet for each hydraulic conductivity (permeability) test is presented in Appendix B. The results are also summarized in the table below.

Permeability Test Results

Boring No.	Depth feet	Hydraulic Conductivity cm/sec	Boring No.	Depth feet	Hydraulic Conductivity cm/sec	Boring No.	Depth feet	Hydraulic Conductivity cm/sec
DP-2	20	9.70E-08	DP-122	10	1.10E-06	DP-208	25 - 45	1.69E-03
DP-4	35 - 50	1.08E-03	DP-122	30 - 50	1.41E-03	DP-215	4	7.70E-08
DP-7	35 - 50	2.32E-03	DP-124	30 - 50	2.31E-03	DP-218	15	3.30E-08
DP-11	2	6.80E-07	DP-126	30 - 50	2.05E-04	DP-221	2	2.30E-08
DP-18	10	6.00E-08	DP-129	4	4.60E-08	DP-226	4	3.90E-08
DP-22	2	3.00E-07	DP-142	8	1.20E-08	DP-229	2	8.10E-07
DP-26	30 - 50	5.85E-04	DP-150	15	2.90E-08	DP-233	25 - 50	1.32E-03
DP-33	6	3.00E-08	DP-156	15	3.00E-08	DP-234	8	2.35E-08
DP-37	6	4.20E-08	DP-159	10	5.50E-08	DP-242	25	1.20E-08
DP-46	0	7.70E-08	DP-165	30 - 50	1.31E-03	DP-244	2	4.00E-08
DP-62	2	1.00E-07	DP-166	20 - 35	1.64E-03	DP-252	2	6.30E-08
DP-65	10	5.70E-08	DP-168	6	6.70E-08	DP-252	25 - 45	7.68E-04
DP-66	35 - 50	7.01E-04	DP-171	4	1.00E-07	DP-253	25 - 50	1.56E-03
DP-82	8	7.20E-08	DP-174	6	6.70E-07	DP-256	15	2.80E-08
DP-87	4	8.10E-07	DP-177	30 - 50	1.80E-03	DP-268	15	1.70E-06
DP-92	2	2.80E-08	DP-183	2	7.50E-07	DP-278	30 - 50	2.63E-03
DP-97	25 - 35	1.43E-03	DP-183	30 - 50	6.85E-04	DP-280	25 - 50	1.54E-03
DP-99	10	6.50E-08	DP-187	6	8.30E-07	DP-282	30 - 50	2.68E-03
DP-106	6	6.40E-07	DP-188	25 - 45	1.29E-03	DP-293	40 - 50	1.25E-03
DP-112	8	1.20E-07	DP-197	8	7.30E-08	DP-296	30 - 50	2.06E-03
DP-117	25 - 35	2.65E-03	DP-197	25 - 45	1.46E-03	DP-299	30 - 50	1.56E-04
DP-118	2	5.60E-06	DP-202	40	9.30E-08			
DP-118	25 - 50	1.58E-03	DP-206	25 - 45	2.00E-04			

Based on the USACE EM 1110-2-1901 *Seepage Analysis and Control for Dams* indirect methods for determining hydraulic conductivity may also be used. For uniform, loose clean sands classified as SP (poorly graded sand), the Hazen[2] equation is suggested for use. The following graph presents the results calculated using the Hazen equation.

[2] Hazen, Allen, "Discussion of 'Dams on Sand Foundations' by A.C. Koenig", Trans. American Society of Civil Engineers, Vol. 73, p. 199, 1911.



GENERAL SITE CONDITIONS

SITE DESCRIPTION

The proposed improvements to the Donna Pump to Brownsville Levee Reach include 48.5 miles of the existing levee alignment located within Cameron County, as well as a small portion of Hidalgo County (approximately 2.5 miles) just west of the Cameron County line, for a total 51 miles. At the time of our field activities, the project site can generally be described as an earthen levee with grass-covered slopes and a caliche-surfaced roadway spanning the levee crest. During our site reconnaissance, heavily vegetated areas were observed along several portions of the existing levee alignment. These vegetated areas were cleared by USIBWC representatives prior to commencement of our drilling operations. Undeveloped, vegetated land was observed along both sides of the existing levee alignment. Irrigation ditches were observed along some portions of the alignment. These ditches were observed to be both dry and wet (full of water) at the time of our field activities.

SITE GEOLOGY

The levee project is located within the confines of the Gulf of Mexico Basin, which formed from down-faulting Paleozoic basement rocks during the break-up of Pangaea in the Late Triassic Period[3,4]. Continental highlands provided a continued source of sediments into the basin causing

[3] Chowdhury, A., Turco, M., Geology of the Gulf Coast Aquifer, Texas; Proceedings of the Gulf Coast Aquifer Conference, Corpus Christi, Texas Water Development Board Report 365
[4] Morrison, R.B., 1991, Quaternary nonglacial geology:conterminous U.S.; The Geology of North America; v. K-2. Geological Society of America, Chp. 19, Quaternary geology of the Gulf of Mexico Coastal Plain, & Plate 8.

rapid accumulation of thick sediment deposits in a fluvial-deltaic or shallow-marine environment[3,4]. Repeated sea-level changes with continued basin subsidence generated cyclic assemblages of river, eolian, and lake sediments. Eighteen major depositional episodes have been mapped in the Gulf of Mexico Basin using lithofacies, thickness, stratigraphic architecture, and facies association[3].

The Quaternary Pleistocene sedimentary units have been separated into the early Pleistocene Willis Sand (has not been identified in the Rio Grande area) overlain by the Lissie Formation, which is comprised of the lower Bentley Formation and upper Montgomery Formation. The Beaumont Clay overlies the Lissie Formation and is a late Pleistocene deposit. The Pleistocene sediments represent erosional and depositional sequences correlating to periods of glaciations and coincident sea-level variations[3].

The Lissie Formation is unconformably packaged between the underlying Miocene Goliad Sand and the overlying Beaumont Clay[3,4]. The Lissie Formation outcrops in a 30-mile wide band parallel to the coast with sediments representing flood plains and deltas, deposited at the mouth of rivers[3]. The sediments consist of reddish, orange, and gray fine-to-coarse-grained, cross-bedded sands and gravelly sands[3]. Caliche beds often distinguish the base of the Lissie Formation. This Formation is absent near the Rio Grande mouth but outcrops east and west of the Rio Grande mouth[4].

The Beaumont Clay is comprised of poorly bedded, marly clay with interbedded lenses of sand that were deposited as natural levees and deltas that coalesced as river mouths migrated, and in marine and lagoonal waters located in the bays and embayments[3,4]. The clay is reddish-brown poorly drained clay, intermixed with lenses of fine sand, decayed organic matter, and buried organic-rich zones that contain calcareous and ferruginous nodules[3]. The Beaumont Clay exhibits plastic and compressible characteristics and varies from five to over several hundred meters thick[3].

Eolian and fluvial-deposited sediments dissecting into, filling in, and covering outcrops of Beaumont Clay dominate the Holocene Epoch[4]. The Holocene depositional systems represent terrace gravels, channel and point bar deposits, and sand dunes with grain sizes ranging from clay to gravel. The terrace gravels are a result of migrating channels dissecting into the underlying sediments, exposing relict deposits and the channel and point bar deposits represent infilling of channels[5]. The down-cutting and infilling cycles correlate to sediment loads received from continental drainages during climatic fluctuations[5]. Eolian sand deposits cover the surficial outcroppings of the underlying deposits and form sand sheets and dunes comprised of relatively clean sands[4].

According to the Soil Survey of Cameron and Hidalgo Counties, Texas, published by the United States Department of Agriculture - Soil Conservation Service, in cooperation with the Texas Agricultural Experiment Station, the existing levee alignment appears to be located within the Laredo-Olmito; Rio Grande-Matamoros; and Harlingen soil associations. The Laredo-Olmito soil association consists of nearly level to gently sloping, well-drained and moderately well-drained

[5] Doser, D.I., Langford, R.: Baker, M. and Dena-Ornela, O., 2001, Studies of grain size variations in fluvial sediments of the Rio Grande using magnetic techniques, Proceedings of the Symposium on the Application of Geophysics to Environmental Engineering Problems (SAGEEP 2001 – Denver, on CD-ROM, paper ASP-5

silty clay loams and silty clays. The Rio Grande-Matamoros soil association consists of nearly level to gently sloping, well-drained and moderately well-drained silt loams and silty clays. The Harlingen soil association consists of level and nearly level, moderately well-drained clays. The corresponding soil symbols within the existing levee alignment appear to be 33, Laredo silty clay loam; 45, Pits, borrow; 62, Rio Grande silt loam; 63, Rio Grande silty clay loam; CA, Camargo silt loam; CC, Camargo silty clay loam; CE, Cameron silty clay; GR, Grulla clay; HA, Harlingen clay; LAA, Laredo silty clay loam; LEA, Laredo-Reynosa complex; MA, Matamoros silty clay; OM, Olmito silty clay; RR, Rio Grande silt loam; and RT, Rio Grande silty clay loam.

SEISMIC COEFFICIENTS

Based upon a review of Section 1613 *Earthquake Loads* of the 2006 International Building Code (IBC), the following information has been summarized for seismic considerations associated with the planned levee alignment. Note that the project covers a substantial geographic range. As such, the values taken from the IBC charts also vary across the project. The following parameters are presented as a range and represent the western most boring (DP-59) to the eastern most boring (DP-277); these values presented are for Boring DP-59 and Boring DP-277, respectively.

- Mapped Maximum Considered Earthquake Ground Motion for a 0.2 sec., Spectral Response Acceleration (Figure 1613.5(1)): **S_s = 0.049 to 0.041g**.
- Mapped Maximum Considered Earthquake Ground Motion for a 1 sec., Spectral Response Acceleration (Figure 1613.5(2)): **S_1 = 0.013 to 0.012g**.

STRATIGRAPHY

The subsurface conditions observed in the borings performed for this study varied along the entire length of levee. In general, fill materials associated with the existing levee were observed overlying naturally deposited soils common to the area.

Embankment fill soils within the existing levee: Levee fill soils consisting of locally available soils were observed at the levee crest extending to the natural ground elevations. These fill soils were observed at thicknesses ranging from about 1 to 18 feet. The vast majority of the fill materials observed in the borings performed for this study consisted of lean clays (CL). The remaining the fill materials were comprised of fat clays (CH), sands (SP and SP-SM), and silts (ML).

The fat clays observed within the existing levee are considered highly to very highly plastic, with measured plasticity indices of 25 to 52 percent, indicating a high potential for shrink-swell type movements associated with changes in moisture content. In addition, these soils will tend to slow construction due to the increased effort needed for compaction control during fill placement.

Areas where sand and/or silt layers were observed within the existing fill soils are of particular concern. Non-cohesive soils have a much higher hydraulic conductivity than cohesive soils, which will allow water to flow through the earthen levee at higher rates within these non-cohesive layers than through cohesive soil layers. When observed, these non-cohesive layers were about 2 to 4 feet in thickness. The borings in which non-cohesive soils were observed in the existing fill soils are tabulated below:

DP-20	DP-31	DP-48	DP-153	DP-174
DP-22	DP-43	DP-133	DP-155	DP-187
DP-23	DP-44	DP-134	DP-161	DP-180
DP-24	DP-46	DP-152	DP-173	

Native soils beneath existing levee: Beneath the fill soils, naturally deposited cohesive soils with interbedded layers of non-cohesive soils were observed. The naturally deposited soils vary over the length of the levee project in both depth and thickness. The native soils encountered in the borings conducted for this study were predominately comprised of cohesive soils, consisting of lean clays (CL) and fat clays (CH). Encountered in lesser extend were sandy fat clays and sandy lean clays. The amount of fat clays observed in the naturally deposited soils is significantly higher than that observed in the fill soils, where lean clays predominated. The native non-cohesive soils observed in our borings were predominately silty sands (SM) , sands with silt (SP-SM), clayey sands (SC), sands (SP), sandy silts (ML), silts (ML), and clayey silts (ML).

A detailed description of the soil conditions observed at each boring location has been presented in the Boring Logs, Figures A-2 through A-301, of Appendix A. The lines designating the interfaces between strata on the boring logs represent approximate boundaries. Transitions between strata may be gradual.

IMPACT OF SAMPLING AND TESTING PROCEDURES ON MEASURED AND DESIGN SOIL PROPERTIES

PERMEABILITY

Soils were deposited along the Rio Grande River floodplain through a series of natural processes, primarily by transport by water and wind. The soils beneath the levee embankments are primarily clays with a significant amount of sands and silts and were generally deposited by the Rio Grande River system, with some relatively thin, fine layers of sand and silt deposited by wind during dust storms. The soil deposits exhibit spatial variability, with resulting anisotropy inherent in the gradation and permeability of the natural deposits. In general, the horizontal permeability of the soil strata are expected to be at least 2 to 5 times greater than their vertical permeability.

The potential impacts of natural soil and compacted soil fill layering on permeability are significant. Under ideal conditions, the field exploration and laboratory testing programs would be aimed at harvesting and testing undisturbed soil samples so that the in-place soil permeability could be measured. Unfortunately, the soil types of greatest interest encountered in this study are very difficult to sample and test in an undisturbed condition. As a result, conventional practice is to obtain disturbed soil samples and perform the various laboratory tests on reconstituted, or remolded, samples, and to make adjustments to the measured values when evaluating their probable behavior in the field. The sampling process destroys the structure and orientation of layers of differing characteristics, and distributes the fine-grained silt and clay fraction throughout the bulk sample. The process of harvesting large volumes of soil and remolding samples has the effect of homogenizing the samples, generally resulting in lower

tested permeability. The impact on tested permeability can be significant. Laboratory measured permeability can be several orders of magnitude lower than the actual maximum field permeability.

The laboratory permeability tests were conducted using ordinary tap water as the permeant in accordance with industry practice. This choice can affect the tested permeability where the soils contain significant amounts of soluble salts, or the tap water contains unusually high amounts of total dissolved solids (TDS). We do not believe that the tested samples contained significant amounts of TDS, and the tap water used in the tests meets current EPA drinking water standards. Given the soil types tested for this study, we do not believe that changes in the tested samples' TDS, if any, had a significant impact on the measured results.

The laboratory permeability tests were performed using hydraulic gradients as high as 11. This test condition is much higher than the typical expected field gradient of less than 0.5. Excessive laboratory hydraulic gradients can cause migration of silt and clay particles within the sample, significantly reducing the measured permeability. However, we do not believe that particle migration significantly affected the test results. Particle migration often occurs when the gradient is applied instantaneously. The test gradient was gradually applied over several minutes in an effort to avoid this problem.

INFERRED PERMEABILITY

The laboratory grain size analyses were used in conjunction with the Hazen formula to provide an estimate of permeability. The Hazen[2] formula was developed using filter sands with effective sizes between 0.1 and 3 mm and uniformity coefficients of less than 5. For this limited range of clean sands, permeability estimates computed using the formula generally was within 20 percent of the measured values.

The soils tested for this study generally do not meet the effective size or fines fraction requirements of the soils Allen Hazen used to develop his correlation. However, in many cases, the effective sizes of the tested sands are close enough to the sands tested by Hazen that the equation can be used to provide some indication of the variability of permeability of the soils. In general, we would expect that the laboratory permeability will be lower than the value calculated using Hazen's correlation.

DEPTH-TO-WATER

Free water was observed in all of exploratory borings conducted for this project except three borings (DP-222, DP-223, and DP-224). The depth-to-water levels recorded during drilling are considered short-term water level readings. Due to the presence of non-cohesive soils, bentonite drilling mud was often introduced after observing free water to keep the saturated sands from "blowing up" the bottom (or unraveling) of the open borehole. Obtaining long-term depth-to-water level readings was not part of our scope of work. At the completion of each day's drilling, each boring was backfilled with cement-bentonite grout from the bottom-up using a tremie pipe.

The depth-to-water level readings ranged from 8 to 43.5 feet below the top of the existing levee. A waiting a period of about 15 minutes was used to observe any immediate changes in the depth-

to-water levels. In general, the depth-to-water levels arose from about 1 to 15 feet from their initial readings.

It should be noted that all depth-to-water level readings were observed in the subsurface soils beneath the levee structure. Free water was not observed within the levee embankment fill soils.

It is possible for groundwater to exist beneath this site at shallower depths on a transient basis following periods of precipitation and/or flooding. Fluctuations in groundwater levels occur due to variations in rainfall and surface water run-off. The construction process itself may also cause variations in the groundwater level.

EARTHEN LEVEE SYSTEM

DESIGN CONSIDERATIONS

The existing and modified levees should meet three important criteria: they should be resistant to the forces of erosion, should exhibit a suitable slope stability design allowable factor of safety with respect to long-term, short-term, and sudden drawdown conditions, as well as performance type scenarios such as underseepage. The levee structure must meet these criteria so that the calculated risk of failure is consistent with criteria established by the USACE and FEMA guidelines.

Probable Failure Modes

Our review of the site and expected conditions for the Lower Rio Grande Flood Control Project indicates that the following major modes of failure could affect the levee system during a flood event:

- Slope erosion
- Slope stability
- Underseepage
- Embankment Seepage

The following sections address each of these failure modes. Please note that while these failure modes have been separated for ease of discussion, it is possible – even likely – that two or more of the four failure modes (erosion, slope stability, underseepage, and embankment seepage) may occur simultaneously.

Slope Stability Based on our review of available data and our visual observations during drilling, the existing embankments along The Lower Rio Grande Flood Control Project alignment appeared to exhibit slopes ranging from about 2.5:1 (horizontal:vertical) to flatter than about 8:1.

In general, slopes flatter than 3:1 would be expected to exhibit the required factors of safety for a normal (non-flood) seepage condition with the area water table 5 to 12 feet below the area ground surface. However, some areas of the levee alignment contain relatively loose, non-cohesive soils. Since the effective angle of internal friction (Φ) of a non-cohesive soil is dependent on density, these soils will exhibit significantly reduced strengths and will be much

more susceptible to slope stability problems. Typically, these materials were also observed in the upper 10 to 15 feet of soils below the embankment.

Unfortunately, any attempts to improve these materials in-place will be problematic. Given the observed conditions, it may be more prudent to limit the slopes to 3:1 to 4:1 (see subsequent discussions) or flatter and widen the levee crests to reduce the risk of failures, and make repairs to areas that develop instabilities on a case-by-case basis.

Underseepage We generally consider underseepage to be the major risk for both the existing and modified levee embankments. Underseepage consists of water flowing beneath the embankment as a result of a rise in river level during the design flood event. The principal failure mechanism related to underseepage occurs when the upward force of the water equals or exceeds the buoyant weight of the soil.

Embankment Seepage Embankment seepage consists of water flowing through the embankment as a result of the rise in river level during the design flood event. The principal failure mechanism related to embankment seepage occurs when the horizontal force of the water equals or exceeds the effective shear strength of the soil. This mode of failure is not expected to occur along the section of levee include in this study.

Slope Erosion The existing embankments are generally composed of cohesive soils, while the underlying soils are generally composed of cohesive soils with layers of fine non-cohesive soils. It appears that the existing embankments were constructed using the soils available within the meander band of the Rio Grande River. These materials – particularly the lean clays – are generally considered acceptable to good materials to use when constructing levees, dams and slopes (see Section 7-6 of USACE EM 1110-2-1913 *Design and Construction of Levees*).

SLOPE STABILITY

This section presents our slope stability analyses performed for this study. In general, the procedures described in USACE EM 1110-2-1913 *Design and Construction of Levees* for the enlargement of existing levees were followed. As such, our analysis focused on embankment stability, settlement, interior drainage, and slope protection.

The slope configurations analyzed, method of analysis, loading conditions, and soil properties used in the analyses are discussed in the following paragraphs.

Minimum Factor of Safety

For a given slope configuration, the forces that "drive" slope failure (including gravity, groundwater seepage pressure, and possible excess pore water pressures from external loading conditions) are compared to the slope's resistance to failure, which is a function of dewatering controls and internal shear strength (cohesion and internal angle of friction) of both the foundation soils and the fill soils utilized for construction of the levees.

For levee enlargement projects, the USACE has specified minimum safety factors against slope failure with respect to loading conditions. The minimum acceptable factors of safety for levees, provided in Table 6-1b on Page 6-5 of EM 1110-2-1913, are listed in the following table.

Condition	Required Factor of Safety
End of Construction	1.3
Sudden Drawdown	1.0 to 1.2*
Long Term (Steady Seepage)	1.4

* Sudden drawdown analysis. FS = 1.0 applies to pool levels prior to drawdown for conditions where these water levels are unlikely to persist for likely periods preceding drawdown. FS = 1.2 applies to pool level, likely to persist for long periods prior to drawdown.

We consider a significant slope failure to involve a volume of slope material that is large enough to substantially impair the serviceability or operation of the levee or that could imperil human life. Shallow, sloughing slope failures that involve relatively little material or that can be repaired locally without substantially impacting the levee operations are considered to be minor slope failures and do not control the conclusions of our stability analyses.

Slope Configurations

At the time this technical memorandum was prepared, conceptual drawings of the planned improvements were not available. As such, we have assumed a generalized geometry for the purposes of discussion only. We analyzed several slope configurations (to determine a minimum acceptable geometry), with a crest width of 12 feet, a final height of 20 feet, and a flood elevation equivalent to a 3-foot freeboard.

We recognized four general soil conditions along the length of the alignment that may be considered as worst-case boundary conditions. As such, four cases were analyzed based on these boundary conditions.

Method of Analysis

The slope stability analyses for this study were conducted with the aid of a computer using the program SLIDE developed by RocScience. The SLIDE computer program randomly generates trial failure surfaces and evaluates the factor of safety for each trial surface. The program allows a large number of potential shear surfaces to be investigated to determine the critical failure surface for each of the analyzed slope configurations.

The portions of the program used in this study employed the Spencer computational method. The Spencer method is a method of slices used to make calculations of the stability of slopes involving failures with circular arcs and/or wedges. The wedge failure surfaces were only used for comparison when examining the long-term (drained) slope stability factors of safety. In each case, the computed factor of safety is the ratio of the forces resisting movement to the driving forces. A factor of safety of 1.0 or less implies the slope is unstable, while a factor of safety greater than 1.0 implies the slope is stable.

Loading Conditions

For satisfactory performance, an earth embankment should have an acceptable factor of safety during construction and throughout its projected service lifetime. Stability analyses should include variations in stress conditions brought on by construction practices and sequencing, external loadings, and any anticipated changes in hydraulic conditions. The following paragraphs discuss each stability condition analyzed in our study.

External Loads External loads for the roadways along the levee crest have also been modeled. A traffic loading of HS20 (modeled as an equivalent uniform surcharge of 100 psf) was applied to the crest of the levee.

End of Construction The short-term (undrained) loading condition models the slope immediately following construction. For this loading condition, the pore pressures developed during construction have not had the opportunity to dissipate and seepage loading from the Rio Grande is not significant. In our analyses, we assumed the water level to be at the original ground surface (the toe elevation). The end of construction condition is applicable to both the riverside and landside slopes. For this loading condition, total stress soil parameters were used in the analysis.

Steady State Seepage from Design Flood Stage The long term (drained), steady-state seepage loading condition was also analyzed. This loading condition models the design flood stage for such a duration that the levee soils are fully saturated and a condition of steady state seepage occurs through the embankment. For this loading condition, effective stress soil parameters were used in the analysis.

Sudden Drawdown from Design Flood Stage This condition represents the situation when the flood water recedes at such a rapid rate that the saturated levee soils do not have time to drain. Consequently, excess pore water pressures result in the soil. In order to model these excess pore pressures, the B_bar method was used in the *Slide* program. For this loading condition, effective stress soil parameters were used in the analysis.

SOIL PARAMETERS

Undrained (undrained cohesion and undrained friction angle) and drained soil parameters (drained cohesion and drained friction angle) were selected for each soil stratum based on the laboratory and field test data collected during our study as well as our experience with similar projects and subsurface conditions. For purposes of our slope stability analyses, we have assigned the material properties presented in the following tables.

Case I: Fat clay fill overlying non-cohesive soils.

Material	Unit Weight (pcf)	Short-Term and Sudden Drawdown (Undrained)		Long-Term (Drained)	
		Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)
Fill: Fat Clay (CH)	125	400	15	500	8
Silty Sand (SM)	115	0	29	0	29
Sand (SP)	115	0	32	0	32

Case II: Lean clay fill overlying varied soils of silt, lean clay, and sand.

Material	Unit Weight (pcf)	Short-Term and Sudden Drawdown (Undrained)		Long-Term (Drained)	
		Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)
Fill: Lean Clay (CL)	125	250	30	650	19
Silt (ML)	110	0	29	0	29
Sandy Lean Clay (CL)	125	300	22	700	31
Silty Sand (SM)	115	0	29	0	29

Case III: Irregular fill soils (with non-cohesive layers) overlying fat and lean clays.

Material	Unit Weight (pcf)	Short-Term and Sudden Drawdown (Undrained)		Long-Term (Drained)	
		Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)
Fill: Lean Clay (CL)	125	250	30	650	19
Fill: Silt (ML)	110	0	30	0	30
Fat Clay (CH)	125	450	12	700	0
Lean Clay (CL)	125	300	22	700	31

Case IV: Fat clay fill overlying fat clay.

Material	Unit Weight (pcf)	Short-Term and Sudden Drawdown (Undrained)		Long-Term (Drained)	
		Cohesion (psf)	Friction Angle (degrees)	Cohesion (psf)	Friction Angle (degrees)
Fill: Fat Clay (CH)	125	400	15	500	8
Fat Clay (CH)	125	450	12	550	0

Results of Analyses

The following table contains a summary of the results from our slope stability analyses for each loading condition and slope configuration. A graphical presentation of the 10 most critical failure surfaces from our SLIDE iterations for each loading condition can be found at the end of this memorandum in Appendix C.

Computed Factors of Safety – Case I (Fat clay fill overlying non-cohesive soils)					
Slope	End of Construction	Steady State at Flood Stage – River Side	Steady State at Flood Stage – Land Side	Sudden Drawdown – Riverside	Sudden Drawdown – Landside
2.5H:1V	> 2	> 2	1.7	< 1	1.7
3 H:1V	> 2	> 2	1.8	1.2	> 2

Computed Factors of Safety – Case II (Lean clay fill overlying varied soils of silt, lean clay, and sand)					
Slope	End of Construction	Steady State at Flood Stage – River Side	Steady State at Flood Stage – Land Side	Sudden Drawdown – Riverside	Sudden Drawdown – Landside
2.5H:1V	1.7	> 2	1.4	**	1.2
3 H:1V	> 2	> 2	1.6	**	1.4

Computed Factors of Safety – Case III (Irregular fill soils with non-cohesive layers overlying fat and lean clays)					
Slope	End of Construction	Steady State at Flood Stage – River Side	Steady State at Flood Stage – Land Side	Sudden Drawdown – Riverside	Sudden Drawdown – Landside
2.5H:1V	> 2	> 2	1.9	1.5	1.7
3 H:1V	> 2	> 2	> 2	> 2	1.9

Computed Factors of Safety – Case IV (Fat clay fill overlying fat clay)					
Slope	End of Construction	Steady State at Flood Stage – River Side	Steady State at Flood Stage – Land Side	Sudden Drawdown – Riverside	Sudden Drawdown – Landside
2.5H:1V	1.3	> 2	1.5	1.7	> 2
3 H:1V	1.5	> 2	1.7	> 2	> 2

Based on the results of our analyses, the factors of safety computed require 3H:1V riverside and landside slopes in order to meet the USACE requirements for minimum safety factors for the assumed flood event.

SEEPAGE ANALYSIS

We performed a steady-state seepage analysis of idealized slope geometries using the finite element groundwater module within SLIDE. Our analyses included slope declinations of 2.5:1, 3:1, 4:1, 5:1 and 6:1 (horizontal: vertical). The analyses were based on the four cases discussed above. The vertical boundaries of the model were located about 900 to 950 feet from the levee profile. Our seepage analyses were performed assuming that the soil properties observed in our borings exhibited the same permeability in both the horizontal and vertical directions.

The following table includes various dimensions and properties that were varied in the seepage analyses, as well as the maximum gradient that was calculated for each case. The purpose of the following table is to summarize the results of analyses for a range of permeabilities resulting from our testing, and also varying the relationship between the horizontal and the vertical permeability to determine the range of estimated exit gradients for the various potential "best case" and "worst case" conditions that may be encountered along the route (Cases I through IV). Additionally, different slopes were evaluated to determine if a certain slope would preclude the need for seepage control (a, b or c). This was done to determine whether certain conditions warranted seepage protection measures

Case	Slope (h:v)	Stratum 1 k cm/sec	Stratum 2 k cm/sec	Stratum 3 k cm/sec	Stratum 4 k cm/sec	Stratum 5 k cm/sec	Calculated Maximum Gradient, i_{MAX} (nd)
Ia	2.5:1	1.00E-08	1.00E-02	1.00E-02	-	-	0.64
Ib	3.0:1	1.00E-08	1.00E-02	1.00E-02	-	-	0.47
Ic	4.0:1	1.00E-08	1.00E-02	1.00E-02	-	-	0.50
IIa	2.5:1	1.00E-08	1.00E-05	1.00E-08	1.00E-02	-	< 0.3
IIb	3.0:1	1.00E-08	1.00E-05	1.00E-08	1.00E-02	-	< 0.3
IIc	4.0:1	1.00E-08	1.00E-05	1.00E-08	1.00E-02	-	< 0.3
IIIa	2.5:1	1.00E-08	1.00E-05	1.00E-08	1.00E-08	1.00E-02	0.34
IIIb	3.0:1	1.00E-08	1.00E-05	1.00E-08	1.00E-08	1.00E-02	0.35

Case	Slope (h:v)	Stratum 1 k cm/sec	Stratum 2 k cm/sec	Stratum 3 k cm/sec	Stratum 4 k cm/sec	Stratum 5 k cm/sec	Calculated Maximum Gradient, i_{MAX} (nd)
IIIc	4.0:1	1.00E-08	1.00E-05	1.00E-08	1.00E-08	1.00E-02	0.32
IVa	2.5:1	1.00E-08	1.00E-08	-	-	-	0.52
IVb	3.0:1	1.00E-08	1.00E-08	-	-	-	0.45
IVc	4.0:1	1.00E-08	1.00E-08	-	-	-	0.35

For Case I and IV, conditions exceeding the maximum allowable seepage exit gradient were calculated for all slope declinations. In addition, the calculated phreatic surface intercepted the landward face of the levee embankment well above the embankment toe. These analyses indicate the need to lengthen the seepage flow paths, intercept the seepage with one or more drainage layers, or both. Various drainage layer arrangements have been successfully employed in levee construction (see USACE EM 1110-2-1913 Figures 5-8 and 5-9.) Other treatment methods could include soil-bentonite or sheet pile seepage cutoffs constructed through the centerline of the levee, as well as impervious blankets constructed on the landward side of the levees. In addition, relief wells could be employed to lower the phreatic surface during flood events. Each approach will be discussed briefly in the following subsections.

Drainage layer

The use of a drainage layer comprised of filter sand and gravel at the toe of the landside of the levee is an option that was evaluated. For the existing levee, it may be difficult to locate the drainage layer within the levee cross-section. The most effective drainage layer layouts (see EM 1110-2-1913 Figure 5-9) would essentially require reconstructing much of the landside toe of levee structure. The drainage layer could also be placed over the landside face of the levee, extending some distance away from the landside toe. This arrangement would leave the levee intact, but would require significantly more drainage blanket area and material. Depending on right-of-way considerations, it may be feasible to construct a combined drainage blanket and toe drain. This approach is less desirable, however, due to concerns with levee stability during and after construction.

Seepage barrier

The seepage exit gradient can be reduced to acceptable levels by forcing seepage to follow a longer path. Three approaches are commonly used to accomplish this goal: construct impermeable berms on the landward side of the levee, install sheet piling through the center of the levee, or construct a soil-bentonite slurry wall through the centerline of the levee. Impermeable earthen berms have the advantages of cost and speed of construction, but may not be feasible due to right-of-way constraints. Both steel sheet pile walls and soil-bentonite slurry walls can be installed to considerable depth, but are slow to construct and relatively expensive. Soil-bentonite cutoff walls also require a considerable amount of working room, and the process is relatively messy.

Relief wells

Relief wells could also be considered as a means to temporarily lower the phreatic surface during a flood event. This approach has been used extensively where other approaches are not considered feasible and the high cost to install, operate and maintain the wells does not preclude their use. We do not consider relief wells a viable option for this project.

Other approaches

Other seepage cutoffs could be used to improve the overall stability of the levees, such as cement or chemical grout curtains and soil-cement jet-grouted walls. In general, we consider these options to be less desirable due to their probable costs and relatively high risk of failure.

SETTLEMENT

At the time this technical memorandum was prepared, detailed plans showing the planned improvements along the levee alignment were not available. As such, settlement estimates were calculated assuming 3 feet of new fill soils would be required to reach final grade and groundwater levels were assumed to be near the ground surface existing at the time of our field study. The four cases described previously for use in our stability analyses were used to model the assumed embankment and subsurface conditions.

In general, the on-site soils are overconsolidated as evidenced by the geologic history of the area and the pre-consolidation pressures observed as part of the laboratory one-dimensional consolidation tests performed for this study. That is, the native soils have experienced a stress history greater than the overburden pressures that will be imposed by the planned improvements.

One method used for estimating settlement was based on NAVFAC DM-7.1, which references Osterberg's stress distribution theory for earthen embankments. We also used a commercially available computer program, Settle3D.

SOIL PARAMETERS

Modified compression and re-compression indices were selected for each soil stratum based on the laboratory and field test data collected during our study as well as our experience with similar projects and subsurface conditions. For purposes of our settlement analyses, we have assigned the material properties presented in the following tables.

Case I: Fat clay fill materials overlying non-cohesive soils.

Material	Effective Unit Wt. (pcf)	Strain-Based Indices	
		$C_{c\varepsilon}$	$C_{r\varepsilon}$
Fill: Fat Clay (CH)	125	0.160	0.030
Silty Sand (SM)	55	0.015	0.003
Sand (SP)	55	0.009	0.0018

Case II: Lean clay fill materials overlying varied soils including silts, lean clays, and sands.

Material	Effective Unit Wt. (pcf)	Strain-Based Indices	
		C_{cs}	C_{rs}
Fill: Lean Clay (CL)	125	0.090	0.015
Silt (ML)	50	0.038	0.006
Sandy Lean Clay (CL)	65	0.060	0.010
Silty Sand (SM)	55	0.015	0.0026

Case III: Irregular fill material (with non-cohesive layers) overlying fat and lean clays.

Material	Effective Unit Wt. (pcf)	Strain-Based Indices	
		C_{cs}	C_{rs}
Fill: Lean Clay (CL)	125	0.090	0.015
Fill: Silt (ML)	50	0.038	0.006
Fat Clay (CH)	65	0.140	0.025
Lean Clay (CL)	65	0.060	0.010

Case IV: Fat clay fill material overlying fat clays.

Material	Effective Unit Wt. (pcf)	Strain-Based Indices	
		C_{cs}	C_{rs}
Fill: Fat Clay (CH)	125	0.160	0.030
Fat Clay (CH)	65	0.140	0.025

Results of Analyses

The following table contains a summary of the results from our settlement analysis for each condition described above.

Condition	Slope	Total Estimated Settlement, Inches	
		NAVFAC	Settle3D
Case 1	3.0H:1V	3-1/4	3-1/4
Case 2	3.0H:1V	1/2	1/4
Case 3	3.0H:1V	1	1-1/4
Case 4	3.0H:1V	1-1/2	1-1/4

Experience suggests that 1% to 1.5% of the height of newly placed fill soils will settle due to the self-weight of the newly placed fill soils. Assuming 1.5% strain, newly placed embankments constructed of cohesive soils will experience about 1 inch of compression settlement for every 5 feet of height. This is in addition to the consolidation-type settlement discussed in the table above.

It should be noted that construction techniques, weather conditions during construction, and local conditions within the existing levee embankment and the underlying native soils may result in localized settlements exceeding our estimates.

TRAFFICABILITY

Based on the information provided, the top of the levee will generally be utilized for light traffic frequencies to facilitate access but may be subject to infrequent heavy equipment loads during flood emergencies and maintenance. Consequently, traffic loading was taken into account during the performance of our slope stability analyses. The embankment soils at the top of the levee are sufficient to hold light vehicular traffic, although they may be subject to pumping under a combination of inundated conditions and heavy loads. The subgrade conditions post improvements will be dependent upon the type of materials utilized which must be properly compacted. Once the source of materials is determined, the information should be provided to **R-K** to determine their impact on trafficability issues.

Prior to placing the gravel surfacing, the subgrade should be scarified and compacted to 95% of the maximum density as determined by ASTM D1557 at a moisture content range of two percentage points below to two points above the optimum moisture content. We recommend that the gravel layer consist of a minimum of 6 in. of aggregate base selected in accordance with TxDOT, 2004 Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges" for Item 247 Flexible Base, Type B Grade 3.

CONCLUSIONS

The existing levee embankments were constructed over soils that include silts and sands that are highly susceptible to erosion and underseepage. Whereas liquefaction is considered a low risk issue in these analyses, seepage beneath the existing embankments represents a serious risk to the levee system during a design flood event. The results of our seepage analyses indicate that a significant risk of an erosion or piping-type failure beneath a large portion of the embankment exists and must be addressed.

RECOMMENDATIONS

EARTHEN LEVEE SYSTEM

Portions of the existing levee will be raised and side slopes reconstructed to a 3:1 slope or flatter. If silts are observed on the river side of the levee, the silts should either be partially replaced with properly compacted clay fill sols or plated with at least 3 feet of properly compacted fill soils.

Underseepage is a major concern for a significant portion of the alignment. Based on the conditions observed in the soil borings drilled for this project, it appears that about one-eighth of the levee alignment may be at risk for this failure mode. After reviewing the soil profiles in the project borings along with the existing and proposed levee cross-sections, it appears that land side toe drains will provide adequate seepage control. This approach will result in a significant cost savings when compared to a full penetration cutoff wall or relief wells. A typical toe drain detail is presented on Figure 11 of the Appendix C.

We recommend that toe drains be installed on the borings and/or boring sequences presented on the following table. Toe drain installation should start half the distance between the boring number listed below and the preceding boring and end half the distance between the boring number listed below and the following boring.

DP-21	DP-70	DP-143	DP-176	DP-208	DP-239
DP-27	DP-107	DP-168	DP-177	DP-209	DP-268
DP-30	DP-125	DP-169	DP-188	DP-210	DP-273
DP-34	DP-134	DP-170	DP-189	DP-214	DP-279
DP-35	DP-135	DP-171	DP-191	DP-223	DP-282
DP-69	DP-142	DP-172	DP-207	DP-227	DP-287

The use of relief wells may also be considered. Portions of the alignment appear favorable for use of this approach. However, relief wells are expected to be very expensive to install and will require significant effort and expense to maintain and operate.

CONSTRUCTION RECOMMENDATIONS

GENERAL CONSTRUCTION CONSIDERATIONS

It is important for the planned clay fill soils and the existing embankment to develop some mechanical bond. Typically, the existing embankment face is excavated so that a series of keys and benches are cut into the slope face. The keys and benches reduce the risk of formation of a preferential failure surface at the old/new fill interface. The existing levees are primarily composed of clays. Excavation in these soils can be difficult, particularly if the soils are dry and not compacted. At a minimum, we recommend that at least one 5-foot bench be cut into the existing slope for every 2 feet of embankment height, with the bench placed within the slope rather than constructed at the toe of the slope. In addition, we recommend that any road base on the top of the existing embankment be removed before the levee height is increased.

SLOPE SURFACES FOR PROPOSED RAISED LEVEE WITH STEEPENED SLOPES

On the basis of our field observations at the time of our original study, the majority of the slope surfaces on both the riverside and the landside of the existing levee embankment structure appear to be covered with light, native grasses. The protection afforded by a grass cover to the riverside slope is only adequate for dry conditions, such as those encountered at the time of the field exploration activities for our original study, or for brief periods of flooding resulting in a water pool acting against the slope. A grass cover over the slope may not be suitable to resist

long-term flooding conditions, particularly if scour due to wave action or river flow action are expected. Wave action or river flow action would require the implementation of properly designed rock riprap, articulated concrete mats, or other types of revetment systems on the riverside slope of the rehabilitated levee. Scour protection for the land side of the levee should also be considered, since erosion when the levee is overtopped will likely cause significant damage on the land side of the embankments.

VEGETATIVE COVER FOR CLAY-PLATED LEVEES

Sections 2-1 through 2-3 of the USACE EM 1110-2-301 titled "Guidelines for Landscape Planting and Vegetation Management at Floodwalls, Levees, and Embankment Dams," dated January 1, 2000, recommend the following:

- Planting must be naturalistic and avoid 'arboretum-type' planting.
- There must be a vegetation-free zone adjacent to the landside and the riverside toes of the levee where no type of vegetation, with the exception of grass, is permitted. This zone is required for maintenance and flood-fighting activities and must be easily accessible at all times.
- The root-free zone must provide a margin of safety between the greatest expected extent of plant roots and the beginning face of the basic project structure (i.e., the engineered feature required for human safety).
- The bottom of the root-free zone will be the external limits of the cross section of the levee as established by the design engineer for stability and/or seepage control.
- Knowledge of the rooting habit of each plant selected is required in the landscape planting plan. **The roots of all selected plant species must not penetrate into the root-free zone.**
- Some type of barrier such as a geomembrane, will be required at the limits of the root-free zone where root penetration is possible. This barrier must not retard groundwater or seepage flow.
- The impact of burrowing animals should be considered. Burrows should be prevented from entering the root-free zone where possible, since burrows can have damaging effects on embankment stability similar to those caused by root systems.

Please refer to the USACE EM 1110-2-301 for additional details regarding guidelines for landscape planting in the proximity of the levee structure.

CRUSHED LIMESTONE BASE

Crushed limestone base should consist of TxDOT Type B, Grade 3 materials. Blending of 2 or more sources is allowed to achieve the following physical characteristics.

Type B, Grade 3:

Grading Requirements	
U.S. Standard Sieve Size	Percent Retained
2 ½ inch	0
1 ¾ inch	0-10
No. 4	45-75
No. 40	50-85
Max Liquid Limit	40
Max Plasticity Index	12

Base course should be placed in lifts with a maximum thickness of 8 in. and compacted to a minimum of 95 percent of the maximum density at a moisture content within the range of 2 percentage points below to 2 percentage points above the optimum moisture content as determined by ASTM D 698.

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

The following Appendices are attached and complete this Final Technical Memorandum:

Field Data..... Appendix A
Laboratory Test Results..... Appendix B
Slope Stability and Seepage Analysis Results ..... Appendix C

APPENDIX A

LOG OF BORING NO. DP-1

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16556070.17700; E 1194373.11140

SURFACE ELEVATION: 75.18 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, dark brown	37		35	
	- with calcareous nodules below a depth of about 2 feet			33	
5			113		
	CLAY, fat, very stiff, brown, with black ferrous stains				95
10				37	97
15					97
20				56	
25		26			98
	CLAY, lean, stiff, brown, wet				
30		12		9	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet				
35		16			
	SAND, silty, medium dense, brown				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/14/2008	**DATE MEASURED:**	10/14/2008	**FIGURE:**	A-2a

LOG OF BORING NO. DP-1

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16556070.17700; E 1194373.11140

SURFACE ELEVATION: 75.18 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)* - becomes dark brown in color below a depth of about 40 feet	27				21
45				26				17
			SAND, with silt, poorly-graded, medium dense, brown	28				11
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 27 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/14/2008	**DATE MEASURED:**	10/14/2008	**FIGURE:**	A-2b

LOG OF BORING NO. DP-2

The Lower Rio Grande Flood Control Project
Cameron County, Texas

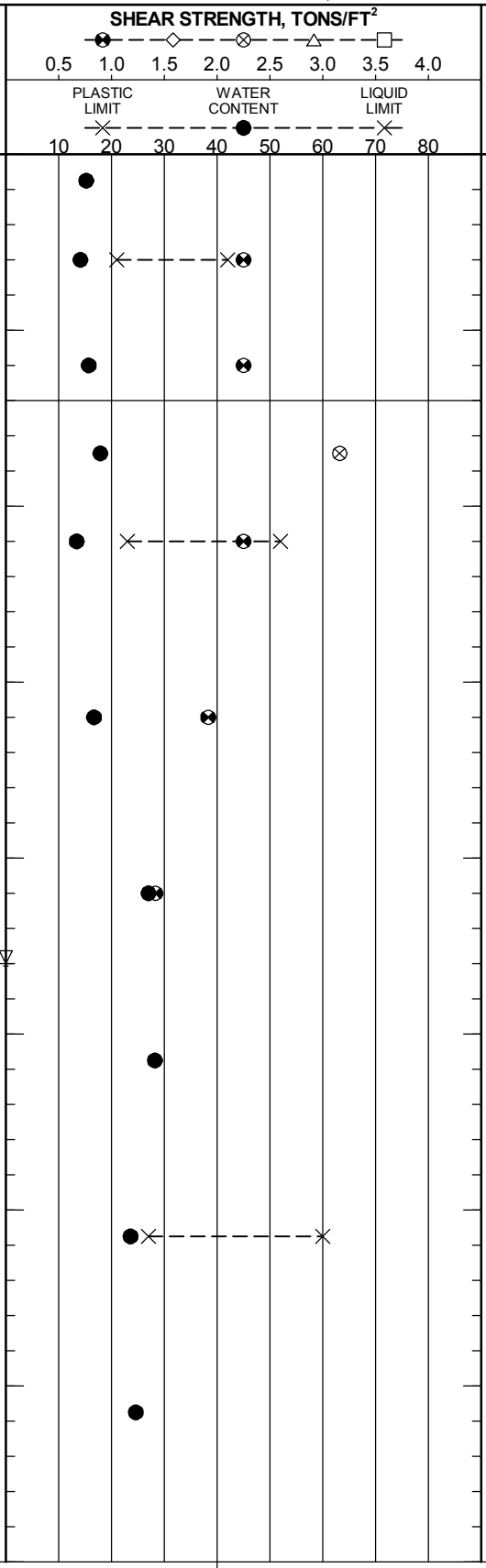
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16555166.27510; E 1194942.25526

SURFACE ELEVATION: 76.05 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, dark brown, with calcareous nodules	29			96
				21	
5					92
	CLAY, fat, hard to very stiff, brown, with calcareous nodules		106		
10				29	
15					96
20					
	Driller's Note: Converted to mud rotary drilling method at a depth of about 23 feet				
25		13			98
30		19		33	
35		18			97



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/14/2008	**DATE MEASURED:**	10/14/2008	**FIGURE:**	A-3a

LOG OF BORING NO. DP-2

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16555166.27510; E 1194942.25526

SURFACE ELEVATION: 76.05 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, hard to very stiff, brown, with calcareous nodules *(continued)*	24				97
45				15			26	
				18				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 28.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/14/2008	**DATE MEASURED:**	10/14/2008	**FIGURE:**	A-3b

LOG OF BORING NO. DP-3

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16554718.33680; E 1195839.83493

SURFACE ELEVATION: 73.60 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown		108		
	- with calcareous nodules below a depth of about 2 feet				90
5	CLAY, fat, very stiff, brown			31	
					95
					94
10	CLAY, fat, very stiff, brown to grayish-brown, with black ferrous stains			41	
15		21			99
20		17		38	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		10			95
30		12			98
35	CLAY, sandy, lean, stiff to very stiff, brown	11		11	53

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/15/2008	**DATE MEASURED:**	10/15/2008	**FIGURE:**	A-4a

LOG OF BORING NO. DP-3

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16554718.33680; E 1195839.83493

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 73.60 ft					
			CLAY, sandy, lean, stiff to very stiff, brown *(continued)*	11				
45								
				16				53
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 38.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/15/2008	**DATE MEASURED:**	10/15/2008	**FIGURE:**	A-4b

LOG OF BORING NO. DP-4

The Lower Rio Grande Flood Control Project
Cameron County, Texas

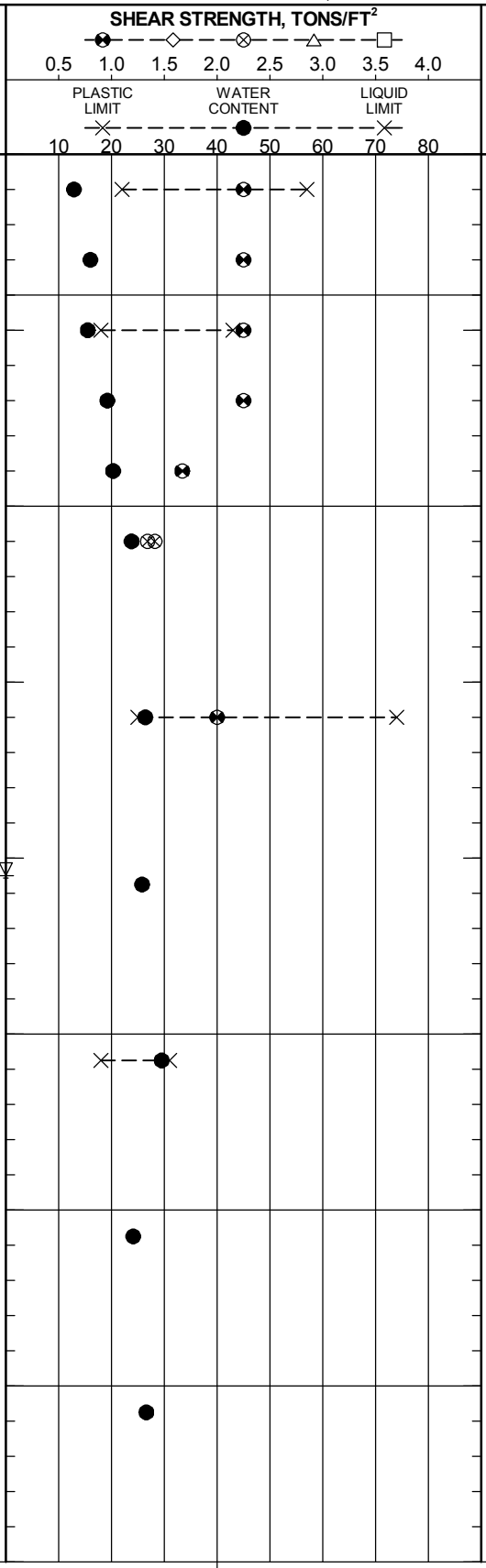
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16554374.29300; E 1196669.28711

SURFACE ELEVATION: 73.12 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, dark brown, with calcareous nodules			35	
5	CLAY, lean, very stiff, dark brown			25	
					93
					93
10	CLAY, fat, very stiff, brown		100		
15				49	
20		15			93
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	CLAY, sandy, lean, firm, brown	5		13	
30	CLAY, fat, very stiff, brown	16			97
35	SAND, clayey, medium dense, brown	16			33



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/18/2008	**DATE MEASURED:**	10/18/2008	**FIGURE:**	A-5a

LOG OF BORING NO. DP-4

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16554374.29300; E 1196669.28711

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 73.12 ft					
			SAND, clayey, medium dense, brown *(continued)*	17				
45								
				27				17
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/18/2008	**DATE MEASURED:**	10/18/2008	**FIGURE:**	A-5b

LOG OF BORING NO. DP-5

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16553755.20010; E 1197621.47760

SURFACE ELEVATION: 75.96 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown				97
				43	
5	CLAY, fat, hard, brown		113		
					94
	CLAY, lean, with sand, very stiff to firm, brown			12	
10					72
	CLAY, fat, stiff, brown, wet				
15		12		45	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet				
20	CLAY, lean, stiff, brown	8		17	
25		14			91
30	SAND, silty, medium dense to dense, brown	15			27
35		17			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	12.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/18/2008	**DATE MEASURED:**	10/18/2008	**FIGURE:**	A-6a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-5

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16553755.20010; E 1197621.47760

SURFACE ELEVATION: 75.96 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, brown *(continued)*	42				24
45								
			- very dense below 48 feet	50/ 10"				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 13.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 12.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	12.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/18/2008	**DATE MEASURED:**	10/18/2008	**FIGURE:**	A-6b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-6

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16552773.29700; E 1197944.97435

SURFACE ELEVATION: 75.73 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, dark brown			30	
					94
5			110		
	CLAY, lean, very stiff, dark brown				97
	CLAY, lean, stiff, brown, with black ferrous stains			21	
10					94
15	SILT, loose, brown	9		NP	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet				
20		6			85
25	CLAY, lean, firm to stiff, brown	6			
30		7		10	
35		15			97

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	11.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/20/2008	**DATE MEASURED:**	10/20/2008	**FIGURE:**	A-7a

LOG OF BORING NO. DP-6

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16552773.29700; E 1197944.97435

SURFACE ELEVATION: 75.73 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, firm to stiff, brown *(continued)* - becomes grayish-brown in color below a depth of about 40 feet	12			NP	62
45			SAND, clayey, medium dense, brown					
50				10				49
			Boring terminated at a depth of about 50 feet.					

NOTES:
During the drilling operations, groundwater was observed at a depth of about 15 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 11.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 43.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

55 60 65 70 75

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	11.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/20/2008	**DATE MEASURED:**	10/20/2008	**FIGURE:**	A-7b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-7

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16552219.76120; E 1198093.15164

SURFACE ELEVATION: 75.64 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown				96
				18	
5	CLAY, fat, very stiff, brown, with black ferrous stains				
	CLAY, lean, firm to soft, brown		91		
				18	
10					98
	SILT, brown, wet				
15		1/18"			85
	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet				
20	CLAY, fat, stiff, brown	11		28	
25		13			94
30		12		24	
35	SAND, silty, dense to medium dense, brown	37			13

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	11.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/20/2008	**DATE MEASURED:**	10/20/2008	**FIGURE:**	A-8a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-7

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16552219.76120; E 1198093.15164

SURFACE ELEVATION: 75.64 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, silty, dense to medium dense, brown *(continued)*	13				15
45								
			- dense below 48 feet	31				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 13 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 11.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	11.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/20/2008	**DATE MEASURED:**	10/20/2008	**FIGURE:**	A-8b

LOG OF BORING NO. DP-8

The Lower Rio Grande Flood Control Project
Cameron County, Texas

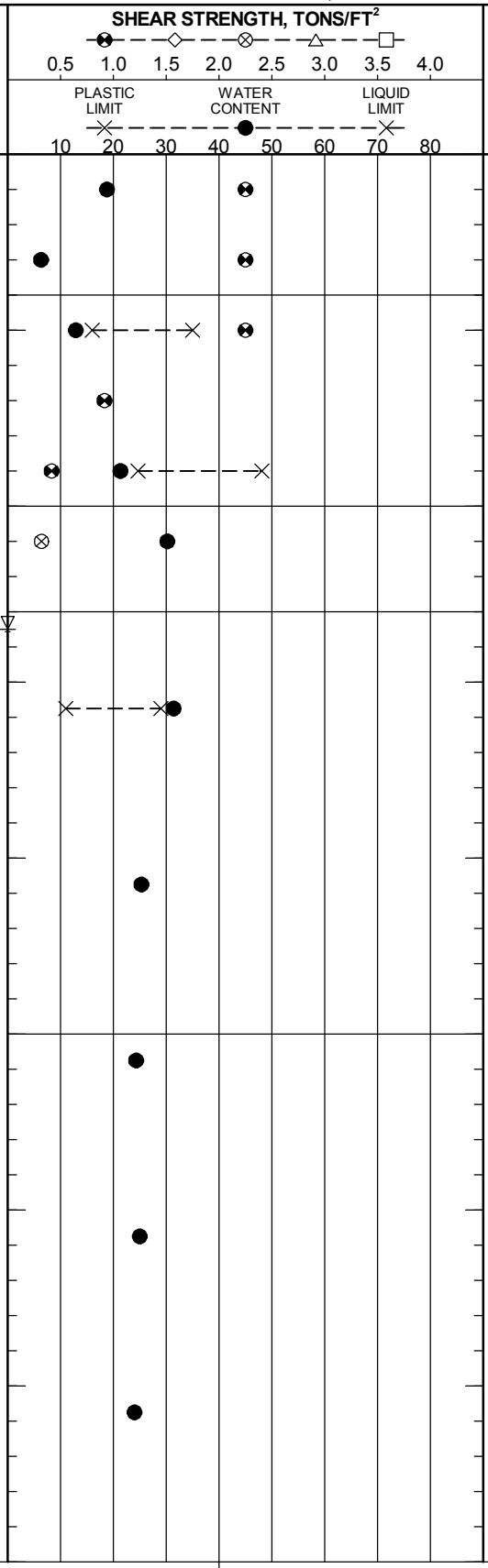
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16551822.17340; E 1198198.58958

SURFACE ELEVATION: 75.67 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown				90
5	CLAY, lean, very stiff to stiff, light brown to brown, with black ferrous stains			19	
	- firm 8 to 10 feet		96	23	97
10	CLAY, fat, firm, brown, with orange ferrous stains		87		
	SAND, clayey, loose, brown				
15		8		18	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet				
20		10			17
25	SAND, silty, medium dense, brown	13		NP	
30		20			15
35		15			24



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/20/2008	**DATE MEASURED:**	10/20/2008	**FIGURE:**	A-9a

LOG OF BORING NO. DP-8

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16551822.17340; E 1198198.58958

SURFACE ELEVATION: 75.67 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)* - with clay lenses below a depth of about 40 feet	16				NP	
45									
				12					17
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 13 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 13.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/20/2008	**DATE MEASURED:**	10/20/2008	**FIGURE:**	A-9b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-9

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16551323.11190; E 1198314.37160

SURFACE ELEVATION: 75.16 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, dark brown to brown			27	
					91
5				22	
	CLAY, fat, stiff to firm, brown, with black ferrous stains			27	
					96
10			93		
15	- with orange ferrous stains below a depth of about 15 feet	8		42	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet				
20		4		32	
25		18			91
	SAND, silty, medium dense, brown				
30		13			14
35		16			17

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	12 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/20/2008	**DATE MEASURED:**	10/20/2008	**FIGURE:**	A-10a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-9

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16551323.11190; E 1198314.37160

SURFACE ELEVATION: 75.16 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, dense, brown	30				8
45				31				
			CLAY, fat, stiff, brown to reddish-brown	11				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT ✕ — WATER CONTENT ● — LIQUID LIMIT ✕ (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 15 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 12 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	12 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/20/2008	**DATE MEASURED:**	10/20/2008	**FIGURE:**	A-10b

LOG OF BORING NO. DP-10

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16550770.19860; E 1198325.74017

SURFACE ELEVATION: 73.63 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, stiff, brown				94
5	CLAY, fat, stiff to firm, brown				96
	SILT, brown				99
10	CLAY, fat, soft to stiff, brown	4		31	
15	- with orange ferrous stains below a depth of about 15 feet		95	31	99
20	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				96
25	CLAY, lean, stiff, brown to grayish-brown, with orange ferrous stains			22	
30		12			
35	CLAY, sandy, lean, stiff, dark brown	8			57

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	12 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/21/2008	**DATE MEASURED:**	10/21/2008	**FIGURE:**	A-11a

LOG OF BORING NO. DP-10

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16550770.19860; E 1198325.74017

SURFACE ELEVATION: 73.63 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown	15				32
45								
			CLAY, fat, very stiff, brown				26	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 12 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	12 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/21/2008	**DATE MEASURED:**	10/21/2008	**FIGURE:**	A-11b

LOG OF BORING NO. DP-11

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549860.84680; E 1197796.74384

SURFACE ELEVATION: 74.21 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			15	
5	CLAY, lean, with sand, firm, brown				70
	- stiff from 6 to 8 feet			11	
10					81
15	CLAY, fat, firm to stiff, brown to grayish-brown, with calcareous nodules			26	
20	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet		97		
25	SAND, with silt, poorly-graded, medium dense, dark brown			NP	
30		22			10
35		23			6

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/21/2008	**DATE MEASURED:**	10/21/2008	**FIGURE:**	A-12a

LOG OF BORING NO. DP-11

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549860.84680; E 1197796.74384

SURFACE ELEVATION: 74.21 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, poorly graded, medium dense, dark brown	25				4
45								
				20				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 15 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/21/2008	**DATE MEASURED:**	10/21/2008	**FIGURE:**	A-12b

LOG OF BORING NO. DP-12

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549073.12270; E 1197293.77136

SURFACE ELEVATION: 74.61 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, dark brown			50	
					98
5	CLAY, lean, soft to firm, brown		99		
					94
				9	
10					100
15				26	
	CLAY, sandy, lean, soft, brown, wet				
20					57
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	- stiff below 25 feet	13		8	
30	SAND, poorly-graded, medium dense, dark brown	13			4
35	SAND, silty, medium dense, dark brown	21			14

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/22/2008	**DATE MEASURED:**	10/22/2008	**FIGURE:**	A-13a

LOG OF BORING NO. DP-12

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549073.12270; E 1197293.77136

SURFACE ELEVATION: 74.61 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown *(continued)*	13				
			CLAY, fat, stiff, grayish-brown to brown					
45								
				15				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 13 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/22/2008	**DATE MEASURED:**	10/22/2008	**FIGURE:**	A-13b

LOG OF BORING NO. DP-13

The Lower Rio Grande Flood Control Project
Cameron County, Texas

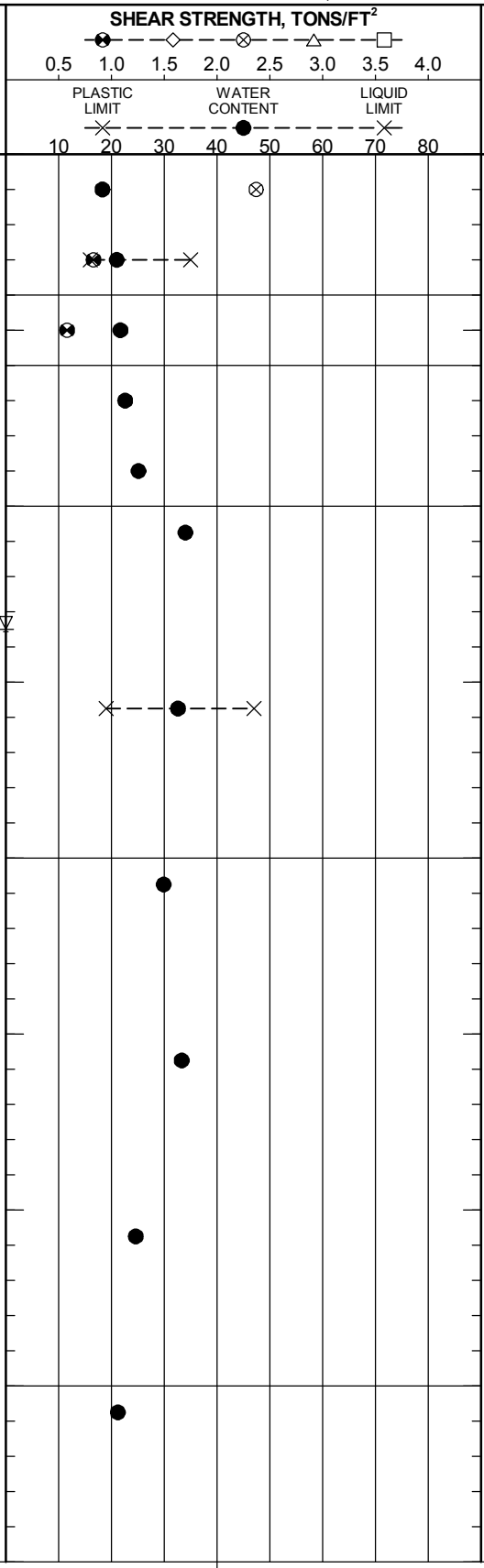
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548096.45130; E 1196820.07241

SURFACE ELEVATION: 74.60 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules		106		
	- stiff below 2 feet			19	
5	CLAY, lean, with sand, stiff, brown				73
	SILT, with sand, brown			NP	81
10	CLAY, lean, soft, brown	4			95
15	- with sand lenses below a depth of about 15 feet	3		28	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet				
20	SAND, silty, medium dense, brown	13		NP	
25		27			12
30		34			13
35	SAND, with silt, poorly-graded, dense to medium dense, brown	46			10



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/21/2008	**DATE MEASURED:**	10/21/2008	**FIGURE:**	A-14a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-13

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548096.45130; E 1196820.07241

SURFACE ELEVATION: 74.60 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, dense to medium dense, brown *(continued)*	19				
45								
			CLAY, fat, very stiff, brown	17				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 12 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 13.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/21/2008	**DATE MEASURED:**	10/21/2008	**FIGURE:**	A-14b

LOG OF BORING NO. DP-14

The Lower Rio Grande Flood Control Project
Cameron County, Texas

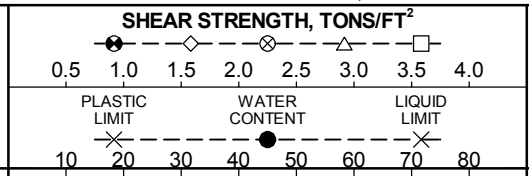
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16547082.52270; E 1196463.46758

SURFACE ELEVATION: 74.65 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with gypsum nodules				85
	FILL: CLAY, lean, with sand, soft, brown	4		11	
5	CLAY, lean, firm to soft, brown	8			98
			95		
				9	
10					97
15					98
	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet				
20		5		13	
25	CLAY, fat, stiff, dark brown	10		36	
30	SAND, silty, medium dense, dark brown	25			24
35	SAND, with silt, poorly-graded, medium dense, dark brown	26			10



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	12.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/21/2008	**DATE MEASURED:**	10/21/2008	**FIGURE:**	A-15a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-14

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16547082.52270; E 1196463.46758

SURFACE ELEVATION: 74.65 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown *(continued)*	18				
45								
			CLAY, lean, stiff, light brown	15				92
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 15 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 12.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 42.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	12.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/21/2008	**DATE MEASURED:**	10/21/2008	**FIGURE:**	A-15b

LOG OF BORING NO. DP-15

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16546302.78230; E 1196969.10129

SURFACE ELEVATION: 74.25 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, very stiff, brown		12	
	FILL: CLAY, sandy, lean, firm, brown	6		55
5	CLAY, lean, firm, brown	7	23	
		5		93
	CLAY, fat, firm, brown	7	26	
10		7		97
15	- with black ferrous stains below a depth of about 15 feet	8	39	
20	CLAY, sandy, lean, very soft, brown			51
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet			
25	CLAY, lean, with sand, firm, brown	4		
30	SAND, silty, medium dense to dense, brown to dark brown	13		24
35		22		

SYMBOL / SAMPLES

UNIT DRY WIEGHT, pcf

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/21/2008	**DATE MEASURED:**	10/21/2008	**FIGURE:**	A-16a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-15

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16546302.78230; E 1196969.10129

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 74.25 ft					
			SAND, silty, medium dense to dense, brown to dark brown *(continued)*	18				23
45								
				48				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 19 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 44.5 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/21/2008	**DATE MEASURED:**	10/21/2008	**FIGURE:**	A-16b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-16

The Lower Rio Grande Flood Control Project
Cameron County, Texas

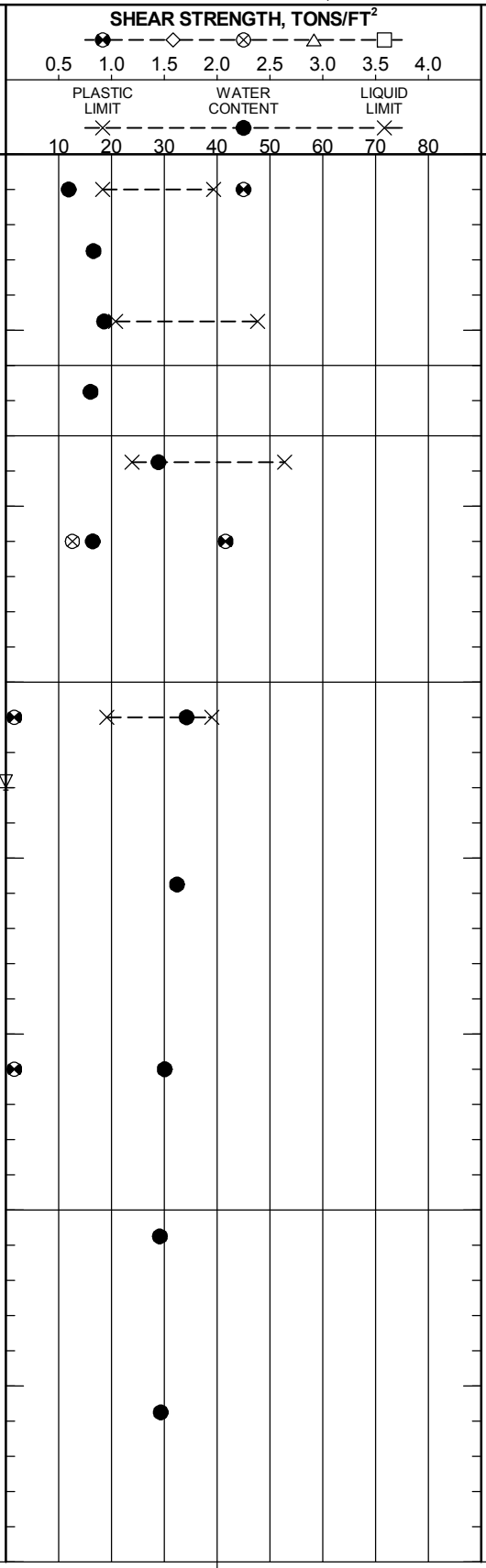
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545972.78970; E 1197666.34357

SURFACE ELEVATION: 75.22 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, dark brown, with orange ferrous stains			21	
		13			96
5		13		27	
	SILT, with sand, brown	10			75
	CLAY, fat, firm to stiff, brown, with orange ferrous stains	7		29	
10			103		
15	CLAY, lean, with sand, very soft, brown			20	
20	- soft at 20 feet	4			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25					79
30	SAND, with silt, poorly-graded, medium dense to loose, dark brown	11			6
35		16			10



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/22/2008	**DATE MEASURED:**	10/22/2008	**FIGURE:**	A-17a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-16

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545972.78970; E 1197666.34357

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 75.22 ft					
			SAND, with silt, poorly-graded, medium dense to loose, dark brown *(continued)*	9				7
45								
			CLAY, fat, firm, light brown	5				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 37 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/22/2008	**DATE MEASURED:**	10/22/2008	**FIGURE:**	A-17b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-17

The Lower Rio Grande Flood Control Project
Cameron County, Texas

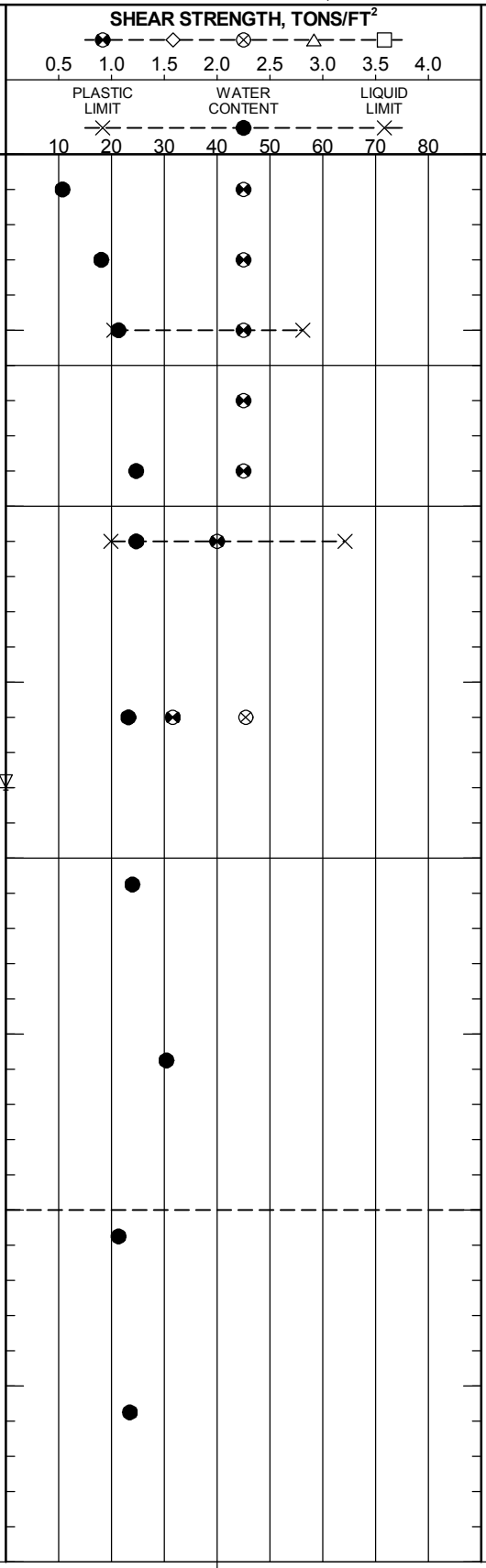
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545869.00180; E 1198768.09281

SURFACE ELEVATION: 74.35 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown, with black ferrrous stains				100
5				36	
	CLAY, lean, very stiff, brown				100
10	CLAY, fat, very stiff to hard, brown			44	
15			99		
20	SAND, with silt, poorly-graded, very loose, brown	3			5
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		2		NP	
30	SAND, with silt, poorly-graded, very dense, dark brown	50/ 10"			9
35		47			10



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/22/2008	**DATE MEASURED:**	10/22/2008	**FIGURE:**	A-18a

LOG OF BORING NO. DP-17

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545869.00180; E 1198768.09281

SURFACE ELEVATION: 74.35 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, poorly graded, medium dense, dark brown	14				14
45								
			CLAY, lean, stiff, light brown, with black ferrous stains	11			17	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/22/2008	**DATE MEASURED:**	10/22/2008	**FIGURE:**	A-18b

LOG OF BORING NO. DP-18

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545805.13220; E 1199790.00515

SURFACE ELEVATION: 74.29 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown		111		97
5	CLAY, fat, very stiff, brown, with orange ferrous stains			38	99
				34	
10	CLAY, lean, very stiff, brown				
15	CLAY, fat, very stiff, brown, with black ferrous stains			44	
20	SAND, clayey, loose, brown, wet	5			47
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	CLAY, sandy, lean, stiff, brown to reddish-brown	15			64
	SAND, silty, medium dense to dense, brown				
30		30			20
35		22			17

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/22/2008	**DATE MEASURED:**	10/22/2008	**FIGURE:**	A-19a

LOG OF BORING NO. DP-18

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545805.13220; E 1199790.00515

SURFACE ELEVATION: 74.29 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT; 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, brown *(continued)*	35				15
45								
			- medium dense below 48 feet	24			NP	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/22/2008	**DATE MEASURED:**	10/22/2008	**FIGURE:**	A-19b

LOG OF BORING NO. DP-19

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545991.41830; E 1200782.64396

SURFACE ELEVATION: 74.05 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, dark brown			32	88
5	CLAY, fat, very stiff, brown, with black ferrous stains		97	30 / 35	96
10	CLAY, sandy, lean, very stiff, brown				69
15	SAND, silty, loose to medium dense, brown	6		NP	
20	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	8			35
25		19			41
30	SAND, with silt, poorly-graded, medium dense, dark brown	17			11
35		17		NP	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/22/2008	**DATE MEASURED:**	10/22/2008	**FIGURE:**	A-20a

LOG OF BORING NO. DP-19

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545991.41830; E 1200782.64396

SURFACE ELEVATION: 74.05 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown	20				18
45								
				21				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/22/2008	**DATE MEASURED:**	10/22/2008	**FIGURE:**	A-20b

LOG OF BORING NO. DP-20

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

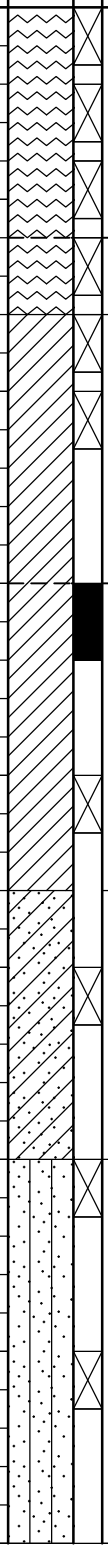
DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545946.17740; E 1201748.67047

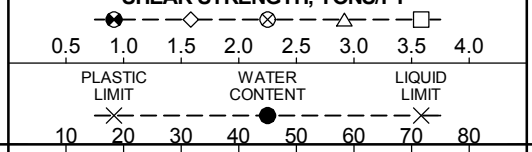
SURFACE ELEVATION: 74.04 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, brown	20		23	
		16			89
5		11		26	
	FILL: SILT, medium dense, brown	17			87
	CLAY, lean, very stiff to stiff, brown, with orange ferrous stains	16			97
10		12		22	
15	CLAY, lean, soft, brown, with orange ferrous stains				
20		3		23	
	SAND, clayey, very loose, dark brown				
25		3			38
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, silty, medium dense, dark brown	12			14
35		21			

SYMBOL / SAMPLES



SHEAR STRENGTH, TONS/FT^2



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/23/2008	**DATE MEASURED:**	10/23/2008	**FIGURE:**	A-21a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-20

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545946.17740; E 1201748.67047

SURFACE ELEVATION: 74.04 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff, brown, with gray clay lenses	9				95
45			- becomes reddish-brown in color below a depth of about 45 feet					
				13				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/23/2008	**DATE MEASURED:**	10/23/2008	**FIGURE:**	A-21b

LOG OF BORING NO. DP-21

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545858.35680; E 1202810.50126

SURFACE ELEVATION: 74.07 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown, with gypsum nodules	13			94
		12		16	
5		15			
		14		22	
		8			95
10	CLAY, lean, stiff, brown, with gypsum nodules		91		87
15	SAND, clayey, very loose, dark brown			12	
20		4			44
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	SAND, with silt, poorly-graded, medium dense, dark brown	18			9
30		15			
35	SAND, silty, loose to dense, dark brown	9			15

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/23/2008	**DATE MEASURED:**	10/23/2008	**FIGURE:**	A-22a

LOG OF BORING NO. DP-21

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545858.35680; E 1202810.50126

SURFACE ELEVATION: 74.07 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT; 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, loose to dense, dark brown *(continued)*	33				12
45								
			CLAY, lean, stiff, brown to reddish-brown, with gypsum nodules	8			25	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/23/2008	**DATE MEASURED:**	10/23/2008	**FIGURE:**	A-22b

LOG OF BORING NO. DP-22

The Lower Rio Grande Flood Control Project
Cameron County, Texas

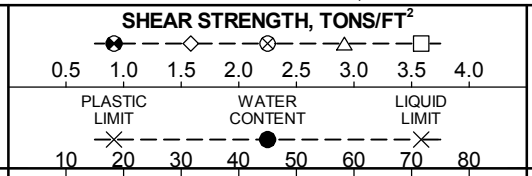
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545762.55260; E 1203824.42992

SURFACE ELEVATION: 73.09 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: SAND, clayey, brown, with calcareous nodules			11	
	FILL: CLAY, lean, hard to very stiff, brown		113		95
	CLAY, lean, with sand, stiff to firm, brown			14	77
				16	
20	SAND, clayey, loose to medium dense, brown	7			37
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		25			32
30		20			
35	SAND, with silt, poorly-graded, reddish-brown	25			9



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/23/2008	**DATE MEASURED:**	10/23/2008	**FIGURE:**	A-23a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-22

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545762.55260; E 1203824.42992

SURFACE ELEVATION: 73.09 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff to stiff, reddish-brown, with black ferrous stains	18		PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	54	
45			- becomes light brown in color below a depth of about 45 feet					
				15				97
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/23/2008	**DATE MEASURED:**	10/23/2008	**FIGURE:**	A-23b

LOG OF BORING NO. DP-23

The Lower Rio Grande Flood Control Project
Cameron County, Texas

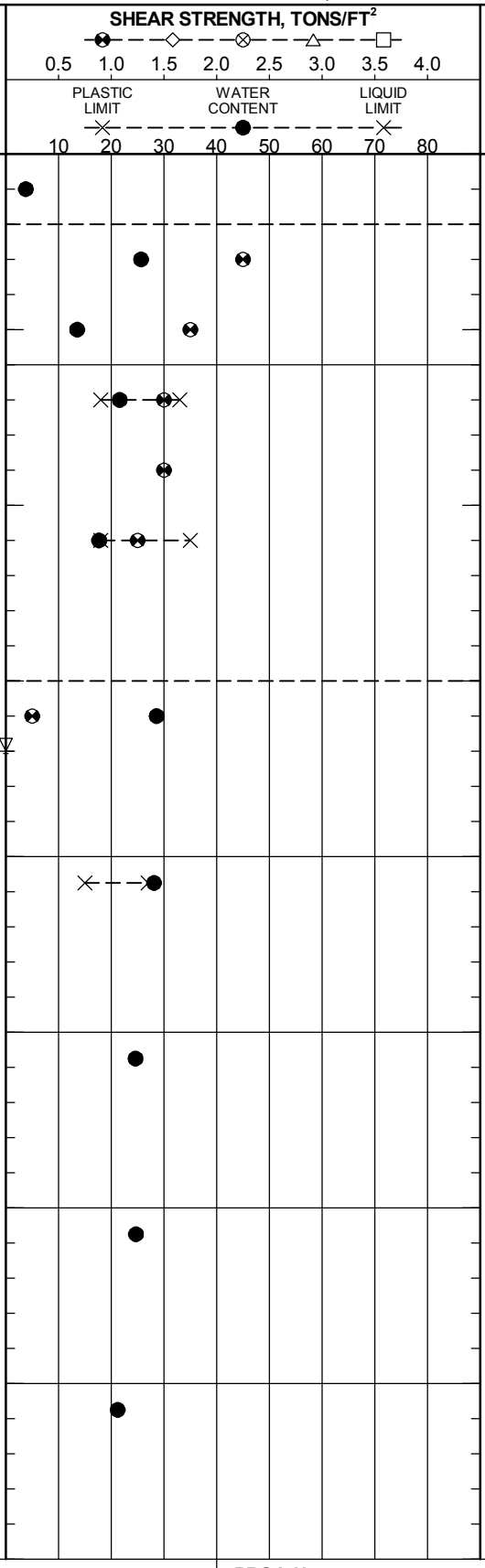
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16546731.24030; E 1203965.47511

SURFACE ELEVATION: 73.36 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: SAND, clayey, brown				21
	FILL: CLAY, lean, very stiff, brown				
5			103		
	CLAY, lean, very stiff, brown			15	
10				17	
15	CLAY, lean, soft, brown				96
20	SAND, clayey, very loose, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	3		12	
25	SAND, with silt, poorly-graded, medium dense, dark brown	18			10
30	SAND, clayey, medium dense, dark brown	13			18
35	SAND, with silt, poorly-graded, medium dense to dense, dark brown	22		NP	



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/23/2008	**DATE MEASURED:**	10/23/2008	**FIGURE:**	A-24a

LOG OF BORING NO. DP-23

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16546731.24030; E 1203965.47511

SURFACE ELEVATION: 73.36 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to dense, dark brown *(continued)*	26				11
45								
				40				8
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT ⊗ — WATER CONTENT ● — LIQUID LIMIT ⊗ (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/23/2008	**DATE MEASURED:**	10/23/2008	**FIGURE:**	A-24b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-24

The Lower Rio Grande Flood Control Project
Cameron County, Texas

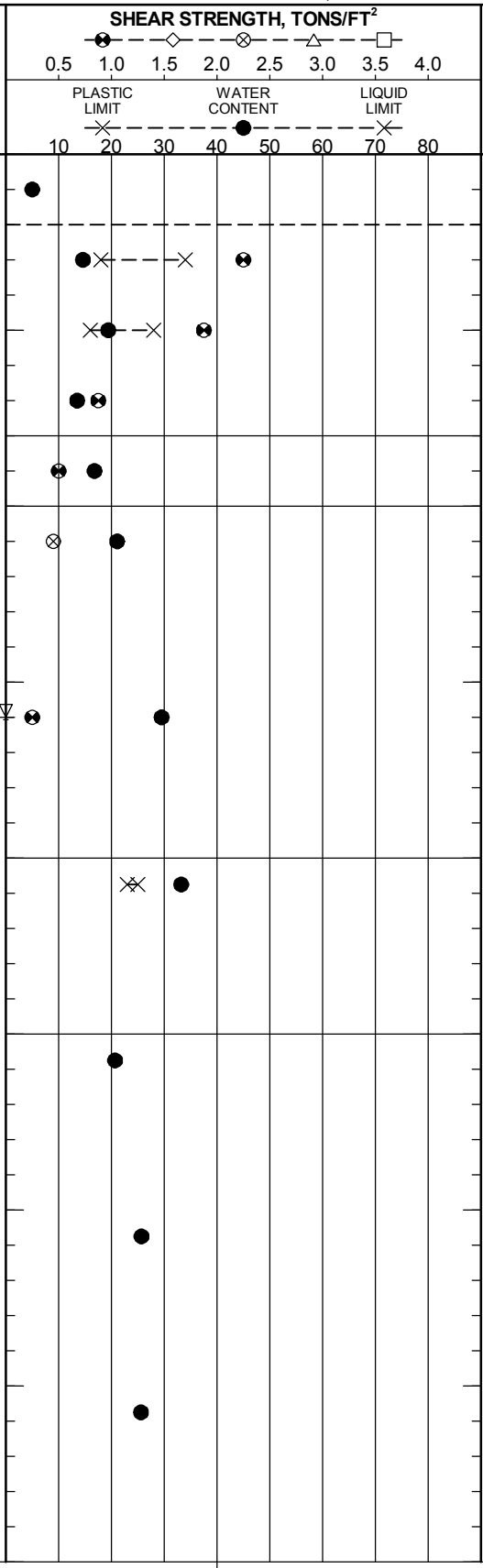
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16547793.07110; E 1204266.19410

SURFACE ELEVATION: 73.59 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: SAND, clayey, light brown				28
	FILL: CLAY, lean, very stiff to stiff, brown to light brown			16	
5				12	
					90
	CLAY, lean, with sand, firm, light brown				74
10	CLAY, fat, firm to soft, brown to dark brown		98		
15	- becomes light brown in color below a depth of about 15 feet				90
20	SAND, silty, loose, brown, wet Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	6		2	
25	SAND, with silt, poorly-graded, medium dense, brown to dark brown	19			
30		29			11
35		12			8



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/23/2008	**DATE MEASURED:**	10/23/2008	**FIGURE:**	A-25a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-24

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16547793.07110; E 1204266.19410

SURFACE ELEVATION: 73.59 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown to dark brown *(continued)*	22				
45								
			CLAY, lean, very stiff, dark brown to grayish-brown	20			16	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/23/2008	**DATE MEASURED:**	10/23/2008	**FIGURE:**	A-25b

LOG OF BORING NO. DP-25

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548469.02350; E 1204641.42754

SURFACE ELEVATION: 74.34 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, brown, with gypsum nodules	24		24	
		9			94
5	FILL: CLAY, lean, with sand, very stiff to stiff, brown	7		20	
			103		
		11			82
10	SAND, with silt, poorly-graded, loose, light brown to brown, with clay lenses			4	40
15		7			8
20	CLAY, lean, very soft, brown, wet Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	2		13	
25	SAND, silty, medium dense, brown	16			34
30	SAND, with silt, poorly-graded, medium dense, brown	17			9
35		29			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/24/2008	**DATE MEASURED:**	10/24/2008	**FIGURE:**	A-26a

LOG OF BORING NO. DP-25

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548469.02350; E 1204641.42754

SURFACE ELEVATION: 74.34 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	16				7
45								
				22				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/24/2008	**DATE MEASURED:**	10/24/2008	**FIGURE:**	A-26b

LOG OF BORING NO. DP-26

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548319.99460; E 1205700.59710

SURFACE ELEVATION: 73.32 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, brown, with calcareous nodules	27			89
	- becomes light brown in color below a depth of about 2 feet	8		17	
5		8			98
	- becomes brown in color below a depth of about 5 feet	9		25	
		8			96
10	CLAY, lean, firm to very soft, brown, with calcareous nodules	6		16	
15		2			
	CLAY, lean, with sand, very soft, brown				
20		2			75
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	CLAY, lean, firm, brown	7		18	
30	SAND, with silt, poorly-graded, medium dense, brown to dark brown				9
35		15			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/24/2008	**DATE MEASURED:**	10/24/2008	**FIGURE:**	A-27a

LOG OF BORING NO. DP-26

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548319.99460; E 1205700.59710

SURFACE ELEVATION: 73.32 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown to dark brown *(continued)*	16				
45								
				17				9
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/24/2008	**DATE MEASURED:**	10/24/2008	**FIGURE:**	A-27b

LOG OF BORING NO. DP-27

The Lower Rio Grande Flood Control Project
Cameron County, Texas

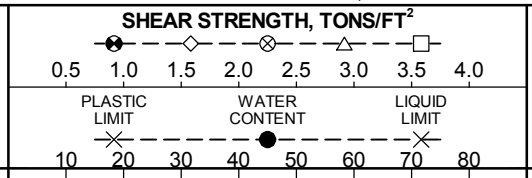
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548642.00350; E 1206775.73405

SURFACE ELEVATION: 73.11 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules		106		
	FILL: CLAY, lean, with sand, very stiff, light brown			16	
5			104		81
10				22	
	SAND, clayey, medium dense, brown				
15		10			20
	SAND, silty, medium dense, brown				
20	CLAY, fat, soft, brown, with calcareous nodules Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	3		23	
25	SILT, sandy, stiff, brown	8		NP	
30		10			60
35	SAND, silty, medium dense, dark brown	14			21



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/24/2008	**DATE MEASURED:**	10/24/2008	**FIGURE:**	A-28a

LOG OF BORING NO. DP-27

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548642.00350; E 1206775.73405

SURFACE ELEVATION: 73.11 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, with silt, poolry-graded, dense, dark brown	40				10
45			SAND, silty, very dense, dark brown					
				50/ 10"				17
50			Boring terminated at a depth of about 49.8 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/24/2008	**DATE MEASURED:**	10/24/2008	**FIGURE:**	A-28b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-28

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548226.85160; E 1207619.34397

SURFACE ELEVATION: 73.36 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, brown	20			88
		14		23	
5		12			85
	- firm 6 to	6		11	
		8			96
10	CLAY, lean, with sand, firm, brown	4		20	
15		6			79
20	CLAY, fat, firm to soft, brown to grayish-brown, with orange ferrous stains and gypsum nodules Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	7		50	
25			96		
30	SAND, silty, medium dense, dark brown	14			15
35	SAND, with silt, poorly-graded, dense, dark brown	33			11

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/26/2008	**DATE MEASURED:**	10/26/2008	**FIGURE:**	A-29a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-28

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548226.85160; E 1207619.34397

SURFACE ELEVATION: 73.36 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, with sand, firm to stiff, grayish-brown to brown	6				
45								
				12				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19.5 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/26/2008	**DATE MEASURED:**	10/26/2008	**FIGURE:**	A-29b

LOG OF BORING NO. DP-29

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16547492.35210; E 1208367.14962

SURFACE ELEVATION: 73.51 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, dark brown to brown, with calcareous nodules	18		22	
		18			99
5		14			98
		9		26	
	- firm below 8 feet	7			100
10	CLAY, fat, firm to soft, brown	7			100
15	- with orange ferrous stains below a depth of about 15 feet	8		35	
20		4			99
25		4			
30					
35		5		43	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/25/2008	**DATE MEASURED:**	10/25/2008	**FIGURE:**	A-30a

LOG OF BORING NO. DP-29

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16547492.35210; E 1208367.14962

SURFACE ELEVATION: 73.51 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, with sand, very soft, grayish-brown	1/18"				76
45			SAND, silty, very loose to loose, dark brown	2				25
			Driller's Note: Converted to mud rotary drilling method at a depth of about 46-1/2 feet					
				9				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring remained uncaved. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/25/2008	**DATE MEASURED:**	10/25/2008	**FIGURE:**	A-30b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-30

The Lower Rio Grande Flood Control Project
Cameron County, Texas

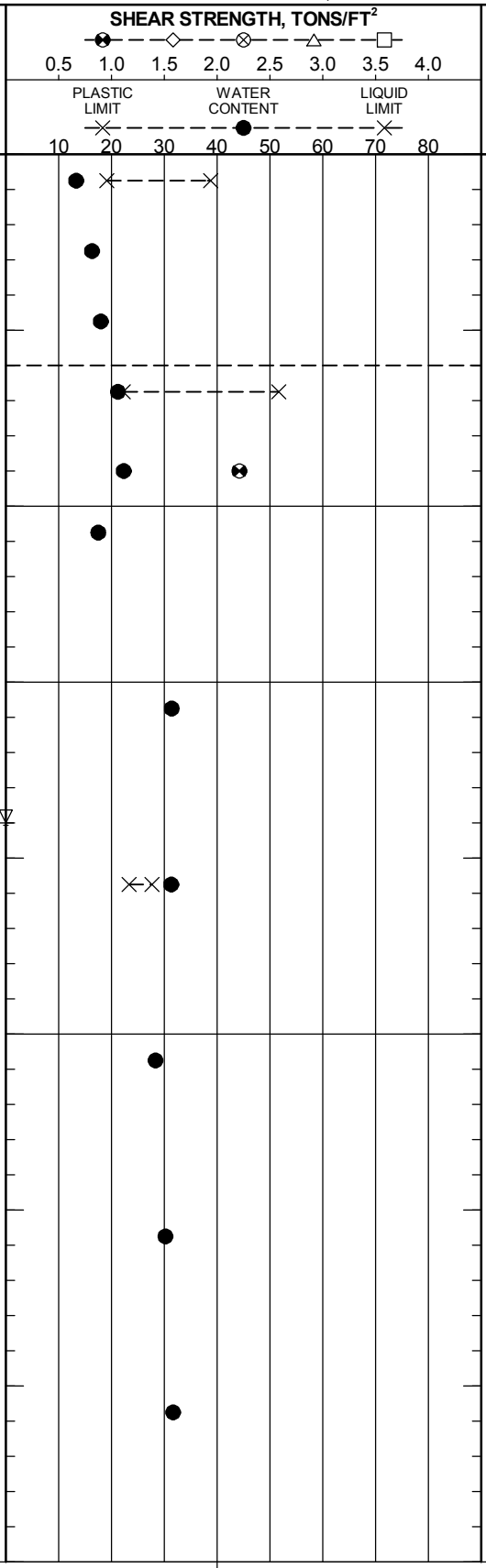
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16546836.06970; E 1209027.17976

SURFACE ELEVATION: 73.19 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, dark brown to brown, with calcareous nodules and black ferrous stains	21		20	
		10			
5		13			95
	FILL: CLAY, fat, firm, brown, with orange ferrous stains	8		30	
10	SILT, loose, brown	7			98
15	CLAY, lean, sandy, very soft, brown	2			56
20		2		5	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	SAND, silty, loose, dark brown	8			32
30		4		NP	
35		8			21



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/25/2008	**DATE MEASURED:**	10/25/2008	**FIGURE:**	A-31a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-30

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16546836.06970; E 1209027.17976

SURFACE ELEVATION: 73.19 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, with silt, pooly-graded, medium dense, dark brown	21				
45								
				19				6
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/25/2008	**DATE MEASURED:**	10/25/2008	**FIGURE:**	A-31b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-31

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16547308.72720; E 1209868.08337

SURFACE ELEVATION: 72.11 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, stiff, brown, with calcareous nodules and black ferrous stains	13			83
	FILL: SILT, stiff, brown	9			95
5	CLAY, lean, firm to soft, brown, with black ferrous stains	7		21	
		4			91
	SILT, with sand, very loose, light brown	2			81
10	CLAY, fat, very soft to stiff, brown	2		33	
15			104		
20			105		
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	- becomes dark brown in color and with calcareous nodules below a depth of about 25 feet	10		46	
30	CLAY, lean, sandy, firm, brown				61
35		6		5	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/31/2008	**DATE MEASURED:**	10/31/2008	**FIGURE:**	A-32a

LOG OF BORING NO. DP-31

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16547308.72720; E 1209868.08337

SURFACE ELEVATION: 72.11 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff to firm, brown to grayish-brown, with black ferrous stains	11				98
45								
				4				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/31/2008	**DATE MEASURED:**	10/31/2008	**FIGURE:**	A-32b

LOG OF BORING NO. DP-32

The Lower Rio Grande Flood Control Project
Cameron County, Texas

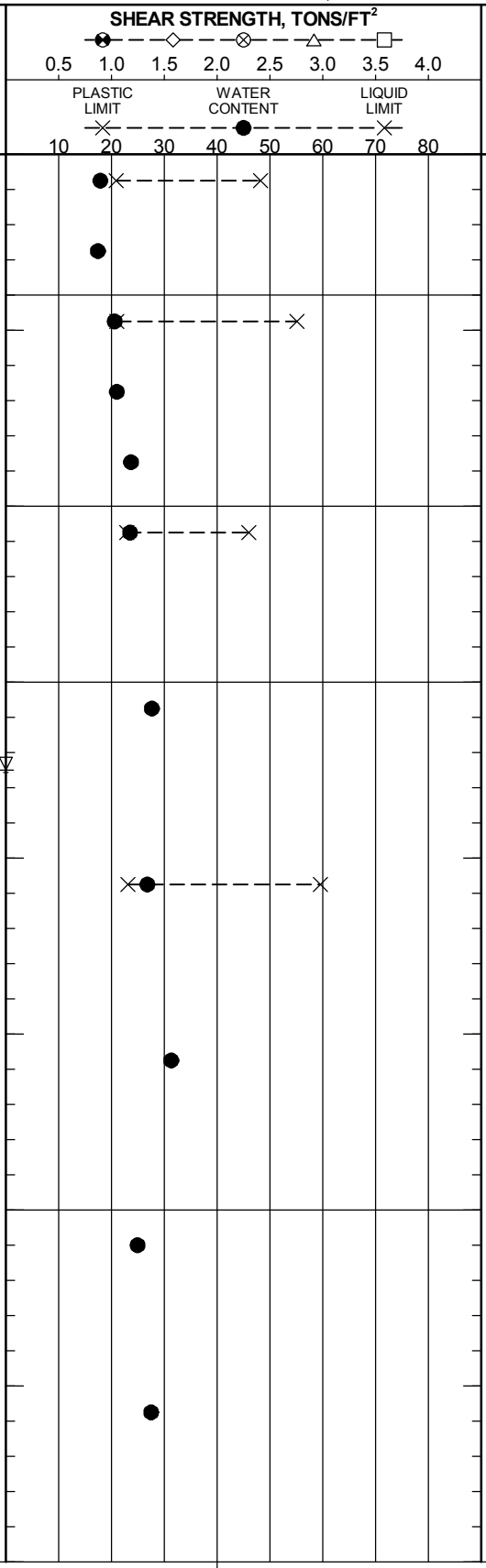
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548343.21330; E 1209844.86792

SURFACE ELEVATION: 71.22 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown	12		27	
		10			99
5	CLAY, fat, stiff to very soft, dark brown, with calcareous nodules	12		34	
		3			98
	- with black ferrous stains and gypsum crystals below a depth of about 7 feet - stiff below 8 feet	8			
10	CLAY, lean, firm, dark brown	7		23	
15	CLAY, fat, stiff to firm, brown, with black ferrous stains and gypsum crystals	10			97
20		11		37	
25	Driller's Note: Converted to mud rotary drilling method at a depth of about 25 feet	5			
30	CLAY, sandy, lean, stiff to very stiff, light brown				60
35		11			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/27/2008	**DATE MEASURED:**	10/27/2008	**FIGURE:**	A-33a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-32

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548343.21330; E 1209844.86792

SURFACE ELEVATION: 71.22 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, sandy, lean, stiff to very stiff, light brown *(continued)*	24				61
45								
			CLAY, fat, soft, grayish-brown	4				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17.5 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/27/2008	**DATE MEASURED:**	10/27/2008	**FIGURE:**	A-33b

LOG OF BORING NO. DP-33

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548907.61120; E 1210008.17727

SURFACE ELEVATION: 71.56 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, dark brown, with orange ferrous stains	11		29	
	FILL: CLAY, fat, stiff to very stiff, dark brown	13			99
5			96		
10	CLAY, fat, very stiff to stiff, brown, with black ferrous stains			37	
15				32	
20					99
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		7		39	
30	SAND, with silt, poorly-graded, loose to medium dense, dark brown				7
35		23			10

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-34a

LOG OF BORING NO. DP-33

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548907.61120; E 1210008.17727

SURFACE ELEVATION: 71.56 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, loose to medium dense, dark brown *(continued)*	20				9
45								
			CLAY, sandy, lean, stiff, brown	9				56
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-34b

LOG OF BORING NO. DP-34

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

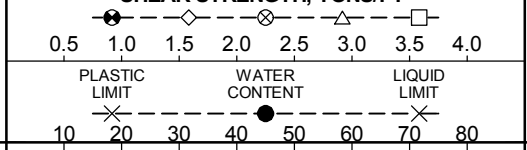
DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549195.53930; E 1210461.53767

SURFACE ELEVATION: 71.70 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown	11			98
	FILL: CLAY, fat. stiff to hard, dark brown, with calcareous nodules	10		40	
5			121	37	98
			105		94
			100	31	100
10	CLAY, fat. very stiff, dark brown, with calcareous nodules			44	
15					99
20	SILT, sandy, soft to stiff, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet			3	
25		15			65
30	SAND, with silt, poorly-graded, brown, medium dense	24			9
35	SAND, silty, medium dense, brown	12			18

SHEAR STRENGTH, TONS/FT^2



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-35a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-34

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549195.53930; E 1210461.53767

SURFACE ELEVATION: 71.70 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	11				
45								
			CLAY, lean, firm, brown to grayish-brown	7			20	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-35b

LOG OF BORING NO. DP-35

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549530.85430; E 1210794.19143

SURFACE ELEVATION: 72.12 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, dark brown to brown				95
	- with calcareous nodules below a depth of about 2 feet			34	
5					99
				33	
			101		
10				35	
15					35
	SAND, clayey, loose, brown				
20		9		9	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	CLAY, sandy, lean, stiff, brown	15			10
30	SAND, with silt, poorly-graded, very dense, dark brown	50/ 10"			14
35	SAND, silty, medium dense, dark brown	21			10

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-36a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-35

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549530.85430; E 1210794.19143

SURFACE ELEVATION: 72.12 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown *(continued)*	27				
45								
			SAND, with silt, poorly-graded, dark brown	33				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-36b

LOG OF BORING NO. DP-36

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549695.85060; E 1211331.75990

SURFACE ELEVATION: 71.52 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, dark brown, with calcareous nodules			37	
	- becomes brown in color below a depth of about 2 feet		101		
5					100
				39	
	CLAY, fat, very stiff to stiff, dark brown, with calcareous nodules and black ferrous stains				97
10					95
15				43	
20		18			95
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	SAND, silty, medium dense to very dense, brown	16		NP	
30		17			30
35		17			23

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-37a

LOG OF BORING NO. DP-36

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549695.85060; E 1211331.75990

SURFACE ELEVATION: 71.52 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to very dense, brown *(continued)*	50/ 11"				
45								
			- medium dense below 48 feet	18				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-37b

LOG OF BORING NO. DP-37

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549482.95220; E 1212228.59443

SURFACE ELEVATION: 71.12 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, dark brown, with calcareous nodules	14		36	
		15			99
5	- with black ferrous stains below a depth of about 6 feet			37	
					100
10	CLAY, fat, very stiff to stiff, dark brown, with calcareous nodules			32	
15			98		
20					100
25	- becomes brown in color below a depth of about 25 feet	17		31	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		12			99
35	- firm below 35 feet	7			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/29/2008	**DATE MEASURED:**	10/29/2008	**FIGURE:**	A-38a

LOG OF BORING NO. DP-37

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549482.95220; E 1212228.59443

SURFACE ELEVATION: 71.12 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff to stiff, dark brown, with calcareous nodules *(continued)* - becomes grayish-brown in color below a depth of about 40 feet	6				100
45								
			SAND, clayey, medium dense, brown	17				47
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21.5 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/29/2008	**DATE MEASURED:**	10/29/2008	**FIGURE:**	A-38b

LOG OF BORING NO. DP-38

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549062.53100; E 1213232.52982

SURFACE ELEVATION: 71.11 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, dark brown, with calcareous nodules	19			99
		8		27	
5		9			98
	CLAY, fat, very stiff to stiff, brown, with gypsum nodules			28	
					99
10					99
15				39	
20	- becomes light brown in color, with calcareous nodules and black ferrous stains below a depth of about 20 feet				100
25				31	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30					100
35					83

SYMBOL

SAMPLES

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/29/2008	**DATE MEASURED:**	10/29/2008	**FIGURE:**	A-39a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-38

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16549062.53100; E 1213232.52982

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION: 71.11 ft	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff to stiff, brown, with gypsum nodules *(continued)* - becomes brown to reddish-brown below a depth of about 40 feet	11				
45								
			CLAY, lean, with sand, firm, brown	6				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22 feet. Upon completion of the drilling operations, the boring remained uncaved. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/29/2008	**DATE MEASURED:**	10/29/2008	**FIGURE:**	A-39b

LOG OF BORING NO. DP-39

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548830.95080; E 1213689.60973

SURFACE ELEVATION: 71.59 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff to stiff, brown, with calcareous nodules	20			98
		18			100
5		11		35	
				32	
	CLAY, fat, very stiff, brown, with calcareous nodules		102		
10				NP	
15					48
20	SAND, silty, medium dense, light brown			38	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		13			73
30	CLAY, fat, stiff, brown to reddish-brown, with black ferrous stains	12			13
35	CLAY, lean, with sand, stiff, brown	10			34

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/29/2008	**DATE MEASURED:**	10/29/2008	**FIGURE:**	A-40a

LOG OF BORING NO. DP-39

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548830.95080; E 1213689.60973

SURFACE ELEVATION: 71.59 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown	19				
45								
				20				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/29/2008	**DATE MEASURED:**	10/29/2008	**FIGURE:**	A-40b

LOG OF BORING NO. DP-40

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548582.83100; E 1214130.53205

SURFACE ELEVATION: 70.44 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, dark brown, with calcareous nodules			40	
	FILL: CLAY, lean, hard, brown		104		
5					100
				30	
	FILL: CLAY, lean, with sand, very stiff, brown				84
10	CLAY, fat, stiff to very stiff to stiff, dark brown to brown, with calcareous nodules			45	
15	- with gypsum nodules below a depth of about 15 feet				99
20		18			100
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		14		29	
30		14			100
35		14			13

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-41a

LOG OF BORING NO. DP-40

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548582.83100; E 1214130.53205

SURFACE ELEVATION: 70.44 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown	26				
45								
			- becomes dark grayish-brown in color and with clay lenses below a depth of about 48 feet	28				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 19 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-41b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-41

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548280.07620; E 1214535.88089

SURFACE ELEVATION: 69.53 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown, with calcareous nodules and roots extending down to a depth of about 2 feet				93
				47	
5			105		
	FILL: CLAY, lean, very stiff, dark brown to brown, with black ferrous stains			28	
					76
10					93
	CLAY, lean, very stiff, dark brown to brown, with black ferrous stains				
15				45	
20	CLAY, fat, vey stiff to stiff, brown to reddish-brown, with black ferrous stains	20			99
25		11		30	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		18			100
35		13			28

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-42a

LOG OF BORING NO. DP-41

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16548280.07620; E 1214535.88089

SURFACE ELEVATION: 69.53 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown to dark brown	24					
45									
				30					
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 19 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-42b

LOG OF BORING NO. DP-42

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16547854.27940; E 1215086.75551

SURFACE ELEVATION: 70.10 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard to very stiff, brown, with calcareous nodules			24	
					95
5					96
	- with black ferrous stains below a depth of about 6 feet		105		
				29	
10	CLAY, lean, very stiff, brown, with calcareous nodules		106	28	95
15					98
	CLAY, fat, very stiff to firm, brown, with black ferrous stains and calcareous nodules				
20		21		32	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		7			97
30	- stiff below 30 feet	9			99
35	SAND, silty, dense, brown	47		NP	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-43a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-42

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16547854.27940; E 1215086.75551

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 70.10 ft					
			SAND, silty, dense, brown *(continued)*	38				40
45								
			SAND, with silt, poorly-graded, dark brown	15				10
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of 49 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/28/2008	**DATE MEASURED:**	10/28/2008	**FIGURE:**	A-43b

LOG OF BORING NO. DP-43

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16547338.00080; E 1215760.04672

SURFACE ELEVATION: 70.23 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, dark brown, with calcareous nodules		105		
	FILL: SILT, sandy, loose, light brown				67
5		7		1	
	FILL: CLAY, sandy, with silt, firm to soft, light brown	5			71
		4		7	
10	CLAY, fat, firm to stiff, brown	7			
15		6		25	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 17 feet				
20		7			98
25		9			98
30	CLAY, lean, stiff, grayish-brown, with black and orange ferrous stains	8		16	
35		13			99

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/30/2008	**DATE MEASURED:**	10/30/2008	**FIGURE:**	A-44a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-43

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16547338.00080; E 1215760.04672

SURFACE ELEVATION: 70.23 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, stiff, grayish-brown, with black and orange ferrous stains *(continued)*	9				
45			SAND, with silt, poorly-graded, medium dense, dark brown					
				23				8
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 15 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/30/2008	**DATE MEASURED:**	10/30/2008	**FIGURE:**	A-44b

LOG OF BORING NO. DP-44

The Lower Rio Grande Flood Control Project
Cameron County, Texas

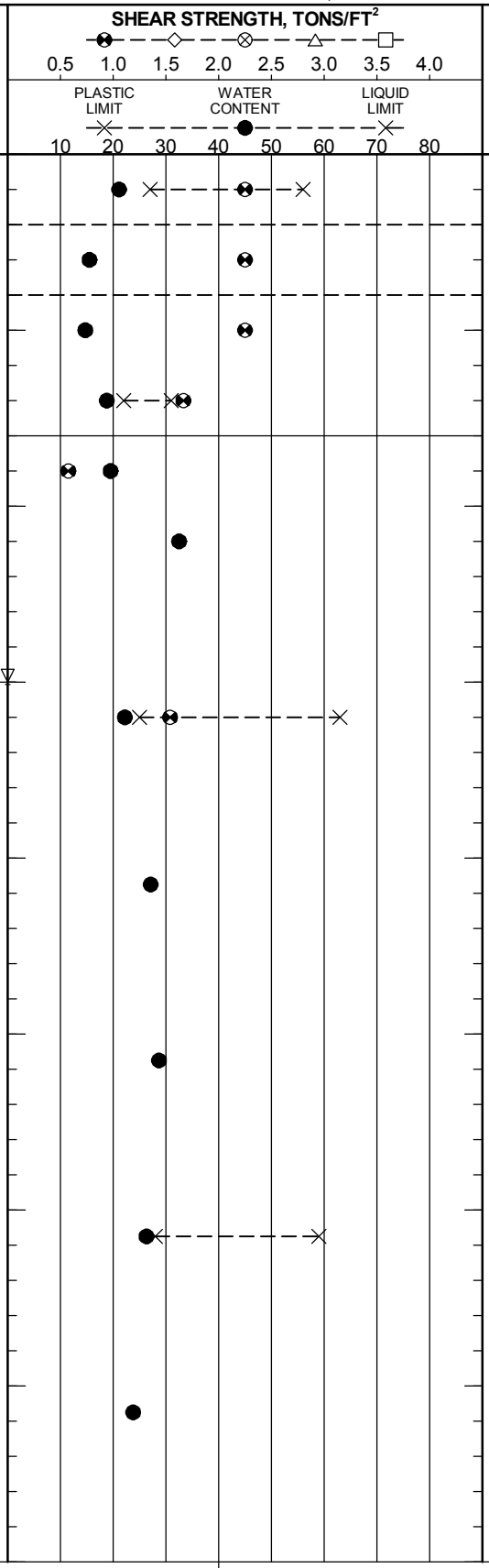
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16546893.57530; E 1216712.76708

SURFACE ELEVATION: 70.22 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, dark brown, with black ferrous stains			29	
	FILL: SILT, very stiff, light brown				93
5	FILL: CLAY, lean, very stiff, brown to light brown		96	9	
	CLAY, fat, firm to stiff to very stiff, dark brown to brown, with calcareous nodules				94
10	- becomes light brown in color below a depth of about 10 feet				91
15	- becomes brown in color and with black ferrous stains below a depth of about 15 feet			38	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 17 feet				
20		10			
25		7			95
30	- with orange ferrous stains below a depth of about 30 feet	18		31	
35		23			96



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/30/2008	**DATE MEASURED:**	10/30/2008	**FIGURE:**	A-45a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-44

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16546893.57530; E 1216712.76708

SURFACE ELEVATION: 70.22 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, light brown	22				
45								
			CLAY, fat, very stiff, brown to reddish-brown, with black ferrous stains	23				94
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 15 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 40 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/30/2008	**DATE MEASURED:**	10/30/2008	**FIGURE:**	A-45b

LOG OF BORING NO. DP-45

The Lower Rio Grande Flood Control Project
Cameron County, Texas

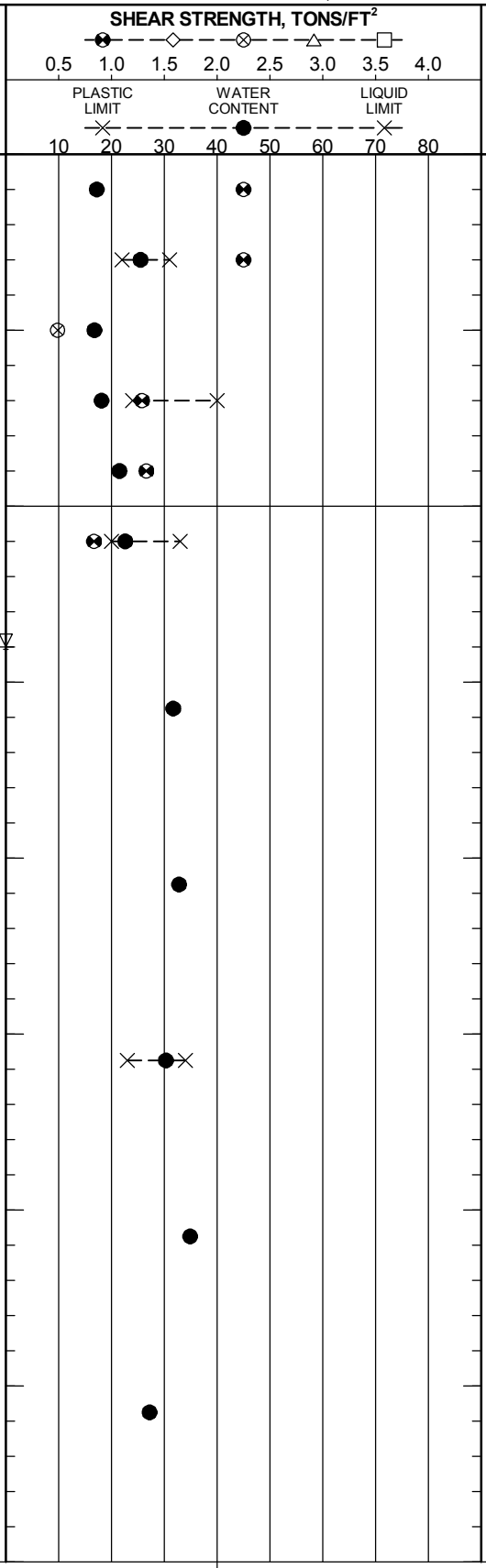
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16546036.65930; E 1217266.30293

SURFACE ELEVATION: 69.65 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with roots extending down to a depth of about 2 feet				
5			97	9	
				16	
					89
10	CLAY, lean, stiff to soft, light brown, with calcareous nodules			13	
15		4			92
	Driller's Note: Converted to mud rotary drilling method at a depth of about 17 feet				
20		3			91
25	- stiff, brown, with orange ferrous stains below 25 feet	8		11	
30	- becomes grayish-brown in color below a depth of about 30 feet	11			
35		13			97



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/31/2008	**DATE MEASURED:**	10/31/2008	**FIGURE:**	A-46a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-45

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16546036.65930; E 1217266.30293

SURFACE ELEVATION: 69.65 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, stiff to soft, light brown, with calcareous nodules *(continued)*	14				94
45			SAND, silty, dense, dark brown					
				37				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/31/2008	**DATE MEASURED:**	10/31/2008	**FIGURE:**	A-46b

LOG OF BORING NO. DP-46

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545735.94030; E 1218280.23158

SURFACE ELEVATION: 69.75 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules			22	
5	FILL: SILT, brown				91
	CLAY, fat, very stiff to stiff, dark brown, with black ferrous stains		97	26	
10					
15				43	
20					95
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	CLAY, lean, soft, brown	4			88
30	CLAY, sandy, lean, stiff, brown to dark brown	11			70
35	CLAY, lean, stiff to very stiff, brown, with orange and black ferrous stains	11			97

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/31/2008	**DATE MEASURED:**	10/31/2008	**FIGURE:**	A-47a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-46

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545735.94030; E 1218280.23158

SURFACE ELEVATION: 69.75 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			CLAY, lean, stiff to very stiff, brown, with orange and black ferrous stains *(continued)*	17			23	
45								
			CLAY, lean, with sand, stiff, brown	10				70
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

PLASTIC LIMIT ✕ — WATER CONTENT ● — LIQUID LIMIT ✕ (10 20 30 40 50 60 70 80)

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/31/2008	**DATE MEASURED:**	10/31/2008	**FIGURE:**	A-47b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-47

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545459.17230; E 1219315.45007

SURFACE ELEVATION: 69.47 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules			14	
			109		
5					
	- becomes dark brown in color and with black ferrous stains below a depth of about 6 feet			19	
					96
10	CLAY, fat, very stiff, dark brown to brown, with black ferrous stains			37	
15					97
20					
25	CLAY, sandy, lean, firm to stiff, brown				70
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		14		10	
35	SAND, clayey, medium dense, brown	13			32

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/31/2008	**DATE MEASURED:**	10/31/2008	**FIGURE:**	A-48a

LOG OF BORING NO. DP-47

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16545459.17230; E 1219315.45007

SURFACE ELEVATION: 69.47 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, clayey, medium dense, brown *(continued)*	18				24
45								
			CLAY, fat, hard, brown to reddish-brown, with black ferrous stains	37				94
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14.5 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	10/31/2008	**DATE MEASURED:**	10/31/2008	**FIGURE:**	A-48b

LOG OF BORING NO. DP-48

The Lower Rio Grande Flood Control Project
Cameron County, Texas

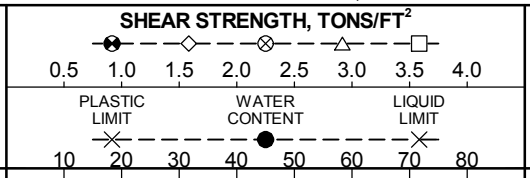
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16544743.30140; E 1220052.61079

SURFACE ELEVATION: 69.46 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			22	
	FILL: SILT, very stiff, brown				91
5	FILL: CLAY, lean, very stiff, brown, with black ferrous stains			14	
					95
			95		
10	CLAY, lean, hard to stiff, dark brown, with black ferrous stains			17	
15					
20					99
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	CLAY, fat, stiff to firm, brown, with gray clay lenses	11		39	
30		11			98
35		6			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/1/2008	**DATE MEASURED:**	11/1/2008	**FIGURE:**	A-49a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-48

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16544743.30140; E 1220052.61079

SURFACE ELEVATION: 69.46 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown	10		PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)		10
45								
				11				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14 feet. Upon completion of the drilling operations, the boring remained uncaved. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/1/2008	**DATE MEASURED:**	11/1/2008	**FIGURE:**	A-49b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-49

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16544141.86350; E 1220872.26965

SURFACE ELEVATION: 69.44 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown, with black ferrous stains		107	50	91
5	FILL: CLAY, lean, very stiff, brown to dark brown, with black ferrous stains			18	87
10	CLAY, fat, very stiff, brown to dark brown, with black ferrous stains			47	
20	SAND, silty, loose to medium dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				15
25		8		2	
30		13			24
35	- becomes dark brown in color below a depth of about 35 feet	23			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/1/2008	**DATE MEASURED:**	11/1/2008	**FIGURE:**	A-50a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-49

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16544141.86350; E 1220872.26965

SURFACE ELEVATION: 69.44 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, loose to medium dense, brown *(continued)*	20				12
45								
			CLAY, fat, stiff, light brown, with calcareous nodules	11				92
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 13 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/1/2008	**DATE MEASURED:**	11/1/2008	**FIGURE:**	A-50b

LOG OF BORING NO. DP-50

The Lower Rio Grande Flood Control Project
Cameron County, Texas

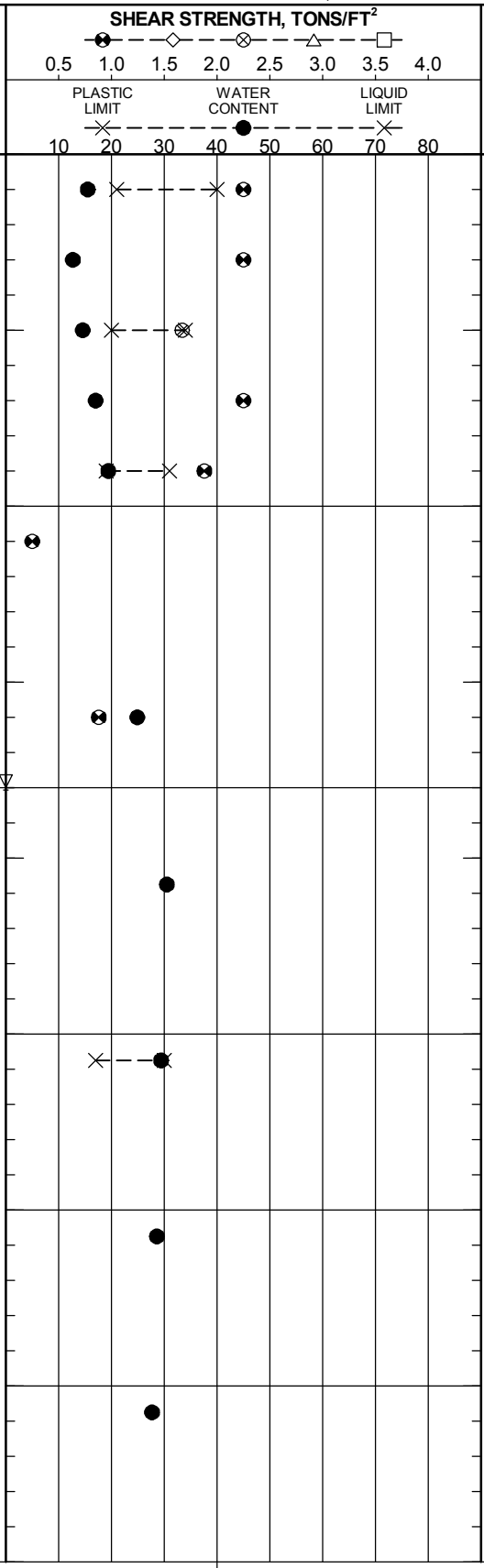
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16543827.83830; E 1221926.11675

SURFACE ELEVATION: 68.92 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard to very stiff, brown, with calcareous nodules			19	
					90
5	- with black ferrous stains below a depth of about 4 feet		100	14	
					94
				12	
10	CLAY, lean, soft to firm, light brown, with calcareous nodules				
15	- becomes dark brown in color below a depth of about 15 feet				96
	SAND, clayey, loose, brown, wet				
20	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	8			26
25	CLAY, lean, with sand, firm, light brown	7		13	
30	SAND, silty, medium dense, dark brown	11			13
35	SAND, with silt, poorly-graded, medium dense, dark brown	21			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/3/2008	**DATE MEASURED:**	11/3/2008	**FIGURE:**	A-51a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-50

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16543827.83830; E 1221926.11675

SURFACE ELEVATION: 68.92 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown *(continued)*	21				9
45								
			CLAY, sandy, lean, very stiff, dark brown	16				68
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 40 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/3/2008	**DATE MEASURED:**	11/3/2008	**FIGURE:**	A-51b

LOG OF BORING NO. DP-51

The Lower Rio Grande Flood Control Project
Cameron County, Texas

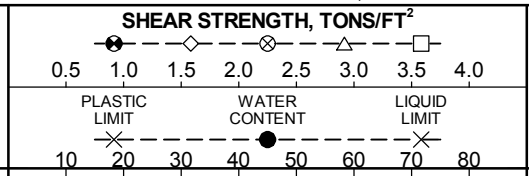
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16543795.90350; E 1222894.80449

SURFACE ELEVATION: 68.37 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown				99
				30	
5				27	99
			101	32	
	CLAY, fat, very stiff, brown				98
10					
15	CLAY, lean, very stiff, light brown, with black ferrous stains			16	
	SAND, clayey, loose, brown, wet				
20	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	CLAY, lean, stiff, light brown, with black ferrous stains	8		20	
30	SAND, clayey, medium dense, dark brown	14			41
35	SAND, silty, medium dense, dark brown	23			18



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/3/2008	**DATE MEASURED:**	11/3/2008	**FIGURE:**	A-52a

LOG OF BORING NO. DP-51

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16543795.90350; E 1222894.80449

SURFACE ELEVATION: 68.37 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, dense, dark brown	36				10
45								
			CLAY, lean, with sand, stiff, light brown	9				73
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 19 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 33.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/3/2008	**DATE MEASURED:**	11/3/2008	**FIGURE:**	A-52b

LOG OF BORING NO. DP-52

The Lower Rio Grande Flood Control Project
Cameron County, Texas

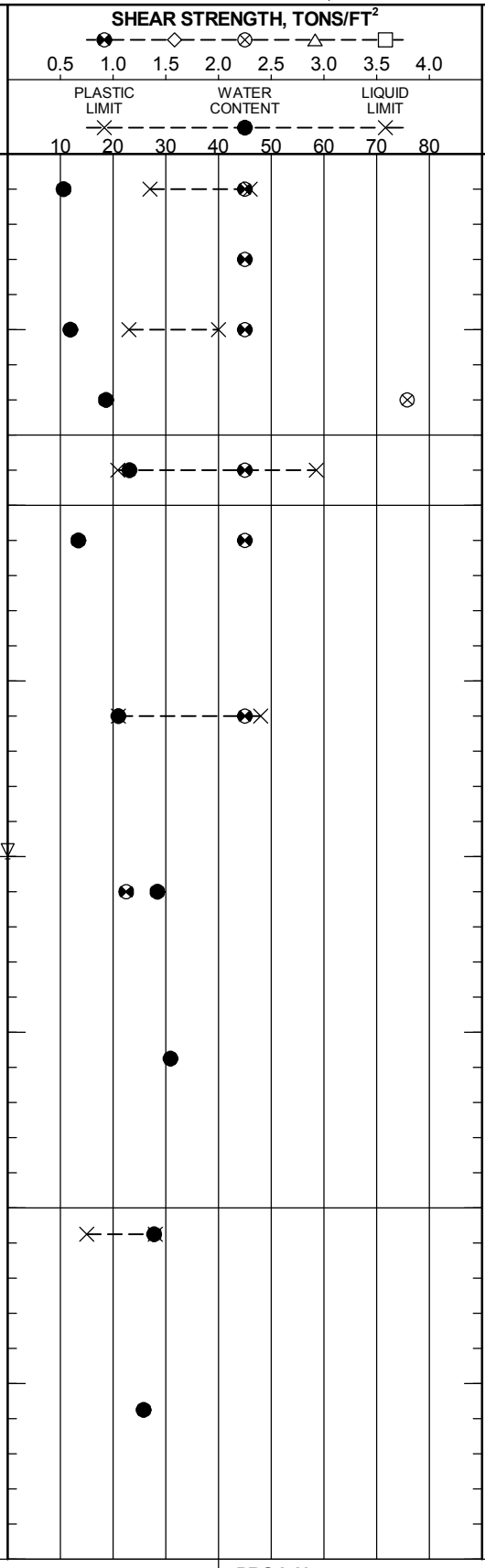
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16543952.91610; E 1223961.95775

SURFACE ELEVATION: 69.63 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules			19	
5			102	17	
	CLAY, fat, very stiff, brown, with calcareous nodules and black ferrous stains			38	
10	CLAY, lean, very stiff, brown, with calcareous nodules and black ferrous stains				97
15				27	
20					99
25		8			94
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	CLAY, sandy, lean, stiff, light brown	9		13	
35		15			53



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/3/2008	**DATE MEASURED:**	11/3/2008	**FIGURE:**	A-53a

LOG OF BORING NO. DP-52

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16543952.91610; E 1223961.95775

SURFACE ELEVATION: 69.63 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown	15					33
45									
				30					23
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 41 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/3/2008	**DATE MEASURED:**	11/3/2008	**FIGURE:**	A-53b

LOG OF BORING NO. DP-53

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16544631.52980; E 1224691.13478

SURFACE ELEVATION: 69.15 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules	17		14	
	FILL: CLAY, lean, firm, brown, with calcareous nodules	5			91
5	CLAY, lean, with sand, very stiff, brown, with black ferrous stains			25	
					82
					83
10	CLAY, lean, stiff to very stiff, dark brown to grayish-brown			13	
15	- becomes light brown in color and with black ferrous stains below a depth of about 15 feet				96
20	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet		89		
25	CLAY, fat, stiff to firm, brown, with gray clay lenses	10		60	
30		4			96
35	- with orange ferrous stains below a depth of about 35 feet	5			96

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/4/2008	**DATE MEASURED:**	11/4/2008	**FIGURE:**	A-54a

LOG OF BORING NO. DP-53

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16544631.52980; E 1224691.13478

SURFACE ELEVATION: 69.15 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff to firm, brown, with gray clay lenses *(continued)*	12				
45								
			CLAY, sandy, lean, firm, brown	8				64
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 13 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 13.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/4/2008	**DATE MEASURED:**	11/4/2008	**FIGURE:**	A-54b

LOG OF BORING NO. DP-54

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16544336.13330; E 1225505.47118

SURFACE ELEVATION: 69.16 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, brown, with calcareous nodules	16			85
		8			88
5	FILL: CLAY, lean, soft to firm, brown with calcareous nodules	3		9	
		4			94
		5		5	
10		2			88
15	CLAY, fat, firm, brown, with black ferrous stains	7		37	
20	- very stiff from 20 to 22 feet				98
	Driller's Note: Converted to mud rotary drilling method at a depth of about 22 feet				
25			90		
30					
35	CLAY, sandy, lean, firm to soft, grayish-brown	4		11	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/4/2008	**DATE MEASURED:**	11/4/2008	**FIGURE:**	A-55a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-54

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16544336.13330; E 1225505.47118

SURFACE ELEVATION: 69.16 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, sandy, lean, firm to soft, grayish-brown *(continued)*	6				62
45								
				3				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 14.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/4/2008	**DATE MEASURED:**	11/4/2008	**FIGURE:**	A-55b

LOG OF BORING NO. DP-55

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16543891.70780; E 1226452.86908

SURFACE ELEVATION: 68.84 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff to very stiff to stiff, brown, with gypsum nodules	14			94
		18		10	
5		14			92
		10		17	
		9			
10	CLAY, lean, stiff, brown, with gypsum nodules	9			
15					
	SAND, with silt, poorly-graded, loose to medium dense, dark brown				
20					
25		6			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		9			12
35		12			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-56a

LOG OF BORING NO. DP-55

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16543891.70780; E 1226452.86908

SURFACE ELEVATION: 68.84 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, loose to medium dense, dark brown *(continued)*	24				9
45								
				13				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18.5 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-56b

LOG OF BORING NO. DP-56

The Lower Rio Grande Flood Control Project
Cameron County, Texas

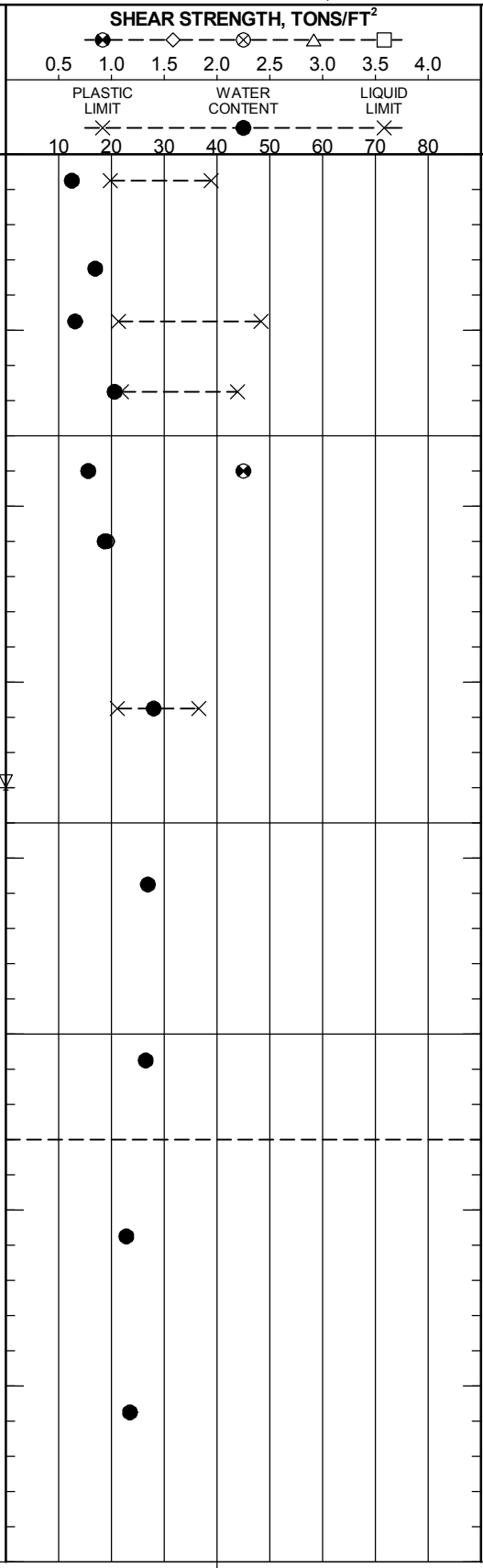
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16544080.65520; E 1227490.74880

SURFACE ELEVATION: 68.36 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, brown, with calcareous nodules	20		19	
		14			99
5		8		27	
		11		22	
	CLAY, lean, very stiff to soft, brown, with calcareous nodules				94
10			106		
15		4		16	
	SAND, clayey, loose, brown				
20		10			41
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	SAND, silty, very loose, dark brown	3			16
	SAND, silty, medium dense, dark brown				
30		13			8
35		15			83



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-57a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-56

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16544080.65520; E 1227490.74880

SURFACE ELEVATION: 68.36 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, loose, dark brown	9				
45								
			CLAY, fat, with sand, firm, brown to dark brown	7				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 19 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-57b

LOG OF BORING NO. DP-57

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16543867.75680; E 1228597.82050

SURFACE ELEVATION: 68.03 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff to firm, brown	12			95
		7		11	
5		6			99
	CLAY, fat, firm to stiff, brown to dark brown	7		27	
		8			100
10				33	
15			94		
	CLAY, sandy, lean, brown				
20					56
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	SAND, silty, loose, brown	4		NP	
	SAND, silty, dense, brown				
30		30			9
35	SAND,with silt, poorly-graded, medium dense to dense, dark brown	12			6

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/4/2008	**DATE MEASURED:**	11/4/2008	**FIGURE:**	A-58a

LOG OF BORING NO. DP-57

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16543867.75680; E 1228597.82050

SURFACE ELEVATION: 68.03 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND,with silt, poorly-graded, medium dense to dense, dark brown *(continued)*	23				
45								
				31				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/4/2008	**DATE MEASURED:**	11/4/2008	**FIGURE:**	A-58b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-58

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16543159.86960; E 1229220.54834

SURFACE ELEVATION: 68.18 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff to firm, brown, with gypsum nodules and roots extending down to a depth of about 2 feet	10		18	
		9			100
5		6		16	
		6			89
	CLAY, lean, soft to firm, brown, with gypsum nodules	3		9	
10		5			100
15	CLAY, fat, firm to stiff, brown, with orange ferrous stains	7		34	
20		9			76
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25					48
30	CLAY, lean, with sand, very stiff, dark brown	16			8
35	SAND, clayey, loose, dark brown	4			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-59a

LOG OF BORING NO. DP-58

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16543159.86960; E 1229220.54834

SURFACE ELEVATION: 68.18 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, clayey, loose, dark brown *(continued)*	5				
45								
			SAND, with silt, poorly-graded, medium dense, dark brown	23				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 14 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-59b

LOG OF BORING NO. DP-59

The Lower Rio Grande Flood Control Project
Cameron County, Texas

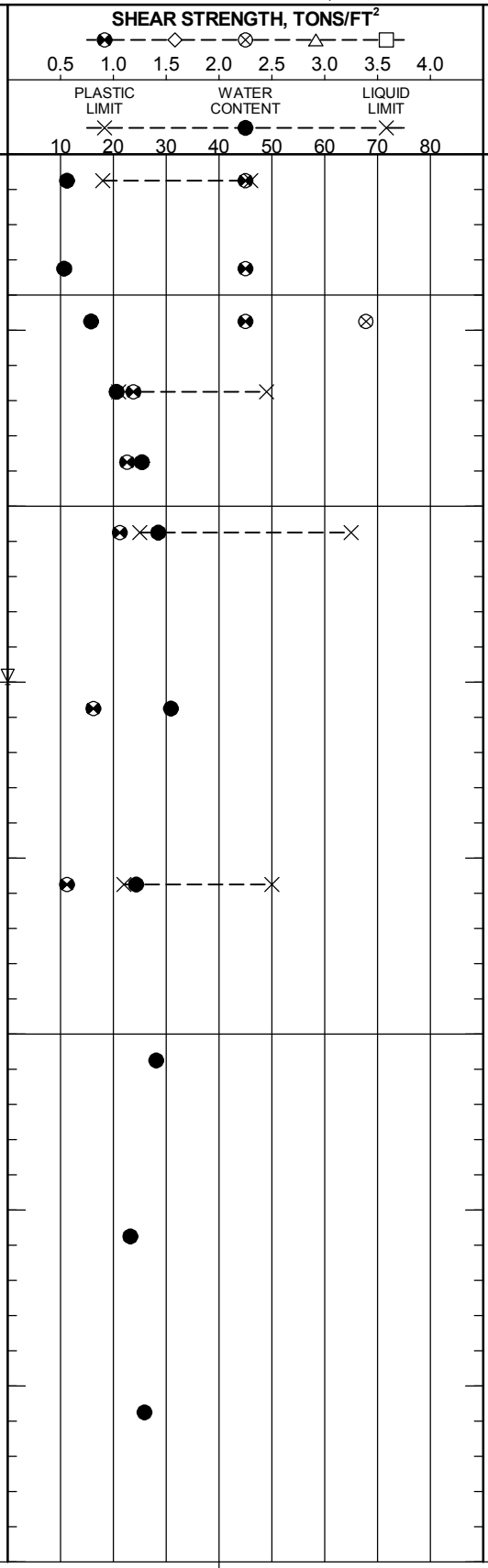
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16551807.93420; E 1184113.53022

SURFACE ELEVATION: 76.25 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, light brown, with gypsum nodules			28	96
					98
5	CLAY, lean, hard to very stiff, brown, with calcareous nodules		111		
	-with black ferrous stains below a depth of about 6 feet			28	93
					97
10	CLAY, fat, stiff, brown, with black ferrous stains			40	97
15					
20				28	98
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	SAND, silty, medium dense, brown	10			
30		22		NP	
35		28			14



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-60a

LOG OF BORING NO. DP-59

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16551807.93420; E 1184113.53022

SURFACE ELEVATION: 76.25 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	23				
45								
				22				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 15 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-60b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-60

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541709.49920; E 1229071.51945

SURFACE ELEVATION: 67.92 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules	22		29	
		19			98
5		16			93
		15		22	
		17			91
10	CLAY, lean, stiff to firm, brown, with calcareous nodules	7			94
15		10		17	
20		5			93
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	SAND, silty, medium dense to loose, dark brown	12		NP	
30		6			
35		10			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-61a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-60

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541709.49920; E 1229071.51945

SURFACE ELEVATION: 67.92 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown	25				8
45								
				14				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-61b

LOG OF BORING NO. DP-61

The Lower Rio Grande Flood Control Project
Cameron County, Texas

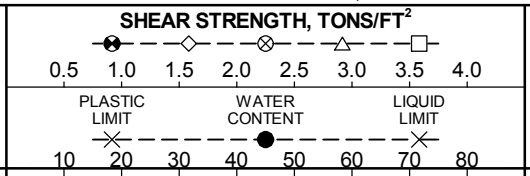
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16542225.77780; E 1230138.67271

SURFACE ELEVATION: 67.65 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown	16			89
	FILL: CLAY, fat, stiff, brown, with calcareous nodules	11		30	
5		15			98
		10		17	
	CLAY, lean, firm, brown	7			98
10		4		42	
15	CLAY, fat, firm, brown, with orange ferrous stains and gray clay lenses	8			49
20	SAND, silty, loose, dark brown Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	7		3	
25		6			42
30	SAND, clayey, medium dense, dark brown	34			35
35		26			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-62a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-61

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16542225.77780; E 1230138.67271

SURFACE ELEVATION: 67.65 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, clayey, very loose to loose, dark brown	3				
45								
				10				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-62b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-62

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16542161.90830; E 1230899.78450

SURFACE ELEVATION: 67.85 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, dark brown to brown, with calcareous nodules				
5	FILL: CLAY, fat, very stiff, dark brown - with calcareous nodules and black ferrous stains below a depth of about 6 feet			46	98
10	CLAY, lean, very stiff, dark brown		93	29	
15		18		26	
20	SAND, with silt, pooly-graded, medium dense to dense, dark brown Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	16			6
25		14			10
30		23			6
35		40			9

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-63a

LOG OF BORING NO. DP-62

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16542161.90830; E 1230899.78450

SURFACE ELEVATION: 67.85 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, pooly-graded, medium dense to dense, dark brown *(continued)*	19			NP	
45			- medium dense at 40 feet					
				32				12
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 34 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-63b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-63

The Lower Rio Grande Flood Control Project
Cameron County, Texas

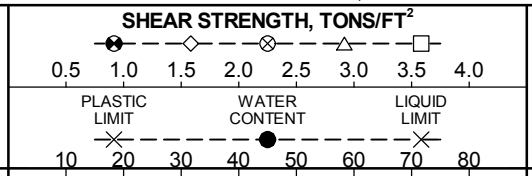
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541454.02110; E 1231809.92518

SURFACE ELEVATION: 67.97 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules		118		
	FILL: CLAY, fat, very stiff, brown				93
5				40	
	CLAY, lean, very stiff to stiff, dark brown to brown, with calcareous nodules				99
				22	
10					76
15	- firm below 15 feet	7			98
20	CLAY, fat, stiff to very stiff, brown to reddish-brown, with black ferrous stains	15		29	
25		16			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		17			99
35		22		35	



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-64a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-63

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541454.02110; E 1231809.92518

SURFACE ELEVATION: 67.97 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown	29				8
45								
				21				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 24 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 28 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-64b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-64

The Lower Rio Grande Flood Control Project
Cameron County, Texas

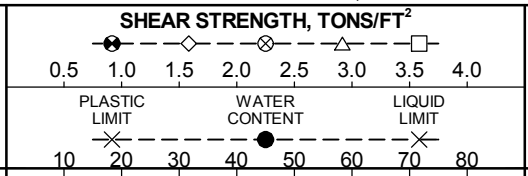
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540551.86410; E 1231956.29283

SURFACE ELEVATION: 67.98 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
			FILL: CLAY, fat, very stiff, dark brown, with roots extending down to a depth of about 2 feet			23	
5			FILL: CLAY, lean, very stiff, brown			24	98
10			CLAY, lean, stiff to soft to firm, brown, calcareous nodules		98	18	
15				20			98
20			- becomes grayish-brown in color below a depth of about 20 feet Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	3		9	
25				3			79
30				7			
35			CLAY, sandy, lean, firm, brown	8			53



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-65a

LOG OF BORING NO. DP-64

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540551.86410; E 1231956.29283

SURFACE ELEVATION: 67.98 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, light brown, with black ferrous stains	22				99
45								
			CLAY, sandy, lean, firm, brown	7				61
50			CLAY, lean, soft to firm, grayish-brown, calcareous nodules CLAY, lean, very stiff, brown, calcareous nodules Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT ⊗ WATER CONTENT ● LIQUID LIMIT ⊗ (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 26 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-65b

LOG OF BORING NO. DP-65

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539716.23790; E 1232280.96290

SURFACE ELEVATION: 67.08 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown			30	96
5					95
	CLAY, fat, very stiff to stiff, brown		97	40	
10					
15				29	94
20	CLAY, fat, firm to stiff, brown	4			88
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		12			97
30					98
35	CLAY, fat, very stiff to stiff, brown				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/18/2008	**DATE MEASURED:**	11/18/2008	**FIGURE:**	A-66a

LOG OF BORING NO. DP-65

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539716.23790; E 1232280.96290

SURFACE ELEVATION: 67.08 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff to stiff, brown *(continued)* - becomes grayish-brown in color below a depth of about 40 feet				28	100
45								
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/18/2008	**DATE MEASURED:**	11/18/2008	**FIGURE:**	A-66b

LOG OF BORING NO. DP-66

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539969.05470; E 1233390.69583

SURFACE ELEVATION: 67.53 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules			22	89
					98
5	- with orange ferrous stains below a depth of about 4 feet			22	96
	CLAY, fat, hard to very stiff, brown		105		
10				37	88
15			101	32	100
20	- becomes light brown in color below a depth of about 20 feet			31	98
25					
30	SAND, silty, medium dense, brown				
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35		23			15

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	28 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/18/2008	**DATE MEASURED:**	11/18/2008	**FIGURE:**	A-67a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-66

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539969.05470; E 1233390.69583

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 67.53 ft					
			SAND, silty, medium dense, brown *(continued)*	22				
45								
				26				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 28 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	28 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/18/2008	**DATE MEASURED:**	11/18/2008	**FIGURE:**	A-67b

LOG OF BORING NO. DP-67

The Lower Rio Grande Flood Control Project
Cameron County, Texas

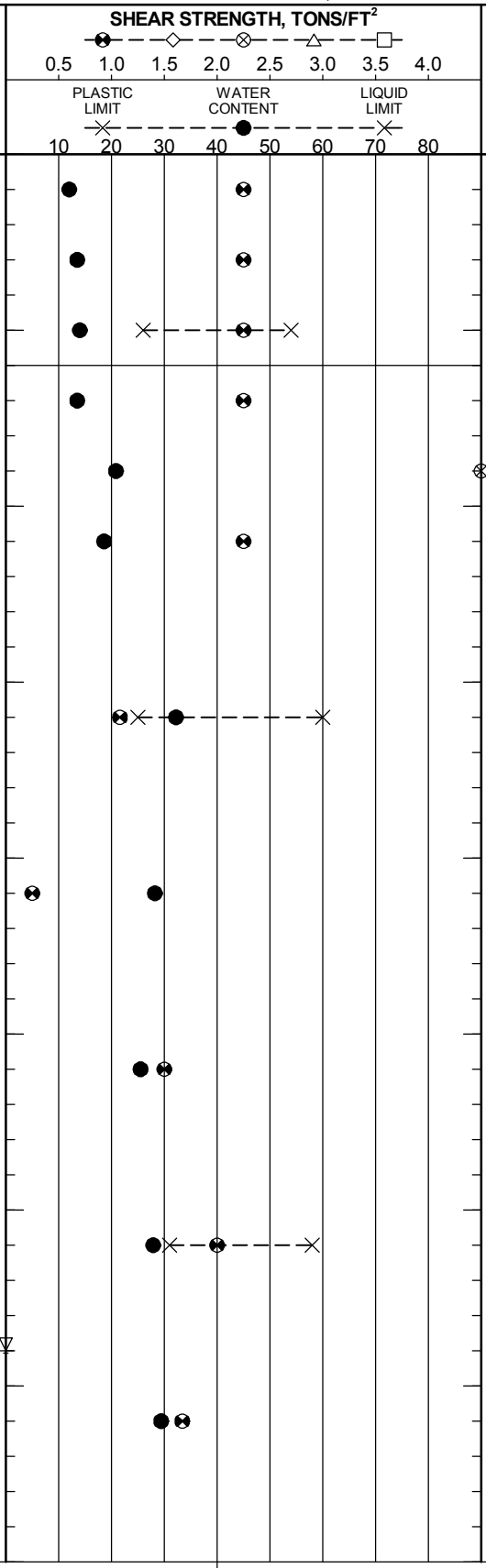
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539503.33950; E 1234335.43250

SURFACE ELEVATION: 67.66 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown				
	- with gravel below a depth of about 2 feet				88
5				28	89
	CLAY, fat, hard to very stiff, light brown				
	- with black ferrous stains below a depth of about 8 feet		106		
10					
15				35	96
20	- firm from 20 to 25 feet				
25					98
30				27	97
35					
	Driller's Note: Converted to mud rotary drilling method at a depth of about 37 feet				



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	34 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/18/2008	**DATE MEASURED:**	11/18/2008	**FIGURE:**	A-68a

LOG OF BORING NO. DP-67

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539503.33950; E 1234335.43250

SURFACE ELEVATION: 67.66 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, hard to very stiff, light brown *(continued)* - firm below 40 feet				29	
45								
			SAND, silty, medium dense, brown	15				18
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 36 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 34 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	34 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/18/2008	**DATE MEASURED:**	11/18/2008	**FIGURE:**	A-68b

LOG OF BORING NO. DP-68

The Lower Rio Grande Flood Control Project
Cameron County, Texas

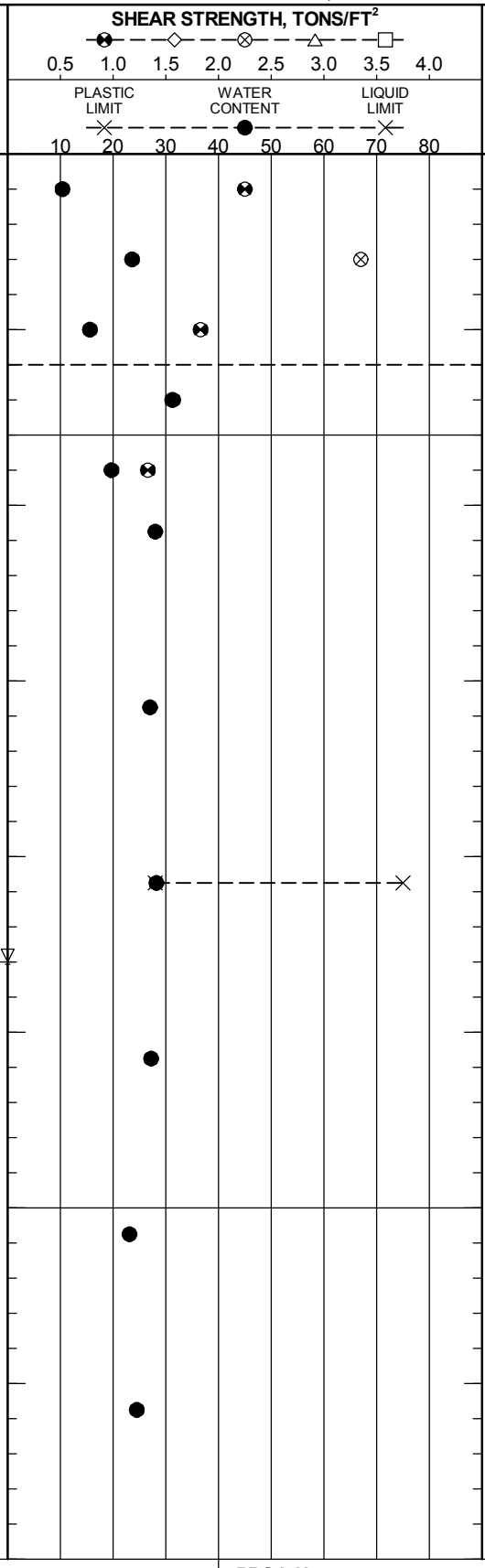
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539136.08970; E 1235277.50794

SURFACE ELEVATION: 67.45 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, hard to very stiff, brown				77
	- with orange ferrous stains below a depth of about 2 feet		100		
5					74
	FILL: CLAY, fat, very stiff, brown				100
	CLAY, fat, stiff to very stiff, light brown				
10		11			
15	- with orange ferrous stains below a depth of about 15 feet	13			
20	- becomes brown in color below a depth of about 20 feet	20		47	98
25		23			98
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, poorly-graded, loose to medium dense, brown, with silt	4			
35		22			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/19/2009	**DATE MEASURED:**	1/19/2009	**FIGURE:**	A-69a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-68

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539136.08970; E 1235277.50794

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 67.45 ft					
			SAND, poorly-graded, loose to medium dense, brown, with silt *(continued)* - dense below 40 feet	31				10
45								
				32				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 24 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 32.5 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/19/2009	**DATE MEASURED:**	1/19/2009	**FIGURE:**	A-69b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-69

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16538417.55760; E 1236219.58338

SURFACE ELEVATION: 67.46 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, sandy, lean, very stiff, brown			18	70
	FILL: CLAY, fat, hard, brown		107		
5				31	
	FILL: CLAY, sandy, lean, very stiff, brown				64
	CLAY, lean, very stiff, brown			23	85
10				24	
15	SAND, with silt, poorly-graded, medium dense, brown	16			6
20		19			19
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	SAND, silty, dense to very dense to medium dense, brown	48			12
30		50/ 11"			
35		50/ 10"			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-70a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-69

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16538417.55760; E 1236219.58338

SURFACE ELEVATION: 67.46 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, dense to very dense to medium dense, brown *(continued)*	16				
45								
				22				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 19 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-70b

LOG OF BORING NO. DP-70

The Lower Rio Grande Flood Control Project
Cameron County, Texas

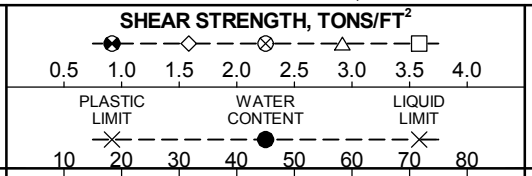
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16538172.72440; E 1236980.69518

SURFACE ELEVATION: 66.75 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown		110		92
				40	99
5	FILL: CLAY, lean, very stiff, brown			23	93
				31	
					23
10	CLAY, fat, very stiff, brown, with black ferrous stains				13
15	SAND, silty, dense to medium dense, light brown to brown			NP	
20		12			11
25		14			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		16			
35		13			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-71a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-70

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16538172.72440; E 1236980.69518

SURFACE ELEVATION: 66.75 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown	15				
45								
				21				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-71b

LOG OF BORING NO. DP-71

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16538374.97790; E 1238031.88105

SURFACE ELEVATION: 66.39 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			27	
					96
5	- with calcareous nodules below a depth of about 4 feet		110	21	
	SILT, brown				100
10				28	
15	CLAY, fat, very stiff to stiff, brown, with black ferrous stains	18			92
20		10		NP	
25	SAND, with silt, poorly-graded, medium dense to dense, brown	17			12
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		27			9
35		20			9

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-72a

LOG OF BORING NO. DP-71

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16538374.97790; E 1238031.88105

SURFACE ELEVATION: 66.39 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to dense, brown *(continued)*	36				
45								
				32				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 24 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-72b

LOG OF BORING NO. DP-72

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16538609.16620; E 1238992.58510

SURFACE ELEVATION: 66.23 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules				94
				20	
5					98
	- with black ferrous stains below a depth of about 6 feet		105	14	96
				12	
10	CLAY, lean, stiff, brown, with calcareous nodules		99		
15	CLAY, fat, very stiff to stiff, brown, with black ferrous stains	21		33	
20		19			100
25	- with orange ferrous stains below a depth of about 25 feet	12		31	
30		15			100
	Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet				
35		14			38

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-73a

LOG OF BORING NO. DP-72

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16538609.16620; E 1238992.58510

SURFACE ELEVATION: 66.23 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff to stiff, brown, with black ferrous stains *(continued)*	16				
45								
			SAND, silty, dense, dark brown	33				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 29 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 27 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 32 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-73b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-73

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539255.84510; E 1239987.88514

SURFACE ELEVATION: 65.44 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with black ferrous stains			19	
			113		92
5				19	
					91
	CLAY, lean, hard to very stiff, brown, with black ferrous stains			16	
10				3	
15	SILT, medium dense, brown, with calcareous nodules	16		36	
20	CLAY, fat, very stiff, brown to reddish-brown, with black ferrous stains	22			52
25	CLAY, sandy, lean, firm, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	5			9
30	CLAY, fat, stiff, brown to reddish-brown	11			10
	SAND, with silt, poorly-graded, medium dense to dense, dark brown				
35		25			11

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-74a

LOG OF BORING NO. DP-73

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539255.84510; E 1239987.88514

SURFACE ELEVATION: 65.44 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to dense, dark brown *(continued)*	40				
45								
			- medium dense at 48 feet	14				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-74b

LOG OF BORING NO. DP-74

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540072.84270; E 1240214.08970

SURFACE ELEVATION: 65.63 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, light brown, with roots			16	98
5	FILL: CLAY, fat, very stiff, brown			36	97, 100
10	CLAY, fat, very stiff to stiff, light brown			40	99
15					
20	- with black ferrous stains below a depth of about 20 feet	7			78
25	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	13			14
30	CLAY, lean, with sand, stiff to soft, brown	10		38	
35		4			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-75a

LOG OF BORING NO. DP-74

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540072.84270; E 1240214.08970

SURFACE ELEVATION: 65.63 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown	23				
45								
			CLAY, fat, very stiff, reddish-brown	27				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 26 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-75b

LOG OF BORING NO. DP-75

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540815.32590; E 1240490.85762

SURFACE ELEVATION: 65.03 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, light brown to brown				92
			105		
5				37	
			84	31	100
	CLAY, fat, very stiff, light brown to brown				92
10					90
15				47	
	CLAY, fat, soft, brown				
20		4			95
	CLAY, lean, with sand, very stiff, brown				
25		22		18	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		18			73
35		22			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-76a

LOG OF BORING NO. DP-75

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540815.32590; E 1240490.85762

SURFACE ELEVATION: 65.03 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, poorly-graded, dense, brown, with silt	47				9
45								
			CLAY, lean, very stiff, reddish-brown	25			17	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-76b

LOG OF BORING NO. DP-76

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541589.74380; E 1241137.53653

SURFACE ELEVATION: 64.70 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, light brown to dark brown			38	
					98
5					100
				37	
	CLAY, fat, hard to very stiff, light brown to dark brown		98		
10					100
15	- with calcareous nodules below a depth of about 15 feet			46	
	CLAY, fat, firm, dark brown				
20		6			97
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	SAND, with silt, poorly-graded, medium dense, brown	22			7
30		18			6
35		14			6

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-77a

LOG OF BORING NO. DP-76

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541589.74380; E 1241137.53653

SURFACE ELEVATION: 64.70 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	29			28	
45								
			CLAY, lean, stiff, dark brown	11				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-77b

LOG OF BORING NO. DP-77

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16542079.41020; E 1241813.48896

SURFACE ELEVATION: 64.22 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, hard, brown				78
	FILL: CLAY, fat, hard, brown			32	
5			114		
	CLAY, lean, with sand, hard, brown			20	
10					73
15	CLAY, fat, stiff to very stiff to stiff, brown				97
20		10			98
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		18		26	
30		14			99
35	CLAY, lean, firm, brown	8		17	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/8/2008	**DATE MEASURED:**	11/8/2008	**FIGURE:**	A-78a

LOG OF BORING NO. DP-77

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16542079.41020; E 1241813.48896

SURFACE ELEVATION: 64.22 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, silty, dense, brown	30				
45								
				32				18
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/8/2008	**DATE MEASURED:**	11/8/2008	**FIGURE:**	A-78b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-78

The Lower Rio Grande Flood Control Project
Cameron County, Texas

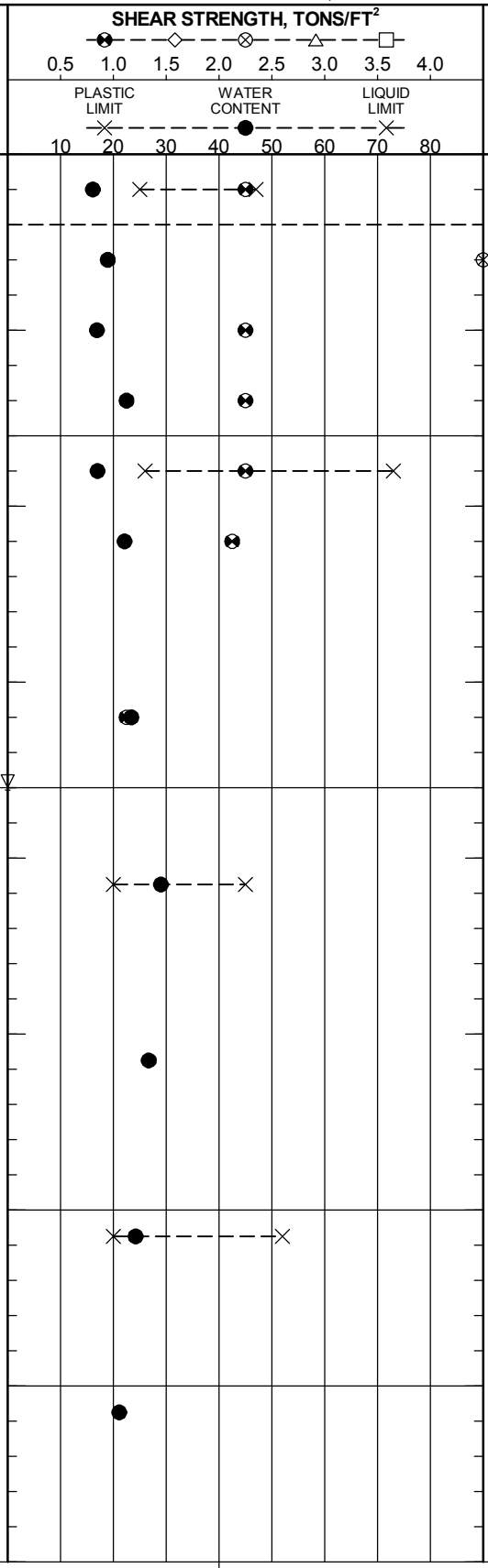
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541954.33240; E 1242766.20932

SURFACE ELEVATION: 63.79 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			22	
	FILL: CLAY, fat, hard, brown		108		
5					99
	CLAY, fat, very stiff, brown			47	
10					96
15					98
	CLAY, lean, stiff to very stiff, brown				
20		11		25	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		16			97
30	CLAY, fat, very stiff, brown	17		32	
35	SAND, with silt, poorly-graded, medium dense to dense, brown	22			8



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/8/2008	**DATE MEASURED:**	11/8/2008	**FIGURE:**	A-79a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-78

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541954.33240; E 1242766.20932

SURFACE ELEVATION: 63.79 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to dense, brown *(continued)*	33				
45								
			CLAY, lean, with sand, very stiff, brown	17				76
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/8/2008	**DATE MEASURED:**	11/8/2008	**FIGURE:**	A-79b

LOG OF BORING NO. DP-79

The Lower Rio Grande Flood Control Project
Cameron County, Texas

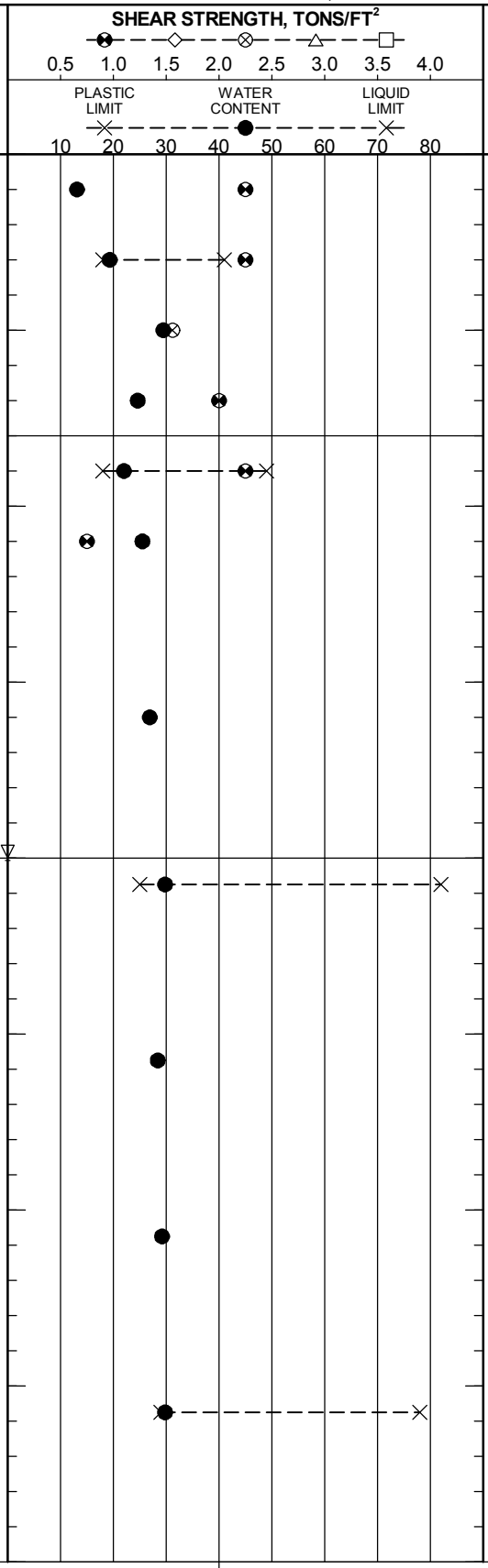
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16542151.26340; E 1243726.91337

SURFACE ELEVATION: 63.68 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown to dark brown, with calcareous nodules				94
				23	
5	- with black ferrous stains below a depth of about 4 feet		92		
					97
	CLAY, lean, very stiff to stiff, brown to dark brown, with calcareous nodules			31	
10					96
15					
20	CLAY, fat, very stiff, brown, with black ferrous stains	18		57	
25	- with orange ferrous stains below a depth of about 25 feet	24			97
30		22			98
35		19		49	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 36-1/2 feet				



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/10/2008	**DATE MEASURED:**	11/10/2008	**FIGURE:**	A-80a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-79

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16542151.26340; E 1243726.91337

SURFACE ELEVATION: 63.68 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, loose to medium dense, dark brown	9				
45								
				17				8
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 33 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 40 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/10/2008	**DATE MEASURED:**	11/10/2008	**FIGURE:**	A-80b

LOG OF BORING NO. DP-80

The Lower Rio Grande Flood Control Project
Cameron County, Texas

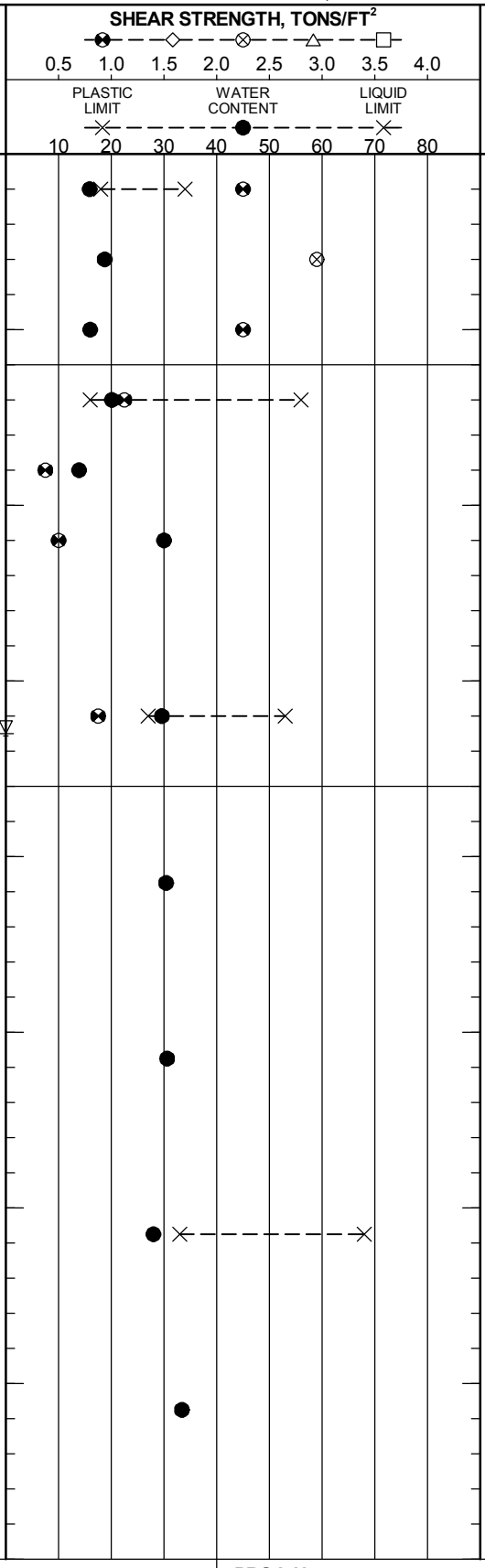
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541935.70370; E 1244168.67756

SURFACE ELEVATION: 63.78 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with gyspum nodules			16	
			108		92
5					88
	CLAY, fat, stiff to firm, brown to dark brown, with black ferrous stains			40	
10					
15				26	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 17 feet				
	CLAY, fat, very stiff, brown, with black ferrous stains				
20		17			96
25		25			99
30		20		35	
35		16			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/10/2008	**DATE MEASURED:**	11/10/2008	**FIGURE:**	A-81a

LOG OF BORING NO. DP-80

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541935.70370; E 1244168.67756

SURFACE ELEVATION: 63.78 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, brown, with black ferrous stains *(continued)*	15				91
45								
			SAND, clayey, medium dense, brown	23				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/10/2008	**DATE MEASURED:**	11/10/2008	**FIGURE:**	A-81b

LOG OF BORING NO. DP-81

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541802.64220; E 1244799.38908

SURFACE ELEVATION: 62.31 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, dark brown			34	
			115	39	96
5			111	30	
	CLAY, lean, very stiff, brown				98
				17	
10	CLAY, fat, very stiff, dark brown			27	
15	SAND, clayey, brown				
20	CLAY, lean, with sand, very stiff to stiff, brown	19		14	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		14			81
30	CLAY, fat, very stiff, brown, with calcareous nodules				96
35	- with black ferrous stains below a depth of about 35 feet				93

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/3/2008	**DATE MEASURED:**	11/3/2008	**FIGURE:**	A-82a

LOG OF BORING NO. DP-81

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541802.64220; E 1244799.38908

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 62.31 ft					
			CLAY, fat, very stiff, brown, with calcareous nodules *(continued)*					97
			- becomes reddish-brown in color below a depth of about 40 feet					
45								97
				19				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 17 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 18.5 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/3/2008	**DATE MEASURED:**	11/3/2008	**FIGURE:**	A-82b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-82

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541855.86680; E 1245374.21478

SURFACE ELEVATION: 62.76 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown, with roots extending down to a depth of about 2 feet				94
				28	
5	- with calcareous nodules below a depth of about 4 feet		107		
				41	
	CLAY, fat, very stiff, brown, with calcareous nodules				
10				24	
15					97
20	- with black ferrous stains below a depth of about 20 feet				96
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25				43	
30					98
35	- becomes brown to reddish-brown in color below a depth of about 35 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/3/2008	**DATE MEASURED:**	11/3/2008	**FIGURE:**	A-83a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-82

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541855.86680; E 1245374.21478

SURFACE ELEVATION: 62.76 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, brown, with calcareous nodules *(continued)*					99
45								
								99
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/3/2008	**DATE MEASURED:**	11/3/2008	**FIGURE:**	A-83b

LOG OF BORING NO. DP-83

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541911.75270; E 1245927.75063

SURFACE ELEVATION: 62.31 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown, with gypsum nodules		37	
		110	34	98
5				99
	- with calcareous nodules below a depth of about 6 feet	106		
	CLAY, fat, very stiff, brown, with gypsum nodules and black ferrous stains		33	
10				98
15	- stiff from 15 to 25 feet		34	
20	- becomes reddish-brown in color below a depth of about 19-1/2 feet			99
25	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet			
30			41	
35				99

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/4/2008	**DATE MEASURED:**	11/4/2008	**FIGURE:**	A-84a

LOG OF BORING NO. DP-83

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541911.75270; E 1245927.75063

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 62.31 ft					
			CLAY, fat, very stiff, brown, with gypsum nodules and black ferrous stains *(continued)* - with gypsum crystals below a depth of about 40 feet					97
45								
								100
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 19.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring remained uncaved. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/4/2008	**DATE MEASURED:**	11/4/2008	**FIGURE:**	A-84b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-84

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541847.88310; E 1246755.39317

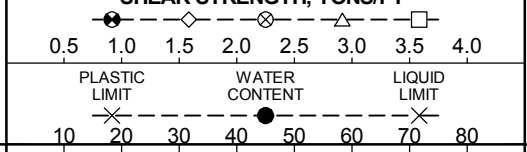
SURFACE ELEVATION: 63.04 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown, with roots extending down to a depth of about 2 feet				94
	- with gypsum nodules below a depth of about 2 feet			34	
5					
	CLAY, fat, very stiff to stiff, brown, with black ferrous stains			42	
					100
10					92
15				33	
20			100		
25					97
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	- becomes reddish-brown in color below a depth of about 30 feet				
35				42	

SYMBOL

SAMPLES

SHEAR STRENGTH, TONS/FT^2



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/4/2008	**DATE MEASURED:**	11/4/2008	**FIGURE:**	A-85a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-84

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541847.88310; E 1246755.39317

SURFACE ELEVATION: 63.04 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, firm, brown, with black ferrous stains					99
45								
			CLAY, lean, firm, light brown					88
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14.5 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/4/2008	**DATE MEASURED:**	11/4/2008	**FIGURE:**	A-85b

LOG OF BORING NO. DP-85

The Lower Rio Grande Flood Control Project
Cameron County, Texas

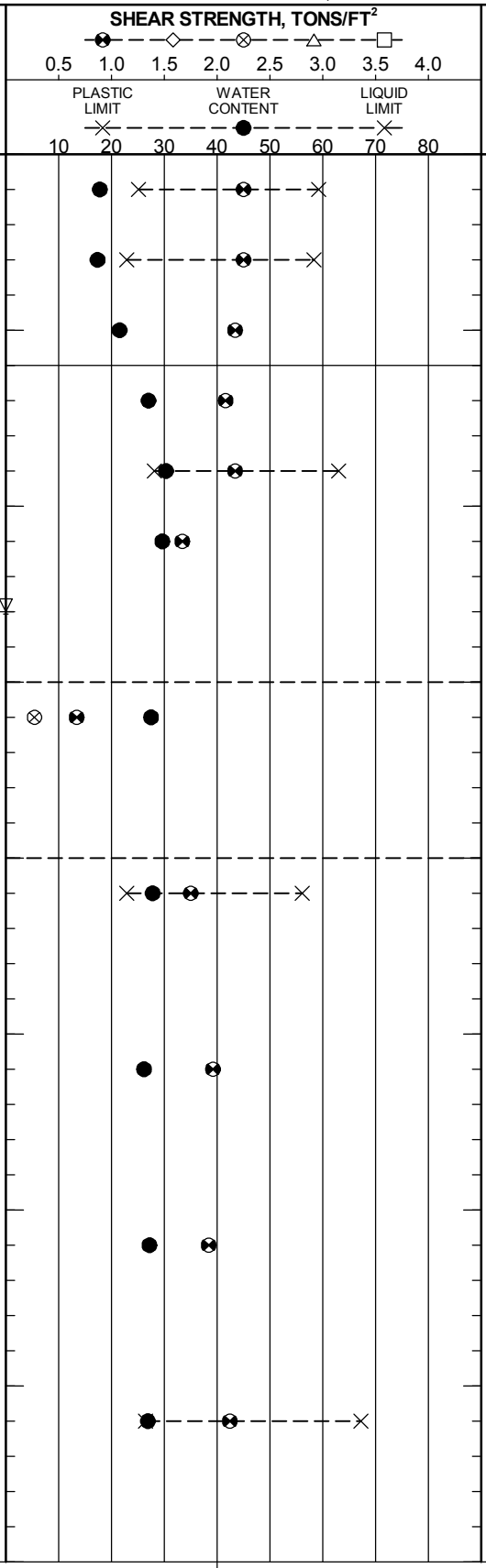
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541642.96840; E 1247798.59536

SURFACE ELEVATION: 61.85 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown, with calcareous nodules			34	
			110	35	98
5					100
	CLAY, fat, very stiff, dark brown, with calcareous nodules and black ferrous stains				
				35	
10					100
15	CLAY, fat, soft, grayish-brown, with calcareous nodules and black ferrous stains		96		
20	CLAY, fat, very stiff, dark brown, with calcareous nodules and black ferrous stains Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet			33	
25					100
30					100
35				41	



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-86a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-85

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541642.96840; E 1247798.59536

SURFACE ELEVATION: 61.85 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, dark brown, with calcareous nodules and black ferrous stains *(continued)* - becomes reddish-brown in color below a depth of about 40 feet					99
45			CLAY, lean, very soft, brown					
								99
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 13 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 17.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-86b

LOG OF BORING NO. DP-86

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541576.43770; E 1248341.48629

SURFACE ELEVATION: 62.19 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown, with roots extending down to a depth of about 2 feet			26	
	- with calcareous nodules below a depth of about 2 feet				99
5			107		
				39	
	CLAY, fat, very stiff to stiff, brown, with black ferrous stains				100
10					100
15	- becomes grayish-brown in color below a depth of about 15 feet			39	
20	- becomes brown in color below a depth of about 20 feet				99
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25					100
30					
35					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/4/2008	**DATE MEASURED:**	11/4/2008	**FIGURE:**	A-87a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-86

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541576.43770; E 1248341.48629

SURFACE ELEVATION: 62.19 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT; 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff to stiff, brown, with black ferrous stains *(continued)* - becomes reddish-brown in color and with calcareous nodules below a depth of about 40 feet				40	
45								
50								99
			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 15 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/4/2008	**DATE MEASURED:**	11/4/2008	**FIGURE:**	A-87b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-87

The Lower Rio Grande Flood Control Project
Cameron County, Texas

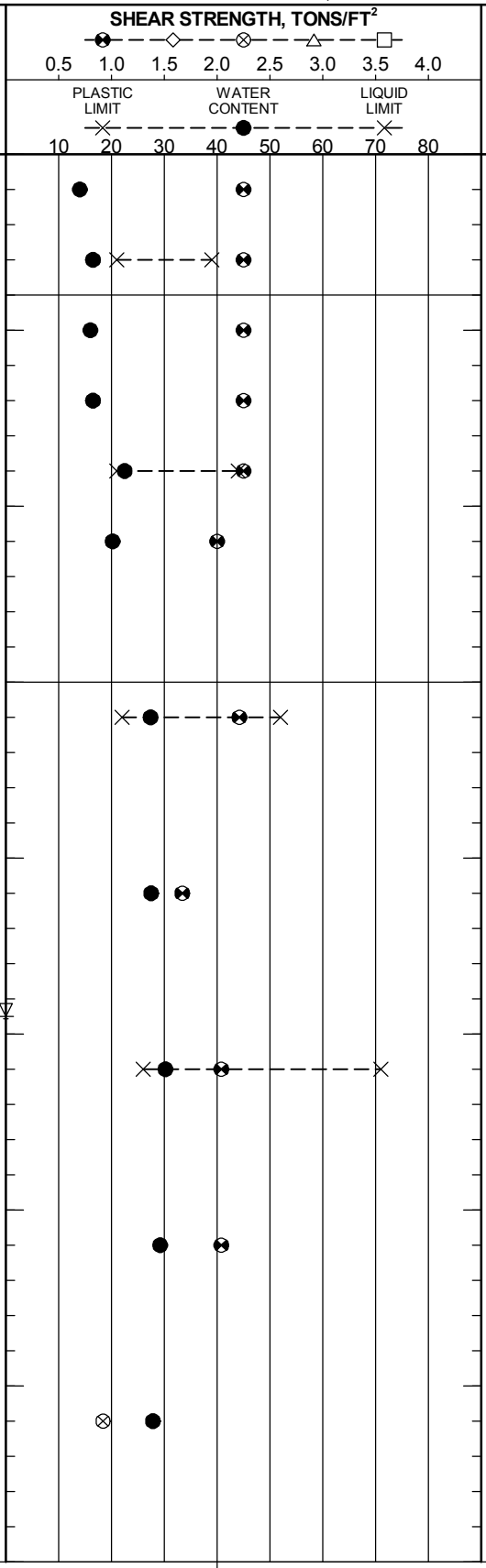
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541640.30720; E 1248940.26305

SURFACE ELEVATION: 61.94 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, hard, brown, with calcareous nodules				81
				18	
5	CLAY, lean, very stiff, brown				
					93
	- with orange ferrous stains and calcareous nodules below a depth of about 8 feet			23	
10					98
15	CLAY, fat, very stiff to stiff, brown to dark brown, with black ferrous stains			30	
20					84
25	- with calcareous nodules below a depth of about 25 feet			45	
30					96
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35	- becomes brown to reddish-brown in color below a depth of about 35 feet		95		



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-88a

LOG OF BORING NO. DP-87

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541640.30720; E 1248940.26305

SURFACE ELEVATION: 61.94 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, sandy, lean, soft, brown					69
45								
			CLAY, lean, stiff, brown					85
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 24.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 19 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-88b

LOG OF BORING NO. DP-88

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541531.19680; E 1249914.27325

SURFACE ELEVATION: 61.14 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules		23	
	FILL: CLAY, fat, very stiff, brown, with calcareous nodules			94
5		96	36	
	CLAY, lean, very stiff to stiff, brown to dark brown, with gypsum nodules		27	
10				98
15	- firm below 15 feet			
20	CLAY, fat, very stiff, brown, with black ferrous stains Driller's Note: Converted to mud rotary drilling method at a depth of about 22 feet			98
25			41	
30			45	
35				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	11.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-89a

LOG OF BORING NO. DP-88

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16541531.19680; E 1249914.27325

SURFACE ELEVATION: 61.14 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, brown, with black ferrous stains *(continued)*				42	
45								
			SILT, dark brown					96
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 11.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 21 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	11.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/5/2008	**DATE MEASURED:**	11/5/2008	**FIGURE:**	A-89b

LOG OF BORING NO. DP-89

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540913.79140; E 1250733.93211

SURFACE ELEVATION: 61.46 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules			19	
	FILL: CLAY, silty, very stiff, brown to dark brown		98		97
5				7	
					99
10	CLAY, lean, stiff to firm, dark brown, with black ferrous stains	9		23	
15		4			85
20	CLAY, fat, very stiff, brown, with black ferrous stains Driller's Note: Converted to mud rotary drilling method at a depth of about 22 feet		99		
25				35	
30					100
35			101	42	99

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-90a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-89

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540913.79140; E 1250733.93211

SURFACE ELEVATION: 61.46 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, brown, with black ferrous stains *(continued)*					96
45								
			CLAY, lean, with sand, stiff, light brown					
				15				79
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 20.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-90b

LOG OF BORING NO. DP-90

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539977.03840; E 1251071.90832

SURFACE ELEVATION: 61.34 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules				94
	FILL: CLAY, fat, very stiff, brown to dark brown, with black ferrous stains			35	
5					99
	FILL: CLAY, lean, very stiff to stiff, brown, with black ferrous stains		103	26	
	- with orange ferrous stains below a depth of about 8 feet	12			98
10	CLAY, fat, very stiff, brown, with black ferrous stains and calcareous nodules			24	
15	CLAY, fat, sofeet, brown, with black ferrous stains and calcareous nodules	4			
20	CLAY, lean, very stiff, brown to reddish-brown, with black ferrous stains	14			88
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25				22	
30					98
35					96

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-91a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-90

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539977.03840; E 1251071.90832

SURFACE ELEVATION: 61.34 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff to very stiff, reddish-brown to brown, with black ferrous stains	13			52	
45								
				18				90
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 30 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/6/2008	**DATE MEASURED:**	11/6/2008	**FIGURE:**	A-91b

LOG OF BORING NO. DP-91

The Lower Rio Grande Flood Control Project
Cameron County, Texas

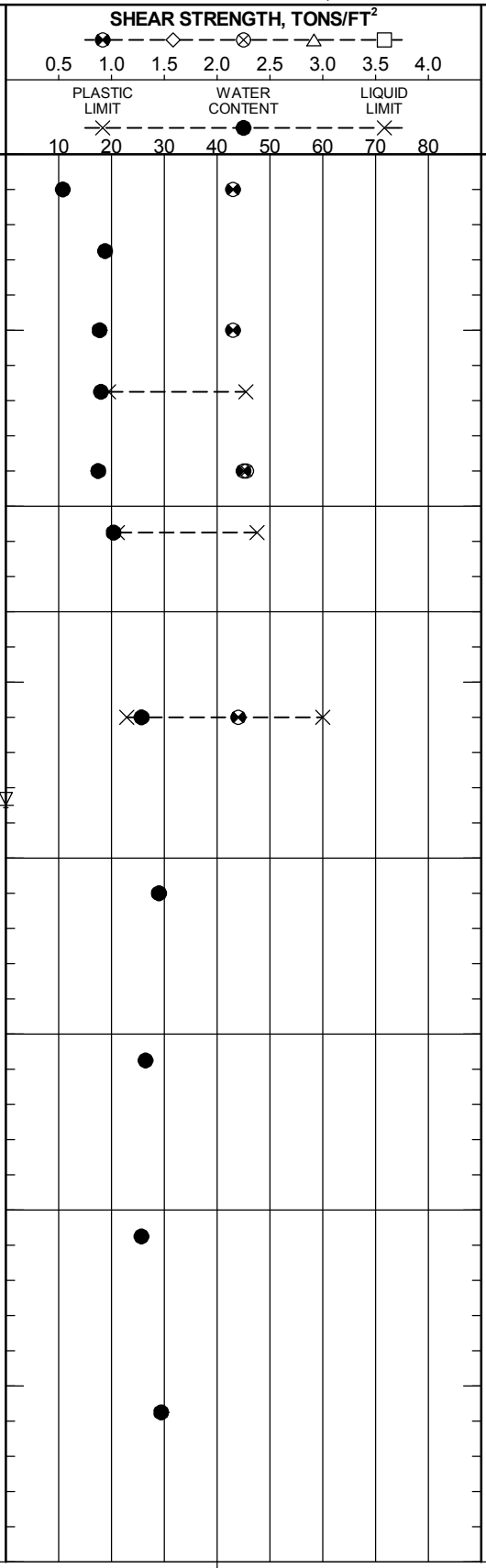
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539718.89910; E 1252061.88591

SURFACE ELEVATION: 60.77 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, dark brown				91
		17			98
5			103		92
		15		26	
			101		
10	CLAY, lean, stiff, brown	14		27	
	CLAY, fat, very stiff, brown				
15				37	100
20	CLAY, lean, with sand, very stiff, brown				83
25	SAND, silty, medium dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	12			24
30	SAND, with silt, poorly graded, medium dense, brown	19			10
35		23		NP	



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-92a

LOG OF BORING NO. DP-91

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539718.89910; E 1252061.88591

SURFACE ELEVATION: 60.77 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, very stiff, reddish-brown, with black ferrous stains					97
45								
							24	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 44 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-92b

LOG OF BORING NO. DP-92

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540189.93680; E 1252809.69155

SURFACE ELEVATION: 60.42 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, brown			24	
5			102		93
		11			91
	CLAY, fat, very stiff to stiff, brown			47	
10					99
15			101	30	100
20	- becomes reddish-brown in color below a depth of about 20 feet			45	
25	- becomes grayish-brown in color below a depth of about 25 feet Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	12			99
30	SAND, with silt, poorly-graded, medium dense, brown				9
35		20		NP	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-93a

LOG OF BORING NO. DP-92

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540189.93680; E 1252809.69155

SURFACE ELEVATION: 60.42 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, very stiff to stiff, reddish-brown to light brown, with black ferrous stains					99
45								
				8				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 44 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-93b

LOG OF BORING NO. DP-93

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540120.74480; E 1253823.62020

SURFACE ELEVATION: 59.91 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, dark brown to brown				95
			107	38	
5					92
	CLAY, lean, stiff to very stiff, light brown	12		9	
10					74
15	CLAY, lean, with sand, stiff, brown	15			100
20	CLAY, fat, very stiff, brown, with black ferrous stains			26	
25					100
30				34	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35	- becomes reddish-brown in color below a depth of about 35 feet				94

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-94a

LOG OF BORING NO. DP-93

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540120.74480; E 1253823.62020

SURFACE ELEVATION: 59.91 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, brown, with black ferrous stains *(continued)*					
45			CLAY, fat, firm, brown, with black ferrous stains					
				6				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 29 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-94b

LOG OF BORING NO. DP-94

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540275.09620; E 1254786.98548

SURFACE ELEVATION: 60.10 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, hard, brown		107		
	FILL: CLAY, fat, very stiff, brown				
5				31	
					95
	- with orange ferrous stains below a depth of about 8 feet			44	
10					97
15	CLAY, lean, very stiff, brown				
20				23	
25					98
	CLAY, lean, with sand, stiff, brown				
30					73
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35	SAND, silty, medium dense to dense, brown	11			43

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/9/2008	**DATE MEASURED:**	11/9/2008	**FIGURE:**	A-95a

LOG OF BORING NO. DP-94

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540275.09620; E 1254786.98548

SURFACE ELEVATION: 60.10 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, brown *(continued)*	33			NP	
45								
				36				50
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 24 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/9/2008	**DATE MEASURED:**	11/9/2008	**FIGURE:**	A-95b

LOG OF BORING NO. DP-95

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540288.40230; E 1255635.91787

SURFACE ELEVATION: 59.55 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown to dark brown, with calcareous nodules				95
	FILL: CLAY, fat, hard, brown				96
5				44	
			102		
				51	
10	CLAY, lean, very stiff, brown				
15					98
20		14		11	
25	CLAY, fat, very stiff, brown				99
30				38	
35	CLAY, sandy, lean, sofeet, dark brown				56
	Driller's Note: Converted to mud rotary drilling method at a depth of about 36-1/2 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/8/2008	**DATE MEASURED:**	11/8/2008	**FIGURE:**	A-96a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-95

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540288.40230; E 1255635.91787

SURFACE ELEVATION: 59.55 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, clayey, loose, dark brown	6				
45								
				5				24
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 27 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 26 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/8/2008	**DATE MEASURED:**	11/8/2008	**FIGURE:**	A-96b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-96

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540309.69220; E 1256546.05855

SURFACE ELEVATION: 60.07 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown		111		
				31	
5					
					99
10	CLAY, fat, very stiff, brown			42	
15					99
20	CLAY, sandy, lean, stiff to sofeet, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				68
25				15	
30	SAND, clayey, medium dense, brown	10			46
35	SAND, silty, medium dense, brown	13			14

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/8/2008	**DATE MEASURED:**	11/8/2008	**FIGURE:**	A-97a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-96

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540309.69220; E 1256546.05855

SURFACE ELEVATION: 60.07 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	22			NP	
45								
				30				37
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/8/2008	**DATE MEASURED:**	11/8/2008	**FIGURE:**	A-97b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-97

The Lower Rio Grande Flood Control Project
Cameron County, Texas

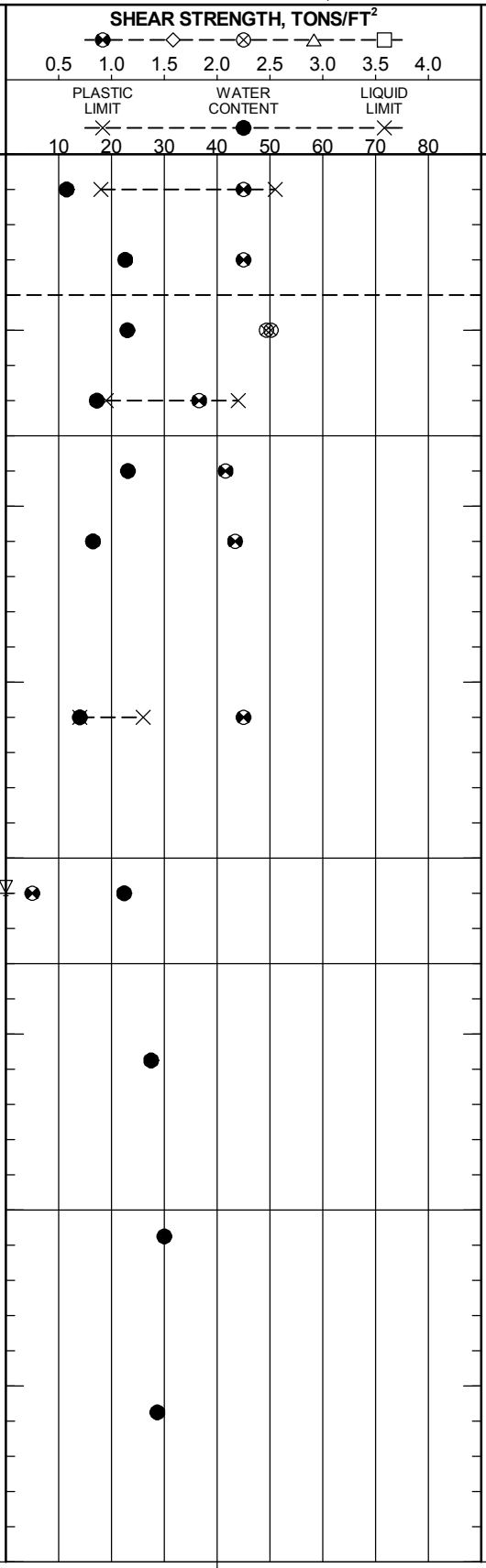
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540485.33340; E 1257381.68479

SURFACE ELEVATION: 58.16 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown			33	98
5	FILL: CLAY, lean, hard to very stiff, brown		100	25	
10	CLAY, lean, very stiff, brown, with black ferrous stains			12	91
20	CLAY, sandy, lean, sofeet, brown				63
25	SAND, silty, medium dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	15			13
30	SAND, with silt, poorly-graded, medium dense, brown	22			
35		21			8



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/9/2008	**DATE MEASURED:**	11/9/2008	**FIGURE:**	A-98a

LOG OF BORING NO. DP-97

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540485.33340; E 1257381.68479

SURFACE ELEVATION: 58.16 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, clayey, dense, brown	42			15	
45								
				42				37
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/9/2008	**DATE MEASURED:**	11/9/2008	**FIGURE:**	A-98b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-98

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540735.48900; E 1258536.65863

SURFACE ELEVATION: 58.32 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown				95
				19	96
5			110		
				15	
10	CLAY, lean, very stiff, brown			20	
15	CLAY, sandy, lean, hard to very stiff, brown			15	
20					66
25	SAND, silty, medium dense to dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	19			20
30		31			
35	SAND, with silt, poorly-graded, medium dense, brown	20			12

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-99a

LOG OF BORING NO. DP-98

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540735.48900; E 1258536.65863

SURFACE ELEVATION: 58.32 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	24				
45								
				25				9
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19.5 feet. Upon completion of the drilling operations, the boring reamained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-99b

LOG OF BORING NO. DP-99

The Lower Rio Grande Flood Control Project
Cameron County, Texas

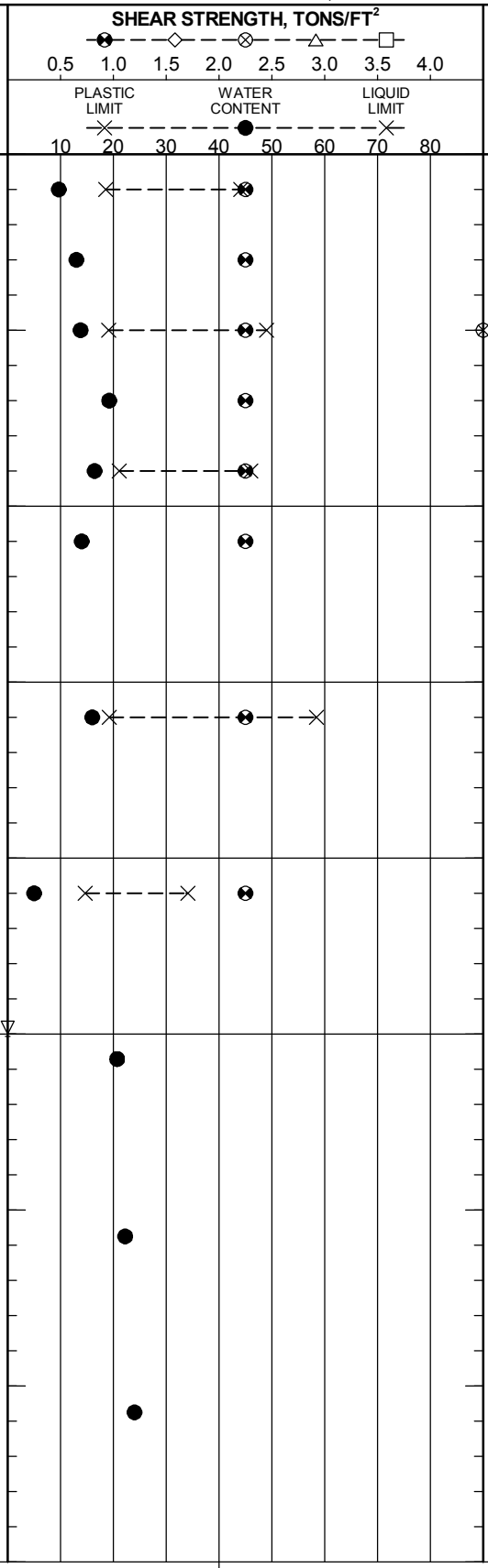
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540453.39860; E 1259345.67257

SURFACE ELEVATION: 58.76 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown			25	95
5			117	30	
					97
				25	96
10	CLAY, lean, very stiff, light brown				
15	CLAY, fat, very stiff, brown			39	
20	CLAY, sandy, lean, very stiff, light brown			19	
25	SAND, silty, very dense to medium dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	50/ 11"			20
30		40			12
35		23			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-100a

LOG OF BORING NO. DP-99

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540453.39860; E 1259345.67257

SURFACE ELEVATION: 58.76 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, very dense to medium dense, brown *(continued)*	20					
45									
				22					20
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 35 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-100b

LOG OF BORING NO. DP-100

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540016.95690; E 1259707.59986

SURFACE ELEVATION: 58.91 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			27	
					96
5					96
				24	84
10	CLAY, lean, very stiff, brown				
15					94
20	CLAY, sandy, lean, very stiff, brown			22	
25		15			69
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, silty, medium dense, brown	16			
35		19			26

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-101a

LOG OF BORING NO. DP-100

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16540016.95690; E 1259707.59986

SURFACE ELEVATION: 58.91 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, sandy, lean, very stiff, brown	19				56
45								
				18			23	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-101b

LOG OF BORING NO. DP-101

The Lower Rio Grande Flood Control Project
Cameron County, Texas

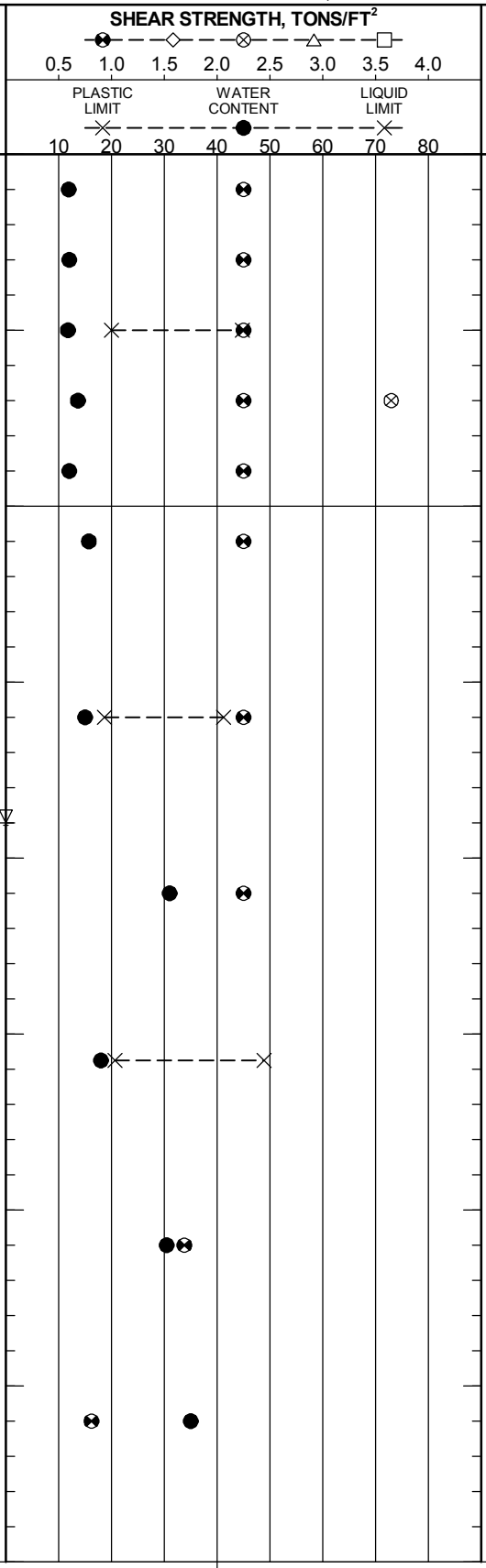
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539665.67450; E 1259984.36778

SURFACE ELEVATION: 58.43 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
			FILL: CLAY, lean, hard, brown				94
5						25	95
					110		86
10			CLAY, lean, very stiff to stiff, brown				96
15						22	
20			- becomes light brown in color below a depth of about 20 feet				
25				17		28	
30							97
			Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35							



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-102a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-101

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539665.67450; E 1259984.36778

SURFACE ELEVATION: 58.43 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, very dense, brown	50/ 10"				11
45								
			CLAY, fat, very stiff, brown				41	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-102b

LOG OF BORING NO. DP-102

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539197.29800; E 1260250.49079

SURFACE ELEVATION: 58.77 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff , brown, with calcareous nodules			33	93
5	FILL: CLAY, lean, very stiff, brown, with black ferrous stains			27	
	FILL: CLAY, fat, very stiff, dark brown			31	
	CLAY, fat, very stiff , brown, with black ferrous stains			28	95
10					
15					
20					97
25	- becomes brown to reddish-brown in color below a depth of about 25 feet		97		
30				38	
35					98
	Driller's Note: Converted to mud rotary drilling method at a depth of about 37 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.9 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/10/2008	**DATE MEASURED:**	11/10/2008	**FIGURE:**	A-103a

LOG OF BORING NO. DP-102

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16539197.29800; E 1260250.49079

SURFACE ELEVATION: 58.77 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, dense to very dense, dark brown	49				12
45								
				50/ 11"				12
50			Boring terminated at a depth of about 49.9 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 37 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.9 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/10/2008	**DATE MEASURED:**	11/10/2008	**FIGURE:**	A-103b

LOG OF BORING NO. DP-103

The Lower Rio Grande Flood Control Project
Cameron County, Texas

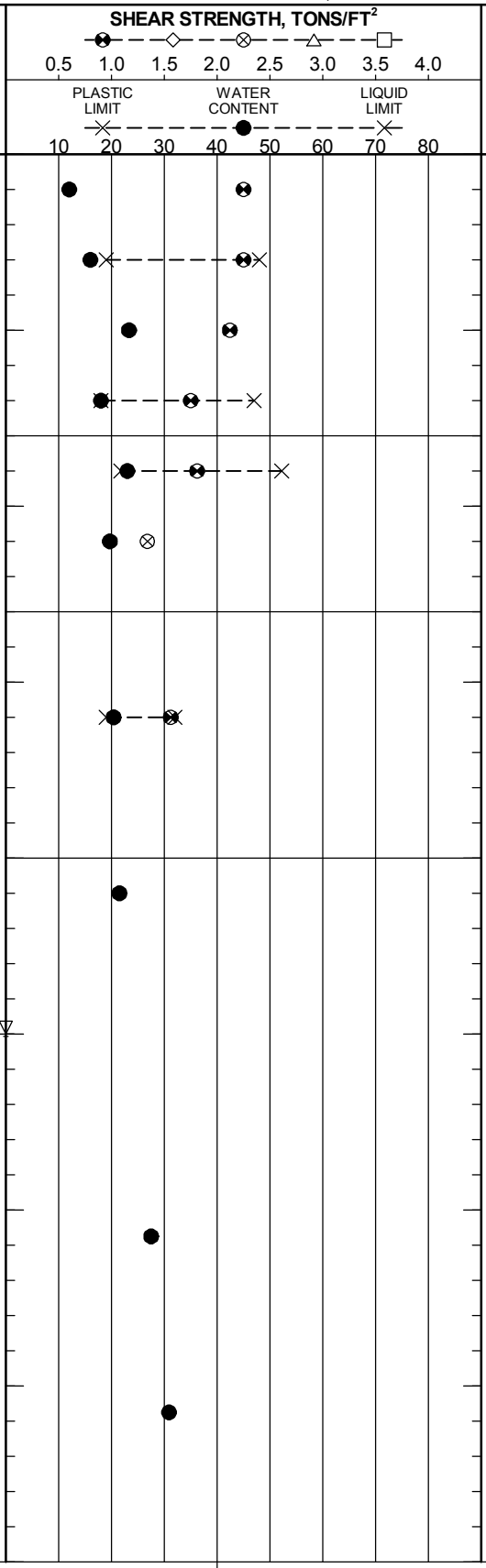
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16538696.98680; E 1260452.74427

SURFACE ELEVATION: 58.69 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
			FILL: CLAY, lean, very stiff, brown				95
						29	
5							97
						29	
			CLAY, fat, very stiff, dark brown		101	30	96
10					103		
			CLAY, lean, very stiff, dark brown				
15						13	
20			SAND, clayey, medium dense, dark brown				
25							40
			Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30				18			42
35				29			38



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/10/2008	**DATE MEASURED:**	11/10/2008	**FIGURE:**	A-104a

LOG OF BORING NO. DP-103

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16538696.98680; E 1260452.74427

SURFACE ELEVATION: 58.69 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, clayey, medium dense, dark brown *(continued)*	25			NP	
45								
			CLAY, fat, very stiff, reddish-brown, with black ferrous stains and calcareous nodules					97
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 27 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/10/2008	**DATE MEASURED:**	11/10/2008	**FIGURE:**	A-104b

LOG OF BORING NO. DP-104

The Lower Rio Grande Flood Control Project
Cameron County, Texas

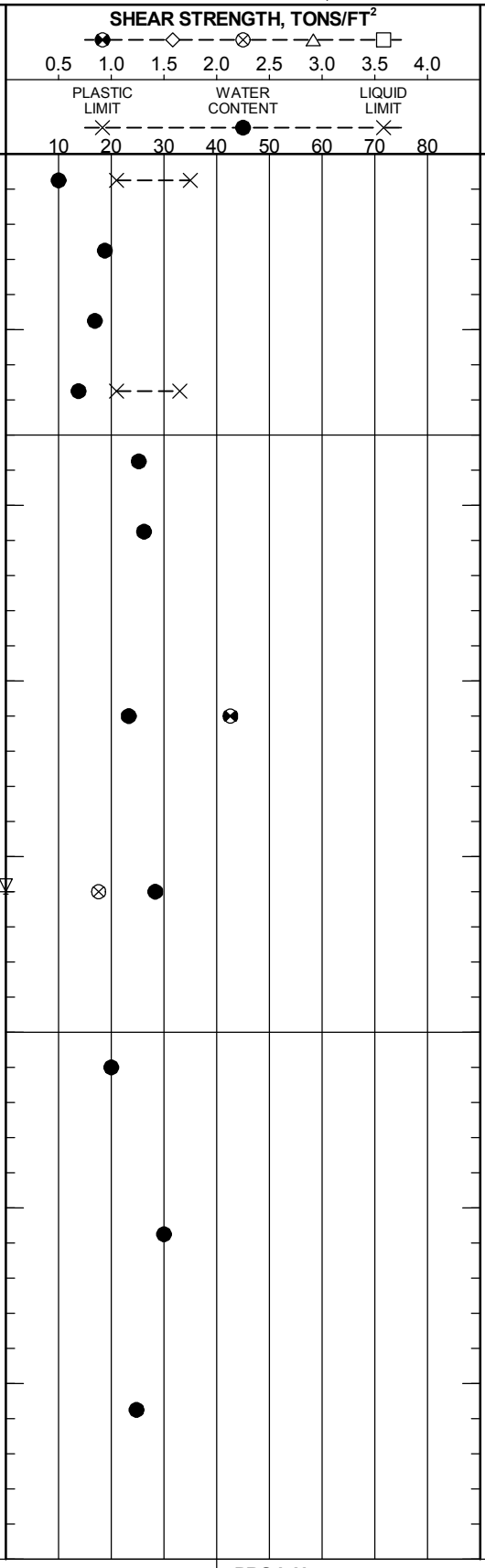
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16538225.94900; E 1260620.40176

SURFACE ELEVATION: 58.30 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, brown, with calcareous nodules	20		14	
		10			95
5		8			95
		9		12	
	CLAY, fat, very stiff to stiff, brown	16			88
10		19			
15	- with calcareous nodules below a depth of about 15 feet				
20			92		
25	SAND, with silt, poorly-graded, medium dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30		17			10
35		15			9



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-105a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-104

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16538225.94900; E 1260620.40176

SURFACE ELEVATION: 58.30 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, stiff, reddish-brown to grayish-brown, with black ferrous stains	12			18	
45								
								96
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-105b

LOG OF BORING NO. DP-105

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16537986.43830; E 1261110.06809

SURFACE ELEVATION: 58.71 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, firm to soft, brown, with calcareous nodules - very stiff 0 to 2 feet	19		94
		7	19	
5	- with gypsum nodules below a depth of about 4 feet	3		91
		6		
	CLAY, lean, firm to stiff, brown, with calcareous nodules	6	18	
10		6		98
15		6		81
20		9	12	
	SAND, with silt, poorly-graded, loose to medium dense, brown			
25		9		
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet			
30		14		12
35		11		

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-106a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-105

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16537986.43830; E 1261110.06809

SURFACE ELEVATION: 58.71 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, loose to medium dense, brown *(continued)*	10				8
45								
			CLAY, lean, stiff, light brown					
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 24 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 24 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/7/2008	**DATE MEASURED:**	11/7/2008	**FIGURE:**	A-106b

LOG OF BORING NO. DP-106

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16537893.29530; E 1261727.47347

SURFACE ELEVATION: 58.62 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules		112		94
				21	
5					96
	CLAY, lean, very stiff, brown, with calcareous nodules			17	
10					99
15	CLAY, sandy, lean, very stiff, light brown	16			58
20		22			
25	SAND, silty, medium dense, light brown Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	21		NP	
30		25			18
35		17			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/10/2008	**DATE MEASURED:**	11/10/2008	**FIGURE:**	A-107a

LOG OF BORING NO. DP-106

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16537893.29530; E 1261727.47347

SURFACE ELEVATION: 58.62 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, light brown *(continued)*	20				
45								
			CLAY, fat, very stiff, brown to reddish-brown, with black ferrous stains	17			31	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/10/2008	**DATE MEASURED:**	11/10/2008	**FIGURE:**	A-107b

LOG OF BORING NO. DP-107

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16537893.29530; E 1262288.99301

SURFACE ELEVATION: 58.15 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown		102	17	
5					97
	SILT, sandy, very stiff to stiff, brown to light brown			NP	
				NP	50
10		12			
15	SAND, silty, medium dense, brown	19			22
20	SAND, with silt, poorly-graded, medium dense, brown	20			5
25		17			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		21			6
35		26			9

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-108a

LOG OF BORING NO. DP-107

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16537893.29530; E 1262288.99301

SURFACE ELEVATION: 58.15 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	27				
45								
			CLAY, sandy, lean, stiff, light brown	14			11	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 24.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 24.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-108b

LOG OF BORING NO. DP-108

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16537520.72310; E 1263255.01952

SURFACE ELEVATION: 57.96 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, light brown		109		
				26	
5					99
					97
	CLAY, lean, very stiff, brown			18	97
10					
15				31	
20	CLAY, lean, with sand, firm, light brown				84
25	SAND, silty, medium dense, brown	17			13
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		16			14
35		15			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-109a

LOG OF BORING NO. DP-108

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16537520.72310; E 1263255.01952

SURFACE ELEVATION: 57.96 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown	17				6
45								
			CLAY, lean, with sand, very stiff, light reddish-brown	22			18	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 27 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 26.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-109b

LOG OF BORING NO. DP-109

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16536783.56240; E 1263702.10617

SURFACE ELEVATION: 56.9 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown			27	92
5					98
					99
			106		
10	CLAY, fat, very stiff, brown, with black ferrous stains			45	
15	CLAY, lean, with sand, very stiff, light brown				82
20	SILT, with sand, very stiff to stiff, brown	18		NP	
25		14			71
	SAND, with silt, poorly-graded, medium dense, brown				
30		14			12
	Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet				
35		31			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-110a

LOG OF BORING NO. DP-109

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16536783.56240; E 1263702.10617

SURFACE ELEVATION: 56.9 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, reddish-brown	17			44	
45								
			- firm below 48 feet	6				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 27.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 27 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/11/2008	**DATE MEASURED:**	11/11/2008	**FIGURE:**	A-110b

LOG OF BORING NO. DP-110

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16536980.49340; E 1264588.29578

SURFACE ELEVATION: 56.81 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, light brown			24	94
					95
5			109		
10	CLAY, fat, very stiff, brown to light brown			50	99
15					
20					99
25				49	
30	SAND, silty, medium dense to dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet	23			
35		29			23

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	28 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-111a

LOG OF BORING NO. DP-110

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16536980.49340; E 1264588.29578

SURFACE ELEVATION: 56.81 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, brown *(continued)*	41				
45								
			CLAY, fat, very stiff, brown				37	98
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 31 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 28 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	28 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-111b

LOG OF BORING NO. DP-111

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16536706.38670; E 1265578.27336

SURFACE ELEVATION: 56.74 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown	110		
	FILL: CLAY, fat, hard, brown		38	98
5				97
10	CLAY, fat, very stiff, light brown		49	
15				97
20	- becomes brown in color below a depth of about 20 feet			96
25			54	98
30	- with gypsum nodules below a depth of about 30 feet			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet			
35	- becomes reddish-brown in color and with black ferrous stains below a depth of about 35 feet			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	38.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-112a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-111

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16536706.38670; E 1265578.27336

SURFACE ELEVATION: 56.74 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, light brown *(continued)* - stiff 40 to 42 feet				34	96
45								
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 40 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 38.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	38.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-112b

LOG OF BORING NO. DP-112

The Lower Rio Grande Flood Control Project
Cameron County, Texas

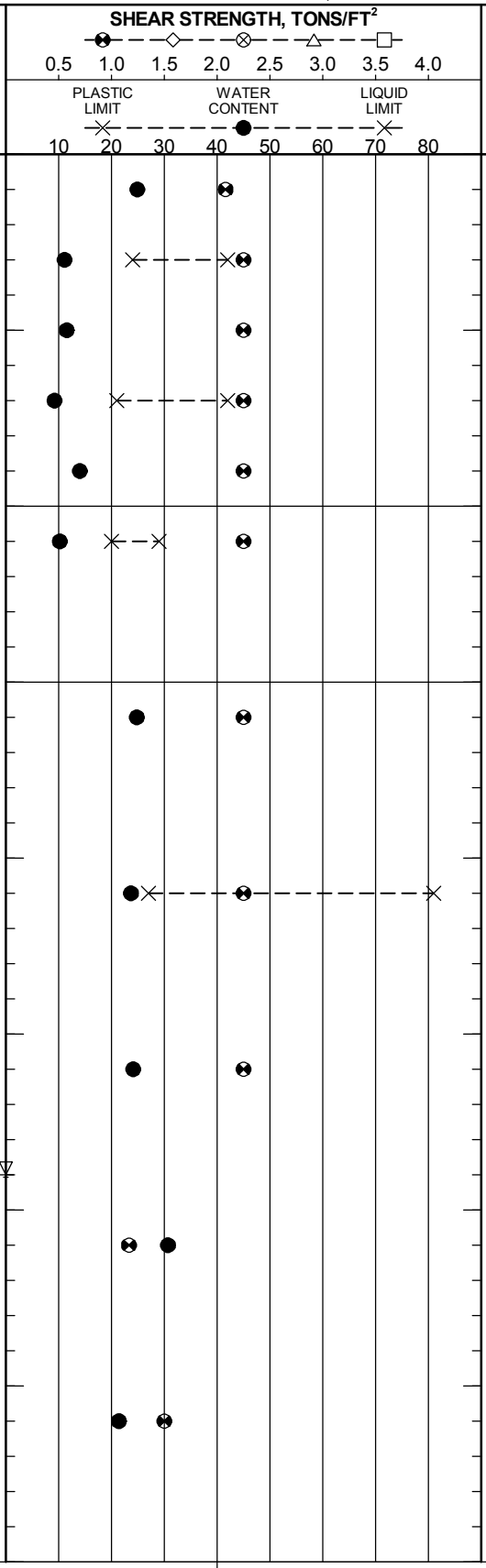
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16535870.76040; E 1266389.94853

SURFACE ELEVATION: 56.79 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
			FILL: CLAY, lean, very stiff, brown				97
						18	
5			- with calcareous nodules below a depth of about 4 feet		103		
						21	90
10			CLAY, lean, very stiff, light brown			9	86
15			CLAY, fat, very stiff, reddish-brown, with black ferrous stains				97
20						54	97
25							
30							
35							85
			Driller's Note: Converted to mud rotary drilling method at a depth of about 37 feet				



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	29 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-113a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-112

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16535870.76040; E 1266389.94853

SURFACE ELEVATION: 56.79 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, clayey, medium dense, brown	17				
45								
			CLAY, fat, very stiff, reddish-brown, with black ferrous stains	24				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 34 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 29 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	29 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-113b

LOG OF BORING NO. DP-113

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16535120.29360; E 1267212.26861

SURFACE ELEVATION: 56.82 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown, with black ferrous stains			36	98
					89
5					
	CLAY, lean, very stiff, light brown			28	95
10					92
15	CLAY, fat, very stiff to stiff, brown, with black ferrous stains		100	46	
20				37	
25					99
30			91	33	95
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35	SAND, poorly-graded, medium dense, brown	26			2

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-114a

LOG OF BORING NO. DP-113

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16535120.29360; E 1267212.26861

SURFACE ELEVATION: 56.82 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, poorly-graded, medium dense, brown *(continued)*	29				
45								
				29				3
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 27 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-114b

LOG OF BORING NO. DP-114

The Lower Rio Grande Flood Control Project
Cameron County, Texas

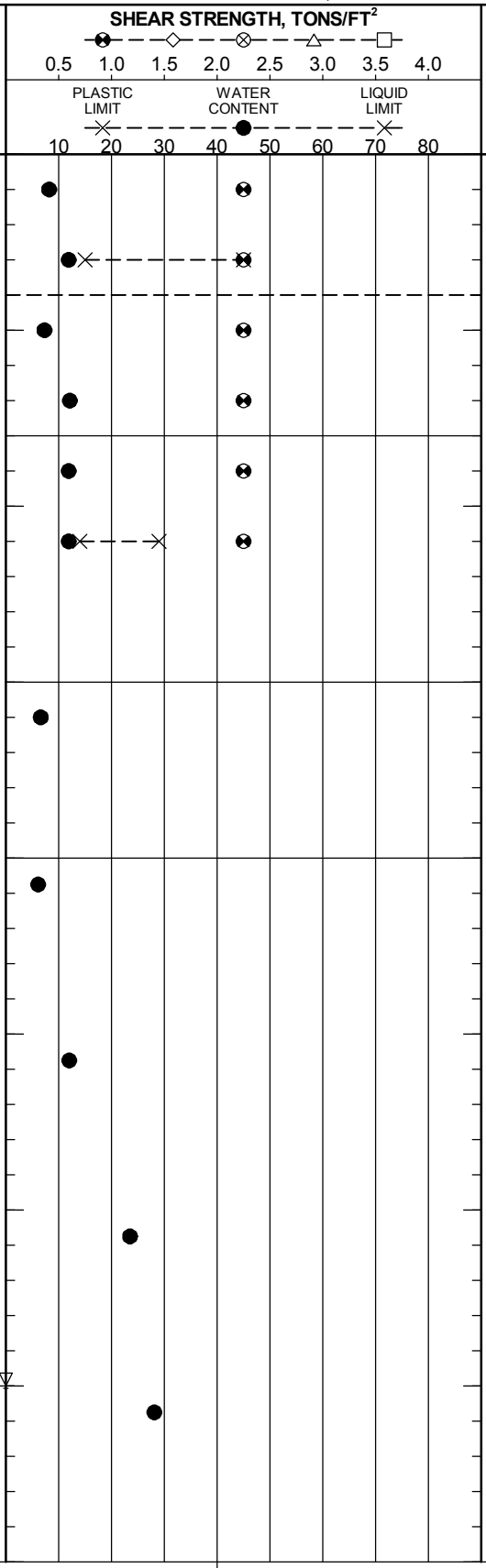
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16534481.59840; E 1267797.73922

SURFACE ELEVATION: 56.04 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, light brown		107	30	87
5	FILL: CLAY, lean, with sand, very stiff, light brown				73
					78
10	CLAY, lean, very stiff, light brown			15	88
15	SAND, clayey, very dense, light brown				49
20	SAND, silty, medium dense to dense, light brown	14		NP	
25		30			
30		19			13
35		20			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 36-1/2 feet				



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	35 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-115a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-114

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16534481.59840; E 1267797.73922

SURFACE ELEVATION: 56.04 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, light brown *(continued)*	50				
45								
			CLAY, fat, very stiff, brown, with calcareous nodules				46	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 35 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 35 feet. Upon completion of the drilling operations, the boring reamined uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	35 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-115b

LOG OF BORING NO. DP-115

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16533411.78390; E 1268095.79699

SURFACE ELEVATION: 56.22 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, very stiff, light brown			30	
					73
5				28	
	CLAY, lean, with sand, hard, light brown		114		71
				24	
10				14	75
15					
20	SAND, silty, medium dense to dense, brown	27			
25		40			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, with silt, poorly-graded, medium dense, brown	25			10
35		28			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-116a

LOG OF BORING NO. DP-115

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16533411.78390; E 1268095.79699

SURFACE ELEVATION: 56.22 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, grayish-brown	18				97
45								
							53	95
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-116b

LOG OF BORING NO. DP-116

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16532490.99830; E 1268252.80956

SURFACE ELEVATION: 55.78 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown				96
5	FILL: CLAY, lean, very stiff, brown		96	24	94
10	CLAY, lean, very stiff, brown			30	91
20	CLAY, fat, with sand, very stiff to stiff, reddish-brown to brown, with black ferrous stains			40	
25		13			84
30	SAND, clayey, loose to medium dense, brown	7			34
35		15			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 36-1/2 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	28 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-117a

LOG OF BORING NO. DP-116

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16532490.99830; E 1268252.80956

SURFACE ELEVATION: 55.78 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, clayey, loose to medium dense, brown *(continued)*	27				47
45								
			CLAY, fat, very stiff, grayish-brown	28			51	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 35 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 28 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	28 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-117b

LOG OF BORING NO. DP-117

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16531383.92660; E 1268186.27881

SURFACE ELEVATION: 55.20 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			FILL: CLAY, fat, stiff, brown, with black ferrous stains	12			47	
			CLAY, lean, stiff to firm, brown	12				89
5				7			18	
				6				92
				9				95
10				8			17	
15			CLAY, sandy, lean, firm to stiff, brown	6				58
20				10				
25			SAND, silty, medium dense, brown	15				
30				20				15
			Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet					
35				24			NP	

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-118a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-117

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16531383.92660; E 1268186.27881

SURFACE ELEVATION: 55.20 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, very dense to dense, brown	50/ 10"				
45								
				31				10
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 26 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-118b

LOG OF BORING NO. DP-118

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16530702.65170; E 1268697.23498

SURFACE ELEVATION: 56.06 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, grayish-brown to light brown, with orange ferrous stains		104	16	
5				18	99
	CLAY, lean, very stiff, brown, with black and orange ferrous stains				98
10				16	97
15		20			98
20	SAND, with silt, poorly-graded, medium dense, light brown	20			
25	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	21			8
30	SAND, clayey, medium dense, brown	28			
35		32			13

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-119a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-118

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16530702.65170; E 1268697.23498

SURFACE ELEVATION: 56.06 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, clayey, medium dense, brown *(continued)*	46				
45								
			- medium dense and light brown in color below a depth of about 48 feet	19			10	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 24 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-119b

LOG OF BORING NO. DP-119

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16530087.90750; E 1269665.92272

SURFACE ELEVATION: 55.61 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			22	
5	FILL: CLAY, sandy, lean, soft, light brown	4			64
	CLAY, lean, firm, light brown	5			89
		7		9	
10	CLAY, fat, stiff, light brown	14		29	96
15	SILT, sandy, medium dense, light brown	13			58
20		13		NP	
25	SAND, silty, medium dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	12			25
30	- loose 30 to 32 feet	7			
35		14		NP	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.9 ft	**DEPTH TO WATER:**	23.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-120a

LOG OF BORING NO. DP-119

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16530087.90750; E 1269665.92272

SURFACE ELEVATION: 55.61 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	15				13
45								
			- very dense below 48 feet	50/ 11"				
50			Boring terminated at a depth of about 49.9 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.9 ft	**DEPTH TO WATER:**	23.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-120b

LOG OF BORING NO. DP-120

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16529305.50590; E 1270977.90914

SURFACE ELEVATION: 55.16 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, dark brown		114	31	
	FILL: CLAY, lean, very stiff, light brown			26	97
5					97
	CLAY, lean, with sand, stiff, brown	13			78
10	CLAY, fat, stiff, brown	15			
15					82
20	SILT, sandy, medium dense, light brown				
25		12			51
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, with silt, poorly-graded, medium dense to dense, brown	18		NP	
35		41			9

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-121a

LOG OF BORING NO. DP-120

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16529305.50590; E 1270977.90914

SURFACE ELEVATION: 55.16 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to dense, brown *(continued)*	34				8
45			SAND, silty, dense, brown					
				33				14
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 24 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-121b

LOG OF BORING NO. DP-121

The Lower Rio Grande Flood Control Project
Cameron County, Texas

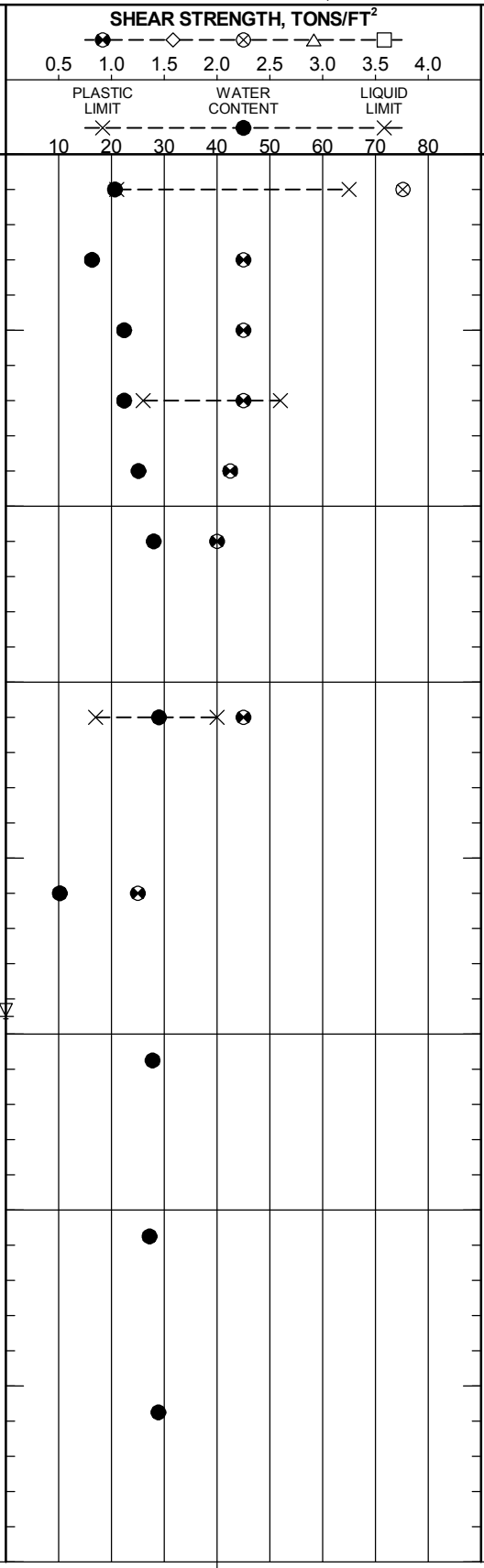
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16528658.82700; E 1271941.27442

SURFACE ELEVATION: 54.79 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown		105	44	
					98
5					
	- with orange ferrous stains below a depth of about 6 feet			26	99
10	CLAY, fat, very stiff, brown				
15	CLAY, lean, very stiff, light brown			23	99
20					
25	SAND, clayey, medium dense, light brown	13			29
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, with silt, poorly-graded, medium dense, brown	11			11
35		13			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-122a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-121

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16528658.82700; E 1271941.27442

SURFACE ELEVATION: 54.79 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	21				6
45								
			CLAY, fat, stiff, grayish-brown	10			33	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 24.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-122b

LOG OF BORING NO. DP-122

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16528371.41410; E 1272683.75761

SURFACE ELEVATION: 54.04 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown			29	92
					96
5			107		
					96
	CLAY, lean, very stiff, light brown to brown			10	96
10					
15				16	
20	CLAY, sandy, lean, stiff, brown			10	
25		10			59
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, silty, medium dense to dense, brown	28			
35		26			15

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-123a

LOG OF BORING NO. DP-122

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16528371.41410; E 1272683.75761

SURFACE ELEVATION: 54.04 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, brown *(continued)*	16				
45								
				40				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 24.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-123b

LOG OF BORING NO. DP-123

The Lower Rio Grande Flood Control Project
Cameron County, Texas

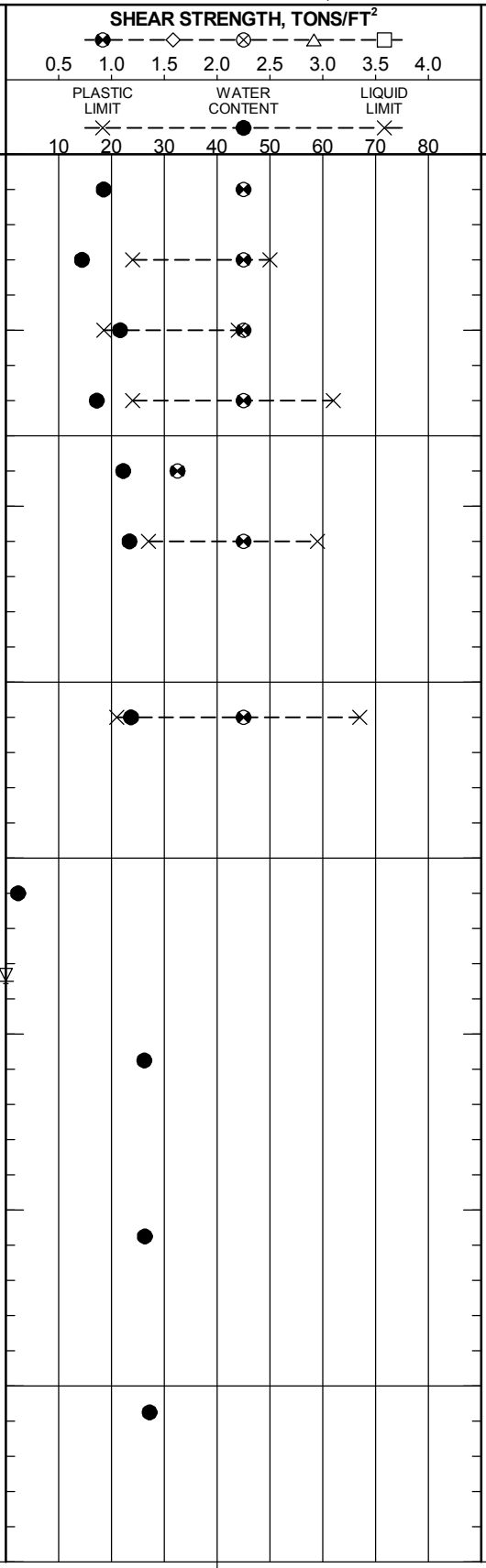
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16528645.74050; E 1273732.88865

SURFACE ELEVATION: 53.40 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, with sand, very stiff, brown		103		
				26	83
5				25	
				38	85
	CLAY, fat, with sand, stiff to very stiff, brown				
10				32	79
15	CLAY, sandy, fat, very stiff, brown, with black ferrous stains			46	68
20	SAND, with silt, poorly-graded, loose to medium dense, light brown				6
25		14			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		23			
35	SAND, silty, medium dense to dense, brown	28			15



DEPTH DRILLED:	49.9 ft	**DEPTH TO WATER:**	23.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-124a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-123

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16528645.74050; E 1273732.88865

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT; 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 53.40 ft					
			SAND, silty, medium dense to dense, brown *(continued)*	50				
45								
			- very dense below 48 feet	50/ 11"				
50			Boring terminated at a depth of about 49.9 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.9 ft	**DEPTH TO WATER:**	23.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-124b

LOG OF BORING NO. DP-124

The Lower Rio Grande Flood Control Project
Cameron County, Texas

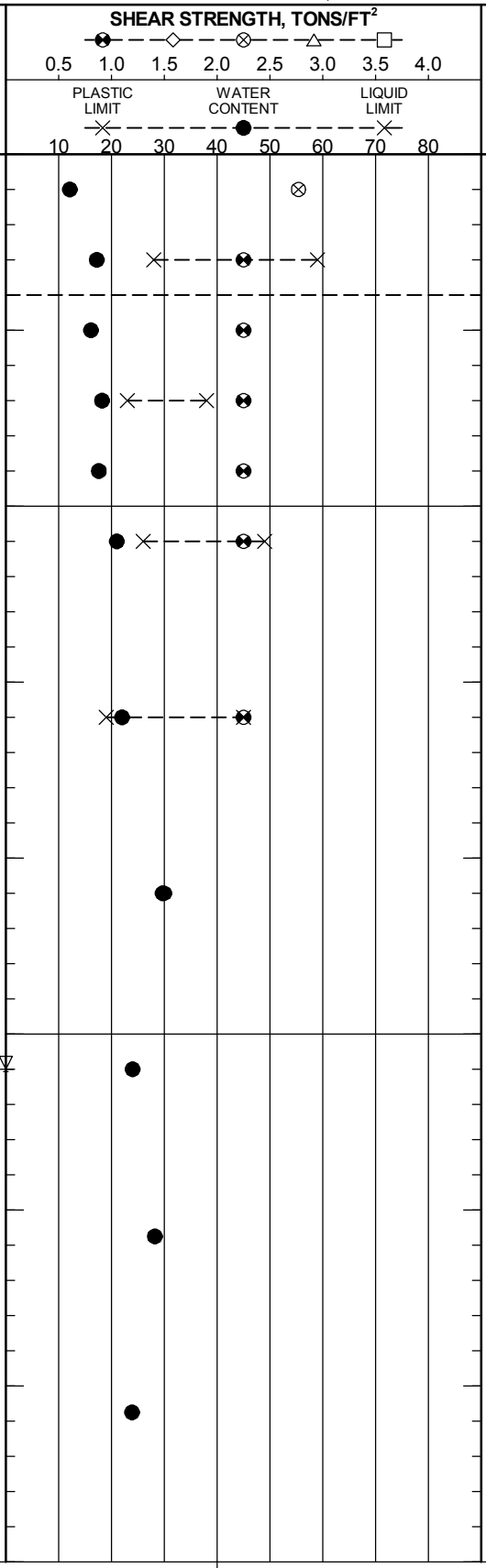
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16527995.98730; E 1274440.58247

SURFACE ELEVATION: 54.56 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown		110		89
				31	94
5	FILL: CLAY, lean, very stiff, brown				
				15	93
10	CLAY, lean, very stiff, light brown				
				23	97
15					
				26	99
20	- with orange ferrous stains below a depth of about 20 feet				97
25	SAND, silty, medium dense, brown				
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30		13			14
35		23			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-125a

LOG OF BORING NO. DP-124

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16527995.98730; E 1274440.58247

SURFACE ELEVATION: 54.56 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	26				
45								
				23				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 27 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 26 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-125b

LOG OF BORING NO. DP-125

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16527010.29170; E 1274922.97619

SURFACE ELEVATION: 54.73 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, very stiff, brown			28	84
	FILL: CLAY, fat, very stiff, brown		110		95
5					96
10	SILT, with sand, dense, light brown	18		NP	76
15	CLAY, lean, very stiff, brown	19			
20				24	93
	SAND, silty, medium dense, brown				
25		19			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		17			
35		13			14

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-126a

LOG OF BORING NO. DP-125

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16527010.29170; E 1274922.97619

SURFACE ELEVATION: 54.73 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	28				
45								
			CLAY, lean, very stiff, light brown, with orange ferrous stains	20			22	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-126b

LOG OF BORING NO. DP-126

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16526219.56140; E 1275310.65310

SURFACE ELEVATION: 52.79 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown			37	95
5	CLAY, lean, hard, brown			24	97
			98	24	
10	CLAY, fat, very stiff, brown to reddish-brown			59	98
15				22	97
20	CLAY, sandy, lean, stiff, brown	8			64
	SAND, silty, loose to medium dense, brown				
25		9			27
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		20			
35	SAND, with silt, poorly-graded, medium dense to dense, brown	25			5

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-127a

LOG OF BORING NO. DP-126

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16526219.56140; E 1275310.65310

SURFACE ELEVATION: 52.79 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to dense, brown *(continued)*	34				
45								
				22				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-127b

LOG OF BORING NO. DP-127

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16524967.70090; E 1275430.14702

SURFACE ELEVATION: 53.49 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown			25	97
5	- with black ferrous stains below a depth of about 4 feet		104		96
	- with orange ferrous stains below a depth of about 8 feet				
10	CLAY, lean, very stiff, brown			23	99
15					
20	CLAY, fat, very stiff, reddish-brown			36	99
	SAND, with silt, poorly-graded, loose to medium dense, brown				
25		9			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		28		NP	
35		20			10

SHEAR STRENGTH, TONS/FT^2: 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10, 20, 30, 40, 50, 60, 70, 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-128a

LOG OF BORING NO. DP-127

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16524967.70090; E 1275430.14702

SURFACE ELEVATION: 53.49 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, loose to medium dense, brown *(continued)*	24					
45									
				24					8
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-128b

LOG OF BORING NO. DP-128

The Lower Rio Grande Flood Control Project
Cameron County, Texas

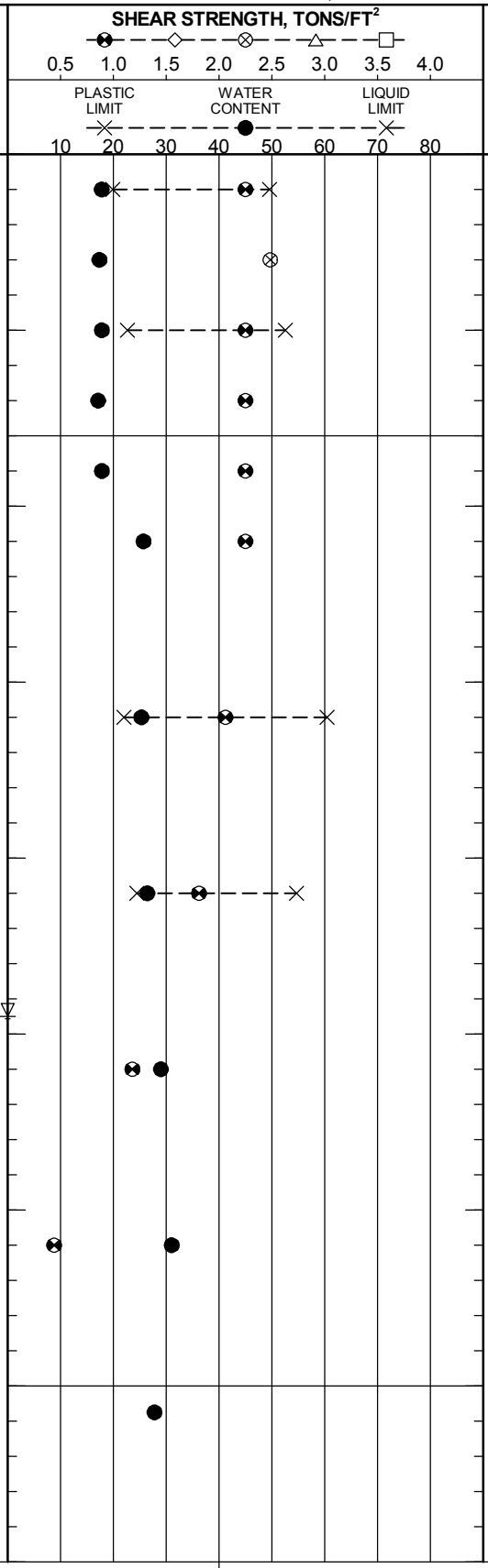
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16524033.60920; E 1275289.10183

SURFACE ELEVATION: 54.28 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, light brown			30	
			105		
5				30	99
	CLAY, fat, very stiff, brown				97
10					99
15				38	100
20				31	99
25	- with orange ferrous stains below a depth of about 25 feet			NP	
30	- firm 30 to 32 feet				21
35	SAND, silty, medium dense to dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 36-1/2 feet	21			21



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-129a

LOG OF BORING NO. DP-128

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16524033.60920; E 1275289.10183

SURFACE ELEVATION: 54.28 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, brown *(continued)* - very dense 40 to 42 feet	50/ 10"				
45								
				41				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 36 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 24.5 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-129b

LOG OF BORING NO. DP-129

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16523048.95400; E 1275142.73418

SURFACE ELEVATION: 54.24 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown, with calcareous nodules			32	97
	- with orange ferrous stains below a depth of about 2 feet				
5			105	30	
					97
	CLAY, fat, very stiff, brown, with calcareous nodules			33	100
10					99
15				28	96
20	CLAY, lean, firm, brown				9
25	SAND, with silt, poorly-graded, loosemedium dense, brown	6			90
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	- dense 30 to 32 feet	34			
35		19			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-130a

LOG OF BORING NO. DP-129

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16523048.95400; E 1275142.73418

SURFACE ELEVATION: 54.24 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, very stiff, brown	21				
45								
				32				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 26 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19.5 feet. Upon completion of the drilling operations, the boring remained uncaved. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-130b

LOG OF BORING NO. DP-130

The Lower Rio Grande Flood Control Project
Cameron County, Texas

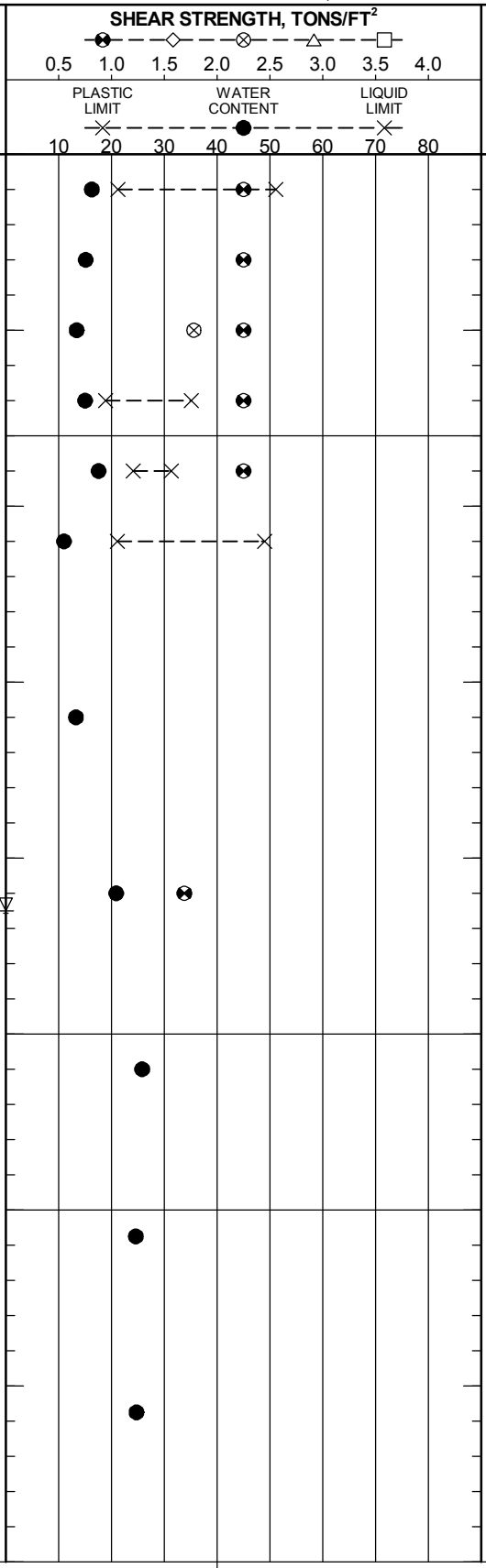
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16522104.21740; E 1275344.98766

SURFACE ELEVATION: 54.01 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown			30	95
					98
5			111		
				16	87
	CLAY, lean, very stiff, brown to light brown			7	97
10				28	98
15				NP	85
20					23
25	SILT, firm, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 26 feet				
30	SAND, silty, medium dense to dense, brown	18			
35		26			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-131a

LOG OF BORING NO. DP-130

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16522104.21740; E 1275344.98766

SURFACE ELEVATION: 54.01 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, brown *(continued)*	47				
45								
			- very dense below 48 feet	50/10"				
50			Boring terminated at a depth of about 49.8 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21.5 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-131b

LOG OF BORING NO. DP-131

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16521207.38280; E 1274839.35395

SURFACE ELEVATION: 53.79 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, stiff to firm, brown, with orange ferrous stains	11		35	
				27	99
5		13			98
		7			96
		6		21	
10	CLAY, lean, firm, light brown	6		NP	
15	SAND, silty, medium dense, brown				13
20	- very loose 20 to 22 feet	3			8
25		13			8
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		18			
35	SAND, with silt, poorly-graded, medium dense, brown	20			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-132a

LOG OF BORING NO. DP-131

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16521207.38280; E 1274839.35395

SURFACE ELEVATION: 53.79 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	15				
45								
				23				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 26.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-132b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-132

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16520246.67880; E 1274490.73281

SURFACE ELEVATION: 54.63 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown	12		22	98
		13		36	100
5		11	101		99
	FILL: CLAY, fat, hard, brown			11	
				NP	
10	CLAY, lean, firm, light brown - very stiff 10 to 12 feet				43
15		5			45
20		5			23
25	SAND, silty, loose to medium dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	4			
30	- very loose 30 to 32 feet	3			
35		9			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-133a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-132

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16520246.67880; E 1274490.73281

SURFACE ELEVATION: 54.63 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, loose to medium dense, brown *(continued)*	15				
45								
				11				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-133b

LOG OF BORING NO. DP-133

The Lower Rio Grande Flood Control Project
Cameron County, Texas

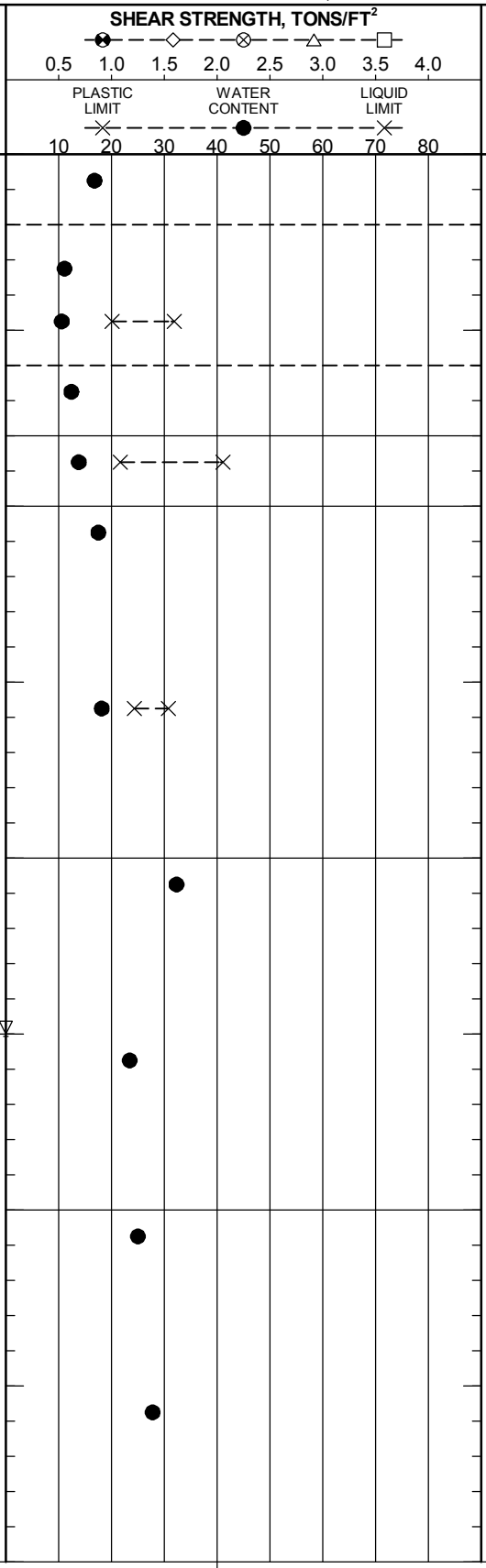
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16519541.45280; E 1274996.36653

SURFACE ELEVATION: 53.71 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown	17		NP	
	FILL: SILT, medium dense to loose, light brown	15			86
5		9		12	
	CLAY, lean, stiff, light brown	15			11
	SAND, with silt, poorly-graded, medium dense, light brown	12		19	
10	CLAY, lean, stiff, light brown	10			96
15		10		7	
20	CLAY, lean, sandy, firm, brown	5			58
25	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	7			12
30	SAND, with silt, poorly-graded, medium dense, brown	16			
35		12			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-134a

LOG OF BORING NO. DP-133

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16519541.45280; E 1274996.36653

SURFACE ELEVATION: 53.71 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	12				
45								
				26				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/19/2008	**DATE MEASURED:**	11/19/2008	**FIGURE:**	A-134b

LOG OF BORING NO. DP-134

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16519972.57210; E 1275762.80078

SURFACE ELEVATION: 52.68 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, firm to stiff, brown	16		15	
		12			89
5		5		14	
		9			88
	FILL: SAND, clayey, loose, light brown	7		14	
10	SAND, clayey, loose, light brown	9			38
15		10			
20	SAND, silty, medium dense, light brown	23			29
25		11			16
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, poorly-graded, medium dense, light brown	14		NP	
35		18			4

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/18/2008	**DATE MEASURED:**	11/18/2008	**FIGURE:**	A-135a

LOG OF BORING NO. DP-134

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16519972.57210; E 1275762.80078

SURFACE ELEVATION: 52.68 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, light brown	19				6
45								
				20				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/18/2008	**DATE MEASURED:**	11/18/2008	**FIGURE:**	A-135b

LOG OF BORING NO. DP-135

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16520385.06270; E 1276726.16606

SURFACE ELEVATION: 54.17 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, sandy, lean, very stiff, light brown	18		25	
		17			68
5	FILL: CLAY, lean, very stiff, brown	18		19	
		17			86
	CLAY, lean, with sand, stiff, brown	13		18	
10		13			82
15		9		19	
20	SAND, clayey, very loose, brown	3			26
25		4			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, with silt, poorly-graded, medium dense, brown	15			8
35		16			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/18/2008	**DATE MEASURED:**	11/18/2008	**FIGURE:**	A-136a

LOG OF BORING NO. DP-135

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16520385.06270; E 1276726.16606

SURFACE ELEVATION: 54.17 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	23				
45								
				15				7
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/18/2008	**DATE MEASURED:**	11/18/2008	**FIGURE:**	A-136b

LOG OF BORING NO. DP-136

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16519836.84940; E 1277795.98054

SURFACE ELEVATION: 54.25 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown	15		20	
		11			97
5		12			
		14			96
	FILL: CLAY, fat, stiff, brown, with black ferrous stains	13		30	
10	CLAY, lean, stiff to firm, brown	10			96
15		7		15	
20		4			
25		4			98
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	CLAY, sandy, lean, firm, brown	5			59
35	SAND, with silt, poorly-graded, medium dense, brown	13			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/18/2008	**DATE MEASURED:**	11/18/2008	**FIGURE:**	A-137a

LOG OF BORING NO. DP-136

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16519836.84940; E 1277795.98054

SURFACE ELEVATION: 54.25 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	12					11
45									
				19				NP	
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/18/2008	**DATE MEASURED:**	11/18/2008	**FIGURE:**	A-137b

LOG OF BORING NO. DP-137

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16519347.18300; E 1278788.61935

SURFACE ELEVATION: 53.04 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown			23	91
			111		
5					98
				24	89
				32	93
10	CLAY, fat, very stiff, brown			29	99
15				10	
20					100
25	CLAY, lean, very stiff, brown	11			15
30	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35	SAND, silty, medium dense, brown	25			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-138a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-137

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16519347.18300; E 1278788.61935

SURFACE ELEVATION: 53.04 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	12				
45								
				25				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 30 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-138b

LOG OF BORING NO. DP-138

The Lower Rio Grande Flood Control Project
Cameron County, Texas

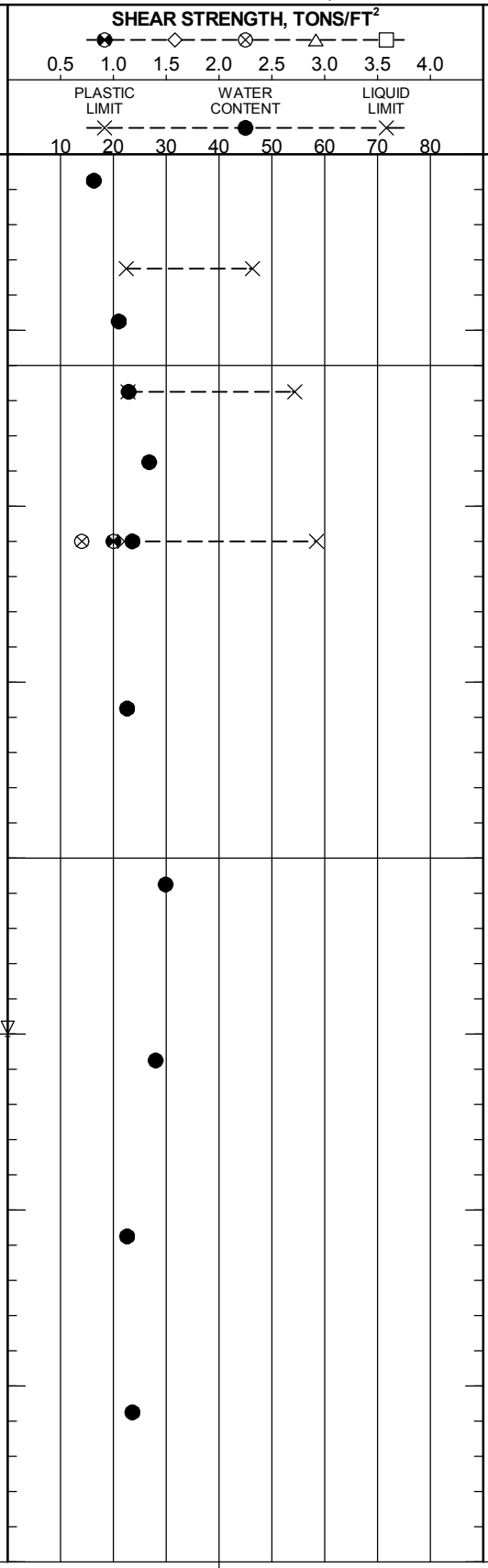
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16518963.96590; E 1279549.73115

SURFACE ELEVATION: 53.27 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown	14			95
		12		24	
5		11			98
	CLAY, fat, stiff, brown, with black ferrous stains	11		31	
		12			100
10			100	36	
15		9			96
20	SAND, with silt, poorly-graded, loose to medium dense, brown	8			
25		8		NP	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	- dense 30 to 32 feet	43			8
35		21			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-139a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-138

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16518963.96590; E 1279549.73115

SURFACE ELEVATION: 53.27 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, loose to medium dense, brown *(continued)*	16				
45								
			- dense below 48 feet	31				11
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-139b

LOG OF BORING NO. DP-139

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16518383.81770; E 1280140.52422

SURFACE ELEVATION: 53.18 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown, with calcareous nodules	13		16	
		13			97
5		13		25	
	- with black ferrous stains below a depth of about 6 feet	9			99
		13		23	
10	CLAY, lean, stiff, light brown, with calcareous nodules	9			100
15	- very stiff 15 to 17 feet	22			
20		10		15	
	SAND, silty, medium dense to loose, brown				
25		14			28
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		9			36
35		10			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-140a

LOG OF BORING NO. DP-139

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16518383.81770; E 1280140.52422

SURFACE ELEVATION: 53.18 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown	11				7
45								
				11				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 21 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21 feet. Upon completion of the drilling operations, the boring remained uncaved.					
			Backfilled with cement/bentonite grout.					
			Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-140b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-140

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16517835.60440; E 1280129.87930

SURFACE ELEVATION: 52.81 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, light brown	16		99
		15	14	
5		11		
		8		100
	CLAY, lean, very stiff to stiff, light brown		18	98
10			23	
15		11		
20		14		99
	SAND, silty, medium dense to dense, brown			
25	- loose 25 to 27 feet	3		31
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet			
30		11		
35		34		

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-141a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-140

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16517835.60440; E 1280129.87930

SURFACE ELEVATION: 52.81 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT; 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, clayey, medium dense, grayish-brown	11				43
45								
				11			15	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 22 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21.5 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-141b

LOG OF BORING NO. DP-141

The Lower Rio Grande Flood Control Project
Cameron County, Texas

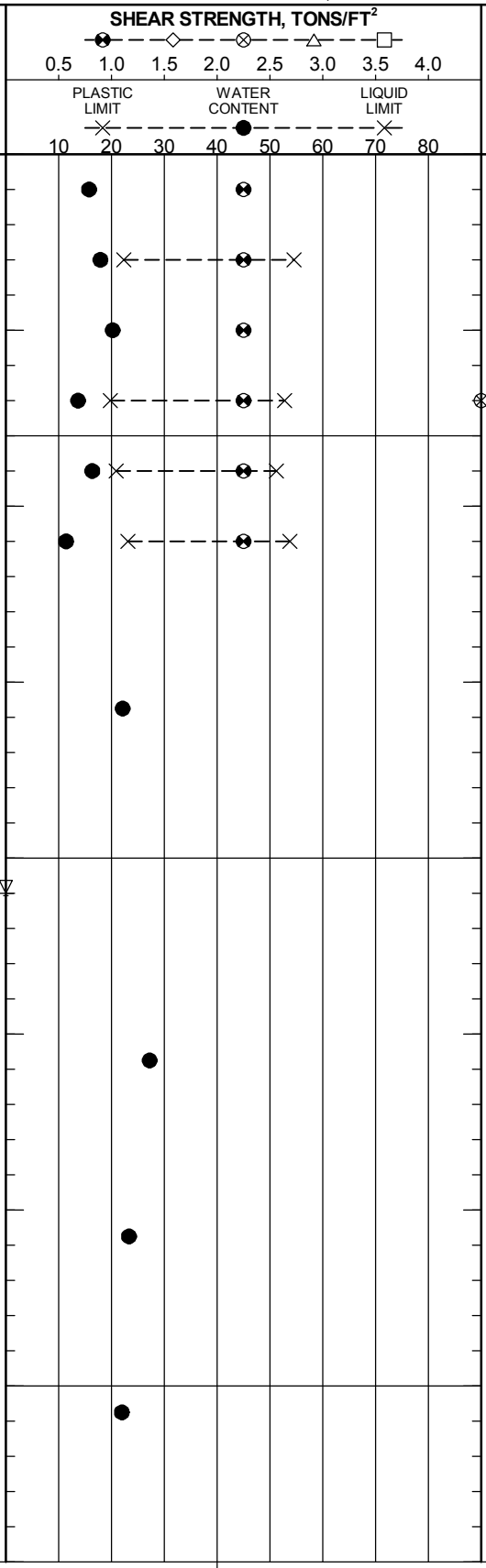
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16517270.14220; E 1279877.94175

SURFACE ELEVATION: 52.27 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown				99
				33	99
5			114	33	
	CLAY, fat, very stiff, brown			30	95
10				31	
15		15			17
20	SAND, silty, medium dense, light brown to brown				12
25		12			5
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		14			
35	SAND, with silt, poorly-graded, medium dense, brown	18			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-142a

LOG OF BORING NO. DP-141

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16517270.14220; E 1279877.94175

SURFACE ELEVATION: 52.27 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	21				
45								
				24				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 24 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-142b

LOG OF BORING NO. DP-142

The Lower Rio Grande Flood Control Project
Cameron County, Texas

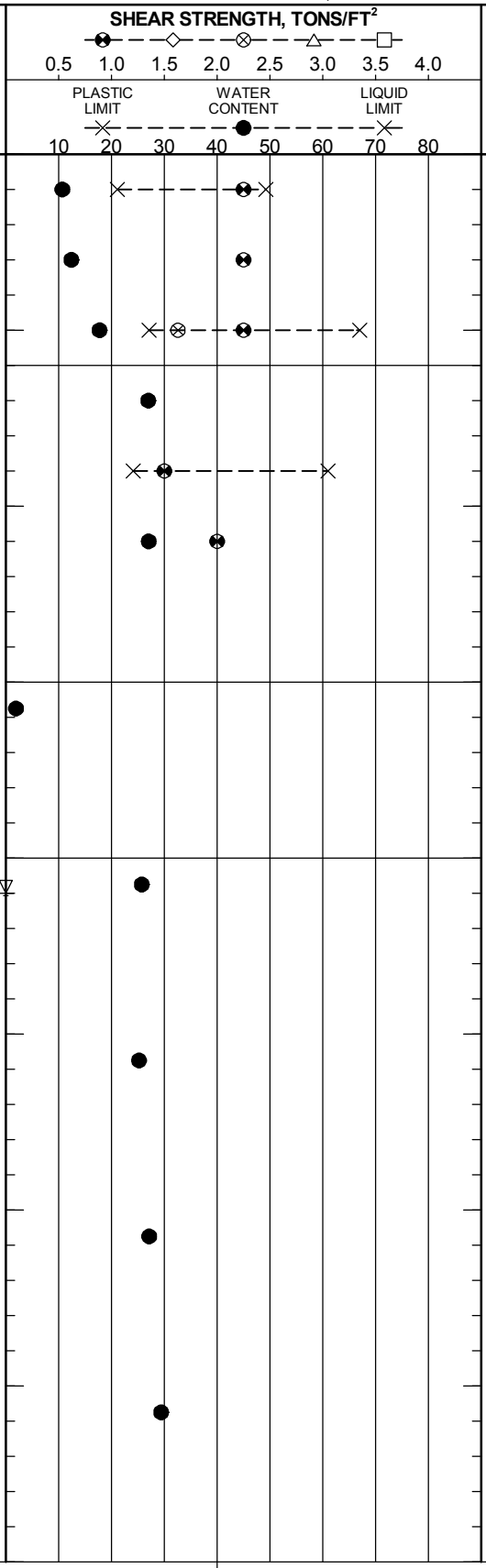
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16516820.68880; E 1279598.08076

SURFACE ELEVATION: 52.61 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			28	98
					100
5			96	40	
	CLAY, fat, very stiff, brown, with black ferrous stains				
				37	98
10					11
15	SAND, with silt, poorly-graded, medium dense, light brown	20			17
20	SAND, silty, medium dense to dense, light brown	24		NP	
25		28			16
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		26			18
35		27			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-143a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-142

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16516820.68880; E 1279598.08076

SURFACE ELEVATION: 52.61 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, light brown *(continued)*	31				
45								
				34				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21 feet. Upon completion of the drilling operations, the remained uncaved.					
			Backfilled with cement/bentonite grout.					
			Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-143b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-143

The Lower Rio Grande Flood Control Project
Cameron County, Texas

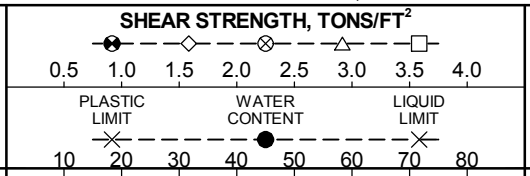
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16516409.05040; E 1279349.32993

SURFACE ELEVATION: 53.77 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, very stiff, brown			27	
				27	78
5				29	98
	FILL: CLAY, lean, very stiff, brown			46	
					37
10	CLAY, fat, very stiff, brown				11
15	SAND, silty, loose to medium dense, brown				41
20		15			30
25		22			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, with silt, poorly-graded, medium dense, brown	26			
35	SAND, silty, medium dense to very dense, brown	12			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-144a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-143

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16516409.05040; E 1279349.32993

SURFACE ELEVATION: 53.77 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to very dense, brown *(continued)*	17				
45								
			- very dense below 48 feet	50/ 11"				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/17/2008	**DATE MEASURED:**	11/17/2008	**FIGURE:**	A-144b

LOG OF BORING NO. DP-144

The Lower Rio Grande Flood Control Project
Cameron County, Texas

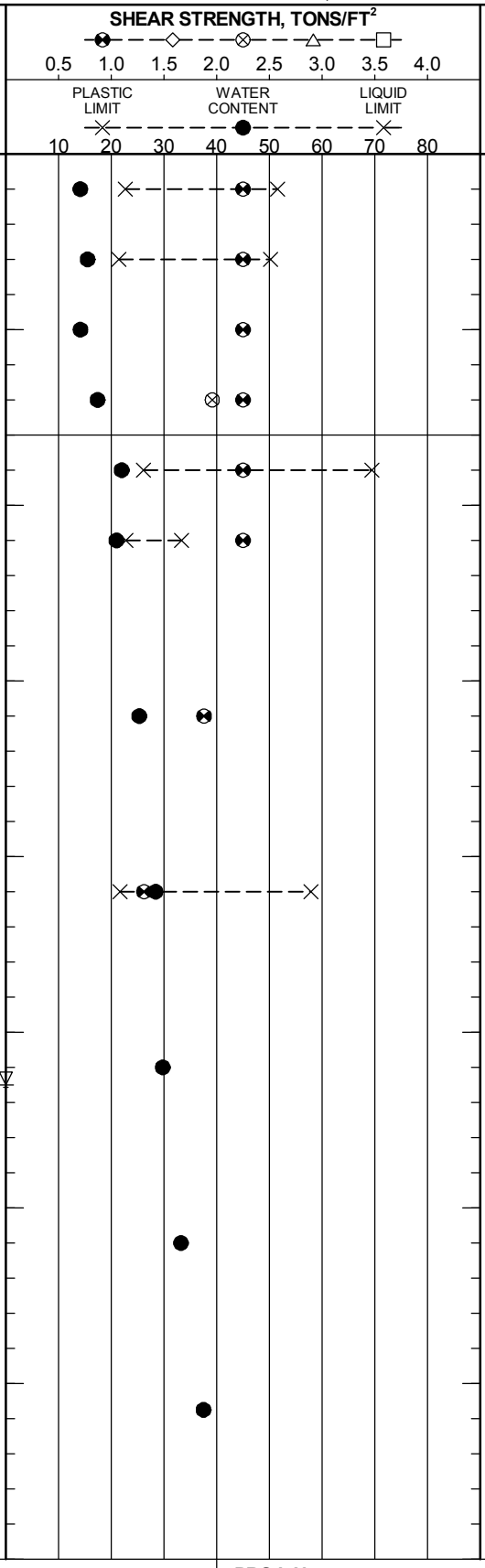
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16515605.63450; E 1279161.32626

SURFACE ELEVATION: 53.06 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
			FILL: CLAY, fat, very stiff, brown			29	99
						29	100
5							100
					104		
			CLAY, fat, very stiff to hard, light brown			43	100
10						10	
15							95
20						36	100
25			- with orange ferrous stains below a depth of about 25 feet				
			Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30							
35			- firm 35 to 37 feet	4			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/16/2008	**DATE MEASURED:**	11/16/2008	**FIGURE:**	A-145a

LOG OF BORING NO. DP-144

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16515605.63450; E 1279161.32626

SURFACE ELEVATION: 53.06 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff to hard, light brown *(continued)*	33				
45								
			- becomes light reddish-brown in color and with black ferrous stains below a depth of about 48 feet					
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 26.5 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/16/2008	**DATE MEASURED:**	11/16/2008	**FIGURE:**	A-145b

LOG OF BORING NO. DP-145

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16515058.38890; E 1279669.19568

SURFACE ELEVATION: 52.7 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, light brown				99
				29	100
	FILL: CLAY, lean, hard, brown		112		
					99
				23	99
10	CLAY, lean, very stiff, brown			26	99
15				35	100
20	SAND, silty, medium dense, brown				
25		19			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		20			
35		29			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/16/2008	**DATE MEASURED:**	11/16/2008	**FIGURE:**	A-146a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-145

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16515058.38890; E 1279669.19568

SURFACE ELEVATION: 52.7 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT; 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	17				
45								
			CLAY, fat, very stiff, light reddish-brown, with black ferrous stains					
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/16/2008	**DATE MEASURED:**	11/16/2008	**FIGURE:**	A-146b

LOG OF BORING NO. DP-146

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16514699.47030; E 1280084.87900

SURFACE ELEVATION: 52.69 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown				95
				37	97
5	- with black ferrous stains below a depth of about 4 feet		110		
				31	98
	CLAY, fat, very stiff, light brown			29	99
10					20
15	CLAY, lean, very stiff, light brown to brown			35	100
20					
25	SAND, silty, dense, brown	32			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		41			
35		31			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/16/2008	**DATE MEASURED:**	11/16/2008	**FIGURE:**	A-147a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-146

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16514699.47030; E 1280084.87900

SURFACE ELEVATION: 52.69 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, dense, brown *(continued)*	36				
45								
			CLAY, fat, very stiff, reddish-brown, with black and orange ferrous stains					
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 26 feet. Upon completion of the drilling operations, the remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/16/2008	**DATE MEASURED:**	11/16/2008	**FIGURE:**	A-147b

LOG OF BORING NO. DP-147

The Lower Rio Grande Flood Control Project
Cameron County, Texas

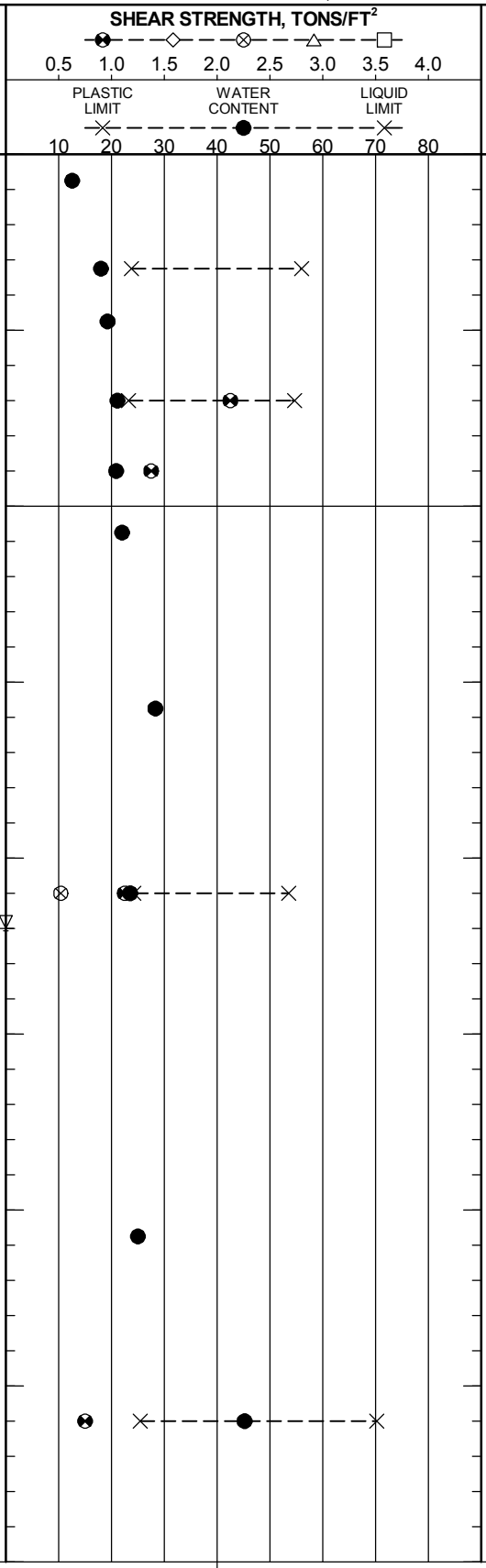
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16514519.50140; E 1280936.59870

SURFACE ELEVATION: 52.25 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown, with calcareous nodules	23			89
		10		32	
5		15			100
				32	99
					99
10	CLAY, fat, stiff to very stiff, dark brown	8			
15		11			100
20			97	30	
25	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30		11			
35	- becomes grayish-brown in color below a depth of about 35 feet			45	99



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/16/2008	**DATE MEASURED:**	11/16/2008	**FIGURE:**	A-148a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-147

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16514519.50140; E 1280936.59870

SURFACE ELEVATION: 52.25 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff to very stiff, dark brown *(continued)*					100
45								
				18				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 22 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/16/2008	**DATE MEASURED:**	11/16/2008	**FIGURE:**	A-148b

LOG OF BORING NO. DP-148

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16514121.91190; E 1281927.19731

SURFACE ELEVATION: 52.27 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, firm, light brown to brown	7		19	
		8			92
5	FILL: CLAY, fat, stiff, brown	7		29	
					93
	CLAY, lean, firm to stiff, brown				95
10			99	21	
15					
20		8			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25					
30	CLAY, fat, stiff to very stiff, light brown to dark grayish-brown, with black ferrous stains	8			91
35		8		42	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/16/2008	**DATE MEASURED:**	11/16/2008	**FIGURE:**	A-149a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-148

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16514121.91190; E 1281927.19731

SURFACE ELEVATION: 52.27 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff to very stiff, light brown to dark grayish-brown, with black ferrous stains *(continued)*				38	100
45								
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 17 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/16/2008	**DATE MEASURED:**	11/16/2008	**FIGURE:**	A-149b

LOG OF BORING NO. DP-149

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16513299.52800; E 1282428.47220

SURFACE ELEVATION: 54.07 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown	13		25	
	CLAY, lean, very stiff to stiff, brown	12			97
5					90
				21	89
	- firm 8 to 12 feet	4			
10		5			98
15		13			
20	CLAY, fat, very stiff, brown, with black ferrous stains - firm 20 to 22 feet		99	29	
25	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30				31	95
35	- becomes light brown in color below a depth of about 35 feet	9			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/16/2008	**DATE MEASURED:**	11/16/2008	**FIGURE:**	A-150a

LOG OF BORING NO. DP-149

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16513299.52800; E 1282428.47220

SURFACE ELEVATION: 54.07 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, brown, with black ferrous stains *(continued)*					
45								
			- becomes light reddish-brown in color below a depth of about 48 feet	17				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/16/2008	**DATE MEASURED:**	11/16/2008	**FIGURE:**	A-150b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-150

The Lower Rio Grande Flood Control Project
Cameron County, Texas

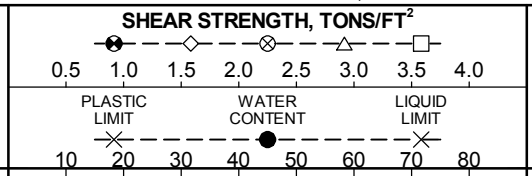
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16513365.28090; E 1283545.32078

SURFACE ELEVATION: 51.47 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, light brown	17		14	91
5	FILL: CLAY, fat, very stiff to hard, brown	11			95
			107	38	92
10	CLAY, lean, with sand, very stiff, brown, with orange ferrous stains	16			79
15	CLAY, fat, very stiff to stiff, brown, with black ferrous stains				
20		19		53	
25	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				96
30					
35	- becomes light brown in color below a depth of about 35 feet	9			91



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-151a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-150

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16513365.28090; E 1283545.32078

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 51.47 ft					
			SILT, loose, light brown					
45								
				6			6	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/12/2008	**DATE MEASURED:**	11/12/2008	**FIGURE:**	A-151b

LOG OF BORING NO. DP-151

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16513476.93110; E 1284592.65459

SURFACE ELEVATION: 51.67 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown	16		26	
	FILL: CLAY, lean, very stiff to stiff, light brown, with calcareous nodules				95
5					
		10		28	
	- firm below 8 feet	7			91
10	CLAY, lean, with sand, stiff, light brown	15			83
15	CLAY, fat, very stiff, brown, with gypsum nodules	23		53	
20			96		97
25	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30	CLAY, lean, very stiff to stiff, light brown, with gypsum nodules and black ferrous stains				91
35					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/15/2008	**DATE MEASURED:**	11/15/2008	**FIGURE:**	A-152a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-151

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16513476.93110; E 1284592.65459

SURFACE ELEVATION: 51.67 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SILT, with sand, stiff, light brown, with orange ferrous stains				NP	85
45								
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/15/2008	**DATE MEASURED:**	11/15/2008	**FIGURE:**	A-152b

LOG OF BORING NO. DP-152

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16513413.91000; E 1285446.34162

SURFACE ELEVATION: 50.40 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: SAND, clayey, light brown				44
	FILL: CLAY, lean, hard, light brown, with calcareous nodules		110		
5				19	91
				17	
					91
10	CLAY, fat, hard to very stiff, brown				
15				44	96
20	- with black ferrous stains below a depth of about 20 feet				
25					90
30	- becomes reddish-brown in color below a depth of about 30 feet			58	98
35					
	Driller's Note: Converted to mud rotary drilling method at a depth of about 37 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	35 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/15/2008	**DATE MEASURED:**	11/15/2008	**FIGURE:**	A-153a

LOG OF BORING NO. DP-152

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16513413.91000; E 1285446.34162

SURFACE ELEVATION: 50.40 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, hard to very stiff, brown *(continued)*				32	93
45			CLAY, lean, very stiff, light brown					
							16	94
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 35 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	35 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/15/2008	**DATE MEASURED:**	11/15/2008	**FIGURE:**	A-153b

LOG OF BORING NO. DP-153

The Lower Rio Grande Flood Control Project
Cameron County, Texas

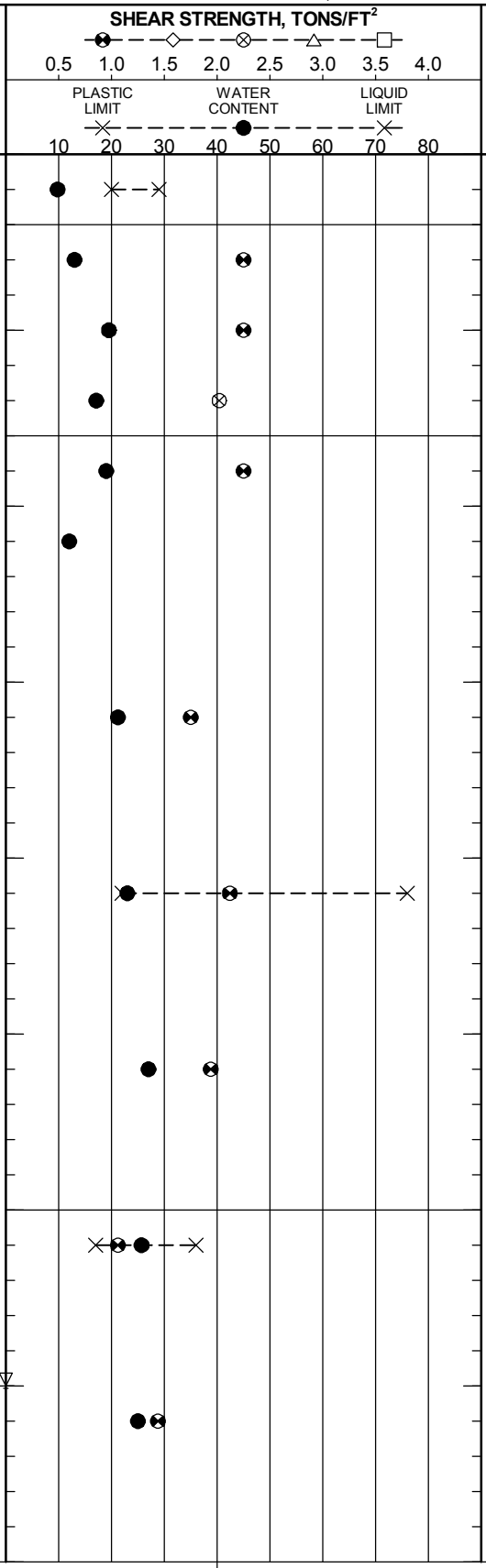
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16513000.07300; E 1286380.14251

SURFACE ELEVATION: 51.41 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: SAND, clayey, brown, with calcareous nodules		9	15
	FILL: CLAY, fat, hard, brown			
5		106		97
	CLAY, fat, very stiff, light brown, with black ferrous stains			
10				
15				94
20			54	
25	- with gypsum nodules below a depth of about 25 feet			
30	CLAY, lean, very stiff, brown, with black ferrous stains		19	95
35				
	Driller's Note: Converted to mud rotary drilling method at a depth of about 37 feet			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	35 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/15/2008	**DATE MEASURED:**	11/15/2008	**FIGURE:**	A-154a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-153

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16513000.07300; E 1286380.14251

SURFACE ELEVATION: 51.41 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, very stiff, brown, with black ferrous stains *(continued)*					89
45								
			- with orange ferrous stains below a depth of about 48 feet				14	96
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 35 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	35 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/15/2008	**DATE MEASURED:**	11/15/2008	**FIGURE:**	A-154b

LOG OF BORING NO. DP-154

The Lower Rio Grande Flood Control Project
Cameron County, Texas

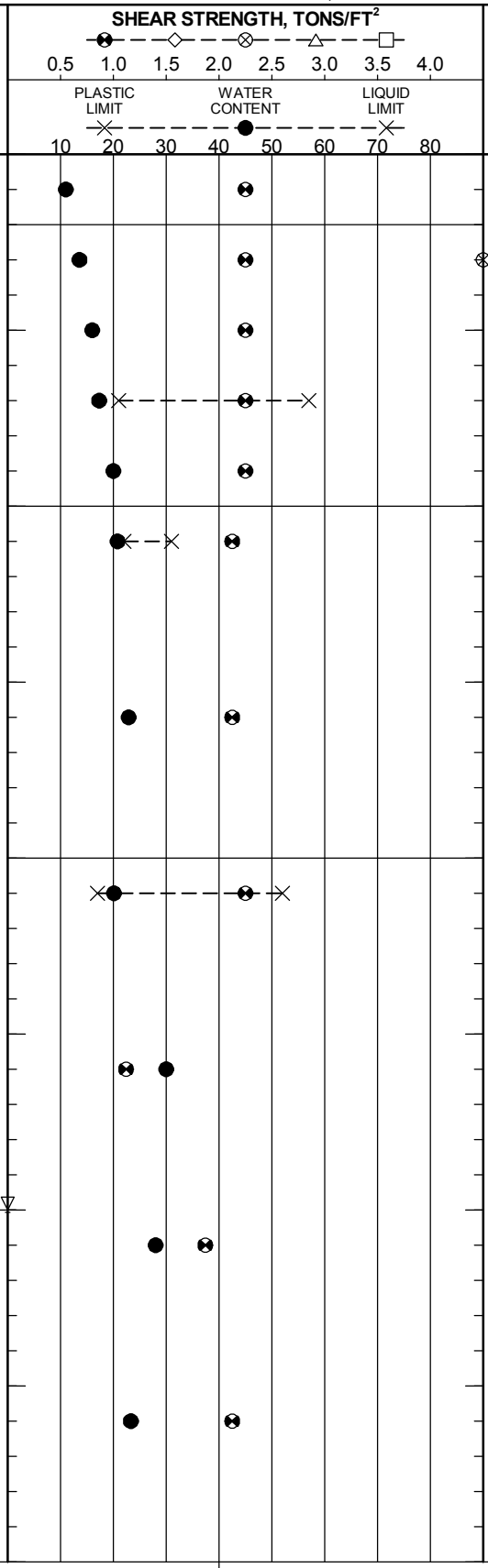
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16512399.82840; E 1287438.11037

SURFACE ELEVATION: 50.70 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown				
	FILL: CLAY, fat, hard, light brown, with gypsum nodules		114		
5				36	94
10	CLAY, lean, very stiff, brown			9	97
15					98
20	CLAY, fat, very stiff, brown, with black ferrous stains			35	96
25					
30	- becomes light brown in color below a depth of about 30 feet				
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35	- with calcareous nodules below a depth of about 35 feet				91



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/15/2008	**DATE MEASURED:**	11/15/2008	**FIGURE:**	A-155a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-154

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16512399.82840; E 1287438.11037

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 50.70 ft					
			CLAY, fat, very stiff, brown, with black ferrous stains *(continued)*				41	90
45								
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/15/2008	**DATE MEASURED:**	11/15/2008	**FIGURE:**	A-155b

LOG OF BORING NO. DP-155

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16511444.74870; E 1287354.21444

SURFACE ELEVATION: 51.60 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: SAND, clayey, brown				49
	FILL: SAND, clayey, reddish-brown, with calcareous nodules and gravel			15	16
5	CLAY, lean, very stiff, brown, with calcareous nodules		105		
10				16	93
15					
20	- becomes light brown in color below a depth of about 20 feet - very soft from 20 to 25 feet			13	99
	Driller's Note: Converted to mud rotary drilling method at a depth of about 22 feet				
25					
30	CLAY, fat, very stiff, light brown				96
35					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	9.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/15/2008	**DATE MEASURED:**	11/15/2008	**FIGURE:**	A-156a

LOG OF BORING NO. DP-155

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16511444.74870; E 1287354.21444

SURFACE ELEVATION: 51.60 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, light brown *(continued)*				35	94
45								
			- becomes light brown in color and with calcareous nodules and black ferrous stains below a depth of about 48 feet					
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 9.5 feet. Upon completion of the drilling operations, the remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	9.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/15/2008	**DATE MEASURED:**	11/15/2008	**FIGURE:**	A-156b

LOG OF BORING NO. DP-156

The Lower Rio Grande Flood Control Project
Cameron County, Texas

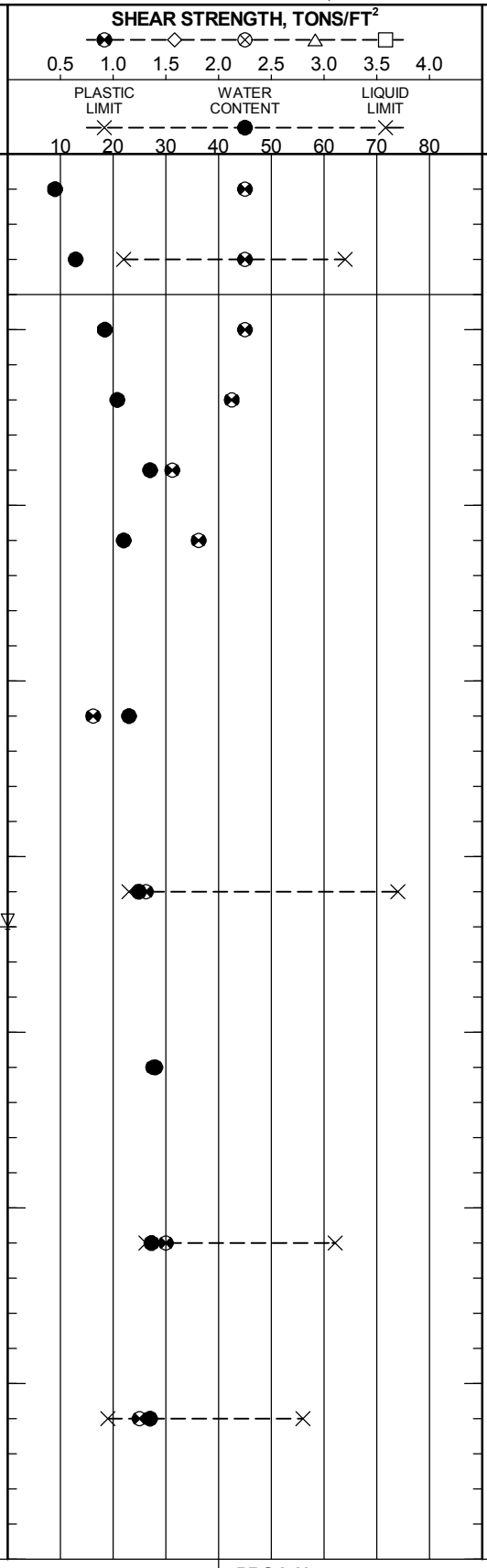
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16510562.18700; E 1287751.25854

SURFACE ELEVATION: 50.43 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, light brown		105		91
				42	91
5	CLAY, fat, very stiff, brown, with black ferrous stains				
	- with orange ferrous stains below a depth of about 6 feet				96
10					97
15					
20				51	94
	Driller's Note: Converted to mud rotary drilling method at a depth of about 22 feet				
25	- with calcareous nodules below a depth of about 25 feet				
30			98	36	99
35	- becomes light grayish-brown in color below a depth of about 35 feet			37	



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-157a

LOG OF BORING NO. DP-156

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16510562.18700; E 1287751.25854

SURFACE ELEVATION: 50.43 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, brown, with black ferrous stains *(continued)*					
45								
			CLAY, sandy, lean, stiff, light reddish-brown, with orange ferrous stains				16	66
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 22 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22 feet. Upon completion of the drilling operations, the remained uncaved. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-157b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-157

The Lower Rio Grande Flood Control Project
Cameron County, Texas

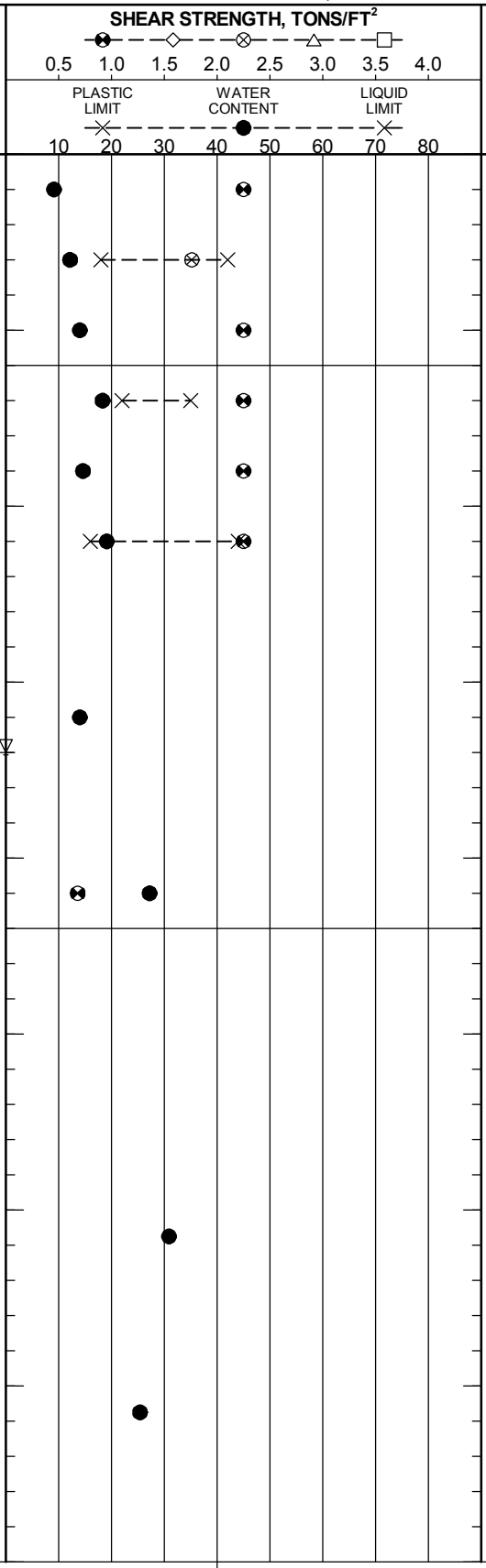
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16510427.32750; E 1288755.61569

SURFACE ELEVATION: 50.37 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, light brown				89
			109	24	
5					
	CLAY, lean, very stiff to stiff, light brown			13	98
					85
10				28	95
15					
20					97
	SAND, silty, dense to medium dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 22 feet				
25					
30		36			19
35		28			20



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-158a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-157

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16510427.32750; E 1288755.61569

SURFACE ELEVATION: 50.37 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, dense to medium dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 22 feet *(continued)*	26				
45								
			CLAY, fat, very stiff, reddish-brown, with orange ferrous stains				40	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 22 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-158b

LOG OF BORING NO. DP-158

The Lower Rio Grande Flood Control Project
Cameron County, Texas

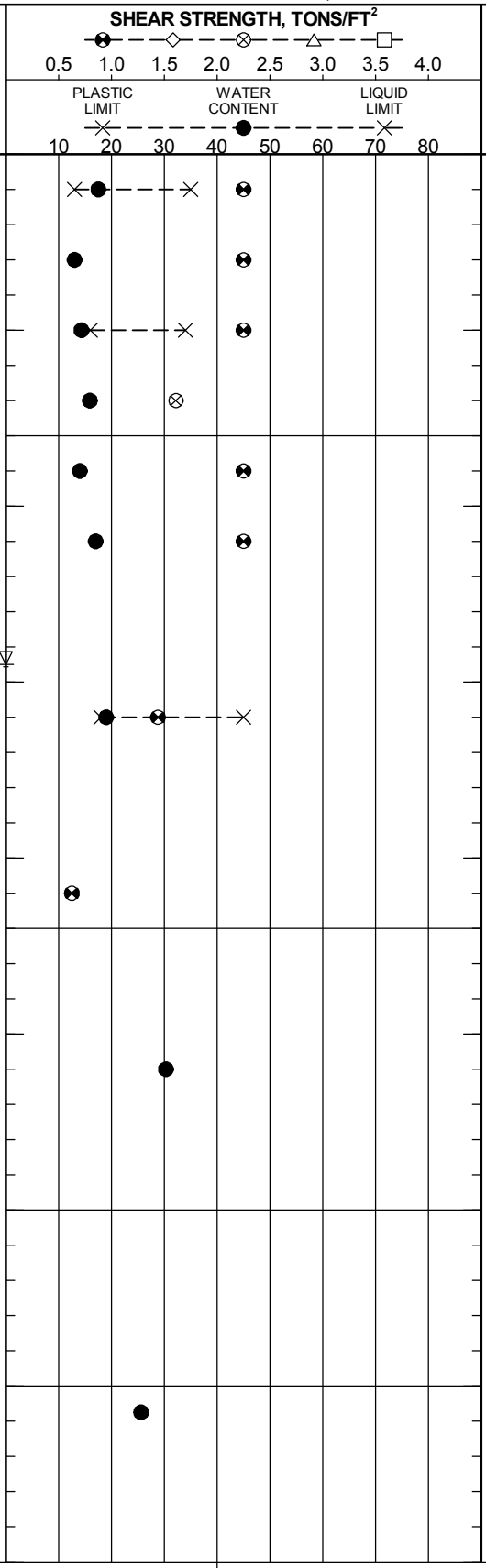
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16510524.34110; E 1289708.82363

SURFACE ELEVATION: 50.22 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			22	96
5				18	90
			106		89
	CLAY, lean, very stiff to stiff, brown, with black ferrous stains				
10					
15				27	
20					
	CLAY, sandy, lean, light brown Driller's Note: Converted to mud rotary drilling method at a depth of about 22 feet				
25					64
30	SAND, silty, medium dense, brown	13			34
35	SAND, with silt, poorly-graded, medium dense to dense, brown	17			8



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-159a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-158

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16510524.34110; E 1289708.82363

SURFACE ELEVATION: 50.22 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to dense, brown *(continued)*	34				
45								
			CLAY, fat, stiff, reddish-brown, with black and orange ferrous stains				39	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 22 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14.5 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-159b

LOG OF BORING NO. DP-159

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16509990.69060; E 1290635.69381

SURFACE ELEVATION: 50.23 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with roots extending down to a depth of about 2 feet			20	89
			109		94
5					
					95
			105	15	86
10	CLAY, fat, very stiff, brown				
15				33	95
20					
25	SAND, silty, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30	CLAY, fat, very stif, reddish-brown, with black ferrous stains				
35				32	95

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-160a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-159

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16509990.69060; E 1290635.69381

SURFACE ELEVATION: 50.23 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stif, reddish-brown, with black ferrous stains *(continued)*					
45								
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-160b

LOG OF BORING NO. DP-160

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16509197.73060; E 1291199.39476

SURFACE ELEVATION: 49.90 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules and gravel			23	
5			106		96
	CLAY, lean, very stiff, brown, with calcareous nodules			25	97
10					98
15					
20					
	CLAY, lean, soft, brown				
25				11	79
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30	CLAY, fat, very stiff, reddish-brown, with black ferous stains				
35					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-161a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-160

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16509197.73060; E 1291199.39476

SURFACE ELEVATION: 49.90 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, reddish-brown, with black ferous stains *(continued)*					
45								
							33	98
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-161b

LOG OF BORING NO. DP-161

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16508203.54820; E 1291832.94665

SURFACE ELEVATION: 49.47 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: SAND, silty, light reddish-brown, with gravel		NP	46
	FILL: CLAY, lean, hard, brown	106		
5			29	97
	- with black ferrous stains below a depth of about 6 feet	108	22	97
	CLAY, lean, with sand, very stiff, brown, with orange ferrous stains			73
10	CLAY, lean, very stiff, brown, with black ferrous stains		33	98
15				
	Driller's Note: Converted to mud rotary drilling method at a depth of about 17 feet			
20				97
25	CLAY, fat, very stiff, reddish-brown			
30				
35				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	12 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/24/2008	**DATE MEASURED:**	11/24/2008	**FIGURE:**	A-162a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-161

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16508203.54820; E 1291832.94665

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 49.47 ft					
			CLAY, fat, very stiff, reddish-brown *(continued)* - becomes light reddish-brown, with gypsum crystals below a depth of about 40 feet				52	96
45								
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 16 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 12 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	12 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/24/2008	**DATE MEASURED:**	11/24/2008	**FIGURE:**	A-162b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-162

The Lower Rio Grande Flood Control Project
Cameron County, Texas

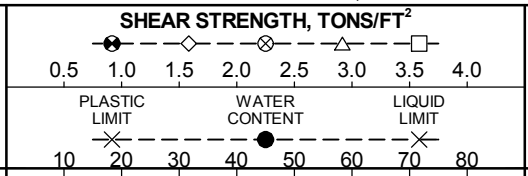
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16507922.93960; E 1292034.66309

SURFACE ELEVATION: 48.82 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff to stiff, brown	19		41	98
	- with calcareous nodules below a depth of about 2 feet	18			
5		13			97
		11		42	98
	CLAY, fat, stiff, brown, with gypsum nodules	14			
10		9			94
15		10		55	
20	CLAY, lean, stiff, light reddish-brown, with black ferrous stains	9		11	95
25		10			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		10			90
35	CLAY, fat, stiff, light reddish-brown, with black ferrous stains	9			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-163a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-162

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16507922.93960; E 1292034.66309

SURFACE ELEVATION: 48.82 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT; 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff, light reddish-brown, with black ferrous stains *(continued)*	12			46	99
45								
				10				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 38 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-163b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-163

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16507394.92290; E 1292071.49166

SURFACE ELEVATION: 49.54 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT)	PLASTICITY INDEX	% -200
			FILL: CLAY, fat, very stiff to stiff, brown	24			48	
				12				98
5				9				
				10				98
			CLAY, fat, stiff to firm, brown	10				
10				14			44	
15				12				98
20			- becomes light brown in color below a depth of about 20 feet	8				
25				4				98
			Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet					
30				8			55	
35				8				90

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-164a

LOG OF BORING NO. DP-163

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16507394.92290; E 1292071.49166

SURFACE ELEVATION: 49.54 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff to firm, brown *(continued)* - becomes light reddish-brown in color and with gypsum crystals below a depth of about 40 feet	10				99
45								
				10			39	
50			- stiff light reddish-brown with gypsum crystals below 40 feet Boring terminated at a depth of about 50 feet. NOTES: During the drilling operations, groundwater was observed at a depth of about 21 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 44 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
55								
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-164b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-164

The Lower Rio Grande Flood Control Project
Cameron County, Texas

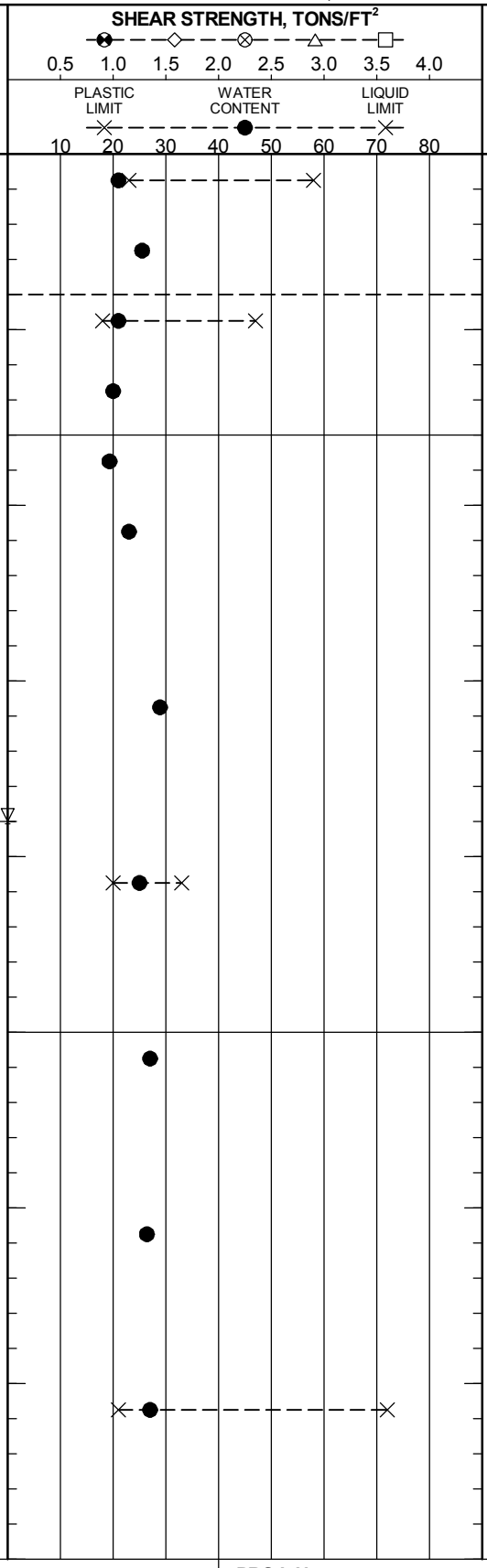
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16506551.63660; E 1292588.14346

SURFACE ELEVATION: 49.13 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
			FILL: CLAY, fat, hard to very stiff, brown	33		35	
				12			97
5			FILL: CLAY, lean, stiff, brown	10		29	
				10			96
			CLAY, lean, stiff to firm, brown, with orange ferrous stains	14			96
10				6			
15			- becomes light brown in color below a depth of about 15 feet	5			93
20				6		13	
25			CLAY, fat, stiff to firm, reddish-brown to light grayish-brown, with calcareous nodules Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	12			
30			- with black ferrous stains below a depth of about 30 feet	7			90
35			- with gypsum crystals below a depth of about 35 feet	8		51	



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-165a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-164

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16506551.63660; E 1292588.14346

SURFACE ELEVATION: 49.13 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff to firm, reddish-brown to light grayish-brown, with calcareous nodules *(continued)*	11				
45			- stiff below 40 feet					
				11				98
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/20/2008	**DATE MEASURED:**	11/20/2008	**FIGURE:**	A-165b

LOG OF BORING NO. DP-165

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16506231.59660; E 1293672.94325

SURFACE ELEVATION: 48.78 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, brown	21		12	
		26			90
5		25		16	
		15			94
		14		15	
10	CLAY, lean, stiff, brown	8			96
15		11		10	
20	CLAY, sandy, lean, firm, brown	5			56
25	SAND, silty, medium dense to loose, brown	16			21
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30		11			13
35		21			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-166a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-165

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16506231.59660; E 1293672.94325

SURFACE ELEVATION: 48.78 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to loose, brown *(continued)*	8				15
45								
			- with clay lenses below a depth of about 48 feet	10				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT ✕ — WATER CONTENT ● — LIQUID LIMIT ✕ (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-166b

LOG OF BORING NO. DP-166

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16505575.47280; E 1294634.12537

SURFACE ELEVATION: 48.35 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, stiff, brown	11			84
	FILL: CLAY, lean, stiff to very stiff, brown, with calcareous nodules	15		16	
5		15			87
		15		18	
		16		15	
10	CLAY, lean, stiff, brown, with calcareous nodules	12			96
15		12		9	
20	SAND, with silt, poorly-graded, medium dense, brown	17			
25		15			8
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30	SAND, silty, medium dense, brown	28			13
35		16			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-167a

LOG OF BORING NO. DP-166

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16505575.47280; E 1294634.12537

SURFACE ELEVATION: 48.35 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	14					29
45									
				14					
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 24.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/21/2008	**DATE MEASURED:**	11/21/2008	**FIGURE:**	A-167b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-167

The Lower Rio Grande Flood Control Project
Cameron County, Texas

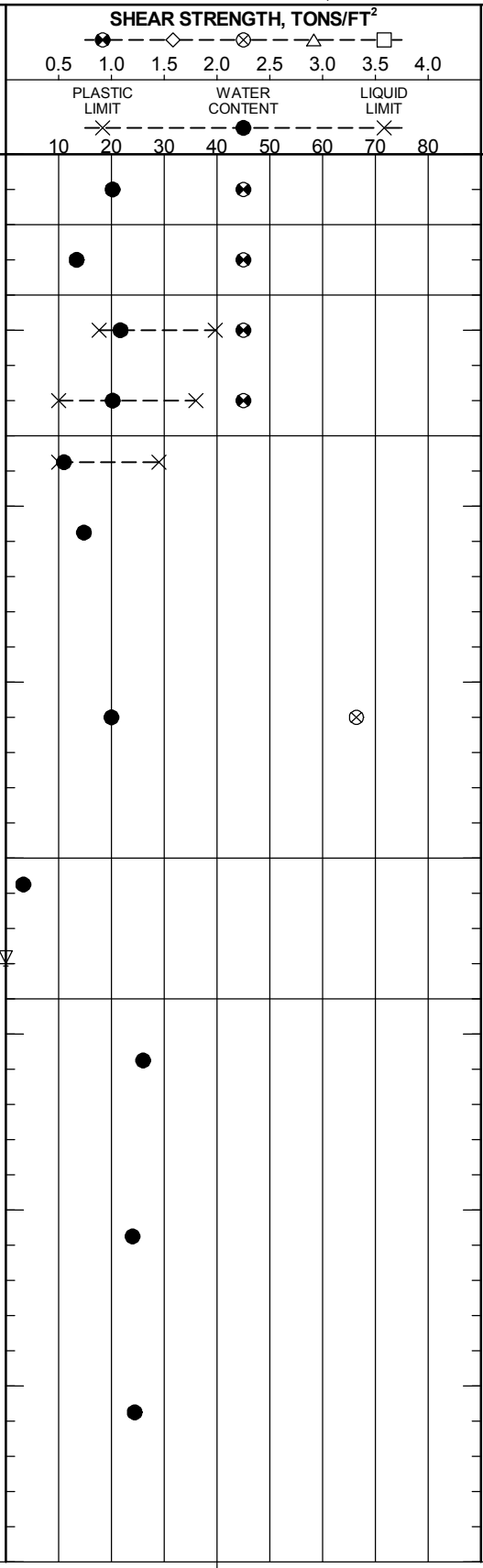
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16504776.14410; E 1295284.22609

SURFACE ELEVATION: 48.25 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown				100
	FILL: CLAY, sandy, lean, hard, brown				60
5	FILL: CLAY, lean, hard, brown			22	
			105	26	92
	CLAY, lean, with sand, very stiff to hard, brown	26		19	
10		30			82
15					
20	SAND, silty, medium dense, brown	29			29
25	SAND, with silt, poorly-graded, medium dense to dense, brown	21		NP	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30		25			
35		14			10



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/24/2008	**DATE MEASURED:**	11/24/2008	**FIGURE:**	A-168a

LOG OF BORING NO. DP-167

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16504776.14410; E 1295284.22609

SURFACE ELEVATION: 48.25 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to dense, brown *(continued)*	42				
45								
				10				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 24 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47.5 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/24/2008	**DATE MEASURED:**	11/24/2008	**FIGURE:**	A-168b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-168

The Lower Rio Grande Flood Control Project
Cameron County, Texas

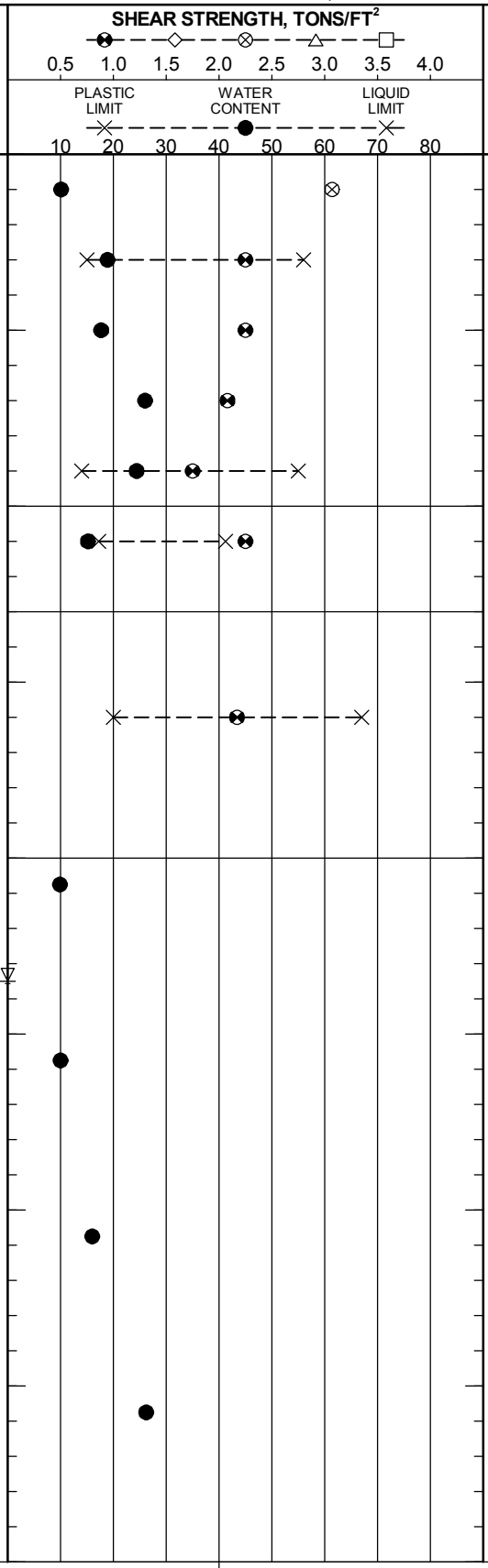
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16504422.25140; E 1296190.03590

SURFACE ELEVATION: 48.83 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard to very stiff, brown		113	41	98
5					95
				41	100
10	CLAY, lean, very stiff, brown		104	24	81
	CLAY, fat, very stiff, brown				
15				47	
20	SAND, silty, medium dense, brown	18			38
25		20			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30		25			
35		15			28



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/24/2008	**DATE MEASURED:**	11/24/2008	**FIGURE:**	A-169a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-168

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16504422.25140; E 1296190.03590

SURFACE ELEVATION: 48.83 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff, reddish-brown	14			44	
45								
			SAND, silty, dense, brown	45				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 24 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/24/2008	**DATE MEASURED:**	11/24/2008	**FIGURE:**	A-169b

LOG OF BORING NO. DP-169

The Lower Rio Grande Flood Control Project
Cameron County, Texas

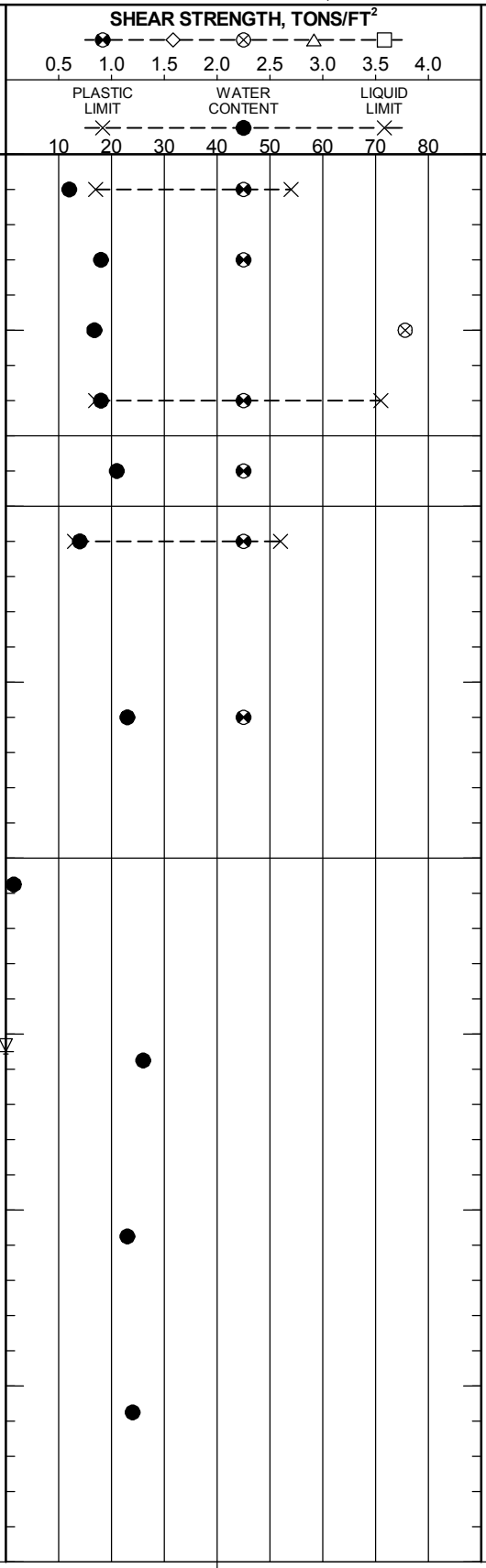
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16503978.70950; E 1297078.11757

SURFACE ELEVATION: 47.95 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown			37	
5	- with calcareous nodules below a depth of about 4 feet		106	54	
	FILL: CLAY, lean, with sand, very stiff, light brown				
10	CLAY, fat, very stiff, brown			39	
15	- with black ferrous stains below a depth of about 15 feet				
20	SAND, silty, medium dense, light brown to brown	18			17
25		23			
30		23			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet				
35		27			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/24/2008	**DATE MEASURED:**	11/24/2008	**FIGURE:**	A-170a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-169

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16503978.70950; E 1297078.11757

SURFACE ELEVATION: 47.95 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, dense to medium dense, brown	46				10
45								
				12			NP	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/24/2008	**DATE MEASURED:**	11/24/2008	**FIGURE:**	A-170b

LOG OF BORING NO. DP-170

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16503388.30900; E 1297872.30666

SURFACE ELEVATION: 48.08 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
			FILL: CLAY, lean, very stiff, light brown			33	97
			FILL: CLAY, fat, hard, brown		103		
5						39	99
							90
10						38	89
			SAND, silty, medium dense, light brown				
15				22		NP	
20				28			31
25			SAND, with silt, poorly-graded, medium dense, brown	24			
30				11			6
			Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet				
35				31			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-171a

LOG OF BORING NO. DP-170

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16503388.30900; E 1297872.30666

SURFACE ELEVATION: 48.08 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	18				10
45								
			CLAY, lean, with sand, stiff, brown	9				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 28 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 27 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-171b

LOG OF BORING NO. DP-171

The Lower Rio Grande Flood Control Project
Cameron County, Texas

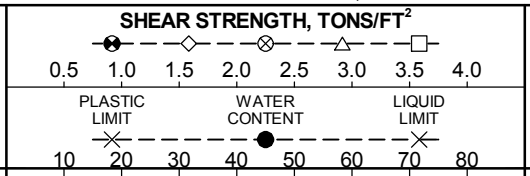
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16502800.69880; E 1298734.37197

SURFACE ELEVATION: 47.84 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown		110		
				41	99
5	- with black ferrous stains below a depth of about 4 feet				
				39	98
	CLAY, fat, very stiff, brown				94
10				37	91
15			106	27	100
20	SAND, silty, medium dense to dense, light brown	14		NP	
25		15			24
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30		33			
35	SAND, with silt, poorly-graded, medium dense to dense, brown	16			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-172a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-171

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16502800.69880; E 1298734.37197

SURFACE ELEVATION: 47.84 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to dense, brown *(continued)*	31				8
45								
			- medium dense below 48 feet	12				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 24 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-172b

LOG OF BORING NO. DP-172

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16502532.49320; E 1299805.78976

SURFACE ELEVATION: 47.53 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			28	92
			106		
5	- becomes light brown in color below a depth of about 4 feet				
	FILL: CLAY, fat, very stiff, brown			36	99
	CLAY, lean, very stiff, brown			31	98
10					96
15	SAND, silty, loose to medium dense, light brown	8			
20		19			17
25	- becomes brown in color below a depth of about 25 feet	13			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		26			19
35		21			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-173a

LOG OF BORING NO. DP-172

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16502532.49320; E 1299805.78976

SURFACE ELEVATION: 47.53 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, loose to medium dense, light brown *(continued)*	29			NP	
45								
				13				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-173b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-173

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16502377.23820; E 1300620.07843

SURFACE ELEVATION: 47.54 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: SAND, clayey, reddish-brown, with gravel				21
	FILL: CLAY, fat, with sand, very stiff, brown to reddish-brown, with gravel			40	75
5					
	CLAY, fat, very stiff, brown				
			100	41	98
10	- with black ferrous stains below a depth of about 10 feet				
15	CLAY, lean, very stiff, light brown			33	91
	Driller's Note: Converted to mud rotary drilling method at a depth of about 17 feet				
20	SAND, silty, dense to medium dense, brown				
25		46			14
30		29			
35		20		NP	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/24/2008	**DATE MEASURED:**	11/24/2008	**FIGURE:**	A-174a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-173

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16502377.23820; E 1300620.07843

SURFACE ELEVATION: 47.54 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, dense to medium dense, brown *(continued)*	23				16
45								
			- dense below 48 feet	40				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 13.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/24/2008	**DATE MEASURED:**	11/24/2008	**FIGURE:**	A-174b

LOG OF BORING NO. DP-174

The Lower Rio Grande Flood Control Project
Cameron County, Texas

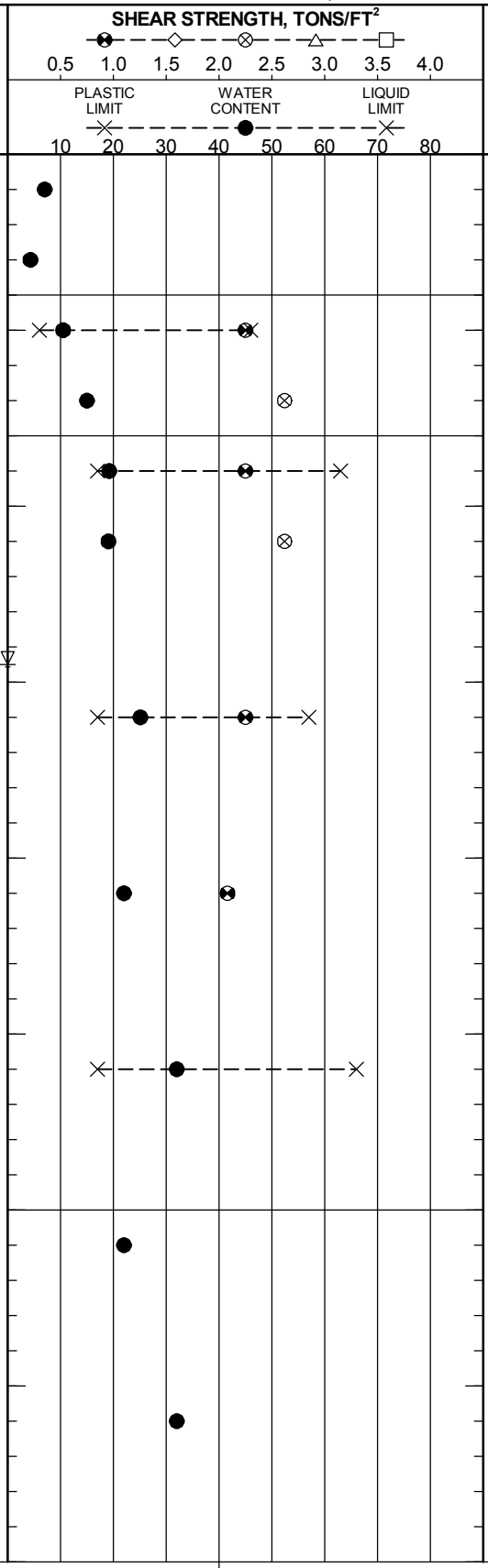
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16501782.38880; E 1301532.64816

SURFACE ELEVATION: 46.90 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: SAND, clayey, very dense, light reddish-brown to light brown, with gravel and calcareous nodules				29
5	FILL: CLAY, sandy, lean, hard, light brown			40	52
10	CLAY, fat, hard to very stiff, brown, with gravel and gyspum nodules		104	46	97
15	Driller's Note: Converted to mud rotary drilling method at a depth of about 17 feet			40	99
20					
25	- stiff below 25 feet	14		49	
30	SAND, silty, medium dense, brown	27			
35		27			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/24/2008	**DATE MEASURED:**	11/24/2008	**FIGURE:**	A-175a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-174

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16501782.38880; E 1301532.64816

SURFACE ELEVATION: 46.90 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT	WATER CONTENT (10 20 30 40 50 60 70 80)	LIQUID LIMIT	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	19							
45											
				22							24
50			Boring terminated at a depth of about 50 feet.								
55											
60											
65											
70											
75											

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 44 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/24/2008	**DATE MEASURED:**	11/24/2008	**FIGURE:**	A-175b

LOG OF BORING NO. DP-175

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16500719.75330; E 1301560.48321

SURFACE ELEVATION: 45.24 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, sandy, fat, very stiff to stiff, brown, with calcareous nodules and gravel	9		37	53
5	CLAY, fat, very stiff to hard, brown, with calcareous nodules and orange ferrous stains			36	99
10	Driller's Note: Converted to mud rotary drilling method at a depth of about 12 feet	16		37	95
15			116		
20	SAND, silty, dense, light brown	50		NP	
25		31			28
30	SAND, with silt, poorly-graded, medium dense to dense, light brown to dark brown	30			8
35		14			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	10 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-176a

LOG OF BORING NO. DP-175

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16500719.75330; E 1301560.48321

SURFACE ELEVATION: 45.24 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to dense, light brown to dark brown *(continued)*	32				
45								
			SAND, silty, very dense, dark brown	50/9"				36
50			Boring terminated at a depth of about 49.8 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 11.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 10 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 44 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	10 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-176b

LOG OF BORING NO. DP-176

The Lower Rio Grande Flood Control Project
Cameron County, Texas

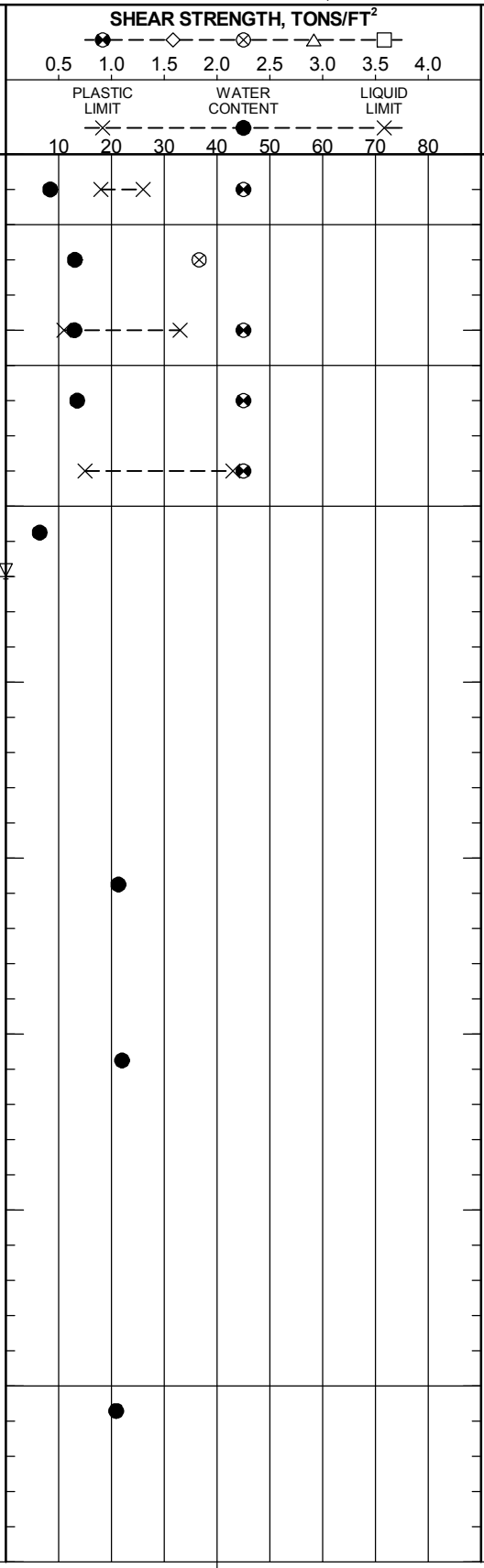
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16499946.90570; E 1301133.13372

SURFACE ELEVATION: 44.90 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, sandy, lean, very stiff, brown, with calcareous nodules and gravel			8	64
	FILL: CLAY, lean, with sand, very stiff, brown, with black ferrous stains, and calcareous nodules		110		
5				22	82
	FILL: CLAY, sandy, lean, very stiff, brown				64
				28	
10	SAND, silty, medium dense to dense, light brown	19			49
15		29		NP	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet				
20		29			14
25		46			13
30		47			
35	SAND, with silt, poorly-graded, very dense to medium dense, brown to dark brown	50/ 11"			11



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	12 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-177a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-176

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16499946.90570; E 1301133.13372

SURFACE ELEVATION: 44.90 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, very dense to medium dense, brown to dark brown *(continued)*	25				
45								
			CLAY, fat, very stiff, dark brown, with calcareous nodules and orange ferrous stains	18				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 16 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 12 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	12 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-177b

LOG OF BORING NO. DP-177

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16498759.92510; E 1301014.37114

SURFACE ELEVATION: 44.32 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown, with gypsum nodules				98
	FILL: CLAY, lean, very stiff, light brown			16	92
5	- with calcareous nodules below a depth of about 6 feet		97	11	
	SILT, sandy, loose, light brown	7		NP	51
10		9			
15	SAND, clayey, silty, loose to medium dense, brown	8		7	
20		12			13
25		17			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		24			14
35	SAND, with silt, poorly-graded, dense to medium dense, dark brown	43			10

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/26/2008	**DATE MEASURED:**	11/26/2008	**FIGURE:**	A-178a

LOG OF BORING NO. DP-177

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16498759.92510; E 1301014.37114

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 44.32 ft					
			SAND, with silt, poorly-graded, dense to medium dense, dark brown *(continued)*	42				
45								
				12				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 24 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/26/2008	**DATE MEASURED:**	11/26/2008	**FIGURE:**	A-178b

LOG OF BORING NO. DP-178

The Lower Rio Grande Flood Control Project
Cameron County, Texas

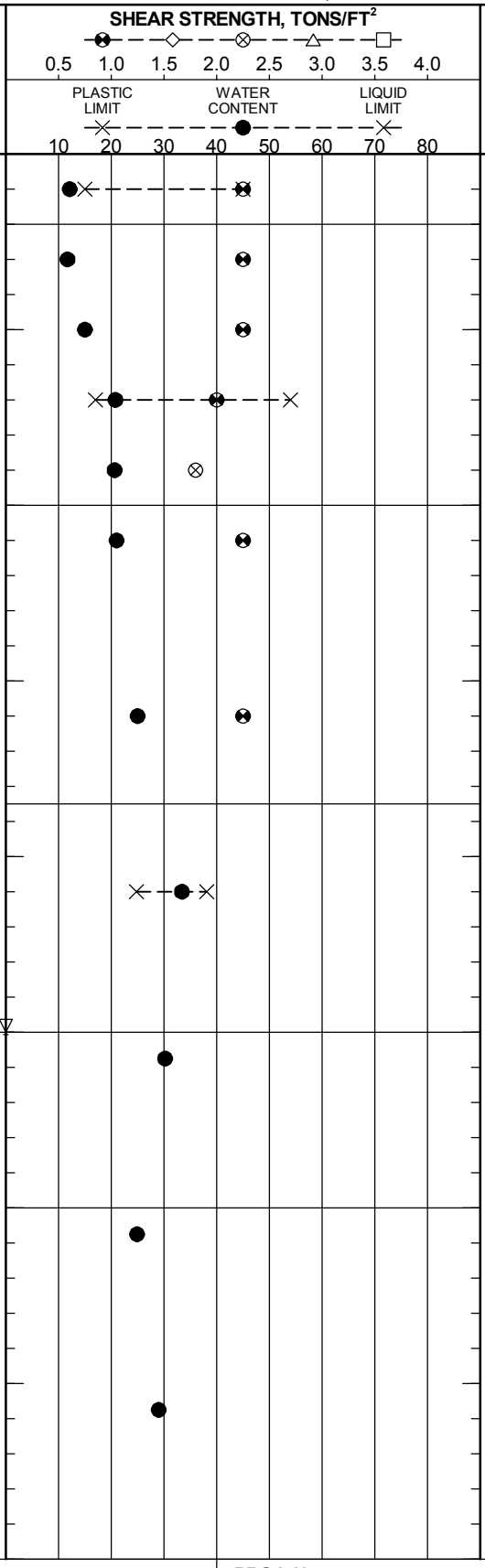
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16498583.20570; E 1301877.45039

SURFACE ELEVATION: 44.56 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			30	97
	FILL: CLAY, fat, very stiff, brown				96
5				37	98
			102		
10	CLAY, fat, very stiff to firt, brown				
15	- with black ferrous stains below a depth of about 15 feet				
	SILT, clayey, brown				
20			87	13	100
25	SAND, silty, medium dense, light brown Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	15			30
30	SAND, with silt, poorly-graded, medium dense, light brown	15		NP	11
35		18			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-179a

LOG OF BORING NO. DP-178

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16498583.20570; E 1301877.45039

SURFACE ELEVATION: 44.56 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff, grayish-brown	8						57	
45											
				10							99
50			Boring terminated at a depth of about 50 feet.								
55											
60											
65											
70											
75											

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-179b

LOG OF BORING NO. DP-179

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16498560.81740; E 1302916.13965

SURFACE ELEVATION: 43.74 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			25	98
					95
5				25	95
			105		
	CLAY, silty, with sand, very stiff, brown			7	80
10	CLAY, lean, with sand, stiff, brown				99
15	CLAY, sandy, lean, stiff, light brown				
20		10			
25	SAND, silty, medium dense to dense, dark brown	19		NP	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		14			
35		19			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-180a

LOG OF BORING NO. DP-179

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16498560.81740; E 1302916.13965

SURFACE ELEVATION: 43.74 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, dark brown *(continued)*	29				
45								
				37				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 24 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/25/2008	**DATE MEASURED:**	11/25/2008	**FIGURE:**	A-180b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-180

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16497940.03960; E 1303353.95978

SURFACE ELEVATION: 44.05 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, very stiff, brown, with calcareous nodules			23	74
5			104		
	FILL: SILT, with sand, light brown				88
	CLAY, lean, very stiff, brown			21	87
10					
15	CLAY, fat, very stiff, brown			45	96
20	SAND, silty, medium dense, brown	12			
25		16		NP	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, with silt, poorly-graded, medium dense, dark brown	16			
35		18			6

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/26/2008	**DATE MEASURED:**	11/26/2008	**FIGURE:**	A-181a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-180

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16497940.03960; E 1303353.95978

SURFACE ELEVATION: 44.05 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown	29				13
45								
				18				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 24 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	11/26/2008	**DATE MEASURED:**	11/26/2008	**FIGURE:**	A-181b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-181

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16497502.21410; E 1303610.04739

SURFACE ELEVATION: 44.04 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			21	80
5	- with orange ferrous stains below a depth of about 6 feet		106	25	96
					99
10	CLAY, fat, stiff, brown, with black ferrous stains			36	
15	SAND, silty, medium dense to dense, brown				
20	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	17			17
25		11			
30		19			18
35		46			13

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/1/2008	**DATE MEASURED:**	12/1/2008	**FIGURE:**	A-182a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-181

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16497502.21410; E 1303610.04739

SURFACE ELEVATION: 44.04 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, brown *(continued)* - dense below 40 feet	25				
45								
			CLAY, fat, firm, light brown	5			41	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 19 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/1/2008	**DATE MEASURED:**	12/1/2008	**FIGURE:**	A-182b

LOG OF BORING NO. DP-182

The Lower Rio Grande Flood Control Project
Cameron County, Texas

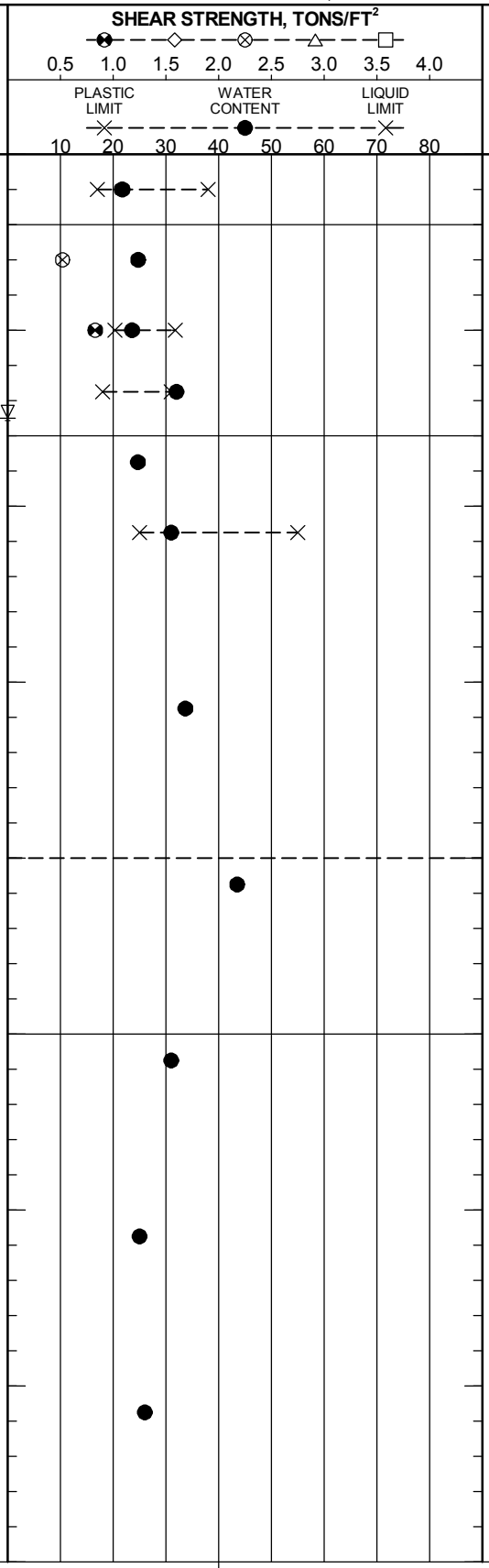
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16496794.54980; E 1304011.99973

SURFACE ELEVATION: 44.85 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown			21	98
	CLAY, lean, stiff, brown		93		
5			105	12	92
		4		13	
	CLAY, fat, stiff to firm, grayish-brown	13			96
10	Driller's Note: Converted to mud rotary drilling method at a depth of about 8 feet	7		30	
15		5			99
20	CLAY, fat, with sand, soft, grayish-brown	3			83
25	SAND, silty, medium dense, brown	21		NP	
30		26			
35		13			12



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	7.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/1/2008	**DATE MEASURED:**	12/1/2008	**FIGURE:**	A-183a

LOG OF BORING NO. DP-182

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16496794.54980; E 1304011.99973

SURFACE ELEVATION: 44.85 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	10				13
45								
			CLAY, fat, very stiff, light brown	18				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 8 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 7.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	7.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/1/2008	**DATE MEASURED:**	12/1/2008	**FIGURE:**	A-183b

LOG OF BORING NO. DP-183

The Lower Rio Grande Flood Control Project
Cameron County, Texas

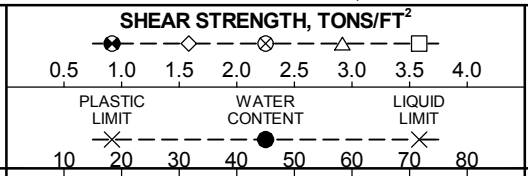
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16496843.69130; E 1304830.70986

SURFACE ELEVATION: 44.71 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, sandy, lean, stiff, brown			12	68
	CLAY, sandy, lean, stiff to firm, brown				
5			98	20	
	CLAY, lean, firm, grayish-brown	5			88
		5		29	
10		7			96
15	SAND, silty, medium dense, brown	16			15
20	CLAY, lean, with sand, stiff, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	8		25	
25	SAND, clayey, loose to medium dense, brown	9			45
30		23			
35		22			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/1/2008	**DATE MEASURED:**	12/1/2008	**FIGURE:**	A-184a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-183

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16496843.69130; E 1304830.70986

SURFACE ELEVATION: 44.71 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, dense to medium dense, brown	33				9
45								
				28				7
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 57.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/1/2008	**DATE MEASURED:**	12/1/2008	**FIGURE:**	A-184b

LOG OF BORING NO. DP-184

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16496099.62470; E 1305438.97829

SURFACE ELEVATION: 45.24 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with black ferrous stains		108		
	CLAY, lean, very stiff, brown, with black ferrous stains			17	90
5					87
	CLAY, lean, with sand, firm to stiff, brown, with orange ferrous stains			24	
					76
10	CLAY, sandy, lean, firm to soft, brown	6			67
	Driller's Note: Converted to mud rotary drilling method at a depth of about 11-1/2 feet				
15		2		11	
20	CLAY, lean, with sand, stiff, light brown	9			84
25		10			
30	CLAY, fat, stiff to firm, light brown	10		49	
35		7			93

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	8 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/4/2008	**DATE MEASURED:**	12/4/2008	**FIGURE:**	A-185a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-184

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16496099.62470; E 1305438.97829

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 45.24 ft					
			CLAY, fat, stiff to firm, light brown *(continued)*	17				
			- stiff, light reddish-brown, with black and orange ferrous stains below a depth of 40 feet					
45								
				20				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 9 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 8 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	8 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/4/2008	**DATE MEASURED:**	12/4/2008	**FIGURE:**	A-185b

LOG OF BORING NO. DP-185

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16494856.53890; E 1305412.16851

SURFACE ELEVATION: 44.55 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with roots extending down to a depth of about 2 feet			18	94
5	CLAY, lean, with sand, very stiff, brown, with calcareous nodules and gravel		108		78
	CLAY, lean, very stiff to firm, brown, with black and orange ferrous stains			19	
10		15			99
15	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet	11			98
20		6		20	
25	SAND, silty, medium dense, brown	12			24
30	SAND, with silt, poorly-graded, medium dense to loose, dark brown	11		NP	
35		9			9

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/4/2008	**DATE MEASURED:**	12/4/2008	**FIGURE:**	A-186a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-185

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16494856.53890; E 1305412.16851

SURFACE ELEVATION: 44.55 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to loose, dark brown *(continued)* - medium dense below 40 feet	18				
45								
			CLAY, fat, stiff, light reddish-brown to grayish-brown	14				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 14 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 13 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	13 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/4/2008	**DATE MEASURED:**	12/4/2008	**FIGURE:**	A-186b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-186

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16493944.77940; E 1305558.04802

SURFACE ELEVATION: 44.22 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules			18	94
					93
5			103		
	CLAY, lean, very stiff, light brown, with calcareous nodules			9	92
					88
10	- with black ferrous stains below a depth of about 10 feet			15	93
15					
	CLAY, lean, sandy, silty, firm to stiff, brown				
20		7		7	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		9			59
30	SAND, silty, medium dense, dark brown	11			
35		17			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/4/2008	**DATE MEASURED:**	12/4/2008	**FIGURE:**	A-187a

LOG OF BORING NO. DP-186

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16493944.77940; E 1305558.04802

SURFACE ELEVATION: 44.22 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown *(continued)*	30				
45								
				24				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/4/2008	**DATE MEASURED:**	12/4/2008	**FIGURE:**	A-187b

LOG OF BORING NO. DP-187

The Lower Rio Grande Flood Control Project
Cameron County, Texas

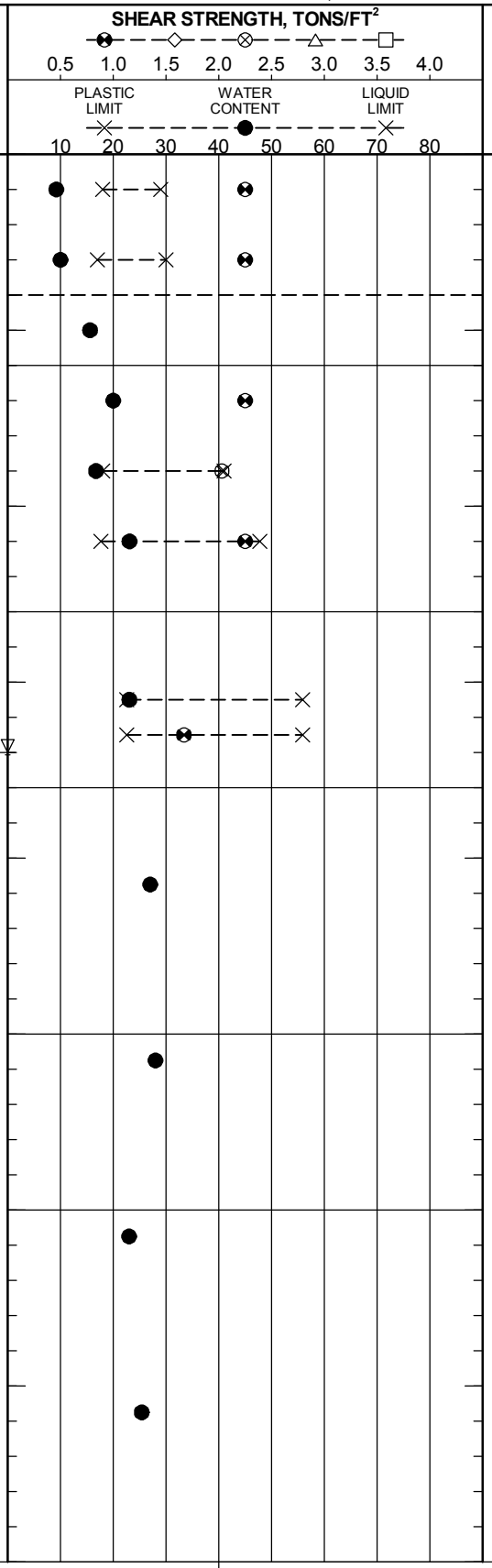
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16493183.00280; E 1304823.19544

SURFACE ELEVATION: 44.10 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			11	91
	- with calcareous nodules below a depth of about 2 feet			13	
	FILL: SILT, with sand, firm, brown				82
5	CLAY, lean, hard to stiff, brown				
			107	23	93
10				30	
	CLAY, fat, very stiff, brown, with sand seams				
15			99	33	97
				33	73
	- with sand seams 16 to 17 feet				
	SAND, silty, medium dense, brown				
20		13		NP	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	CLAY, lean, with sand, very soft, dark brown	2			
30	SAND, with silt, poorly-graded, medium dense, dark brown	30			
35		27			9



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/5/2008	**DATE MEASURED:**	12/5/2008	**FIGURE:**	A-188a

LOG OF BORING NO. DP-187

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16493183.00280; E 1304823.19544

SURFACE ELEVATION: 44.10 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown	29				
45								
				25				18
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/5/2008	**DATE MEASURED:**	12/5/2008	**FIGURE:**	A-188b

LOG OF BORING NO. DP-188

The Lower Rio Grande Flood Control Project
Cameron County, Texas

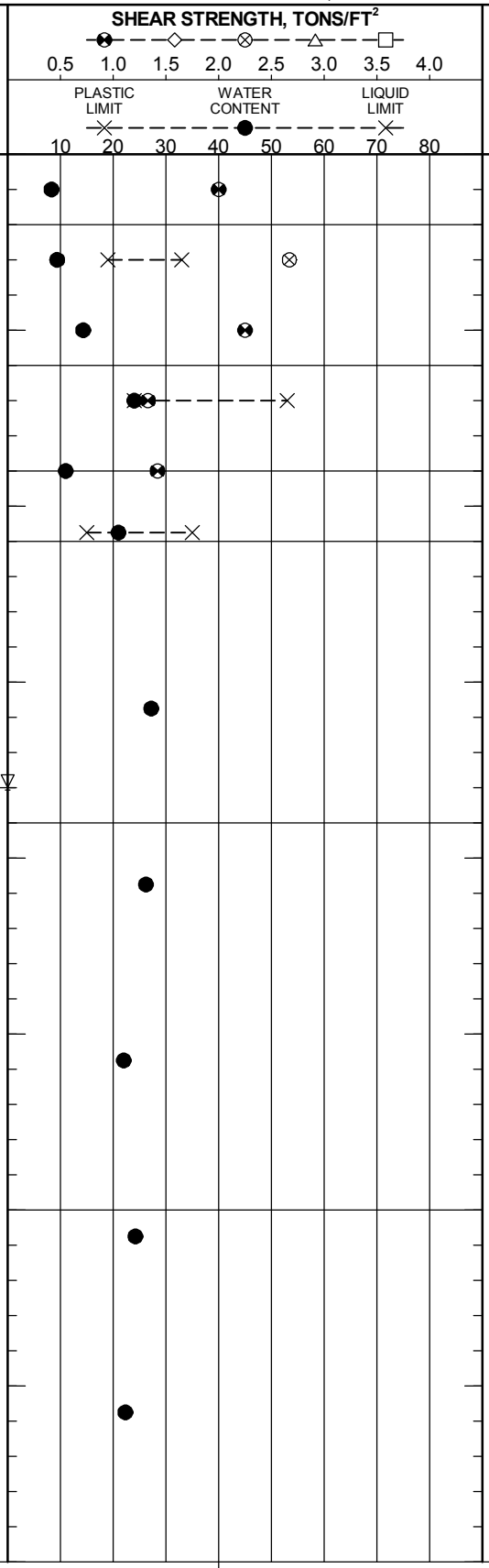
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492413.75560; E 1305204.45116

SURFACE ELEVATION: 43.69 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, sandy, lean, very stiff, brown				58
	FILL: CLAY, lean, hard, brown, with sand		111	14	
5					84
	FILL: CLAY, fat, very stiff, brown to dark brown			29	
	FILL: CLAY, lean, stiff, brown				
10		12		20	
	SILT, with sand, loose, brown				
15		9			73
	SAND, silty, loose to medium dense, brown				
20		6			23
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		23			
30	SAND, with silt, poorly-graded, medium dense, dark brown	24			7
35		30			11



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/5/2008	**DATE MEASURED:**	12/5/2008	**FIGURE:**	A-189a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-188

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492413.75560; E 1305204.45116

SURFACE ELEVATION: 43.69 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown *(continued)*	25				9
45								
			CLAY, lean, very stiff, brown, with orange ferrous stains	19			10	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 19 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/5/2008	**DATE MEASURED:**	12/5/2008	**FIGURE:**	A-189b

LOG OF BORING NO. DP-189

The Lower Rio Grande Flood Control Project
Cameron County, Texas

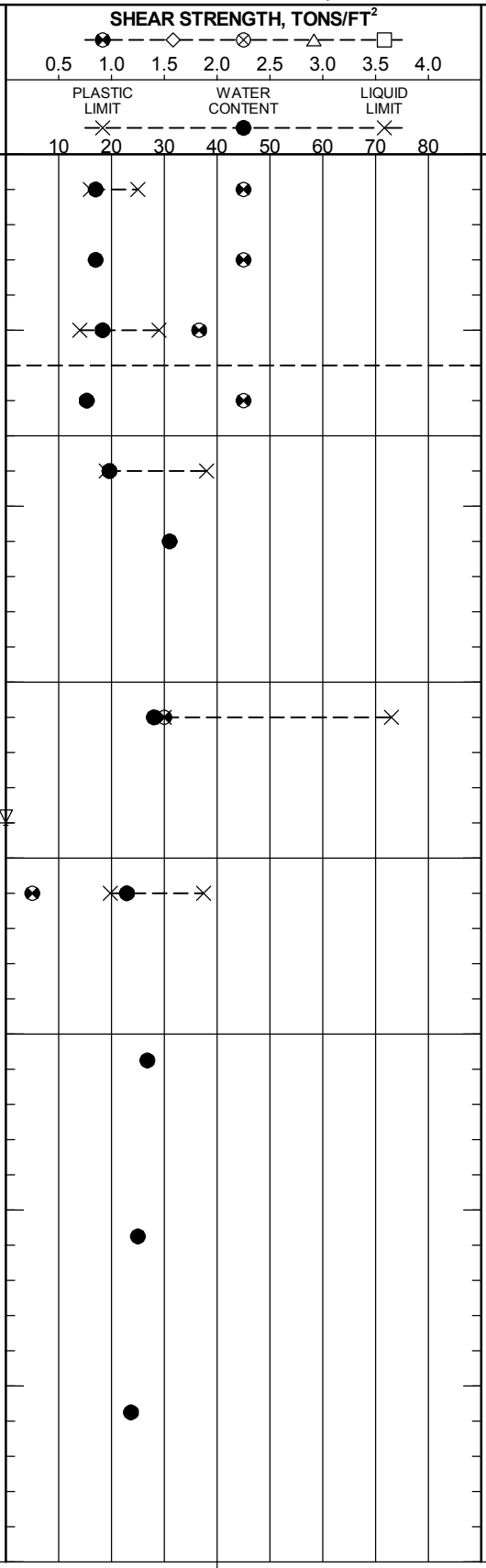
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492067.24550; E 1305612.97047

SURFACE ELEVATION: 43.21 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, dark brown, with calcareous nodules		106	9	91
5				15	93
	FILL: CLAY, lean, with sand, very stiff, dark brown				74
	SAND, clayey, silty, light brown to brown			19	9
10					
15	CLAY, lean, firm, dark brown, with black ferrous stains			43	
20	CLAY, fat, very stiff, dark brown, with black ferrous stains		97	17	94
	Driller's Note: Converted to mud rotary drilling method at a depth of about 22 feet				
25	SAND, silty, medium dense to loose, brown	11			25
30	- becomes dark brown in color below a depth of about 30 feet	8			
35	- medium dense below 35 feet	21			18



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/5/2008	**DATE MEASURED:**	12/5/2008	**FIGURE:**	A-190a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-189

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492067.24550; E 1305612.97047

SURFACE ELEVATION: 43.21 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to loose, brown *(continued)*	27				
45								
				10				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/5/2008	**DATE MEASURED:**	12/5/2008	**FIGURE:**	A-190b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-190

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492126.17590; E 1305995.87013

SURFACE ELEVATION: 43.29 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, sandy, lean, very stiff, light brown		103	22	65
5	CLAY, lean, very stiff, brown, with calcareous nodules		114	25	88
				18	93
10	CLAY, lean, with sand, very stiff, brown				
15			104	22	82
20	SAND, silty, loose to medium dense, dark brown	5			39
25		12			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		16			38
35		19			37

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-191a

LOG OF BORING NO. DP-190

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492126.17590; E 1305995.87013

SURFACE ELEVATION: 43.29 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, hard, reddish-brown, with black ferrous stains	30			42	
45								
				36				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-191b

LOG OF BORING NO. DP-191

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492461.60210; E 1306450.75886

SURFACE ELEVATION: 43.91 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules			92
	FILL: CLAY, fat, very stiff, dark brown to brown		46	98
5		109		
	CLAY, lean, very stiff to stiff, dark brown, with black ferrous stains		19	96
10		95		
15	SILT, brown			96
20	CLAY, fat, very stiff, brown, with black ferrous stains			
25	- becomes light brown in color and with gypsum nodules below a depth of about 25 feet		38	94
30	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet			
35			29	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-192a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-191

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492461.60210; E 1306450.75886

SURFACE ELEVATION: 43.91 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, brown, with black ferrous stains *(continued)*					
45								
								99
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-192b

LOG OF BORING NO. DP-192

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492597.75330; E 1307093.49524

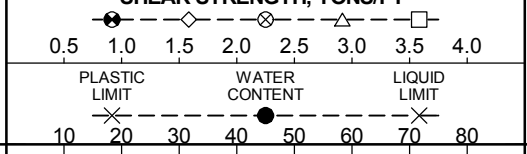
SURFACE ELEVATION: 44.00 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, light brown to brown, with orange ferrous stains and roots extending down to a depth of about 2 feet			15	
					98
5					98
	CLAY, fat, stiff to very stiff, brown, with black ferrous stains		96	41	96
10					
15					99
20					
25				40	91
30	- becomes reddish-brown in color and with gypsum crystals below a depth of about 30 feet Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35					100

SYMBOL

SAMPLES

SHEAR STRENGTH, TONS/FT^2



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-193a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-192

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492597.75330; E 1307093.49524

SURFACE ELEVATION: 44.00 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff to very stiff, brown, with black ferrous stains *(continued)*	21			43	
45								
				32				99
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 27.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 26 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-193b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-193

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492486.04440; E 1307948.82081

SURFACE ELEVATION: 43.91 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown			16	
			111		98
5	FILL: CLAY, fat, with sand, very stiff, brown			36	79
	CLAY, fat, very stiff, brown				89
10				30	
15	- becomes light brown in color and with black ferrous stains below a depth of about 15 feet				
20					97
25	- with gypsum nodules below a depth of about 25 feet				
30	CLAY, lean, stiff to very stiff, reddish-brown			25	94
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	28.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-194a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-193

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492486.04440; E 1307948.82081

SURFACE ELEVATION: 43.91 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff to very stiff, reddish-brown	15				98
45								
				25				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 29 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 28.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	28.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-194b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-194

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492075.89590; E 1309072.40912

SURFACE ELEVATION: 42.96 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, light brown			15	97
	CLAY, fat, hard to very stiff, brown				
5			100		
				46	97
10					95
15					
20	- with black ferrous stains below a depth of about 20 feet				
25				44	93
30	- stiff below 30 feet				94
	CLAY, lean, very stiff, reddish-brown				
35				18	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 37 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-195a

LOG OF BORING NO. DP-194

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16492075.89590; E 1309072.40912

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 42.96 ft					
			CLAY, lean, very stiff, reddish-brown *(continued)*	19				
45								
				22				97
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 32 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 30.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 38 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-195b

LOG OF BORING NO. DP-195

The Lower Rio Grande Flood Control Project
Cameron County, Texas

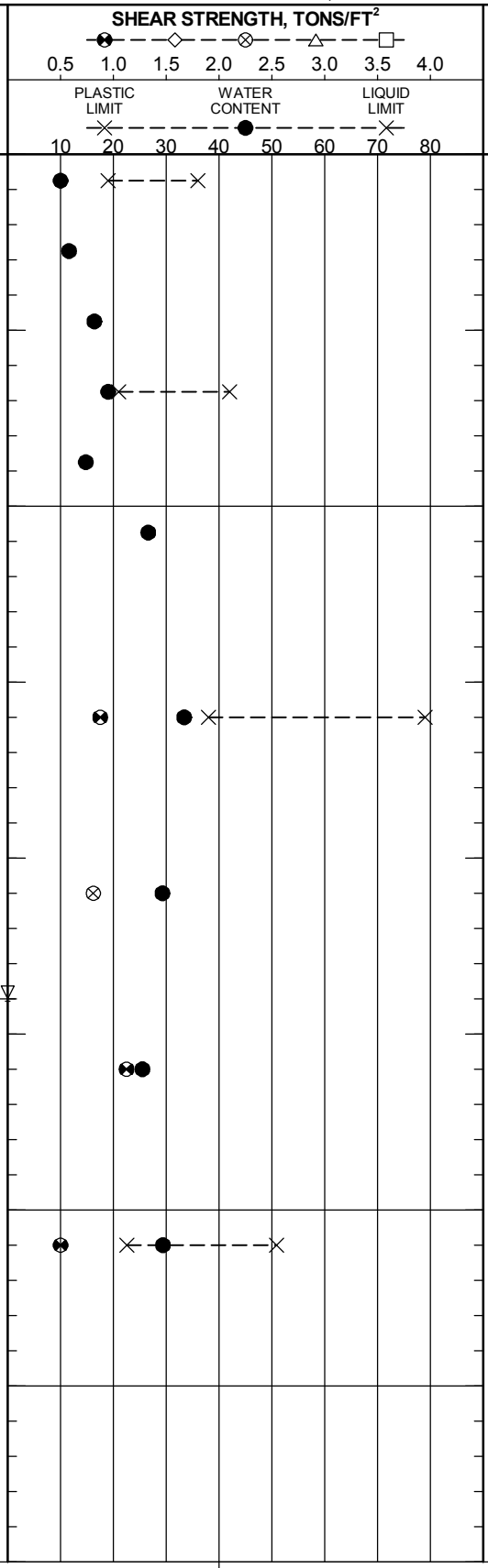
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16491626.62280; E 1309950.56404

SURFACE ELEVATION: 43.15 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, light brown	12		17	
	- very stiff from 2 to 6 feet	24			91
5	- becomes brown in color below a depth of about 4 feet	15			94
	- with black ferrous stains below a depth of about 6 feet	11		21	
		10			97
10	CLAY, fat, stiff, brown to light brown, with black ferrous stains	14			91
15				41	99
20			92		
25					91
30	CLAY, sandy, lean, stiff, light brown, with black ferrous stains Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet			28	99
35	SAND, silty, light brown				



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/2/2008	**DATE MEASURED:**	12/2/2008	**FIGURE:**	A-196a

LOG OF BORING NO. DP-195

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16491626.62280; E 1309950.56404

SURFACE ELEVATION: 43.15 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT: 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, soft, light brown, with gypsum crystals				16	94
45								
			- very stiff at 48 feet	16				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 24 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/2/2008	**DATE MEASURED:**	12/2/2008	**FIGURE:**	A-196b

LOG OF BORING NO. DP-196

The Lower Rio Grande Flood Control Project
Cameron County, Texas

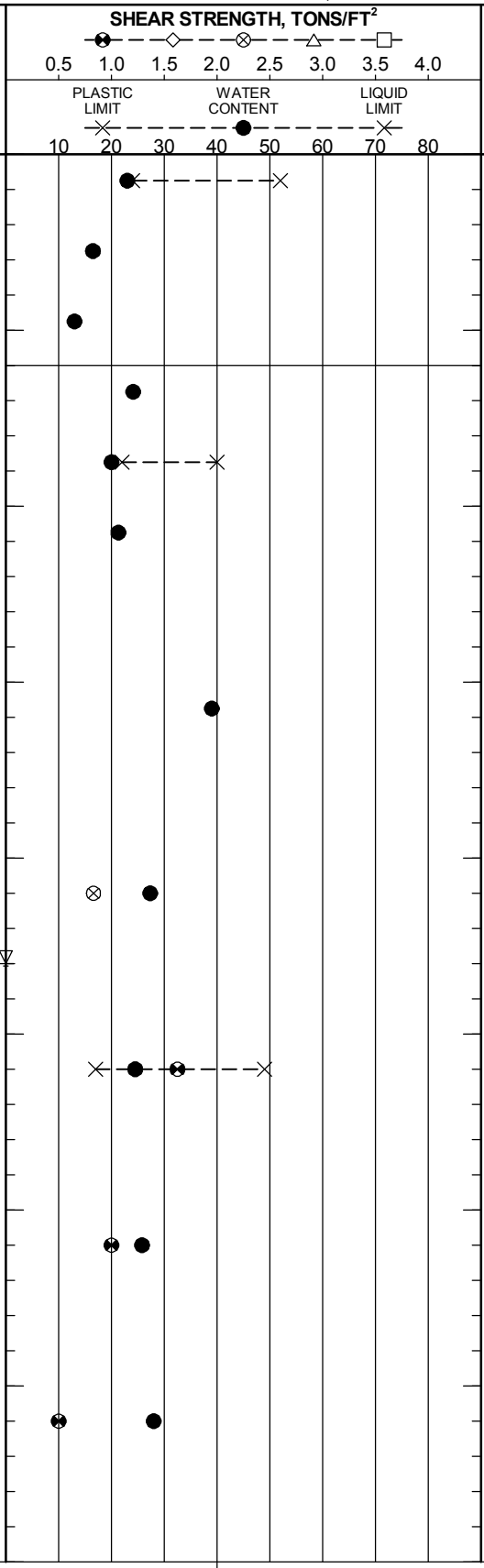
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16490831.54480; E 1310757.03851

SURFACE ELEVATION: 43.39 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, stiff, brown, with orange ferrous stains	11		28	
	-very stiff 2 to 4 feet	16			92
5		13			
	CLAY, lean, stiff, brown, with orange ferrous stains	13			97
		12		18	
10		14			97
15	- with black ferrous stains below a depth of about 15 feet	13			
20			94		97
25				32	91
30	- with calcareous nodules below a depth of about 30 feet				98
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35					



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/2/2008	**DATE MEASURED:**	12/2/2008	**FIGURE:**	A-197a

LOG OF BORING NO. DP-196

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16490831.54480; E 1310757.03851

SURFACE ELEVATION: 43.39 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, stiff, brown, with orange ferrous stains *(continued)*					
45								
			CLAY, fat, stiff, light brown					
				14			35	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/2/2008	**DATE MEASURED:**	12/2/2008	**FIGURE:**	A-197b

LOG OF BORING NO. DP-197

The Lower Rio Grande Flood Control Project
Cameron County, Texas

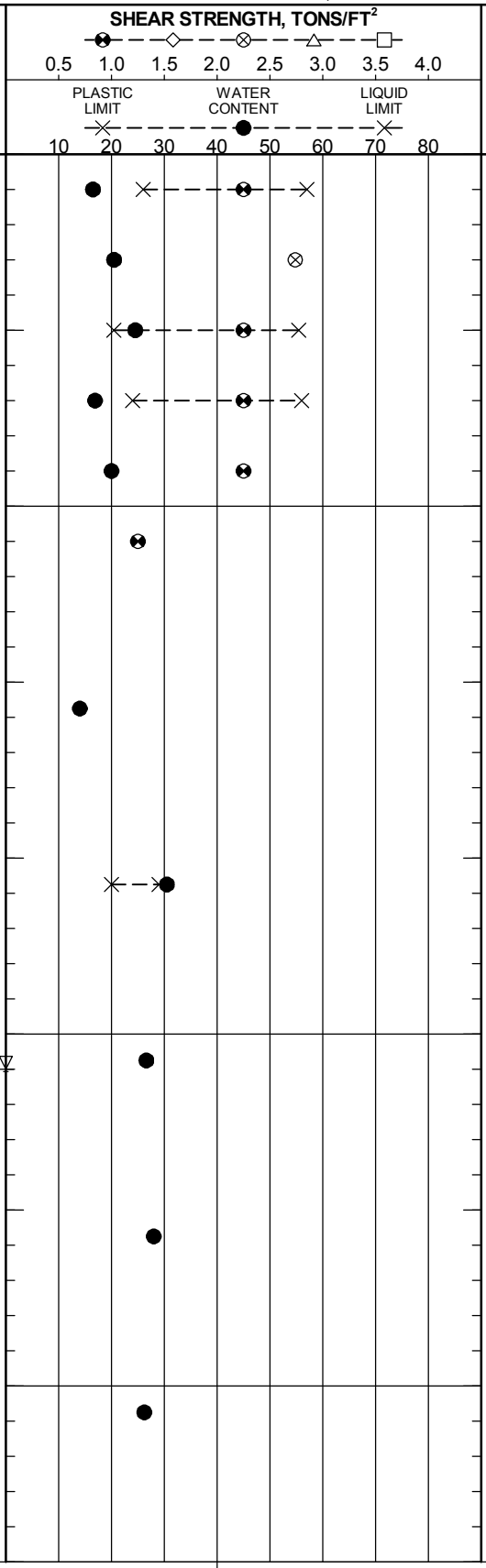
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16489807.98630; E 1311179.23565

SURFACE ELEVATION: 42.89 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown, with gypsum nodules			31	97
			102		
5				35	
				32	98
10	CLAY, lean, stiff to firm, brown				
15		7			
20		7		9	86
25	SAND, with silt, poorly-graded, loose to medium dense, brown	9			7
30		16			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet				
35	SAND, silty, medium dense, brown	21			17



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-198a

LOG OF BORING NO. DP-197

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16489807.98630; E 1311179.23565

SURFACE ELEVATION: 42.89 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown	25				10
45								
			CLAY, fat, very stiff, reddish-brown, with black ferrous stains	24			41	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 27.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 26 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-198b

LOG OF BORING NO. DP-198

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16489388.50610; E 1311484.29200

SURFACE ELEVATION: 42.78 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown		108		91
	FILL: CLAY, lean, with sand, very stiff, brown			13	77
5					
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules			19	93
10	CLAY, lean, very stiff, brown, with calcareous nodules			20	99
15	CLAY, fat, very stiff, brown, with calcareous nodules			35	
20	CLAY, lean, stiff, brown, with calcareous nodules		100	25	99
25	SILT, dark brown				97
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30	SAND, silty, medium dense, dark brown	11			16
35		21			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-199a

LOG OF BORING NO. DP-198

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16489388.50610; E 1311484.29200

SURFACE ELEVATION: 42.78 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown *(continued)*	31				20
45								
			CLAY, fat, hard, brown, with black ferrous stains	33				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 24 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

SHEAR STRENGTH, TONS/FT^2: PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-199b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-199

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16489439.15580; E 1312242.57097

SURFACE ELEVATION: 43.38 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown		100	12	90
5	SILT, brown, with calcareous nodules			NP	90
	CLAY, lean, very stiff, light brown to brown		107		
	- with black ferrous stains below a depth of about 8 feet				95
10					
15				15	98
20			97	25	98
	SAND, clayey, loose, light brown				
25		5		13	
	SAND, silty, medium dense, dark brown				
30		23			16
	Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet				
35	- dense at 35 feet	37			29

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-200a

LOG OF BORING NO. DP-199

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16489439.15580; E 1312242.57097

SURFACE ELEVATION: 43.38 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown *(continued)*	24				
45								
			CLAY, fat, firm, brown, with black ferrous stains	7				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 28.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 26.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 43.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-200b

LOG OF BORING NO. DP-200

The Lower Rio Grande Flood Control Project
Cameron County, Texas

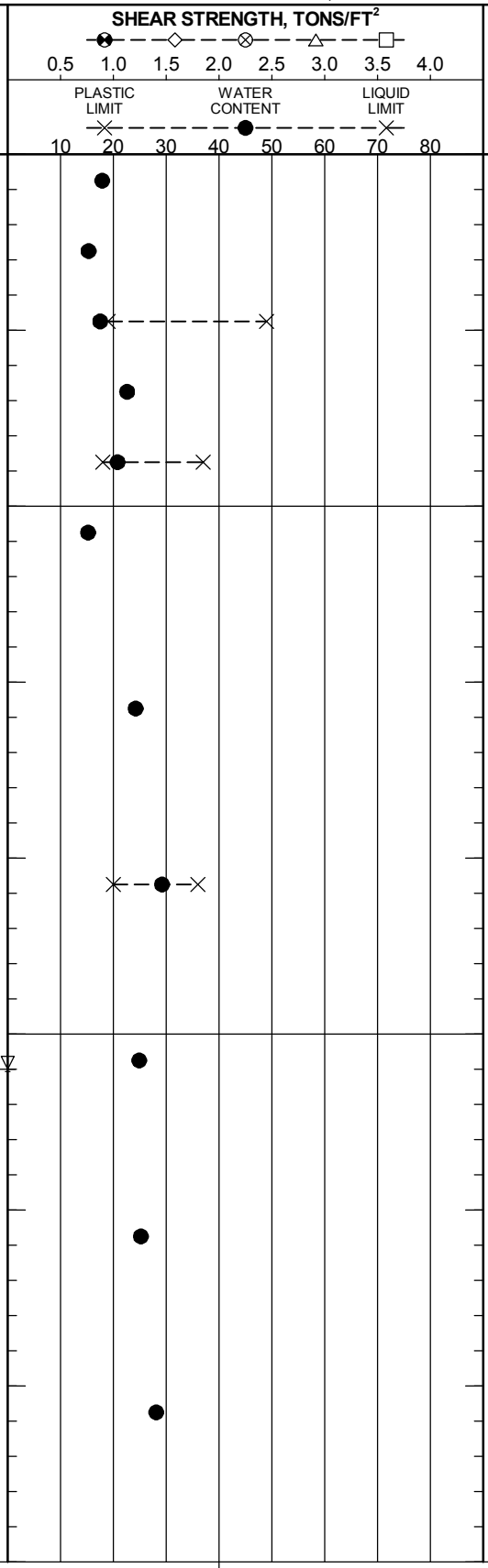
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16489689.53970; E 1312756.48562

SURFACE ELEVATION: 42.58 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff , brown	9			95
		14			94
5	- very stiff from 4 to 8 feet	18		30	
		15			
		14		19	
10	CLAY, lean, stiff, brown	14			86
15	- with orange ferrous stains below a depth of about 15 feet	11			95
20		10		16	
25	SAND, silty, medium dense to dense, brown	12			38
30		10			31
	Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet				
35		17			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/3/2008	**DATE MEASURED:**	12/3/2008	**FIGURE:**	A-201a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-200

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16489689.53970; E 1312756.48562

SURFACE ELEVATION: 42.58 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, brown *(continued)*	34				13
45								
			CLAY, fat, stiff, light brown	8			55	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 26 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet. Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/3/2008	**DATE MEASURED:**	12/3/2008	**FIGURE:**	A-201b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-201

The Lower Rio Grande Flood Control Project
Cameron County, Texas

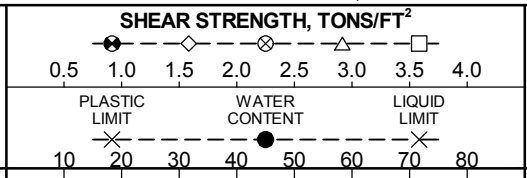
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16490001.56170; E 1313463.12860

SURFACE ELEVATION: 42.96 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
			FILL: CLAY, sandy, lean, very stiff, light brown	16		12	
			CLAY, fat, stiff to very stiff, brown	14			97
5				13			
				22		30	
				12			96
10				15			
15			CLAY, lean, with sand, very stiff, light brown	15			82
20			- with orange ferrous stains below a depth of about 20 feet	16		12	
25			CLAY, lean, stiff, grayish-brown	9			96
30			Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet	9		9	
35			SAND, silty, medium dense, brown	23			15



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/3/2008	**DATE MEASURED:**	12/3/2008	**FIGURE:**	A-202a

LOG OF BORING NO. DP-201

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16490001.56170; E 1313463.12860

SURFACE ELEVATION: 42.96 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	25				15
45								
				14				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 30 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/3/2008	**DATE MEASURED:**	12/3/2008	**FIGURE:**	A-202b

LOG OF BORING NO. DP-202

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16489339.93270; E 1314225.64544

SURFACE ELEVATION: 39.68 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, with sand, firm to stiff, light brown to brown, with calcareous nodules	6			85
		7		28	
5	- sand content decreases with depth	9			95
	CLAY, sandy, lean, stiff to firm, brown, with calcareous nodules and black ferrous stains	15		13	
		4			
10	SAND, clayey, medium dense, light brown	13			39
15	CLAY, fat, stiff to very stiff, brown to light brown, with black ferrous stains	8		32	
20		9			89
25		10		42	
30	- becomes reddish-brown in color below a depth of about 30 feet		101	40	99
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35	- firm 35 to 37 feet		95		99

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/3/2008	**DATE MEASURED:**	12/3/2008	**FIGURE:**	A-203a

LOG OF BORING NO. DP-202

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16489339.93270; E 1314225.64544

SURFACE ELEVATION: 39.68 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff to very stiff, brown to light brown, with black ferrous stains *(continued)*					
45								
								97
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 22 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 32 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/3/2008	**DATE MEASURED:**	12/3/2008	**FIGURE:**	A-203b

LOG OF BORING NO. DP-203

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16488278.60700; E 1314467.80372

SURFACE ELEVATION: 42.16 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, brown, with calcareous nodules and gravel	18		16	
		7			97
5		8			90
	CLAY, lean, with sand, firm to stiff, light brown	8		9	
		6			85
10		11			82
15	CLAY, fat, stiff, brown, with black ferrous stains	13		33	
20		10			99
25				30	
30	SAND, with silt, poorly-graded, loose, dark brown Driller's Note: Converted to mud rotary drilling method at a depth of about 30 feet	6			9
35	CLAY, fat, stiff, light reddish-brown, with black and orange ferrous stains	10			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/4/2008	**DATE MEASURED:**	12/4/2008	**FIGURE:**	A-204a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-203

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16488278.60700; E 1314467.80372

SURFACE ELEVATION: 42.16 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown	13				
45								
			CLAY, fat, soft, light brown					
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT
10 20 30 40 50 60 70 80

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/4/2008	**DATE MEASURED:**	12/4/2008	**FIGURE:**	A-204b

LOG OF BORING NO. DP-204

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487307.92440; E 1314551.74396

SURFACE ELEVATION: 42.76 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, brown	17			94
		11		18	
5		14			98
	CLAY, fat, stiff, brown	12		27	
		10			100
10	- with black and orange ferrous stains below a depth of about 10 feet				
15		12		25	
20	SAND, silty, medium dense, light brown	16			15
25		12		NP	
30	- loose 30 to 32 feet	9			19
	Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet				
35		12			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/4/2008	**DATE MEASURED:**	12/4/2008	**FIGURE:**	A-205a

LOG OF BORING NO. DP-204

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487307.92440; E 1314551.74396

SURFACE ELEVATION: 42.76 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, light brown *(continued)*						
45									
			CLAY, fat, stiff, light reddish-brown						
				10					99
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 37 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/4/2008	**DATE MEASURED:**	12/4/2008	**FIGURE:**	A-205b

LOG OF BORING NO. DP-205

The Lower Rio Grande Flood Control Project
Cameron County, Texas

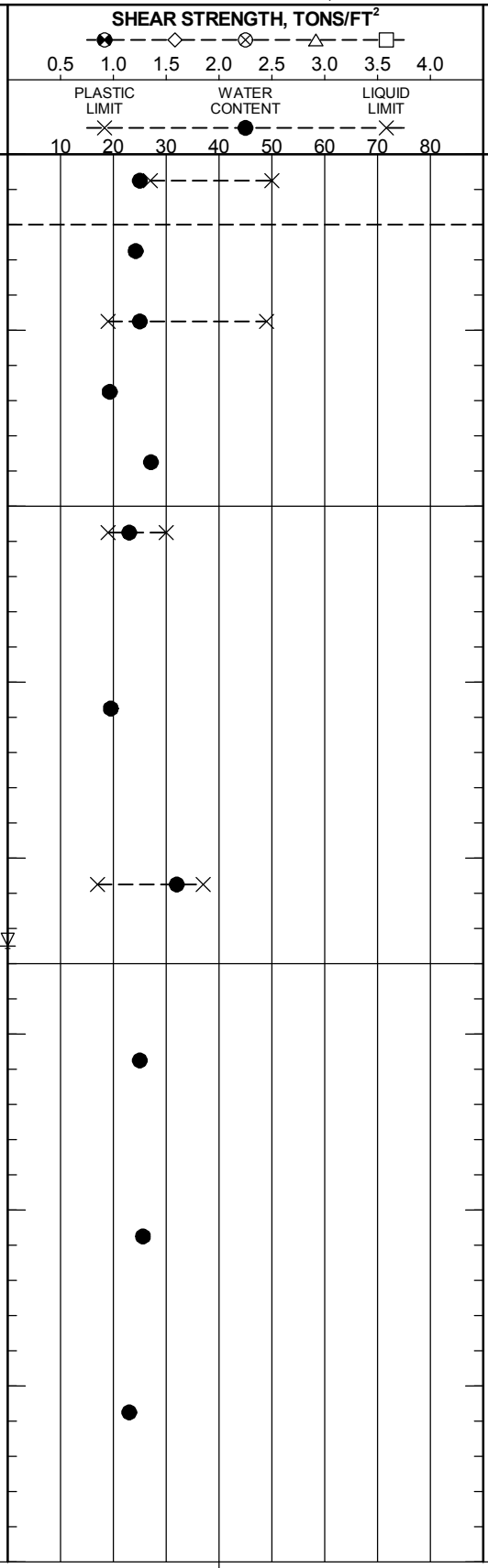
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487013.94850; E 1315343.54685

SURFACE ELEVATION: 42.82 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, stiff, brown	13	23	
	FILL: CLAY, lean, firm to stiff, brown, with calcareous nodules and gravel	7		88
5		11	30	
	- with sand seams 6 to 8 feet	13		85
		9		95
10	CLAY, lean, with sand, stiff to firm, light brown to brown	14	11	
15		8		80
20		5	20	
	SAND, with silt, poorly-graded, medium dense to dense, dark brown			
25		14		
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet			
30		17		9
35		31		



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/4/2008	**DATE MEASURED:**	12/4/2008	**FIGURE:**	A-206a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-205

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487013.94850; E 1315343.54685

SURFACE ELEVATION: 42.82 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to dense, dark brown *(continued)*	21				10
45								
			CLAY, fat, stiff, light reddish-brown	9				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/4/2008	**DATE MEASURED:**	12/4/2008	**FIGURE:**	A-206b

LOG OF BORING NO. DP-206

The Lower Rio Grande Flood Control Project
Cameron County, Texas

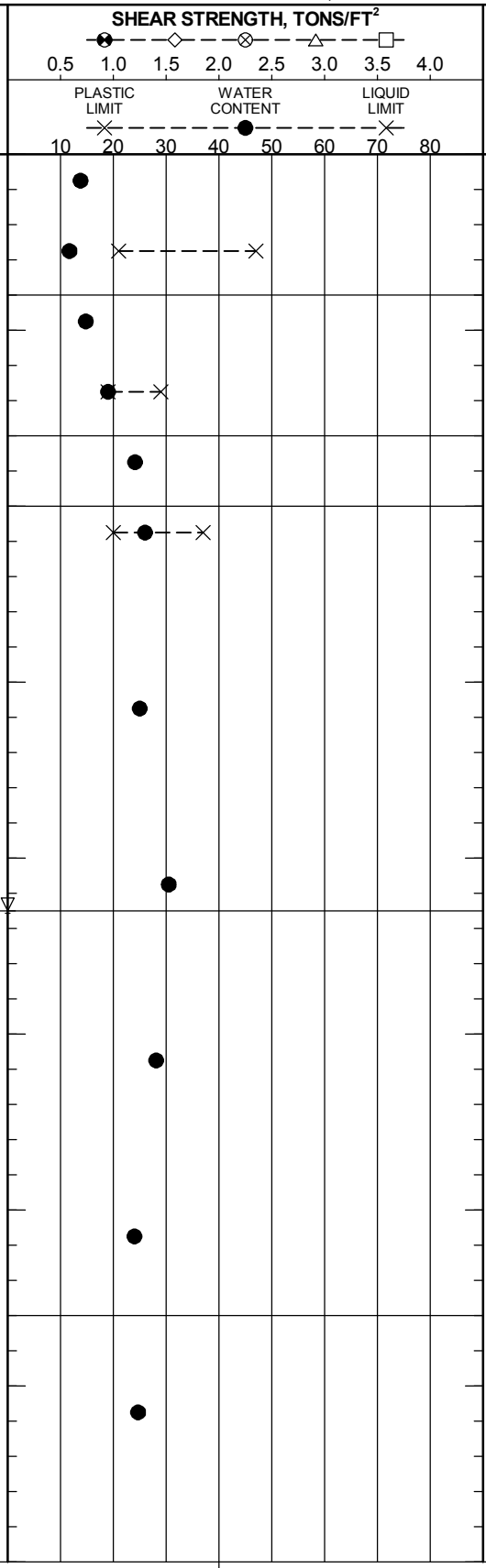
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487193.41990; E 1316216.05867

SURFACE ELEVATION: 42.88 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, very stiff to stiff, dark brown	16		84
		11	26	
5	CLAY, lean, stiff to very stiff, brown	13		
		16	10	
	SAND, clayey, medium dense, brown	10		23
10	CLAY, lean, stiff to firm, brown, with orange ferrous stains	9	17	
15		7		
20		4		93
	SAND, poorly-graded, loose to medium dense, brown			
25		5		3
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet			
30		15		
	SAND, with silt, poorly-graded, medium dense, brown			
35	- with silt below a depth of about 35 feet	23		9



UNIT DRY WIEGHT, pcf

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/5/2008	**DATE MEASURED:**	12/5/2008	**FIGURE:**	A-207a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-206

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487193.41990; E 1316216.05867

SURFACE ELEVATION: 42.88 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	19				11
45								
			CLAY, fat, stiff, reddish-brown	14			37	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 45 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/5/2008	**DATE MEASURED:**	12/5/2008	**FIGURE:**	A-207b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-207

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487138.98690; E 1317057.75586

SURFACE ELEVATION: 41.53 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown	12			92
		12		13	
5	FILL: CLAY, fat, stiff, brown, with orange ferrous stains	14			96
		14		27	
	CLAY, lean, very stiff to stiff, brown	20			96
10		13		25	
	CLAY, lean, firm, brown				
15		7			88
20	SAND, with silt, poorly-graded, loose to medium dense, brown to dark brown	4		NP	
25		14			7
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		12			
35	SAND, silty, medium dense, dark brown	11			23

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/5/2008	**DATE MEASURED:**	12/5/2008	**FIGURE:**	A-208a

LOG OF BORING NO. DP-207

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487138.98690; E 1317057.75586

SURFACE ELEVATION: 41.53 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown *(continued)*	11				
45								
			CLAY, fat, stiff, reddish-brown, with black ferrous stains	12				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 19 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/5/2008	**DATE MEASURED:**	12/5/2008	**FIGURE:**	A-208b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-208

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486983.87190; E 1317768.76699

SURFACE ELEVATION: 41.93 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff to very stiff, brown	9		17	
		13			88
5		14		17	
		15			
		17		22	
10	CLAY, lean, very stiff, brown	15			93
15	CLAY, sandy, lean, stiff to firm, light brown	11			50
20		4		11	
	SAND, with silt, poorly-graded, loose to medium dense, dark brown				
25		7			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		15			8
35		23			12

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/5/2008	**DATE MEASURED:**	12/5/2008	**FIGURE:**	A-209a

LOG OF BORING NO. DP-208

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486983.87190; E 1317768.76699

SURFACE ELEVATION: 41.93 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, loose to medium dense, dark brown *(continued)*	17				
45								
				17				5
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/5/2008	**DATE MEASURED:**	12/5/2008	**FIGURE:**	A-209b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-209

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486638.10560; E 1318431.64324

SURFACE ELEVATION: 42.04 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown	13			92
		11		21	
5		15			86
		11			92
	CLAY, fat, very stiff to stiff, brown, with black ferrous stains	17		31	
10		11			95
15	SAND, clayey, very loose, light brown to brown	4			44
20		3		11	
	SAND, silty, medium dense, brown				
25		11			16
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, with silt, poorly-graded, medium dense, brown	16			
35		23			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/8/2008	**DATE MEASURED:**	12/8/2008	**FIGURE:**	A-210a

LOG OF BORING NO. DP-209

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486638.10560; E 1318431.64324

SURFACE ELEVATION: 42.04 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	12				7
45								
			CLAY, fat, stiff, light brown	11			36	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 27 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/8/2008	**DATE MEASURED:**	12/8/2008	**FIGURE:**	A-210b

LOG OF BORING NO. DP-210

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486158.05120; E 1319256.84168

SURFACE ELEVATION: 41.99 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, very stiff to stiff, brown	23		17	
		14			84
5	FILL: CLAY, fat, very stiff to stiff, dark brown	18			91
		16		38	
	- with black ferrous stains below a depth of about 8 feet	18			94
10	CLAY, fat, stiff, dark brown	11		36	
15	SILT, loose, brown	7			99
20		6			
	SAND, silty, medium dense, brown				
25		12			40
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, with silt, poorly-graded, medium dense, brown	12			9
35		17			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/8/2008	**DATE MEASURED:**	12/8/2008	**FIGURE:**	A-211a

LOG OF BORING NO. DP-210

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486158.05120; E 1319256.84168

SURFACE ELEVATION: 41.99 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, stiff, light brown	8			27	
45								
				8				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20 feet. Upon completion of the drilling operations, the boring remaine uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/8/2008	**DATE MEASURED:**	12/8/2008	**FIGURE:**	A-211b

LOG OF BORING NO. DP-211

The Lower Rio Grande Flood Control Project
Cameron County, Texas

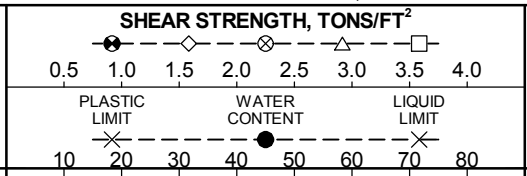
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16485654.77400; E 1320229.87241

SURFACE ELEVATION: 41.37 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, light brown	18			96
		16		14	
5		16			96
		17			
	CLAY, lean, very stiff to stiff, brown with orange ferrous stains	17		27	
10		14			94
15		14			94
20	CLAY, fat, stiff, dark brown	10		45	
25	- with orange ferrous stains below a depth of about 25 feet	10			99
30		9			
35	- firm and grayish-brown 35 to 36.5 feet	5		34	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 36-1/2 feet				



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/8/2008	**DATE MEASURED:**	12/8/2008	**FIGURE:**	A-212a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-211

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16485654.77400; E 1320229.87241

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 41.37 ft					
			CLAY, fat, stiff, dark brown *(continued)*	12				98
45								
			- becomes reddish-brown in color below a depth of about 48 feet	14				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 36 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/8/2008	**DATE MEASURED:**	12/8/2008	**FIGURE:**	A-212b

LOG OF BORING NO. DP-212

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16485901.35080; E 1321054.33456

SURFACE ELEVATION: 41.42 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown	15		24	
	CLAY, lean, stiff, brown	12			95
5		11		20	
		11			90
	- very stiff 8 to 9.5 feet				
	- with black and orange ferrous stains below a depth of about 8 feet	16		24	
10		12			
15		11			98
20	SILT, loose, brown	7			85
25	SAND, with silt, poorly-graded, loose to medium dense, light brown to brown	4			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		11			12
35		14		NP	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-213a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-212

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16485901.35080; E 1321054.33456

SURFACE ELEVATION: 41.42 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, loose to medium dense, light brown to brown *(continued)*	14				
45								
				16				10
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-213b

LOG OF BORING NO. DP-213

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486311.67760; E 1322000.11052

SURFACE ELEVATION: 41.65 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff to very stiff, brown	16		20	
		14			96
5		17		14	
	CLAY, lean, stiff, brown	15			94
		13			96
10		12			
15		11		16	
20	SILT, loose, brown	7			94
25	SAND, silty, medium dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	10			43
30		12			
35		13		NP	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-214a

LOG OF BORING NO. DP-213

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486311.67760; E 1322000.11052

SURFACE ELEVATION: 41.65 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	23				
45								
			CLAY, fat, very stiff, light brown, with orange ferrous stains	20				91
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-214b

LOG OF BORING NO. DP-214

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486683.37520; E 1322845.39736

SURFACE ELEVATION: 41.63 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff to very stiff, brown	18		24	
		12			94
5		17			95
		14		20	
	CLAY, lean, stiff, brown, with black ferrous stains	12			95
10		11		22	
15	SILT, medium dense, light brown	11			
20	SAND, clayey, very loose to medium dense, brown	2		12	
	- medium dense below 25 feet				
25		14			18
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, with silt, poorly-graded, medium dense, brown	14			10
35		22			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-215a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-214

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486683.37520; E 1322845.39736

SURFACE ELEVATION: 41.63 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	22				7
45								
				17				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-215b

LOG OF BORING NO. DP-215

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487216.17680; E 1323701.07429

SURFACE ELEVATION: 41.68 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, sandy, lean, hard, reddish-brown				59
	CLAY, lean, hard to very stiff, dark brown		112	25	
5					
	- with orange ferrous stains below a depth of about 6 feet			18	92
				23	
10				20	94
15	- with black ferrous stains below a depth of about 15 feet			26	94
20				20	99
25	SAND, silty, medium dense, brown	12			
30		13			32
	Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet				
35		24			
	SAND, with silt, poorly-graded, medium dense to loose, brown				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/8/2008	**DATE MEASURED:**	12/8/2008	**FIGURE:**	A-216a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-215

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487216.17680; E 1323701.07429

SURFACE ELEVATION: 41.68 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to loose, brown *(continued)*	20				8
45								
				6				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 15.5 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/8/2008	**DATE MEASURED:**	12/8/2008	**FIGURE:**	A-216b

LOG OF BORING NO. DP-216

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487171.81800; E 1324340.64351

SURFACE ELEVATION: 41.55 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, sandy, lean, hard, light reddish-brown				53
	CLAY, lean, with sand, hard, brown				83
5	CLAY, lean, hard to very stiff, brown			21	95
			109	19	93
10	- with calcareous nodules and orange ferrous stains below a depth of about 10 feet				90
15					
20	SAND, silty, loose to medium dense, brown	7		NP	
25		16			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	- very loose 30 to 31.5 feet	3			48
35		19			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/8/2008	**DATE MEASURED:**	12/8/2008	**FIGURE:**	A-217a

LOG OF BORING NO. DP-216

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487171.81800; E 1324340.64351

SURFACE ELEVATION: 41.55 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, firm, brown	4			33	
45								
			SAND, silty, medium dense, brown	27				21
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 22 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/8/2008	**DATE MEASURED:**	12/8/2008	**FIGURE:**	A-217b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-217

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487818.88570; E 1324509.92756

SURFACE ELEVATION: 41.47 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules			27	
5				16	
			104		97
					95
10	CLAY, lean, hard, brown, with calcareous nodules				95
15				17	
20	SAND, silty, medium dense to loose, brown	28			19
25		8			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		8			37
35		13		NP	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/8/2008	**DATE MEASURED:**	12/8/2008	**FIGURE:**	A-218a

LOG OF BORING NO. DP-217

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487818.88570; E 1324509.92756

SURFACE ELEVATION: 41.47 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT; 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to loose, brown *(continued)*	13				
45								
				9				35
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 22 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/8/2008	**DATE MEASURED:**	12/8/2008	**FIGURE:**	A-218b

LOG OF BORING NO. DP-218

The Lower Rio Grande Flood Control Project
Cameron County, Texas

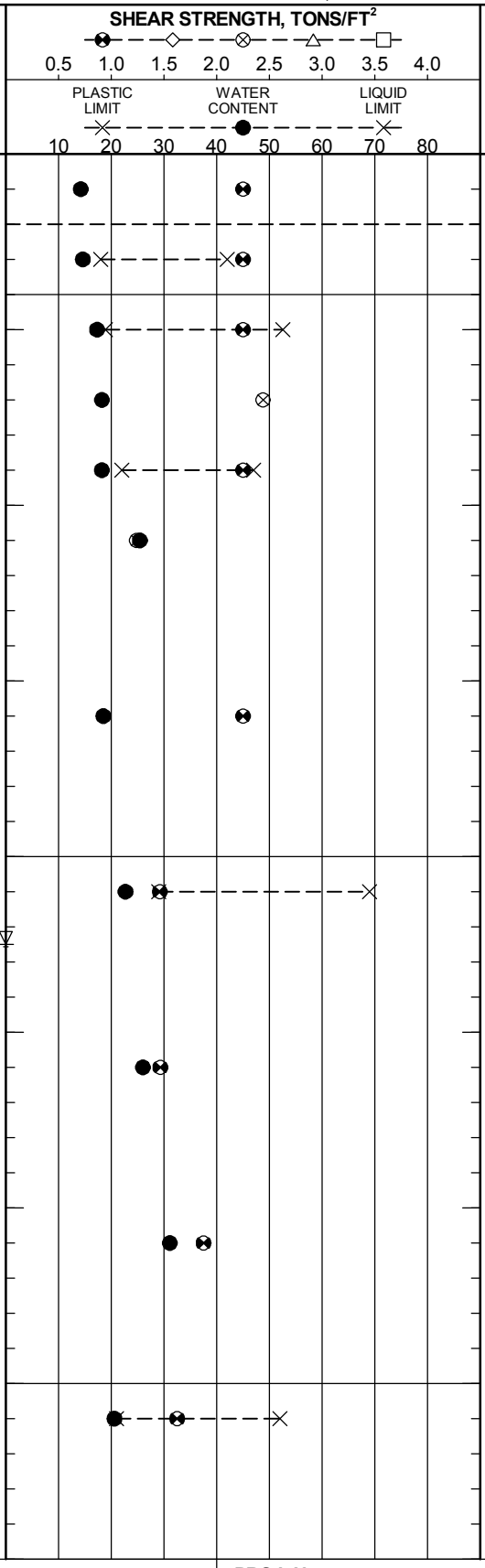
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16488375.76100; E 1324847.61315

SURFACE ELEVATION: 40.15 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules				94
	FILL: CLAY, lean, with sand, hard, light brown, with calcareous nodules			24	81
5	CLAY, lean, hard to very stiff, brown, with calcareous nodules			34	
	- with orange ferrous stains below a depth of about 6 feet		108		89
	- becomes reddish-brown in color and with black ferrous stains below a depth of about 8 feet			25	90
10			100		
15					
20	CLAY, fat, very stiff, reddish-brown			40	97
25	- becomes brown in color and with black ferrous stains below a depth of about 25 feet				
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30					95
35	CLAY, fat, with sand, very stiff, light brown			31	73



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-219a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-218

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16488375.76100; E 1324847.61315

SURFACE ELEVATION: 40.15 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, with sand, very stiff, light brown		109		29	83
45								
			- becomes reddish-brown in color below a depth of about 47 feet					
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 27 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 41 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-219b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-219

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487829.30460; E 1325602.57505

SURFACE ELEVATION: 38.80 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, dark brown, with calcareous nodules			
		99		
5				98
	- becomes brown in color below a depth of about 6 feet		52	98
	CLAY, fat, very stiff, dark brown, with black ferrous stains	95		
10			50	98
15				
20	CLAY, lean, very stiff, brown to reddish-brown, with black ferrous stains			99
25			23	98
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet			
30				
35	CLAY, fat, with sand, stiff to very stiff, light brown, with orange ferrous stains			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT: 10 20 30 40 50 60 70 80

BLOWS PER FT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-220a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-219

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487829.30460; E 1325602.57505

SURFACE ELEVATION: 38.80 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, with sand, stiff to very stiff, light brown, with orange ferrous stains *(continued)*				35	76
45								
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 32 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-220b

LOG OF BORING NO. DP-220

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487259.41670; E 1326552.02139

SURFACE ELEVATION: 38.33 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, dark brown, with calcareous nodules			46	96
					96
5			100		
	CLAY, fat, very stiff, dark brown, with black ferrous stains			58	97
					97
10			102		
15				42	96
20	SAND, clayey, loose, brown				
	Driller's Note: Converted to mud rotary drilling method at a depth of about 23 feet				
25	CLAY, fat, stiff to very stiff, brown to reddish-brown, with black ferrous stains				
30				58	96
35					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-221a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-220

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16487259.41670; E 1326552.02139

SURFACE ELEVATION: 38.33 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, with sand, stiff to hard, light brown, with black ferrous stains, and calcareous nodules					84
45								
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/9/2008	**DATE MEASURED:**	12/9/2008	**FIGURE:**	A-221b

LOG OF BORING NO. DP-221

The Lower Rio Grande Flood Control Project
Cameron County, Texas

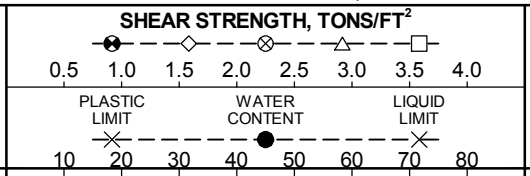
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486710.76460; E 1327437.50543

SURFACE ELEVATION: 38.23 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard to very stiff, brown			34	93
5	- with black ferrous stains below a depth of about 4 feet		103		93
				48	95
	CLAY, fat, very stiff, dark brown			53	
10					
15				54	97
20	SAND, silty, medium dense, light brown Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	11			
25	CLAY, fat, with sand, stiff to very stiff, reddish-brown, with black and orange ferrous stains	13			83
30					
35	CLAY, sandy, fat, very stiff, grayish-brown to reddish-brown, with calcareous nodules and black ferrous stains			50	68



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-222a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-221

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486710.76460; E 1327437.50543

SURFACE ELEVATION: 38.23 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, very stiff, reddish-brown		110		17	88
45								
			CLAY, fat, very stiff, reddish-brown to grayish-brown, with black ferrous stains					98
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-222b

LOG OF BORING NO. DP-222

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486364.97780; E 1327734.08634

SURFACE ELEVATION: 38.36 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard to very stiff, dark brown, with calcareous nodules and black ferrous stains				
			109	35	95
5					
	- with black ferrous stains below a depth of about 6 feet		101		
				33	97
10					
15	CLAY, fat, very stiff, grayish-brown, with calcareous nodules and black ferrous stains			45	93
20	CLAY, lean, with sand, very stiff, light brown	17			76
25	SAND, clayey, very loose, light brown				
30	CLAY, fat, very stiff, light brown, with black ferrous stains			47	95
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	DRY	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-223a

LOG OF BORING NO. DP-222

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16486364.97780; E 1327734.08634

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 38.36 ft					
			CLAY, fat, very stiff, light brown, with black ferrous stains *(continued)* - becomes reddish-brown in color below a depth of about 40 feet					96
45								
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: Upon completion of the drilling operations, the boring was observed dry and caved-in to a depth of about 42 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	DRY	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-223b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-223

The Lower Rio Grande Flood Control Project
Cameron County, Texas

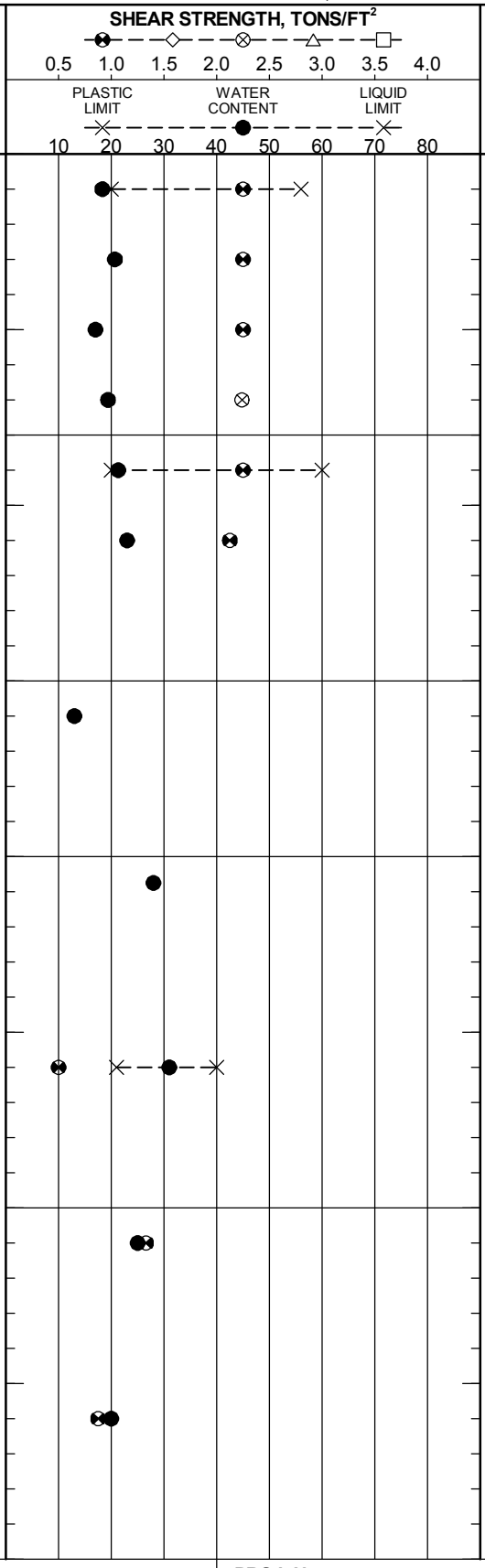
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16485997.55340; E 1328004.38344

SURFACE ELEVATION: 37.93 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown			36	93
					97
5			104		
	CLAY, fat, hard, brown, with black ferrous stains			40	91
10					
15	SAND, clayey, loose, brown				
20	CLAY, lean, stiff, light brown	9			
25				19	99
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30	CLAY, fat, very stiff, brown to light brown				
35	- stiff 35 to 37 feet				



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	DRY	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-224a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-223

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16485997.55340; E 1328004.38344

SURFACE ELEVATION: 37.93 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, brown to light brown *(continued)* - becomes reddish-brown in color below a depth of about 40 feet					90
45								
							50	99
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: Upon completion of the drilling operations, the boring was observed dry and caved-in to a depth of about 17 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	DRY	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-224b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-224

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16485578.31120; E 1328330.44845

SURFACE ELEVATION: 38.08 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, with sand, hard, brown to dark brown				
5			111	32	76
10				47	83
15	CLAY, sandy, lean, hard, light brown to brown			13	56
20	- stiff below 20 feet Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	8			
25	CLAY, fat, stiff, reddish-brown to light grayish-brown				99
30					
35	CLAY, lean, with sand, very stiff, light brown				73

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	DRY	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-225a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-224

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16485578.31120; E 1328330.44845

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 38.08 ft					
			CLAY, fat, very stiff, reddish-brown, with black ferrous stains				45	89
45								
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: Upon completion of the drilling operations, the boring was observed dry and caved-in to a depth of about 44.5 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	DRY	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-225b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-225

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16485158.31910; E 1328644.02093

SURFACE ELEVATION: 38.53 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown				
5				27	94
	CLAY, lean, hard to very stiff, brown		107		88
10				25	89
				34	
15					
20					95
25	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	22		24	
30	CLAY, fat, very stiff, light brown				96
35	- with calcareous nodules below depth of about 35 feet				

SYMBOL

SAMPLES

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-226a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-225

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16485158.31910; E 1328644.02093

SURFACE ELEVATION: 38.53 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, light brown *(continued)*				33	
45								
			- becomes reddish-brown in color and with black ferrous stains below a depth of about 47 feet					98
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 25 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-226b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-226

The Lower Rio Grande Flood Control Project
Cameron County, Texas

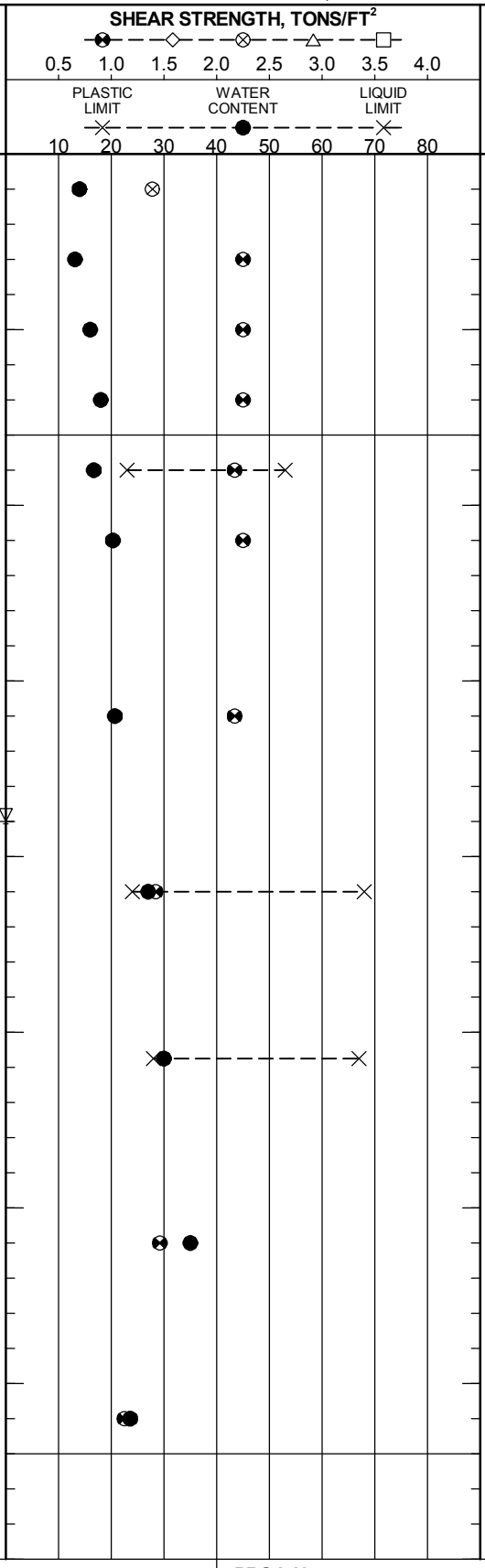
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16484788.84610; E 1328921.96352

SURFACE ELEVATION: 38.86 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown		110		89
					86
5					
	CLAY, fat, very stiff, brown, with orange ferrous stains			30	92
10					94
15					90
20				44	
	- reddish-brown below 23 feet				
25		18		39	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	- with gypsum crystals below a depth of about 30 feet				
35					76
	CLAY, fat, with sand, very stiff with gypsum crystals				



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-227a

LOG OF BORING NO. DP-226

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16484788.84610; E 1328921.96352

SURFACE ELEVATION: 38.86 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, with sand, very stiff with gypsum crystals *(continued)*					
45			CLAY, fat, very stiff, light reddish-brown					
							35	100
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 22 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 20.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-227b

LOG OF BORING NO. DP-227

The Lower Rio Grande Flood Control Project
Cameron County, Texas

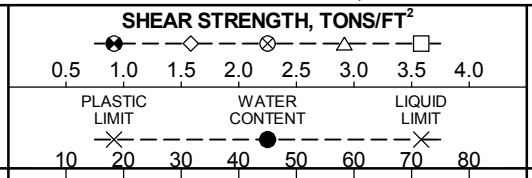
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16484417.32440; E 1329207.55159

SURFACE ELEVATION: 38.26 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown			30	
					93
5					
			107		90
	CLAY, fat, very stiff, brown, with black ferrous stains		109	32	92
10				35	88
15	CLAY, sandy, lean, very stiff, brown				61
20					
	CLAY, lean, with sand, very stiff, brown to reddish-brown				
25		12		21	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	- with black ferrous stains and gypsum crystals below a depth of about 30 feet				
	CLAY, sandy, lean, very stiff, light brown				
35					70
	CLAY, fat, with sand, stiff, light reddish-brown				



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-228a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-227

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16484417.32440; E 1329207.55159

SURFACE ELEVATION: 38.26 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, with sand, stiff, light reddish-brown *(continued)*				32	79
45								
			- becomes reddish-brown in color below a depth of about 47 feet					
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 22 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-228b

LOG OF BORING NO. DP-228

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16483984.83980; E 1329521.87391

SURFACE ELEVATION: 38.34 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, sandy, lean, very stiff, brown			23	55
5	FILL: CLAY, lean, very stiff, brown		103	21	92
10	CLAY, lean, with sand, very stiff, brown				95
20					82
25	CLAY, fat, firm, brown to reddish-brown	7			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
	- very stiff below 30 feet				
30	- with black ferrous stains below a depth of about 30 feet			37	96
35	- becomes light brown in color below a depth of about 35 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-229a

LOG OF BORING NO. DP-228

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16483984.83980; E 1329521.87391

SURFACE ELEVATION: 38.34 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, firm, brown to reddish-brown *(continued)*					
45								
			CLAY, lean, very stiff, reddish-brown				26	93
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 24 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-229b

LOG OF BORING NO. DP-229

The Lower Rio Grande Flood Control Project
Cameron County, Texas

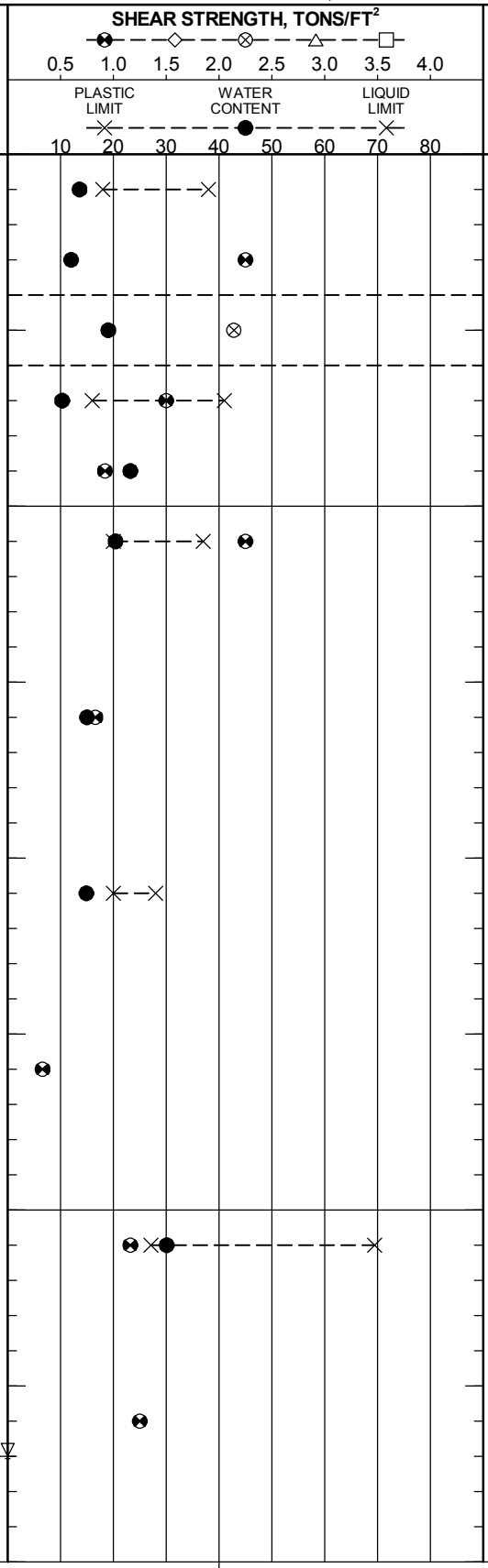
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16483550.30660; E 1329843.84171

SURFACE ELEVATION: 38.16 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, sandy, lean, hard, brown			20	67
	- with calcareous nodules below a depth of about 2 feet				
5	FILL: CLAY, fat, hard, dark brown, with calcareous nodules		105		
	FILL: CLAY, lean, very stiff to stiff, brown			25	98
					97
10	CLAY, lean, hard to soft, brown to dark brown, with calcareous nodules			17	98
15					
20				8	98
25	- firm 25 to 27 feet				
30	CLAY, fat, very stiff, brown to light brown, with gypsum crystals		103	42	100
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35					



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	37 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/13/2008	**DATE MEASURED:**	12/13/2008	**FIGURE:**	A-230a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-229

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16483550.30660; E 1329843.84171

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 38.16 ft					
			CLAY, fat, very stiff, brown to light brown, with gypsum crystals *(continued)*					96
45								
			SAND, clayey, loose, brown					
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 35 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 37 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	37 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/13/2008	**DATE MEASURED:**	12/13/2008	**FIGURE:**	A-230b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-230

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16482747.80010; E 1330468.73715

SURFACE ELEVATION: 38.04 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules			9	94
5	FILL: CLAY, fat, very stiff, brown, with gypsum nodules				
	CLAY, lean, very stiff, brown		104		94
				9	95
10					99
15	- with calcareous nodules below a depth of about 15 feet				
20				8	96
25	CLAY, fat, very stiff, brown			29	100
30	SAND, silty, medium dense, light brown to brown	23			
35		22			15
	Driller's Note: Converted to mud rotary drilling method at a depth of about 36-1/2 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	38 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/13/2008	**DATE MEASURED:**	12/13/2008	**FIGURE:**	A-231a

LOG OF BORING NO. DP-230

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16482747.80010; E 1330468.73715

SURFACE ELEVATION: 38.04 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, light brown to brown *(continued)*	11				
45								
				28				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 40 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 38 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	38 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/13/2008	**DATE MEASURED:**	12/13/2008	**FIGURE:**	A-231b

LOG OF BORING NO. DP-231

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16482249.78530; E 1329941.96308

SURFACE ELEVATION: 37.84 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, sandy, lean, very stiff, brown, with calcareous nodules			15	58
	FILL: CLAY, lean, with sand, very stiff, brown, with calcareous nodules		110		
5				19	84
	CLAY, sandy, lean, very stiff, brown, with calcareous nodules				69
10	CLAY, lean, very stiff, brown, with calcareous nodules				
15				13	99
20					
	- firm 25 to 27 feet				
25				14	94
30	SAND, silty, loose to very loose, light brown to brown	7			
35		2			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 36-1/2 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	35 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/13/2008	**DATE MEASURED:**	12/13/2008	**FIGURE:**	A-232a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-231

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16482249.78530; E 1329941.96308

SURFACE ELEVATION: 37.84 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, dense, brown	30				15
45								
				33				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 35 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	35 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/13/2008	**DATE MEASURED:**	12/13/2008	**FIGURE:**	A-232b

LOG OF BORING NO. DP-232

The Lower Rio Grande Flood Control Project
Cameron County, Texas

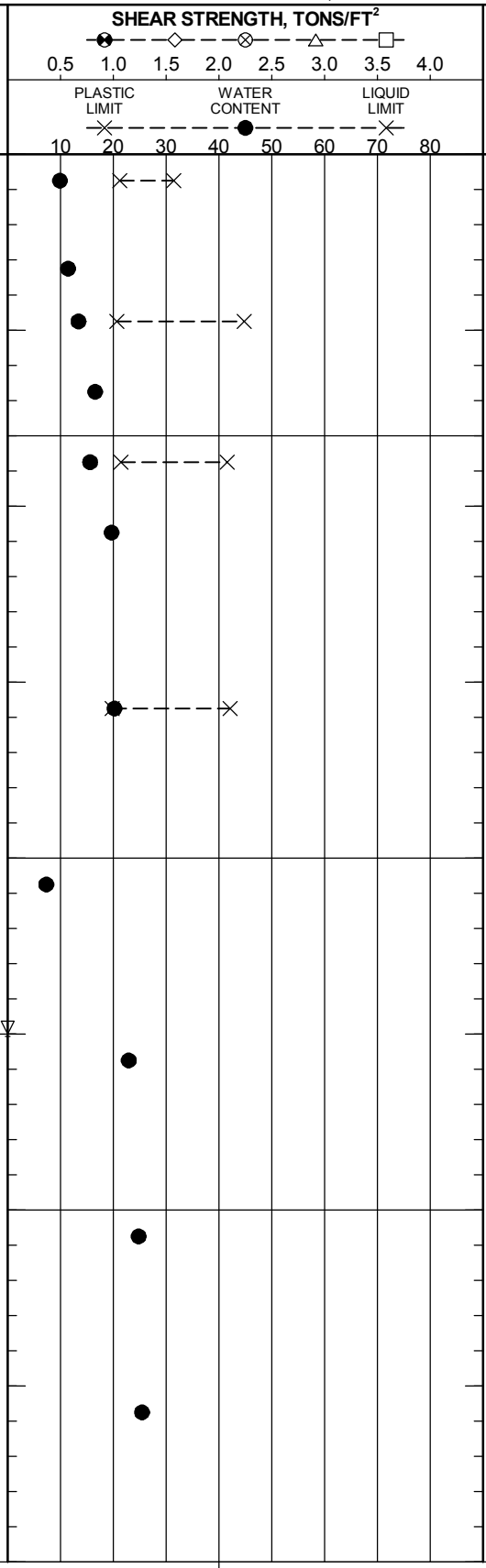
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16481238.64060; E 1330015.19265

SURFACE ELEVATION: 37.20 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff to very stiff, brown	18		10	
		13			93
5		16		24	
		17			95
	CLAY, lean, stiff, dark brown, with black ferrous stains	10		21	
10		9			100
15	- with orange ferrous stains below a depth of about 15 feet	12		22	
20	SAND, silty, medium dense to loose, light brown	13			33
25		7			11
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, poorly-graded, medium dense, brown, with silt	19			17
35		16			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/10/2008	**DATE MEASURED:**	12/10/2008	**FIGURE:**	A-233a

LOG OF BORING NO. DP-232

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16481238.64060; E 1330015.19265

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 37.20 ft					
			SAND, silty, medium dense, brown	19				
45								
				26				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/10/2008	**DATE MEASURED:**	12/10/2008	**FIGURE:**	A-233b

LOG OF BORING NO. DP-233

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16480668.14990; E 1330829.26981

SURFACE ELEVATION: 37.48 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules				
				18	88
5					
				18	98
	FILL: CLAY, fat, hard, brown		107		
10	CLAY, lean, hard, brown, with calcareous nodules				
				22	94
15			108	24	97
20				23	
25	SAND, silty, medium dense, light brown	20			21
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		21			
35		26			13

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/14/2008	**DATE MEASURED:**	12/14/2008	**FIGURE:**	A-234a

LOG OF BORING NO. DP-233

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16480668.14990; E 1330829.26981

SURFACE ELEVATION: 37.48 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, light brown *(continued)*	21				
45			SAND, with silt, medium dense, light brown					
				25				12
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/14/2008	**DATE MEASURED:**	12/14/2008	**FIGURE:**	A-234b

LOG OF BORING NO. DP-234

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16480125.09470; E 1331724.44793

SURFACE ELEVATION: 37.25 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to hard, brown, with calcareous nodules			23	88
			107		
5				25	
					99
	CLAY, lean, very stiff, brown, with calcareous nodules				
10				21	96
15					97
20	- becomes brown in color below a depth of about 20 feet				99
25	- becomes grayish-brown in color below a depth of about 25 feet Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	24		29	95
30					
35	CLAY, sandy, lean, very stiff, grayish-brown				56

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/14/2008	**DATE MEASURED:**	12/14/2008	**FIGURE:**	A-235a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-234

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16480125.09470; E 1331724.44793

SURFACE ELEVATION: 37.25 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, sandy, lean, very stiff, grayish-brown *(continued)*		108		28	85
45								
			- becomes brown in color below a depth of about 47 feet					
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 29.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/14/2008	**DATE MEASURED:**	12/14/2008	**FIGURE:**	A-235b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-235

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16479660.72940; E 1332050.71385

SURFACE ELEVATION: 36.68 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown			21	
					95
	- with gravel below a depth of about 4 feet		112		93
				22	92
10	CLAY, lean, very stiff, dark brown				97
15					99
20	CLAY, fat, very stiff to stiff, reddish-brown, with black ferrous stains			35	98
25		19			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30					
35					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-236a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-235

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16479660.72940; E 1332050.71385

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0; PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT: 10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 36.68 ft					
			CLAY, lean, very stiff, reddish-brown				21	91
45								
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring remained uncaved. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-236b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-236

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16478699.15290; E 1332030.69794

SURFACE ELEVATION: 36.53 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown	34	
5		31	96
	CLAY, lean, very stiff, brown		96
10			99
15			
	CLAY, fat, very stiff, brown		
20		47	98
25	CLAY, sandy, lean, firm, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet		
30	CLAY, lean, with sand, stiff to very stiff, grayish-brown to reddish-brown, with black and orange ferrous stains		
35			71

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

BLOWS PER FT

UNIT DRY WIEGHT, pcf

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-237a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-236

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16478699.15290; E 1332030.69794

SURFACE ELEVATION: 36.53 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, with sand, stiff to very stiff, grayish-brown to reddish-brown, with black and orange ferrous stains *(continued)* - with calcareous nodules below a depth of about 40 feet		107		21	
45			CLAY, lean, very stiff, reddish-brown, with black and orange ferrous stains and calcareous nodules					94
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 27 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-237b

LOG OF BORING NO. DP-237

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16477711.78780; E 1331831.68948

SURFACE ELEVATION: 36.07 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown				88
				26	
5					98
	CLAY, fat, very stiff, brown			45	100
			91		
10					
15				46	
20	- becomes reddish-brown in color and with black ferrous stains below a depth of about 20 feet				
25	- becomes brown in color below a depth of about 25 feet				95
30	CLAY, sandy, lean, stiff, brown			18	67
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35	CLAY, fat, very stiff, reddish-brown, with calcareous nodules and black ferrous stains				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-238a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-237

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16477711.78780; E 1331831.68948

SURFACE ELEVATION: 36.07 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, reddish-brown, with calcareous nodules and black ferrous stains *(continued)*					
45								
								95
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-238b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-238

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476797.63780; E 1332016.94993

SURFACE ELEVATION: 36.05 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown				91
	- with calcareous nodules below a depth of about 2 feet		96		
5	FILL: CLAY, lean, hard, brown			17	95
	CLAY, fat, very stiff, brown			30	99
10	- with silt seams 8 to 10 feet				
15	- becomes reddish-brown in color below a depth of about 15 feet				
20	- with orange ferrous stains below a depth of about 20 feet			35	98
25					
30	- becomes grayish-brown in color below a depth of about 30 feet				
35	CLAY, lean, with sand, very stiff, light grayish-brown			23	74
	Driller's Note: Converted to mud rotary drilling method at a depth of about 37 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	33 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-239a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-238

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476797.63780; E 1332016.94993

SURFACE ELEVATION: 36.05 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, sandy, grayish-brown				14	61
45			SAND, silty, dense, light grayish-brown					
				36				17
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 35 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 33 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 44 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	33 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-239b

LOG OF BORING NO. DP-239

The Lower Rio Grande Flood Control Project
Cameron County, Texas

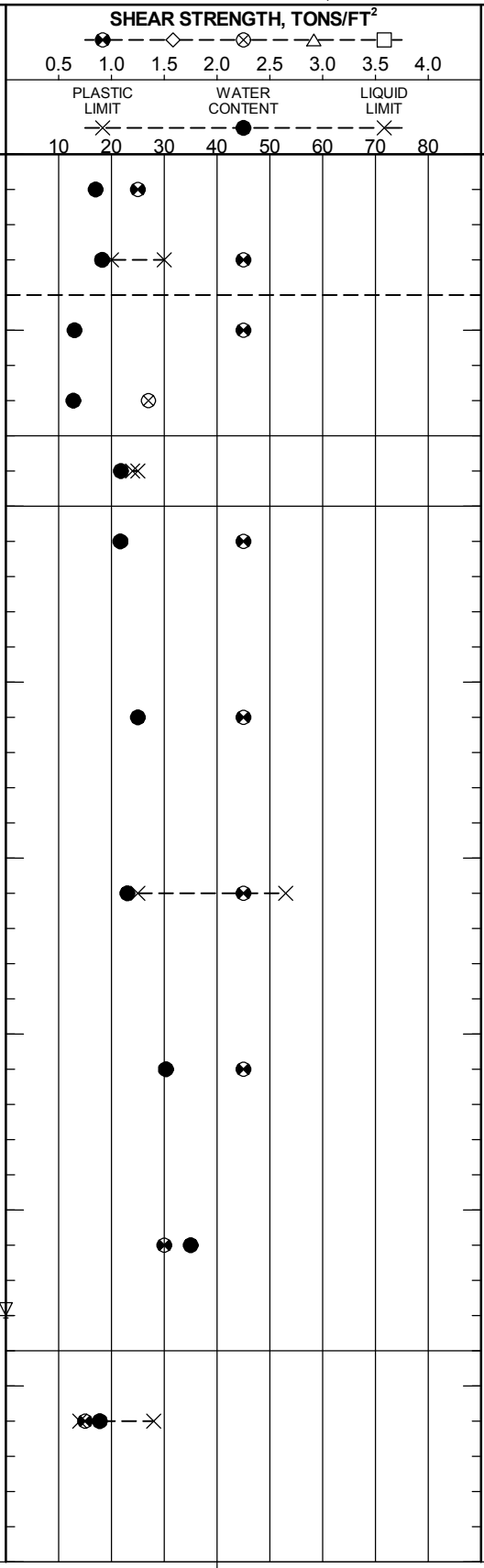
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476593.43420; E 1333084.86713

SURFACE ELEVATION: 36.32 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, very stiff, brown			10	82
5	FILL: CLAY, lean, very stiff, brown to light brown, with black ferrous stains		102		93
	SILT, loose, brown			1	97
10	CLAY, fat, hard to very stiff, brown, with black ferrous stains				98
15					
20	- becomes reddish-brown in color and with gypsum noduiles below a depth of about 20 feet			28	
25					98
30					
35	CLAY, sandy, lean, stiff, reddish-brown, with orange ferrous stains Driller's Note: Converted to mud rotary drilling method at a depth of about 37 feet			14	57



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	33 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-240a

LOG OF BORING NO. DP-239

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476593.43420; E 1333084.86713

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 36.32 ft					
			SAND, silty, medium dense, reddish-brown					
45								
				18				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 34 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 33 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 47 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	33 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-240b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-240

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476572.46760; E 1333988.82798

SURFACE ELEVATION: 35.60 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown				
	- with black ferrous stains below a depth of about 4 feet			26	96
5			103	22	
	CLAY, lean, hard to very stiff, brown				91
10					98
15					
20					
25	CLAY, lean, with sand, firm, reddish-brown, with black ferrous stains and gypsum crystals				
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30				31	71
	CLAY, lean, stiff to very stiff, reddish-brown				
35		11			96

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-241a

LOG OF BORING NO. DP-240

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476572.46760; E 1333988.82798

SURFACE ELEVATION: 35.60 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, sandy, lean, stiff to very stiff, grayish-brown	14				
45								
				25			23	52
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23 feet. Upon completion of the drilling operations, the boring remained uncaved.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-241b

LOG OF BORING NO. DP-241

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475996.23290; E 1334916.08772

SURFACE ELEVATION: 34.63 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, hard, brown	116	27	79
5				
	CLAY, lean, hard, light brown to brown		23	98
10				
15	CLAY, silty, hard, light brown		6	86
20	CLAY, fat, hard, brown to reddish-brown, with black ferrous stains			98
25	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet			
30	CLAY, fat, with sand, very stiff, dark brown to reddish-brown		55	75
35				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	31 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-242a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-241

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475996.23290; E 1334916.08772

SURFACE ELEVATION: 34.63 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, with sand, very stiff, dark brown to reddish-brown *(continued)* - becomes light brown in color below a depth of about 40 feet	11				
45								
			SAND, clayey, dense, light brown	33			23	15
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 32 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 31 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 39.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	31 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-242b

LOG OF BORING NO. DP-242

The Lower Rio Grande Flood Control Project
Cameron County, Texas

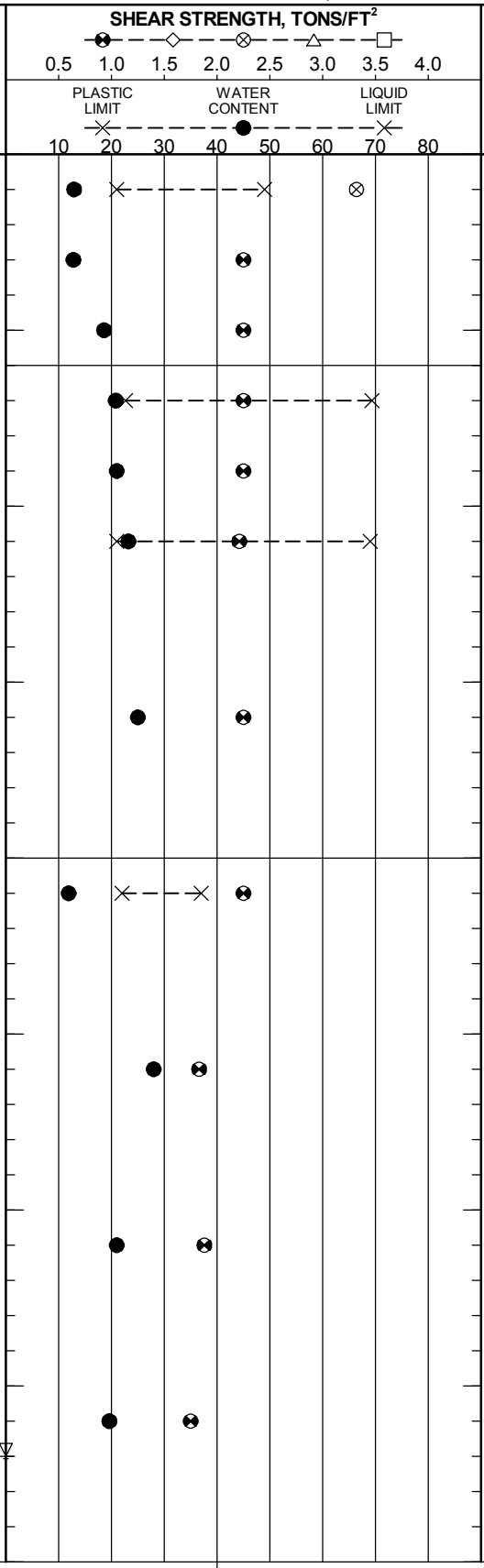
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475453.67280; E 1335610.63559

SURFACE ELEVATION: 34.28 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, hard, brown, with black ferrous stains		110	28	
					76
5					82
	CLAY, fat, hard, brown, with calcareous nodules		104	46	92
10	- becomes light brown in color below a depth of about 10 feet			48	99
15	- becomes brown in color and with gypsum nodules below a depth of about 15 feet				
20	CLAY, lean, hard to very stiff, light brown, with black ferrous stains			15	99
25	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30	- becomes light reddish-brown in color below a depth of about 30 feet				
35	- with black ferrous stains and gypsum nodules below a depth of about 10 feet				95



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	37 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-243a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-242

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475453.67280; E 1335610.63559

SURFACE ELEVATION: 34.28 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, hard to very stiff, light brown, with black ferrous stains *(continued)*		98		27	95
45								
			SAND, clayey, medium dense, reddish-brown	16				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 38 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 37 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 35 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	37 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-243b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-243

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475467.03730; E 1336585.25348

SURFACE ELEVATION: 34.48 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown			35	94
	- with gravel below a depth of about 2 feet				98
5			101	50	95
	CLAY, fat, hard to very stiff, brown, with black and orange ferrous stains			57	98
					97
10					
15				51	95
20	- becomes reddish-brown in color below a depth of about 20 feet				
25	CLAY, sandy, lean, stiff, reddish-brown				
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30	CLAY, lean, very stiff to stiff, light brown, with calcareous nodules and black ferrous stains				
35	- becomes reddish-brown in color below a depth of about 35 feet				78

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-244a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-243

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475467.03730; E 1336585.25348

SURFACE ELEVATION: 34.48 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, reddish-brown, with black ferrous stains				40	95
45								
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 36 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-244b

LOG OF BORING NO. DP-244

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475504.89170; E 1337759.00192

SURFACE ELEVATION: 33.74 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, dark brown, with calcareous nodules			32	98
5			100	46	99
	CLAY, fat, hard, dark brown, with calcareous nodules			45	99
10					
15	- with black ferrous stains below a depth of about 15 feet				99
20	- becomes brown in color below a depth of about 20 feet			NP	96
25	SILT, loose, brown				94
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30	CLAY, fat, very stiff, brown			47	99
35	- with calcareous nodules below a depth of about 35 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	29 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-245a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-244

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475504.89170; E 1337759.00192

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 33.74 ft					
			CLAY, fat, very stiff, brown *(continued)* - becomes reddish-brown in color below a depth of about 40 feet					
45								
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 30 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 29 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 40 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	29 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-245b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-245

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 16475507.44980; E 1338177.60198

SURFACE ELEVATION: 34.18 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown, with calcareous nodules				100
				40	99
5				36	96
	CLAY, fat, hard, brown, with calcareous nodules		108		
					97
10				14	84
15				27	72
20	CLAY, lean, with sand, very stiff to stiff, brown				99
25					
30	- becomes light brown and black ferrous stains below a depth of about 30 feet				
35	CLAY, lean, very stiff, light brown, with calcareous nodules and black ferrous stains				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	28.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-246a

LOG OF BORING NO. DP-245

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 16475507.44980; E 1338177.60198

SURFACE ELEVATION: 34.18 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, very stiff, light brown, with calcareous nodules and black ferrous stains *(continued)*					
45								
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 30 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 28.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 44 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	28.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-246b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-246

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

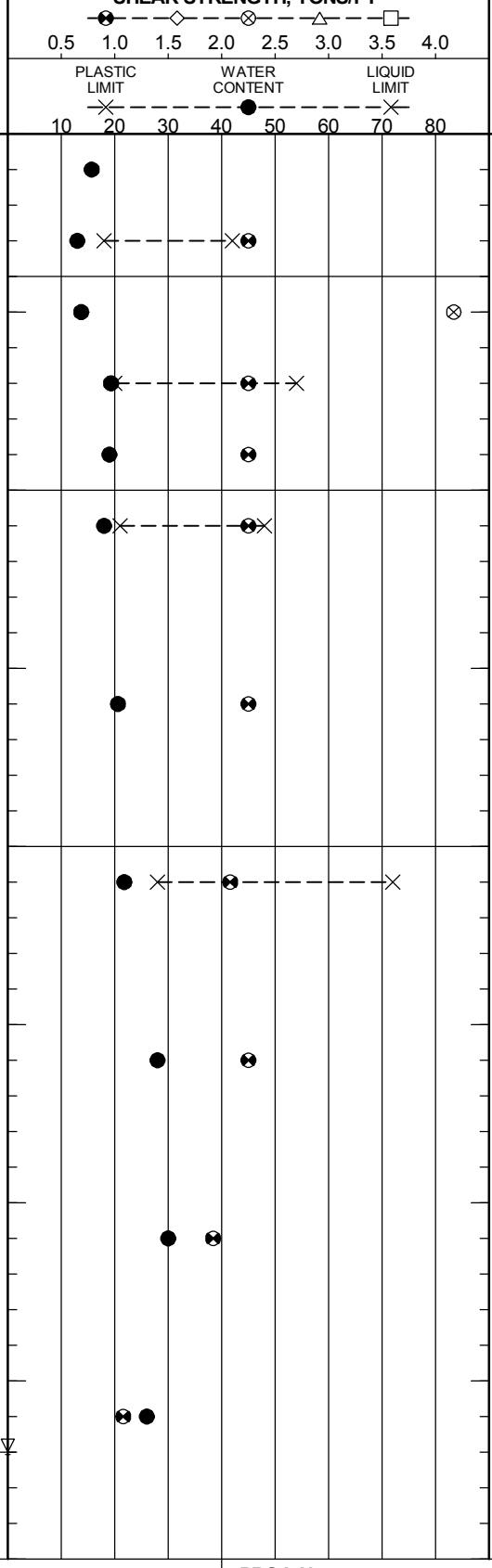
LOCATION: N 16475526.10260; E 1338780.79147

SURFACE ELEVATION: 33.93 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules			24	96
5	CLAY, fat, hard, brown, with calcareous nodules and black ferrous stains		113	34	97
10	CLAY, lean, hard, brown, with orange ferrous stains			27	98
15					96
20	CLAY, fat, hard to very stiff, light brown, with black and orange ferrous stains, and calcareous nodules			44	99
25					
30	- with gypsum nodules below a depth of about 30 feet				
35	Driller's Note: Converted to mud rotary drilling method at a depth of about 37 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	37 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-247a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-246

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475526.10260; E 1338780.79147

SURFACE ELEVATION: 33.93 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, hard to very stiff, light brown, with black and orange ferrous stains, and calcareous nodules *(continued)*					
45								
			- becomes light reddish-brown in color below a depth of about 47 feet					
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 37 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 30 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	37 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-247b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-247

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 16475529.06250; E 1339289.63764

SURFACE ELEVATION: 34.18 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, hard, brown, with calcareous nodules				81
			109		
5				21	94
	CLAY, lean, hard, brown to dark brown, with calcareous nodules				99
				15	100
10	- with black ferrous stains below a depth of about 10 feet			41	99
15				35	100
20	CLAY, fat, hard to very stiff, brown to dark brown, with black ferrous stains and calcareous nodules				
25					
30	CLAY, sandy, lean, very stiff, dark brown				
35	CLAY, fat, very stiff, dark brown				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	40 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-248a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-247

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 16475529.06250; E 1339289.63764

SURFACE ELEVATION: 34.18 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff, dark brown *(continued)*					
45								
			SAND, silty, medium dense, dark brown					
				11				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 40 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 40 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 41 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	40 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-248b

LOG OF BORING NO. DP-248

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 16475534.82090; E 1339803.33085

SURFACE ELEVATION: 33.85 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, dark brown, with calcareous nodules			29	97
					99
5				34	99
	CLAY, fat, hard, dark brown, with calcareous nodules		110		
				31	96
10				37	100
15					11
20	SILT, very stiff, light brown				
25	CLAY, fat, very stiff, brown, with calcareous nodules				
30					
35	SAND, with silt, poorly-graded, medium dense, dark brown	25			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-249a

LOG OF BORING NO. DP-248

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 16475534.82090; E 1339803.33085

SURFACE ELEVATION: 33.85 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown *(continued)*	29				
45								
				28				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 34 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 27.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 35.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-249b

LOG OF BORING NO. DP-249

The Lower Rio Grande Flood Control Project
Cameron County, Texas

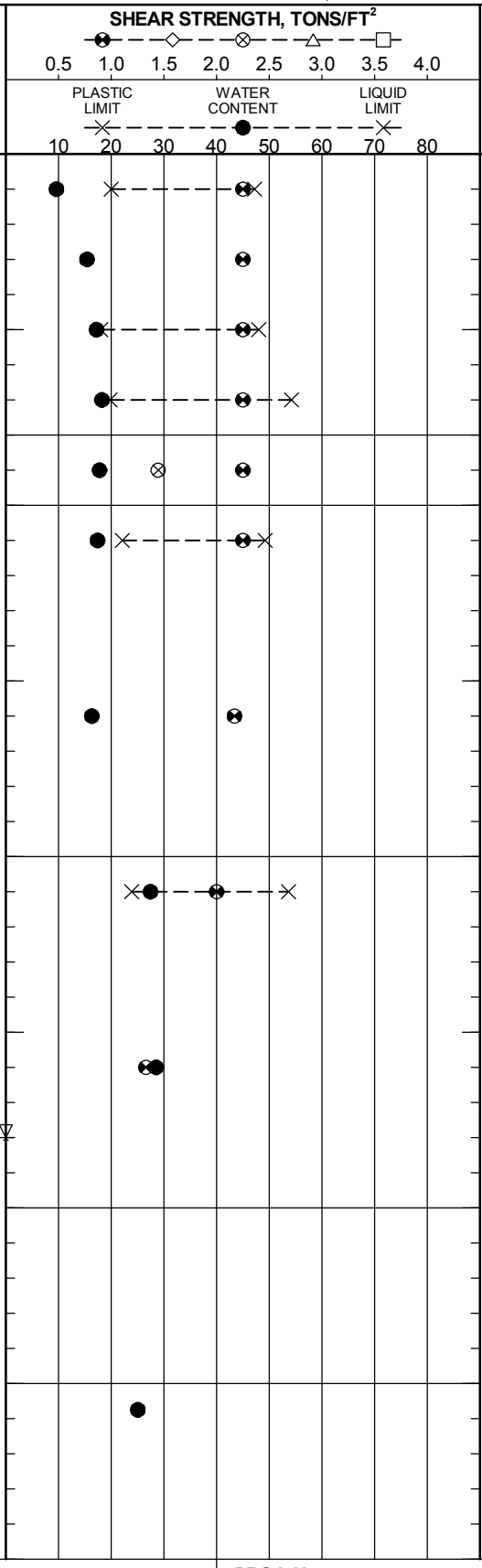
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 16475536.28120; E 1340287.19197

SURFACE ELEVATION: 33.31 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules			27	99
					98
5				30	97
				34	
	CLAY, lean, hard, brown, with calcareous nodules		107		
10	CLAY, fat, hard to very stiff, brown, with calcareous nodules and black ferrous stains			27	100
15					100
20	CLAY, lean, very stiff, brown			30	100
25					7
30	CLAY, fat, very stiff				
35	SAND, with silt, poorly-graded, medium dense, dark brown	13			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	28 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-250a

LOG OF BORING NO. DP-249

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: N 16475536.28120; E 1340287.19197

SURFACE ELEVATION: 33.31 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown *(continued)*	24				
45								
			CLAY, fat, very stiff, light brown, with black ferrous stains	24				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 35.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 28 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 36 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	28 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-250b

LOG OF BORING NO. DP-250

The Lower Rio Grande Flood Control Project
Cameron County, Texas

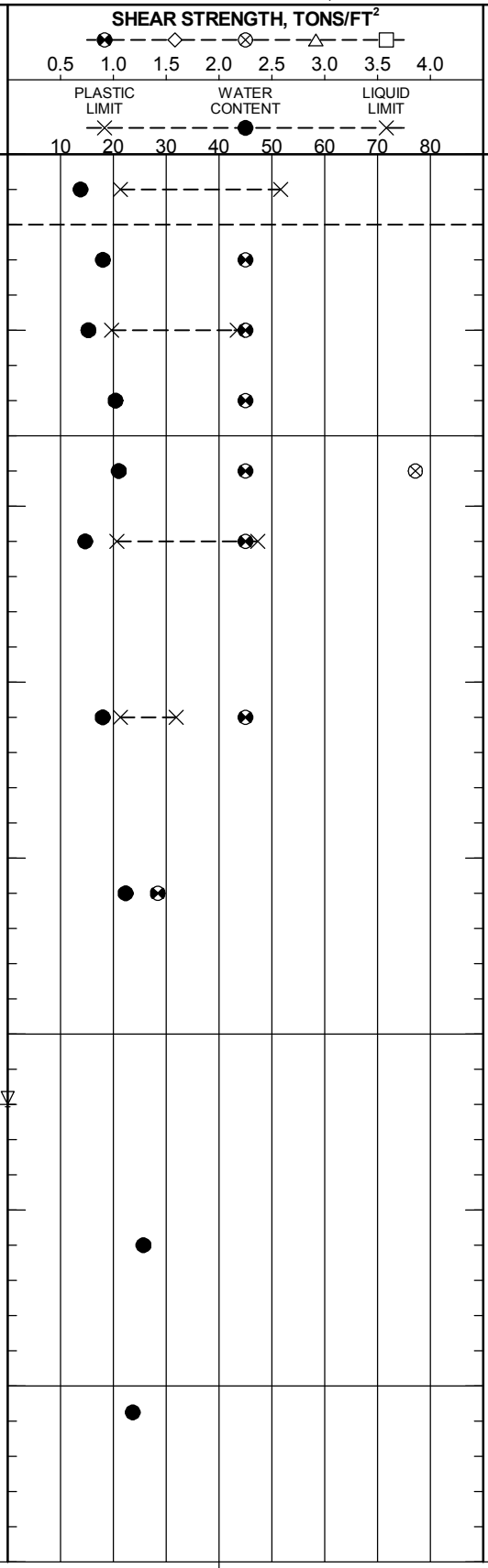
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475749.85960; E 1340545.18304

SURFACE ELEVATION: 33.02 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown			31	94
	FILL: CLAY, lean, hard, brown, with calcareous nodules				99
5				23	95
					99
	CLAY, lean, hard to very stiff, dark brown, with calcareous nodules		105		
10	- becomes light brown in color below a depth of about 10 feet			26	100
15				11	
20	- with black ferrrous stains below a depth of about 20 feet				13
25	SAND, clayey, light brown, with orange ferrous stains Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30					
35	SAND, silty, dense to medium dense, dark brown	40			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-251a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-250

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475749.85960; E 1340545.18304

SURFACE ELEVATION: 33.02 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, dense to medium dense, dark brown *(continued)*	29				
45								
			CLAY, fat, very stiff, brown, with black ferrous stains	21				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 27 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 21.5 feet.
Backfilled with cement/bentonite grout.
Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	27 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-251b

LOG OF BORING NO. DP-251

The Lower Rio Grande Flood Control Project
Cameron County, Texas

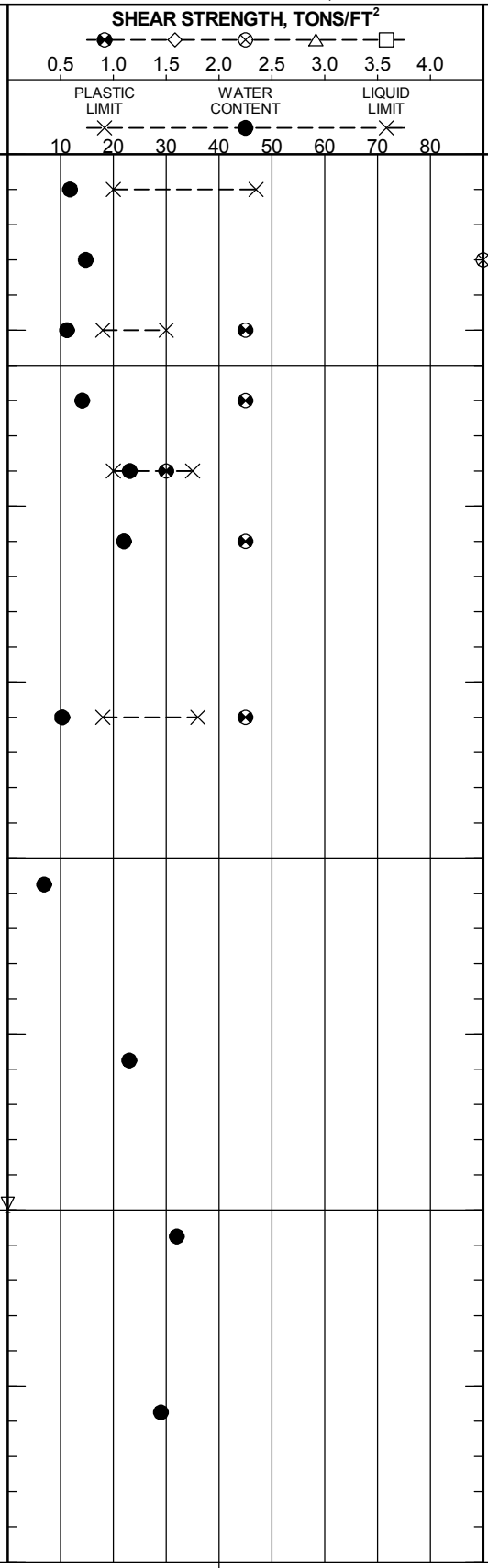
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476279.09850; E 1340756.64462

SURFACE ELEVATION: 33.51 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules			27	90
			110		
5				12	93
	CLAY, lean, very stiff, light brown, with calcareous nodules, and black and orange ferrous stains				95
				15	95
10	- becomes dark brown in color below a depth of about 10 feet				
15				18	98
20	CLAY, sandy, lean, very stiff, light brown	21			60
25		33			
30	SAND, clayey, medium dense to dense to medium dense, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet	25			
35		48			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-252a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-251

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476279.09850; E 1340756.64462

SURFACE ELEVATION: 33.51 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, clayey, medium dense to dense to medium dense, brown *(continued)*	15				
45								
			CLAY, fat, very stiff, light grayish-brown, with black ferrous stains	22				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-252b

LOG OF BORING NO. DP-252

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476741.57670; E 1340942.02331

SURFACE ELEVATION: 32.64 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, dark brown			33	86
	FILL: CLAY, fat, with sand, very stiff, dark brown, calcareous nodules, and black ferrous stains				81
5	CLAY, fat, hard, dark brown, with gypsum nodules			34	96
10	- becomes light brown in color and with calcareous nodules below a depth of about 10 feet		104		
	CLAY, lean, hard, light brown			19	98
15			113		
20	SAND, silty, medium dense to dense, brown			NP	47
25		26			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		18			21
35		40			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-253a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-252

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476741.57670; E 1340942.02331

SURFACE ELEVATION: 32.64 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, brown *(continued)*	26				
45								
			CLAY, fat, very stiff, reddish-brown				33	98
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 20.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	26.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-253b

LOG OF BORING NO. DP-253

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16477623.45860; E 1341305.33612

SURFACE ELEVATION: 32.84 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown			33	92
5					95
	FILL: CLAY, lean, very stiff, dark brown			29	94
10	CLAY, fat, very stiff, reddish-brown		105		92
15					
20	SAND, silty, medium dense, brown	14			14
25		11		NP	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, with silt, poorly-graded, medium dense, brown	10			9
35		19			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-254a

LOG OF BORING NO. DP-253

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16477623.45860; E 1341305.33612

SURFACE ELEVATION: 32.84 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown *(continued)*	22				NP	
45									
				23					7
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-254b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-254

The Lower Rio Grande Flood Control Project
Cameron County, Texas

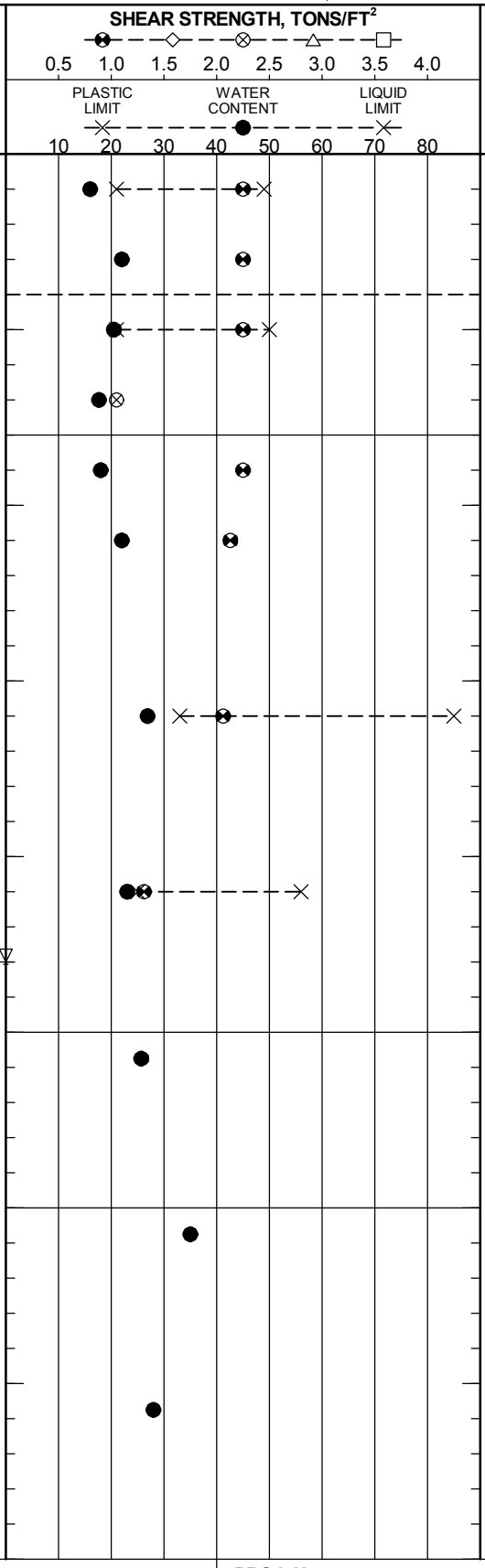
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16477921.49980; E 1342134.98399

SURFACE ELEVATION: 33.64 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with black ferrous stains			28	
5	FILL: CLAY, fat, very stiff, dark brown, with black ferrous stains		103	29	89
10	CLAY, fat, very stiff, dark brown, with black ferrous stains				90
15	- becomes reddish-brown in color and with gypsum nodules below a depth of about 15 feet			52	98
20				31	
25	CLAY, lean, with sand, stiff, light brown Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet	11			78
30	SAND, silty, loose to very dense, brown	9			
35		11			24



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-255a

LOG OF BORING NO. DP-254

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16477921.49980; E 1342134.98399

SURFACE ELEVATION: 33.64 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, silty, loose to very dense, brown *(continued)*	25				
45								
				50/9"				
50			Boring terminated at a depth of about 49.8 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23 feet. Upon completion of the drilling operations, the boring remained uncaved.					
			Backfilled with cement/bentonite grout.					
			Elevation and coordinates provided by Client.					
60								
65								
70								
75								

Shear strength legend: PLASTIC LIMIT; WATER CONTENT; LIQUID LIMIT. Scale: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-255b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-255

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16477945.91100; E 1343251.86670

SURFACE ELEVATION: 32.66 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown, with black ferrous stains		100	30	96
5					
	CLAY, lean, very stiff to stiff, brown			14	94
10					
15					95
20	- becomes reddish-brown and with black ferrous stains below a depth of about 20 feet			24	94
25		11			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	CLAY, fat, with sand, stiff to very stiff, reddish-brown to brown	12		29	
35		16			73

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-256a

LOG OF BORING NO. DP-255

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16477945.91100; E 1343251.86670

SURFACE ELEVATION: 32.66 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown	18					13
45									
				27					
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 22.5 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	22.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-256b

LOG OF BORING NO. DP-256

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16477253.95010; E 1344381.65819

SURFACE ELEVATION: 32.89 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, hard, brown				81
	FILL: CLAY, fat, hard, brown			34	
5	- with black ferrous stains below a depth of about 4 feet				
					98
			104		
10	CLAY, lean, very stiff to stiff, brown			27	93
15					
20	- becomes dark brown in color below a depth of about 20 feet				86
25	- becomes light brown in color and with orange ferrous stains below a depth of about 25 feet	20		14	
30	- with black ferrous stains below a depth of about 30 feet				99
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-257a

LOG OF BORING NO. DP-256

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16477253.95010; E 1344381.65819

SURFACE ELEVATION: 32.89 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, very stiff to stiff, brown *(continued)* - becomes grayish-brown in color below a depth of about 40 feet	11			18	
45								
			SAND, silty, medium dense, light brown	26				19
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 31 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-257b

LOG OF BORING NO. DP-257

The Lower Rio Grande Flood Control Project
Cameron County, Texas

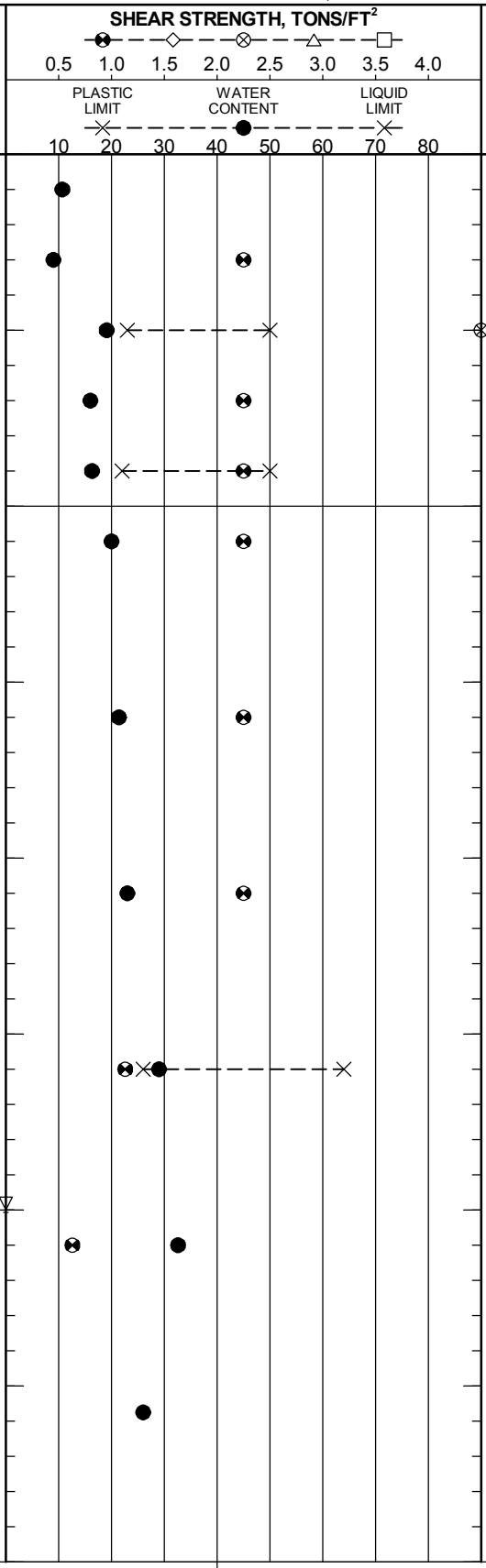
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476692.38920; E 1344550.77017

SURFACE ELEVATION: 32.76 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown				90
5	- with black ferrous stains below a depth of about 4 feet		108	27	
				28	99
10	CLAY, fat, very stiff, light brown, with gypsum nodules				
15					99
20					
25				38	97
30	- stiff 28 to 30 feet				96
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35		21			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-258a

LOG OF BORING NO. DP-257

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476692.38920; E 1344550.77017

SURFACE ELEVATION: 32.76 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, sandy, lean, stiff to very stiff, gray to light brown	11				
45								
50							26	58
			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 46 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-258b

LOG OF BORING NO. DP-258

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475742.15360; E 1344427.26577

SURFACE ELEVATION: 32.88 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown to dark brown, with calcareous nodules			31	86
					86
5			112		
				21	87
					91
10	CLAY, fat, hard, brown, with calcareous nodules		104		
15				37	
20		34			90
25	CLAY, lean, very stiff to stiff, brown to reddish-brown, with black ferrous stains	20		17	
30					95
	Driller's Note: Converted to mud rotary drilling method at a depth of about 32 feet				
35					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-259a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-258

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475742.15360; E 1344427.26577

SURFACE ELEVATION: 32.88 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, very stiff to stiff, brown to reddish-brown, with black ferrous stains *(continued)*					95
45								
			CLAY, fat, very stiff, brown, with calcareous nodules					
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 4 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-259b

LOG OF BORING NO. DP-259

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474602.28060; E 1344277.53140

SURFACE ELEVATION: 32.79 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, dark brown to brown, with calcareous nodules				96
			114		
5				32	
					94
	CLAY, fat, hard to very stiff, brown				
10				30	98
15			108		
20	- becomes brown to reddish-brown in color and with black ferrous stains below a depth of about 20 feet				95
25		22			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	CLAY, fat, with sand, very stiff, light brown			40	84
35	CLAY, sandy, lean, very stiff to stiff, light brown, with calcareous nodules and black ferrous stains				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-260a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-259

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474602.28060; E 1344277.53140

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 32.79 ft					
			CLAY, sandy, lean, very stiff to stiff, light brown, with calcareous nodules and black ferrous stains *(continued)*				23	54
45								
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-260b

LOG OF BORING NO. DP-260

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474274.04880; E 1345242.56288

SURFACE ELEVATION: 32.24 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, stiff, brown	10		23	
	CLAY, fat, stiff, brown	12			98
5		9			
		9			97
		11		42	
10	- with orange ferrous stains below a depth of about 10 feet	11			96
15	CLAY, sandy, lean, stiff, brown	12			64
20	CLAY, lean, stiff, brown, with orange ferrous stains	14		27	
25		10			
30		8		16	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet				
35		9			99

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-261a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-260

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474274.04880; E 1345242.56288

SURFACE ELEVATION: 32.24 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, brown	16				9
45								
				22				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 49 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-261b

LOG OF BORING NO. DP-261

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474229.85150; E 1346386.13123

SURFACE ELEVATION: 31.75 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, stiff, brown	12		30	
		11			98
5		9			98
	CLAY, lean, stiff, brown, with black ferrous stains	8		22	
	- with black ferrous stains below a depth of about 8 feet	11			
10		12		23	
15	- with gypsum nodules below a depth of about 15 feet	12			97
20	- becomes reddish-brown in color below a depth of about 20 feet				
25		13		16	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	- becomes grayish-brown in color below a depth of about 30 feet	13			98
35	SAND, silty, medium dense, brown	11			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-262a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-261

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474229.85150; E 1346386.13123

SURFACE ELEVATION: 31.75 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)* - loose 40 to 42 feet	9				13
45								
				24				13
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-262b

LOG OF BORING NO. DP-262

The Lower Rio Grande Flood Control Project
Cameron County, Texas

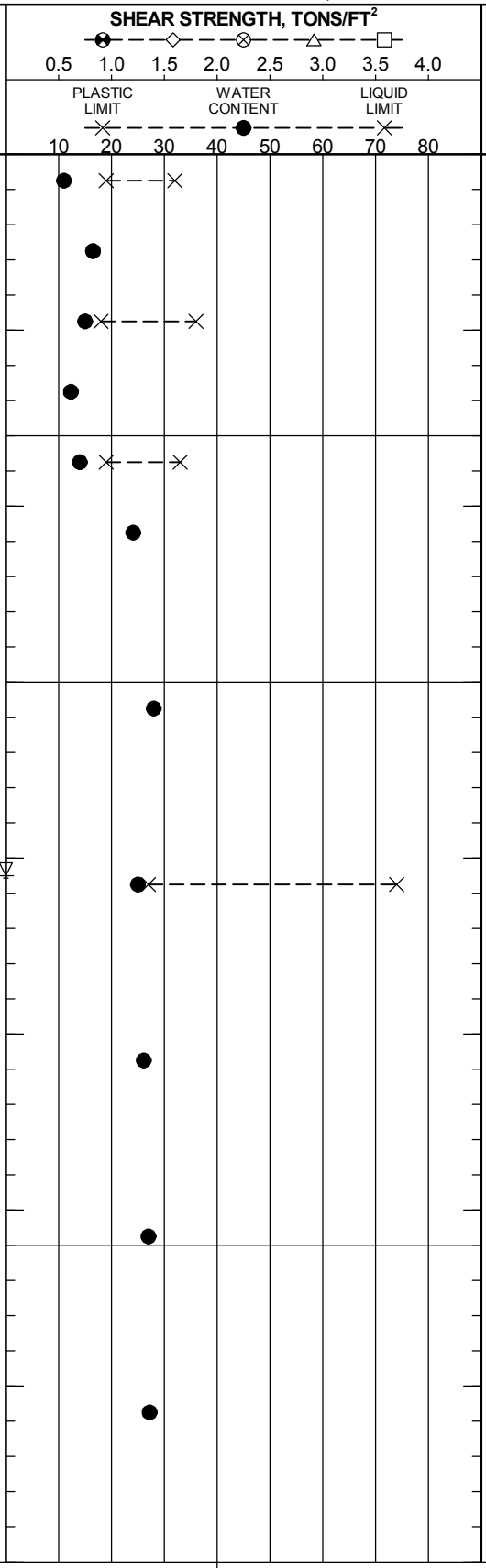
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474353.19820; E 1347271.39992

SURFACE ELEVATION: 31.68 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
			FILL: CLAY, lean, stiff, brown	13		13	
				11			87
5				9		18	
				12			86
			CLAY, lean, firm to stiff, brown to dak brown	7		14	
10				13			97
15			CLAY, fat, stiff, brown, with black ferrous stains and gypsum nodules	12			
20				11		47	
25				11			98
			Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30				14			
			SAND, silty, medium dense, brown				
35				21			22



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-263a

LOG OF BORING NO. DP-262

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474353.19820; E 1347271.39992

SURFACE ELEVATION: 31.68 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, brown *(continued)*	15				13
45								
				21				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 21.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 21.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-263b

LOG OF BORING NO. DP-263

The Lower Rio Grande Flood Control Project
Cameron County, Texas

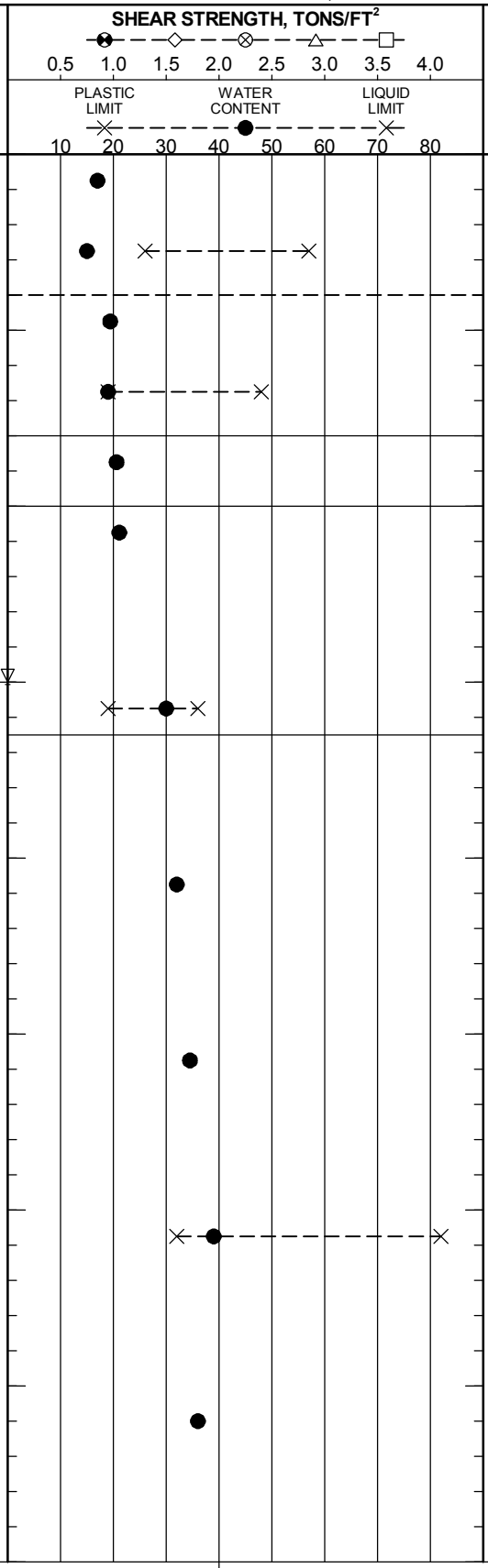
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474528.41660; E 1348268.90042

SURFACE ELEVATION: 31.21 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff to stiff, brown, with gypsum nodules	16			90
		11		31	
5	FILL: CLAY, lean, with sand, stiff to very stiff, brown, with black ferrous stains	13			81
		16		29	
	CLAY, lean, stiff, dark brown, with black ferrous stains	12			88
10	CLAY, sandy, lean, stiff to firm, light brown	10			62
15		7		17	
	CLAY, fat, stiff, brown, with orange ferrous stains				
20		9			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		10			98
30		10		50	
35					



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-264a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-263

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474528.41660; E 1348268.90042

SURFACE ELEVATION: 31.21 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff, brown, with orange ferrous stains *(continued)*	12				100
45								
			SAND, with silt, poorly-graded, loose, brown	9				6
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 16.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 15 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-264b

LOG OF BORING NO. DP-264

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474122.28410; E 1349356.46054

SURFACE ELEVATION: 30.83 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, very stiff to stiff, dark brown, with calcareous nodules	20			82
		14		30	
5	FILL: CLAY, fat, stiff, dark brown	13			95
		10			94
	CLAY, lean, firm, brown	6		18	
10	CLAY, fat, stiff, dark brown to brown, with gypsum nodules and black ferrous stains	15			
15		11			
20		9			96
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25					
30	CLAY, lean, firm, brown, with black ferrous stains	7		24	95
35					

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-265a

LOG OF BORING NO. DP-264

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474122.28410; E 1349356.46054

SURFACE ELEVATION: 30.83 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, clayey, medium dense, brown	14			23	47
45								
				13				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16.5 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/16/2008	**DATE MEASURED:**	12/16/2008	**FIGURE:**	A-265b

LOG OF BORING NO. DP-265

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474182.07040; E 1350310.73950

SURFACE ELEVATION: 30.73 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, dark brown to brown, with calcareous nodules	14			94
		10		26	
5		12			95
		15			
	CLAY, fat, very stiff to stiff, dark brown to brown, with calcareous nodules and black ferrous stains	16		33	
10		15			97
15		12			
	CLAY, lean, firm, brown, with calcareous nodules				
20		7		27	
25			92		92
	Driller's Note: Converted to mud rotary drilling method at a depth of about 27 feet				
30	SAND, clayey, loose, brown				
35	CLAY, sandy, lean, firm, brown, with gypsum nodules	4			56

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-266a

LOG OF BORING NO. DP-265

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474182.07040; E 1350310.73950

SURFACE ELEVATION: 30.73 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, sandy, lean, firm, brown, with gypsum nodules *(continued)*				12	50
45								
			CLAY, lean, firm, brown, with gypsum nodules					93
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 16.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 48.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-266b

LOG OF BORING NO. DP-266

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474347.39370; E 1351268.71382

SURFACE ELEVATION: 30.47 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff to stiff, dark brown, with calcareous nodules	15	31	
		15		96
5		13	41	
		14		94
		14		97
10	CLAY, sandy, fat, brown		34	67
15	SAND, clayey, medium dense, brown	18		16
20	CLAY, lean, with sand, firm to stiff, brown	4		
25	- with black ferrous stains below a depth of about 25 feet	8		
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet			
30				
35	- with calcareous nodules below a depth of about 35 feet	5		

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-267a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-266

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474347.39370; E 1351268.71382

SURFACE ELEVATION: 30.47 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, with sand, firm to stiff, brown *(continued)*				17	79
45								
			CLAY, fat, very stiff, brown to grayish-brown, with gypsum nodules	18				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 15 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 15 feet. Upon completion of the drilling operations, the boring caved-in to a depth of about 15 feet.					
			Backfilled with cement/bentonite grout.					
			Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-267b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-267

The Lower Rio Grande Flood Control Project
Cameron County, Texas

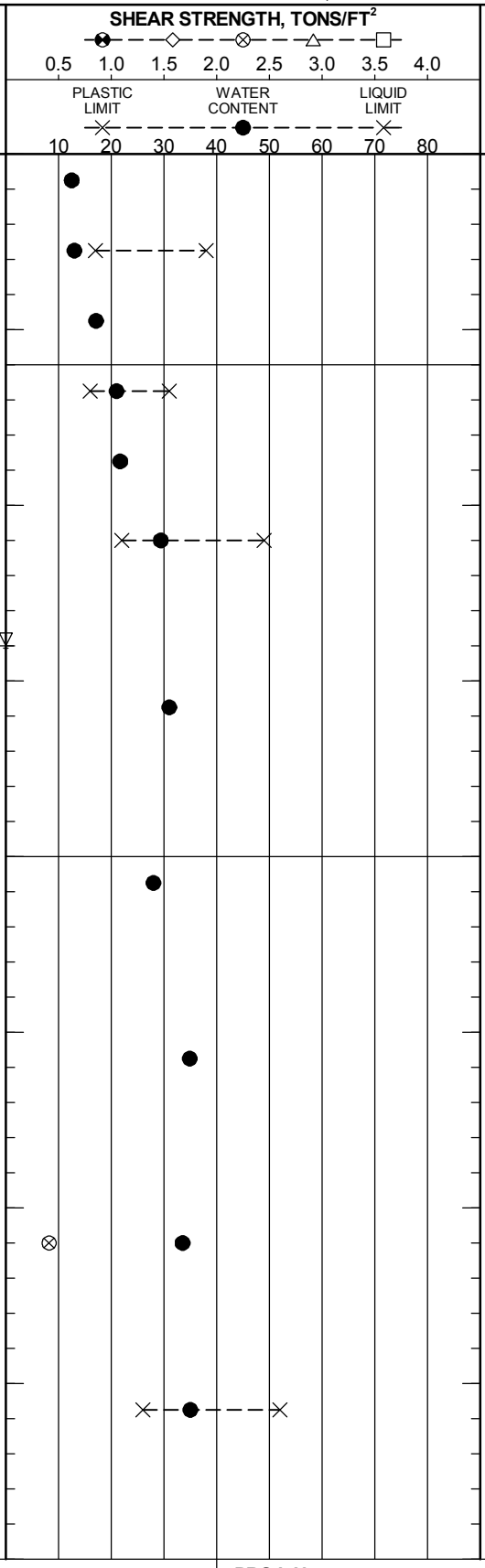
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474618.65600; E 1352320.62962

SURFACE ELEVATION: 29.32 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff to stiff, dark brown, with black ferrous stains	16			88
		13		21	
5		9			92
	CLAY, lean, stiff to firm, brown, with calcareous nodules	11		15	
		6			98
10				27	98
15		4			
20	CLAY, fat, stiff to firm, brown to grayish-brown	10			95
25		8			99
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30			87		
35		4		26	



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-268a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-267

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16474618.65600; E 1352320.62962

SURFACE ELEVATION: 29.32 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, stiff to firm, brown to grayish-brown *(continued)*	4				85
45			- stiff with black ferrous stains below a depth of about 47 feet	10				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 15 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/15/2008	**DATE MEASURED:**	12/15/2008	**FIGURE:**	A-268b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-268

The Lower Rio Grande Flood Control Project
Cameron County, Texas

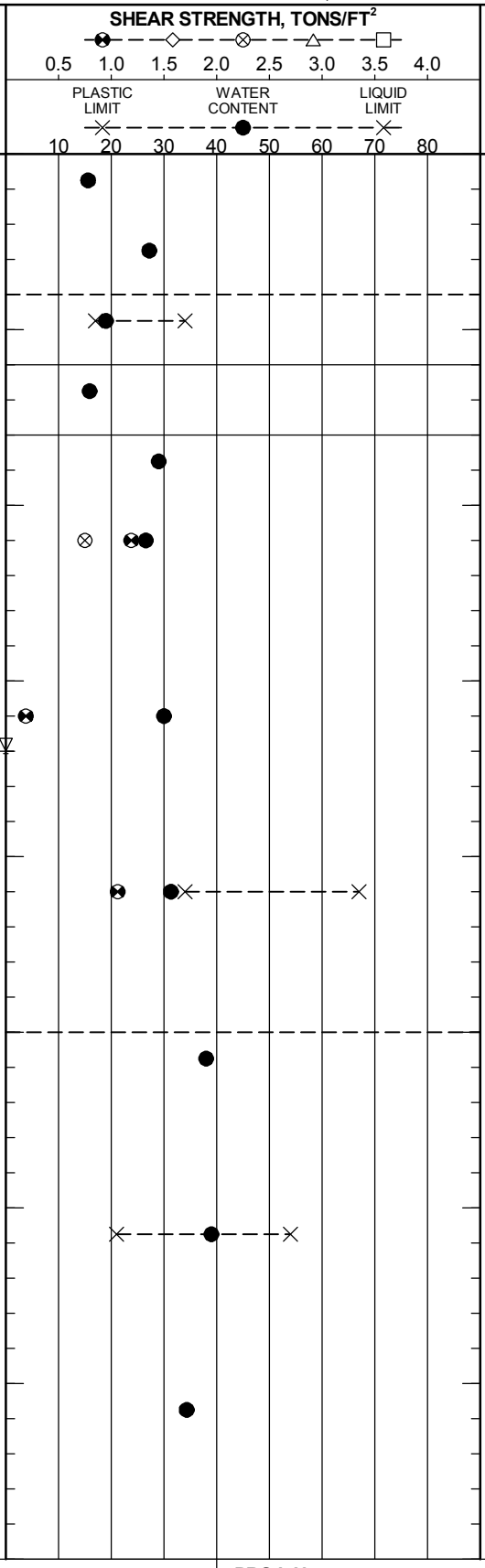
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475315.30630; E 1353023.54397

SURFACE ELEVATION: 28.98 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff to stiff, brown	20			90
		13			95
5	FILL: CLAY, sandy, lean, stiff, brown	12		17	
	SILT, firm, brown	4			85
	CLAY, fat, stiff, brown, with black ferrous stains	9			
10			95		98
15	- soft 15 to 17 feet				
20				33	99
	Driller's Note: Converted to mud rotary drilling method at a depth of about 22 feet				
25	CLAY, fat, soft, grayish-brown, with orange ferrous stains	4			
30	- becomes brown in color below a depth of about 30 feet	2		33	
35	- becomes light brown in color below a depth of about 35 feet	2			94



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/13/2008	**DATE MEASURED:**	12/13/2008	**FIGURE:**	A-269a

LOG OF BORING NO. DP-268

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16475315.30630; E 1353023.54397

SURFACE ELEVATION: 28.98 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, light grayish-brown					
45								
			- becomes light brown in color below a depth of about 48 feet	13			NP	
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/13/2008	**DATE MEASURED:**	12/13/2008	**FIGURE:**	A-269b

LOG OF BORING NO. DP-269

The Lower Rio Grande Flood Control Project
Cameron County, Texas

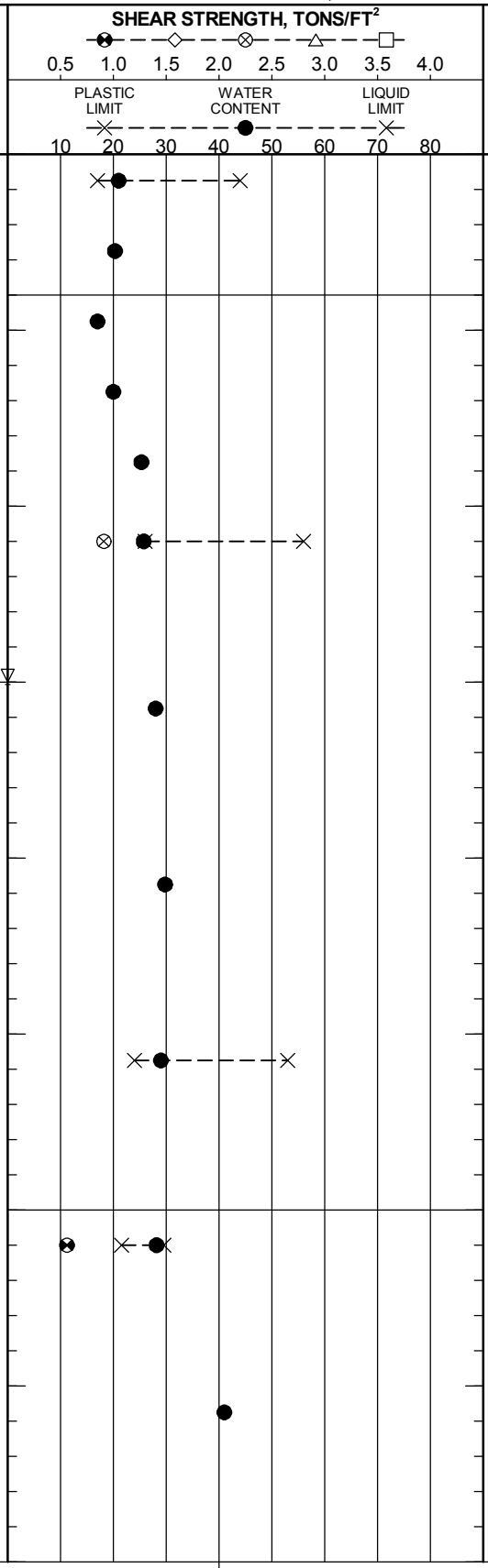
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476145.62520; E 1353655.74745

SURFACE ELEVATION: 26.52 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with black ferrous stains	16		27	
		15			91
5	CLAY, fat, stiff, grayish- brown to brown, with black ferrous stains	14			86
		13			
		12			98
10			96	30	
15		12			
20		8			96
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	- firm 25 to 27 feet	5		29	
30	CLAY, sandy, lean, stiff to firm, light brown, with calcareous nodules		94	8	85
35	- soft 35 to 37 feet	2			90



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/13/2008	**DATE MEASURED:**	12/13/2008	**FIGURE:**	A-270a

LOG OF BORING NO. DP-269

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16476145.62520; E 1353655.74745

SURFACE ELEVATION: 26.52 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, sandy, lean, stiff to firm, light brown, with calcareous nodules *(continued)*				13	60
45								
			- very stiff below 48 feet	20				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 15 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/13/2008	**DATE MEASURED:**	12/13/2008	**FIGURE:**	A-270b

LOG OF BORING NO. DP-270

The Lower Rio Grande Flood Control Project
Cameron County, Texas

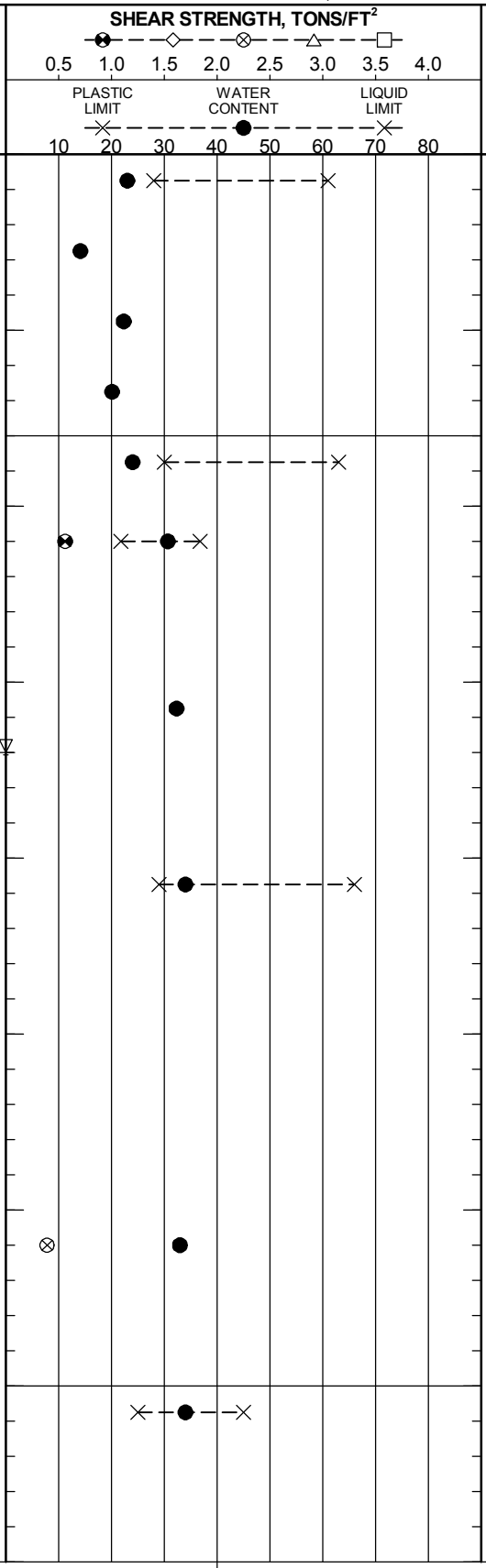
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16477114.09730; E 1353665.31944

SURFACE ELEVATION: 27.30 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, firm to stiff, dark brown	7		33	
	- very stiff 2 to 6 feet	16			96
5		15			97
		13			97
	CLAY, fat, stiff, brown	14		33	
10				15	
15	- firm 15 to 17 feet	4			90
20	- becomes reddish-brown in color and with black and orange ferrous stains below a depth of about 20 feet Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	10		37	
25	- becomes grayish-brown in color below a depth of about 25 feet				100
30	- firm below 30 feet		87		100
35	CLAY, lean, soft, grayish-brown	3		20	



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-271a

LOG OF BORING NO. DP-270

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16477114.09730; E 1353665.31944

SURFACE ELEVATION: 27.30 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, soft, grayish-brown *(continued)*					
45								
			CLAY, sandy, lean, firm, grayish-brown	6				66
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-271b

LOG OF BORING NO. DP-271

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16478040.79370; E 1353647.30885

SURFACE ELEVATION: 27.11 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown	15			94
	- with gypsum nodules and black ferrous stains below a depth of about 2 feet	17		35	
5	- stiff 4 to 6 feet	13			
		19			87
		15			
10	CLAY, fat, stiff, grayish-brown		90	42	98
15	- becomes brown in color and with calcareous nodules below a depth of about 15 feet	14		29	
20					
25	SAND, silty, medium dense, brown	14			14
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		13			12
35		15			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-272a

LOG OF BORING NO. DP-271

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16478040.79370; E 1353647.30885

SURFACE ELEVATION: 27.11 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, with sand, firm, light brown, with black ferrous stains	6			19	
45								
				8				76
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 24 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	24 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-272b

LOG OF BORING NO. DP-272

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16479112.55330; E 1353623.09863

SURFACE ELEVATION: 28.61 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, stiff, brown	12			89
		13			96
5		12		25	
		12			98
	CLAY, fat, stiff, brown, with orange ferrous stains	14		27	
10		12			
15	CLAY, sandy, lean, very stiff, light brown	16			61
20	SAND, with silt, poorly-graded, loose, grayish-brown Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	9			10
25	CLAY, fat, firm, light grayish-brown to light brown	7		55	
30		5			99
35	CLAY, sandy, lean, firm to stiff, grayish-brown to light grayish-brown	4		21	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-273a

LOG OF BORING NO. DP-272

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16479112.55330; E 1353623.09863

SURFACE ELEVATION: 28.61 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, sandy, lean, firm to stiff, grayish-brown to light grayish-brown *(continued)*					
45								
				14				56
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/12/2008	**DATE MEASURED:**	12/12/2008	**FIGURE:**	A-273b

LOG OF BORING NO. DP-273

The Lower Rio Grande Flood Control Project
Cameron County, Texas

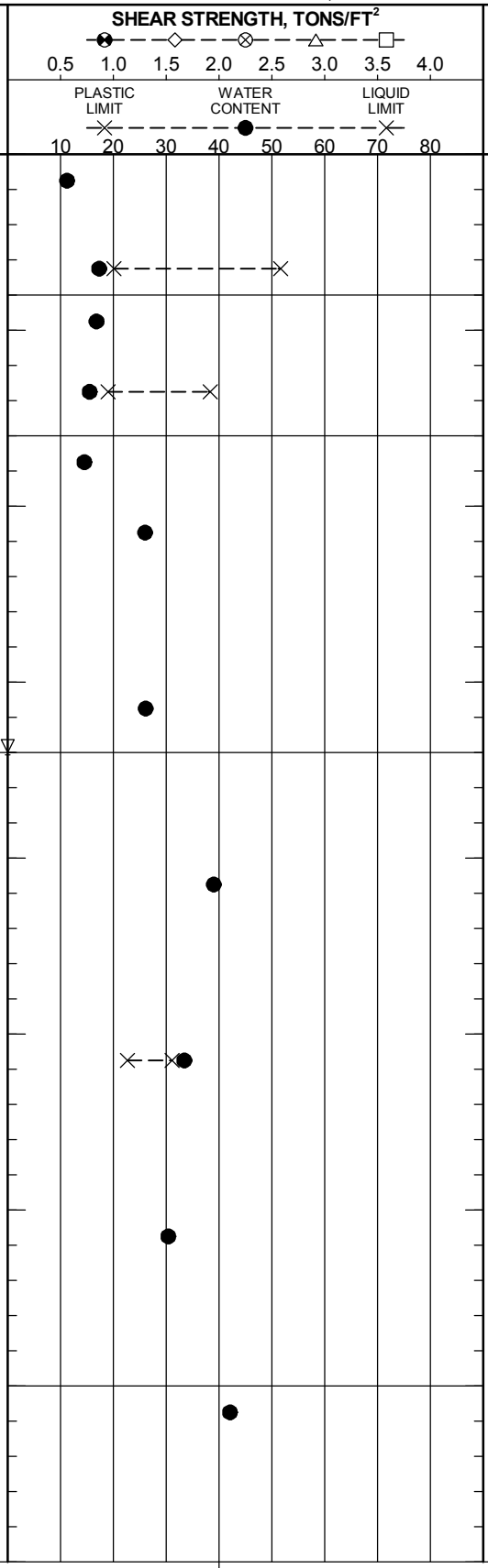
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16480074.67870; E 1353610.48400

SURFACE ELEVATION: 27.63 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, stiff, brown	13			86
		12		32	
5	CLAY, lean, firm, brown	8			96
		6		19	
	SILT, loose to medium dense, light brown to dark brown	8			88
10		13		NP	
15		14			99
	CLAY, lean, firm, light brown				
20		8			96
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		8		8	
30		5			75
35	CLAY, fat, with sand, firm, grayish-brown	4			19



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-274a

LOG OF BORING NO. DP-273

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16480074.67870; E 1353610.48400

SURFACE ELEVATION: 27.63 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, with sand, firm, grayish-brown *(continued)*	8				
45								
			SAND, silty, loose, brown	6				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-274b

LOG OF BORING NO. DP-274

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16481034.00560; E 1353593.02234

SURFACE ELEVATION: 26.64 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff to stiff, brown	20		33	
		13			91
5		12			88
	CLAY, fat, stiff, dark brown	14		33	
		13			86
10		10			55
15	CLAY, sandy, lean, very stiff, brown	16			76
20	CLAY, lean, with sand, very stiff to stiff, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	17		18	
25		14			95
30	CLAY, lean, firm, brown to grayish-brown	6			
35	- with black ferrous stains below a depth of about 35 feet	6			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-275a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-274

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16481034.00560; E 1353593.02234

SURFACE ELEVATION: 26.64 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, firm, brown to grayish-brown *(continued)*	8				
45								
			- stiff below 48 feet	13				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-275b

LOG OF BORING NO. DP-275

The Lower Rio Grande Flood Control Project
Cameron County, Texas

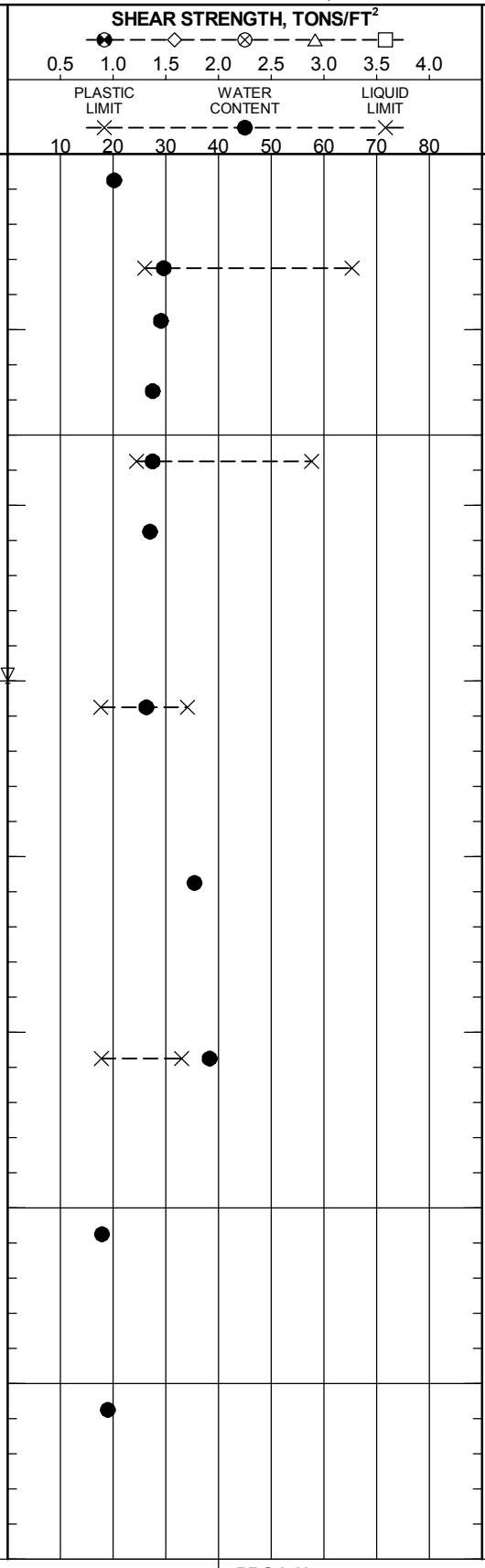
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16481913.53030; E 1353582.85815

SURFACE ELEVATION: 26.30 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, stiff, dark brown	15			97
	- with roots 0 to 2 feet	10		39	
5	- firm 4 to 6 feet	7			98
		11			100
	CLAY, fat, stiff to firm, brown, with black and orange ferrous stains	13		34	
10		11			98
15		14		16	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet				
20		5			38
25		8		15	87
30	CLAY, lean, stiff, light grayish-brown, with black and orange ferrous stains	11		NP	
35	SAND, clayey, medium dense, light grayish-brown	12			



NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-276a

LOG OF BORING NO. DP-275

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16481913.53030; E 1353582.85815

SURFACE ELEVATION: 26.30 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, stiff, reddish-brown	11				
45								
			SAND, silty, medium dense, reddish-brown	18				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 15 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	15 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/11/2008	**DATE MEASURED:**	12/11/2008	**FIGURE:**	A-276b

LOG OF BORING NO. DP-276

The Lower Rio Grande Flood Control Project
Cameron County, Texas

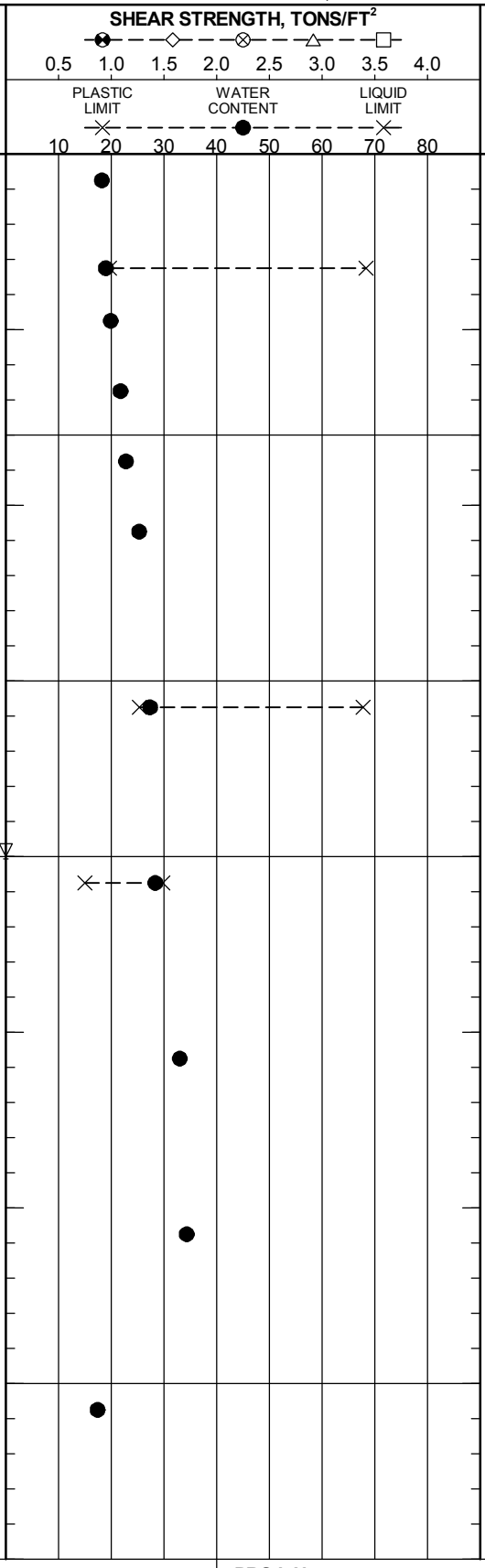
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16483051.30090; E 1353572.23830

SURFACE ELEVATION: 23.53 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, stiff, brown	12			92
		10		48	
5		12			94
		9			97
	CLAY, fat, stiff, brown	14			80
10		14			100
15	SILT, with sand, loose, light brown	9		43	
20	CLAY, fat, firm, grayish-brown to reddish-brown, with black ferrous stains Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	8		15	
25		7			84
30		4		NP	
35	CLAY, lean, with sand, stiff, light grayish-brown, with calcareous nodules and orange ferrous stains	10			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/10/2008	**DATE MEASURED:**	12/10/2008	**FIGURE:**	A-277a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-276

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16483051.30090; E 1353572.23830

SURFACE ELEVATION: 23.53 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, with sand, stiff, light grayish-brown, with calcareous nodules and orange ferrous stains *(continued)*	9				
45								
			SAND, silty, medium dense, reddish-brown	12				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/10/2008	**DATE MEASURED:**	12/10/2008	**FIGURE:**	A-277b

LOG OF BORING NO. DP-277

The Lower Rio Grande Flood Control Project
Cameron County, Texas

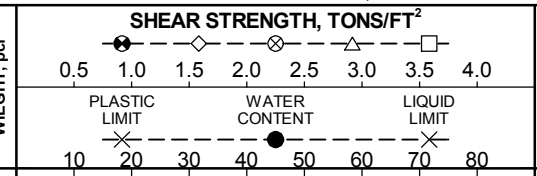
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16483970.35180; E 1353552.17911

SURFACE ELEVATION: 24.25 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, stiff, dark brown	13		32	
	- with roots 0 to 2 feet				
	- with black ferrous stains below a depth of about 2 feet	13			100
5		15			100
	CLAY, fat, stiff to firm, brown, with black ferrous stains	11		36	
		13			100
10		14		15	97
15		10		9	71
20	- with calcareous nodules below a depth of about 20 feet	5			85
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	CLAY, lean, firm, light brown to reddish-brown, with orange ferrous stains	5			
30		6			
35	CLAY, lean, stiff, light grayish-brown to light reddish-brown	11			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/10/2008	**DATE MEASURED:**	12/10/2008	**FIGURE:**	A-278a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-277

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16483970.35180; E 1353552.17911

SURFACE ELEVATION: 24.25 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, lean, stiff, light grayish-brown to light reddish-brown *(continued)*	15				
45								
				11				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/10/2008	**DATE MEASURED:**	12/10/2008	**FIGURE:**	A-278b

LOG OF BORING NO. DP-278

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16552020.25170; E 1185035.43543

SURFACE ELEVATION: 76.35 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, dark brown to brown		115		
5					
	FILL: CLAY, fat, stiff to very stiff, brown, with orange ferrous stains			39	94
10	CLAY, lean, very stiff to firmbrown, with black ferrous stains			12	97
15		7		22	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet				
20		4			88
25	SAND, silty, medium dense, dark brown	13		NP	
30		11			
35		15			16

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-279a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-278

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16552020.25170; E 1185035.43543

SURFACE ELEVATION: 76.35 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense	24				7
45								
				22				10
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 16 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-279b

LOG OF BORING NO. DP-279

The Lower Rio Grande Flood Control Project
Cameron County, Texas

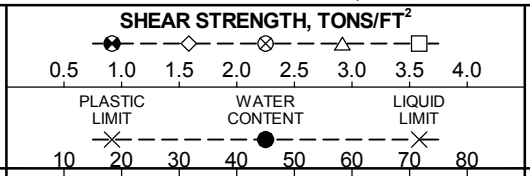
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16552503.55350; E 1185543.88012

SURFACE ELEVATION: 76.45 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, dak brown			33	
	FILL: CLAY, lean, very stiff, brown			14	96
5					92
	FILL: CLAY, fat, very stiff, brown			39	99
	CLAY, fat, very stiff, brown, with calcareous nodules		92		
10				31	98
15	SAND, silty, medium dense, brown	14			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet				
20		24			
25		10			14
30		18			
35	SAND, with silt, poorly-graded, medium dense, brown	14			6



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-280a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-279

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16552503.55350; E 1185543.88012

SURFACE ELEVATION: 76.45 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, silty, dense to medium dense, grayish-brown	42				
45								
				14				14
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 16 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

SHEAR STRENGTH, TONS/FT^2: PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-280b

LOG OF BORING NO. DP-280

The Lower Rio Grande Flood Control Project
Cameron County, Texas

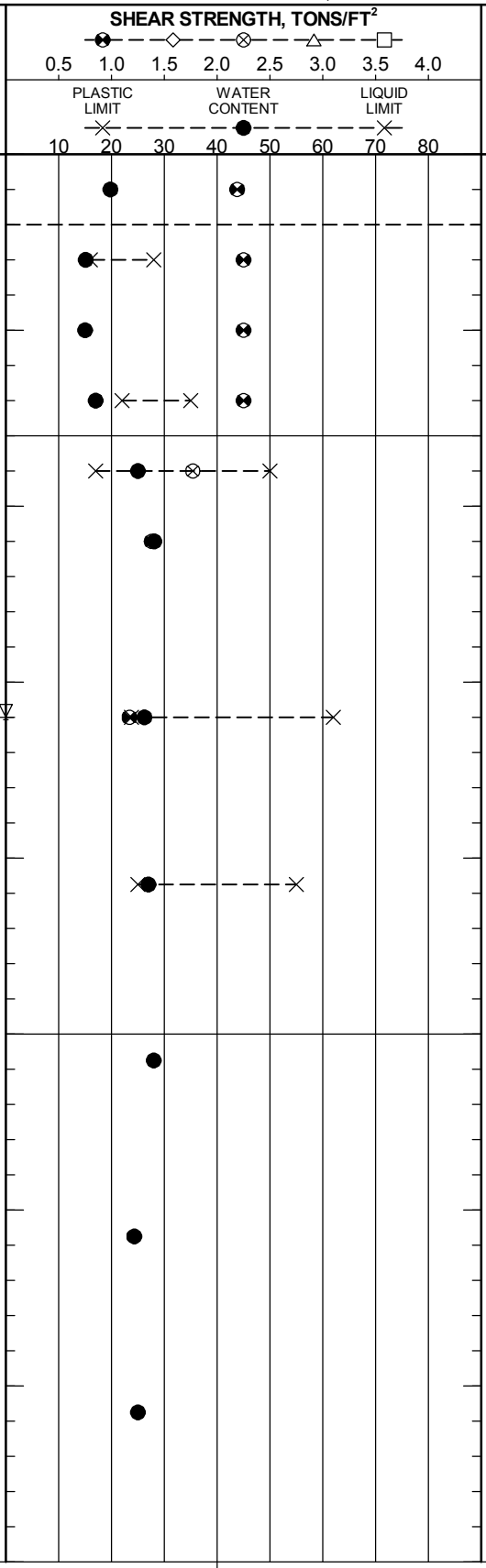
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16553408.69680; E 1186164.07090

SURFACE ELEVATION: 76.48 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, dark brown				96
	FIILL: CLAY, lean, very stiff, brown, with calcareous nodules			12	90
5				13	
	CLAY, fat, very stiff to stiff, brown to dark brown, with black ferrous stains		99	33	
10					97
15			96	38	100
20		13		30	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	SAND, with silt, poorly-graded, medium dense to dense, brown	13			
30		23			8
35		24			11



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-281a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-280

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16553408.69680; E 1186164.07090

SURFACE ELEVATION: 76.48 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense to dense, brown *(continued)*	35					
45									
				31					11
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 17 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 16 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	16 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/17/2008	**DATE MEASURED:**	12/17/2008	**FIGURE:**	A-281b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-281

The Lower Rio Grande Flood Control Project
Cameron County, Texas

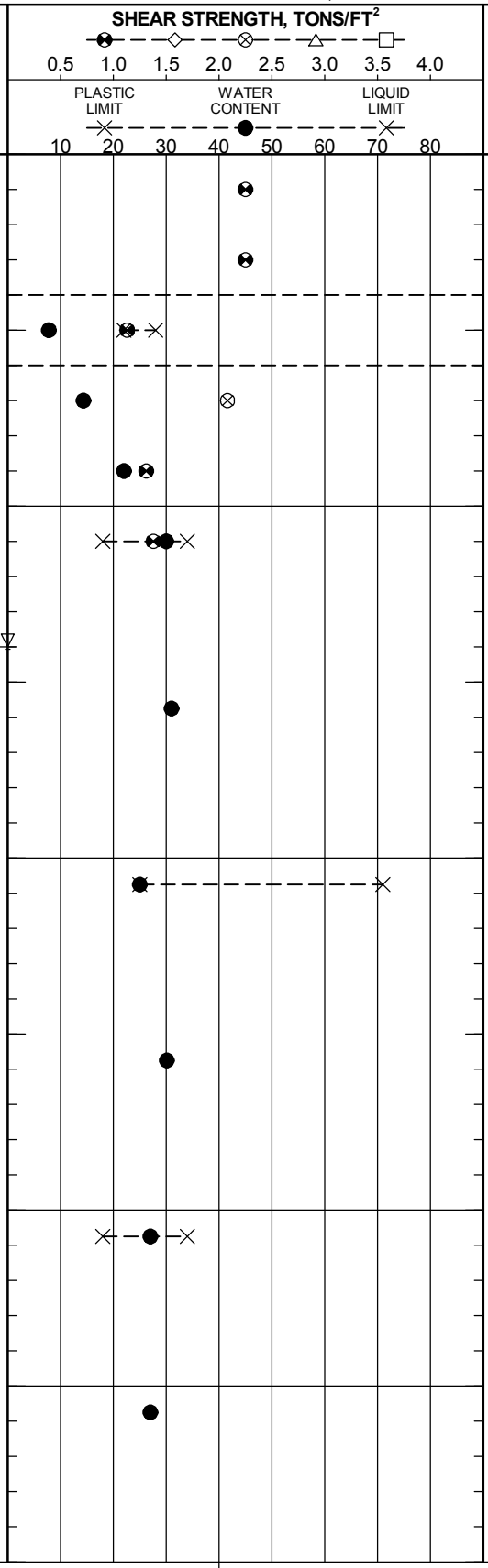
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16553989.77650; E 1186996.57924

SURFACE ELEVATION: 76.44 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, light brown, with black ferrous stains and calcareous nodules				98
5	FILL: CLAY, silty, very stiff, brown			6	88
	FILL: CLAY, lean, hard to very stiff, brown, with calcareous nodules		104		92
10	CLAY, lean, very stiff, dark brown			16	
15	- firm 15 to 17 feet	6			95
	Driller's Note: Converted to mud rotary drilling method at a depth of about 16-1/2 feet				
20	CLAY, fat, very stiff, brown to reddish-brown, with black ferrous stains	18		46	
25		20			98
30	CLAY, lean, very stiff, brown	16		16	
35	SAND, with silt, poorly-graded, medium dense, dark brown	23			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/18/2008	**DATE MEASURED:**	12/18/2008	**FIGURE:**	A-282a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-281

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16553989.77650; E 1186996.57924

SURFACE ELEVATION: 76.44 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown *(continued)* - dense 40 to 42 feet	44				7
45								
				29				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 16 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 14 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	14 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/18/2008	**DATE MEASURED:**	12/18/2008	**FIGURE:**	A-282b

LOG OF BORING NO. DP-282

The Lower Rio Grande Flood Control Project
Cameron County, Texas

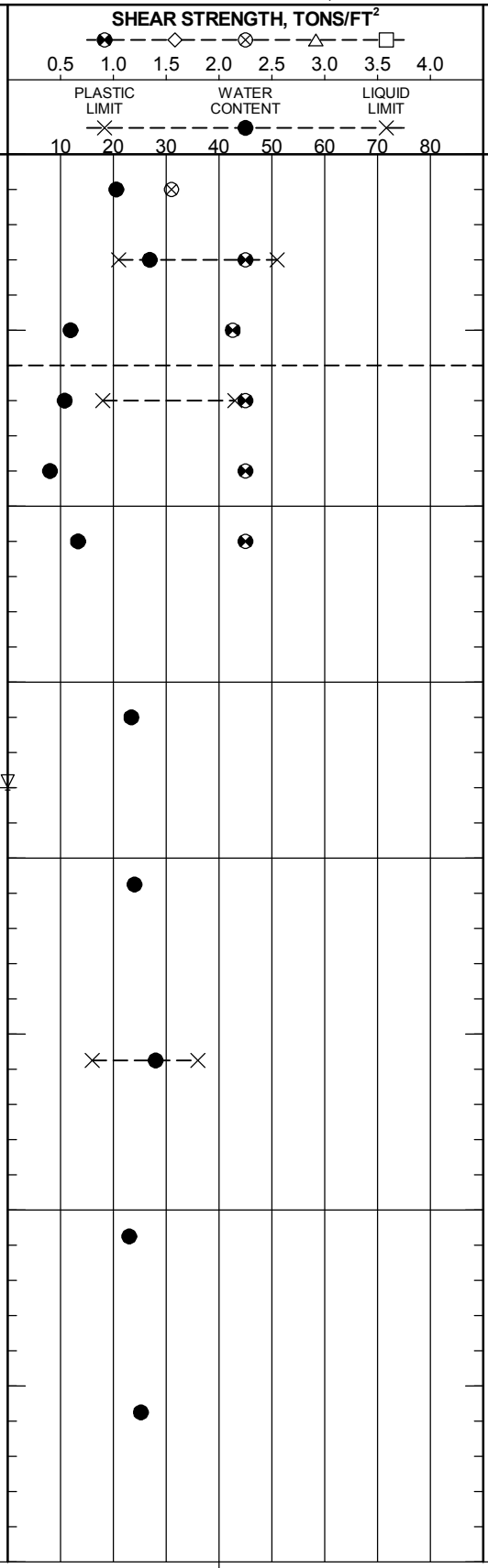
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16554523.36410; E 1187865.40507

SURFACE ELEVATION: 76.5 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, dark brown		102		
	- with calcareous nodules below a depth of about 2 feet			30	93
5					78
	FILL: CLAY, lean, very stiff, light brown			25	93
10	CLAY, lean, very stiff, brown, with calcareous nodules				85
15	SILT, sandy, stiff, brown			NP	68
20	CLAY, lean, very stiff to stiff, brown to reddish-brown, with calcareous nodules and black ferrous stains Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	16			
25		14		20	
30	SAND, silty, medium dense, dark brown	24			
35		19			34



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/18/2008	**DATE MEASURED:**	12/18/2008	**FIGURE:**	A-283a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-282

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16554523.36410; E 1187865.40507

SURFACE ELEVATION: 76.5 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown *(continued)* - dense 40 to 42 feet	43				
45								
				22				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/18/2008	**DATE MEASURED:**	12/18/2008	**FIGURE:**	A-283b

LOG OF BORING NO. DP-283

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16555311.17400; E 1188683.94515

SURFACE ELEVATION: 77.43 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, dark brown, with calcareous nodules		106	21	95
5				12	91
	FILL: CLAY, sandy, lean, stiff, light brown				64
	CLAY, lean, very stiff to stiff, brown to dark brown, with calcareous nodules				
10				13	75
15					
20	CLAY, fat, very stiff, brown, with black ferrous stains Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	19			98
25		18		35	
30		19			
35	SAND, with silt, poorly-graded, medium dense, dark brown	17			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/19/2008	**DATE MEASURED:**	12/19/2008	**FIGURE:**	A-284a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-283

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16555311.17400; E 1188683.94515

SURFACE ELEVATION: 77.43 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown *(continued)*	15					11
45									
				15					
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring remained uncaved.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/19/2008	**DATE MEASURED:**	12/19/2008	**FIGURE:**	A-284b

LOG OF BORING NO. DP-284

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16555434.09470; E 1189633.78688

SURFACE ELEVATION: 77.56 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, hard, light brown		109	16	82
5	FILL: CLAY, fat, very stiff, dark brown				94
					96
10	CLAY, fat, very stiff to stiff, dark brown			36	
15					
20	CLAY, lean, very stiff, dark brown to brown, with black ferrous stains			19	94
25					
30	CLAY, sandy, lean, stiff, dark brown			18	69
35	SAND, silty, medium dense, dark brown Driller's Note: Converted to mud rotary drilling method at a depth of about 36-1/2 feet	17			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/19/2008	**DATE MEASURED:**	12/19/2008	**FIGURE:**	A-285a

LOG OF BORING NO. DP-284

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16555434.09470; E 1189633.78688

SURFACE ELEVATION: 77.56 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense, dark brown *(continued)* - dense 40 to 42 feet	47				12
45								
				29				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 45 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/19/2008	**DATE MEASURED:**	12/19/2008	**FIGURE:**	A-285b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-285

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16555459.23750; E 1190653.46992

SURFACE ELEVATION: 77.63 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules				87
	FILL: CLAY, sandy, lean, very stiff, light brown				
5			101	20	54
	FILL: CLAY, lean, with sand, stiff, light brown			15	72
10	CLAY, sandy, lean, very stiff to stiff, brown, with calcareous nodules				69
15				17	70
20	CLAY, lean, stiff to firm, brown	11			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		7		16	
30	SAND, silty, loose, dark brown	8			
35	- dense 35 to 37 feet	38			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/19/2008	**DATE MEASURED:**	12/19/2008	**FIGURE:**	A-286a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-285

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16555459.23750; E 1190653.46992

SURFACE ELEVATION: 77.63 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, loose, dark brown *(continued)*	9				31
45								
			- dense below 48 feet	44				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 30 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 45 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	30 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/19/2008	**DATE MEASURED:**	12/19/2008	**FIGURE:**	A-286b

LOG OF BORING NO. DP-286

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16555517.90420; E 1191684.32756

SURFACE ELEVATION: 76.17 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules		106		90
5	FILL: CLAY, sandy, lean, very stiff, brown, with calcareous nodules			15	69
10	CLAY, lean, with sand, very stiff, light brown			10	79
15	CLAY, sandy, lean, stiff to very stiff, brown	13			62
20	- firm 20 to 22 feet	4		12	
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		16			64
30		15		15	
35	SAND, with silt, poorly-graded, medium dense, dark brown	14			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/19/2008	**DATE MEASURED:**	12/19/2008	**FIGURE:**	A-287a

LOG OF BORING NO. DP-286

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16555517.90420; E 1191684.32756

SURFACE ELEVATION: 76.17 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown *(continued)*	11				
45								
				25				9
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT (10 20 30 40 50 60 70 80)

NOTES:
During the drilling operations, groundwater was observed at a depth of about 25 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 48 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	25 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/19/2008	**DATE MEASURED:**	12/19/2008	**FIGURE:**	A-287b

LOG OF BORING NO. DP-287

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16555827.99960; E 1192583.88356

SURFACE ELEVATION: 75.81 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown, with calcareous nodules			41	98
5					
	FILL: CLAY, lean, very stiff, light brown to brown, with calcareous nodules			17	89
10	SILT, sandy, very stiff, brown, with calcareous nodules				70
15	CLAY, fat, very stiff to stiff, dark brown, with calcareous nodules			38	
20			97		
	Driller's Note: Converted to mud rotary drilling method at a depth of about 22 feet				
25					98
30	- becomes light brown in color below a depth of about 30 feet				91
35	- becomes dark brown in color below a depth of about 35 feet				

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/19/2008	**DATE MEASURED:**	12/19/2008	**FIGURE:**	A-288a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-287

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16555827.99960; E 1192583.88356

SURFACE ELEVATION: 75.81 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			CLAY, fat, very stiff to stiff, dark brown, with calcareous nodules *(continued)*				27	98
45								
			- soft below 48 feet					
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 26 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 33 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/19/2008	**DATE MEASURED:**	12/19/2008	**FIGURE:**	A-288b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-288

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16556210.73000; E 1193452.70938

SURFACE ELEVATION: 76.04 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown, with calcareous nodules			32	94
5	FILL: CLAY, fat, with sand, very stiff, light brown			32	81
10	CLAY, fat, hard, brown to dark brown, with calcareous nodules		104	34	96
20	CLAY, lean, firm, brown	6			92
25	- very stiff 25 to 27 feet	22			
30	SILT, with sand, medium dense, dark brown			NP	75
35	SAND, with silt, poorly-graded, medium dense, dark brown Driller's Note: Converted to mud rotary drilling method at a depth of about 37 feet	30			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/18/2008	**DATE MEASURED:**	12/18/2008	**FIGURE:**	A-289a

LOG OF BORING NO. DP-288

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: N 16556210.73000; E 1193452.70938

SURFACE ELEVATION: 76.04 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0)	PLASTIC LIMIT / WATER CONTENT / LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown *(continued)*	19					
45									
				26					9
50			Boring terminated at a depth of about 50 feet.						
55									
60									
65									
70									
75									

NOTES:
During the drilling operations, groundwater was observed at a depth of about 20.5 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 20 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 47 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	20 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	12/18/2008	**DATE MEASURED:**	12/18/2008	**FIGURE:**	A-289b

LOG OF BORING NO. DP-289

The Lower Rio Grande Flood Control Project
Cameron County, Texas

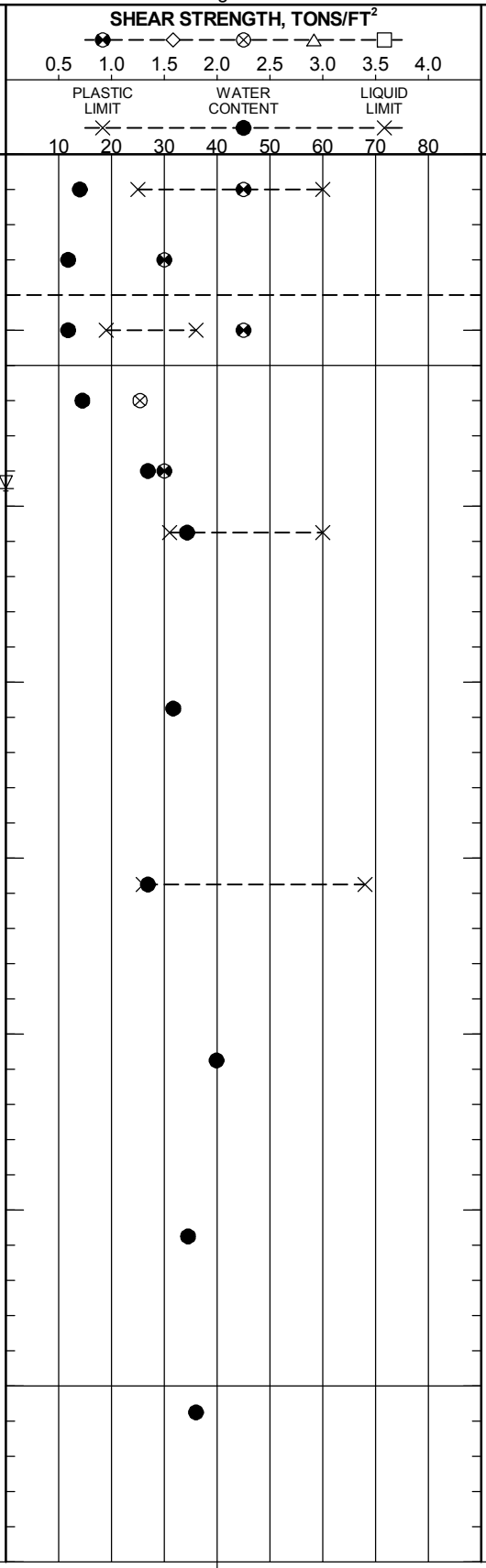
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 75.97 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, very stiff, brown			35	98
					86
5	FILL: CLAY, lean, with sand, very stiff, brown, with calcareous nodules		106	17	82
	CLAY, fat, very stiff to stiff, brown		106		94
10	- becomes light brown in color below a depth of about 10 feet Driller's Note: Converted to mud rotary drilling method at a depth of about 11-1/2 feet	11		29	
15		12			98
20		15		42	
25	- firm 25 to 27 feet	7			
30		12			86
35	SAND, silty, medium dense to dense, brown	23			



DEPTH DRILLED:	49.7 ft	**DEPTH TO WATER:**	9.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/15/2009	**DATE MEASURED:**	1/15/2009	**FIGURE:**	A-290a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-289

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 75.97 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, brown *(continued)*	34				
45								
			- very dense below 48 feet	50/8"				
50			Boring terminated at a depth of about 49.7 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 10 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 9.5 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 36.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.7 ft	**DEPTH TO WATER:**	9.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/15/2009	**DATE MEASURED:**	1/15/2009	**FIGURE:**	A-290b

LOG OF BORING NO. DP-290

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 73.87 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown		105	15	95
					96
5				12	59
			105		
				10	98
10	CLAY, lean, very stiff, light brown to light grayish-brown, with orange ferrous stains				96
15	- firm below 15 feet			12	100
	CLAY, sandy, lean, soft, brown				
20		3			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		4			59
30	SAND, silty, medium dense, brown	18			
35		18			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/20/2009	**DATE MEASURED:**	1/20/2009	**FIGURE:**	A-291a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-290

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 73.87 ft					
			SAND, silty, medium dense, brown *(continued)*	24				
45								
				14				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 35.5 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/20/2009	**DATE MEASURED:**	1/20/2009	**FIGURE:**	A-291b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-291

The Lower Rio Grande Flood Control Project
Cameron County, Texas

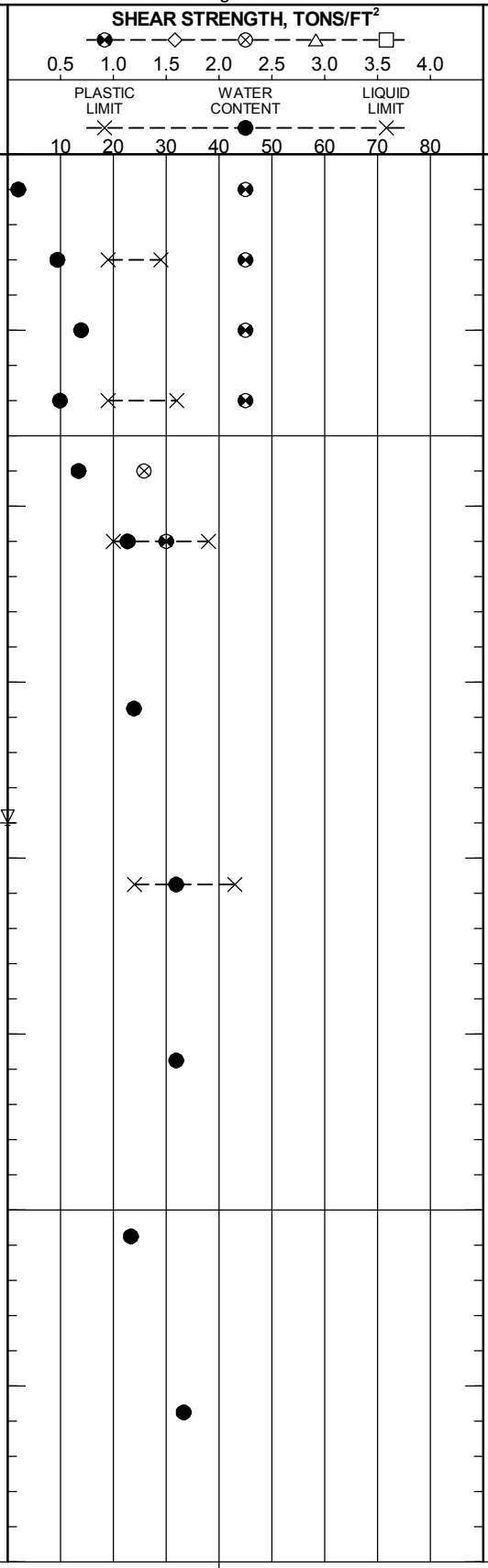
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 73.02 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with roots				93
	- becomes light brown in color below a depth of about 2 feet		105	10	94
5					93
				13	92
	CLAY, lean, very stiff to stiff, brown, with orange ferrous stains		105		
10				18	96
15	- becomes light brown in color below a depth of about 15 feet	10			93
20	- firm to soft below 20 feet	7		19	96
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25		3			
30	SAND, silty, medium dense to dense, light brown	16			
35		39			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/19/2009	**DATE MEASURED:**	1/19/2009	**FIGURE:**	A-292a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-291

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 73.02 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, light brown *(continued)* - becomes brown in color below a depth of about 40 feet	6				
45								
				32				
50								
55								
60								
65								
70								
75								

NOTES:
- loose 40 to 45 feet
- Boring terminated at a depth of about 50 feet
- During the drilling operations, groundwater was observed at a depth of about 20 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 19 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 36 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	19 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/19/2009	**DATE MEASURED:**	1/19/2009	**FIGURE:**	A-292b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-292

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 70.21 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, dark brown, with calcareous nodules and orange ferrous stains		103	26	92
	- becomes brown in color below a depth of about 2 feet		103		93
5				13	99
					95
				19	97
10	CLAY, fat, stiff to very stiff, light brown				
	- firm 15 to 17 feet				
15	- with shell fragments below a depth of about 15 feet	7		14	93
20		10			
25		12			95
30	- becomes light reddish-brown below a depth of about 30 feet	19			
	Driller's Note: Converted to mud rotary drilling method at a depth of about 31-1/2 feet				
35	SAND, silty, loose to medium dense, light brown	8			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/19/2009	**DATE MEASURED:**	1/19/2009	**FIGURE:**	A-293a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-292

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 70.21 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, loose to medium dense, light brown *(continued)*	19				
45								
			- very dense below 48 feet	50/9"				
50			Boring terminated at a depth of about 49.8 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 27 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 26 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 42.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	49.8 ft	**DEPTH TO WATER:**	26 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/19/2009	**DATE MEASURED:**	1/19/2009	**FIGURE:**	A-293b

LOG OF BORING NO. DP-293

The Lower Rio Grande Flood Control Project
Cameron County, Texas

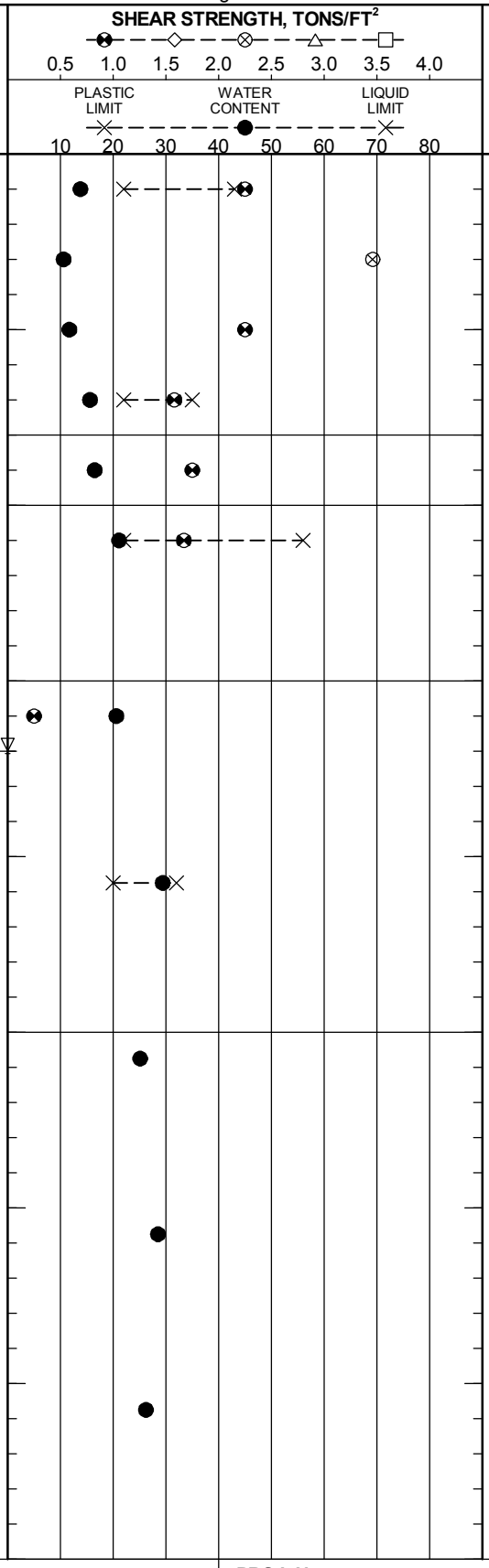
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 53.14 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard to very stiff, light brown to brown		116	21	95
			116		97
5					41
				13	97
	CLAY, lean, with sand, very stiff, light brown				
10	CLAY, fat, very stiff to soft, brown			34	99
15	CLAY, lean, with sand, firm, light brown				
20		4		12	80
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	SAND, clayey, medium dense, brown	16			41
30		18			
35		18			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/20/2009	**DATE MEASURED:**	1/20/2009	**FIGURE:**	A-294a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-293

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 53.14 ft					
			SAND, silty, dense, brown	40				
45								
				33				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 30.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/20/2009	**DATE MEASURED:**	1/20/2009	**FIGURE:**	A-294b

LOG OF BORING NO. DP-294

The Lower Rio Grande Flood Control Project
Cameron County, Texas

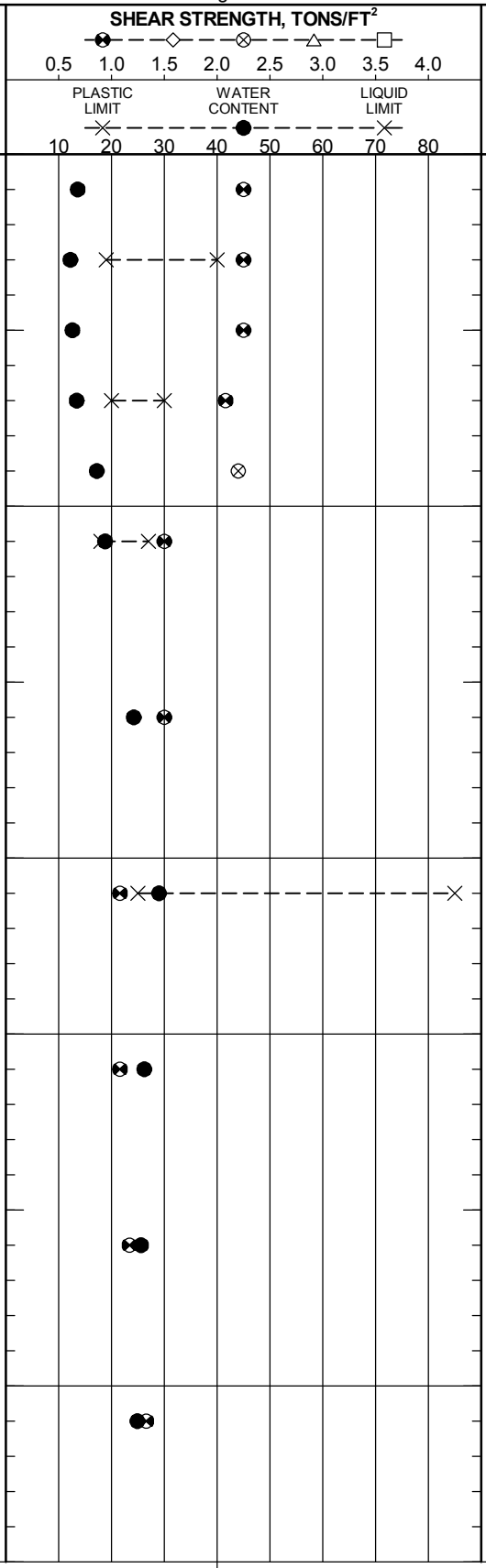
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

SURFACE ELEVATION: 51.06 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown				92
			107	21	94
5					97
	- becomes light brown in color below a depth of about 6 feet			10	93
			107		
10	CLAY, lean, very stiff, brown			9	93
15					
20	CLAY, fat, very stiff, brown, with black ferrous stains			60	98
25	CLAY, lean, very stiff, light brown, with gypsum nodules and black ferrous stains				97
30					
35	CLAY, fat, very stiff to stiff, light grayish-brown, with black and orange ferrous stains and gypsum crystals				



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	43.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/21/2009	**DATE MEASURED:**	1/21/2009	**FIGURE:**	A-295a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-294

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 51.06 ft					
			CLAY, fat, very stiff to stiff, light grayish-brown, with black and orange ferrous stains and gypsum crystals *(continued)*					
			CLAY, sandy, lean, very stiff, light brown, with calcareous nodules					
45								
				18				
50			Boring terminated at a depth of about 50 feet.					
			NOTES: During the drilling operations, groundwater was observed at a depth of about 43.5 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 45.5 feet. Backfilled with cement/bentonite grout. Elevation and coordinates provided by Client.					
55								
60								
65								
70								
75								

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	43.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/21/2009	**DATE MEASURED:**	1/21/2009	**FIGURE:**	A-295b

LOG OF BORING NO. DP-295

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 47.37 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, fat, hard, brown, with calcareous nodules		107	31	97
			107		98
5	- with black ferrous stains below a depth of about 4 feet			41	24
					98
	- with orange ferrous stains below a depth of about 8 feet				
10				37	93
	CLAY, sandy, lean, very stiff, light brown, with black ferrous stains				
15					
20				16	63
	SAND, silty, dense to medium dense, brown				
25		32			24
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30		11			
35		16			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/21/2009	**DATE MEASURED:**	1/21/2009	**FIGURE:**	A-296a

LOG OF BORING NO. DP-295

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SURFACE ELEVATION: 47.37 ft					
			SAND, silty, dense to medium dense, brown *(continued)*	16				
45								
				25				
50			Boring terminated at a depth of about 50 feet.					
55			NOTES: During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 23 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 35.5 feet.					
			Backfilled with cement/bentonite grout.					
			Elevation and coordinates provided by Client.					
60								
65								
70								
75								

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	23 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/21/2009	**DATE MEASURED:**	1/21/2009	**FIGURE:**	A-296b

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-296

The Lower Rio Grande Flood Control Project
Cameron County, Texas

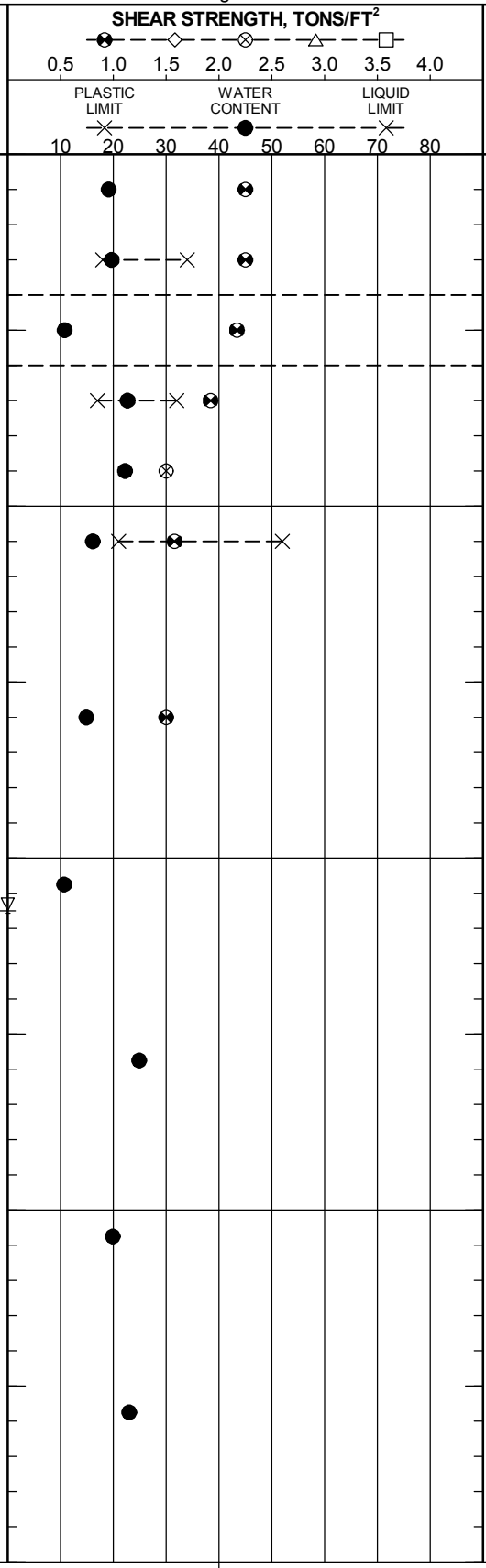
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 44.29 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, with sand, very stiff, brown, with black ferous stains				70
	- with calcareous nodules below a depth of about 2 feet		100	16	73
5	FILL: CLAY, sandy, lean, very stiff, brown				9
	FILL: CLAY, lean, very stiff, brown, with calcareous nodules and orange ferrous stains			15	95
			100		
10	CLAY, fat, very stiff, light brown, with orange ferrous stains			31	82
15					
20	SAND, silty, medium dense, light brown	13		NP	
25		15			29
	Driller's Note: Converted to mud rotary drilling method at a depth of about 26-1/2 feet				
30	SAND, with silt, poorly-graded, dense to medium dense, brown	35			9
35		32			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/21/2009	**DATE MEASURED:**	1/21/2009	**FIGURE:**	A-297a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-296

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 44.29 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, dense to medium dense, brown *(continued)*	31				
45								
				25				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 23 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 21.5 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 34.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	21.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/21/2009	**DATE MEASURED:**	1/21/2009	**FIGURE:**	A-297b

LOG OF BORING NO. DP-297

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 44.10 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown		110	21	98
			110		82
5	FILL: CLAY, silty, very stiff, brown			7	43
	FILL: CLAY, lean, with sand, very stiff, brown				82
	CLAY, lean, very stiff, brown, with orange ferrous stains			16	92
10					
15					
	CLAY, sandy, lean, soft, brown				
20		4			64
	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet				
25	SAND, silty, loose to medium dense, brown	4		NP	
30		7			43
35		22			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/22/2009	**DATE MEASURED:**	1/22/2009	**FIGURE:**	A-298a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-297

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 44.10 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, loose to medium dense, brown *(continued)*	24				
45								
			CLAY, fat, with sand, stiff, light reddish-brown, with black ferrous stains	9				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 17.5 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 34.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	17.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/22/2009	**DATE MEASURED:**	1/22/2009	**FIGURE:**	A-298b

LOG OF BORING NO. DP-298

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 43.33 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown, with calcareous nodules and black ferrous stains		105		
	- with orange ferrous stains below a depth of about 2 feet			22	90
5					82
	CLAY, fat, very stiff, brown			35	98
10				44	98
15	SILT, sandy, medium dense, brown to dark brown				
20	Driller's Note: Converted to mud rotary drilling method at a depth of about 21-1/2 feet	10		NP	52
25	SILT, with sand, medium dense, dark brown	12			82
30		18			
35	SAND, silty, dense to medium dense, dark brown	36			

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/22/2009	**DATE MEASURED:**	1/22/2009	**FIGURE:**	A-299a

LOG OF BORING NO. DP-298

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 43.33 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, dense to medium dense, dark brown *(continued)*	28				
45								
			CLAY, fat, very stiff, light reddish-brown to light grayish-brown, with calcareous nodules and orange ferrous stains	18				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 18 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 38 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/22/2009	**DATE MEASURED:**	1/22/2009	**FIGURE:**	A-299b

LOG OF BORING NO. DP-299

The Lower Rio Grande Flood Control Project
Cameron County, Texas

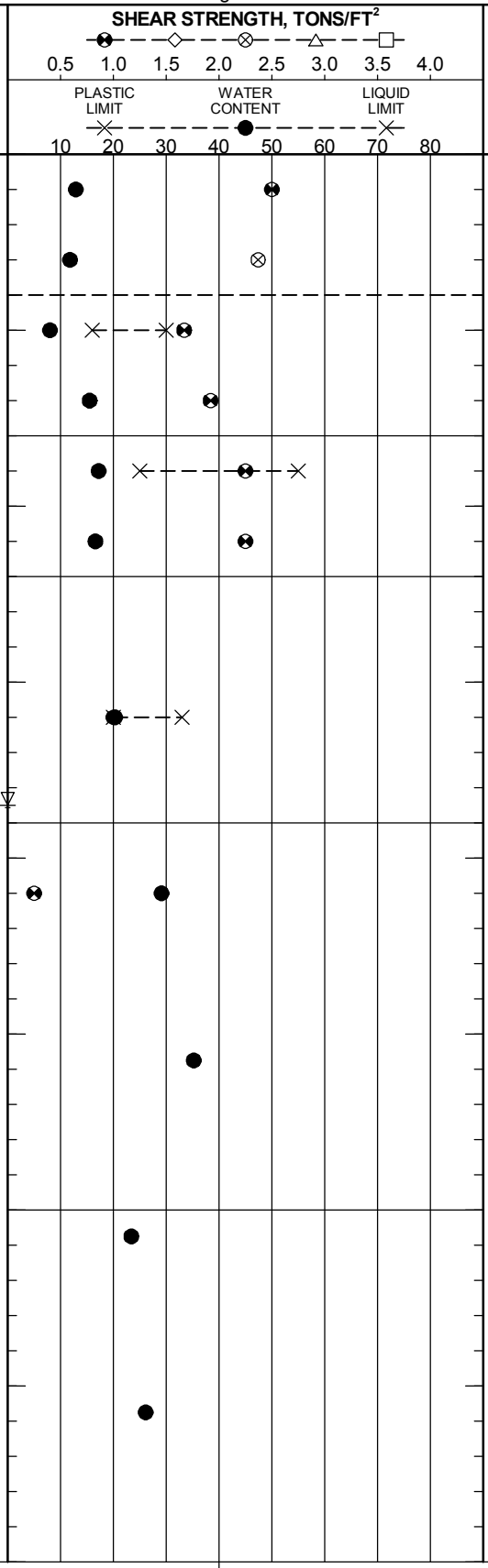
Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 41.78 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, hard, brown		114		93
5	FILL: CLAY, lean, with sand, very stiff, brown - with black ferrous stains below a depth of about 6 feet			14	68
10	FILL: CLAY, fat, very stiff, dark brown			30	94
15	CLAY, lean, very stiff, brown			13	95
20	CLAY, sandy, lean, firm, brown Driller's Note: Converted to mud rotary drilling method at a depth of about 22 feet				
25		7			68
30	SAND, with silt, poorly-graded, medium dense, dark brown	15		NP	
35		17			



DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/23/2009	**DATE MEASURED:**	1/23/2009	**FIGURE:**	A-300a

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

LOG OF BORING NO. DP-299

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 41.78 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, with silt, poorly-graded, medium dense, dark brown *(continued)*	20				8
45								
				20				
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 19 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 18.5 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 34.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	18.5 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/23/2009	**DATE MEASURED:**	1/23/2009	**FIGURE:**	A-300b

LOG OF BORING NO. DP-300

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 28.18 ft

DEPTH, FT	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	PLASTICITY INDEX	% -200
	FILL: CLAY, lean, very stiff, brown, with black ferrous stains		93	25	93
					54
5	- with calcareous nodules below a depth of about 4 feet			19	43
	CLAY, fat, very stiff to stiff, dark brown		93		
10					
15	SILT, sandy, loose, brown to grayish-brown			NP	54
	Driller's Note: Converted to mud rotary drilling method at a depth of about 17 feet				
20		8			
25		8			54
30	SAND, clayey, medium dense, brown	11			42
35	CLAY, fat, very stiff, grayish-brown, with orange ferrous stains	21		56	

SHEAR STRENGTH, TONS/FT^2: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0

PLASTIC LIMIT — WATER CONTENT — LIQUID LIMIT: 10 20 30 40 50 60 70 80

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	11 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/23/2009	**DATE MEASURED:**	1/23/2009	**FIGURE:**	A-301a

LOG OF BORING NO. DP-300

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Raba Kistner
TBPE Firm Registration No. F-3257

DRILLING METHOD: Straight Flight Auger & Mud Rotary

LOCATION: See Figure 1

SURFACE ELEVATION: 28.18 ft

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WIEGHT, pcf	SHEAR STRENGTH, TONS/FT^2 (0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0) / PLASTIC LIMIT, WATER CONTENT, LIQUID LIMIT (10 20 30 40 50 60 70 80)	PLASTICITY INDEX	% -200
			SAND, silty, medium dense to dense, grayish-brown	29				
45								
				33				43
50			Boring terminated at a depth of about 50 feet.					
55								
60								
65								
70								
75								

NOTES:
During the drilling operations, groundwater was observed at a depth of about 14 feet. Within 15 minutes of encountering groundwater, groundwater was measured at about 13 feet. Upon completion of the drilling operations, the boring caved-in at a depth of about 34.5 feet.

Backfilled with cement/bentonite grout.

Elevation and coordinates provided by Client.

NOTE: THESE LOGS SHOULD NOT BE USED SEPARATELY FROM THE PROJECT REPORT

DEPTH DRILLED:	50.0 ft	**DEPTH TO WATER:**	11 ft	**PROJ. No.:**	AMA08-115-00
DATE DRILLED:	1/23/2009	**DATE MEASURED:**	1/23/2009	**FIGURE:**	A-301b

KEY TO TERMS AND SYMBOLS

MATERIAL TYPES

SOIL TERMS

- CALCAREOUS
- CALICHE
- CLAY
- CLAYEY
- GRAVEL
- GRAVELLY
- PEAT
- SAND
- SANDY
- SILT
- SILTY
- FILL

ROCK TERMS

- CHALK
- CLAYSTONE
- CLAY-SHALE
- CONGLOMERATE
- DOLOMITE
- IGNEOUS
- LIMESTONE
- MARL
- METAMORPHIC
- SANDSTONE
- SHALE
- SILTSTONE

OTHER

- ASPHALT
- BASE
- CONCRETE/CEMENT
- BRICKS / PAVERS
- WASTE
- NO INFORMATION

WELL CONSTRUCTION AND PLUGGING MATERIALS

- BLANK PIPE
- SCREEN
- BENTONITE
- CEMENT GROUT
- BENTONITE & CUTTINGS
- CONCRETE/CEMENT
- CUTTINGS
- GRAVEL
- SAND
- VOLCLAY

SAMPLE TYPES

- AIR ROTARY
- GRAB SAMPLE
- CORE
- GEOPROBE SAMPLER
- MUD ROTARY
- NO RECOVERY
- NX CORE
- TEXAS CONE PENETROMETER
- SHELBY TUBE
- SPLIT BARREL
- SPLIT SPOON

STRENGTH TEST TYPES

- POCKET PENETROMETER
- TORVANE
- UNCONFINED COMPRESSION
- TRIAXIAL COMPRESSION UNCONSOLIDATED-UNDRAINED
- TRIAXIAL COMPRESSION CONSOLIDATED-UNDRAINED

NOTE: VALUES SYMBOLIZED ON BORING LOGS REPRESENT SHEAR STRENGTHS UNLESS OTHERWISE NOTED

PROJECT NO. AMA08-115-00

KEY TO TERMS AND SYMBOLS (CONT'D)

TERMINOLOGY

Terms used in this report to describe soils with regard to their consistency or conditions are in general accordance with the discussion presented in Article 45 of SOILS MECHANICS IN ENGINEERING PRACTICE, Terzaghi and Peck, John Wiley & Sons, Inc., 1967, using the most reliable information available from the field and laboratory investigations. Terms used for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in American Society for Testing and Materials D2487-06 and D2488-00, Volume 04.08, Soil and Rock; Dimension Stone; Geosynthetics; 2005.

The depths shown on the boring logs are not exact, and have been estimated to the nearest half-foot. Depth measurements may be presented in a manner that implies greater precision in depth measurement, i.e 6.71 meters. The reader should understand and interpret this information only within the stated half-foot tolerance on depth measurements.

RELATIVE DENSITY

Penetration Resistance Blows per ft	Relative Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
> 50	Very Dense

COHESIVE STRENGTH

Resistance Blows per ft	Consistency	Cohesion TSF
0 - 2	Very Soft	0 - 0.125
2 - 4	Soft	0.125 - 0.25
4 - 8	Firm	0.25 - 0.5
8 - 15	Stiff	0.5 - 1.0
15 - 30	Very Stiff	1.0 - 2.0
> 30	Hard	> 2.0

PLASTICITY

Plasticity Index	Degree of Plasticity
0 - 5	None
5 - 10	Low
10 - 20	Moderate
20 - 40	Plastic
> 40	Highly Plastic

ABBREVIATIONS

B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
BTEX = Total BTEX
TPH = Total Petroleum Hydrocarbons
ND = Not Detected
NA = Not Analyzed
NR = Not Recorded/No Recovery
OVA = Organic Vapor Analyzer
ppm = Parts Per Million

Qam, Qas, Qal = Quaternary Alluvium
Qat = Low Terrace Deposits
Qbc = Beaumont Formation
Qt = Fluviatile Terrace Deposits
Qao = Seymour Formation
Qle = Leona Formation
Q-Tu = Uvalde Gravel
Ewi = Wilcox Formation
Emi = Midway Group
Mc = Catahoula Formation
El = Laredo Formation
Kknm = Navarro Group and Marlbrook Marl
Kpg = Pecan Gap Chalk
Kau = Austin Chalk

Kef = Eagle Ford Shale
Kbu = Buda Limestone
Kdr = Del Rio Clay
Kft = Fort Terrett Member
Kgt = Georgetown Formation
Kep = Person Formation
Kek = Kainer Formation
Kes = Escondido Formation
Kew = Walnut Formation
Kgr = Glen Rose Formation
Kgru = Upper Glen Rose Formation
Kgrl = Lower Glen Rose Formation
Kh = Hensell Sand

APPENDIX B

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-1	0.0 to 1.5	37	15	54	19	35	CH				
	2.0 to 4.0		15	51	18	33		101		2.09	PP
	5.0 to 7.0		14					113		5.50	UC
	7.5 to 9.5		18						95	2.25	PP
	10.0 to 12.0		21	59	22	37	CH		97	2.25	PP
	15.0 to 17.0		22						97	2.00	PP
	20.0 to 22.0		27	78	22	56	CH			1.17	PP
	25.0 to 26.5	26	22						98		
	30.0 to 31.5	12	30	29	20	9	CL				
	35.0 to 36.5	16	29								
	40.0 to 41.5	27	24						21		
	45.0 to 46.5	26	28						17		
	48.5 to 50.0	28	21						11		
DP-2	0.0 to 1.5	29	15						96		
	2.0 to 4.0		14	42	21	21	CL			2.25	PP
	5.0 to 7.0		16						92	2.25	PP
	7.5 to 9.5		18					106		3.16	UC
	10.0 to 12.0		13	52	23	29	CH			2.25	PP
	15.0 to 17.0		17						96	1.92	PP
	20.0 to 22.0		27							1.42	PP
	25.0 to 26.5	13	28						98		
	30.0 to 31.5	19	24	60	27	33	CH				
	35.0 to 36.5	18	25						97		
	40.0 to 41.5	24	27						97		
	45.0 to 46.5	15	28	54	28	26	CH				
	48.5 to 50.0	18	29								
DP-3	0.0 to 2.0		19					108		5.29	UC
	2.0 to 4.0		16						90	2.25	PP
	4.0 to 6.0		17	50	19	31	CH			2.25	PP
	6.0 to 8.0		20						95	2.25	PP
	8.0 to 10.0		14						94	2.25	PP
	10.0 to 12.0		19	70	29	41	CH			2.25	PP
	15.0 to 16.5	21	27						99		
	20.0 to 21.5	17	27	58	20	38	CH				
	25.0 to 26.5	10	25						95		
	30.0 to 31.5	12	25						98		
	35.0 to 36.5	11	28	30	19	11	CL		53		
	40.0 to 41.5	11	30								
	48.5 to 50.0	16	29						53		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303a

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-4	0.0 to 2.0		13	57	22	35	CH			2.25	PP
	2.0 to 4.0		16							2.25	PP
	4.0 to 6.0		16	43	18	25	CL			2.25	PP
	6.0 to 8.0		19						93	2.25	PP
	8.0 to 10.0		20						93	1.67	PP
	10.0 to 12.0		24					100		1.34	UC
	15.0 to 17.0		26	74	25	49	CH			2.00	PP
	20.0 to 21.5	15	26						93		
	25.0 to 26.5	5	30	31	18	13	CL				
	30.0 to 31.5	16	24						97		
	35.0 to 36.5	16	27						33		
	40.0 to 41.5	17	28								
	48.5 to 50.0	27	26						17		
DP-5	0.0 to 2.0		17						97	2.25	PP
	2.0 to 4.0		15	62	19	43	CH			2.25	PP
	4.0 to 6.0		12					113		2.25	PP
	6.0 to 8.0		14						94	2.25	PP
	8.0 to 10.0		19	28	16	12	CL			1.50	PP
	10.0 to 12.0		25						72	0.33	PP
	15.0 to 16.5	12	27	65	20	45	CH				
	20.0 to 21.5	8	28	31	14	17	CL				
	25.0 to 26.5	14	27						91		
	30.0 to 31.5	15	30						27		
	35.0 to 36.5	17	29								
	40.0 to 41.5	42	24						24		
	48.5 to 49.8	50/ 10"	26								
DP-6	0.0 to 2.0		12	46	16	30	CL			2.25	PP
	2.0 to 4.0		6						94	2.25	PP
	4.0 to 6.0		13					110		2.33	UC
	6.0 to 8.0		23						97	2.25	PP
	8.0 to 10.0		30	43	22	21	CL			0.50	PP
	10.0 to 12.0		26						94	0.83	PP
	15.0 to 16.5	9	25	CNBD	CNBD	NP	ML				
	20.0 to 21.5	6	38						85		
	25.0 to 26.5	6	29								
	30.0 to 31.5	7	27	29	19	10	CL				
	35.0 to 36.5	15	28						97		
	40.0 to 41.5	12	46			NP	ML		62		
	48.5 to 50.0	10	35						49		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303b

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-7	0.0 to 2.0		15						96	2.25	PP
	2.0 to 4.0		14	38	20	18	CL			2.25	PP
	4.0 to 6.0		19							2.25	PP
	6.0 to 8.0		29					91		0.34	UC
	8.0 to 10.0		29	35	17	18	CL			0.25	PP
	10.0 to 12.0		31						98	0.17	PP
	15.0 to 16.5	1/18"	37						85		
	20.0 to 21.5	11	30	57	29	28	CH				
	25.0 to 26.5	13	32						94		
	30.0 to 31.5	12	28	51	27	24	CH				
	35.0 to 36.5	37	22						13		
	40.0 to 41.5	13	22						15		
	48.5 to 50.0	31	25								
DP-8	0.0 to 2.0		19							2.25	PP
	2.0 to 4.0		6						90	2.25	PP
	4.0 to 6.0		13	35	16	19	CL			2.25	PP
	6.0 to 8.0									0.92	PP
	8.0 to 10.0		21	48	25	23	CL	96	97	0.42	PP
	10.0 to 12.0		30					87		0.32	UC
	15.0 to 16.5	8	31	29	11	18	CL				
	20.0 to 21.5	10	25						17		
	25.0 to 26.5	13	24	CNBD	CNBD	NP	SM				
	30.0 to 31.5	20	25						15		
	35.0 to 36.5	15	24						24		
	40.0 to 41.5	16	25	CNBD	CNBD	NP	SM				
	48.5 to 50.0	12	26						17		
DP-9	0.0 to 1.5		21	49	22	27	CL				
	2.0 to 4.0		22						91	0.58	PP
	4.0 to 6.0		28	45	23	22	CL			0.54	PP
	6.0 to 8.0		29	47	20	27		93		0.58	PP
	8.0 to 10.0		27						96	0.33	PP
	10.0 to 12.0		30					93		0.26	UC
	15.0 to 17.0	8	31	72	30	42	CH				
	20.0 to 21.5	4	29	57	25	32	CH				
	25.0 to 26.5	18	28						91		
	30.0 to 31.5	13	22						14		
	35.0 to 36.5	16	25						17		
	40.0 to 41.5	30	21						8		
	45.0 to 46.5	31	25								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303c

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Uni t Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-9	48.5 to 50.0	11	30								
DP-10	0.0 to 2.0		24						94	0.75	PP
	2.0 to 4.0		32							0.67	PP
	4.0 to 6.0									0.79	PP
	6.0 to 8.0		27						96	0.46	PP
	8.0 to 10.0		33						99		
	10.0 to 11.5	4	33	56	25	31	CH				
	15.0 to 17.0		27	55	24	31	CH	95	99	1.08	PP
	20.0 to 22.0		31						96	0.54	PP
	25.0 to 26.5		31	45	23	22	CL				
	30.0 to 31.5	12	29								
	35.0 to 36.5	8	27						57		
	40.0 to 41.5	15	25						32		
	48.0 to 50.0		29	50	24	26	CH			1.21	PP
DP-11	0.0 to 2.0		17	35	20	15	CL			2.25	PP
	2.0 to 4.0		22							0.96	PP
	4.0 to 6.0		21						70	0.46	PP
	6.0 to 8.0		27	30	19	11	CL			0.96	PP
	8.0 to 10.0		26						81	0.29	PP
	10.0 to 12.0										
	15.0 to 17.0		30	52	26	26	CH			0.50	PP
	20.0 to 22.0		26					97		0.71	UC
	25.0 to 27.0		23	CNBD	CNBD	NP	SM				
	30.0 to 31.5	22	21						10		
	35.0 to 36.5	23	24						6		
	40.0 to 41.5	25	23						4		
	48.5 to 50.0	20	24								
DP-12	0.0 to 2.0		24	73	23	50	CH			2.25	PP
	2.0 to 4.0		26						98	1.67	PP
	4.0 to 6.0		18					99		0.20	UC
	6.0 to 8.0		28						94	0.42	PP
	8.0 to 10.0		29	30	21	9	CL			0.38	PP
	10.0 to 12.0		36						100	0.17	PP
	15.0 to 17.0		30	45	19	26	CL			0.42	PP
	20.0 to 22.0		25						57	0.08	PP
	25.0 to 26.5	13	29	27	19	8	CL				
	30.0 to 31.5	13	26						4		
	35.0 to 36.5	21	26						14		
	40.0 to 41.5	13	29								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303d

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-12	48.5 to 50.0	15	30								
DP-13	0.0 to 2.0		18					106		2.37	UC
	2.0 to 4.0		21	35	16	19	CL			0.83	PP
	4.0 to 6.0		22						73	0.58	PP
	6.0 to 8.0		23						81		
	8.0 to 10.0		25	CNBD	CNBD	NP	SM				
	10.0 to 11.5	4	34						95		
	15.0 to 16.5	3	33	47	19	28	CL				
	20.0 to 21.5	13	30	CNBD	CNBD	NP	SM				
	25.0 to 26.5	27	33						12		
	30.0 to 31.5	34	25						13		
	35.0 to 36.5	46	21						10		
	40.0 to 41.5	19	24								
	48.5 to 50.0	17	31								
DP-14	0.0 to 2.0		21						85	2.25	PP
	2.0 to 3.5	4	12	30	19	11	CL				
	4.0 to 5.5	8	26						98		
	6.0 to 8.0		24					95		0.52	UC
	8.0 to 10.0		32	33	24	9	CL			0.25	PP
	10.0 to 12.0		29						97	0.25	PP
	15.0 to 17.0		34						98	0.25	PP
	20.0 to 21.5	5	33	35	22	13	CL				
	25.0 to 26.5	10	34	58	22	36	CH				
	30.0 to 31.5	25	26						24		
	35.0 to 36.5	26	26						10		
	40.0 to 41.5	18	29								
	48.5 to 50.0	15	30						92		
DP-15	0.0 to 2.0		15	22	10	12	CL			2.25	PP
	2.0 to 3.5	6	22						55		
	4.0 to 5.5	7	29	49	26	23	CL				
	6.0 to 7.5	5	26						93		
	8.0 to 9.5	7	24	53	27	26	CH				
	10.0 to 11.5	7	25						97		
	15.0 to 16.5	8	30	61	22	39	CH				
	20.0 to 22.0		25						51	0.25	PP
	25.0 to 26.5	4	38								
	30.0 to 31.5	13	26						24		
	35.0 to 36.5	22	24								
	40.0 to 41.5	18	35						23		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303e

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-15	48.5 to 50.0	48	25								
DP-16	0.0 to 2.0		12	39	18	21	CL			2.25	PP
	2.0 to 3.5	13	17						96		
	4.0 to 5.5	13	19	48	21	27	CL				
	6.0 to 7.5	10	16						75		
	8.0 to 9.5	7	29	53	24	29	CH				
	10.0 to 12.0		16					103		0.63	UC
	15.0 to 17.0		34	39	19	20	CL			0.08	PP
	20.0 to 21.5	4	32								
	25.0 to 27.0		30						79	0.08	PP
	30.0 to 31.5	11	29						6		
	35.0 to 36.5	16	29						10		
	40.0 to 41.5	9	27						7		
	48.5 to 50.0	5	30								
DP-17	0.0 to 2.0		11						100	2.25	PP
	2.0 to 4.0		18					106		2.25	PP
	4.0 to 6.0		21	56	20	36	CH			2.25	PP
	6.0 to 8.0									2.25	PP
	8.0 to 10.0		25						100	2.25	PP
	10.0 to 12.0		25	64	20	44	CH			2.00	PP
	15.0 to 17.0		23					99		2.27	UC
	20.0 to 21.5	3	24						5		
	25.0 to 26.5	2	30	CNBD	CNBD	NP	SP-SM				
	30.0 to 31.5	50/ 10"	21						9		
	35.0 to 36.5	47	23						10		
	40.0 to 41.5	14	24						14		
	48.5 to 50.0	11	27	37	20	17	CL				
DP-18	0.0 to 2.0		15					111		2.18	UC
	2.0 to 4.0		17						97	2.25	PP
	4.0 to 6.0		20	63	25	38	CH			2.25	PP
	6.0 to 8.0		19						99	2.25	PP
	8.0 to 10.0		22	56	22	34	CH			2.25	PP
	10.0 to 12.0									2.17	PP
	15.0 to 17.0		30	69	25	44	CH			2.08	PP
	20.0 to 21.5	5	29						47		
	25.0 to 26.5	15	35						64		
	30.0 to 31.5	30	26						20		
	35.0 to 36.5	22	26						17		
	40.0 to 41.5	35	23						15		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303f

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-18	48.5 to 50.0	24	30	CNBD	CNBD	NP	SM				
DP-19	0.0 to 2.0		15	52	20	32	CH			2.25	PP
	2.0 to 4.0		14						88	2.25	PP
	4.0 to 6.0			52	22	30	CH		96	2.25	PP
	6.0 to 8.0		25	61	26	35	CH			2.25	PP
	8.0 to 10.0		25					97		1.61	UC
	10.0 to 12.0		24						69	1.17	PP
	15.0 to 16.5	6	31	CNBD	CNBD	NP	SM				
	20.0 to 21.5	8	27						35		
	25.0 to 26.5	19	28						41		
	30.0 to 31.5	17	23						11		
	35.0 to 36.5	17	21	CNBD	CNBD	NP	SP-SM				
	40.0 to 41.5	20	22						18		
	48.5 to 50.0	21	22								
DP-20	0.0 to 1.5	20	13	41	18	23	CL				
	2.0 to 3.5	16	18						89		
	4.0 to 5.5	11	18	43	17	26	CL				
	6.0 to 7.5	17	20						87		
	8.0 to 9.5	16	17						97		
	10.0 to 11.5	12	21	41	19	22	CL				
	15.0 to 17.0		33							0.17	PP
	20.0 to 21.5	3	34	42	19	23	CL				
	25.0 to 26.5	3	32						38		
	30.0 to 31.5	12	26						14		
	35.0 to 36.5	21	24								
	40.0 to 41.5	9	29						95		
	48.5 to 50.0	13	27								
DP-21	0.0 to 1.5	13	17						94		
	2.0 to 3.5	12	12	34	18	16	CL				
	4.0 to 5.5	15	15								
	6.0 to 7.5	14	19	39	17	22	CL				
	8.0 to 9.5	8	23						95		
	10.0 to 12.0		27					91	87	0.59	UC
	15.0 to 17.0		33	27	15	12	SC				
	20.0 to 21.5	4	30						44		
	25.0 to 26.5	18	28						9		
	30.0 to 31.5	15	29								
	35.0 to 36.5	9	25						15		
	40.0 to 41.5	33	29						12		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

Raba-Kistner

FIGURE A-303g

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-21	48.5 to 50.0	8	27	43	18	25	CL				
DP-22	0.0 to 2.0		6	24	13	11	SC				
	2.0 to 4.0		16							2.25	PP
	4.0 to 6.0		11					113		2.91	UC
	6.0 to 8.0		14						95	1.25	PP
	8.0 to 10.0		12	29	15	14	CL			1.25	PP
	10.0 to 12.0		14						77	0.25	PP
	15.0 to 17.0		29	34	18	16	CL			0.25	PP
	20.0 to 21.5	7	28						37		
	25.0 to 26.5	25	25						32		
	30.0 to 31.5	20	26								
	35.0 to 36.5	25	23						9		
	40.0 to 41.5	18	31	77	23	54	CH				
	48.5 to 50.0	15	28						97		
DP-23	0.0 to 2.0		4						21		
	2.0 to 4.0		26					98		2.25	PP
	4.0 to 6.0		14					103		1.75	PP
	6.0 to 8.0		22	33	18	15	CL			1.50	PP
	8.0 to 10.0									1.50	PP
	10.0 to 12.0		18	35	18	17	CL			1.25	PP
	15.0 to 17.0		29						96	0.25	PP
	20.0 to 21.5	3	28	27	15	12	CL				
	25.0 to 26.5	18	25						10		
	30.0 to 31.5	13	25						18		
	35.0 to 36.5	22	21	CNBD	CNBD	NP	SP-SM				
	40.0 to 41.5	26	24						11		
	48.5 to 50.0	40	22						8		
DP-24	0.0 to 2.0		5						28		
	2.0 to 4.0		15	34	18	16	CL			2.25	PP
	4.0 to 6.0		19	28	16	12	CL			1.88	PP
	6.0 to 8.0		14						90	0.88	PP
	8.0 to 10.0		17						74	0.50	PP
	10.0 to 12.0		21					98		0.45	UC
	15.0 to 17.0		30						90	0.25	PP
	20.0 to 21.5	6	33	25	23	2	SM				
	25.0 to 26.5	19	21								
	30.0 to 31.5	29	26						11		
	35.0 to 36.5	12	26						8		
	40.0 to 41.5	22	23								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303h

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-24	48.5 to 50.0	20	24	30	14	16	CL				
DP-25	0.0 to 1.5	24	8	39	15	24	CL				
	2.0 to 3.5	9	17						94		
	4.0 to 5.5	7	23	38	18	20	CL				
	6.0 to 8.0		18					103		1.45	UC
	8.0 to 9.5	11	23						82		
	10.0 to 12.0		20	21	17	4	SC-SM		40		
	15.0 to 16.5	7	29						8		
	20.0 to 21.5	2	32	32	19	13	CL				
	25.0 to 26.5	16	29						34		
	30.0 to 31.5	17	24						9		
	35.0 to 36.5	29	24								
	40.0 to 41.5	16	28						7		
	48.5 to 50.0	22	27								
DP-26	0.0 to 1.5	27	11						89		
	2.0 to 3.5	8	12	35	18	17	CL				
	4.0 to 5.5	8	15						98		
	6.0 to 7.5	9	19	43	18	25	CL				
	8.0 to 9.5	8	27						96		
	10.0 to 11.5	6	17	34	18	16	CL				
	15.0 to 16.5	2	32								
	20.0 to 21.5	2	33						75		
	25.0 to 26.5	7	32	36	18	18	CL				
	30.0 to 32.0		29						9		
	35.0 to 36.5	15	27								
	40.0 to 41.5	16	26								
	48.5 to 50.0	17	25						9		
DP-27	0.0 to 2.0		9					106		3.21	UC
	2.0 to 4.0		8	32	16	16	CL			2.25	PP
	4.0 to 6.0		9					104	81	2.25	PP
	6.0 to 8.0									2.25	PP
	8.0 to 10.0		20					99		2.25	PP
	10.0 to 12.0		14	39	17	22	CL			1.83	PP
	15.0 to 16.5	10	28						20		
	20.0 to 21.5	3	33	51	28	23	CH				
	25.0 to 26.5	8	30	CNBD	CNBD	NP	ML				
	30.0 to 31.5	10	32						60		
	35.0 to 36.5	14	33						21		
	40.0 to 41.5	40	23						10		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303i

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-27	48.0 to 49.5	50/ 10"	22						17		
DP-28	0.0 to 1.5	20	16						88		
	2.0 to 3.5	14	21	41	18	23	CL				
	4.0 to 5.5	12	13						85		
	6.0 to 7.5	6	15	32	21	11	CL				
	8.0 to 9.5	8	20						96		
	10.0 to 11.5	4	22	39	19	20	CL				
	15.0 to 16.5	6	32						79		
	20.0 to 21.5	7	35	76	26	50	CH				
	25.0 to 27.0		30					96		0.18	UC
	30.0 to 31.5	14	29						15		
	35.0 to 36.5	33	26						11		
	40.0 to 41.5	6	41								
	48.5 to 50.0	12	30								
DP-29	0.0 to 1.5	18	13	44	22	22	CL				
	2.0 to 3.5	18	15						99		
	4.0 to 5.5	14	17						98		
	6.0 to 7.5	9	19	47	21	26	CL				
	8.0 to 9.5	7	18						100		
	10.0 to 11.5	7	21						100		
	15.0 to 16.5	8	26	59	24	35	CH				
	20.0 to 21.5	4	32						99		
	25.0 to 26.5	4	30								
	30.0 to 32.0									-0.50	PP
	35.0 to 36.5	5	39	72	29	43	CH				
	40.0 to 41.5	1/18"	32						76		
	45.0 to 46.5	2	36						25		
	48.5 to 50.0	9	27								
DP-30	0.0 to 1.5	21	13	39	19	20	CL				
	2.0 to 3.5	10	16								
	4.0 to 5.5	13	18						95		
	6.0 to 7.5	8	21	52	22	30	CH				
	8.0 to 10.0		22							2.21	PP
	10.0 to 11.5	7	17						98		
	15.0 to 16.5	2	31						56		
	20.0 to 21.5	2	31	28	23	5	CL-ML				
	25.0 to 26.5	8	28						32		
	30.0 to 31.5	4	30	CNBD	CNBD	NP	SM				
	35.0 to 36.5	8	32						21		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303j

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-30	40.0 to 41.5	21	27								
	48.5 to 50.0	19	26						6		
DP-31	0.0 to 1.5	13	12						83		
	2.0 to 3.5	9	16						95		
	4.0 to 5.5	7	19	44	23	21	CL				
	6.0 to 7.5	4	21						91		
	8.0 to 9.5	2	27						81		
	10.0 to 11.5	2	29	57	24	33	CH				
	15.0 to 17.0		22					104		0.55	UC
	20.0 to 22.0		25					105		0.84	UC
	25.0 to 26.5	10	32	74	28	46	CH				
	30.0 to 32.0		25						61		
	35.0 to 36.5	6	33	28	23	5	CL-ML				
	40.0 to 41.5	11	31						98		
	48.5 to 50.0	4	30								
DP-32	0.0 to 1.5	12	18	48	21	27	CL				
	2.0 to 3.5	10	17						99		
	4.0 to 5.5	12	21	55	21	34	CH				
	6.0 to 7.5	3	21						98		
	8.0 to 9.5	8	24								
	10.0 to 11.5	7	24	46	23	23	CL				
	15.0 to 16.5	10	28						97		
	20.0 to 21.5	11	27	60	23	37	CH				
	25.0 to 26.5	5	31								
	30.0 to 32.0		25						60		
	35.0 to 36.5	11	28								
	40.0 to 41.5	24	32						61		
	48.5 to 50.0	4	32								
DP-33	0.0 to 1.5	11	19	47	18	29	CL				
	2.0 to 3.5	13	16						99		
	4.0 to 6.0		20					110		2.25	PP
	6.0 to 8.0		21							1.67	PP
	8.0 to 10.0		22					96		1.13	UC
	10.0 to 12.0		21	57	20	37	CH			1.96	PP
	15.0 to 17.0		29	57	25	32	CH			1.17	PP
	20.0 to 22.0		31						99	1.13	PP
	25.0 to 26.5	7	29	62	23	39	CH				
	30.0 to 32.0		28						7		
	35.0 to 36.5	23	25						10		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303k

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-33	40.0 to 41.5	20	27						9		
	48.5 to 50.0	9	29						56		
DP-34	0.0 to 1.5	11	19						98		
	2.0 to 3.5	10	40	61	21	40	CH				
	4.0 to 6.0		18	59	22	37	CH	121	98	2.08	PP
	6.0 to 8.0		21					105	94	2.27	UC
	8.0 to 10.0		25	55	24	31	CH	100	100	1.92	PP
	10.0 to 12.0		25	68	24	44	CH			1.96	PP
	15.0 to 17.0		28						99	1.04	PP
	20.0 to 22.0		29	30	27	3	ML			0.25	PP
	25.0 to 26.5	15	31						65		
	30.0 to 31.5	24	27						9		
	35.0 to 36.5	12	27						18		
	40.0 to 41.5	11	25								
	48.5 to 50.0	7	29	40	20	20	CL				
DP-35	0.0 to 2.0		15						95	2.25	PP
	2.0 to 4.0			55	21	34				2.25	PP
	4.0 to 6.0		15						99	2.25	PP
	6.0 to 8.0		20	55	22	33				2.25	PP
	8.0 to 10.0		19				CH	101		2.85	UC
	10.0 to 12.0		24	58	23	35				2.25	PP
	15.0 to 17.0		29						35	1.00	PP
	20.0 to 21.5	9	26	32	23	9					
	25.0 to 26.5	15	34						10		
	30.0 to 31.3	50/ 10"	22						14		
	35.0 to 36.5	21	24						10		
	40.0 to 41.5	27	25								
	48.5 to 50.0	33	26								
DP-36	0.0 to 1.5		17	59	22	37	CH			2.25	PP
	2.0 to 3.5		15					101		1.62	UC
	4.0 to 6.0		19						100	2.25	PP
	6.0 to 8.0		21	64	25	39	CH			2.25	PP
	8.0 to 10.0		19						97	2.25	PP
	10.0 to 12.0		17						95	2.25	PP
	15.0 to 17.0		29	66	23	43	CH			0.92	PP
	20.0 to 21.5	18	27						95		
	25.0 to 26.5	16	26	CNBD	CNBD	NP	SM				
	30.0 to 31.5	17	27						30		
	35.0 to 36.5	17	24						23		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303I

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-36	40.0 to 41.4	50/ 11"	24								
	48.5 to 50.0	18	24								
DP-37	0.0 to 1.5	14	19	56	20	36	CH				
	2.0 to 3.5	15	15						99		
	4.0 to 6.0		20	61	24	37	CH			2.25	PP
	6.0 to 8.0		24							1.88	PP
	8.0 to 10.0		21						100	2.25	PP
	10.0 to 12.0		23	56	24	32	CH			2.25	PP
	15.0 to 17.0		25					98		1.45	UC
	20.0 to 22.0		27						100	1.00	PP
	25.0 to 26.5	17	28	54	23	31	CH				
	30.0 to 31.5	12	31						99		
	35.0 to 36.5	7	30								
	40.0 to 41.5	6	31						100		
	48.5 to 50.0	17	26						47		
DP-38	0.0 to 1.5	19	15						99		
	2.0 to 3.5	8	13	46	19	27	CL				
	4.0 to 5.5	9	17						98		
	6.0 to 8.0		19	50	22	28				2.25	PP
	8.0 to 10.0		21						99	2.25	PP
	10.0 to 12.0		25						99	1.92	PP
	15.0 to 17.0		24	63	24	39				1.71	PP
	20.0 to 22.0		27						100	0.88	PP
	25.0 to 27.0		28	55	24	31				2.00	PP
	30.0 to 32.0		26						100	1.21	PP
	35.0 to 37.0								83		
	40.0 to 41.5	11	25								
	48.5 to 50.0	6	31								
DP-39	0.0 to 1.5	20	16						98		
	2.0 to 3.5	18	15						100		
	4.0 to 5.5	11	19	54	19	35	CH				
	6.0 to 8.0		20	55	23	32				2.25	PP
	8.0 to 10.0		24				CH	102		1.34	UC
	10.0 to 12.0		25	CNBD	CNBD	NP				1.46	PP
	15.0 to 17.0		24						48	2.09	PP
	20.0 to 22.0		30	61	23	38	SM				
	25.0 to 26.5	13	29						73		
	30.0 to 31.5	12	30						13		
	35.0 to 36.5	10	30						34		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303m

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-39	40.0 to 41.5	19	25								
	48.5 to 50.0	20	29								
DP-40	0.0 to 2.0		18	62	22	40	CH			2.25	PP
	2.0 to 4.0		14					104		3.44	UC
	4.0 to 6.0		19					108	100	2.25	PP
	6.0 to 8.0		15	47	17	30	CL			2.25	PP
	8.0 to 10.0		18						84	2.25	PP
	10.0 to 12.0			69	24	45				1.42	PP
	15.0 to 17.0		28						99	1.34	PP
	20.0 to 21.5	18	30						100		
	25.0 to 26.5	14	33	51	22	29					
	30.0 to 31.5	14	32						100		
	35.0 to 36.5	14	31						13		
	40.0 to 41.5	26	23								
	48.5 to 50.0	28	25								
DP-41	0.0 to 2.0		15						93	2.25	PP
	2.0 to 4.0		20	67	20	47	CH			2.25	PP
	4.0 to 6.0		21					105		3.71	UC
	6.0 to 8.0		20	44	16	28	CL			2.25	PP
	8.0 to 10.0		18						76	2.25	PP
	10.0 to 12.0		20						93	2.25	PP
	15.0 to 17.0			69	24	45				1.09	PP
	20.0 to 21.5	20	25						99		
	25.0 to 26.5	11	30	51	21	30					
	30.0 to 31.5	18	27						100		
	35.0 to 36.5	13	27						28		
	40.0 to 41.5	24	24								
	48.5 to 50.0	30	24								
DP-42	0.0 to 2.0		14	45	21	24	CL			2.25	PP
	2.0 to 4.0		16						95	2.25	PP
	4.0 to 6.0		16						96	2.25	PP
	6.0 to 8.0		22					105		2.18	UC
	8.0 to 10.0		17	48	19	29	CL			1.75	PP
	10.0 to 12.0		19	47	19	28	CL	106	95	1.75	PP
	15.0 to 17.0		26						98	1.50	PP
	20.0 to 21.5	21	24	55	23	32	CH				
	25.0 to 26.5	7	30						97		
	30.0 to 31.5	9	30						99		
	35.0 to 36.5	47	26	CNBD	CNBD	NP	SM				

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303n

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-42	40.0 to 41.5	38	26						40		
	48.5 to 50.0	15	25						10		
DP-43	0.0 to 2.0		23					105		2.79	UC
	2.0 to 4.0		5						67		
	4.0 to 5.5	7	9	25	24	1	ML				
	6.0 to 7.5	5	12						71		
	8.0 to 9.5	4	28	30	23	7	CL-ML				
	10.0 to 11.5	7	27								
	15.0 to 16.5	6	31	53	28	25	CH				
	20.0 to 21.5	7	28						98		
	25.0 to 26.5	9	29						98		
	30.0 to 31.5	8	31	40	24	16	CL				
	35.0 to 36.5	13	34						99		
	40.0 to 41.5	9	34								
	48.5 to 50.0	23	29						8		
DP-44	0.0 to 2.0		21	56	27	29	CH			2.25	PP
	2.0 to 4.0		16						93	2.25	PP
	4.0 to 6.0		15					96		2.25	PP
	6.0 to 8.0		19	31	22	9	CL			1.67	PP
	8.0 to 10.0		20						94	0.58	PP
	10.0 to 12.0		33						91		
	15.0 to 17.0		22	63	25	38	CH			1.54	PP
	20.0 to 21.5	10	27								
	25.0 to 26.5	7	29						95		
	30.0 to 31.5	18	26	59	28	31	CH				
	35.0 to 36.5	23	24						96		
	40.0 to 41.5	22	27								
	48.5 to 50.0	23	28						94		
DP-45	0.0 to 2.0		17							2.25	PP
	2.0 to 4.0		26	31	22	9	CL			2.25	PP
	4.0 to 6.0		17					97		0.49	UC
	6.0 to 8.0		18	40	24	16	CL			1.29	PP
	8.0 to 10.0		22						89	1.33	PP
	10.0 to 12.0		23	33	20	13	CL			0.84	PP
	15.0 to 16.5	4	32						92		
	20.0 to 21.5	3	33						91		
	25.0 to 26.5	8	30	34	23	11	CL				
	30.0 to 31.5	11	35								
	35.0 to 36.5	13	27						97		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303o

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-45	40.0 to 41.5	14	27						94		
	48.5 to 50.0	37	25								
DP-46	0.0 to 2.0		19							2.25	PP
	2.0 to 4.0		14	38	16	22	CL			2.25	PP
	4.0 to 6.0		11						91		
	6.0 to 8.0		22					97		1.24	UC
	8.0 to 10.0		26	54	28	26	CH			1.71	PP
	10.0 to 12.0		27							1.46	PP
	15.0 to 17.0		28	73	30	43	CH			0.88	PP
	20.0 to 22.0		26						95	1.17	PP
	25.0 to 26.5	4	31						88		
	30.0 to 31.5	11	25						70		
	35.0 to 36.5	11	27						97		
	40.0 to 41.5	17	26	47	24	23	CL				
	48.5 to 50.0	10	29						70		
DP-47	0.0 to 2.0		8	28	14	14	CL			2.25	PP
	2.0 to 4.0		12					109		2.35	UC
	4.0 to 6.0									2.25	PP
	6.0 to 8.0		15	35	16	19	CL			1.71	PP
	8.0 to 10.0		21						96	1.33	PP
	10.0 to 12.0		26	56	19	37	CH			1.33	PP
	15.0 to 17.0		25						97	1.29	PP
	20.0 to 22.0		28					94		1.08	PP
	25.0 to 27.0		27						70	0.17	PP
	30.0 to 31.5	14	29	23	13	10	CL				
	35.0 to 36.5	13	28						32		
	40.0 to 41.5	18	26						24		
	48.5 to 50.0	37	22						94		
DP-48	0.0 to 2.0		13	41	19	22	CL			2.25	PP
	2.0 to 4.0		11						91	2.25	PP
	4.0 to 6.0		18	36	22	14	CL			2.25	PP
	6.0 to 8.0		20						95	1.96	PP
	8.0 to 10.0		27					95		1.26	UC
	10.0 to 12.0		23	37	20	17	CL			2.21	PP
	15.0 to 17.0		28							1.08	PP
	20.0 to 22.0		27						99	1.79	PP
	25.0 to 26.5	11	31	72	33	39	CH				
	30.0 to 31.5	11	32						98		
	35.0 to 36.5	6	32								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303p

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-48	40.0 to 41.5	10	31						10		
	48.5 to 50.0	11	28								
DP-49	0.0 to 2.0		15						91	2.25	PP
	2.0 to 4.0		13					107		1.32	UC
	4.0 to 6.0		20	72	22	50	CH			1.71	PP
	6.0 to 8.0		15						87	2.25	PP
	8.0 to 10.0		20	35	17	18	CL			1.71	PP
	10.0 to 12.0		19							1.71	PP
	15.0 to 17.0			71	24	47	CH			1.21	PP
	20.0 to 22.0		27						15		
	25.0 to 26.5	8	27	23	21	2	SM				
	30.0 to 31.5	13	27						24		
	35.0 to 36.5	23	23								
	40.0 to 41.5	20	24						12		
	48.5 to 50.0	11	28						92		
DP-50	0.0 to 2.0		16	40	21	19	CL			2.25	PP
	2.0 to 4.0		13						90	2.25	PP
	4.0 to 6.0		15	34	20	14	CL	100		1.67	UC
	6.0 to 8.0		17						94	2.25	PP
	8.0 to 10.0		19	31	19	12	CL			1.88	PP
	10.0 to 12.0									0.25	PP
	15.0 to 17.0		25						96	0.88	PP
	20.0 to 21.5	8	31						26		
	25.0 to 26.5	7	29	30	17	13	CL				
	30.0 to 31.5	11	29						13		
	35.0 to 36.5	21	28								
	40.0 to 41.5	21	15						9		
	48.5 to 50.0	16	25						68		
DP-51	0.0 to 2.0		11						99	2.25	PP
	2.0 to 4.0		9	50	20	30	CH			2.25	PP
	4.0 to 6.0			50	23	27	CH		99	2.25	PP
	6.0 to 8.0		21	53	21	32	CH	101		2.12	UC
	8.0 to 10.0		19						98	2.12	PP
	15.0 to 17.0		23	40	24	16	CL			1.25	PP
	20.0 to 22.0										
	25.0 to 26.5	8	29	46	26	20	CL				
	30.0 to 31.5	14	27						41		
	35.0 to 36.5	23	33						18		
	40.0 to 41.5	36	26						10		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303q

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-51	48.5 to 50.0	9	26						73		
DP-52	0.0 to 2.0		11	46	27	19	CL			2.25	PP
	2.0 to 4.0									2.25	PP
	4.0 to 6.0		12	40	23	17	CL			2.25	PP
	6.0 to 8.0		19					102		3.79	UC
	8.0 to 10.0		23	59	21	38		95		2.25	PP
	10.0 to 12.0		13						97	2.25	PP
	15.0 to 17.0		21	48	21	27	CL			2.25	PP
	20.0 to 22.0		28						99	1.13	PP
	25.0 to 26.5	8	31						94		
	30.0 to 31.5	9	28	28	15	13	CL				
	35.0 to 36.5	15	26						53		
	40.0 to 41.5	15	24						33		
	48.5 to 50.0	30	24						23		
DP-53	0.0 to 1.5	17	12	36	22	14	CL				
	2.0 to 3.5	5	14						91		
	4.0 to 6.0		21	47	22	25	CL			2.08	PP
	6.0 to 8.0		22						82	2.17	PP
	8.0 to 10.0		25						83	1.12	PP
	10.0 to 12.0		26	31	18	13	CL			0.58	PP
	15.0 to 17.0		26						96	0.83	PP
	20.0 to 22.0		28					89		1.29	PP
	25.0 to 26.5	10	30	81	21	60	CH				
	30.0 to 31.5	4	23						96		
	35.0 to 36.5	5	30						96		
	40.0 to 41.5	12	27								
	48.5 to 50.0	8	30						64		
DP-54	0.0 to 1.5	16	8						85		
	2.5 to 4.0	8	23						88		
	4.0 to 5.5	3	19	30	21	9	CL				
	6.0 to 7.5	4	20						94		
	8.0 to 9.5	5	23	24	19	5	CL				
	10.0 to 11.5	2	28						88		
	15.0 to 16.5	7	35	71	34	37	CH				
	20.0 to 22.0		26						98	1.08	PP
	25.0 to 27.0		29					90		0.39	UC
	35.0 to 36.5	4	32	29	18	11	CL				
	40.0 to 41.5	6	27						62		
	48.5 to 50.0	3	33								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303r

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-55	0.0 to 1.5	14	9						94		
	2.0 to 3.5	18	15	30	20	10	CL				
	4.0 to 5.5	14	15						92		
	6.0 to 7.5	10	11	35	18	17	CL				
	8.0 to 9.5	9	17								
	10.0 to 11.5	9	19								
	15.0 to 17.0									0.67	PP
	20.0 to 22.0										
	25.0 to 26.5	6	37								
	30.0 to 31.5	9	29						12		
	35.0 to 36.5	12	26								
	40.0 to 41.5	24	26						9		
	48.5 to 50.0	13	37								
DP-56	0.0 to 1.5	20	13	39	20	19	CL				
	2.5 to 4.0	14	17						99		
	4.0 to 5.5	8	13	48	21	27	CL				
	6.0 to 7.5	11	21	44	22	22	CL				
	8.0 to 10.0		16						94	2.25	PP
	10.0 to 12.0		19					106		0.96	UC
	15.0 to 16.5	4	28	37	21	16	CL				
	20.0 to 21.5	10	27						41		
	25.0 to 26.5	3	27						16		
	30.0 to 31.5	13	23						8		
	35.0 to 36.5	15	24						83		
	40.0 to 41.5	9	24								
	48.5 to 50.0	7	30								
DP-57	0.0 to 1.5	12	11						95		
	2.5 to 4.0	7	10	33	22	11	CL				
	4.0 to 5.5	6	12						99		
	6.0 to 7.5	7	19	51	24	27	CH				
	8.0 to 9.5	8	23						100		
	10.0 to 12.0		23	55	22	33	CH			1.50	PP
	15.0 to 17.0		27					94		0.92	UC
	20.0 to 22.0		25						56		
	25.0 to 26.5	4	26	CNBD	CNBD	NP	SM				
	30.0 to 31.5	30	24						9		
	35.0 to 36.5	12	26						6		
	40.0 to 41.5	23	27								
	48.5 to 50.0	31	25								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303s

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-58	0.0 to 1.5	10	13	36	18	18	CL				
	2.5 to 4.0	9	19						100		
	4.0 to 5.5	6	16	33	17	16	CL				
	6.0 to 7.5	6	17						89		
	8.0 to 9.5	3	19	28	19	9					
	10.0 to 11.5	5	20						100		
	15.0 to 16.5	7	32	60	26	34					
	20.0 to 21.5	9	31						76		
	25.0 to 26.5								48		
	30.0 to 31.5	16	31						8		
	35.0 to 36.5	4	32								
	40.0 to 41.5	5	28								
	48.5 to 50.0	23	24								
DP-59	0.0 to 1.5		11	46	18	28	CL		96	2.25	PP
	2.5 to 4.0		11						98	2.25	PP
	4.0 to 5.5		16					111		3.39	UC
	6.0 to 7.5		21	49	21	28	CL		93	1.19	PP
	8.0 to 9.5		25						97	1.13	PP
	10.0 to 11.5		29	65	25	40	CH		97	1.06	PP
	15.0 to 16.5		31							0.81	PP
	20.0 to 21.5		24	50	22	28	CH		98	0.56	PP
	25.0 to 26.5	10	28								
	30.0 to 31.5	22	23	CNBD	CNBD	NP	SM				
	35.0 to 36.5	28	26						14		
	40.0 to 41.5	23	26								
	48.5 to 50.0	22	34								
DP-60	0.0 to 1.5	22	13	49	20	29	CL				
	2.5 to 4.0	19	17						98		
	4.0 to 5.5	16	17						93		
	6.0 to 7.5	15	21	40	18	22	CL				
	8.0 to 9.5	17	20						91		
	10.0 to 11.5	7	20						94		
	15.0 to 16.5	10	23	38	21	17	CL				
	20.0 to 21.5	5	28						93		
	25.0 to 26.5	12	29	CNBD	CNBD	NP	SM				
	30.0 to 31.5	6	24								
	35.0 to 36.5	10									
	40.0 to 41.5	25	24						8		
	48.5 to 50.0	14	26								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303t

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-61	0.0 to 1.5	16	14						89		
	2.5 to 4.0	11	23	51	21	30	CH				
	4.0 to 5.5	15	16						98		
	6.0 to 7.5	10	22	38	21	17					
	8.0 to 9.5	7	15						98		
	10.0 to 11.5	4	29	67	25	42					
	15.0 to 16.5	8	30						49		
	20.0 to 21.5	7	31	29	26	3					
	25.0 to 26.5	6	33						42		
	30.0 to 31.5	34	27						35		
	35.0 to 36.5	26	26								
	40.0 to 41.5	3	26								
	48.5 to 50.0	10	27								
DP-62	0.0 to 2.0		20					105		2.25	PP
	2.0 to 4.0		16							2.25	PP
	4.0 to 6.0		26	70	24	46	CH			2.13	PP
	6.0 to 8.0		25						98	2.00	PP
	8.0 to 10.0		22	49	20	29	CL			1.75	PP
	10.0 to 12.0		28					93		1.05	UC
	15.0 to 16.5	18	26	47	21	26	CL				
	20.0 to 21.5	16	22						6		
	25.0 to 26.5	14	24						10		
	30.0 to 31.5	23	25						6		
	35.0 to 36.5	40	25						9		
	40.0 to 41.5	19	26	CNBD	CNBD	NP	SP-SM				
	48.5 to 50.0	32	27						12		
DP-63	0.0 to 2.0		8					118		4.49	UC
	2.0 to 4.0		6						93	2.25	PP
	4.0 to 6.0		12	58	18	40	CH			2.25	PP
	6.0 to 8.0		25						99	2.13	PP
	8.0 to 10.0		21	36	14	22	CL			0.75	PP
	10.0 to 12.0		18						76	0.75	PP
	15.0 to 16.5	7	29						98		
	20.0 to 21.5	15	28	56	27	29	CH				
	25.0 to 26.5	16	31								
	30.0 to 31.5	17	27						99		
	35.0 to 36.5	22	30	65	30	35	CH				
	40.0 to 41.5	29	26						8		
	48.5 to 50.0	21									

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303u

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-64	0.0 to 2.0		17	53	30	23	CH			2.25	PP
	2.0 to 4.0									2.25	PP
	4.0 to 6.0		17	41	17	24	CL			2.25	PP
	6.0 to 8.0		22						98	2.25	PP
	8.0 to 10.0		25	41	23	18	CL			1.63	PP
	10.0 to 12.0		22					98		1.42	UC
	15.0 to 16.5	20	26						98		
	20.0 to 21.5	3	32	31	22	9	CL				
	25.0 to 26.5	3	36						79		
	30.0 to 31.5	7	35								
	35.0 to 36.5	8	34						53		
	40.0 to 41.5	22	27						99		
	48.5 to 50.0	7	31						61		
DP-65	0.0 to 2.0		14	53	23	30	CH		96	2.25	PP
	2.0 to 4.0		19							2.25	PP
	4.0 to 6.0		15						95	2.25	PP
	6.0 to 8.0		25	59	19	40	CH	97		1.41	UC
	8.0 to 10.0		27					96		2.13	PP
	10.0 to 12.0		31							1.63	PP
	15.0 to 17.0		32	57	28	29	CH		94	0.67	PP
	20.0 to 21.5	4	31						88		
	25.0 to 26.5	12	31						97		
	30.0 to 32.0		34						98	0.59	PP
	35.0 to 37.0		28							1.75	PP
	40.0 to 42.0		36	51	23	28	CH		100	0.75	PP
	48.5 to 50.5		33							0.83	PP
DP-66	0.0 to 2.0		13	46	24	22	CL		89	2.25	PP
	2.0 to 4.0		13						98	2.25	PP
	4.0 to 6.0		16	47	25	22	CL		96	2.25	PP
	6.0 to 8.0		20					105		2.32	UC
	8.0 to 10.0		21							2.25	PP
	10.0 to 12.0		17	56	19	37	CH		88	2.17	PP
	15.0 to 17.0		24	56	24	32	CH	101	100	1.67	PP
	20.0 to 22.0		28	50	19	31	CH		98	1.00	PP
	25.0 to 27.0		26							1.17	PP
	30.0 to 32.0		28								
	35.0 to 36.5	23	28						15		
	40.0 to 41.5	22	25								
	48.5 to 50.0	26	20								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303v

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-67	0.0 to 2.0		12							2.25	PP
	2.0 to 4.0		14						88	2.25	PP
	4.0 to 6.0		14	54	26	28	CH		89	2.25	PP
	6.0 to 8.0		14							2.25	PP
	8.0 to 10.0		21					106		5.61	UC
	10.0 to 12.0		19							2.25	PP
	15.0 to 17.0		32	60	25	35	CH		96	1.08	PP
	20.0 to 22.0		28							0.25	PP
	25.0 to 27.0		26						98	1.50	PP
	30.0 to 32.0		28	58	31	27	MH		97	2.00	PP
	35.0 to 37.0		29							1.67	PP
	40.0 to 42.0		34	52	23	29	CH			0.33	PP
	48.5 to 50.0	15	22						18		
DP-68	0.0 to 2.0		10				CL		77	2.25	PP
	2.0 to 4.0		24					100		3.35	UC
	4.0 to 6.0		16						74	1.83	PP
	6.0 to 8.0		31				CH		100	1.57	PP
	8.0 to 10.0		20							1.33	PP
	10.0 to 11.5	11	28				CH				
	15.0 to 16.5	13	27								
	20.0 to 21.5	20	28	75	28	47	CH		98		
	25.0 to 26.5	23	27						98		
	30.0 to 31.5	4	23								
	35.0 to 36.5	22	25								
	40.0 to 41.5	31	24						10		
	48.5 to 50.0	32	28								
DP-69	0.0 to 2.0		10	38	20	18	CL		70	2.25	PP
	2.0 to 4.0		19					107		2.38	UC
	4.0 to 6.0		16	50	19	31	CH			2.25	PP
	6.0 to 8.0		11						64	2.17	PP
	8.0 to 10.0		19	43	20	23	CL		85	2.25	PP
	10.0 to 12.0		17	42	18	24	CL			2.17	PP
	15.0 to 16.5	16	8						6		
	20.0 to 21.5	19	12						19		
	25.0 to 26.5	48	23						12		
	30.0 to 31.5	50/ 11"	23								
	35.0 to 36.5	50/ 10"	22								
	40.0 to 41.5	16	24								
	48.5 to 50.0	22	23								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

Raba-Kistner

FIGURE A-303w

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-70	0.0 to 2.0		14					110	92	4.41	UC
	2.0 to 4.0		23	66	26	40	CH		99	2.25	PP
	4.0 to 6.0		17	44	21	23	CL		93	2.25	PP
	6.0 to 8.0		17	52	21	31	CL			2.25	PP
	8.0 to 10.0		19						23	2.25	PP
	10.0 to 12.0		18						13	2.25	PP
	15.0 to 17.0			CNBD	CNBD	NP					
	20.0 to 21.5	12	17						11		
	25.0 to 26.5	14	21								
	30.0 to 31.5	16	26								
	35.0 to 36.5	13	23								
	40.0 to 41.5	15	26				SP-SM				
	48.5 to 50.0	21	23								
DP-71	0.0 to 2.0		15	49	22	27	CL			2.25	PP
	2.0 to 4.0		11						96	2.25	PP
	4.0 to 6.0		16	38	17	21	CL	110		1.58	UC
	6.0 to 8.0		20							2.25	PP
	8.0 to 10.0								100		
	10.0 to 12.0		16	51	23	28					
	15.0 to 16.5	18							92		
	20.0 to 21.5	10	26	CNBD	CNBD	NP					
	25.0 to 26.5	17	25						12		
	30.0 to 31.5	27	25						9		
	35.0 to 36.5	20	25						9		
	40.0 to 41.5	36	28								
	48.5 to 50.0	32	27								
DP-72	0.0 to 2.0		14						94	2.25	PP
	2.0 to 4.0		15	40	20	20	CL			2.25	PP
	4.0 to 6.0		22						98	2.25	PP
	6.0 to 8.0		19	33	19	14	CL	105	96	2.25	PP
	8.0 to 10.0		20	33	21	12	CL			1.75	PP
	10.0 to 12.0		20					99		0.75	PP
	15.0 to 16.5	21	28	57	24	33	CH				
	20.0 to 21.5	19	28						100		
	25.0 to 26.5	12	29	58	27	31					
	30.0 to 31.5	15	33						100		
	35.0 to 36.5	14	33						38		
	40.0 to 41.5	16	30								
	48.5 to 50.0	33	27								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

Raba-Kistner

FIGURE A-303x

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-73	0.0 to 2.0		14	38	19	19	CL			2.25	PP
	2.0 to 4.0		14					113	92	3.48	UC
	4.0 to 6.0		17	38	19	19		97		2.25	PP
	6.0 to 8.0		14						91	2.25	PP
	8.0 to 10.0		15	37	21	16	CL			2.25	PP
	10.0 to 12.0			25	22	3				2.00	PP
	15.0 to 16.5	16	16	61	25	36	ML				
	20.0 to 21.5	22	27						52		
	25.0 to 26.5	5	29						9		
	30.0 to 31.5	11	38						10		
	35.0 to 36.5	25	25						11		
	40.0 to 41.5	40	25								
	48.5 to 50.0	14	30								
DP-74	0.0 to 2.0		9	37	21	16	CL			2.25	PP
	2.0 to 4.0		12						98	2.25	PP
	4.0 to 6.0		13	57	21	36	CH			2.25	PP
	6.0 to 8.0		16						97	2.25	PP
	8.0 to 10.0		15						100	2.25	PP
	10.0 to 12.0		18	63	23	40				2.25	PP
	15.0 to 17.0		25						99	2.25	PP
	20.0 to 21.5	7	26						78		
	25.0 to 26.5	13	28						14		
	30.0 to 31.5	10	33	59	21	38					
	35.0 to 36.5	4	25								
	40.0 to 41.5	23	25								
	48.5 to 50.0	27	24				CH				
DP-75	0.0 to 2.0		16						92	2.25	PP
	2.0 to 4.0		20					105		3.34	UC
	4.0 to 6.0		17	58	21	37	CH			2.25	PP
	6.0 to 8.0		33	55	24	31	CH	84	100	2.25	PP
	8.0 to 10.0		12						92	2.25	PP
	10.0 to 12.0		11						90	2.25	PP
	15.0 to 17.0		27	72	25	47	CH			2.25	PP
	20.0 to 21.5	4	31						95		
	25.0 to 26.5	22	33	38	20	18	CL				
	30.0 to 31.5	18	28						73		
	35.0 to 36.5	22	26								
	40.0 to 41.5	47	27						9		
	48.5 to 50.0	25	26	36	19	17	CL				

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303y

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-76	0.0 to 2.0		13	59	21	38	CH			2.25	PP
	2.0 to 4.0		15						98	2.25	PP
	4.0 to 6.0		25						100	2.25	PP
	6.0 to 8.0		25	58	21	37	CH			2.25	PP
	8.0 to 10.0		25					98		2.13	UC
	10.0 to 12.0		29						100	2.25	PP
	15.0 to 17.0		25	69	23	46	CH			1.75	PP
	20.0 to 21.5	6	31						97		
	25.0 to 26.5	22	24						7		
	30.0 to 31.5	18	28						6		
	35.0 to 36.5	14	30						6		
	40.0 to 41.5	29	28	48	20	28					
	48.5 to 50.0	11	32				CL				
DP-77	0.0 to 2.0		10						78	2.25	PP
	2.0 to 4.0		13	61	29	32	CH			2.25	PP
	4.0 to 6.0		10					114		3.88	UC
	6.0 to 8.0		11	41	21	20	CL			2.25	PP
	8.0 to 10.0		15							2.25	PP
	10.0 to 12.0		19						73	2.25	PP
	15.0 to 17.0		26						97	1.25	PP
	20.0 to 21.5	10	30						98		
	25.0 to 26.5	18	28	53	27	26	CH				
	30.0 to 31.5	14	26						99		
	35.0 to 36.5	8	29	37	20	17	CL				
	40.0 to 41.5	30	30								
	48.5 to 50.0	32	27						18		
DP-78	0.0 to 2.0		16	47	25	22	CL			2.25	PP
	2.0 to 4.0		19					108		5.56	UC
	4.0 to 6.0		17							2.25	PP
	6.0 to 8.0		23						99	2.25	PP
	8.0 to 10.0		17	73	26	47	CH			2.25	PP
	10.0 to 12.0		22						96	2.13	PP
	15.0 to 17.0		23						98	1.13	PP
	20.0 to 21.5	11	29	45	20	25	CL				
	25.0 to 26.5	16	27						97		
	30.0 to 31.5	17	24	52	20	32	CH				
	35.0 to 36.5	22	21						8		
	40.0 to 41.5	33	23								
	48.5 to 50.0	17	34						76		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303z

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-79	0.0 to 2.0		13						94	2.25	PP
	2.0 to 4.0		19	41	18	23	CL			2.25	PP
	4.0 to 6.0		29					92		1.56	UC
	6.0 to 8.0		25						97	2.00	PP
	8.0 to 10.0		22	49	18	31	CL			2.25	PP
	10.0 to 12.0		26						96	0.75	PP
	15.0 to 17.0		27								
	20.0 to 21.5	18	30	82	25	57	CH				
	25.0 to 26.5	24	28						97		
	30.0 to 31.5	22	29						98		
	35.0 to 36.5	19	30	78	29	49	CH				
	40.0 to 41.5	9	25								
	48.5 to 50.0	17	26						8		
DP-80	0.0 to 2.0		16	34	18	16	CL			2.25	PP
	2.0 to 4.0		19					108	92	2.95	UC
	4.0 to 6.0		16						88	2.25	PP
	6.0 to 8.0		20	56	16	40	CH			1.13	PP
	8.0 to 10.0		14							0.38	PP
	10.0 to 12.0		30							0.50	PP
	15.0 to 17.0		30	53	27	26	CH			0.88	PP
	20.0 to 21.5	17	30						96		
	25.0 to 26.5	25	31						99		
	30.0 to 31.5	20	28	68	33	35	CH				
	35.0 to 36.5	16	33								
	40.0 to 41.5	15	26						91		
	48.5 to 50.0	23	29								
DP-81	0.0 to 1.5		16	61	27	34	CH				
	2.0 to 4.0		15	57	18	39	CH	115	96	2.25	PP
	4.0 to 6.0		16	57	27	30	CH	111		3.09	UC
	6.0 to 8.0		20						98	2.25	PP
	8.0 to 10.0		19	37	20	17		98		2.25	PP
	10.0 to 12.0		21	53	26	27	CH			1.58	PP
	15.0 to 17.0										
	20.0 to 21.5	19	31	28	14	14	CL				
	25.0 to 26.5	14	31						81		
	30.0 to 32.0		27						96	2.08	PP
	35.0 to 37.0		24						93	2.08	PP
	40.0 to 42.0		29						97	2.08	PP
	45.0 to 47.0		26						97	2.25	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303aa

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-81	48.5 to 50.0	19	27								
DP-82	0.0 to 2.0		9						94	2.25	PP
	2.0 to 4.0		16	51	23	28	CH			2.25	PP
	4.0 to 6.0		14					107		3.24	UC
	6.0 to 8.0		17	63	22	41	CH			2.25	PP
	8.0 to 10.0									2.21	PP
	10.0 to 12.0		23	50	26	24	CH			0.96	PP
	15.0 to 17.0		23						97	1.25	PP
	20.0 to 22.0		23						96	1.25	PP
	25.0 to 27.0		26	67	24	43	CH			2.21	PP
	30.0 to 32.0		28						98	2.13	PP
	35.0 to 37.0		29							2.21	PP
	40.0 to 42.0		30						99	2.25	PP
	48.0 to 50.0		25						99	2.25	PP
DP-83	0.0 to 2.0		17	57	20	37	CH			2.25	PP
	2.0 to 4.0		18	56	22	34	CH	110	98	2.25	PP
	4.0 to 6.0		20						99	2.25	PP
	6.0 to 8.0		18					106		2.57	UC
	8.0 to 10.0		21	54	21	33	CH			2.25	PP
	10.0 to 12.0		25						98	1.38	PP
	15.0 to 17.0		27	56	22	34	CH			0.88	PP
	20.0 to 22.0		27						99	0.88	PP
	25.0 to 27.0		26							1.32	PP
	30.0 to 32.0		29	65	24	41	CH			1.25	PP
	35.0 to 37.0		27						99	1.88	PP
	40.0 to 42.0		27						97	1.38	PP
	48.5 to 50.5		27						100	1.38	PP
DP-84	0.0 to 2.0		11						94	2.25	PP
	2.0 to 4.0		19	61	27	34	CH			2.25	PP
	4.0 to 6.0		14							2.25	PP
	6.0 to 8.0		25	69	27	42	CH			2.25	PP
	8.0 to 10.0		27						100	2.00	PP
	10.0 to 12.0		25						92	1.75	PP
	15.0 to 17.0		32	64	31	33	CH			1.00	PP
	20.0 to 22.0		26					100		0.78	UC
	25.0 to 27.0		27						97	1.25	PP
	30.0 to 32.0		28							1.38	PP
	35.0 to 37.0		27	68	26	42	CH			1.44	PP
	40.0 to 42.0		26						99	0.37	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

Raba-Kistner

FIGURE A-303bb

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-84	48.0 to 50.0		28						88	0.50	PP
DP-85	0.0 to 2.0		18	59	25	34	CH			2.25	PP
	2.0 to 4.0		17	58	23	35	CH	110	98	2.25	PP
	4.0 to 6.0		22						100	2.17	PP
	6.0 to 8.0		27					94		2.08	PP
	8.0 to 10.0		30	63	28	35	CH			2.17	PP
	10.0 to 12.0		30						100	1.67	PP
	15.0 to 17.0		27					96		0.27	UC
	20.0 to 22.0		28	56	23	33	CH			1.75	PP
	25.0 to 27.0		26						100	1.96	PP
	30.0 to 32.0		27						100	1.92	PP
	35.0 to 37.0		27	67	26	41	CH			2.12	PP
	40.0 to 42.0		27						99	2.08	PP
	48.0 to 50.0		27						99	0.25	PP
DP-86	0.0 to 2.0		17	52	26	26	CH			2.25	PP
	2.0 to 4.0		27						99	2.25	PP
	4.0 to 6.0		23					107		1.47	UC
	6.0 to 8.0		29	65	26	39	CH			1.94	PP
	8.0 to 10.0		31						100	1.38	PP
	10.0 to 12.0		34						100	1.62	PP
	15.0 to 17.0		34	65	26	39	CH			0.88	PP
	20.0 to 22.0		27						99	1.13	PP
	25.0 to 27.0		29						100	1.00	PP
	30.0 to 32.0		31							2.00	PP
	35.0 to 37.0		27							1.69	PP
	40.0 to 42.0		28	67	27	40	CH			1.38	PP
	48.5 to 50.5		28						99	1.38	PP
DP-87	0.0 to 2.0		14						81	2.25	PP
	2.0 to 4.0		17	39	21	18	CL			2.25	PP
	4.0 to 6.0		16							2.25	PP
	6.0 to 8.0		17						93	2.25	PP
	8.0 to 10.0		23	44	21	23	CL			2.25	PP
	10.0 to 12.0		20						98	2.00	PP
	15.0 to 17.0		27	52	22	30	CH			2.21	PP
	20.0 to 22.0		28						84	1.67	PP
	25.0 to 27.0		30	71	26	45	CH			2.04	PP
	30.0 to 32.0		29						96	2.04	PP
	35.0 to 37.0		28					95		0.92	UC
	40.0 to 42.0		27						69	0.30	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

Raba-Kistner

FIGURE A-303cc

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-87	48.0 to 50.0		27						85	0.54	PP
DP-88	0.0 to 2.0		18	42	19	23	CL			2.25	PP
	2.0 to 4.0		21						94	2.25	PP
	4.0 to 6.0		22	60	24	36	CH			2.25	PP
	6.0 to 8.0		26					96		0.99	UC
	8.0 to 10.0		28	44	17	27	CL			1.63	PP
	10.0 to 12.0		31						98	0.50	PP
	15.0 to 17.0									0.33	PP
	20.0 to 22.0		27						98	1.79	PP
	25.0 to 27.0		29	70	29	41	CH			1.79	PP
	30.0 to 32.0		26	68	23	45	CH			2.04	PP
	35.0 to 37.0		26							2.04	PP
	40.0 to 42.0		24	63	21	42	CH			1.96	PP
	48.0 to 50.0		36						96		
DP-89	0.0 to 2.0		10	39	20	19	CL			2.08	PP
	2.0 to 4.0		13					98	97	2.04	PP
	4.0 to 6.0		9	30	23	7	CL-ML			1.12	PP
	6.0 to 8.0		24						99	1.04	PP
	8.0 to 10.0		19					106		1.79	PP
	10.0 to 12.0	9	24	43	20	23	CL				
	15.0 to 16.5	4	27						85		
	20.0 to 22.0		25					99		1.24	UC
	25.0 to 27.0		30	61	26	35	CH			1.79	PP
	30.0 to 32.0		26						100	2.12	PP
	35.0 to 37.0		23	65	23	42	CH	101	99	2.12	PP
	40.0 to 42.0		25						96	1.00	PP
	48.5 to 50.0	15	29						79		
DP-90	0.0 to 2.0		13						94	2.15	PP
	2.0 to 4.0		24	63	28	35	CH			2.00	PP
	4.0 to 6.0		22						99	1.75	PP
	6.0 to 8.0		19	43	17	26	CL	103		1.84	UC
	8.0 to 9.5	12	26						98		
	10.0 to 12.0		25	50	26	24	CH			1.55	PP
	15.0 to 16.5	4									
	20.0 to 21.5	14	28						88		
	25.0 to 27.0		30	48	26	22	CL			1.10	PP
	30.0 to 32.0		25						98	2.05	PP
	35.0 to 37.0		26						96	1.95	PP
	40.0 to 41.5	13	33	80	28	52	CH				

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303dd

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-90	48.5 to 50.0	18	30						90		
DP-91	0.0 to 2.0		11						91	2.15	PP
	2.0 to 3.5	17	19						98		
	4.0 to 6.0		18					103	92	2.15	PP
	6.0 to 7.5	15	18	45	19	26	CL				
	8.0 to 10.0		17					101		2.28	UC
	10.0 to 11.5	14	20	48	21	27	CL				
	15.0 to 17.0		26	60	23	37	CH	101	100	2.20	PP
	20.0 to 22.0		29						83	1.45	PP
	25.0 to 26.5	12	26						24		
	30.0 to 31.5	19	26						10		
	35.0 to 36.5	23	29	CNBD	CNBD	NP	SP-SM				
	40.0 to 42.0		26						97	1.95	PP
	48.0 to 50.0		29	46	22	24	CL			1.40	PP
DP-92	0.0 to 2.0		18	44	20	24	CL			2.25	PP
	2.0 to 4.0		25							2.25	PP
	4.0 to 6.0		21					102	93	1.60	PP
	6.0 to 7.5	11	25						91		
	8.0 to 10.0		29	74	27	47	CH			1.90	PP
	10.0 to 12.0		30						99	2.00	PP
	15.0 to 17.0		23	53	23	30	CH	101	100	2.15	PP
	20.0 to 22.0		28	71	26	45	CH			2.15	PP
	25.0 to 26.5	12	28						99		
	30.0 to 32.0		27						9		
	35.0 to 36.5	20	32	CNBD	CNBD	NP	SP-SM				
	40.0 to 42.0		30						99	1.90	PP
	48.5 to 50.0	8	33								
DP-93	0.0 to 2.0		17						95	2.15	PP
	2.0 to 4.0		18	65	27	38		107		3.03	UC
	4.0 to 6.0		28				CH	94		2.20	PP
	6.0 to 8.0								92	2.20	PP
	8.0 to 9.4	12	21	31	22	9					
	10.0 to 12.0		13						74	2.15	PP
	15.0 to 16.5	15	9						100		
	20.0 to 22.0		26	51	25	26				2.00	PP
	25.0 to 27.0		29						100	1.80	PP
	30.0 to 32.0		25	57	23	34				1.50	PP
	35.0 to 37.0		25						94	1.85	PP
	40.0 to 42.0		28							1.80	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ee

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-93	48.5 to 50.0	6	31								
DP-94	0.0 to 2.0		15					107		4.60	UC
	2.0 to 4.0		16							2.25	PP
	4.0 to 6.0		21	61	30	31	CH			2.25	PP
	6.0 to 8.0		22						95	2.25	PP
	8.0 to 10.0		25	76	32	44	CH			2.25	PP
	10.0 to 12.0		28						97	2.25	PP
	15.0 to 17.0		27							2.25	PP
	20.0 to 22.0		22	46	23	23	CL			1.83	PP
	25.0 to 27.0		27						98	1.58	PP
	30.0 to 32.0		25						73	0.50	PP
	35.0 to 36.5	11	35						43		
	40.0 to 41.5	33	29	CNBD	CNBD	NP	SM				
	48.5 to 50.0	36	30						50		
DP-95	0.0 to 2.0		11						95	2.25	PP
	2.0 to 4.0		16						96	2.25	PP
	4.0 to 6.0		20	64	20	44	CH			2.25	PP
	6.0 to 8.0		21					102		4.18	UC
	8.0 to 10.0		21	72	21	51	CH			2.25	PP
	10.0 to 12.0		22							2.25	PP
	15.0 to 17.0		22						98	2.25	PP
	20.0 to 21.5	14	16	28	17	11	CL				
	25.0 to 27.0		28						99	1.33	PP
	30.0 to 32.0		24	62	24	38	CH			1.17	PP
	35.0 to 37.0		33						56	0.25	PP
	40.0 to 41.5	6	24								
	48.5 to 50.0	5	29						24		
DP-96	0.0 to 2.0		12					111		7.84	UC
	2.0 to 4.0		11	49	18	31	CL			2.25	PP
	4.0 to 6.0		13							2.25	PP
	6.0 to 8.0		20							2.17	PP
	8.0 to 10.0		26						99	2.25	PP
	10.0 to 12.0		27	64	22	42	CH			2.00	PP
	15.0 to 17.0		19						99	1.42	PP
	20.0 to 22.0		18						68	1.08	PP
	25.0 to 27.0		28	31	16	15	CL			0.25	PP
	30.0 to 31.5	10	28						46		
	35.0 to 36.5	13	29						14		
	40.0 to 41.5	22	23	CNBD	CNBD	NP	SM				

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ff

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-96	48.5 to 50.0	30	26						37		
DP-97	0.0 to 2.0		12	51	18	33	CH			2.25	PP
	2.0 to 4.0		23						98	2.25	PP
	4.0 to 6.0		23					100		2.47	UC
	6.0 to 8.0		17	44	19	25	CL			1.83	PP
	8.0 to 10.0		23							2.08	PP
	10.0 to 12.0		17						91	2.17	PP
	15.0 to 17.0		14	26	14	12	CL			2.25	PP
	20.0 to 22.0		22						63	0.25	PP
	25.0 to 26.5	15	28						13		
	30.0 to 31.5	22	30								
	35.0 to 36.5	21	29						8		
	40.0 to 41.5	42	26	30	15	15	SC				
	48.5 to 50.0	42	28						37		
DP-98	0.0 to 2.0		12						95	2.25	PP
	2.0 to 4.0		13	35	16	19	CL		96	2.25	PP
	4.0 to 6.0		14					110		3.83	UC
	6.0 to 8.0		14	31	16	15	CL			2.25	PP
	8.0 to 10.0		13							2.25	PP
	10.0 to 12.0		15	37	17	20	CL			1.81	PP
	15.0 to 17.0		15	31	16	15	CL			2.25	PP
	20.0 to 22.0		26						66		
	25.0 to 26.5	19	29						20		
	30.0 to 31.5	31	26								
	35.0 to 36.5	20	27						12		
	40.0 to 41.5	24	26								
	48.5 to 50.0	25	26						9		
DP-99	0.0 to 2.0		10	44	19	25	CL		95	2.25	PP
	2.0 to 4.0		13							2.25	PP
	4.0 to 6.0		14	49	19	30	CL	117		5.88	UC
	6.0 to 8.0		19						97	2.25	PP
	8.0 to 10.0		16	46	21	25	CL		96	2.25	PP
	10.0 to 12.0		14							2.25	PP
	15.0 to 17.0		16	58	19	39	CH			2.25	PP
	20.0 to 22.0		5	34	15	19	CL			2.25	PP
	25.0 to 26.4	50/ 11"	21						20		
	30.0 to 31.5	40	22						12		
	35.0 to 36.5	23	24								
	40.0 to 41.5	20	24								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303gg

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-99	48.5 to 50.0	22	22						20		
DP-100	0.0 to 2.0		13	45	18	27	CL			2.25	PP
	2.0 to 4.0		11						96	2.25	PP
	4.0 to 6.0		12						96	2.25	PP
	6.0 to 8.0		10							2.25	PP
	8.0 to 10.0		12	41	17	24	CL		84	2.25	PP
	10.0 to 12.0									2.25	PP
	15.0 to 17.0		14						94	2.25	PP
	20.0 to 22.0		12	38	16	22	CL			2.25	PP
	25.0 to 26.5	15	17						69		
	30.0 to 31.5	16	28								
	35.0 to 36.5	19	26						26		
	40.0 to 41.5	19	29						56		
	48.5 to 50.0	18	28	41	18	23	CL				
DP-101	0.0 to 2.0		12						94	2.25	PP
	2.0 to 4.0		12							2.25	PP
	4.0 to 6.0		12	45	20	25	CL		95	2.25	PP
	6.0 to 8.0		14					110	86	3.65	UC
	8.0 to 10.0		12							2.25	PP
	10.0 to 12.0		16						96	2.25	PP
	15.0 to 17.0		15	41	19	22	CL			2.25	PP
	20.0 to 22.0		31							2.25	PP
	25.0 to 26.5	17	18	49	21	28	CL				
	30.0 to 32.0		30						97	1.69	PP
	35.0 to 37.0		35							0.81	PP
	40.0 to 41.3	50/ 10"	23						11		
	48.0 to 50.0		28	68	27	41	CH			1.81	PP
DP-102	0.0 to 2.0		9	50	17	33	CH			2.25	PP
	2.0 to 4.0		16						93	2.25	PP
	4.0 to 6.0		18	43	16	27	CL			2.25	PP
	6.0 to 8.0		17	51	20	31		110		2.25	PP
	8.0 to 10.0		18	51	23	28	CH			2.25	PP
	10.0 to 12.0		18						95	2.25	PP
	15.0 to 17.0		18							2.21	PP
	20.0 to 22.0		20						97	2.25	PP
	25.0 to 27.0		25					97		1.82	UC
	30.0 to 32.0		27	67	29	38	CH			1.25	PP
	35.0 to 37.0		27						98	1.04	PP
	40.0 to 41.5	49	26						12		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303hh

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-102	48.5 to 49.9	50/ 11"	31						12		
DP-103	0.0 to 2.0		12						95	2.25	PP
	2.0 to 4.0		16	48	19	29	CL			2.25	PP
	4.0 to 6.0		23						97	2.12	PP
	6.0 to 8.0		18	47	18	29	CL			1.75	PP
	8.0 to 10.0		23	52	22	30	CH	101	96	1.81	PP
	10.0 to 12.0		20					103		1.34	UC
	15.0 to 17.0		20	32	19	13	CL			1.56	PP
	20.0 to 22.0		22								
	25.0 to 27.0								40		
	30.0 to 31.5	18	28						42		
	35.0 to 36.5	29	31						38		
	40.0 to 41.5	25	28	CNBD	CNBD	NP	SM				
	48.0 to 50.0		27						97	1.54	PP
DP-104	0.0 to 1.5	20	10	35	21	14	CL				
	2.0 to 3.5	10	19						95		
	4.0 to 5.5	8	17						95		
	6.0 to 7.5	9	14	33	21	12	CL				
	8.0 to 9.5	16	25						88		
	10.0 to 11.5	19	26								
	15.0 to 17.0		23							2.13	PP
	20.0 to 22.0		28					92		0.88	UC
	25.0 to 27.0		20								
	30.0 to 31.5	17	30						10		
	35.0 to 36.5	15	25						9		
	40.0 to 41.5	12	36	40	22	18	CL				
	48.0 to 50.0		39						96	0.88	PP
DP-105	0.0 to 1.5	19	13						94		
	2.0 to 3.5	7	18	45	26	19	CL				
	4.0 to 5.5	3	25						91		
	6.0 to 7.5	6	24								
	8.0 to 9.5	6	21	38	20	18	CL				
	10.0 to 11.5	6	18						98		
	15.0 to 16.5	6	14						81		
	20.0 to 21.5	9	15	24	12	12	CL				
	25.0 to 26.5	9	23								
	30.0 to 31.5	14	25						12		
	35.0 to 36.5	11	25								
	40.0 to 41.5	10	24						8		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ii

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-105	48.5 to 50.5		26							0.63	PP
DP-106	0.0 to 2.0		11					112	94	3.34	UC
	2.0 to 4.0		18	45	24	21	CL			2.25	PP
	4.0 to 6.0		9						96	2.25	PP
	6.0 to 8.0		16							2.25	PP
	8.0 to 10.0		11	37	20	17	CL			2.25	PP
	10.0 to 12.0		13						99	2.25	PP
	15.0 to 16.5	16	6						58		
	20.0 to 21.5	22	5								
	25.0 to 26.5	21	25	CNBD	CNBD	NP	SM				
	30.0 to 31.5	25	25						18		
	35.0 to 36.5	17	29								
	40.0 to 41.5	20	33								
	48.5 to 50.0	17	26	50	19	31	CH				
DP-107	0.0 to 2.0		16	38	21	17	CL	102		2.25	PP
	2.0 to 4.0		24					101		2.25	PP
	4.0 to 6.0		17						97	2.25	PP
	6.0 to 8.0		11	CNBD	CNBD	NP	ML			2.25	PP
	8.0 to 10.0		5	CNBD	CNBD	NP	ML		50		
	10.0 to 11.5	12	7								
	15.0 to 16.5	19	3						22		
	20.0 to 21.5	20	4						5		
	25.0 to 26.5	17	26								
	30.0 to 31.5	21	25						6		
	35.0 to 36.5	26	24						9		
	40.0 to 41.5	27	23								
	48.5 to 50.0	14	31	34	23	11	CL				
DP-108	0.0 to 2.0		11					109		2.95	UC
	2.0 to 4.0		14	47	21	26	CL			2.25	PP
	4.0 to 6.0		16						99	2.25	PP
	6.0 to 8.0		9						97	2.25	PP
	8.0 to 10.0		11	38	20	18	CL		97	2.25	PP
	10.0 to 12.0		14							2.25	PP
	15.0 to 17.0		24	59	28	31		98		2.25	PP
	20.0 to 22.0		18						84	0.87	PP
	25.0 to 26.5	17	26						13		
	30.0 to 31.5	16	27						14		
	35.0 to 36.5	15	27								
	40.0 to 41.5	17	24						6		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303jj

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-108	48.5 to 50.0	22	30	39	21	18	CL				
DP-109	0.0 to 2.0		11	47	20	27	CL		92	2.25	PP
	2.0 to 4.0		14							2.25	PP
	4.0 to 6.0		19						98	2.25	PP
	6.0 to 8.0		19						99	2.25	PP
	8.0 to 10.0		18					106		2.82	UC
	10.0 to 12.0		24	71	26	45	CH			2.25	PP
	15.0 to 17.0		12						82	2.00	PP
	20.0 to 21.5	18	13	CNBD	CNBD	NP	ML				
	25.0 to 26.5	14	27						71		
	30.0 to 31.5	14	24						12		
	35.0 to 36.5	31									
	40.0 to 41.5	17	36	70	26	44	CH				
	48.5 to 50.0	6									
DP-110	0.0 to 2.0		12	46	22	24	CL		94	2.25	PP
	2.0 to 4.0		12						95	2.25	PP
	4.0 to 6.0		12							2.25	PP
	6.0 to 8.0		14					109		5.16	UC
	8.0 to 10.0		17							2.25	PP
	10.0 to 12.0		19	77	27	50	CH		99	2.25	PP
	15.0 to 17.0		20							2.25	PP
	20.0 to 22.0		19						99	2.25	PP
	25.0 to 27.0		23	79	30	49	CH			2.25	PP
	30.0 to 31.5	23	21								
	35.0 to 36.5	29	25						23		
	40.0 to 41.5	41	19								
	48.0 to 50.0		25	64	27	37	CH		98	1.69	PP
DP-111	0.0 to 2.0		11					110		4.59	UC
	2.0 to 4.0		15	61	23	38	CH		98	2.25	PP
	4.0 to 6.0		17							2.25	PP
	6.0 to 8.0		19						97	2.25	PP
	8.0 to 10.0		20							2.25	PP
	10.0 to 12.0		20	69	20	49	CH			2.25	PP
	15.0 to 17.0		21						97	1.25	PP
	20.0 to 22.0		26						96	1.92	PP
	25.0 to 27.0		29	78	24	54	CH		98	1.83	PP
	30.0 to 32.0		26							1.67	PP
	35.0 to 37.0		28							2.00	PP
	40.0 to 42.0		26	57	23	34	CH		96	0.83	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303kk

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-111	48.0 to 50.0		23							1.58	PP
DP-112	0.0 to 2.0		25						97	2.08	PP
	2.0 to 4.0		11	42	24	18	CL			2.25	PP
	4.0 to 6.0		12					103		2.25	PP
	6.0 to 8.0		9	42	21	21	CL		90	2.25	PP
	8.0 to 10.0		14							2.25	PP
	10.0 to 12.0		10	29	20	9	CL		86	2.25	PP
	15.0 to 17.0		25						97	2.25	PP
	20.0 to 22.0		24	81	27	54	CH		97	2.25	PP
	25.0 to 27.0		24							2.25	PP
	30.0 to 32.0		31							1.17	PP
	35.0 to 37.0		21						85	1.50	PP
	40.0 to 41.5	17	25								
	48.5 to 50.0	24	27								
DP-113	0.0 to 2.0		31	64	28	36	CH		98	2.25	PP
	2.0 to 4.0		14						89	2.25	PP
	4.0 to 6.0		8							2.25	PP
	6.0 to 8.0		16	49	21	28	CL		95	2.25	PP
	8.0 to 10.0		19							1.75	PP
	10.0 to 12.0		17						92	2.25	PP
	15.0 to 17.0		21	69	23	46	CH	100		1.66	UC
	20.0 to 22.0		25	58	21	37	CH			1.42	PP
	25.0 to 27.0		29						99	1.25	PP
	30.0 to 32.0		29	58	25	33	CH	91	95	0.92	PP
	35.0 to 36.5	26	24				SP		2		
	40.0 to 41.5	29	25								
	48.5 to 50.0	29	23						3		
DP-114	0.0 to 2.0		8					107		2.25	PP
	2.0 to 4.0		12	45	15	30	CL		87	2.25	PP
	4.0 to 6.0		7						73	2.25	PP
	6.0 to 8.0		12						78	2.25	PP
	8.0 to 10.0		12							2.25	PP
	10.0 to 12.0		12	29	14	15	CL		88	2.25	PP
	15.0 to 17.0		7						49		
	20.0 to 21.5	14	6	CNBD	CNBD	NP	SM				
	25.0 to 26.5	30	12								
	30.0 to 31.5	19	24						13		
	35.0 to 36.5	20	28								
	40.0 to 41.5	50	22								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303II

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-114	48.0 to 50.0		27	65	19	46	CH			1.13	PP
DP-115	0.0 to 2.0		19	49	19	30	CL			2.25	PP
	2.0 to 4.0		6						73	2.25	PP
	4.0 to 6.0		15	45	17	28	CL			2.25	PP
	6.0 to 8.0		8					114	71	1.85	UC
	8.0 to 10.0		19	40	16	24		103		2.19	PP
	10.0 to 12.0		10	28	14	14	CL		75	2.25	PP
	15.0 to 17.0		9							2.25	PP
	20.0 to 21.5	27	12								
	25.0 to 26.5	40									
	30.0 to 31.5	25	21						10		
	35.0 to 36.5	28	27								
	40.0 to 41.5	18	30						97		
	48.0 to 50.0		27	74	21	53	CH		95	1.19	PP
DP-116	0.0 to 2.0		19						96	2.25	PP
	2.0 to 4.0		11							2.25	PP
	4.0 to 6.0		16	39	15	24	CL		94	2.25	PP
	6.0 to 8.0		21					96		1.79	UC
	8.0 to 10.0		15					112		2.25	PP
	10.0 to 12.0		15	46	16	30	CL		91	2.25	PP
	15.0 to 17.0		29							2.25	PP
	20.0 to 22.0		25	65	25	40	CH			2.25	PP
	25.0 to 26.5	13	20						84		
	30.0 to 31.5	7	30						34		
	35.0 to 36.5	15	26								
	40.0 to 41.5	27	24						47		
	48.5 to 50.0	28	32	83	32	51	CH				
DP-117	0.0 to 1.5	12	19	70	23	47	CH				
	2.0 to 3.5	12	17						89		
	4.0 to 5.5	7	15	34	16	18	CL				
	6.0 to 7.5	6	19						92		
	8.0 to 9.5	9	16						95		
	10.0 to 11.5	8	19	28	11	17	CL				
	15.0 to 16.5	6	17						58		
	20.0 to 21.5	10	15								
	25.0 to 26.5	15	17								
	30.0 to 31.5	20	23						15		
	35.0 to 36.5	24	26	CNBD	CNBD	NP	SM				
	40.0 to 41.3	50/ 10"	23								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303mm

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-117	48.5 to 50.0	31	24						10		
DP-118	0.0 to 2.0		15	34	18	16	CL	104		2.76	UC
	2.0 to 4.0		13							2.25	PP
	4.0 to 6.0		15	39	21	18	CL		99	2.25	PP
	6.0 to 8.0		22						98	2.25	PP
	8.0 to 10.0		22	34	18	16	CL		97	2.25	PP
	10.0 to 12.0		14					101		2.25	PP
	15.0 to 16.5	20	17						98		
	20.0 to 21.5	20	4								
	25.0 to 26.5	21	3						8		
	30.0 to 31.5	28	26								
	35.0 to 36.5	32	25						13		
	40.0 to 41.5	46	23								
	48.5 to 50.0	19	28	27	17	10	SC				
DP-119	0.0 to 2.0		22							2.25	PP
	2.0 to 4.0		10	43	21	22	CL			2.25	PP
	4.0 to 5.5	4	6						64		
	6.0 to 7.5	5	14						89		
	8.0 to 9.5	7	9	30	21	9	CL				
	10.0 to 11.5	14	7	55	26	29	CH		96		
	15.0 to 16.5	13	8						58		
	20.0 to 21.5	13	5	CNBD	CNBD	NP	ML				
	25.0 to 26.5	12	29						25		
	30.0 to 31.5	7	33								
	35.0 to 36.5	14	26	CNBD	CNBD	NP	SM				
	40.0 to 41.5	15	25						13		
	48.5 to 49.9	50/ 11"	26								
DP-120	0.0 to 2.0		13	50	19	31	CH	114		6.27	UC
	2.0 to 4.0		14	42	16	26	CL		97	2.25	PP
	4.0 to 6.0		15						97	2.25	PP
	6.0 to 8.0		5								
	8.0 to 9.5	13	10						78		
	10.0 to 11.5	15	18								
	15.0 to 17.0								82	1.25	PP
	20.0 to 22.0		17							1.13	PP
	25.0 to 26.5	12	29						51		
	30.0 to 31.5	18	28	CNBD	CNBD	NP	SM				
	35.0 to 36.5	41	25						9		
	40.0 to 41.5	34	28						8		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303nn

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-120	48.5 to 49.8	33	27						14		
DP-121	0.0 to 2.0		21	65	21	44	CH	105		3.76	UC
	2.0 to 4.0		16						98	2.25	PP
	4.0 to 6.0		22							2.25	PP
	6.0 to 8.0		22	52	26	26	CH		99	2.25	PP
	8.0 to 10.0		25							2.13	PP
	10.0 to 12.0		28							2.00	PP
	15.0 to 17.0		29	40	17	23	CL		99	2.25	PP
	20.0 to 22.0		10							1.25	PP
	25.0 to 26.5	13	28						29		
	30.0 to 31.5	11	27						11		
	35.0 to 36.5	13	29								
	40.0 to 41.5	21	24						6		
	48.5 to 50.0	10	46	54	21	33	CH				
DP-122	0.0 to 2.0		12	53	24	29	CH		92	2.25	PP
	2.0 to 4.0		15						96	2.25	PP
	4.0 to 6.0		16					107		2.69	UC
	6.0 to 8.0		15						96	2.25	PP
	8.0 to 10.0		17	32	22	10	CL		96	2.25	PP
	10.0 to 12.0		20							2.25	PP
	15.0 to 17.0		18	36	20	16	CL			2.13	PP
	20.0 to 22.0		20	29	19	10	CL			0.50	PP
	25.0 to 26.5	10	32						59		
	30.0 to 31.5	28	26								
	35.0 to 36.5	26	26						15		
	40.0 to 41.5	16	28								
	48.5 to 50.0	40	25								
DP-123	0.0 to 2.0		19					103		2.25	PP
	2.0 to 4.0		14	50	24	26	CH		83	2.25	PP
	4.0 to 6.0		22	44	19	25		102		2.25	PP
	6.0 to 8.0		17	62	24	38	CH		85	2.25	PP
	8.0 to 10.0		22							1.63	PP
	10.0 to 12.0		23	59	27	32	CH		79	2.25	PP
	15.0 to 17.0		24	67	21	46	CH		68	2.25	PP
	20.0 to 22.0		2						6		
	25.0 to 26.5	14	26								
	30.0 to 31.5	23	26								
	35.0 to 36.5	28	27						15		
	40.0 to 41.5	50	27								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303oo

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-123	48.5 to 49.9	50/ 11"	27								
DP-124	0.0 to 2.0		12					110	89	2.77	UC
	2.0 to 4.0		17	59	28	31	CH		94	2.25	PP
	4.0 to 6.0		16							2.25	PP
	6.0 to 8.0		18	38	23	15	CL		93	2.25	PP
	8.0 to 10.0		18							2.25	PP
	10.0 to 12.0		21	49	26	23	CL		97	2.25	PP
	15.0 to 17.0		22	45	19	26	CL		99	2.25	PP
	20.0 to 22.0		30						97	1.50	PP
	25.0 to 27.0		24								
	30.0 to 31.5	13	28						14		
	35.0 to 36.5	23	24								
	40.0 to 41.5	26	24								
	48.5 to 50.0	23	29								
DP-125	0.0 to 2.0		14	49	21	28	CL		84	2.25	PP
	2.0 to 4.0		15					110	95	2.25	PP
	4.0 to 6.0		19							2.25	PP
	6.0 to 8.0		20						96	2.25	PP
	8.0 to 10.0		12							2.25	PP
	10.0 to 11.5	18	8	CNBD	CNBD	NP	ML		76		
	15.0 to 16.5	19	24								
	20.0 to 22.0		15	43	19	24	CL		93	2.25	PP
	25.0 to 26.5	19	22								
	30.0 to 31.5	17	23								
	35.0 to 36.5	13	23						14		
	40.0 to 41.5	28	25								
	48.5 to 50.0	20	22	39	17	22	CL				
DP-126	0.0 to 2.0		18							2.25	PP
	2.0 to 4.0		16	58	21	37	CH		95	2.25	PP
	4.0 to 6.0		17	48	24	24	CL		97	2.25	PP
	6.0 to 8.0		20							2.25	PP
	8.0 to 10.0		22	46	22	24	CL	98		3.78	UC
	10.0 to 12.0		21	82	23	59	CH		98	2.25	PP
	15.0 to 17.0		23	48	26	22	CL	97	97	2.25	PP
	20.0 to 21.5	8	24						64		
	25.0 to 26.5	9	27						27		
	30.0 to 31.5	20	28								
	35.0 to 36.5	25	29						5		
	40.0 to 41.5	34	27								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303pp

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-126	48.5 to 50.0	22	26								
DP-127	0.0 to 2.0		13							2.25	PP
	2.0 to 4.0		20	51	26	25	CH		97	2.25	PP
	4.0 to 6.0		14					104	96	2.10	UC
	6.0 to 8.0		19							2.25	PP
	8.0 to 10.0		22							2.25	PP
	10.0 to 12.0		21	47	24	23	CL		99	1.34	PP
	15.0 to 17.0		21							2.17	PP
	20.0 to 22.0		27	58	22	36	CH		99	1.58	PP
	25.0 to 26.5	9	28								
	30.0 to 31.5	28	26	CNBD	CNBD	NP	SM				
	35.0 to 36.5	20	29						10		
	40.0 to 41.5	24	26								
	48.5 to 50.0	24	28						8		
DP-128	0.0 to 2.0		18	50	20	30	CH			2.25	PP
	2.0 to 4.0		17					105		2.49	UC
	4.0 to 6.0		18	53	23	30	CH		99	2.25	PP
	6.0 to 8.0		17					104		2.25	PP
	8.0 to 10.0		18						97	2.25	PP
	10.0 to 12.0		26						99	2.25	PP
	15.0 to 17.0		25	60	22	38	CH		100	2.06	PP
	20.0 to 22.0		26	55	24	31	CH		99	1.81	PP
	25.0 to 27.0		29	CNBD	CNBD	NP				1.18	PP
	30.0 to 32.0		31					92	21	0.44	PP
	35.0 to 36.5	21	28						21		
	40.0 to 41.3	50/ 10"	25								
	48.5 to 50.0	41	26								
DP-129	0.0 to 2.0		15	55	23	32	CH		97	2.25	PP
	2.0 to 4.0		16							2.25	PP
	4.0 to 6.0		21	51	21	30		105		1.68	UC
	6.0 to 8.0		21						97	2.25	PP
	8.0 to 10.0		15	55	22	33	CH		100	2.25	PP
	10.0 to 12.0		19						99	2.25	PP
	15.0 to 17.0		18	49	21	28	CL		96	2.25	PP
	20.0 to 22.0		17						9		
	25.0 to 26.5	6	28						90		
	30.0 to 31.5	34	23								
	35.0 to 36.5	19	24								
	40.0 to 41.5	21	23								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303qq

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-129	48.5 to 50.0	32	23								
DP-130	0.0 to 2.0		16	51	21	30	CH		95	2.25	PP
	2.0 to 4.0		15						98	2.25	PP
	4.0 to 6.0		13					111		1.78	UC
	6.0 to 8.0		15	35	19	16	CL		87	2.25	PP
	8.0 to 10.0		18	31	24	7	ML		97	2.25	PP
	10.0 to 12.0		11	49	21	28	CL		98		
	15.0 to 17.0		13	CNBD	CNBD	NP	ML		85		
	20.0 to 22.0		21						23	1.69	PP
	25.0 to 27.0		26				ML				
	30.0 to 31.5	18	25								
	35.0 to 36.5	26	25								
	40.0 to 41.5	47	23								
	48.5 to 49.8	50/ 10"	22								
DP-131	0.0 to 1.5	11	21	58	23	35	CH				
	2.0 to 4.0			50	23	27	CH		99		
	4.0 to 5.5	13	17						98		
	6.0 to 7.5	7	20						96		
	8.0 to 9.5	6	17	45	24	21					
	10.0 to 11.5	6	18	CNBD	CNBD	NP	CL				
	15.0 to 17.0								13		
	20.0 to 21.5	3	27						8		
	25.0 to 26.5	13	28						8		
	30.0 to 31.5	18	27								
	35.0 to 36.5	20	23								
	40.0 to 41.5	15	27								
	48.5 to 50.0	23	25								
DP-132	0.0 to 1.5	12	16	44	22	22	CL		98		
	2.0 to 3.5	13	15	64	28	36	CH		100		
	4.0 to 5.5	11	21					101	99	2.05	UC
	6.0 to 8.0		24	34	23	11				2.25	PP
	8.0 to 10.0		23	CNBD	CNBD	NP				2.25	PP
	10.0 to 12.0		19						43	2.25	PP
	15.0 to 16.5	5	22						45		
	20.0 to 21.5	5							23		
	25.0 to 26.5	4	32				SM				
	30.0 to 31.5	3	26								
	35.0 to 36.5	9	32								
	40.0 to 41.5	15	28								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303rr

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-132	48.5 to 50.0	11	29								
DP-133	0.0 to 1.5	17	17	CNBD	CNBD	NP					
	2.5 to 4.0	15	11						86		
	4.0 to 5.5	9	11	32	20	12					
	6.0 to 7.5	15	12						11		
	8.0 to 9.5	12	14	41	22	19					
	10.0 to 11.5	10	18						96		
	15.0 to 16.5	10	18	31	24	7					
	20.0 to 21.5	5	32						58		
	25.0 to 26.5	7	23						12		
	30.0 to 31.5	16	25								
	35.0 to 36.5	12	28								
	40.0 to 41.5	12	25								
	48.5 to 50.0	26	23								
DP-134	0.0 to 1.5	16	14	30	15	15	CL				
	2.0 to 3.5	12	14						89		
	4.0 to 5.5	5	12	31	17	14	CL				
	6.0 to 7.5	9	17						88		
	8.0 to 9.5	7	14	27	13	14	SC				
	10.0 to 11.5	9	8						38		
	15.0 to 16.5	10	5								
	20.0 to 21.5	23	18						29		
	25.0 to 26.5	11	25						16		
	30.0 to 31.5	14	28	CNBD	CNBD	NP	SM				
	35.0 to 36.5	18	26				SP		4		
	40.0 to 41.5	19	28						6		
	48.5 to 50.0	20	25								
DP-135	0.0 to 1.5	18	19	43	18	25	CL				
	2.0 to 3.5	17	10						68		
	4.0 to 5.5	18	13	35	16	19	CL				
	6.0 to 7.5	17	13						86		
	8.0 to 9.5	13	11	31	13	18	CL				
	10.0 to 11.5	13	19						82		
	15.0 to 16.5	9	18	32	13	19	CL				
	20.0 to 21.5	3	29						26		
	25.0 to 26.5	4	28								
	30.0 to 31.5	15	26						8		
	35.0 to 36.5	16	27								
	40.0 to 41.5	23	23								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ss

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-135	48.5 to 50.0	15	30						7		
DP-136	0.0 to 1.5	15	9	33	13	20	CL				
	2.0 to 3.5	11	19						97		
	4.0 to 5.5	12	20								
	6.0 to 7.5	14	13						96		
	8.0 to 9.5	13	20	56	26	30	CH				
	10.0 to 11.5	10	22						96		
	15.0 to 16.5	7	28	34	19	15	CL				
	20.0 to 21.5	4	30								
	25.0 to 26.5	4	41						98		
	30.0 to 31.5	5	37						59		
	35.0 to 36.5	13	28								
	40.0 to 41.5	12	26						11		
	48.5 to 50.0	19	28	CNBD	CNBD	NP	SM				
DP-137	0.0 to 2.0		17	49	26	23	CL		91	2.25	PP
	2.0 to 4.0		16					111		4.97	UC
	4.0 to 6.0		15						98	2.25	PP
	6.0 to 8.0		8	43	19	24	CL		89	2.25	PP
	8.0 to 10.0		15	54	22	32	CH		93	2.18	PP
	10.0 to 12.0		20	50	21	29	CH		99	1.69	PP
	15.0 to 17.0		23	31	21	10				1.31	PP
	20.0 to 22.0		21						100		
	25.0 to 26.5	11	26						15		
	30.0 to 32.0		30							1.06	PP
	35.0 to 36.5	25	23								
	40.0 to 41.5	12	22								
	48.5 to 50.0	25	24								
DP-138	0.0 to 1.5	14	16						95		
	2.5 to 4.0	12		46	22	24	CL				
	4.0 to 5.5	11	21						98		
	6.0 to 7.5	11	23	54	23	31	CH				
	8.0 to 9.5	12	27						100		
	10.0 to 12.0		24	58	22	36	CH	100		0.70	UC
	15.0 to 16.5	9	23						96		
	20.0 to 21.5	8	30								
	25.0 to 26.5	8	28	CNBD	CNBD	NP	SP-SM				
	30.0 to 31.5	43	23						8		
	35.0 to 36.5	21	24								
	40.0 to 41.5	16	30								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

Raba-Kistner

FIGURE A-303tt

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-138	48.5 to 50.0	31	25						11		
DP-139	0.0 to 1.5	13	14	35	19	16	CL				
	2.5 to 4.0	13	11						97		
	4.0 to 5.5	13	17	48	23	25	CL				
	6.0 to 7.5	9	16						99		
	8.0 to 9.5	13	14	45	22	23	CL				
	10.0 to 11.5	9	19						100		
	15.0 to 16.5	22	23								
	20.0 to 21.5	10	25	37	22	15	CL				
	25.0 to 26.5	14	28						28		
	30.0 to 31.5	9	33						36		
	35.0 to 36.5	10	29								
	40.0 to 41.5	11	24						7		
	48.5 to 50.0	11	24								
DP-140	0.0 to 1.5	16	14						99		
	2.5 to 4.0	15	11	34	20	14	CL				
	4.0 to 5.5	11	17								
	6.0 to 7.5	8	17						100		
	8.0 to 10.0		14	32	14	18	CL		98		
	10.0 to 12.0		18	44	21	23	CL			2.00	PP
	15.0 to 16.5	11	22								
	20.0 to 21.5	14	27						99		
	25.0 to 26.5	3	30						31		
	30.0 to 31.5	11									
	35.0 to 36.5	34	28								
	40.0 to 41.5	11	29						43		
	48.5 to 50.0	11	34	31	16	15	SC				
DP-141	0.0 to 2.0		16						99	2.25	PP
	2.0 to 4.0		18	55	22	33	CH		99	2.25	PP
	4.0 to 6.0		20					105		2.25	PP
	6.0 to 8.0		14	53	20	33	CH	114		5.08	UC
	8.0 to 10.0		16	51	21	30	CH		95	2.25	PP
	10.0 to 12.0		11	54	23	31				2.25	PP
	15.0 to 16.5	15	22						17		
	20.0 to 22.0								12		
	25.0 to 26.5	12	27						5		
	30.0 to 31.5	14	23								
	35.0 to 36.5	18	22								
	40.0 to 41.5	21	22								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303uu

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-141	48.5 to 50.0	24	23								
DP-142	0.0 to 2.0		11	49	21	28	CL		98	2.25	PP
	2.0 to 4.0		12						100	2.25	PP
	4.0 to 6.0		18	67	27	40		96		1.63	UC
	6.0 to 8.0		27				CH				
	8.0 to 10.0			61	24	37	CH		98	1.50	PP
	10.0 to 12.0		27						11	2.00	PP
	15.0 to 16.5	20	2						17		
	20.0 to 21.5	24	26	CNBD	CNBD	NP					
	25.0 to 26.5	28	25						16		
	30.0 to 31.5	26	27						18		
	35.0 to 36.5	27	29								
	40.0 to 41.5	31	23								
	48.5 to 50.0	34	24								
DP-143	0.0 to 2.0		14	46	19	27	CL			2.25	PP
	2.0 to 4.0		11	45	18	27	CL		78	2.25	PP
	4.0 to 6.0		13	47	18	29	CL		98	2.25	PP
	6.0 to 8.0		20	67	21	46	CL			2.25	PP
	8.0 to 10.0		18						37	2.25	PP
	10.0 to 12.0		18						11	2.25	PP
	15.0 to 17.0								41		
	20.0 to 21.5	15	16						30		
	25.0 to 26.5	22	25								
	30.0 to 31.5	26	25								
	35.0 to 36.5	12	28								
	40.0 to 41.5	17	26								
	48.5 to 49.9	50/ 11"	27								
DP-144	0.0 to 2.0		14	52	23	29	CH		99	2.25	PP
	2.0 to 4.0		16	50	21	29	CH		100	2.25	PP
	4.0 to 6.0		14						100	2.25	PP
	6.0 to 8.0		17					104		1.96	UC
	8.0 to 10.0		22	69	26	43	CH		100	2.25	PP
	10.0 to 12.0		21	33	23	10				2.25	PP
	15.0 to 17.0		25						95	1.88	PP
	20.0 to 22.0		28	58	22	36	CH		100	1.31	PP
	25.0 to 27.0		30				CL	90			
	30.0 to 32.0		33								
	35.0 to 36.5	4	38								
	40.0 to 41.5	33	28								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303vv

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-144	48.0 to 50.0		23				CH			1.68	PP
DP-145	0.0 to 2.0		12						99	2.25	PP
	2.0 to 4.0		17	50	21	29	CH		100	2.25	PP
	4.0 to 6.0		16					112		4.58	UC
	6.0 to 8.0		16						99	2.25	PP
	8.0 to 10.0		15	43	20	23	CL		99	2.25	PP
	10.0 to 12.0		16	47	21	26	CL		99	2.25	PP
	15.0 to 17.0		18	57	22	35	CH		100	2.25	PP
	20.0 to 22.0		22								
	25.0 to 26.5	19	23								
	30.0 to 31.5	20	23								
	35.0 to 36.5	29	22								
	40.0 to 41.5	17	27								
	48.0 to 50.0		21				CH			2.06	PP
DP-146	0.0 to 2.0		14						95	2.25	PP
	2.0 to 4.0		15	57	20	37	CH		97	2.25	PP
	4.0 to 6.0		17					110		5.06	UC
	6.0 to 8.0		18	50	19	31	CH		98	2.25	PP
	8.0 to 10.0		19	48	19	29	CL		99	2.25	PP
	10.0 to 12.0		19						20	2.25	PP
	15.0 to 17.0		18	59	24	35	CH		100	2.25	PP
	20.0 to 22.0		19							2.25	PP
	25.0 to 26.5	32	19								
	30.0 to 31.5	41	22								
	35.0 to 36.5	31	26								
	40.0 to 41.5	36	27								
	48.0 to 50.0		25				CH			2.00	PP
DP-147	0.0 to 1.5	23	13						89		
	2.5 to 4.0	10	18	56	24	32	CH				
	4.0 to 5.5	15	19						100		
	6.0 to 8.0		21	55	23	32	CH		99	2.13	PP
	8.0 to 10.0		21						99	1.38	PP
	10.0 to 11.5	8	22								
	15.0 to 16.5	11	28						100		
	20.0 to 22.0		24	54	24	30	CH	97		0.52	UC
	25.0 to 27.0										
	30.0 to 31.5	11	25								
	35.0 to 37.0		45	70	25	45	CH		99	0.75	PP
	40.0 to 42.0		34						100		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ww

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-147	48.5 to 50.0	18	26								
DP-148	0.0 to 1.5	7	17	40	21	19	CL				
	2.5 to 4.0	8	19						92		
	4.0 to 5.5	7	24	52	23	29	CH				
	6.0 to 8.0		24						93	0.63	PP
	8.0 to 10.0		24						95	0.50	PP
	10.0 to 12.0		25	40	19	21	CL	99		0.33	UC
	15.0 to 17.0									-0.50	PP
	20.0 to 21.5	8	32								
	25.0 to 27.0										
	30.0 to 31.5	8	26						91		
	35.0 to 36.5	8	34	68	26	42	CH				
	40.0 to 42.0		26	63	25	38	CH		100	1.13	PP
	48.5 to 50.0		29							1.13	PP
DP-149	0.0 to 1.5	13	14	44	19	25	CL				
	2.5 to 4.0	12	18						97		
	4.0 to 6.0		19						90	2.25	PP
	6.0 to 8.0		21	39	18	21	CL		89	0.88	PP
	8.0 to 9.5	4	27								
	10.0 to 11.5	5	26						98		
	15.0 to 16.5	13	24								
	20.0 to 22.0		26	52	23	29	CH	99		0.32	UC
	25.0 to 27.0		32							1.13	PP
	30.0 to 32.0		31	53	22	31	CH		95	1.13	PP
	35.0 to 36.5	9	25								
	40.0 to 42.0										
	48.5 to 50.0	17	25								
DP-150	0.0 to 2.0		16	33	19	14	CL		91		
	2.0 to 3.5	17	12								
	4.0 to 5.5	11	12						95		
	6.0 to 8.0		17						92	1.75	PP
	8.0 to 10.0		18	54	16	38	CH	107		2.42	UC
	10.0 to 11.5	16	12						79		
	15.0 to 17.0		23							2.12	PP
	20.0 to 21.5	19	24	79	26	53	CH				
	25.0 to 27.0		27						96	1.00	PP
	30.0 to 32.0										
	35.0 to 36.5	9	28						91		
	40.0 to 42.0										

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303xx

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-150	48.5 to 50.0	6	28	26	20	6	CL-ML				
DP-151	0.0 to 1.5	16	14	43	17	26	CL				
	2.0 to 4.0		13						95	2.25	PP
	4.0 to 6.0		15							2.25	PP
	6.0 to 7.5	10	15	45	17	28	CL				
	8.0 to 9.5	7	17						91		
	10.0 to 11.5	15	11						83		
	15.0 to 16.5	23	13	70	17	53	CH				
	20.0 to 22.0		24					96	97	1.26	UC
	25.0 to 27.0		27							2.00	PP
	30.0 to 32.0		25						91	1.75	PP
	35.0 to 37.0		28							0.63	PP
	40.0 to 42.0		24	CNBD	CNBD	NP	ML		85	0.75	PP
	48.5 to 50.5		25							0.63	PP
DP-152	0.0 to 2.0		14						44		
	2.0 to 4.0		11					110		2.12	UC
	4.0 to 6.0		14	29	10	19	CL		91	2.25	PP
	6.0 to 8.0		15	35	18	17	CL	108		2.25	PP
	8.0 to 10.0		18						91	2.25	PP
	10.0 to 12.0		13							2.25	PP
	15.0 to 17.0		27	63	19	44	CH		96	1.19	PP
	20.0 to 22.0		33							1.25	PP
	25.0 to 27.0		26						90	1.25	PP
	30.0 to 32.0		29	82	24	58	CH		98	1.06	PP
	35.0 to 37.0		25							1.38	PP
	40.0 to 42.0			54	22	32	CH		93	1.25	PP
	48.0 to 50.0		20	32	16	16	CL		94	1.06	PP
DP-153	0.0 to 2.0		10	29	20	9	SC		15		
	2.0 to 4.0		13							2.25	PP
	4.0 to 6.0		20						97	2.25	PP
	6.0 to 8.0		17					106		2.02	UC
	8.0 to 10.0		19							2.25	PP
	10.0 to 12.0		12								
	15.0 to 17.0		21						94	1.75	PP
	20.0 to 22.0		23	76	22	54	CH			2.12	PP
	25.0 to 27.0		27							1.94	PP
	30.0 to 32.0		26	36	17	19	CL		95	1.06	PP
	35.0 to 37.0		25							1.44	PP
	40.0 to 42.0		27						89	1.94	PP

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CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

Raba-Kistner

FIGURE A-303yy

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-153	48.0 to 50.0		26	36	22	14	CL		96	0.94	PP
DP-154	0.0 to 2.0		11							2.25	PP
	2.0 to 4.0		14					114		6.37	UC
	4.0 to 6.0		16							2.25	PP
	6.0 to 8.0		17	57	21	36	CH		94	2.25	PP
	8.0 to 10.0		20							2.25	PP
	10.0 to 12.0		21	31	22	9	CL		97	2.13	PP
	15.0 to 17.0		23						98	2.13	PP
	20.0 to 22.0		20	52	17	35	CH		96	2.25	PP
	25.0 to 27.0		30							1.12	PP
	30.0 to 32.0		28							1.87	PP
	35.0 to 37.0		23						91	2.13	PP
	40.0 to 42.0		22	59	18	41	CH		90	1.62	PP
	48.0 to 50.0		22							1.81	PP
DP-155	0.0 to 2.0		12						49		
	2.0 to 4.0		5	37	22	15	SC		16		
	4.0 to 6.0		18					105		1.61	UC
	6.0 to 8.0		18							2.25	PP
	8.0 to 10.0		19	36	20	16	CL		93	2.25	PP
	10.0 to 12.0		25							2.13	PP
	15.0 to 17.0		24							1.44	PP
	20.0 to 22.0		32	35	22	13	CL		99	0.13	PP
	25.0 to 27.0		29							1.31	PP
	30.0 to 32.0		27						96	1.56	PP
	35.0 to 37.0		23							1.50	PP
	40.0 to 42.0		25	51	16	35	CH		94	1.06	PP
	48.0 to 50.0		22							1.25	PP
DP-156	0.0 to 2.0		9					105	91	2.25	PP
	2.0 to 4.0		13	64	22	42	CH		91	2.25	PP
	4.0 to 6.0		18					105		2.25	PP
	6.0 to 8.0		21						96	2.13	PP
	8.0 to 10.0		27							1.56	PP
	10.0 to 12.0		22						97	1.81	PP
	15.0 to 17.0		23							0.81	PP
	20.0 to 22.0		25	74	23	51	CH		94	1.31	PP
	25.0 to 27.0		28							1.38	PP
	30.0 to 32.0		27	62	26	36	CH	98	99	1.50	PP
	35.0 to 37.0		27	56	19	37	CH			1.25	PP
	40.0 to 42.0		26							1.18	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

Raba-Kistner

FIGURE A-303zz

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-156	48.0 to 50.0		18	30	14	16	CL		66	1.00	PP
DP-157	0.0 to 2.0		9						89	2.25	PP
	2.0 to 4.0		12	42	18	24	CL	109		1.76	UC
	4.0 to 6.0		14							2.25	PP
	6.0 to 8.0		18	35	22	13	CL		98	2.25	PP
	8.0 to 10.0		15						85	2.25	PP
	10.0 to 12.0		19	44	16	28	CL		95	2.25	PP
	15.0 to 17.0		14								
	20.0 to 22.0		27						97	0.68	PP
	25.0 to 27.0										
	30.0 to 31.5	36	31						19		
	35.0 to 36.5	28	25						20		
	40.0 to 41.5	26	26								
	48.0 to 50.0		24	58	18	40	CH			1.13	PP
DP-158	0.0 to 2.0		18	35	13	22	CL		96	2.25	PP
	2.0 to 4.0		13							2.25	PP
	4.0 to 6.0		14	34	16	18	CL		90	2.25	PP
	6.0 to 8.0		16					106	89	1.61	UC
	8.0 to 10.0		14							2.25	PP
	10.0 to 12.0		17							2.25	PP
	15.0 to 17.0		19	45	18	27	CL			1.44	PP
	20.0 to 22.0									0.63	PP
	25.0 to 27.0		30						64		
	30.0 to 31.5	13							34		
	35.0 to 36.5	17	26						8		
	40.0 to 41.5	34	25								
	48.0 to 50.0		25	59	20	39	CH			1.69	PP
DP-159	0.0 to 2.0		15	37	17	20	CL		89	2.25	PP
	2.0 to 4.0		12					109	94	4.18	UC
	4.0 to 6.0		18					105		2.25	PP
	6.0 to 8.0		21						95	2.25	PP
	8.0 to 10.0		21	34	19	15	CL	105	86	2.25	PP
	10.0 to 12.0		20							1.25	PP
	15.0 to 17.0		25	54	21	33	CH		95	1.44	PP
	20.0 to 22.0		23							1.94	PP
	25.0 to 27.0		23								
	30.0 to 32.0		24							2.00	PP
	35.0 to 37.0		30	54	22	32	CH		95	1.81	PP
	40.0 to 42.0		23							1.69	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303aaa

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-159	48.5 to 50.5									1.31	PP
DP-160	0.0 to 2.0		12	42	19	23	CL				
	2.0 to 4.0		10								
	4.0 to 6.0		19					106	96	2.40	UC
	6.0 to 8.0		20							2.25	PP
	8.0 to 10.0		19	43	18	25	CL		97	2.00	PP
	10.0 to 12.0		19						98	2.25	PP
	15.0 to 17.0									2.19	PP
	20.0 to 22.0		24							1.19	PP
	25.0 to 27.0		26	29	18	11	CL		79	0.19	PP
	30.0 to 32.0		26							1.69	PP
	35.0 to 37.0		24							1.81	PP
	40.0 to 42.0		21							1.81	PP
	48.0 to 50.0		25	62	29	33	CH		98	1.75	PP
DP-161	0.0 to 2.0		11	CNBD	CNBD	NP	SM		46		
	2.0 to 4.0		20					106		2.20	UC
	4.0 to 6.0		17	44	15	29	CL		97	2.25	PP
	6.0 to 8.0		19	43	21	22	CL	108	97	2.25	PP
	8.0 to 10.0		12						73	2.25	PP
	10.0 to 12.0		20	49	16	33	CL		98	2.25	PP
	15.0 to 17.0		25							2.21	PP
	20.0 to 22.0		29						97	2.04	PP
	25.0 to 27.0		29							1.79	PP
	30.0 to 32.0		26							2.17	PP
	35.0 to 37.0		25							2.25	PP
	40.0 to 42.0		24	63	11	52	CH		96	2.25	PP
	48.0 to 50.0		25							2.25	PP
DP-162	0.0 to 1.5	19	15	68	27	41	CH		98		
	2.0 to 3.5	18	17								
	4.0 to 5.5	13	18						97		
	6.0 to 7.5	11	23	71	29	42	CH		98		
	8.0 to 9.5	14	20								
	10.0 to 11.5	9	25						94		
	15.0 to 16.5	10	30	79	24	55	CH				
	20.0 to 21.5	9	28	31	20	11	CL		95		
	25.0 to 26.5	10	28								
	30.0 to 31.5	10	26						90		
	35.0 to 36.5	9	24								
	40.0 to 41.5	12	24	67	21	46	CH		99		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303bbb

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-162	48.5 to 50.0	10	35								
DP-163	0.0 to 1.5	24	18	68	20	48	CH				
	2.0 to 3.5	12	22						98		
	4.0 to 5.5	9	23								
	6.0 to 7.5	10	26						98		
	8.0 to 9.5	10	29								
	10.0 to 11.5	14	19	64	20	44	CH				
	15.0 to 16.5	12	31						98		
	20.0 to 21.5	8	28								
	25.0 to 26.5	4	26						98		
	30.0 to 31.5	8	26	75	20	55	CH				
	35.0 to 36.5	8	28						90		
	40.0 to 41.5	10	26						99		
	48.5 to 50.0	10	24	56	17	39	CH				
DP-164	0.0 to 1.5	33	21	58	23	35	CH				
	2.0 to 3.5	12	26						97		
	4.0 to 5.5	10	21	47	18	29	CL				
	6.0 to 7.5	10	20						96		
	8.0 to 9.5	14	19						96		
	10.0 to 11.5	6	23								
	15.0 to 16.5	5	29						93		
	20.0 to 21.5	6	25	33	20	13	CL				
	25.0 to 26.5	12	27								
	30.0 to 31.5	7	26						90		
	35.0 to 36.5	8	27	72	21	51	CH				
	40.0 to 41.5	11	25								
	48.5 to 50.0	11	22						98		
DP-165	0.0 to 1.5	21	9	28	16	12	CL				
	2.0 to 3.5	26	9						90		
	4.0 to 5.5	25	18	34	18	16	CL				
	6.0 to 7.5	15	13						94		
	8.0 to 9.5	14	19	34	19	15	CL				
	10.0 to 11.5	8	16						96		
	15.0 to 16.5	11	12	29	19	10	CL				
	20.0 to 21.5	5	22						56		
	25.0 to 26.5	16	26						21		
	30.0 to 31.5	11	29						13		
	35.0 to 36.5	21	27								
	40.0 to 41.5	8	28						15		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ccc

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-165	48.5 to 50.0	10	27								
DP-166	0.0 to 1.5	11	17						84		
	2.0 to 3.5	15	13	30	14	16	CL				
	4.0 to 5.5	15	20						87		
	6.0 to 7.5	15	16	34	16	18	CL				
	8.0 to 9.5	16	16	33	18	15	CL				
	10.0 to 11.5	12	22						96		
	15.0 to 16.5	12	24	29	20	9	CL				
	20.0 to 21.5	17	29								
	25.0 to 26.5	15	24						8		
	30.0 to 31.5	28	24						13		
	35.0 to 36.5	16	24								
	40.0 to 41.5	14	24						29		
	48.5 to 50.0	14	27								
DP-167	0.0 to 2.0		20						100	2.25	PP
	2.0 to 4.0		13						60	2.25	PP
	4.0 to 6.0		22	40	18	22		102		2.25	PP
	6.0 to 8.0		20	36	10	26	CL	105	92	2.25	PP
	8.0 to 9.5	26	11	29	10	19	CL				
	10.0 to 11.5	30	15						82		
	15.0 to 17.0		20							3.32	UC
	20.0 to 21.5	29	3						29		
	25.0 to 26.5	21	26	CNBD	CNBD	NP	SM				
	30.0 to 31.5	25	24								
	35.0 to 36.5	14	24						10		
	40.0 to 41.5	42	23								
	48.0 to 49.5	10	24								
DP-168	0.0 to 2.0		10					113		3.07	UC
	2.0 to 4.0		19	56	15	41	CH		98	2.25	PP
	4.0 to 6.0		18						95	2.25	PP
	6.0 to 8.0		26							2.08	PP
	8.0 to 10.0		24	55	14	41	CH		100	1.75	PP
	10.0 to 12.0		15	41	17	24	CL	104	81	2.25	PP
	15.0 to 17.0			67	20	47	CH			2.17	PP
	20.0 to 21.5	18	10						38		
	25.0 to 26.5	20	10								
	30.0 to 31.5	25	16								
	35.0 to 36.5	15	26						28		
	40.0 to 41.5	14	24	60	16	44	CH				

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ddd

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-168	48.5 to 50.0	45	23								
DP-169	0.0 to 2.0		12	54	17	37	CH			2.25	PP
	2.0 to 4.0		18							2.25	PP
	4.0 to 6.0		17					106		3.78	UC
	6.0 to 8.0		18	71	17	54	CH			2.25	PP
	8.0 to 10.0		21							2.25	PP
	10.0 to 12.0		14	52	13	39	CH			2.25	PP
	15.0 to 17.0		23							2.25	PP
	20.0 to 21.5	18	2						17		
	25.0 to 26.5	23	26								
	30.0 to 31.5	23	23								
	35.0 to 36.5	27	24								
	40.0 to 41.5	46	27						10		
	48.5 to 50.0	12	23	CNBD	CNBD	NP	SP-SM				
DP-170	0.0 to 2.0		12	48	15	33	CL		97	2.25	PP
	2.0 to 4.0		24					102		2.25	PP
	4.0 to 6.0		20					103		2.91	UC
	6.0 to 8.0		22	56	17	39	CH		99	2.25	PP
	8.0 to 10.0		23						90	2.25	PP
	10.0 to 12.0		14	53	15	38	CH		89	2.08	PP
	15.0 to 16.5	22		CNBD	CNBD	NP	SM				
	20.0 to 21.5	28	3						31		
	25.0 to 26.5	24									
	30.0 to 31.5	11	25						6		
	35.0 to 36.5	31									
	40.0 to 41.5	18	28						10		
	48.5 to 50.0	9									
DP-171	0.0 to 2.0		12					110		6.28	UC
	2.0 to 4.0		17	57	16	41	CH		99	2.25	PP
	4.0 to 6.0		21							2.25	PP
	6.0 to 8.0		17	56	17	39	CH		98	2.25	PP
	8.0 to 10.0		19						94	2.25	PP
	10.0 to 12.0		18	51	14	37	CH		91	2.25	PP
	15.0 to 17.0		20	51	24	27	CH	106	100	2.25	PP
	20.0 to 22.0	14		CNBD	CNBD	NP	SM				
	25.0 to 27.0	15	25						24		
	30.0 to 32.0	33									
	35.0 to 37.0	16									
	40.0 to 42.0	31	30						8		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303eee

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-171	48.0 to 50.0	12									
DP-172	0.0 to 2.0		11	43	15	28	CL		92	2.25	PP
	2.0 to 4.0		15					106		2.25	PP
	4.0 to 6.0									2.25	PP
	6.0 to 8.0		23	51	15	36	CH		99	2.25	PP
	8.0 to 10.0		13	47	16	31	CL		98	2.25	PP
	10.0 to 12.0		21						96	1.67	PP
	15.0 to 16.5	8									
	20.0 to 21.5	19	4						17		
	25.0 to 26.5	13									
	30.0 to 31.5	26	30						19		
	35.0 to 36.5	21									
	40.0 to 41.5	29		CNBD	CNBD	NP	SM				
	48.5 to 50.0	13									
DP-173	0.0 to 2.0		8						21	2.25	PP
	2.0 to 4.0		10	53	13	40	CH		75	2.25	PP
	4.0 to 6.0		11							2.25	PP
	6.0 to 8.0		17							2.25	PP
	8.0 to 10.0		22	63	22	41	CH	100	98	1.62	UC
	10.0 to 12.0		18							2.25	PP
	15.0 to 17.0		14	41	8	33	CL		91	2.25	PP
	20.0 to 22.0		30								
	25.0 to 26.5	46	21						14		
	30.0 to 31.5	29	25								
	35.0 to 36.5	20	23	CNBD	CNBD	NP	SM				
	40.0 to 41.5	23	24						16		
	48.5 to 50.0	40	21								
DP-174	0.0 to 2.0		7								
	2.0 to 4.0		4						29		
	4.0 to 6.0		11	46	6	40	CL		52	2.25	PP
	6.0 to 8.0		15							2.62	UC
	8.0 to 10.0		19	63	17	46	CH		97	2.25	PP
	10.0 to 12.0		19					104		2.62	UC
	15.0 to 17.0		25	57	17	40	CH		99	2.25	PP
	20.0 to 22.0		22							2.08	PP
	25.0 to 27.0	14	32	66	17	49	CH				
	30.0 to 32.0	27	22								
	35.0 to 37.0	27	32								
	40.0 to 42.0	19	26								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303fff

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-174	48.0 to 50.0	22	24						24		
DP-175	0.0 to 2.0			52	15	37	CH			2.21	PP
	2.0 to 3.5	9	15						53		
	4.0 to 6.0		17	51	15	36	CH		99	2.25	PP
	6.0 to 8.0		24					103		2.25	PP
	8.0 to 10.0		19	52	15	37	CH		95	2.25	PP
	10.0 to 11.5	16									
	15.0 to 17.0		10					116		4.01	UC
	20.0 to 21.5	50		CNBD	CNBD	NP	SM				
	25.0 to 26.5	31	25						28		
	30.0 to 31.5	30	25						8		
	35.0 to 36.5	14									
	40.0 to 41.5	32	21								
	48.5 to 49.8	50/9"	23						36		
DP-176	0.0 to 2.0		8	26	18	8	CL		64	2.25	PP
	2.0 to 4.0		13					110		1.83	UC
	4.0 to 6.0		13	33	11	22	CL		82	2.25	PP
	6.0 to 8.0		14						64	2.25	PP
	8.0 to 10.0			43	15	28	CL			2.25	PP
	10.0 to 11.5	19	6						49		
	15.0 to 16.5	29		CNBD	CNBD	NP	SM				
	20.0 to 21.5	29	21						14		
	25.0 to 26.5	46	22						13		
	30.0 to 31.5	47									
	35.0 to 36.4	50/ 11"	21						11		
	40.0 to 41.5	25									
	48.5 to 50.0	18									
DP-177	0.0 to 2.0		17						98	2.25	PP
	2.0 to 4.0		12	35	19	16	CL		92	2.25	PP
	4.0 to 6.0		11							2.25	PP
	6.0 to 8.0		10	33	22	11	CL	97		2.25	PP
	8.0 to 9.5	7	6	CNBD	CNBD	NP	ML		51		
	10.0 to 11.5	9	11								
	15.0 to 16.5	8	15	25	18	7	SC-SM				
	20.0 to 21.5	12	29						13		
	25.0 to 26.5	17	28								
	30.0 to 31.5	24	23						14		
	35.0 to 36.5	43	25						10		
	40.0 to 41.5	42	25								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ggg

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Uni t Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-177	48.0 to 49.5	12	31								
DP-178	0.0 to 2.0		12	45	15	30	CL		97	2.25	PP
	2.0 to 4.0		12						96	2.25	PP
	4.0 to 6.0		15							2.25	PP
	6.0 to 8.0		21	54	17	37	CH		98	2.00	PP
	8.0 to 10.0		21					102		1.80	UC
	10.0 to 12.0		21							2.25	PP
	15.0 to 17.0		25							2.25	PP
	20.0 to 22.0		33	38	25	13	ML	87	100		
	25.0 to 26.5	15	30						30		
	30.0 to 31.5	15	25	CNBD	CNBD	NP			11		
	35.0 to 36.5	18	29								
	40.0 to 41.5	8	37	73	16	57	CH				
	48.5 to 50.0	10	50						99		
DP-179	0.0 to 2.0		10	40	15	25	CL		98	2.25	PP
	2.0 to 4.0		12						95	2.25	PP
	4.0 to 6.0		14	40	15	25	CL		95	2.25	PP
	6.0 to 8.0		17					105		1.23	UC
	8.0 to 10.0		15	28	21	7	CL-ML		80	2.25	PP
	10.0 to 12.0		19						99	0.75	PP
	15.0 to 17.0									0.75	PP
	20.0 to 21.5	10	18								
	25.0 to 26.5	19	24	CNBD	CNBD	NP	SM				
	30.0 to 31.5	14	29								
	35.0 to 36.5	19	27								
	40.0 to 41.5	29	28								
	48.5 to 50.0	37	28								
DP-180	0.0 to 2.0		14							2.25	PP
	2.0 to 4.0		10	39	16	23	CL		74	2.25	PP
	4.0 to 6.0		17					104		2.25	PP
	6.0 to 8.0		7						88	2.25	PP
	8.0 to 10.0		18	38	17	21	CL		87	2.25	PP
	10.0 to 12.0		21							2.25	PP
	15.0 to 17.0		22	67	22	45	CH		96	1.25	PP
	20.0 to 21.5	12									
	25.0 to 26.5	16		CNBD	CNBD	NP	SM				
	30.0 to 31.5	16									
	35.0 to 36.5	18	26						6		
	40.0 to 41.5	29	24						13		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303hhh

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-180	48.5 to 50.0	18	27								
DP-181	0.0 to 2.0		13	41	20	21	CL		80	2.25	PP
	2.0 to 4.0		23					101		2.25	PP
	4.0 to 6.0		13	45	20	25	CL		96	2.25	PP
	6.0 to 8.0		21						99	2.25	PP
	8.0 to 10.0		17					106		1.83	UC
	10.0 to 12.0		25	60	24	36	CH			1.75	PP
	15.0 to 17.0		31							1.33	PP
	20.0 to 21.5	17	24						17		
	25.0 to 26.5	11									
	30.0 to 31.5	19	28						18		
	35.0 to 36.5	46	31						13		
	40.0 to 41.5	25	31								
	48.5 to 50.0	5	28	61	20	41	CH				
DP-182	0.0 to 2.0		22	38	17	21	CL		98	1.08	PP
	2.0 to 4.0		25					93		0.52	UC
	4.0 to 6.0		24	32	20	12	CL	105	92	0.83	PP
	6.0 to 7.5	4	32	31	18	13	CL				
	8.0 to 9.5	13	25						96		
	10.0 to 11.5	7	31	55	25	30	CH				
	15.0 to 16.5	5	34						99		
	20.0 to 21.5	3	44						83		
	25.0 to 26.5	21	31	CNBD	CNBD	NP	SM				
	30.0 to 31.5	26	25								
	35.0 to 36.5	13	26						12		
	40.0 to 41.5	10	31						13		
	48.5 to 50.0	18	25								
DP-183	0.0 to 2.0		19	27	15	12	CL		68	1.00	PP
	2.0 to 4.0		26							0.83	PP
	4.0 to 6.0		22	36	16	20	CL	98		0.40	UC
	6.0 to 7.5	5	29						88		
	8.0 to 9.5	5	31	49	20	29	CL				
	10.0 to 11.5	7	36						96		
	15.0 to 16.5	16	25						15		
	20.0 to 21.5	8	33	42	17	25	CL				
	25.0 to 26.5	9	33						45		
	30.0 to 31.5	23	34								
	35.0 to 36.5	22	27								
	40.0 to 41.5	33	25						9		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303iii

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-183	48.5 to 50.0	28	25						7		
DP-184	0.0 to 2.0		17					108		2.30	UC
	2.0 to 4.0		17	35	18	17	CL		90	1.92	PP
	4.0 to 6.0		16						87	1.83	PP
	6.0 to 8.0		24	43	19	24	CL			0.25	PP
	8.0 to 10.0		18						76	0.83	PP
	10.0 to 11.5	6	22						67		
	15.0 to 16.5	2	28	29	18	11	CL				
	20.0 to 21.5	9	36						84		
	25.0 to 26.5	10	28								
	30.0 to 31.5	10	28	71	22	49	CH				
	35.0 to 36.5	7	30						93		
	40.0 to 41.5	17	29								
	48.5 to 50.0	20									
DP-185	0.0 to 2.0		18						94	2.25	PP
	2.0 to 4.0		12	36	18	18	CL			2.00	PP
	4.0 to 6.0		13						78	2.25	PP
	6.0 to 8.0		18					108		1.81	UC
	8.0 to 10.0		13	39	20	19	CL			2.08	PP
	10.0 to 11.5	15	8						99		
	15.0 to 16.5	11	30						98		
	20.0 to 21.5	6	32	43	23	20	CL				
	25.0 to 26.5	12	29						24		
	30.0 to 31.5	11	30	CNBD	CNBD	NP	SM				
	35.0 to 36.5	9	25						9		
	40.0 to 41.5	18	27								
	48.5 to 50.0	14	33								
DP-186	0.0 to 2.0		14	39	21	18	CL		94	2.25	PP
	2.0 to 4.0		11						93	2.25	PP
	4.0 to 6.0		17					103		2.31	UC
	6.0 to 8.0		12	30	21	9	CL		92	2.25	PP
	8.0 to 10.0		15						88	2.25	PP
	10.0 to 12.0		16	36	21	15	CL		93	1.75	PP
	15.0 to 17.0		30							1.50	PP
	20.0 to 21.5	7	29	26	19	7	CL-ML				
	25.0 to 26.5	9	26						59		
	30.0 to 31.5	11	27								
	35.0 to 36.5	17	25								
	40.0 to 41.5	30	26								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303jjj

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-186	48.5 to 50.0	24	27								
DP-187	0.0 to 2.0		9	29	18	11	CL		91	2.25	PP
	2.0 to 4.0		10	30	17	13	CL			2.25	PP
	4.0 to 6.0		16						82		
	6.0 to 8.0		20							2.25	PP
	8.0 to 10.0		17	41	18	23	CL	107	93	2.03	UC
	10.0 to 12.0		23	48	18	30	CL	99		2.25	PP
	15.0 to 16.0		23	56	23	33	CH	99	97		
	16.0 to 17.0			56	23	33	CH		73	1.67	PP
	20.0 to 21.5	13	27	CNBD	CNBD	NP	SM				
	25.0 to 26.5	2	28								
	30.0 to 31.5	30	23								
	35.0 to 36.5	27	25						9		
	40.0 to 41.5	29	24								
	48.5 to 50.0	25	30						18		
DP-188	0.0 to 2.0		8						58	2.00	PP
	2.0 to 4.0		9	33	19	14	CL	111		2.67	UC
	4.0 to 6.0		14						84	2.25	PP
	6.0 to 8.0		24	53	24	29	CH			1.33	PP
	8.0 to 10.0		11							1.42	PP
	10.0 to 11.5	12	21	35	15	20	CL				
	15.0 to 16.5	9	27						73		
	20.0 to 21.5	6	26						23		
	25.0 to 26.5	23	22								
	30.0 to 31.5	24	24						7		
	35.0 to 36.5	30	22						11		
	40.0 to 41.5	25	22						9		
	48.5 to 50.0	19	23	24	14	10	CL				
DP-189	0.0 to 2.0		17	25	16	9	CL	106	91	2.25	PP
	2.0 to 4.0		17							2.25	PP
	4.0 to 6.0		18	29	14	15	CL		93	1.83	PP
	6.0 to 8.0		15						74	2.25	PP
	8.0 to 10.0		20	38	19	19			9		
	10.0 to 12.0		31								
	15.0 to 17.0		28	73	30	43	CH			1.50	PP
	20.0 to 22.0		23	37	20	17	CL	97	94	0.25	PP
	25.0 to 26.5	11	27						25		
	30.0 to 31.5	8	25								
	35.0 to 36.5	21	24						18		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303kkk

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-189	40.0 to 41.5	27	24								
	48.5 to 50.0	10	31								
DP-190	0.0 to 2.0		15	43	21	22	CL		65	2.25	PP
	2.0 to 4.0		8					103		2.25	PP
	4.0 to 6.0		12	47	22	25	CL		88	2.25	PP
	6.0 to 8.0		11					114		1.73	UC
	8.0 to 10.0		13	35	17	18	CL		93	2.25	PP
	10.0 to 12.0										
	15.0 to 17.0		20	40	18	22	CL	104	82		
	20.0 to 21.5	5	25						39		
	25.0 to 26.5	12	30								
	30.0 to 31.5	16	28						38		
	35.0 to 36.5	19	26						37		
	40.0 to 41.5	30	29	71	29	42	CH				
	48.5 to 50.0	36	28								
DP-191	0.0 to 2.0		10						92	2.25	PP
	2.0 to 4.0		28	76	30	46	CH		98	1.88	PP
	4.0 to 6.0		15					109		2.25	PP
	6.0 to 8.0		6							2.13	PP
	8.0 to 10.0		17	39	20	19	CL		96	2.25	PP
	10.0 to 12.0		18					95		0.81	UC
	15.0 to 17.0		29						96		
	20.0 to 22.0		26							1.00	PP
	25.0 to 27.0		25	60	22	38	CH		94	1.13	PP
	30.0 to 32.0		24							1.38	PP
	35.0 to 37.0		33	52	23	29	CH			1.50	PP
	40.0 to 42.0		25							2.25	PP
	48.0 to 50.0		29						99	2.13	PP
DP-192	0.0 to 2.0		11	35	20	15	CL			2.25	PP
	2.0 to 4.0		26						98	2.25	PP
	4.0 to 6.0		24						98	2.25	PP
	6.0 to 8.0		22							2.25	PP
	8.0 to 10.0		23	65	24	41	CH	96	96	0.48	UC
	10.0 to 12.0		24							2.00	PP
	15.0 to 17.0		27						99	1.08	PP
	20.0 to 22.0		23							1.08	PP
	25.0 to 27.0		23	60	20	40	CH		91	1.42	PP
	30.0 to 32.0		23							2.08	PP
	35.0 to 37.0		25						100	1.92	PP

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CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303III

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-192	40.0 to 41.5	21	26	64	21	43	CH				
	48.5 to 50.0	32	24						99		
DP-193	0.0 to 2.0		20	37	21	16	CL			2.25	PP
	2.0 to 4.0		12					111	98	3.43	UC
	4.0 to 6.0		18	64	28	36	CH		79	1.67	PP
	6.0 to 8.0		14							2.25	PP
	8.0 to 10.0		13						89	2.25	PP
	10.0 to 12.0		17	55	25	30	CH			2.25	PP
	15.0 to 17.0		18							2.25	PP
	20.0 to 22.0		25						97	1.33	PP
	25.0 to 27.0		25							1.42	PP
	30.0 to 32.0		28	47	22	25	CL		94	0.58	PP
	35.0 to 37.0		24							1.33	PP
	40.0 to 41.5	15	28						98		
	48.5 to 50.0	25	24								
DP-194	0.0 to 2.0		14	32	17	15	CL		97	2.25	PP
	2.0 to 4.0		23							2.25	PP
	4.0 to 6.0		22					100		3.25	UC
	6.0 to 8.0		18	72	26	46	CH		97	2.25	PP
	8.0 to 10.0		11							2.25	PP
	10.0 to 12.0		14						95	1.42	PP
	15.0 to 17.0		28							1.33	PP
	20.0 to 22.0		29							1.08	PP
	25.0 to 27.0		25	66	22	44	CH		93	1.00	PP
	30.0 to 32.0		26						94	0.50	PP
	35.0 to 37.0		24	38	20	18	CL			1.08	PP
	40.0 to 41.5	19	31								
	48.5 to 50.0	22	32						97		
DP-195	0.0 to 1.5	12	10	36	19	17	CL				
	2.0 to 3.5	24	12						91		
	4.0 to 5.5	15	16						94		
	6.0 to 7.5	11	19	42	21	21	CL				
	8.0 to 9.5	10	15						97		
	10.0 to 11.5	14	27						91		
	15.0 to 17.0		33	79	38	41	MH		99	0.88	PP
	20.0 to 22.0		29					92		0.81	UC
	25.0 to 27.0		26						91	1.13	PP
	30.0 to 32.0		29	51	23	28	CH	94	99	0.50	PP
	35.0 to 37.0										

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303mmm

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-195	40.0 to 42.0		26	36	20	16	CL		94	0.25	PP
	48.5 to 50.0	16									
DP-196	0.0 to 1.5	11	23	52	24	28	CH				
	2.0 to 3.5	16	17						92		
	4.0 to 5.5	13	13								
	6.0 to 7.5	13	24						97		
	8.0 to 9.5	12	20	40	22	18	CL				
	10.0 to 11.5	14	21						97		
	15.0 to 16.5	13	39								
	20.0 to 22.0		27					94	97	0.83	UC
	25.0 to 27.0		25	49	17	32	CL		91	1.63	PP
	30.0 to 32.0		26						98	1.00	PP
	35.0 to 37.0		28							0.50	PP
	40.0 to 42.0										
	48.5 to 50.0	14		63	28	35	CH				
DP-197	0.0 to 2.0		17	57	26	31	CH		97	2.25	PP
	2.0 to 4.0		20					102		2.74	UC
	4.0 to 6.0		25	55	20	35		99		2.25	PP
	6.0 to 8.0		17	56	24	32	CH		98	2.25	PP
	8.0 to 10.0		20							2.25	PP
	10.0 to 12.0									1.25	PP
	15.0 to 16.5	7	14								
	20.0 to 21.5	7	31	29	20	9	CL		86		
	25.0 to 26.5	9	27						7		
	30.0 to 31.5	16	28								
	35.0 to 36.5	21	26						17		
	40.0 to 41.5	25	27						10		
	48.5 to 50.0	24	32	72	31	41	CH				
DP-198	0.0 to 2.0		6					108	91	2.25	PP
	2.0 to 4.0		12	29	16	13	CL		77	2.25	PP
	4.0 to 6.0		22							2.25	PP
	6.0 to 8.0		21	39	20	19	CL		93	2.25	PP
	8.0 to 10.0		17							2.25	PP
	10.0 to 12.0		17	47	27	20	CL		99	2.25	PP
	15.0 to 17.0		24	64	29	35	CH			2.17	PP
	20.0 to 22.0		25	47	22	25	CL	100	99	0.75	PP
	25.0 to 27.0		31						97		
	30.0 to 31.5	11	30						16		
	35.0 to 36.5	21	30								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303nnn

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-198	40.0 to 41.5	31	31						20		
	48.5 to 50.0	33	20								
DP-199	0.0 to 2.0		18	31	19	12	CL		90	2.08	PP
	2.0 to 4.0		21					100		1.04	UC
	4.0 to 6.0		11	CNBD	CNBD	NP	ML		90		
	6.0 to 8.0		14					107		1.19	UC
	8.0 to 10.0		23						95	2.17	PP
	10.0 to 12.0		21							2.08	PP
	15.0 to 17.0		21	32	17	15	CL		98	2.17	PP
	20.0 to 22.0		26	47	22	25	CL	97	98		
	25.0 to 26.5	5		32	19	13	SC				
	30.0 to 31.5	23	27						16		
	35.0 to 36.5	37	28						29		
	40.0 to 41.5	24	28								
	48.5 to 50.0	7	35								
DP-200	0.0 to 1.5	9	18						95		
	2.0 to 3.5	14	15						94		
	4.0 to 5.5	18	18	49	19	30	CL				
	6.0 to 7.5	15	23								
	8.0 to 9.5	14	21	37	18	19	CL				
	10.0 to 11.5	14	15						86		
	15.0 to 16.5	11	24						95		
	20.0 to 21.5	10	29	36	20	16	CL				
	25.0 to 26.5	12	25						38		
	30.0 to 31.5	10	25						31		
	35.0 to 36.5	17	28								
	40.0 to 41.5	34	23						13		
	48.5 to 50.0	8	25	75	20	55	CH				
DP-201	0.0 to 1.5	16	11	28	16	12	CL				
	2.0 to 3.5	14	16						97		
	4.0 to 5.5	13	18								
	6.0 to 7.5	22	18	51	21	30	CH				
	8.0 to 9.5	12	23						96		
	10.0 to 11.5	15	22								
	15.0 to 16.5	15	17						82		
	20.0 to 21.5	16	13	31	19	12	CL				
	25.0 to 26.5	9	29						96		
	30.0 to 31.5	9	37	27	18	9	CL				
	35.0 to 36.5	23	24						15		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ooo

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-201	40.0 to 41.5	25	23						15		
	48.5 to 50.0	14	21								
DP-202	0.0 to 1.5	6	15						85		
	2.0 to 3.5	7	18	54	26	28	CH				
	4.0 to 5.5	9	24						95		
	6.0 to 7.5	15	9	33	20	13	CL				
	8.0 to 9.5	4	12								
	10.0 to 11.5	13	25						39		
	15.0 to 16.5	8	30	55	23	32	CH				
	20.0 to 21.5	9	25						89		
	25.0 to 26.5	10	23	57	15	42	CH				
	30.0 to 32.0		25	64	24	40	CH	101	99	1.44	PP
	35.0 to 37.0		26					95	99	0.12	UC
	40.0 to 42.0									1.25	PP
	48.0 to 50.0		37						97	0.75	PP
DP-203	0.0 to 1.5	18	18	39	23	16	CL				
	2.0 to 3.5	7	18						97		
	4.0 to 5.5	8	13						90		
	6.0 to 7.5	8	11	28	19	9	CL				
	8.0 to 9.5	6	14						85		
	10.0 to 11.5	11	13						82		
	15.0 to 16.5	13	25	55	22	33	CH				
	20.0 to 21.5	10	29						99		
	25.0 to 27.0		40	52	22	30	CH				
	30.0 to 31.5	6	23						9		
	35.0 to 36.5	10	26								
	40.0 to 41.5	13	26								
	48.0 to 50.0		26								
DP-204	0.0 to 1.5	17	20						94		
	2.0 to 3.5	11	21	39	21	18	CL				
	4.0 to 5.5	14	25						98		
	6.0 to 7.5	12	25	53	26	27	CH				
	8.0 to 9.5	10	25						100		
	10.0 to 12.0		29					91		1.50	PP
	15.0 to 16.5	12	26	51	26	25	CH				
	20.0 to 21.5	16	8						15		
	25.0 to 26.5	12	18	CNBD	CNBD	NP	SM				
	30.0 to 31.5	9	34						19		
	35.0 to 36.5	12	27								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ppp

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-204	40.0 to 42.0									-0.50	PP
	48.5 to 50.0	10	28						99		
DP-205	0.0 to 1.5	13	25	50	27	23	CH				
	2.0 to 3.5	7	24						88		
	4.0 to 5.5	11	25	49	19	30	CL				
	6.0 to 7.5	13	19						85		
	8.0 to 9.5	9	27						95		
	10.0 to 11.5	14	23	30	19	11	CL				
	15.0 to 16.5	8	20						80		
	20.0 to 21.5	5	32	37	17	20	CL				
	25.0 to 26.5	14	25								
	30.0 to 31.5	17	26						9		
	35.0 to 36.5	31	23								
	40.0 to 41.5	21	27						10		
	48.5 to 50.0	9	30								
DP-206	0.0 to 1.5	16	14						84		
	2.0 to 3.5	11	12	47	21	26	CL				
	4.0 to 5.5	13	15								
	6.0 to 7.5	16	19	29	19	10	CL				
	8.0 to 9.5	10	24						23		
	10.0 to 11.5	9	26	37	20	17	CL				
	15.0 to 16.5	7	25								
	20.0 to 21.5	4	31						93		
	25.0 to 26.5	5	28						3		
	30.0 to 31.5	15	24								
	35.0 to 36.5	23	25						9		
	40.0 to 41.5	19	28						11		
	48.5 to 50.0	14	22	59	22	37	CH				
DP-207	0.0 to 1.5	12	18						92		
	2.0 to 3.5	12	17	29	16	13	CL				
	4.0 to 5.5	14	19						96		
	6.0 to 7.5	14	21	52	25	27	CH				
	8.0 to 9.5	20	16						96		
	10.0 to 11.5	13	17	47	22	25	CL				
	15.0 to 16.5	7	33						88		
	20.0 to 21.5	4	26	CNBD	CNBD	NP	SP-SM				
	25.0 to 26.5	14	26						7		
	30.0 to 31.5	12	26								
	35.0 to 36.5	11	30						23		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303qqq

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-207	40.0 to 41.5	11	28								
	48.5 to 50.0	12	27								
DP-208	0.0 to 1.5	9	16	33	16	17	CL				
	2.0 to 3.5	13	22						88		
	4.0 to 5.5	14	22	34	17	17	CL				
	6.0 to 7.5	15	23								
	8.0 to 9.5	17	22	42	20	22	CL				
	10.0 to 11.5	15	18						93		
	15.0 to 16.5	11	12						50		
	20.0 to 21.5	4	25	27	16	11	CL				
	25.0 to 26.5	7	30								
	30.0 to 31.5	15	24						8		
	35.0 to 36.5	23	31						12		
	40.0 to 41.5	17	27								
	48.5 to 50.0	17	28						5		
DP-209	0.0 to 1.5	13	13						92		
	2.0 to 3.5	11	16	38	17	21	CL				
	4.0 to 5.5	15	17						86		
	6.0 to 7.5	11	20						92		
	8.0 to 9.5	17	20	54	23	31	CH				
	10.0 to 11.5	11	20						95		
	15.0 to 16.5	4	8						44		
	20.0 to 21.5	3	34	28	17	11	SC				
	25.0 to 26.5	11	27						16		
	30.0 to 31.5	16	24								
	35.0 to 36.5	23	26								
	40.0 to 41.5	12	26						7		
	48.5 to 50.0	11	24	57	21	36	CH				
DP-210	0.0 to 1.5	23	11	33	16	17	CL				
	2.0 to 3.5	14	18						84		
	4.0 to 5.5	18	15						91		
	6.0 to 7.5	16	22	59	21	38	CH				
	8.0 to 9.5	18	19						94		
	10.0 to 11.5	11	16	58	22	36	CH				
	15.0 to 16.5	7	23						99		
	20.0 to 21.5	6	31								
	25.0 to 26.5	12	29						40		
	30.0 to 31.5	12	24						9		
	35.0 to 36.5	17	30								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303rrr

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-210	40.0 to 41.5	8	25	44	17	27	CL				
	48.5 to 50.0	8									
DP-211	0.0 to 1.5	18	11						96		
	2.0 to 3.5	16	14	33	19	14	CL				
	4.0 to 5.5	16	14						96		
	6.0 to 7.5	17	14								
	8.0 to 9.5	17	16	46	19	27	CL				
	10.0 to 11.5	14	20						94		
	15.0 to 16.5	14	20						94		
	20.0 to 21.5	10	30	77	32	45	CH				
	25.0 to 26.5	10	35						99		
	30.0 to 31.5	9	28								
	35.0 to 36.5	5	42	59	25	34	CH				
	40.0 to 41.5	12	38						98		
	48.5 to 50.0	14	31								
DP-212	0.0 to 1.5	15	16	45	21	24	CL				
	2.0 to 3.5	12	18						95		
	4.0 to 5.5	11	21	40	20	20	CL				
	6.0 to 7.5	11	15						90		
	8.0 to 9.5	16	23	47	23	24	CL				
	10.0 to 11.5	12	24								
	15.0 to 16.5	11	16						98		
	20.0 to 21.5	7	16						85		
	25.0 to 26.5	4	28								
	30.0 to 31.5	11	23						12		
	35.0 to 36.5	14	31	CNBD	CNBD	NP	SM				
	40.0 to 41.5	14	26								
	48.5 to 50.0	16	23						10		
DP-213	0.0 to 1.5	16	15	38	18	20	CL				
	2.0 to 3.5	14	17						96		
	4.0 to 5.5	17	16	30	16	14	CL				
	6.0 to 7.5	15	20						94		
	8.0 to 9.5	13	18						96		
	10.0 to 11.5	12	15								
	15.0 to 16.5	11	16	36	20	16	CL				
	20.0 to 21.5	7	22						94		
	25.0 to 26.5	10	28						43		
	30.0 to 31.5	12	32								
	35.0 to 36.5	13	23	CNBD	CNBD	NP	SM				

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303sss

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-213	40.0 to 41.5	23	23								
	48.5 to 50.0	20	19						91		
DP-214	0.0 to 1.5	18	13	45	21	24	CL				
	2.0 to 3.5	12	17						94		
	4.0 to 5.5	17	16						95		
	6.0 to 7.5	14	16	39	19	20	CL				
	8.0 to 9.5	12	20						95		
	10.0 to 11.5	11	18	39	17	22	CL				
	15.0 to 16.5	11	22								
	20.0 to 21.5	2	26	27	15	12	SC				
	25.0 to 26.5	14	23						18		
	30.0 to 31.5	14	24						10		
	35.0 to 36.5	22	23								
	40.0 to 41.5	22	23						7		
	48.5 to 50.0	17	24								
DP-215	0.0 to 1.5		15						59		
	2.0 to 4.0		15	49	24	25	CL	112		3.97	UC
	4.0 to 6.0		18							2.25	PP
	6.0 to 8.0		16	40	22	18	CL		92	2.25	PP
	8.0 to 10.0		21	41	18	23		106		2.25	PP
	10.0 to 12.0		17	39	19	20	CL		94	2.13	PP
	15.0 to 17.0		18	48	22	26	CL		94	2.25	PP
	20.0 to 22.0			39	19	20	CL		99	1.62	PP
	25.0 to 26.5	12	34								
	30.0 to 31.5	13	31						32		
	35.0 to 36.5	24	27								
	40.0 to 41.5	20	28						8		
	48.5 to 50.0	6	26								
DP-216	0.0 to 1.5		19						53		
	2.0 to 4.0		15						83	2.25	PP
	4.0 to 6.0		18	41	20	21	CL		95	2.25	PP
	6.0 to 8.0		17							2.25	PP
	8.0 to 10.0		14	41	22	19	CL	109	93	1.62	UC
	10.0 to 12.0		20						90	2.08	PP
	15.0 to 17.0		18							2.25	PP
	20.0 to 21.5	7	25	CNBD	CNBD	NP	SM				
	25.0 to 26.5	16	24								
	30.0 to 31.5	3	35						48		
	35.0 to 36.5	19	28								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ttt

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-216	40.0 to 41.5	4	32	57	24	33	CH				
	48.5 to 50.0	27	32						21		
DP-217	0.0 to 1.5		16	47	20	27	CL				
	2.0 to 4.0		18							2.25	PP
	4.0 to 6.0		14	35	19	16	CL			2.25	PP
	6.0 to 8.0		17					104	97	2.33	UC
	8.0 to 10.0		18						95	2.25	PP
	10.0 to 12.0		15						95	2.25	PP
	15.0 to 17.0		18	35	18	17	CL			2.25	PP
	20.0 to 21.5	28	16						19		
	25.0 to 26.5	8	27								
	30.0 to 31.5	8	27						37		
	35.0 to 36.5	13	28	CNBD	CNBD	NP	SM				
	40.0 to 41.5	13	31								
	48.5 to 50.0	9	30						35		
DP-218	0.0 to 2.0		14						94	2.25	PP
	2.0 to 4.0		15	42	18	24	CL		81	2.25	PP
	4.0 to 6.0		17	53	19	34		106		2.25	PP
	6.0 to 8.0		18					108	89	2.44	UC
	8.0 to 10.0		18	47	22	25	CL		90	2.25	PP
	10.0 to 12.0		25					100		1.24	UC
	15.0 to 17.0		19							2.25	PP
	20.0 to 22.0		23	69	29	40	CH		97	1.46	PP
	25.0 to 27.0		26							1.47	PP
	30.0 to 32.0		31						95	1.88	PP
	35.0 to 37.0		21	52	21	31	CH		73	1.63	PP
	40.0 to 42.0		19	45	16	29	CL	109	83	1.84	PP
	48.0 to 50.0		27							1.88	PP
DP-219	0.0 to 1.5		26								
	2.0 to 4.0		22					99		1.86	UC
	4.0 to 6.0		24						98	1.75	PP
	6.0 to 8.0		20	80	28	52	CH		98	2.17	PP
	8.0 to 10.0		25					95		1.25	UC
	10.0 to 12.0		20	78	28	50	CH		98	2.25	PP
	15.0 to 17.0		25							1.38	PP
	20.0 to 22.0		29						99	1.59	PP
	25.0 to 27.0		30	41	18	23	CL		98	1.25	PP
	30.0 to 32.0		37							1.17	PP
	35.0 to 37.0		26							0.83	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303uuu

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-219	40.0 to 42.0		20	52	17	35	CH		76	1.71	PP
	48.0 to 50.0		24							2.25	PP
DP-220	0.0 to 2.0		17	75	29	46	CH		96	2.25	PP
	2.0 to 4.0		16						96	2.25	PP
	4.0 to 6.0		23					100		2.47	UC
	6.0 to 8.0		21	76	18	58	CH		97	2.25	PP
	8.0 to 10.0		22						97	1.88	PP
	10.0 to 12.0		22					102		1.92	UC
	15.0 to 17.0		30	68	26	42	CH		96	1.92	PP
	20.0 to 22.0		22								
	25.0 to 27.0		33							0.92	PP
	30.0 to 32.0		33	81	23	58	CH		96	1.29	PP
	35.0 to 37.0		23							1.42	PP
	40.0 to 42.0		22						84	1.04	PP
	48.0 to 50.0		21							2.25	PP
DP-221	0.0 to 2.0		17	60	26	34	CH		93	2.25	PP
	2.0 to 4.0		21							2.25	PP
	4.0 to 6.0		20					103	93	2.08	UC
	6.0 to 8.0		26	75	27	48	CH		95	1.79	PP
	8.0 to 10.0		33	76	23	53		88		1.71	PP
	10.0 to 12.0		29							1.79	PP
	15.0 to 17.0		22	80	26	54	CH		97	2.04	PP
	20.0 to 21.5	11	21								
	25.0 to 26.5	13	32						83		
	30.0 to 32.0		35							1.13	PP
	35.0 to 37.0		24	80	30	50	CH		68	1.08	PP
	40.0 to 42.0		20	35	18	17	CL	110	88	1.13	PP
	48.0 to 50.0		22						98	1.50	PP
DP-222	0.0 to 2.0		19							5.41	UC
	2.0 to 4.0		19	58	23	35	CH	109	95	2.25	PP
	4.0 to 6.0		18							2.25	PP
	6.0 to 8.0		24					101		2.33	UC
	8.0 to 10.0		24	52	19	33	CH		97	2.00	PP
	10.0 to 12.0									1.88	PP
	15.0 to 17.0		25	66	21	45	CH		93	1.79	PP
	20.0 to 21.5	17	22						76		
	25.0 to 27.0		26								
	30.0 to 32.0		31	77	30	47	CH		95	1.29	PP
	35.0 to 37.0		24							1.00	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

Raba-Kistner

FIGURE A-303vvv

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-222	40.0 to 42.0		25						96	1.67	PP
	48.0 to 50.0		21							2.00	PP
DP-223	0.0 to 2.0		18	56	20	36	CH		93	2.25	PP
	2.0 to 4.0		21						97	2.25	PP
	4.0 to 6.0		17							2.25	PP
	6.0 to 8.0		19					104		2.24	UC
	8.0 to 10.0		21	60	20	40	CH		91	2.25	PP
	10.0 to 12.0		23							2.13	PP
	15.0 to 17.0		13								
	20.0 to 21.5	9	28								
	25.0 to 27.0		31	40	21	19	CL		99	0.50	PP
	30.0 to 32.0		25							1.33	PP
	35.0 to 37.0		20							0.88	PP
	40.0 to 42.0		20						90	1.50	PP
	48.0 to 50.0		26	77	27	50	CH		99	2.21	PP
DP-224	0.0 to 2.0		23							2.00	PP
	2.0 to 4.0		21	50	18	32	CH		76	2.25	PP
	4.0 to 6.0		14					111		3.23	UC
	6.0 to 8.0		19							2.25	PP
	8.0 to 10.0		15	69	22	47	CH		83	2.25	PP
	10.0 to 12.0		19							2.08	PP
	15.0 to 17.0		14	28	15	13	CL		56	2.25	PP
	20.0 to 21.5	8	28								
	25.0 to 27.0		40						99	0.92	PP
	30.0 to 32.0		27							0.88	PP
	35.0 to 37.0		25						73	1.58	PP
	40.0 to 42.0		21	62	17	45	CH		89	2.17	PP
	48.0 to 50.0		25							2.08	PP
DP-225	0.0 to 2.0		19							1.42	PP
	2.0 to 4.0		13	47	20	27	CL		94	2.25	PP
	4.0 to 6.0		12							2.25	PP
	6.0 to 8.0		18					107	88	3.19	UC
	8.0 to 10.0		18	45	20	25	CL		89	2.25	PP
	10.0 to 12.0		19	50	16	34		109		1.88	PP
	15.0 to 17.0		24							1.79	PP
	20.0 to 22.0		26						95	2.17	PP
	25.0 to 26.5	22	26	47	23	24	CL				
	30.0 to 32.0		36						96	1.38	PP
	35.0 to 37.0		22							1.21	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303www

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-225	40.0 to 42.0		22	59	26	33	CH			1.96	PP
	48.0 to 50.0		26						98	1.79	PP
DP-226	0.0 to 2.0		14					110	89	1.39	UC
	2.0 to 4.0		13						86	2.25	PP
	4.0 to 6.0		16							2.25	PP
	6.0 to 8.0		18							2.25	PP
	8.0 to 10.0		17	53	23	30	CH		92	2.17	PP
	10.0 to 12.0		20						94	2.25	PP
	15.0 to 17.0		21						90	2.17	PP
	20.0 to 22.0		27	68	24	44	CH			1.42	PP
	25.0 to 26.5	18	30	67	28	39	CH				
	30.0 to 32.0		35							1.46	PP
	35.0 to 37.0		24						76	1.13	PP
	40.0 to 42.0		26							1.88	PP
	48.0 to 50.0		28	61	26	35	CH		100	2.08	PP
DP-227	0.0 to 2.0		21	57	27	30	CH			2.08	PP
	2.0 to 4.0		13						93	2.25	PP
	4.0 to 6.0		6							2.25	PP
	6.0 to 8.0		17					107	90	4.00	UC
	8.0 to 10.0		16	50	18	32	CH	109	92	2.25	PP
	10.0 to 12.0		25	60	25	35	CH		88	2.12	PP
	15.0 to 17.0		17						61	1.54	PP
	20.0 to 22.0		29							1.25	PP
	25.0 to 26.5	12	25	43	22	21	CL				
	30.0 to 32.0		30							1.75	PP
	35.0 to 37.0		19						70	1.58	PP
	40.0 to 42.0		22	52	20	32	CH		79	1.50	PP
	48.0 to 50.0		24							2.00	PP
DP-228	0.0 to 2.0		11								
	2.0 to 4.0		15	40	17	23	CL		55	2.25	PP
	4.0 to 6.0		15						92	2.25	PP
	6.0 to 8.0		20					103		1.42	UC
	8.0 to 10.0		19	41	20	21	CL		95	1.13	PP
	10.0 to 12.0										
	15.0 to 17.0		22							1.46	PP
	20.0 to 22.0		25						82	1.50	PP
	25.0 to 26.5	7	30								
	30.0 to 32.0		27	68	31	37	CH		96	1.42	PP
	35.0 to 37.0		18							1.29	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

Raba-Kistner

FIGURE A-303xxx

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-228	40.0 to 42.0		26							1.63	PP
	48.0 to 50.0		17	47	21	26	CL		93	1.54	PP
DP-229	0.0 to 2.0		14	38	18	20	CL		67		
	2.0 to 4.0		12							2.25	PP
	4.0 to 6.0		19					105		2.14	UC
	6.0 to 8.0		10	41	16	25	CL		98	1.50	PP
	8.0 to 10.0		23						97	0.92	PP
	10.0 to 12.0		20	37	20	17	CL		98	2.25	PP
	15.0 to 17.0		15							0.83	PP
	20.0 to 22.0		15	28	20	8	CL		98		
	25.0 to 27.0									0.33	PP
	30.0 to 32.0		30	69	27	42	CH	103	100	1.16	PP
	35.0 to 37.0									1.25	PP
	40.0 to 42.0		21						96	1.29	PP
	48.0 to 50.0										
DP-230	0.0 to 2.0		18								
	2.0 to 4.0		13	30	21	9	CL		94	2.25	PP
	4.0 to 6.0		15							2.25	PP
	6.0 to 8.0		16					104	94	1.57	UC
	8.0 to 10.0		18	28	19	9	CL		95		
	10.0 to 12.0		22						99	1.75	PP
	15.0 to 17.0		12							2.25	PP
	20.0 to 22.0		20	31	23	8	ML		96		
	25.0 to 27.0		23	50	21	29	CH		100	1.79	PP
	30.0 to 31.5	23	9								
	35.0 to 36.5	22	22						15		
	40.0 to 41.5	11	30								
	48.5 to 50.0	28	25								
DP-231	0.0 to 2.0		9	33	18	15	CL		58		
	2.0 to 4.0		8					110		2.01	UC
	4.0 to 6.0		12					104		2.25	PP
	6.0 to 8.0		16	36	17	19	CL		84	2.25	PP
	8.0 to 10.0		14						69	2.25	PP
	10.0 to 12.0		12							2.25	PP
	15.0 to 17.0		14	33	20	13	CL		99	2.25	PP
	20.0 to 22.0		17							1.25	PP
	25.0 to 27.0		25	31	17	14	CL		94	0.17	PP
	30.0 to 31.5	7	19								
	35.0 to 36.5	2	29								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303yyy

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-231	40.0 to 41.5	30	28						15		
	48.5 to 50.0	33	24								
DP-232	0.0 to 1.5	18	10	31	21	10	CL				
	2.5 to 4.0	13	11						93		
	4.0 to 5.5	16	13	45	21	24	CL				
	6.0 to 7.5	17	17						95		
	8.0 to 9.5	10	16	42	21	21	CL				
	10.0 to 11.5	9	20						100		
	15.0 to 16.5	12	20	42	20	22	CL				
	20.0 to 21.5	13	7						33		
	25.0 to 26.5	7	23						11		
	30.0 to 31.5	19	25						17		
	35.0 to 36.5	16	25								
	40.0 to 41.5	19	22								
	48.5 to 50.0	26	23								
DP-233	0.0 to 2.0		9								
	2.0 to 4.0		10	41	23	18	CL		88	2.25	PP
	4.0 to 6.0		15							2.25	PP
	6.0 to 8.0		14	37	19	18	CL		98	2.25	PP
	8.0 to 10.0		18					107		2.57	UC
	10.0 to 12.0		16	41	19	22	CL		94	2.25	PP
	15.0 to 17.0		19	46	22	24	CL	108	97	2.25	PP
	20.0 to 22.0		24	40	17	23	CL			2.25	PP
	25.0 to 26.5	20	4						21		
	30.0 to 31.5	21	28								
	35.0 to 36.5	26	24						13		
	40.0 to 41.5	21	25								
	48.5 to 50.0	25	25						12		
DP-234	0.0 to 2.0		14	45	22	23	CL		88		
	2.0 to 4.0		12					107		1.61	UC
	4.0 to 6.0		15	42	17	25	CL			2.25	PP
	6.0 to 8.0		18						99	2.25	PP
	8.0 to 10.0		24							1.96	PP
	10.0 to 12.0		22	39	18	21	CL		96	1.50	PP
	15.0 to 17.0		22						97	1.33	PP
	20.0 to 22.0		28						99	1.38	PP
	25.0 to 26.5	24	36	47	18	29	CL		95		
	30.0 to 32.0		35							1.33	PP
	35.0 to 37.0		21						56	1.00	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303zzz

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-234	40.0 to 42.0		20	46	18	28	CL	108	85	1.67	PP
	48.0 to 50.0		24							1.33	PP
DP-235	0.0 to 2.0		12	38	17	21	CL				
	2.0 to 4.0		13						95	2.25	PP
	4.0 to 6.0		14					112	93	1.96	UC
	6.0 to 8.0		20	43	21	22	CL		92	2.19	PP
	8.0 to 10.0		19							2.25	PP
	10.0 to 12.0		21						97	1.81	PP
	15.0 to 17.0		29						99	1.25	PP
	20.0 to 22.0		29	59	24	35	CH		98	1.06	PP
	25.0 to 26.5	19	29								
	30.0 to 32.0		31							1.31	PP
	35.0 to 37.0		23							1.31	PP
	40.0 to 42.0		18	39	18	21	CL		91	1.81	PP
	48.0 to 50.0		22							1.94	PP
DP-236	0.0 to 2.0		18	55	21	34	CH				
	2.0 to 4.0		20							2.25	PP
	4.0 to 6.0		22	54	23	31	CH		96	2.25	PP
	6.0 to 8.0		23							2.25	PP
	8.0 to 10.0		20						96	2.25	PP
	10.0 to 12.0		27						99	2.19	PP
	15.0 to 17.0		24							1.82	PP
	20.0 to 22.0		29	74	27	47	CH		98	1.06	PP
	25.0 to 27.0										
	30.0 to 32.0		34							1.00	PP
	35.0 to 37.0		19						71	1.19	PP
	40.0 to 42.0		20	41	20	21	CL	107		1.33	UC
	48.0 to 50.0		25						94	1.44	PP
DP-237	0.0 to 2.0		11						88		
	2.0 to 4.0		12	43	17	26	CL			2.25	PP
	4.0 to 6.0		18						98	2.25	PP
	6.0 to 8.0		23	70	25	45	CH		100	2.25	PP
	8.0 to 10.0		25					91		1.19	UC
	10.0 to 12.0		29							2.06	PP
	15.0 to 17.0		24	69	23	46	CH			2.19	PP
	20.0 to 22.0		31							1.34	PP
	25.0 to 27.0		33						95	1.00	PP
	30.0 to 32.0		24	33	15	18	CL		67	0.56	PP
	35.0 to 37.0		18							1.56	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303aaaa

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-237	40.0 to 42.0		21							2.25	PP
	48.0 to 50.0		18						95	2.25	PP
DP-238	0.0 to 2.0		12						91	2.25	PP
	2.0 to 4.0		26					96		2.26	UC
	4.0 to 6.0		18	37	20	17	CL		95	2.25	PP
	6.0 to 8.0		22							2.00	PP
	8.0 to 10.0		28	52	22	30	CH		99	0.25	PP
	10.0 to 12.0		28							1.38	PP
	15.0 to 17.0		20							2.13	PP
	20.0 to 22.0		26	58	23	35	CH		98	1.25	PP
	25.0 to 27.0		30							2.00	PP
	30.0 to 32.0		35							1.00	PP
	35.0 to 37.0		24	44	21	23	CL		74	1.38	PP
	40.0 to 42.0			30	16	14	CL		61		
	48.5 to 50.0	36	25						17		
DP-239	0.0 to 2.0		17							1.25	PP
	2.0 to 4.0		18	30	20	10	CL		82	2.25	PP
	4.0 to 6.0		13						93	2.25	PP
	6.0 to 8.0		13					102		1.35	UC
	8.0 to 10.0		22	25	24	1	ML		97		
	10.0 to 12.0		22						98	2.25	PP
	15.0 to 17.0		25							2.25	PP
	20.0 to 22.0		23	53	25	28	CH			2.25	PP
	25.0 to 27.0		30						98	2.25	PP
	30.0 to 32.0		35							1.50	PP
	35.0 to 37.0		18	28	14	14	CL		57	0.75	PP
	40.0 to 42.0										
	48.5 to 50.0	18									
DP-240	0.0 to 2.0		15							2.25	PP
	2.0 to 4.0		17	47	21	26	CL		96	2.25	PP
	4.0 to 6.0		21							2.25	PP
	6.0 to 8.0		21	44	22	22	CL	103		5.16	UC
	8.0 to 10.0		16						91	2.25	PP
	10.0 to 12.0		19						98	2.25	PP
	15.0 to 17.0		29							2.00	PP
	20.0 to 22.0		29							2.00	PP
	25.0 to 27.0									0.25	PP
	30.0 to 32.0		38	47	16	31	CL		71	0.38	PP
	35.0 to 36.5	11	43						96		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

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FIGURE A-303bbbb

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-240	40.0 to 41.5	14	21								
	48.5 to 50.0	25	20	36	13	23	CL		52		
DP-241	0.0 to 2.0		9	49	22	27	CL	116		3.48	UC
	2.0 to 4.0		11						79	2.25	PP
	4.0 to 6.0		20							2.25	PP
	6.0 to 8.0		19	47	24	23	CL		98	2.25	PP
	8.0 to 10.0		19							2.00	PP
	10.0 to 12.0		23							2.25	PP
	15.0 to 17.0		13	28	22	6	CL-ML		86	2.25	PP
	20.0 to 22.0		22						98	2.25	PP
	25.0 to 27.0		33							2.21	PP
	30.0 to 32.0		20	80	25	55	CH		75	1.17	PP
	35.0 to 37.0		21							1.00	PP
	40.0 to 41.5	11	22								
	48.5 to 50.0	33	20	36	13	23	SC		15		
DP-242	0.0 to 2.0		13	49	21	28	CL	110		3.32	UC
	2.0 to 4.0		13						76	2.25	PP
	4.0 to 6.0		19						82	2.25	PP
	6.0 to 8.0		21	69	23	46	CH	104	92	2.25	PP
	8.0 to 10.0		21							2.25	PP
	10.0 to 12.0		23	69	21	48	CH		99	2.21	PP
	15.0 to 17.0		25							2.25	PP
	20.0 to 22.0		12	37	22	15	CL		99	2.25	PP
	25.0 to 27.0		28							1.83	PP
	30.0 to 32.0		21							1.88	PP
	35.0 to 37.0		20						95	1.75	PP
	40.0 to 42.0		25	45	18	27	CL	98	95	1.08	PP
	48.5 to 50.0	16	27								
DP-243	0.0 to 2.0		13	56	21	35	CH		94	2.25	PP
	2.0 to 4.0		11						98	2.25	PP
	4.0 to 6.0		23	70	20	50	CH	101	95	2.39	UC
	6.0 to 8.0		28	83	26	57	CH	94	98	2.25	PP
	8.0 to 10.0		25						97	2.08	PP
	10.0 to 12.0		26							2.08	PP
	15.0 to 17.0		23	78	27	51	CH		95	1.92	PP
	20.0 to 22.0		26							1.92	PP
	25.0 to 27.0									0.92	PP
	30.0 to 32.0		18							1.58	PP
	35.0 to 37.0		20						78	0.92	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303cccc

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-243	40.0 to 42.0		22	60	20	40	CH		95	2.25	PP
	48.0 to 50.0		25								
DP-244	0.0 to 2.0		20	56	24	32	CH		98	2.25	PP
	2.0 to 4.0		18							2.25	PP
	4.0 to 6.0		24	69	23	46	CH		99	2.25	PP
	6.0 to 8.0		25					100		2.52	UC
	8.0 to 10.0		27	69	24	45	CH		99	2.00	PP
	10.0 to 12.0		26					97		2.25	PP
	15.0 to 17.0		27						99	2.25	PP
	20.0 to 22.0		24	CNBD	CNBD	NP	ML		96	2.25	PP
	25.0 to 27.0		30						94	0.25	PP
	30.0 to 32.0		19	69	22	47	CH		99	1.38	PP
	35.0 to 37.0		23							1.38	PP
	40.0 to 42.0		23					104		2.13	PP
	48.0 to 50.0		19							1.63	PP
DP-245	0.0 to 2.0		13						100	2.25	PP
	2.0 to 4.0		16	60	20	40	CH		99	2.25	PP
	4.0 to 6.0		18	55	19	36	CH		96	2.25	PP
	6.0 to 8.0		17					108		2.76	UC
	8.0 to 10.0		18						97	2.25	PP
	10.0 to 12.0		19	35	21	14	CL		84	2.25	PP
	15.0 to 17.0		26	43	16	27	CL		72	2.25	PP
	20.0 to 22.0		17						99	2.25	PP
	25.0 to 27.0		26							0.88	PP
	30.0 to 32.0		24							0.75	PP
	35.0 to 37.0		20							1.38	PP
	40.0 to 42.0		23							2.25	PP
	48.0 to 50.0		17							2.00	PP
DP-246	0.0 to 2.0		16						96		
	2.0 to 4.0		13	42	18	24	CL			2.25	PP
	4.0 to 6.0		14					113		4.17	UC
	6.0 to 8.0		19	54	20	34	CH		97	2.25	PP
	8.0 to 10.0		19							2.25	PP
	10.0 to 12.0		18	48	21	27	CL		98	2.25	PP
	15.0 to 17.0		21						96	2.25	PP
	20.0 to 22.0		22	72	28	44	CH		99	2.08	PP
	25.0 to 27.0		28							2.25	PP
	30.0 to 32.0		30							1.92	PP
	35.0 to 37.0		26							1.08	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303dddd

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-246	40.0 to 42.0		23							1.00	PP
	48.0 to 50.0		21							2.00	PP
DP-247	0.0 to 2.0		11						81	2.25	PP
	2.0 to 4.0		14					109		3.27	UC
	4.0 to 6.0		14	40	19	21	CL		94	2.25	PP
	6.0 to 8.0		15						99	2.25	PP
	8.0 to 10.0		20	38	23	15	CL		100	2.25	PP
	10.0 to 12.0		19	64	23	41	CH		99	2.25	PP
	15.0 to 17.0		17	59	24	35	CH		100	2.25	PP
	20.0 to 22.0		23							2.04	PP
	25.0 to 27.0		26							1.71	PP
	30.0 to 32.0		29							1.33	PP
	35.0 to 37.0		31							1.83	PP
	40.0 to 42.0		37							1.17	PP
	48.5 to 50.0	11	28								
DP-248	0.0 to 2.0		16	54	25	29	CH		97	2.25	PP
	2.0 to 4.0		11						99	2.25	PP
	4.0 to 6.0		19	57	23	34	CH		99	2.25	PP
	6.0 to 8.0		17					110		4.45	UC
	8.0 to 10.0		19	52	21	31	CH		96	2.25	PP
	10.0 to 12.0		19	65	28	37	CH		100	2.25	PP
	15.0 to 17.0		18						11	2.25	PP
	20.0 to 22.0									1.58	PP
	25.0 to 27.0		28							2.25	PP
	30.0 to 32.0		30							1.83	PP
	35.0 to 36.5	25	23								
	40.0 to 41.5	29	24								
	48.5 to 50.0	28	24								
DP-249	0.0 to 2.0		10	47	20	27	CL		99	2.25	PP
	2.0 to 4.0		15						98	2.25	PP
	4.0 to 6.0		17	48	18	30	CL		97	2.25	PP
	6.0 to 8.0		18	54	20	34				2.25	PP
	8.0 to 10.0		18					107		1.45	UC
	10.0 to 12.0		17	49	22	27	CL		100	2.25	PP
	15.0 to 17.0		16						100	2.17	PP
	20.0 to 22.0		27	54	24	30	CH		100	2.00	PP
	25.0 to 27.0		29						7	1.33	PP
	30.0 to 32.0										
	35.0 to 36.5	13	25								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303eeee

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-249	40.0 to 41.5	24	22								
	48.5 to 50.0	24	22								
DP-250	0.0 to 2.0		14	52	21	31	CH		94		
	2.0 to 4.0		18						99	2.25	PP
	4.0 to 6.0		15	43	20	23	CL		95	2.25	PP
	6.0 to 8.0		20						99	2.25	PP
	8.0 to 10.0		21					105		3.86	UC
	10.0 to 12.0		15	47	21	26	CL		100	2.25	PP
	15.0 to 17.0		18	32	21	11				2.25	PP
	20.0 to 22.0		22						13	1.42	PP
	25.0 to 27.0										
	30.0 to 32.0		26								
	35.0 to 36.5	40	24								
	40.0 to 41.5	29	25								
	48.5 to 50.0	21	28								
DP-251	0.0 to 2.0		12	47	20	27	CL		90		
	2.0 to 4.0		15					110		4.68	UC
	4.0 to 6.0		11	30	18	12	CL		93	2.25	PP
	6.0 to 8.0		14						95	2.25	PP
	8.0 to 10.0		23	35	20	15	CL		95	1.50	PP
	10.0 to 12.0		22							2.25	PP
	15.0 to 17.0		10	36	18	18	CL		98	2.25	PP
	20.0 to 21.5	21	7						60		
	25.0 to 26.5	33	23								
	30.0 to 31.5	25	32								
	35.0 to 36.5	48	29								
	40.0 to 41.5	15	35								
	48.5 to 50.0	22	26								
DP-252	0.0 to 2.0		13	54	21	33	CH		86		
	2.0 to 4.0		13							2.25	PP
	4.0 to 6.0		11						81	2.25	PP
	6.0 to 8.0									2.25	PP
	8.0 to 10.0		21	58	24	34	CH		96	2.25	PP
	10.0 to 12.0		20					104		3.50	UC
	15.0 to 17.0		11	40	21	19	CL	113	98	2.25	PP
	20.0 to 22.0		14	CNBD	CNBD	NP	SM		47		
	25.0 to 26.5	26	28								
	30.0 to 31.5	18	30						21		
	35.0 to 36.5	40	27								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ffff

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-252	40.0 to 41.5	26	27								
	48.0 to 50.0		23	55	22	33	CH		98	1.54	PP
DP-253	0.0 to 2.0		13							2.25	PP
	2.0 to 4.0		19	53	20	33	CH		92	2.25	PP
	4.0 to 6.0		20						95	2.25	PP
	6.0 to 8.0		17							2.25	PP
	8.0 to 10.0		20	47	18	29	CL		94	2.25	PP
	10.0 to 12.0		19					105	92	1.75	UC
	15.0 to 17.0		16							2.13	PP
	20.0 to 21.5	14	26						14		
	25.0 to 26.5	11	27	CNBD	CNBD	NP	SM				
	30.0 to 31.5	10	27						9		
	35.0 to 36.5	19	36								
	40.0 to 41.5	22	28	CNBD	CNBD	NP	SM				
	48.5 to 50.0	23	25						7		
DP-254	0.0 to 2.0		16	49	21	28	CL			2.25	PP
	2.0 to 4.0		22							2.25	PP
	4.0 to 6.0		21	50	21	29	CH		89	2.25	PP
	6.0 to 8.0		18					103		1.05	UC
	8.0 to 10.0		18						90	2.25	PP
	10.0 to 12.0		22							2.13	PP
	15.0 to 17.0		27	85	33	52	CH		98	2.06	PP
	20.0 to 22.0		23	56	25	31	CH			1.31	PP
	25.0 to 26.5	11	26						78		
	30.0 to 31.5	9	35								
	35.0 to 36.5	11	28						24		
	40.0 to 41.5	25	24								
	48.5 to 49.8	50/9"	24								
DP-255	0.0 to 2.0		17	53	23	30	CH		96	2.25	PP
	2.0 to 4.0		20					100		2.12	UC
	4.0 to 6.0		19							2.25	PP
	6.0 to 8.0		16	32	18	14	CL		94	2.25	PP
	8.0 to 10.0		19							1.29	PP
	10.0 to 12.0		20							2.25	PP
	15.0 to 17.0		21						95	2.25	PP
	20.0 to 22.0		24	46	22	24	CL		94	0.68	PP
	25.0 to 26.5	11	30								
	30.0 to 31.5	12	36	56	27	29	CH				
	35.0 to 36.5	16	28						73		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303gggg

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-255	40.0 to 41.5	18	27						13		
	48.5 to 50.0	27	30								
DP-256	0.0 to 2.0		15						81		
	2.0 to 4.0		19	57	23	34	CH			2.25	PP
	4.0 to 6.0									2.25	PP
	6.0 to 8.0		20						98	2.25	PP
	8.0 to 10.0		20					104		3.09	UC
	10.0 to 12.0		18	47	20	27	CL		93	2.25	PP
	15.0 to 17.0		25							2.25	PP
	20.0 to 22.0		19						86	2.25	PP
	25.0 to 26.5	20	25	31	17	14	CL				
	30.0 to 32.0		24						99	1.17	PP
	35.0 to 37.0		31							0.79	PP
	40.0 to 41.5	11	24	32	14	18	CL				
	48.5 to 50.0	26	22						19		
DP-257	0.0 to 2.0		11						90		
	2.0 to 4.0		9							2.25	PP
	4.0 to 6.0		19	50	23	27	CH	108		5.66	UC
	6.0 to 8.0		16							2.25	PP
	8.0 to 10.0		16	50	22	28	CH		99	2.25	PP
	10.0 to 12.0		20							2.25	PP
	15.0 to 17.0		21						99	2.25	PP
	20.0 to 22.0		23							2.25	PP
	25.0 to 27.0		29	64	26	38	CH		97	1.13	PP
	30.0 to 32.0		33						96	0.63	PP
	35.0 to 36.5	21	26								
	40.0 to 41.5	11	43								
	48.5 to 50.5		20	45	19	26	CL		58	1.88	PP
DP-258	0.0 to 2.0		11	49	18	31	CL		86		
	2.0 to 4.0		13						86	2.25	PP
	4.0 to 6.0		14					112		4.88	UC
	6.0 to 8.0		19	40	19	21	CL		87	2.25	PP
	8.0 to 10.0		12						91	2.25	PP
	10.0 to 12.0		17					104		3.62	UC
	15.0 to 17.0		15	59	22	37	CH			2.25	PP
	20.0 to 21.5	34	12						90		
	25.0 to 26.5	20	20	38	21	17	CL				
	30.0 to 32.0		23						95	1.50	PP
	35.0 to 37.0		16							0.88	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303hhhh

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-258	40.0 to 42.0		30						95	0.88	PP
	48.0 to 50.0		16							2.13	PP
DP-259	0.0 to 2.0		15						96		
	2.0 to 4.0		13					114		5.88	UC
	4.0 to 6.0		14	50	18	32	CH			2.25	PP
	6.0 to 8.0		19						94	2.25	PP
	8.0 to 10.0		16							2.25	PP
	10.0 to 12.0		12	52	22	30	CH		98	2.25	PP
	15.0 to 17.0		14					108		3.07	UC
	20.0 to 22.0		15						95	2.25	PP
	25.0 to 26.5	22	26								
	30.0 to 32.0		28	62	22	40	CH		84	2.00	PP
	35.0 to 37.0		22							1.75	PP
	40.0 to 42.0		17	36	13	23	CL		54	1.00	PP
	48.0 to 50.0		20							0.63	PP
DP-260	0.0 to 1.5	10	7	41	18	23	CL				
	2.0 to 3.5	12	18						98		
	4.0 to 5.5	9	22								
	6.0 to 7.5	9	22						97		
	8.0 to 9.5	11	25	63	21	42	CH				
	10.0 to 11.5	11	24						96		
	15.0 to 16.5	12	26						64		
	20.0 to 21.5	14	22	46	19	27	CL				
	25.0 to 26.5	10	27								
	30.0 to 31.5	8	27	33	17	16	CL				
	35.0 to 36.5	9	21						99		
	40.0 to 41.5	16	28						9		
	48.5 to 50.0	22	22								
DP-261	0.0 to 1.5	12	16	54	24	30	CH				
	2.0 to 3.5	11	22						98		
	4.0 to 5.5	9	22						98		
	6.0 to 7.5	8	16	39	17	22	CL				
	8.0 to 9.5	11	16								
	10.0 to 11.5	12	23	41	18	23	CL				
	15.0 to 16.5	12	26						97		
	20.0 to 22.0		21								
	25.0 to 26.5	13	23	35	19	16	CL				
	30.0 to 31.5	13	35						98		
	35.0 to 36.5	11	43								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303iiii

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-261	40.0 to 41.5	9	29						13		
	48.5 to 50.0	24	27						13		
DP-262	0.0 to 1.5	13	11	32	19	13	CL				
	2.0 to 3.5	11	17						87		
	4.0 to 5.5	9	15	36	18	18	CL				
	6.0 to 7.5	12	12						86		
	8.0 to 9.5	7	14	33	19	14	CL				
	10.0 to 11.5	13	24						97		
	15.0 to 16.5	12	28								
	20.0 to 21.5	11	25	74	27	47	CH				
	25.0 to 26.5	11	26						98		
	30.0 to 31.5	14	27								
	35.0 to 36.5	21	27						22		
	40.0 to 41.5	15	28						13		
	48.5 to 50.0	21									
DP-263	0.0 to 1.5	16	17						90		
	2.0 to 3.5	11	15	57	26	31	CH				
	4.0 to 5.5	13	19						81		
	6.0 to 7.5	16	19	48	19	29	CL				
	8.0 to 9.5	12	21						88		
	10.0 to 11.5	10	21						62		
	15.0 to 16.5	7	30	36	19	17	CL				
	20.0 to 21.5	9	32								
	25.0 to 26.5	10	35						98		
	30.0 to 31.5	10	39	82	32	50	CH				
	35.0 to 37.0		36								
	40.0 to 41.5	12	36						100		
	48.5 to 50.0	9	24						6		
DP-264	0.0 to 1.5	20	19						82		
	2.0 to 3.5	14	20	49	19	30	CL				
	4.0 to 5.5	13	18						95		
	6.0 to 7.5	10	22						94		
	8.0 to 9.5	6	22	32	14	18	CL				
	10.0 to 11.5	15	26								
	15.0 to 16.5	11	30								
	20.0 to 21.5	9	31						96		
	25.0 to 27.0										
	30.0 to 31.5	7	30	43	19	24	CL		95		
	35.0 to 37.0										

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303jjjj

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-264	40.0 to 41.5	14	18	39	16	23	SC		47		
	48.5 to 50.0	13	23								
DP-265	0.0 to 1.5	14	19						94		
	2.0 to 3.5	10	16	45	19	26	CL				
	4.0 to 5.5	12	18						95		
	6.0 to 7.5	15	18								
	8.0 to 9.5	16	22	56	23	33	CH				
	10.0 to 11.5	15	21						97		
	15.0 to 16.5	12	27								
	20.0 to 21.5	7	33	48	21	27	CL				
	25.0 to 27.0		28					92	92	0.31	UC
	30.0 to 32.0										
	35.0 to 36.5	4	41						56		
	40.0 to 42.0		19	25	13	12	CL		50		
	48.0 to 50.0		21						93		
DP-266	0.0 to 1.5	15	17	52	21	31	CH				
	2.0 to 3.5	15	18						96		
	4.0 to 5.5	13	22	64	23	41	CH				
	6.0 to 7.5	14	20						94		
	8.0 to 9.5	14	23						97		
	10.0 to 12.0		23	51	17	34	CH		67		
	15.0 to 16.5	18	24						16		
	20.0 to 21.5	4	33								
	25.0 to 26.5	8	31								
	30.0 to 32.0										
	35.0 to 36.5	5	31								
	40.0 to 42.0		21	30	13	17	CL		79		
	48.5 to 50.0	18	24								
DP-267	0.0 to 1.5	16	13						88		
	2.0 to 3.5	13	13	38	17	21	CL				
	4.0 to 5.5	9	17						92		
	6.0 to 7.5	11	21	31	16	15	CL				
	8.0 to 9.5	6	22						98		
	10.0 to 12.0		29	49	22	27	CL		98		
	15.0 to 16.5	4	31								
	20.0 to 21.5	10	28						95		
	25.0 to 26.5	8	35						99		
	30.0 to 32.0		34					87		0.41	UC
	35.0 to 36.5	4	35	52	26	26	CH				

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CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303kkkk

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-267	40.0 to 41.5	4	30						85		
	48.5 to 50.0	10	30								
DP-268	0.0 to 1.5	20	16						90		
	2.0 to 3.5	13	27						95		
	4.0 to 5.5	12	19	34	17	17	CL				
	6.0 to 7.5	4	16						85		
	8.0 to 9.5	9	29								
	10.0 to 12.0		27					95	98	0.75	UC
	15.0 to 17.0		30							0.19	PP
	20.0 to 22.0		31	67	34	33	MH		99	1.06	PP
	25.0 to 26.5	4	38								
	30.0 to 31.5	2	39	54	21	33	CH				
	35.0 to 36.5	2	34						94		
	40.0 to 42.0										
	48.5 to 50.0	13	22	CNBD	CNBD	NP	SM				
DP-269	0.0 to 1.5	16	21	44	17	27	CL				
	2.0 to 3.5	15	20						91		
	4.0 to 5.5	14	17						86		
	6.0 to 7.5	13	20								
	8.0 to 9.5	12	25						98		
	10.0 to 12.0		26	56	26	30	CH	96		0.91	UC
	15.0 to 16.5	12	28								
	20.0 to 21.5	8	30						96		
	25.0 to 26.5	5	29	53	24	29	CH				
	30.0 to 32.0		28	30	22	8	CL	94	85	0.56	PP
	35.0 to 36.5	2	41						90		
	40.0 to 42.0		19	27	14	13	CL		60	0.44	PP
	48.5 to 50.0	20	20								
DP-270	0.0 to 1.5	7	23	61	28	33	CH				
	2.0 to 3.5	16	14						96		
	4.0 to 5.5	15	22						97		
	6.0 to 7.5	13	20						97		
	8.0 to 9.5	14	24	63	30	33	CH				
	10.0 to 12.0		31	37	22	15		90		0.56	PP
	15.0 to 16.5	4	32						90		
	20.0 to 21.5	10	34	66	29	37	CH				
	25.0 to 27.0								100		
	30.0 to 32.0		33					87	100	0.39	UC
	35.0 to 36.5	3	34	45	25	20	CL				

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-270	40.0 to 42.0										
	48.5 to 50.0	6	34						66		
DP-271	0.0 to 1.5	15	20						94		
	2.0 to 3.5	17	18	66	31	35	CH				
	4.0 to 5.5	13	22								
	6.0 to 7.5	19	19						87		
	8.0 to 9.5	15	23								
	10.0 to 12.0		26	68	26	42	CH	90	98	0.71	UC
	15.0 to 16.5	14	27	57	28	29	CH				
	20.0 to 22.0		29							1.19	PP
	25.0 to 26.5	14	25						14		
	30.0 to 31.5	13	28						12		
	35.0 to 36.5	15	28								
	40.0 to 41.5	6	22	33	14	19	CL				
	48.5 to 50.0	8	18						76		
DP-272	0.0 to 1.5	12	13						89		
	2.0 to 3.5	13	17						96		
	4.0 to 5.5	12	18	47	22	25	CL				
	6.0 to 7.5	12	19						98		
	8.0 to 9.5	14	24	53	26	27	CH				
	10.0 to 11.5	12	19								
	15.0 to 16.5	16	27						61		
	20.0 to 21.5	9	25						10		
	25.0 to 26.5	7	32	83	28	55	CH				
	30.0 to 31.5	5	39						99		
	35.0 to 36.5	4	49	40	19	21	CL				
	40.0 to 42.0		22							0.81	PP
	48.5 to 50.0	14	19						56		
DP-273	0.0 to 1.5	13	11						86		
	2.5 to 4.0	12	17	52	20	32	CH				
	4.0 to 5.5	8	17						96		
	6.0 to 7.5	6	16	38	19	19	CL				
	8.0 to 9.5	8	15						88		
	10.0 to 11.5	13	26	CNBD	CNBD	NP					
	15.0 to 16.5	14	26						99		
	20.0 to 21.5	8	39						96		
	25.0 to 26.5	8	33	31	23	8					
	30.0 to 31.5	5	30						75		
	35.0 to 36.5	4	42						19		

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CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303mmmm

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-273	40.0 to 41.5	8	22								
	48.5 to 50.0	6	24								
DP-274	0.0 to 1.5	20	14	58	25	33	CH				
	2.5 to 4.0	13	18						91		
	4.0 to 5.5	12	16						88		
	6.0 to 7.5	14	21	56	23	33	CH				
	8.0 to 9.5	13	21						86		
	10.0 to 11.5	10	27						55		
	15.0 to 16.5	16	25						76		
	20.0 to 21.5	17	32	35	17	18					
	25.0 to 26.5	14	31						95		
	30.0 to 31.5	6	24				CL				
	35.0 to 36.5	6	19								
	40.0 to 41.5	8	21								
	48.5 to 50.0	13	25								
DP-275	0.0 to 1.5	15	20						97		
	2.5 to 4.0	10	30	65	26	39	CH				
	4.0 to 5.5	7	29						98		
	6.0 to 7.5	11	28						100		
	8.0 to 9.5	13	27	58	24	34					
	10.0 to 11.5	11	27						98		
	15.0 to 16.5	14	26	34	18	16	CH				
	20.0 to 21.5	5	35						38		
	25.0 to 26.5	8	38	33	18	15	CL		87		
	30.0 to 31.5	11	18	CNBD	CNBD	NP	CL				
	35.0 to 36.5	12	19								
	40.0 to 41.5	11	21								
	48.5 to 50.0	18	25				SM				
DP-276	0.0 to 1.5	12	18						92		
	2.5 to 4.0	10	19	68	20	48					
	4.0 to 5.5	12	20						94		
	6.0 to 7.5	9	22						97		
	8.0 to 9.5	14	23						80		
	10.0 to 11.5	14	25						100		
	15.0 to 16.5	9	27	68	25	43					
	20.0 to 21.5	8	28	30	15	15					
	25.0 to 26.5	7	33						84		
	30.0 to 31.5	4	34	CNBD	CNBD	NP					
	35.0 to 36.5	10	17				CL				

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303nnnn

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-276	40.0 to 41.5	9	22								
	48.5 to 50.0	12	22				SM				
DP-277	0.0 to 1.5	13	17	57	25	32	CH				
	2.5 to 4.0	13	22						100		
	4.0 to 5.5	15	23						100		
	6.0 to 7.5	11	23	60	24	36					
	8.0 to 9.5	13	27						100		
	10.0 to 11.5	14	19	32	17	15	CL		97		
	15.0 to 16.5	10	33	24	15	9	CL		71		
	20.0 to 21.5	5	24						85		
	25.0 to 26.5	5	25								
	30.0 to 31.5	6	37								
	35.0 to 36.5	11	22								
	40.0 to 41.5	15	19								
	48.5 to 50.0	11	37								
DP-278	0.0 to 2.0		12					115		3.62	UC
	2.0 to 4.0									2.25	PP
	4.0 to 6.0		16							2.25	PP
	6.0 to 8.0		26	64	25	39	CH		94	0.94	PP
	8.0 to 10.0		28							1.31	PP
	10.0 to 12.0		26	28	16	12	CL		97	2.00	PP
	15.0 to 16.5	7	31	41	19	22	CL				
	20.0 to 21.5	4	34						88		
	25.0 to 26.5	13	25	CNBD	CNBD	NP	SM				
	30.0 to 31.5	11	14								
	35.0 to 36.5	15	22						16		
	40.0 to 41.5	24	25						7		
	48.5 to 50.0	22	22						10		
DP-279	0.0 to 2.0		18	55	22	33	CH			2.25	PP
	2.0 to 4.0		19	33	19	14	CL		96	2.25	PP
	4.0 to 6.0		20						92	2.19	PP
	6.0 to 8.0		29	64	25	39	CH		99	1.94	PP
	8.0 to 10.0		21					92		1.31	PP
	10.0 to 12.0		27	57	26	31	CH		98	1.19	PP
	15.0 to 16.5	14	25								
	20.0 to 21.5	24	24								
	25.0 to 26.5	10	26						14		
	30.0 to 31.5	18	25								
	35.0 to 36.5	14	27						6		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303oooo

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-279	40.0 to 41.5	42	29								
	48.5 to 50.0	14	26						14		
DP-280	0.0 to 2.0		20						96	2.19	PP
	2.0 to 4.0		15	28	16	12	CL		90	2.25	PP
	4.0 to 6.0		15							2.25	PP
	6.0 to 8.0		17	35	22	13	CL			2.25	PP
	8.0 to 10.0		25	50	17	33	CH	99		1.77	UC
	10.0 to 12.0		28						97	1.38	PP
	15.0 to 17.0		26	62	24	38	CH	96	100	1.17	PP
	20.0 to 21.5	13	27	55	25	30	CH				
	25.0 to 26.5	13	28								
	30.0 to 31.5	23	24						8		
	35.0 to 36.5	24	25						11		
	40.0 to 41.5	35	23								
	48.5 to 50.0	31	24						11		
DP-281	0.0 to 2.0									2.25	PP
	2.0 to 4.0								98	2.25	PP
	4.0 to 6.0		8	28	22	6	CL-ML		88	1.13	PP
	6.0 to 8.0		14					104		2.08	UC
	8.0 to 10.0		22						92	1.31	PP
	10.0 to 12.0		30	34	18	16	CL			1.38	PP
	15.0 to 16.5	6	31						95		
	20.0 to 21.5	18	25	71	25	46	CH				
	25.0 to 26.5	20	30						98		
	30.0 to 31.5	16	27	34	18	16	CL				
	35.0 to 36.5	23	27								
	40.0 to 41.5	44	24						7		
	48.5 to 50.0	29	26								
DP-282	0.0 to 2.0		21					102		1.55	UC
	2.0 to 4.0		27	51	21	30	CH		93	2.25	PP
	4.0 to 6.0		12						78	2.13	PP
	6.0 to 8.0		11	43	18	25	CL		93	2.25	PP
	8.0 to 10.0		8							2.25	PP
	10.0 to 12.0		13						85	2.25	PP
	15.0 to 17.0		23	CNBD	CNBD	NP	ML		68		
	20.0 to 21.5	16	24								
	25.0 to 26.5	14	28	36	16	20	CL				
	30.0 to 31.5	24	23								
	35.0 to 36.5	19	25						34		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303pppp

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-282	40.0 to 41.5	43	25								
	48.5 to 50.0	22	23								
DP-283	0.0 to 2.0		15	38	17	21	CL		95	2.25	PP
	2.0 to 4.0		11					106		2.25	PP
	4.0 to 6.0		11	30	18	12	CL		91		
	6.0 to 8.0		8						64		
	8.0 to 10.0		16							1.92	PP
	10.0 to 12.0		15	30	17	13	CL		75	1.58	PP
	15.0 to 17.0		27							0.58	PP
	20.0 to 21.5	19	35						98		
	25.0 to 26.5	18	35	63	28	35	CH				
	30.0 to 31.5	19	25								
	35.0 to 36.5	17	26								
	40.0 to 41.5	15	29						11		
	48.5 to 50.0	15	31								
DP-284	0.0 to 2.0		16					109		2.08	UC
	2.0 to 4.0		13	30	14	16	CL		82	2.25	PP
	4.0 to 6.0		16						94	2.25	PP
	6.0 to 8.0		21						96	2.25	PP
	8.0 to 10.0		27	66	30	36	CH			2.25	PP
	10.0 to 12.0		28							1.92	PP
	15.0 to 17.0		34							0.92	PP
	20.0 to 22.0		33	41	22	19	CL		94	1.04	PP
	25.0 to 27.0		31							1.08	PP
	30.0 to 32.0		29	36	18	18	CL		69		
	35.0 to 36.5	17	28								
	40.0 to 41.5	47	23						12		
	48.5 to 50.0	29	23								
DP-285	0.0 to 2.0		13						87	2.25	PP
	2.0 to 4.0		9							2.25	PP
	4.0 to 6.0		5	37	17	20	CL		54	1.50	PP
	6.0 to 8.0		14					101		1.75	UC
	8.0 to 10.0		9	29	14	15	CL		72		
	10.0 to 12.0		13						69	2.25	PP
	15.0 to 17.0		23	29	12	17	CL		70	0.58	PP
	20.0 to 21.5	11	35								
	25.0 to 26.5	7	31	36	20	16	CL				
	30.0 to 31.5	8	27								
	35.0 to 36.5	38	25								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303qqqq

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-285	40.0 to 41.5	9	29						31		
	48.5 to 50.0	44	26								
DP-286	0.0 to 2.0		14						90		
	2.0 to 4.0		11					106		2.25	PP
	4.0 to 6.0		13						69	2.25	PP
	6.0 to 8.0		8	32	17	15	CL			1.88	PP
	8.0 to 10.0		11						79	1.13	PP
	10.0 to 12.0		8	25	15	10	CL				
	15.0 to 16.5	13	19						62		
	20.0 to 21.5	4	30	27	15	12	CL				
	25.0 to 26.5	16	28						64		
	30.0 to 31.5	15	36	29	14	15	CL				
	35.0 to 36.5	14	25								
	40.0 to 41.5	11	26								
	48.5 to 50.0	25	23						9		
DP-287	0.0 to 2.0		17								
	2.0 to 4.0		14	60	19	41	CH		98	2.25	PP
	4.0 to 6.0		15							2.25	PP
	6.0 to 8.0		15	35	18	17	CL			2.25	PP
	8.0 to 10.0		7						89	2.25	PP
	10.0 to 12.0		7						70	2.25	PP
	15.0 to 17.0		19	62	24	38	CH			2.25	PP
	20.0 to 22.0		24					97		1.10	UC
	25.0 to 27.0		27						98	0.87	PP
	30.0 to 32.0		31						91	0.63	PP
	35.0 to 37.0		30							0.88	PP
	40.0 to 42.0		26	51	24	27	CH		98	1.38	PP
	48.0 to 50.0									0.23	PP
DP-288	0.0 to 2.0		13	51	19	32	CH			2.25	PP
	2.0 to 4.0		12						94	2.25	PP
	4.0 to 6.0		7	52	20	32	CH		81	2.25	PP
	6.0 to 8.0		11							2.25	PP
	8.0 to 10.0		17					104	96	2.56	UC
	10.0 to 12.0		21	52	18	34	CH			2.25	PP
	15.0 to 17.0		23							2.25	PP
	20.0 to 21.5	6	29						92		
	25.0 to 26.5	22	24								
	30.0 to 32.0		29	CNBD	CNBD	NP	ML		75	0.63	PP
	35.0 to 36.5	30	24								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303rrrr

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-288	40.0 to 41.5	19	25								
	48.5 to 50.0	26	23						9		
DP-289	0.0 to 2.0		14	60	25	35	CH		98	2.25	PP
	2.0 to 4.0		12						86	1.50	PP
	4.0 to 6.0		12	36	19	17	CL	106	82	2.25	PP
	6.0 to 8.0		15					106	94	1.27	UC
	8.0 to 10.0		27							1.50	PP
	10.0 to 11.5	11	34	60	31	29	CH				
	15.0 to 16.5	12	32						98		
	20.0 to 21.5	15	27	68	26	42	CH				
	25.0 to 26.5	7	40								
	30.0 to 31.5	12	35						86		
	35.0 to 36.5	23	36								
	40.0 to 41.5	34	24								
	48.5 to 49.7	50/8"	24								
DP-290	0.0 to 2.0		16	33	18	15	CL	105	95	2.25	PP
	2.0 to 4.0		20						96	2.25	PP
	4.0 to 6.0		15	31	19	12	CL		59	2.17	PP
	6.0 to 8.0		21					105		1.57	UC
	8.0 to 10.0		22	31	21	10	CL		98	2.08	PP
	10.0 to 12.0		19						96	1.92	PP
	15.0 to 17.0		28	34	22	12	CL		100	0.25	PP
	20.0 to 21.5	3	36								
	25.0 to 26.5	4	37						59		
	30.0 to 31.5	18	26								
	35.0 to 36.5	18	31								
	40.0 to 41.5	24	29								
	48.5 to 50.0	14	32								
DP-291	0.0 to 2.0		2						93	2.25	PP
	2.0 to 4.0		9	29	19	10	CL	105	94	2.25	PP
	4.0 to 6.0		14						93	2.25	PP
	6.0 to 8.0		10	32	19	13	CL		92	2.25	PP
	8.0 to 10.0		13					105		1.29	UC
	10.0 to 12.0		23	38	20	18	CL		96	1.50	PP
	15.0 to 16.5	10	24						93		
	20.0 to 21.5	7	32	43	24	19	CL		96		
	25.0 to 26.5	3	32								
	30.0 to 31.5	16	23								
	35.0 to 36.5	39	33								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303ssss

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-291	40.0 to 41.5	6	30								
	48.5 to 50.0	32	25								
DP-292	0.0 to 2.0		16	44	18	26	CL	103	92	2.25	PP
	2.0 to 4.0		17					103	93	1.84	UC
	4.0 to 6.0		17	32	19	13	CL		99	2.25	PP
	6.0 to 8.0		25						95	2.25	PP
	8.0 to 10.0		20	41	22	19	CL		97	2.17	PP
	10.0 to 12.0		25					97			
	15.0 to 16.5	7	28	34	20	14	CL		93		
	20.0 to 21.5	10	29								
	25.0 to 26.5	12	26						95		
	30.0 to 31.5	19	27								
	35.0 to 36.5	8	23								
	40.0 to 41.5	19	29								
	48.5 to 49.8	50/9"	33								
DP-293	0.0 to 2.0		14	43	22	21	CL	116	95	2.25	PP
	2.0 to 4.0		11					116	97	3.46	UC
	4.0 to 6.0		12						41	2.25	PP
	6.0 to 8.0		16	35	22	13	CL		97	1.58	PP
	8.0 to 10.0		17							1.75	PP
	10.0 to 12.0		21	56	22	34	CH		99	1.67	PP
	15.0 to 17.0		21							0.25	PP
	20.0 to 21.5	4	29	32	20	12	CL		80		
	25.0 to 26.5	16	25						41		
	30.0 to 31.5	18	29								
	35.0 to 36.5	18	26								
	40.0 to 41.5	40	24								
	48.5 to 50.0	33	26								
DP-294	0.0 to 2.0		14						92	2.25	PP
	2.0 to 4.0		12	40	19	21	CL	107	94	2.25	PP
	4.0 to 6.0		13						97	2.25	PP
	6.0 to 8.0		13	30	20	10	CL		93	2.08	PP
	8.0 to 10.0		17					107		2.20	UC
	10.0 to 12.0		19	27	18	9	CL		93	1.50	PP
	15.0 to 17.0		24							1.50	PP
	20.0 to 22.0		29	85	25	60	CH		98	1.08	PP
	25.0 to 27.0		26						97	1.08	PP
	30.0 to 32.0		26							1.17	PP
	35.0 to 37.0		25							1.33	PP

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303tttt

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-294	40.0 to 42.0		23							0.92	PP
	48.5 to 50.0	18	26								
DP-295	0.0 to 2.0		13	54	23	31	CH	107	97	2.25	PP
	2.0 to 4.0		19					107	98	5.78	UC
	4.0 to 6.0		13	62	21	41	SC		24	2.25	PP
	6.0 to 8.0		20						98	2.25	PP
	8.0 to 10.0		22							2.25	PP
	10.0 to 12.0		16	58	21	37	CH		93	2.25	PP
	15.0 to 17.0		17							2.25	PP
	20.0 to 22.0		8	31	15	16	CL		63	1.58	PP
	25.0 to 26.5	32	26						24		
	30.0 to 31.5	11	32								
	35.0 to 36.5	16	30								
	40.0 to 41.5	16	27								
	48.5 to 50.0	25	26								
DP-296	0.0 to 2.0		19						70	2.25	PP
	2.0 to 4.0		20	34	18	16	CL	100	73	2.25	PP
	4.0 to 6.0		11						9	2.17	PP
	6.0 to 8.0		23	32	17	15	CL		95	1.92	PP
	8.0 to 10.0		22					100		1.50	UC
	10.0 to 12.0		16	52	21	31	CH		82	1.58	PP
	15.0 to 17.0		15							1.50	PP
	20.0 to 21.5	13	11	CNBD	CNBD	NP	SM				
	25.0 to 26.5	15	25						29		
	30.0 to 31.5	35	20						9		
	35.0 to 36.5	32	23								
	40.0 to 41.5	31	25								
	48.5 to 50.0	25	26								
DP-297	0.0 to 2.0		12	40	19	21	CL	110	98	2.25	PP
	2.0 to 4.0		15					110	82	3.21	UC
	4.0 to 6.0		10	28	21	7	SC-SM		43	1.75	PP
	6.0 to 8.0		12						82	1.50	PP
	8.0 to 10.0		13	32	16	16	CL		92	1.75	PP
	10.0 to 12.0		18							2.08	PP
	15.0 to 17.0		19							1.17	PP
	20.0 to 21.5	4	34						64		
	25.0 to 26.5	4	31	CNBD	CNBD	NP	SM				
	30.0 to 31.5	7	32						43		
	35.0 to 36.5	22	29								

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303uuuu

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-297	40.0 to 41.5	24	25								
	48.5 to 50.0	9	30								
DP-298	0.0 to 2.0		19					105		3.63	UC
	2.0 to 4.0		19	44	22	22	CL		90	2.25	PP
	4.0 to 6.0		21						82	2.17	PP
	6.0 to 8.0		24	55	20	35	CH		98	1.75	PP
	8.0 to 10.0		19							1.08	PP
	10.0 to 12.0		27	70	26	44	CH		98	1.75	PP
	15.0 to 17.0		16							0.92	PP
	20.0 to 21.5	10	29	CNBD	CNBD	NP	CL		52		
	25.0 to 26.5	12	32						82		
	30.0 to 31.5	18	33								
	35.0 to 36.5	36	27								
	40.0 to 41.5	28	28								
	48.5 to 50.0	18	28								
DP-299	0.0 to 2.0		13						93	2.50	PP
	2.0 to 4.0		12					114		2.37	UC
	4.0 to 6.0		8	30	16	14	CL		68	1.67	PP
	6.0 to 8.0		16							1.92	PP
	8.0 to 10.0		17	55	25	30	CH		94	2.25	PP
	10.0 to 12.0		17							2.25	PP
	15.0 to 17.0		20	33	20	13	CL		95	1.00	PP
	20.0 to 22.0		29							0.25	PP
	25.0 to 26.5	7	35						68		
	30.0 to 31.5	15	23	CNBD	CNBD	NP	SP-SM				
	35.0 to 36.5	17	26								
	40.0 to 41.5	20	23						8		
	48.5 to 50.0	20	26								
DP-300	0.0 to 2.0		18	45	20	25	CL	93	93	2.50	PP
	2.0 to 4.0		17						54	2.50	PP
	4.0 to 6.0		11	35	16	19	SC		43	2.50	PP
	6.0 to 8.0		23							2.00	PP
	8.0 to 10.0		26					93		1.14	UC
	10.0 to 12.0		19							0.67	PP
	15.0 to 17.0		30	CNBD	CNBD	NP	SM		54	0.25	PP
	20.0 to 21.5	8	27								
	25.0 to 26.5	8	27						54		
	30.0 to 31.5	11	27						42		
	35.0 to 36.5	21	33	79	23	56	CH				

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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FIGURE A-303vvvv

RESULTS OF SOIL SAMPLE ANALYSES

PROJECT NAME: The Lower Rio Grande Flood Control Project
Cameron County, Texas

FILE NAME: AMA08-115-00.GPJ 7/23/2009

Boring No.	Sample Depth (ft)	Blows per ft	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	USCS	Dry Unit Weight (pcf)	% -200 Sieve	Shear Strength (tsf)	Strength Test
DP-300	40.0 to 41.5	29	19								
	48.5 to 50.0	33	17						43		

PP = Pocket Penetrometer TV = Torvane UC = Unconfined Compression FV = Field Vane UU = Unconsolidated Undrained Triaxial

CU = Consolidated Undrained Triaxial CNBD = Cound Not Be Determined NP = Non-Plastic PROJECT NO. AMA08-115-00

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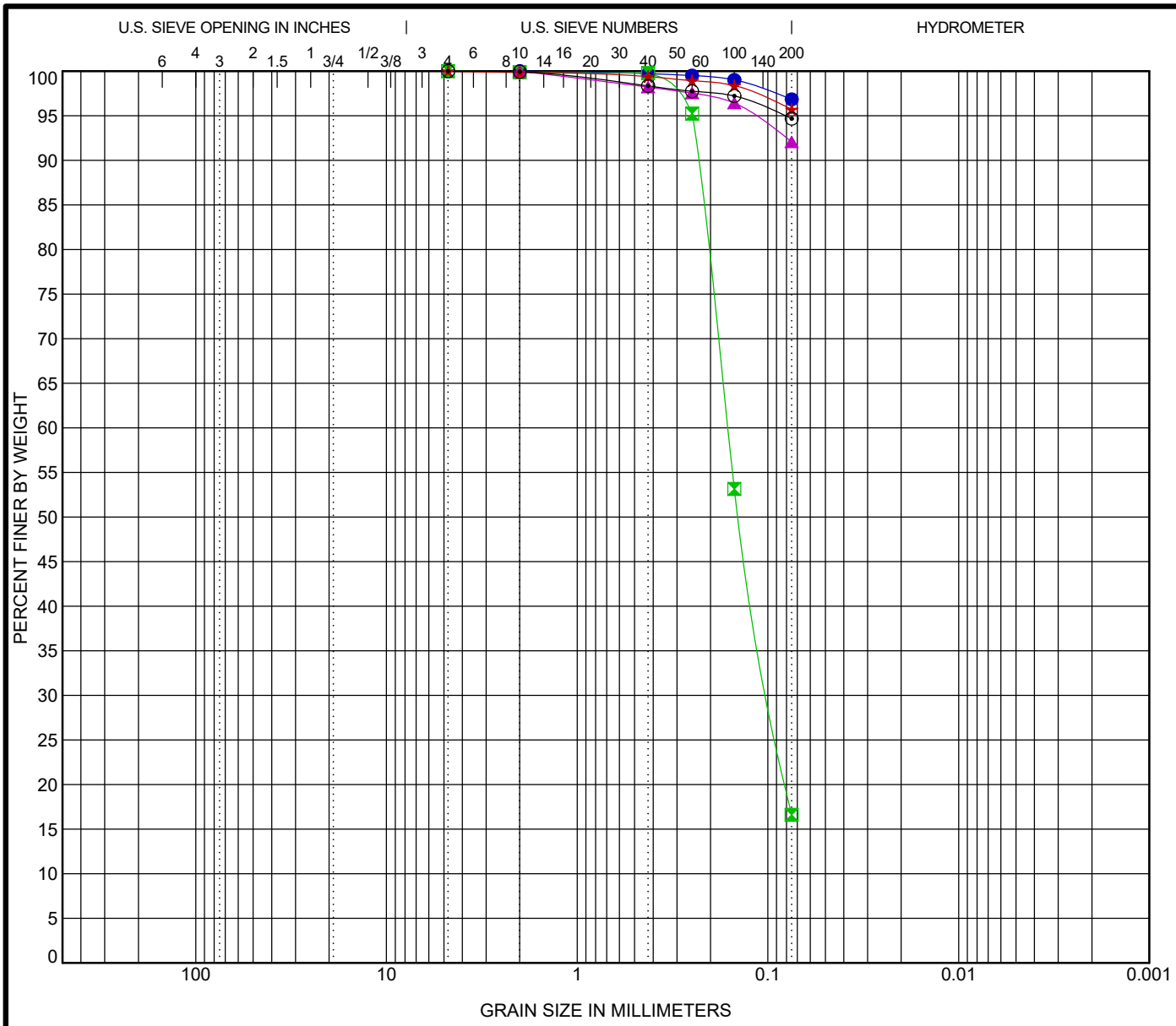
FIGURE A-303wwww

APPENDIX B



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-1	10.0	FAT CLAY (CH)	59	22	37		
⊠	DP-1	45.0	SILTY SAND (SM)					
▲	DP-2	5.0	FILL: LEAN CLAY (CL)					
★	DP-2	15.0	SAND w/ SILT (SP-SM)					
⊙	DP-3	6.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-1	10.0	2				0.0	3.2	96.8	
⊠	DP-1	45.0	4.75	0.163	0.097		0.0	83.4	16.6	
▲	DP-2	5.0	2				0.0	7.9	92.1	
★	DP-2	15.0	4.75				0.0	4.3	95.7	
⊙	DP-3	6.0	4.75				0.0	5.3	94.7	

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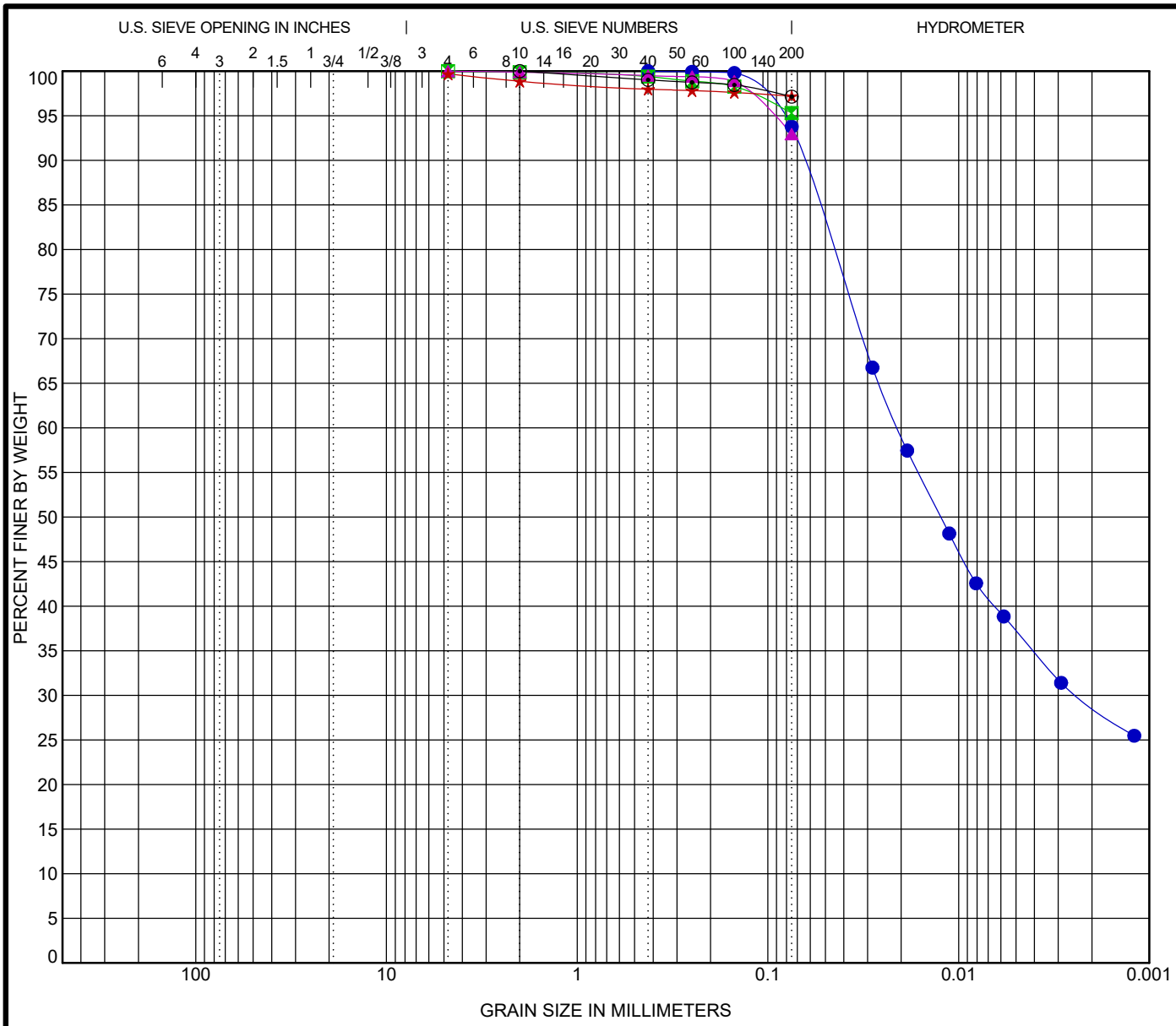
FIGURE B-1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	DP-3	8.0	FAT CLAY (CH)					
⊠	DP-3	25.0	FAT CLAY (CH)					
▲	DP-4	6.0	CLAY LEAN (CL)					
★	DP-4	30.0	FAT CLAY (CH)					
⊙	DP-5	0.0	FILL: FAT CLAY (CH)					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-3	8.0	0.425	0.021	0.002		0.0	6.2	56.5	37.3
⊠	DP-3	25.0	4.75				0.0	4.7	95.3	
▲	DP-4	6.0	4.75				0.0	7.1	92.9	
★	DP-4	30.0	4.75				0.0	2.5	97.2	
⊙	DP-5	0.0	2				0.0	2.9	97.1	

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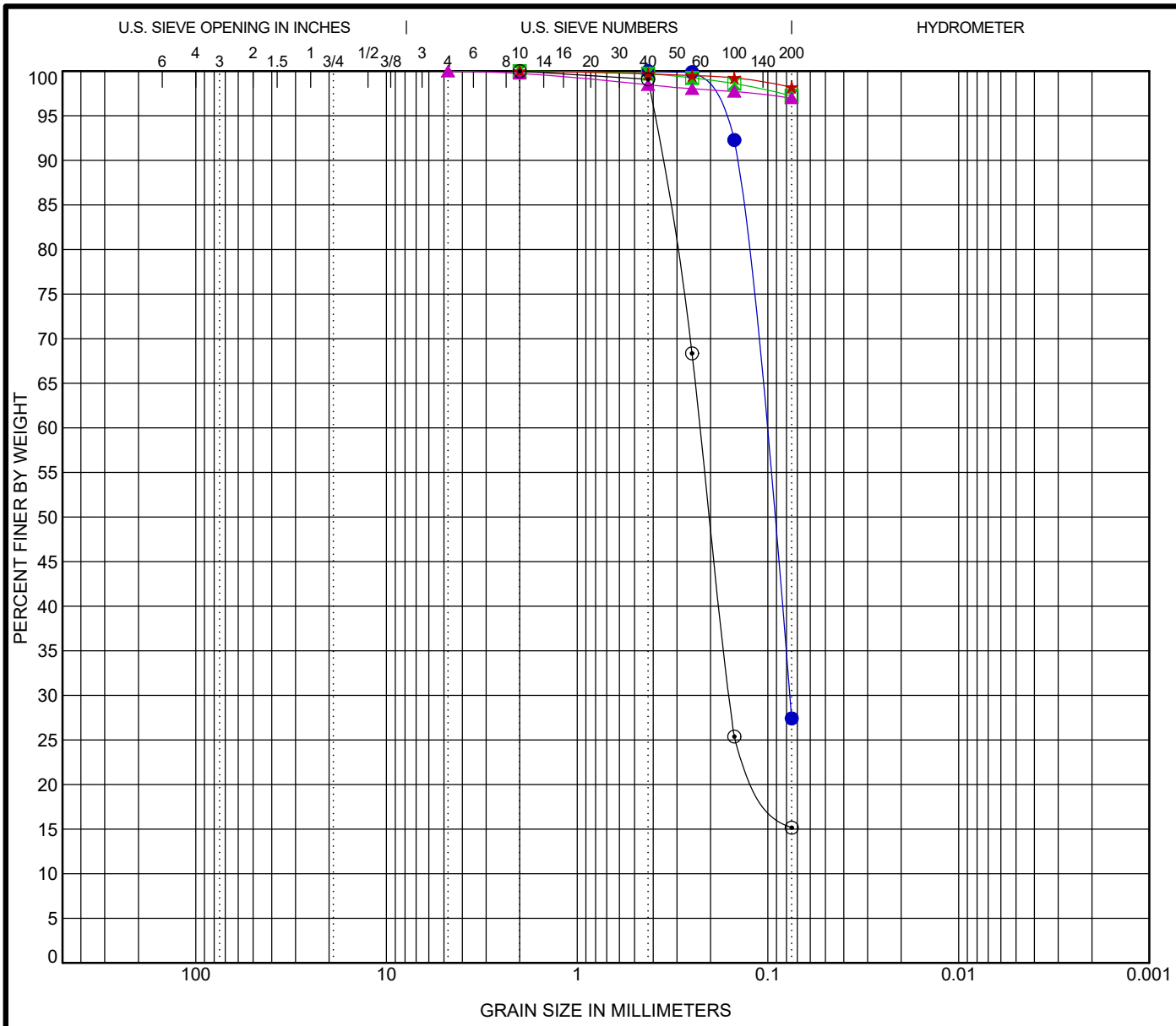
FIGURE B-2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-5	30.0	**SILTY SAND (SM)**					
⊠	DP-6	6.0	**CLAY LEAN (CL)**					
▲	DP-6	35.0	**CLAY LEAN (CL)**					
★	DP-7	10.0	**CLAYEY SAND (SC)**					
⊙	DP-7	40.0	**SILTY SAND (SM)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-5	30.0	0.425	0.106	0.077		0.0	72.6	27.4	
⊠	DP-6	6.0	2				0.0	2.8	97.2	
▲	DP-6	35.0	4.75				0.0	3.0	97.0	
★	DP-7	10.0	2				0.0	1.8	98.2	
⊙	DP-7	40.0	2	0.226	0.158		0.0	84.8	15.2	

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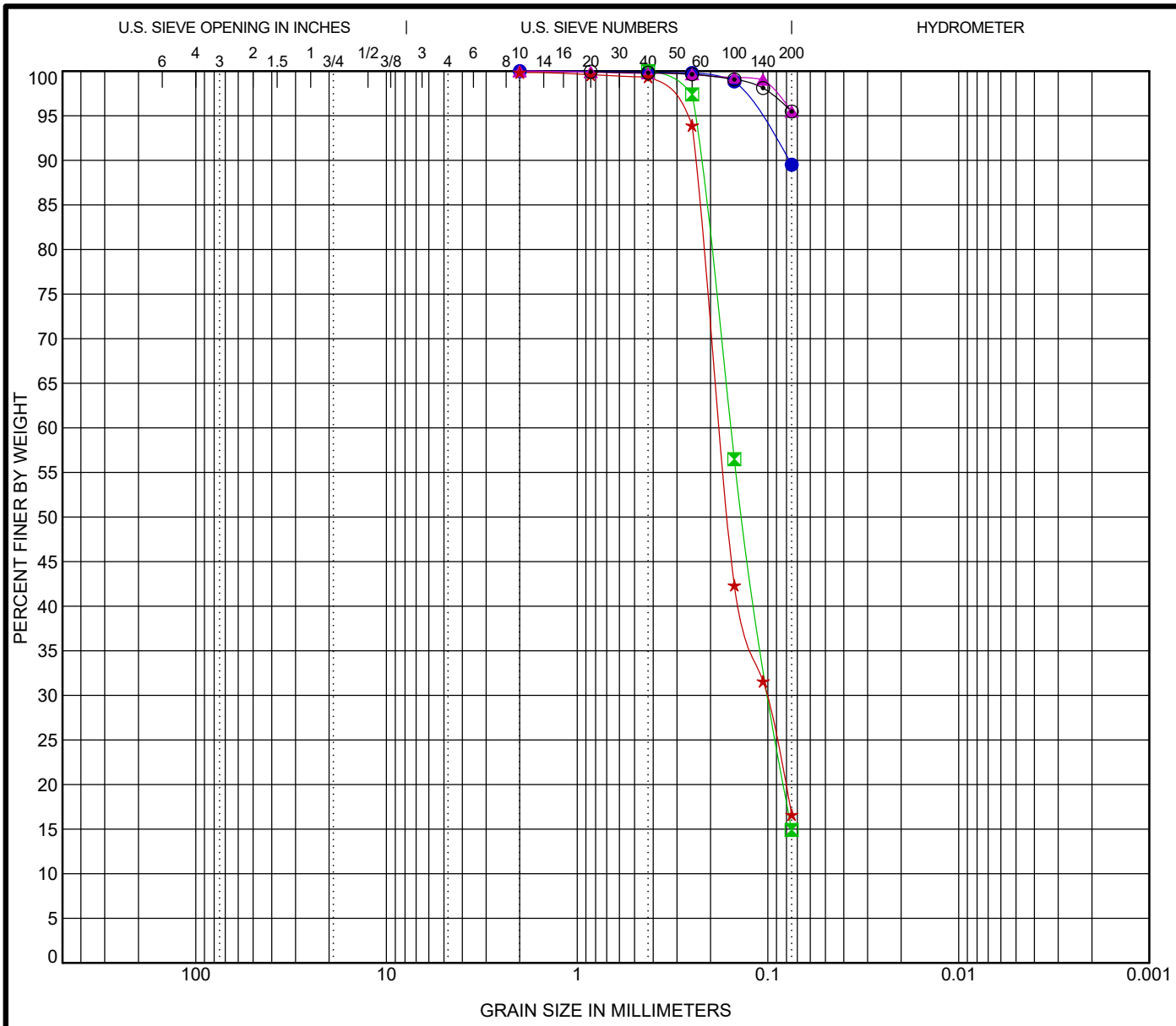
FIGURE B-3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	DP-8	2.0	FILL: LEAN CLAY (CL)					
⊠	DP-8	30.0	SILTY SAND (SM)					
▲	DP-9	8.0	FAT CLAY (CH)					
★	DP-9	35.0	SILTY SAND (SM)					
⊙	DP-10	6.0	FAT CLAY (CH)					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-8	2.0	2				0.0	10.5	89.5	
⊠	DP-8	30.0	0.425	0.157	0.096		0.0	85.1	14.9	
▲	DP-9	8.0	2				0.0	4.5	95.5	
★	DP-9	35.0	2	0.179	0.102		0.0	83.2	16.6	
⊙	DP-10	6.0	0.85				0.0	4.5	95.5	

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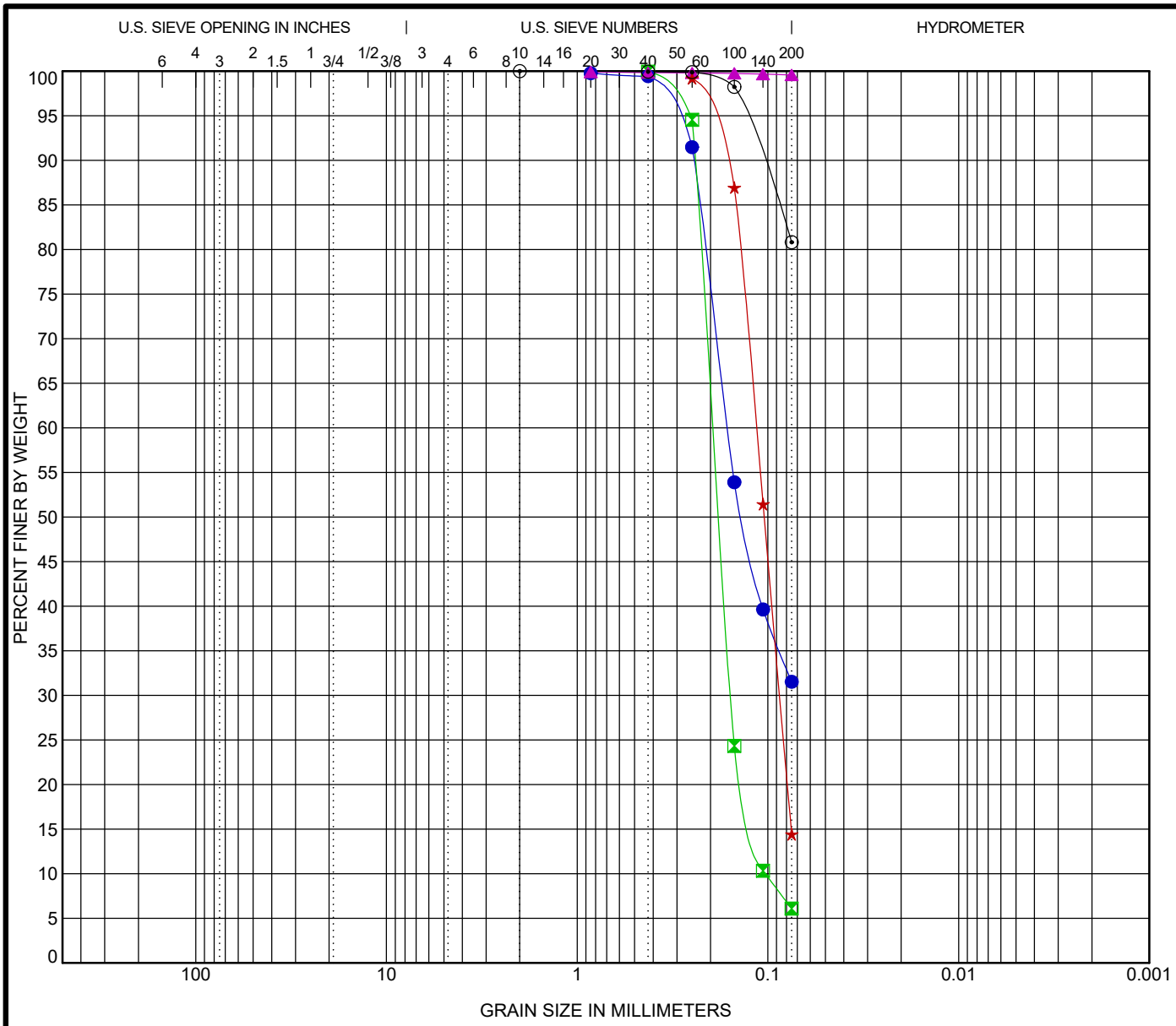
FIGURE B-4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-10	40.0	SILTY SAND (SM)					
⊠	DP-11	35.0	SAND w/ SILT (SP-SM)				1.22	1.88
▲	DP-12	10.0	SAND (SP)					
★	DP-12	35.0	SILTY SAND (SM)					
⊙	DP-13	6.0	SILT w/ SAND (ML)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-10	40.0	0.85	0.163			0.0	68.2	31.5	
⊠	DP-11	35.0	0.425	0.194	0.156	0.103	0.0	93.9	6.1	
▲	DP-12	10.0	0.85				0.0	0.3	99.6	
★	DP-12	35.0	0.25	0.115	0.087		0.0	84.8	14.4	
⊙	DP-13	6.0	2				0.0	19.2	80.8	

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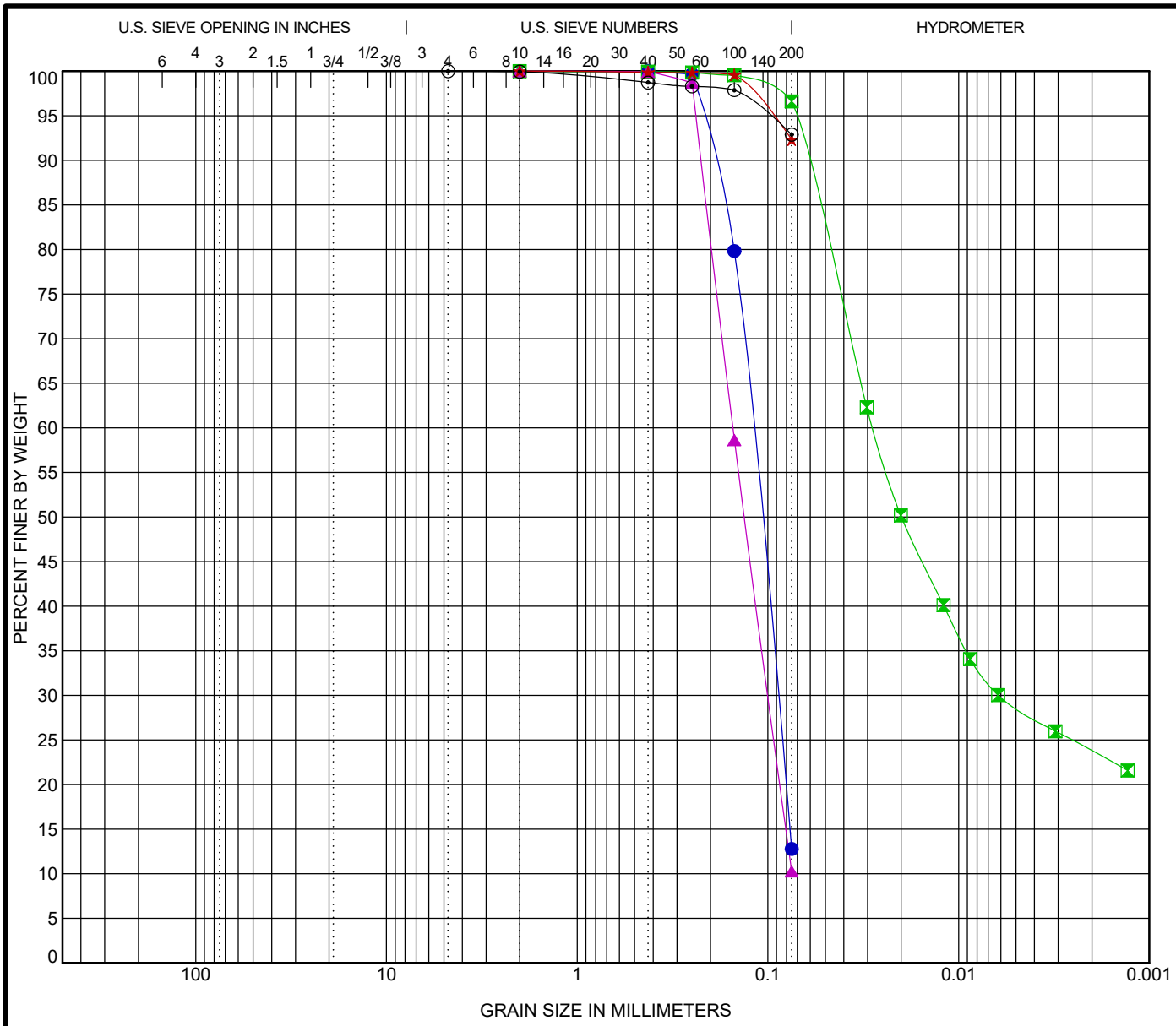
FIGURE B-5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-13	30.0	SILTY SAND (SM)					
⊠	DP-14	10.0	FAT CLAY (CH)					
▲	DP-14	35.0	SAND w/ SILT (SP-SM)				0.87	2.04
★	DP-14	48.5	CLAY LEAN (CL)					
⊙	DP-15	6.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-13	30.0	0.425	0.122	0.09		0.0	87.2	12.8	
⊠	DP-14	10.0	2	0.028	0.006		0.0	3.4	67.9	28.8
▲	DP-14	35.0	2	0.153	0.1		0.0	89.7	10.3	
★	DP-14	48.5	2				0.0	7.7	92.3	
⊙	DP-15	6.0	4.75				0.0	7.1	92.9	

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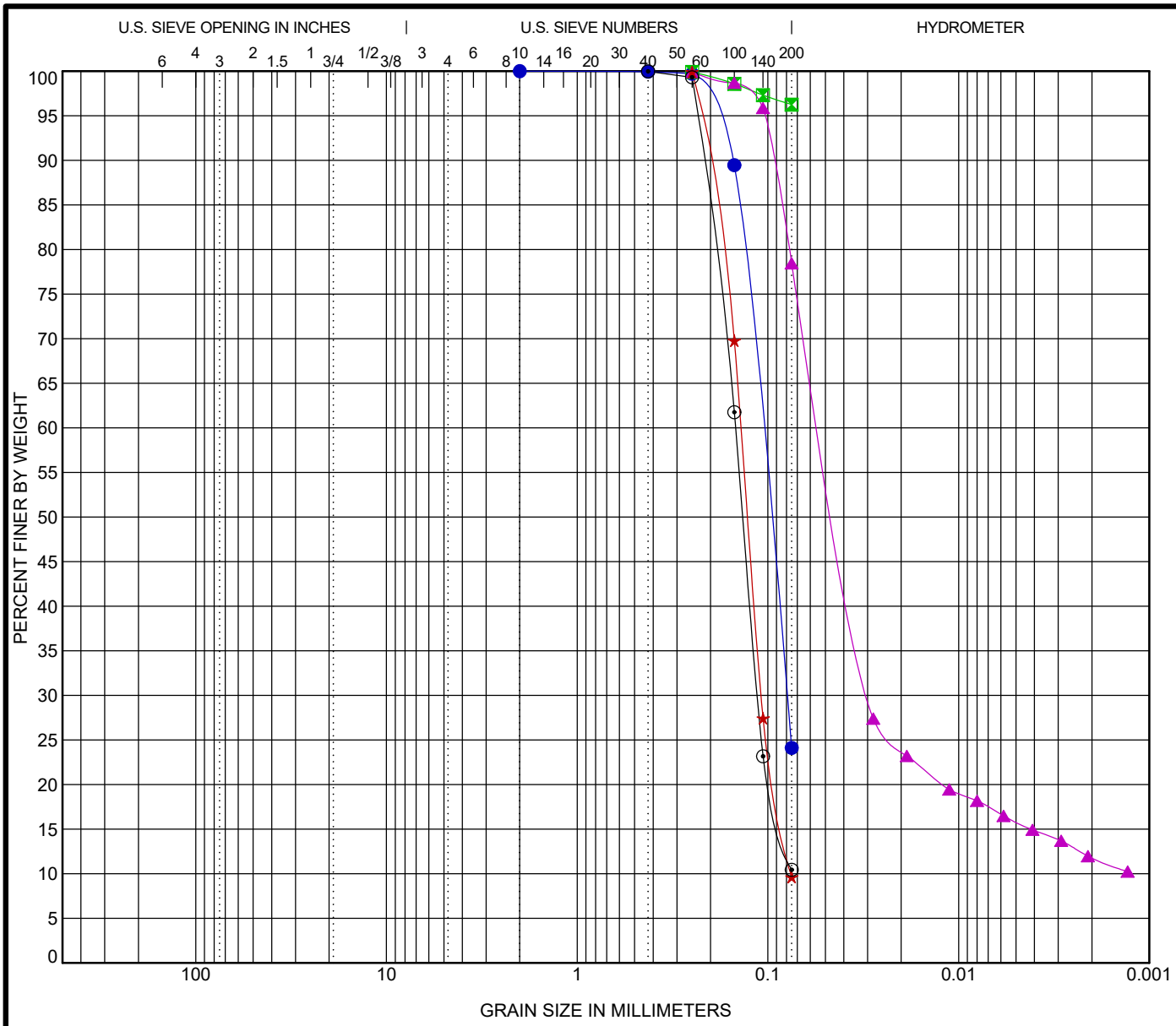
FIGURE B-6



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-15	30.0	SILTY SAND (SM)					
⊠	DP-16	2.0	FILL: LEAN CLAY (CL)					
▲	DP-16	25.0	CLAY LEAN (CL)					
★	DP-16	35.0	SAND w/ SILT (SP-SM)				1.12	1.83
⊙	DP-17	35.0	SAND w/ SILT (SP-SM)				1.16	1.99

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-15	30.0	2	0.11	0.08		0.0	75.9	24.1	
⊠	DP-16	2.0	0.25				0.0	3.6	96.2	
▲	DP-16	25.0	0.25	0.053	0.029		0.0	21.4	62.6	15.8
★	DP-16	35.0	0.25	0.138	0.108	0.076	0.0	90.3	9.6	
⊙	DP-17	35.0	0.425	0.148	0.113		0.0	89.5	10.4	

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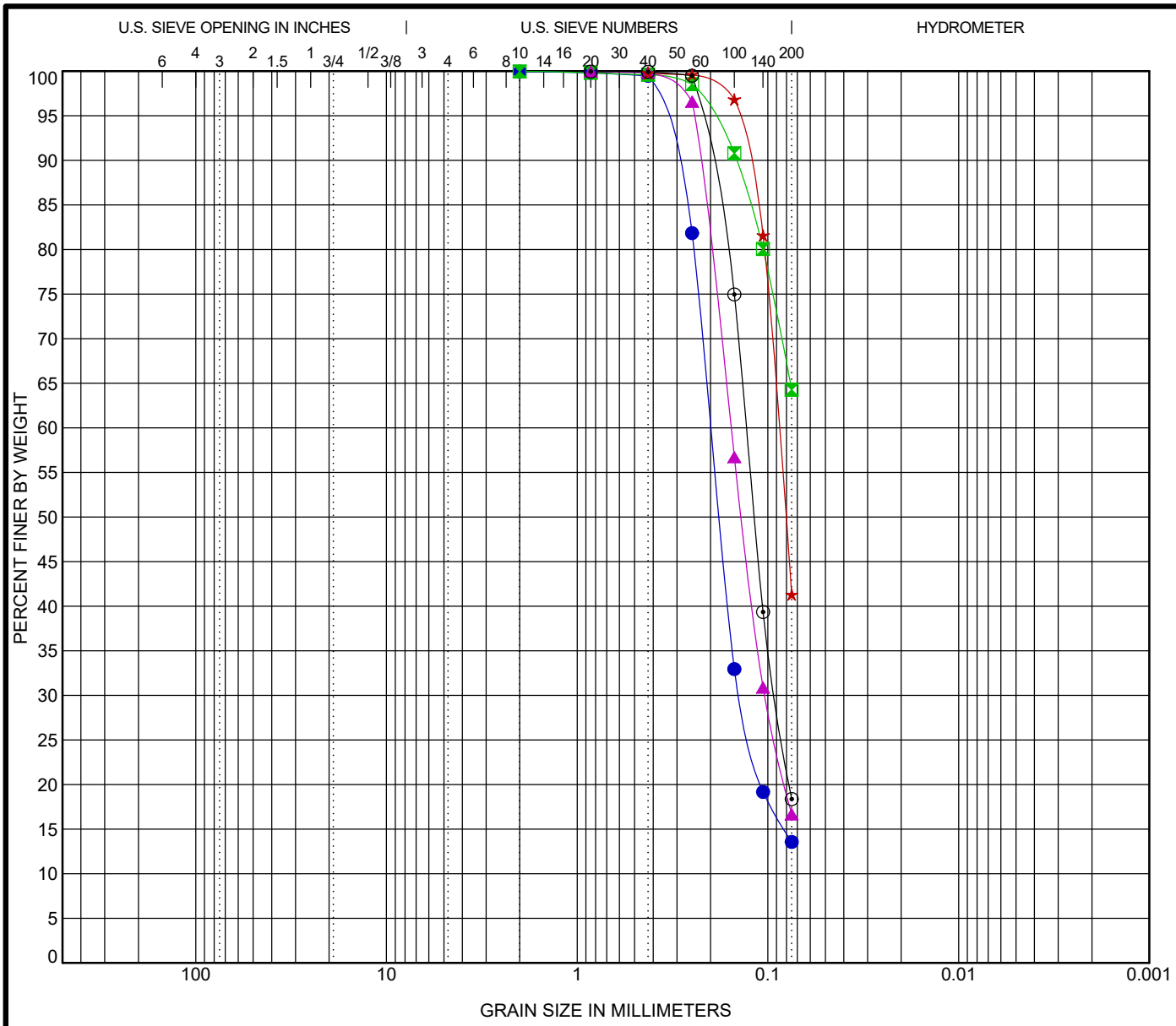
FIGURE B-7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-17**	**40.0**	**SILTY SAND (SM)**					
⊠	**DP-18**	**25.0**	**SANDY LEAN CLAY (CL)**					
▲	**DP-18**	**35.0**	**SILTY SAND (SM)**					
★	**DP-19**	**25.0**	**SILTY SAND (SM)**					
⊙	**DP-19**	**40.0**	**SILTY SAND (SM)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-17**	**40.0**	**2**	**0.199**	**0.139**		**0.0**	**86.4**	**13.6**	
⊠	**DP-18**	**25.0**	**2**				**0.0**	**35.7**	**64.3**	
▲	**DP-18**	**35.0**	**0.85**	**0.156**	**0.104**		**0.0**	**83.3**	**16.7**	
★	**DP-19**	**25.0**	**0.425**	**0.088**			**0.0**	**58.5**	**41.3**	
⊙	**DP-19**	**40.0**	**0.85**	**0.13**	**0.091**		**0.0**	**81.6**	**18.4**	

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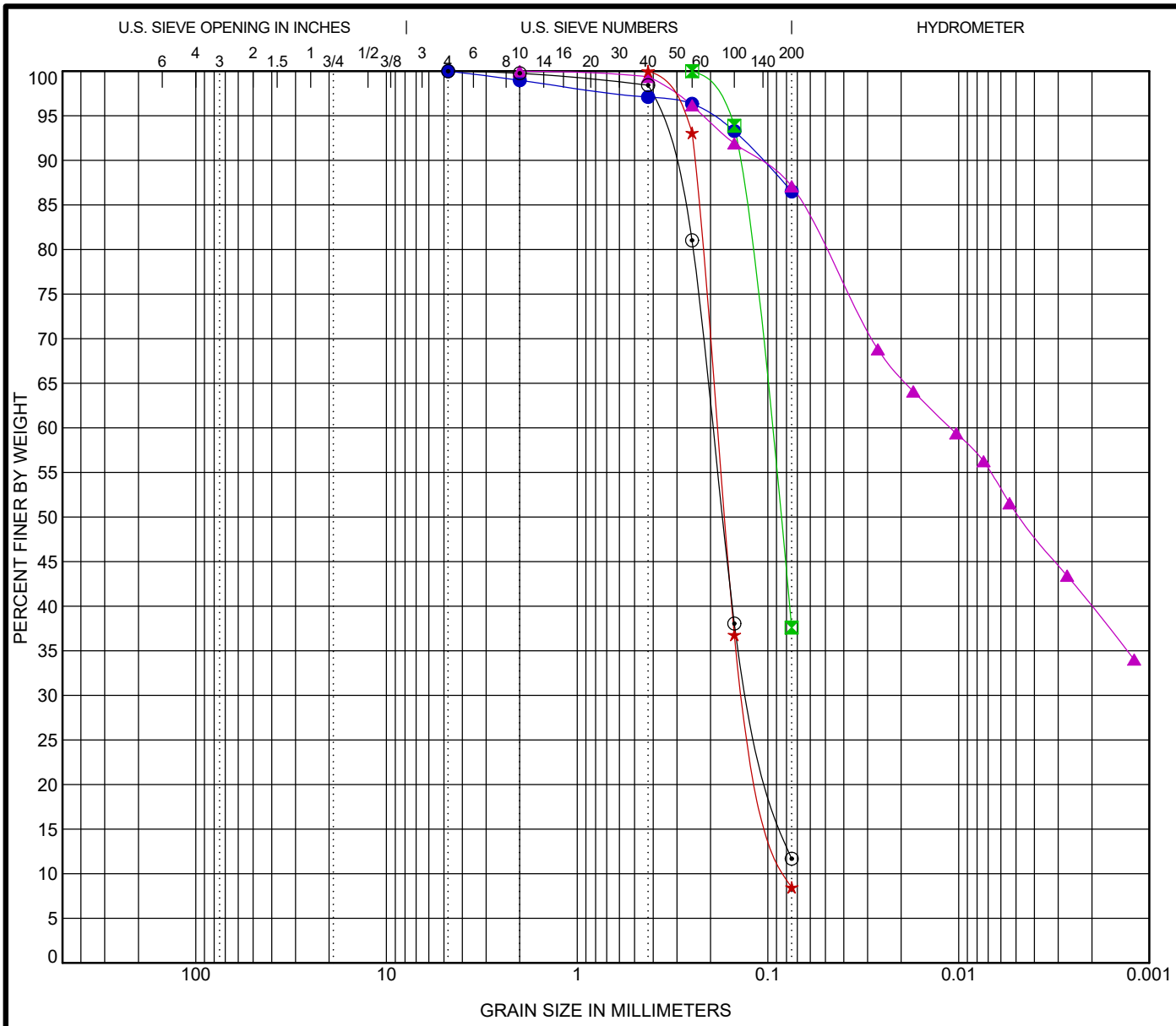
FIGURE B-8



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-20	6.0	FILL: SILT (ML)					
⊠	DP-20	25.0	CLAYEY SAND (SC)					
▲	DP-21	10.0	CLAY LEAN (CL)					
★	DP-21	25.0	SAND w/ SILT (SP-SM)				1.12	2.38
⊙	DP-21	40.0	SILTY SAND (SM)				1.05	2.71

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-20	6.0	4.75				0.0	13.5	86.5	
⊠	DP-20	25.0	0.25	0.099			0.0	62.4	37.6	
▲	DP-21	10.0	2	0.011			0.0	12.9	36.4	50.6
★	DP-21	25.0	0.425	0.185	0.127	0.078	0.0	91.5	8.5	
⊙	DP-21	40.0	4.75	0.195	0.121		0.0	88.3	11.7	

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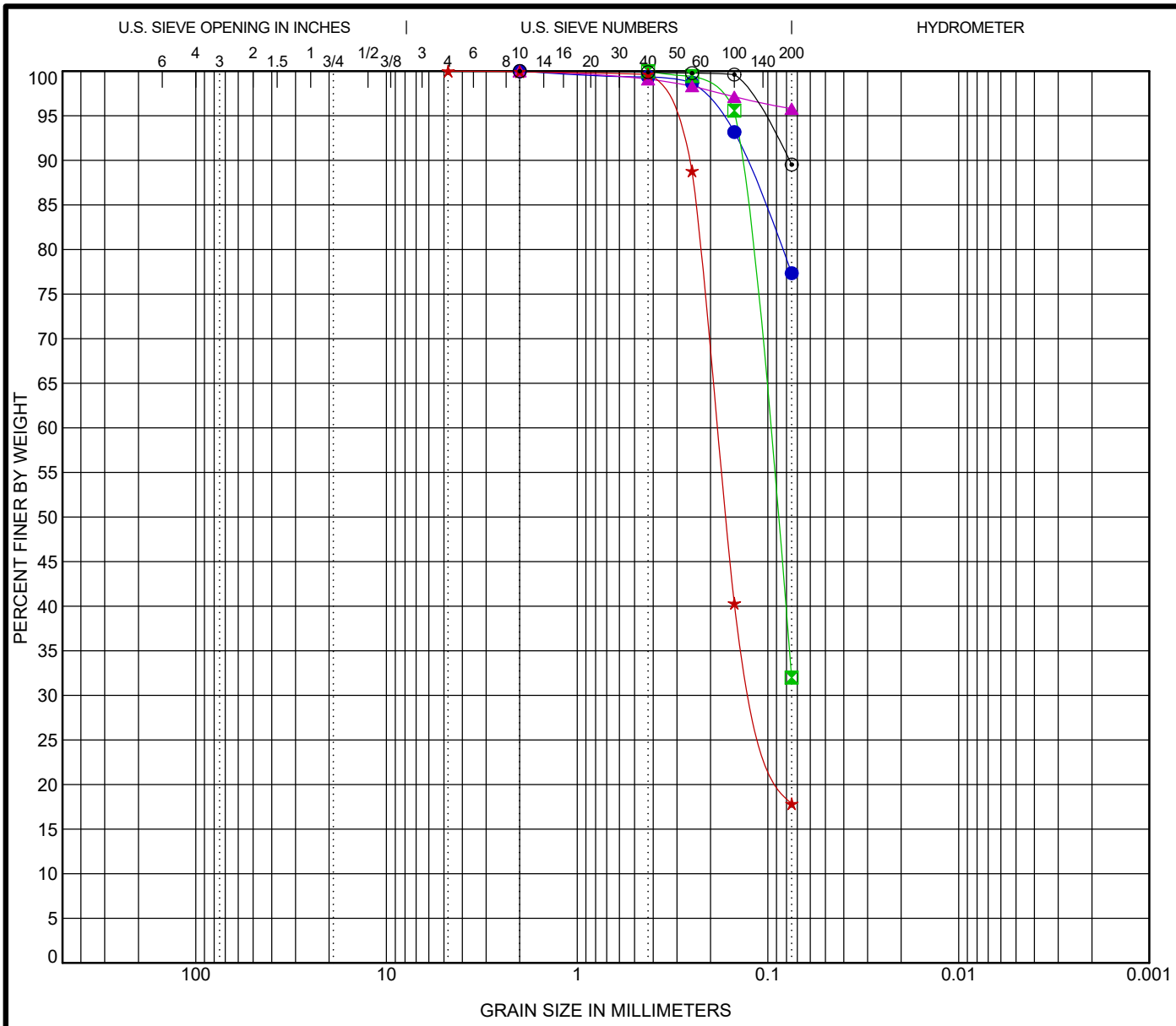
FIGURE B-9



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-22	10.0	CLAY LEAN (CL)					
⊠	DP-22	25.0	CLAYEY SAND (SC)					
▲	DP-23	15.0	CLAY LEAN (CL)					
★	DP-23	30.0	CLAYEY SAND (SC)					
⊙	DP-24	6.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-22	10.0	2				0.0	22.7	77.3	
⊠	DP-22	25.0	0.425	0.102			0.0	68.0	32.0	
▲	DP-23	15.0	2				0.0	4.2	95.8	
★	DP-23	30.0	4.75	0.185	0.109		0.0	82.2	17.8	
⊙	DP-24	6.0	2				0.0	10.5	89.5	

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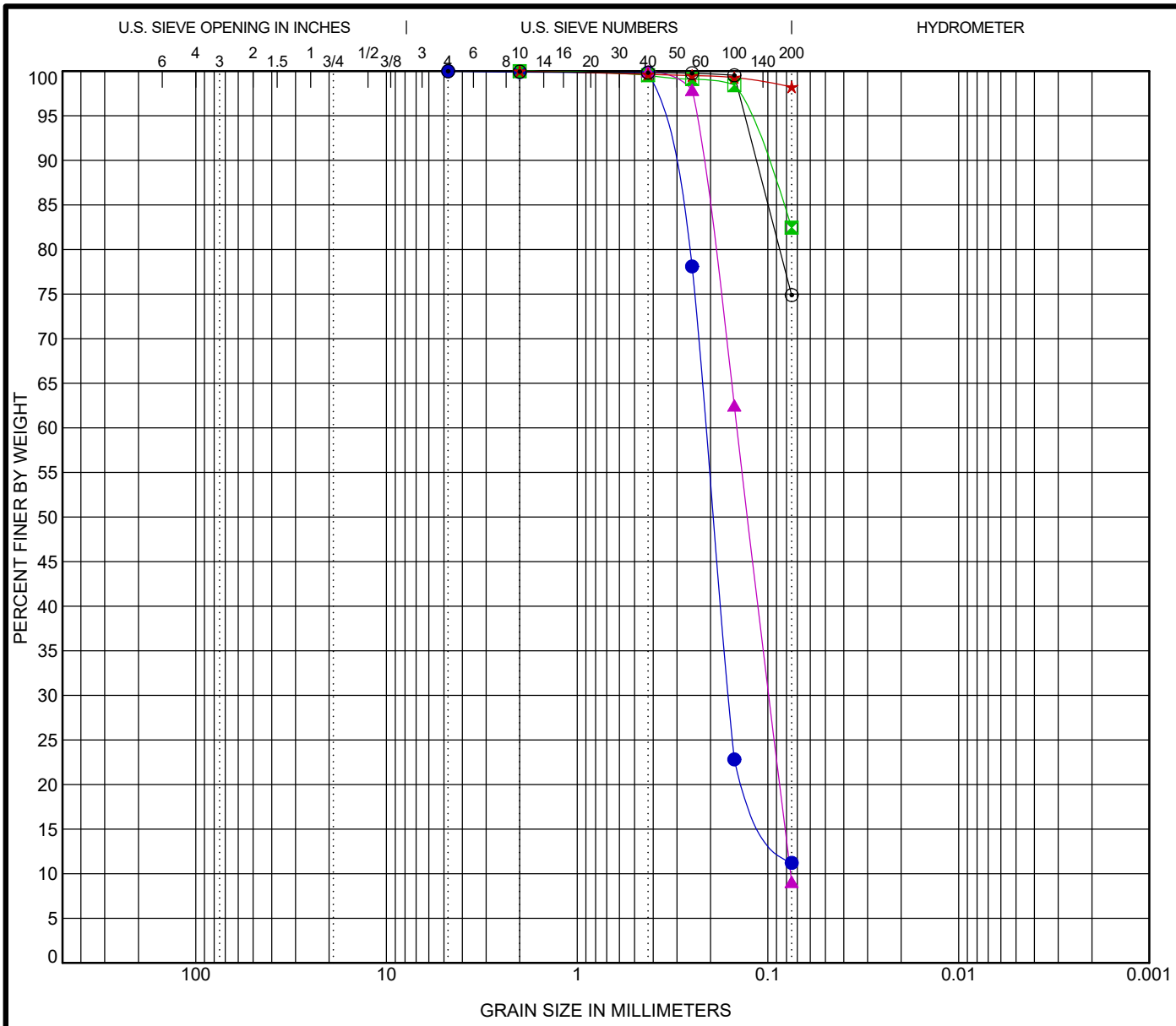
FIGURE B-10



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-24	30.0	SAND w/ SILT (SP-SM)				1.74	3.03
⊠	DP-25	8.0	FILL: LEAN CLAY (CL)					
▲	DP-25	30.0	SAND w/ SILT (SP-SM)				0.88	1.91
★	DP-26	4.0	FILL: LEAN CLAY (CL)					
⊙	DP-26	20.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-24	30.0	4.75	0.211	0.16		0.0	88.8	11.2	
⊠	DP-25	8.0	2				0.0	17.6	82.4	
▲	DP-25	30.0	0.425	0.145	0.098	0.076	0.0	90.9	9.1	
★	DP-26	4.0	2				0.0	1.8	98.2	
⊙	DP-26	20.0	4.75				0.0	25.1	74.9	

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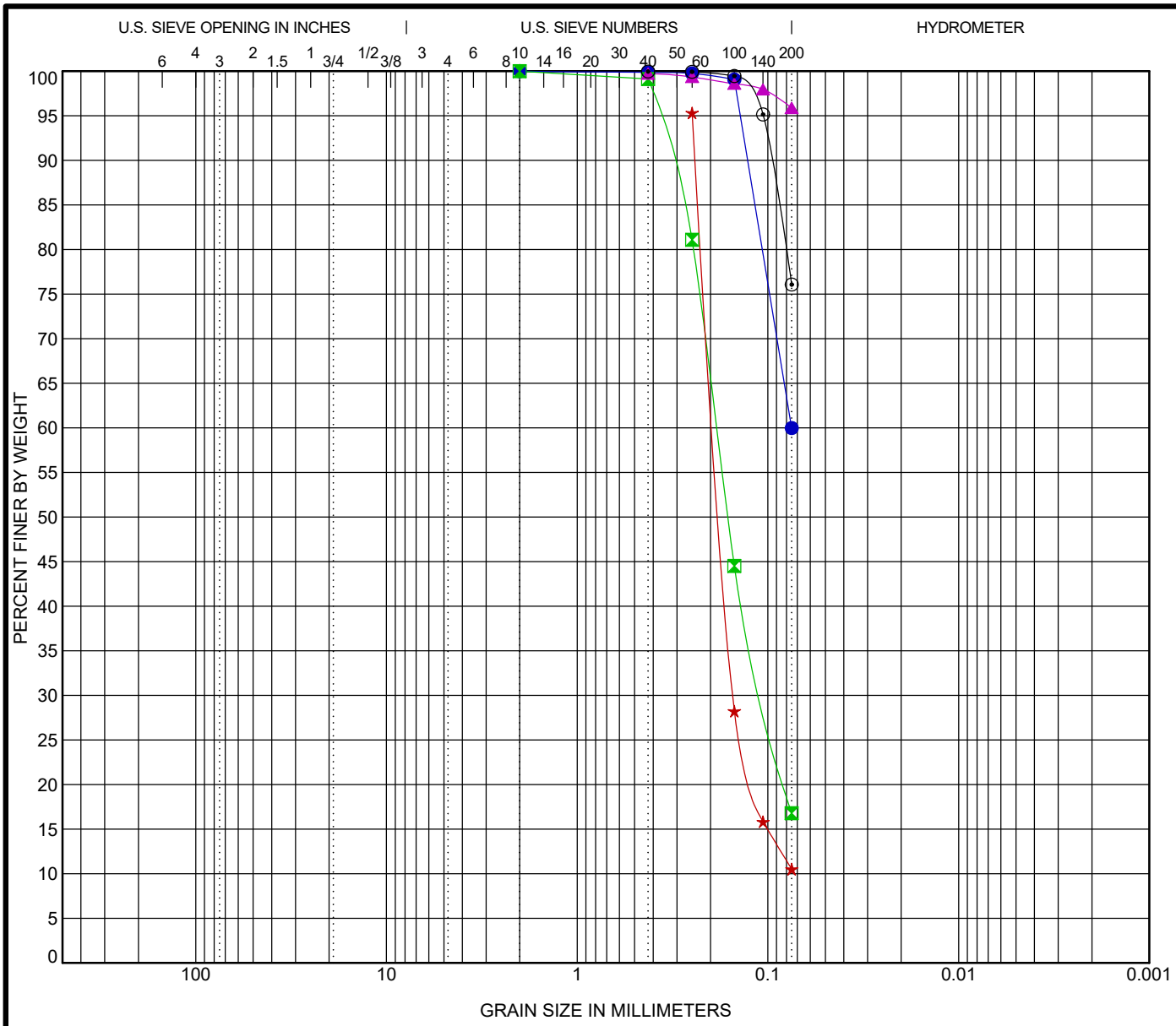
FIGURE B-11



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-27	30.0	SANDY SILTY (ML)					
⊠	DP-27	48.0	SILTY SAND (SM)					
▲	DP-28	8.0	FILL: LEAN CLAY (CL)					
★	DP-28	35.0	SAND w/ SILT (SP-SM)				1.67	2.63
⊙	DP-29	40.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-27	30.0	2	0.075			0.0	40.0	60.0	
⊠	DP-27	48.0	2	0.186	0.104		0.0	83.2	16.8	
▲	DP-28	8.0	0.425				0.0	3.9	95.9	
★	DP-28	35.0	0.25	0.191	0.152		0.0	84.8	10.5	
⊙	DP-29	40.0	0.425				0.0	23.9	76.1	

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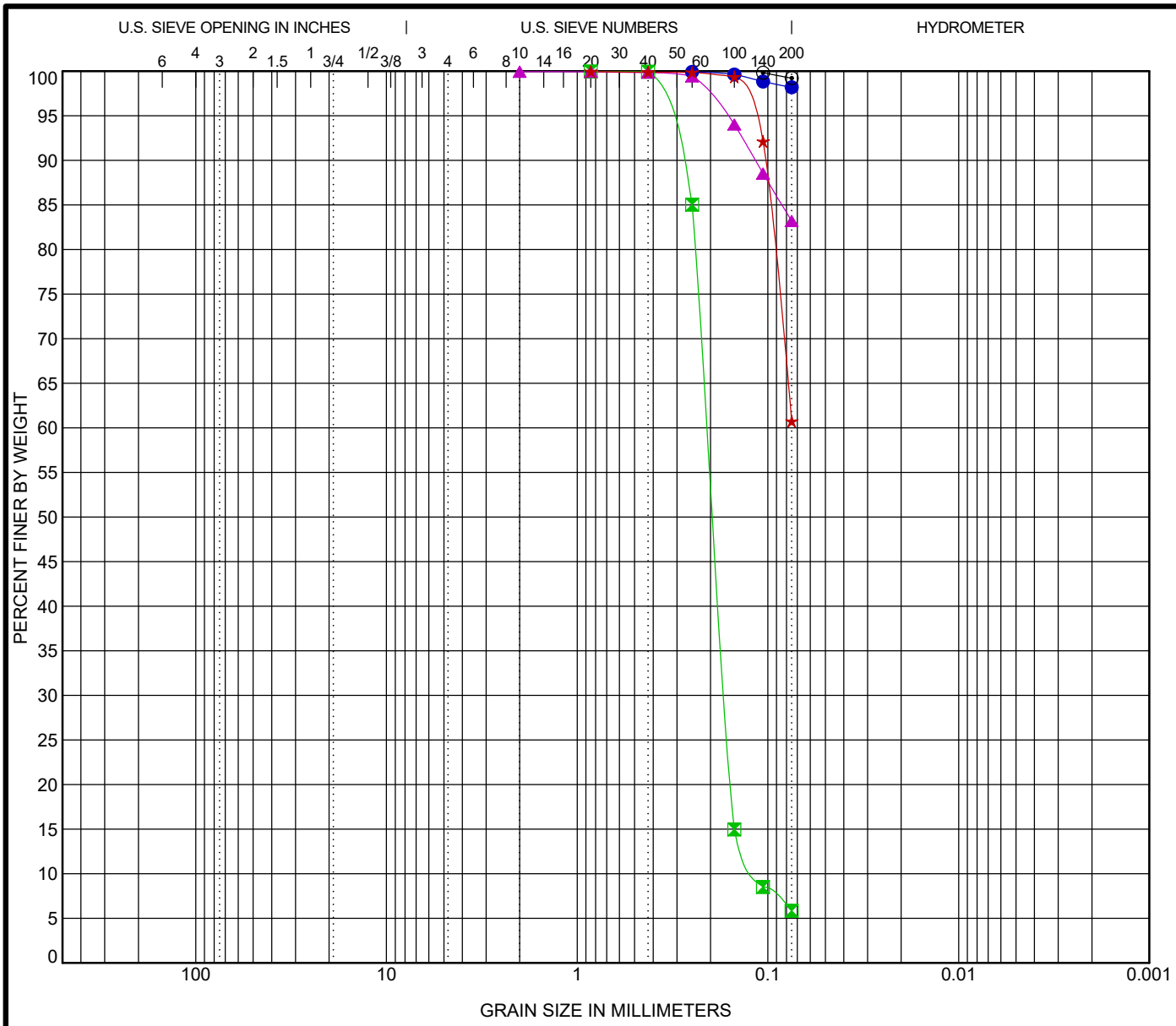
FIGURE B-12



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-30	10.0	SILT (ML)					
⊠	DP-30	48.5	SAND w/ SILT (SP-SM)				1.17	1.81
▲	DP-31	0.0	FILL: LEAN CLAY (CL)					
★	DP-31	30.0	SANDY LEAN CLAY (CL)					
⊙	DP-32	2.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-30	10.0	0.25				0.0	1.7	98.2	
⊠	DP-30	48.5	0.85	0.208	0.167	0.115	0.0	94.1	5.8	
▲	DP-31	0.0	2				0.0	16.7	83.2	
★	DP-31	30.0	0.85				0.0	39.2	60.8	
⊙	DP-32	2.0	0.106				0.0	0.6	99.2	

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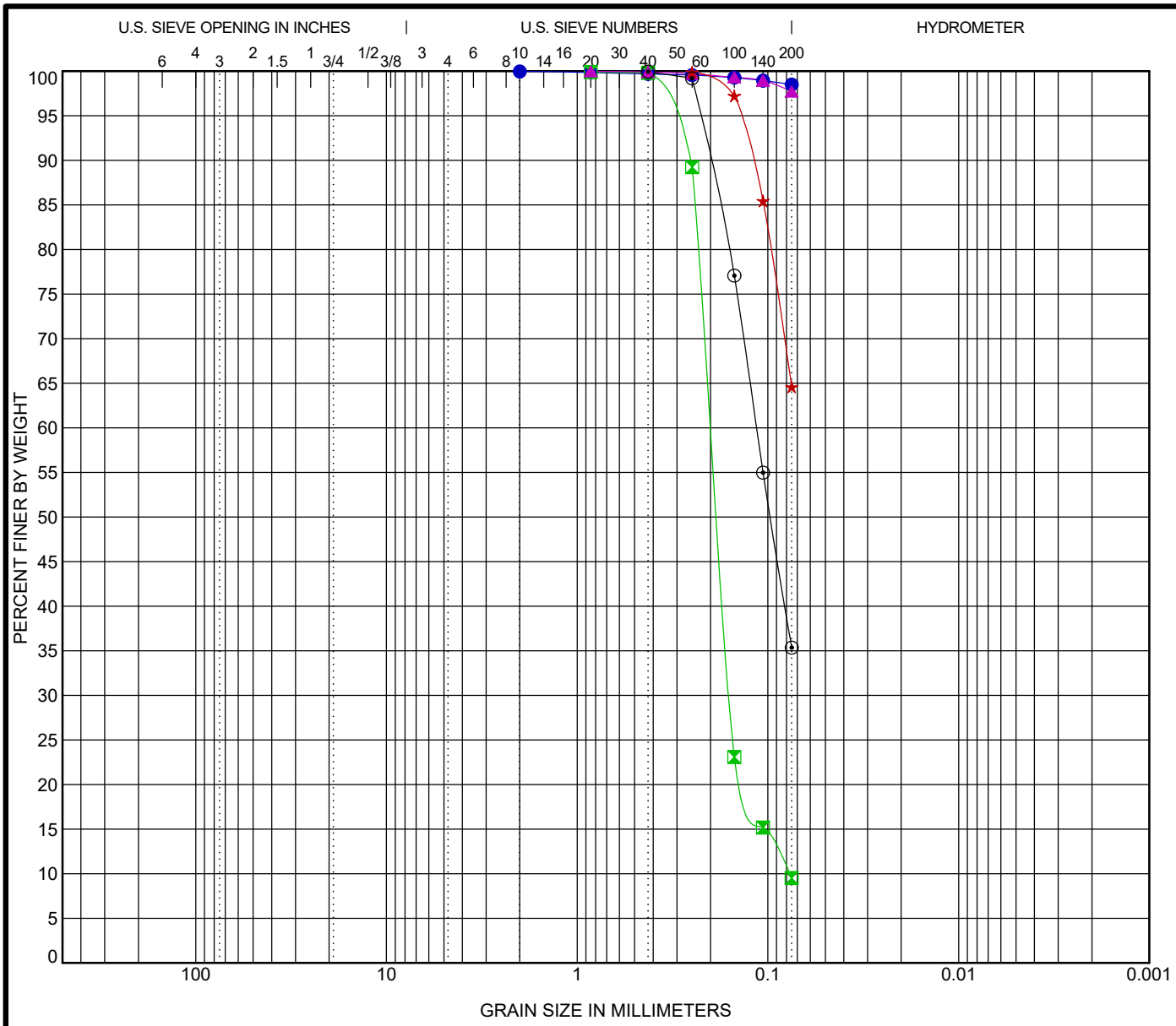
FIGURE B-13



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-33	20.0	FAT CLAY (CH)					
⊠	DP-33	35.0	SAND w/ SILT (SP-SM)				1.62	2.58
▲	DP-34	0.0	FILL: LEAN CLAY (CL)					
★	DP-34	25.0	SANDY SILTY (ML)					
⊙	DP-35	20.0	CLAYEY SAND (SC)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-33	20.0	2				0.0	1.5	98.5	
⊠	DP-33	35.0	0.85	0.199	0.158	0.077	0.0	90.4	9.5	
▲	DP-34	0.0	0.85				0.0	2.3	97.7	
★	DP-34	25.0	0.25				0.0	35.3	64.6	
⊙	DP-35	20.0	0.425	0.115			0.0	64.6	35.4	

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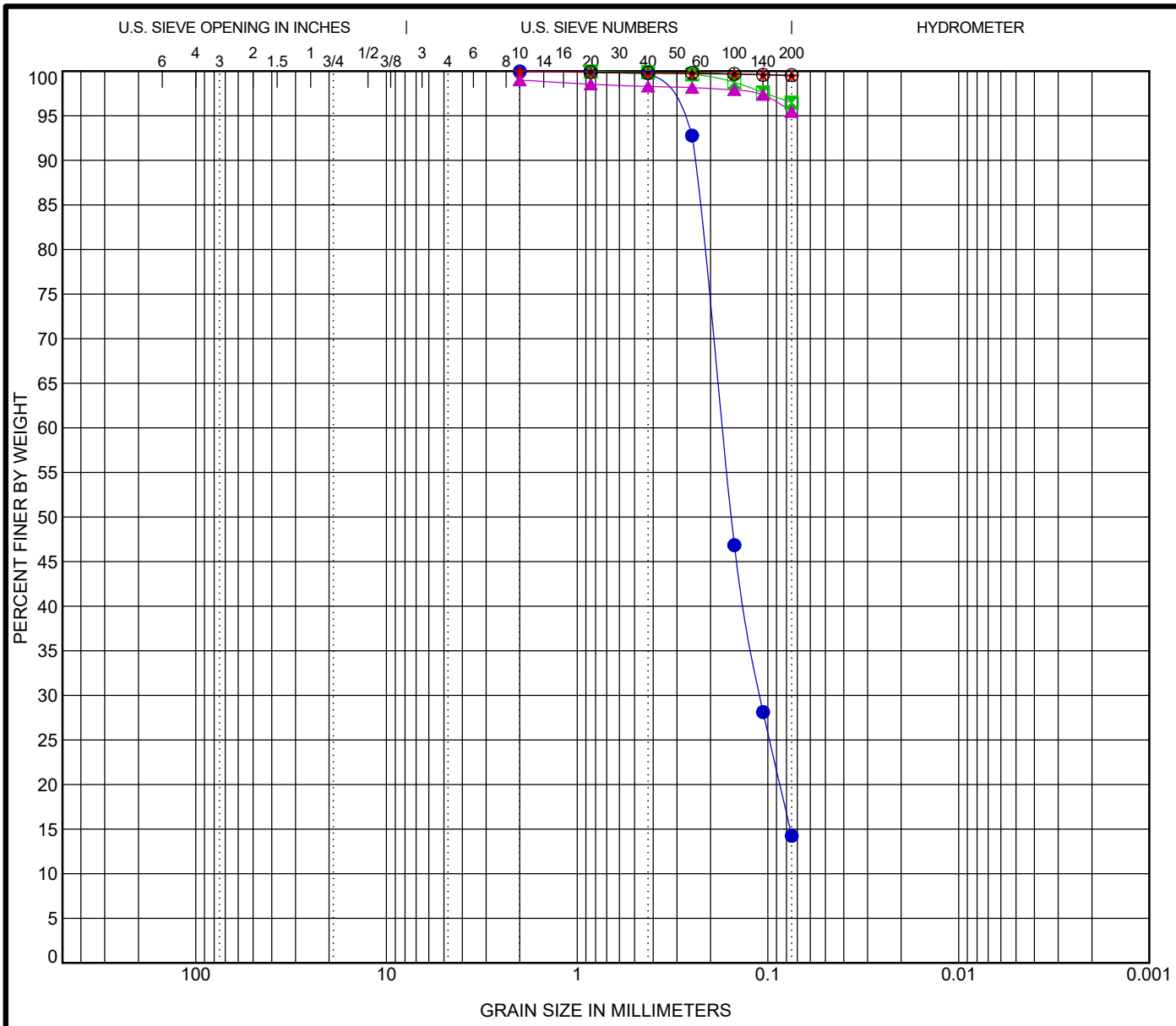
FIGURE B-14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-35	35.0	**SILTY SAND (SM)**					
⊠	DP-36	8.0	**FAT CLAY (CH)**					
▲	DP-36	20.0	**SAND w/ SILT (SP-SM)**					
★	DP-37	8.0	**FILL: FAT CLAY (CH)**					
⊙	DP-37	20.0	**FAT CLAY (CH)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-35	35.0	2	0.174	0.11		0.0	85.7	14.2	
⊠	DP-36	8.0	0.85				0.0	3.5	96.5	
▲	DP-36	20.0	2				0.0	3.6	95.4	
★	DP-37	8.0	2				0.0	0.5	99.5	
⊙	DP-37	20.0	0.85				0.0	0.3	99.6	

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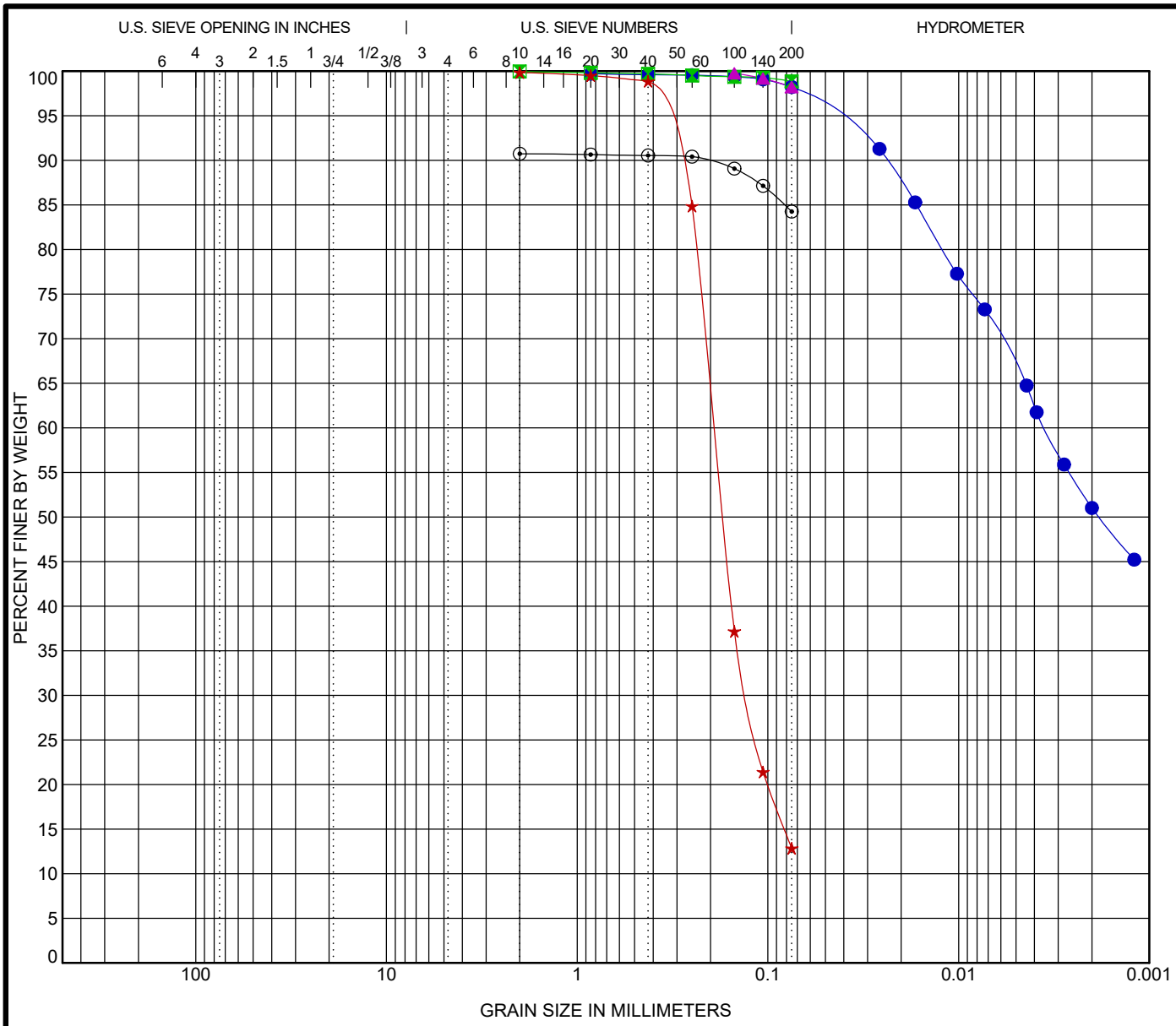
FIGURE B-15



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-38	4.0	FILL: LEAN CLAY (CL)					
⊠	DP-38	10.0	CLAYEY SAND (SC)					
▲	DP-39	0.0	FILL: FAT CLAY (CH)					
★	DP-39	40.0	SILTY SAND (SM)					
⊙	DP-40	8.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-38	4.0	0.85	0.004			0.0	1.5	31.3	66.9
⊠	DP-38	10.0	2				0.0	1.1	98.9	
▲	DP-39	0.0	0.15				0.0	1.5	98.2	
★	DP-39	40.0	2	0.192	0.128		0.0	87.0	12.9	
⊙	DP-40	8.0	2				0.0	6.5	84.3	

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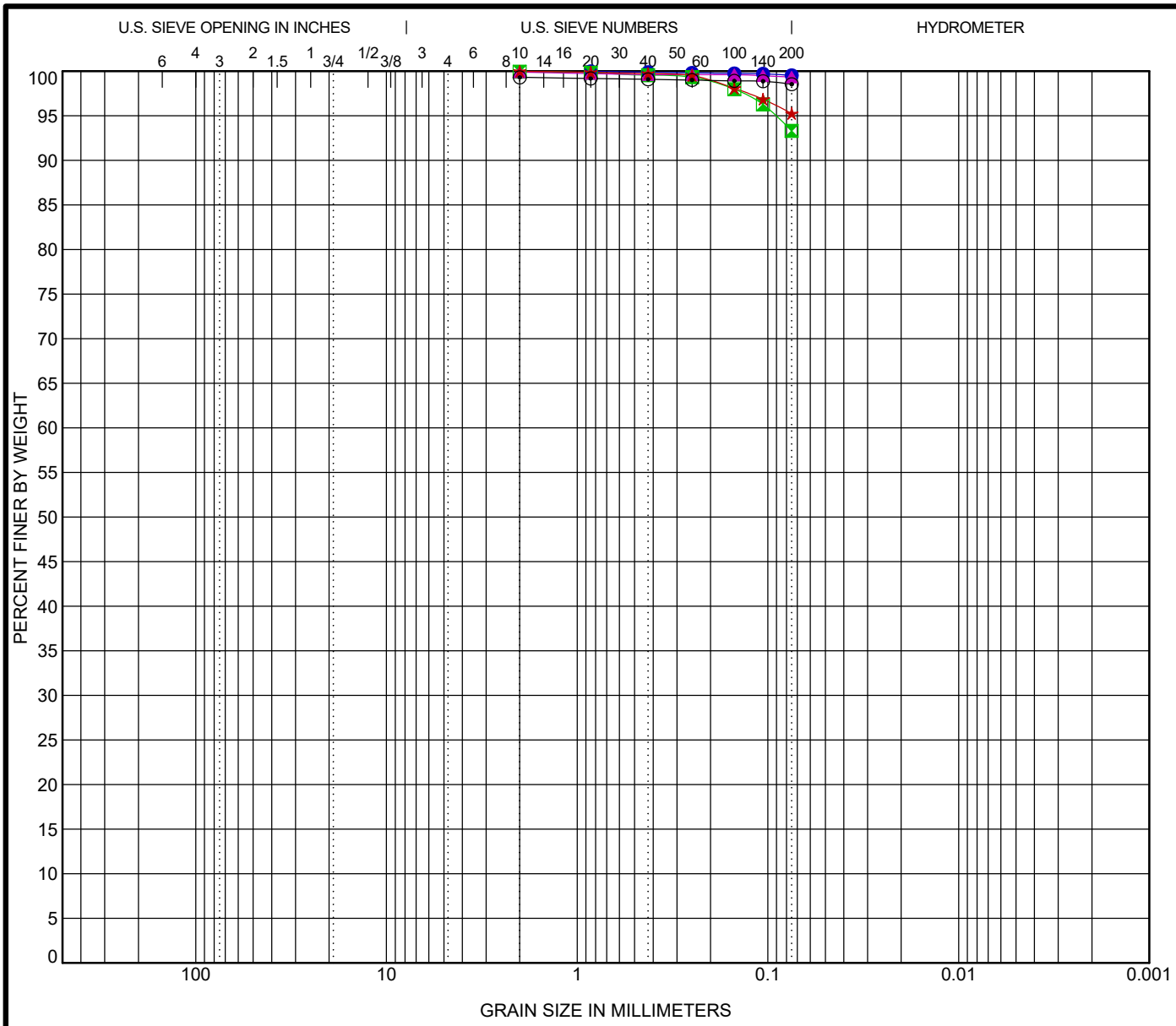
FIGURE B-16



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-40	35.0	FAT CLAY (CH)					
⊠	DP-41	10.0	SILTY SAND (SM)					
▲	DP-41	25.0	FAT CLAY (CH)					
★	DP-42	2.0	FILL: LEAN CLAY (CL)					
⊙	DP-42	30.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-40	35.0	0.85				0.0	0.4	99.5	
⊠	DP-41	10.0	2				0.0	6.7	93.3	
▲	DP-41	25.0	2				0.0	0.6	99.3	
★	DP-42	2.0	2				0.0	4.7	95.3	
⊙	DP-42	30.0	2				0.0	0.8	98.5	

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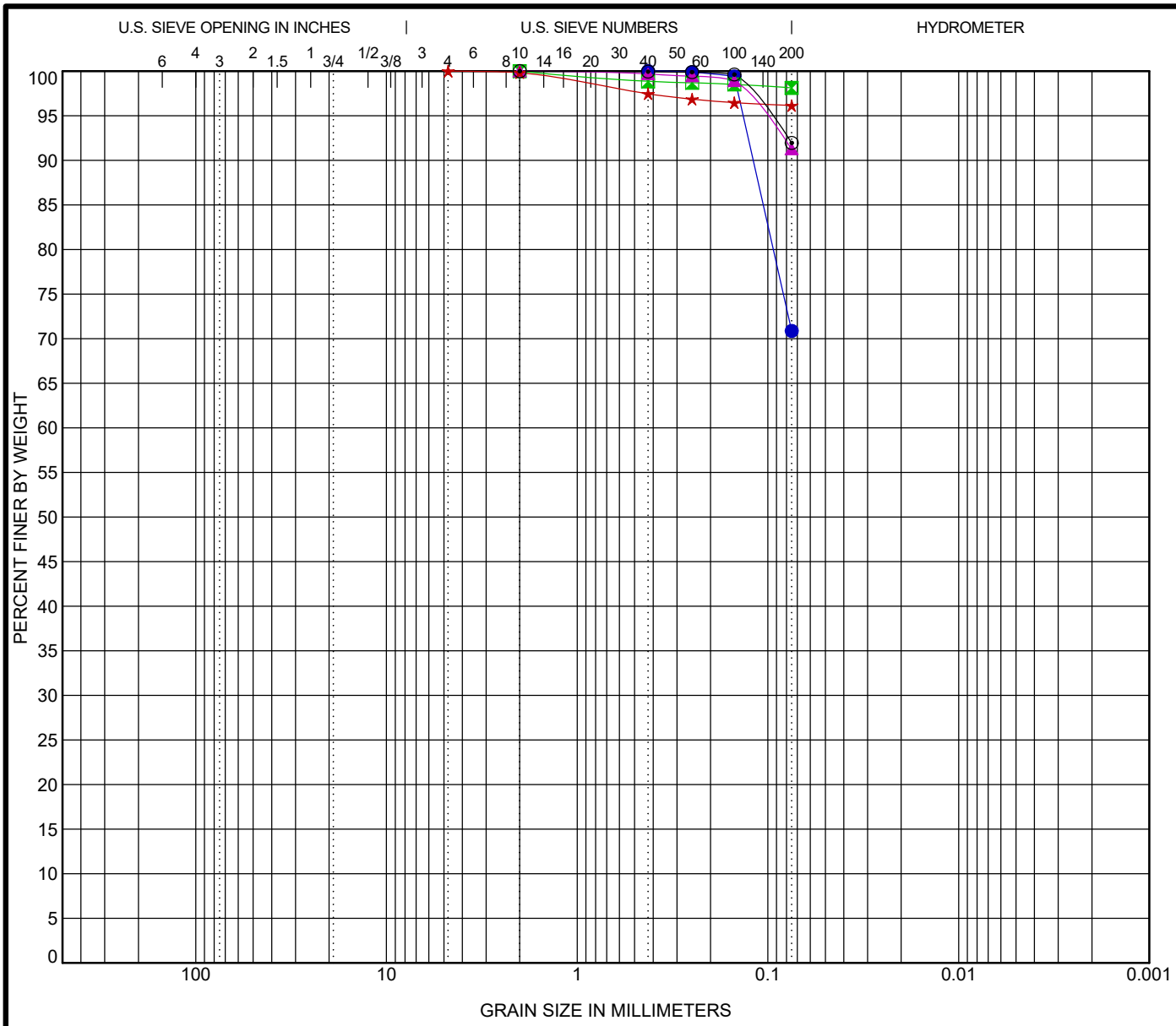

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-43	6.0	FILL: SANDY LEAN CLAY (CL)					
⊠	DP-43	25.0	SAND w/ SILT (SP-SM)					
▲	DP-44	10.0	SAND w/ SILT (SP-SM)					
★	DP-44	35.0	SAND w/ SILT (SP-SM)					
⊙	DP-45	15.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-43	6.0	0.425				0.0	29.1	70.9	
⊠	DP-43	25.0	2				0.0	1.9	98.1	
▲	DP-44	10.0	2				0.0	8.7	91.3	
★	DP-44	35.0	4.75				0.0	3.9	96.1	
⊙	DP-45	15.0	2				0.0	8.0	92.0	

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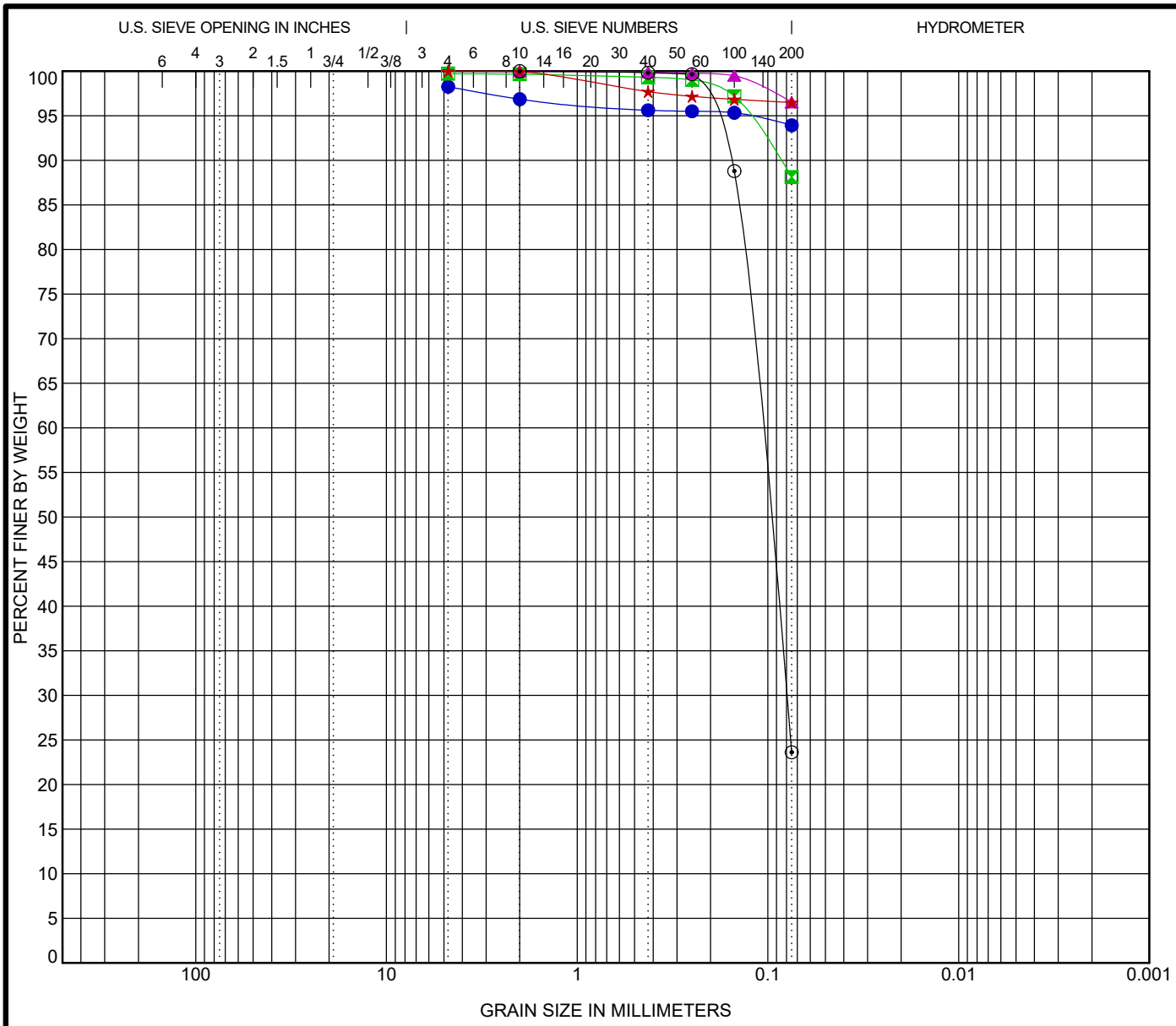
FIGURE B-18



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-45	40.0	CLAY LEAN (CL)					
⊠	DP-46	25.0	CLAY LEAN (CL)					
▲	DP-46	35.0	CLAY LEAN (CL)					
★	DP-47	15.0	FAT CLAY (CH)					
⊙	DP-47	40.0	CLAYEY SAND (SC)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-45	40.0	4.75				0.0	4.3	93.9	
⊠	DP-46	25.0	4.75				0.0	11.6	88.1	
▲	DP-46	35.0	2				0.0	3.5	96.5	
★	DP-47	15.0	4.75				0.0	3.5	96.5	
⊙	DP-47	40.0	2	0.11	0.08		0.0	76.4	23.6	

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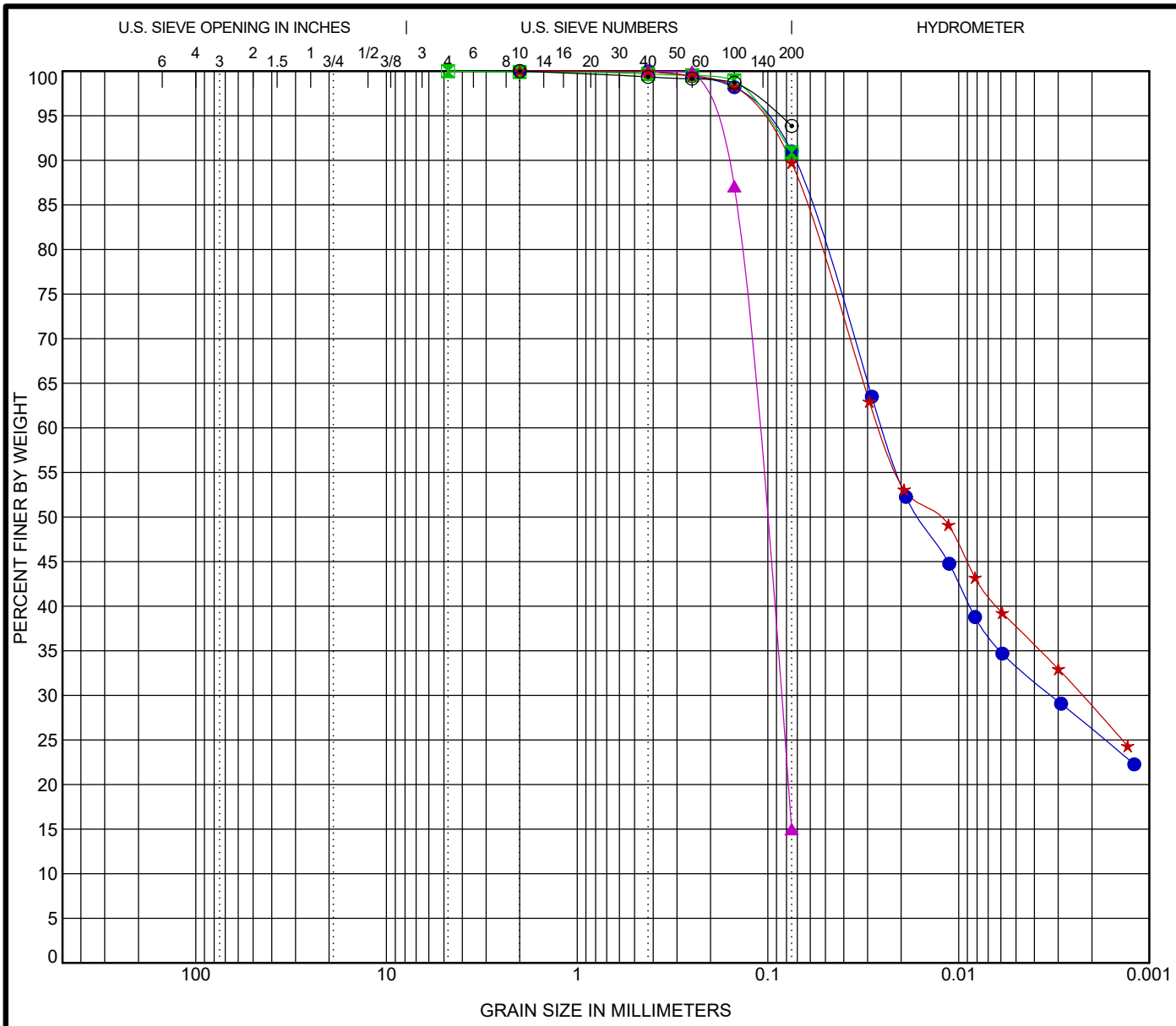
FIGURE B-19



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-48	2.0	FILL: SILT (ML)					
⊠	DP-49	0.0	FILL: FAT CLAY (CH)					
▲	DP-49	20.0	SILTY SAND (SM)					
★	DP-50	2.0	FILL: LEAN CLAY (CL)					
⊙	DP-50	6.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-48	2.0	2	0.025	0.003		0.0	9.0	57.6	33.4
⊠	DP-49	0.0	4.75				0.0	9.1	90.9	
▲	DP-49	20.0	0.425	0.116	0.087		0.0	85.0	15.0	
★	DP-50	2.0	2	0.026	0.002		0.0	10.3	52.0	37.7
⊙	DP-50	6.0	2				0.0	6.1	93.9	

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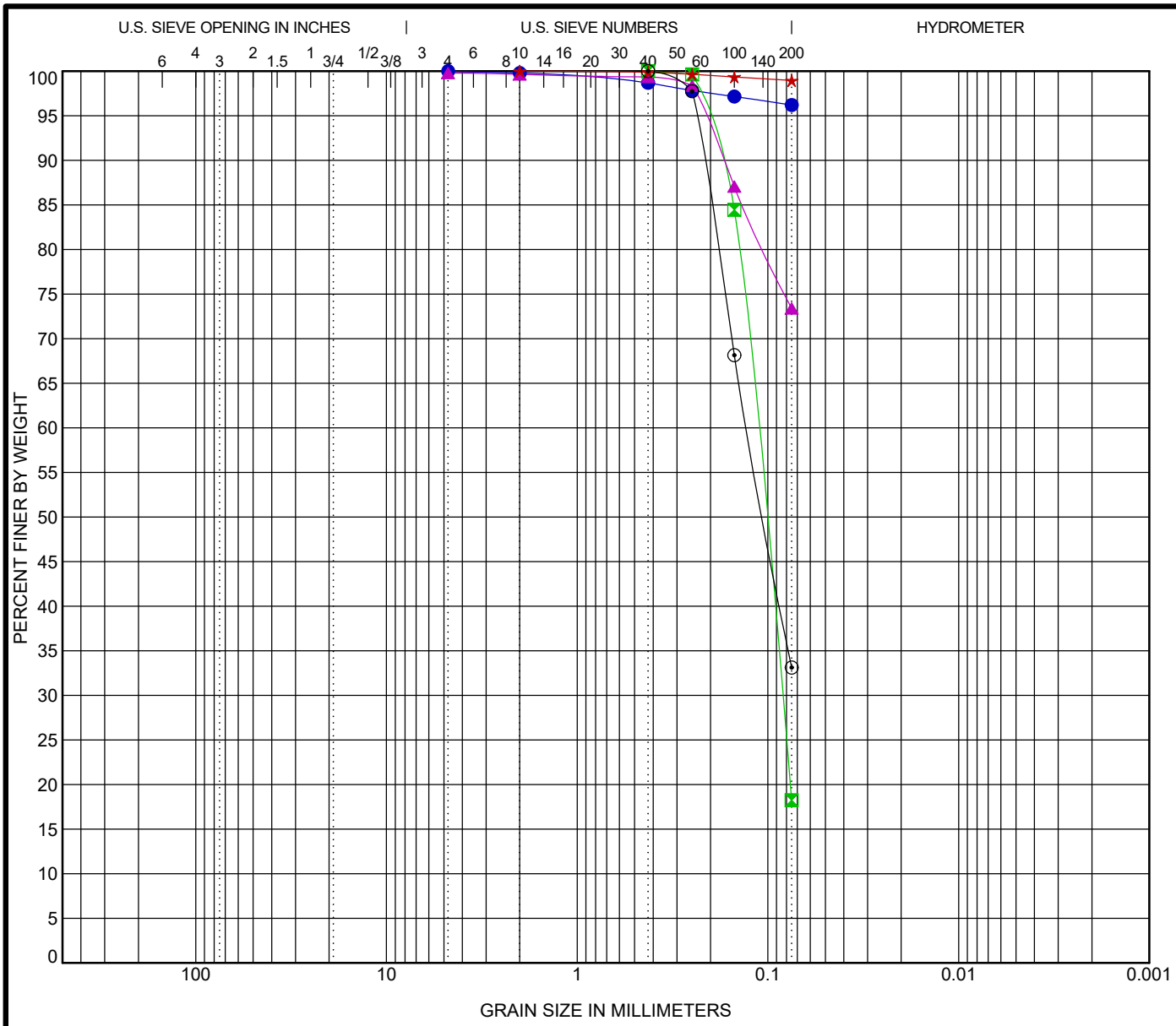
FIGURE B-20



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-50	15.0	CLAY LEAN (CL)					
⊠	DP-51	35.0	SILTY SAND (SM)					
▲	DP-51	48.5	CLAY LEAN (CL)					
★	DP-52	20.0	CLAY LEAN (CL)					
⊙	DP-52	40.0	SILTY SAND (SM)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-50	15.0	4.75				0.0	3.8	96.2	
⊠	DP-51	35.0	0.425	0.116	0.085		0.0	81.8	18.2	
▲	DP-51	48.5	4.75				0.0	26.4	73.4	
★	DP-52	20.0	2				0.0	1.1	98.9	
⊙	DP-52	40.0	0.425	0.128			0.0	66.9	33.1	

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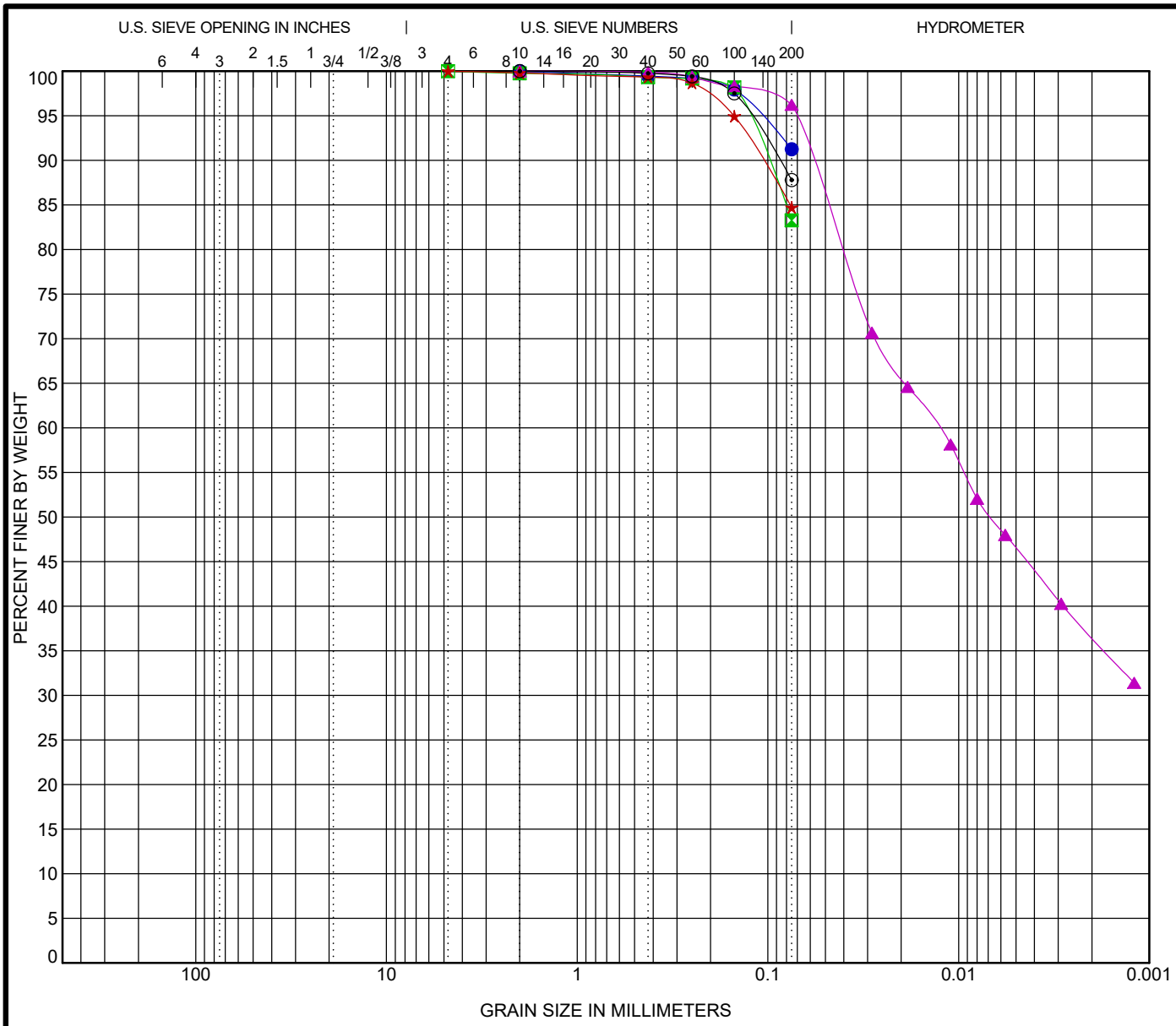

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-53	2.0	FILL: LEAN CLAY (CL)					
⊠	DP-53	8.0	CLAY LEAN (CL)					
▲	DP-53	35.0	FAT CLAY (CH)					
★	DP-54	0.0	FILL: LEAN CLAY (CL)					
⊙	DP-54	10.0	SANDY LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-53	2.0	2				0.0	8.8	91.2	
⊠	DP-53	8.0	4.75				0.0	16.7	83.3	
▲	DP-53	35.0	2	0.013			0.0	3.8	49.7	46.5
★	DP-54	0.0	4.75				0.0	15.3	84.7	
⊙	DP-54	10.0	2				0.0	12.2	87.8	

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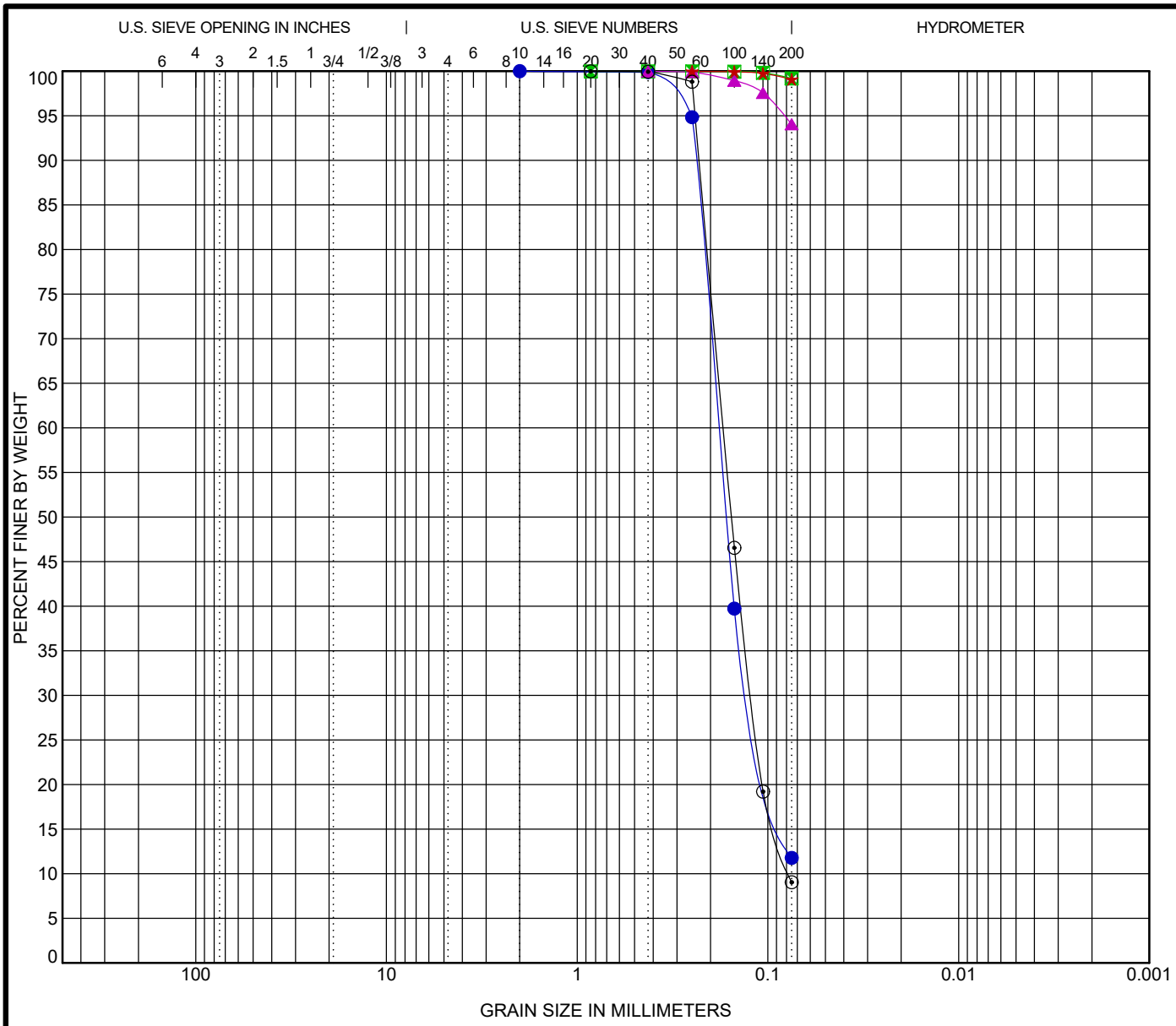
FIGURE B-22



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-55	30.0	SAND w/ SILT (SP-SM)				1.07	2.52
⊠	DP-56	2.5	FILL: LEAN CLAY (CL)					
▲	DP-56	8.0	CLAY LEAN (CL)					
★	DP-57	4.0	FILL: LEAN CLAY (CL)					
⊙	DP-57	35.0	SAND w/ SILT (SP-SM)				1.12	2.21

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-55	30.0	2	0.181	0.118		0.0	88.2	11.8	
⊠	DP-56	2.5	0.85				0.0	0.8	99.2	
▲	DP-56	8.0	0.425				0.0	5.9	94.0	
★	DP-57	4.0	0.25				0.0	0.9	99.1	
⊙	DP-57	35.0	0.85	0.171	0.122	0.077	0.0	90.9	9.0	

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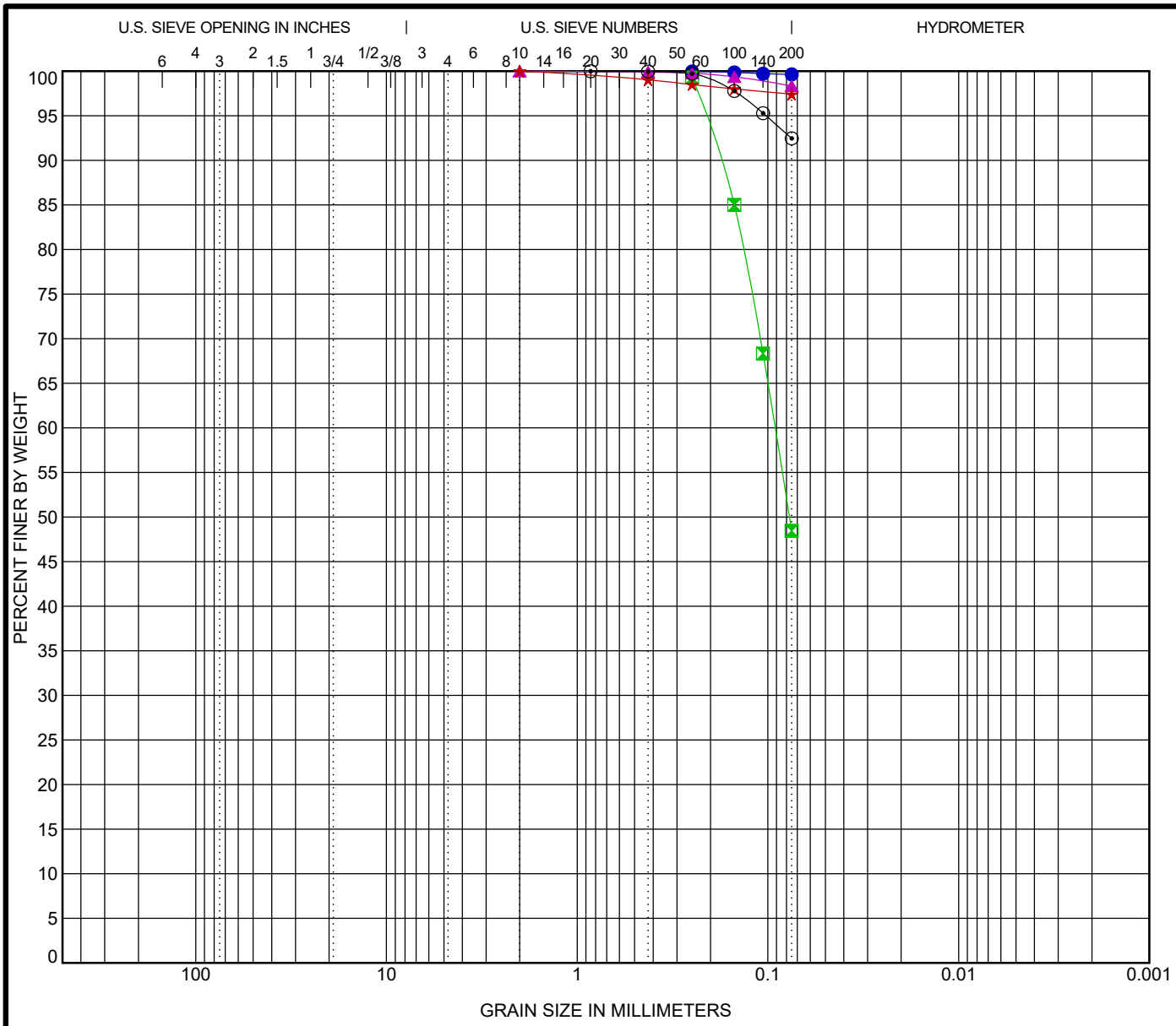
FIGURE B-23



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-58	2.5	FILL: LEAN CLAY (CL)					
⊠	DP-58	40.0	CLAYEY SAND (SC)					
▲	DP-59	2.5	FILL: LEAN CLAY (CL)					
★	DP-59	8.0	CLAY LEAN (CL)					
⊙	DP-60	4.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-58	2.5	0.25				0.0	0.3	99.6	
⊠	DP-58	40.0	0.25	0.092			0.0	50.9	48.4	
▲	DP-59	2.5	2				0.0	1.7	98.3	
★	DP-59	8.0	2				0.0	2.6	97.4	
⊙	DP-60	4.0	0.85				0.0	7.5	92.5	

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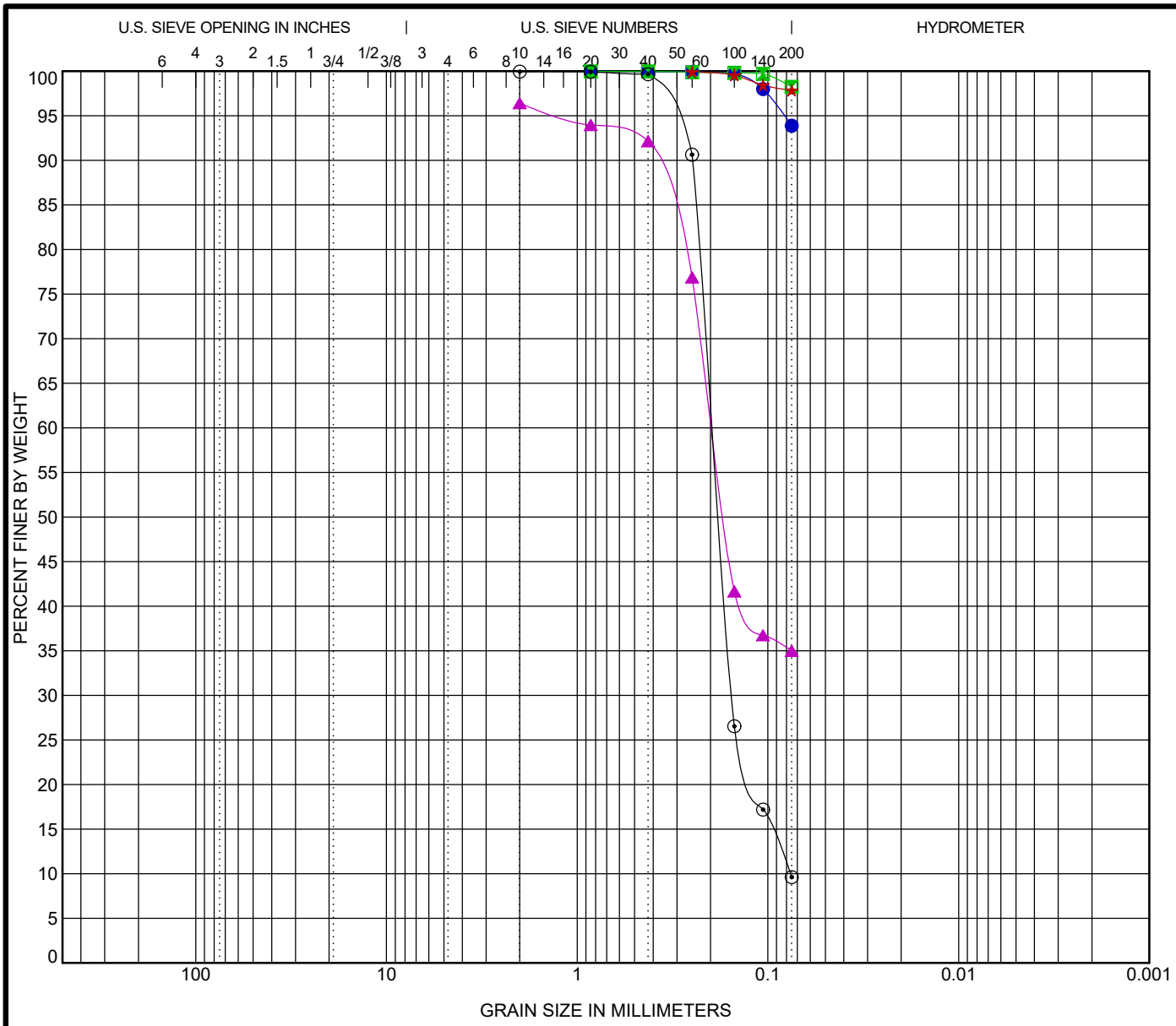
FIGURE B-24



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-60	10.0	CLAY LEAN (CL)					
⊠	DP-61	10.0	SAND w/ SILT (SP-SM)					
▲	DP-61	40.0	CLAYEY SAND (SC)					
★	DP-62	6.0	FILL: FAT CLAY (CH)					
⊙	DP-62	25.0	SAND w/ SILT (SP-SM)				1.59	2.57

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-60	10.0	0.85				0.0	6.1	93.9	
⊠	DP-61	10.0	0.85				0.0	1.7	98.2	
▲	DP-61	40.0	2	0.196			0.0	61.4	35.0	
★	DP-62	6.0	0.25				0.0	2.1	97.9	
⊙	DP-62	25.0	2	0.196	0.154	0.076	0.0	90.3	9.6	

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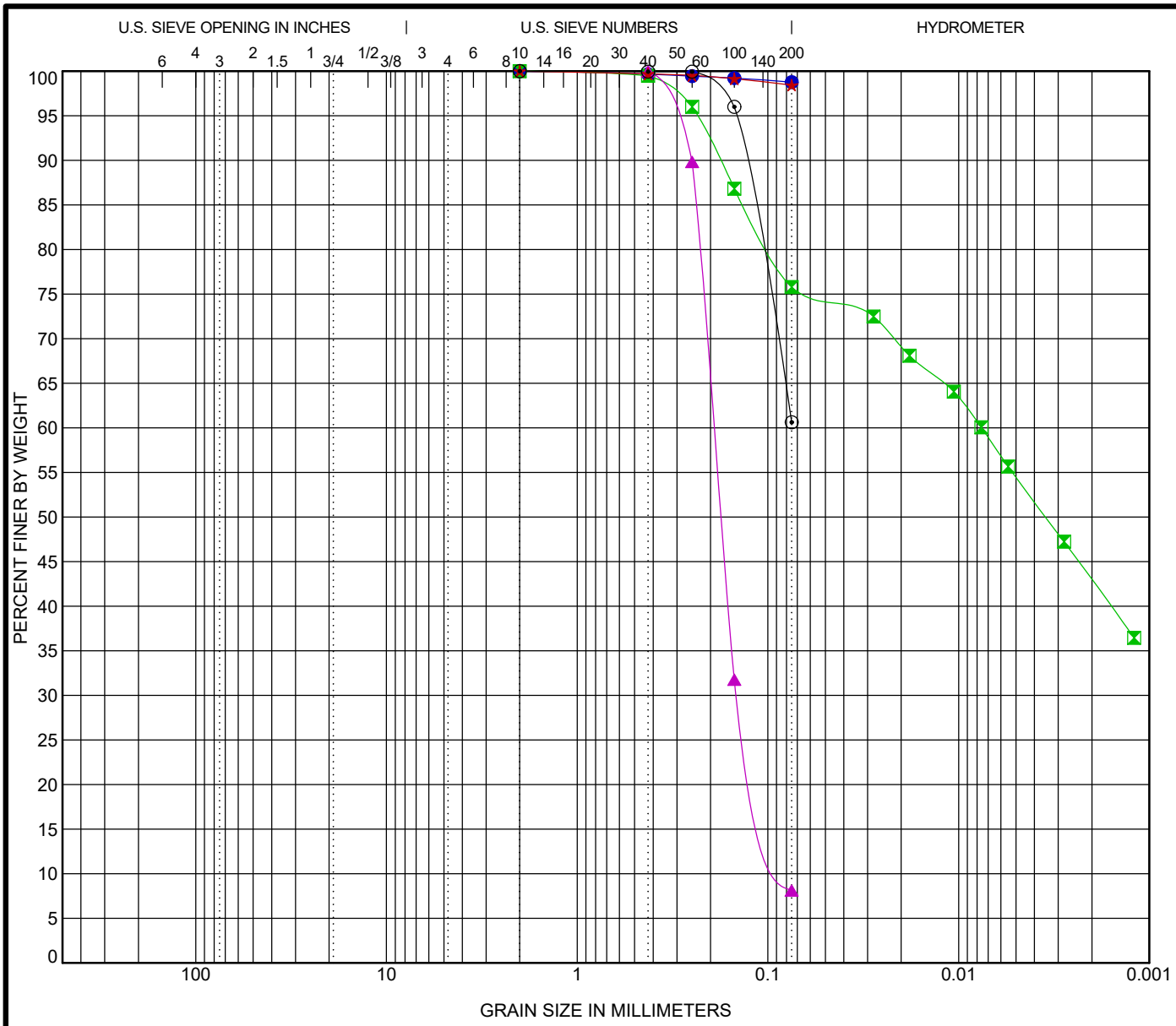
FIGURE B-25



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-63	6.0	CLAY LEAN (CL)					
⊠	DP-63	10.0	CLAY LEAN (CL)					
▲	DP-63	40.0	SAND w/ SILT (SP-SM)				1.33	2.43
★	DP-64	15.0	SAND w/ SILT (SP-SM)					
⊙	DP-64	48.5	SANDY LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-63	6.0	2				0.0	1.2	98.8	
⊠	DP-63	10.0	2	0.008			0.0	24.2	21.3	54.5
▲	DP-63	40.0	0.425	0.192	0.142	0.079	0.0	91.9	8.1	
★	DP-64	15.0	2				0.0	1.6	98.4	
⊙	DP-64	48.5	2				0.0	39.4	60.6	

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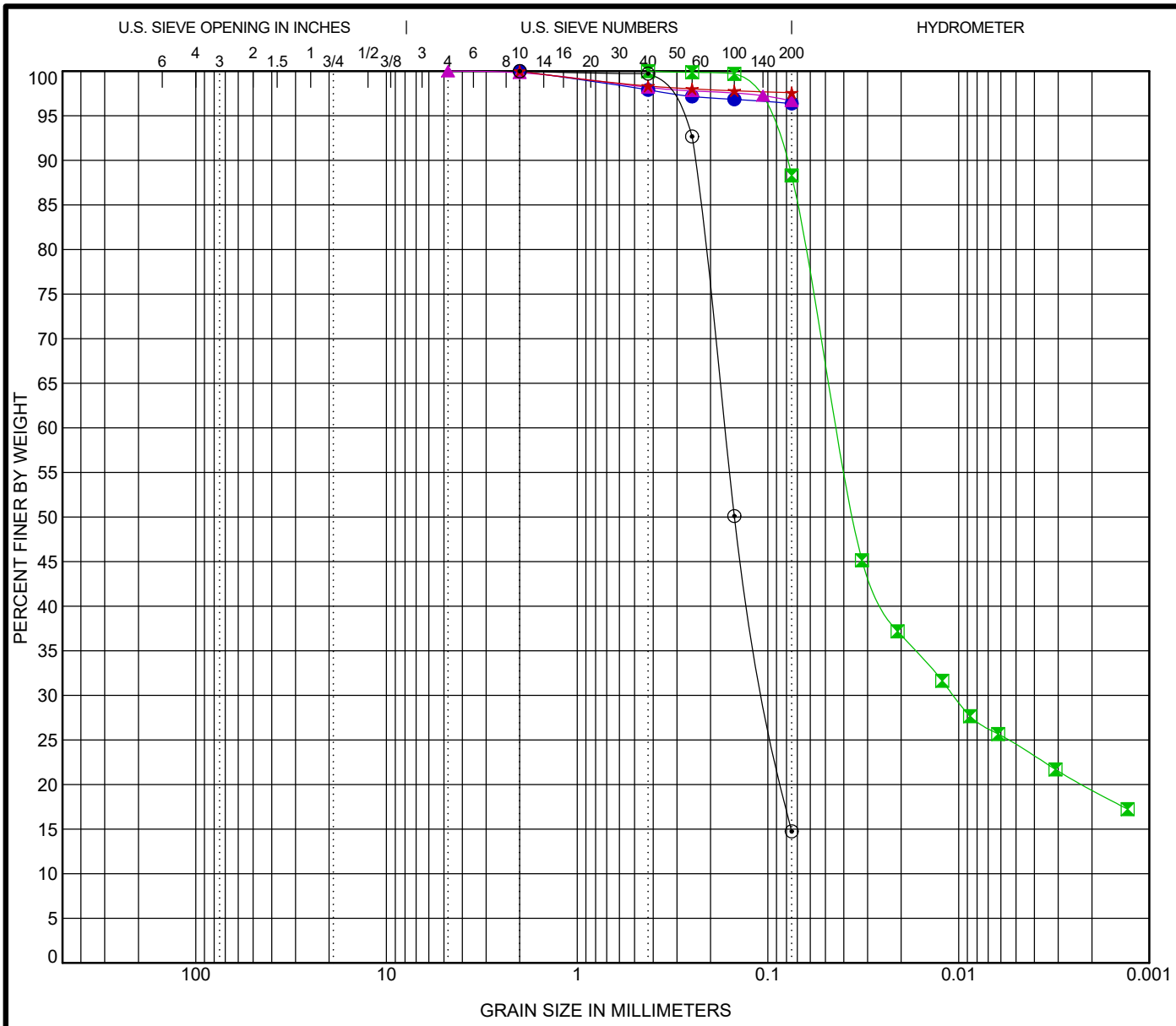
FIGURE B-26



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-65	0.0	FILL: FAT CLAY (CH)	53	23	30		
⊠	DP-65	20.0	FAT CLAY (CH)					
▲	DP-65	25.0	FAT CLAY (CH)					
★	DP-66	2.0	FILL: LEAN CLAY (CL)					
⊙	DP-66	35.0	SILTY SAND (SM)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-65	0.0	2				0.0	3.6	96.4	
⊠	DP-65	20.0	0.425	0.043	0.011		0.0	11.7	63.9	24.4
▲	DP-65	25.0	4.75				0.0	3.3	96.7	
★	DP-66	2.0	2				0.0	2.4	97.6	
⊙	DP-66	35.0	2	0.169	0.101		0.0	85.2	14.8	

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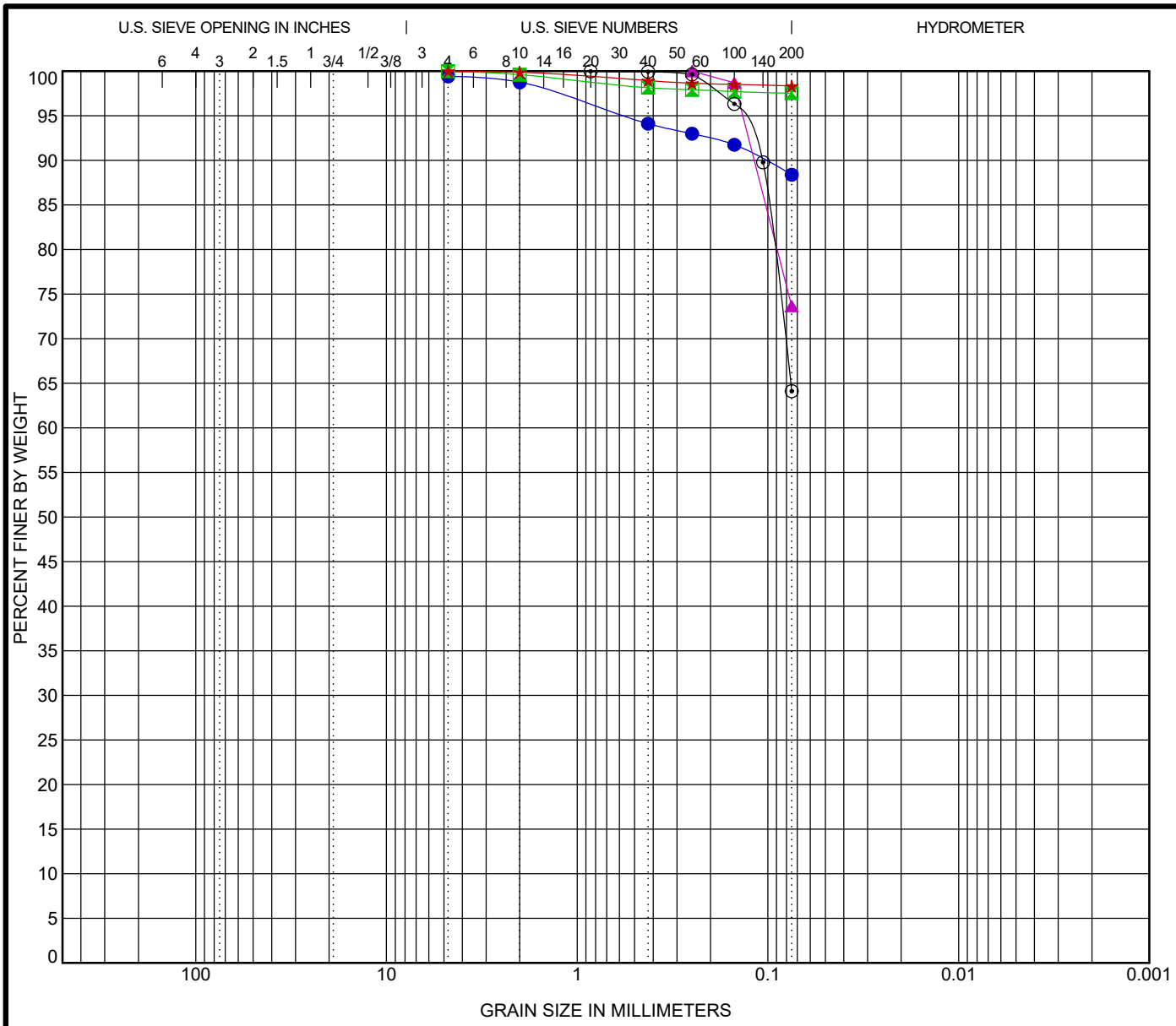
FIGURE B-27



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-67	2.0	FILL: FAT CLAY (CH)					
⊠	DP-67	25.0	SILTY SAND (SM)					
▲	DP-68	4.0	FILL: LEAN CLAY (CL)					
★	DP-68	20.0	SILTY SAND (SM)	75	28	47		
⊙	DP-69	6.0	FILL: SANDY LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-67	2.0	4.75				0.0	11.0	88.4	
⊠	DP-67	25.0	4.75				0.0	2.5	97.5	
▲	DP-68	4.0	0.25				0.0	26.3	73.7	
★	DP-68	20.0	4.75				0.0	1.7	98.3	
⊙	DP-69	6.0	0.85				0.0	35.9	64.1	

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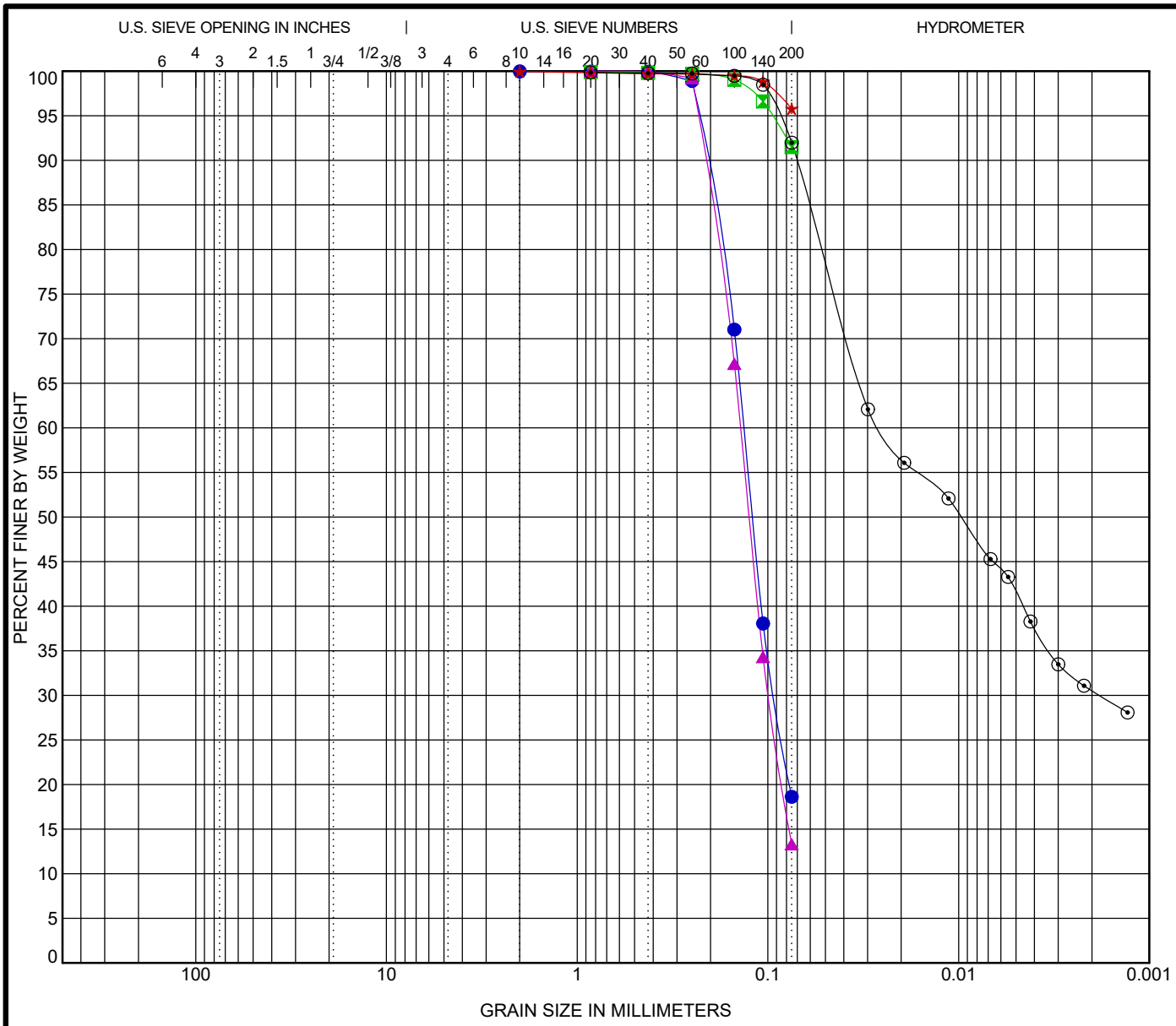

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-69	25.0	SILTY SAND (SM)					
⊠	DP-70	0.0	FILL: FAT CLAY (CH)					
▲	DP-70	35.0	SILTY SAND (SM)					
★	DP-71	2.0	FILL: LEAN CLAY (CL)					
⊙	DP-71	20.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-69	25.0	2	0.134	0.092		0.0	81.3	18.6	
⊠	DP-70	0.0	0.85				0.0	8.4	91.5	
▲	DP-70	35.0	0.85	0.139	0.099		0.0	86.7	13.3	
★	DP-71	2.0	2				0.0	4.2	95.8	
⊙	DP-71	20.0	0.85	0.026	0.002		0.0	7.9	50.5	41.5

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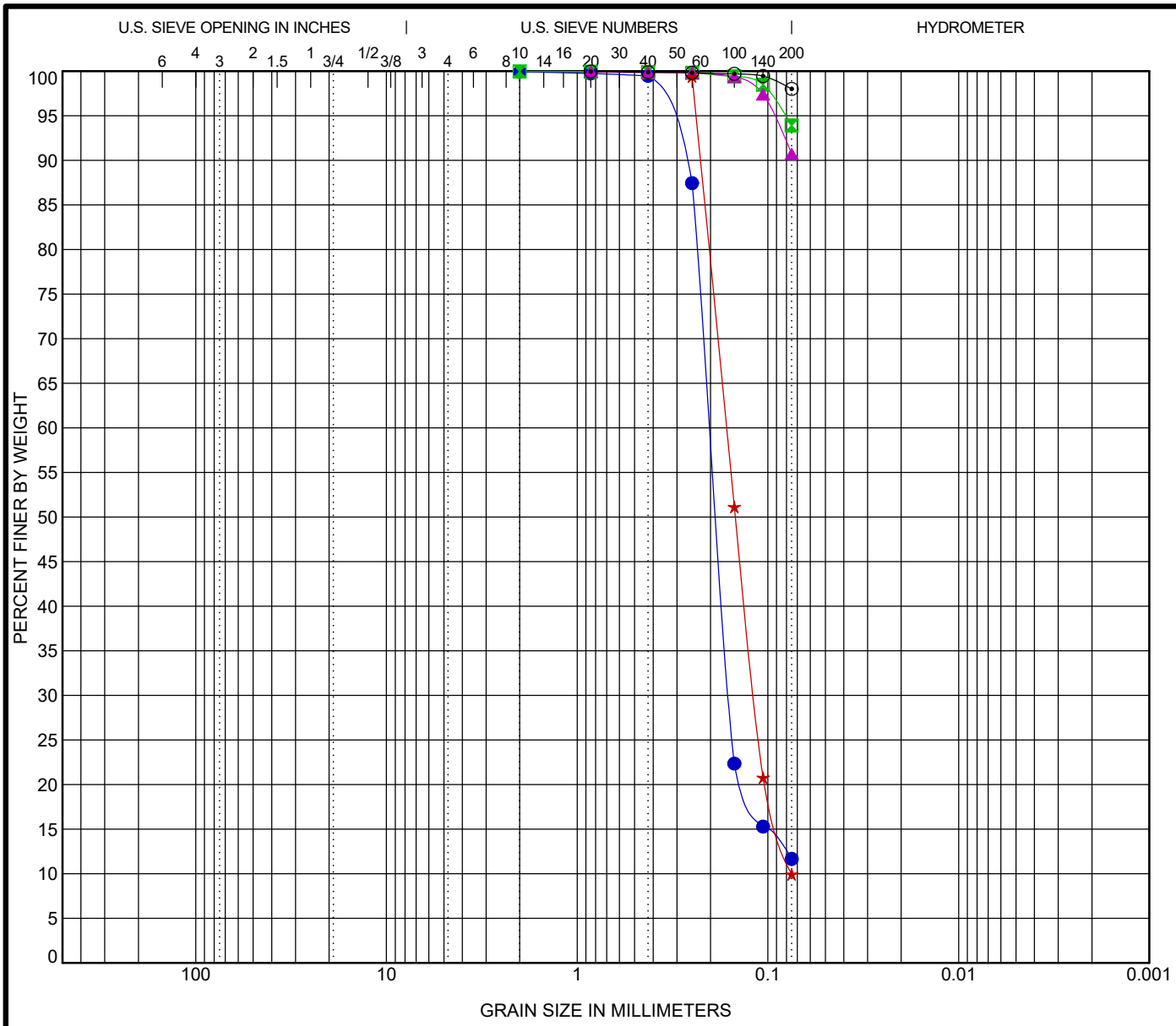
FIGURE B-29



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-71	30.0	SAND w/ SILT (SP-SM)				1.97	3.15
⊠	DP-72	0.0	FILL: LEAN CLAY (CL)					
▲	DP-73	6.0	FILL: LEAN CLAY (CL)					
★	DP-73	40.0	SAND w/ SILT (SP-SM)				1.12	2.19
⊙	DP-74	2.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-71	30.0	2	0.202	0.159		0.0	88.3	11.7	
⊠	DP-72	0.0	2				0.0	6.1	93.9	
▲	DP-73	6.0	0.85				0.0	9.2	90.7	
★	DP-73	40.0	0.25	0.165	0.118	0.075	0.0	89.5	9.9	
⊙	DP-74	2.0	0.85				0.0	1.9	98.0	

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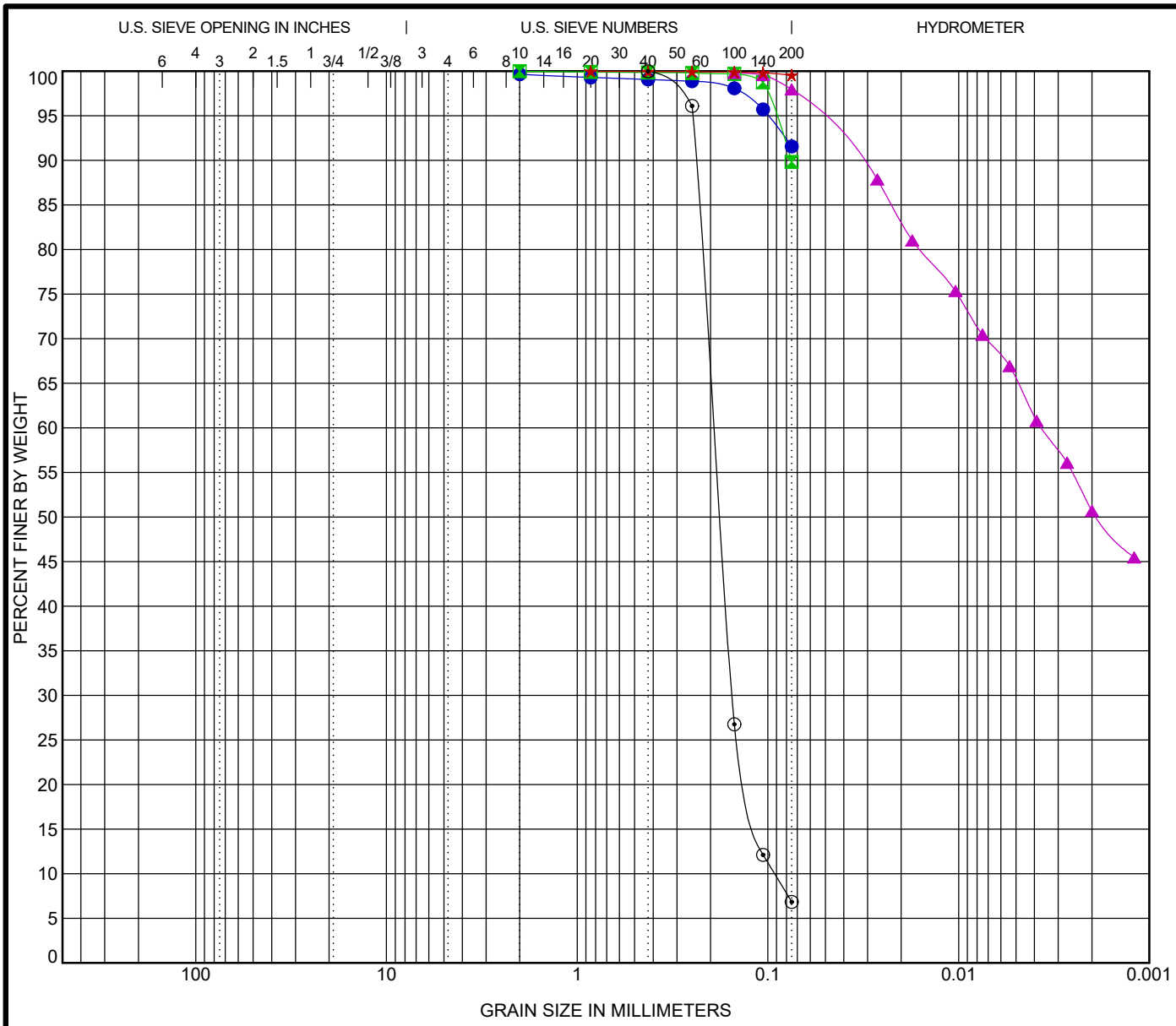
FIGURE B-30



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-75	0.0	FILL: FAT CLAY (CH)					
⊠	DP-75	10.0	FAT CLAY (CH)					
▲	DP-76	2.0	FILL: FAT CLAY (CH)					
★	DP-76	4.0	FILL: FAT CLAY (CH)					
⊙	DP-76	25.0	SAND w/ SILT (SP-SM)				1.33	2.08

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-75	0.0	2				0.0	8.1	91.6	
⊠	DP-75	10.0	2				0.0	10.2	89.8	
▲	DP-76	2.0	0.15	0.004			0.0	1.8	32.5	65.5
★	DP-76	4.0	0.85				0.0	0.4	99.6	
⊙	DP-76	25.0	0.425	0.192	0.154	0.092	0.0	93.1	6.8	

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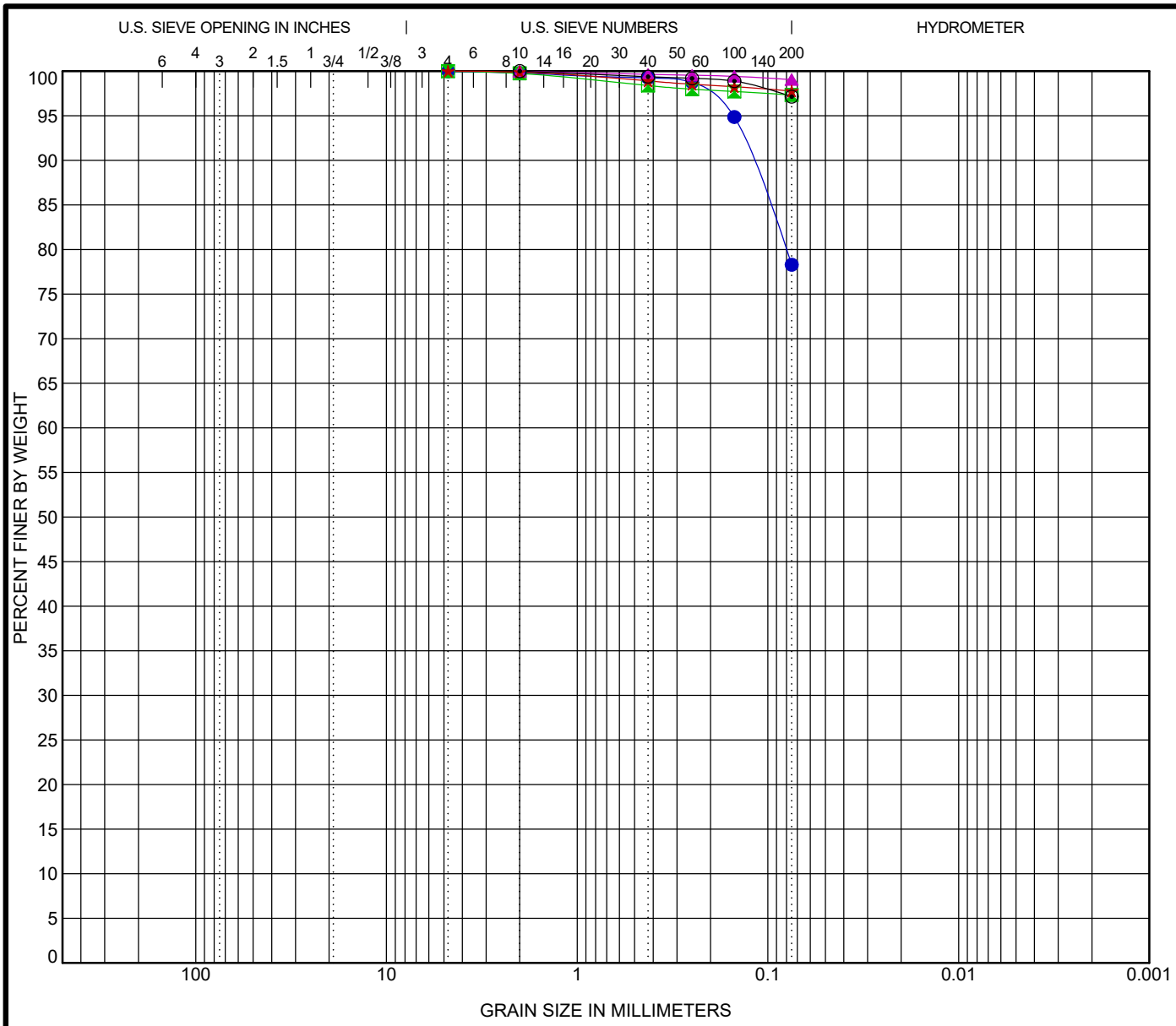

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-77	0.0	FILL: LEAN CLAY (CL)					
⊠	DP-77	15.0	FAT CLAY (CH)					
▲	DP-78	6.0	FILL: FAT CLAY (CH)					
★	DP-78	15.0	SILTY SAND (SM)					
⊙	DP-79	6.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-77	0.0	4.75				0.0	21.7	78.3	
⊠	DP-77	15.0	4.75				0.0	2.7	97.3	
▲	DP-78	6.0	2				0.0	0.9	99.1	
★	DP-78	15.0	4.75				0.0	2.2	97.8	
⊙	DP-79	6.0	2				0.0	2.9	97.1	

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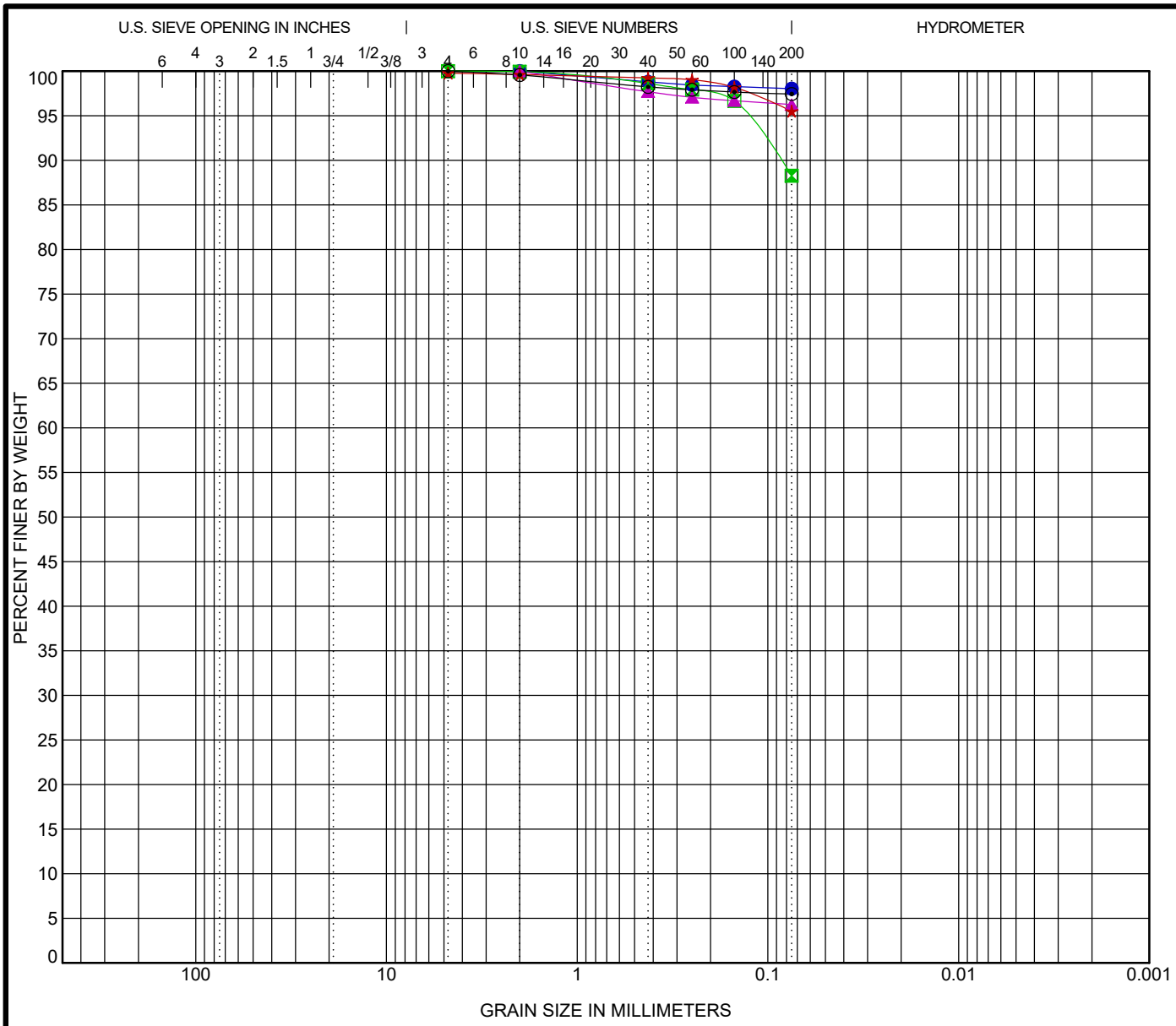

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-79**	**30.0**	**FAT CLAY (CH)**					
⊠	**DP-80**	**4.0**	**FILL: LEAN CLAY (CL)**					
▲	**DP-80**	**20.0**	**FAT CLAY (CH)**					
★	**DP-81**	**30.0**	**FAT CLAY (CH)**					
⊙	**DP-81**	**40.0**	**FAT CLAY (CH)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-79**	**30.0**	**2**				**0.0**	**2.0**	**98.0**	
⊠	**DP-80**	**4.0**	**4.75**				**0.0**	**11.7**	**88.3**	
▲	**DP-80**	**20.0**	**2**				**0.0**	**3.8**	**96.2**	
★	**DP-81**	**30.0**	**4.75**				**0.0**	**4.3**	**95.5**	
⊙	**DP-81**	**40.0**	**4.75**				**0.0**	**2.6**	**97.4**	

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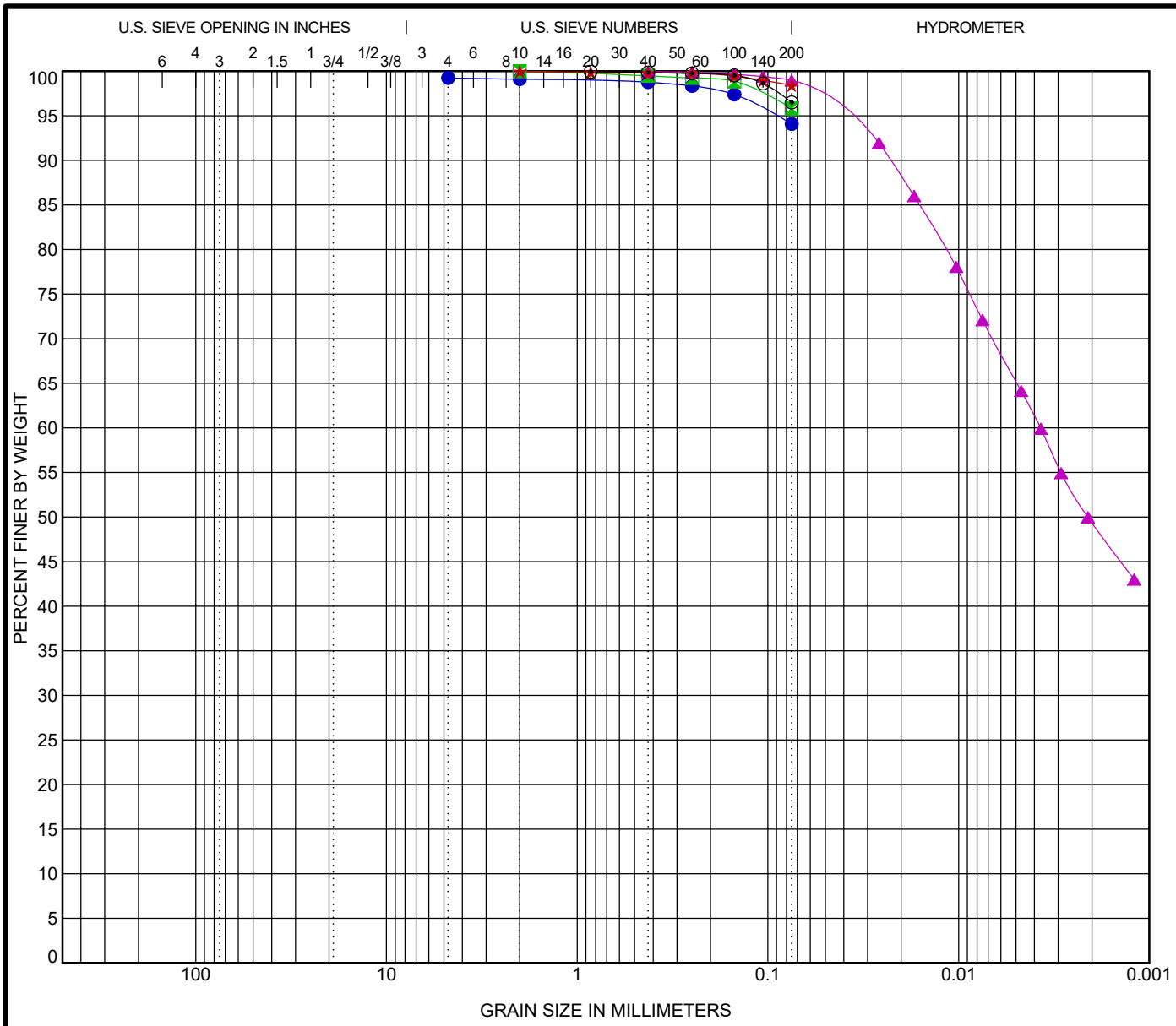

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-82	0.0	FILL: FAT CLAY (CH)					
⊠	DP-82	20.0	FAT CLAY (CH)					
▲	DP-83	4.0	FILL: FAT CLAY (CH)					
★	DP-83	10.0	FAT CLAY (CH)					
⊙	DP-83	40.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-82	0.0	4.75				0.0	5.2	94.1	
⊠	DP-82	20.0	2				0.0	4.2	95.8	
▲	DP-83	4.0	0.425	0.004			0.0	1.0	33.8	65.2
★	DP-83	10.0	2				0.0	1.5	98.4	
⊙	DP-83	40.0	0.85				0.0	3.4	96.5	

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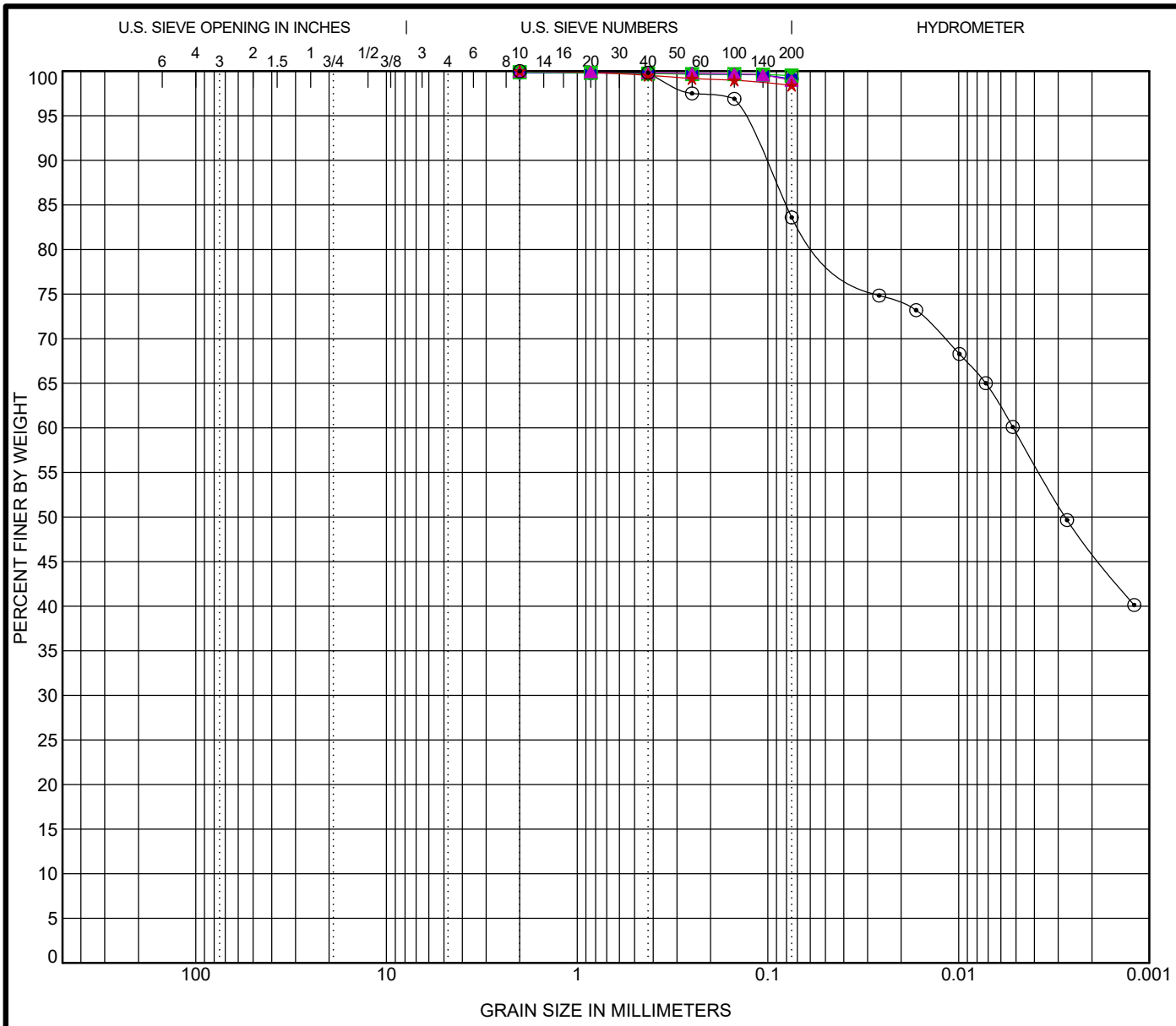
FIGURE B-34



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-84	40.0	FAT CLAY (CH)					
⊠	DP-85	25.0	FAT CLAY (CH)					
▲	DP-85	40.0	FAT CLAY (CH)					
★	DP-87	10.0	CLAY LEAN (CL)					
⊙	DP-87	20.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-84	40.0	2				0.0	0.7	99.1	
⊠	DP-85	25.0	2				0.0	0.4	99.5	
▲	DP-85	40.0	2				0.0	1.0	98.9	
★	DP-87	10.0	2				0.0	1.6	98.4	
⊙	DP-87	20.0	2	0.005			0.0	16.4	24.1	59.5

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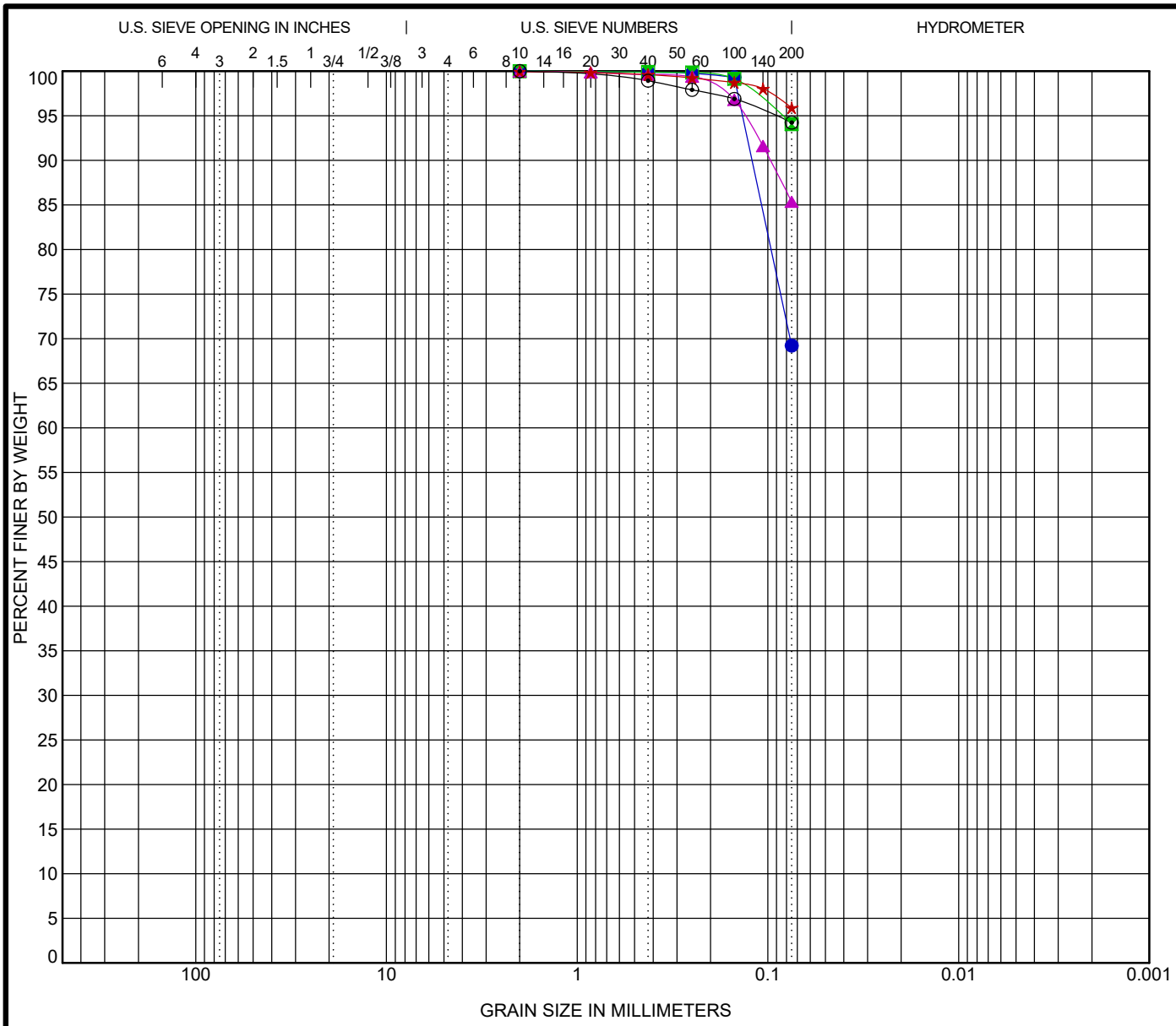
FIGURE B-35



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-87	40.0	SANDY LEAN CLAY (CL)					
⊠	DP-88	2.0	FILL: FAT CLAY (CH)					
▲	DP-89	15.0	CLAY LEAN (CL)					
★	DP-89	40.0	FAT CLAY (CH)					
⊙	DP-90	0.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-87	40.0	2				0.0	30.8	69.2	
⊠	DP-88	2.0	2				0.0	5.9	94.1	
▲	DP-89	15.0	2				0.0	14.6	85.3	
★	DP-89	40.0	2				0.0	4.0	95.9	
⊙	DP-90	0.0	2				0.0	5.8	94.2	

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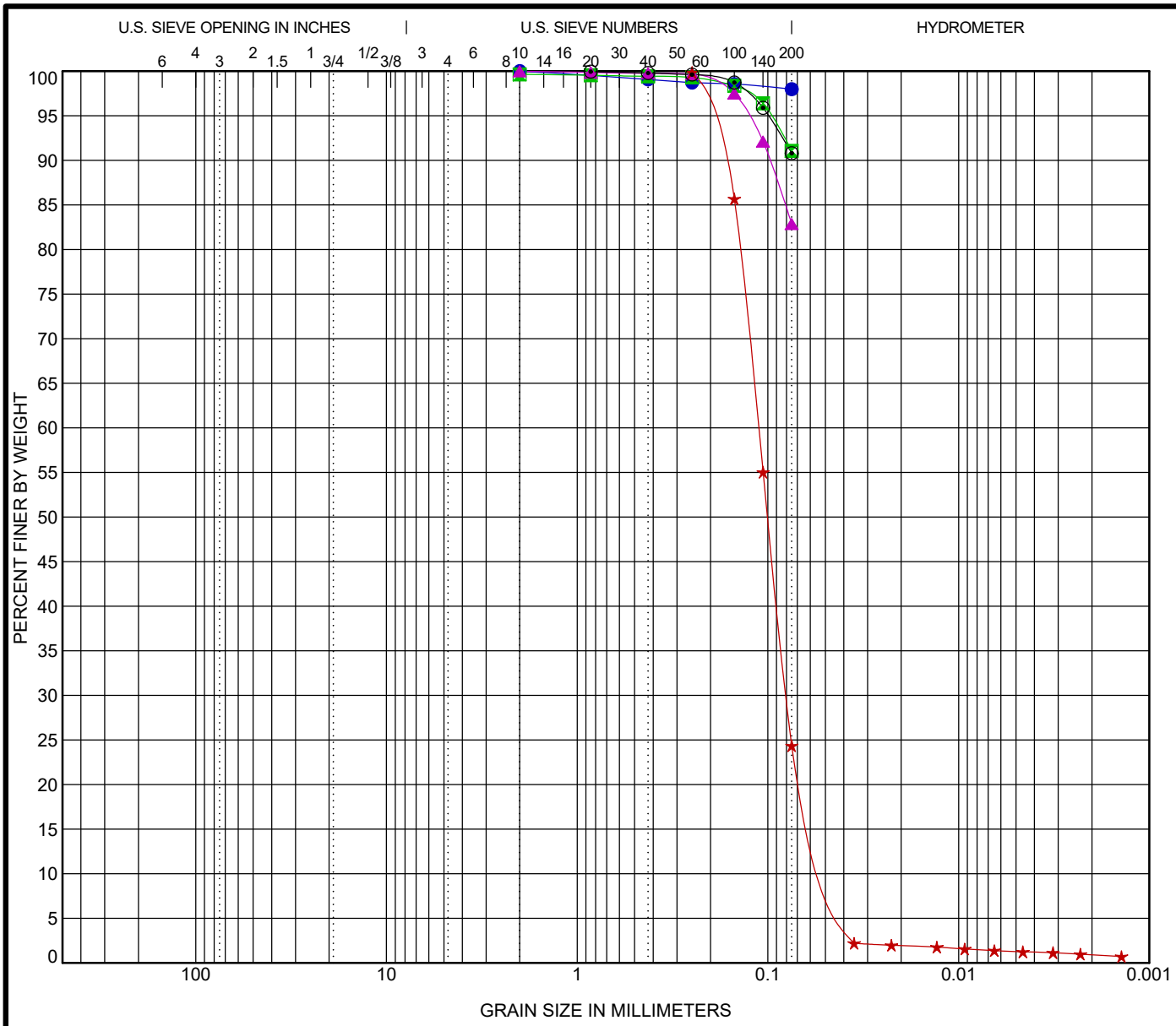
FIGURE B-36



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-90	30.0	CLAY LEAN (CL)					
⊠	DP-91	0.0	FILL: LEAN CLAY (CL)					
▲	DP-91	20.0	CLAY LEAN (CL)					
★	DP-91	25.0	SILTY SAND (SM)				1.24	2.44
⊙	DP-92	6.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-90	30.0	2				0.0	2.0	98.0	
⊠	DP-91	0.0	2				0.0	8.6	91.1	
▲	DP-91	20.0	2				0.0	17.1	82.9	
★	DP-91	25.0	0.25	0.112	0.08	0.046	0.0	75.5	23.1	1.3
⊙	DP-92	6.0	0.85				0.0	9.2	90.8	

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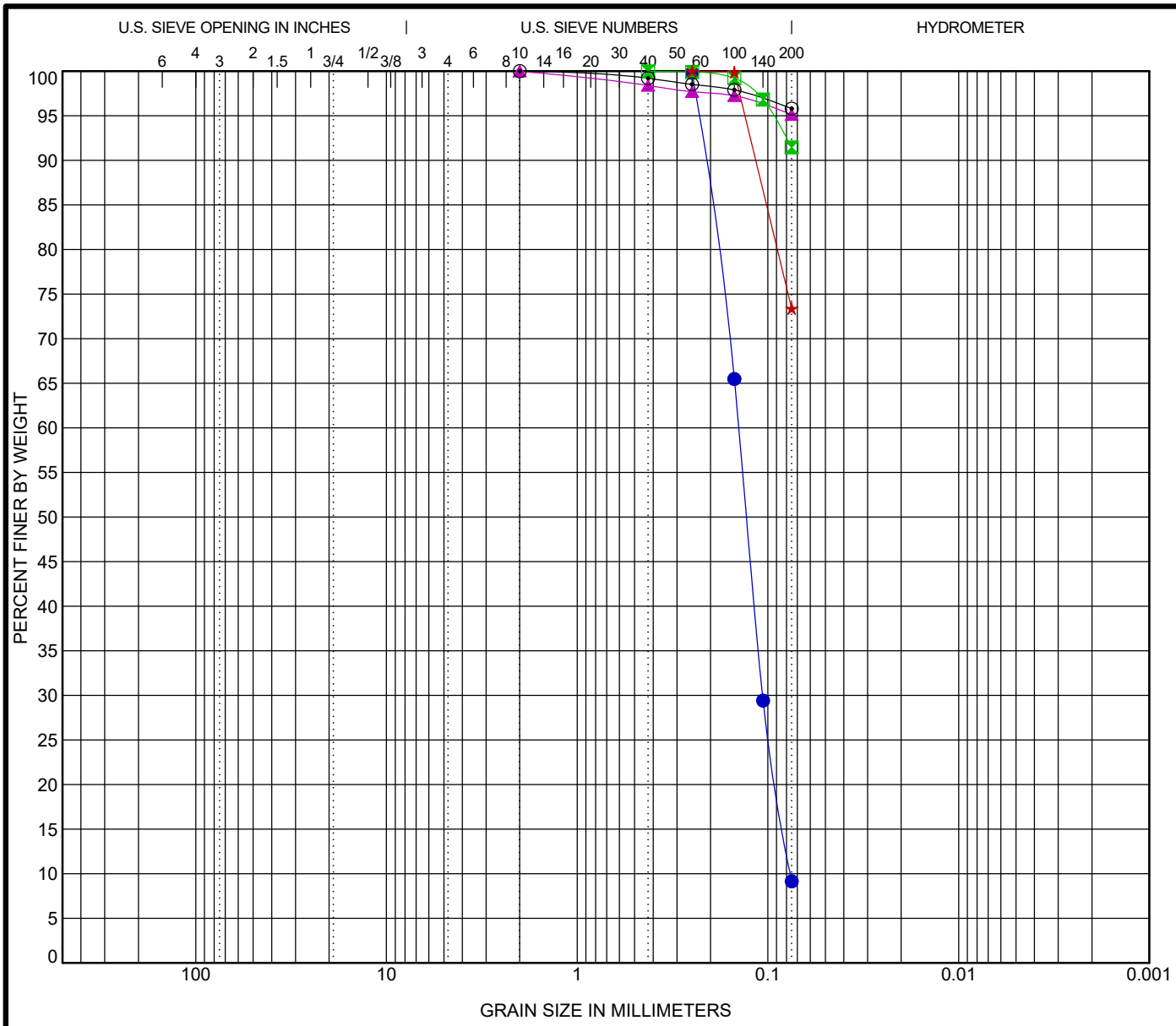

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-92	30.0	SAND w/ SILT (SP-SM)				1.05	1.87
⊠	DP-93	8.0	CLAY LEAN (CL)					
▲	DP-94	6.0	FILL: FAT CLAY (CH)					
★	DP-94	30.0	CLAY LEAN (CL)					
⊙	DP-95	2.0	FILL: FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-92	30.0	0.25	0.142	0.107	0.076	0.0	90.7	9.1	
⊠	DP-93	8.0	0.425				0.0	8.5	91.5	
▲	DP-94	6.0	2				0.0	4.9	95.1	
★	DP-94	30.0	0.25				0.0	26.6	73.4	
⊙	DP-95	2.0	2				0.0	4.2	95.8	

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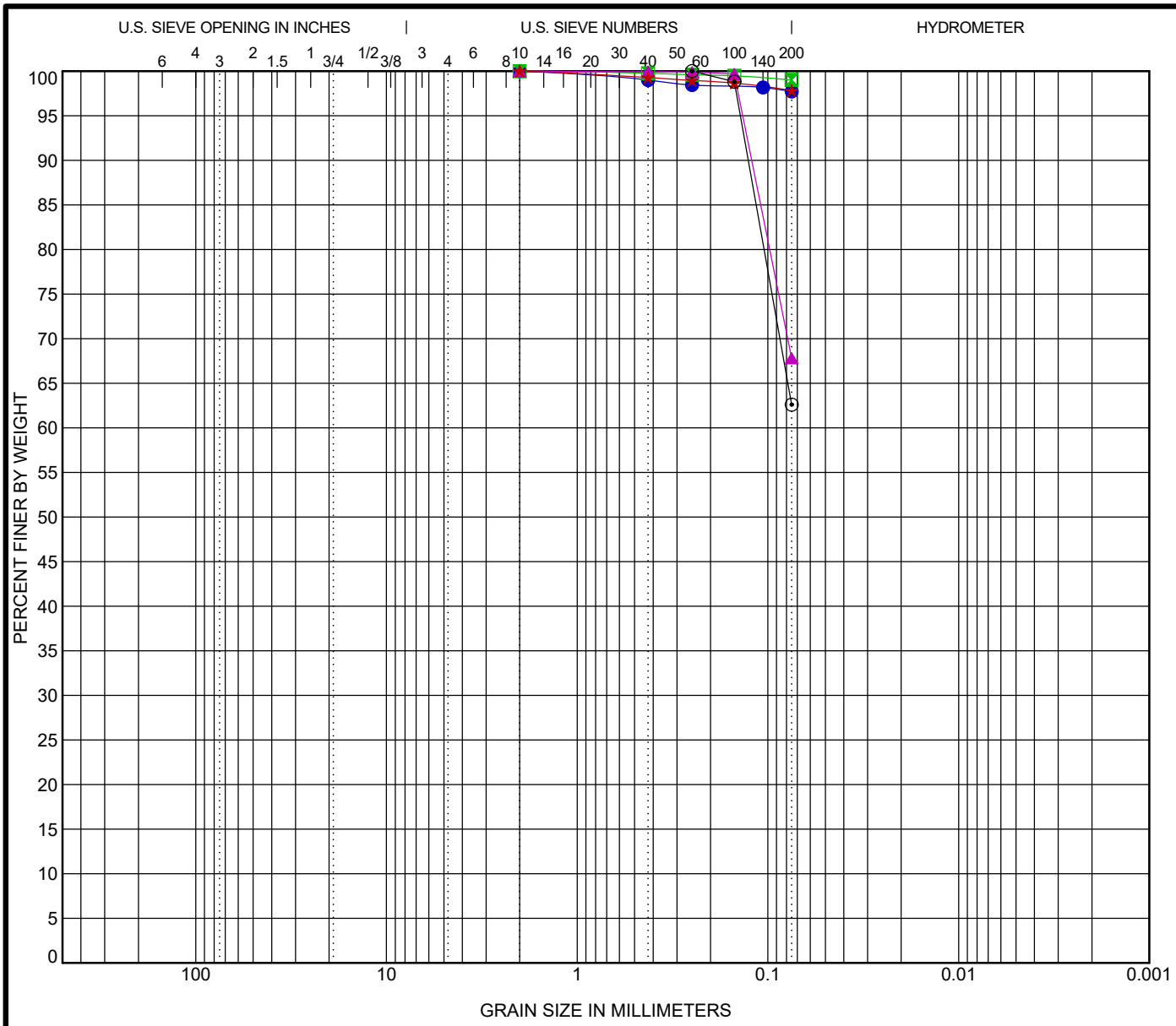

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-95	15.0	**CLAY LEAN (CL)**					
⊠	DP-96	8.0	**FILL: LEAN CLAY (CL)**					
▲	DP-96	20.0	**SANDY LEAN CLAY (CL)**					
★	DP-97	2.0	**FILL: FAT CLAY (CH)**					
⊙	DP-97	20.0	**SANDY LEAN CLAY (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-95	15.0	2				0.0	2.3	97.7	
⊠	DP-96	8.0	2				0.0	1.0	99.0	
▲	DP-96	20.0	2				0.0	32.2	67.8	
★	DP-97	2.0	2				0.0	2.2	97.8	
⊙	DP-97	20.0	0.25				0.0	37.4	62.6	

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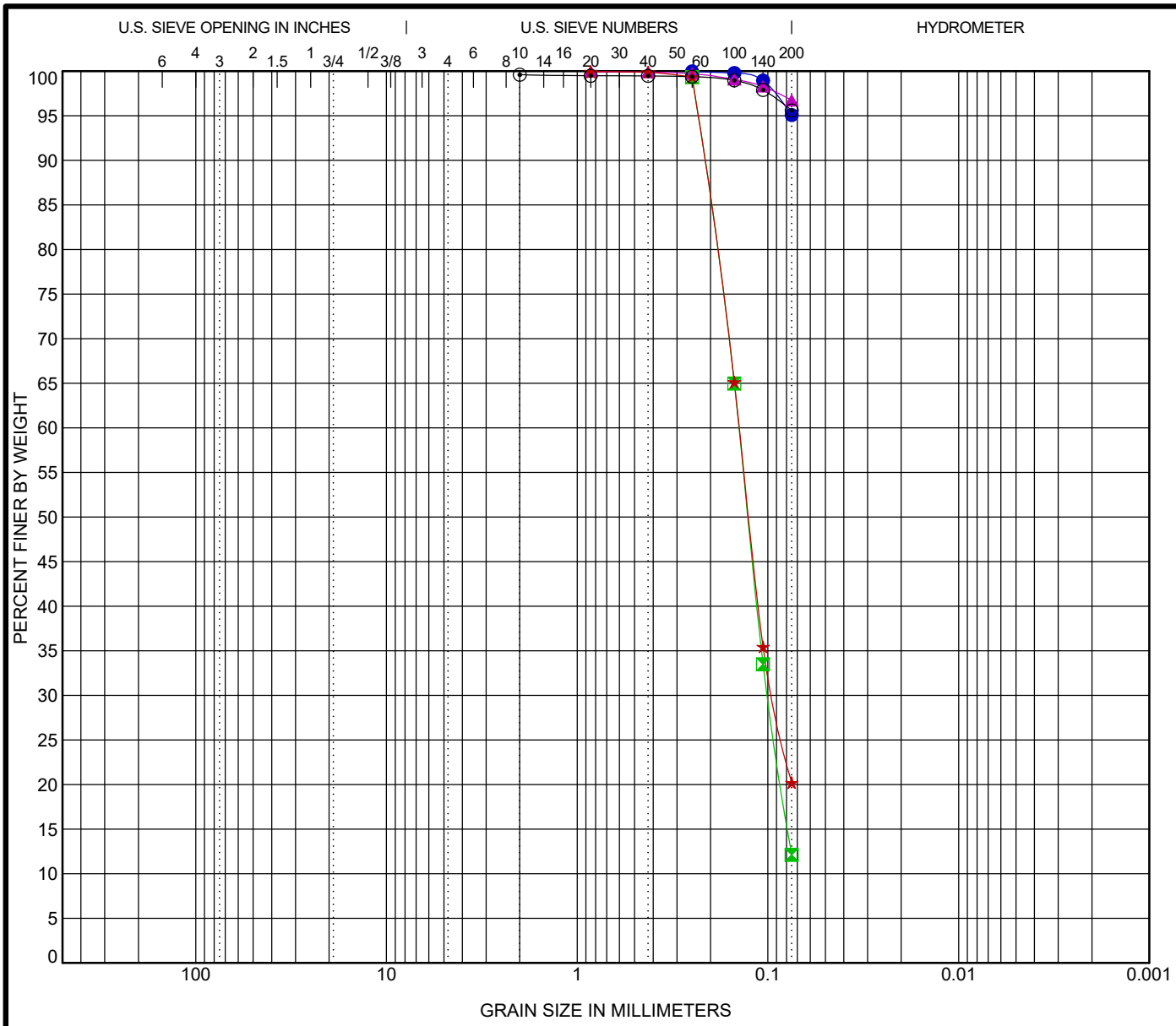

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	DP-98	0.0	FILL: LEAN CLAY (CL)					
⊠	DP-98	35.0	SAND w/ SILT (SP-SM)				0.98	1.96
▲	DP-99	6.0	FILL: LEAN CLAY (CL)					
★	DP-99	25.0	SILTY SAND (SM)					
⊙	DP-100	2.0	FILL: LEAN CLAY (CL)					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-98	0.0	0.25				0.0	4.9	95.1	
⊠	DP-98	35.0	0.25	0.142	0.1		0.0	87.2	12.1	
▲	DP-99	6.0	0.85				0.0	3.2	96.7	
★	DP-99	25.0	0.85	0.141	0.094		0.0	79.7	20.2	
⊙	DP-100	2.0	2				0.0	4.0	95.6	

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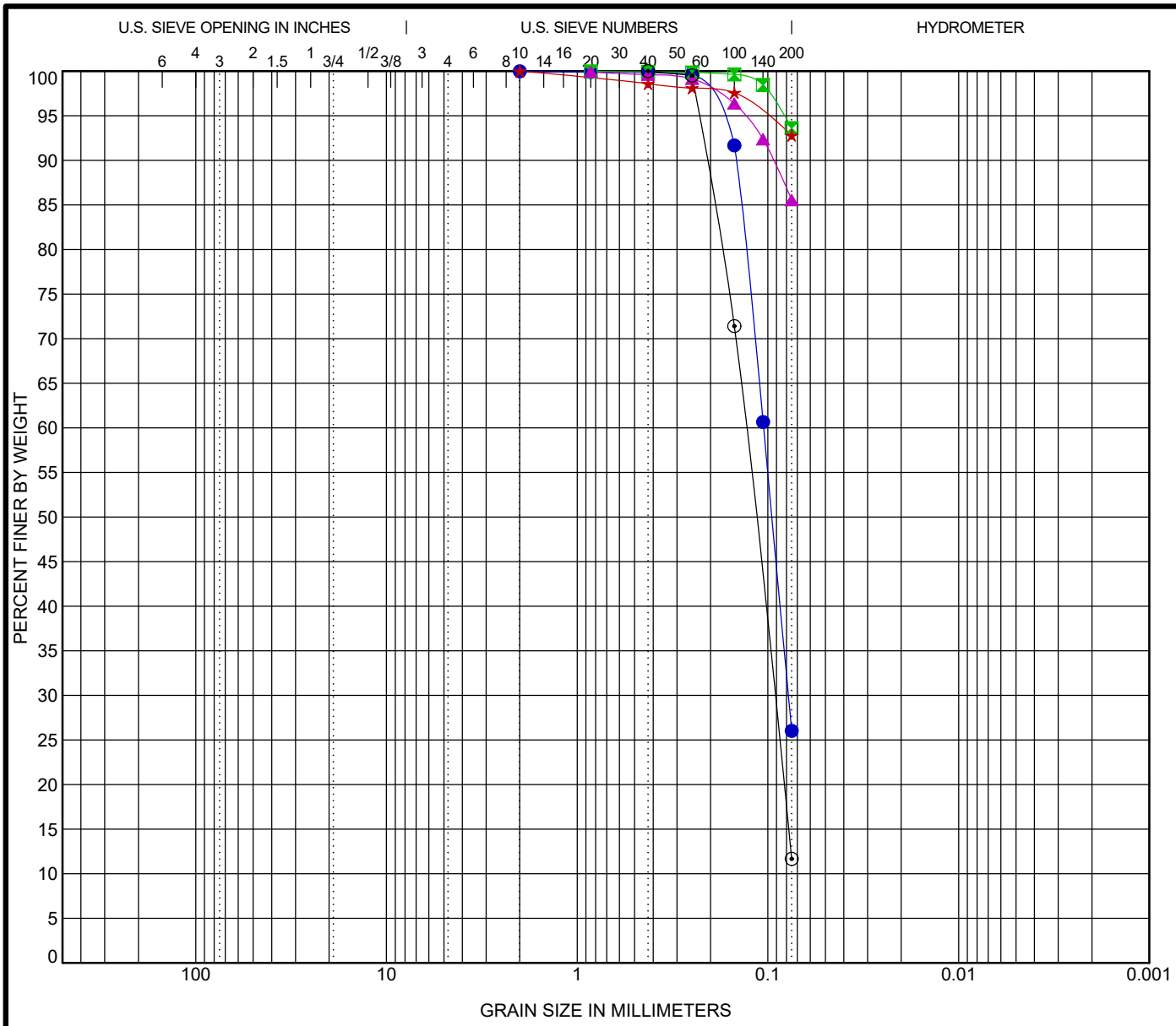
FIGURE B-40



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-100**	**35.0**	**SILTY SAND (SM)**					
⊠	**DP-101**	**0.0**	**FILL: LEAN CLAY (CL)**					
▲	**DP-101**	**6.0**	**FILL: LEAN CLAY (CL)**					
★	**DP-102**	**2.0**	**FILL: FAT CLAY (CH)**					
⊙	**DP-102**	**40.0**	**SAND w/ SILT (SP-SM)**				**0.89**	**1.79**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-100**	**35.0**	**2**	**0.105**	**0.078**		**0.0**	**74.0**	**26.0**	
⊠	**DP-101**	**0.0**	**0.85**				**0.0**	**6.4**	**93.6**	
▲	**DP-101**	**6.0**	**0.85**				**0.0**	**14.4**	**85.5**	
★	**DP-102**	**2.0**	**2**				**0.0**	**7.2**	**92.8**	
⊙	**DP-102**	**40.0**	**0.425**	**0.131**	**0.093**		**0.0**	**88.3**	**11.7**	

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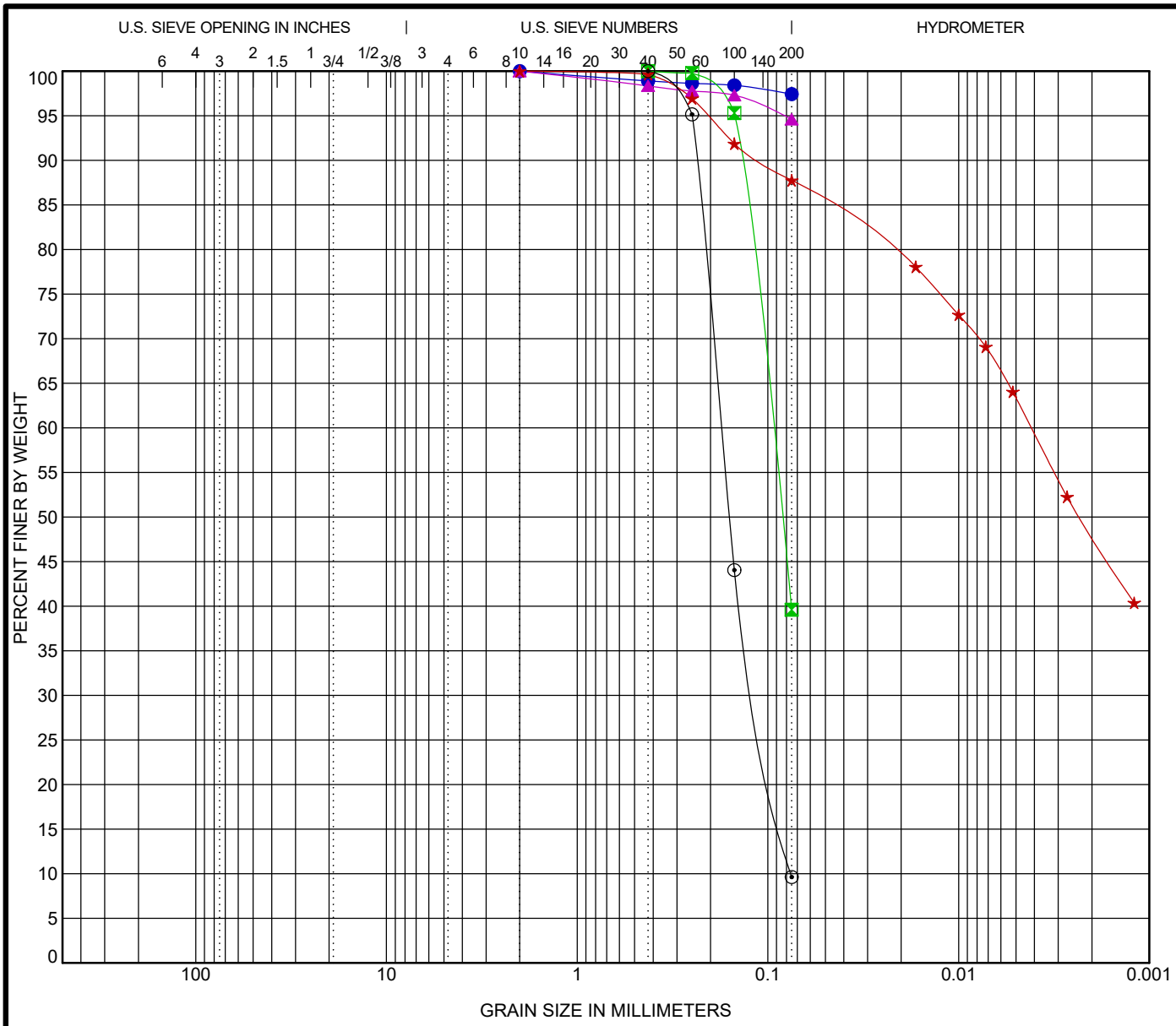

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-103	4.0	FILL: LEAN CLAY (CL)					
⊠	DP-103	25.0	CLAYEY SAND (SC)					
▲	DP-104	2.0	FILL: LEAN CLAY (CL)					
★	DP-104	8.0	FAT CLAY (CH)					
⊙	DP-104	30.0	SAND w/ SILT (SP-SM)				0.96	2.33

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-103	4.0	2				0.0	2.6	97.4	
⊠	DP-103	25.0	0.425	0.097			0.0	60.4	39.6	
▲	DP-104	2.0	2				0.0	5.4	94.6	
★	DP-104	8.0	2	0.004			0.0	12.2	24.4	63.3
⊙	DP-104	30.0	0.425	0.176	0.113	0.076	0.0	90.4	9.6	

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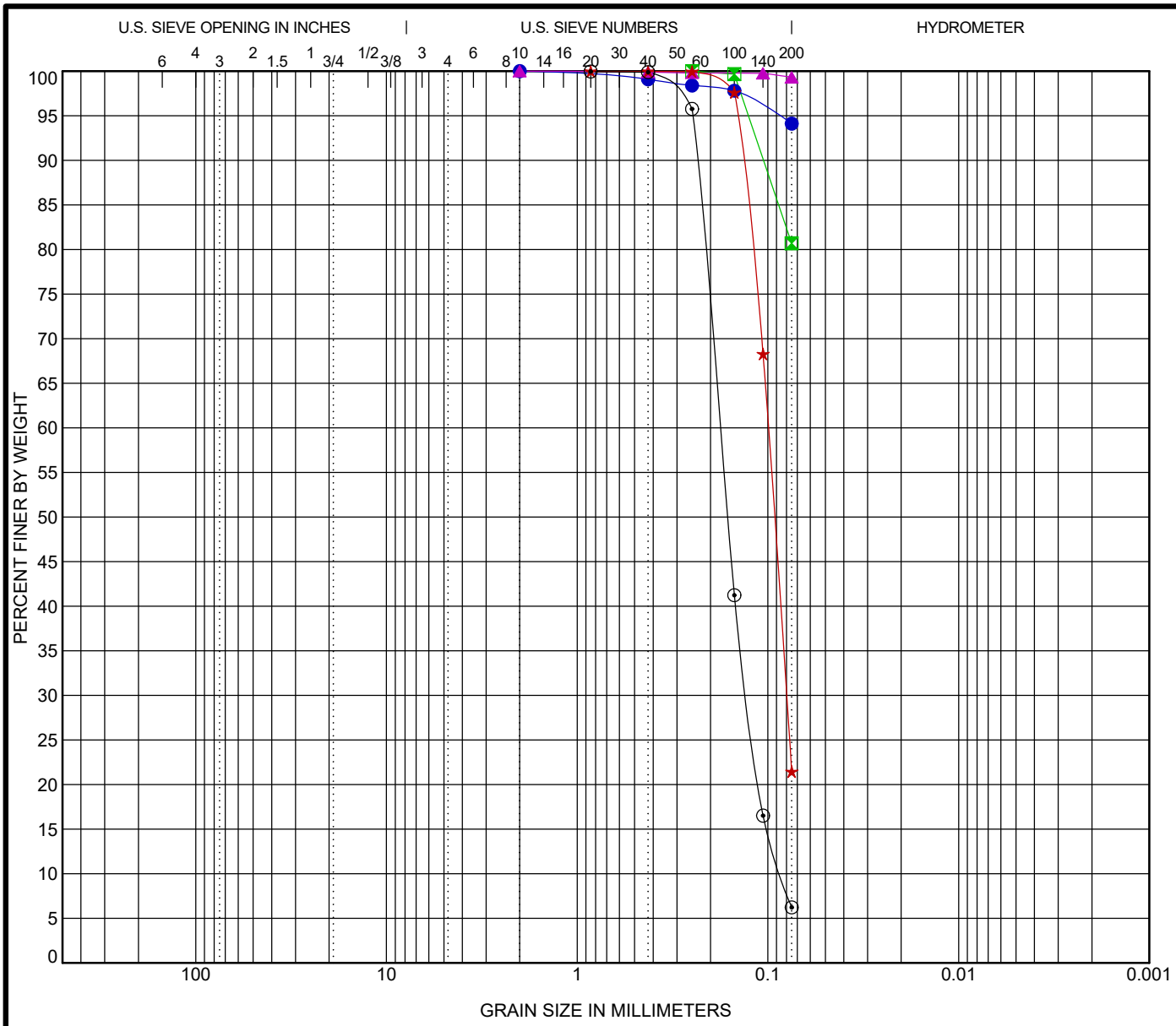

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-105**	**0.0**	**FILL: LEAN CLAY (CL)**					
⊠	**DP-105**	**15.0**	**CLAY LEAN (CL)**					
▲	**DP-106**	**10.0**	**CLAY LEAN (CL)**					
★	**DP-107**	**15.0**	**SILTY SAND (SM)**					
⊙	**DP-107**	**30.0**	**SAND w/ SILT (SP-SM)**				**1.08**	**2.10**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-105**	**0.0**	**2**				**0.0**	**5.9**	**94.1**	
⊠	**DP-105**	**15.0**	**0.25**				**0.0**	**19.3**	**80.7**	
▲	**DP-106**	**10.0**	**2**				**0.0**	**0.7**	**99.3**	
★	**DP-107**	**15.0**	**0.85**	**0.1**	**0.08**		**0.0**	**78.5**	**21.5**	
⊙	**DP-107**	**30.0**	**0.85**	**0.179**	**0.128**	**0.085**	**0.0**	**93.7**	**6.2**	

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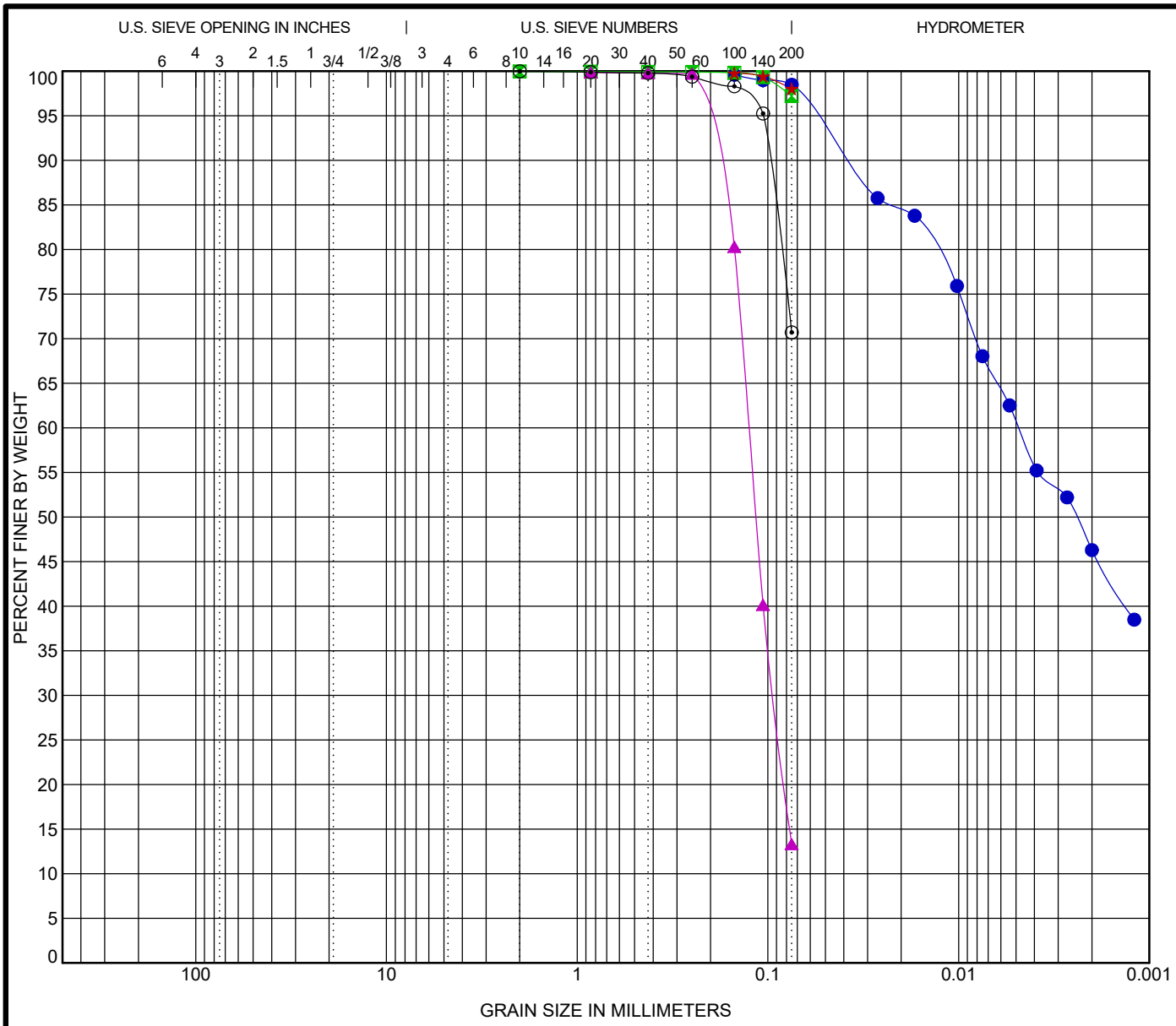
FIGURE B-43



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-108	4.0	FILL: LEAN CLAY (CL)					
⊠	DP-108	6.0	FILL: LEAN CLAY (CL)					
▲	DP-108	25.0	SILTY SAND (SM)					
★	DP-109	4.0	FILL: LEAN CLAY (CL)					
⊙	DP-109	25.0	SILT w/ SAND (ML)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-108	4.0	0.15	0.005			0.0	1.1	37.7	60.8
⊠	DP-108	6.0	2				0.0	2.8	97.2	
▲	DP-108	25.0	0.85	0.126	0.093		0.0	86.5	13.3	
★	DP-109	4.0	0.15				0.0	1.7	98.0	
⊙	DP-109	25.0	2				0.0	29.3	70.7	

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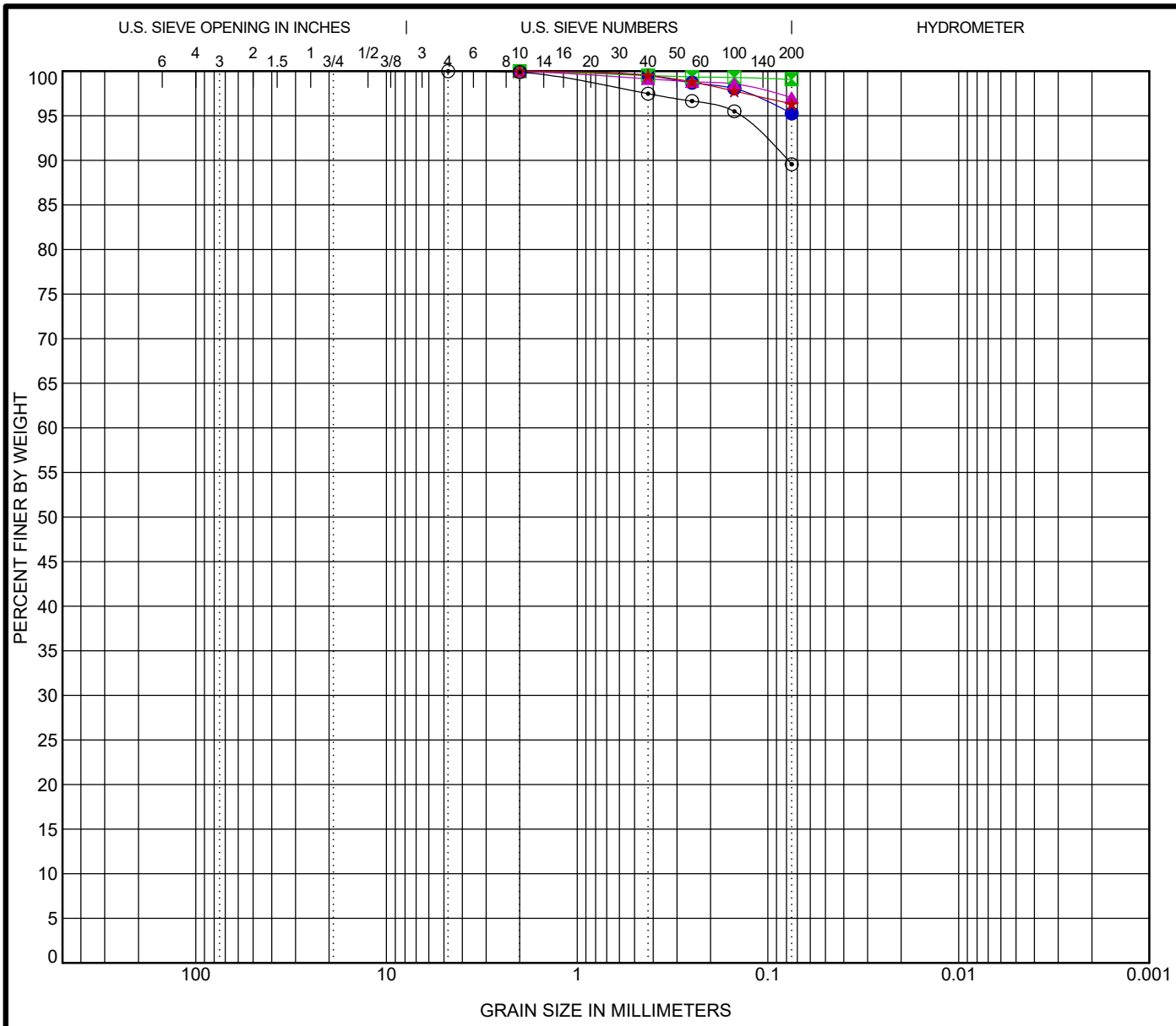

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-110**	**2.0**	**FILL: LEAN CLAY (CL)**					
⊠	**DP-110**	**20.0**	**FAT CLAY (CH)**					
▲	**DP-111**	**6.0**	**FILL: FAT CLAY (CH)**					
★	**DP-111**	**20.0**	**FAT CLAY (CH)**					
⊙	**DP-112**	**6.0**	**FILL: LEAN CLAY (CL)**	**42**	**21**	**21**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-110**	**2.0**	**2**				**0.0**	**4.8**	**95.3**	
⊠	**DP-110**	**20.0**	**2**				**0.0**	**0.9**	**99.1**	
▲	**DP-111**	**6.0**	**2**				**0.0**	**3.0**	**97.0**	
★	**DP-111**	**20.0**	**2**				**0.0**	**3.7**	**96.3**	
⊙	**DP-112**	**6.0**	**4.75**				**0.0**	**10.4**	**89.6**	

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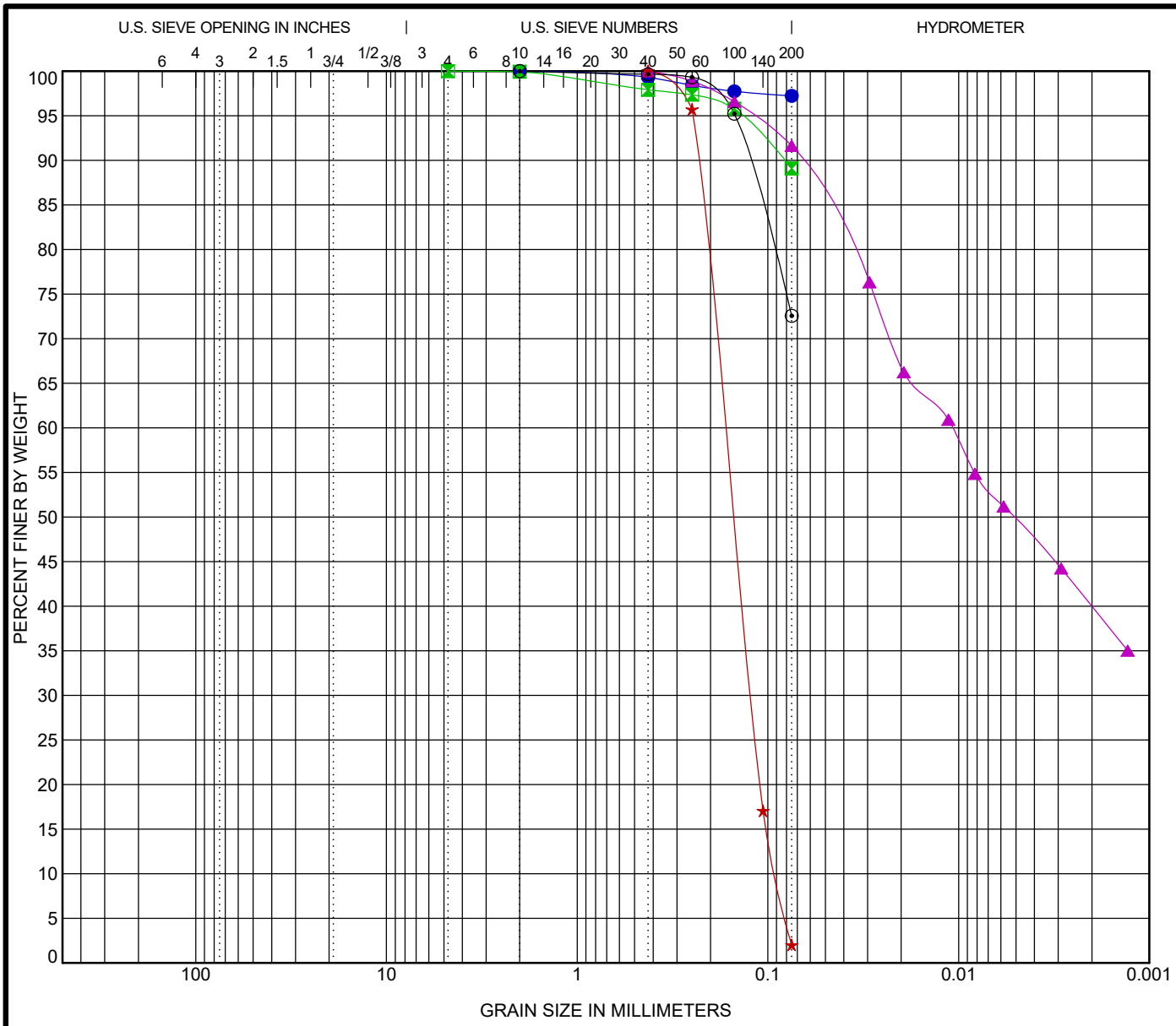
FIGURE B-45



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-112	15.0	FAT CLAY (CH)					
⊠	DP-113	2.0	FILL: FAT CLAY (CH)					
▲	DP-113	10.0	FAT CLAY (CH)					
★	DP-113	35.0	SAND (SP)				0.98	1.88
⊙	DP-114	4.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-112	15.0	2				0.0	2.8	97.2	
⊠	DP-113	2.0	4.75				0.0	10.9	89.1	
▲	DP-113	10.0	0.425	0.011			0.0	8.4	41.9	49.7
★	DP-113	35.0	0.425	0.169	0.122	0.09	0.0	98.0	2.0	
⊙	DP-114	4.0	2				0.0	27.4	72.6	

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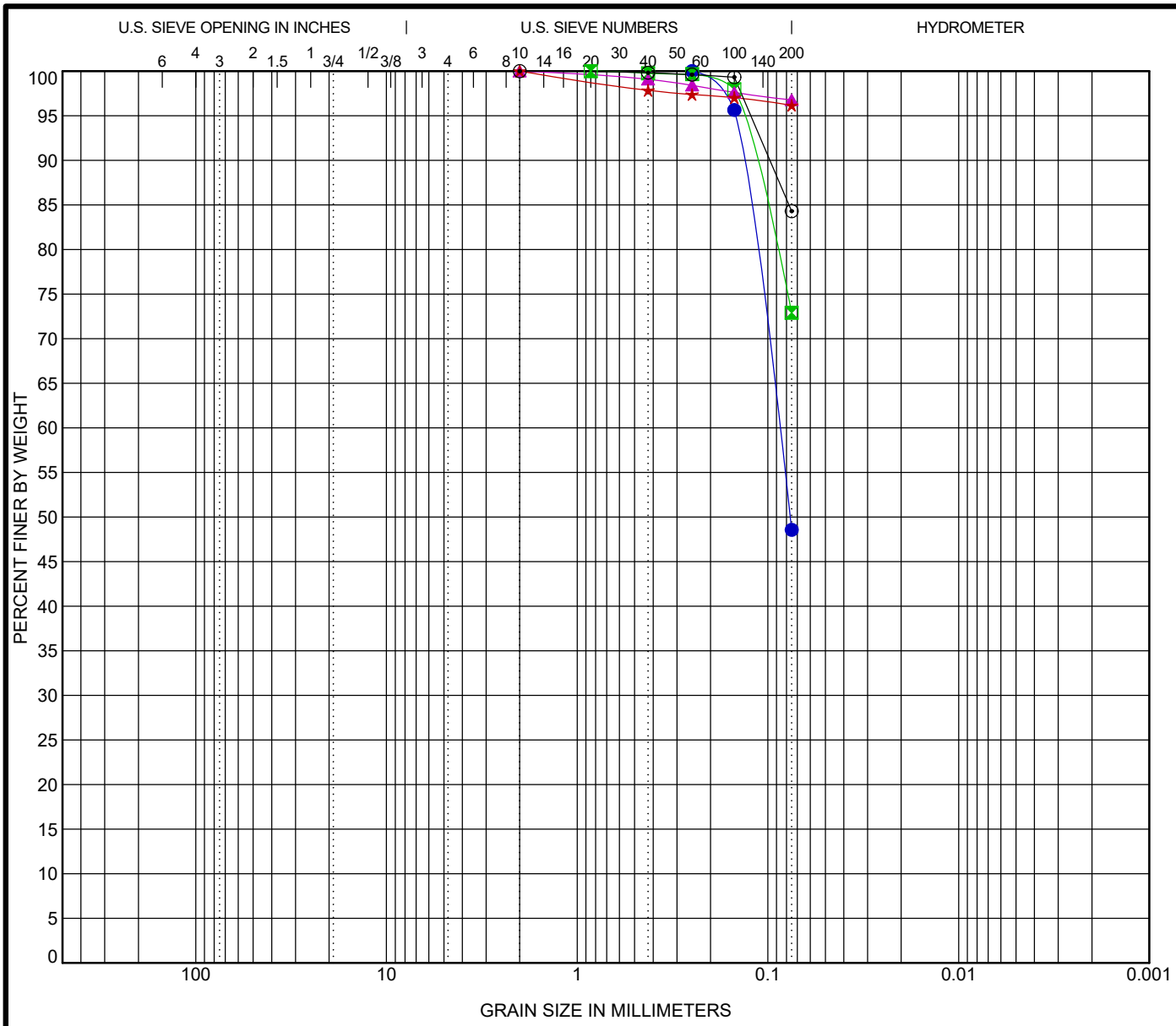
FIGURE B-46



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-114	15.0	CLAYEY SAND (SC)					
⊠	DP-115	2.0	FILL: LEAN CLAY (CL)					
▲	DP-115	40.0	FAT CLAY (CH)					
★	DP-116	0.0	FILL: FAT CLAY (CH)					
⊙	DP-116	25.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-114	15.0	0.25	0.089			0.0	51.4	48.6	
⊠	DP-115	2.0	0.85				0.0	27.1	72.9	
▲	DP-115	40.0	2				0.0	3.2	96.8	
★	DP-116	0.0	2				0.0	3.8	96.2	
⊙	DP-116	25.0	2				0.0	15.7	84.3	

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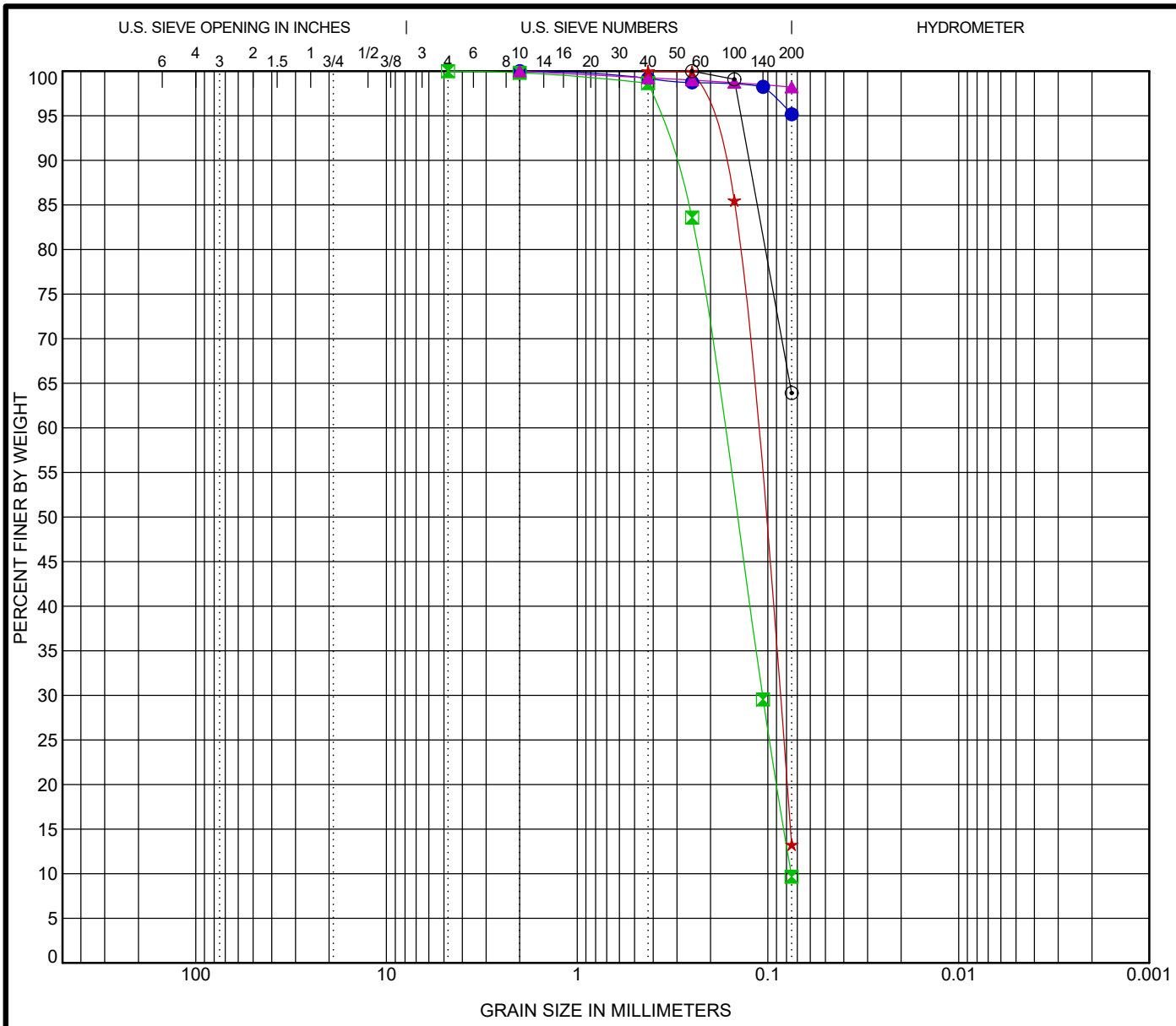

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-117	8.0	CLAY LEAN (CL)					
⊠	DP-117	48.5	SAND w/ SILT (SP-SM)				0.88	2.28
▲	DP-118	6.0	CLAY LEAN (CL)					
★	DP-118	35.0	CLAYEY SAND (SC)					
⊙	DP-119	4.0	FILL: SANDY LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-117	8.0	2				0.0	4.8	95.2	
⊠	DP-117	48.5	4.75	0.172	0.107	0.075	0.0	90.3	9.7	
▲	DP-118	6.0	2				0.0	1.8	98.2	
★	DP-118	35.0	0.425	0.117	0.088		0.0	86.7	13.3	
⊙	DP-119	4.0	0.25				0.0	36.1	63.9	

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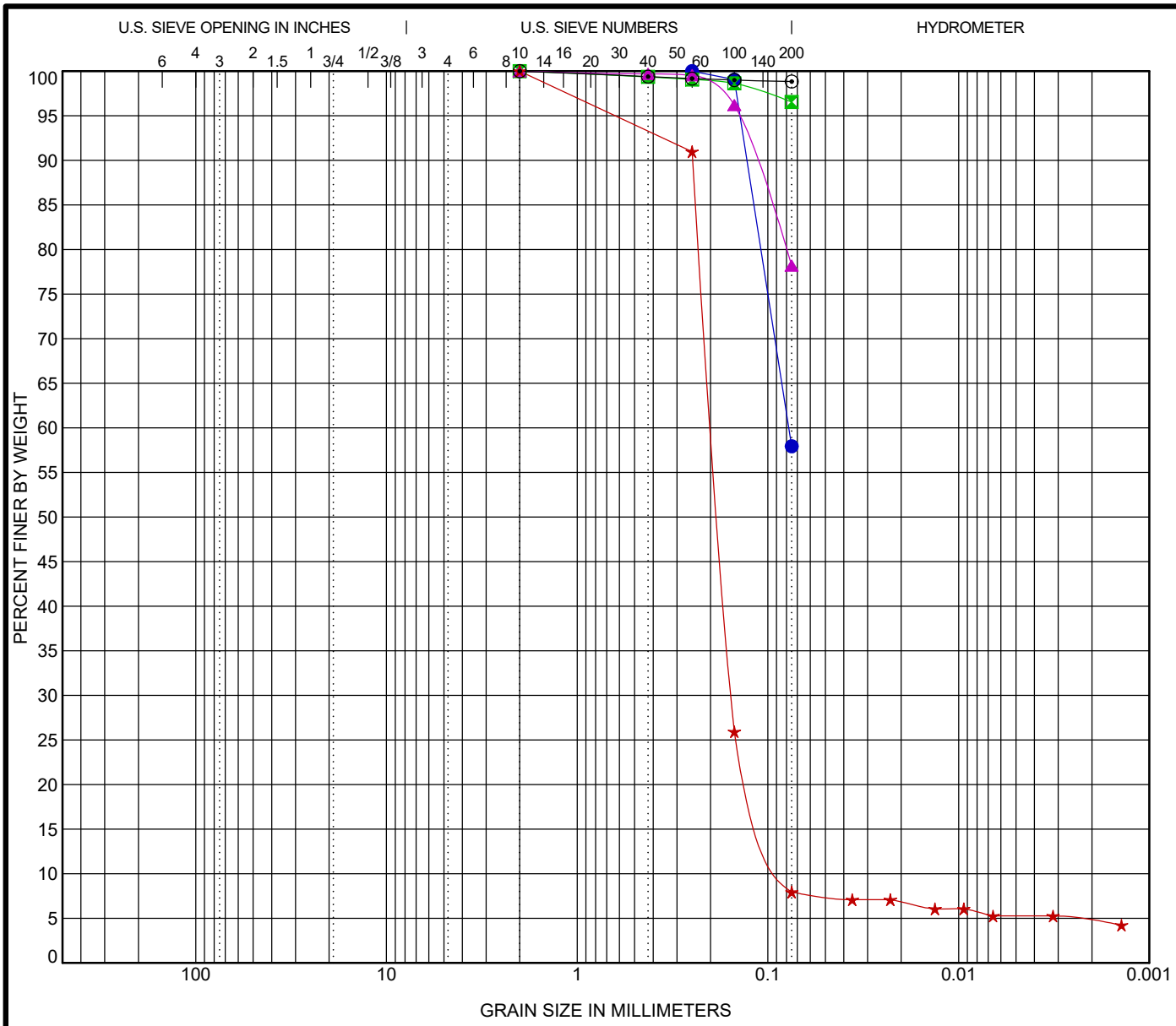
FIGURE B-48



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-119	15.0	SANDY SILTY (ML)					
⊠	DP-120	4.0	FILL: LEAN CLAY (CL)					
▲	DP-120	8.0	CLAY LEAN (CL)					
★	DP-120	40.0	SAND w/ SILT (SP-SM)				1.51	2.41
⊙	DP-121	6.0	FILL: FAT CLAY (CH)	52	26	26		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-119	15.0	0.25	0.078			0.0	42.1	57.9	
⊠	DP-120	4.0	2				0.0	3.5	96.5	
▲	DP-120	8.0	2				0.0	21.8	78.2	
★	DP-120	40.0	2	0.196	0.155	0.081	0.0	92.1	2.7	5.3
⊙	DP-121	6.0	2				0.0	1.2	98.8	

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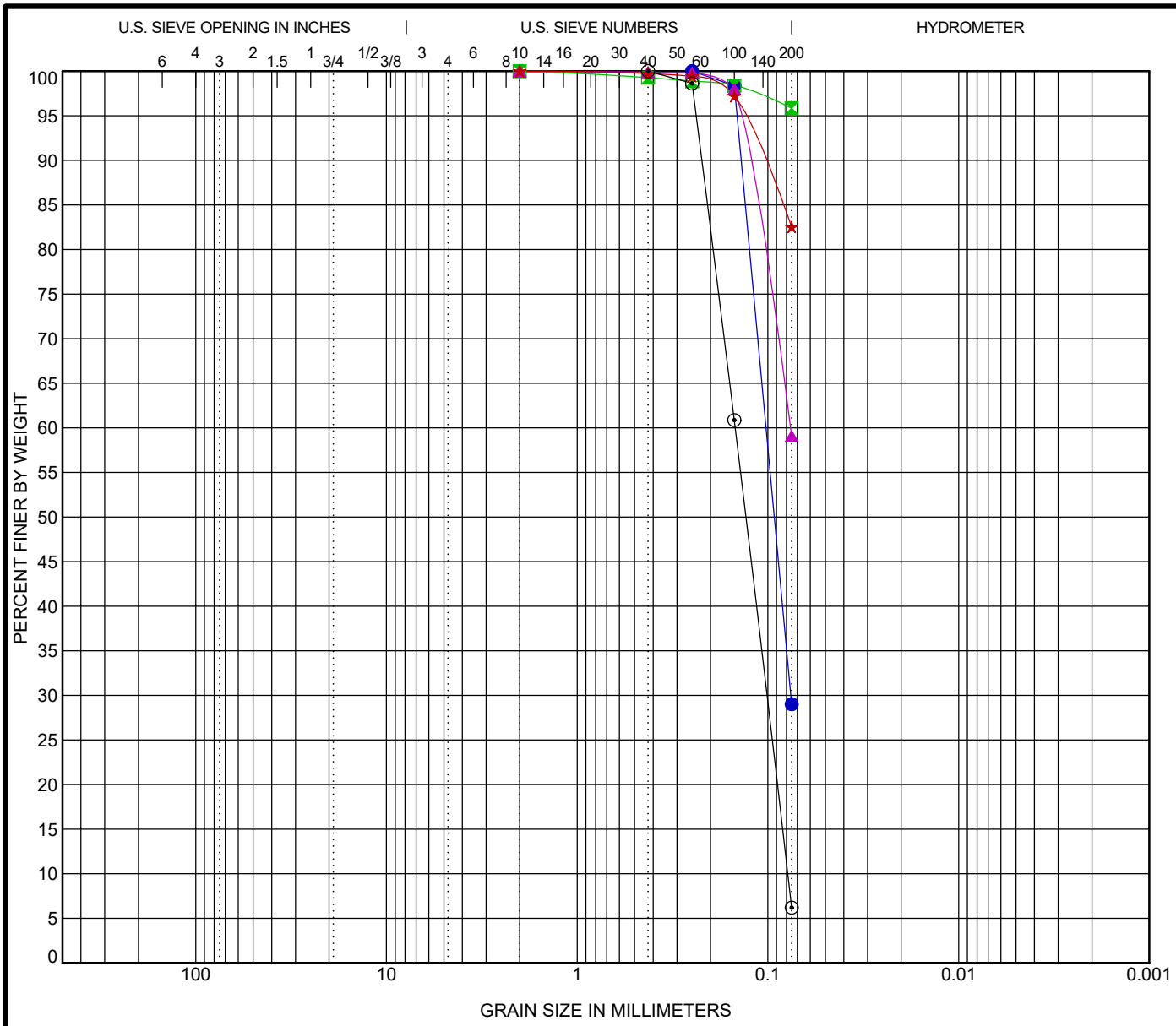
FIGURE B-49



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-121**	**25.0**	**CLAYEY SAND (SC)**					
⊠	**DP-122**	**2.0**	**FILL: FAT CLAY (CH)**					
▲	**DP-122**	**25.0**	**SANDY LEAN CLAY (CL)**					
★	**DP-123**	**2.0**	**FILL: FAT CLAY (CH)**	**50**	**24**	**26**		
⊙	**DP-123**	**20.0**	**SAND w/ SILT (SP-SM)**				**0.88**	**1.88**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-121**	**25.0**	**0.25**	**0.102**	**0.076**		**0.0**	**71.0**	**29.0**	
⊠	**DP-122**	**2.0**	**2**				**0.0**	**4.2**	**95.8**	
▲	**DP-122**	**25.0**	**2**	**0.076**			**0.0**	**40.9**	**59.1**	
★	**DP-123**	**2.0**	**2**				**0.0**	**17.5**	**82.5**	
⊙	**DP-123**	**20.0**	**0.425**	**0.148**	**0.101**	**0.079**	**0.0**	**93.8**	**6.2**	

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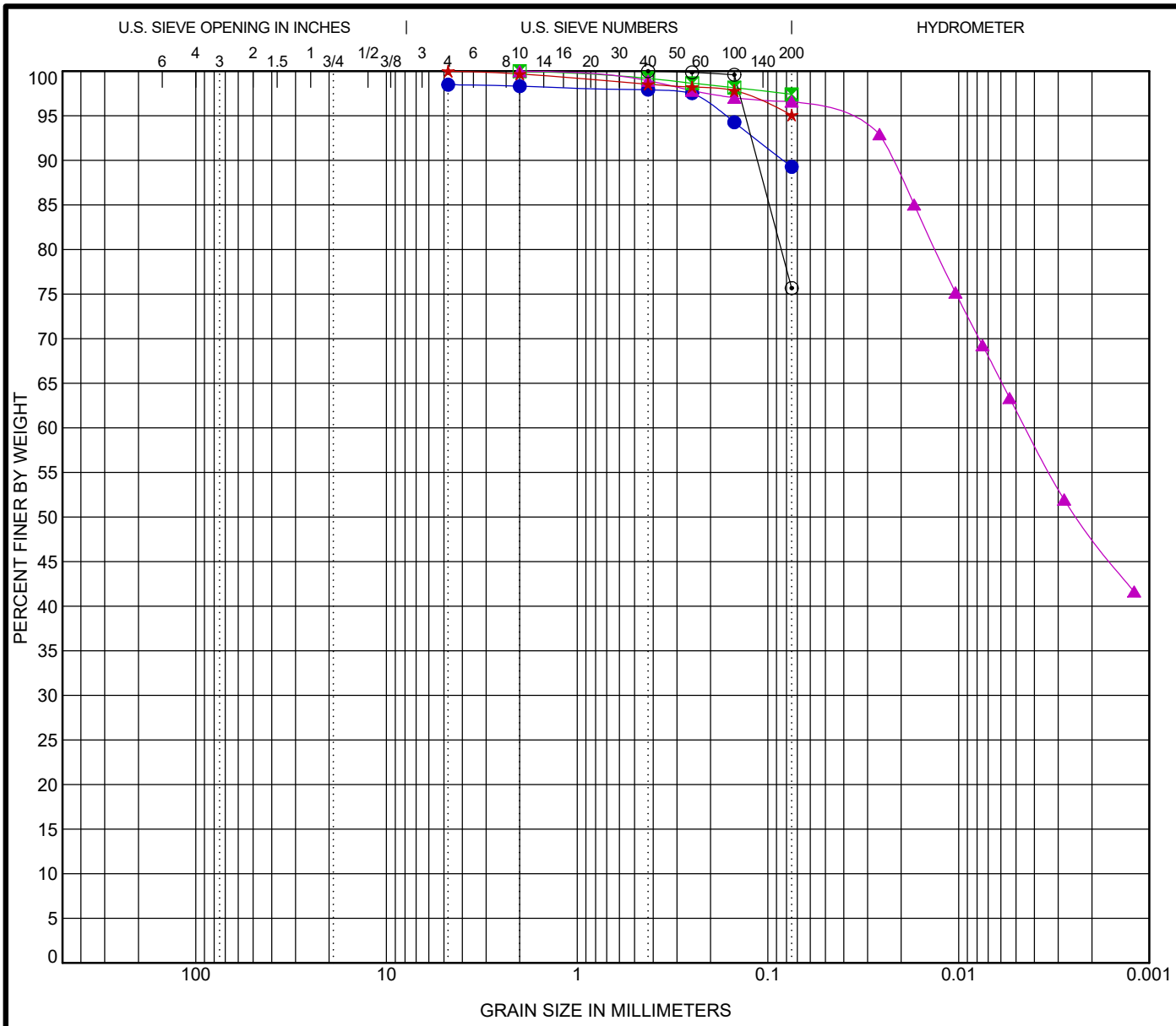
FIGURE B-50



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-124	0.0	FILL: FAT CLAY (CH)					
⊠	DP-124	10.0	CLAY LEAN (CL)	49	26	23		
▲	DP-124	20.0	CLAY LEAN (CL)					
★	DP-125	2.0	FILL: FAT CLAY (CH)					
⊙	DP-125	10.0	SILT w/ SAND (ML)	NP	NP	NP		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-124	0.0	4.75				0.0	9.2	89.3	
⊠	DP-124	10.0	2				0.0	2.6	97.4	
▲	DP-124	20.0	2	0.004			0.0	3.4	34.6	62.0
★	DP-125	2.0	4.75				0.0	4.9	95.1	
⊙	DP-125	10.0	0.425				0.0	24.3	75.7	

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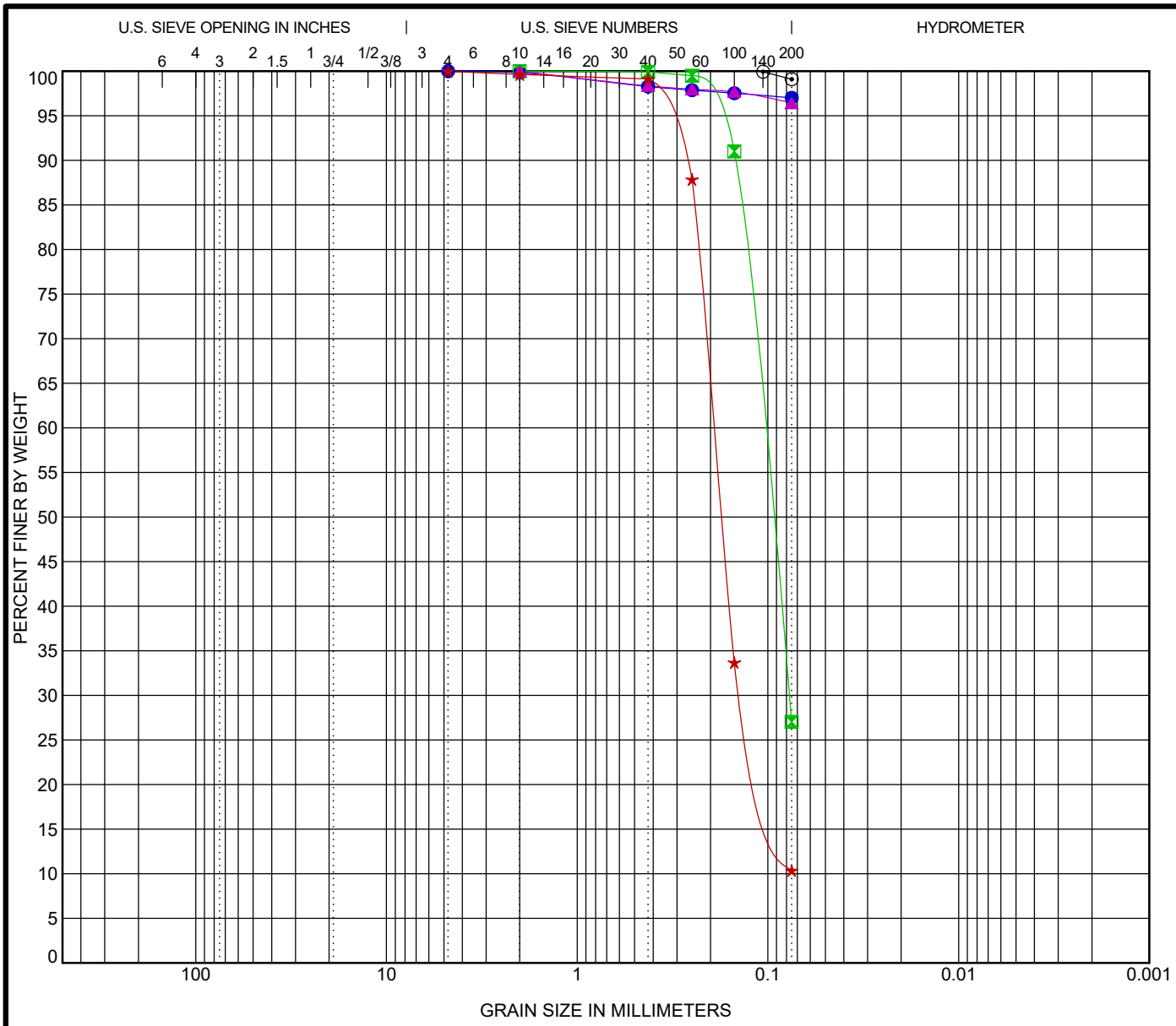

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-126	4.0	CLAY LEAN (CL)	48	24	24		
⊠	DP-126	25.0	SILTY SAND (SM)					
▲	DP-127	4.0	FILL: FAT CLAY (CH)					
★	DP-127	35.0	SAND w/ SILT (SP-SM)				1.27	2.59
⊙	DP-128	10.0	SAND w/ SILT (SP-SM)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-126	4.0	4.75				0.0	3.0	97.0	
⊠	DP-126	25.0	2	0.107	0.077		0.0	73.0	27.0	
▲	DP-127	4.0	2				0.0	3.6	96.4	
★	DP-127	35.0	4.75	0.192	0.134		0.0	89.6	10.4	
⊙	DP-128	10.0	0.106				0.0	0.8	99.1	

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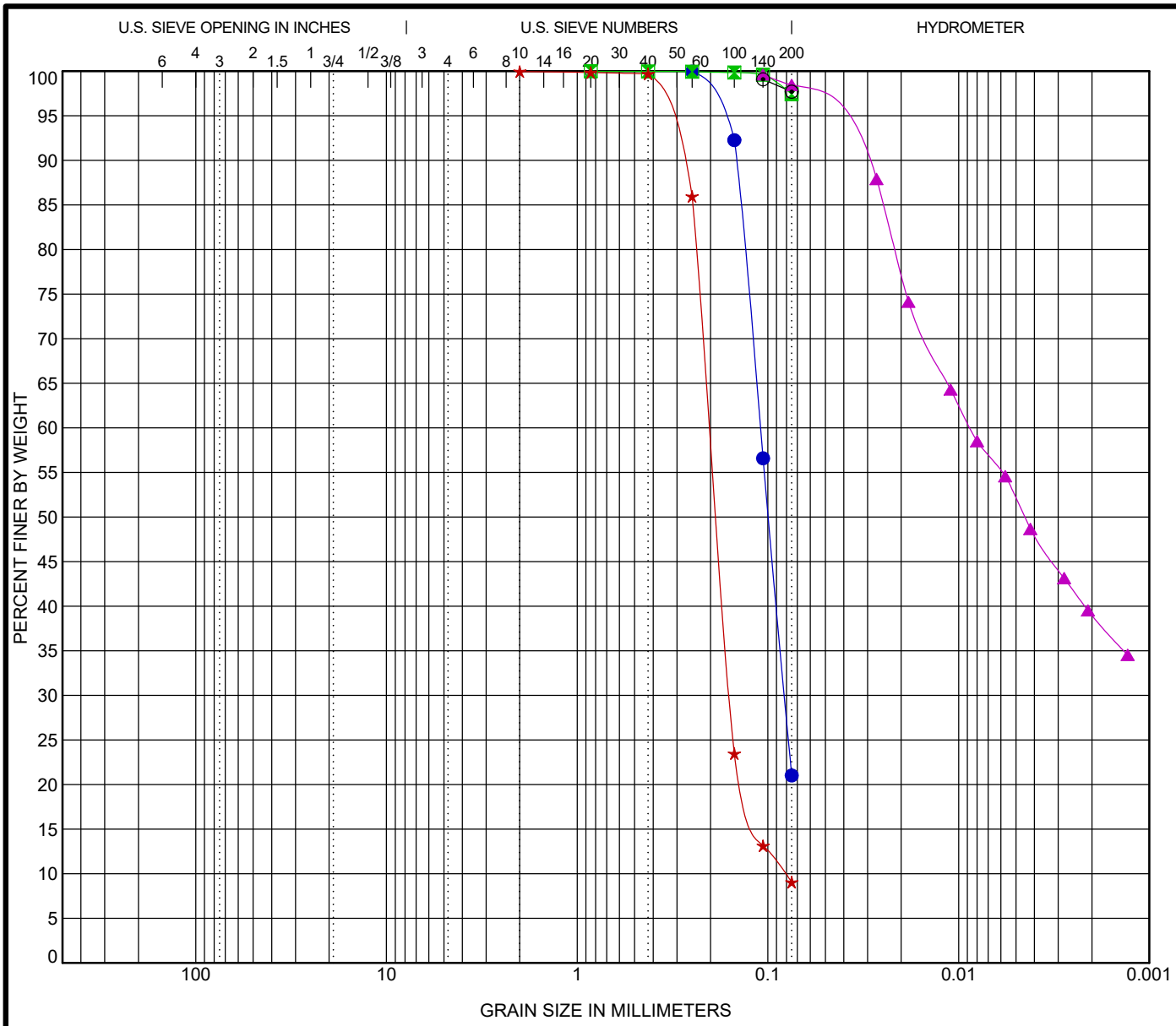

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-128	48.5	SILTY SAND (SM)					
⊠	DP-129	8.0	FAT CLAY (CH)					
▲	DP-129	15.0	SILTY SAND (SM)					
★	DP-129	30.0	SAND w/ SILT (SP-SM)				1.52	2.49
⊙	DP-130	2.0	FILL: FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-128	48.5	0.25	0.11	0.082		0.0	78.9	21.0	
⊠	DP-129	8.0	0.85				0.0	2.6	97.4	
▲	DP-129	15.0	0.106	0.009			0.0	1.2	46.4	52.0
★	DP-129	30.0	2	0.202	0.158	0.081	0.0	90.9	9.1	
⊙	DP-130	2.0	0.106				0.0	1.4	97.7	

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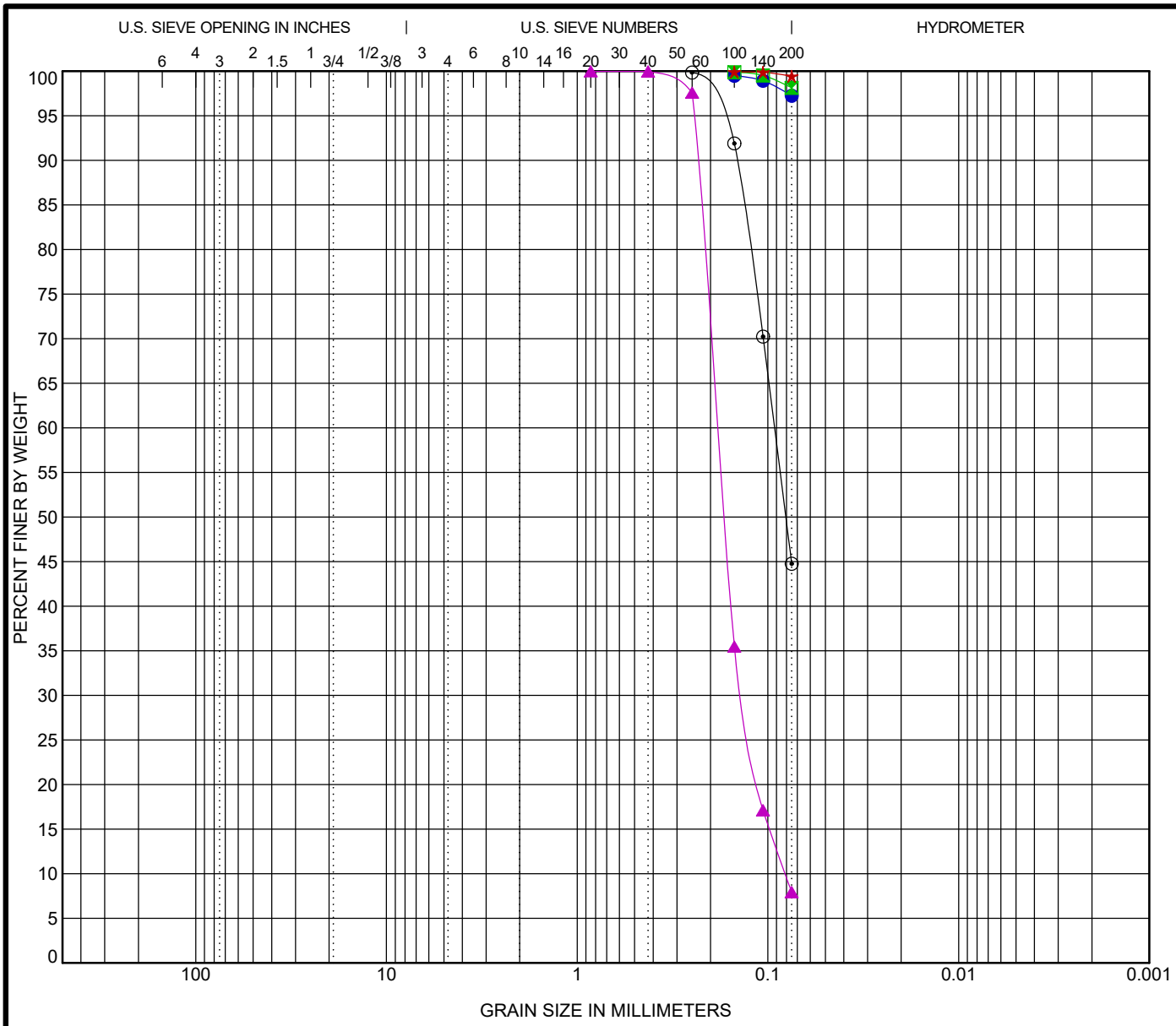
FIGURE B-53



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-130	15.0	CLAY LEAN (CL)	31	24	7		
⊠	DP-131	6.0	FILL: FAT CLAY (CH)					
▲	DP-131	35.0	SAND w/ SILT (SP-SM)				1.23	2.26
★	DP-132	8.0	FILL: FAT CLAY (CH)					
⊙	DP-132	35.0	SILTY SAND (SM)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-130	15.0	0.15				0.0	2.2	97.2	
⊠	DP-131	6.0	0.15				0.0	1.8	98.1	
▲	DP-131	35.0	0.85	0.184	0.135	0.081	0.0	92.0	7.9	
★	DP-132	8.0	0.15				0.0	0.5	99.4	
⊙	DP-132	35.0	0.25	0.092			0.0	55.1	44.8	

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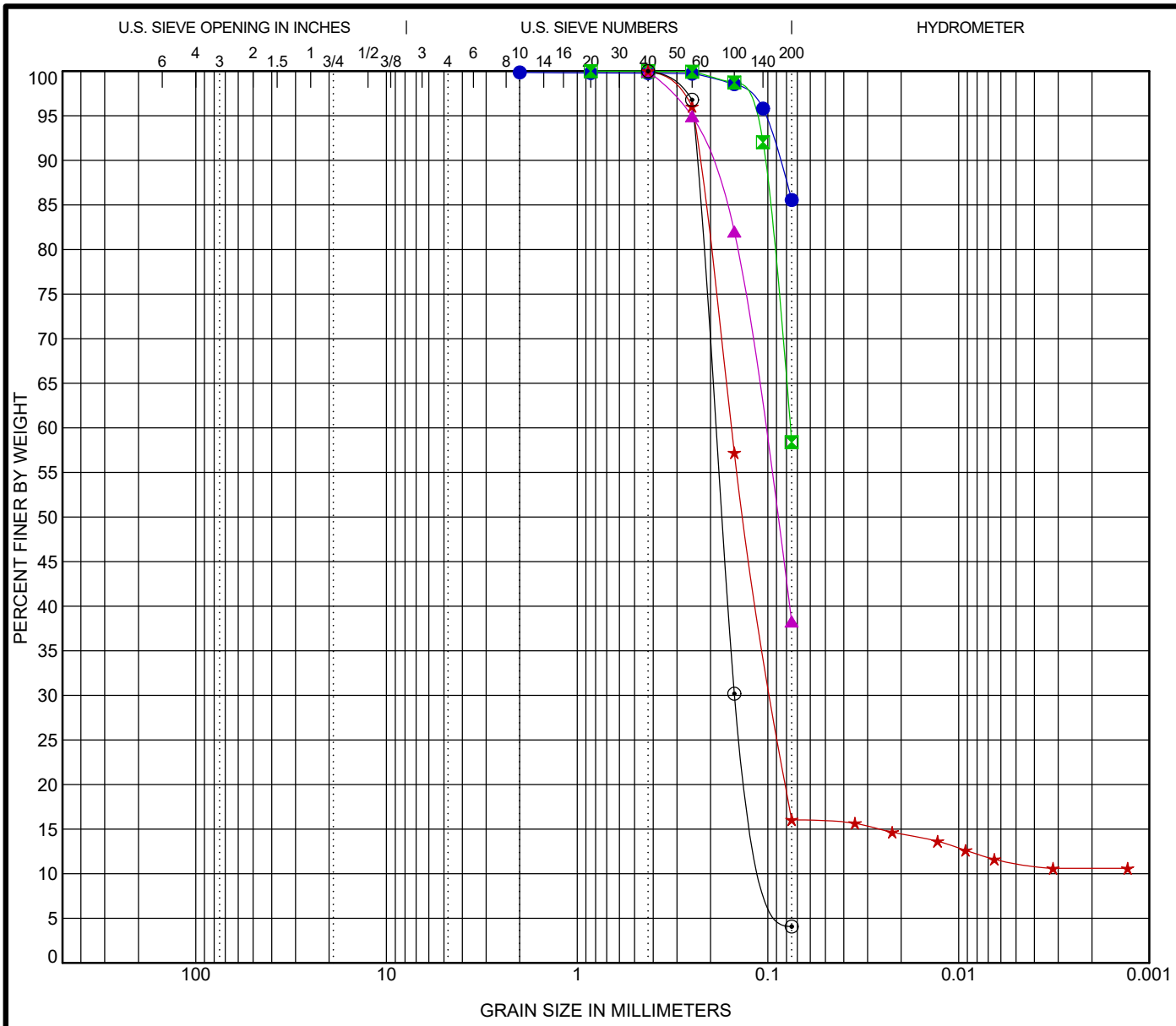
FIGURE B-54



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-133**	**4.0**	**FILL: SILT (ML)**					
⊠	**DP-133**	**25.0**	**SANDY LEAN CLAY (CL)**					
▲	**DP-134**	**10.0**	**CLAYEY SAND (SC)**					
★	**DP-134**	**25.0**	**SILTY SAND (SM)**					
⊙	**DP-134**	**35.0**	**SAND (SP)**				**1.35**	**2.15**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-133**	**4.0**	**2**				**0.0**	**14.3**	**85.6**	
⊠	**DP-133**	**25.0**	**0.85**	**0.076**			**0.0**	**41.6**	**58.4**	
▲	**DP-134**	**10.0**	**0.425**	**0.106**			**0.0**	**61.7**	**38.3**	
★	**DP-134**	**25.0**	**0.425**	**0.156**	**0.095**		**0.0**	**83.9**	**4.8**	**11.2**
⊙	**DP-134**	**35.0**	**0.425**	**0.189**	**0.149**	**0.088**	**0.0**	**95.9**	**4.1**	

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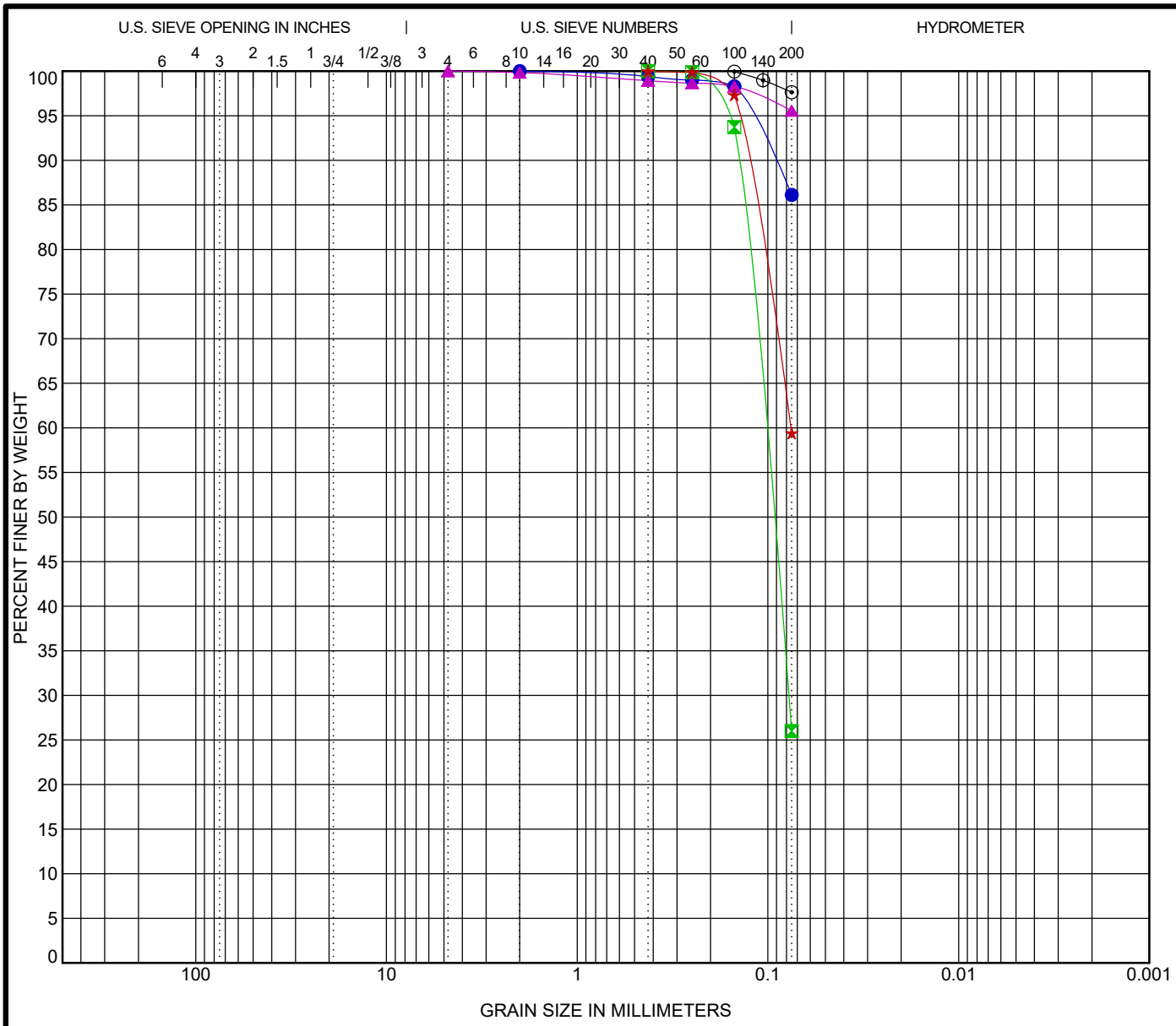
FIGURE B-55



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	DP-135	6.0	FILL: LEAN CLAY (CL)					
⊠	DP-135	20.0	CLAYEY SAND (SC)					
▲	DP-136	6.0	FILL: LEAN CLAY (CL)					
★	DP-136	30.0	SANDY LEAN CLAY (CL)					
⊙	DP-137	4.0	FILL: LEAN CLAY (CL)					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-135	6.0	2				0.0	13.9	86.1	
⊠	DP-135	20.0	0.425	0.106	0.078		0.0	74.0	26.0	
▲	DP-136	6.0	4.75				0.0	4.4	95.6	
★	DP-136	30.0	0.425	0.076			0.0	40.6	59.4	
⊙	DP-137	4.0	0.15				0.0	2.3	97.6	

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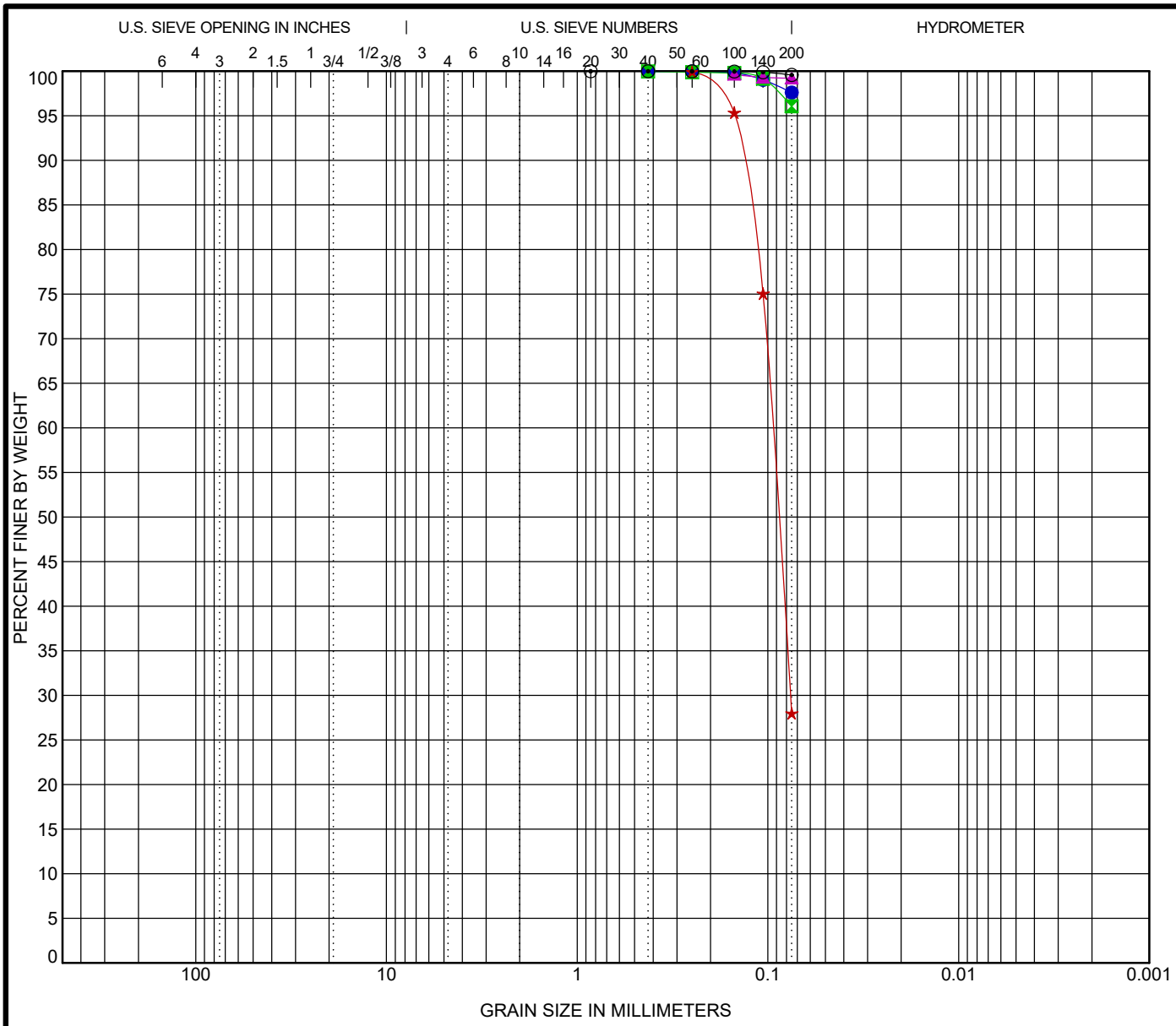

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	DP-138	4.0	FILL: LEAN CLAY (CL)					
⊠	DP-138	15.0	SILTY SAND (SM)					
▲	DP-139	6.0	FILL: LEAN CLAY (CL)					
★	DP-139	25.0	SILTY SAND (SM)					
⊙	DP-140	6.0	FILL: LEAN CLAY (CL)					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-138	4.0	0.425				0.0	2.4	97.6	
⊠	DP-138	15.0	0.425				0.0	3.9	96.1	
▲	DP-139	6.0	0.15				0.0	0.4	99.2	
★	DP-139	25.0	0.25	0.095	0.076		0.0	71.9	28.0	
⊙	DP-140	6.0	0.85				0.0	0.4	99.6	

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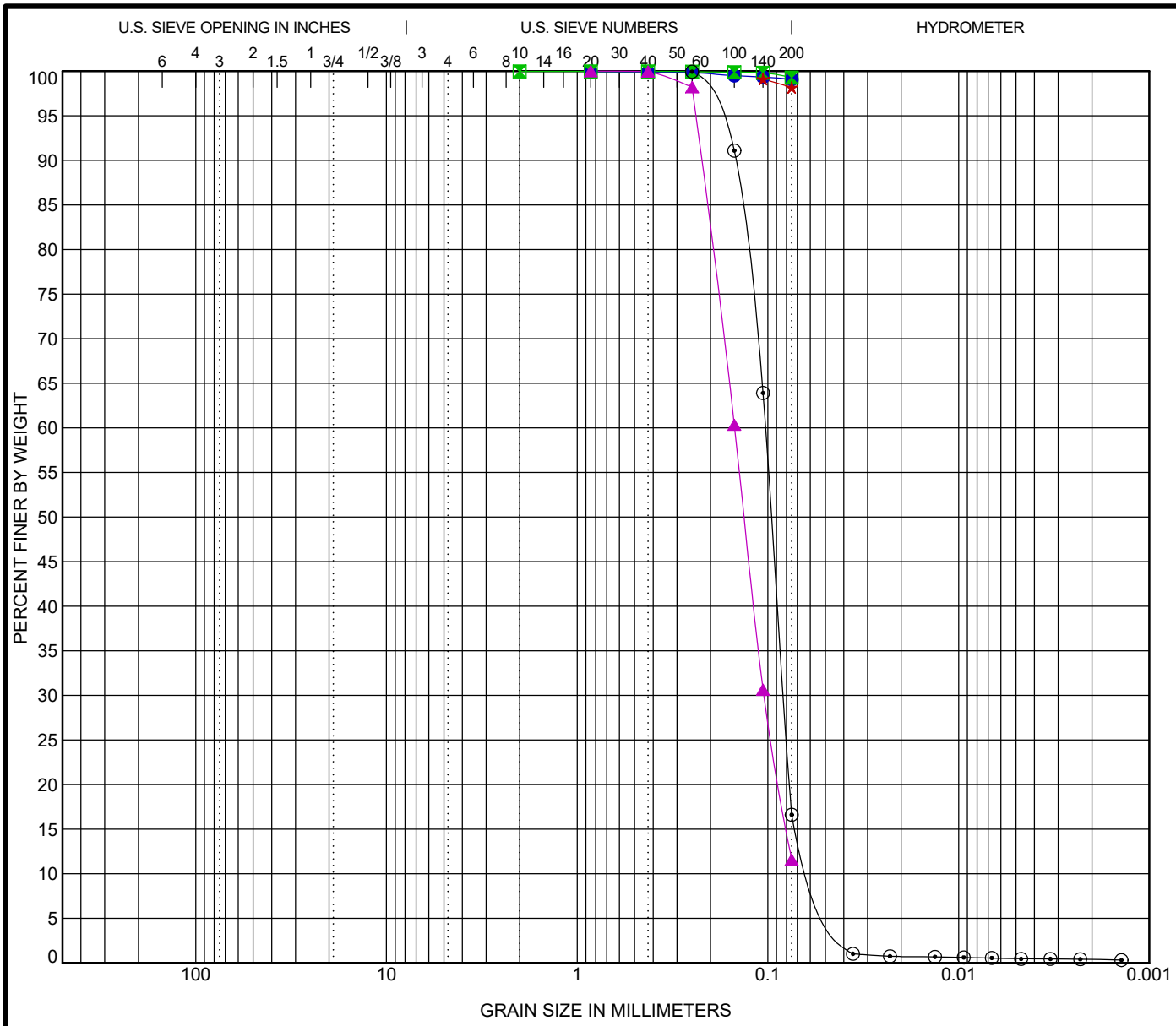

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-140	20.0	SAND w/ SILT (SP-SM)					
⊠	DP-141	0.0	FILL: FAT CLAY (CH)					
▲	DP-141	35.0	SAND w/ SILT (SP-SM)				1.01	2.05
★	DP-142	10.0	SAND w/ SILT (SP-SM)	61	24	37		
⊙	DP-142	20.0	SILTY SAND (SM)				1.21	1.88

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-140	20.0	0.85				0.0	0.9	99.1	
⊠	DP-141	0.0	2				0.0	0.7	99.3	
▲	DP-141	35.0	0.85	0.149	0.105		0.0	88.4	11.6	
★	DP-142	10.0	0.106				0.0	0.9	98.2	
⊙	DP-142	20.0	0.25	0.103	0.083	0.055	0.0	83.3	16.1	0.5

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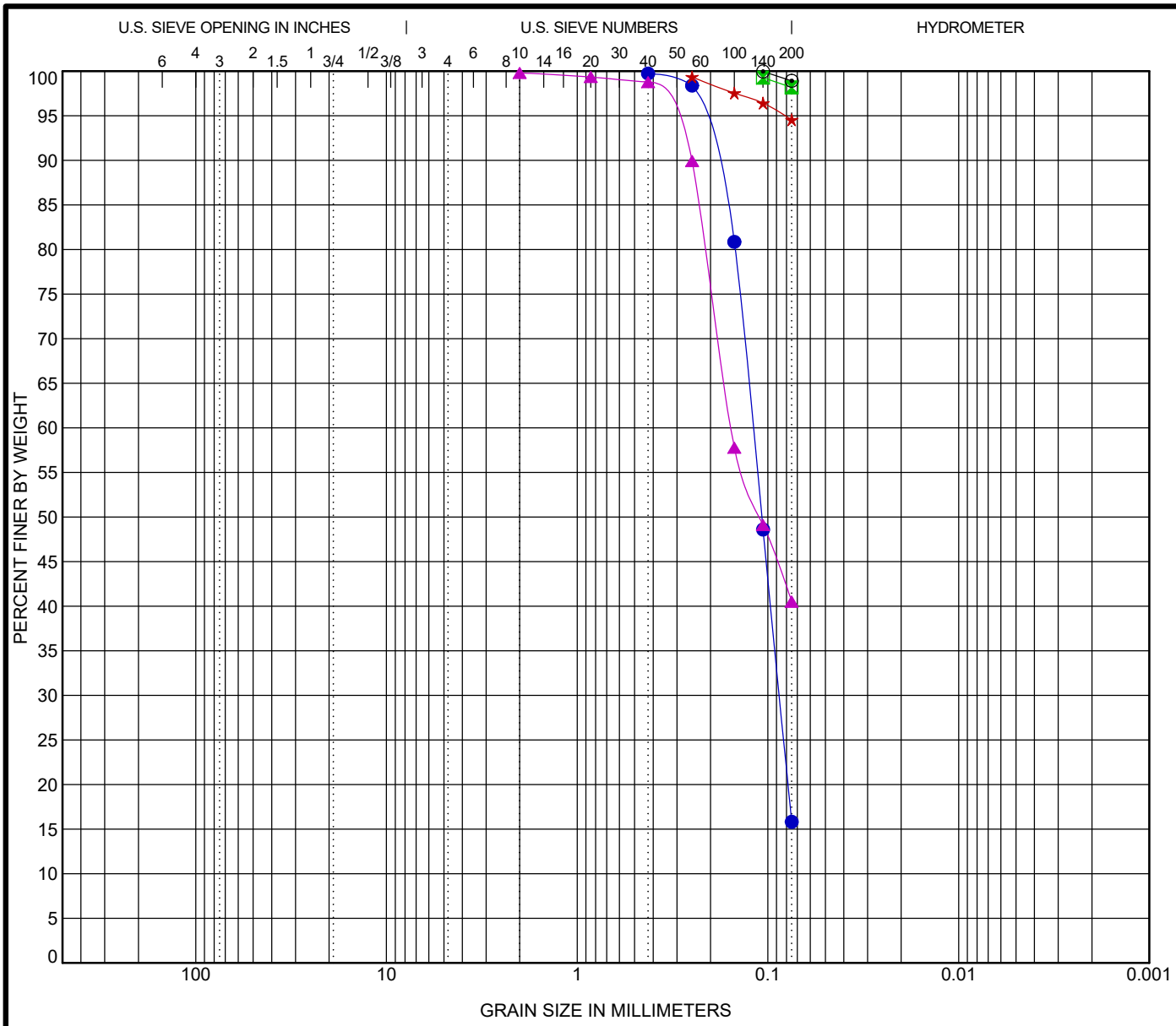
FIGURE B-58



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-142	30.0	SILTY SAND (SM)					
⊠	DP-143	6.0	FILL: LEAN CLAY (CL)	47	18	29		
▲	DP-143	35.0	SILTY SAND (SM)					
★	DP-144	30.0	SILTY SAND (SM)					
⊙	DP-145	0.0	FILL: FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-142	30.0	0.425	0.12	0.087		0.0	83.9	15.8	
⊠	DP-143	6.0	0.106				0.0	1.1	98.2	
▲	DP-143	35.0	2	0.155			0.0	59.3	40.5	
★	DP-144	30.0	0.25				0.0	4.8	94.5	
⊙	DP-145	0.0	0.106				0.0	1.1	98.9	

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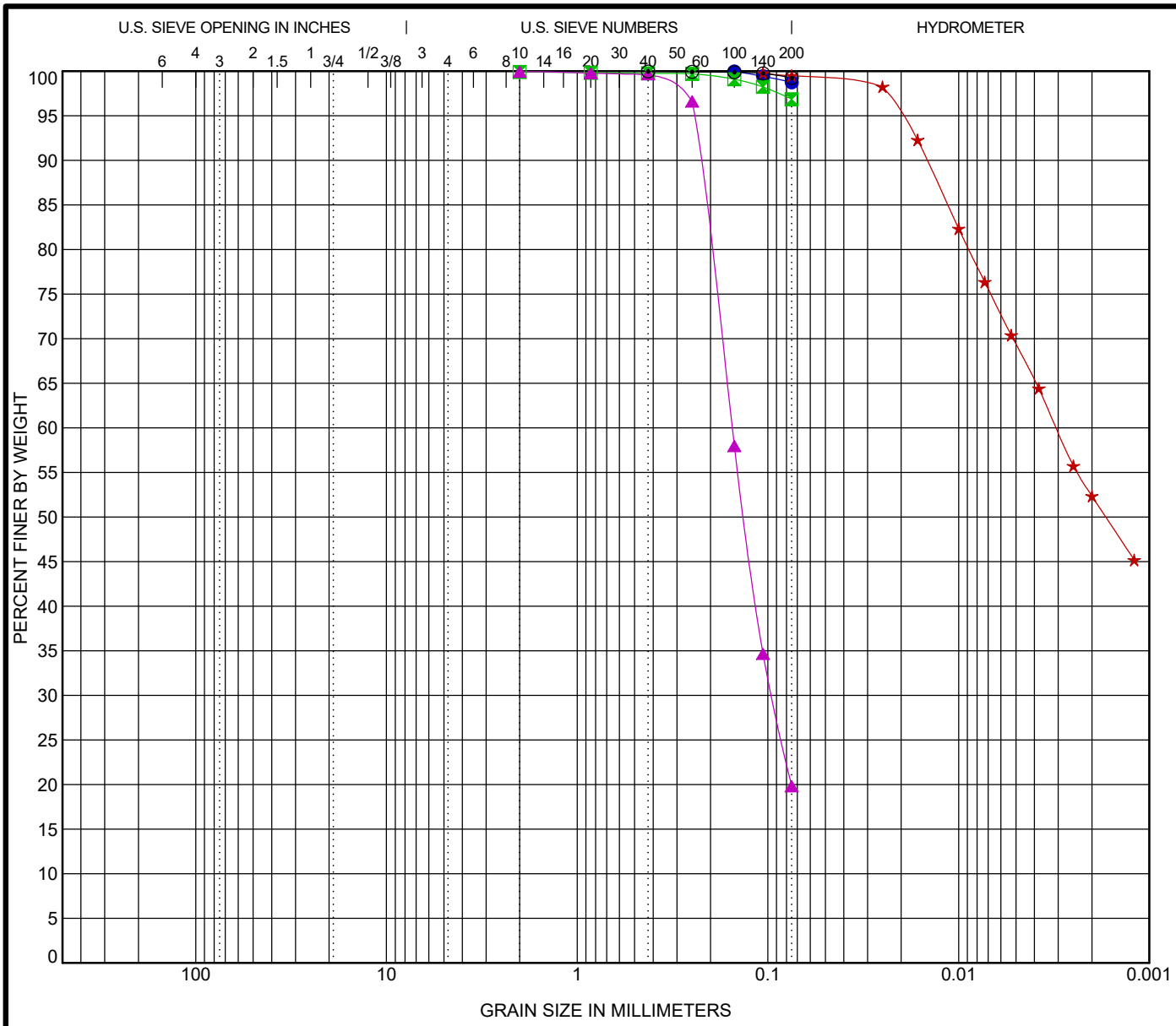
FIGURE B-59



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-145	6.0	FILL: LEAN CLAY (CL)					
⊠	DP-146	2.0	FILL: FAT CLAY (CH)	57	20	37		
▲	DP-146	30.0	SILTY SAND (SM)					
★	DP-147	4.0	FILL: FAT CLAY (CH)					
⊙	DP-147	8.0	FILL: FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-145	6.0	0.15				0.0	1.2	98.7	
⊠	DP-146	2.0	2				0.0	3.1	96.9	
▲	DP-146	30.0	2	0.154	0.095		0.0	80.1	19.8	
★	DP-147	4.0	0.106	0.003			0.0	0.3	30.1	69.4
⊙	DP-147	8.0	0.425				0.0	0.7	99.2	

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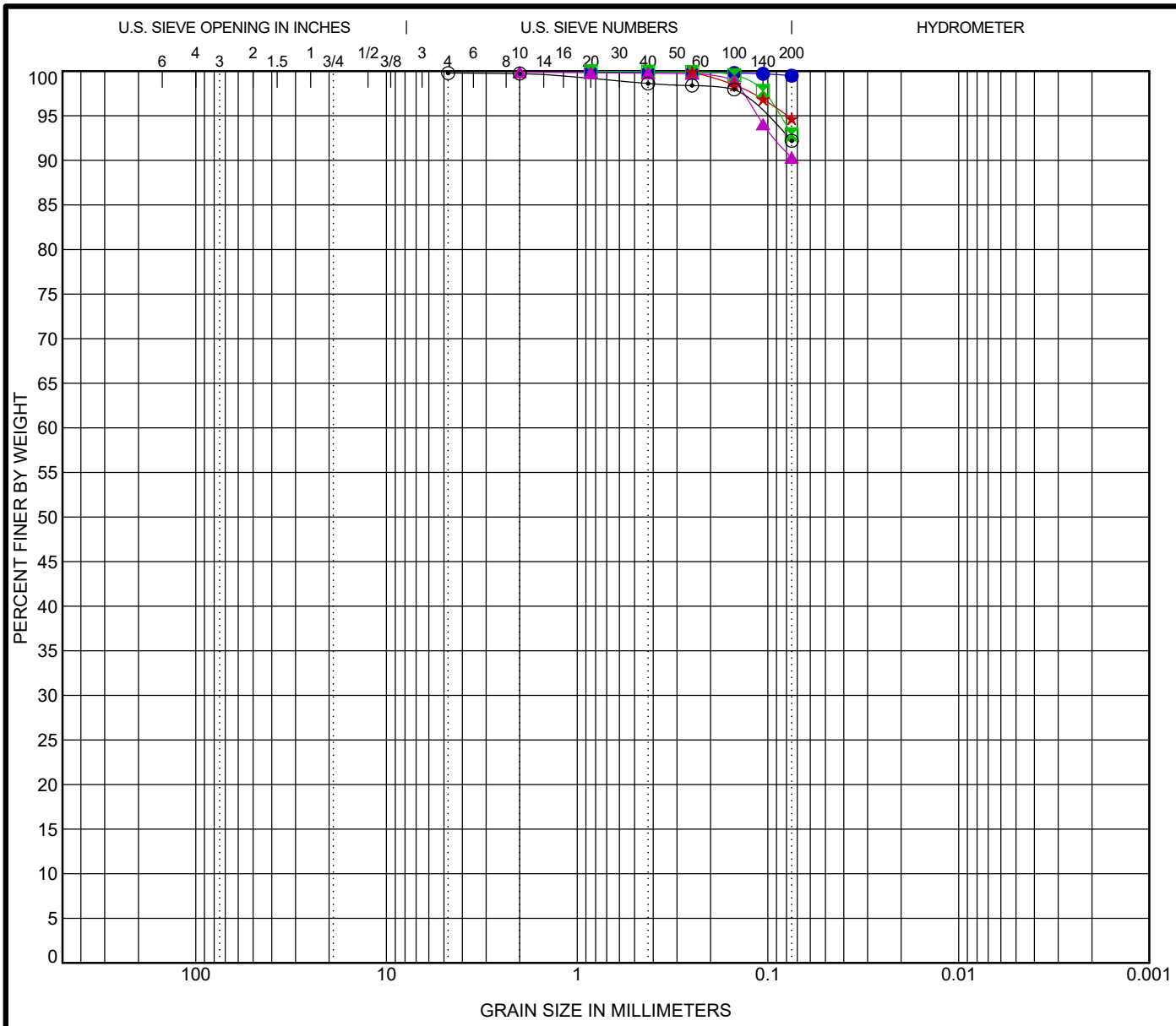
FIGURE B-60



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-147**	**40.0**	**FAT CLAY (CH)**					
⊠	**DP-148**	**6.0**	**FILL: FAT CLAY (CH)**					
▲	**DP-149**	**4.0**	**CLAY LEAN (CL)**					
★	**DP-149**	**30.0**	**FAT CLAY (CH)**	**53**	**22**	**31**		
⊙	**DP-150**	**6.0**	**FILL: FAT CLAY (CH)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-147**	**40.0**	**0.85**				**0.0**	**0.4**	**99.5**	
⊠	**DP-148**	**6.0**	**0.85**				**0.0**	**7.1**	**92.9**	
▲	**DP-149**	**4.0**	**2**				**0.0**	**9.6**	**90.3**	
★	**DP-149**	**30.0**	**0.25**				**0.0**	**5.2**	**94.7**	
⊙	**DP-150**	**6.0**	**4.75**				**0.0**	**7.6**	**92.2**	

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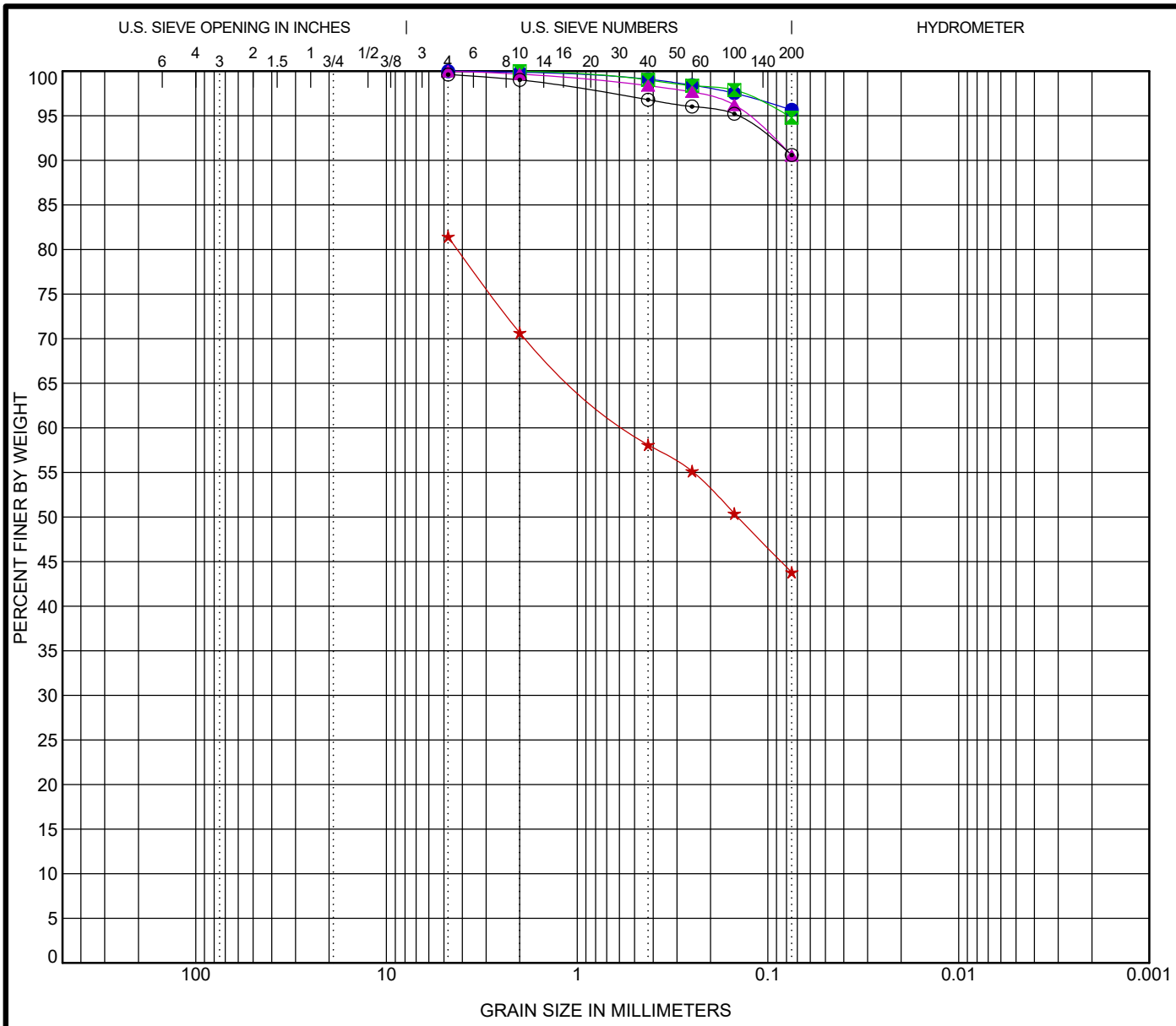
FIGURE B-61



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-150**	**25.0**	**FAT CLAY (CH)**					
⊠	**DP-151**	**2.0**	**FILL: LEAN CLAY (CL)**					
▲	**DP-151**	**30.0**	**CLAY LEAN (CL)**					
★	**DP-152**	**0.0**	**FILL: CLAYEY SAND (SC)**					
⊙	**DP-152**	**8.0**	**FILL: LEAN CLAY (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-150**	**25.0**	**4.75**				**0.0**	**4.3**	**95.7**	
⊠	**DP-151**	**2.0**	**2**				**0.0**	**5.2**	**94.8**	
▲	**DP-151**	**30.0**	**4.75**				**0.0**	**9.5**	**90.5**	
★	**DP-152**	**0.0**	**4.75**	**0.537**			**0.0**	**37.7**	**43.8**	
⊙	**DP-152**	**8.0**	**4.75**				**0.0**	**9.0**	**90.6**	

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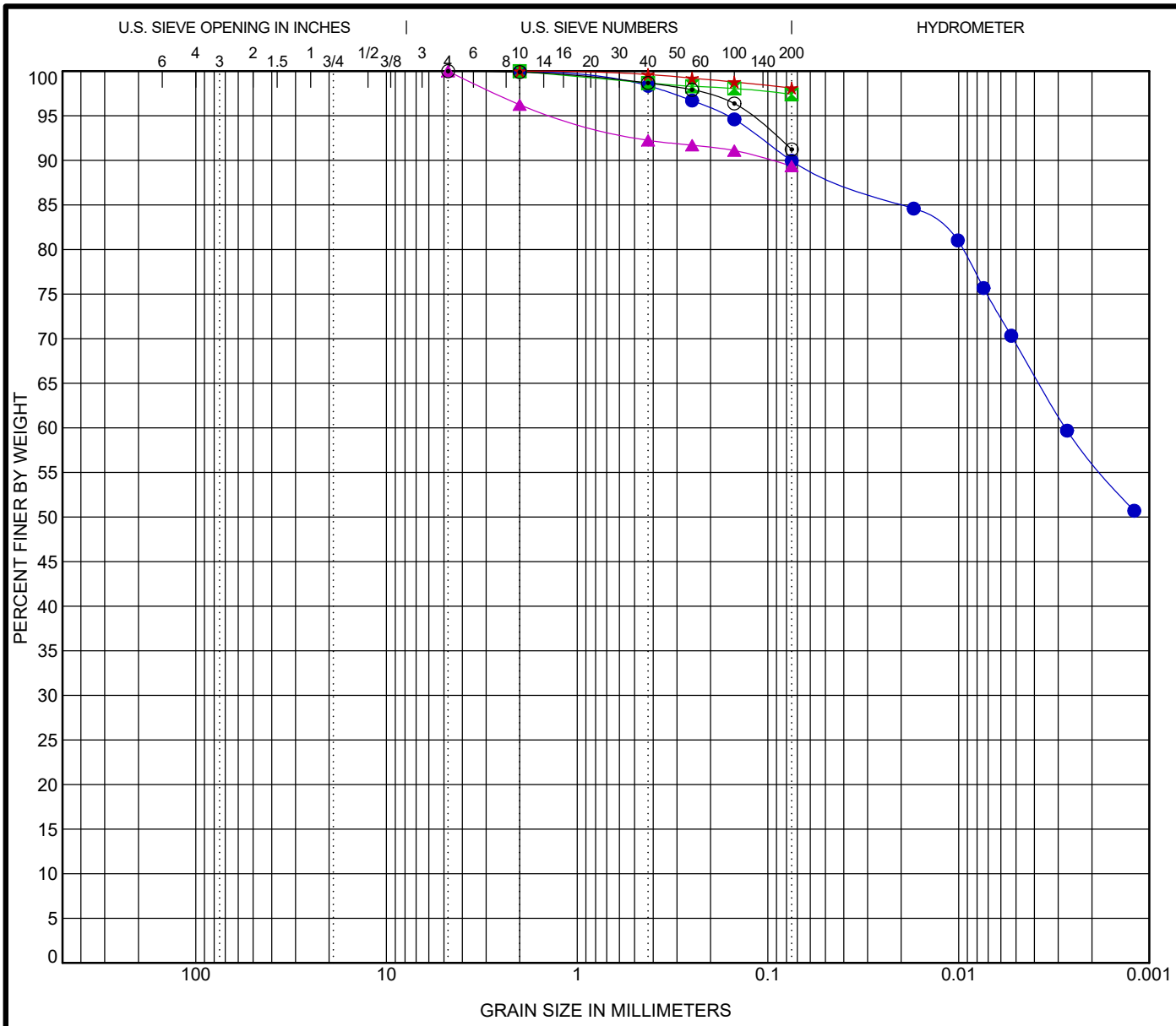

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-152**	**25.0**	**FAT CLAY (CH)**					
⊠	**DP-153**	**4.0**	**FILL: FAT CLAY (CH)**					
▲	**DP-153**	**40.0**	**CLAY LEAN (CL)**					
★	**DP-154**	**15.0**	**CLAY LEAN (CL)**					
⊙	**DP-154**	**35.0**	**FAT CLAY (CH)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-152**	**25.0**	**2**	**0.003**			**0.0**	**10.1**	**20.5**	**69.4**
⊠	**DP-153**	**4.0**	**2**				**0.0**	**2.6**	**97.4**	
▲	**DP-153**	**40.0**	**4.75**				**0.0**	**10.7**	**89.3**	
★	**DP-154**	**15.0**	**2**				**0.0**	**1.9**	**98.1**	
⊙	**DP-154**	**35.0**	**4.75**				**0.0**	**8.8**	**91.2**	

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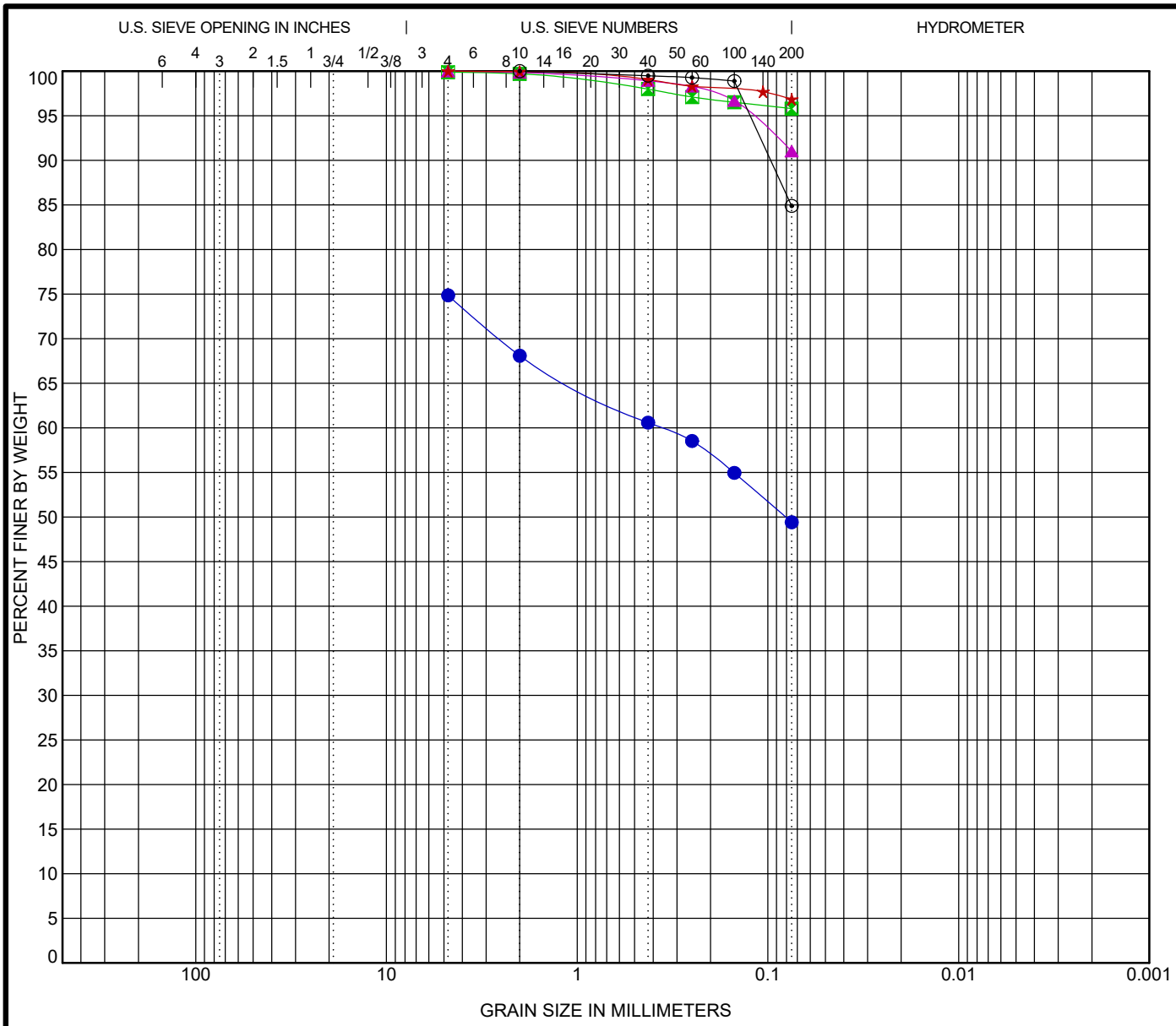

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-155	0.0	FILL: CLAYEY SAND (SC)					
⊠	DP-155	30.0	FAT CLAY (CH)					
▲	DP-156	2.0	FILL: FAT CLAY (CH)	64	22	42		
★	DP-156	10.0	FAT CLAY (CH)					
⊙	DP-157	8.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-155	0.0	4.75	0.365			0.0	25.4	49.4	
⊠	DP-155	30.0	4.75				0.0	4.1	95.8	
▲	DP-156	2.0	4.75				0.0	9.0	91.0	
★	DP-156	10.0	4.75				0.0	3.1	96.9	
⊙	DP-157	8.0	2				0.0	15.1	84.9	

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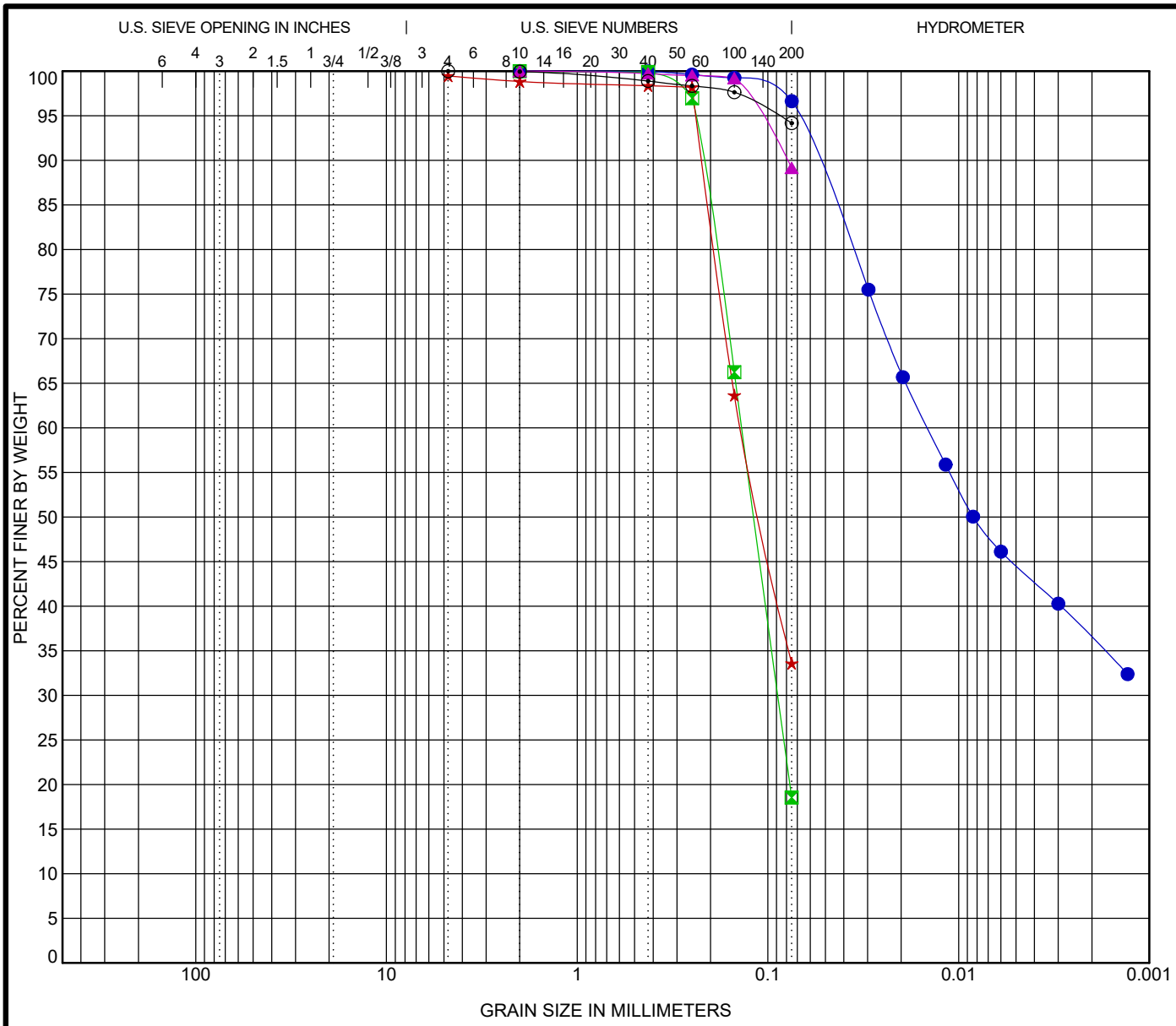

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-157	20.0	SANDY LEAN CLAY (CL)					
⊠	DP-157	30.0	SILTY SAND (SM)					
▲	DP-158	6.0	FILL: LEAN CLAY (CL)					
★	DP-158	30.0	SILTY SAND (SM)					
⊙	DP-159	2.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-157	20.0	2	0.015			0.0	3.4	52.1	44.6
⊠	DP-157	30.0	2	0.137	0.089		0.0	81.4	18.6	
▲	DP-158	6.0	2				0.0	10.8	89.2	
★	DP-158	30.0	4.75	0.138			0.0	65.9	33.6	
⊙	DP-159	2.0	4.75				0.0	5.8	94.2	

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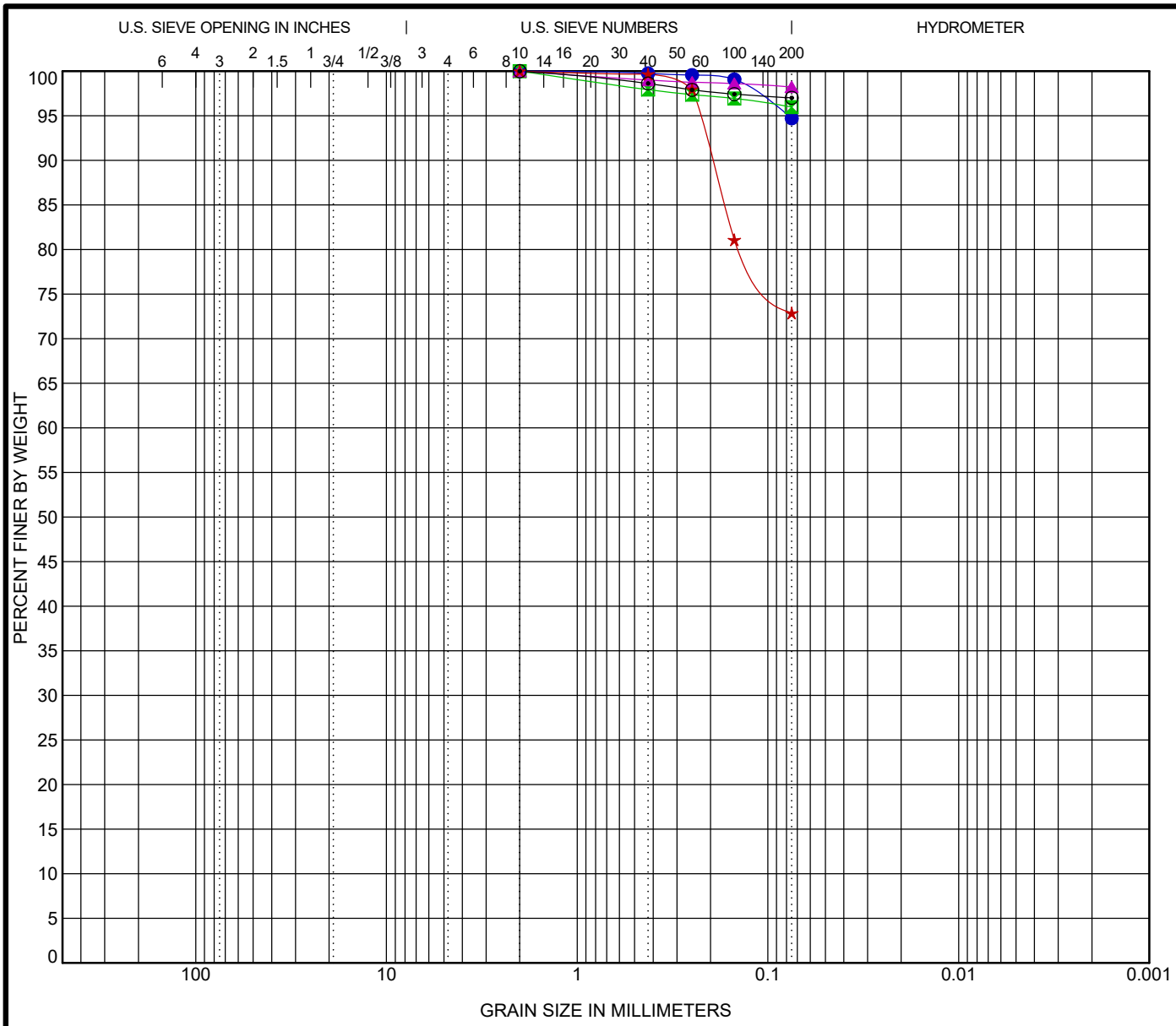
FIGURE B-65



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-159**	**6.0**	**FILL: LEAN CLAY (CL)**					
⊠	**DP-160**	**4.0**	**FILL: LEAN CLAY (CL)**					
▲	**DP-160**	**10.0**	**FAT CLAY (CH)**					
★	**DP-161**	**8.0**	**CLAY LEAN (CL)**					
⊙	**DP-161**	**20.0**	**CLAY LEAN (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-159**	**6.0**	**2**				**0.0**	**5.3**	**94.7**	
⊠	**DP-160**	**4.0**	**2**				**0.0**	**4.0**	**96.0**	
▲	**DP-160**	**10.0**	**2**				**0.0**	**1.8**	**98.2**	
★	**DP-161**	**8.0**	**2**				**0.0**	**27.1**	**72.9**	
⊙	**DP-161**	**20.0**	**2**				**0.0**	**3.0**	**97.0**	

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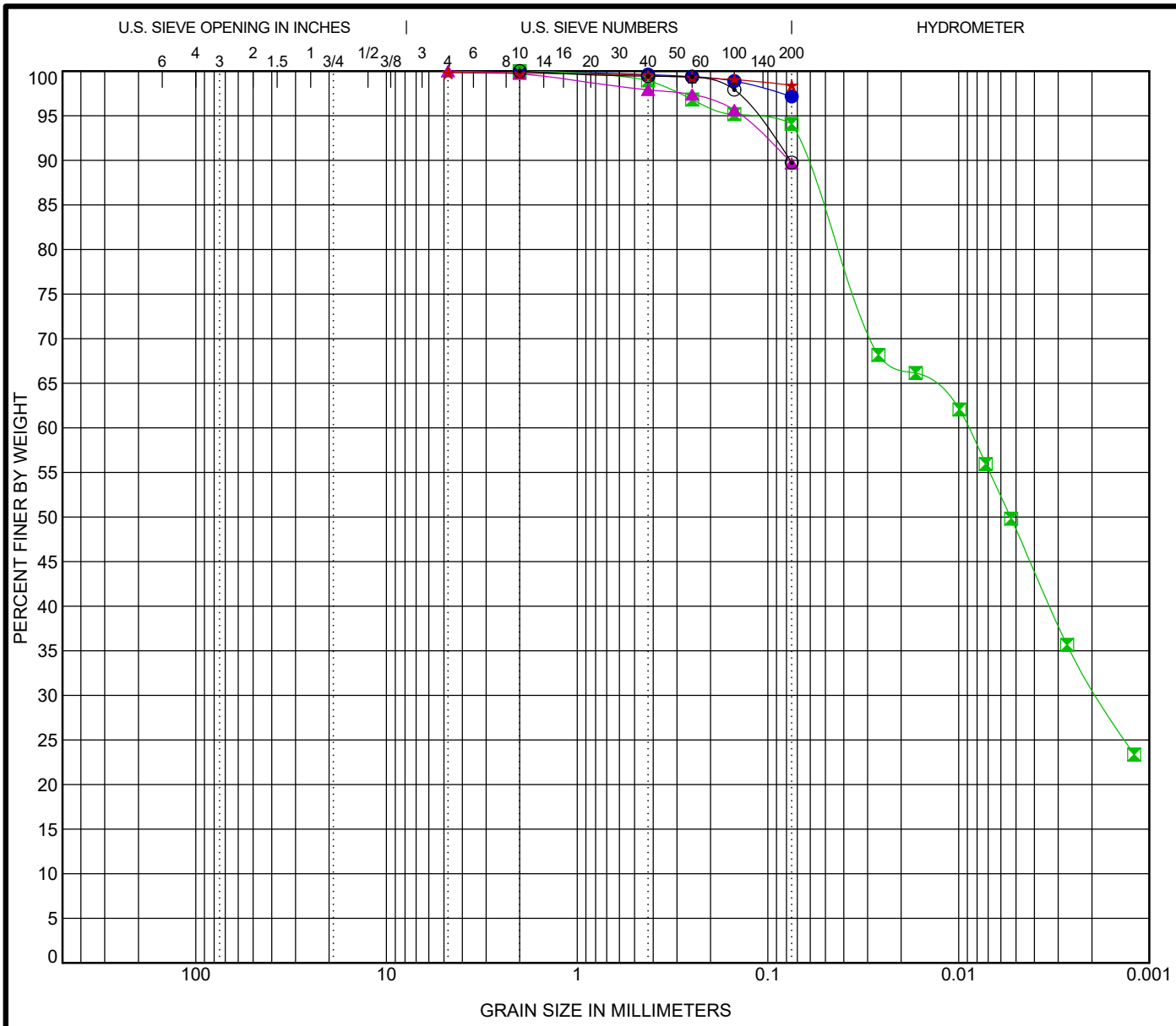
FIGURE B-66



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	DP-162	4.0	FILL: FAT CLAY (CH)					
⊠	DP-162	10.0	FAT CLAY (CH)					
▲	DP-162	30.0	CLAY LEAN (CL)					
★	DP-163	6.0	FILL: FAT CLAY (CH)					
⊙	DP-163	35.0	FAT CLAY (CH)					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-162	4.0	2				0.0	2.8	97.2	
⊠	DP-162	10.0	2	0.009	0.002		0.0	5.9	45.5	48.6
▲	DP-162	30.0	4.75				0.0	10.3	89.7	
★	DP-163	6.0	4.75				0.0	1.4	98.4	
⊙	DP-163	35.0	2				0.0	10.3	89.7	

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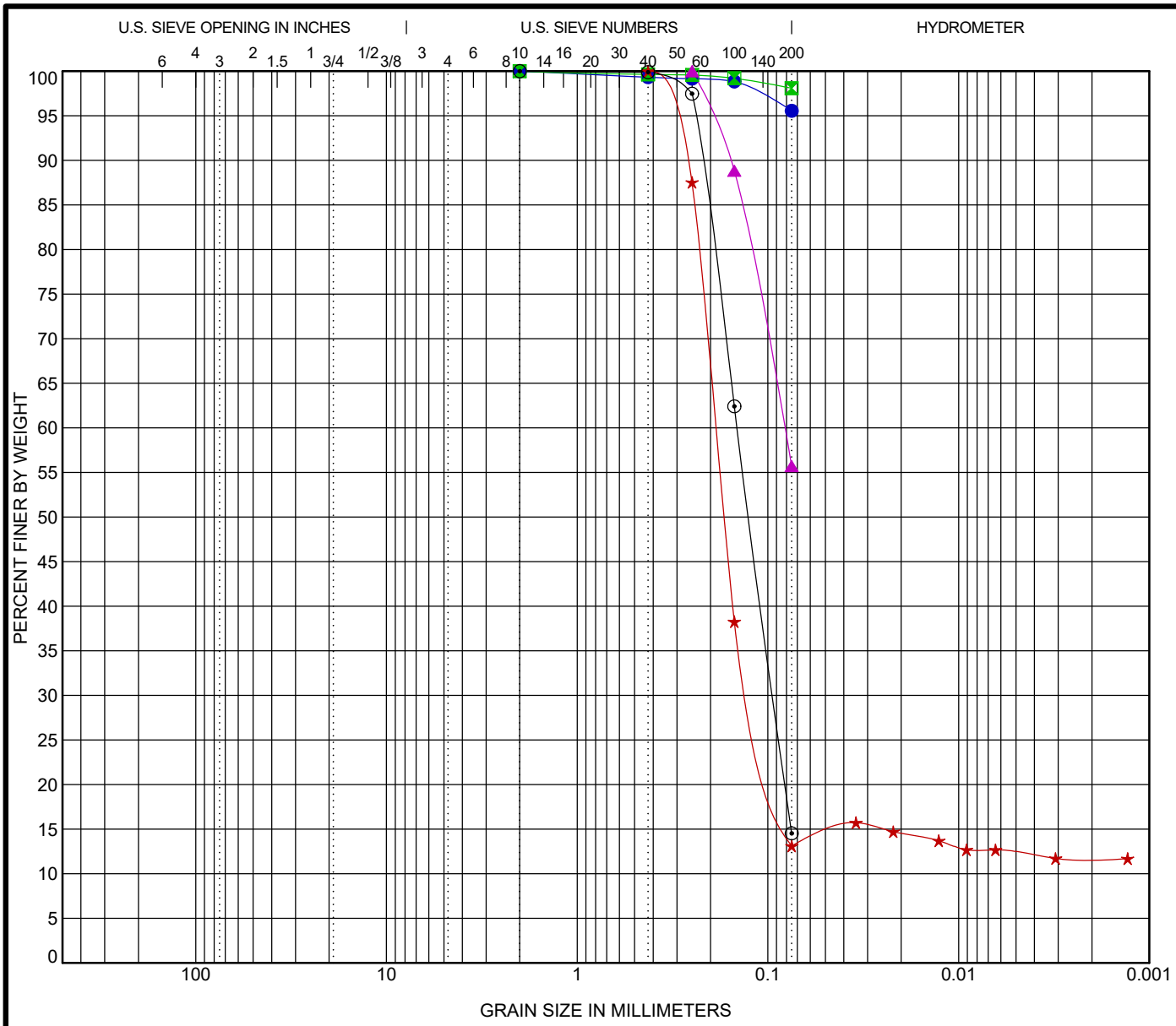

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-164	6.0	FILL: LEAN CLAY (CL)					
⊠	DP-164	48.5	FAT CLAY (CH)					
▲	DP-165	20.0	SANDY LEAN CLAY (CL)					
★	DP-165	30.0	SILTY SAND (SM)					
⊙	DP-165	40.0	SILTY SAND (SM)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-164	6.0	2				0.0	4.5	95.5	
⊠	DP-164	48.5	2				0.0	1.9	98.1	
▲	DP-165	20.0	0.25	0.082			0.0	44.3	55.7	
★	DP-165	30.0	0.425	0.188	0.087		0.0	86.9	0.8	12.4
⊙	DP-165	40.0	2	0.145	0.094		0.0	85.5	14.5	

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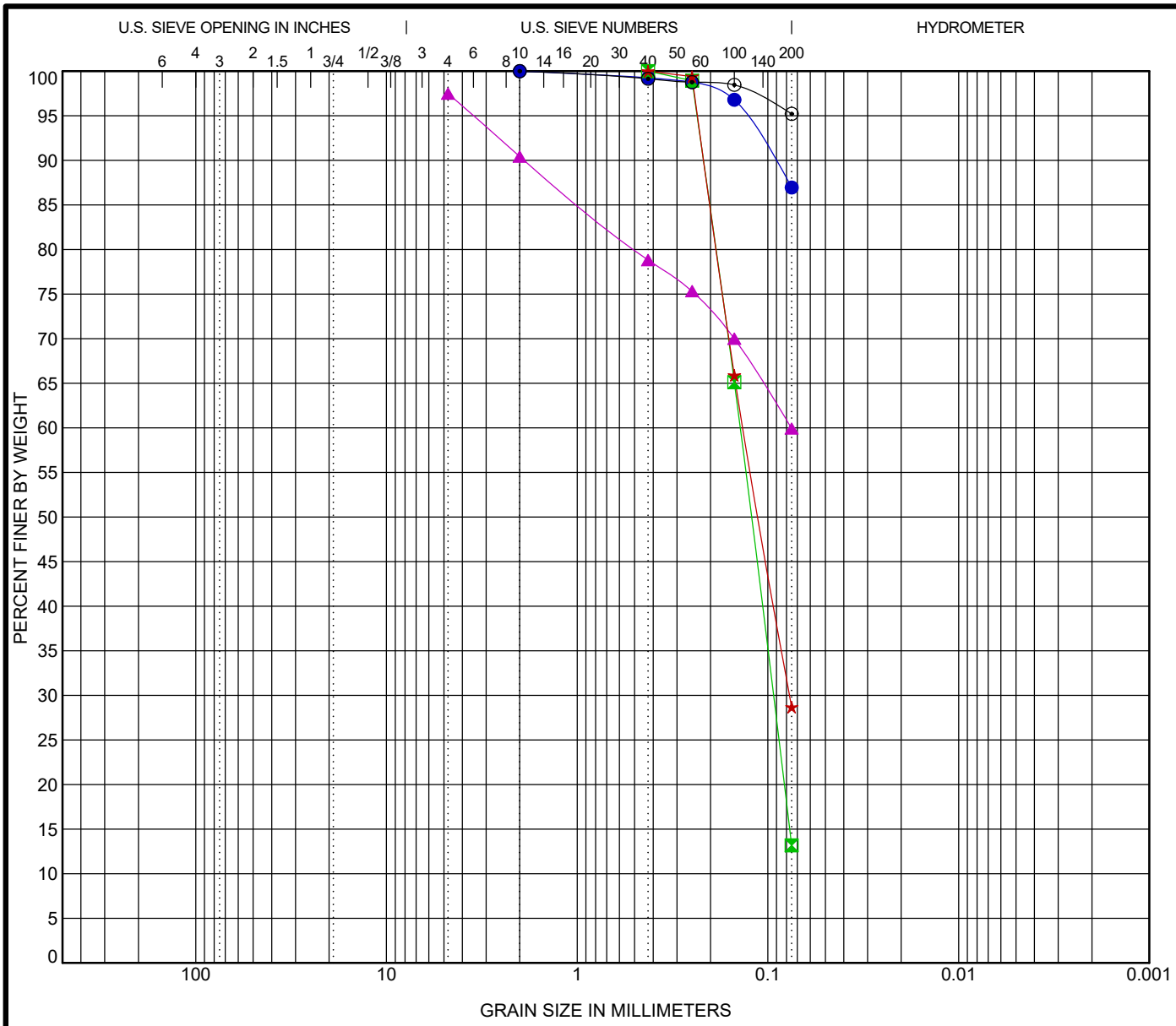
FIGURE B-68



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-166	4.0	FILL: LEAN CLAY (CL)					
⊠	DP-166	30.0	SILTY SAND (SM)					
▲	DP-167	2.0	FILL: SANDY LEAN CLAY (CL)					
★	DP-167	20.0	SILTY SAND (SM)					
⊙	DP-168	4.0	FILL: FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-166	4.0	2				0.0	13.0	87.0	
⊠	DP-166	30.0	0.425	0.14	0.094		0.0	86.8	13.2	
▲	DP-167	2.0	4.75	0.075			0.0	37.6	59.9	
★	DP-167	20.0	0.425	0.134	0.077		0.0	71.3	28.7	
⊙	DP-168	4.0	2				0.0	4.8	95.2	

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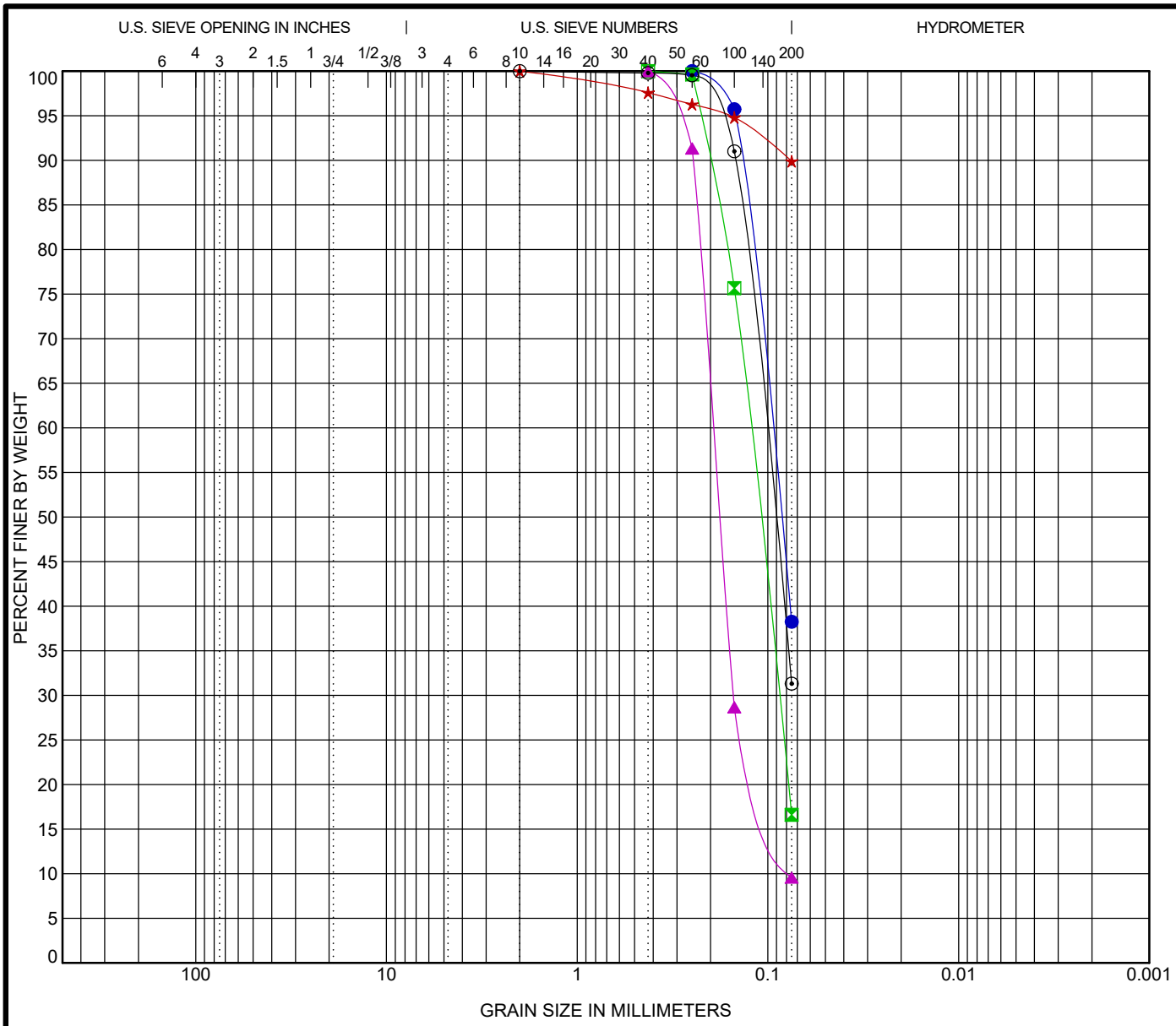

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-168	20.0	SILTY SAND (SM)					
⊠	DP-169	20.0	SILTY SAND (SM)					
▲	DP-169	40.0	SAND w/ SILT (SP-SM)				1.56	2.54
★	DP-170	8.0	FILL: FAT CLAY (CH)					
⊙	DP-170	20.0	SILTY SAND (SM)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-168	20.0	0.25	0.097			0.0	61.7	38.3	
⊠	DP-169	20.0	0.425	0.125	0.088		0.0	83.4	16.6	
▲	DP-169	40.0	0.425	0.194	0.152	0.076	0.0	90.4	9.6	
★	DP-170	8.0	2				0.0	10.1	89.9	
⊙	DP-170	20.0	2	0.105			0.0	68.7	31.3	

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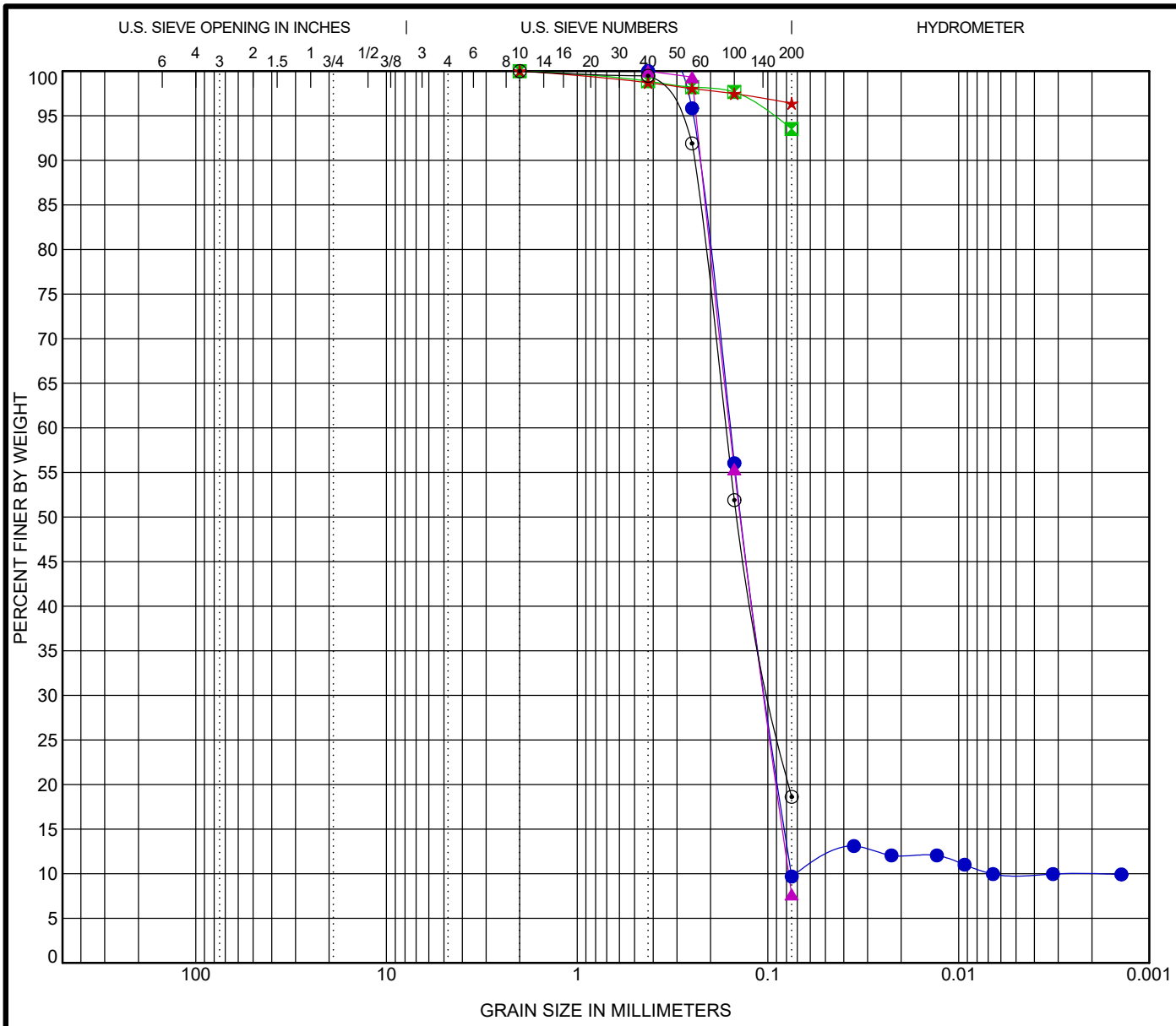
FIGURE B-70



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-170	40.0	SAND w/ SILT (SP-SM)				3.71	23.64
⊠	DP-171	8.0	FAT CLAY (CH)					
▲	DP-171	40.0	SAND w/ SILT (SP-SM)				0.88	2.04
★	DP-172	10.0	SAND w/ SILT (SP-SM)					
⊙	DP-172	30.0	SILTY SAND (SM)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-170	40.0	0.425	0.158	0.062	0.007	0.0	90.3	-0.3	10.0
⊠	DP-171	8.0	2				0.0	6.5	93.5	
▲	DP-171	40.0	0.425	0.158	0.104	0.078	0.0	92.3	7.7	
★	DP-172	10.0	2				0.0	3.6	96.4	
⊙	DP-172	30.0	2	0.166	0.095		0.0	81.4	18.6	

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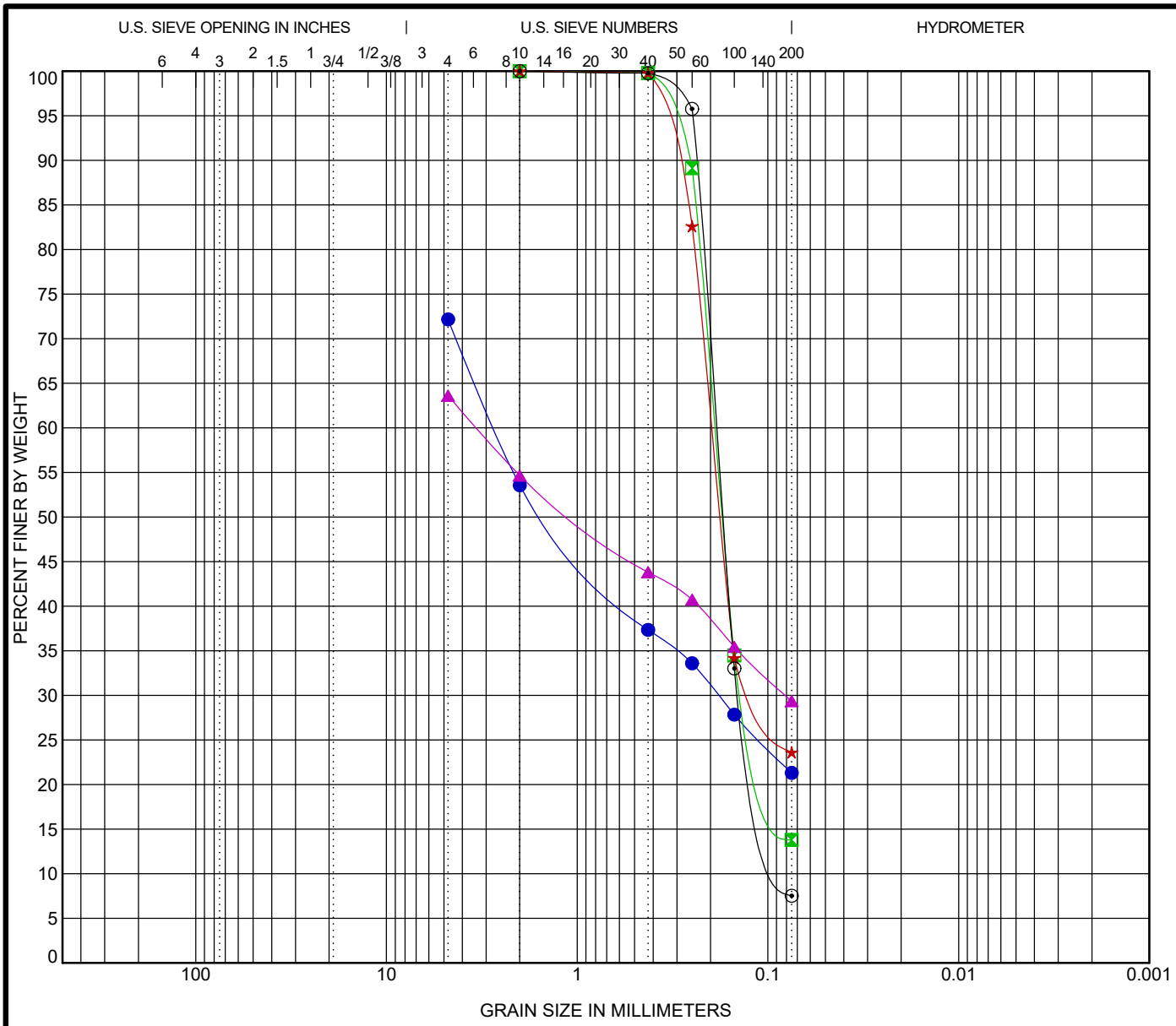
FIGURE B-71



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-173	0.0	FILL: CLAYEY SAND (SC)					
⊠	DP-173	25.0	SILTY SAND (SM)					
▲	DP-174	2.0	FILL: CLAYEY SAND (SC)					
★	DP-174	48.0	SILTY SAND (SM)					
⊙	DP-175	30.0	SAND w/ SILT (SP-SM)				1.27	2.33

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-173	0.0	4.75	2.698	0.182		0.0	50.9	21.3	
⊠	DP-173	25.0	2	0.19	0.129		0.0	86.2	13.8	
▲	DP-174	2.0	4.75	3.351	0.081		0.0	34.3	29.4	
★	DP-174	48.0	2	0.197	0.114		0.0	76.4	23.6	
⊙	DP-175	30.0	2	0.187	0.138	0.08	0.0	92.5	7.5	

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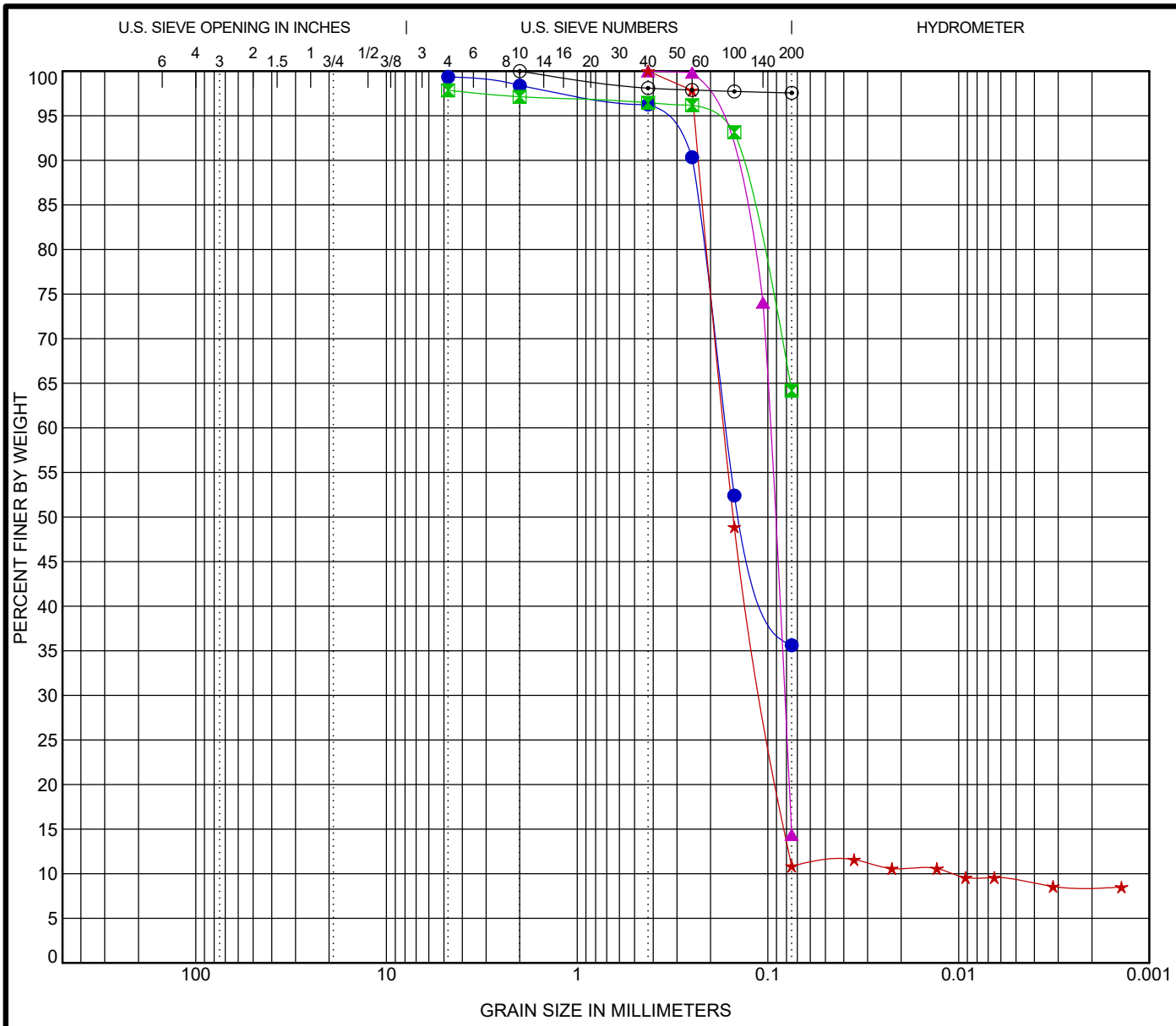
FIGURE B-72



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-175	48.5	SILTY SAND (SM)					
⊠	DP-176	6.0	FILL: SANDY LEAN CLAY (CL)					
▲	DP-176	20.0	SILTY SAND (SM)					
★	DP-176	35.0	SAND w/ SILT (SP-SM)				2.90	15.81
⊙	DP-177	0.0	FILL: FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-175	48.5	4.75	0.166			0.0	63.7	35.6	
⊠	DP-176	6.0	4.75				0.0	33.7	64.2	
▲	DP-176	20.0	0.425	0.098	0.082		0.0	85.6	14.4	
★	DP-176	35.0	0.425	0.168	0.072	0.011	0.0	89.2	1.6	9.2
⊙	DP-177	0.0	2				0.0	2.4	97.6	

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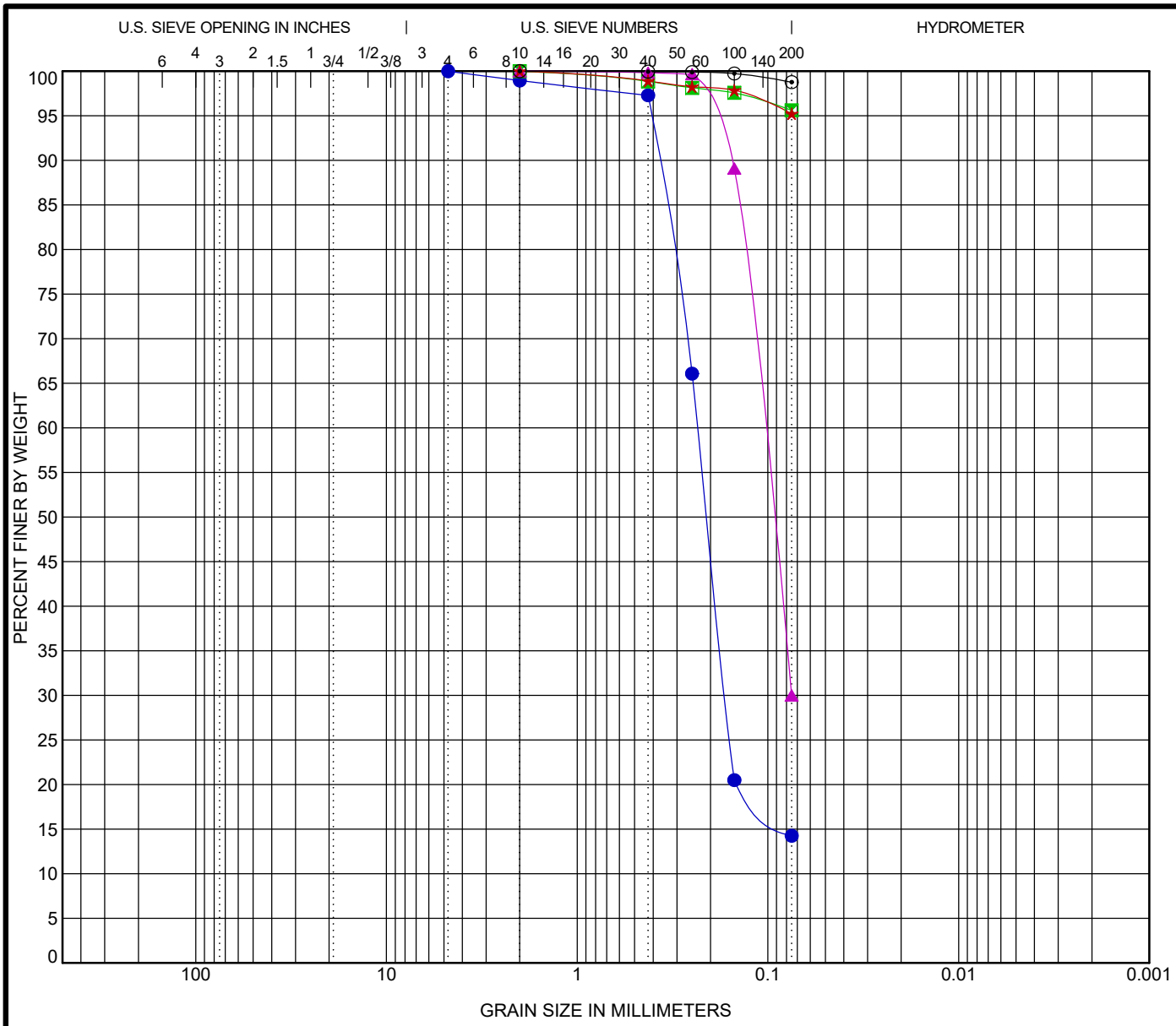

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-177	30.0	CLAYEY SAND (SC)					
⊠	DP-178	2.0	FILL: FAT CLAY (CH)					
▲	DP-178	25.0	SILTY SAND (SM)					
★	DP-179	2.0	FILL: LEAN CLAY (CL)					
⊙	DP-179	10.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-177	30.0	4.75	0.234	0.167		0.0	85.7	14.3	
⊠	DP-178	2.0	2				0.0	4.4	95.6	
▲	DP-178	25.0	2	0.107	0.075		0.0	70.0	30.0	
★	DP-179	2.0	2				0.0	4.8	95.2	
⊙	DP-179	10.0	2				0.0	1.2	98.8	

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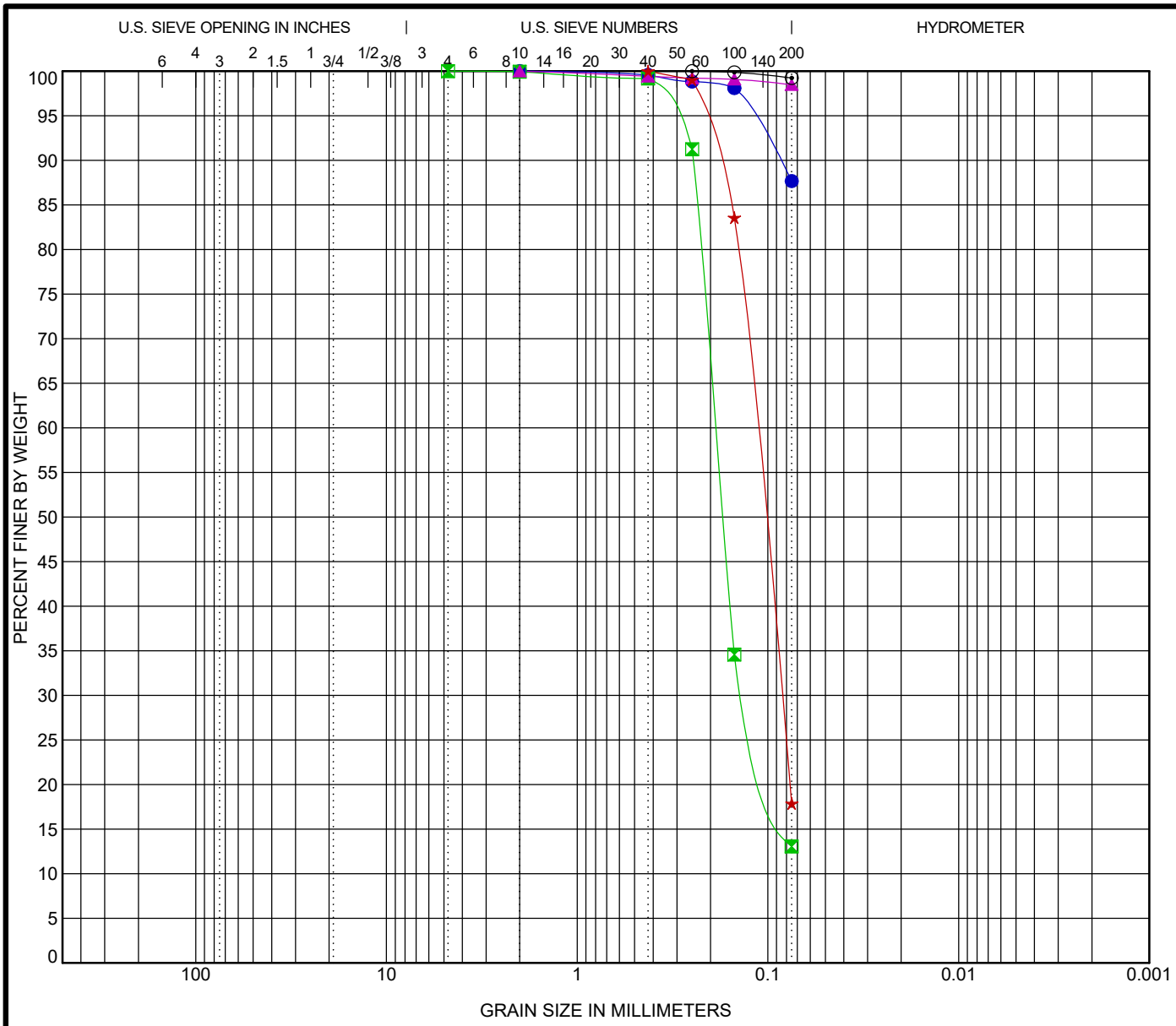
FIGURE B-74



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-180	6.0	FILL: SILT w/ SAND (ML)					
⊠	DP-180	40.0	SILTY SAND (SM)					
▲	DP-181	6.0	FILL: LEAN CLAY (CL)					
★	DP-181	30.0	SILTY SAND (SM)					
⊙	DP-182	15.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-180	6.0	2				0.0	12.3	87.7	
⊠	DP-180	40.0	4.75	0.189	0.129		0.0	86.9	13.1	
▲	DP-181	6.0	2				0.0	1.5	98.5	
★	DP-181	30.0	0.425	0.117	0.085		0.0	82.1	17.9	
⊙	DP-182	15.0	0.25				0.0	0.8	99.2	

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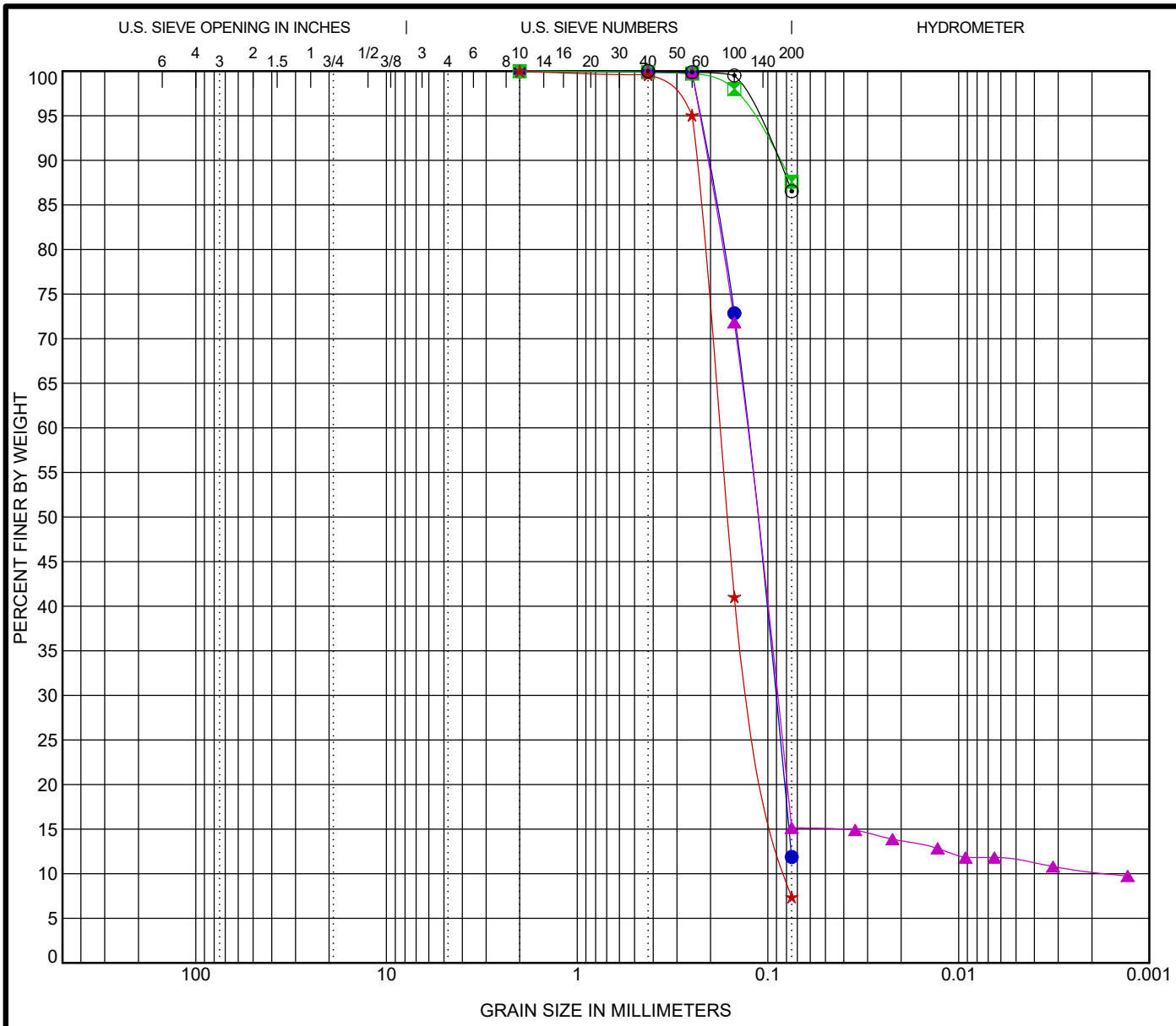

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-182	35.0	SILTY SAND (SM)				0.89	1.77
⊠	DP-183	6.0	CLAY LEAN (CL)					
▲	DP-183	15.0	SILTY SAND (SM)				38.73	80.67
★	DP-183	48.5	SAND w/ SILT (SP-SM)				1.01	2.27
⊙	DP-184	4.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-182	35.0	2	0.13	0.092		0.0	88.1	11.9	
⊠	DP-183	6.0	2				0.0	12.4	87.6	
▲	DP-183	15.0	0.425	0.13	0.09	0.002	0.0	84.9	3.7	11.4
★	DP-183	48.5	2	0.179	0.119	0.079	0.0	92.6	7.4	
⊙	DP-184	4.0	0.425				0.0	13.5	86.5	

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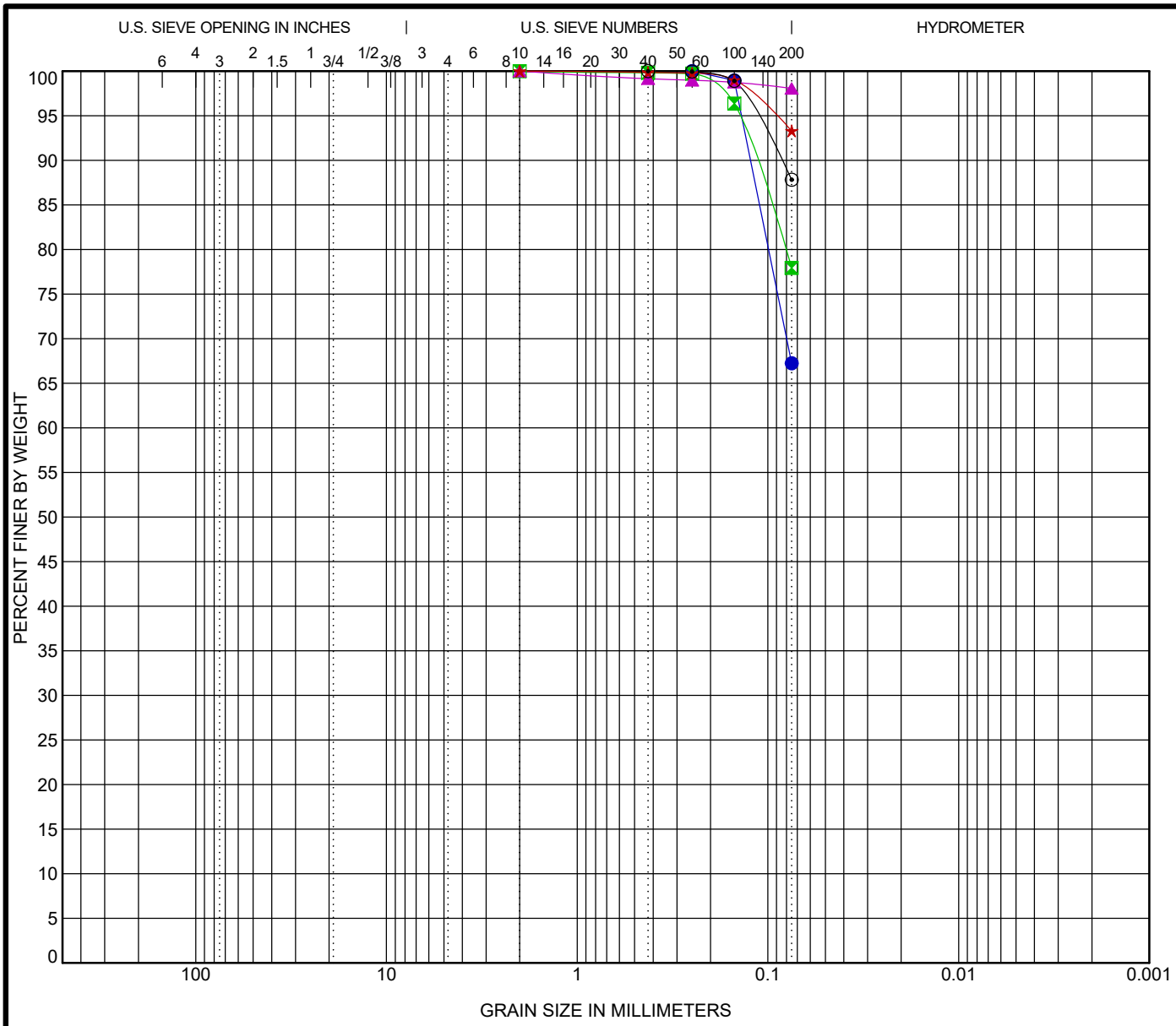
FIGURE B-76



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-184	10.0	SANDY LEAN CLAY (CL)					
⊠	DP-185	4.0	CLAY LEAN (CL)					
▲	DP-185	15.0	FAT CLAY (CH)					
★	DP-186	2.0	FILL: LEAN CLAY (CL)					
⊙	DP-186	8.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-184	10.0	0.25				0.0	32.8	67.2	
⊠	DP-185	4.0	2				0.0	22.1	77.9	
▲	DP-185	15.0	2				0.0	1.9	98.1	
★	DP-186	2.0	2				0.0	6.7	93.3	
⊙	DP-186	8.0	0.425				0.0	12.2	87.8	

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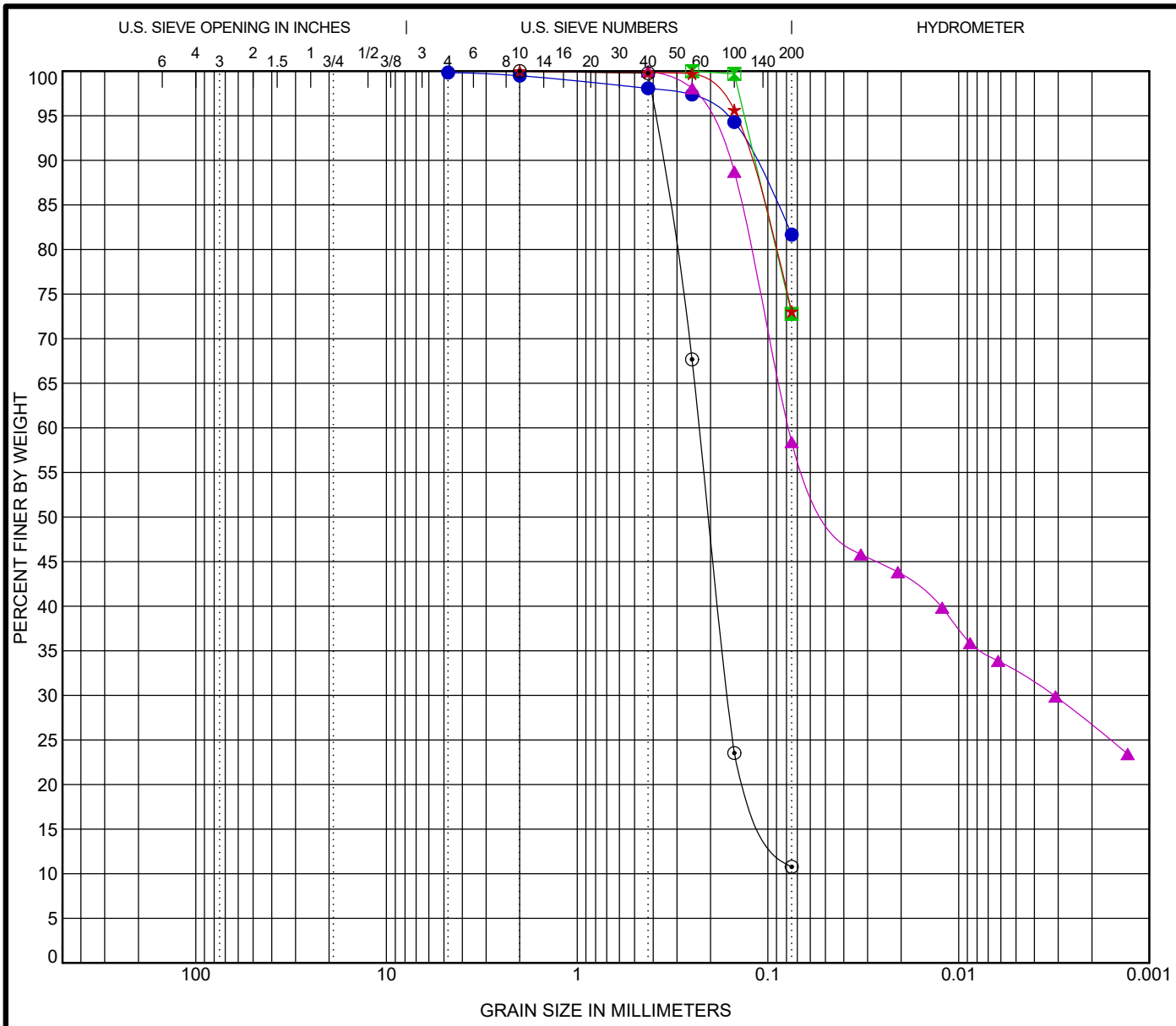

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-187	4.0	FILL: SILT w/ SAND (ML)					
⊠	DP-187	16.5	FAT CLAY (CH)					
▲	DP-188	0.0	FILL: SANDY LEAN CLAY (CL)					
★	DP-188	15.0	SILT w/ SAND (ML)					
⊙	DP-188	35.0	SAND w/ SILT (SP-SM)				1.59	3.18

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-187	4.0	4.75				0.0	18.2	81.7	
⊠	DP-187	16.5	0.25				0.0	27.2	72.8	
▲	DP-188	0.0	0.425	0.078	0.003		0.0	41.6	25.8	32.6
★	DP-188	15.0	2				0.0	26.9	73.1	
⊙	DP-188	35.0	2	0.229	0.162		0.0	89.2	10.8	

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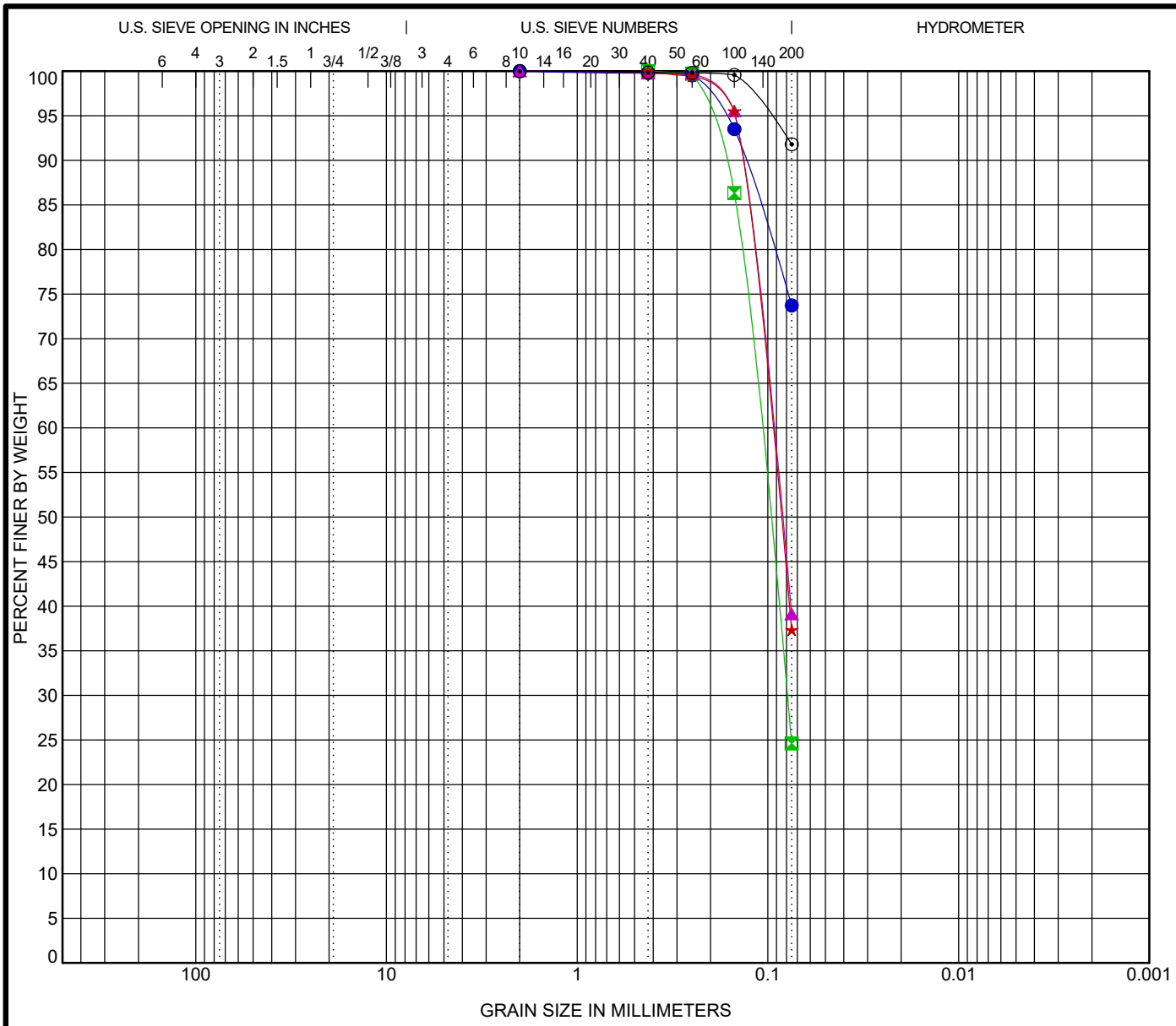

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-189**	**6.0**	**FILL: LEAN CLAY (CL)**					
⊠	**DP-189**	**25.0**	**SILTY SAND (SM)**					
▲	**DP-190**	**20.0**	**SILTY SAND (SM)**					
★	**DP-190**	**35.0**	**SILTY SAND (SM)**					
⊙	**DP-191**	**0.0**	**FILL: LEAN CLAY (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-189**	**6.0**	**2**				**0.0**	**26.3**	**73.7**	
⊠	**DP-189**	**25.0**	**0.425**	**0.112**	**0.08**		**0.0**	**75.4**	**24.6**	
▲	**DP-190**	**20.0**	**2**	**0.097**			**0.0**	**60.9**	**39.1**	
★	**DP-190**	**35.0**	**0.425**	**0.098**			**0.0**	**62.7**	**37.3**	
⊙	**DP-191**	**0.0**	**2**				**0.0**	**8.2**	**91.8**	

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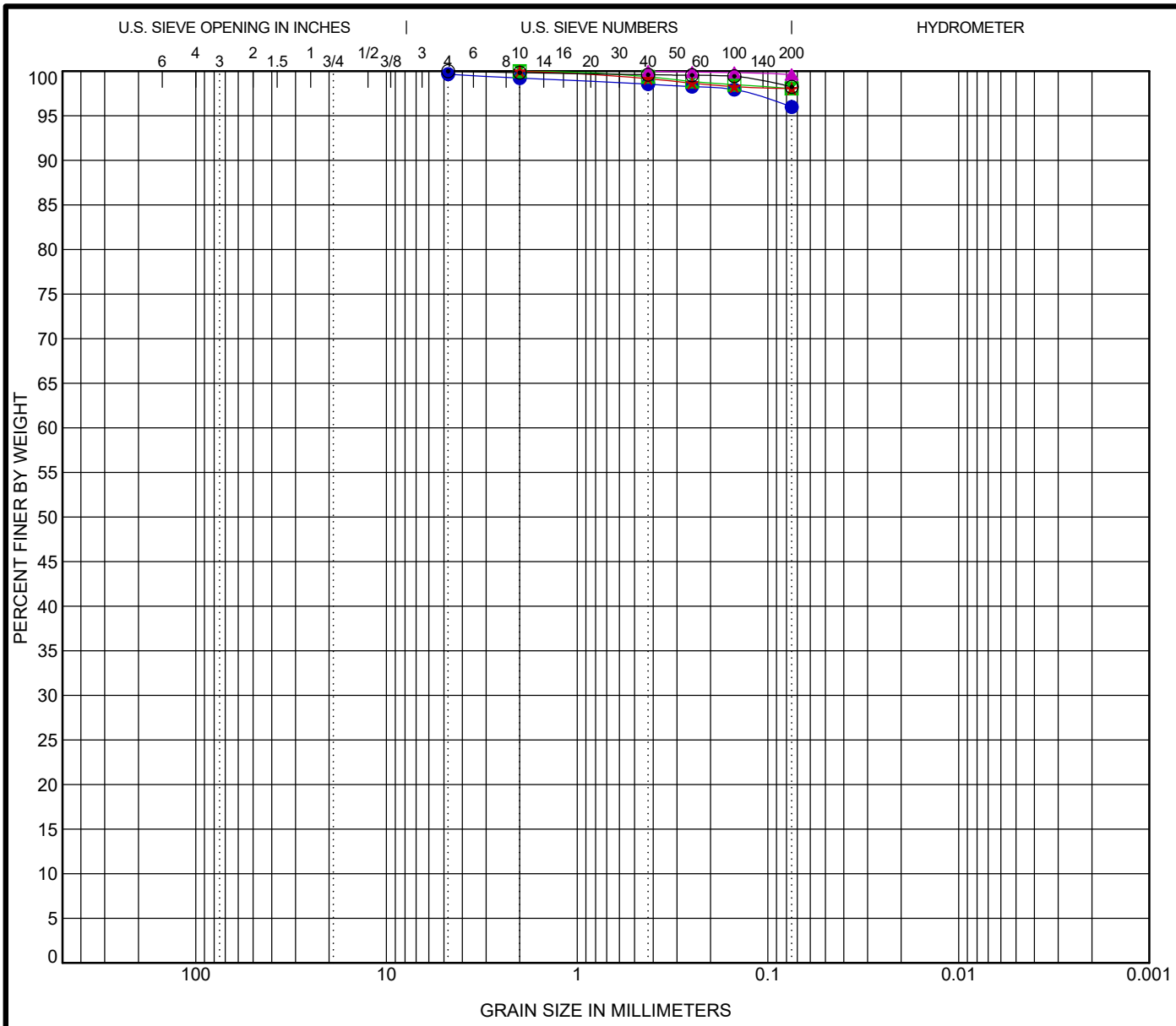
FIGURE B-79



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-191**	**15.0**	**SILT (ML)**					
⊠	**DP-192**	**2.0**	**FILL: LEAN CLAY (CL)**					
▲	**DP-192**	**35.0**	**FAT CLAY (CH)**					
★	**DP-193**	**2.0**	**FILL: LEAN CLAY (CL)**					
⊙	**DP-193**	**40.0**	**FAT CLAY (CH)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-191**	**15.0**	**4.75**				**0.0**	**3.7**	**96.0**	
⊠	**DP-192**	**2.0**	**2**				**0.0**	**1.9**	**98.1**	
▲	**DP-192**	**35.0**	**0.425**				**0.0**	**0.4**	**99.6**	
★	**DP-193**	**2.0**	**2**				**0.0**	**2.0**	**98.0**	
⊙	**DP-193**	**40.0**	**4.75**				**0.0**	**1.8**	**98.2**	

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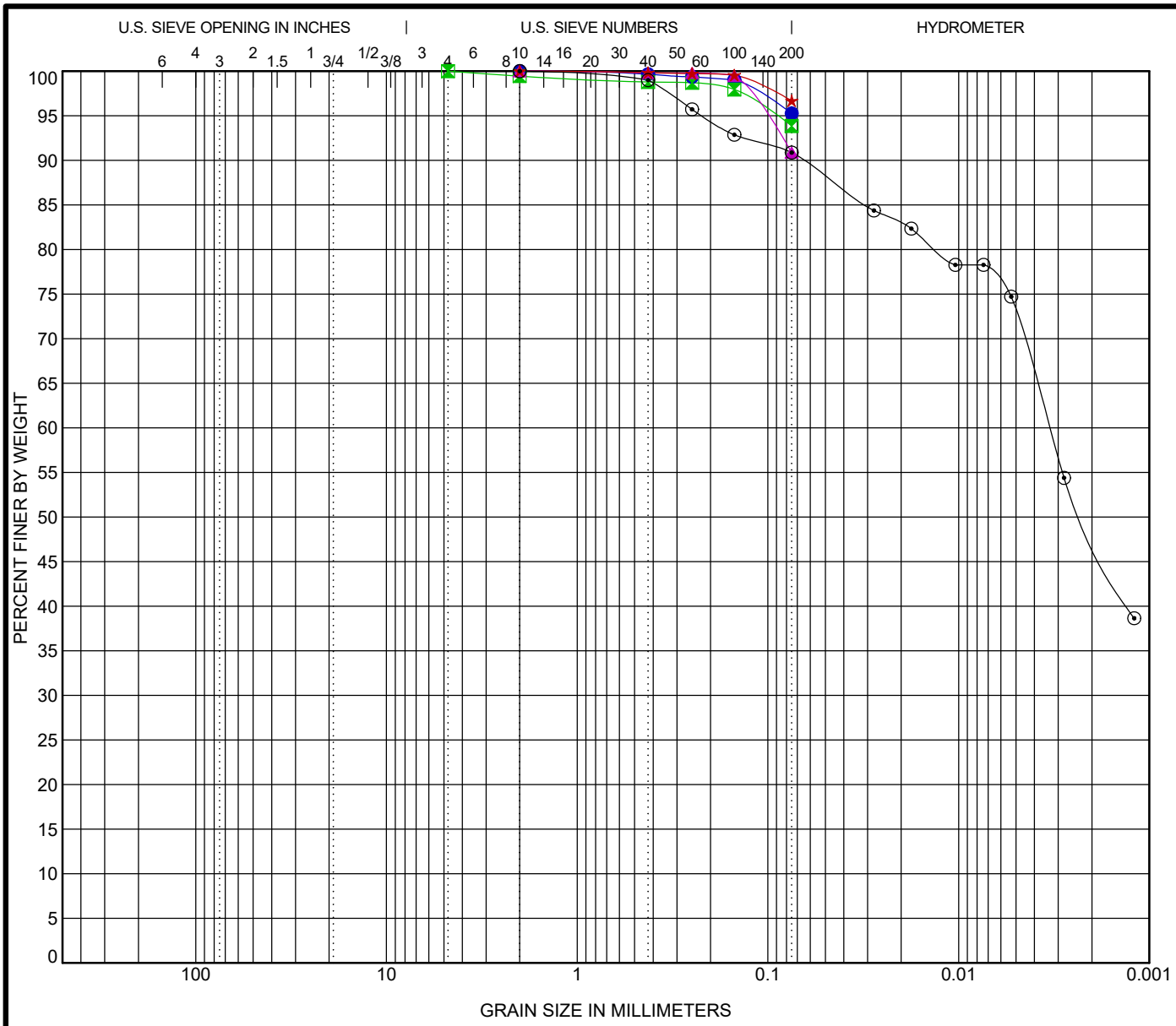

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	DP-194	10.0	FAT CLAY (CH)					
⊠	DP-194	30.0	FAT CLAY (CH)					
▲	DP-195	2.0	FILL: LEAN CLAY (CL)					
★	DP-195	8.0	FILL: LEAN CLAY (CL)					
⊙	DP-195	10.0	FAT CLAY (CH)					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-194	10.0	2				0.0	4.7	95.3	
⊠	DP-194	30.0	4.75				0.0	6.1	93.9	
▲	DP-195	2.0	2				0.0	9.1	90.9	
★	DP-195	8.0	2				0.0	3.3	96.7	
⊙	DP-195	10.0	2	0.003			0.0	9.1	18.0	72.9

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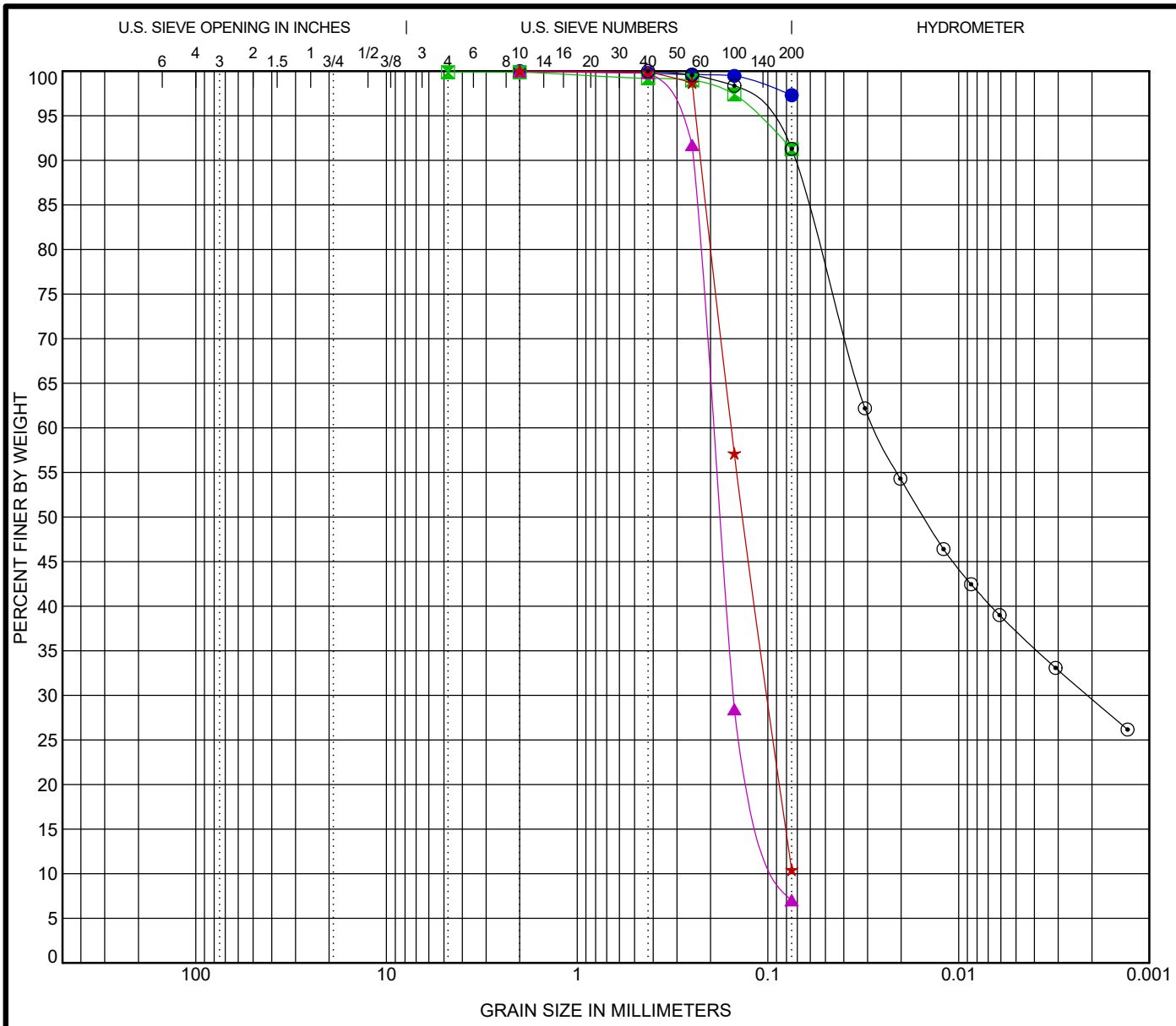

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-196	6.0	CLAY LEAN (CL)					
⊠	DP-196	25.0	CLAY LEAN (CL)	49	17	32		
▲	DP-197	25.0	SAND w/ SILT (SP-SM)				1.44	2.34
★	DP-197	40.0	SAND w/ SILT (SP-SM)				0.87	2.09
⊙	DP-198	0.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-196	6.0	2				0.0	2.7	97.3	
⊠	DP-196	25.0	4.75				0.0	8.6	91.3	
▲	DP-197	25.0	2	0.194	0.152	0.083	0.0	93.0	7.0	
★	DP-197	40.0	2	0.155	0.1		0.0	89.6	10.4	
⊙	DP-198	0.0	0.425	0.028	0.002		0.0	8.7	54.0	37.3

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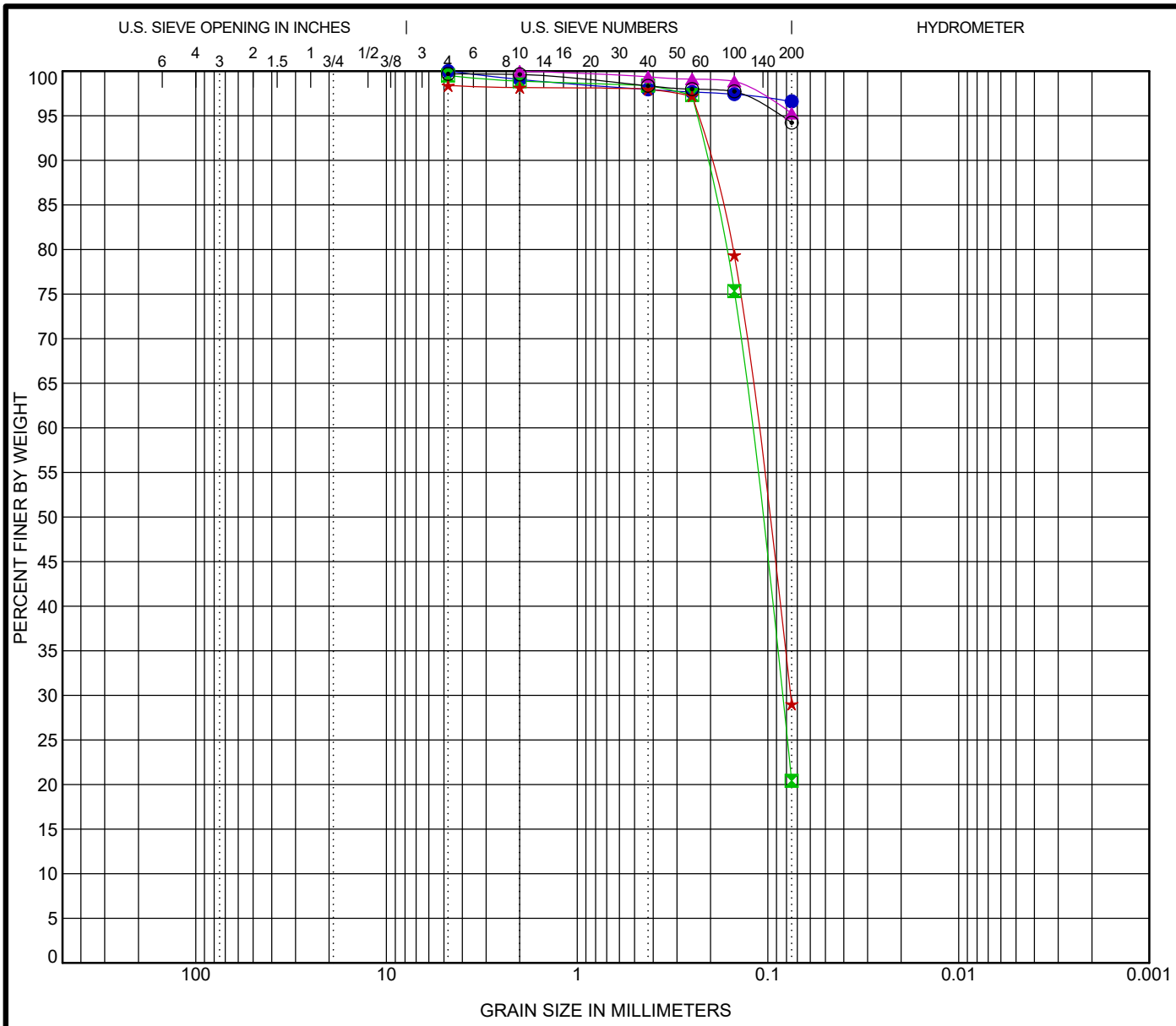
FIGURE B-82



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-198**	**25.0**	**SILT (ML)**					
⊠	**DP-198**	**40.0**	**SILTY SAND (SM)**					
▲	**DP-199**	**8.0**	**CLAY LEAN (CL)**					
★	**DP-199**	**35.0**	**SILTY SAND (SM)**					
⊙	**DP-200**	**2.0**	**FILL: LEAN CLAY (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-198**	**25.0**	**4.75**				**0.0**	**3.4**	**96.6**	
⊠	**DP-198**	**40.0**	**4.75**	**0.124**	**0.085**		**0.0**	**79.1**	**20.4**	
▲	**DP-199**	**8.0**	**2**				**0.0**	**4.7**	**95.3**	
★	**DP-199**	**35.0**	**4.75**	**0.115**	**0.076**		**0.0**	**69.4**	**29.0**	
⊙	**DP-200**	**2.0**	**4.75**				**0.0**	**5.5**	**94.2**	

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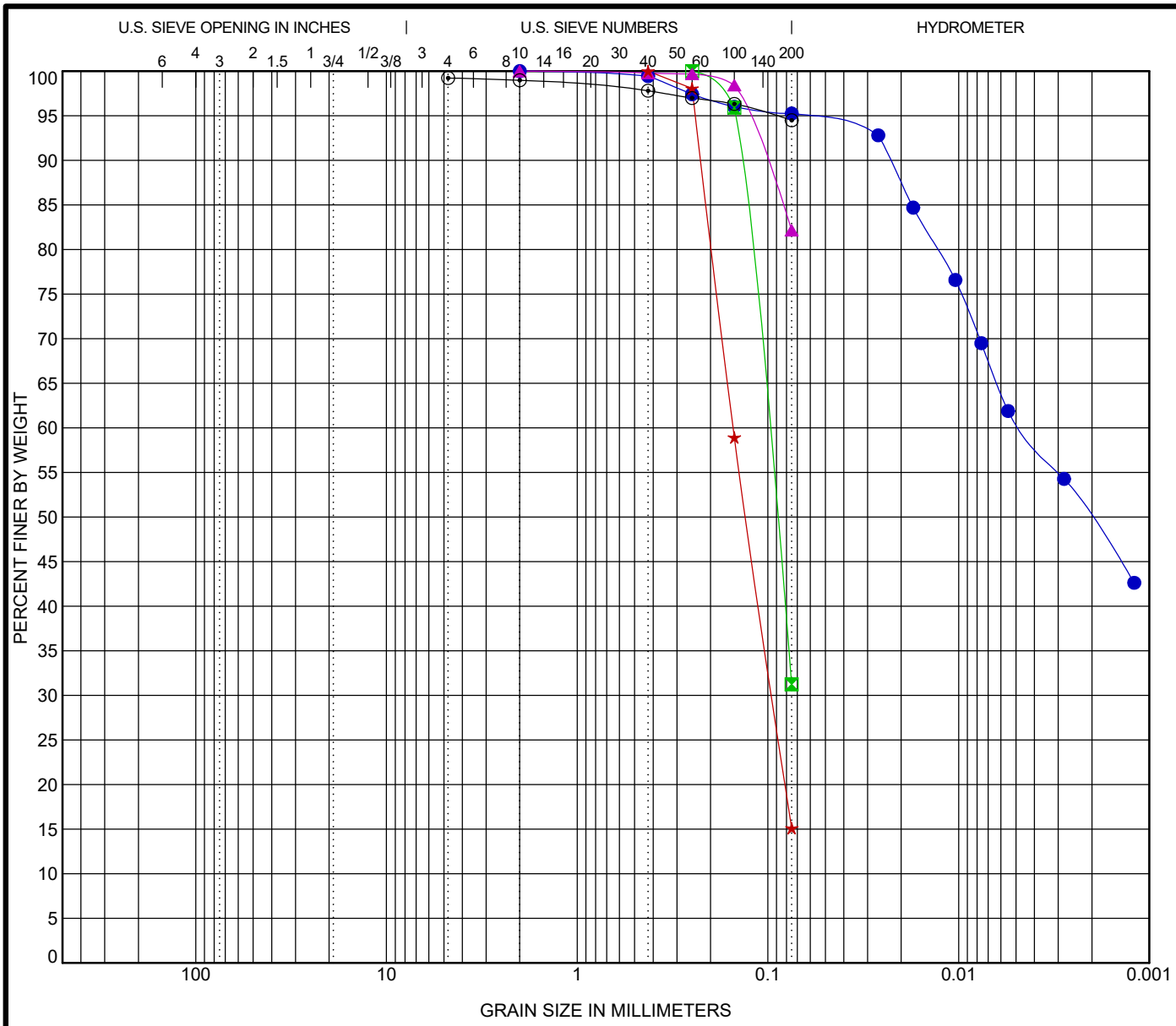

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-200	15.0	CLAY LEAN (CL)					
⊠	DP-200	30.0	SILTY SAND (SM)					
▲	DP-201	15.0	CLAY LEAN (CL)					
★	DP-201	40.0	SILTY SAND (SM)					
⊙	DP-202	4.0	FILL: FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-200	15.0	2	0.005			0.0	4.8	34.4	60.8
⊠	DP-200	30.0	0.25	0.102			0.0	68.8	31.2	
▲	DP-201	15.0	2				0.0	17.8	82.2	
★	DP-201	40.0	0.425	0.152	0.095		0.0	84.9	15.1	
⊙	DP-202	4.0	4.75				0.0	4.7	94.5	

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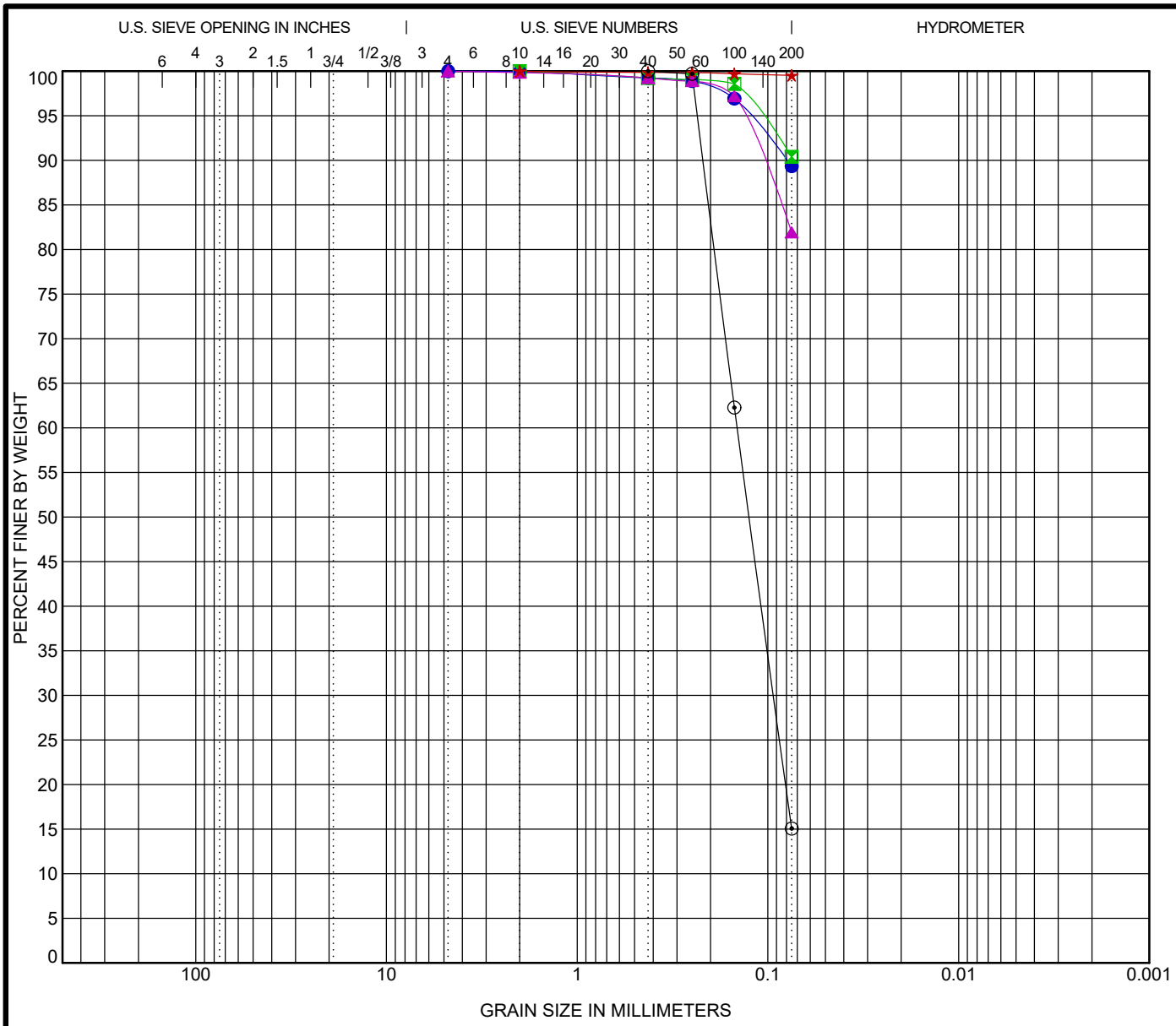

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-202	20.0	FAT CLAY (CH)					
⊠	DP-203	4.0	FILL: LEAN CLAY (CL)					
▲	DP-203	10.0	FAT CLAY (CH)					
★	DP-204	8.0	FAT CLAY (CH)					
⊙	DP-204	20.0	SILTY SAND (SM)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-202	20.0	4.75				0.0	10.7	89.3	
⊠	DP-203	4.0	2				0.0	9.6	90.4	
▲	DP-203	10.0	4.75				0.0	18.1	81.9	
★	DP-204	8.0	2				0.0	0.5	99.5	
⊙	DP-204	20.0	0.425	0.145	0.093		0.0	84.9	15.1	

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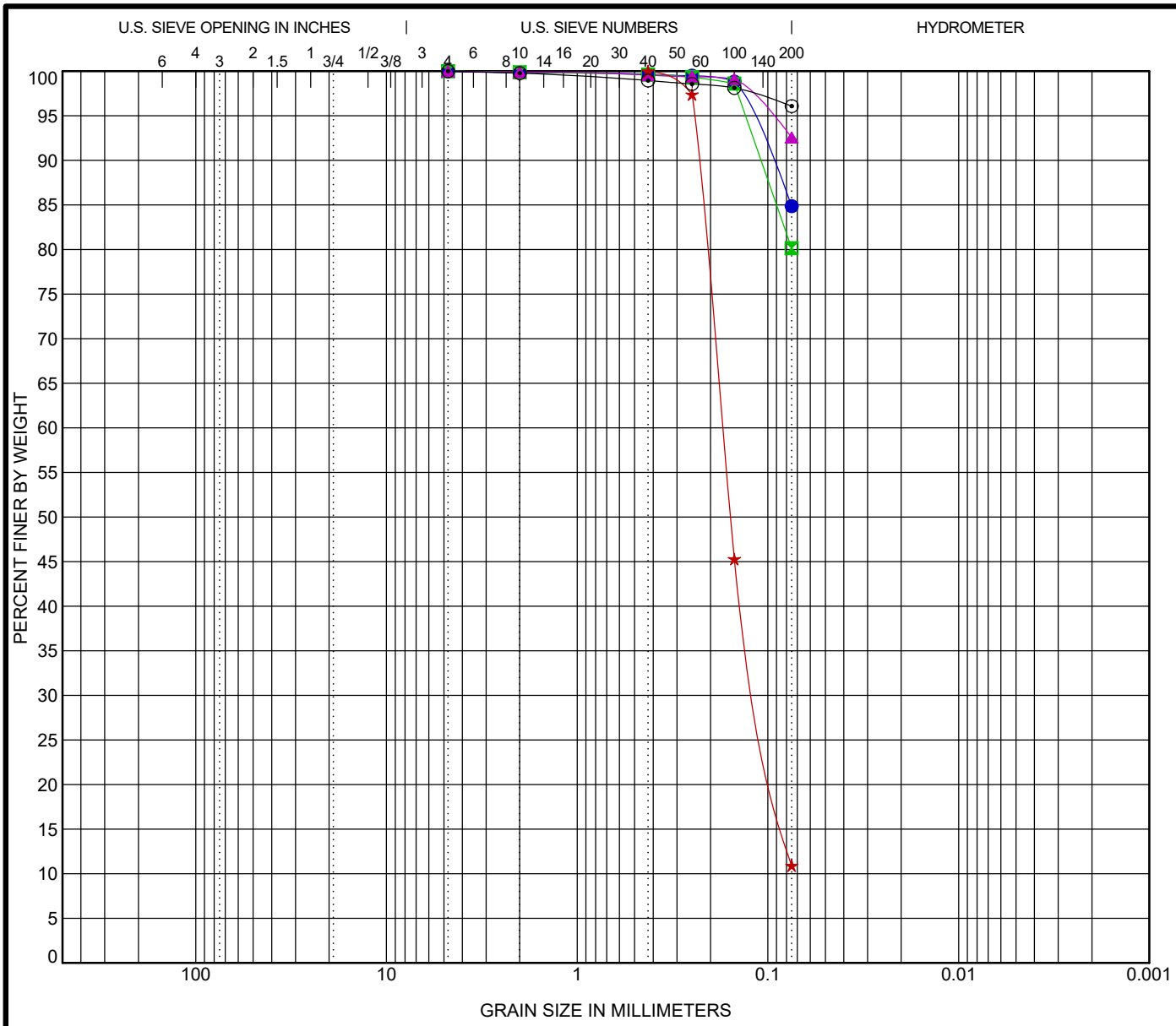
FIGURE B-85



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-205	6.0	FILL: LEAN CLAY (CL)					
⊠	DP-205	15.0	CLAY LEAN (CL)					
▲	DP-206	20.0	CLAY LEAN (CL)					
★	DP-206	40.0	SAND w/ SILT (SP-SM)				0.95	2.35
⊙	DP-207	8.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-205	6.0	4.75				0.0	15.1	84.9	
⊠	DP-205	15.0	4.75				0.0	19.8	80.2	
▲	DP-206	20.0	4.75				0.0	7.4	92.6	
★	DP-206	40.0	0.425	0.173	0.11		0.0	89.1	10.9	
⊙	DP-207	8.0	4.75				0.0	3.9	96.1	

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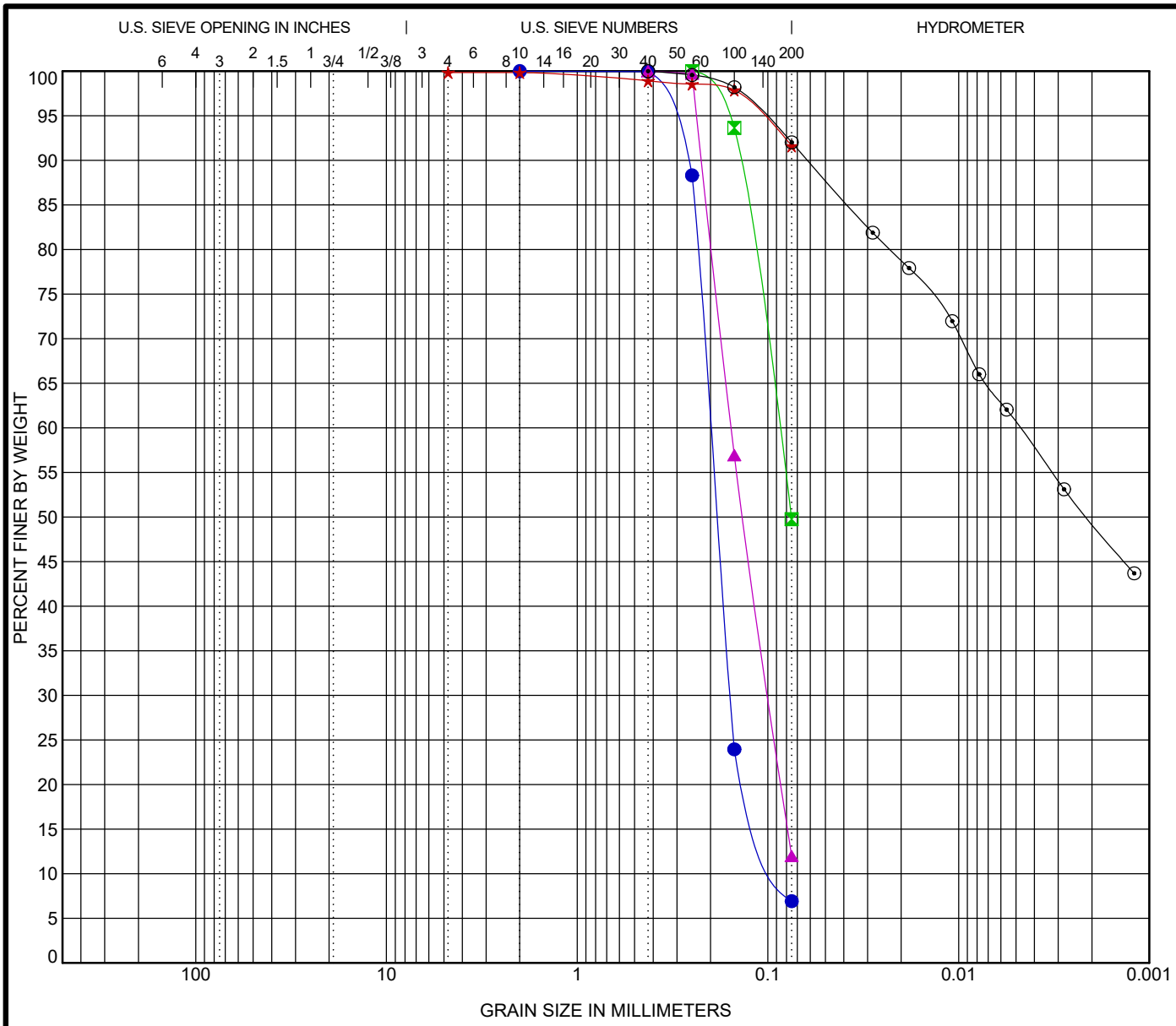
FIGURE B-86



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-207	25.0	SAND w/ SILT (SP-SM)				1.46	2.35
⊠	DP-208	15.0	SANDY LEAN CLAY (CL)					
▲	DP-208	35.0	SAND w/ SILT (SP-SM)				0.87	2.14
★	DP-209	0.0	FILL: LEAN CLAY (CL)					
⊙	DP-209	6.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-207	25.0	2	0.2	0.157	0.085	0.0	93.1	6.9	
⊠	DP-208	15.0	0.25	0.088			0.0	50.2	49.8	
▲	DP-208	35.0	0.425	0.156	0.099		0.0	88.0	12.0	
★	DP-209	0.0	4.75				0.0	8.2	91.6	
⊙	DP-209	6.0	0.425	0.005			0.0	8.0	31.4	60.6

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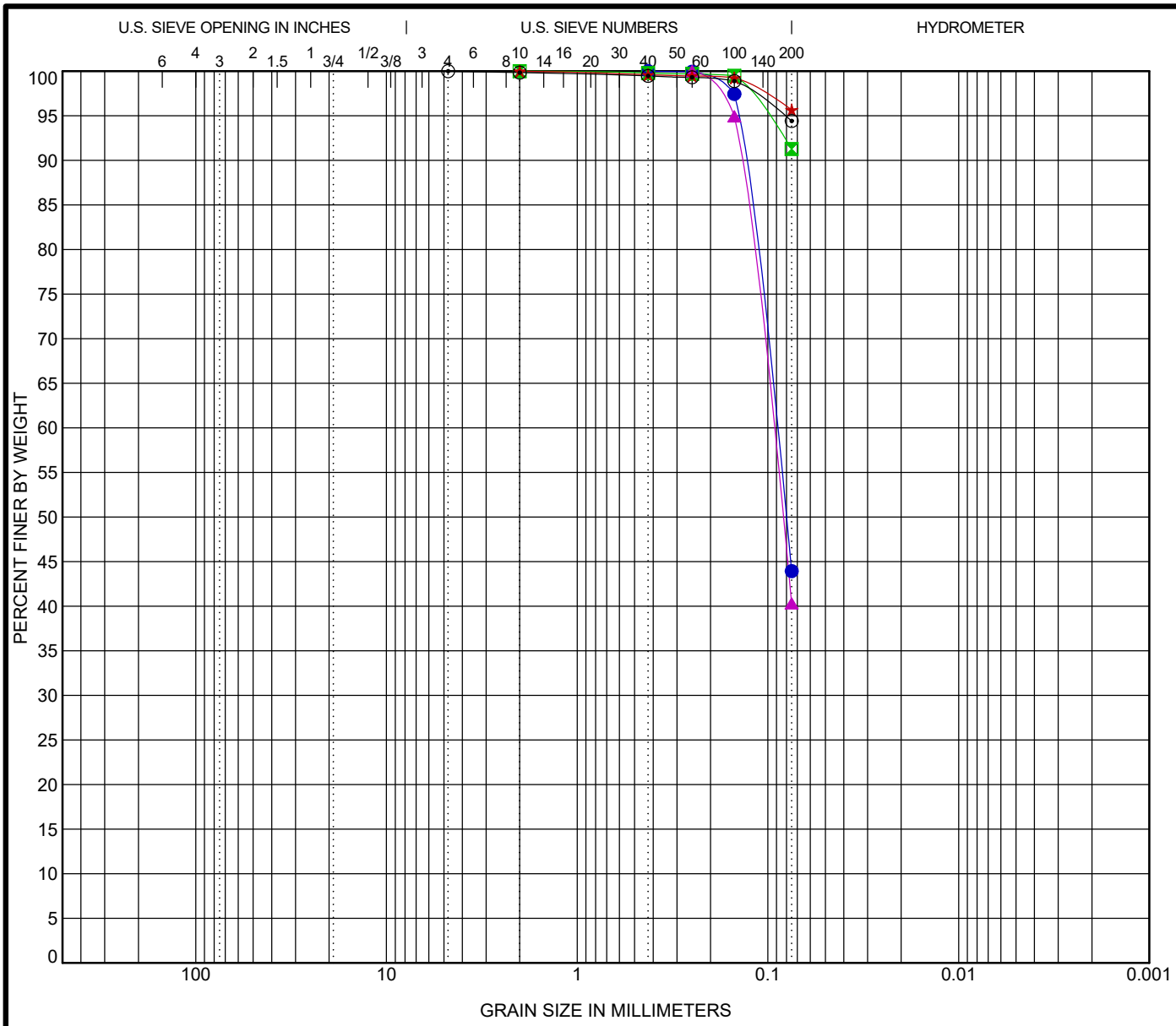

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-209	15.0	CLAYEY SAND (SC)					
⊠	DP-210	4.0	FILL: FAT CLAY (CH)					
▲	DP-210	25.0	SILTY SAND (SM)					
★	DP-211	0.0	FILL: LEAN CLAY (CL)					
⊙	DP-211	10.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-209	15.0	0.425	0.092			0.0	56.1	43.9	
⊠	DP-210	4.0	2				0.0	8.7	91.3	
▲	DP-210	25.0	0.25	0.096			0.0	59.7	40.3	
★	DP-211	0.0	2				0.0	4.3	95.7	
⊙	DP-211	10.0	4.75				0.0	5.6	94.4	

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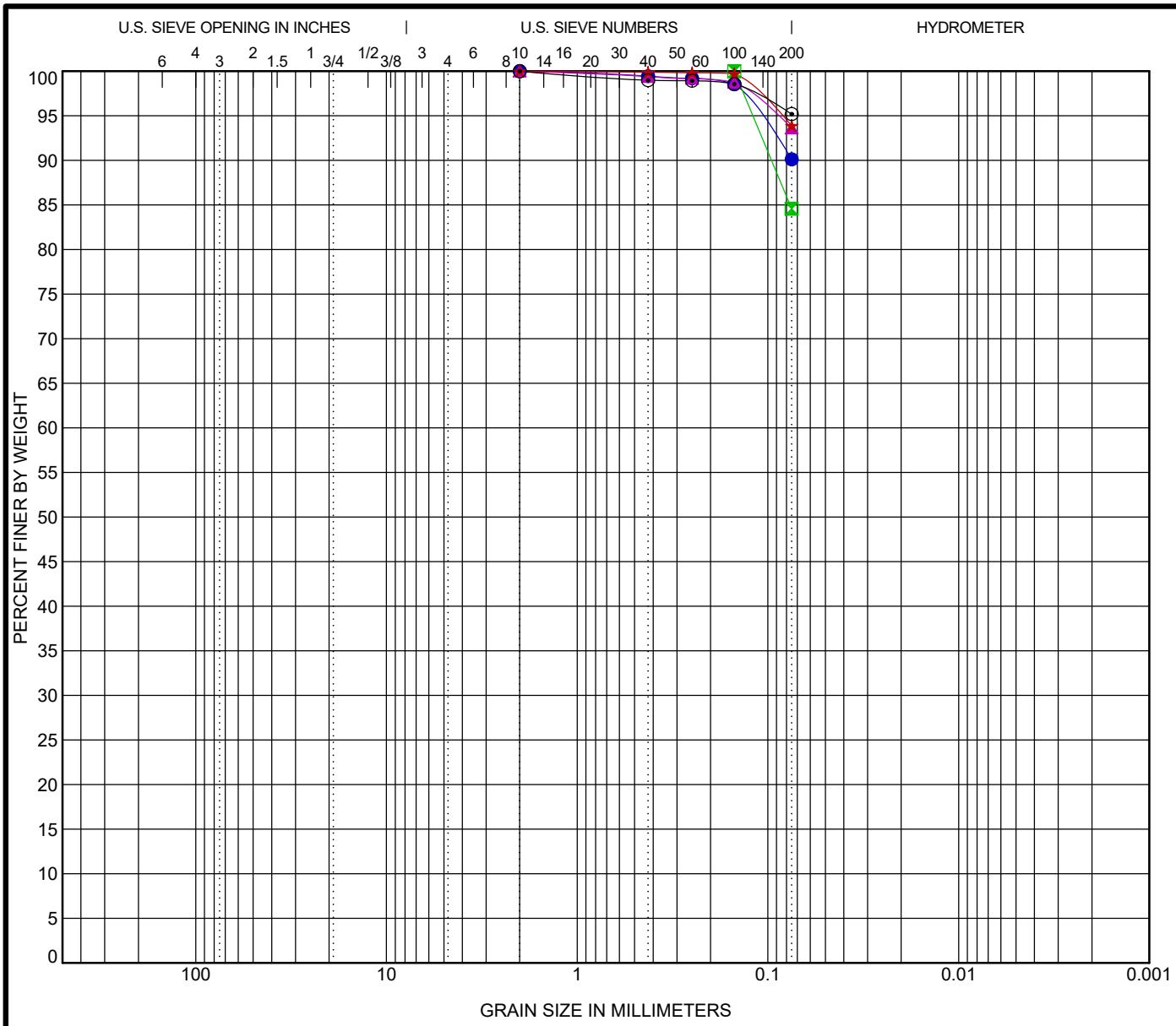

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-212**	**6.0**	**CLAY LEAN (CL)**					
⊠	**DP-212**	**20.0**	**SILT (ML)**					
▲	**DP-213**	**6.0**	**CLAY LEAN (CL)**					
★	**DP-213**	**20.0**	**SILT (ML)**					
⊙	**DP-214**	**4.0**	**FILL: LEAN CLAY (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-212**	**6.0**	**2**				**0.0**	**9.9**	**90.1**	
⊠	**DP-212**	**20.0**	**0.15**				**0.0**	**15.4**	**84.6**	
▲	**DP-213**	**6.0**	**2**				**0.0**	**6.4**	**93.6**	
★	**DP-213**	**20.0**	**2**				**0.0**	**6.1**	**93.9**	
⊙	**DP-214**	**4.0**	**2**				**0.0**	**4.8**	**95.2**	

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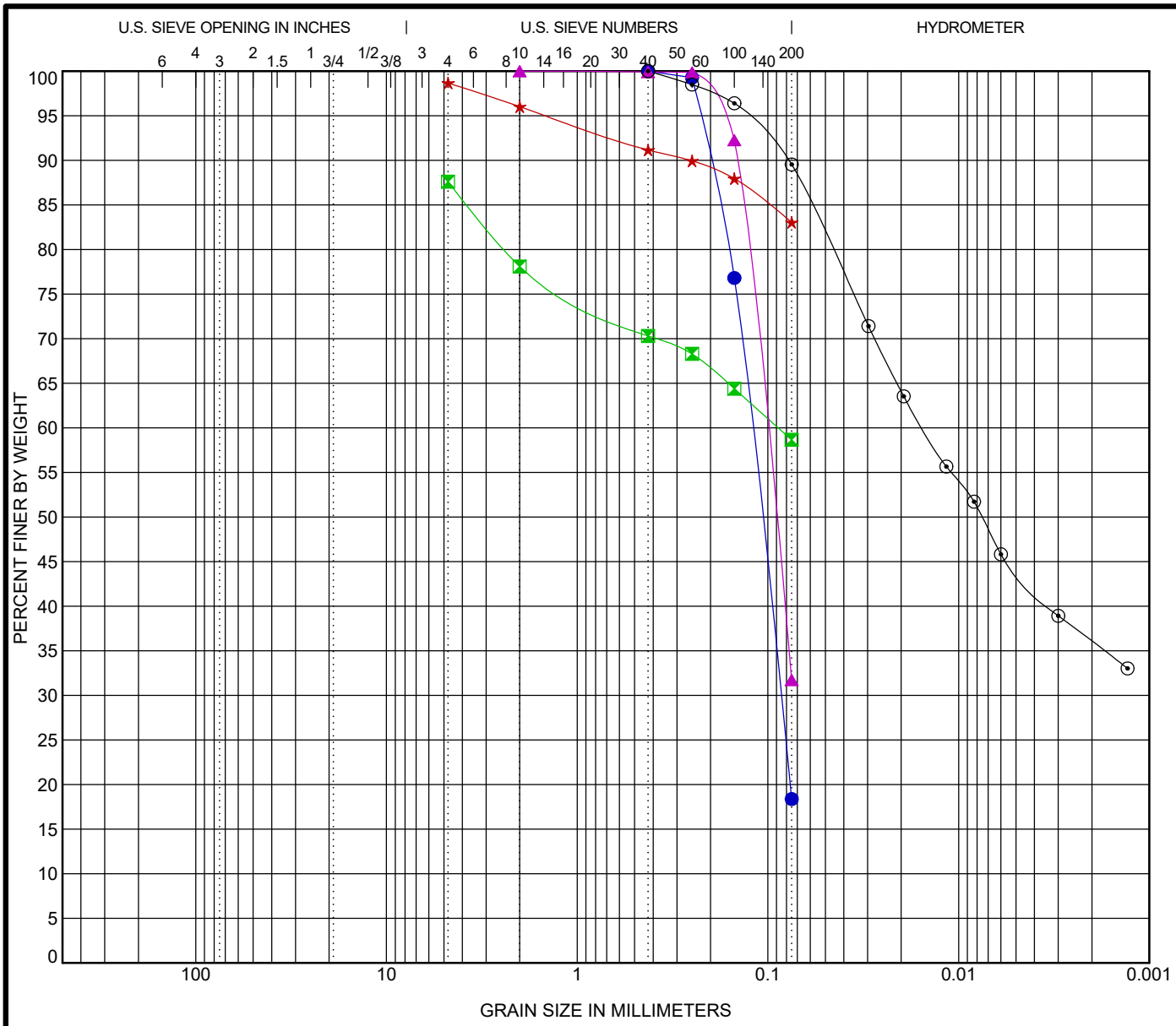
FIGURE B-89



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-214	25.0	CLAYEY SAND (SC)					
⊠	DP-215	0.0	FILL: SANDY LEAN CLAY (CL)					
▲	DP-215	30.0	SILTY SAND (SM)					
★	DP-216	2.0	CLAY LEAN (CL)					
⊙	DP-216	10.0	SAND w/ SILT (SP-SM)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-214	25.0	0.425	0.123	0.086		0.0	81.6	18.4	
⊠	DP-215	0.0	4.75	0.088			0.0	29.0	58.7	
▲	DP-215	30.0	2	0.104			0.0	68.3	31.7	
★	DP-216	2.0	4.75				0.0	15.6	83.0	
⊙	DP-216	10.0	0.425	0.015			0.0	10.5	45.5	44.0

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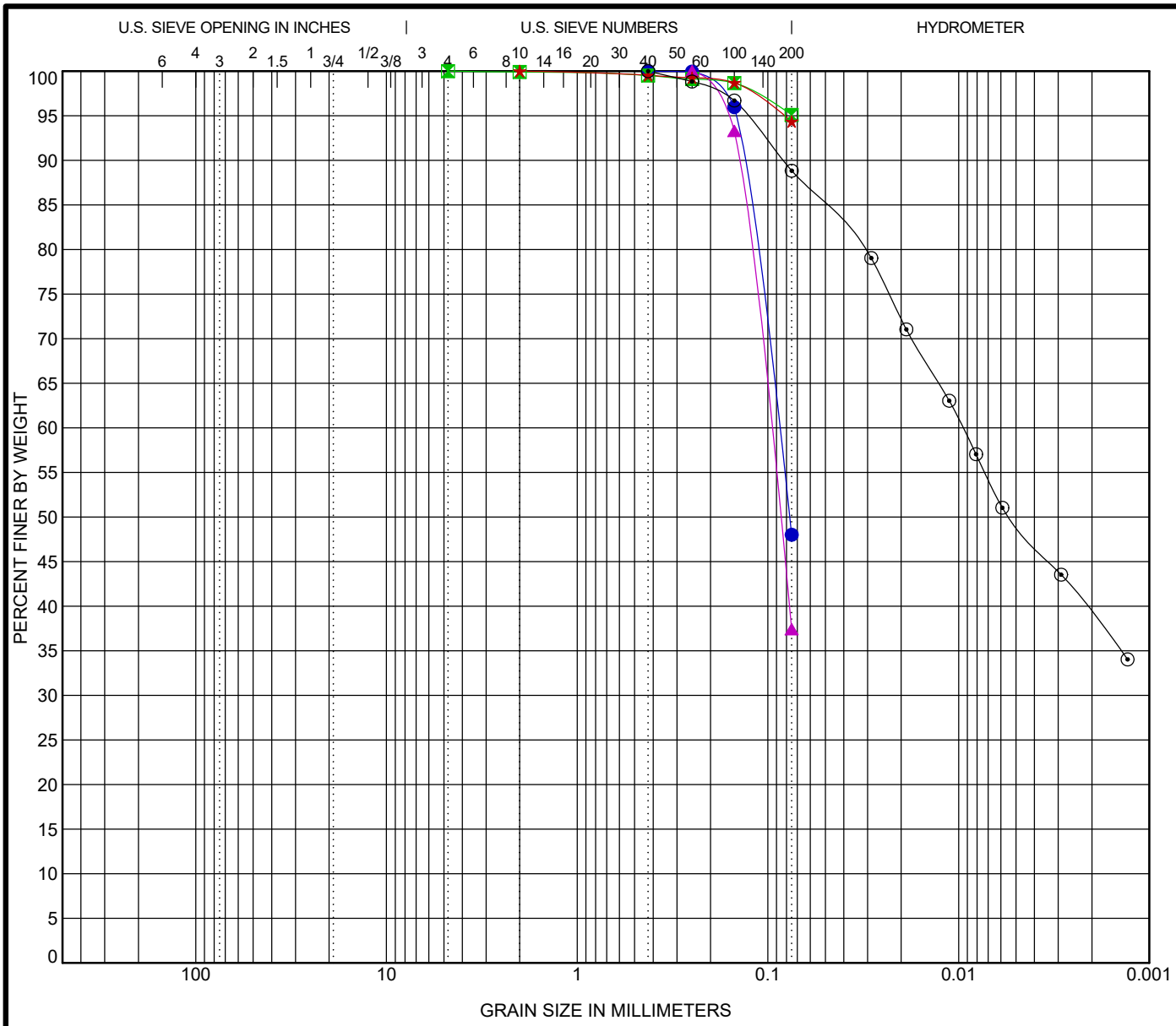
FIGURE B-90



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-216	30.0	SILTY SAND (SM)					
⊠	DP-217	8.0	FILL: LEAN CLAY (CL)					
▲	DP-217	30.0	SILTY SAND (SM)					
★	DP-218	0.0	FILL: LEAN CLAY (CL)					
⊙	DP-218	6.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-216	30.0	0.425	0.089			0.0	52.0	48.0	
⊠	DP-217	8.0	4.75				0.0	4.9	95.1	
▲	DP-217	30.0	0.25	0.099			0.0	62.6	37.4	
★	DP-218	0.0	2				0.0	5.6	94.4	
⊙	DP-218	6.0	0.425	0.01			0.0	11.2	39.5	49.3

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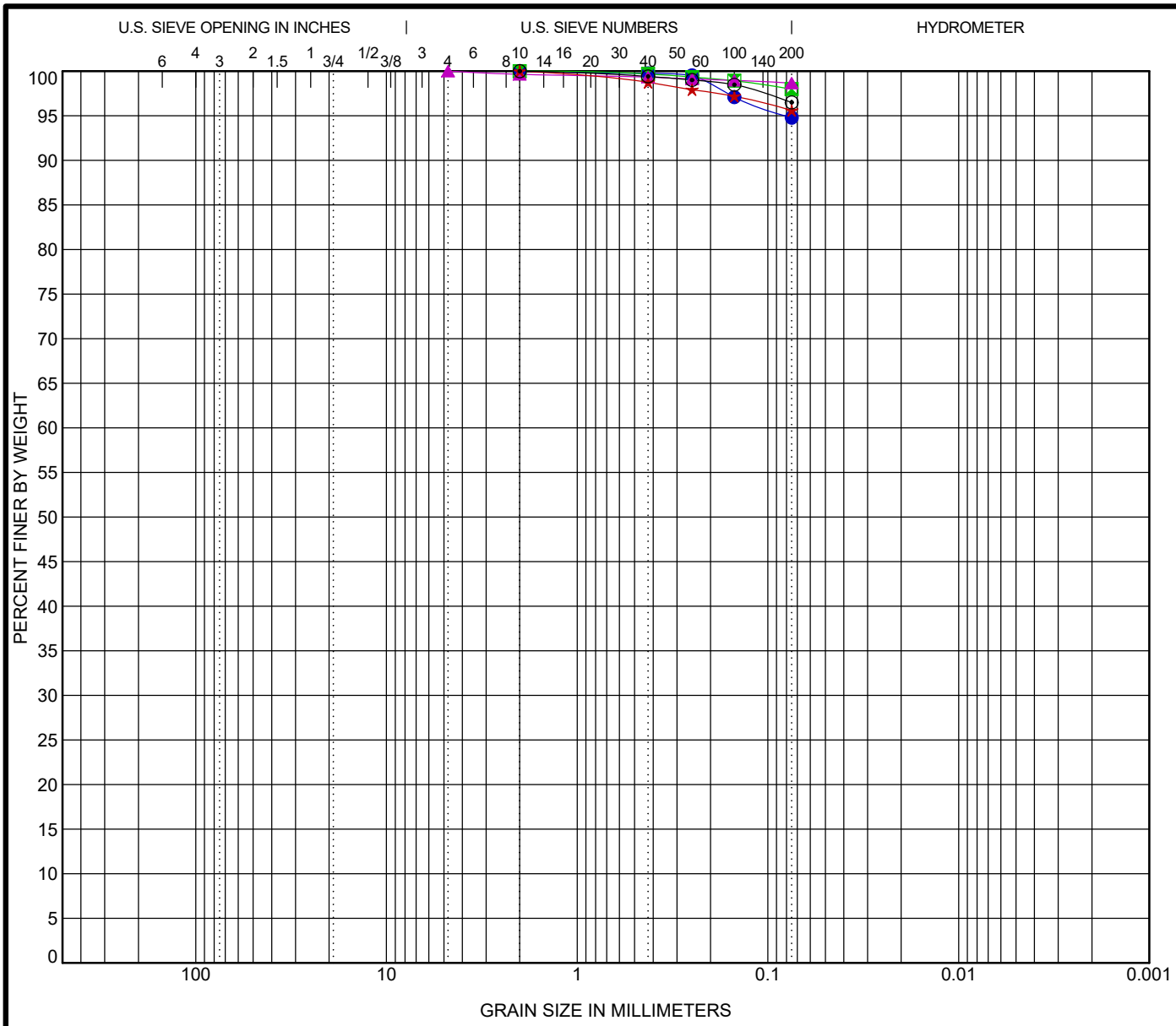

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-218**	**30.0**	**FAT CLAY (CH)**					
⊠	**DP-219**	**4.0**	**FILL: FAT CLAY (CH)**					
▲	**DP-219**	**20.0**	**CLAY LEAN (CL)**					
★	**DP-220**	**2.0**	**FILL: FAT CLAY (CH)**					
⊙	**DP-220**	**8.0**	**FAT CLAY (CH)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-218**	**30.0**	**2**				**0.0**	**5.2**	**94.8**	
⊠	**DP-219**	**4.0**	**2**				**0.0**	**2.0**	**98.0**	
▲	**DP-219**	**20.0**	**4.75**				**0.0**	**1.3**	**98.7**	
★	**DP-220**	**2.0**	**2**				**0.0**	**4.4**	**95.6**	
⊙	**DP-220**	**8.0**	**2**				**0.0**	**3.5**	**96.5**	

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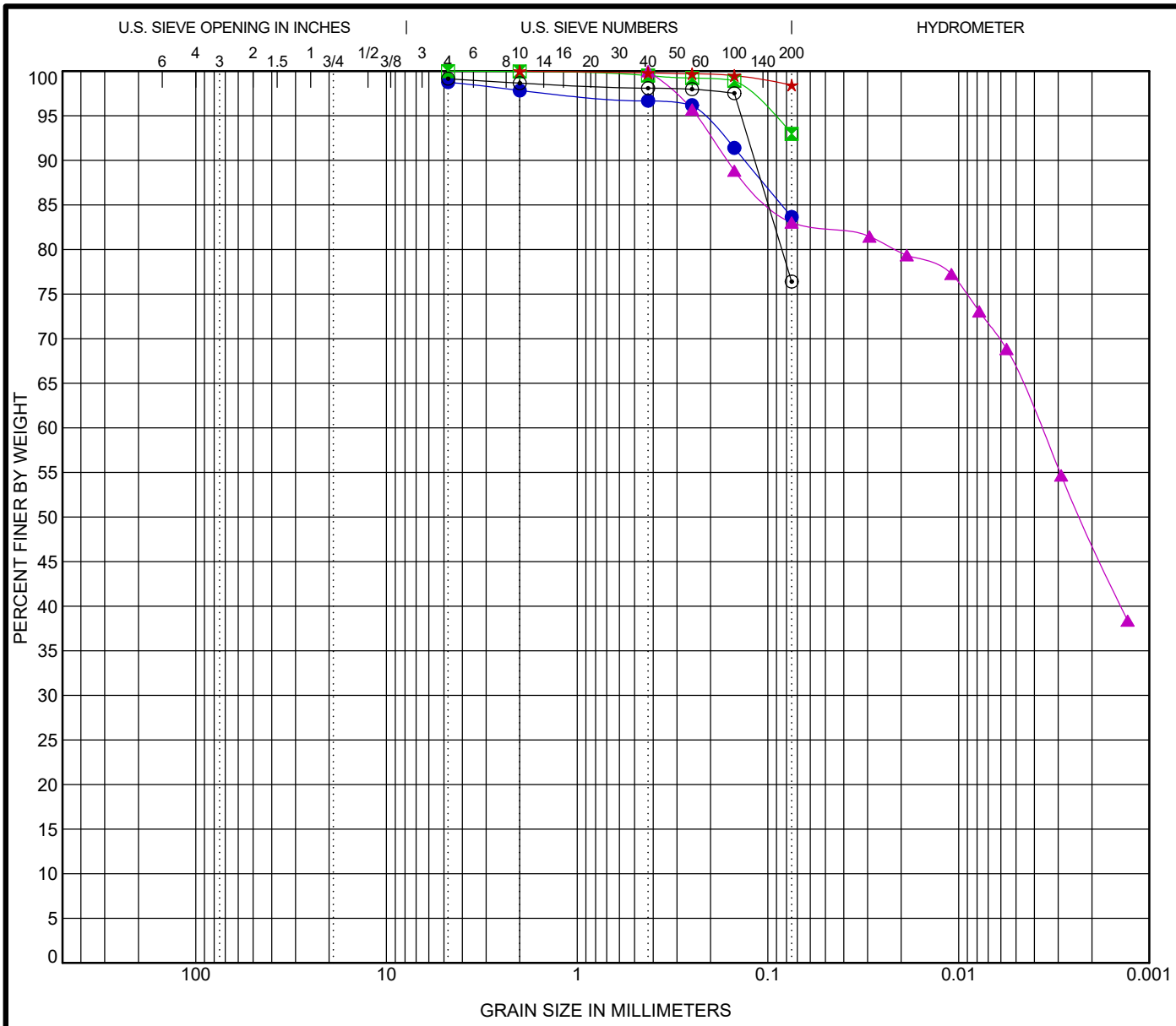

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-220	40.0	FAT CLAY (CH)					
⊠	DP-221	4.0	FILL: FAT CLAY (CH)					
▲	DP-221	25.0	FAT CLAY (CH)					
★	DP-221	48.0	FAT CLAY (CH)					
⊙	DP-222	20.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-220	40.0	4.75				0.0	15.1	83.6	
⊠	DP-221	4.0	4.75				0.0	7.0	93.0	
▲	DP-221	25.0	0.425	0.004			0.0	17.0	16.6	66.4
★	DP-221	48.0	2				0.0	1.6	98.4	
⊙	DP-222	20.0	4.75				0.0	22.8	76.4	

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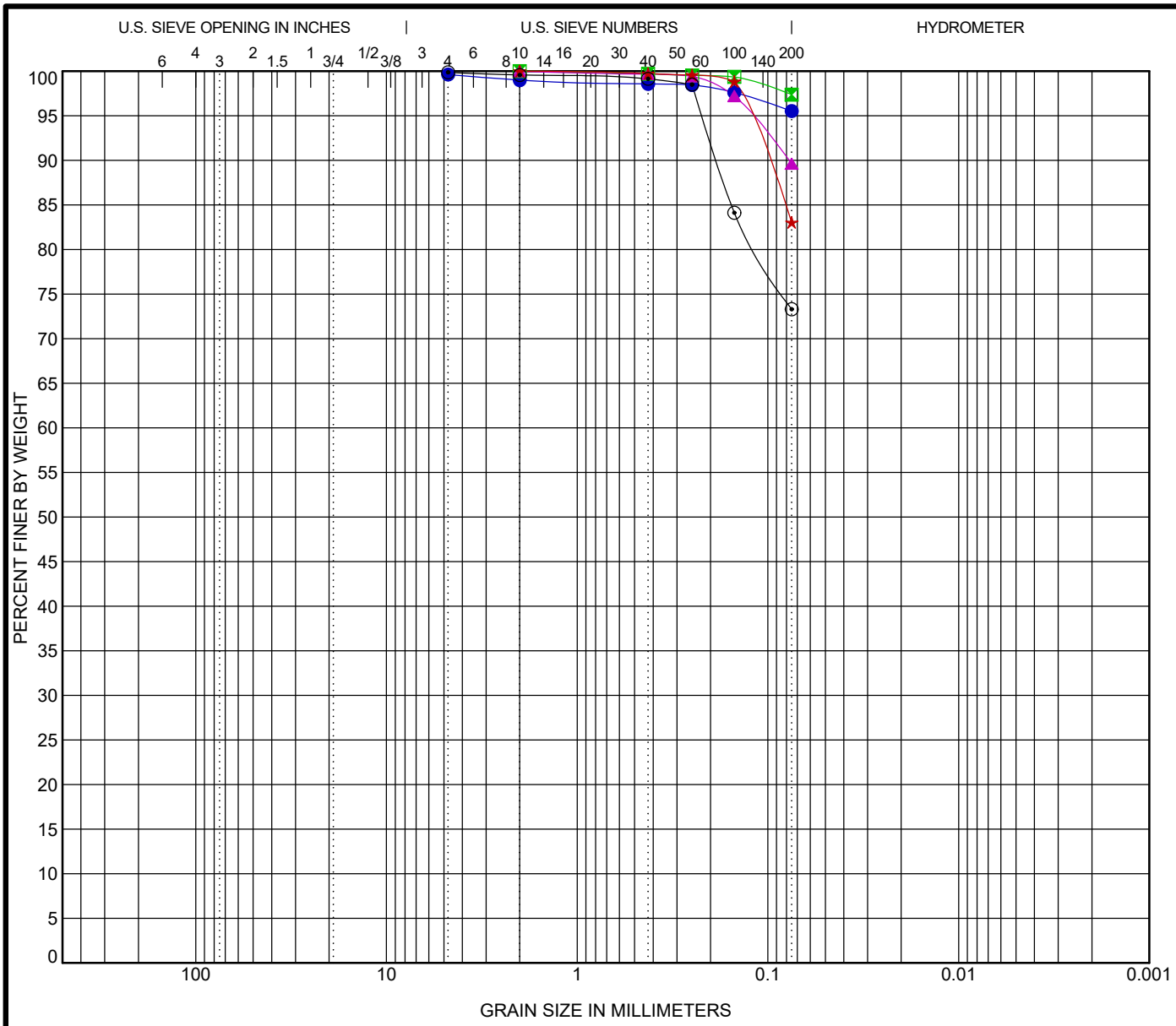
FIGURE B-93



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-222**	**40.0**	**FAT CLAY (CH)**					
⊠	**DP-223**	**2.0**	**FILL: FAT CLAY (CH)**					
▲	**DP-223**	**40.0**	**FAT CLAY (CH)**					
★	**DP-224**	**8.0**	**FILL: FAT CLAY (CH)**	**69**	**22**	**47**		
⊙	**DP-224**	**35.0**	**CLAY LEAN (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-222**	**40.0**	**4.75**				**0.0**	**4.1**	**95.5**	
⊠	**DP-223**	**2.0**	**2**				**0.0**	**2.6**	**97.4**	
▲	**DP-223**	**40.0**	**2**				**0.0**	**10.4**	**89.6**	
★	**DP-224**	**8.0**	**2**				**0.0**	**17.0**	**83.0**	
⊙	**DP-224**	**35.0**	**4.75**				**0.0**	**26.6**	**73.3**	

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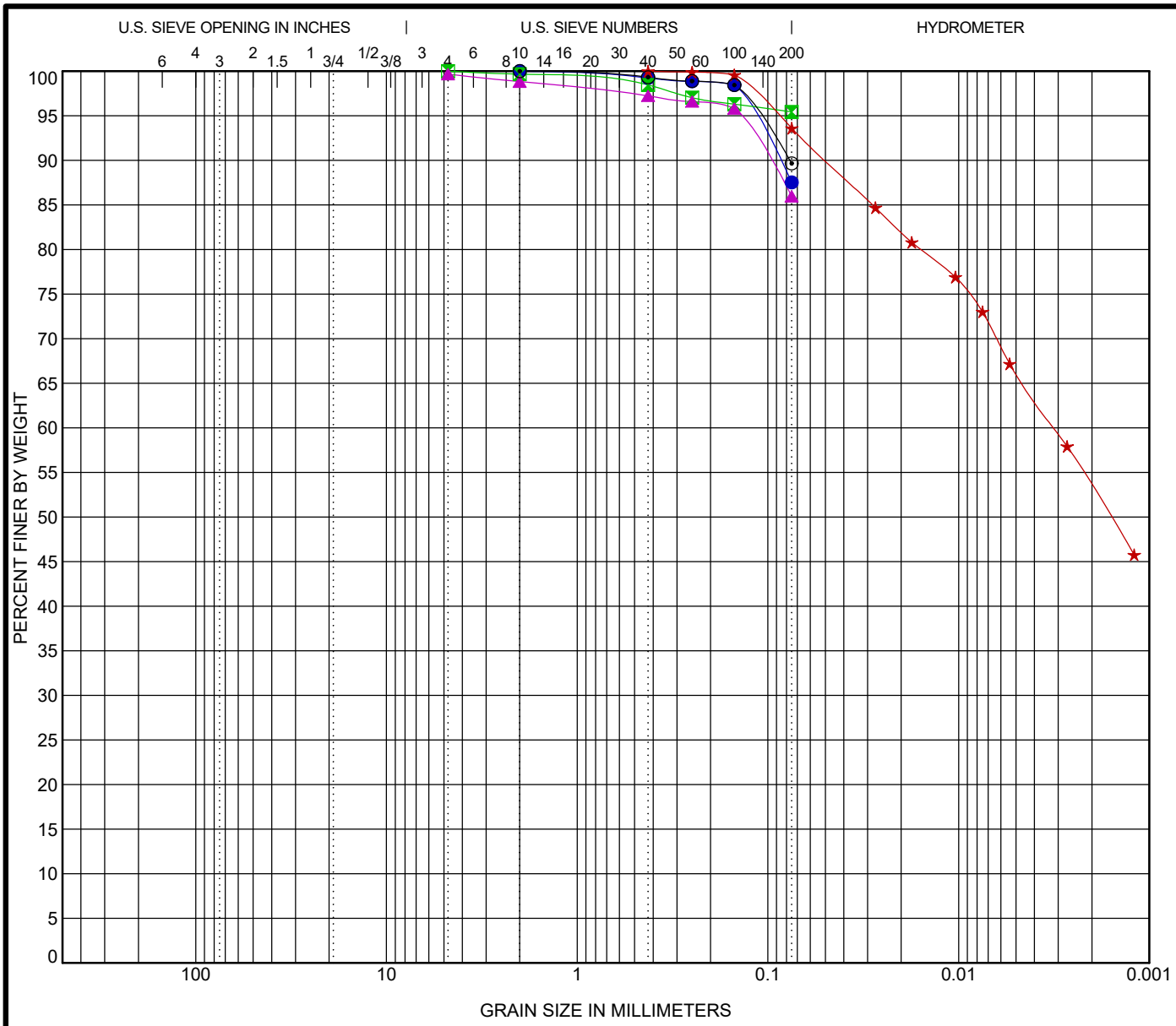
FIGURE B-94



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-225	6.0	CLAY LEAN (CL)					
⊠	DP-225	20.0	CLAY LEAN (CL)					
▲	DP-226	2.0	FILL: FAT CLAY (CH)					
★	DP-226	10.0	FAT CLAY (CH)					
⊙	DP-226	15.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-225	6.0	2				0.0	12.5	87.5	
⊠	DP-225	20.0	4.75				0.0	4.6	95.4	
▲	DP-226	2.0	4.75				0.0	13.7	86.0	
★	DP-226	10.0	0.425	0.003			0.0	6.4	27.5	66.2
⊙	DP-226	15.0	2				0.0	10.3	89.7	

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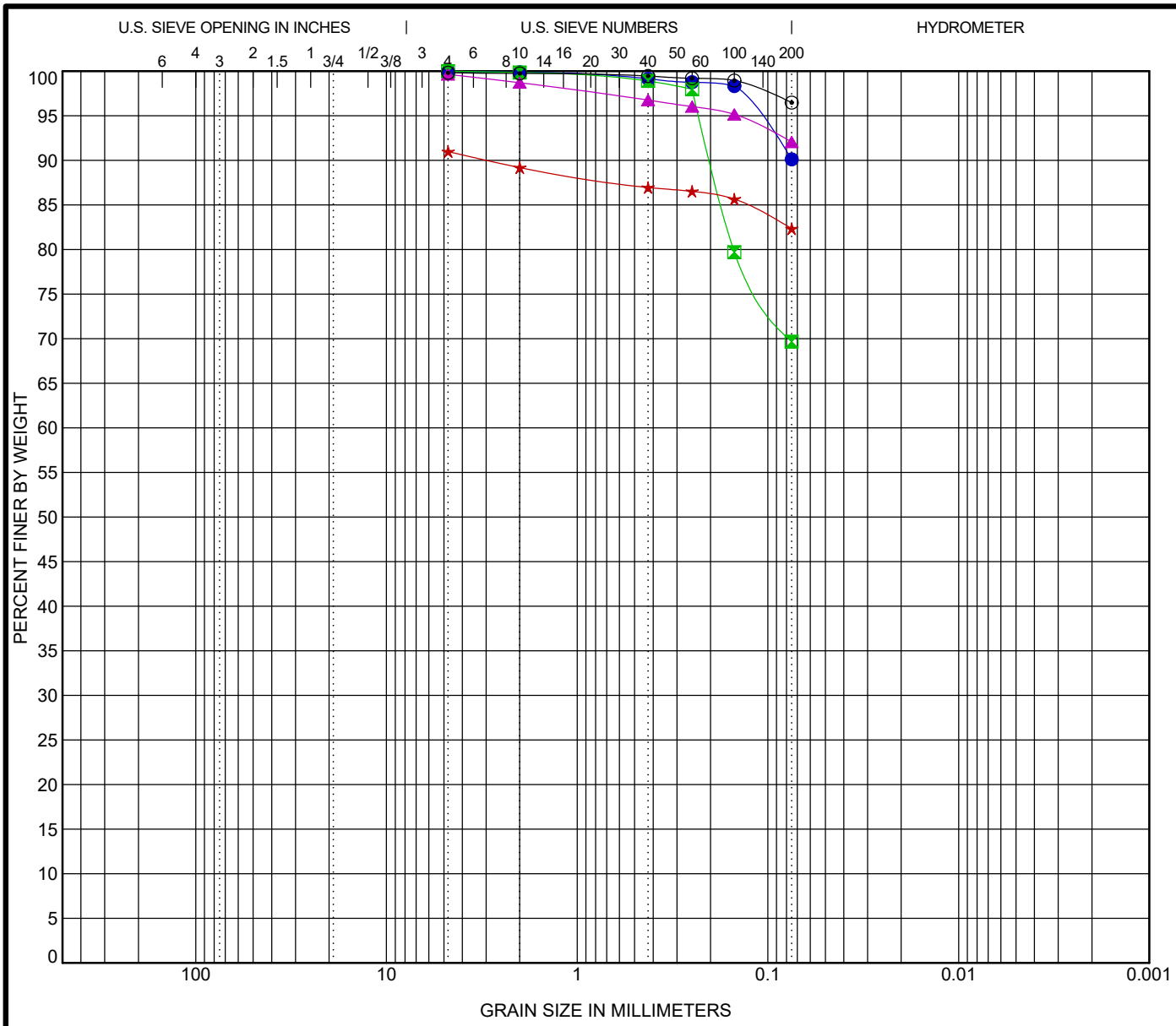
FIGURE B-95



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-227	6.0	FILL: FAT CLAY (CH)					
⊠	DP-227	35.0	SANDY LEAN CLAY (CL)					
▲	DP-228	4.0	FILL: LEAN CLAY (CL)					
★	DP-228	20.0	CLAY LEAN (CL)					
⊙	DP-229	8.0	FILL: LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-227	6.0	4.75				0.0	9.9	90.1	
⊠	DP-227	35.0	4.75				0.0	30.3	69.7	
▲	DP-228	4.0	4.75				0.0	7.6	92.1	
★	DP-228	20.0	4.75				0.0	8.6	82.3	
⊙	DP-229	8.0	4.75				0.0	3.3	96.5	

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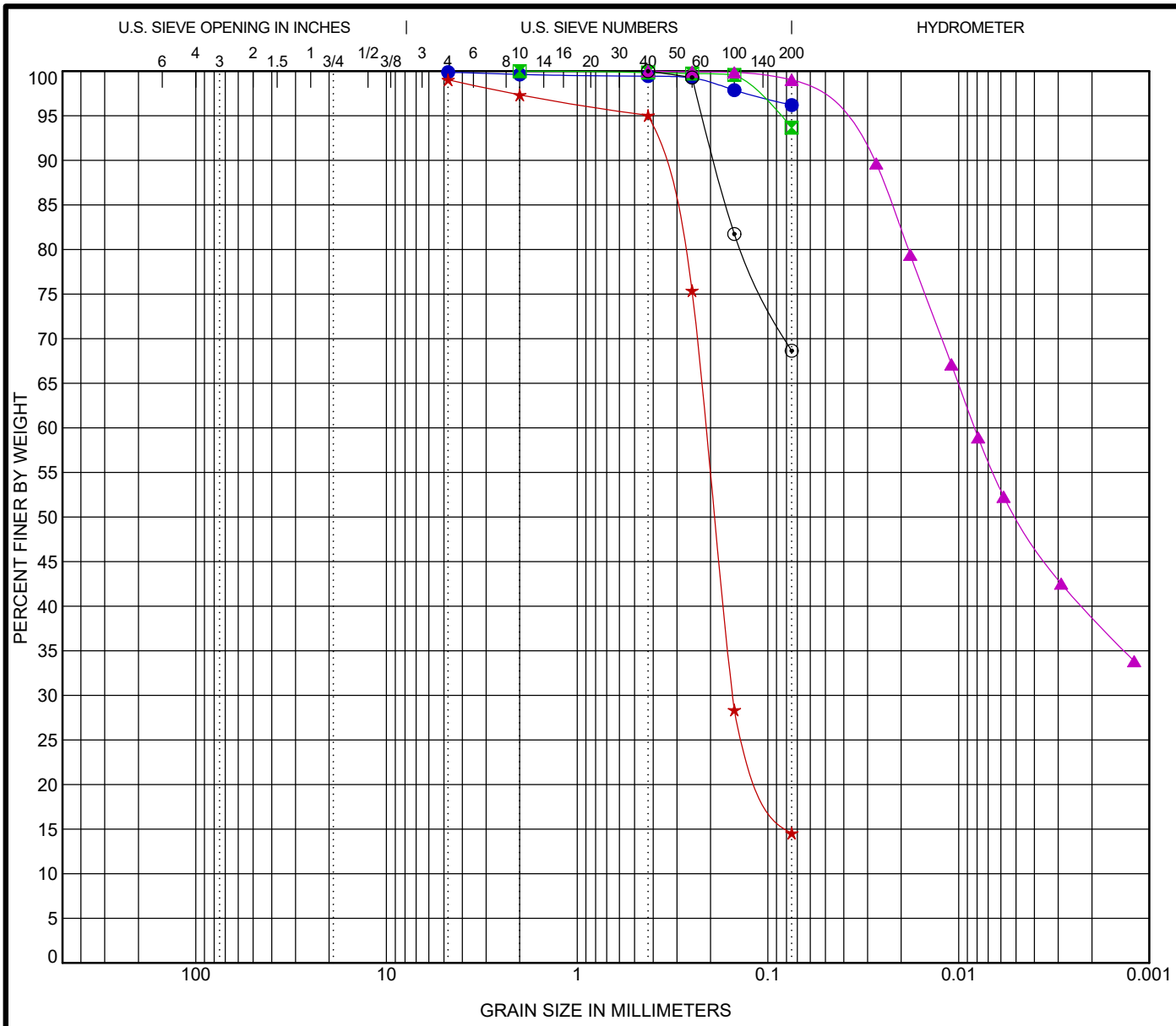
FIGURE B-96



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-229	40.0	FAT CLAY (CH)					
⊠	DP-230	6.0	CLAY LEAN (CL)					
▲	DP-230	10.0	CLAYEY SAND (SC)					
★	DP-230	35.0	SILTY SAND (SM)					
⊙	DP-231	8.0	SANDY LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-229	40.0	4.75				0.0	3.7	96.2	
⊠	DP-230	6.0	2				0.0	6.3	93.7	
▲	DP-230	10.0	0.425	0.008			0.0	1.0	48.8	50.2
★	DP-230	35.0	4.75	0.212	0.153		0.0	84.5	14.5	
⊙	DP-231	8.0	0.425				0.0	31.4	68.6	

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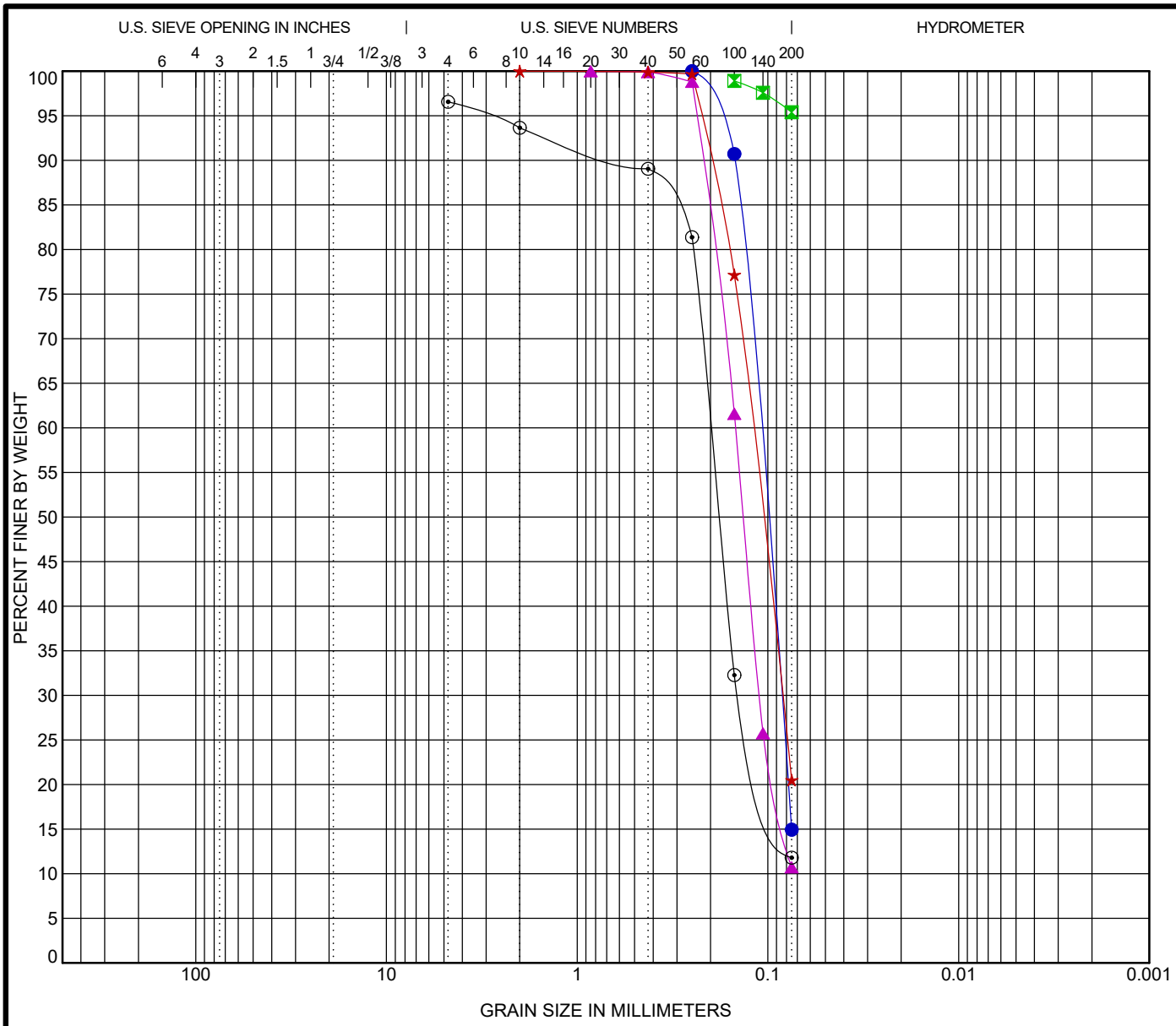
FIGURE B-97



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-231	40.0	SILTY SAND (SM)					
⊠	DP-232	6.0	FILL: LEAN CLAY (CL)					
▲	DP-232	35.0	SAND (SP)				1.12	2.00
★	DP-233	25.0	SILTY SAND (SM)					
⊙	DP-233	48.5	SAND w/ SILT (SP-SM)				1.37	2.84

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-231	40.0	0.25	0.113	0.086		0.0	85.1	14.9	
⊠	DP-232	6.0	0.15				0.0	3.5	95.4	
▲	DP-232	35.0	0.85	0.148	0.11		0.0	89.3	10.7	
★	DP-233	25.0	2	0.122	0.084		0.0	79.5	20.5	
⊙	DP-233	48.5	4.75	0.2	0.139		0.0	84.8	11.8	

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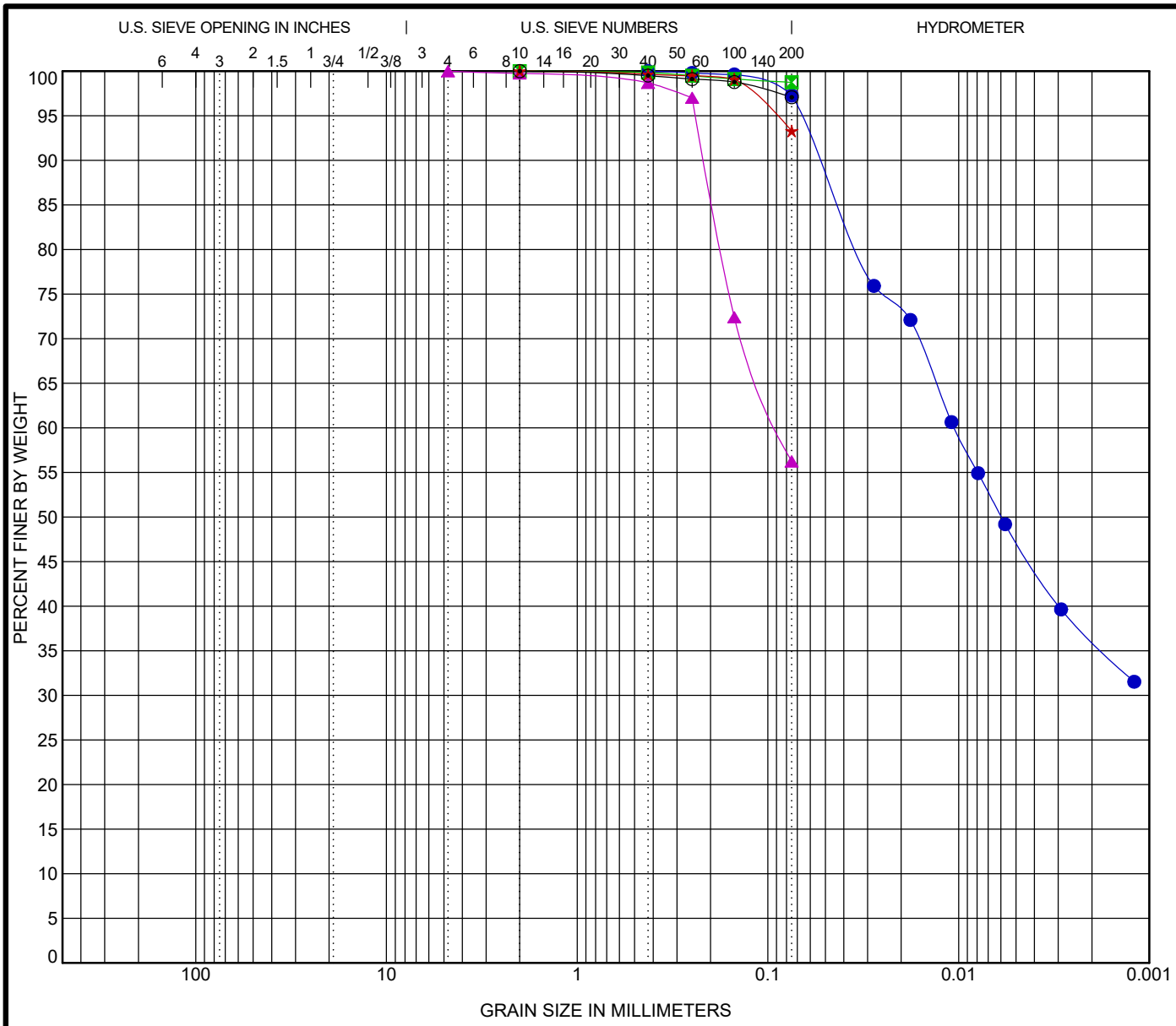
FIGURE B-98



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-234	15.0	SAND w/ SILT (SP-SM)					
⊠	DP-234	20.0	SAND w/ SILT (SP-SM)					
▲	DP-234	35.0	SANDY LEAN CLAY (CL)					
★	DP-235	4.0	FILL: LEAN CLAY (CL)					
⊙	DP-235	10.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-234	15.0	0.425	0.011			0.0	2.7	49.9	47.3
⊠	DP-234	20.0	2				0.0	1.3	98.7	
▲	DP-234	35.0	4.75	0.088			0.0	43.8	56.3	
★	DP-235	4.0	2				0.0	6.7	93.3	
⊙	DP-235	10.0	2				0.0	2.9	97.1	

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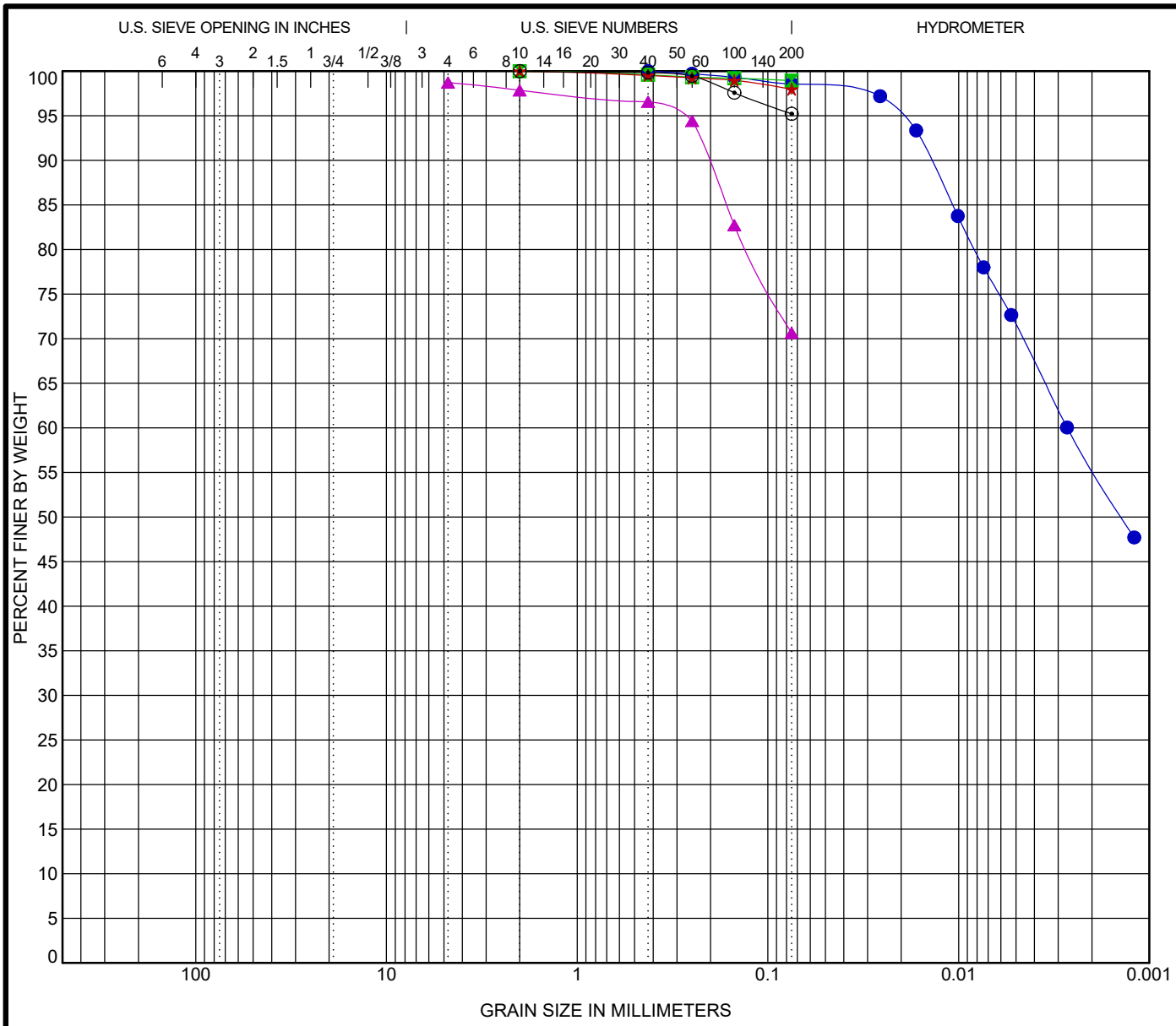

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-235**	**15.0**	**CLAY LEAN (CL)**					
⊠	**DP-236**	**10.0**	**CLAY LEAN (CL)**					
▲	**DP-236**	**35.0**	**CLAY LEAN (CL)**					
★	**DP-237**	**4.0**	**FILL: LEAN CLAY (CL)**					
⊙	**DP-237**	**25.0**	**CLAY LEAN (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-235**	**15.0**	**0.425**	**0.003**			**0.0**	**1.4**	**27.0**	**71.6**
⊠	**DP-236**	**10.0**	**2**				**0.0**	**1.1**	**98.9**	
▲	**DP-236**	**35.0**	**4.75**				**0.0**	**28.1**	**70.7**	
★	**DP-237**	**4.0**	**2**				**0.0**	**2.0**	**98.0**	
⊙	**DP-237**	**25.0**	**2**				**0.0**	**4.8**	**95.2**	

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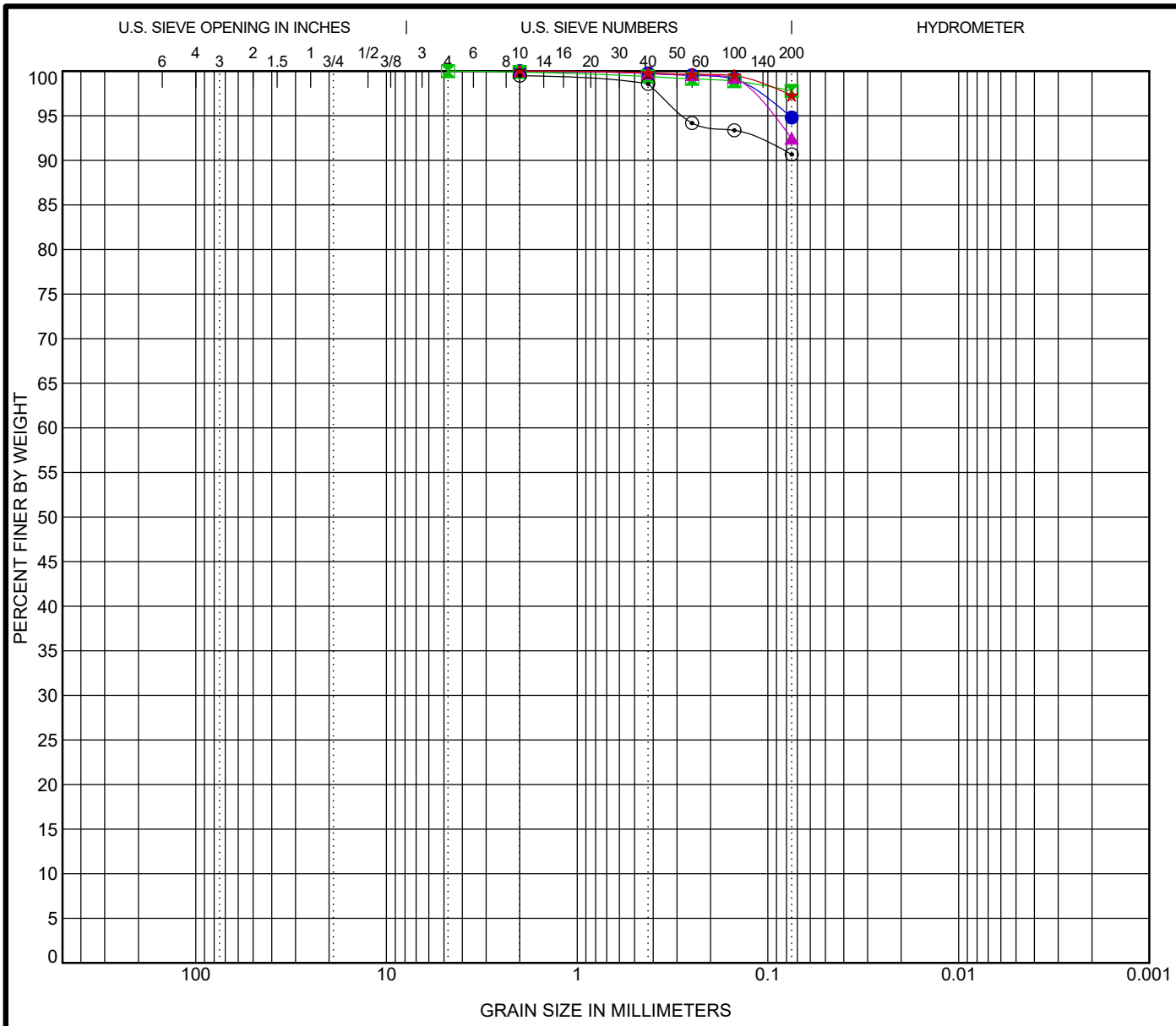
FIGURE B-100



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-238	4.0	FILL: LEAN CLAY (CL)	37	20	17		
⊠	DP-238	20.0	FAT CLAY (CH)	58	23	35		
▲	DP-239	4.0	FILL: LEAN CLAY (CL)					
★	DP-239	8.0	SILT (ML)	25	24	1		
⊙	DP-240	8.0	CLAY LEAN (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-238	4.0	2				0.0	5.2	94.8	
⊠	DP-238	20.0	4.75				0.0	2.2	97.8	
▲	DP-239	4.0	2				0.0	7.5	92.5	
★	DP-239	8.0	2				0.0	2.7	97.3	
⊙	DP-240	8.0	2				0.0	8.8	90.7	

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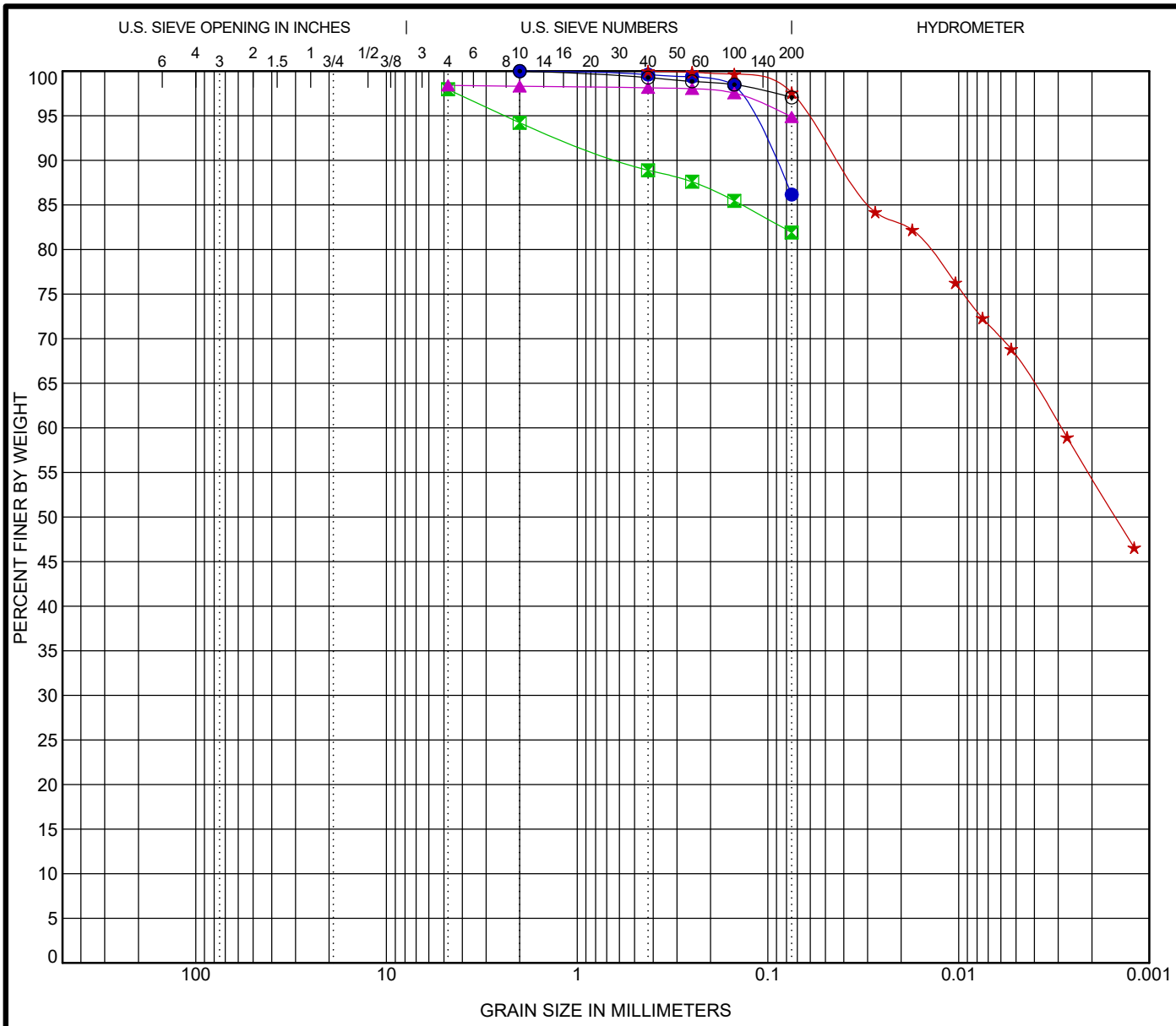
FIGURE B-101



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-241	15.0	SILTY CLAY (CL-ML)	28	22	6		
⊠	DP-242	4.0	FILL: LEAN CLAY (CL)					
▲	DP-242	40.0	CLAY LEAN (CL)	45	18	27		
★	DP-243	2.0	FILL: FAT CLAY (CH)					
⊙	DP-243	8.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-241	15.0	2				0.0	13.8	86.2	
⊠	DP-242	4.0	4.75				0.0	16.0	81.9	
▲	DP-242	40.0	4.75				0.0	3.6	94.9	
★	DP-243	2.0	0.425	0.003			0.0	2.4	29.6	68.0
⊙	DP-243	8.0	2				0.0	3.0	97.0	

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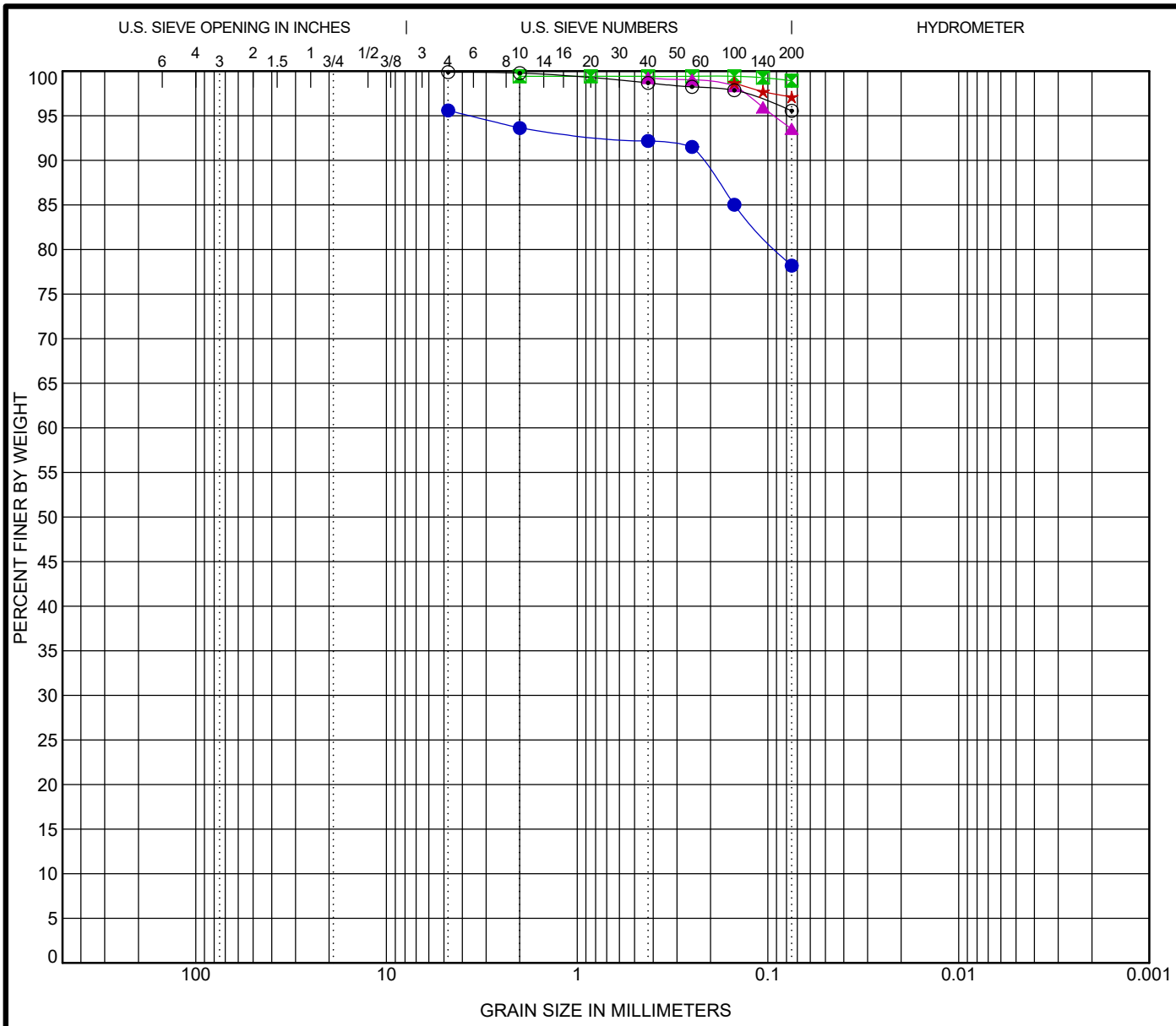
FIGURE B-102



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-243**	**35.0**	**CLAY LEAN (CL)**					
⊠	**DP-244**	**15.0**	**FAT CLAY (CH)**					
▲	**DP-244**	**35.0**	**FAT CLAY (CH)**					
★	**DP-245**	**10.0**	**FAT CLAY (CH)**					
⊙	**DP-246**	**0.0**	**FILL: LEAN CLAY (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-243**	**35.0**	**4.75**				**0.0**	**17.4**	**78.2**	
⊠	**DP-244**	**15.0**	**2**				**0.0**	**0.5**	**98.9**	
▲	**DP-244**	**35.0**	**0.425**				**0.0**	**5.7**	**93.5**	
★	**DP-245**	**10.0**	**0.15**				**0.0**	**1.6**	**97.1**	
⊙	**DP-246**	**0.0**	**4.75**				**0.0**	**4.3**	**95.5**	

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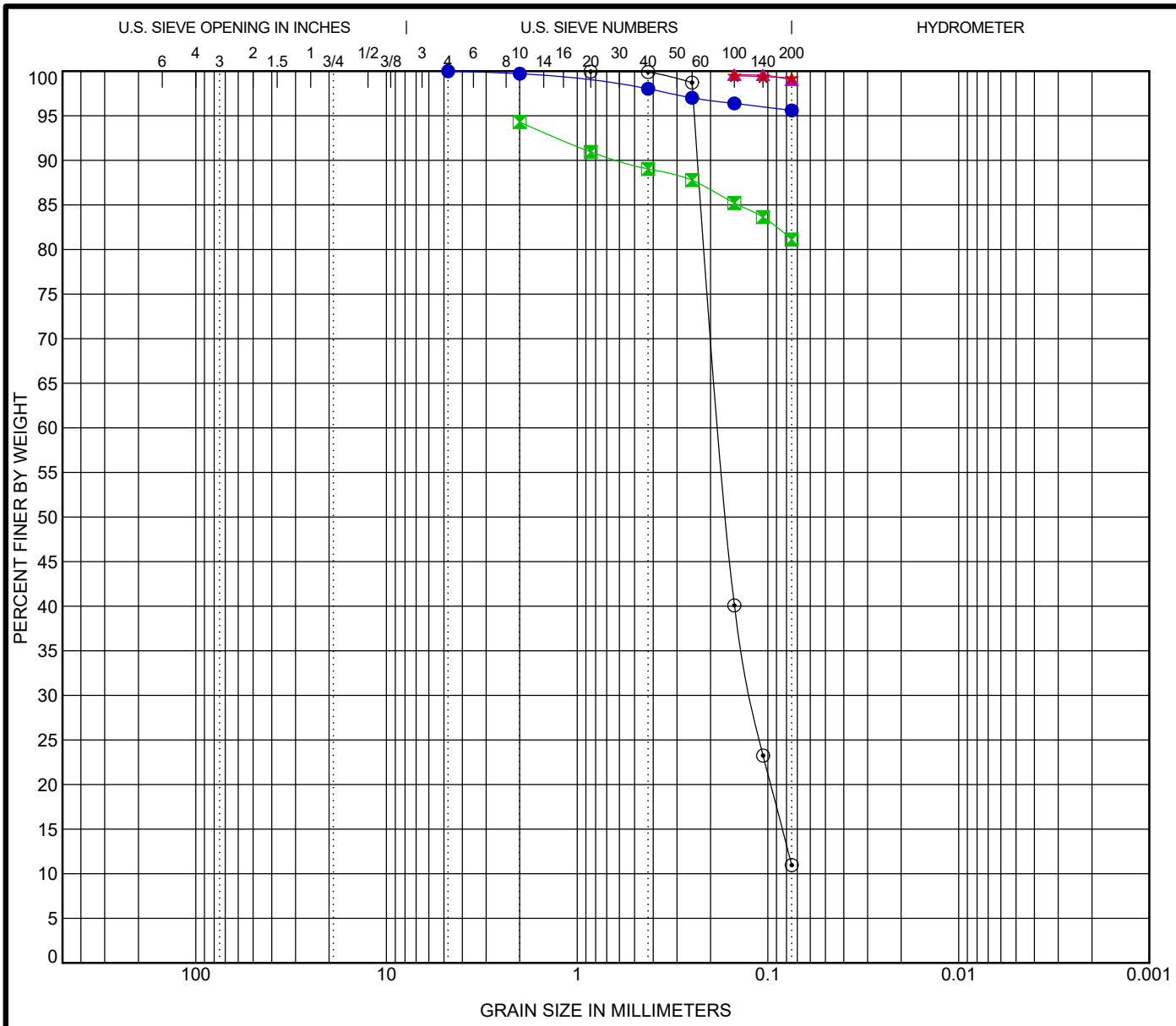
FIGURE B-103



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-246	15.0	CLAY LEAN (CL)					
⊠	DP-247	0.0	FILL: LEAN CLAY (CL)					
▲	DP-247	10.0	FAT CLAY (CH)					
★	DP-248	2.0	FILL: FAT CLAY (CH)					
⊙	DP-248	35.0	SAND w/ SILT (SP-SM)				1.14	2.44

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-246	15.0	4.75				0.0	4.4	95.6	
⊠	DP-247	0.0	2				0.0	13.2	81.1	
▲	DP-247	10.0	0.15				0.0	0.6	99.0	
★	DP-248	2.0	0.15				0.0	0.3	99.2	
⊙	DP-248	35.0	0.85	0.178	0.122		0.0	89.0	11.0	

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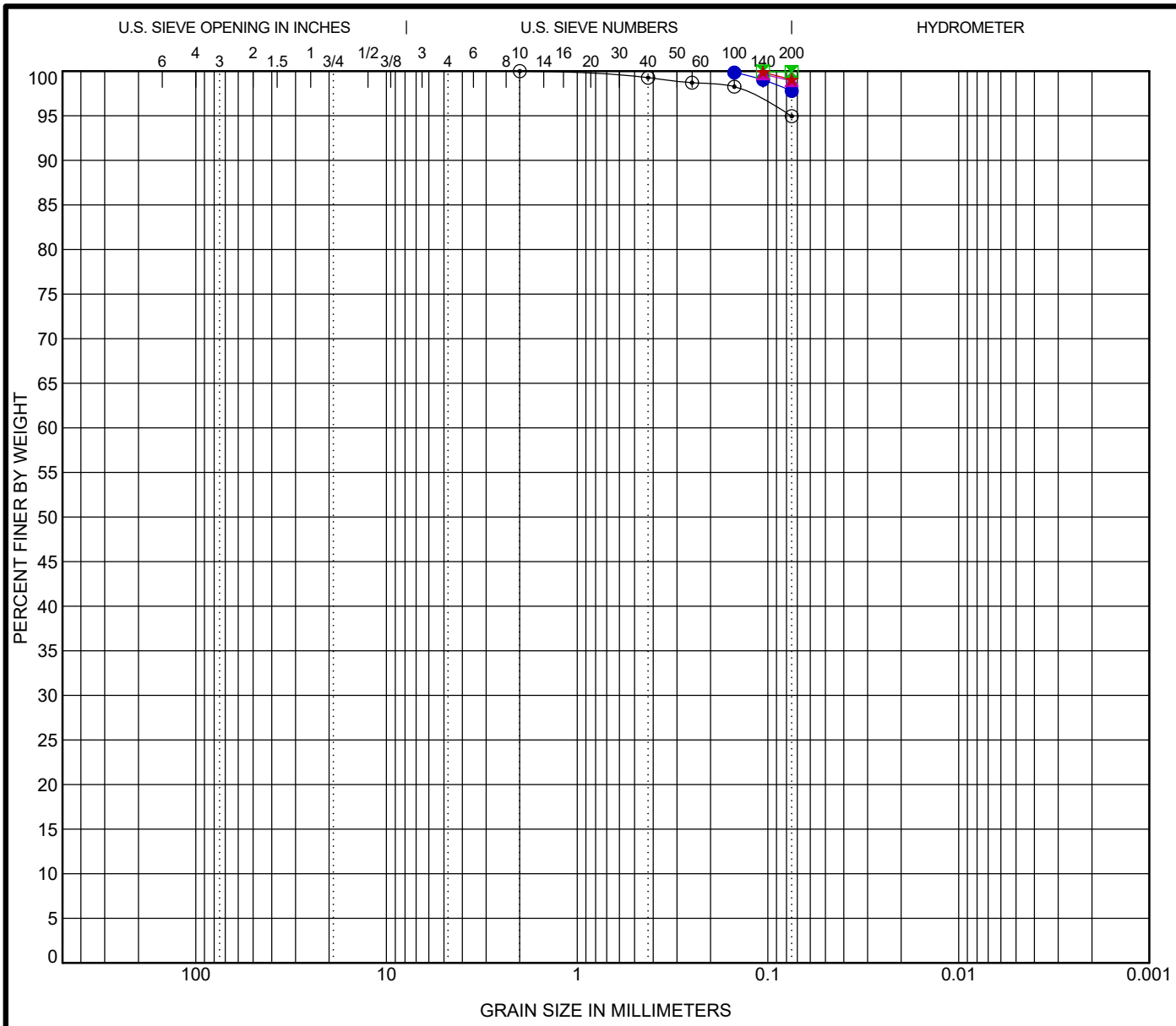
FIGURE B-104



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-249**	**6.0**	**FILL: LEAN CLAY (CL)**					
⊠	**DP-249**	**25.0**	**CLAY LEAN (CL)**					
▲	**DP-250**	**2.0**	**FILL: LEAN CLAY (CL)**					
★	**DP-250**	**8.0**	**CLAY LEAN (CL)**					
⊙	**DP-251**	**6.0**	**CLAY LEAN (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-249**	**6.0**	**0.15**				**0.0**	**2.1**	**97.8**	
⊠	**DP-249**	**25.0**	**0.106**				**0.0**	**0.1**	**99.9**	
▲	**DP-250**	**2.0**	**0.106**				**0.0**	**0.8**	**98.9**	
★	**DP-250**	**8.0**	**0.106**				**0.0**	**0.8**	**99.1**	
⊙	**DP-251**	**6.0**	**2**				**0.0**	**5.1**	**94.9**	

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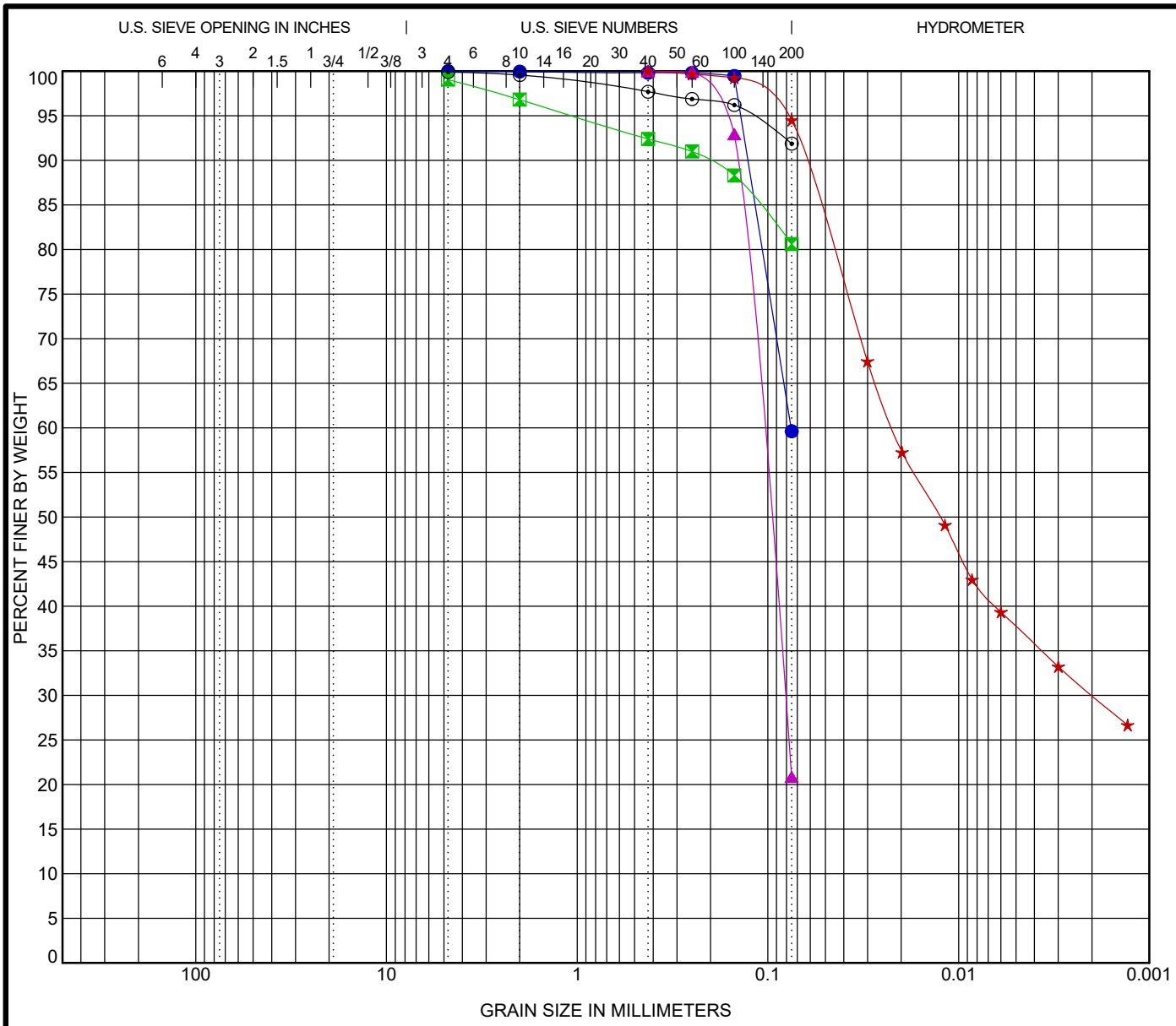
FIGURE B-105



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-251	20.0	SANDY LEAN CLAY (CL)					
⊠	DP-252	4.0	FILL: FAT CLAY (CH)					
▲	DP-252	30.0	SILTY SAND (SM)					
★	DP-253	4.0	FILL: FAT CLAY (CH)					
⊙	DP-253	10.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-251	20.0	4.75	0.076			0.0	40.4	59.6	
⊠	DP-252	4.0	4.75				0.0	18.5	80.6	
▲	DP-252	30.0	0.425	0.109	0.082		0.0	79.1	20.9	
★	DP-253	4.0	0.425	0.022	0.002		0.0	5.5	56.8	37.7
⊙	DP-253	10.0	4.75				0.0	8.0	91.9	

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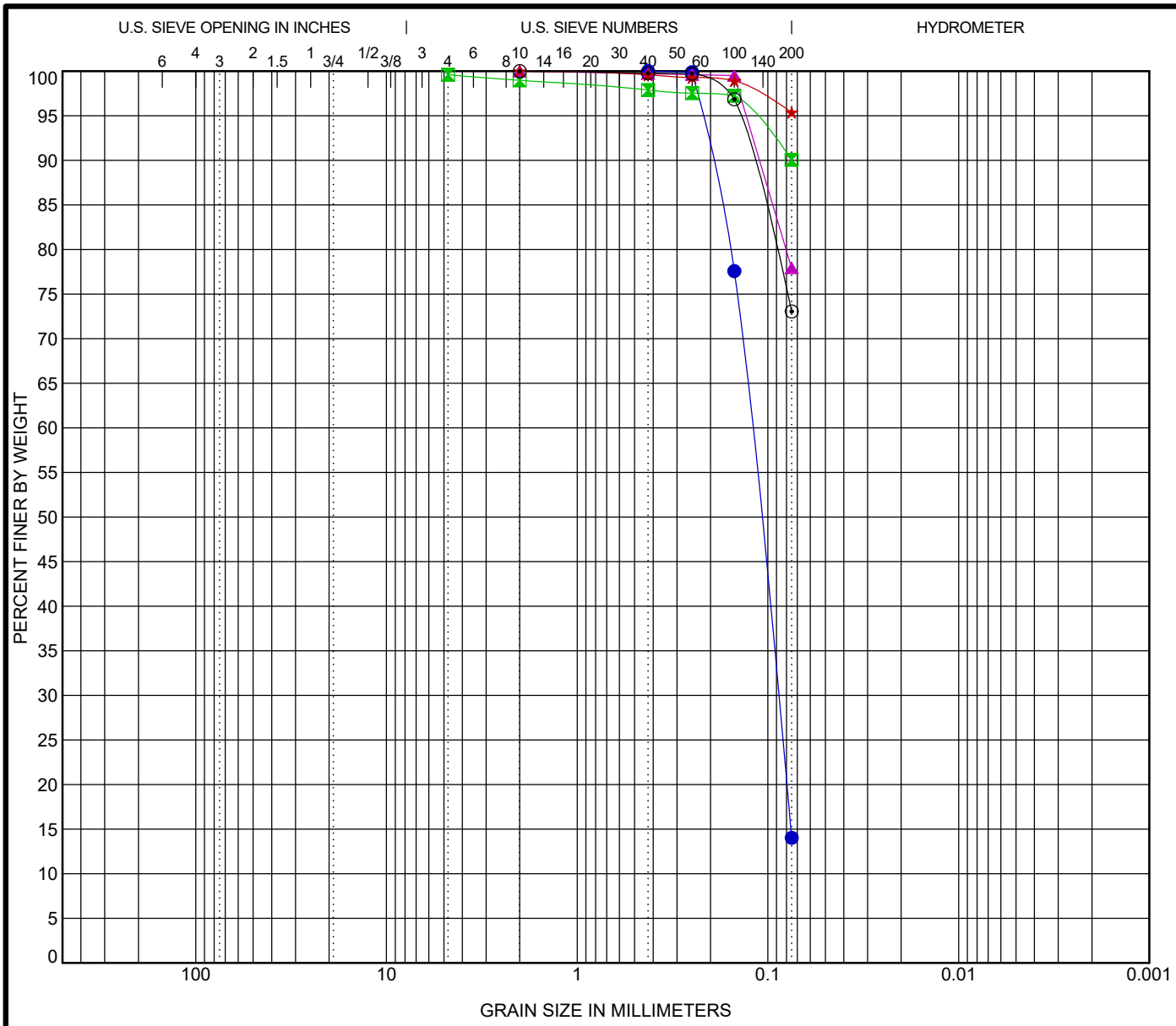
FIGURE B-106



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	DP-253	20.0	**SILTY SAND (SM)**					
⊠	DP-254	8.0	**FAT CLAY (CH)**					
▲	DP-254	25.0	**CLAY LEAN (CL)**					
★	DP-255	15.0	**SILTY SAND (SM)**					
⊙	DP-255	35.0	**FAT CLAY (CH)**					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-253	20.0	**0.425**	**0.124**	**0.089**		**0.0**	**86.0**	**14.0**	
⊠	DP-254	8.0	**4.75**				**0.0**	**9.5**	**90.1**	
▲	DP-254	25.0	**2**				**0.0**	**22.1**	**77.9**	
★	DP-255	15.0	**2**				**0.0**	**4.6**	**95.4**	
⊙	DP-255	35.0	**2**				**0.0**	**26.9**	**73.1**	

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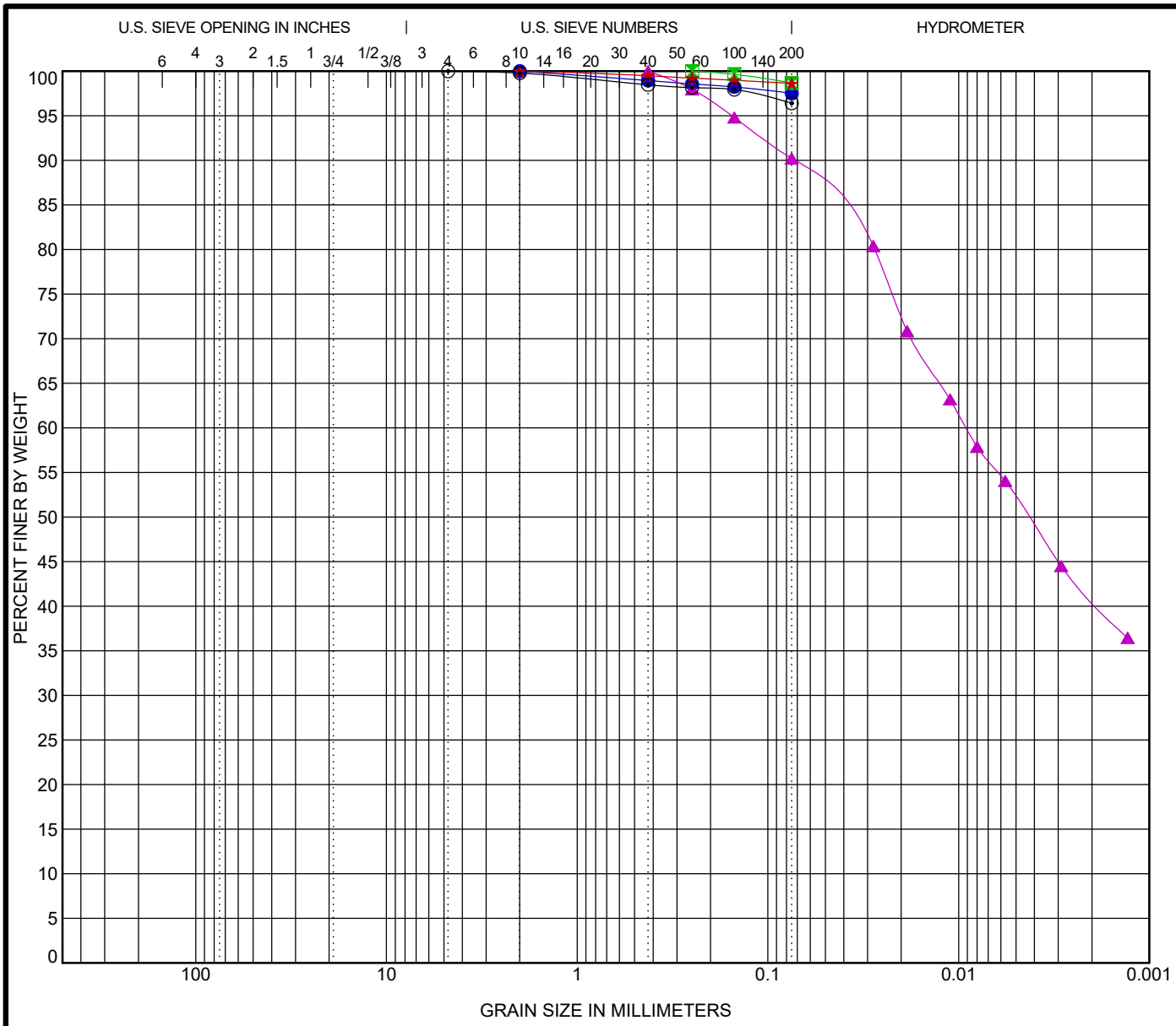
FIGURE B-107



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-256	6.0	FILL: FAT CLAY (CH)					
⊠	DP-256	30.0	CLAY LEAN (CL)					
▲	DP-257	0.0	FILL: FAT CLAY (CH)					
★	DP-257	15.0	FAT CLAY (CH)					
⊙	DP-257	30.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-256	6.0	2				0.0	2.5	97.5	
⊠	DP-256	30.0	0.25				0.0	1.3	98.7	
▲	DP-257	0.0	0.425	0.009			0.0	9.8	38.0	52.2
★	DP-257	15.0	2				0.0	1.4	98.6	
⊙	DP-257	30.0	4.75				0.0	3.6	96.4	

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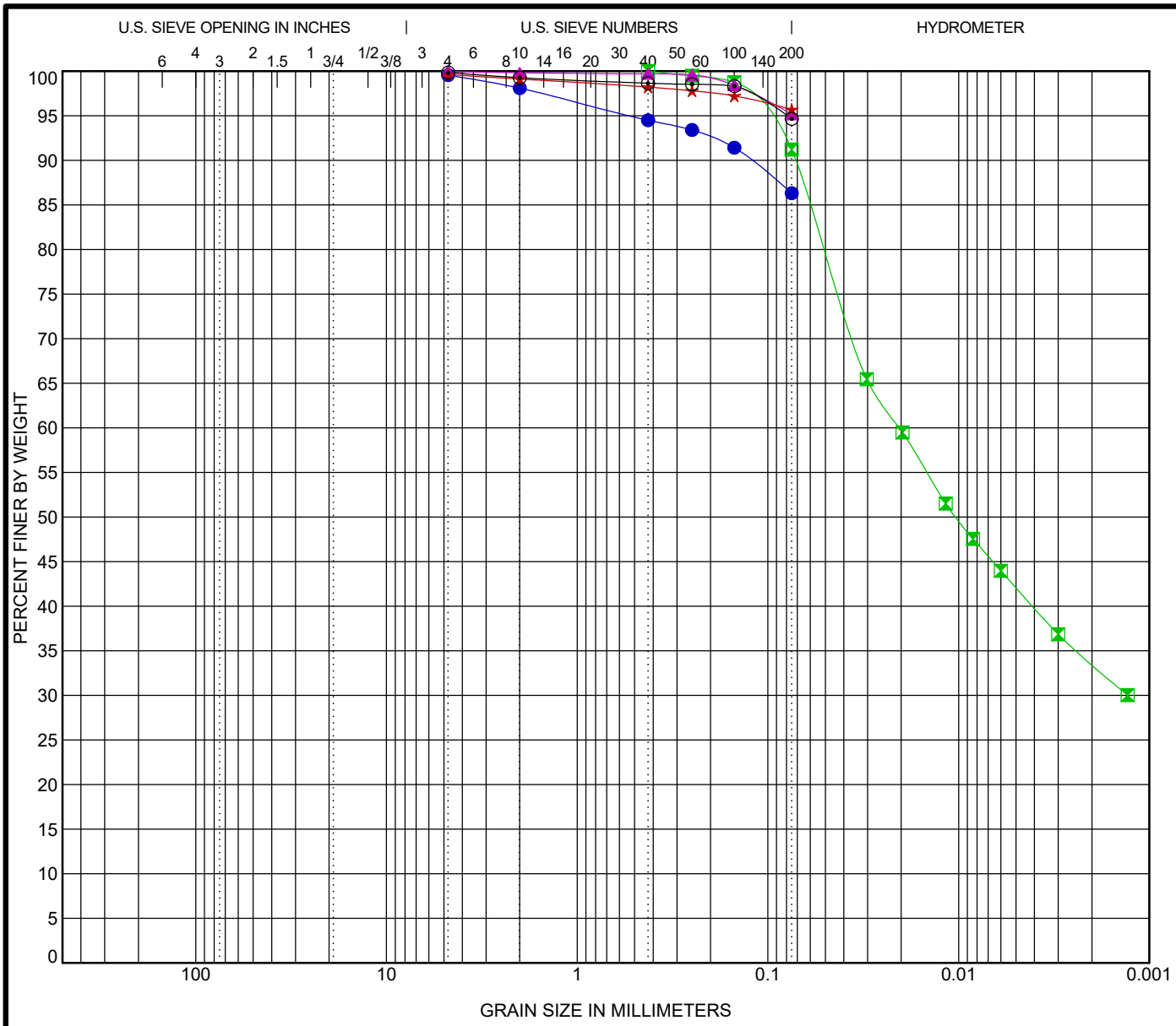

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	DP-258	2.0	FILL: LEAN CLAY (CL)					
⊠	DP-258	8.0	FILL: LEAN CLAY (CL)					
▲	DP-258	30.0	CLAY LEAN (CL)					
★	DP-259	0.0	FILL: FAT CLAY (CH)					
⊙	DP-259	20.0	FAT CLAY (CH)					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-258	2.0	4.75				0.0	13.2	86.3	
⊠	DP-258	8.0	0.425	0.02			0.0	8.8	49.1	42.1
▲	DP-258	30.0	4.75				0.0	4.8	95.2	
★	DP-259	0.0	4.75				0.0	3.9	95.7	
⊙	DP-259	20.0	4.75				0.0	5.2	94.7	

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FIGURE B-109

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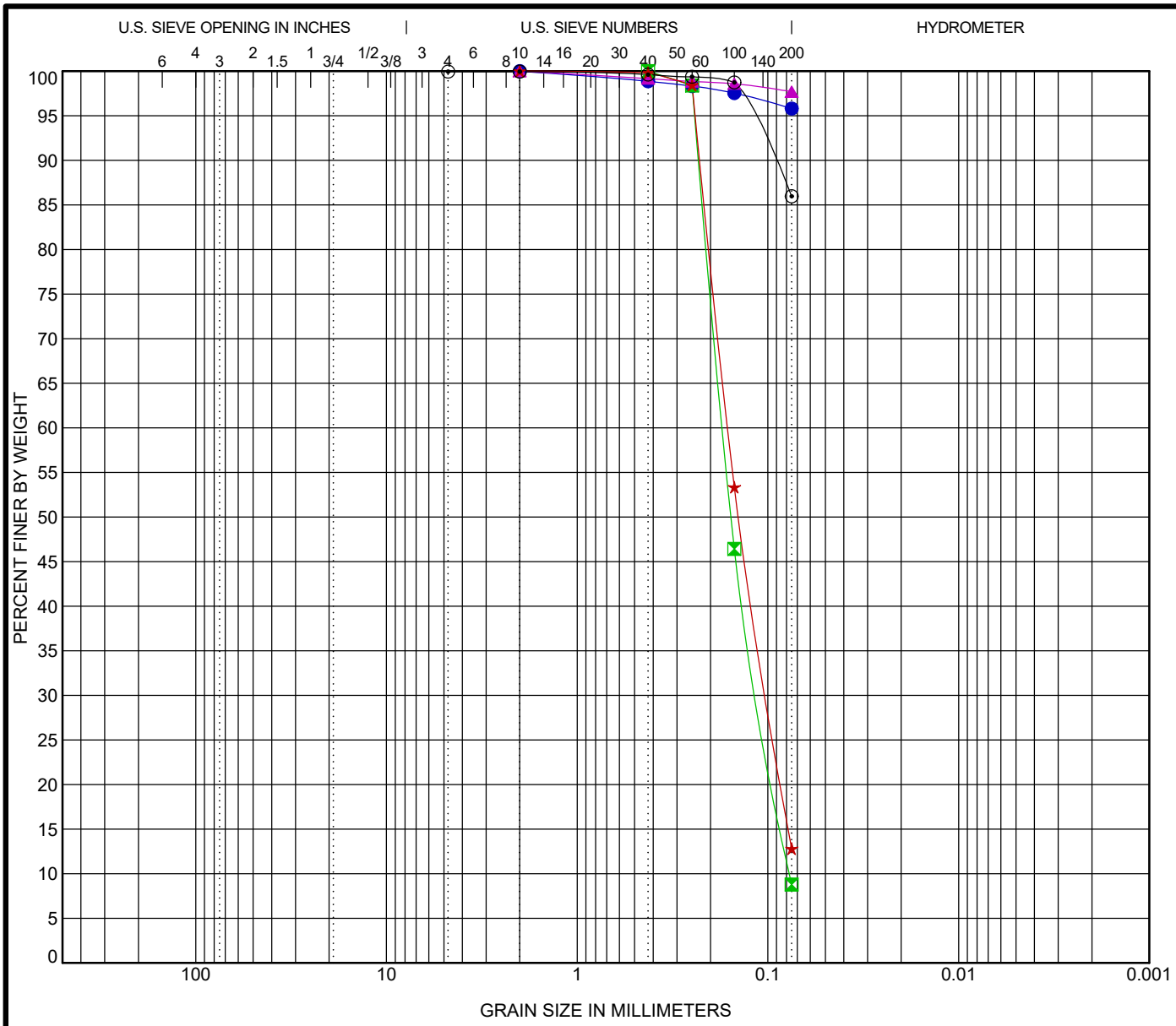

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-260**	**10.0**	**SANDY LEAN CLAY (CL)**					
⊠	**DP-260**	**40.0**	**SAND w/ SILT (SP-SM)**				**0.93**	**2.24**
▲	**DP-261**	**4.0**	**FILL: FAT CLAY (CH)**					
★	**DP-261**	**40.0**	**SILTY SAND (SM)**					
⊙	**DP-262**	**6.0**	**FILL: LEAN CLAY (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-260**	**10.0**	**2**				**0.0**	**4.2**	**95.8**	
⊠	**DP-260**	**40.0**	**0.425**	**0.171**	**0.111**	**0.077**	**0.0**	**91.2**	**8.8**	
▲	**DP-261**	**4.0**	**2**				**0.0**	**2.3**	**97.7**	
★	**DP-261**	**40.0**	**2**	**0.162**	**0.101**		**0.0**	**87.2**	**12.8**	
⊙	**DP-262**	**6.0**	**4.75**				**0.0**	**14.0**	**86.0**	

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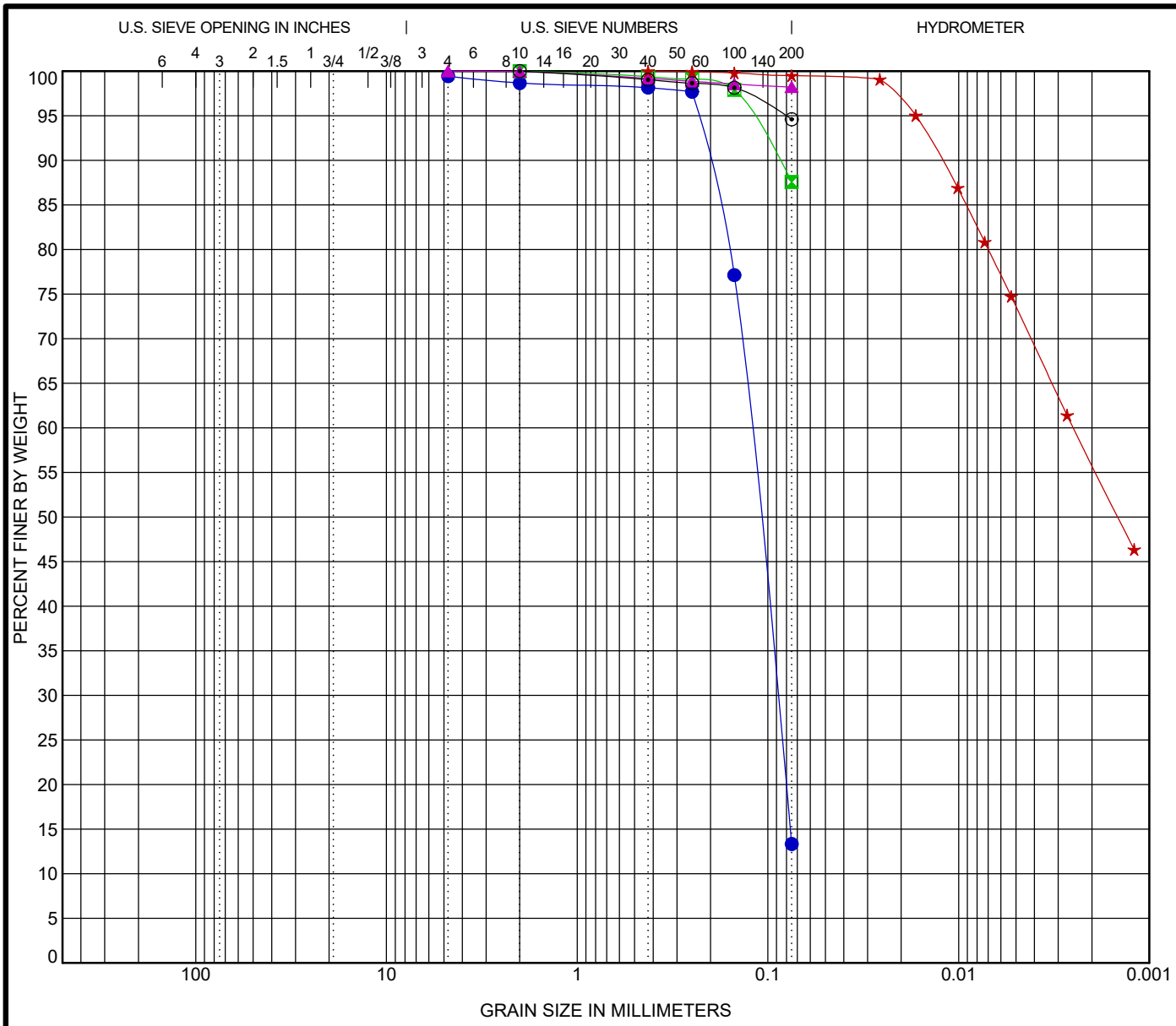
FIGURE B-110



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	DP-262	40.0	**SILTY SAND (SM)**					
⊠	DP-263	8.0	**CLAY LEAN (CL)**					
▲	DP-263	25.0	**FAT CLAY (CH)**					
★	DP-263	40.0	**FAT CLAY (CH)**					
⊙	DP-264	4.0	**FILL: FAT CLAY (CH)**					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-262	40.0	**4.75**	**0.125**	**0.09**		**0.0**	**86.1**	**13.3**	
⊠	DP-263	8.0	**2**				**0.0**	**12.4**	**87.6**	
▲	DP-263	25.0	**4.75**				**0.0**	**1.8**	**98.2**	
★	DP-263	40.0	**0.425**	**0.003**			**0.0**	**0.5**	**25.9**	**73.6**
⊙	DP-264	4.0	**2**				**0.0**	**5.4**	**94.6**	

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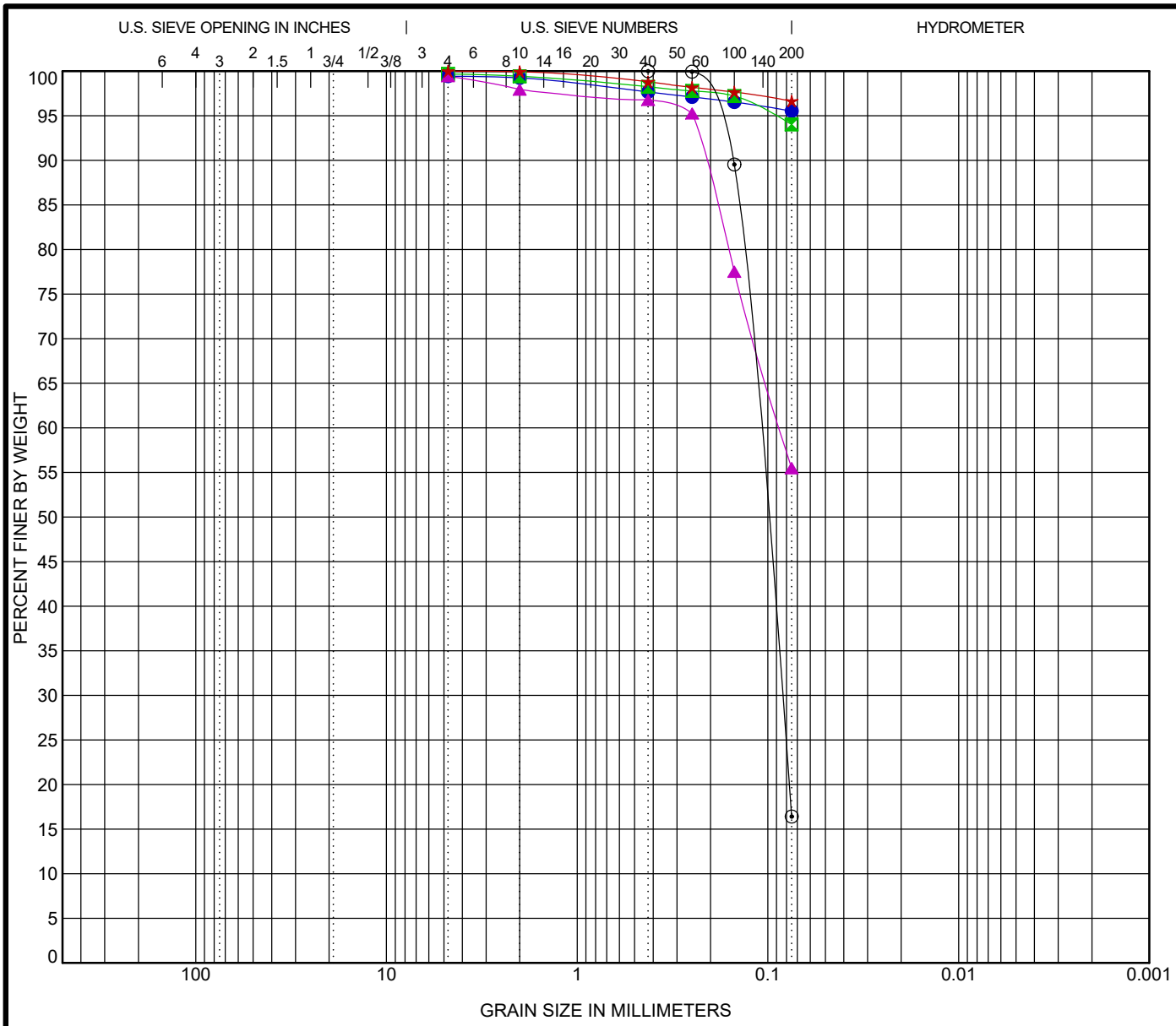
FIGURE B-111



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-264	20.0	FAT CLAY (CH)					
⊠	DP-265	0.0	FILL: LEAN CLAY (CL)					
▲	DP-265	35.0	SANDY LEAN CLAY (CL)					
★	DP-266	8.0	FILL: FAT CLAY (CH)					
⊙	DP-266	15.0	CLAYEY SAND (SC)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-264	20.0	4.75				0.0	3.9	95.5	
⊠	DP-265	0.0	4.75				0.0	5.7	94.0	
▲	DP-265	35.0	4.75	0.086			0.0	44.0	55.5	
★	DP-266	8.0	4.75				0.0	3.4	96.6	
⊙	DP-266	15.0	0.425	0.113	0.085		0.0	83.6	16.4	

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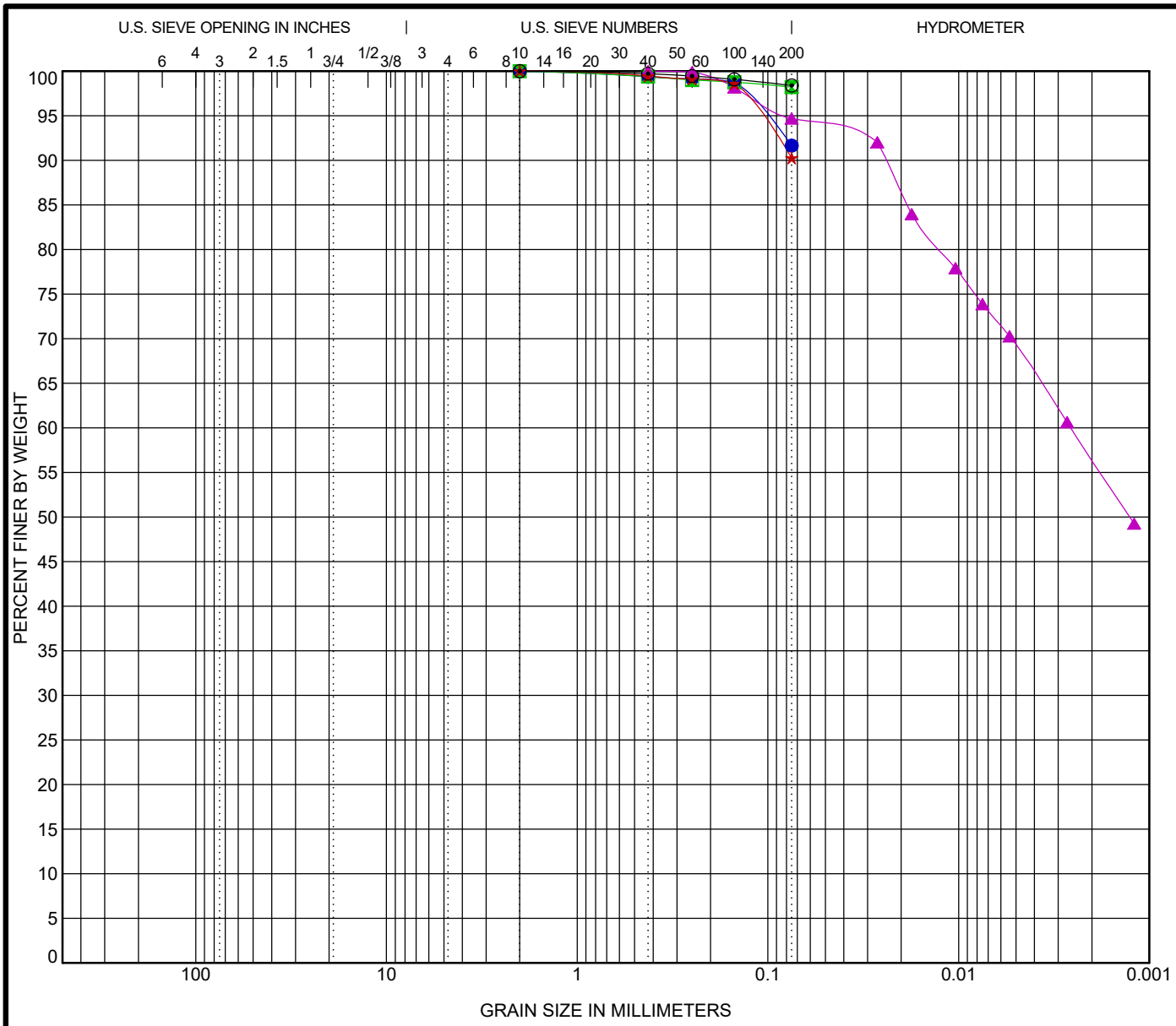
FIGURE B-112



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-267	4.0	FILL: LEAN CLAY (CL)					
⊠	DP-267	8.0	CLAY LEAN (CL)					
▲	DP-267	20.0	FAT CLAY (CH)					
★	DP-268	0.0	FILL: FAT CLAY (CH)					
⊙	DP-268	10.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-267	4.0	2				0.0	8.4	91.6	
⊠	DP-267	8.0	2				0.0	1.8	98.2	
▲	DP-267	20.0	0.425	0.003			0.0	5.3	25.5	69.2
★	DP-268	0.0	2				0.0	9.7	90.3	
⊙	DP-268	10.0	2				0.0	1.6	98.4	

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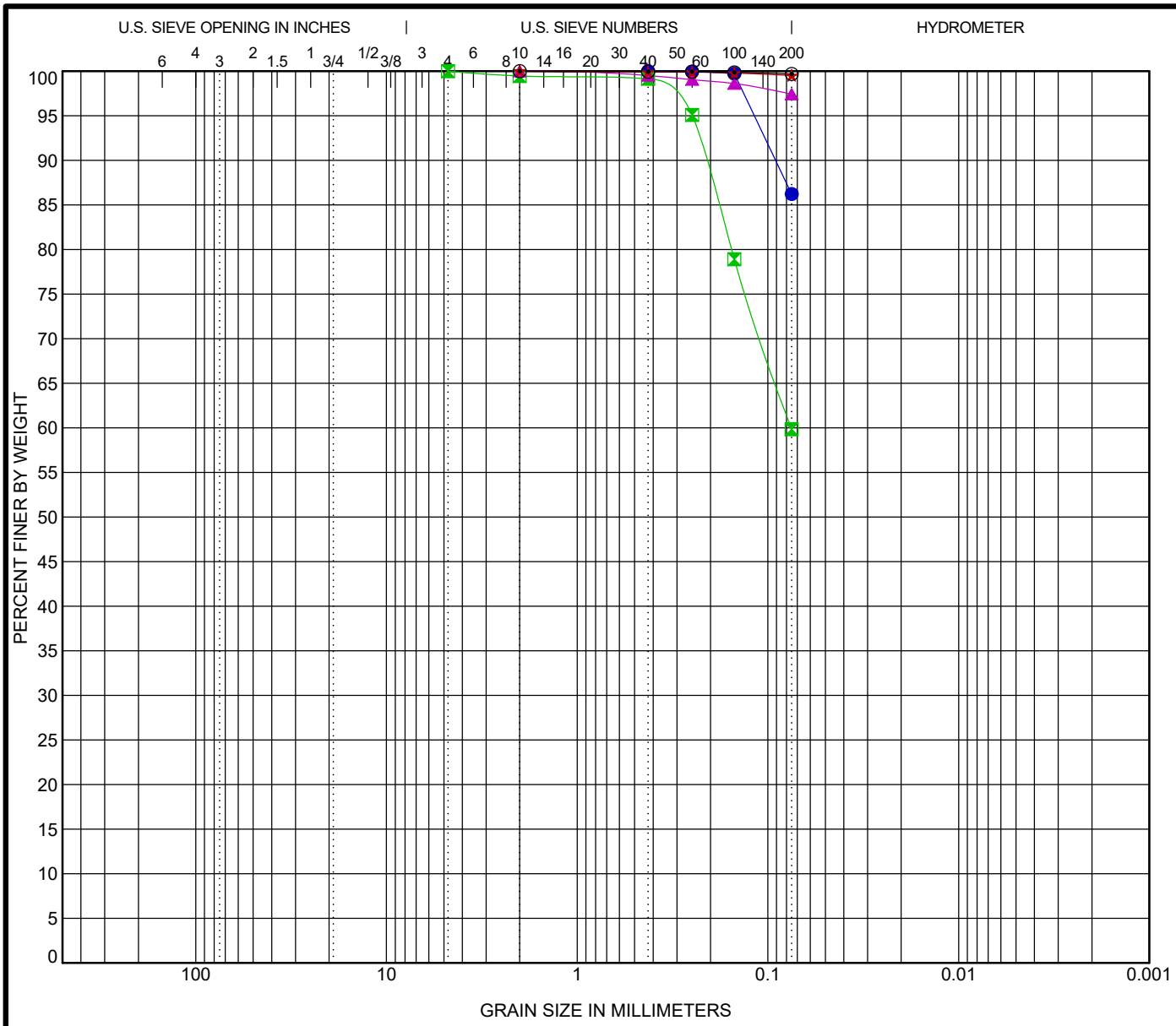

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	DP-269	4.0	**FAT CLAY (CH)**					
⊠	DP-269	40.0	**SANDY LEAN CLAY (CL)**	**27**	**14**	**13**		
▲	DP-270	4.0	**FILL: FAT CLAY (CH)**					
★	DP-270	25.0	**FAT CLAY (CH)**					
⊙	DP-270	30.0	**FAT CLAY (CH)**					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-269	4.0	**0.425**				**0.0**	**13.8**	**86.2**	
⊠	DP-269	40.0	**4.75**	**0.075**			**0.0**	**40.2**	**59.8**	
▲	DP-270	4.0	**2**				**0.0**	**2.6**	**97.4**	
★	DP-270	25.0	**2**				**0.0**	**0.5**	**99.5**	
⊙	DP-270	30.0	**2**				**0.0**	**0.3**	**99.7**	

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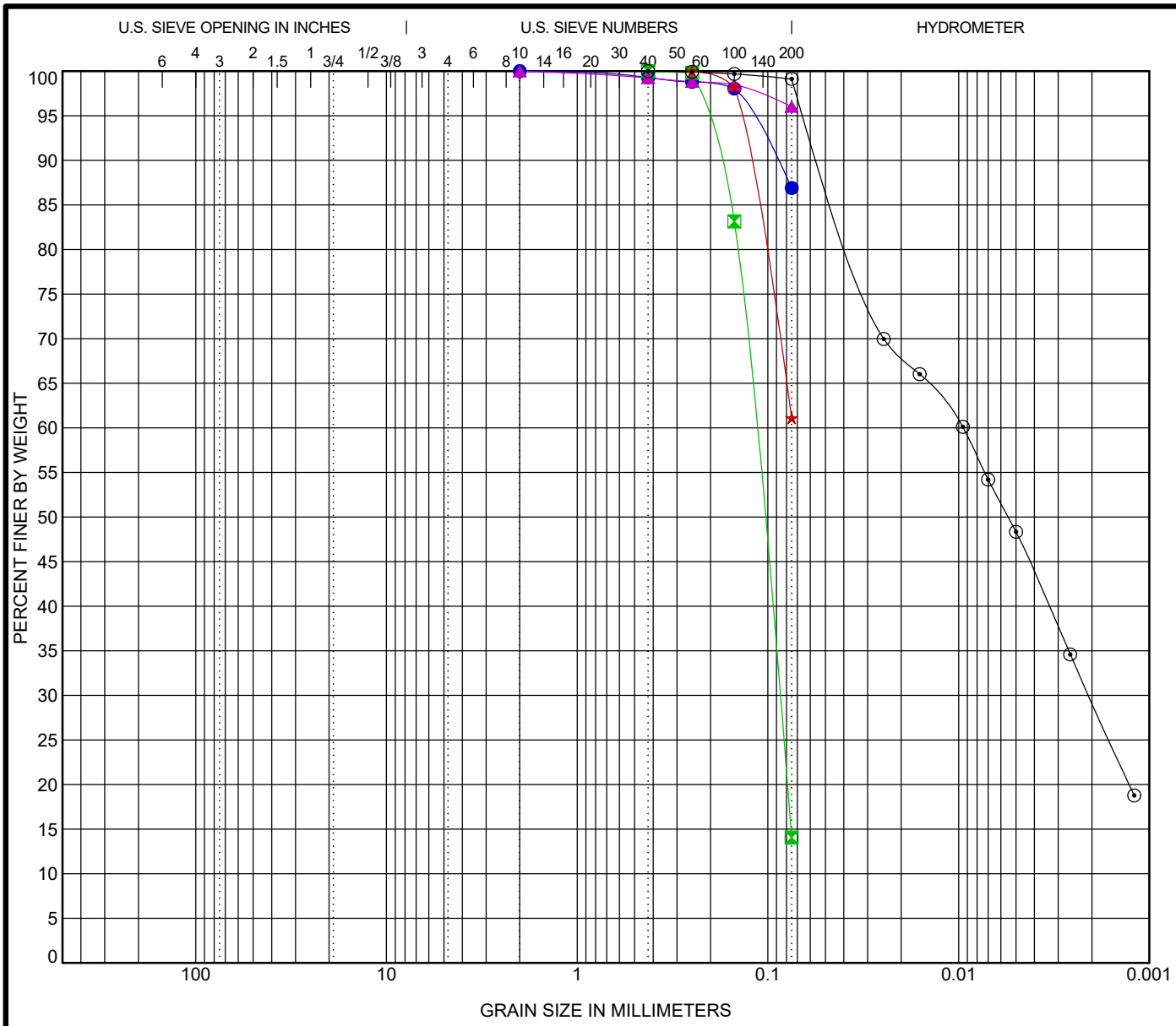
FIGURE B-114



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-271	6.0	FILL: FAT CLAY (CH)					
⊠	DP-271	25.0	SILTY SAND (SM)					
▲	DP-272	2.0	FILL: LEAN CLAY (CL)					
★	DP-272	15.0	SANDY LEAN CLAY (CL)					
⊙	DP-272	30.0	FAT CLAY (CH)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-271	6.0	2				0.0	13.1	86.9	
⊠	DP-271	25.0	0.425	0.119	0.088		0.0	86.0	14.0	
▲	DP-272	2.0	2				0.0	4.0	96.0	
★	DP-272	15.0	0.25				0.0	38.9	61.1	
⊙	DP-272	30.0	0.425	0.009	0.002		0.0	0.9	50.8	48.3

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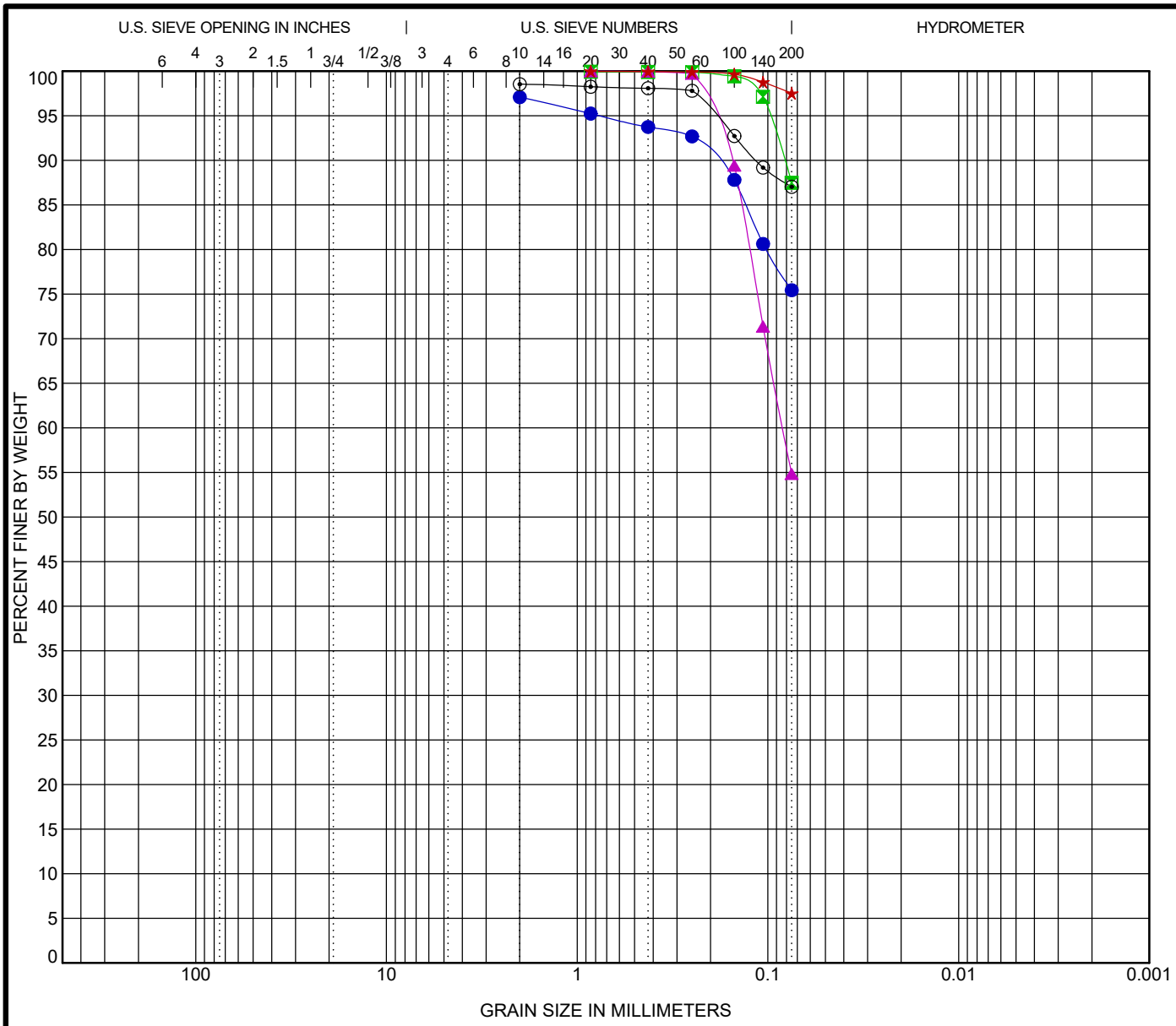
FIGURE B-115



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-273	35.0	FAT CLAY (CH)					
⊠	DP-274	4.0	FILL: FAT CLAY (CH)					
▲	DP-274	15.0	SANDY LEAN CLAY (CL)					
★	DP-275	4.0	FILL: FAT CLAY (CH)					
⊙	DP-275	40.0	CLAY LEAN (CL)	33	18	15		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-273	35.0	2				0.0	21.6	75.4	
⊠	DP-274	4.0	0.85				0.0	12.4	87.5	
▲	DP-274	15.0	0.85	0.084			0.0	45.2	54.8	
★	DP-275	4.0	0.85				0.0	2.5	97.5	
⊙	DP-275	40.0	2				0.0	11.5	87.0	

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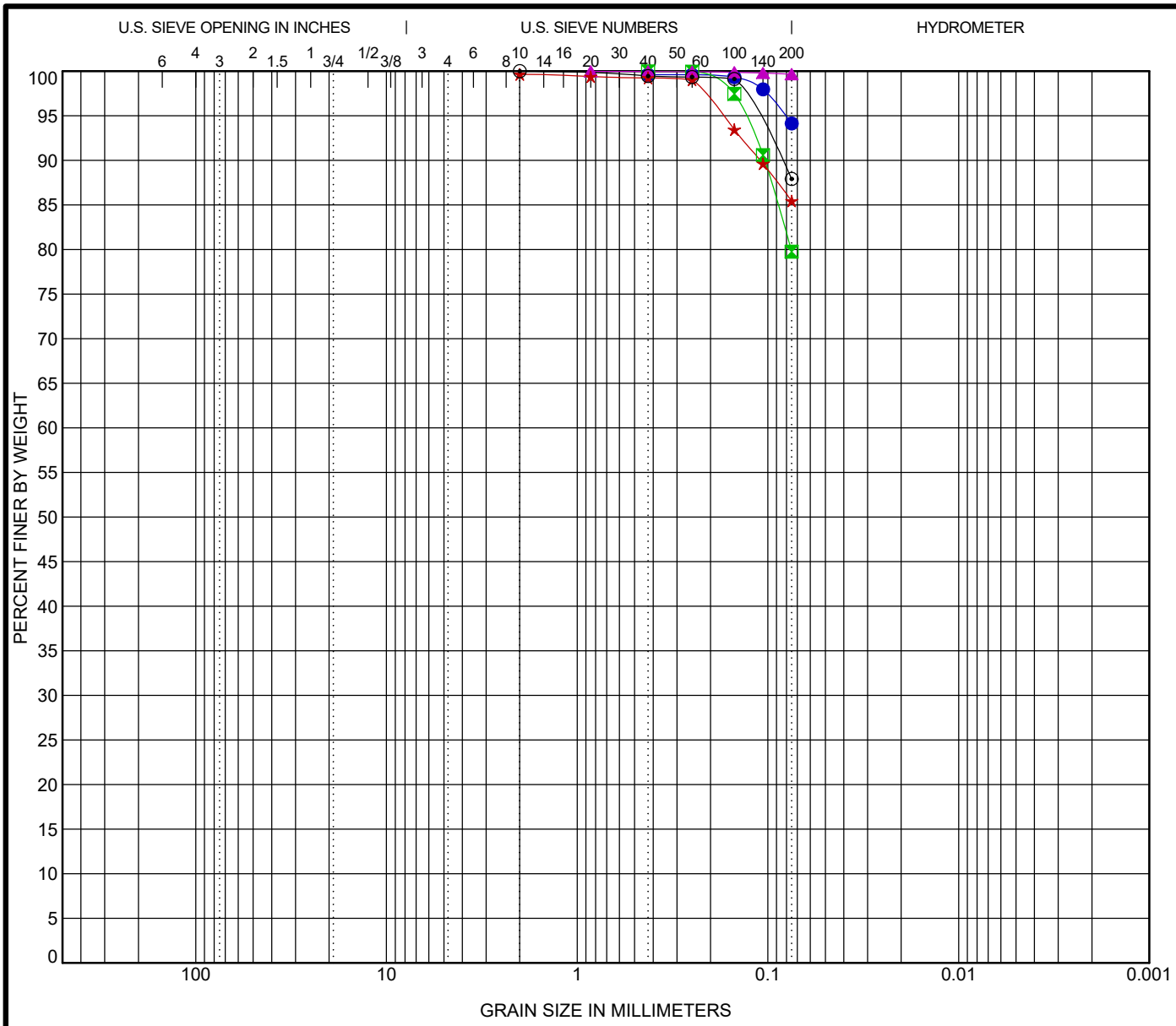

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-276**	**6.0**	**FILL: FAT CLAY (CH)**					
⊠	**DP-276**	**15.0**	**SILT w/ SAND (ML)**					
▲	**DP-277**	**8.0**	**FAT CLAY (CH)**					
★	**DP-277**	**40.0**	**CLAY LEAN (CL)**					
⊙	**DP-278**	**20.0**	**CLAY LEAN (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-276**	**6.0**	**0.425**				**0.0**	**5.5**	**94.1**	
⊠	**DP-276**	**15.0**	**0.425**				**0.0**	**20.2**	**79.8**	
▲	**DP-277**	**8.0**	**0.85**				**0.0**	**0.3**	**99.7**	
★	**DP-277**	**40.0**	**2**				**0.0**	**14.2**	**85.4**	
⊙	**DP-278**	**20.0**	**2**				**0.0**	**12.1**	**87.9**	

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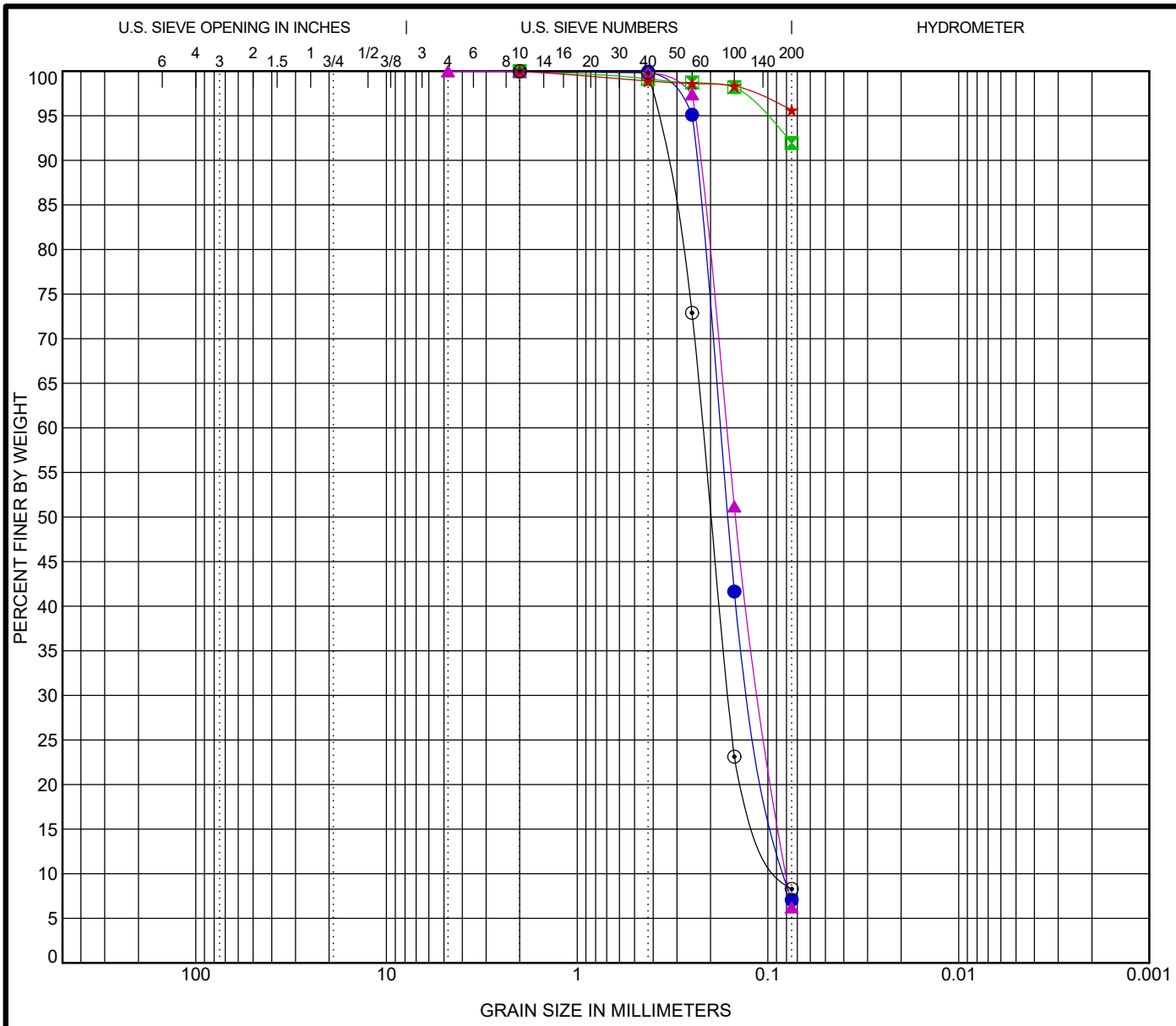
FIGURE B-117



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-278	40.0	SAND w/ SILT (SP-SM)				0.99	2.25
⊠	DP-279	4.0	FILL: LEAN CLAY (CL)					
▲	DP-279	35.0	SAND w/ SILT (SP-SM)				0.89	2.08
★	DP-280	0.0	FILL: FAT CLAY (CH)					
⊙	DP-280	30.0	SAND w/ SILT (SP-SM)				1.46	2.70

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-278	40.0	2	0.179	0.119	0.08	0.0	92.9	7.1	
⊠	DP-279	4.0	2				0.0	8.1	91.9	
▲	DP-279	35.0	4.75	0.165	0.108	0.079	0.0	93.8	6.2	
★	DP-280	0.0	2				0.0	4.4	95.6	
⊙	DP-280	30.0	2	0.219	0.161	0.081	0.0	91.7	8.3	

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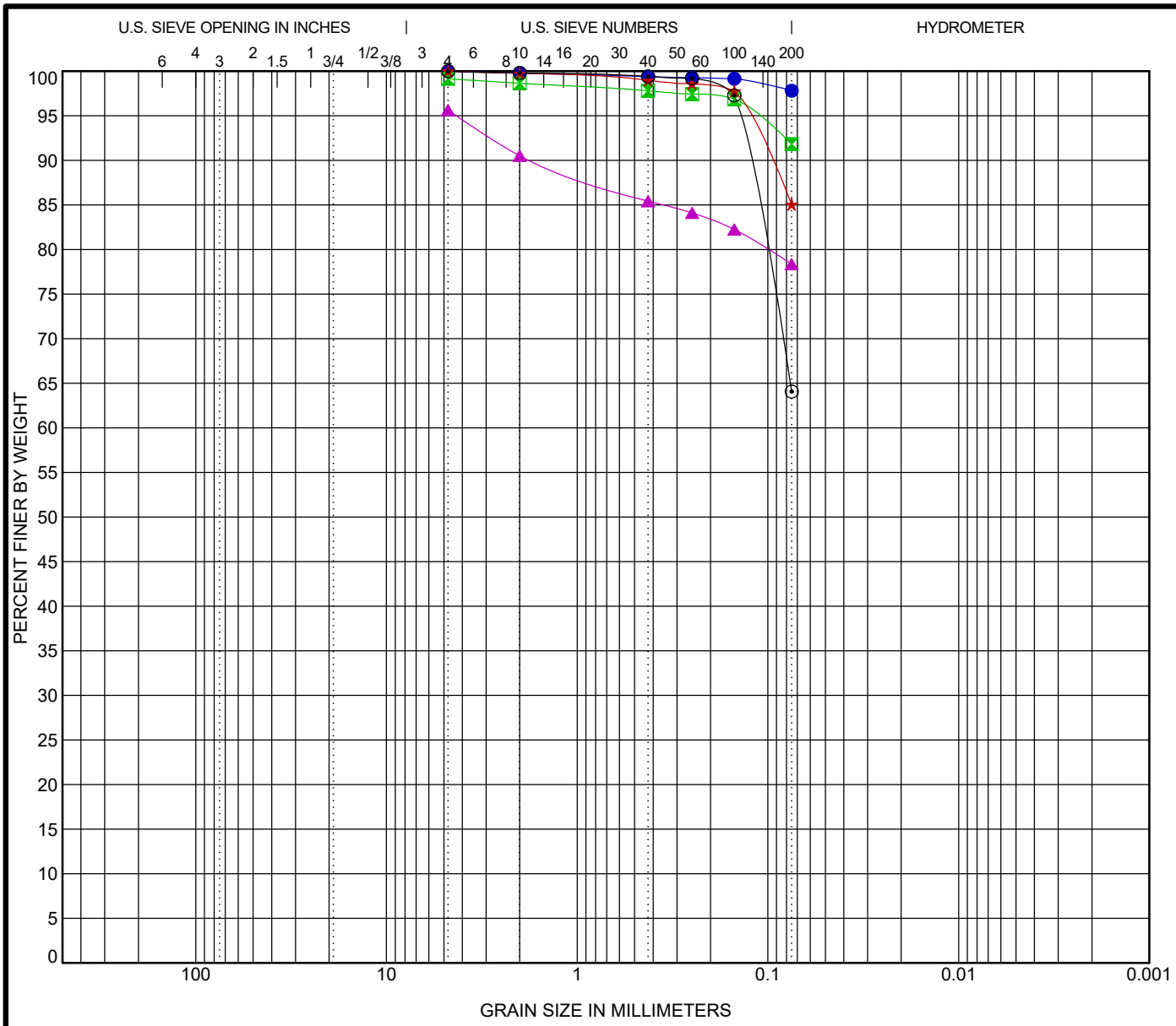
FIGURE B-118



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-281	2.0	FILL: LEAN CLAY (CL)					
⊠	DP-281	8.0	FILL: LEAN CLAY (CL)					
▲	DP-282	4.0	FILL: FAT CLAY (CH)					
★	DP-282	10.0	CLAY LEAN (CL)					
⊙	DP-283	6.0	FILL: SANDY LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-281	2.0	4.75				0.0	2.2	97.8	
⊠	DP-281	8.0	4.75				0.0	7.3	91.8	
▲	DP-282	4.0	4.75				0.0	17.3	78.3	
★	DP-282	10.0	4.75				0.0	14.9	85.1	
⊙	DP-283	6.0	4.75				0.0	35.9	64.1	

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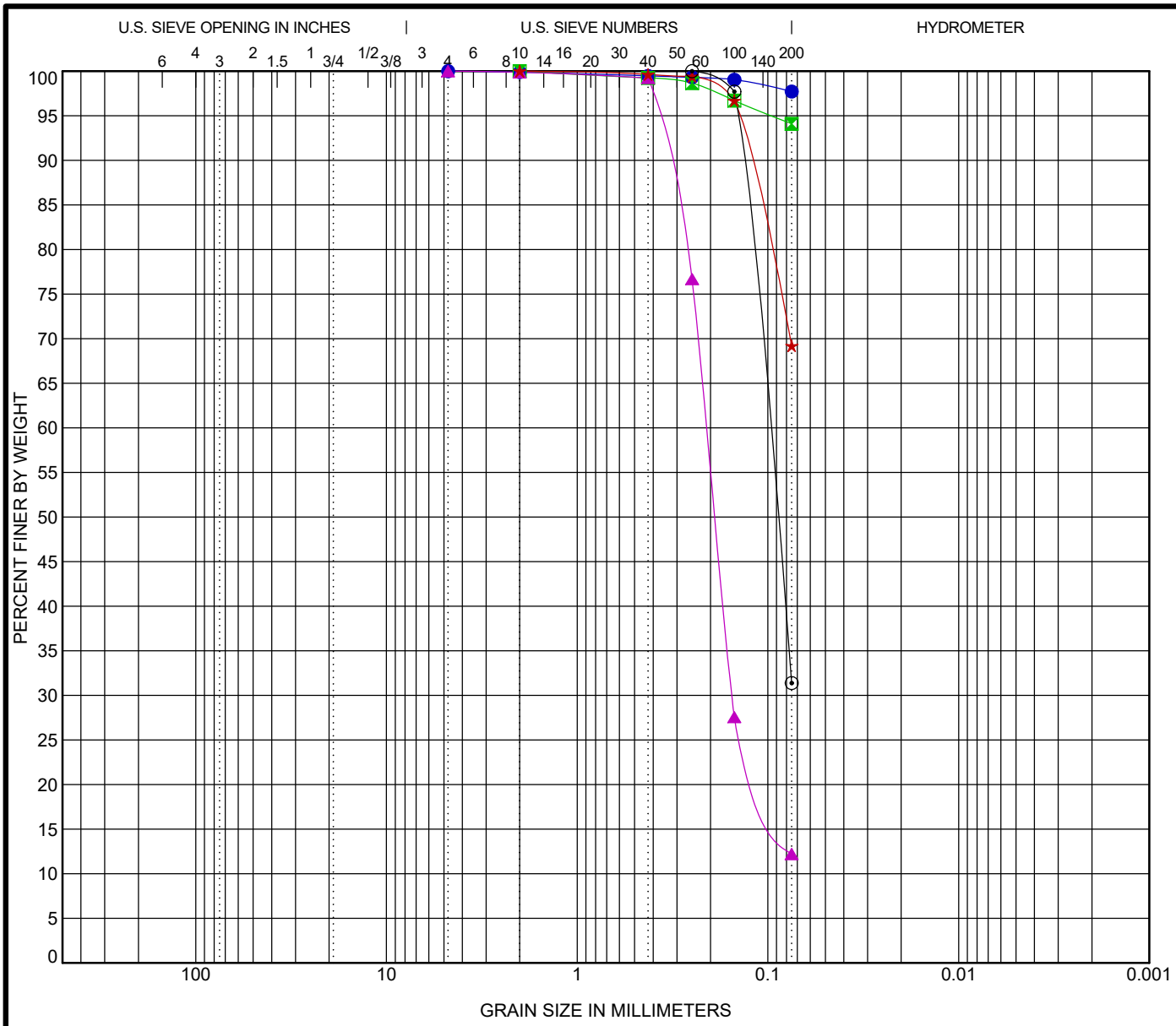
FIGURE B-119



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-283	20.0	FAT CLAY (CH)					
⊠	DP-284	4.0	FILL: FAT CLAY (CH)					
▲	DP-284	40.0	SILTY SAND (SM)				1.66	3.10
★	DP-285	10.0	SANDY LEAN CLAY (CL)					
⊙	DP-285	40.0	SILTY SAND (SM)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-283	20.0	4.75				0.0	2.3	97.7	
⊠	DP-284	4.0	2				0.0	5.9	94.1	
▲	DP-284	40.0	4.75	0.21	0.154		0.0	87.8	12.2	
★	DP-285	10.0	2				0.0	30.8	69.2	
⊙	DP-285	40.0	0.25	0.101			0.0	68.6	31.4	

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FIGURE B-120

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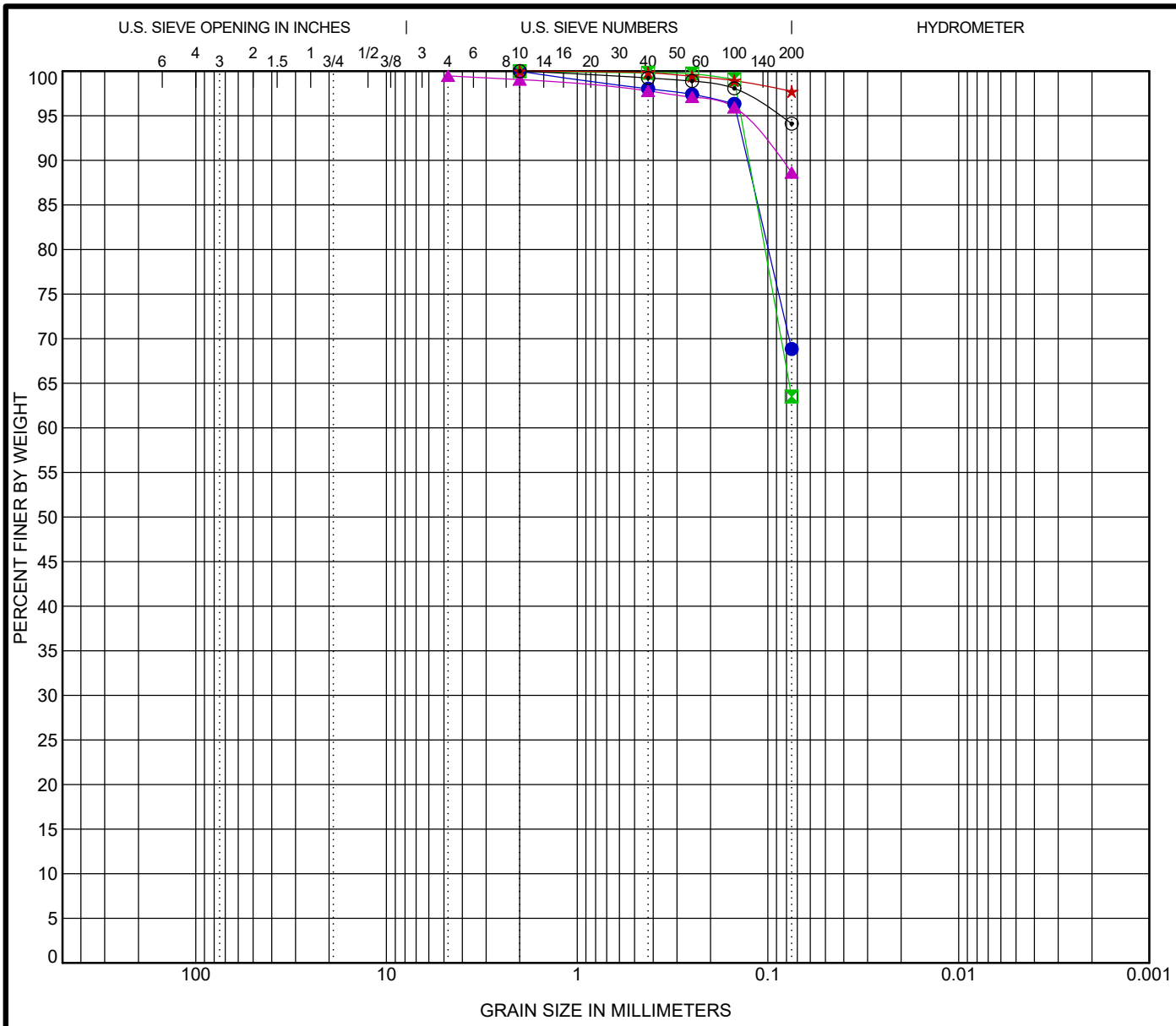

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-286**	**4.0**	**FILL: SANDY LEAN CLAY (CL)**					
⊠	**DP-286**	**25.0**	**SANDY LEAN CLAY (CL)**					
▲	**DP-287**	**8.0**	**FILL: LEAN CLAY (CL)**					
★	**DP-287**	**25.0**	**FAT CLAY (CH)**					
⊙	**DP-288**	**2.0**	**FILL: FAT CLAY (CH)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-286**	**4.0**	**2**				**0.0**	**31.2**	**68.8**	
⊠	**DP-286**	**25.0**	**2**				**0.0**	**36.5**	**63.5**	
▲	**DP-287**	**8.0**	**4.75**				**0.0**	**10.8**	**88.6**	
★	**DP-287**	**25.0**	**2**				**0.0**	**2.3**	**97.7**	
⊙	**DP-288**	**2.0**	**2**				**0.0**	**5.9**	**94.1**	

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FIGURE B-121

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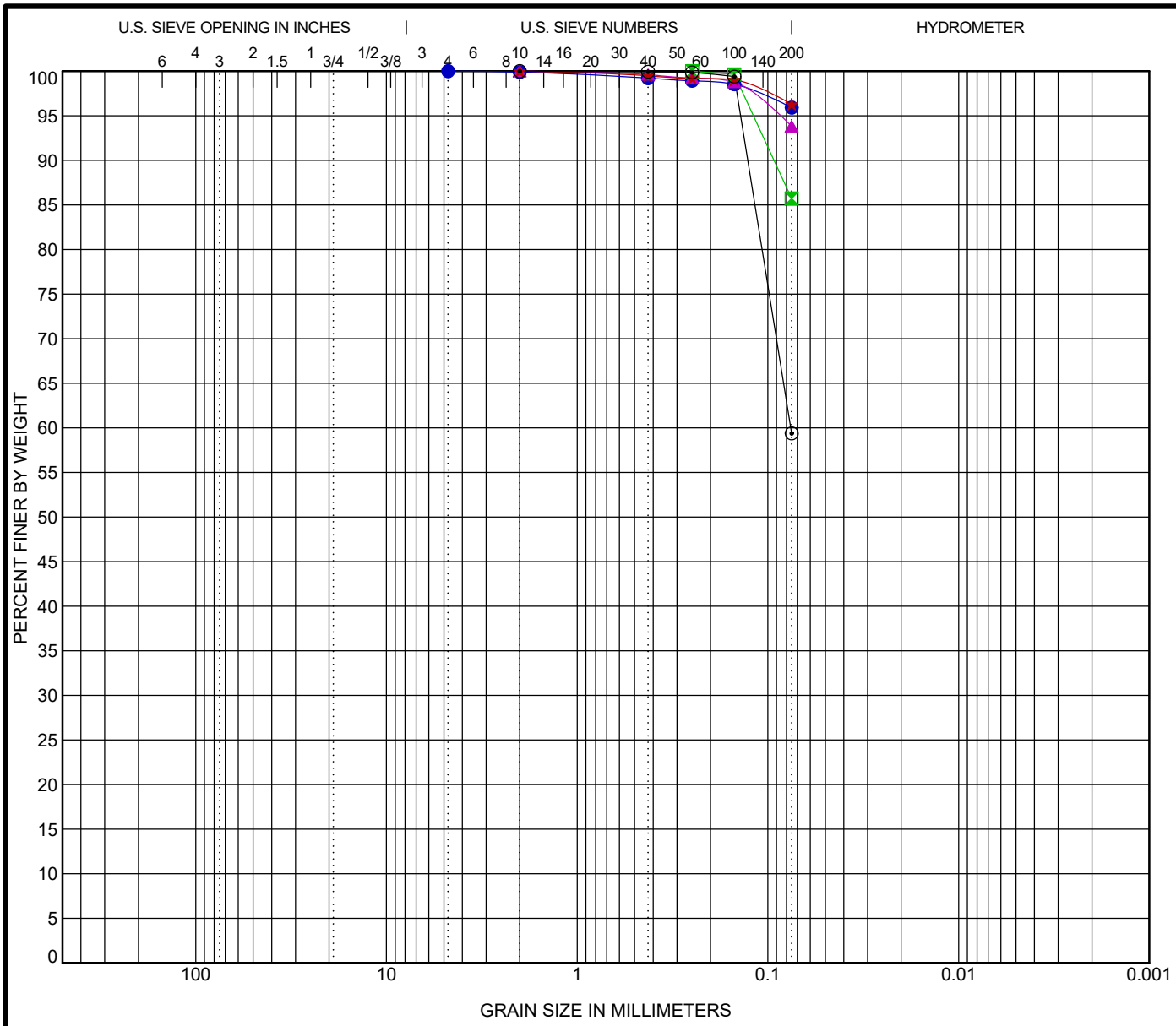

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-288	8.0	FAT CLAY (CH)					
⊠	DP-289	2.0	FILL: FAT CLAY (CH)					
▲	DP-289	25.0	SAND w/ SILT (SP-SM)					
★	DP-290	10.0	CLAY LEAN (CL)					
⊙	DP-290	25.0	SANDY LEAN CLAY (CL)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-288	8.0	4.75				0.0	4.1	95.9	
⊠	DP-289	2.0	0.25				0.0	14.3	85.7	
▲	DP-289	25.0	2				0.0	6.2	93.8	
★	DP-290	10.0	2				0.0	3.7	96.3	
⊙	DP-290	25.0	2	0.076			0.0	40.6	59.4	

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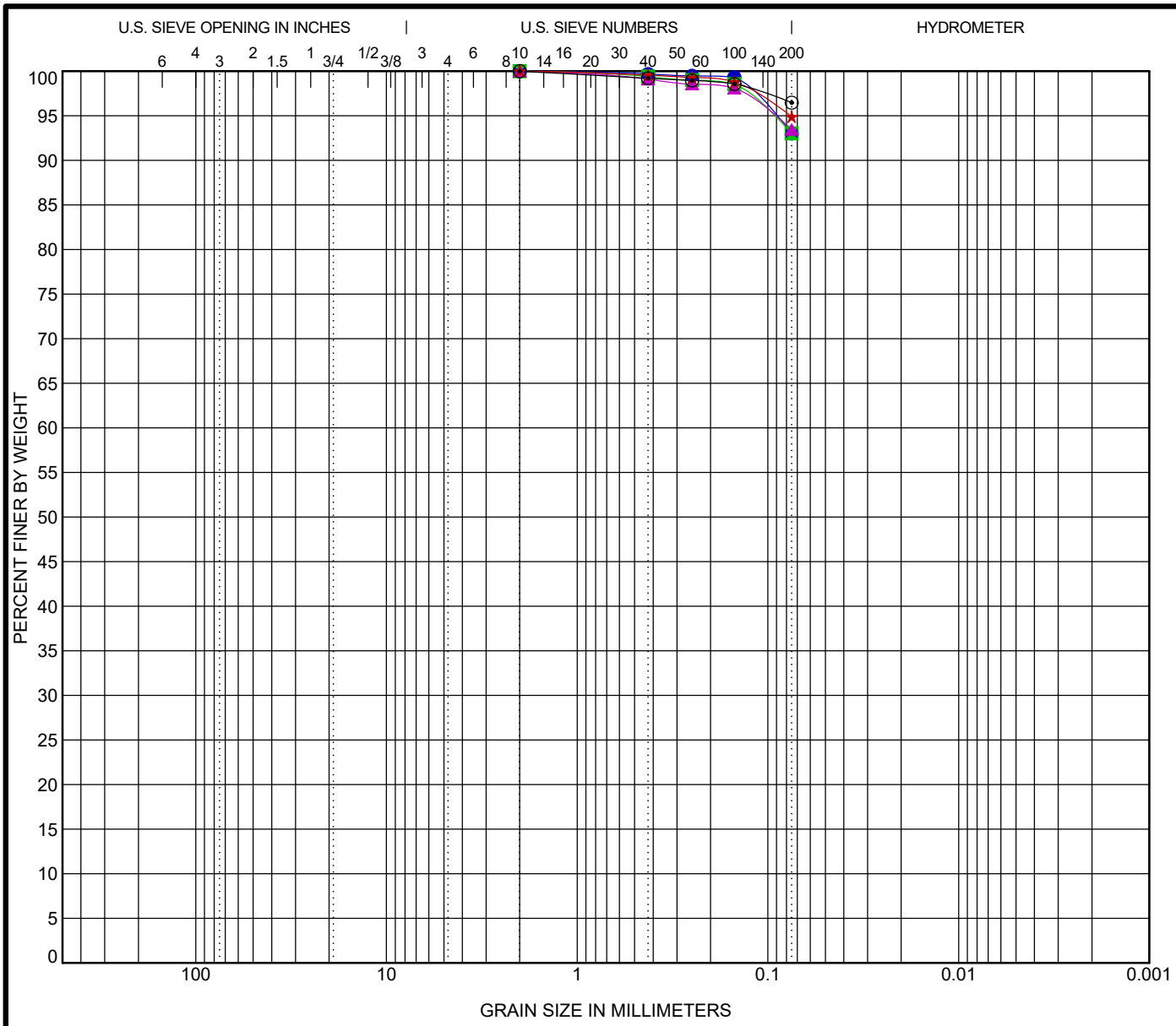

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**DP-291**	**4.0**	**FILL: LEAN CLAY (CL)**					
⊠	**DP-291**	**15.0**	**SILTY SAND (SM)**					
▲	**DP-292**	**6.0**	**FILL: LEAN CLAY (CL)**					
★	**DP-292**	**25.0**	**CLAY LEAN (CL)**					
⊙	**DP-293**	**4.0**	**FILL: LEAN CLAY (CL)**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP-291**	**4.0**	**2**				**0.0**	**7.0**	**93.0**	
⊠	**DP-291**	**15.0**	**2**				**0.0**	**7.0**	**93.0**	
▲	**DP-292**	**6.0**	**2**				**0.0**	**6.6**	**93.4**	
★	**DP-292**	**25.0**	**2**				**0.0**	**5.1**	**94.9**	
⊙	**DP-293**	**4.0**	**2**				**0.0**	**3.5**	**96.5**	

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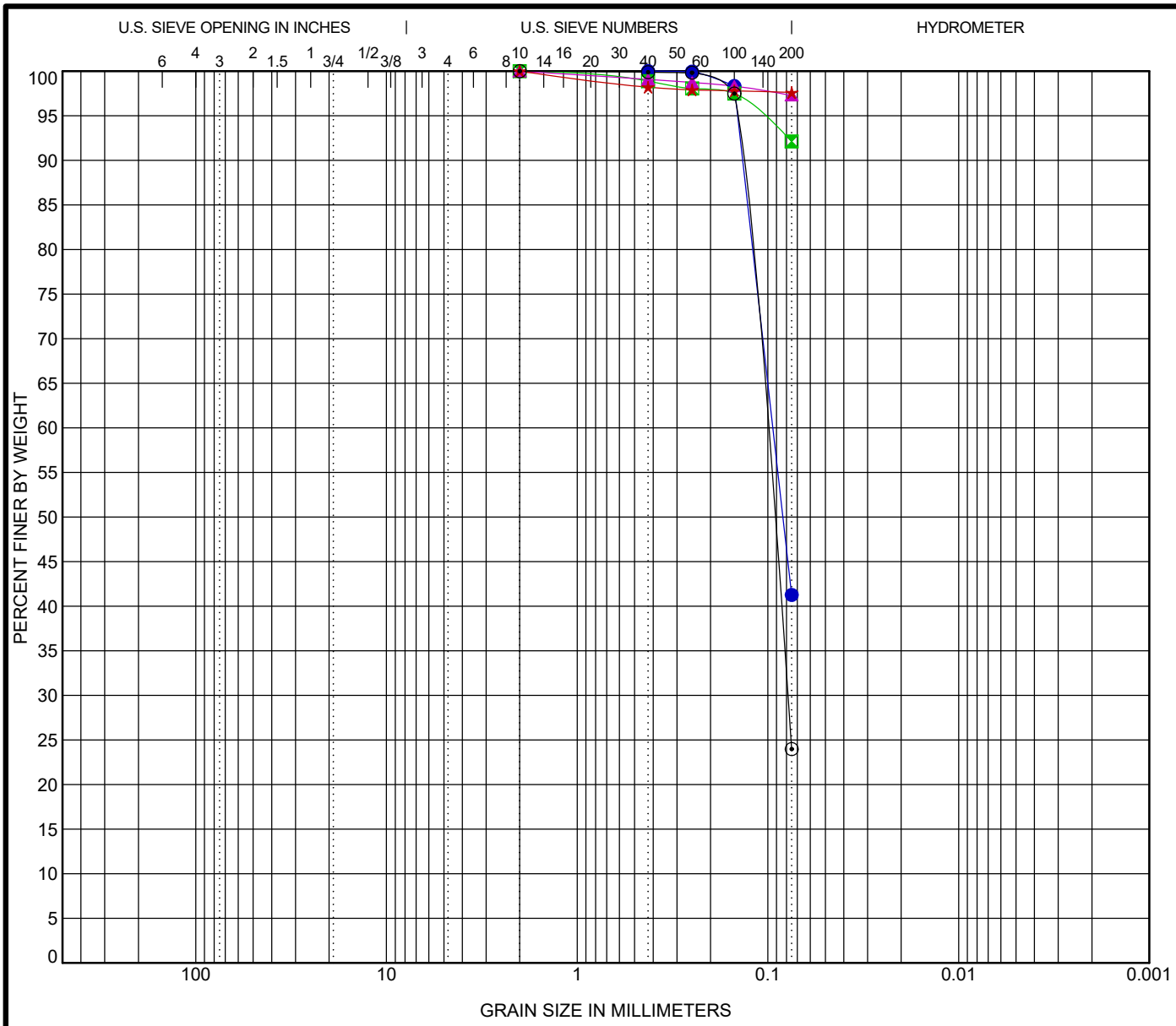
FIGURE B-123



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-293	25.0	CLAYEY SAND (SC)					
⊠	DP-294	4.0	FILL: LEAN CLAY (CL)					
▲	DP-294	25.0	CLAY LEAN (CL)					
★	DP-295	6.0	FILL: FAT CLAY (CH)					
⊙	DP-295	25.0	SILTY SAND (SM)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-293	25.0	0.425	0.094			0.0	58.7	41.3	
⊠	DP-294	4.0	2				0.0	7.9	92.1	
▲	DP-294	25.0	2				0.0	2.7	97.3	
★	DP-295	6.0	2				0.0	2.4	97.6	
⊙	DP-295	25.0	2	0.105	0.079		0.0	76.0	24.0	

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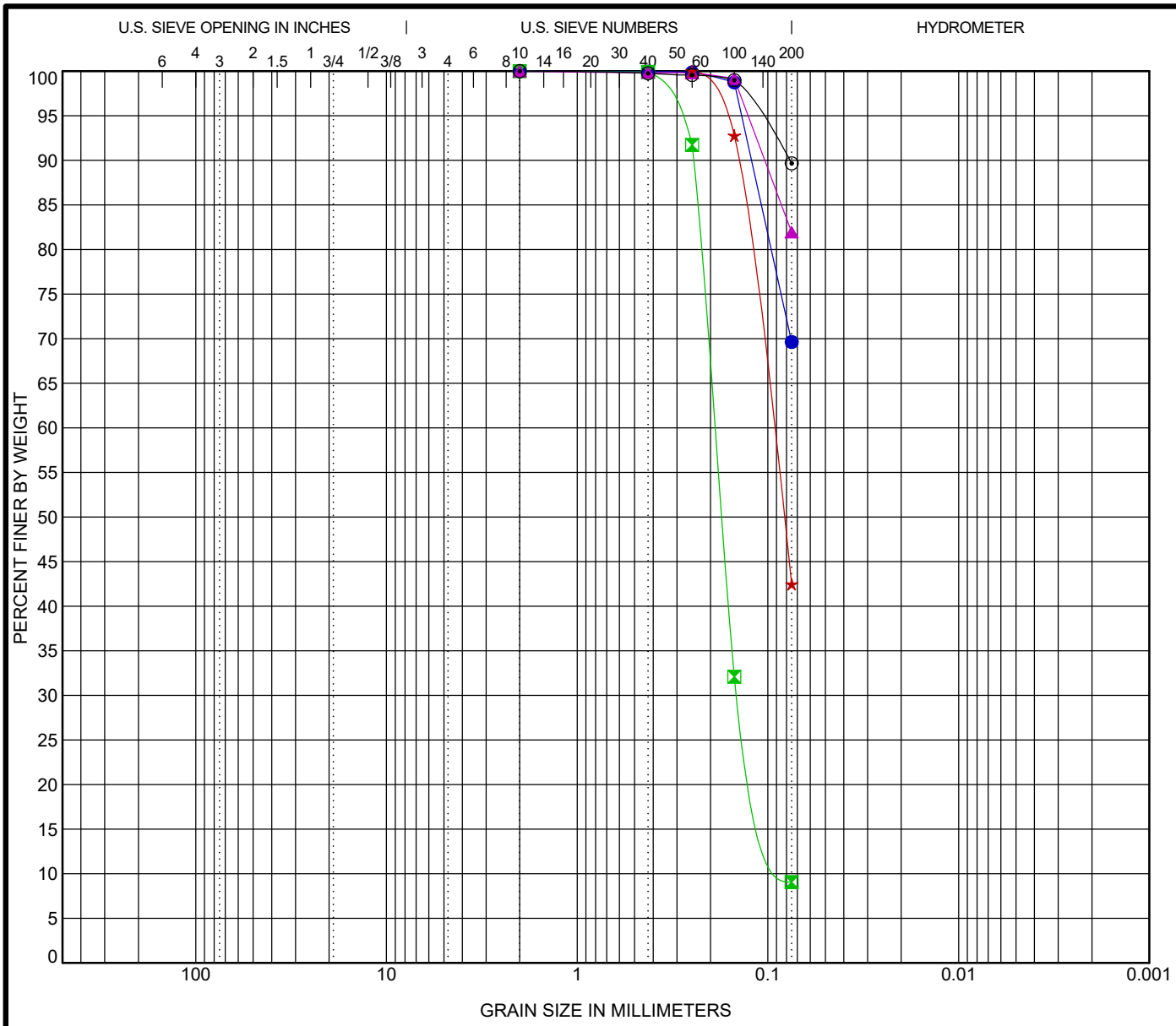
FIGURE B-124



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	DP-296	4.0	FILL: SANDY LEAN CLAY (CL)					
⊠	DP-296	30.0	SAND w/ SILT (SP-SM)				1.35	2.47
▲	DP-297	6.0	FILL: LEAN CLAY (CL)					
★	DP-297	30.0	SILTY SAND (SM)					
⊙	DP-298	4.0	FILL: LEAN CLAY (CL)					

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-296	4.0	2				0.0	30.4	69.6	
⊠	DP-296	30.0	2	0.19	0.141	0.077	0.0	90.9	9.1	
▲	DP-297	6.0	2				0.0	18.1	81.9	
★	DP-297	30.0	0.25	0.095			0.0	57.5	42.5	
⊙	DP-298	4.0	2				0.0	10.3	89.7	

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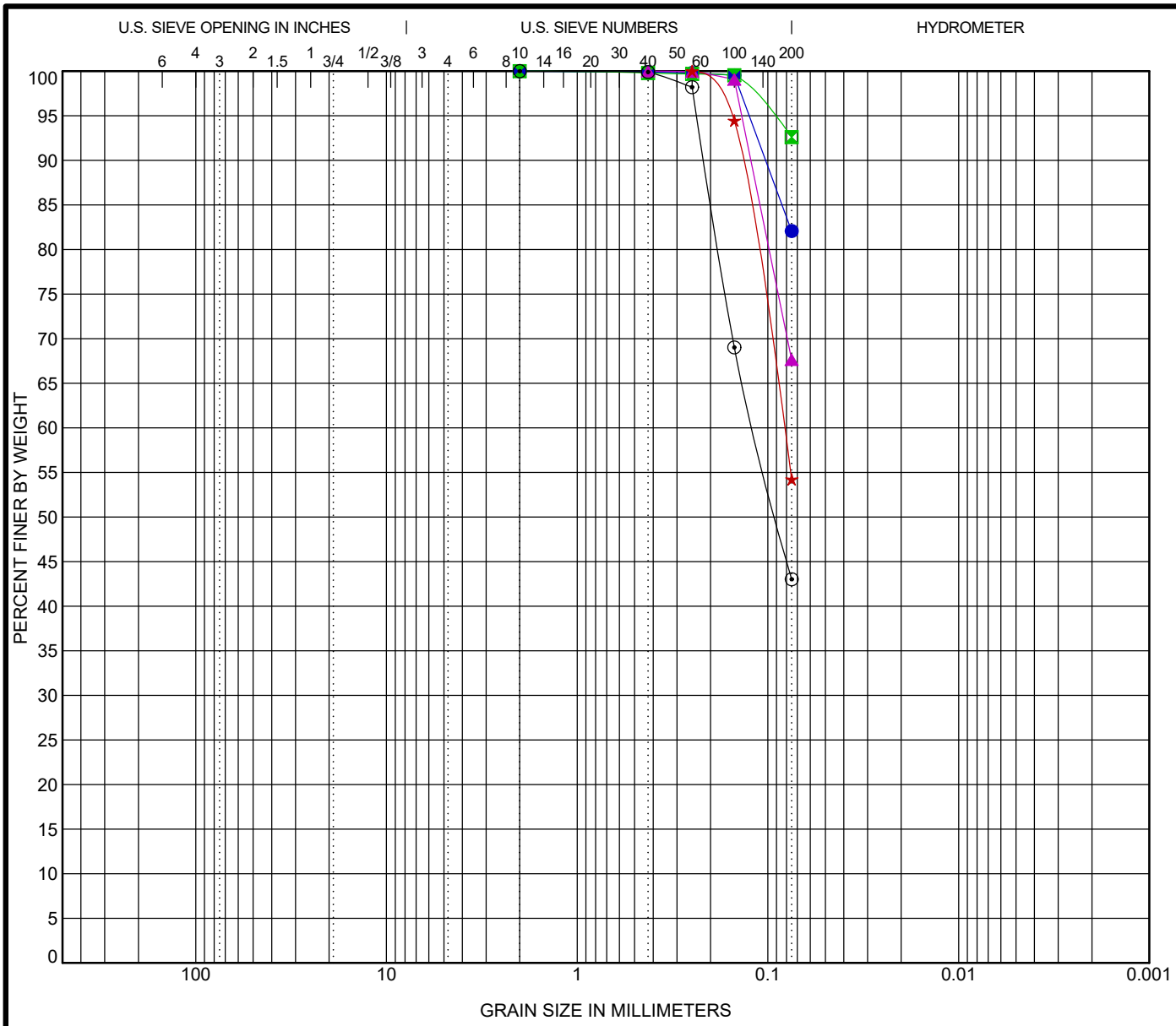
FIGURE B-125



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	DP-298	25.0	SILT w/ SAND (ML)					
⊠	DP-299	0.0	FILL: LEAN CLAY (CL)					
▲	DP-299	25.0	SANDY LEAN CLAY (CL)					
★	DP-300	25.0	SANDY SILTY (ML)					
⊙	DP-300	48.5	SILTY SAND (SM)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DP-298	25.0	2				0.0	17.9	82.1	
⊠	DP-299	0.0	2				0.0	7.4	92.6	
▲	DP-299	25.0	0.425				0.0	32.4	67.6	
★	DP-300	25.0	0.25	0.083			0.0	45.8	54.2	
⊙	DP-300	48.5	2	0.118			0.0	57.0	43.0	

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FIGURE B-126

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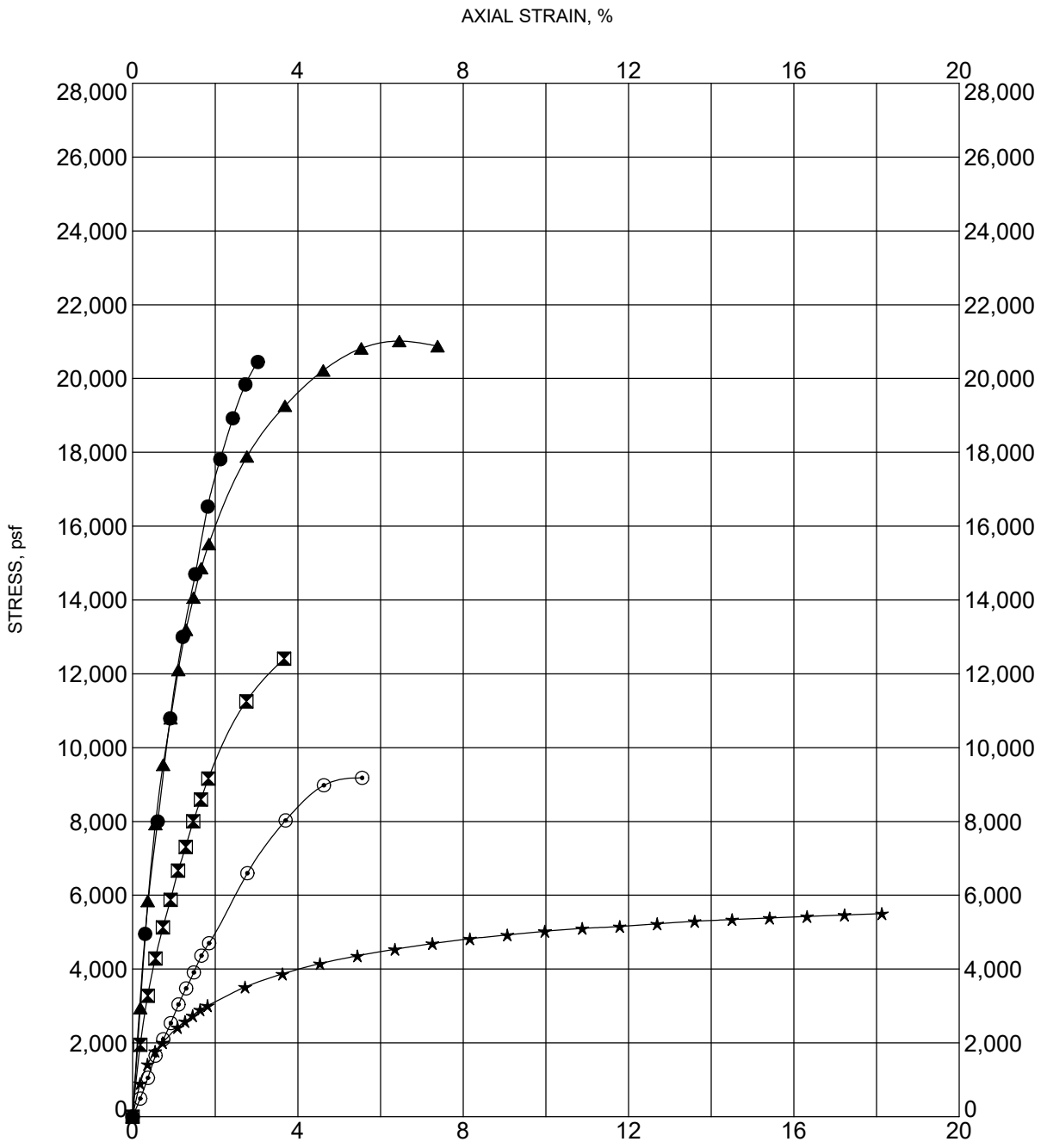

FIGURE B-127

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-1	5 ft	FILL: FAT CLAY (CH)				112.7	14.4
⊠ DP-2	8 ft	FAT CLAY (CH)				106.0	17.9
▲ DP-3	0 ft	FILL: FAT CLAY (CH)				108.5	18.6
★ DP-4	10 ft	FAT CLAY (CH)	1.3	15.0		100.3	23.8
⊙ DP-6	4 ft	FILL: LEAN CLAY (CL)				109.5	12.8

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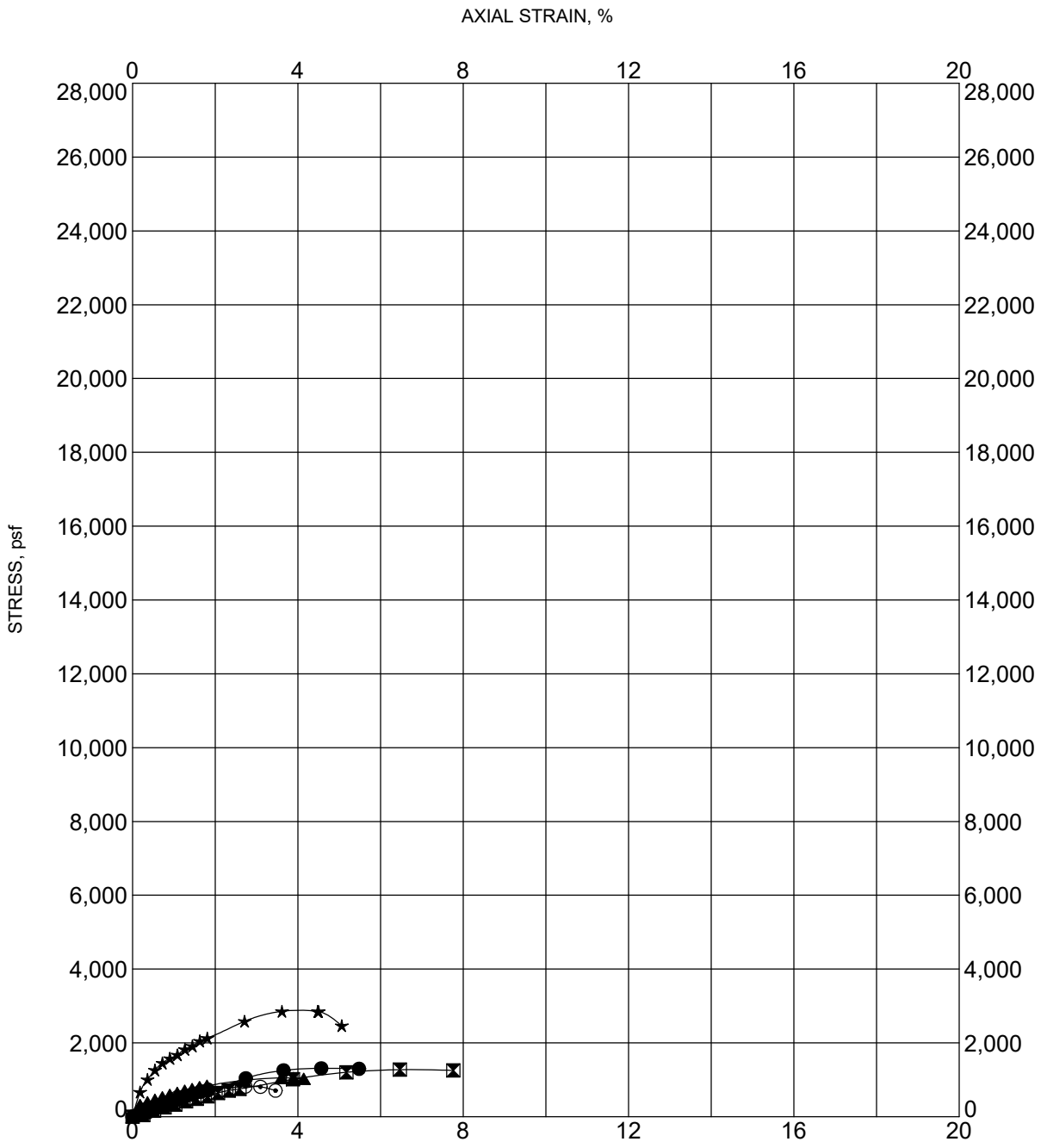

FIGURE B-128

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-7	6 ft	CLAY LEAN (CL)				91.1	28.8
⧗ DP-8	10 ft	FAT CLAY (CH)				86.7	30.2
▲ DP-9	10 ft	SILTY SAND (SM)	0.3	3.6		92.9	29.8
★ DP-11	20 ft	FAT CLAY (CH)	0.7	3.6		96.8	26.5
⊙ DP-12	4 ft	CLAY LEAN (CL)	0.2	2.7		99.0	17.7

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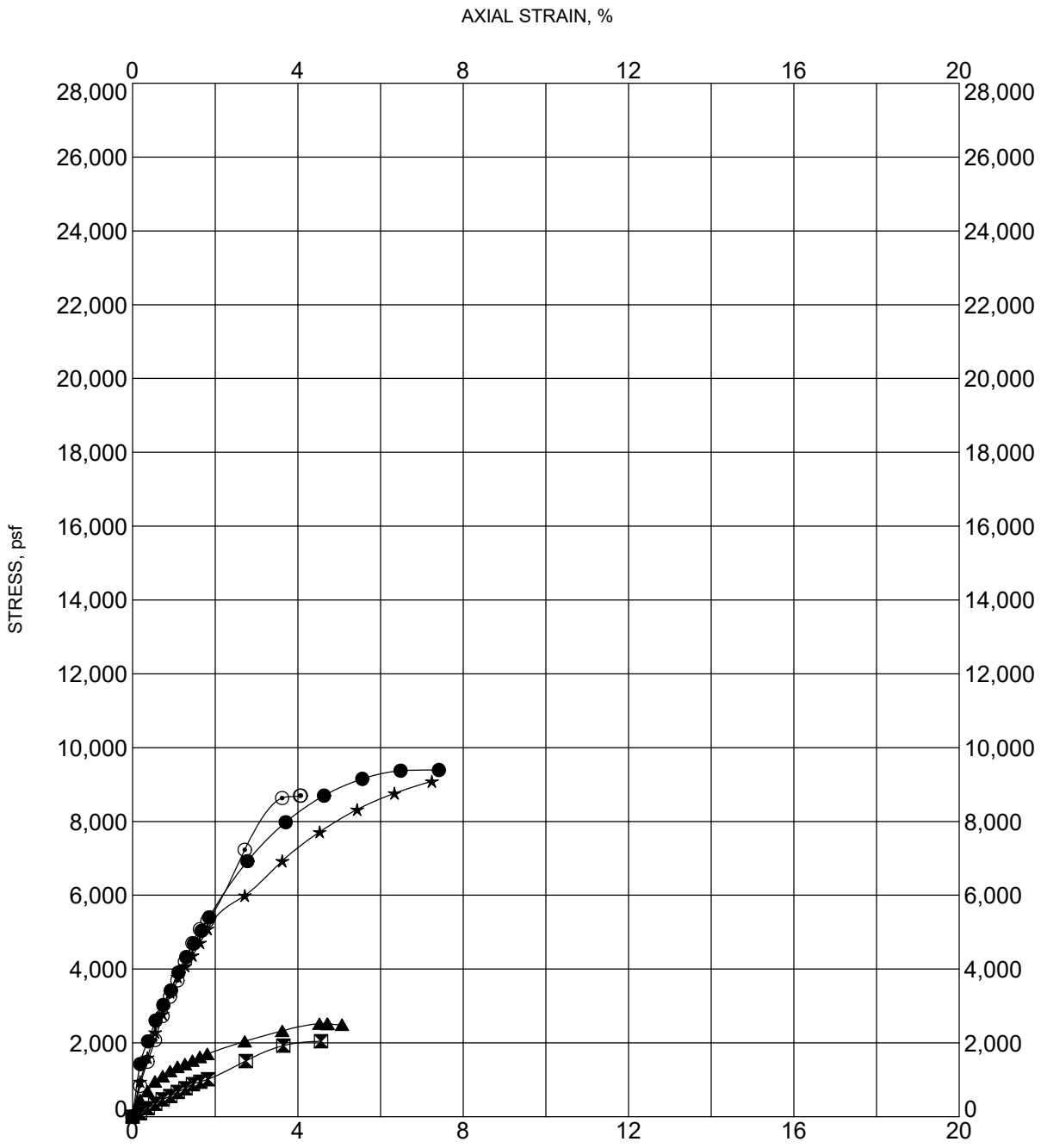

FIGURE B-129

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-13	0 ft	FILL: LEAN CLAY (CL)				106.2	18.3
⧗ DP-14	6 ft	CLAY LEAN (CL)				94.8	23.8
▲ DP-16	10 ft	SILTY SAND (SM)	0.6	4.5		102.8	16.4
★ DP-17	15 ft	FAT CLAY (CH)	2.3	7.2		99.3	23.2
⊙ DP-18	0 ft	FILL: LEAN CLAY (CL)	2.2	4.1		110.5	14.6

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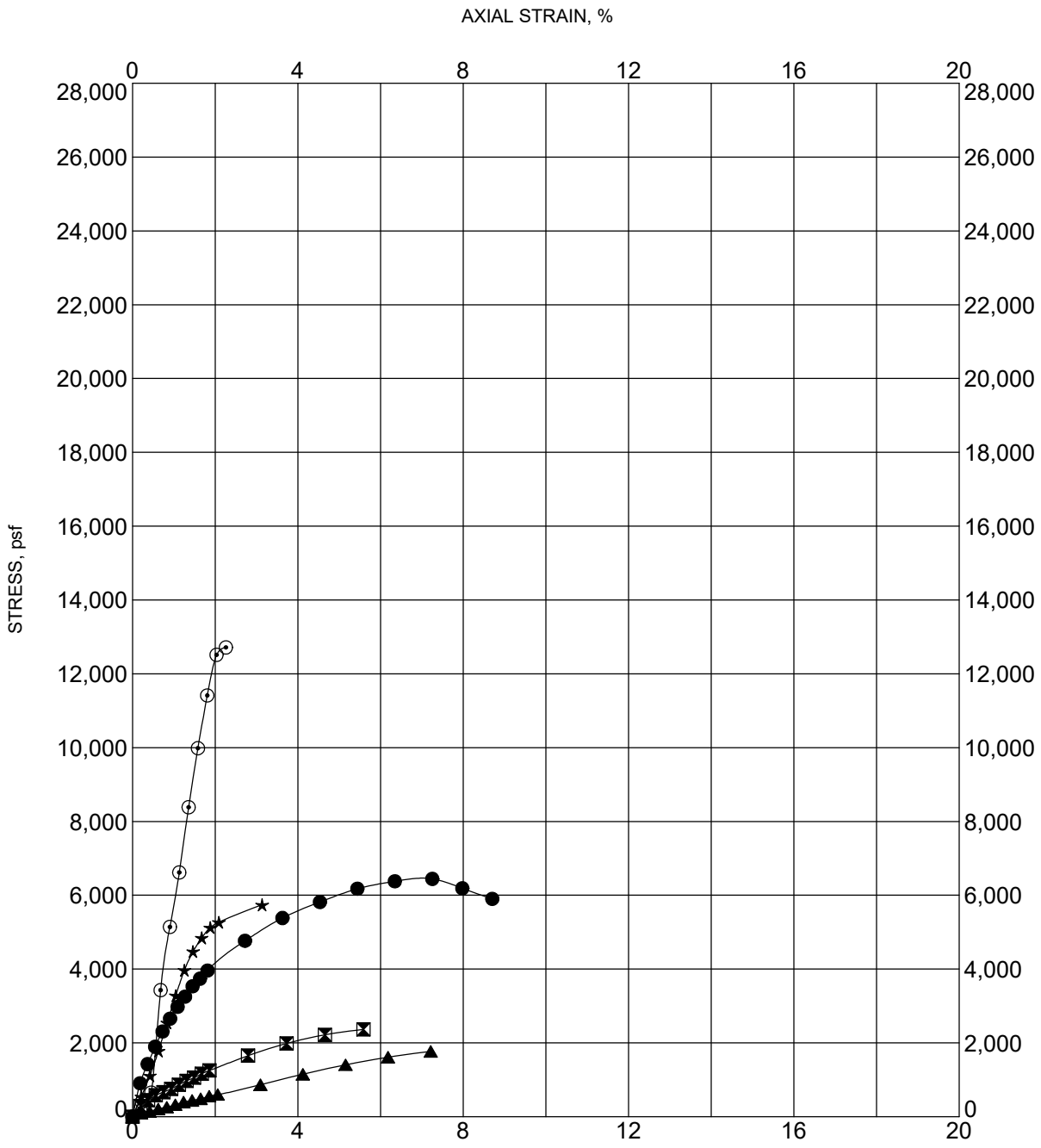

FIGURE B-130

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-19	8 ft	FAT CLAY (CH)	1.6	7.3		96.6	25.1
⧗ DP-21	10 ft	CLAY LEAN (CL)				91.3	26.6
▲ DP-24	10 ft	FAT CLAY (CH)				98.4	21.1
★ DP-25	6 ft	FILL: LEAN CLAY (CL)				102.8	17.9
⊙ DP-27	0 ft	FILL: LEAN CLAY (CL)				105.9	8.9

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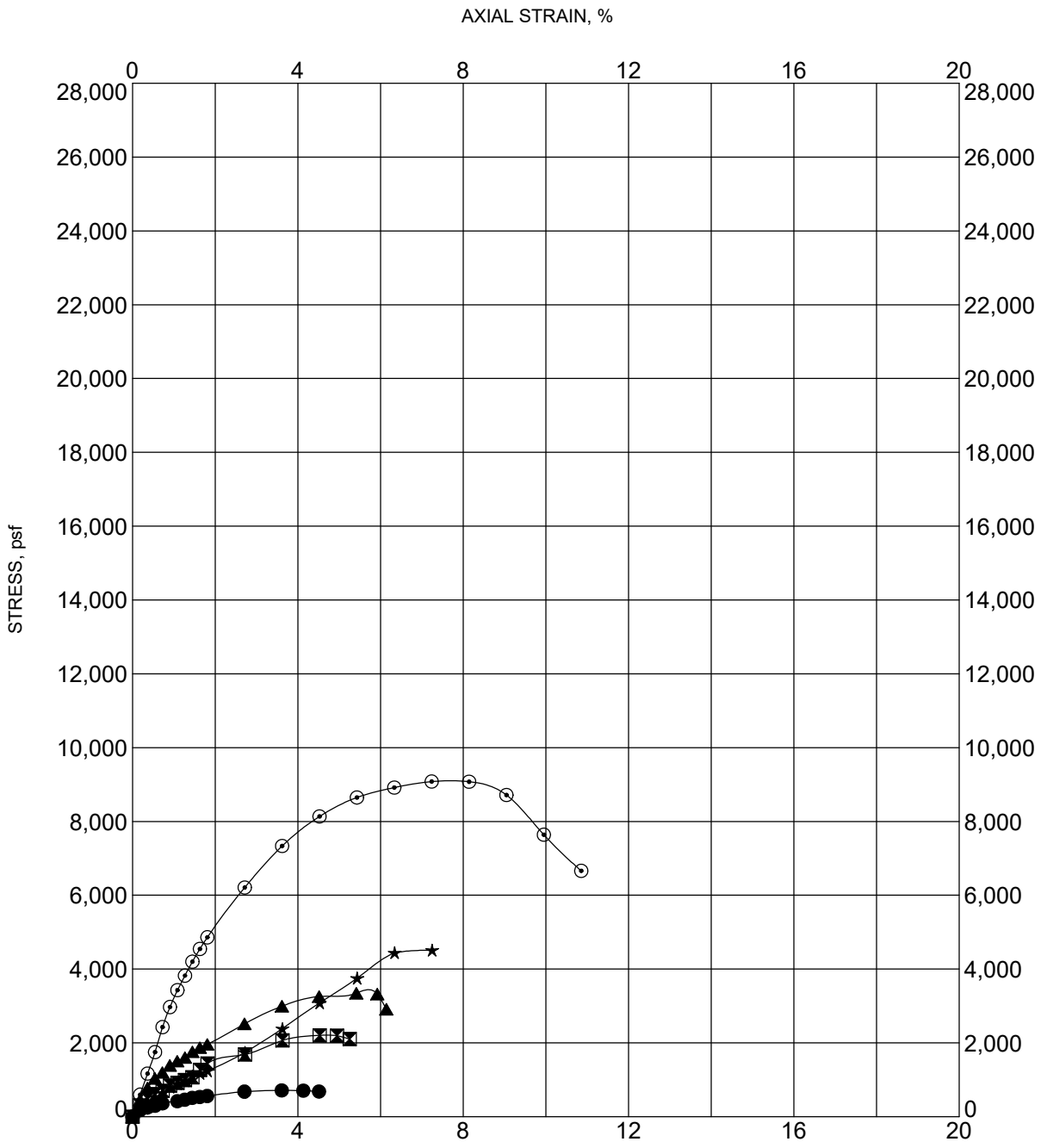

FIGURE B-131

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-28	25 ft	FAT CLAY (CH)	0.2	3.6		96.1	30.5
⧗ DP-31	15 ft	FAT CLAY (CH)	0.6	4.5		103.6	22.5
▲ DP-31	20 ft	FAT CLAY (CH)	0.8	5.4		104.6	24.7
★ DP-33	8 ft	FILL: FAT CLAY (CH)	1.1	7.2		95.8	22.1
⊙ DP-34	6 ft	FILL: FAT CLAY (CH)	2.3	7.2		104.6	20.9

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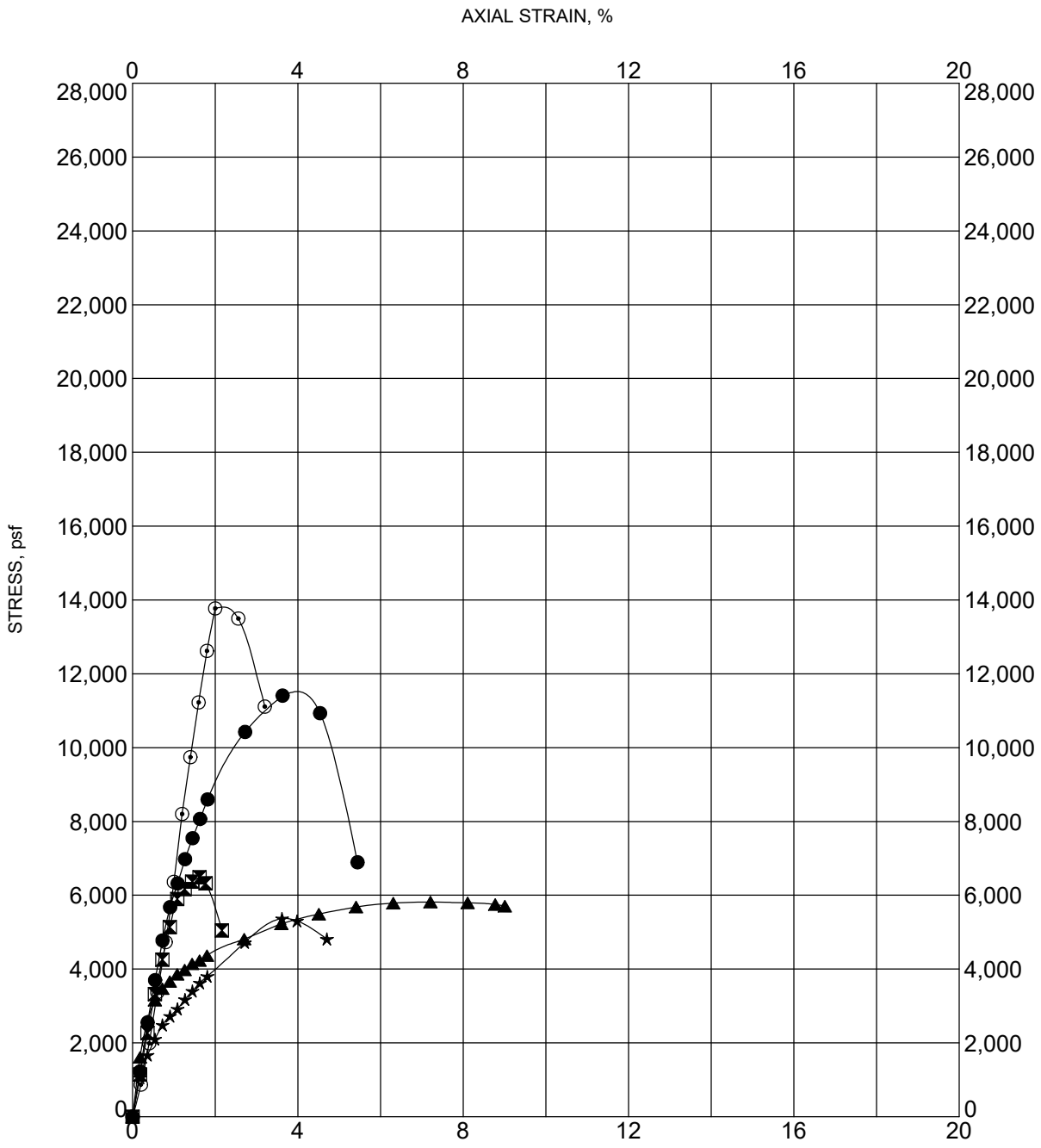

FIGURE B-132

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-35	10 ft	CLAY LEAN (CL)	2.9	3.6		101.1	24.0
⧗ DP-36	2 ft	FILL: FAT CLAY (CH)	1.6	1.6		101.4	15.4
▲ DP-37	15 ft	FAT CLAY (CH)	1.5	7.2		97.7	24.6
★ DP-39	15 ft	CLAY LEAN (CL)	1.3	3.6		102.2	24.1
⊙ DP-40	2 ft	FILL: LEAN CLAY (CL)	3.4	2.0		104.3	14.1

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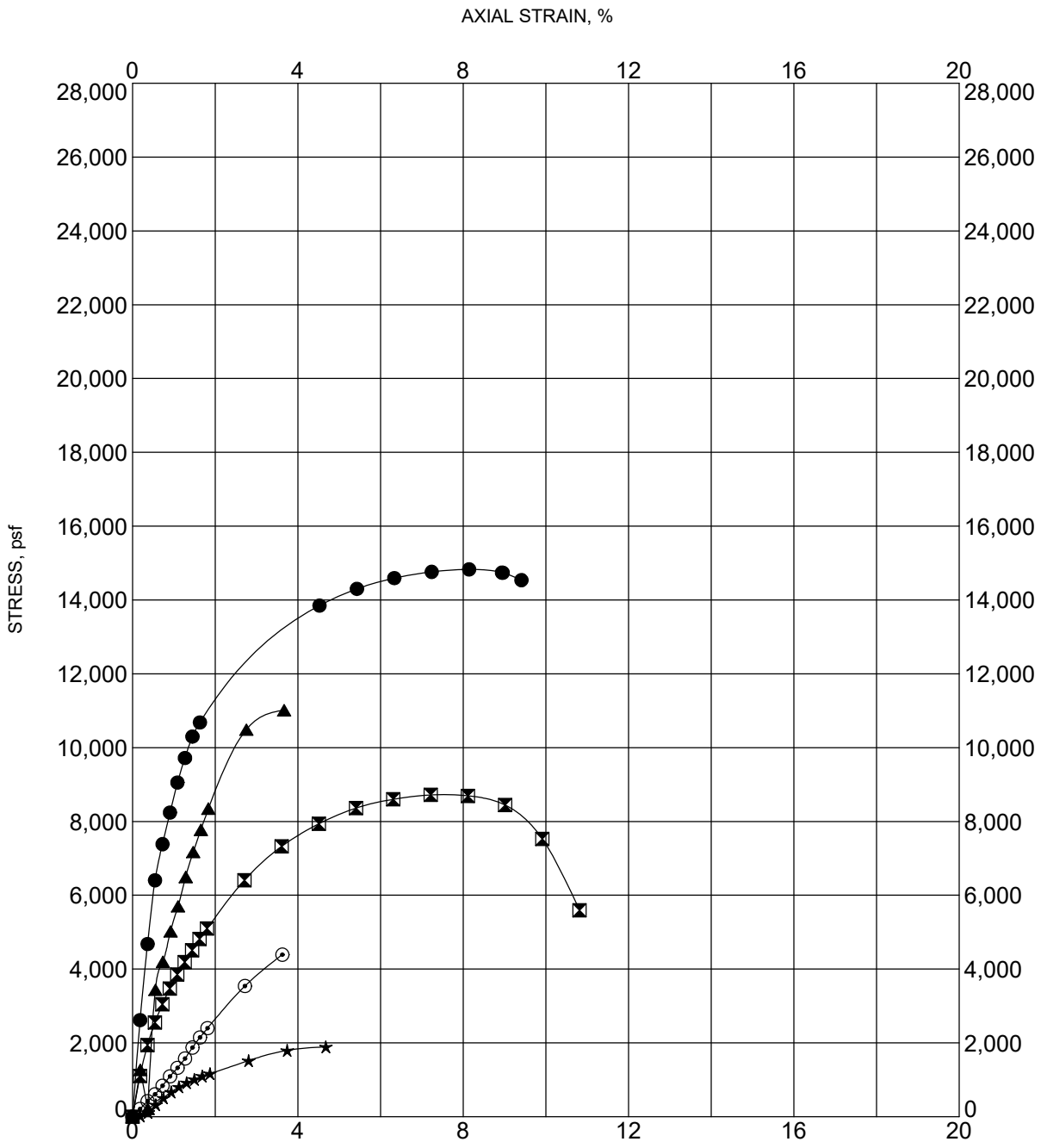

FIGURE B-133

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-41	4 ft	FILL: FAT CLAY (CH)	3.7	8.1		104.9	21.0
⊠ DP-42	6 ft	FILL: LEAN CLAY (CL)	2.2	7.2		104.9	22.0
▲ DP-43	0 ft	FILL: FAT CLAY (CH)				105.1	23.1
★ DP-45	4 ft	FILL: LEAN CLAY (CL)				96.7	16.8
⊙ DP-46	6 ft	FAT CLAY (CH)				96.6	22.1

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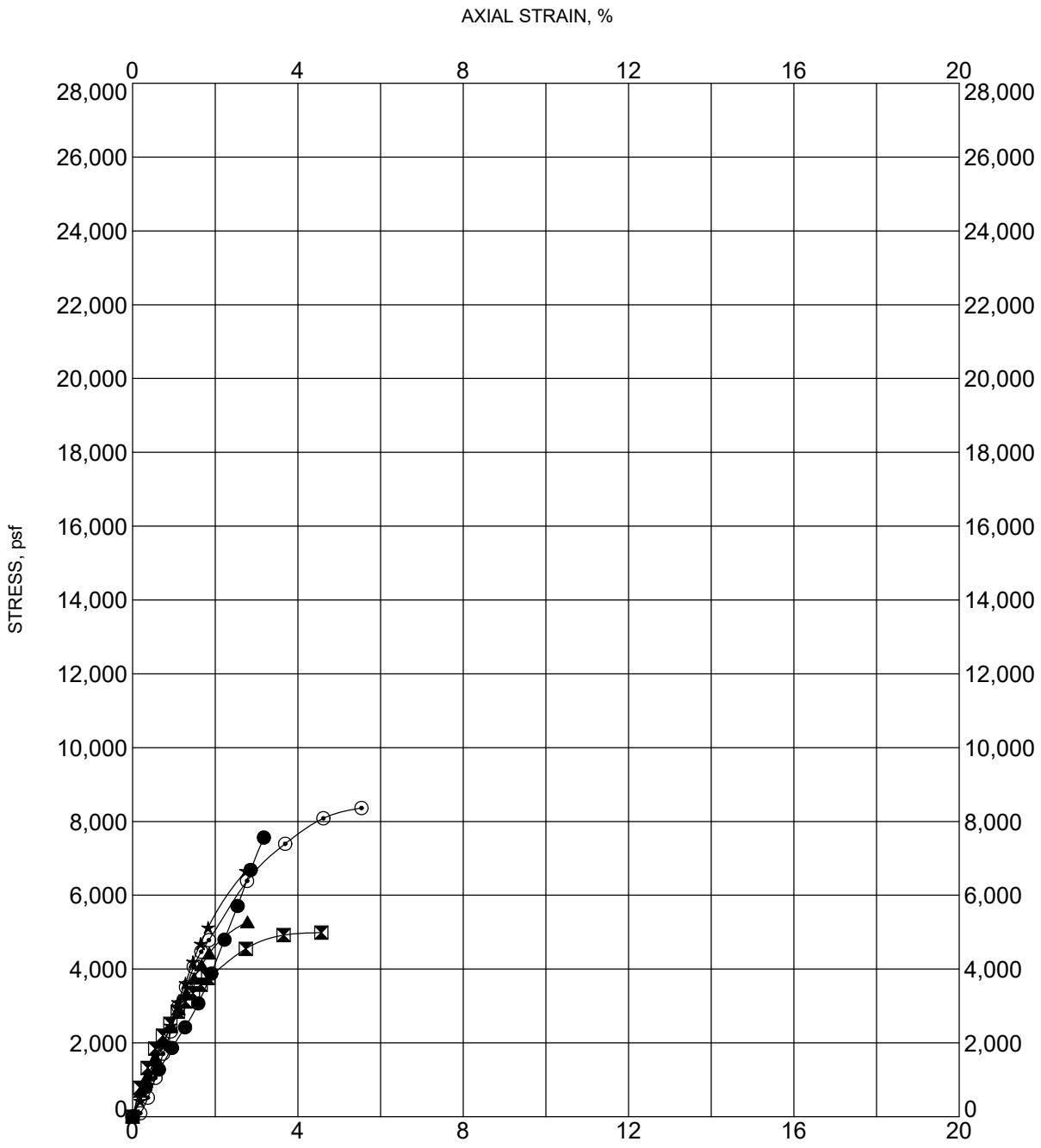

FIGURE B-134

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-47	2 ft	FILL: LEAN CLAY (CL)				108.9	11.7
⧗ DP-48	8 ft	FILL: LEAN CLAY (CL)				94.6	27.2
▲ DP-49	2 ft	FILL: FAT CLAY (CH)				106.8	12.7
★ DP-50	4 ft	FILL: LEAN CLAY (CL)			14	100.4	14.6
⊙ DP-51	6 ft	FILL: FAT CLAY (CH)			32	100.6	20.6

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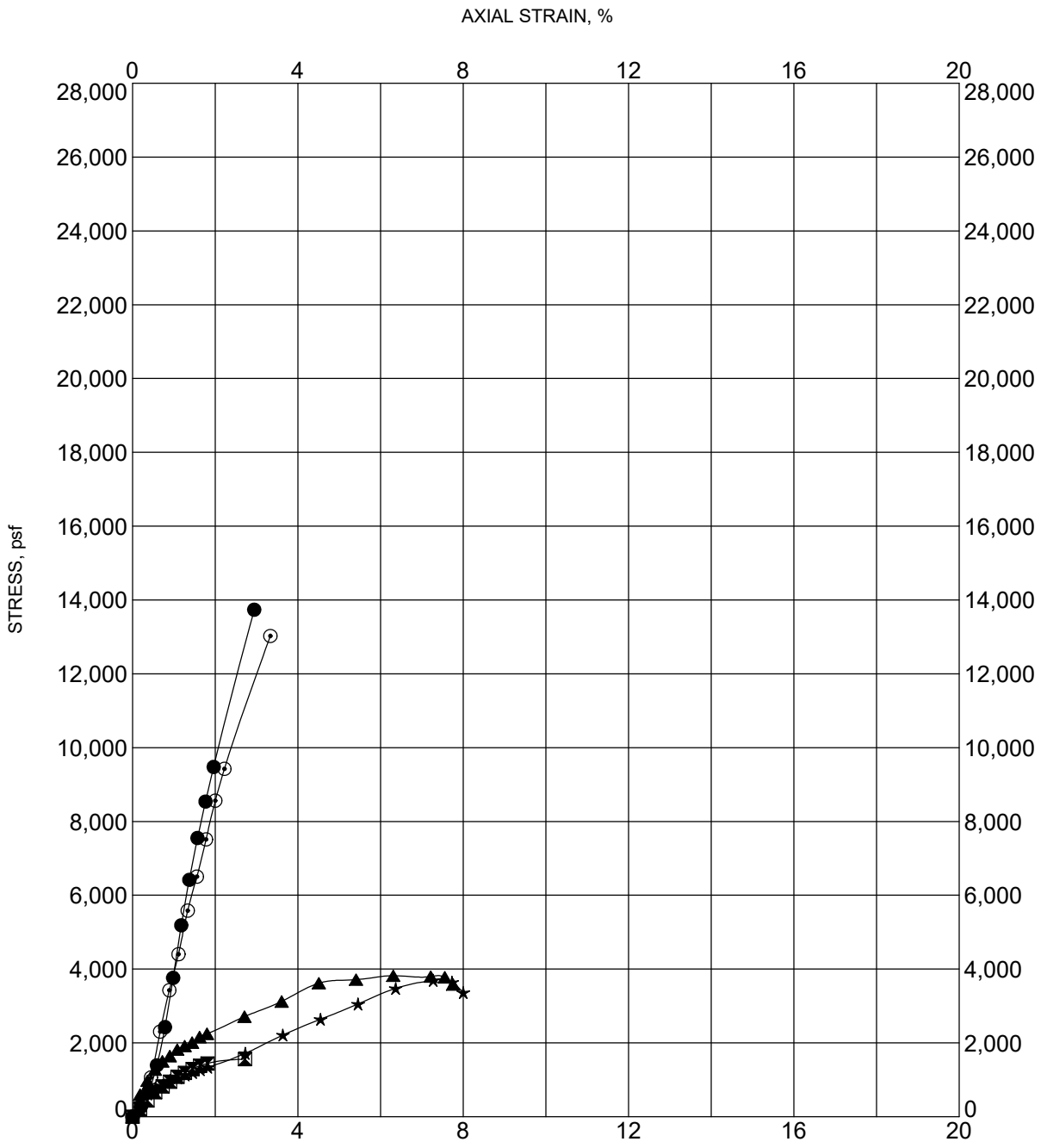

FIGURE B-135

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-52	6 ft	FILL: LEAN CLAY (CL)				102.2	18.6
⧗ DP-54	25 ft	FAT CLAY (CH)				90.3	29.4
▲ DP-56	10 ft	SAND w/ SILT (SP-SM)	1.0	6.3		106.4	18.7
★ DP-57	15 ft	FAT CLAY (CH)	0.9	7.3		93.7	26.5
⊙ DP-59	4 ft	CLAY LEAN (CL)				110.7	15.8

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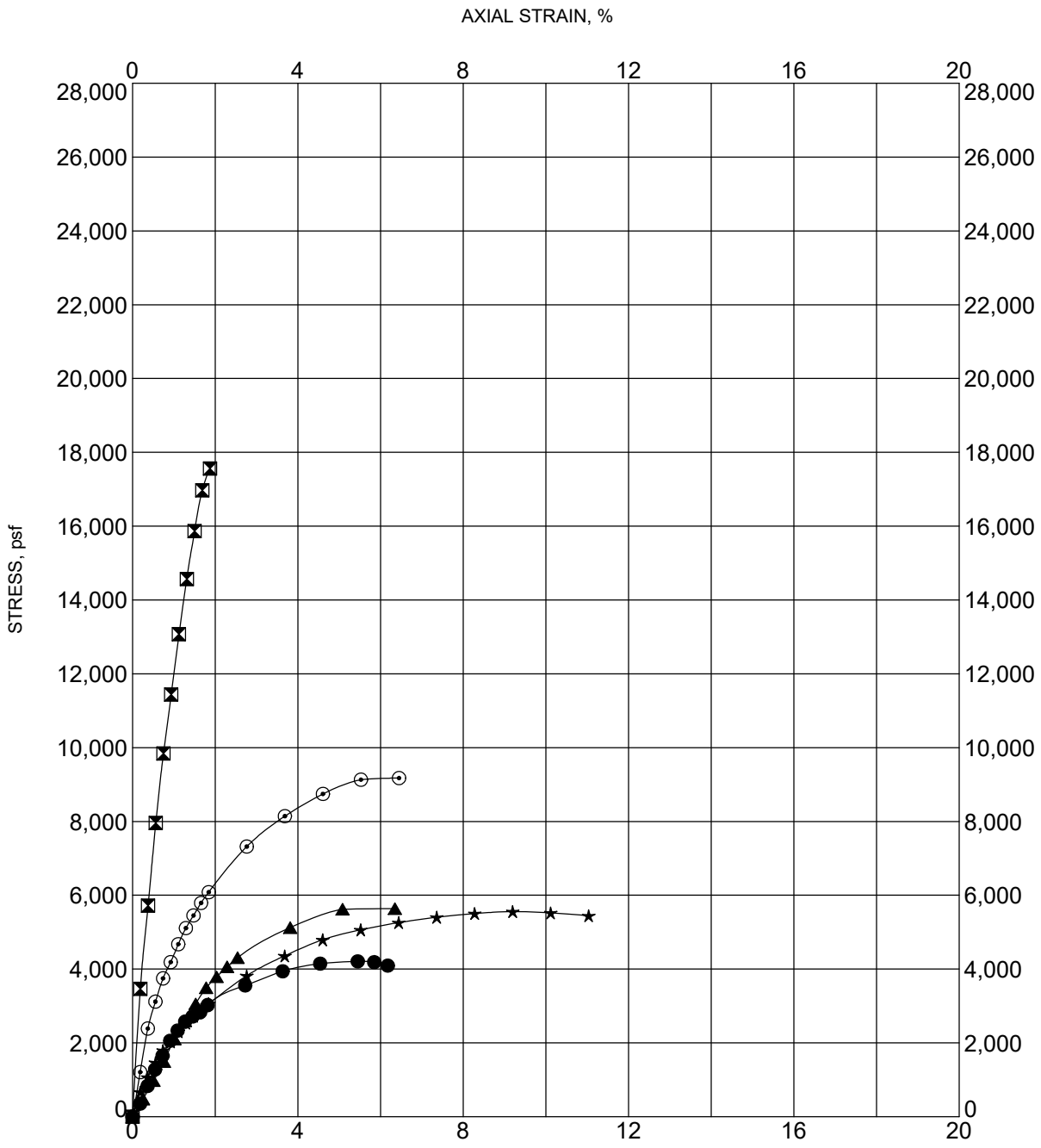

FIGURE B-136

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-62	10 ft	CLAYEY SAND (SC)	1.1	5.4		93.4	28.3
⊠ DP-63	0 ft	FILL: LEAN CLAY (CL)				118.5	7.5
▲ DP-64	10 ft	SAND w/ SILT (SP-SM)				98.0	21.8
★ DP-65	6 ft	FAT CLAY (CH)			40	96.9	25.4
⊙ DP-66	6 ft	FAT CLAY (CH)				105.2	19.7

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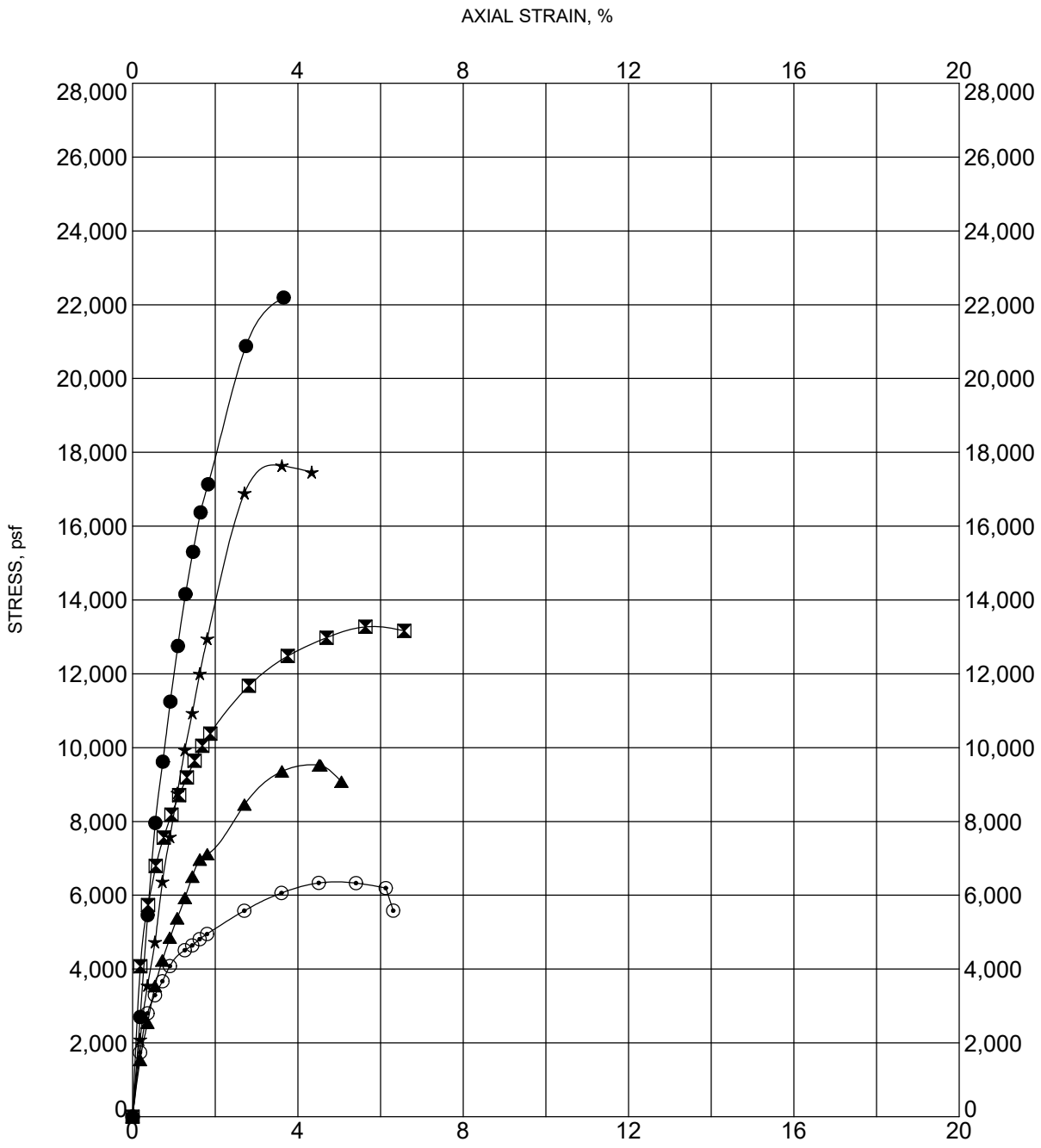

FIGURE B-137

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-67	8 ft	FAT CLAY (CH)				106.0	20.8
⊠ DP-68	2 ft	FILL: LEAN CLAY (CL)				100.0	23.6
▲ DP-69	2 ft	FILL: FAT CLAY (CH)	2.4	4.5		107.5	19.4
★ DP-70	0 ft	FILL: FAT CLAY (CH)	4.4	3.6		110.3	14.4
⊙ DP-71	4 ft	FILL: LEAN CLAY (CL)	1.6	4.5	21	110.4	15.7

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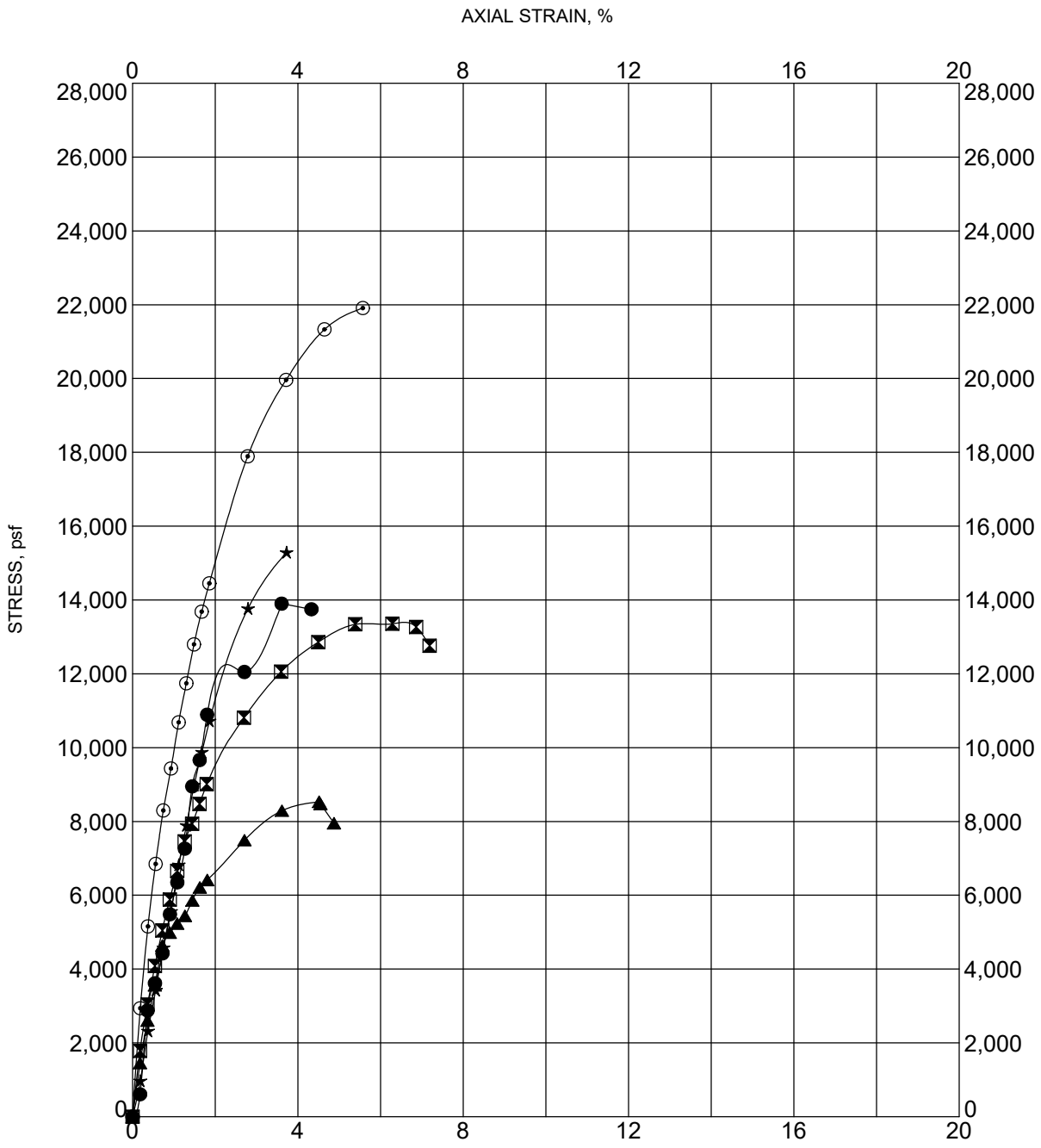

FIGURE B-138

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-73	2 ft	FILL: LEAN CLAY (CL)	3.5	3.6		113.5	13.5
⊠ DP-75	2 ft	FILL: FAT CLAY (CH)	3.3	6.3		105.2	20.4
▲ DP-76	8 ft	FAT CLAY (CH)	2.1	4.5		98.3	25.1
★ DP-77	4 ft	FILL: FAT CLAY (CH)				113.8	9.9
⊙ DP-78	2 ft	FILL: FAT CLAY (CH)				108.3	18.9

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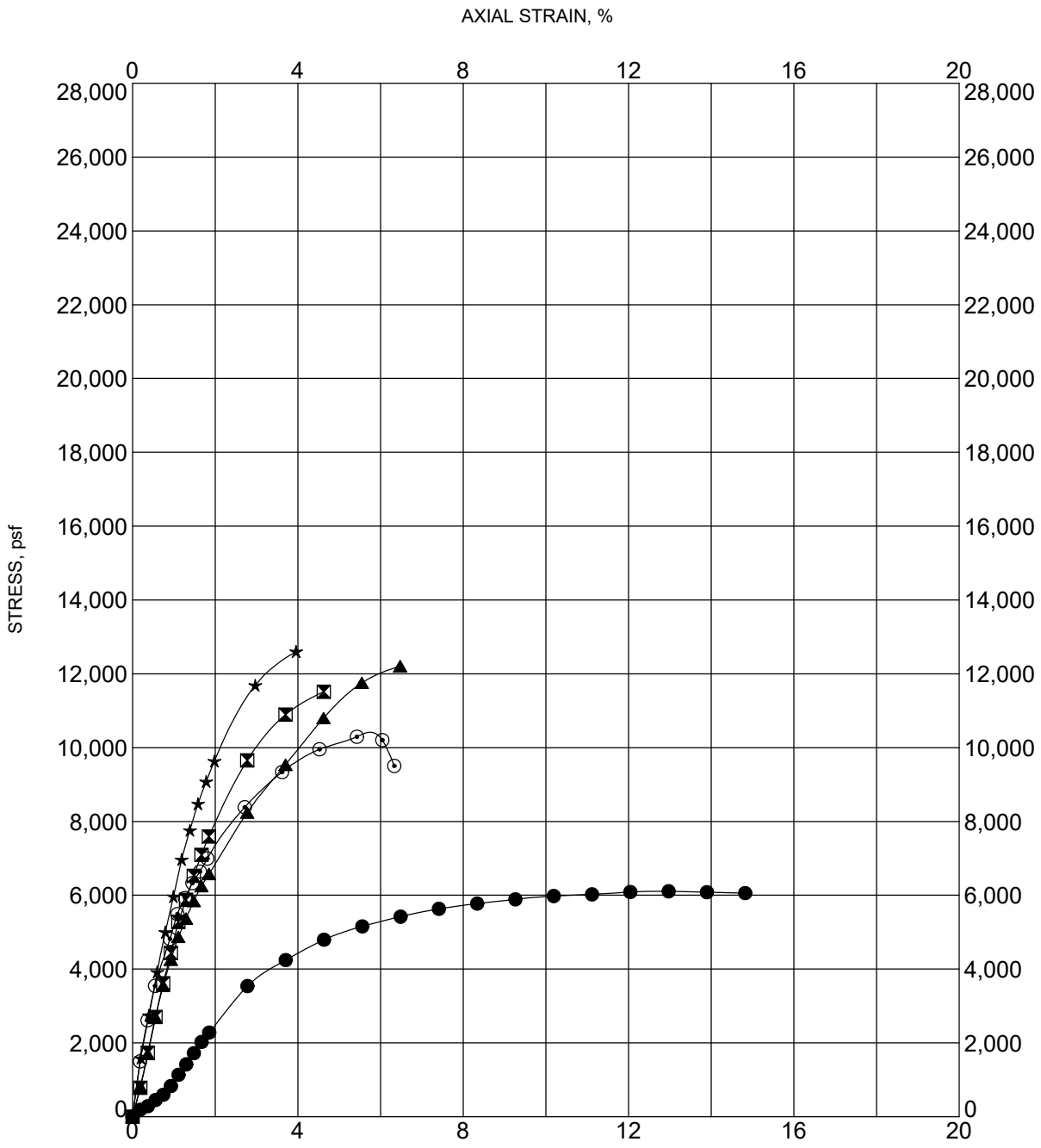

FIGURE B-139

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-79	4 ft	FILL: LEAN CLAY (CL)				91.7	29.4
⊠ DP-80	2 ft	FILL: LEAN CLAY (CL)				108.4	18.8
▲ DP-81	4 ft	FILL: FAT CLAY (CH)			30	110.9	15.5
★ DP-82	4 ft	FILL: FAT CLAY (CH)				107.1	13.5
⊙ DP-83	6 ft	FILL: FAT CLAY (CH)	2.6	5.4		106.1	18.3

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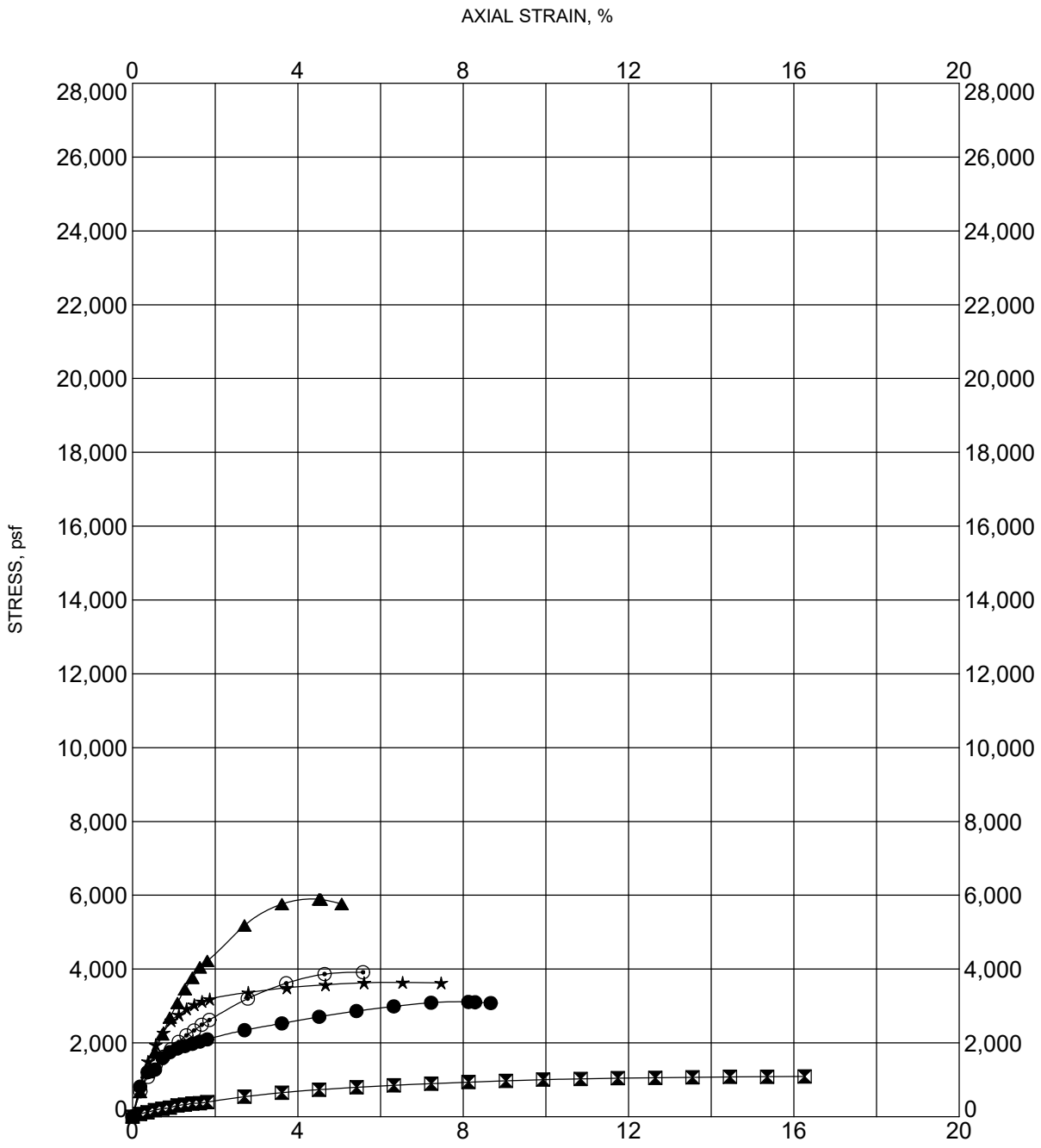

FIGURE B-140

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-84	20 ft	FAT CLAY (CH)	0.8	8.1		100.1	26.1
⧗ DP-85	15 ft	FAT CLAY (CH)	0.3	15.0		96.4	27.5
▲ DP-86	4 ft	FILL: FAT CLAY (CH)	1.5	4.5		106.5	22.7
★ DP-87	35 ft	FAT CLAY (CH)				95.5	27.8
⊙ DP-88	6 ft	FILL: FAT CLAY (CH)				95.9	26.0

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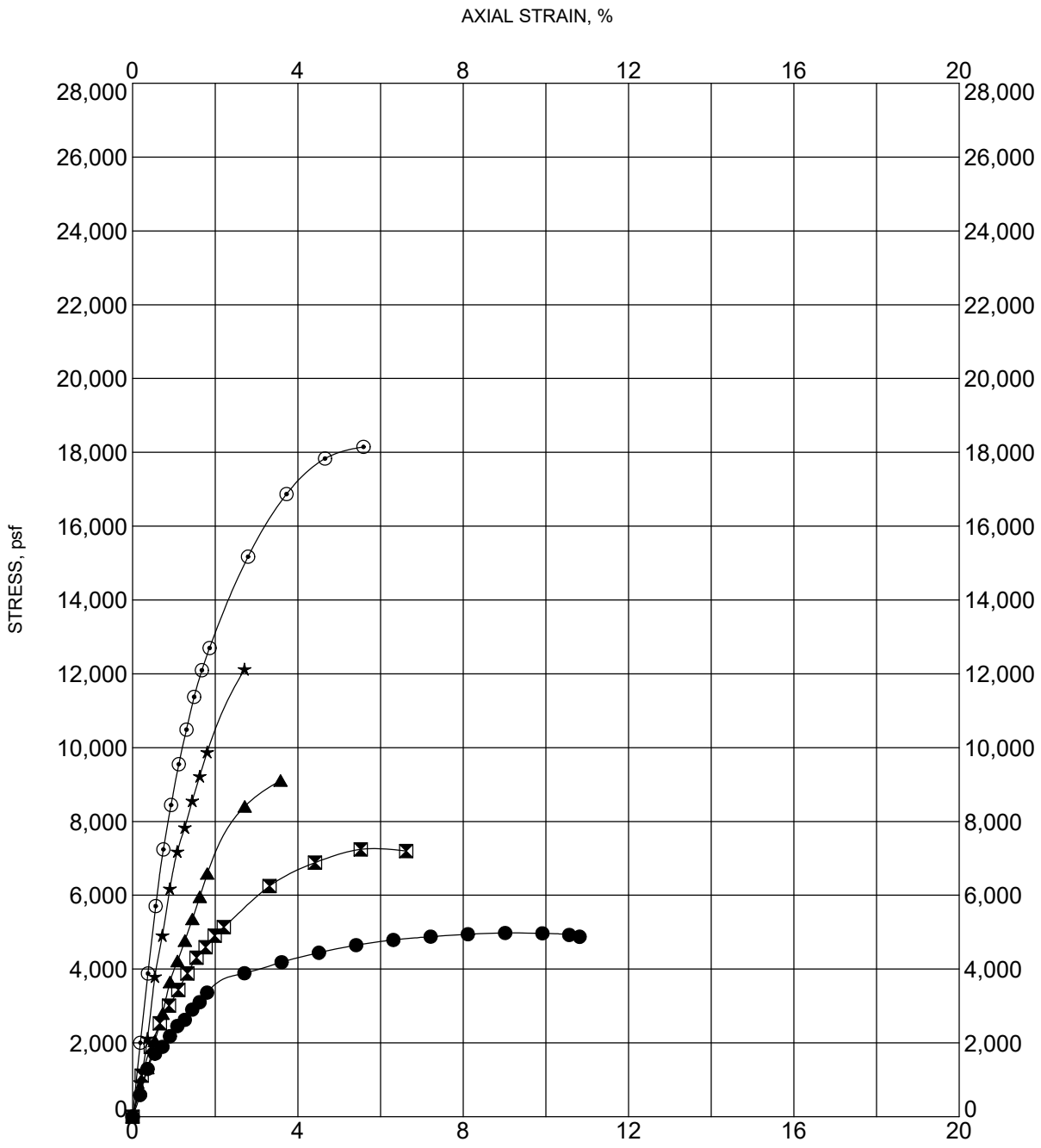

FIGURE B-141

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-89	20 ft	FAT CLAY (CH)	1.2	9.0		99.4	25.1
⊠ DP-90	6 ft	FILL: LEAN CLAY (CL)			26	102.9	18.9
▲ DP-91	8 ft	FILL: LEAN CLAY (CL)	2.3	3.6		101.0	17.5
★ DP-93	4 ft	FILL: FAT CLAY (CH)	3.0	2.7	38	106.6	15.8
⊙ DP-94	0 ft	FILL: LEAN CLAY (CL)				107.3	15.2

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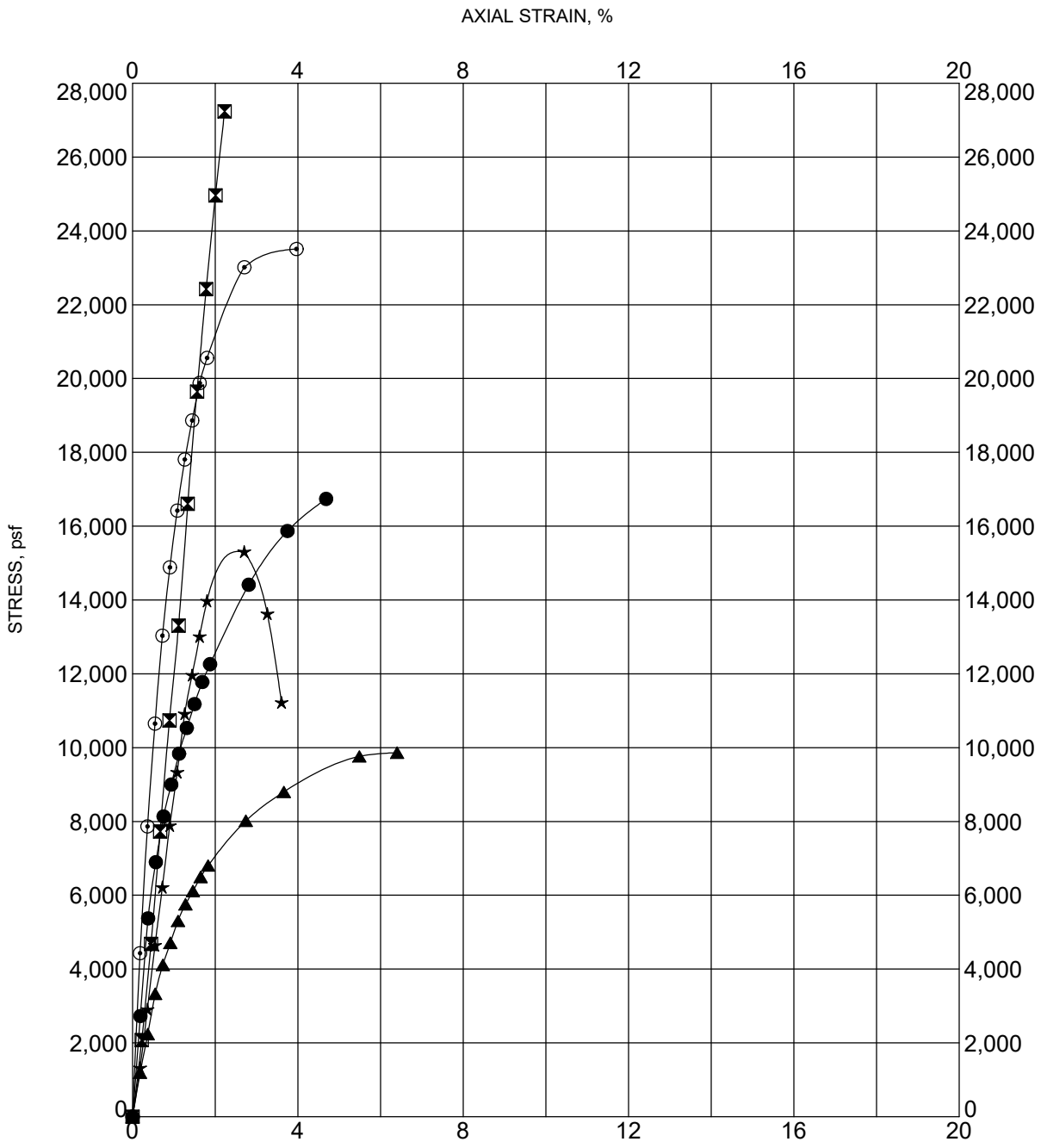

FIGURE B-142

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-95	6 ft		4.2	4.7		102.3	21.3
⊠ DP-96	0 ft	FILL: LEAN CLAY (CL)				110.9	12.3
▲ DP-97	4 ft	FILL: LEAN CLAY (CL)	2.5	6.4		100.2	23.0
★ DP-98	4 ft	FILL: LEAN CLAY (CL)	3.8	2.7		110.1	14.3
⊙ DP-99	4 ft	FILL: LEAN CLAY (CL)	5.9	4.0	30	117.3	13.8

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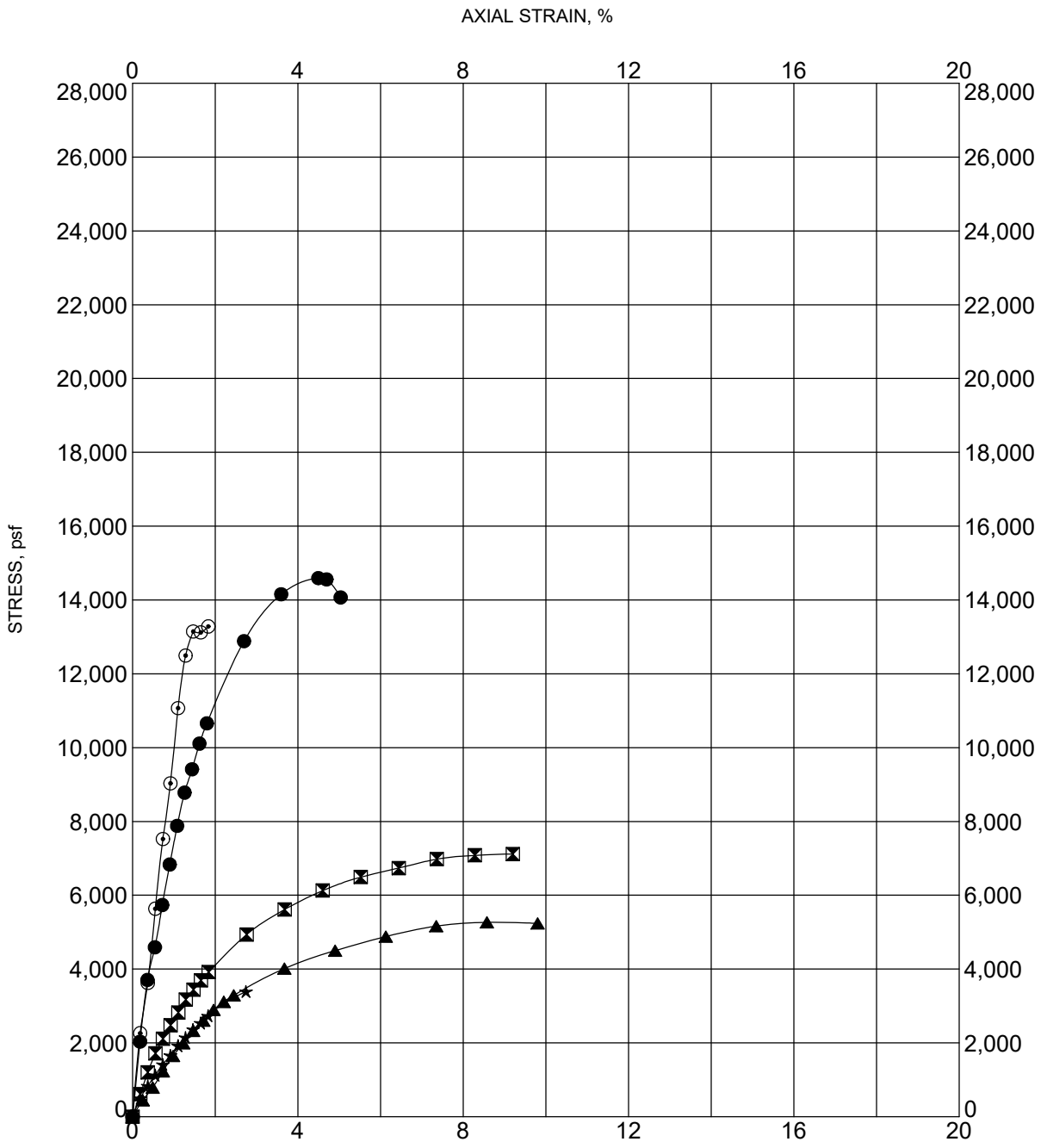

FIGURE B-143

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-101	6 ft	FILL: LEAN CLAY (CL)	3.6	4.5		110.3	13.6
⊠ DP-102	25 ft	FAT CLAY (CH)				97.3	25.0
▲ DP-103	10 ft	SAND w/ SILT (SP-SM)				103.1	19.7
★ DP-104	20 ft	FAT CLAY (CH)				91.7	28.4
⊙ DP-106	0 ft	FILL: LEAN CLAY (CL)				111.9	10.7

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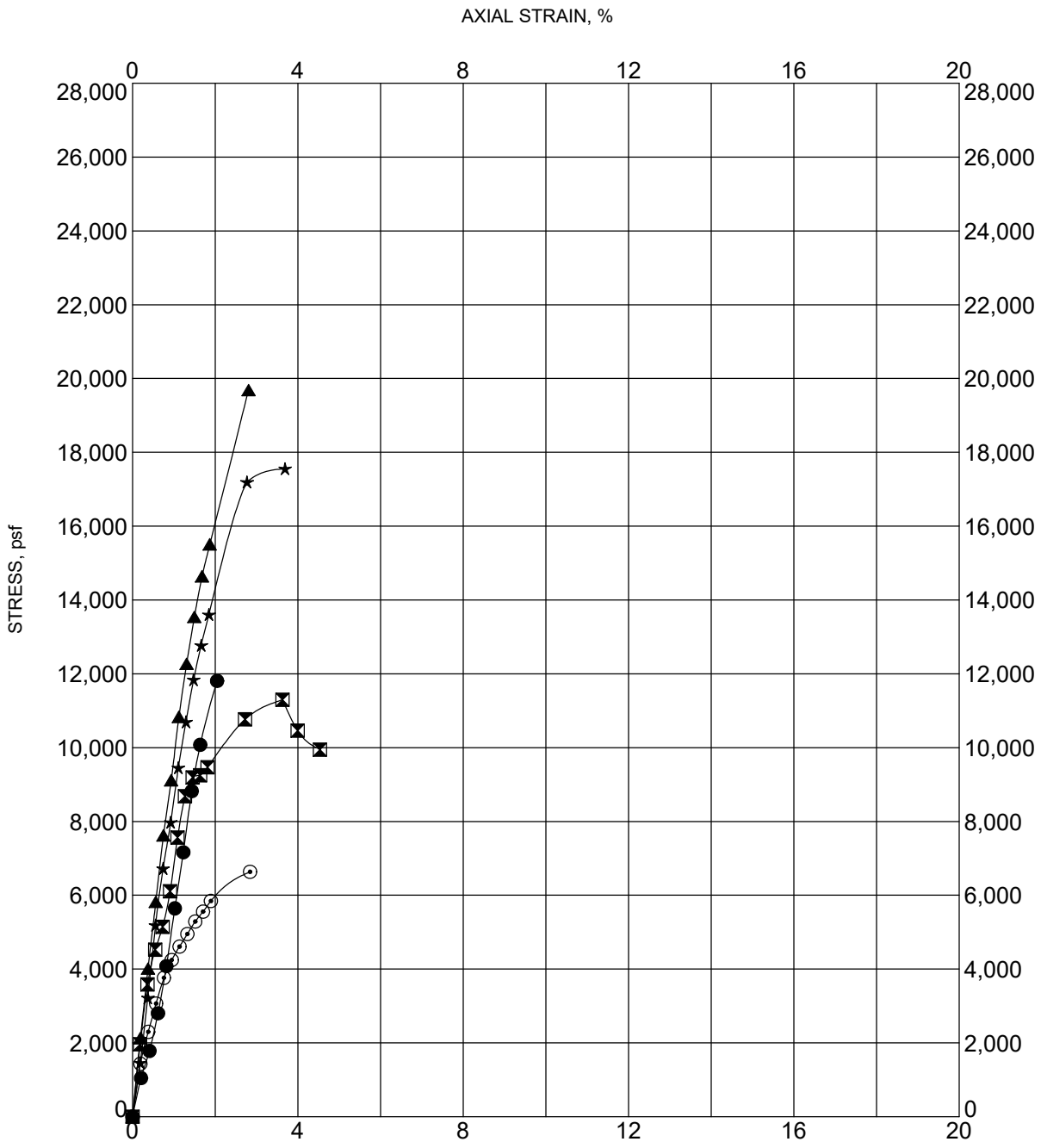

FIGURE B-144

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-108	0 ft	FILL: LEAN CLAY (CL)	3.0	2.0		109.2	10.5
⊠ DP-109	8 ft	FILL: LEAN CLAY (CL)	2.8	3.6		105.8	18.1
▲ DP-110	6 ft	FILL: LEAN CLAY (CL)				109.3	14.5
★ DP-111	0 ft	FILL: LEAN CLAY (CL)				110.2	11.1
⊙ DP-113	15 ft		1.7	2.8	46	99.8	20.8

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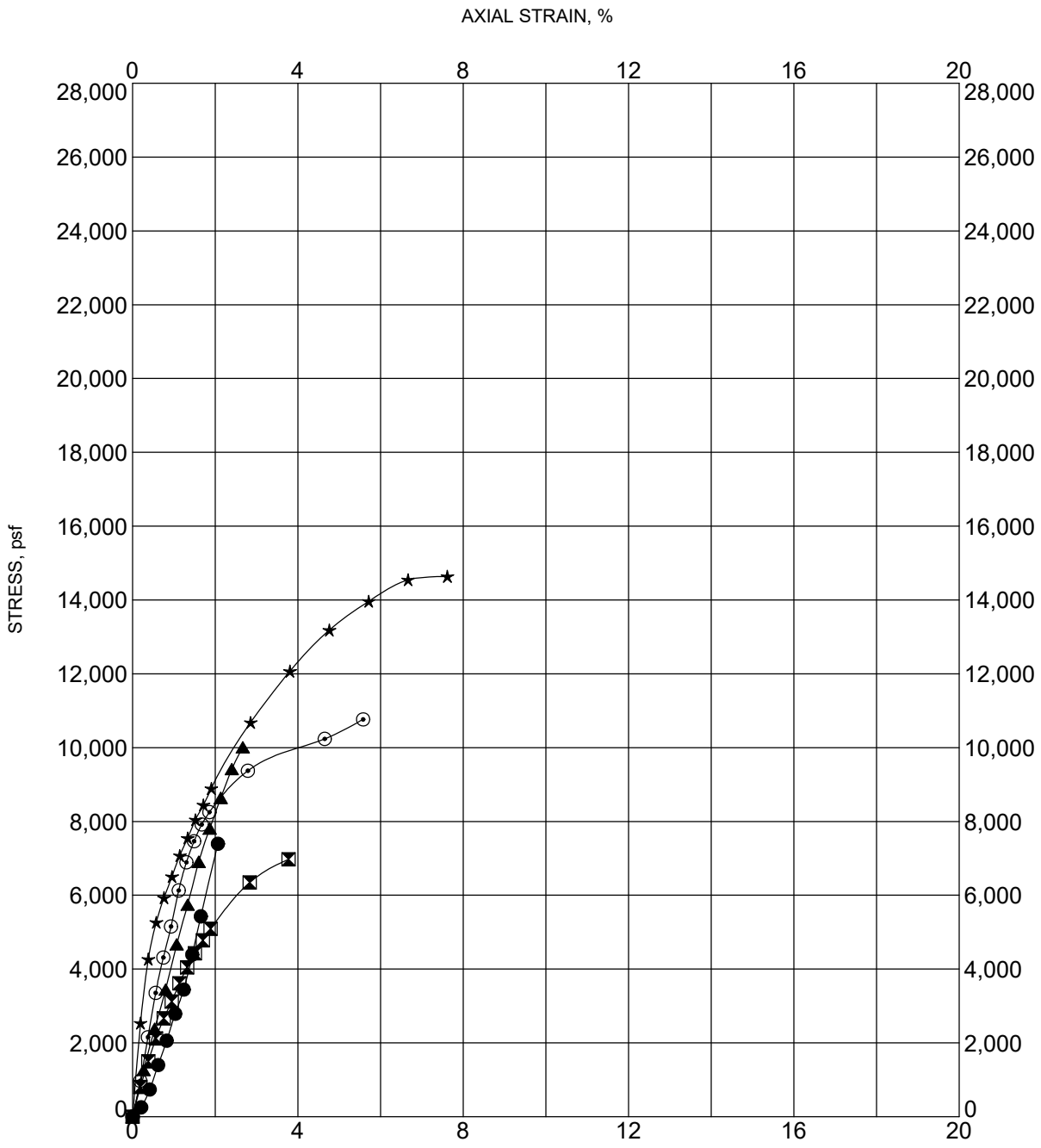

FIGURE B-145

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-115	6 ft	CLAY LEAN (CL)	1.8	2.1		114.0	7.8
⊠ DP-116	6 ft	FILL: LEAN CLAY (CL)				95.6	20.6
▲ DP-118	0 ft	FILL: LEAN CLAY (CL)			16	104.0	15.0
★ DP-121	0 ft	FILL: FAT CLAY (CH)			44	104.8	20.7
⊙ DP-122	4 ft	FILL: FAT CLAY (CH)	2.7	5.6		107.0	15.9

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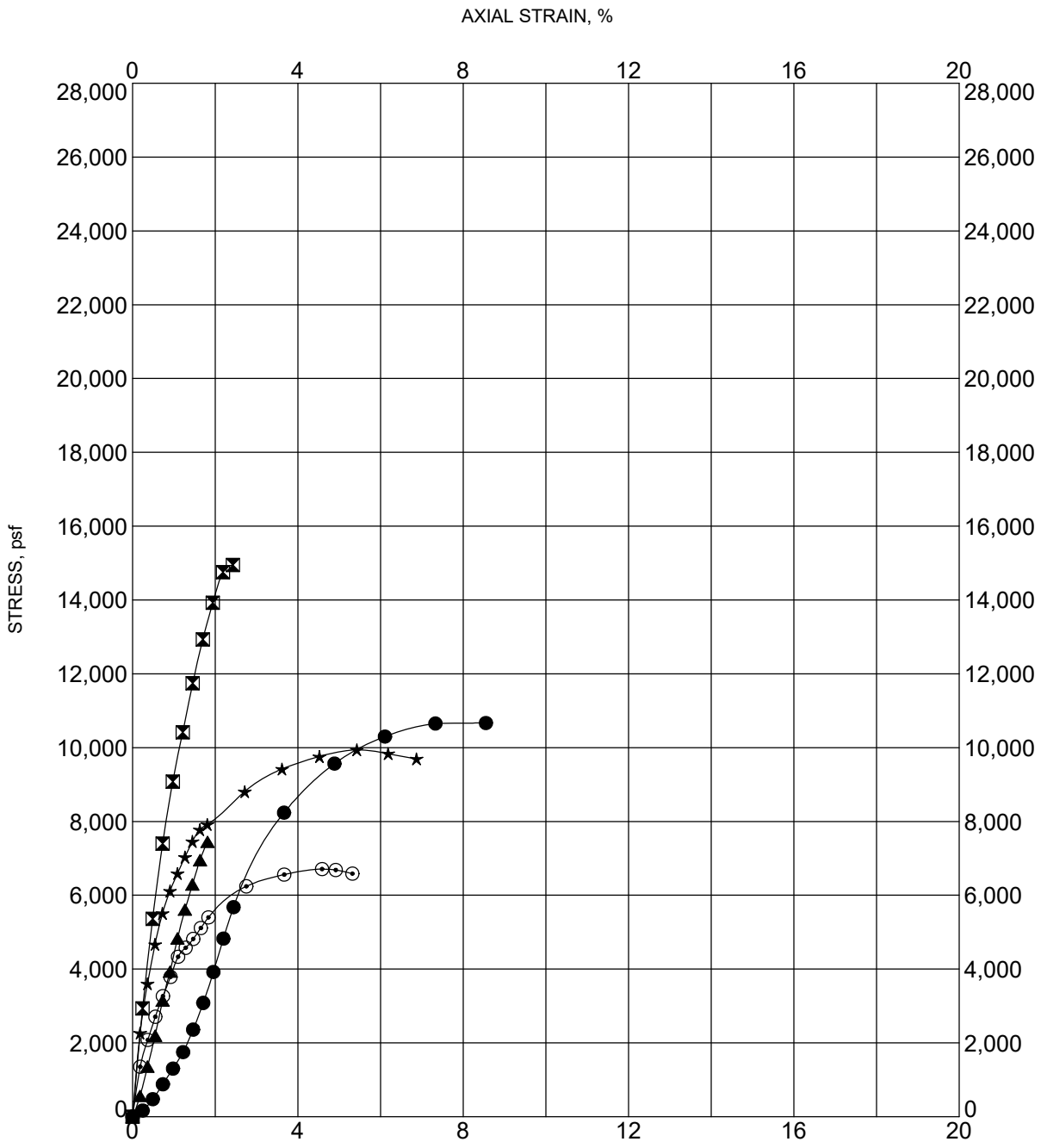

FIGURE B-146

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-124	0 ft	FILL: FAT CLAY (CH)				110.4	12.1
⊠ DP-126	8 ft	CLAY LEAN (CL)			24	97.9	21.7
▲ DP-127	4 ft	FILL: FAT CLAY (CH)				104.0	14.4
★ DP-128	2 ft	FILL: FAT CLAY (CH)	2.5	5.4		105.4	17.4
⊙ DP-129	6 ft	FILL: FAT CLAY (CH)	1.7	4.6	30	105.2	20.6

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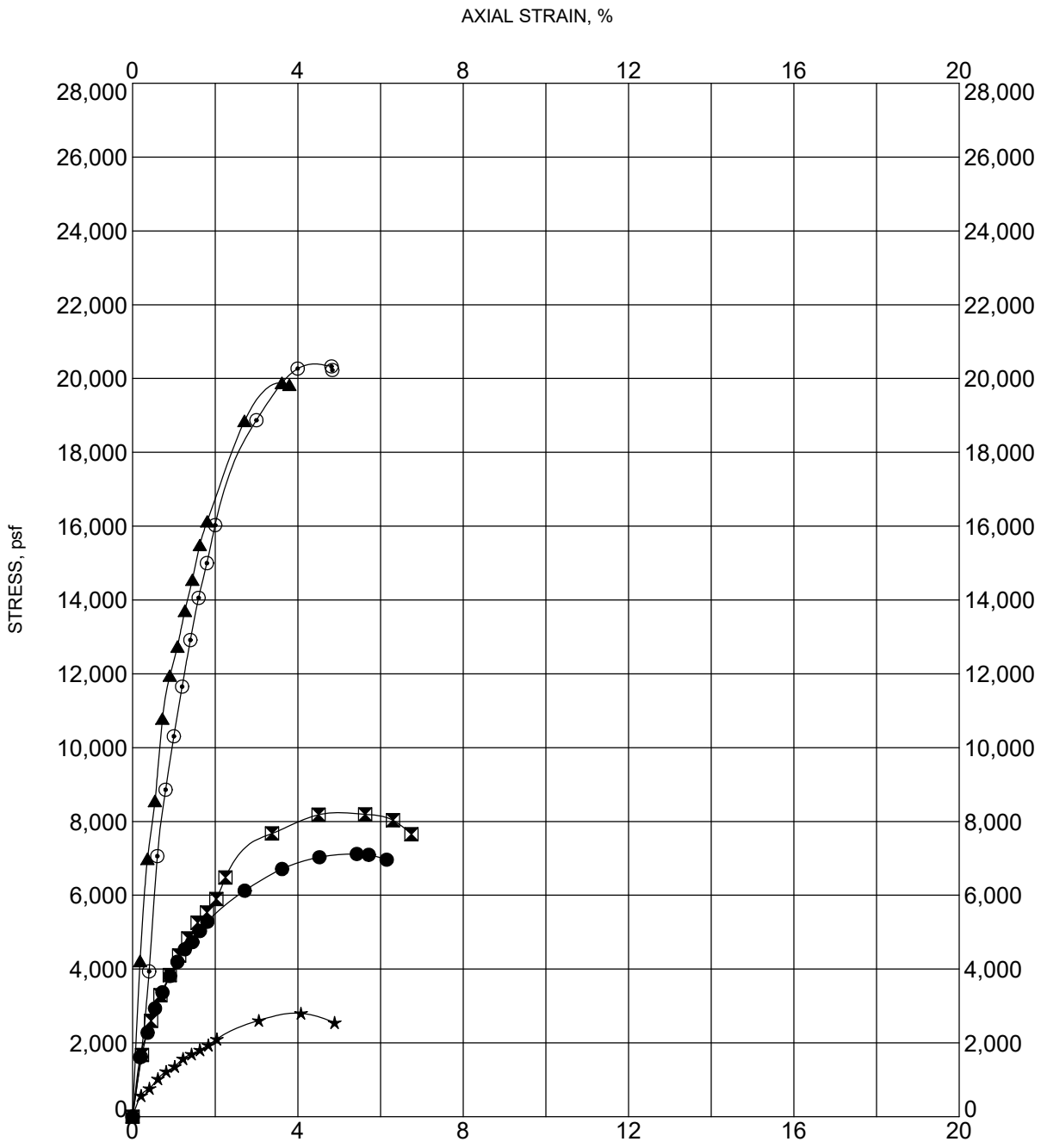

FIGURE B-147

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-130	6 ft	FILL: FAT CLAY (CH)	1.8	5.4		110.7	15.0
⊠ DP-132	8 ft	FILL: FAT CLAY (CH)	2.0	5.6		100.9	23.3
▲ DP-137	2 ft	FILL: LEAN CLAY (CL)	5.0	3.6		111.2	15.7
★ DP-138	10 ft	SILTY SAND (SM)	0.7	4.1	36	99.8	23.6
⊙ DP-141	6 ft	FILL: FAT CLAY (CH)	5.1	4.8	33	114.0	13.7

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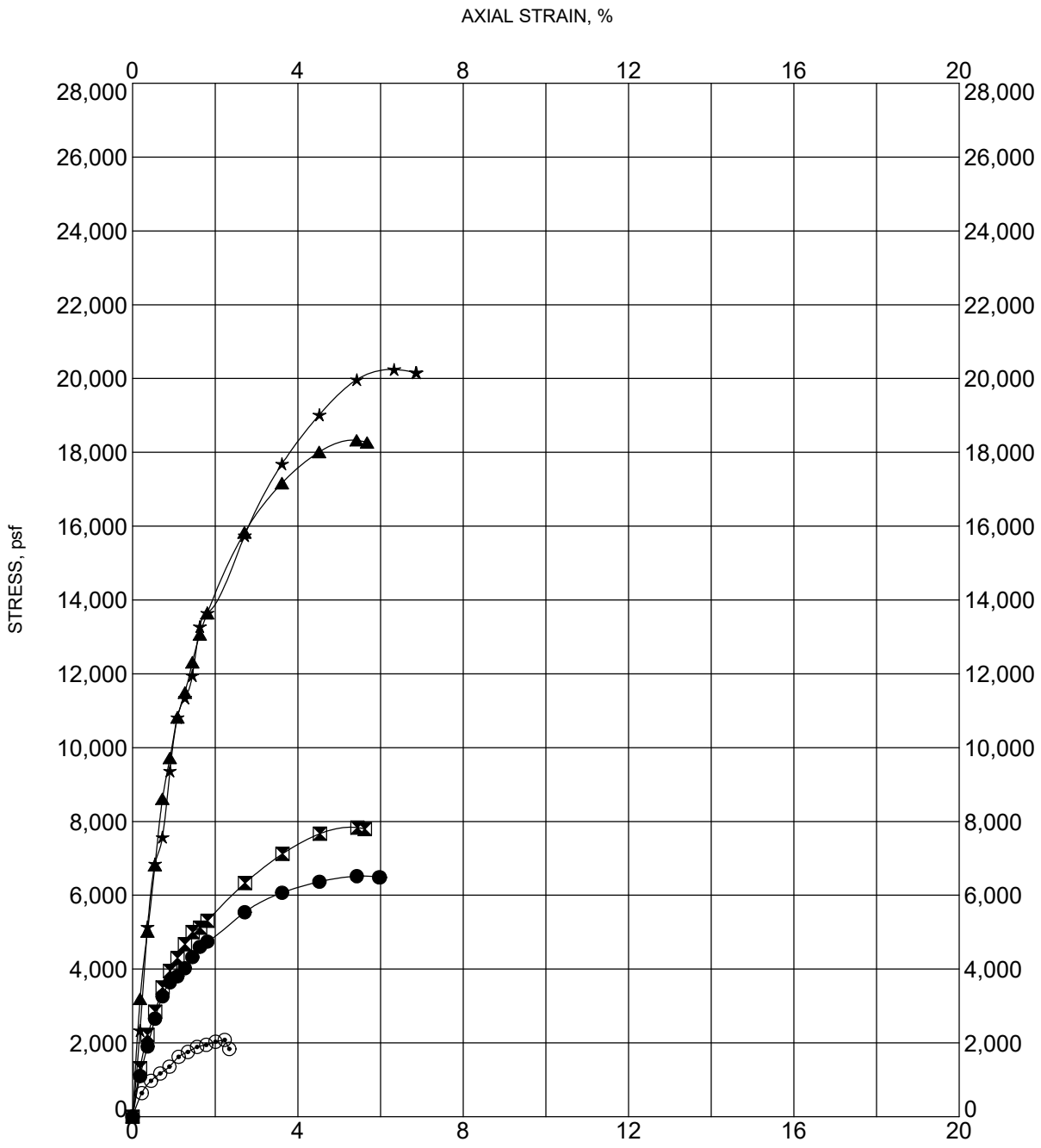

FIGURE B-148

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-142	6 ft	FAT CLAY (CH)	1.6	5.4	40	96.3	27.0
⧗ DP-144	10 ft	SILTY SAND (SM)	2.0	5.4		103.8	21.0
▲ DP-145	4 ft	FILL: LEAN CLAY (CL)	4.6	5.4		112.3	16.4
★ DP-146	6 ft	FILL: FAT CLAY (CH)	5.1	6.3		109.5	18.4
⊙ DP-147	20 ft	FAT CLAY (CH)	0.5	2.2	30	97.1	23.5

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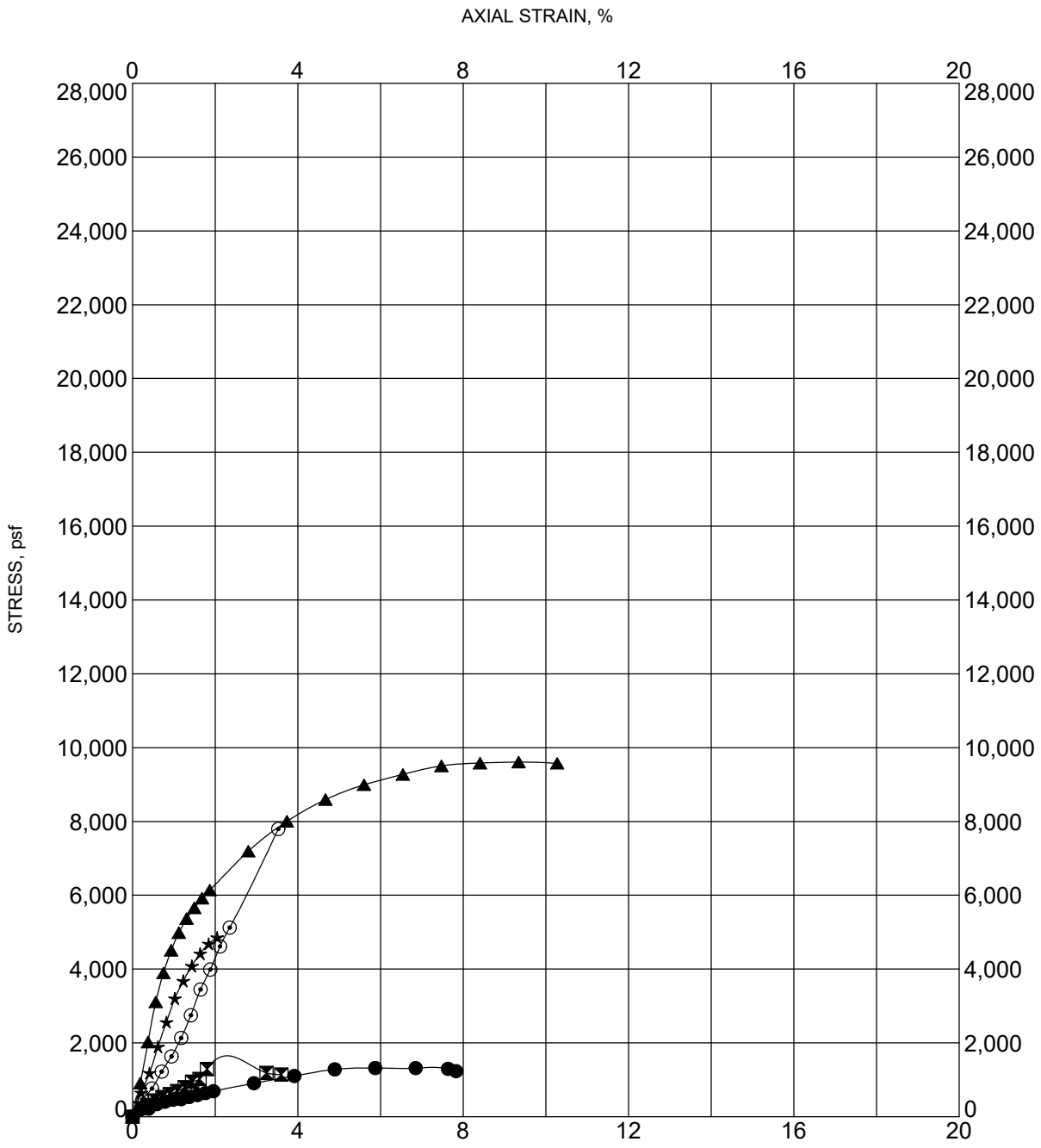

FIGURE B-149

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-148	10 ft	FAT CLAY (CH)	0.3	5.9	21	98.8	24.6
⧗ DP-149	20 ft	FAT CLAY (CH)	0.3	1.8	29	99.2	26.5
▲ DP-150	8 ft	FILL: FAT CLAY (CH)			38	106.7	18.4
★ DP-151	20 ft	FAT CLAY (CH)				95.5	24.3
⊙ DP-152	2 ft	FILL: LEAN CLAY (CL)				110.0	10.7

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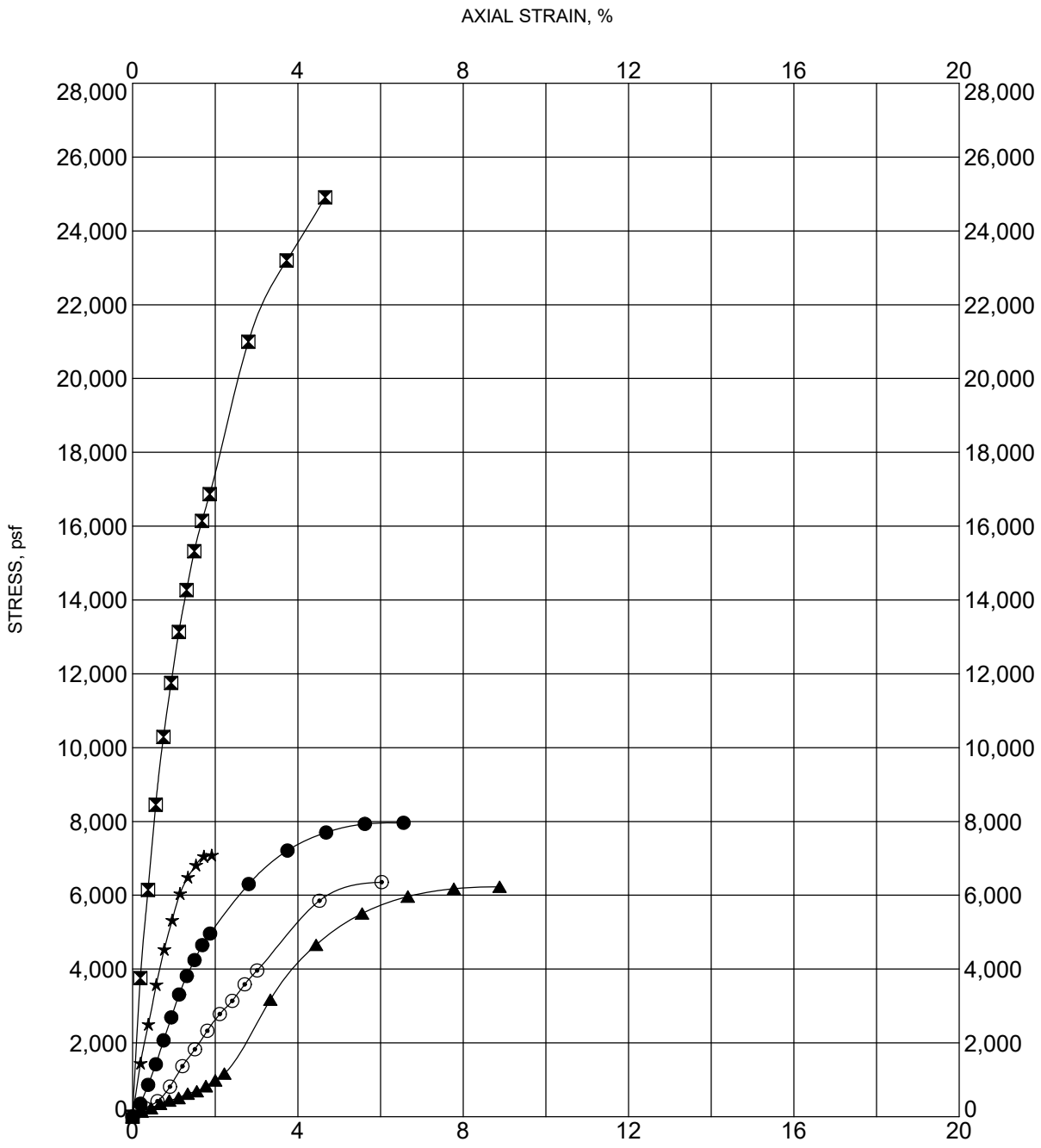

FIGURE B-150

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-153	6 ft	FILL: FAT CLAY (CH)				106.5	17.1
⊠ DP-154	2 ft	FILL: FAT CLAY (CH)				113.7	13.6
▲ DP-155	4 ft	CLAY LEAN (CL)				104.6	17.9
★ DP-157	2 ft	FILL: LEAN CLAY (CL)			24	108.9	12.2
⊙ DP-158	6 ft	FILL: LEAN CLAY (CL)				106.3	15.9

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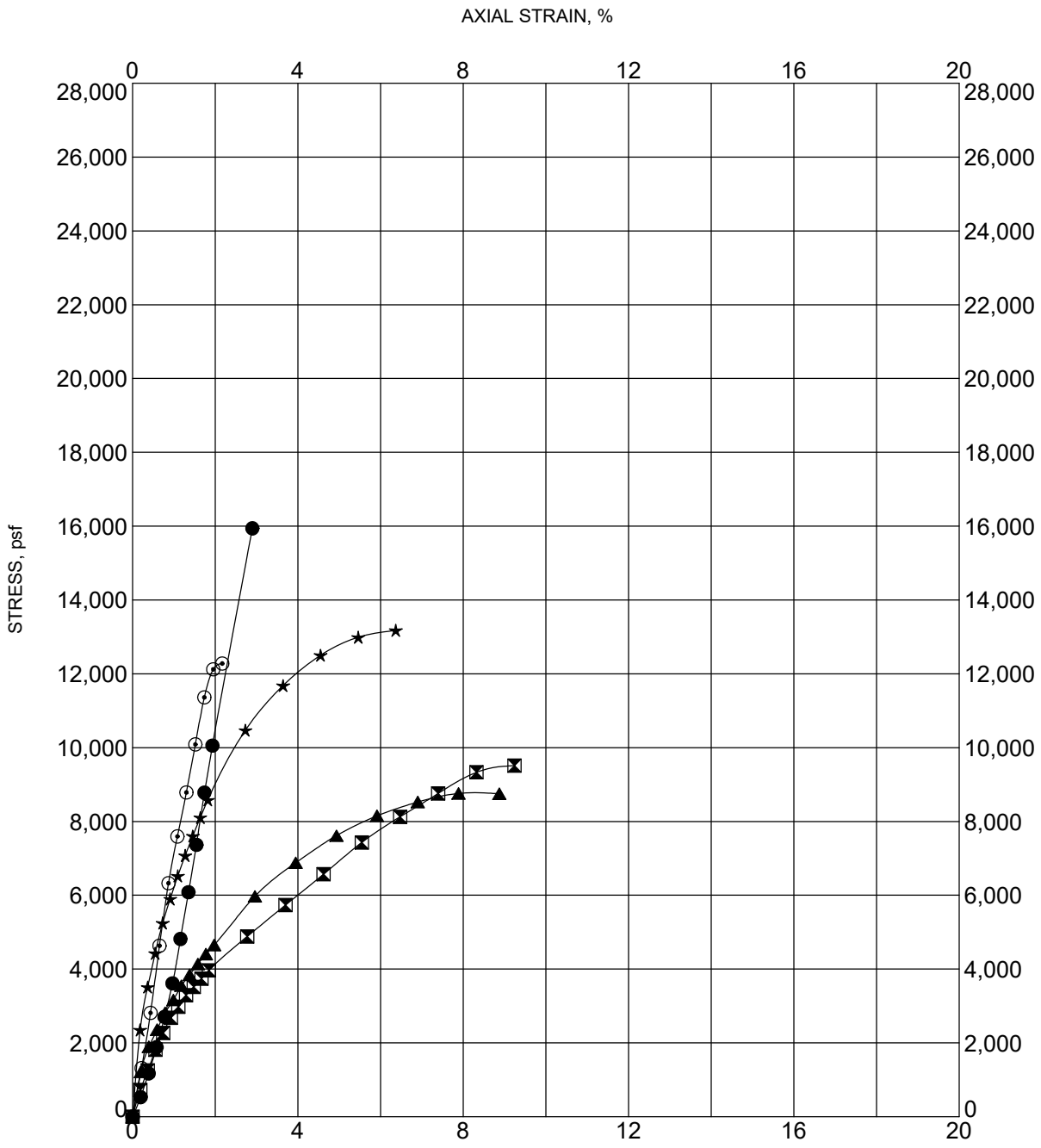

FIGURE B-151

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-159	2 ft	FILL: LEAN CLAY (CL)				109.4	12.4
⊠ DP-160	4 ft	FILL: LEAN CLAY (CL)				105.6	19.4
▲ DP-161	2 ft	FILL: LEAN CLAY (CL)				105.7	19.6
★ DP-167	6 ft	FILL: LEAN CLAY (CL)			26	105.3	20.2
⊙ DP-168	0 ft	FILL: FAT CLAY (CH)				113.3	10.1

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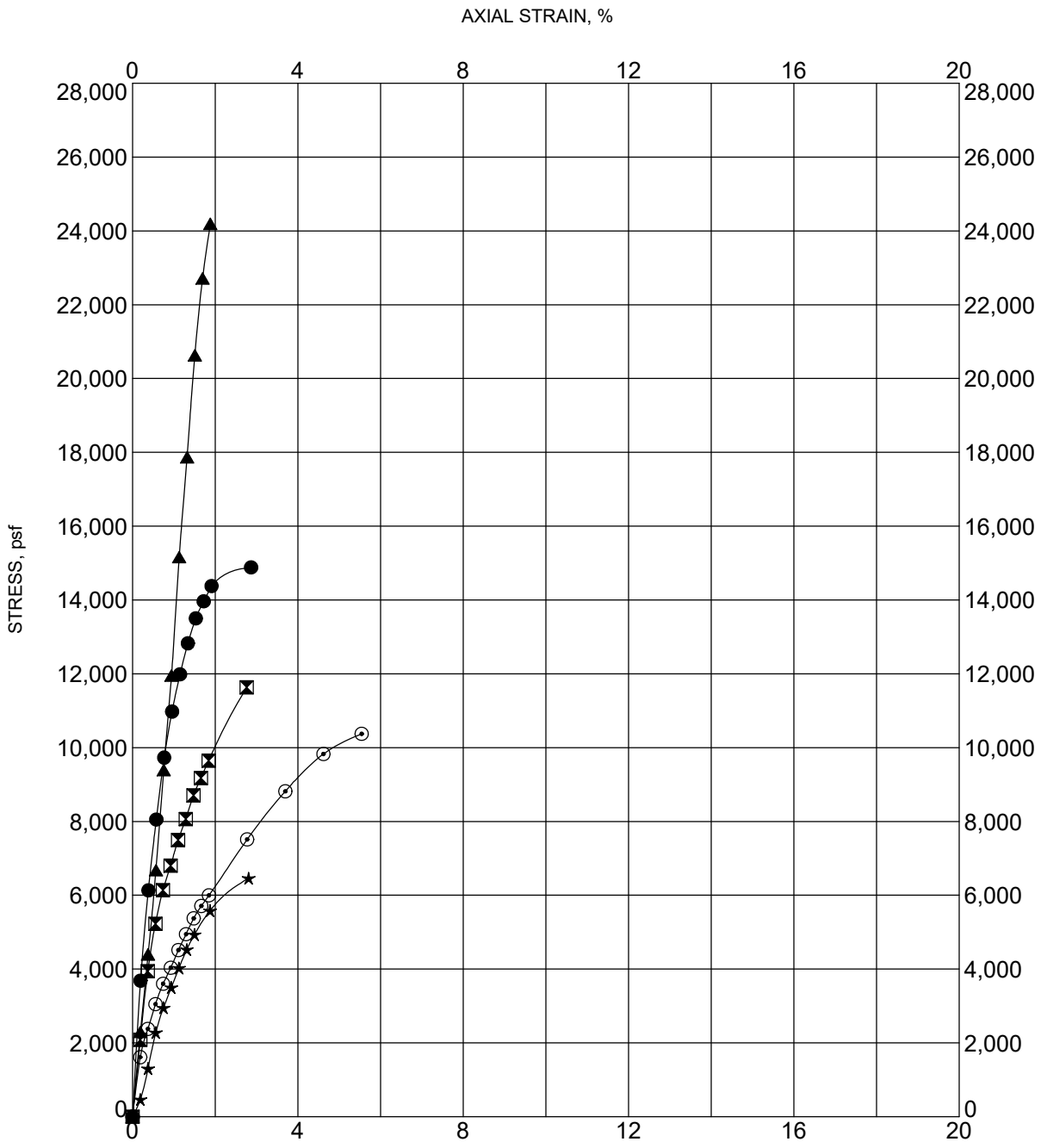

FIGURE B-152

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-169	4 ft	FILL: FAT CLAY (CH)				106.4	16.8
⊠ DP-170	4 ft	FILL: FAT CLAY (CH)	2.9	2.8		102.9	19.8
▲ DP-171	0 ft	FILL: FAT CLAY (CH)				109.8	12.1
★ DP-173	8 ft	FAT CLAY (CH)	1.6	2.8	41	100.0	21.9
⊙ DP-174	10 ft	SILTY SAND (SM)				104.1	19.1

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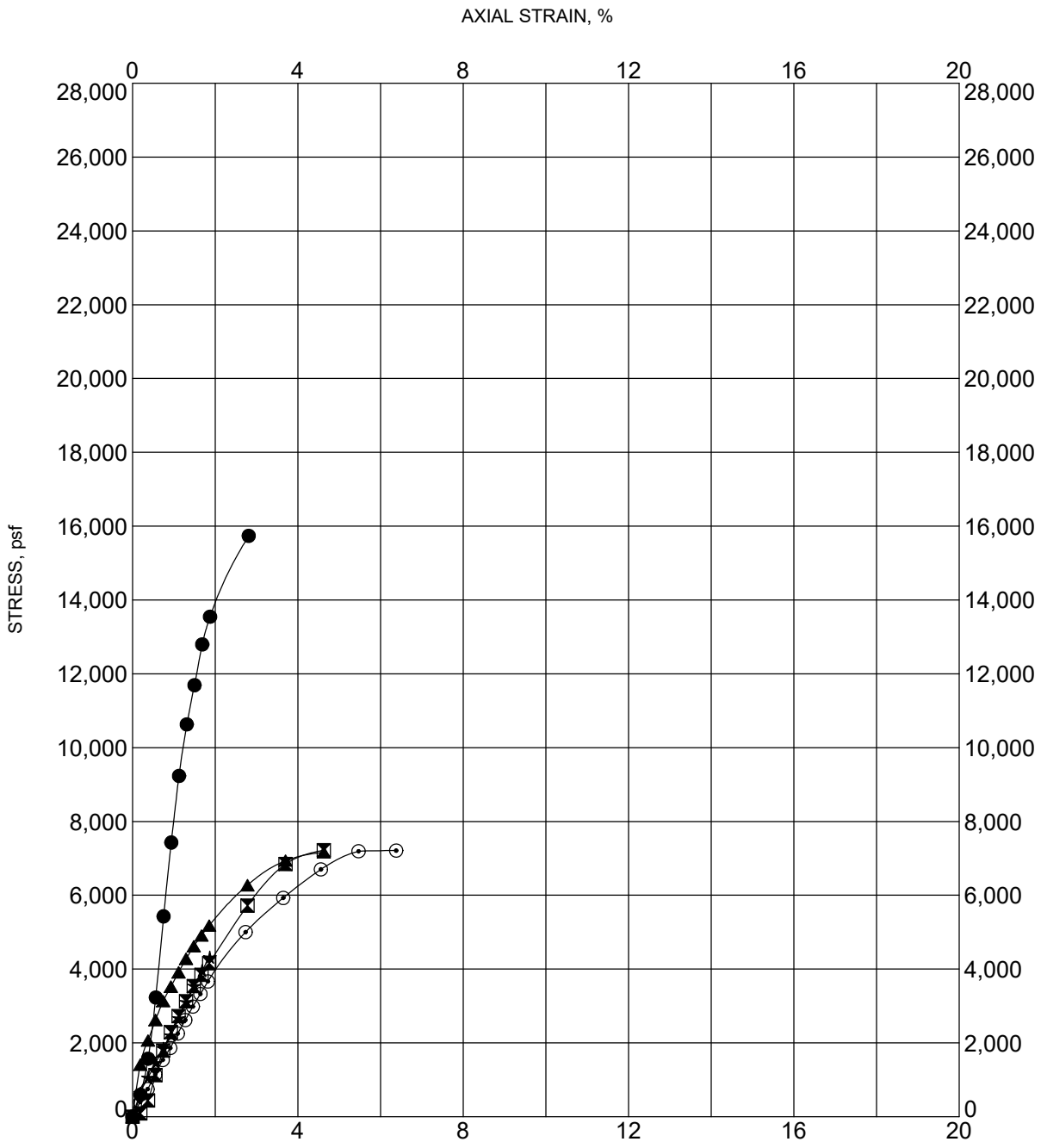

FIGURE B-153

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-175	15 ft	SILTY SAND (SM)				116.4	9.9
⧗ DP-176	2 ft	FILL: LEAN CLAY (CL)				109.6	13.1
▲ DP-178	8 ft	FILL: FAT CLAY (CH)				101.8	20.6
★ DP-179	6 ft	FILL: LEAN CLAY (CL)				105.2	16.7
⊙ DP-181	8 ft	FILL: LEAN CLAY (CL)				105.7	17.5

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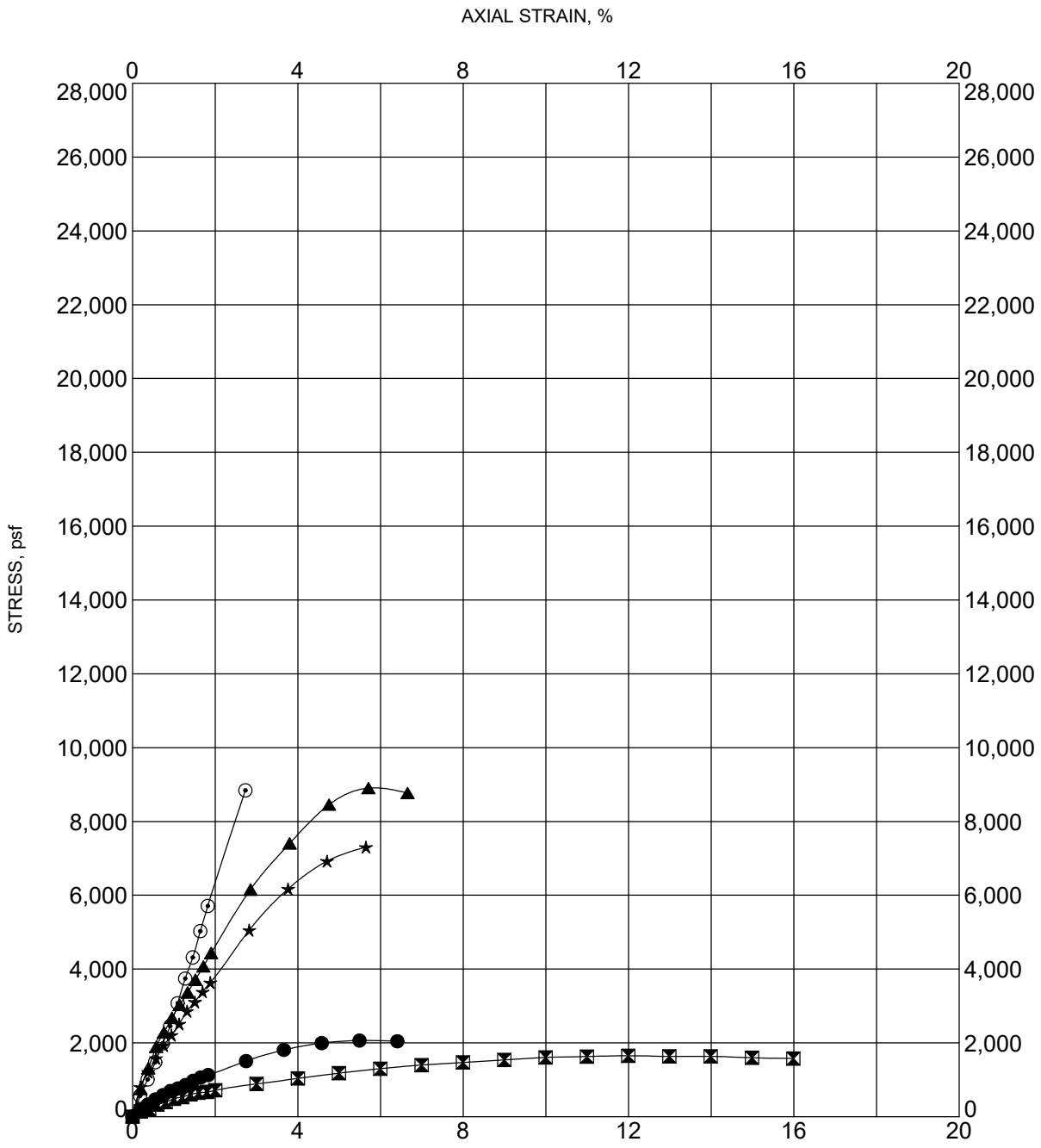

FIGURE B-154

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-182	2 ft	CLAY LEAN (CL)				93.3	24.7
⊠ DP-183	4 ft	SANDY LEAN CLAY (CL)			20	97.6	22.2
▲ DP-184	0 ft	FILL: LEAN CLAY (CL)				108.0	17.2
★ DP-185	6 ft	CLAY LEAN (CL)				107.7	18.1
⊙ DP-186	4 ft	FILL: LEAN CLAY (CL)				103.4	17.4

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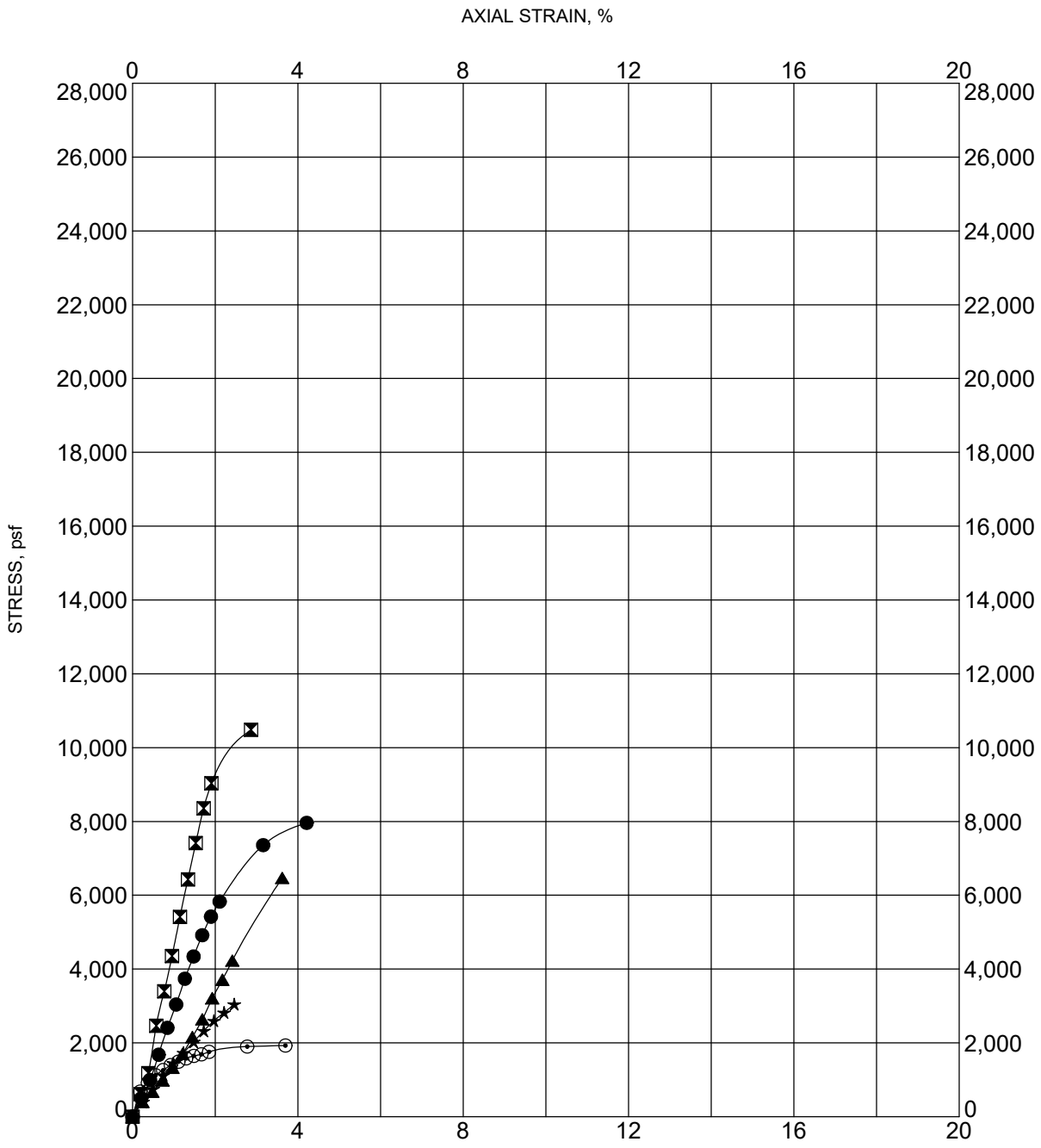

FIGURE B-155

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-187	8 ft	CLAY LEAN (CL)			23	107.1	16.7
⊠ DP-188	2 ft	FILL: LEAN CLAY (CL)			14	110.8	9.4
▲ DP-190	6 ft	CLAY LEAN (CL)				113.7	11.4
★ DP-191	10 ft	FAT CLAY (CH)				95.4	18.1
⊙ DP-192	8 ft	FAT CLAY (CH)			41	96.0	22.8

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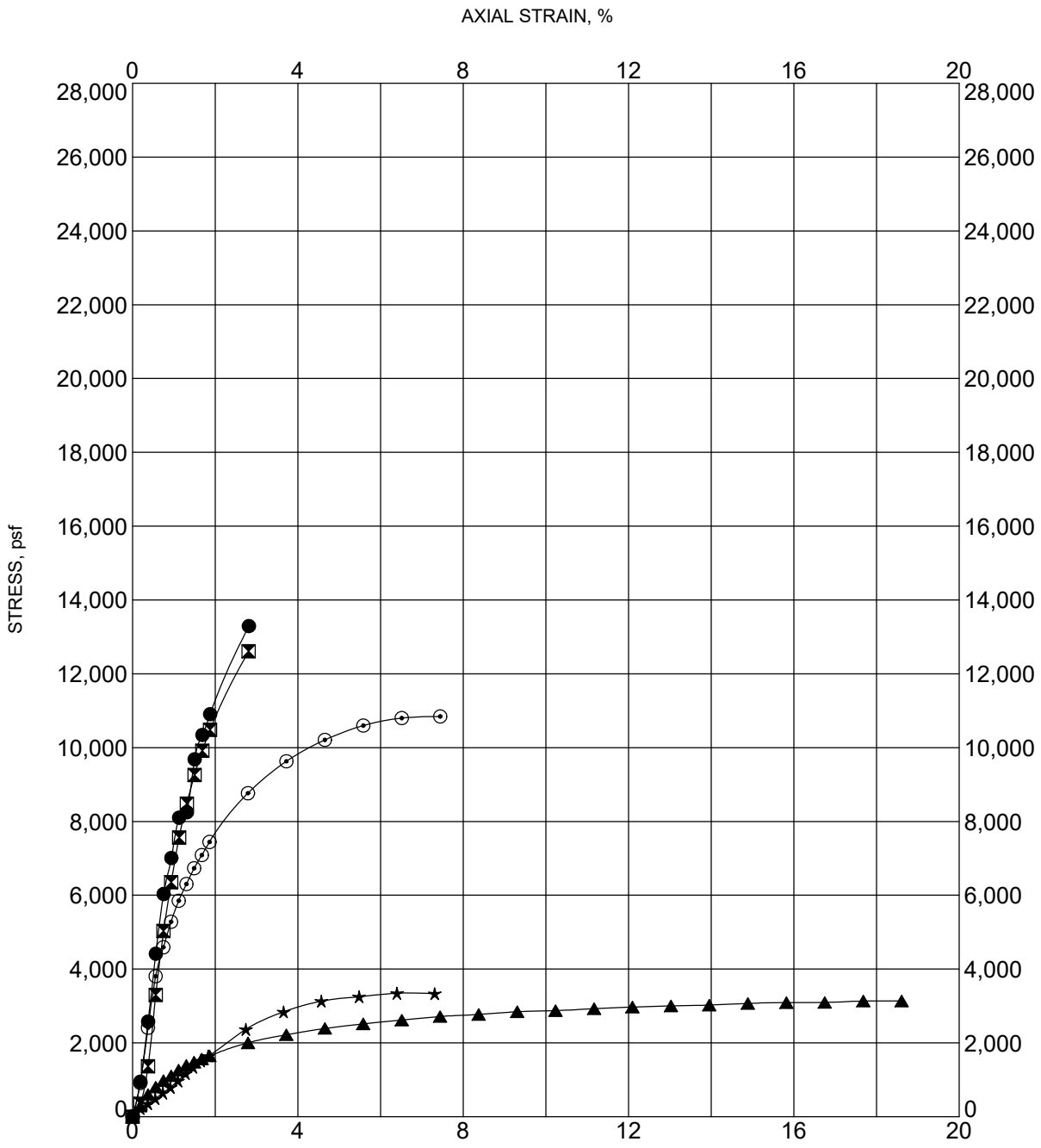

FIGURE B-156

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-193	2 ft	FILL: LEAN CLAY (CL)				110.8	11.9
⊠ DP-194	4 ft	FAT CLAY (CH)				100.4	22.1
▲ DP-195	20 ft	FAT CLAY (CH)				92.2	29.3
★ DP-196	20 ft	CLAY LEAN (CL)				93.7	27.3
⊙ DP-197	2 ft	FILL: FAT CLAY (CH)				102.5	20.5

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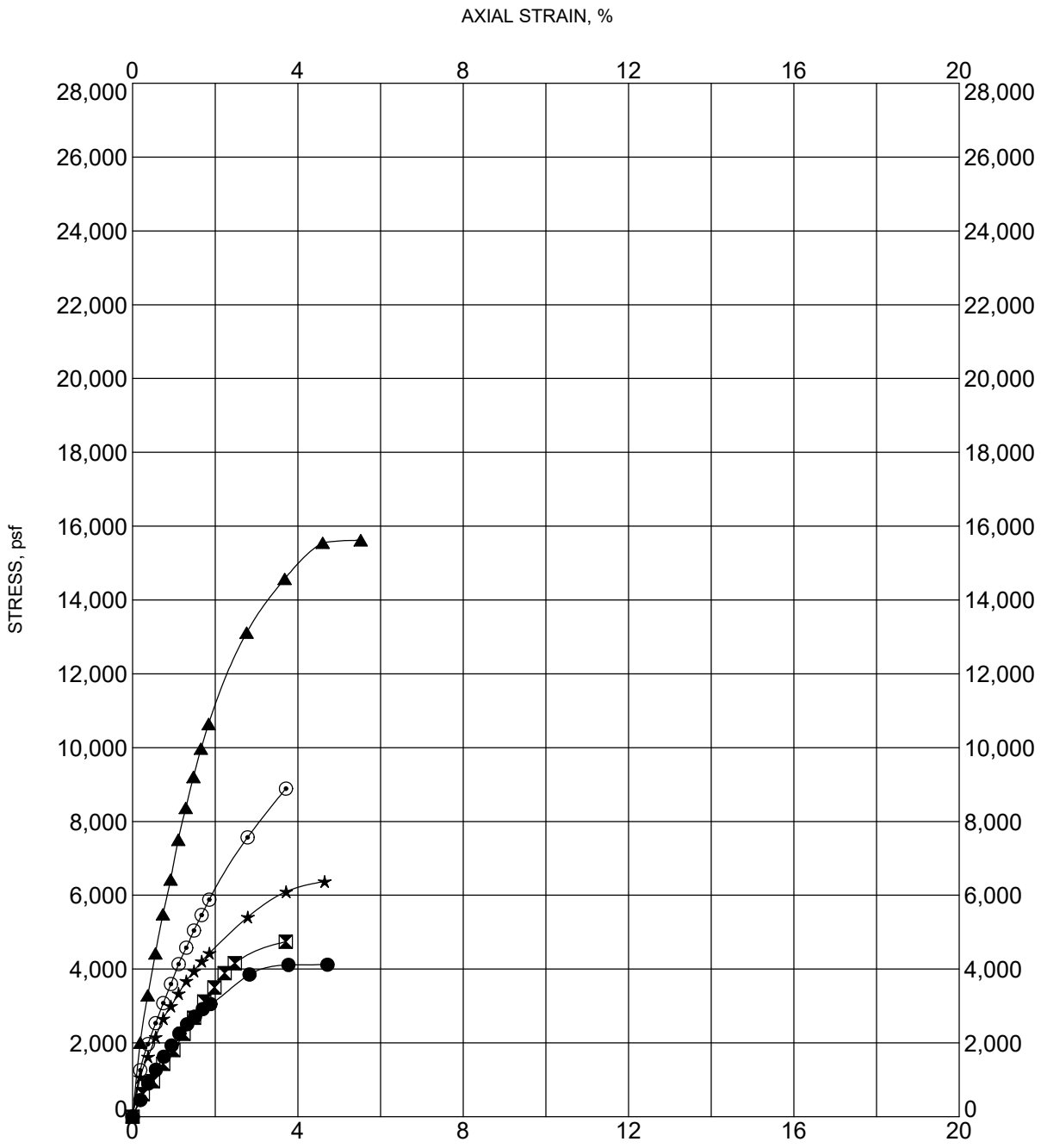

FIGURE B-157

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-199	2 ft	FILL: LEAN CLAY (CL)				100.2	20.9
⧗ DP-199	6 ft	CLAY LEAN (CL)				106.5	13.6
▲ DP-215	2 ft	CLAY LEAN (CL)			25	112.3	14.8
★ DP-216	8 ft	CLAY LEAN (CL)			19	109.1	14.2
⊙ DP-217	6 ft	FILL: LEAN CLAY (CL)				103.9	17.3

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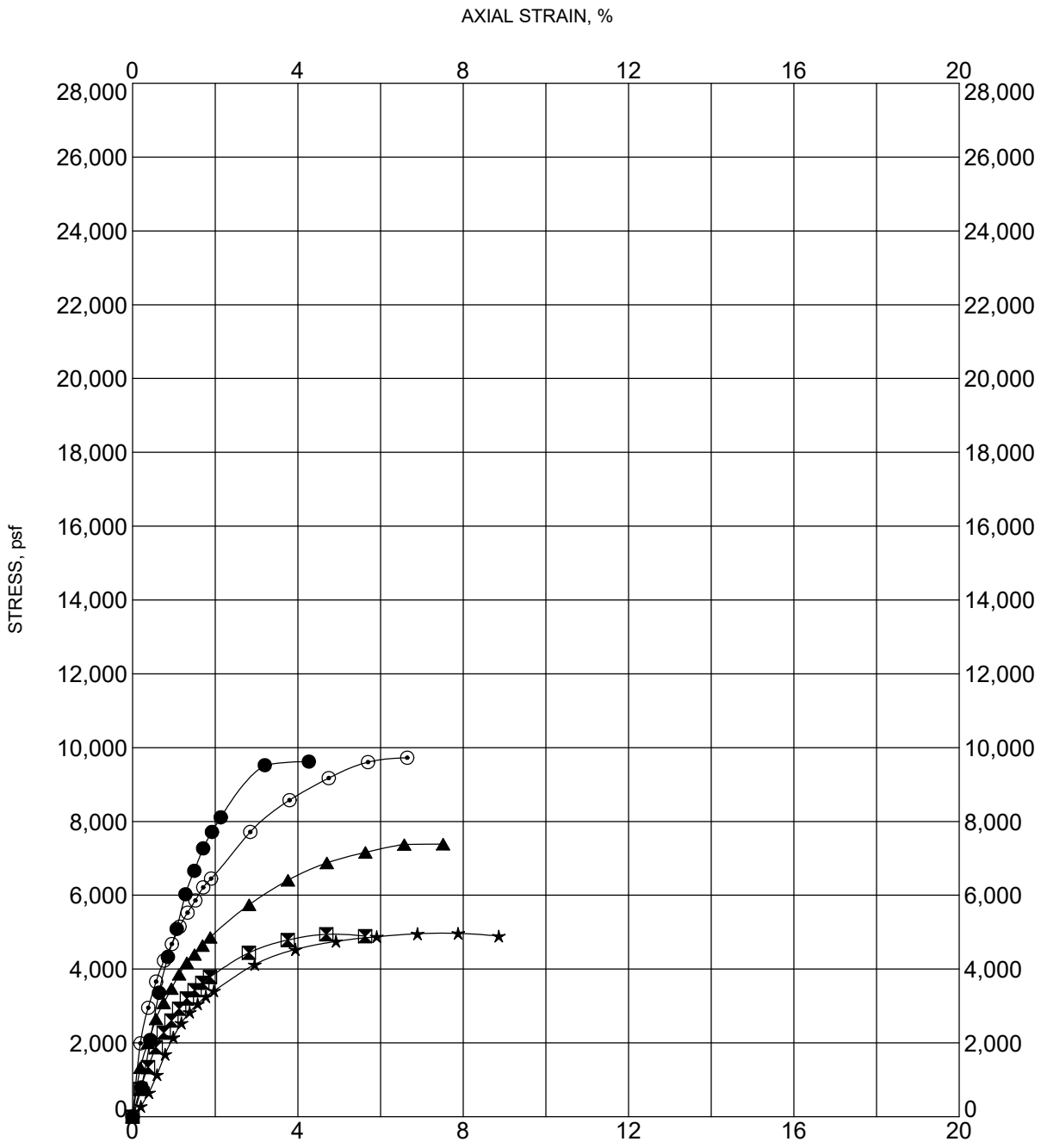

FIGURE B-158

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-218	6 ft	CLAY LEAN (CL)				108.1	18.2
⧗ DP-218	10 ft	SILTY SAND (SM)				99.5	25.4
▲ DP-219	2 ft	FILL: FAT CLAY (CH)				99.2	21.9
★ DP-219	8 ft	FAT CLAY (CH)				94.9	25.4
⊙ DP-220	4 ft	FILL: FAT CLAY (CH)				100.0	22.9

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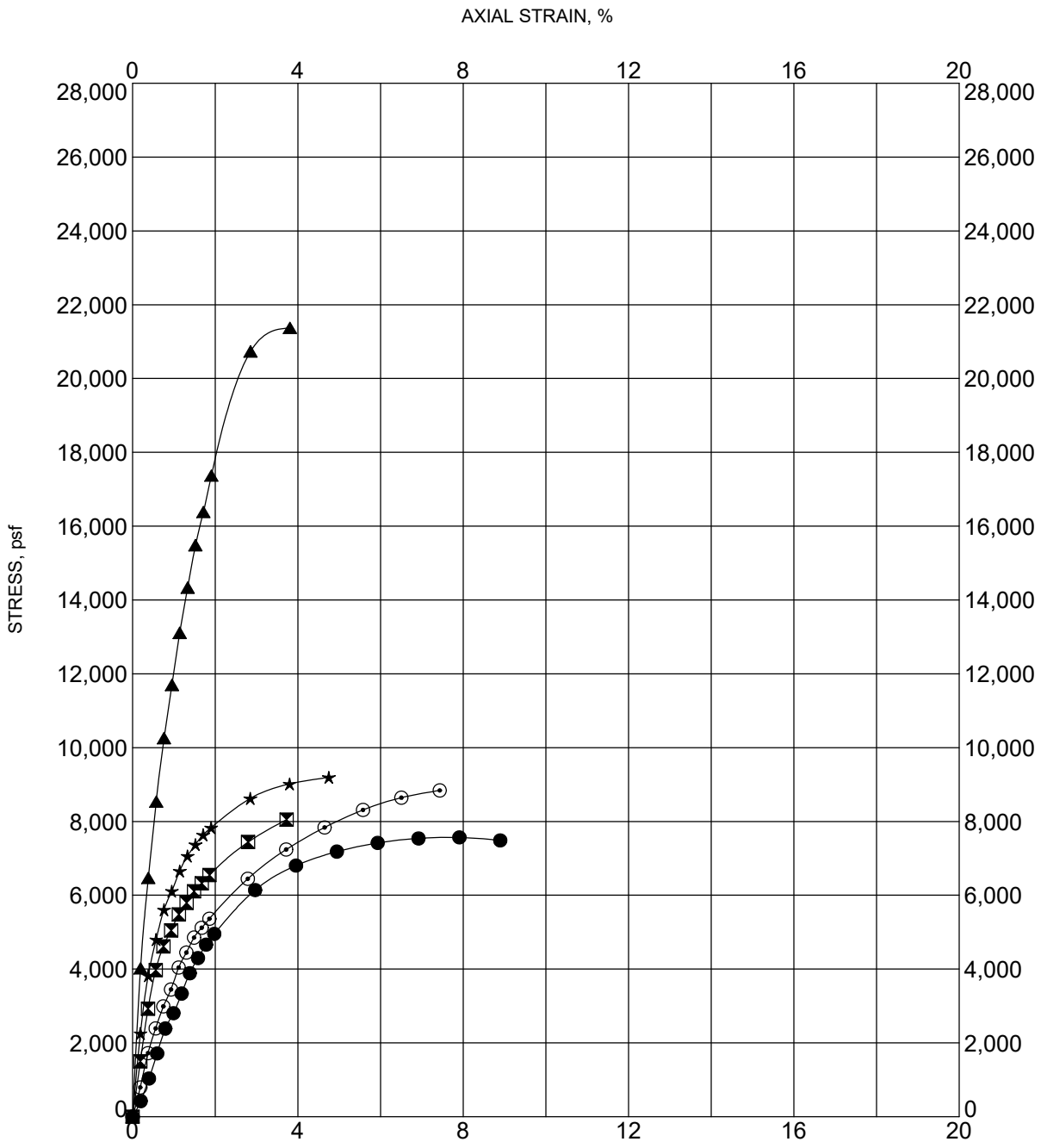

FIGURE B-159

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-220	10 ft	FAT CLAY (CH)				101.9	21.8
⊠ DP-221	4 ft	FILL: FAT CLAY (CH)				103.1	19.8
▲ DP-222	2 ft	FILL: FAT CLAY (CH)			35	109.2	18.5
★ DP-222	6 ft	FILL: FAT CLAY (CH)				101.0	24.0
⊙ DP-223	6 ft	FILL: FAT CLAY (CH)				103.6	19.4

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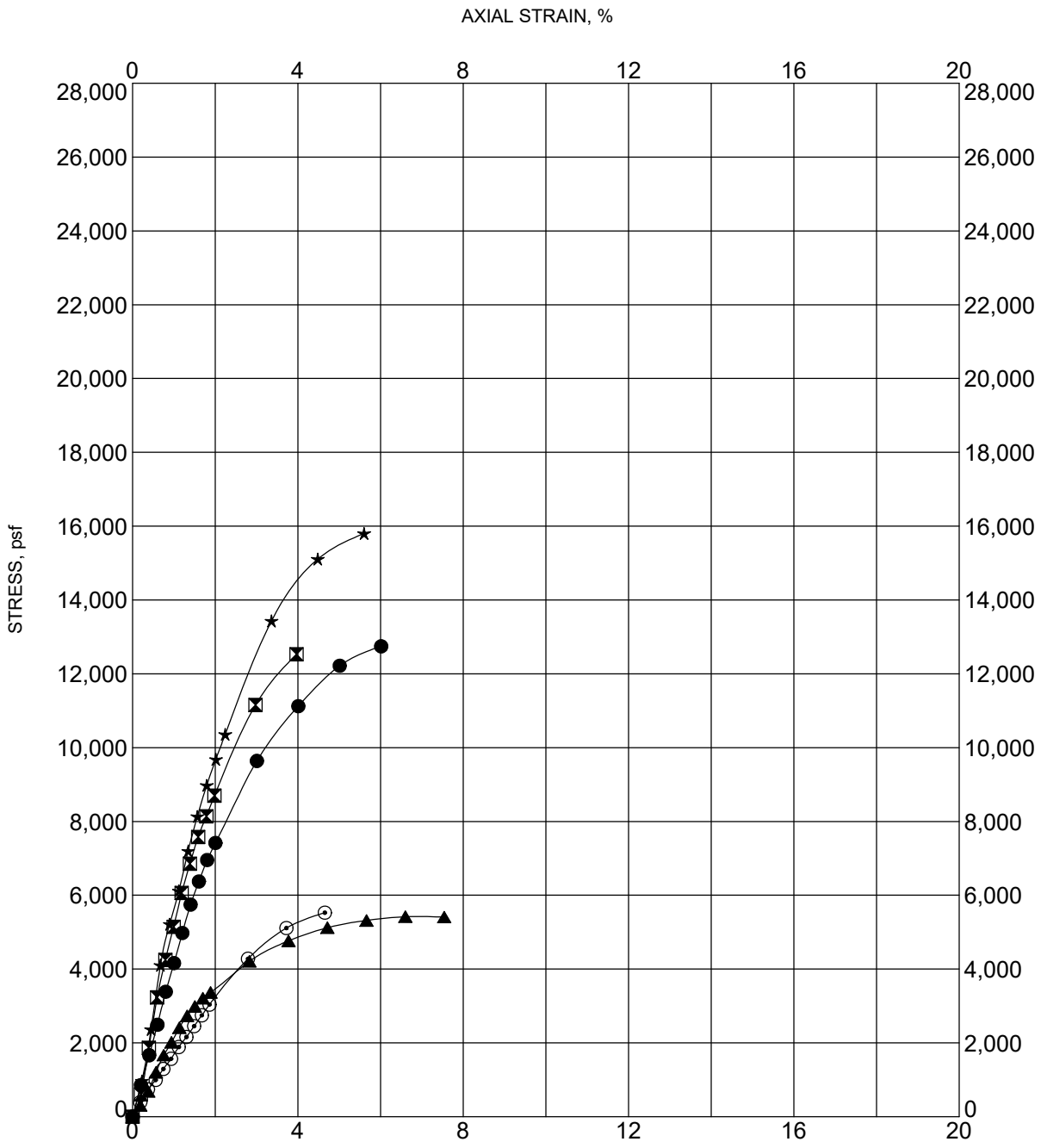

FIGURE B-160

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-224	4 ft	FILL: FAT CLAY (CH)				110.6	14.0
⊠ DP-225	6 ft	CLAY LEAN (CL)				107.0	17.8
▲ DP-226	0 ft	FILL: FAT CLAY (CH)				109.6	14.0
★ DP-227	6 ft	FILL: FAT CLAY (CH)				107.4	16.7
⊙ DP-228	6 ft	FILL: LEAN CLAY (CL)				102.6	19.9

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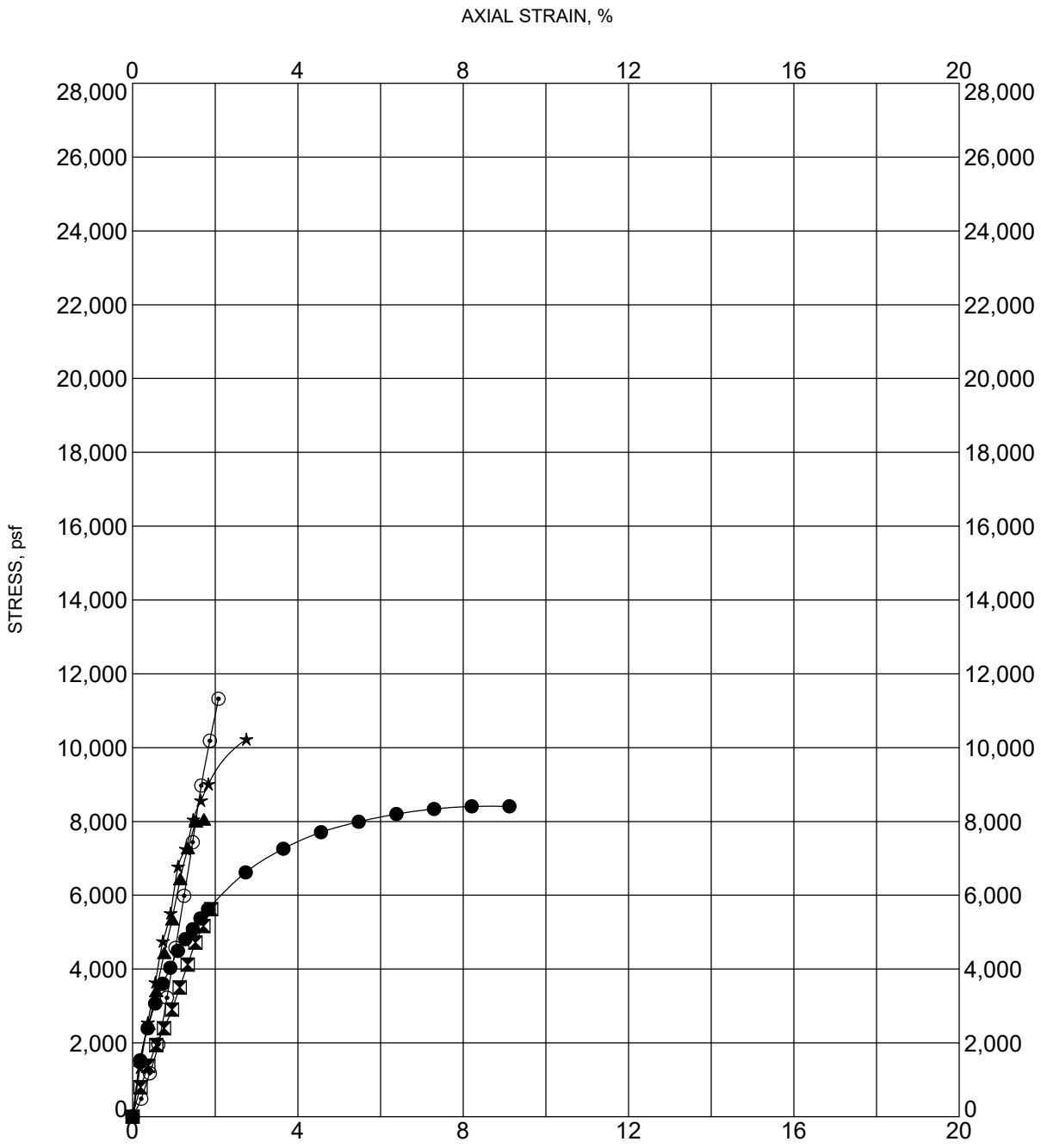

FIGURE B-161

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-229	4 ft	FILL: FAT CLAY (CH)				104.7	19.0
⧗ DP-230	6 ft	CLAY LEAN (CL)				103.8	16.2
▲ DP-231	2 ft	FILL: LEAN CLAY (CL)	2.0	1.7		110.0	7.7
★ DP-233	8 ft	FILL: FAT CLAY (CH)				107.5	18.3
⊙ DP-234	2 ft	FILL: LEAN CLAY (CL)				106.6	11.9

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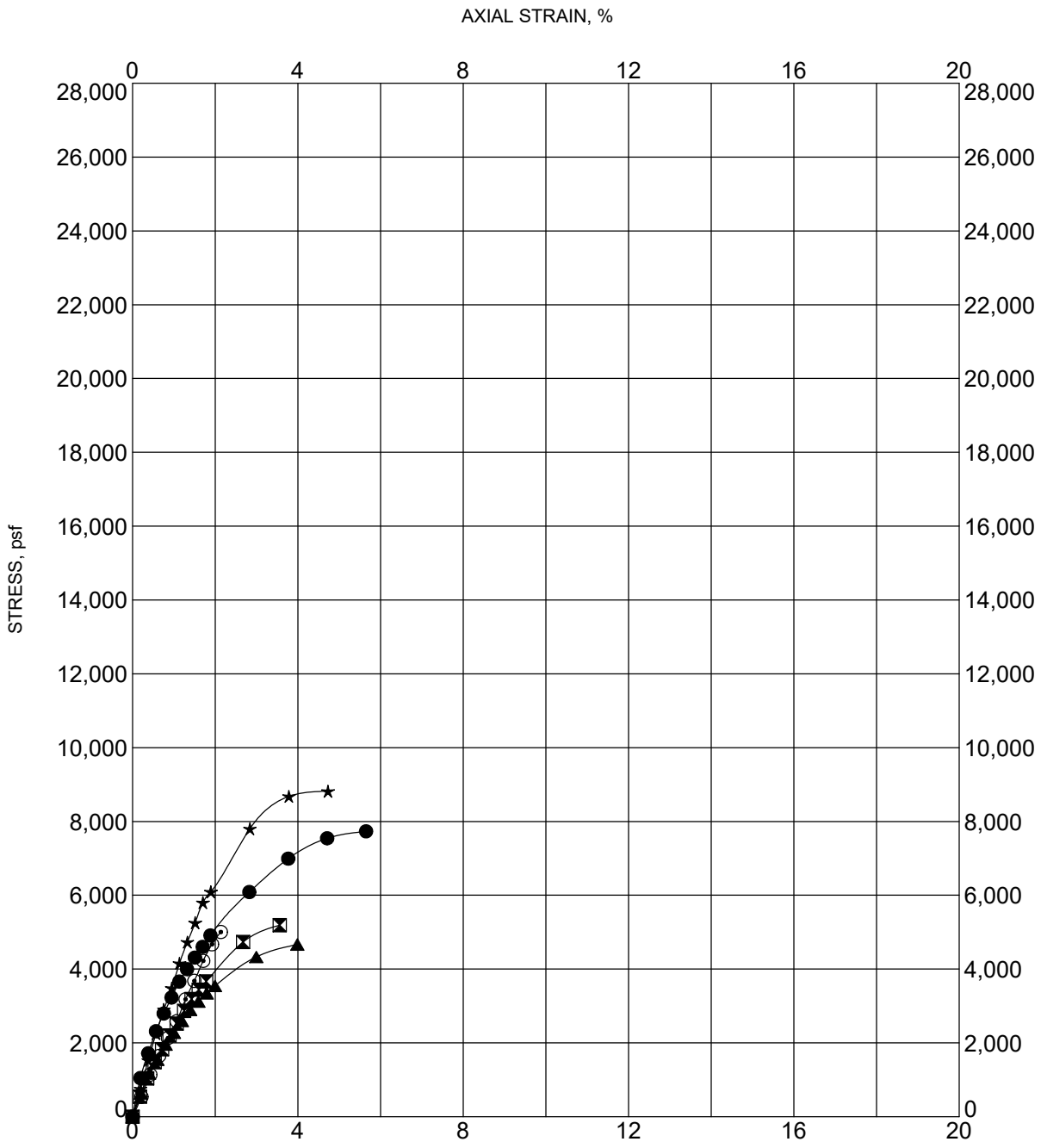

FIGURE B-162

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-235	4 ft	FILL: LEAN CLAY (CL)				112.3	14.1
⧗ DP-236	40 ft	CLAY LEAN (CL)			21	106.5	19.9
▲ DP-237	8 ft	FAT CLAY (CH)				91.2	25.3
★ DP-238	2 ft	FILL: FAT CLAY (CH)				95.8	26.2
⊙ DP-239	6 ft	FILL: LEAN CLAY (CL)				101.6	12.8

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PROJECT NO. AMA08-115-00

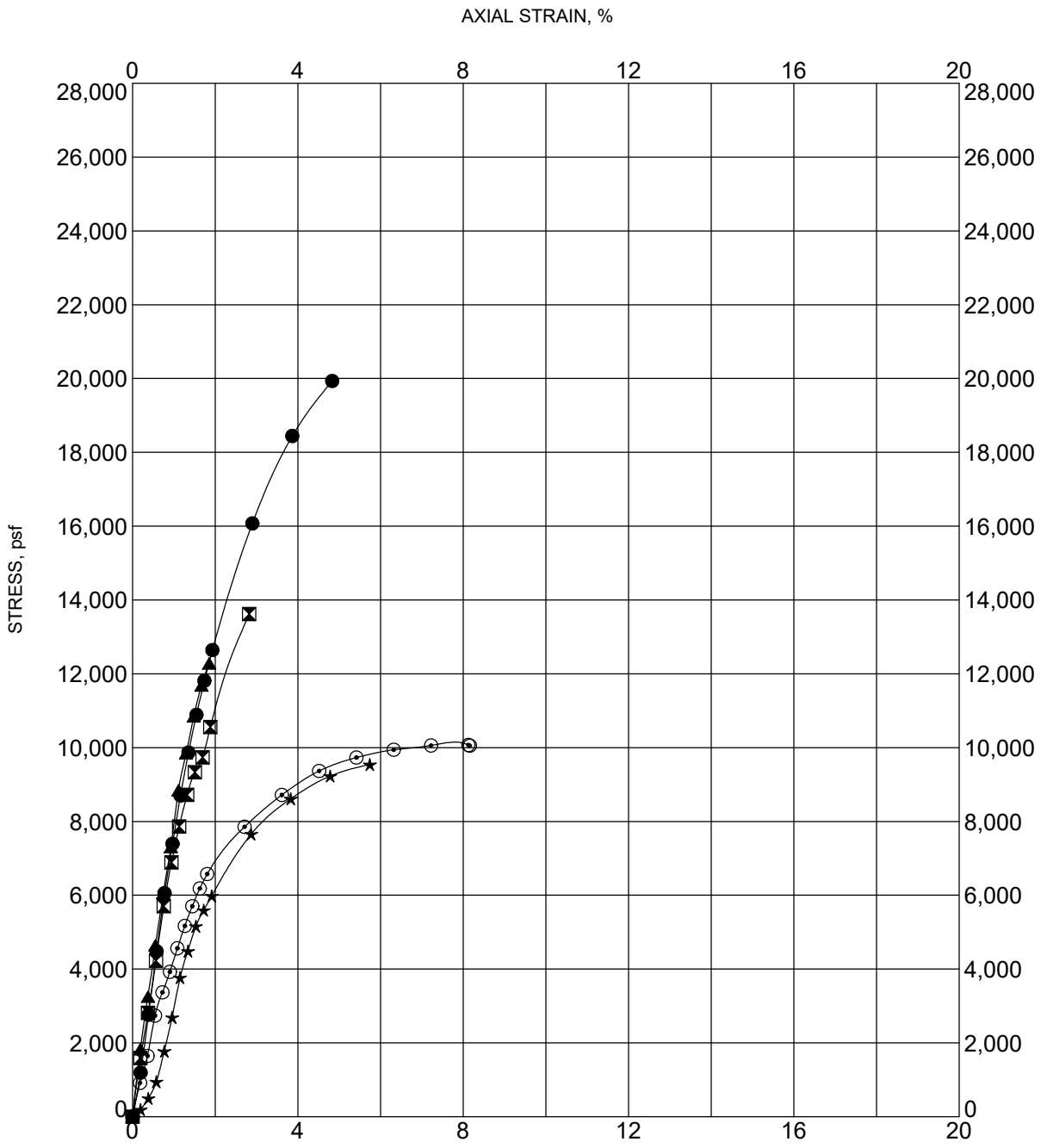

FIGURE B-163

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-240	6 ft	FILL: LEAN CLAY (CL)			22	102.7	21.4
⊠ DP-241	0 ft	FILL: LEAN CLAY (CL)			27	116.5	9.2
▲ DP-242	0 ft	FILL: LEAN CLAY (CL)			28	110.4	12.9
★ DP-243	4 ft	FILL: FAT CLAY (CH)	2.4	5.7	50	100.7	23.3
⊙ DP-244	6 ft	FILL: FAT CLAY (CH)	2.5	8.1		100.3	24.8

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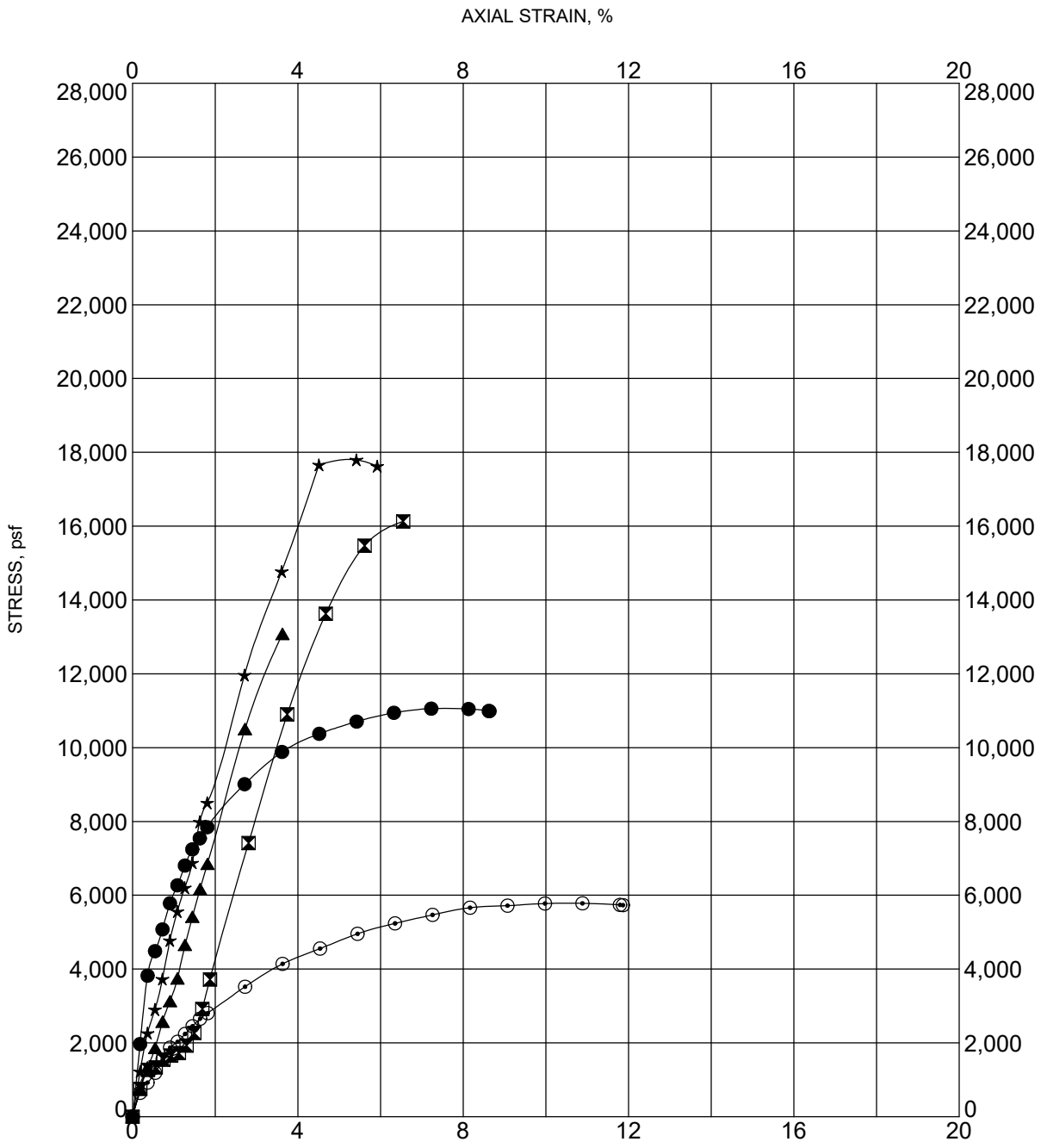

FIGURE B-164

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-245	8 ft	FAT CLAY (CH)	2.8	7.2		107.6	17.5
⊠ DP-246	4 ft	FAT CLAY (CH)				113.3	13.7
▲ DP-247	4 ft	FILL: LEAN CLAY (CL)	3.3	3.6		109.2	14.5
★ DP-248	6 ft	FAT CLAY (CH)	4.4	5.4		110.3	16.9
⊙ DP-249	15 ft	FAT CLAY (CH)	1.4	10.9		106.8	16.3

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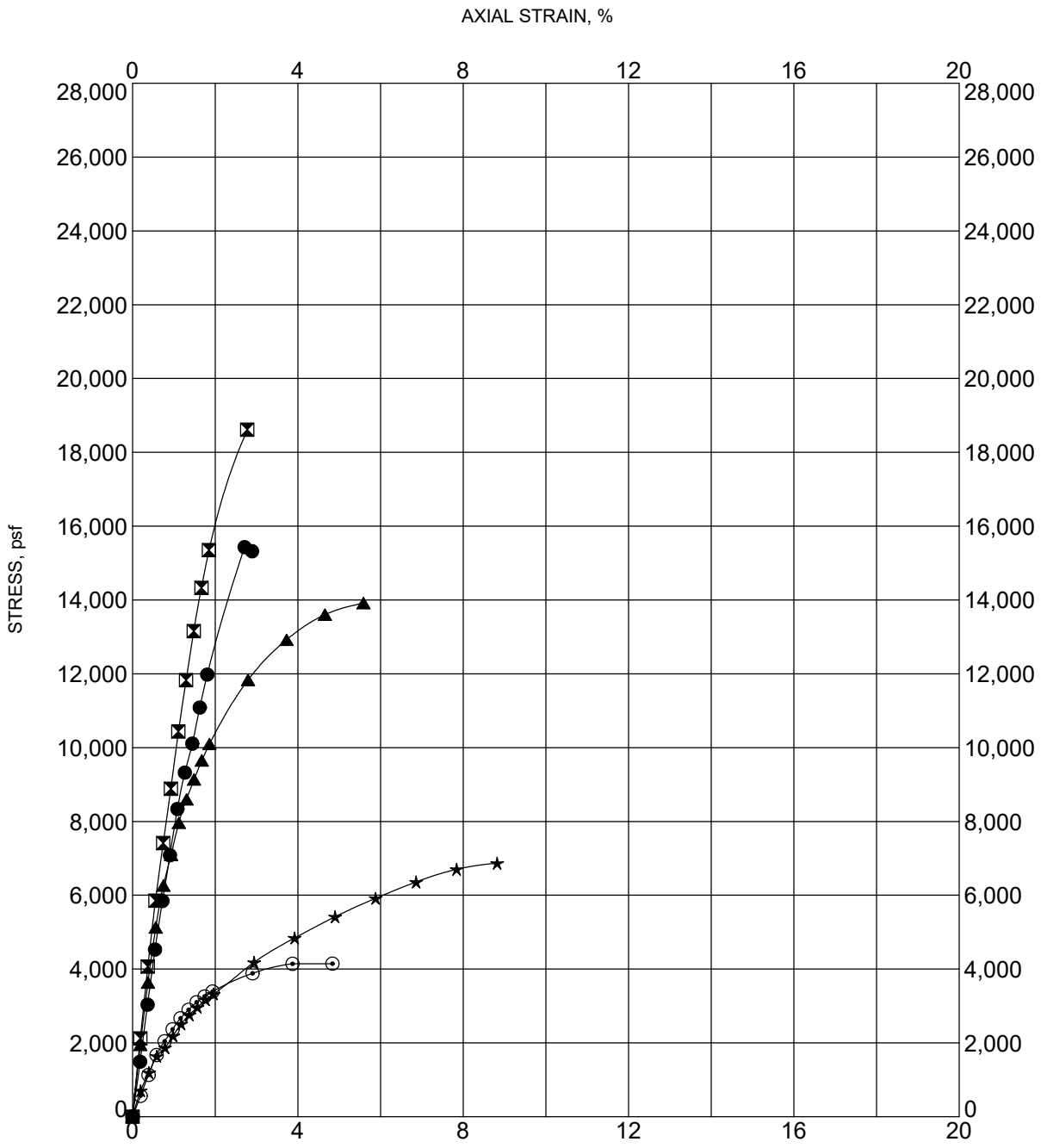

FIGURE B-165

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-250	10 ft	FAT CLAY (CH)	3.9	2.7		104.8	14.7
⊠ DP-251	2 ft	FILL: LEAN CLAY (CL)				109.9	14.8
▲ DP-252	10 ft	FAT CLAY (CH)				103.8	20.2
★ DP-253	10 ft	FAT CLAY (CH)				105.0	18.9
⊙ DP-254	6 ft	FILL: FAT CLAY (CH)				103.1	17.7

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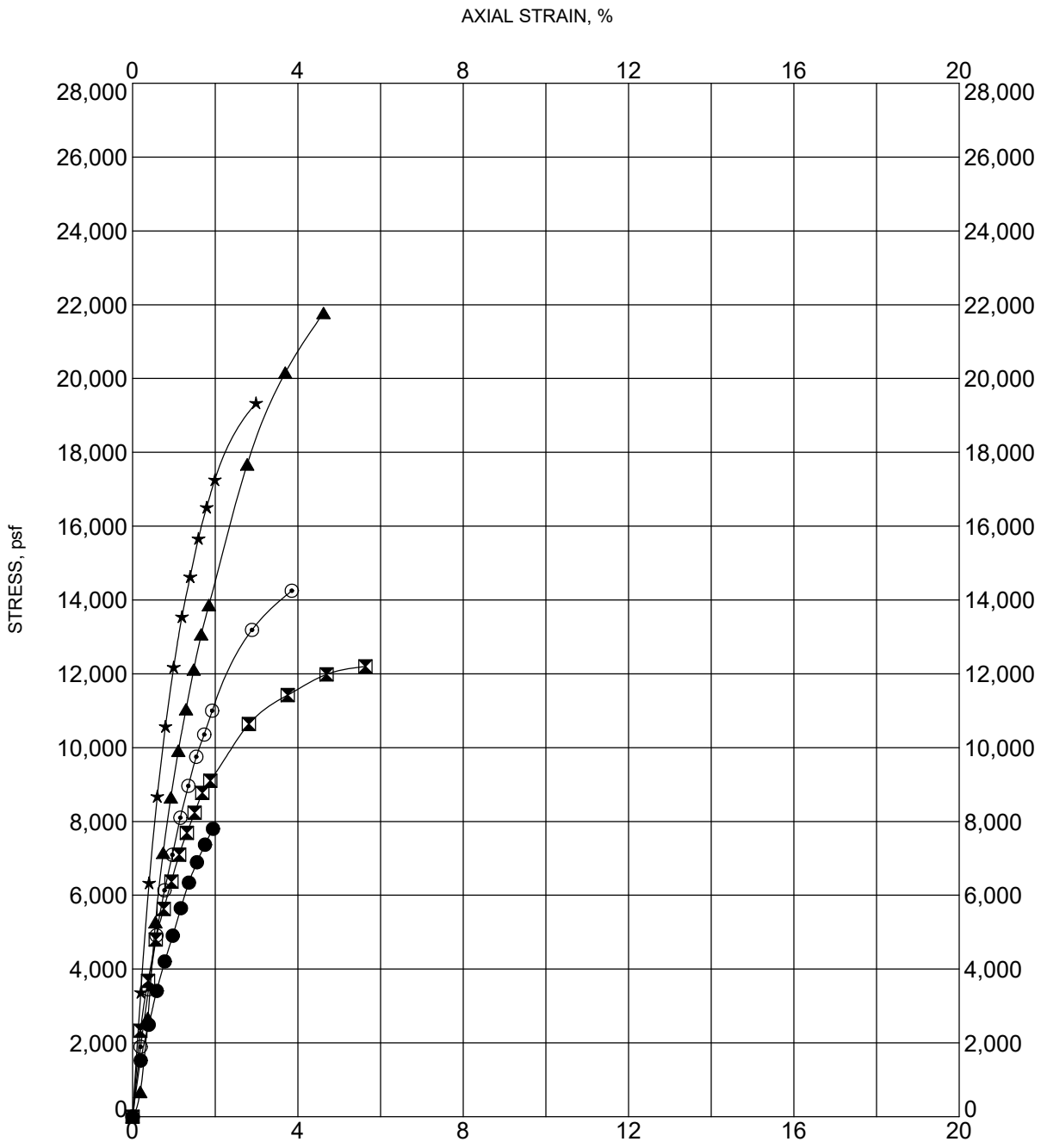

FIGURE B-166

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-255	2 ft	FILL: FAT CLAY (CH)				100.3	19.5
⊠ DP-256	8 ft	FILL: FAT CLAY (CH)				104.1	20.4
▲ DP-257	4 ft	FILL: FAT CLAY (CH)			27	107.8	19.1
★ DP-258	4 ft	FILL: LEAN CLAY (CL)				112.4	13.6
⊙ DP-258	10 ft	FAT CLAY (CH)				103.8	16.7

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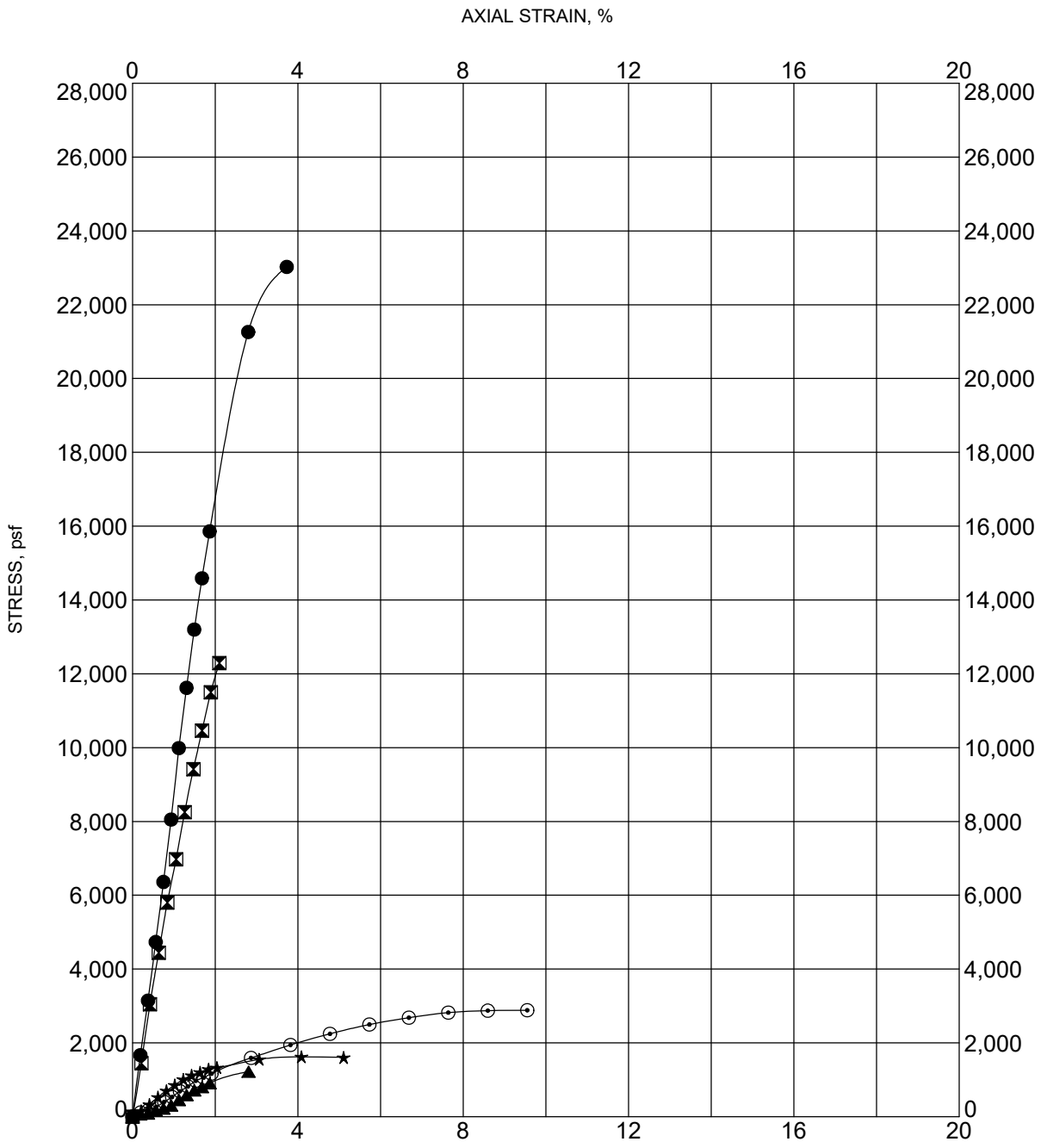

FIGURE B-167

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-259	2 ft	FILL: FAT CLAY (CH)				113.7	12.5
⊠ DP-259	15 ft	FAT CLAY (CH)	3.1	2.1		108.1	13.8
▲ DP-265	25 ft	CLAY LEAN (CL)				91.8	27.7
★ DP-267	30 ft	FAT CLAY (CH)				86.6	33.5
⊙ DP-268	10 ft	FAT CLAY (CH)				95.1	26.6

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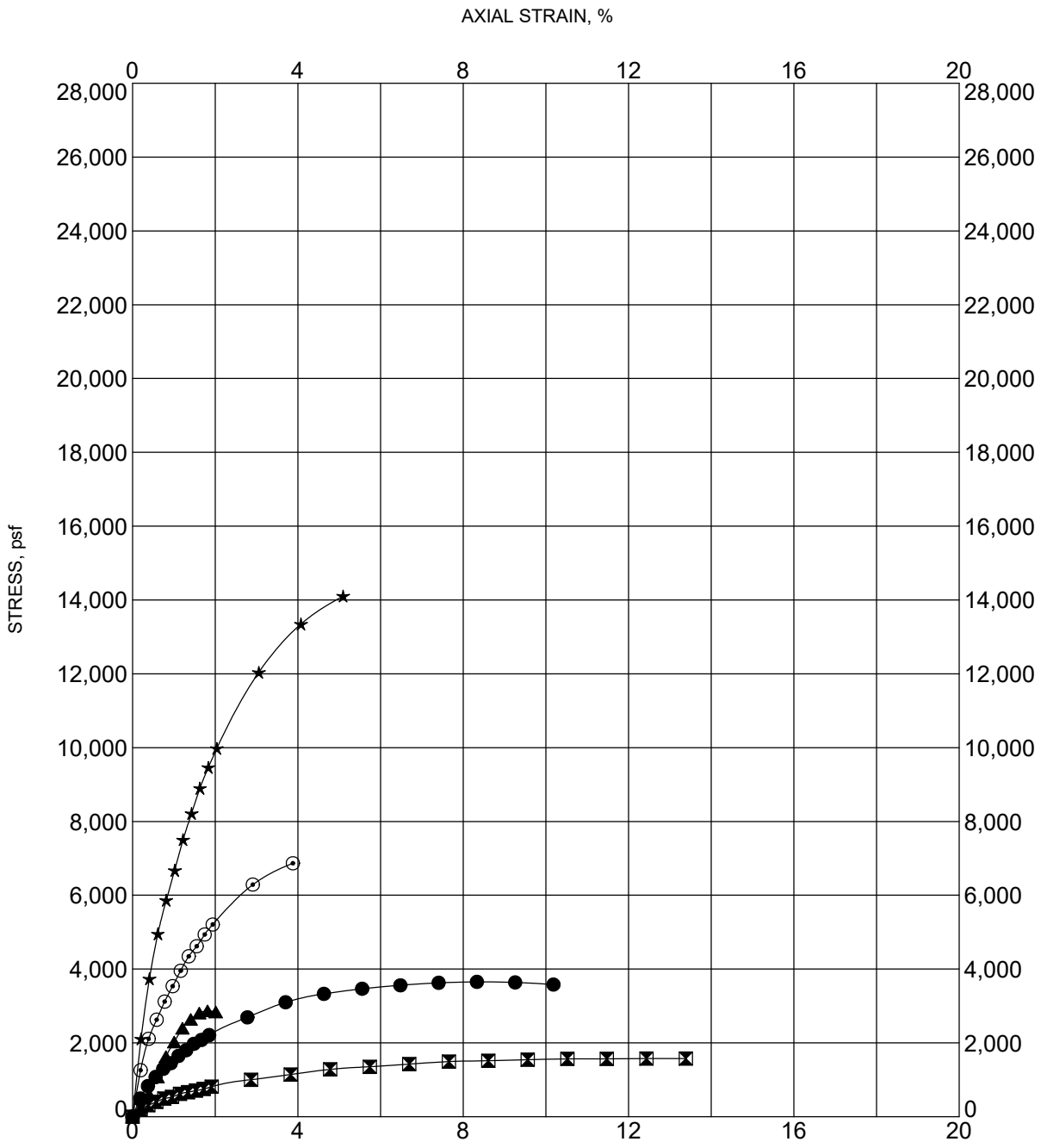

FIGURE B-168

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-269	10 ft	SILTY SAND (SM)			30	95.7	25.7
⧗ DP-270	30 ft	FAT CLAY (CH)				87.4	33.0
▲ DP-271	10 ft	FAT CLAY (CH)			42	90.1	25.6
★ DP-278	0 ft	FILL: LEAN CLAY (CL)				114.9	11.8
⊙ DP-280	8 ft	FAT CLAY (CH)			33	99.4	25.0

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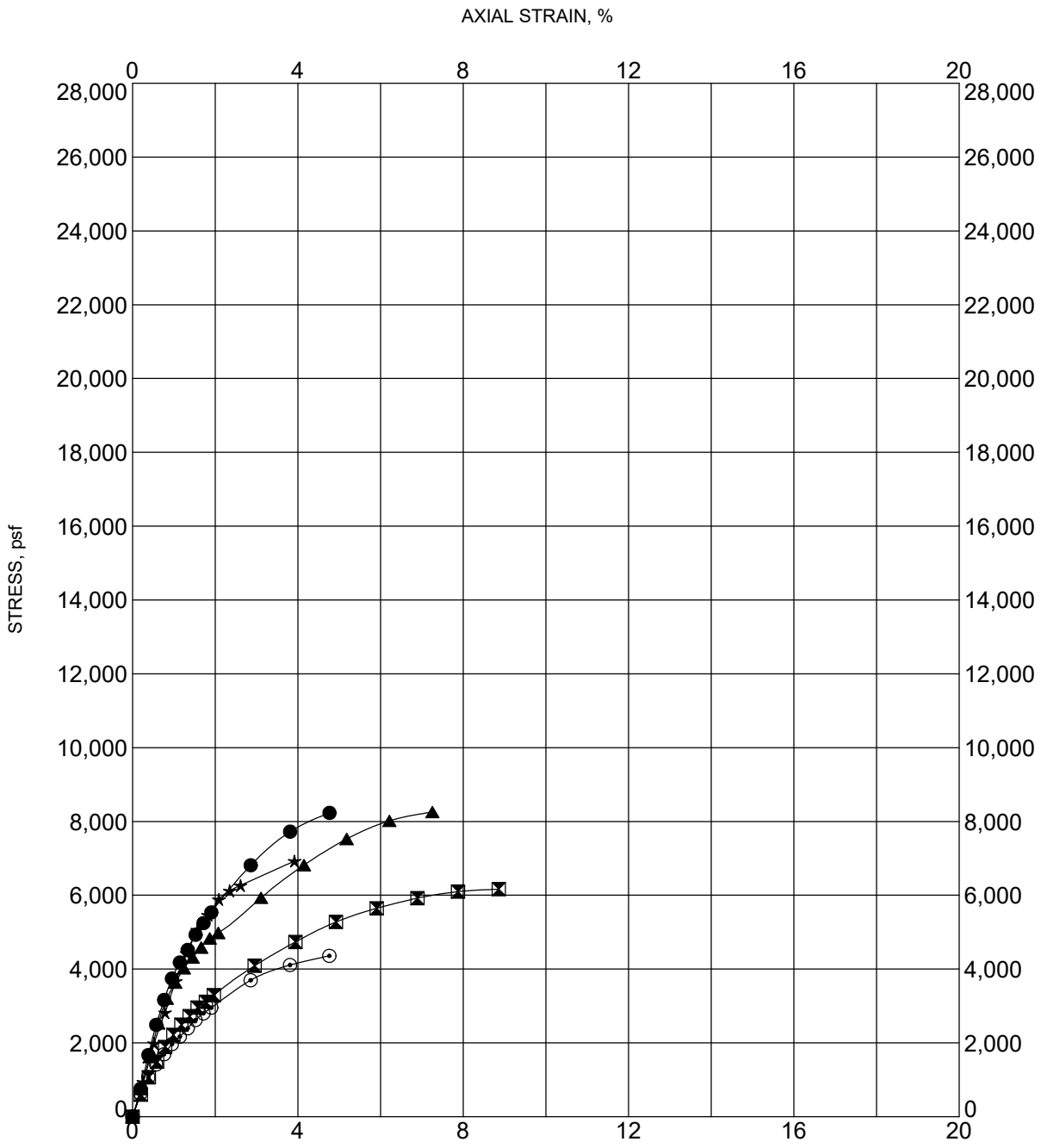

FIGURE B-169

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-281	6 ft	FILL: LEAN CLAY (CL)				103.9	14.3
⧗ DP-282	0 ft	FILL: FAT CLAY (CH)				101.8	20.5
▲ DP-284	0 ft	FILL: LEAN CLAY (CL)				108.7	16.1
★ DP-285	6 ft	FILL: SANDY LEAN CLAY (CL)				101.2	13.8
⊙ DP-287	20 ft	FAT CLAY (CH)				96.7	24.5

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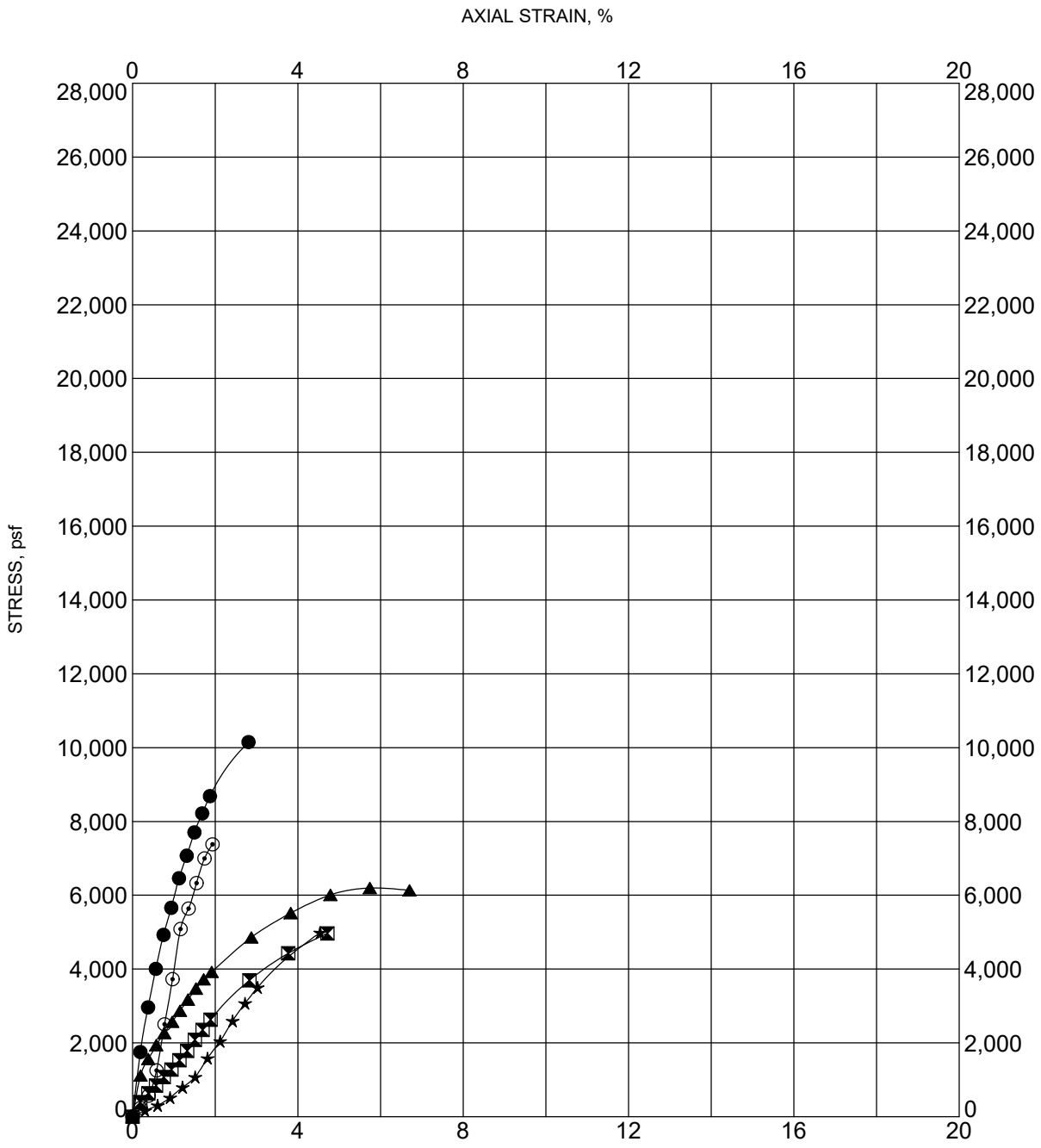

FIGURE B-170

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-288	8 ft	FAT CLAY (CH)				103.7	16.6
⧗ DP-289	6 ft	FAT CLAY (CH)				105.6	14.5
▲ DP-290	6 ft	FILL: LEAN CLAY (CL)				104.8	21.4
★ DP-291	8 ft	CLAY LEAN (CL)				104.6	13.4
⊙ DP-292	2 ft	FILL: LEAN CLAY (CL)				103.1	17.2

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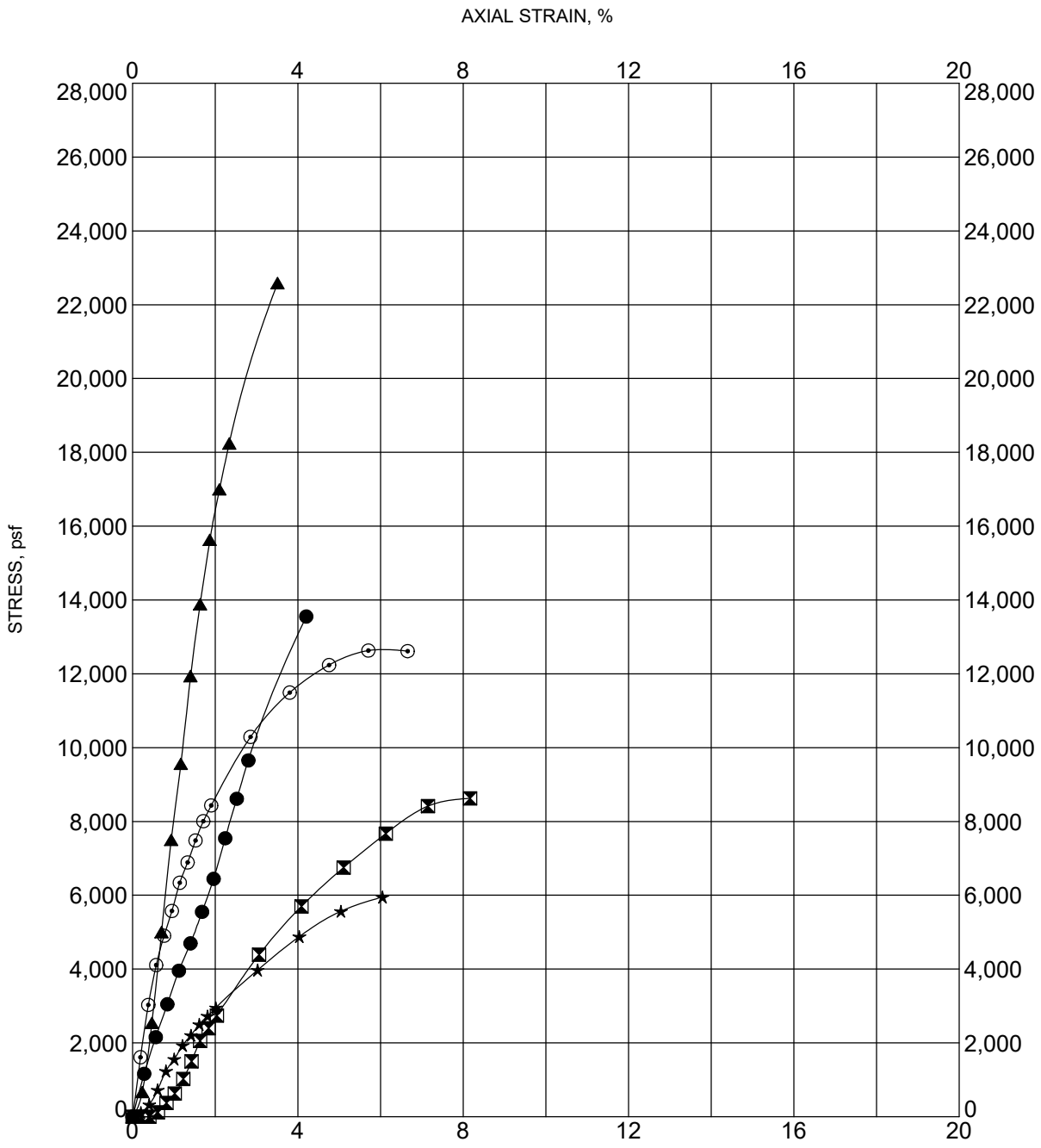

FIGURE B-171

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-293	2 ft	FILL: LEAN CLAY (CL)				115.8	10.6
⊠ DP-294	8 ft	FILL: LEAN CLAY (CL)				106.7	17.2
▲ DP-295	2 ft	FILL: FAT CLAY (CH)				106.8	18.6
★ DP-296	8 ft	FILL: LEAN CLAY (CL)				99.8	22.2
⊙ DP-297	2 ft	FILL: LEAN CLAY (CL)				109.7	15.4

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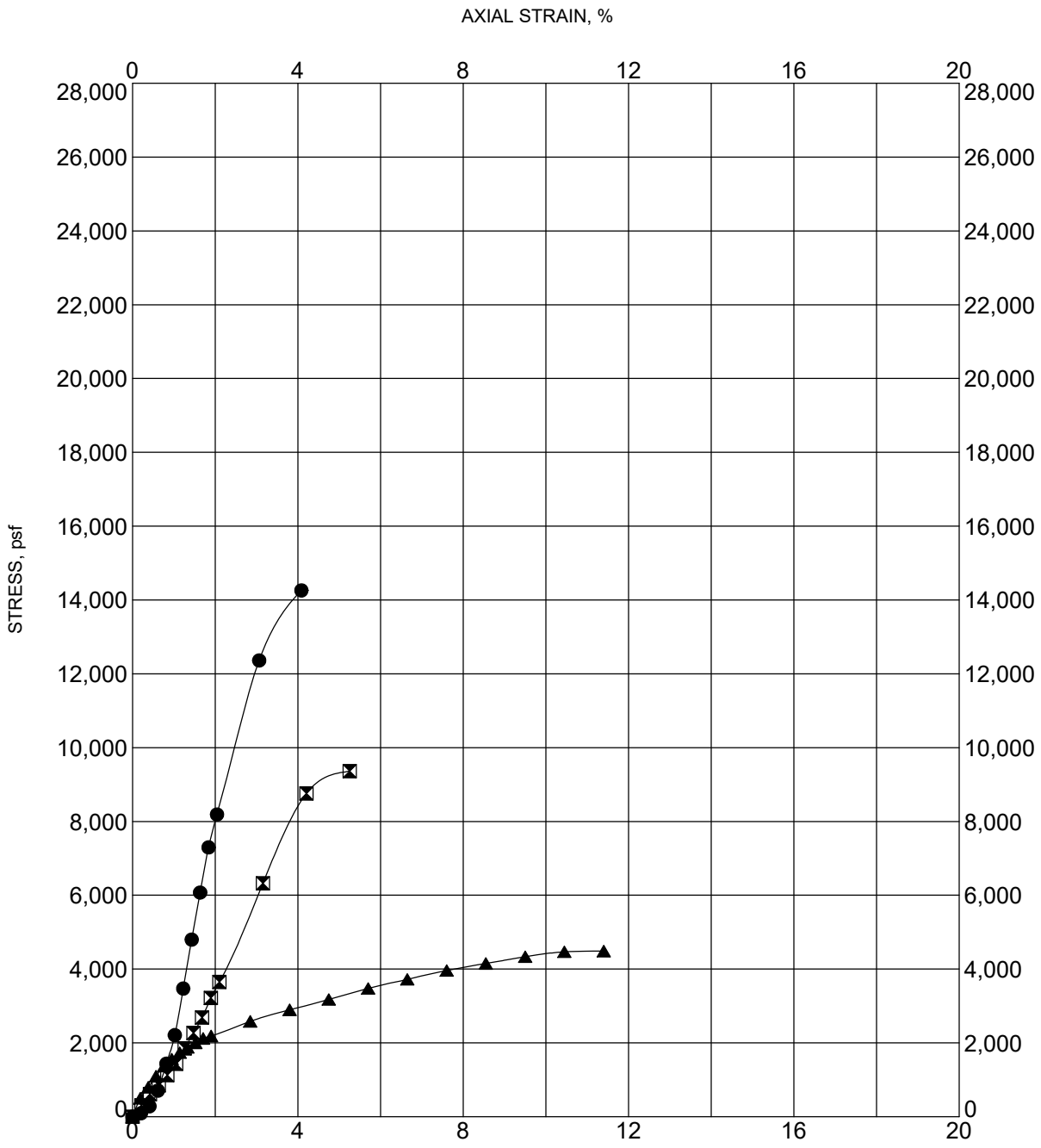

FIGURE B-172

Specimen Identification		Classification	Shear Str. (tsf)	Failure Strain (%)	PI	Dry Unit Weight (pcf)	w (%)
● DP-298	0 ft	FILL: LEAN CLAY (CL)				105.2	18.7
⊠ DP-299	2 ft	FILL: LEAN CLAY (CL)				114.3	11.8
▲ DP-300	8 ft	FAT CLAY (CH)				93.3	25.8

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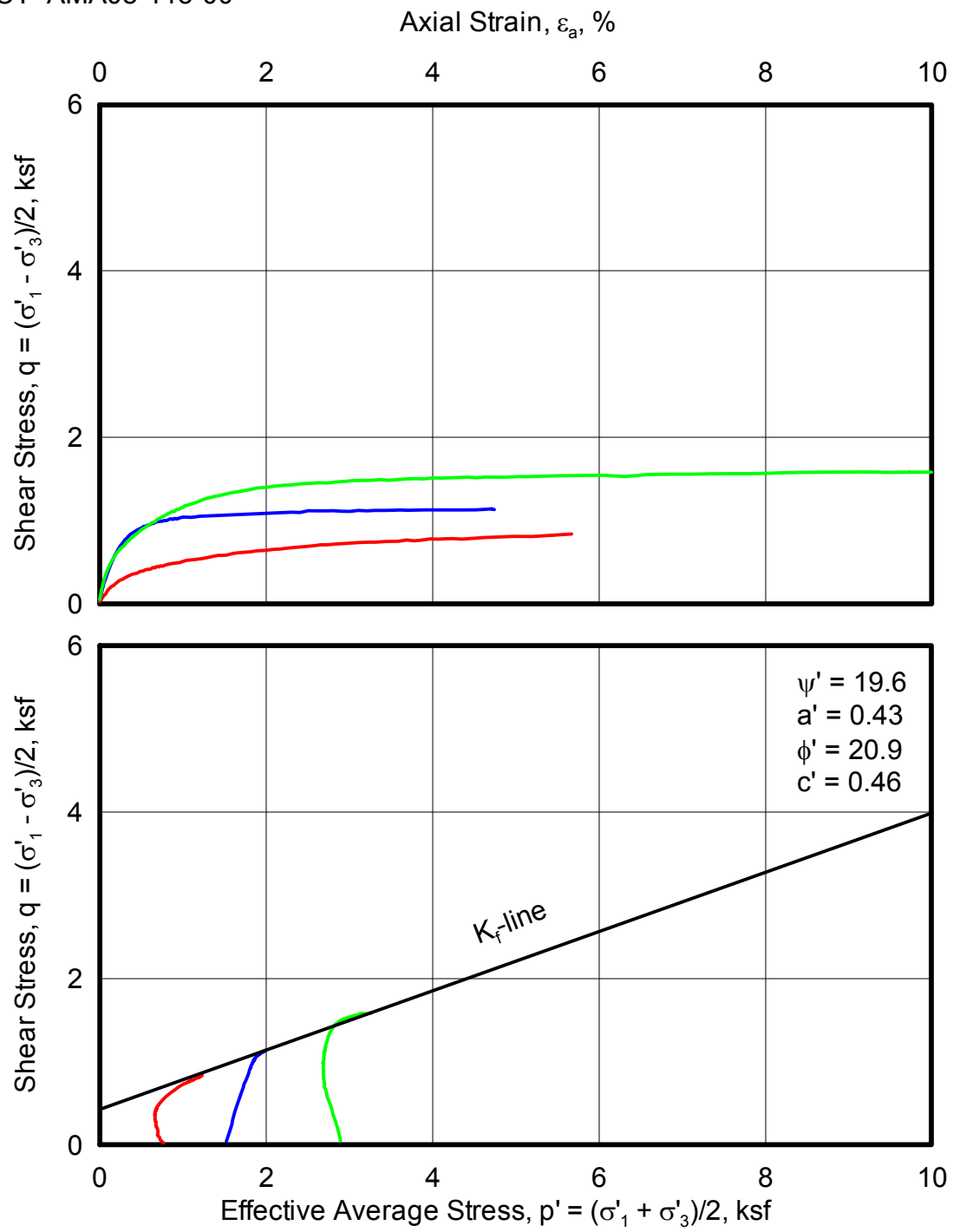

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-8, 8 TO 10 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 21.3
INITIAL DRY UNIT WEIGHT: 96.1 pcf
INITIAL VOID RATIO: 0.79
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 27.7
INITIAL DEGREE OF SATURATION: 74.4%
FINAL DEGREE OF SATURATION: 100.0%
LL = 48; PL = 25; PI = 23

FIGURE 173a

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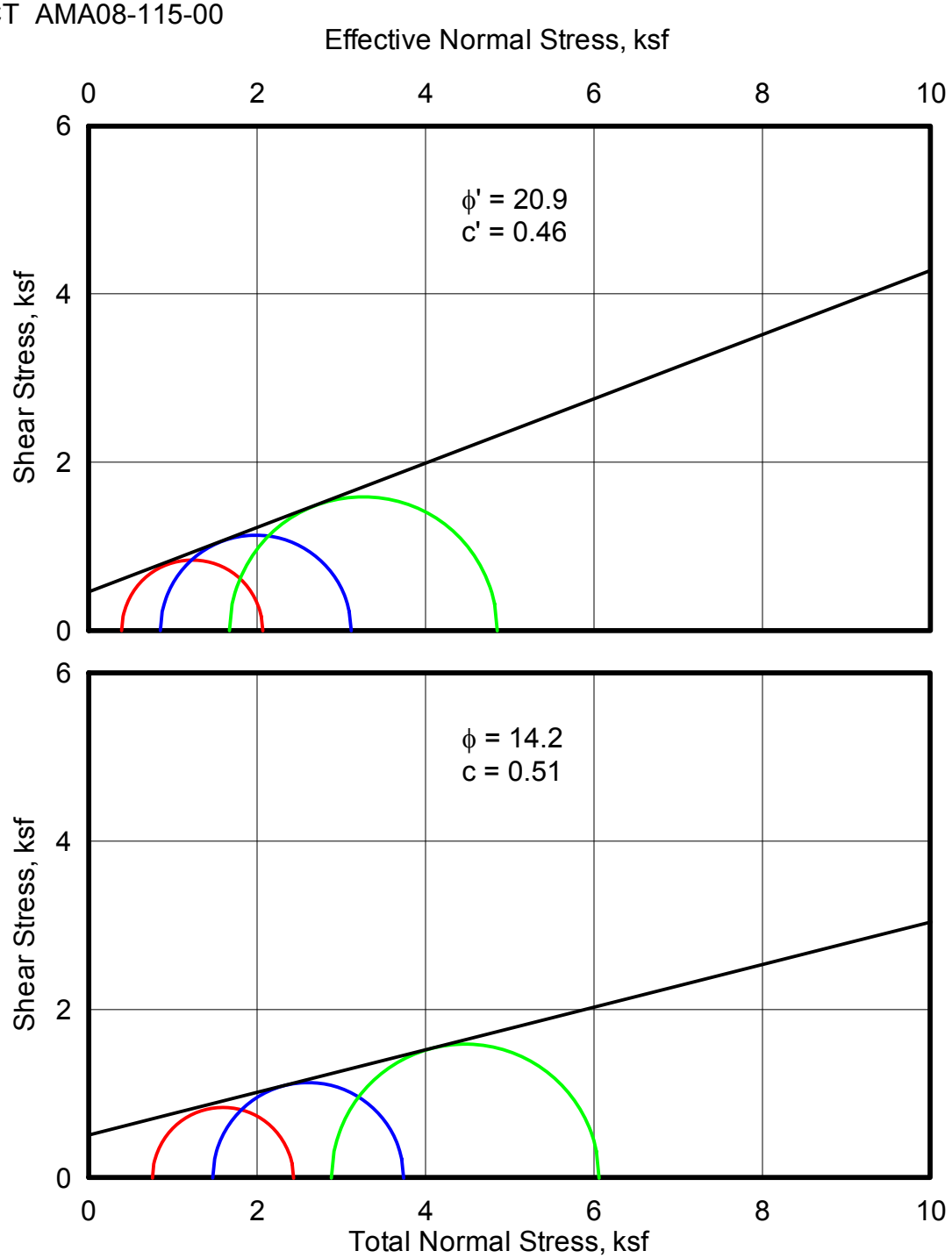
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-8, 8 TO 10 FEET

MATERIAL: LEAN CLAY (CL)
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LL = 48; PL = 25; PI = 23

FIGURE 173b

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MOHR'S CIRCLES

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CAMERON COUNTY, TEXAS

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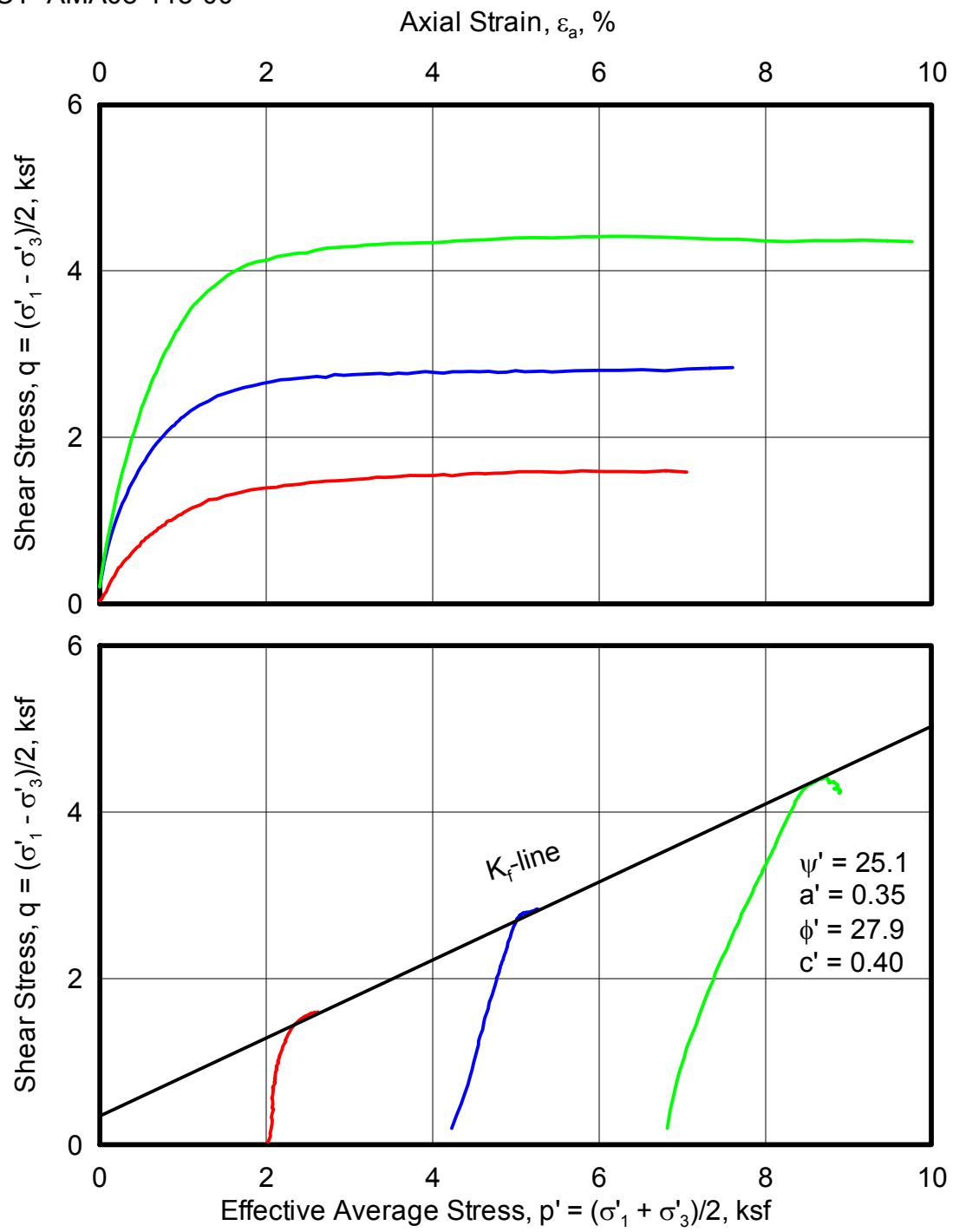

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH

BORING DP-10, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 27.4
INITIAL DRY UNIT WEIGHT: 95.1 pcf
INITIAL VOID RATIO: 0.80
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 36.8
INITIAL DEGREE OF SATURATION: 93.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 55; PL = 24; PI = 31

FIGURE 174a

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CAMERON COUNTY, TEXAS

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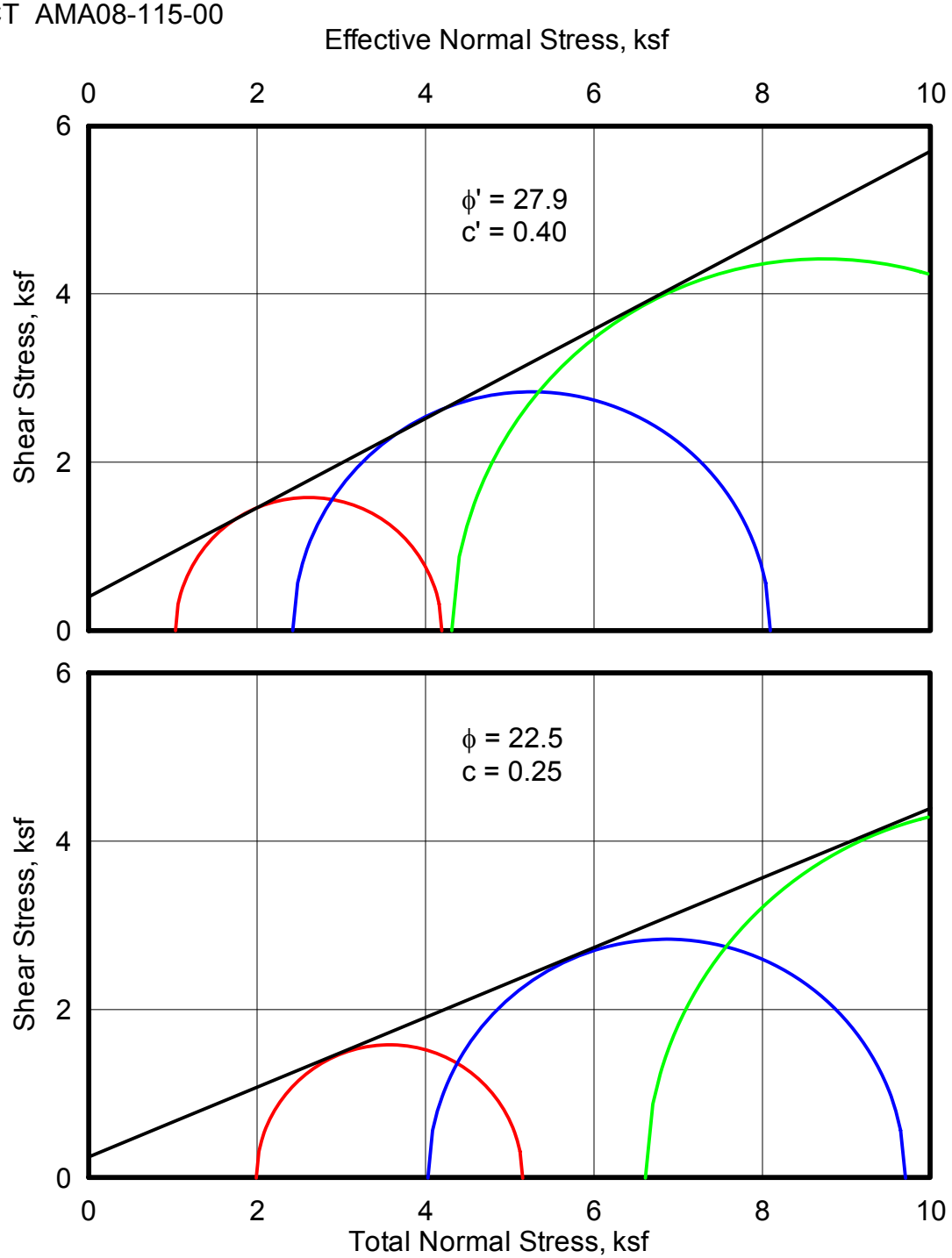

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-10, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 27.4
INITIAL DRY UNIT WEIGHT: 95.1 pcf
INITIAL VOID RATIO: 0.80
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 36.8
INITIAL DEGREE OF SATURATION: 93.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 55; PL = 24; PI = 31

FIGURE 174b

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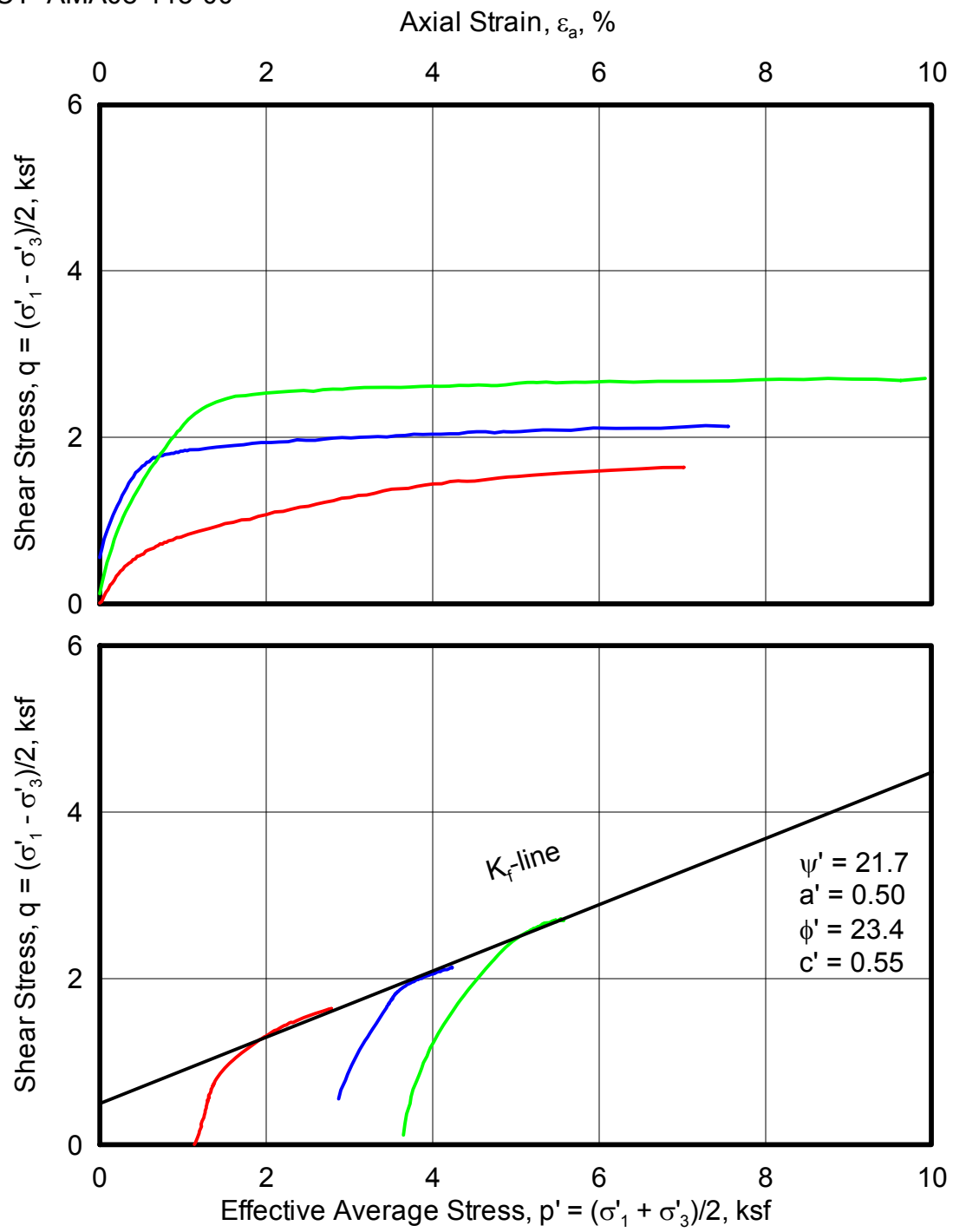

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-34, 8 TO 10 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 25.2
INITIAL DRY UNIT WEIGHT: 99.8 pcf
INITIAL VOID RATIO: 0.72
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 26.6
INITIAL DEGREE OF SATURATION: 96.4%
FINAL DEGREE OF SATURATION: 100.0%
LL = 55; PL = 24; PI = 31

FIGURE 175a

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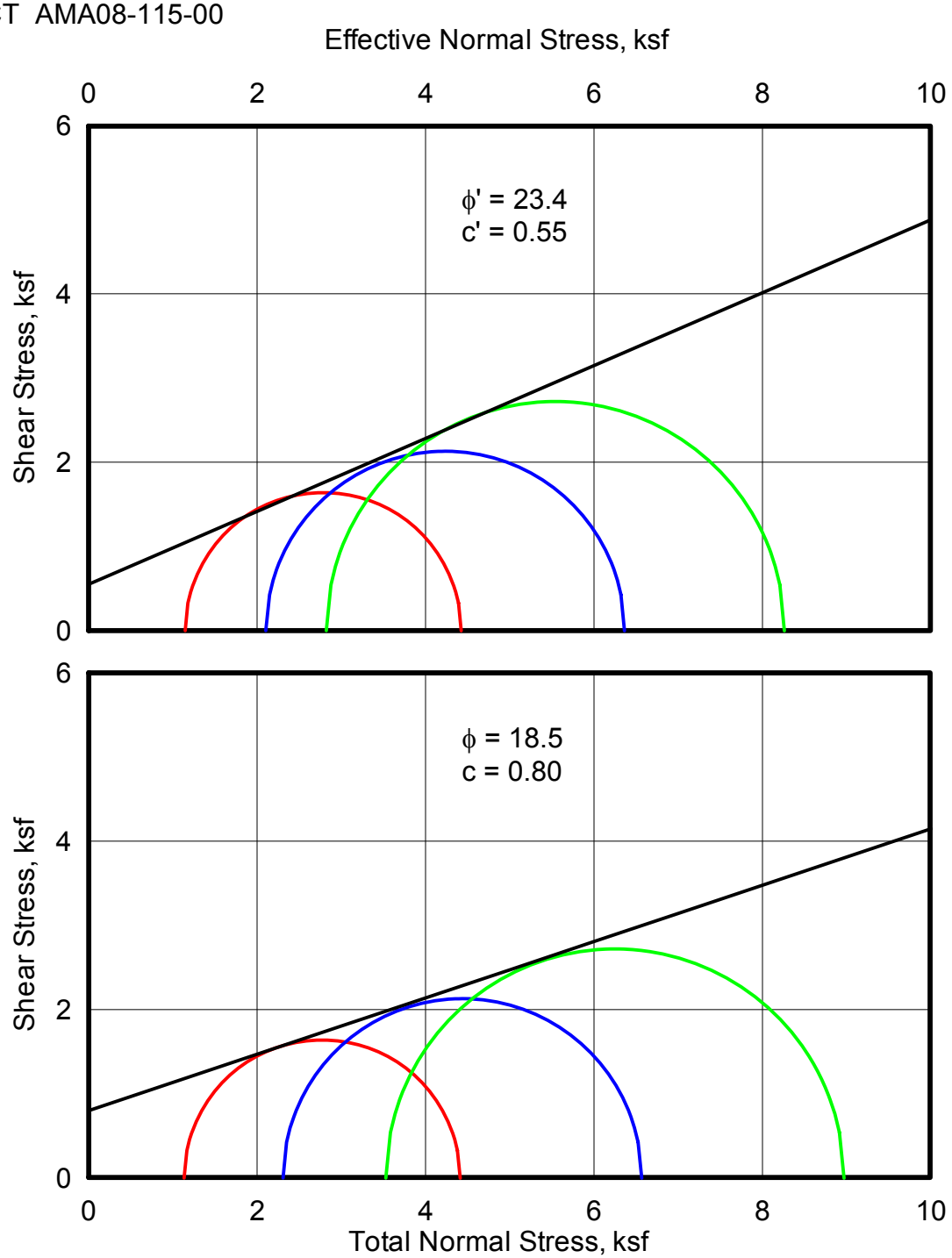

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-34, 8 TO 10 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 25.2
INITIAL DRY UNIT WEIGHT: 99.8 pcf
INITIAL VOID RATIO: 0.72
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 26.6
INITIAL DEGREE OF SATURATION: 96.4%
FINAL DEGREE OF SATURATION: 100.0%
LL = 55; PL = 24; PI = 31

FIGURE 175b

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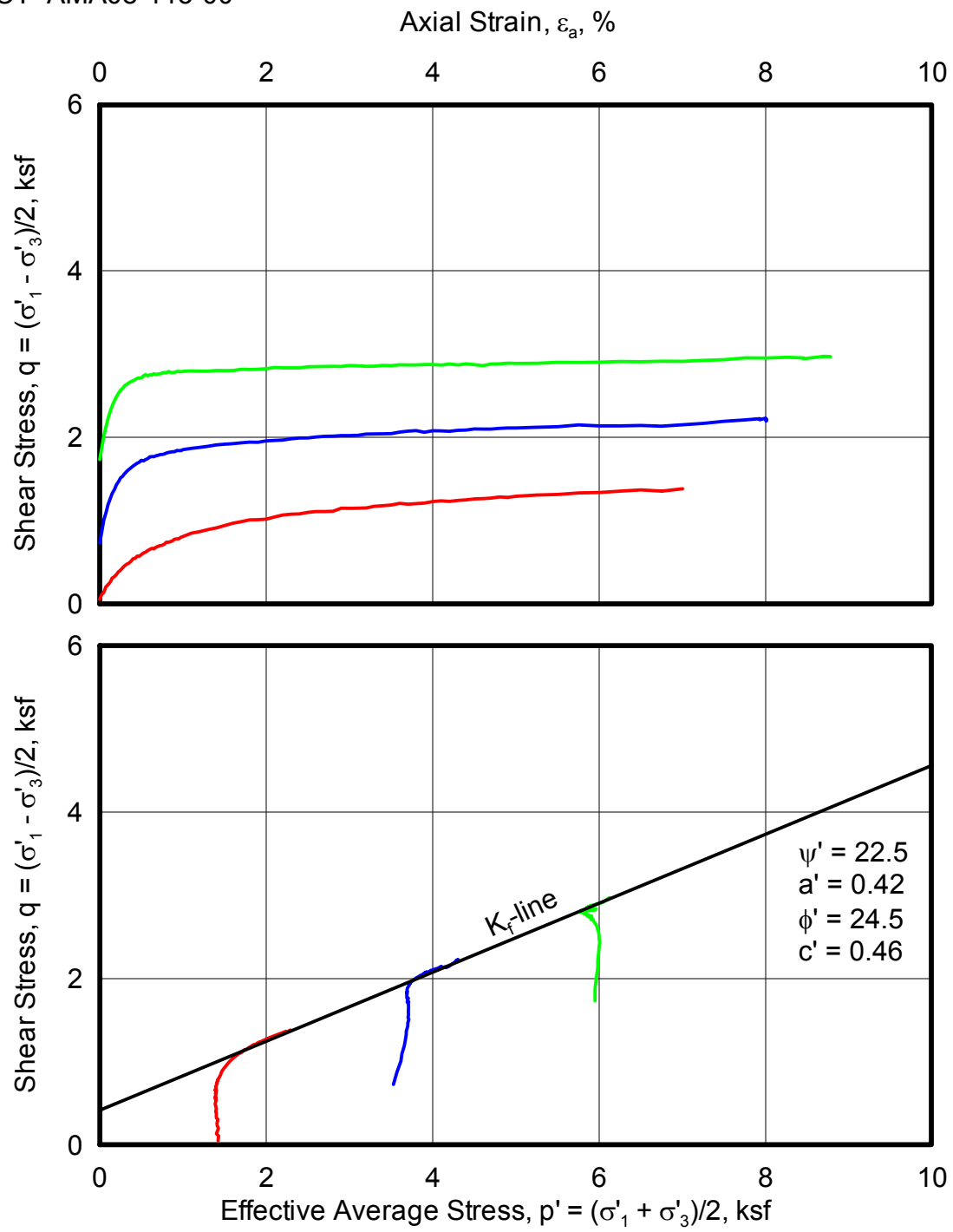

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-42,10 TO 12 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 18.6
INITIAL DRY UNIT WEIGHT: 106.2 pcf
INITIAL VOID RATIO: 0.62
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 20.1
INITIAL DEGREE OF SATURATION: 82.9%
FINAL DEGREE OF SATURATION: 100.0%
LL = 47; PL = 19; PI = 28

FIGURE 176a

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STRESS PATH

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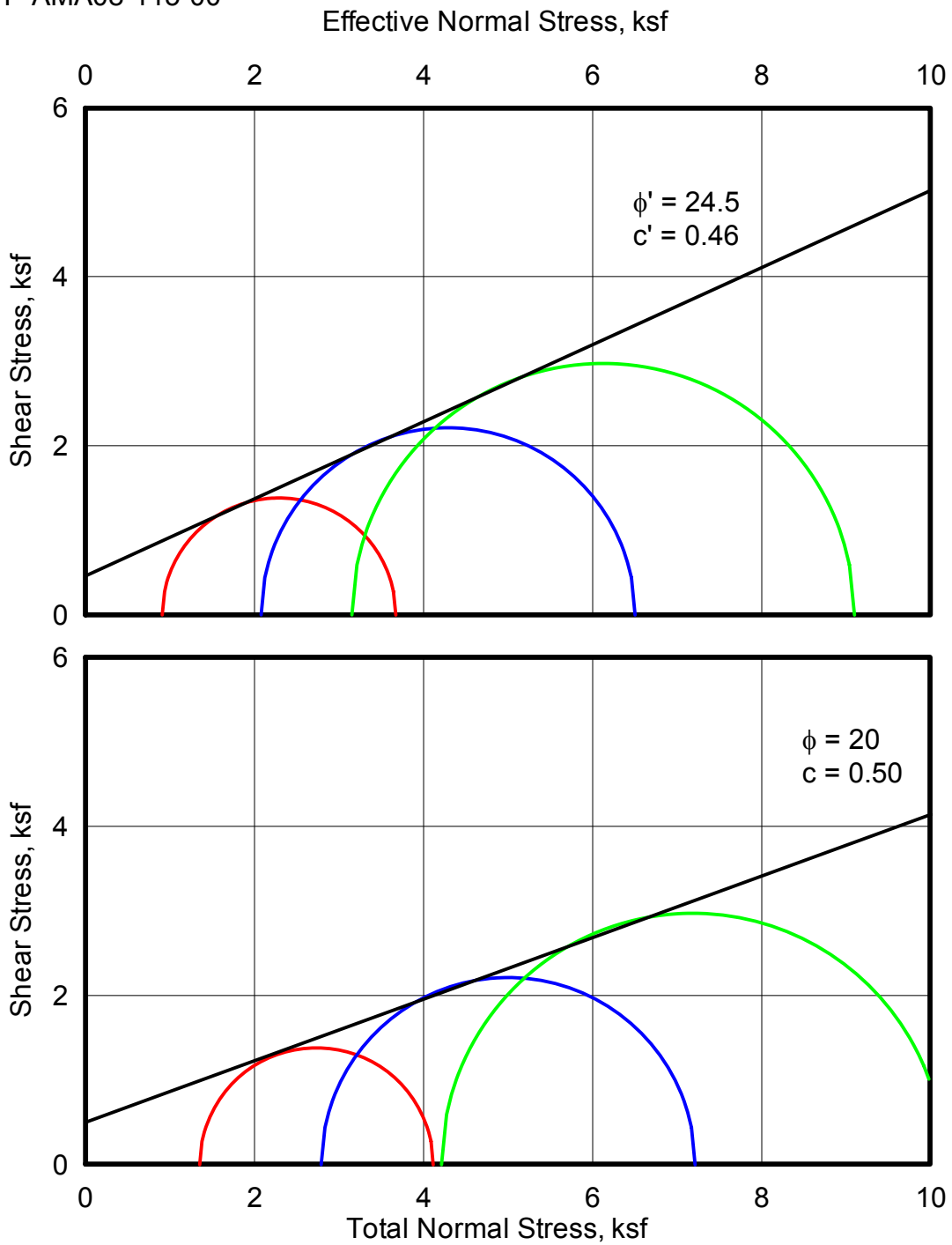

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-42,10 TO 12 FEET

MATERIAL: LEAN CLAY (CL)
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SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 20.1
INITIAL DEGREE OF SATURATION: 82.9%
FINAL DEGREE OF SATURATION: 100.0%
LL = 47; PL = 19; PI = 28

FIGURE 176b

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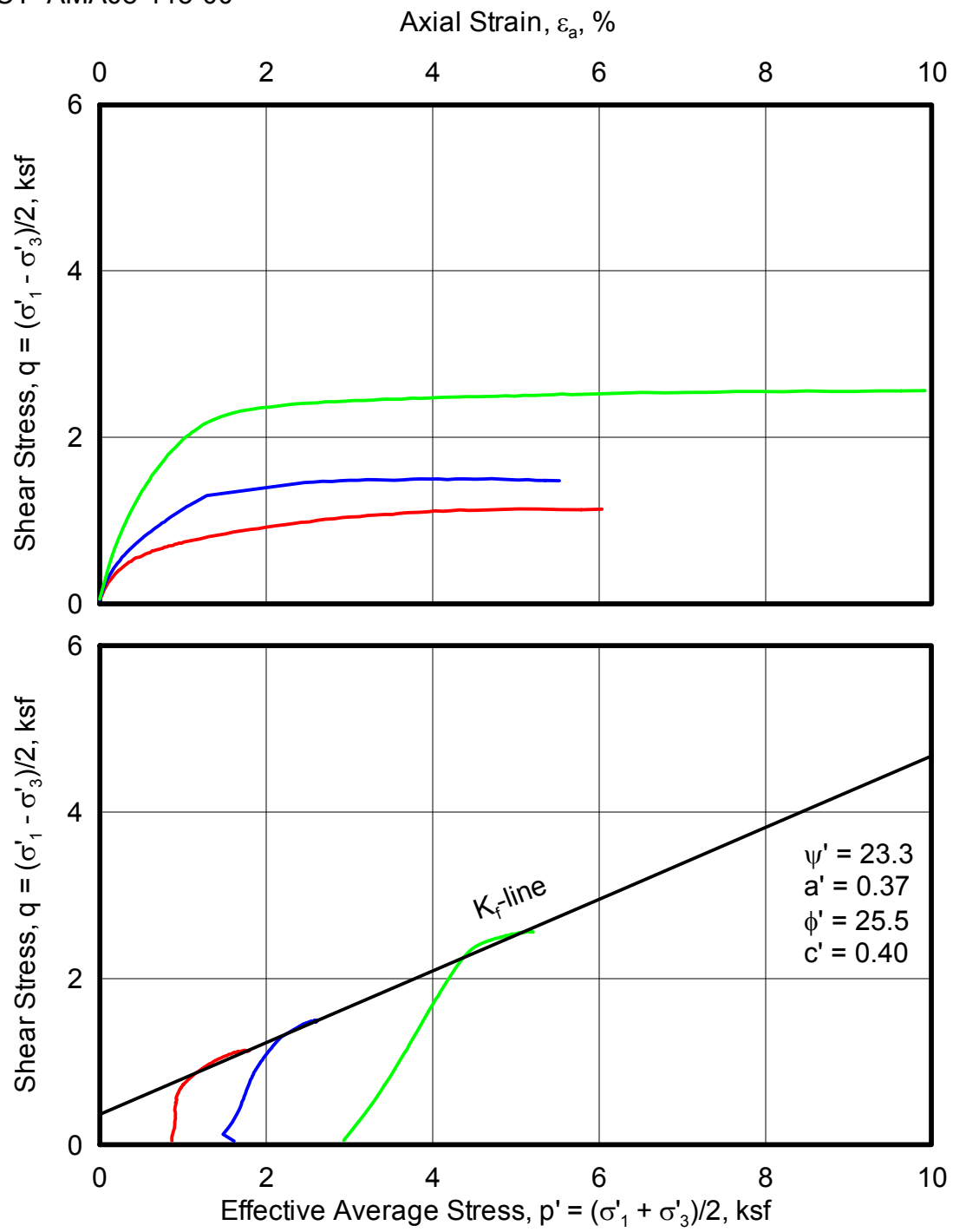

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-51, 4 TO 6 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 15.0
INITIAL DRY UNIT WEIGHT: 105.3 pcf
INITIAL VOID RATIO: 0.63
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.4
INITIAL DEGREE OF SATURATION: 65.5%
FINAL DEGREE OF SATURATION: 100.0%
LL = 50; PL = 23; PI = 27

FIGURE 177a

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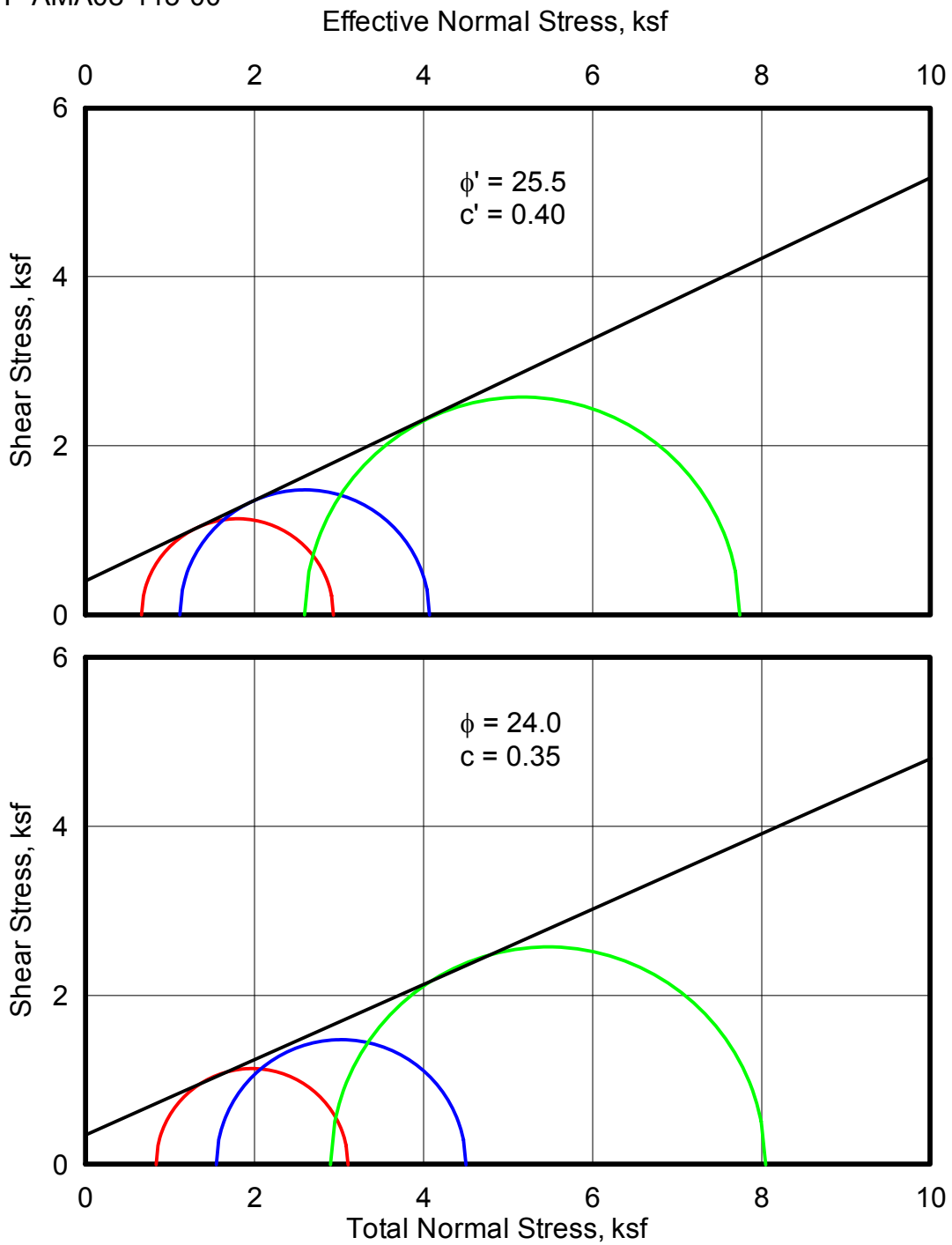
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-51, 4 TO 6 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 15.0
INITIAL DRY UNIT WEIGHT: 105.3 pcf
INITIAL VOID RATIO: 0.63
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.4
INITIAL DEGREE OF SATURATION: 65.5%
FINAL DEGREE OF SATURATION: 100.0%
LL = 50; PL = 23; PI = 27

FIGURE 177b

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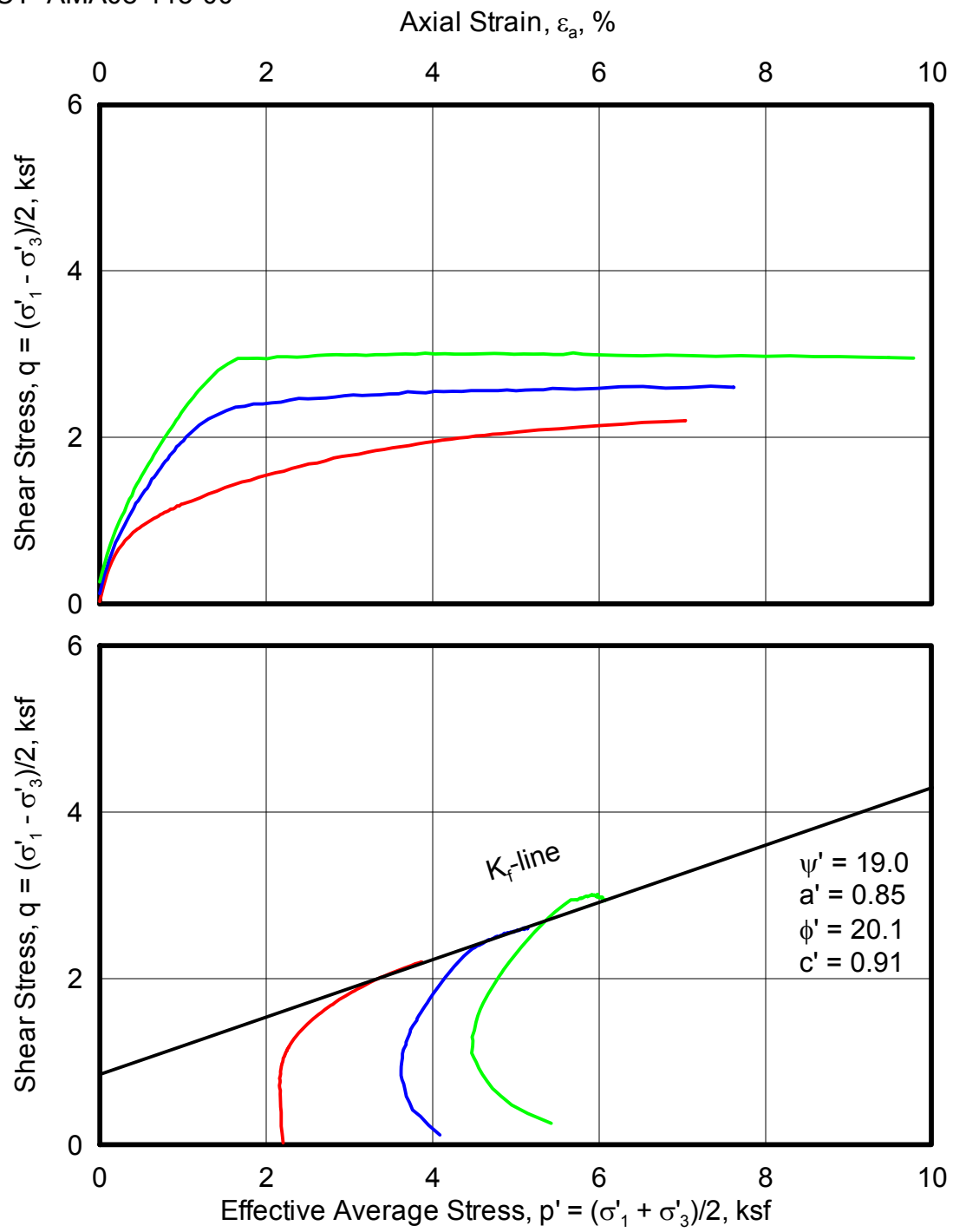
MOHR'S CIRCLES

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-66, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.9
INITIAL DRY UNIT WEIGHT: 100.9 pcf
INITIAL VOID RATIO: 0.70
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 25.1
INITIAL DEGREE OF SATURATION: 93.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 56; PL = 24; PI = 32

FIGURE 178a

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STRESS PATH

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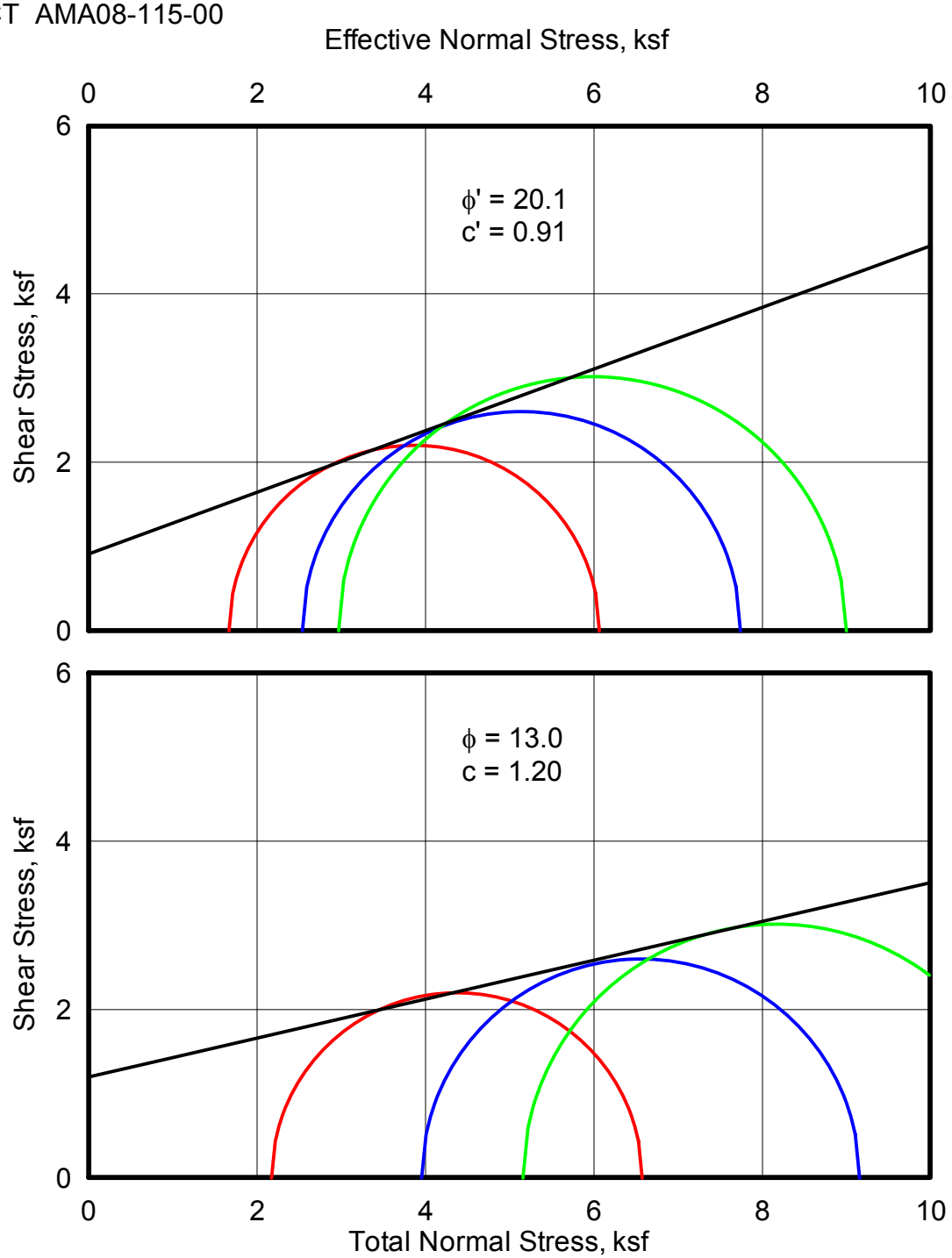
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-66, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.9
INITIAL DRY UNIT WEIGHT: 100.9 pcf
INITIAL VOID RATIO: 0.70
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 25.1
INITIAL DEGREE OF SATURATION: 93.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 56; PL = 24; PI = 32

FIGURE 178b

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CAMERON COUNTY, TEXAS

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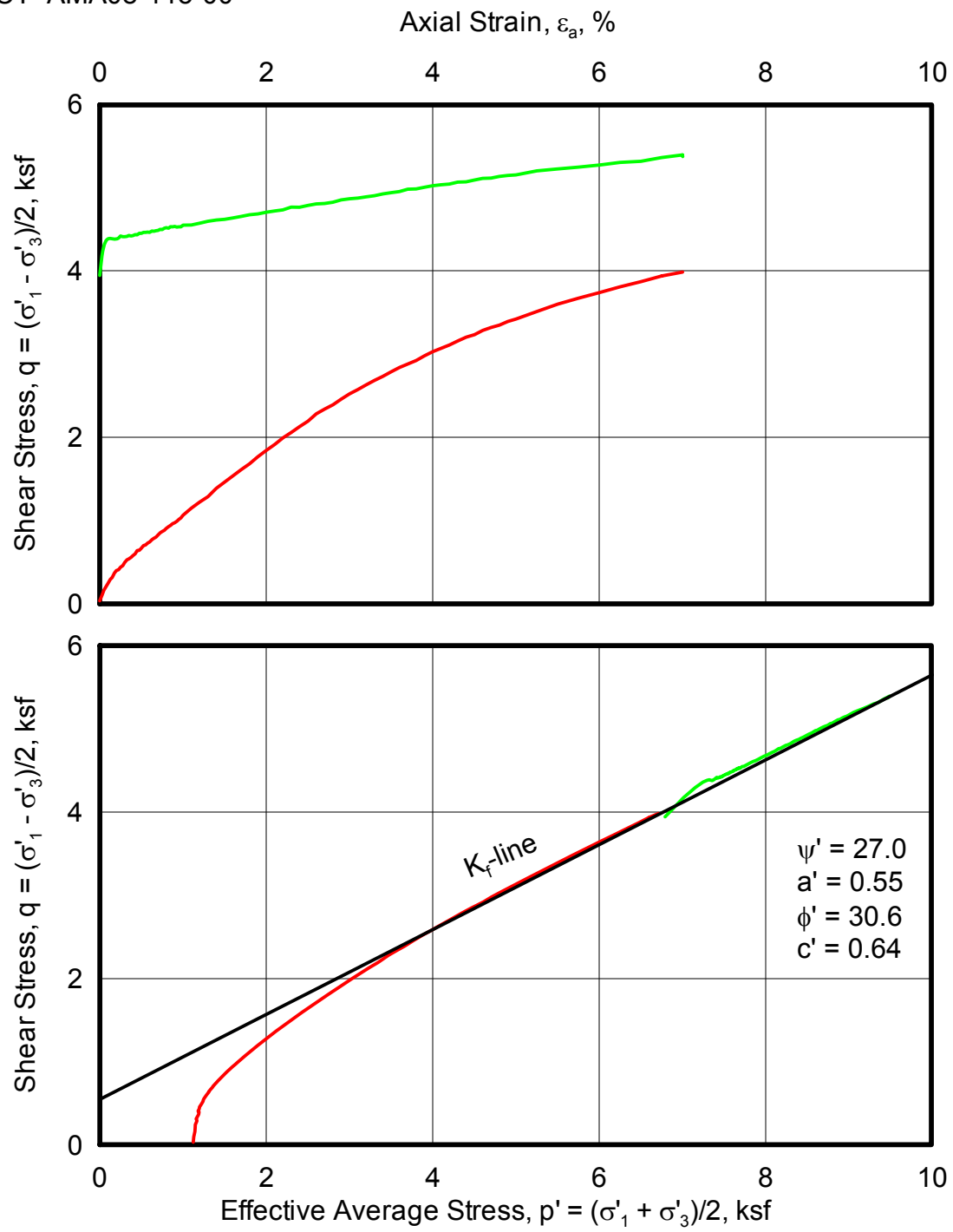

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-72, 6 TO 8 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 18.8
INITIAL DRY UNIT WEIGHT: 105.4 pcf
INITIAL VOID RATIO: 0.63
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 21.5
INITIAL DEGREE OF SATURATION: 82.3%
FINAL DEGREE OF SATURATION: 100.0%
LL = 33; PL = 19; PI = 14

FIGURE 179a

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STRESS PATH

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LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

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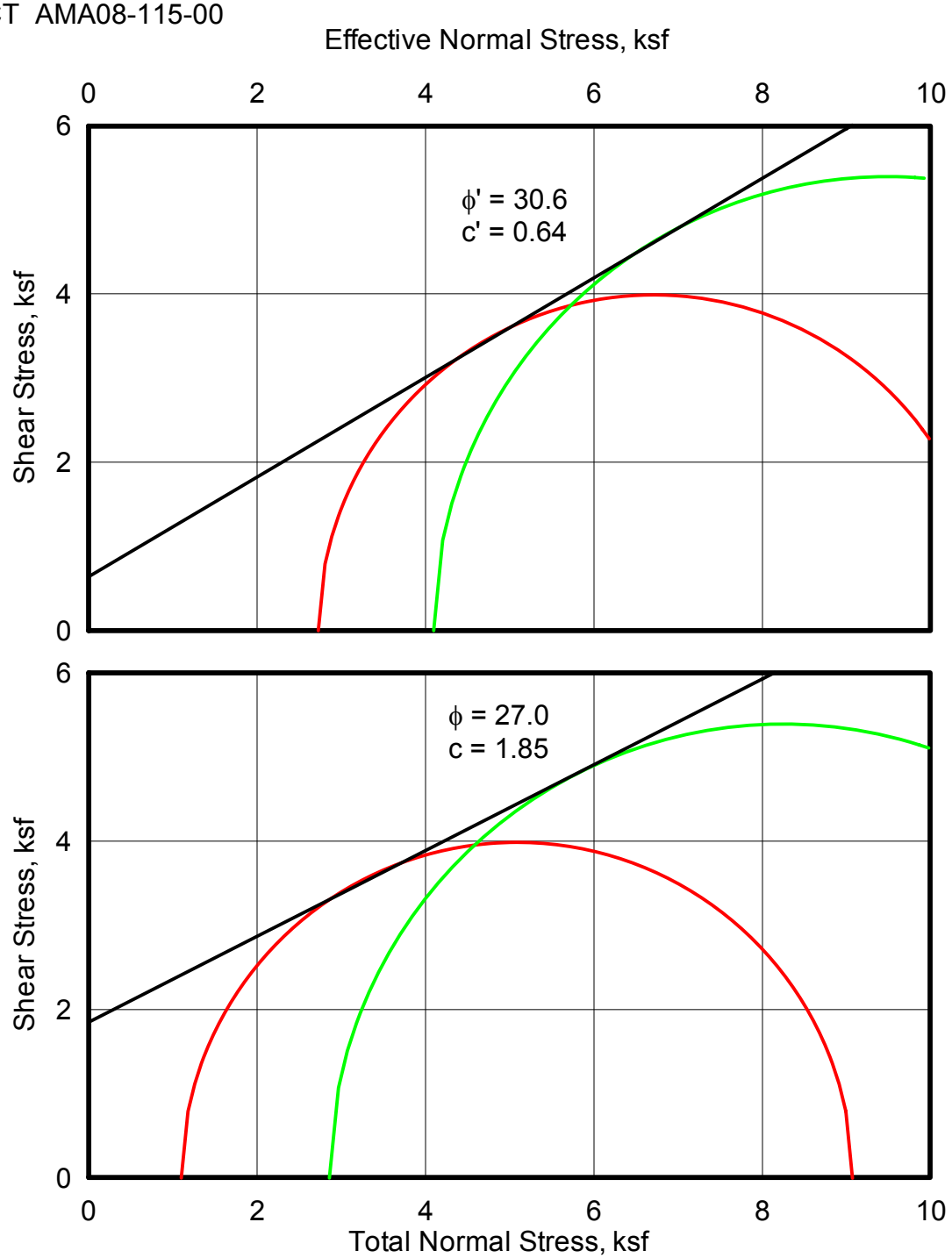

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-72, 6 TO 8 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 18.8
INITIAL DRY UNIT WEIGHT: 105.4 pcf
INITIAL VOID RATIO: 0.63
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 21.5
INITIAL DEGREE OF SATURATION: 82.3%
FINAL DEGREE OF SATURATION: 100.0%
LL = 33; PL = 19; PI = 14

FIGURE 179b

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CAMERON COUNTY, TEXAS

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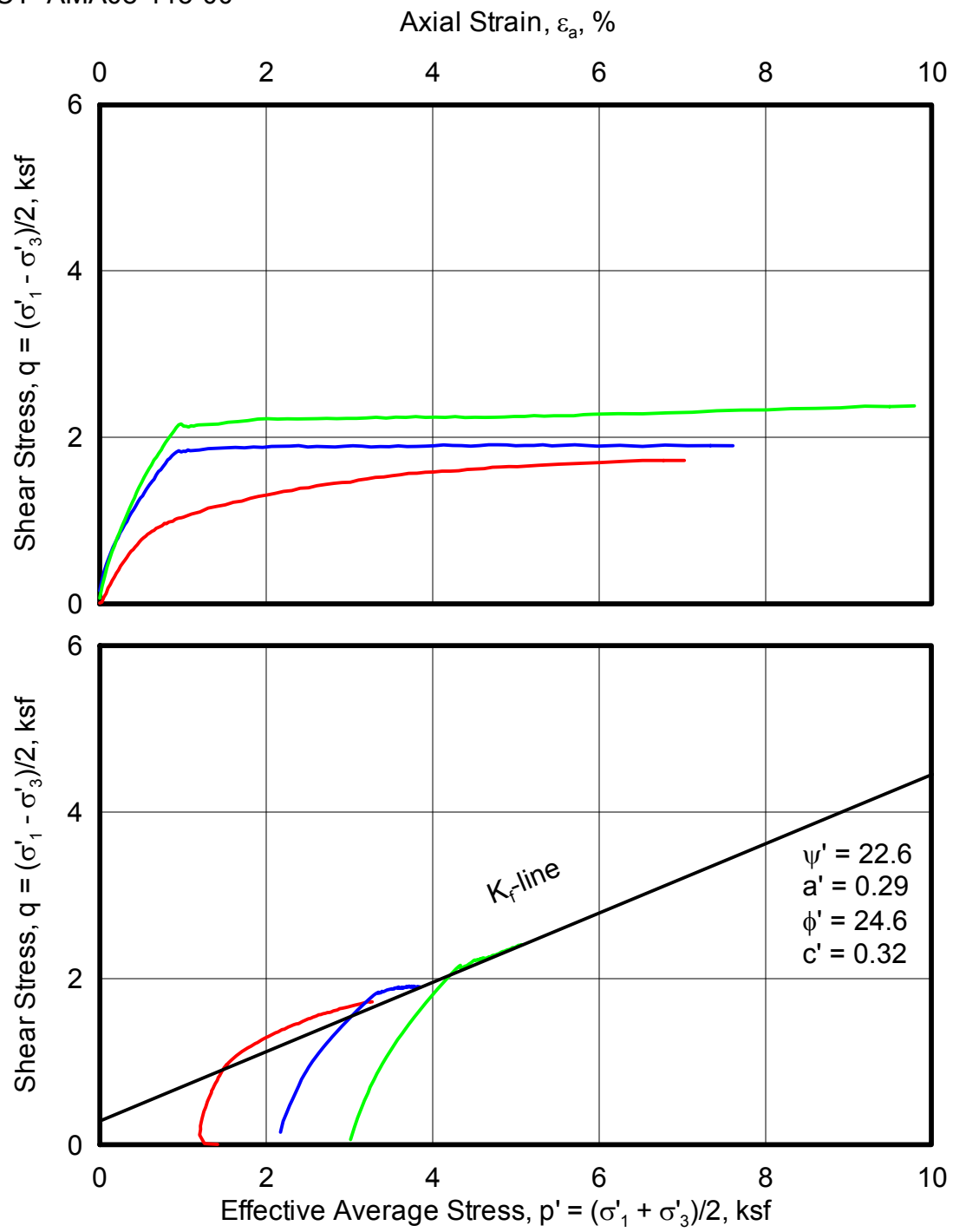

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-75, 6 TO 8 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 33.2
INITIAL DRY UNIT WEIGHT: 83.8 pcf
INITIAL VOID RATIO: 1.05
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 38.3
INITIAL DEGREE OF SATURATION: 86.9%
FINAL DEGREE OF SATURATION: 100.0%
LL = 55; PL = 24; PI = 31

FIGURE 180a

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STRESS PATH

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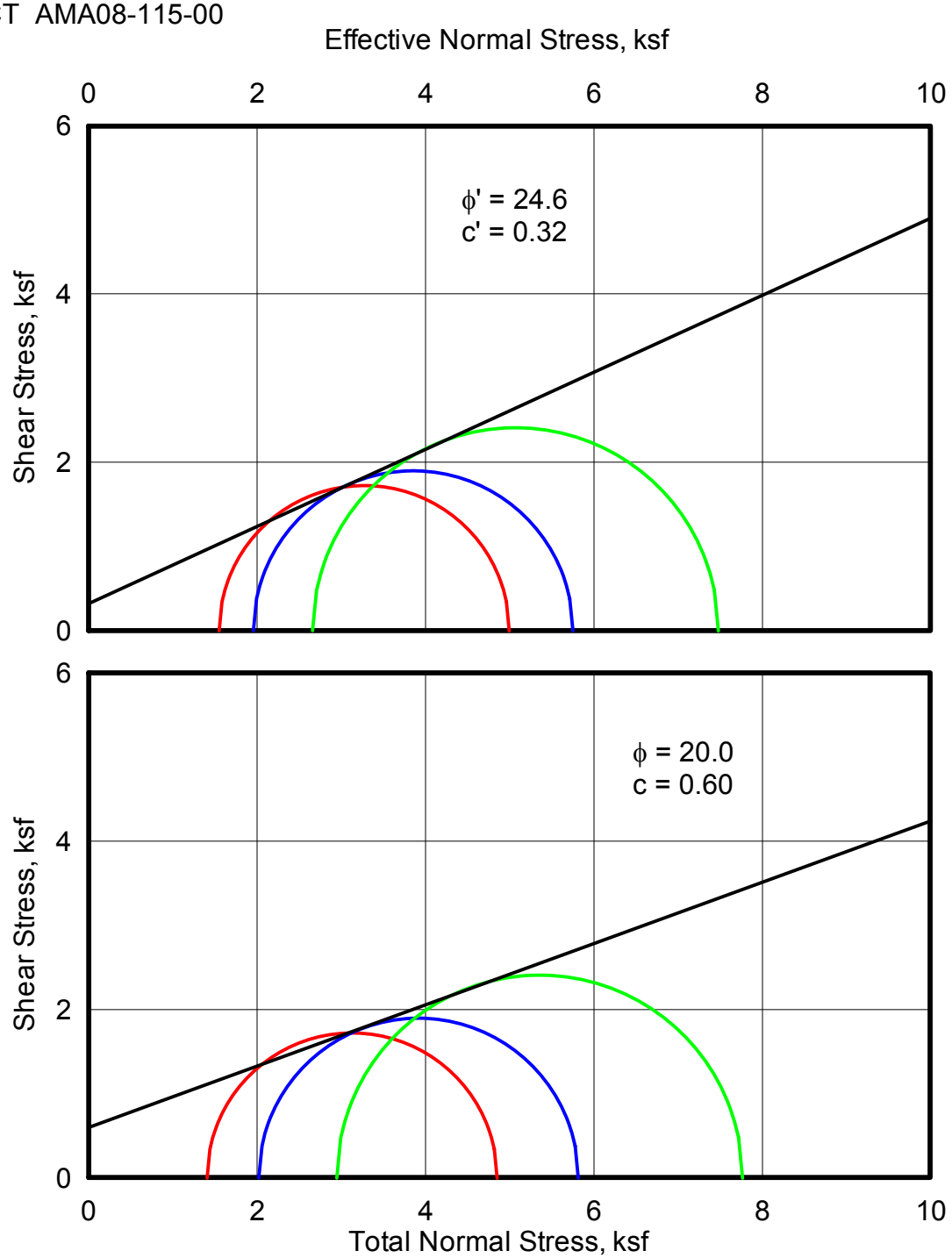
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-75, 6 TO 8 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 33.2
INITIAL DRY UNIT WEIGHT: 83.8 pcf
INITIAL VOID RATIO: 1.05
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 38.3
INITIAL DEGREE OF SATURATION: 86.9%
FINAL DEGREE OF SATURATION: 100.0%
LL = 55; PL = 24; PI = 31

FIGURE 180b

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MOHR'S CIRCLES

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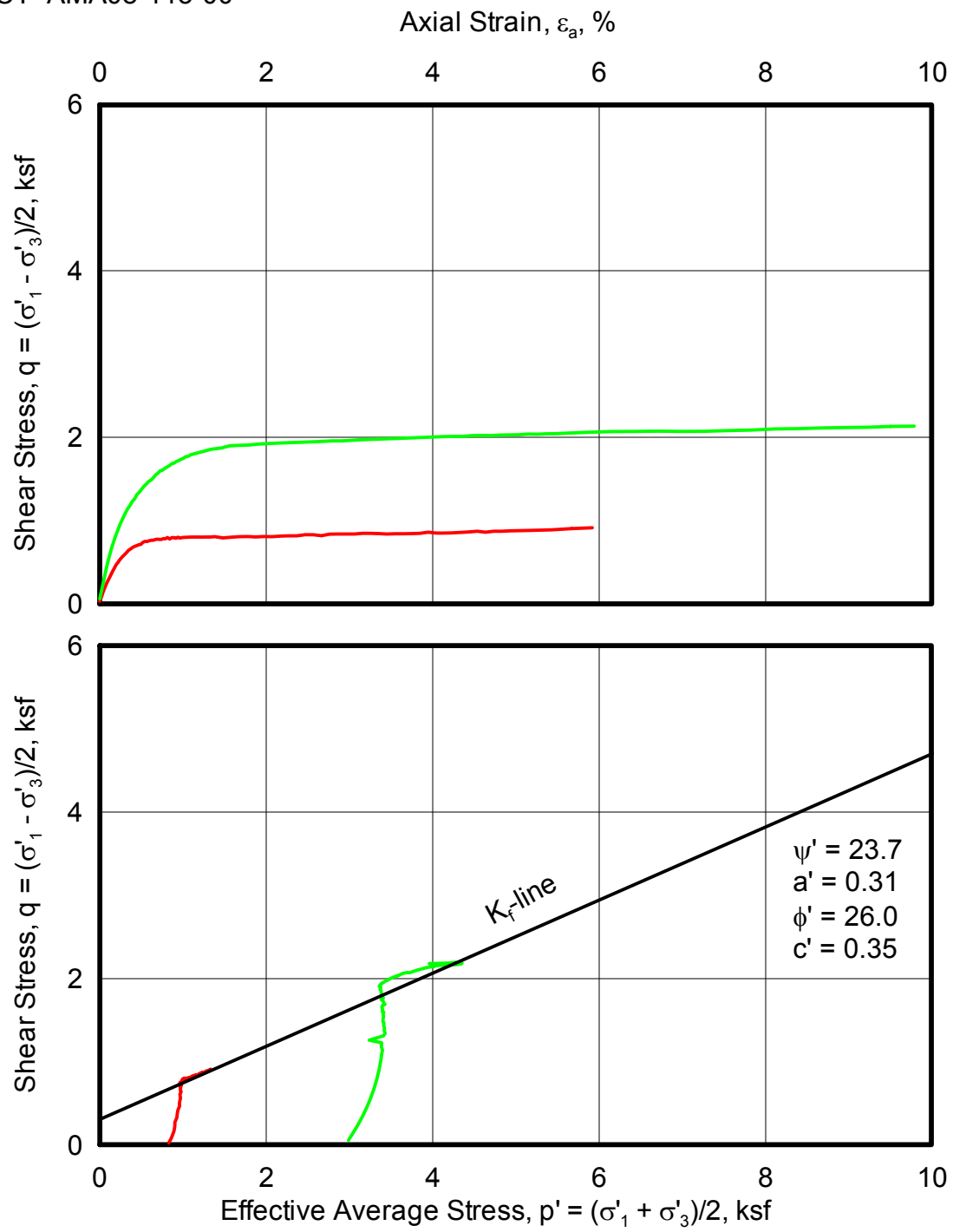
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-81, 2 TO 4 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 14.7
INITIAL DRY UNIT WEIGHT: 114.6 pcf
INITIAL VOID RATIO: 0.50
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 21.8
INITIAL DEGREE OF SATURATION: 81.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 57; PL = 18; PI = 39

FIGURE 181a

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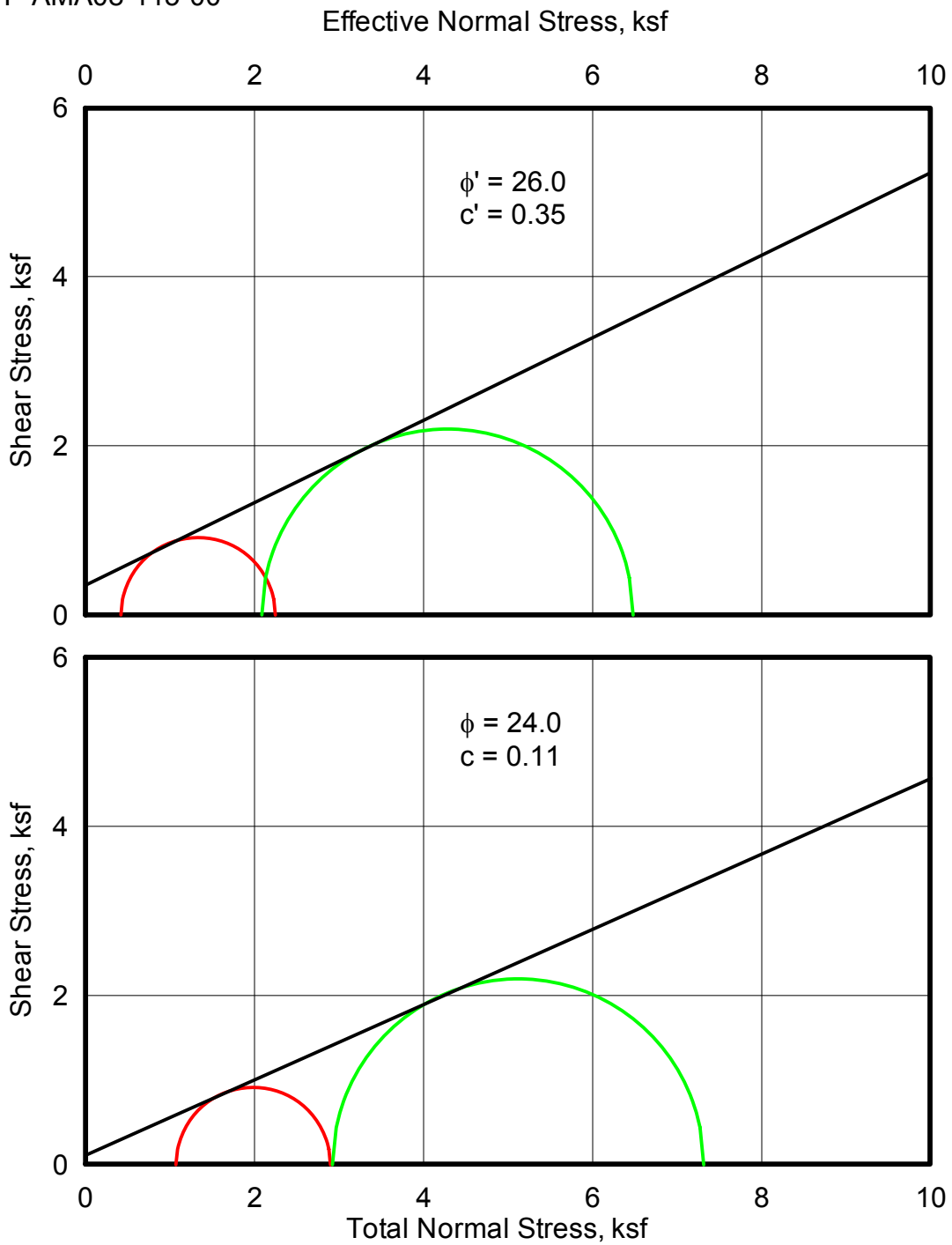
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-81, 2 TO 4 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 14.7
INITIAL DRY UNIT WEIGHT: 114.6 pcf
INITIAL VOID RATIO: 0.50
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 21.8
INITIAL DEGREE OF SATURATION: 81.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 57; PL = 18; PI = 39

FIGURE 181b

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MOHR'S CIRCLES

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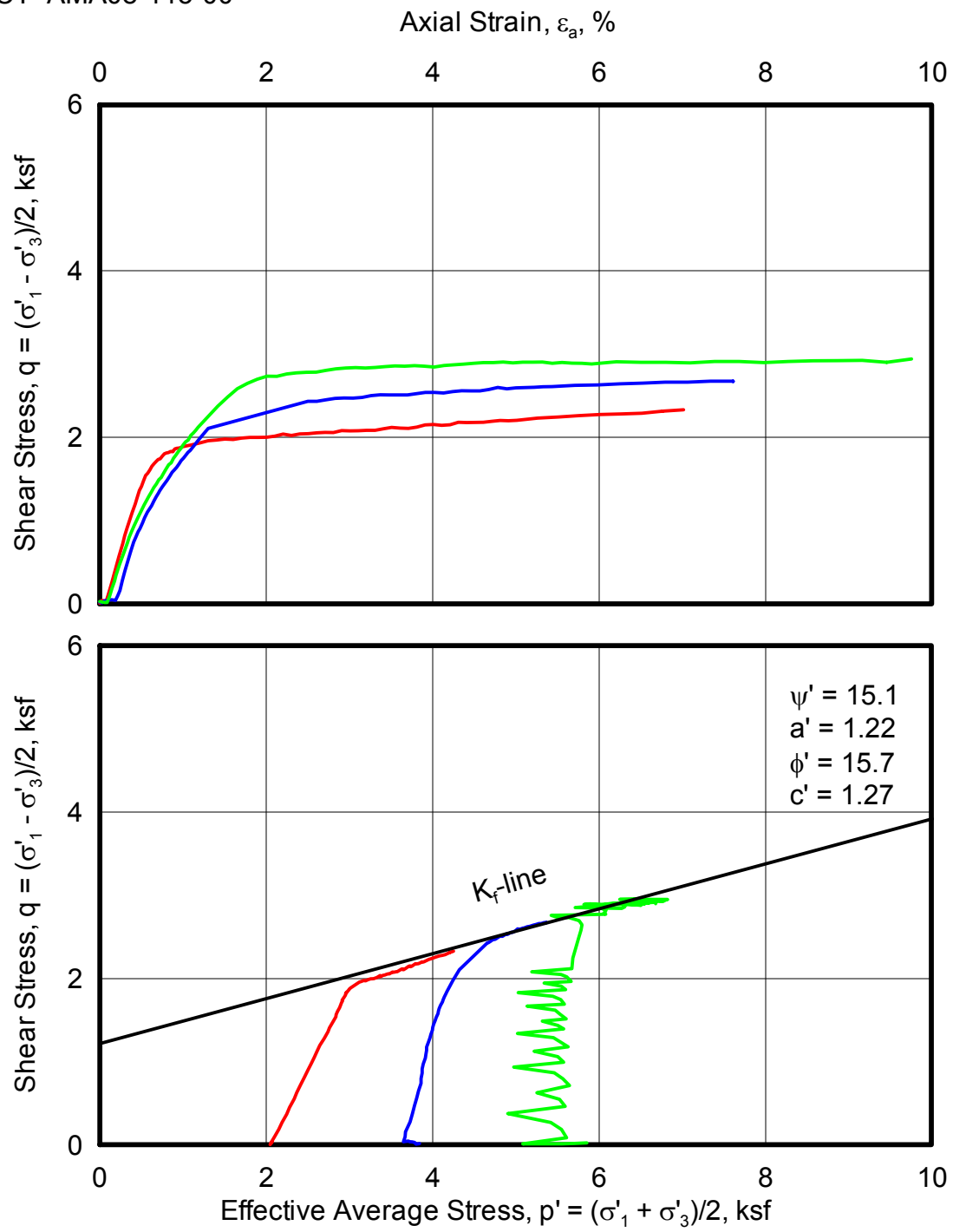
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-83,2 TO 4 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 15.5
INITIAL DRY UNIT WEIGHT: 112.5 pcf
INITIAL VOID RATIO: 0.53
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.0
INITIAL DEGREE OF SATURATION: 81.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 56; PL = 22; PI = 34

FIGURE 182a

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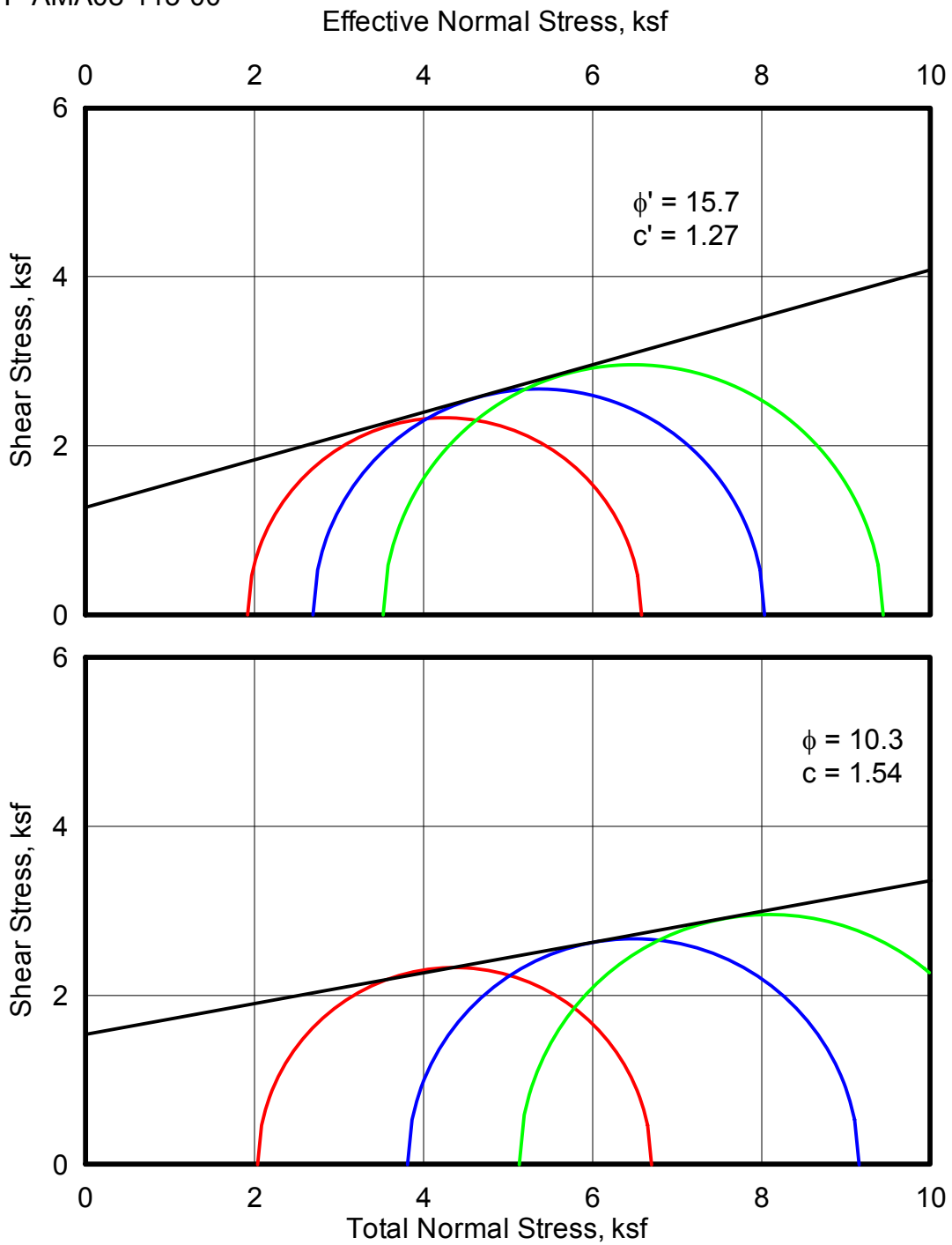
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-83,2 TO 4 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 15.5
INITIAL DRY UNIT WEIGHT: 112.5 pcf
INITIAL VOID RATIO: 0.53
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.0
INITIAL DEGREE OF SATURATION: 81.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 56; PL = 22; PI = 34

FIGURE 182b

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MOHR'S CIRCLES

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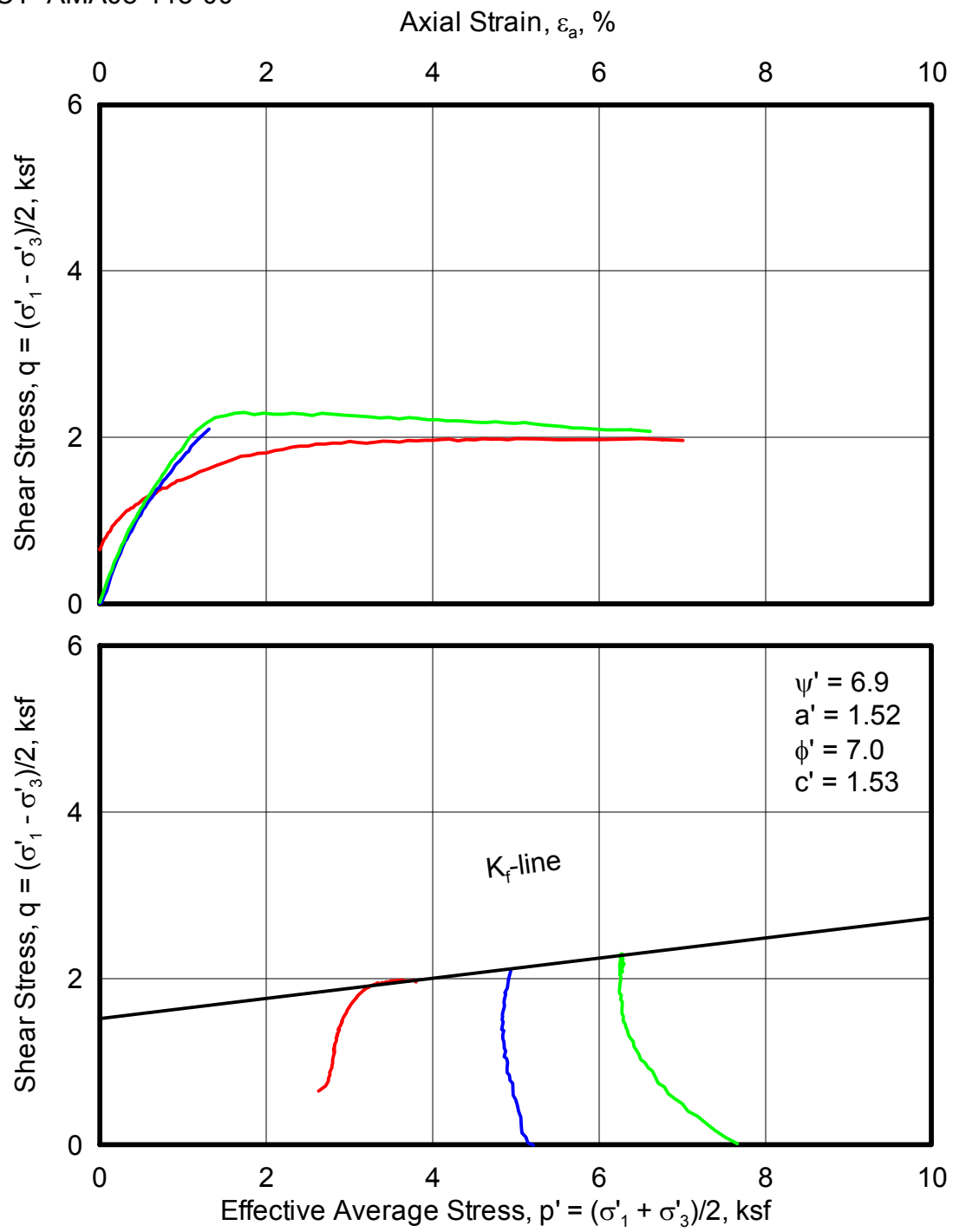
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-89, 35 TO 37 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 22.5
INITIAL DRY UNIT WEIGHT: 101.3 pcf
INITIAL VOID RATIO: 0.70
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 23.0
INITIAL DEGREE OF SATURATION: 89.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 65; PL = 23; PI = 42

FIGURE 183a

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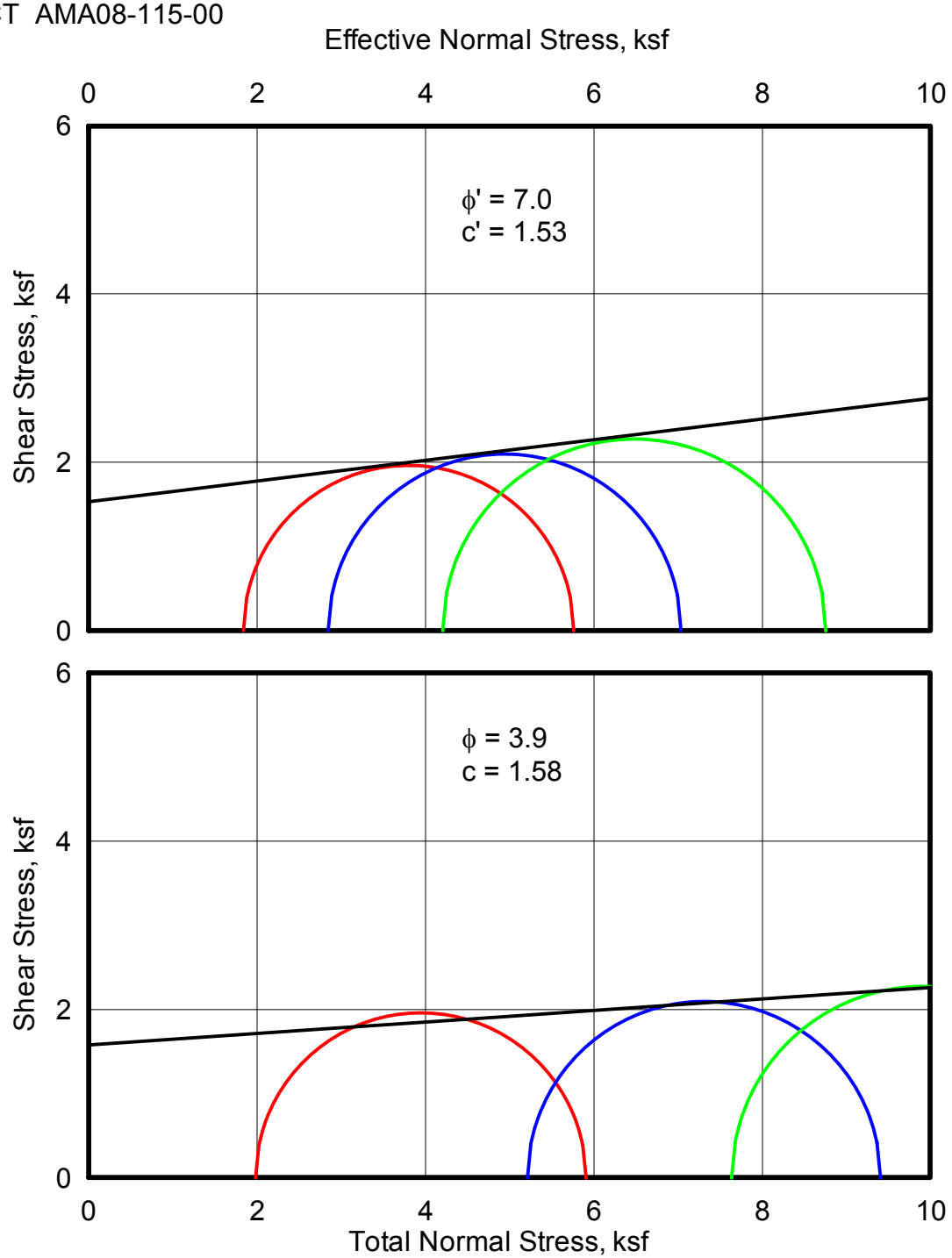
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH

BORING DP-89, 35 TO 37 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 22.5
INITIAL DRY UNIT WEIGHT: 101.3 pcf
INITIAL VOID RATIO: 0.70
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 23.0
INITIAL DEGREE OF SATURATION: 89.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 65; PL = 23; PI = 42

FIGURE 183b

Raba Kistner

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MOHR'S CIRCLES

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LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

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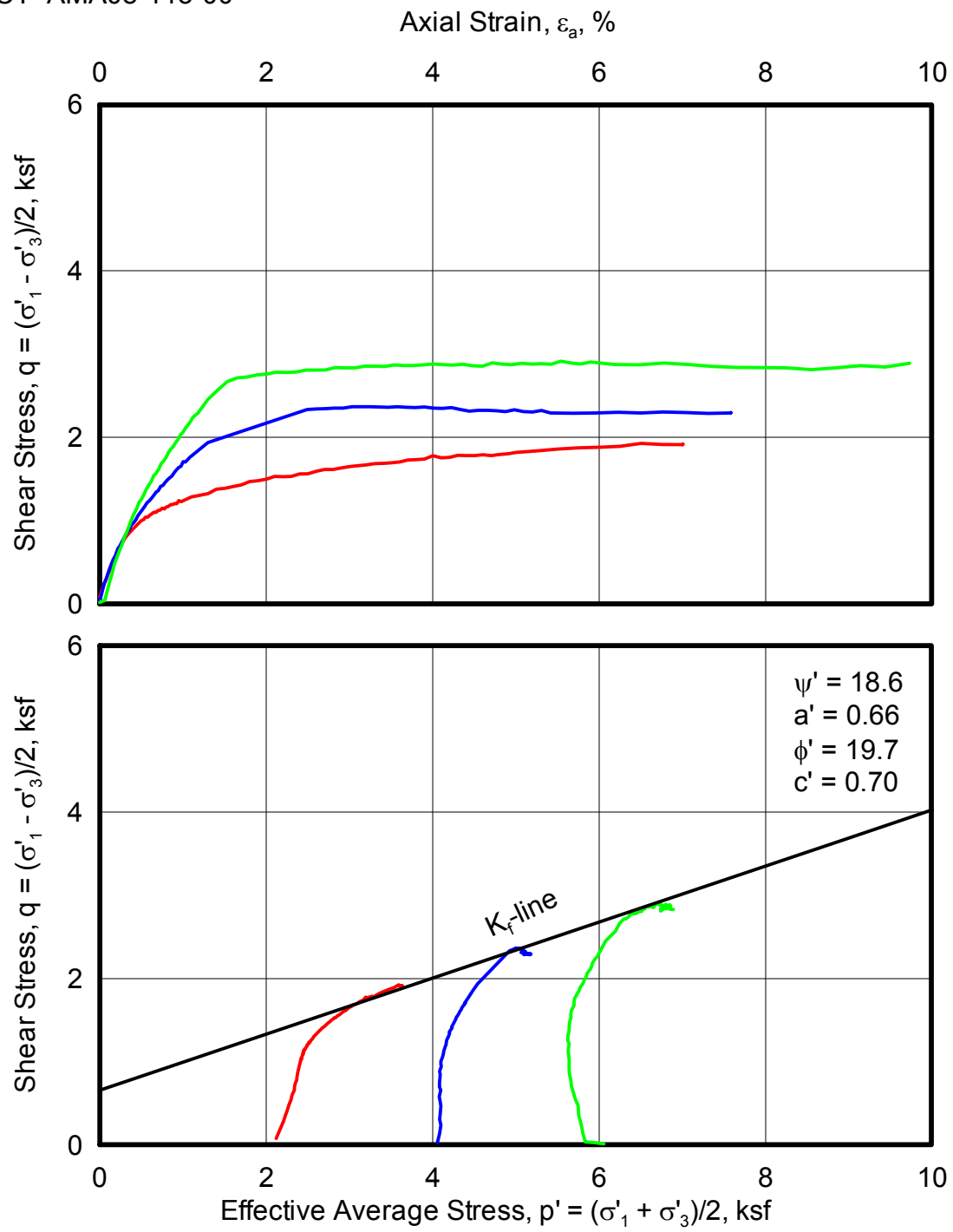

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-91,15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 20.5
INITIAL DRY UNIT WEIGHT: 100.5 pcf
INITIAL VOID RATIO: 0.71
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.4
INITIAL DEGREE OF SATURATION: 79.5%
FINAL DEGREE OF SATURATION: 100.0%
LL = 60; PL = 23; PI = 37

FIGURE 184a

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STRESS PATH

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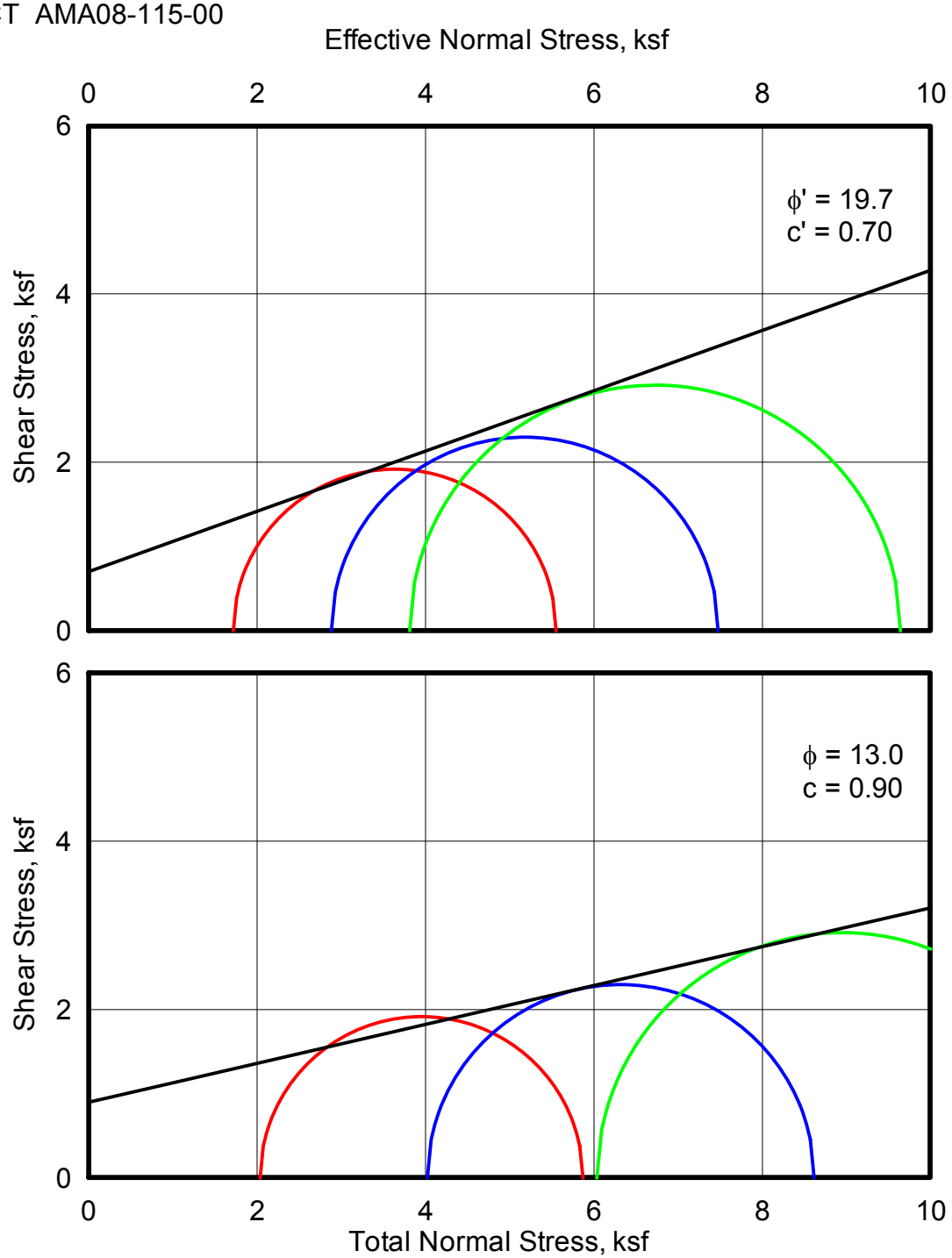
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-91,15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 20.5
INITIAL DRY UNIT WEIGHT: 100.5 pcf
INITIAL VOID RATIO: 0.71
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.4
INITIAL DEGREE OF SATURATION: 79.5%
FINAL DEGREE OF SATURATION: 100.0%
LL = 60; PL = 23; PI = 37

FIGURE 184b

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MOHR'S CIRCLES

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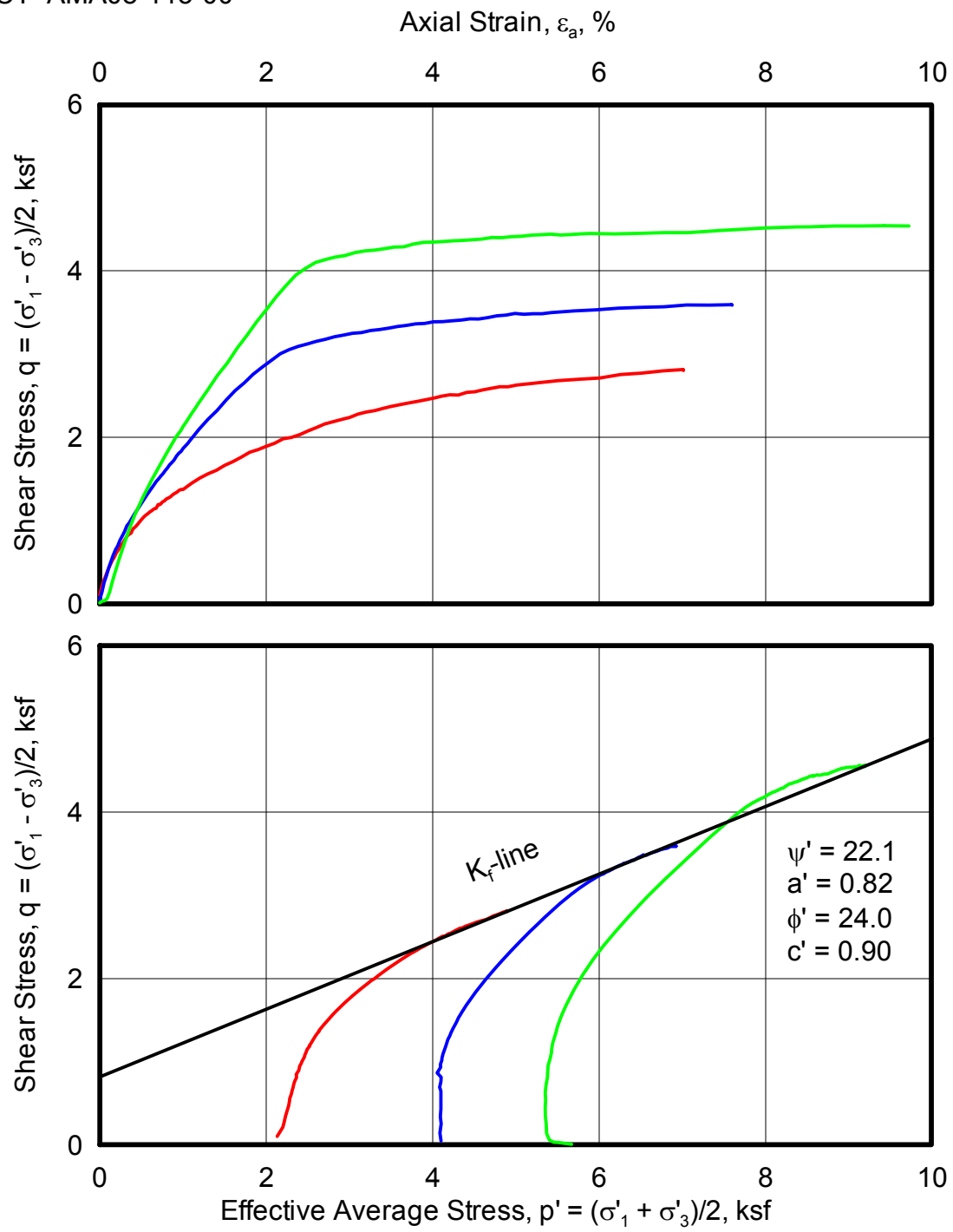
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-92, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.3
INITIAL DRY UNIT WEIGHT: 100.8 pcf
INITIAL VOID RATIO: 0.70
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.5
INITIAL DEGREE OF SATURATION: 91.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 53; PL = 23; PI = 30

FIGURE 185a

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STRESS PATH

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LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
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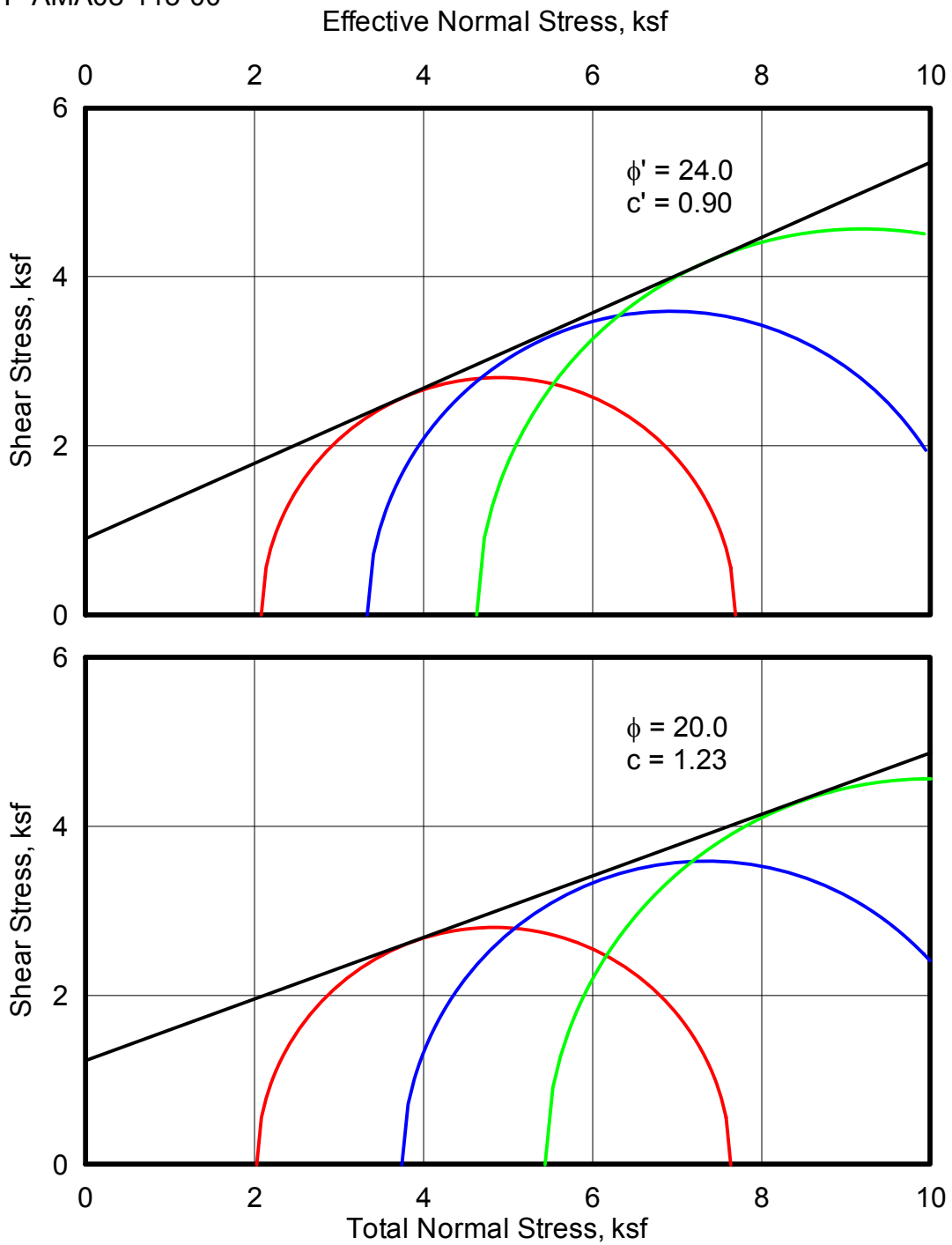
PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-92, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.3
INITIAL DRY UNIT WEIGHT: 100.8 pcf
INITIAL VOID RATIO: 0.70
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.5
INITIAL DEGREE OF SATURATION: 91.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 53; PL = 23; PI = 30

FIGURE 185b

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MOHR'S CIRCLES

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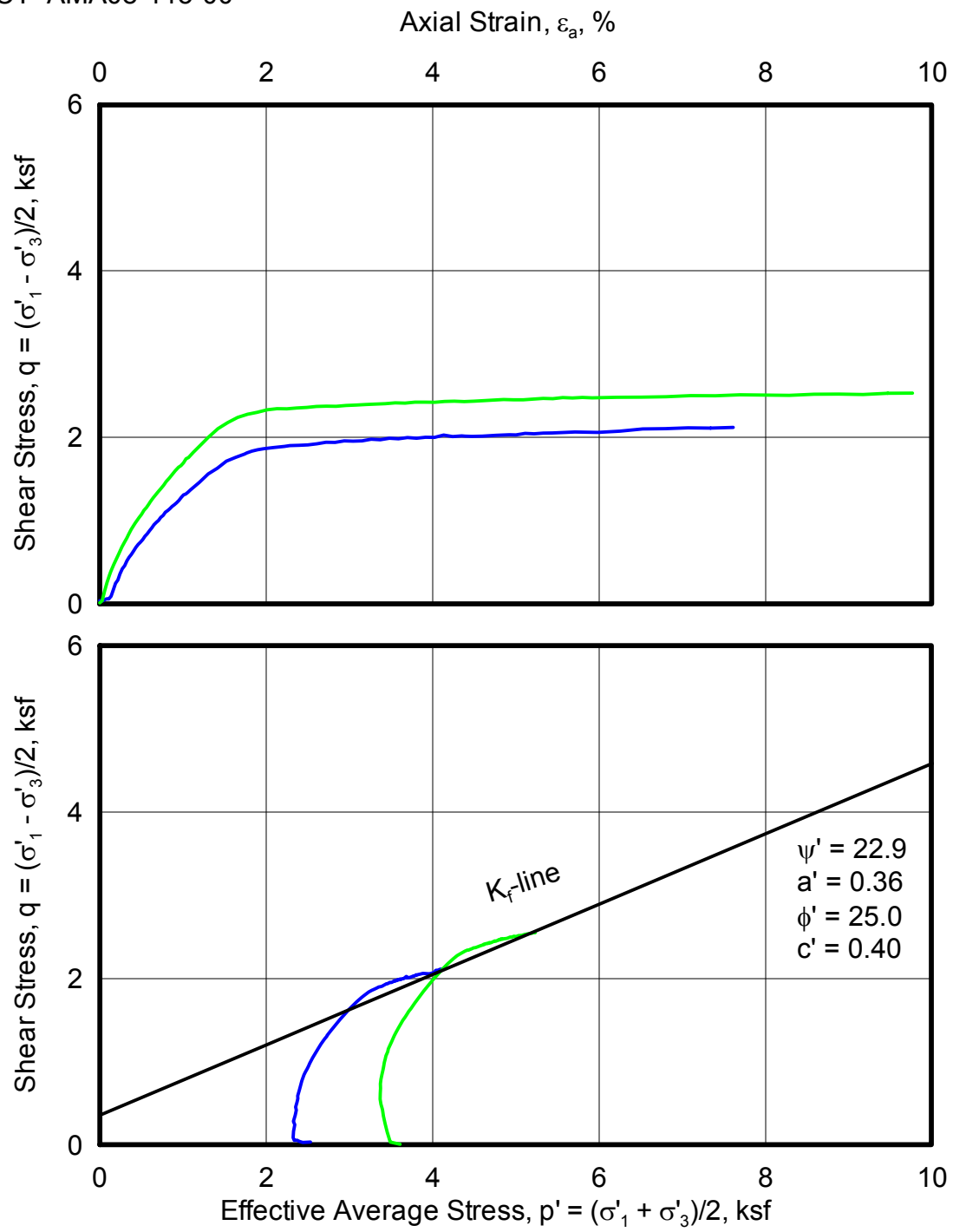
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-103, 8 TO 10 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.0
INITIAL DRY UNIT WEIGHT: 101.3 pcf
INITIAL VOID RATIO: 0.69
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 26.2
INITIAL DEGREE OF SATURATION: 91.1%
FINAL DEGREE OF SATURATION: 100.0%
LL = 52; PL = 22; PI = 30

FIGURE 186a

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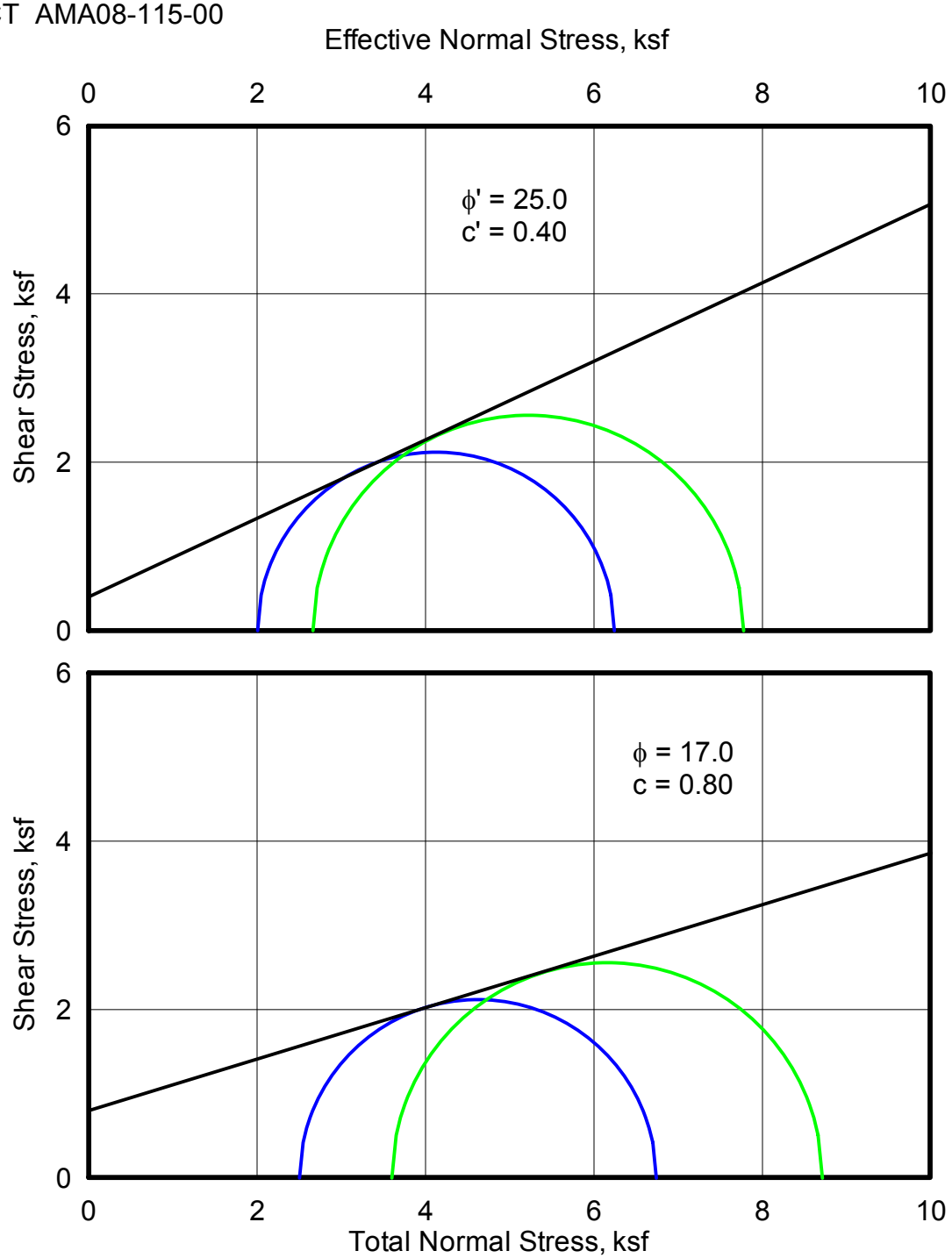
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-103, 8 TO 10 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.0
INITIAL DRY UNIT WEIGHT: 101.3 pcf
INITIAL VOID RATIO: 0.69
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 26.2
INITIAL DEGREE OF SATURATION: 91.1%
FINAL DEGREE OF SATURATION: 100.0%
LL = 52; PL = 22; PI = 30

FIGURE 186b

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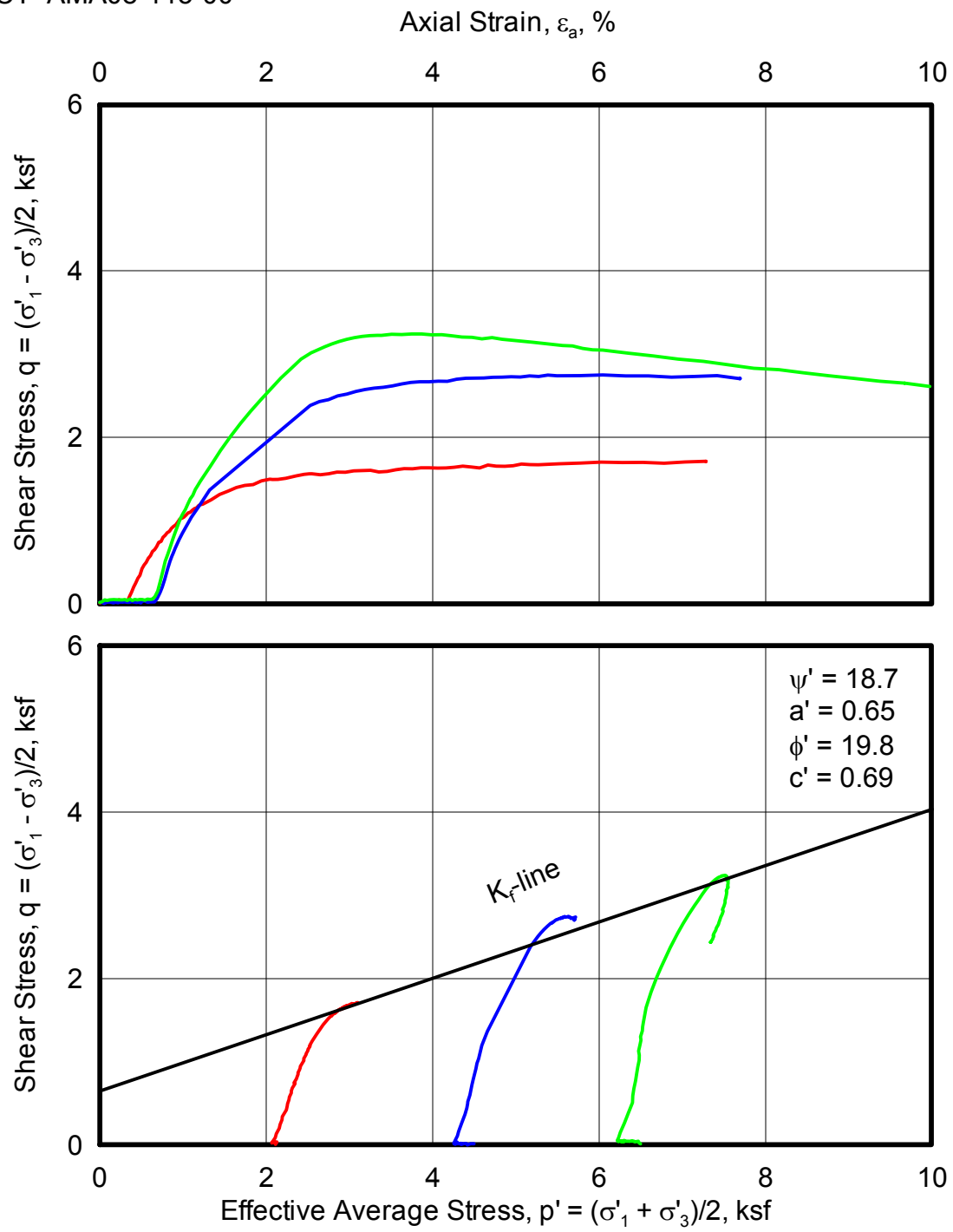
MOHR'S CIRCLES

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-108, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.7
INITIAL DRY UNIT WEIGHT: 98.2 pcf
INITIAL VOID RATIO: 0.72
SPECIFIC GRAVITY: 2.70 (assumed)

FINAL WATER CONTENT: 26.5
INITIAL DEGREE OF SATURATION: 89.3%
FINAL DEGREE OF SATURATION: 100.0%
LL = 59; PL = 28; PI = 31

FIGURE 187a

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STRESS PATH

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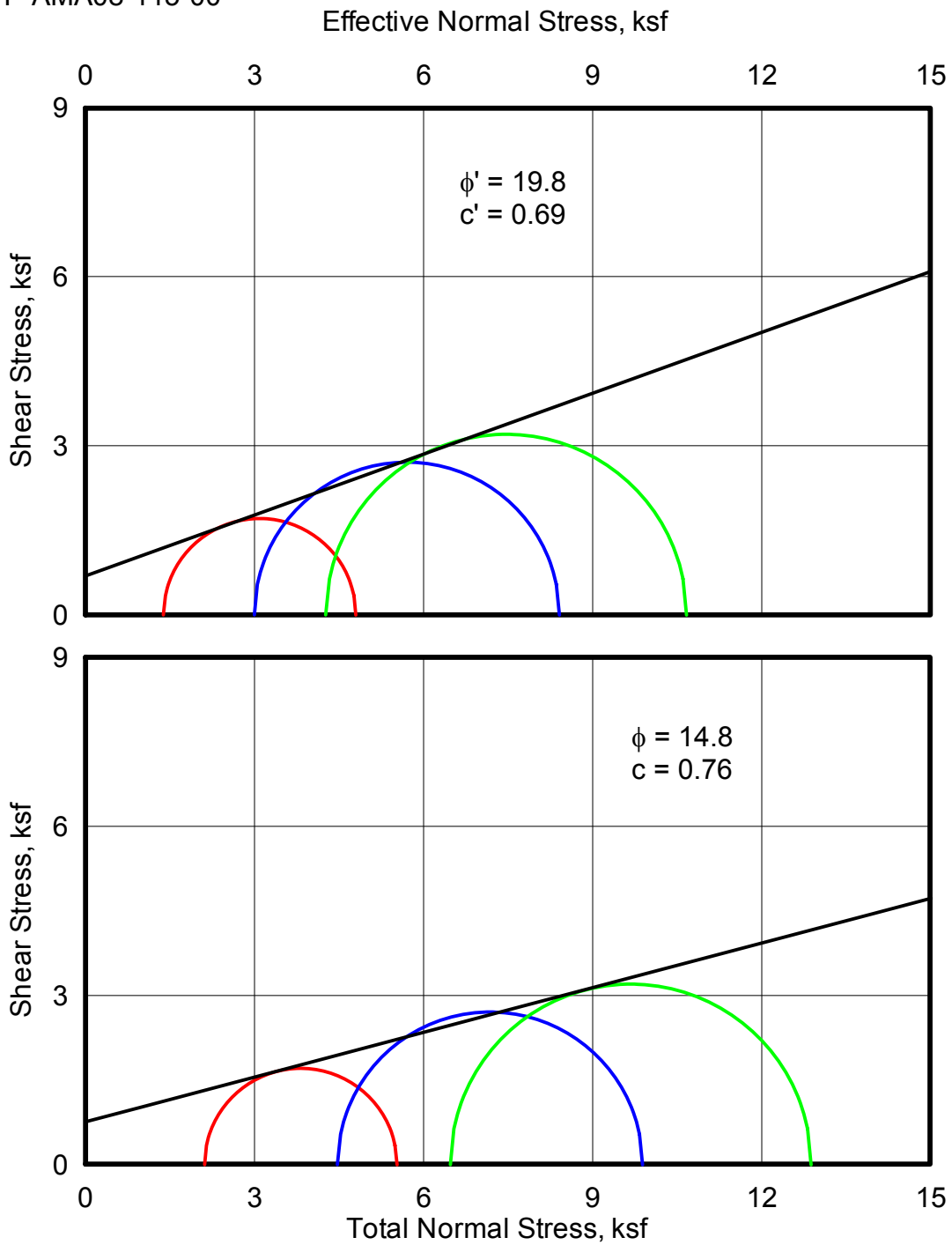
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-108, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.7
INITIAL DRY UNIT WEIGHT: 98.2 pcf
INITIAL VOID RATIO: 0.72
SPECIFIC GRAVITY: 2.70 (assumed)

FINAL WATER CONTENT: 26.5
INITIAL DEGREE OF SATURATION: 89.3%
FINAL DEGREE OF SATURATION: 100.0%
LL = 59; PL = 28; PI = 31

FIGURE 187b

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LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

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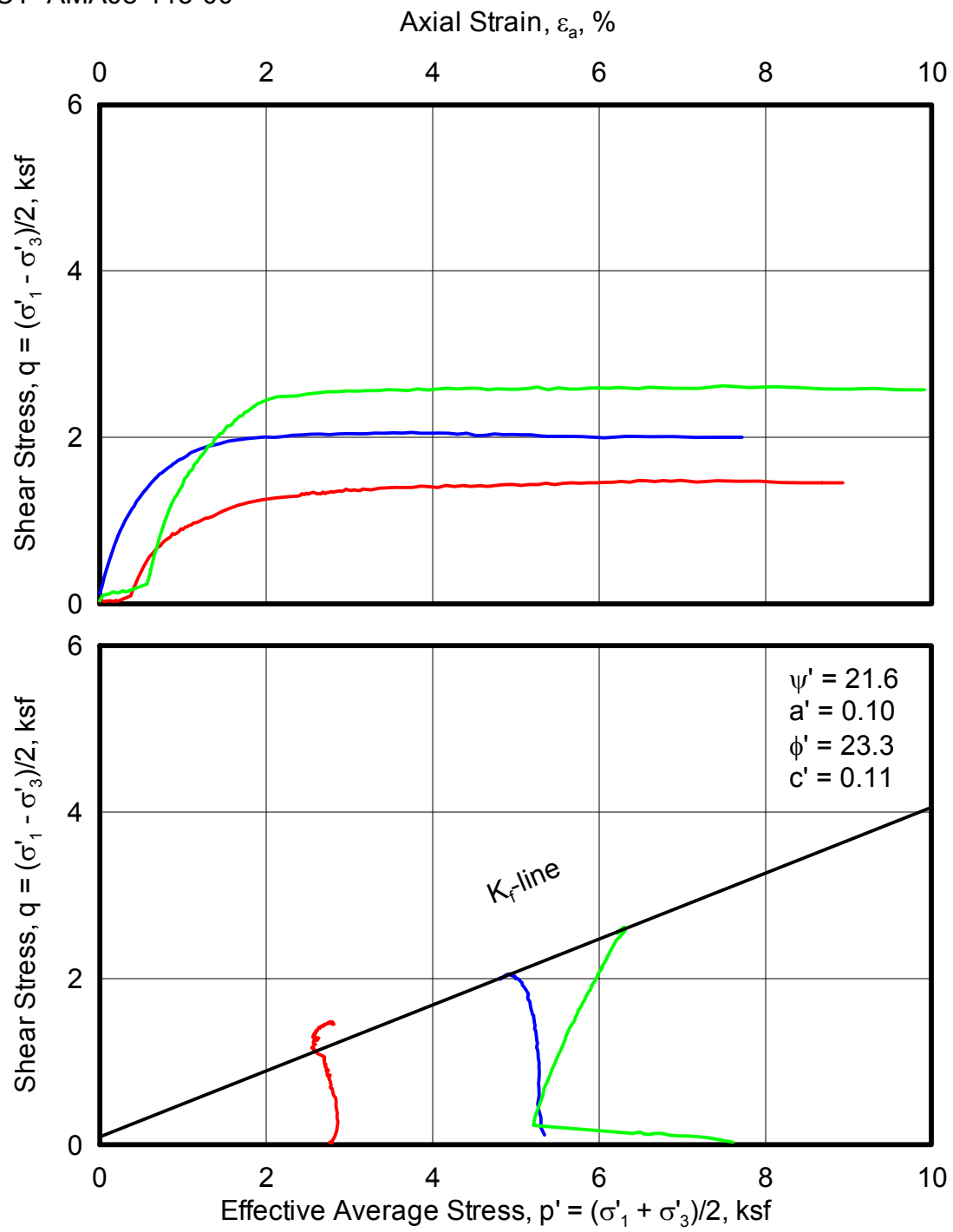

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-113, 30 TO 32 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 28.6
INITIAL DRY UNIT WEIGHT: 91.2 pcf
INITIAL VOID RATIO: 0.88
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 28.4
INITIAL DEGREE OF SATURATION: 89.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 58; PL = 25; PI = 33

FIGURE 188a

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LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

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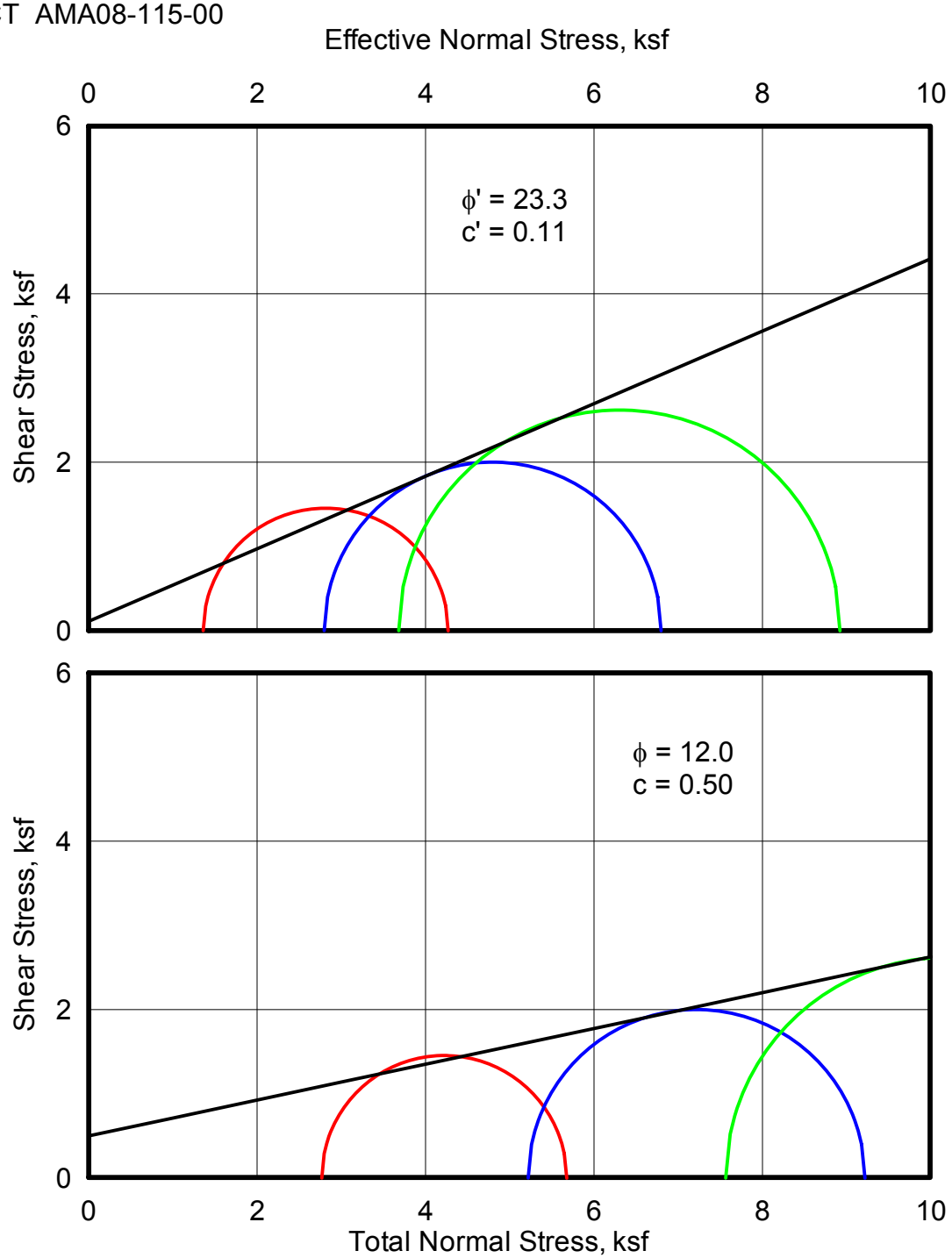

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-113, 30 TO 32 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 28.6
INITIAL DRY UNIT WEIGHT: 91.2 pcf
INITIAL VOID RATIO: 0.88
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 28.4
INITIAL DEGREE OF SATURATION: 89.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 58; PL = 25; PI = 33

FIGURE 188b

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LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

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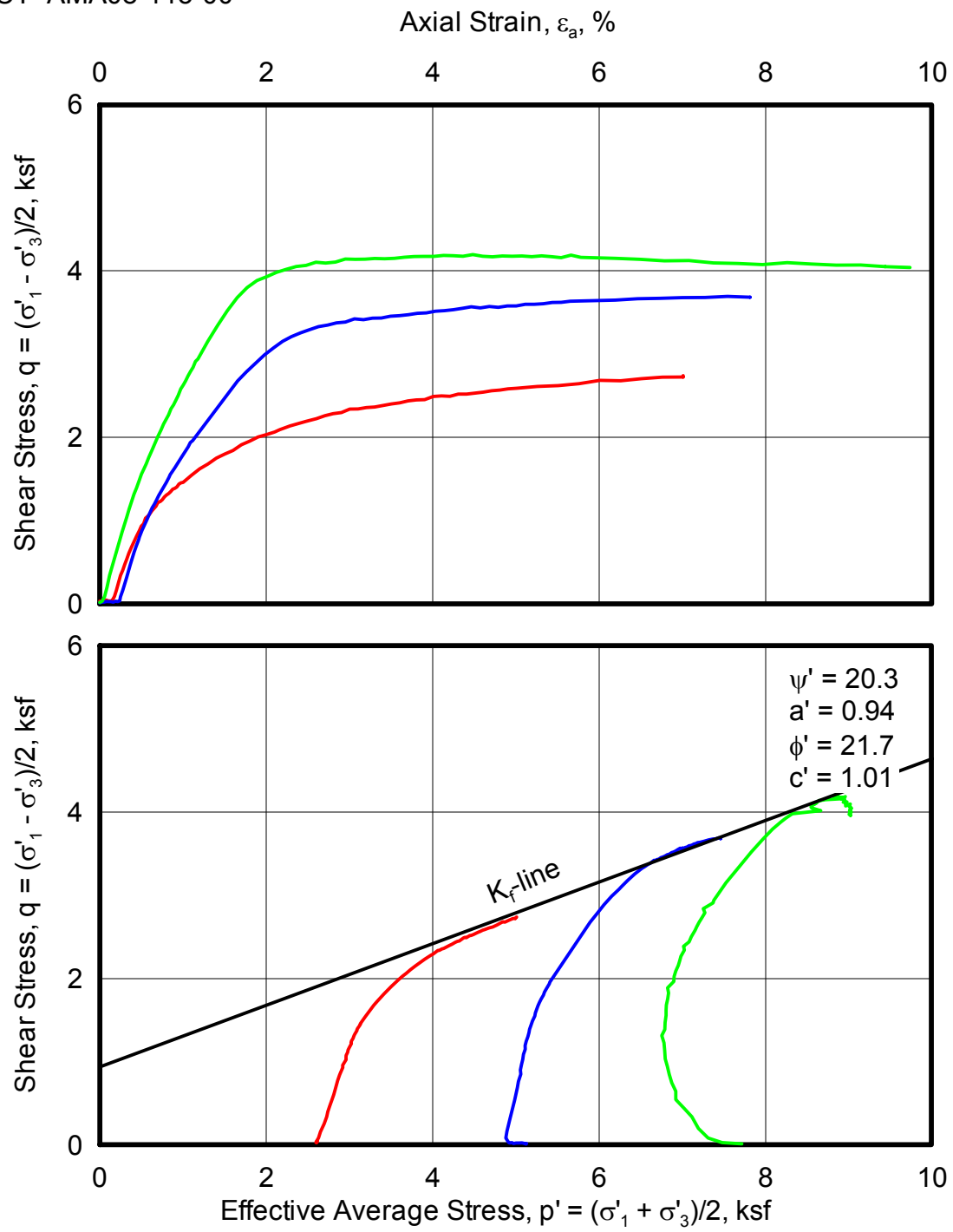

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-126, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.5
INITIAL DRY UNIT WEIGHT: 97.1 pcf
INITIAL VOID RATIO: 0.77
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 25.7
INITIAL DEGREE OF SATURATION: 84.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 48; PL = 26; PI = 22

FIGURE 189a

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STRESS PATH

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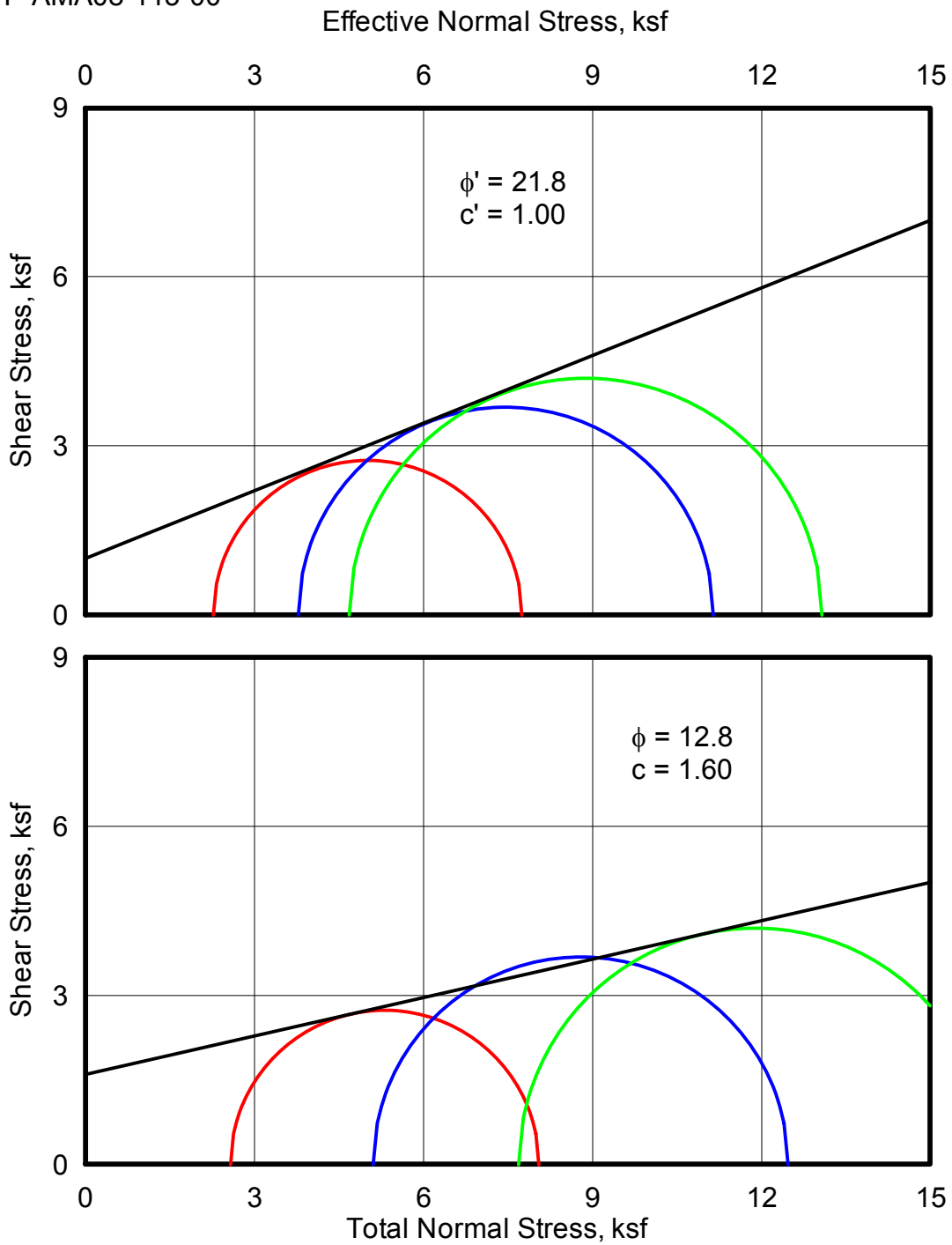
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-126, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.5
INITIAL DRY UNIT WEIGHT: 97.1 pcf
INITIAL VOID RATIO: 0.77
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 25.7
INITIAL DEGREE OF SATURATION: 84.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 48; PL = 26; PI = 22

FIGURE 189b

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MOHR'S CIRCLES

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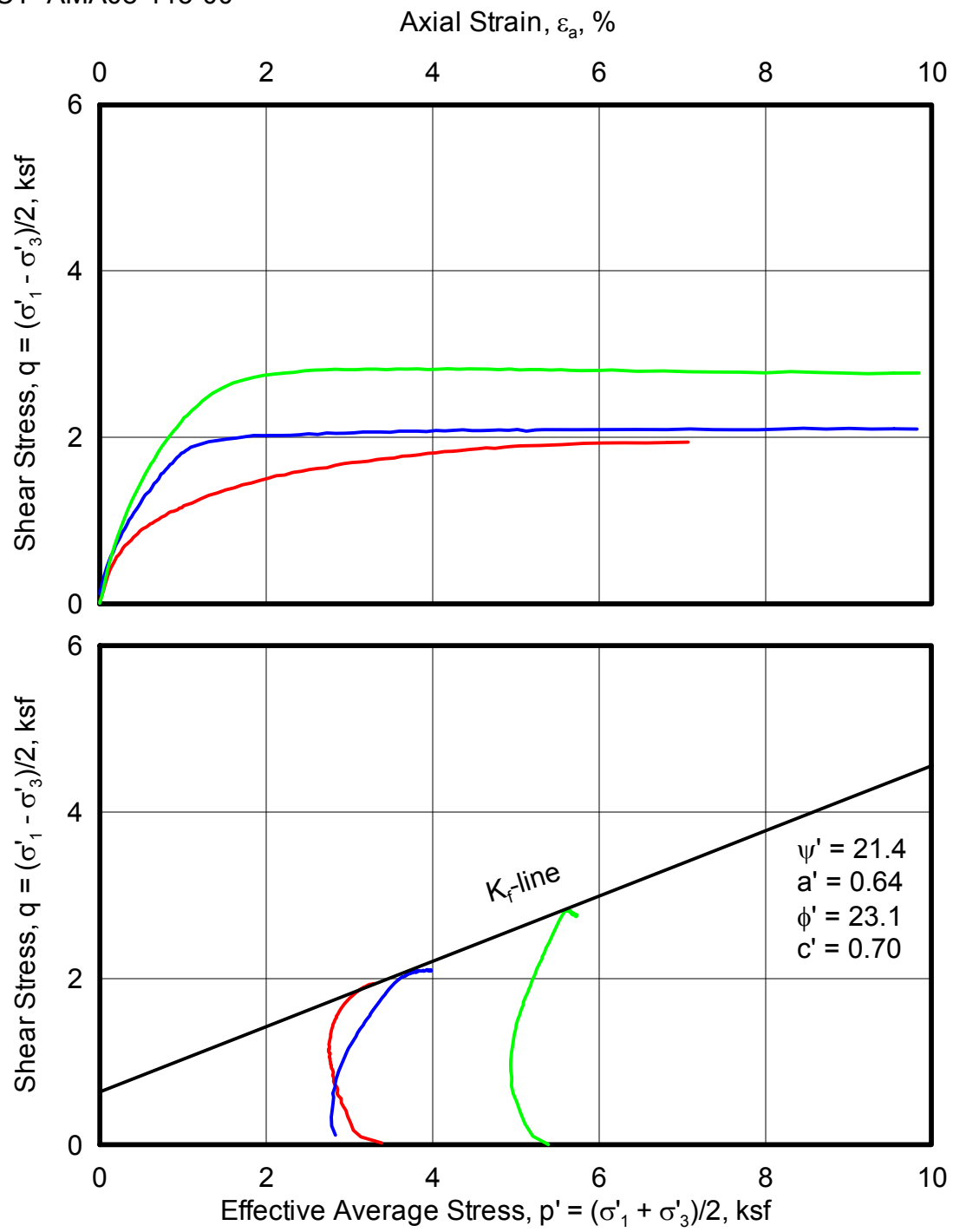
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-128, 30 TO 32 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 31.0
INITIAL DRY UNIT WEIGHT: 91.6 pcf
INITIAL VOID RATIO: 0.87
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 28.7
INITIAL DEGREE OF SATURATION: 97.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 55; PL = 24; PI = 31

FIGURE 190a

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STRESS PATH

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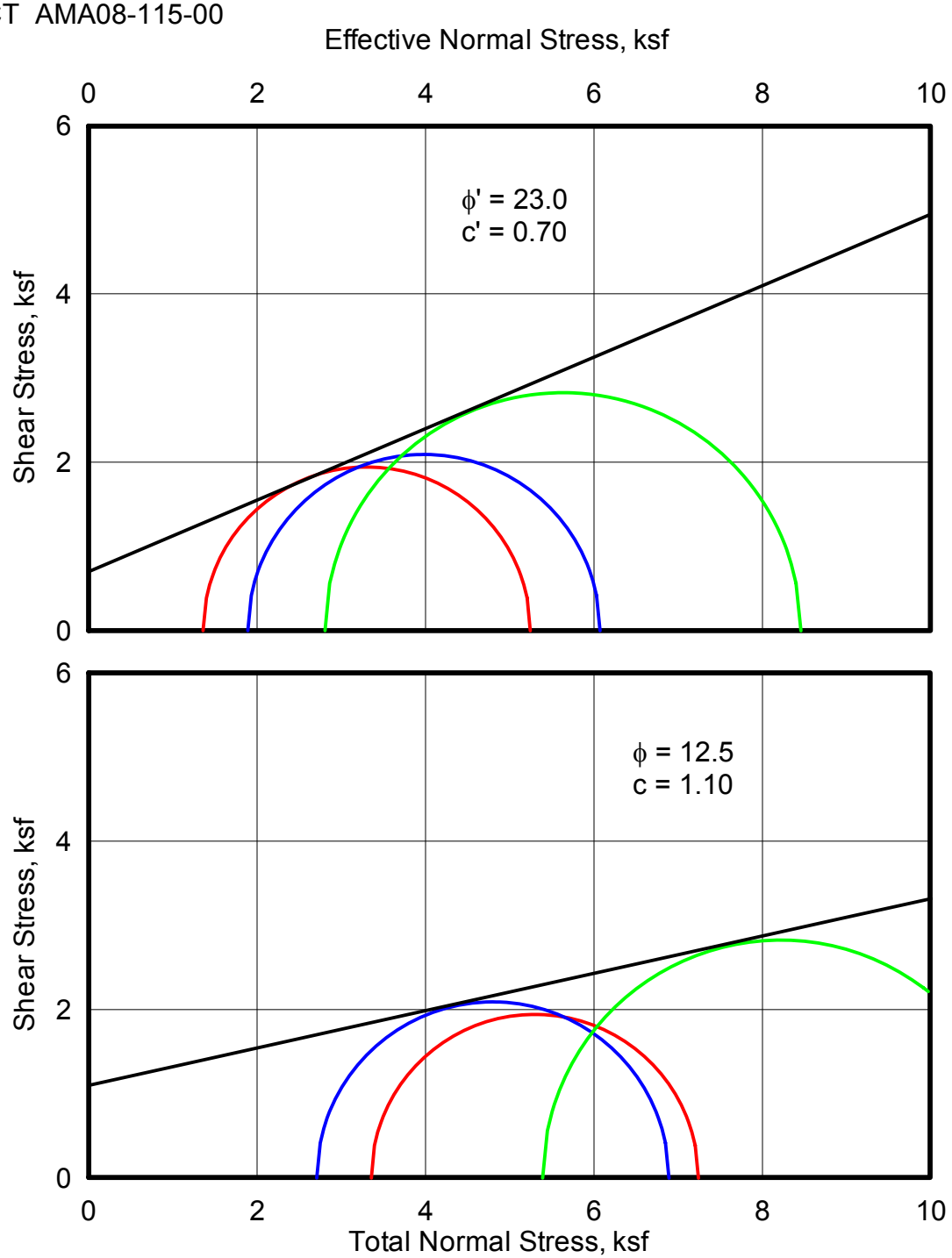
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-128, 30 TO 32 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 31.0
INITIAL DRY UNIT WEIGHT: 91.6 pcf
INITIAL VOID RATIO: 0.87
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 28.7
INITIAL DEGREE OF SATURATION: 97.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 55; PL = 24; PI = 31

FIGURE 190b

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MOHR'S CIRCLES

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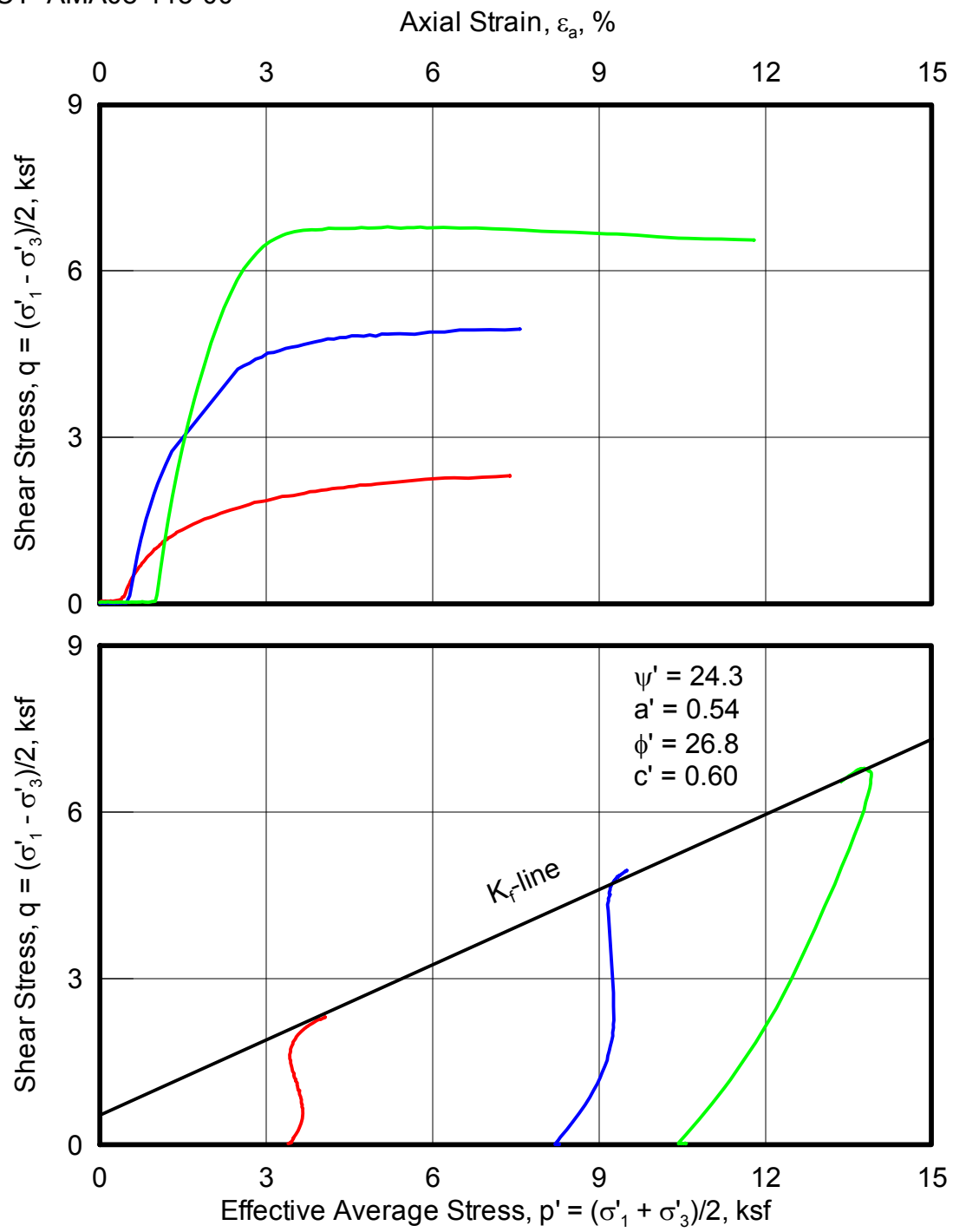
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-144, 25 TO 27 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 29.8
INITIAL DRY UNIT WEIGHT: 90.1 pcf
INITIAL VOID RATIO: 0.91
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.5
INITIAL DEGREE OF SATURATION: 90.3%
FINAL DEGREE OF SATURATION: 100.0%
LL = 33; PL = 23; PI = 10

FIGURE 191a

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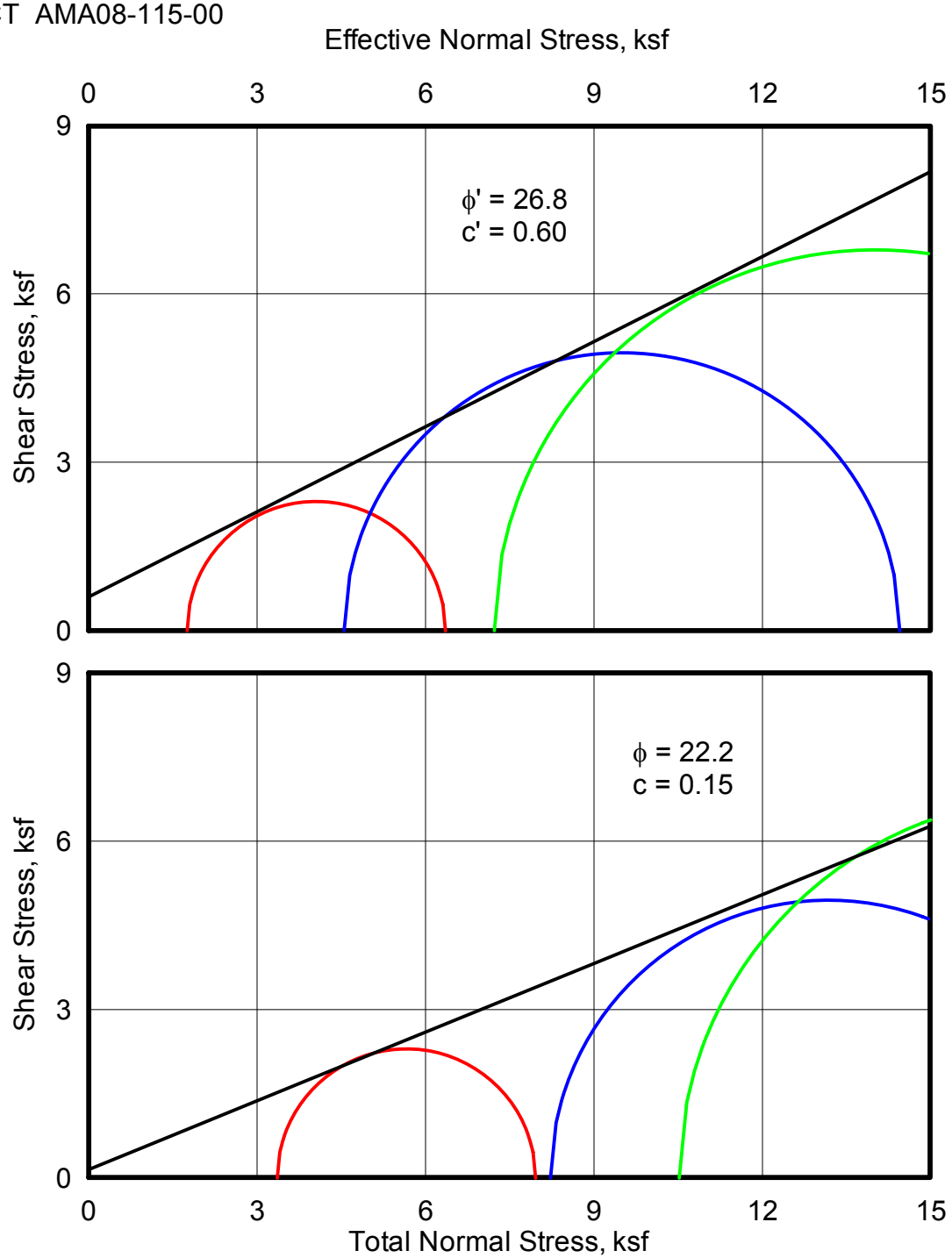
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-144, 25 TO 27 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 29.8
INITIAL DRY UNIT WEIGHT: 90.1 pcf
INITIAL VOID RATIO: 0.91
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.5
INITIAL DEGREE OF SATURATION: 90.3%
FINAL DEGREE OF SATURATION: 100.0%
LL = 33; PL = 23; PI = 10

FIGURE 191b

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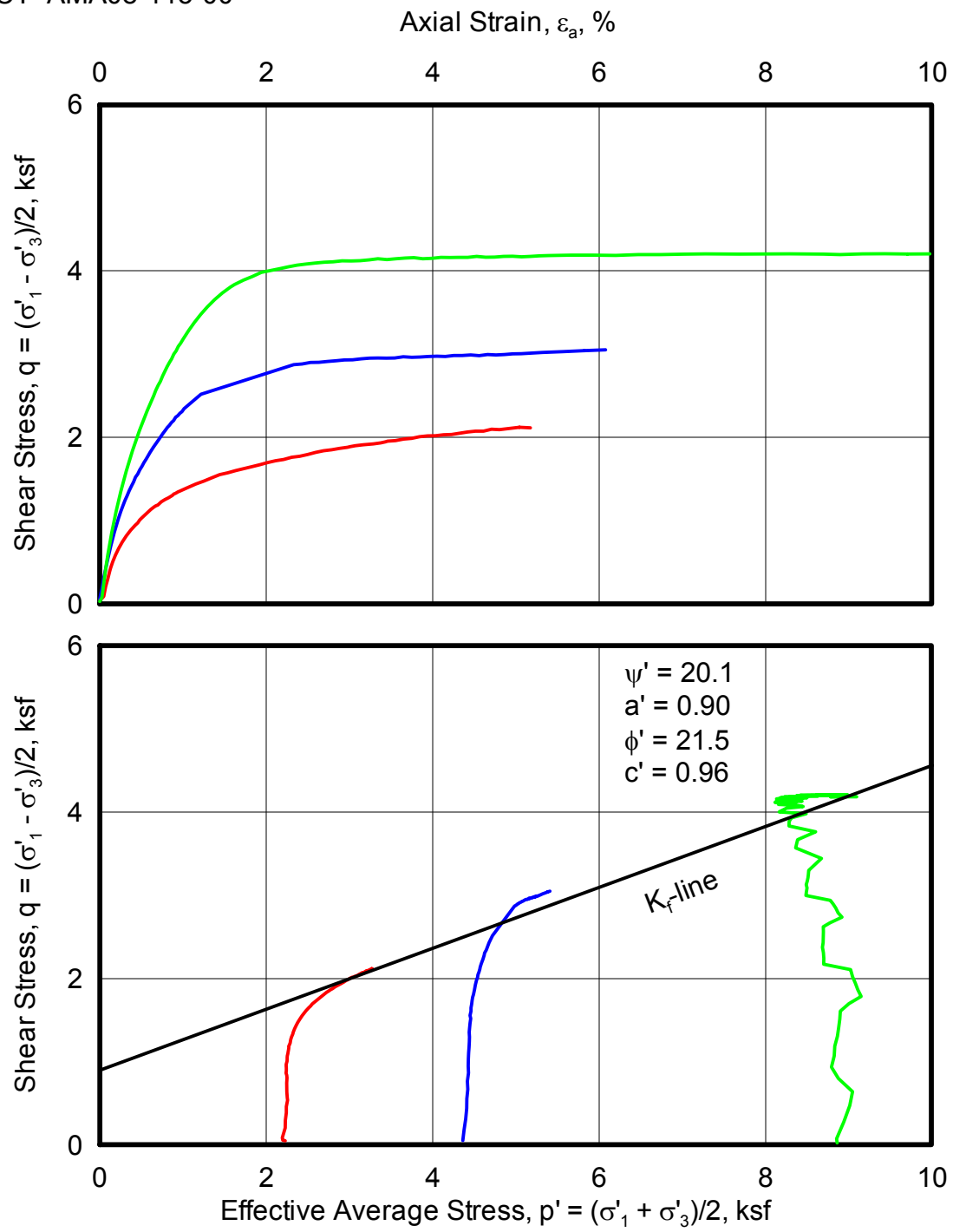
MOHR'S CIRCLES

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-152, 40 TO 42 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.5
INITIAL DRY UNIT WEIGHT: 103.1 pcf
INITIAL VOID RATIO: 0.67
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.7
INITIAL DEGREE OF SATURATION: 97.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 54; PL = 22; PI = 32

FIGURE 192a

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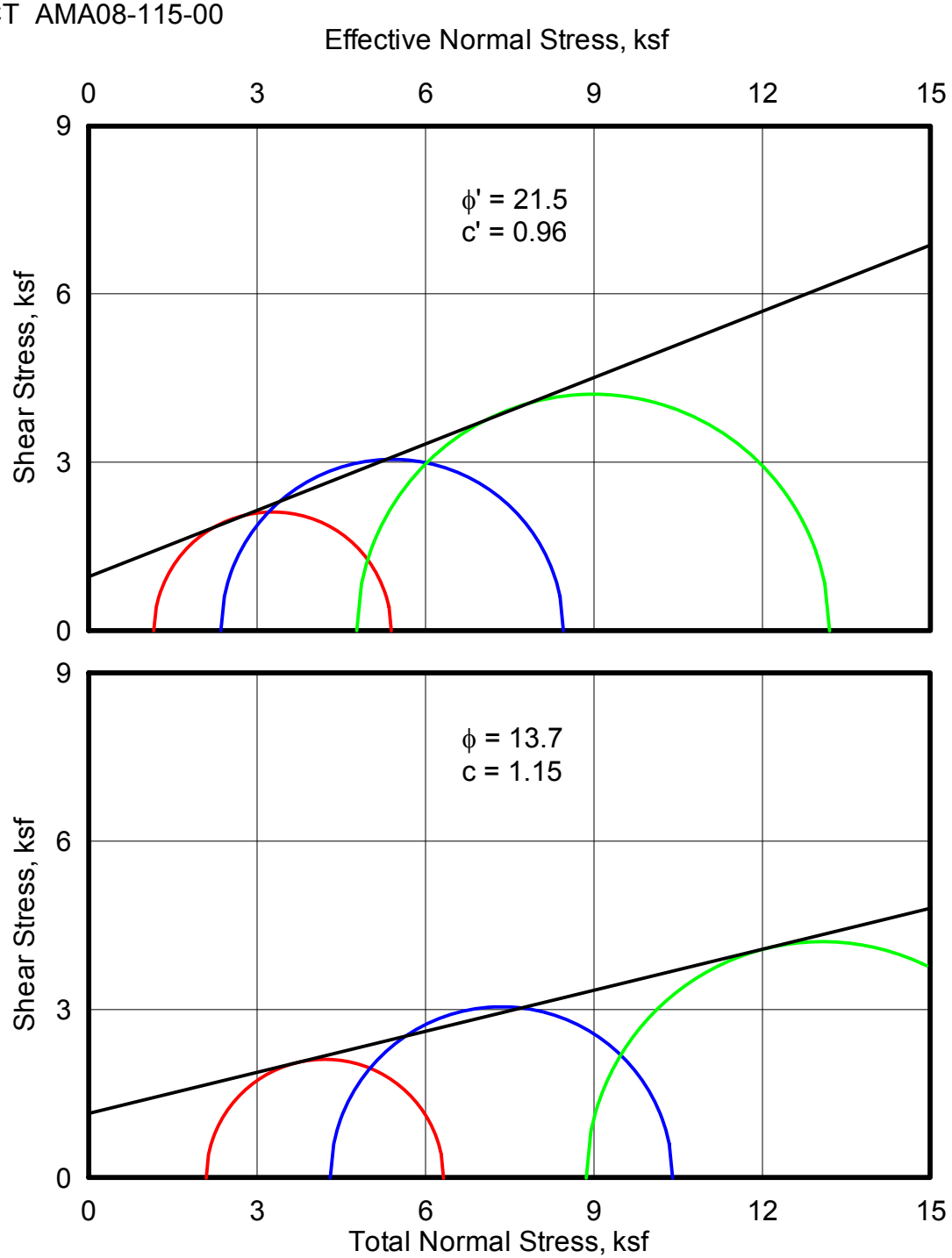
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-152, 40 TO 42 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.5
INITIAL DRY UNIT WEIGHT: 103.1 pcf
INITIAL VOID RATIO: 0.67
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.7
INITIAL DEGREE OF SATURATION: 97.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 54; PL = 22; PI = 32

FIGURE 192b

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MOHR'S CIRCLES

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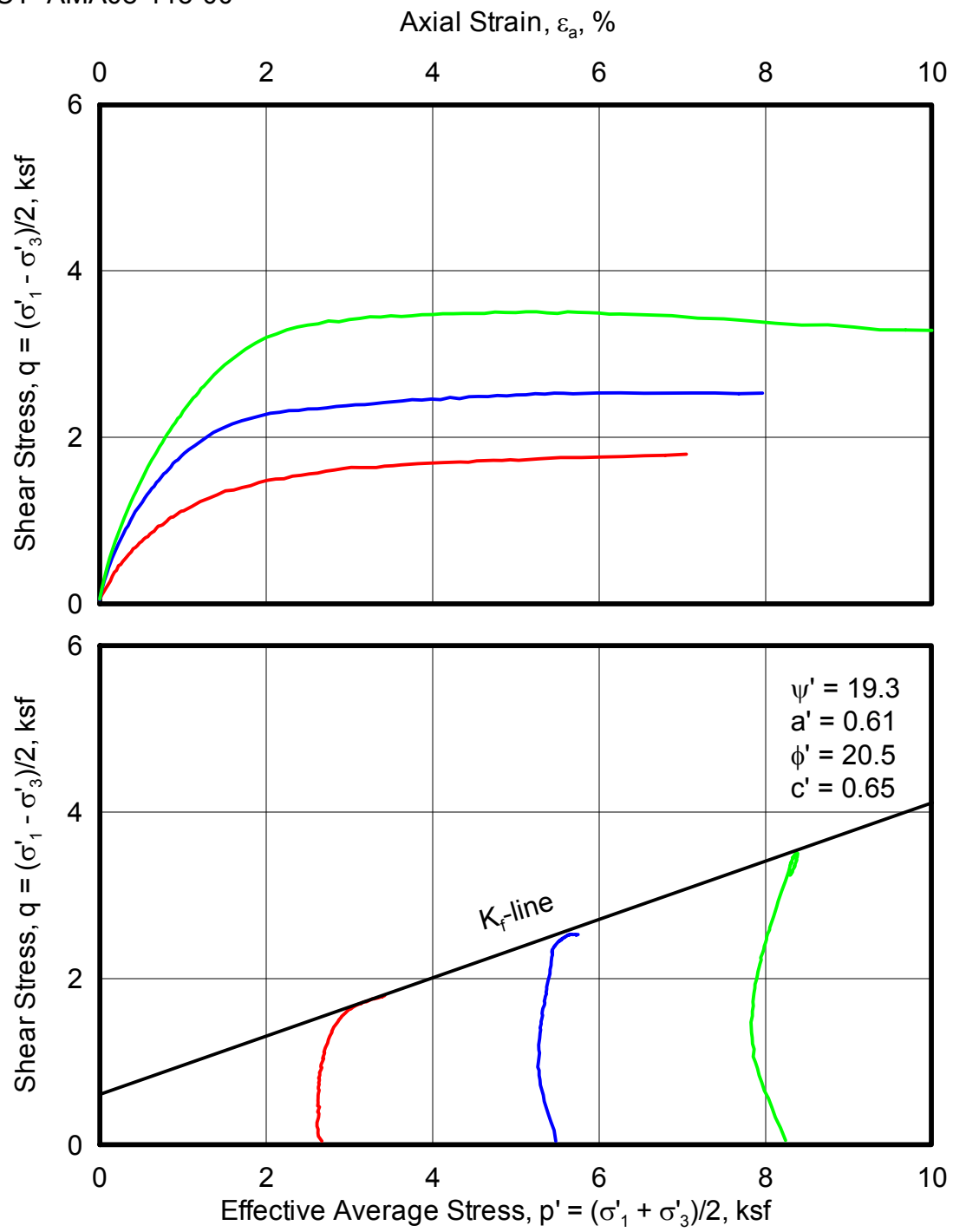
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-156, 30 TO 32 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 27.3
INITIAL DRY UNIT WEIGHT: 98.4 pcf
INITIAL VOID RATIO: 0.75
SPECIFIC GRAVITY: 2.76 (assumed)

FINAL WATER CONTENT: 25.4
INITIAL DEGREE OF SATURATION: 100.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 62; PL = 26; PI = 36

FIGURE 193a

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STRESS PATH

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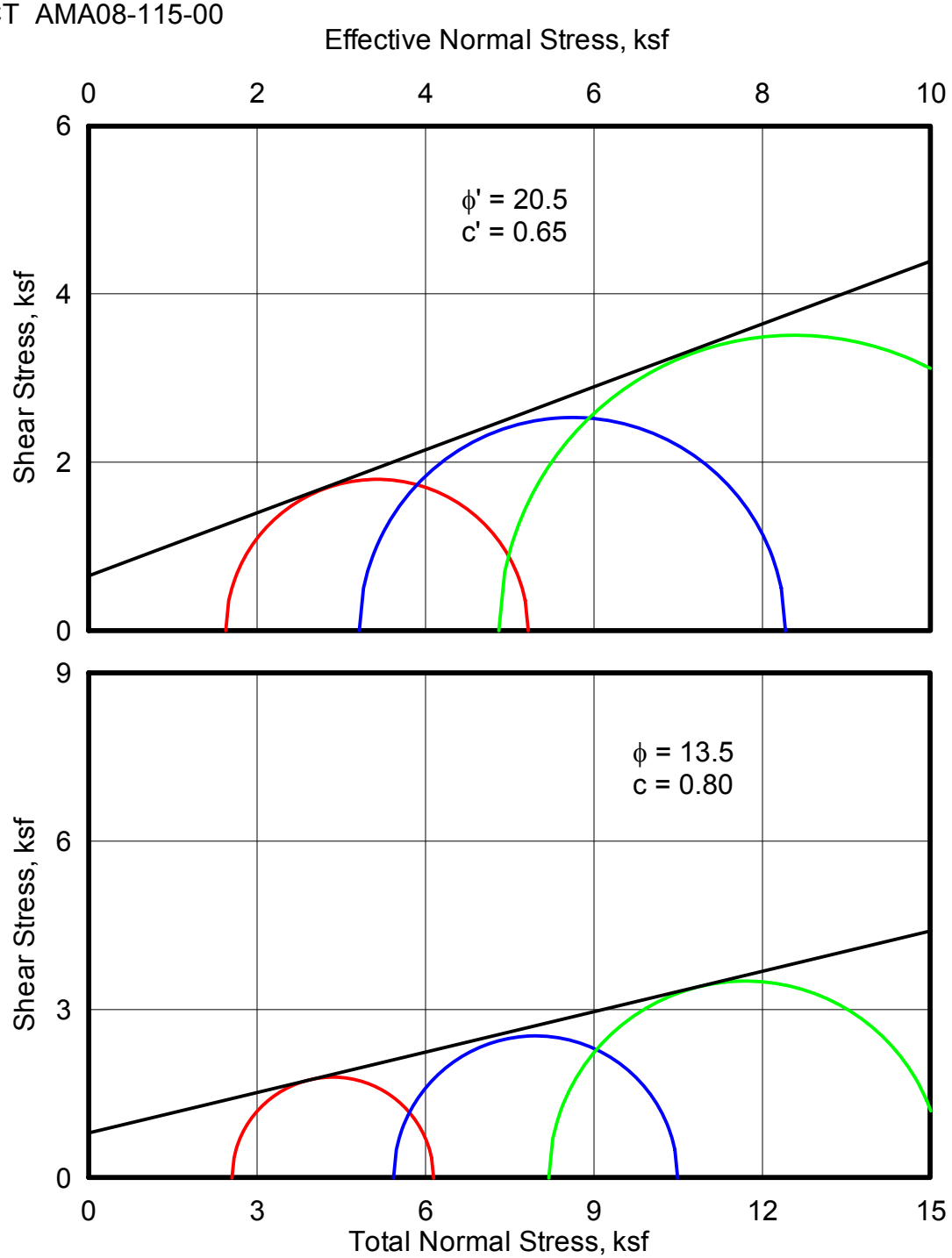
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-156, 30 TO 32 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 27.3
INITIAL DRY UNIT WEIGHT: 98.4 pcf
INITIAL VOID RATIO: 0.75
SPECIFIC GRAVITY: 2.76 (assumed)

FINAL WATER CONTENT: 25.4
INITIAL DEGREE OF SATURATION: 100.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 62; PL = 26; PI = 36

FIGURE 193b

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MOHR'S CIRCLES

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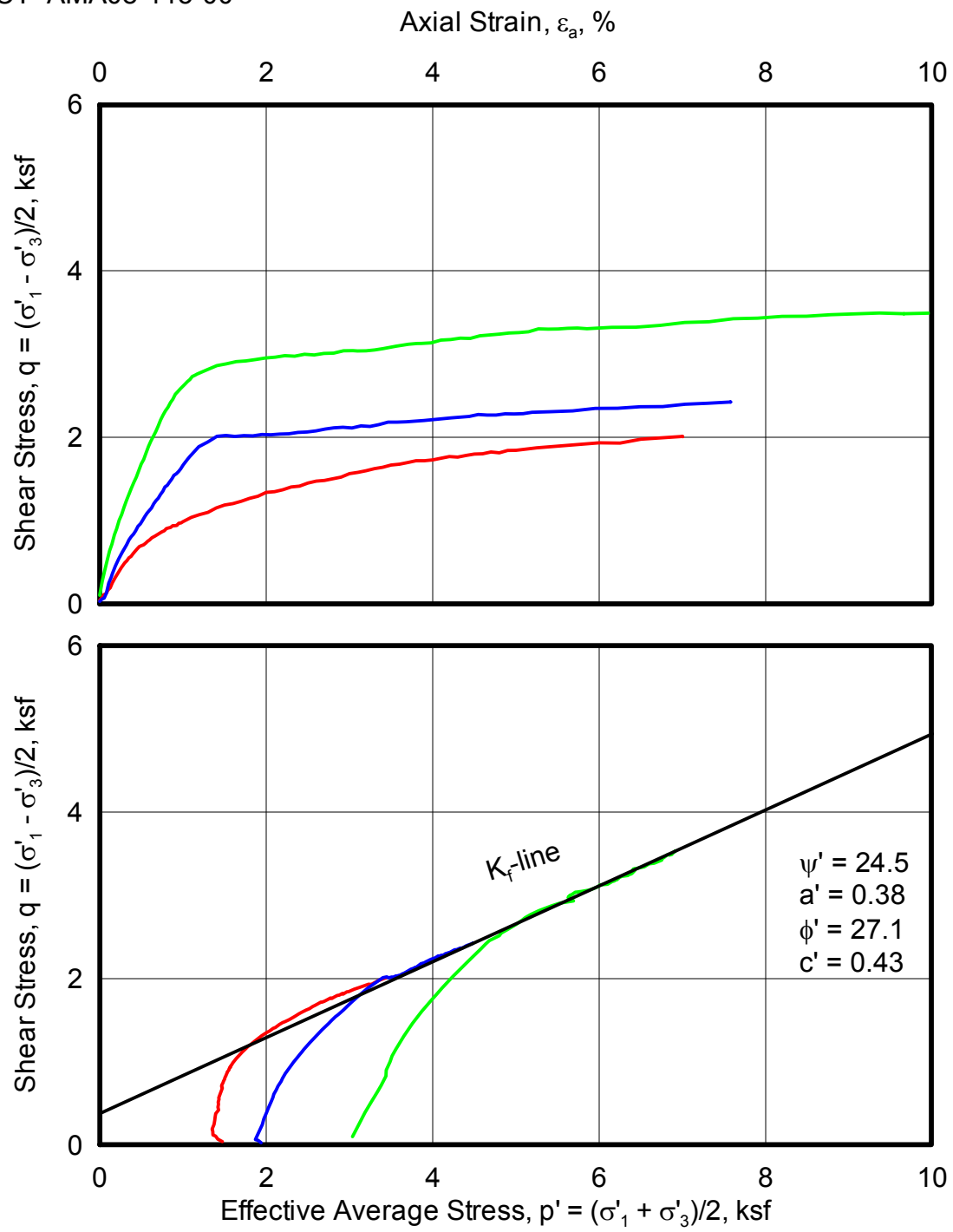
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-161, 6 TO 8 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 19.4
INITIAL DRY UNIT WEIGHT: 108.0 pcf
INITIAL VOID RATIO: 0.59
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 21.6
INITIAL DEGREE OF SATURATION: 90.3%
FINAL DEGREE OF SATURATION: 100.0%
LL = 43; PL = 21; PI = 22

FIGURE 194a

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STRESS PATH

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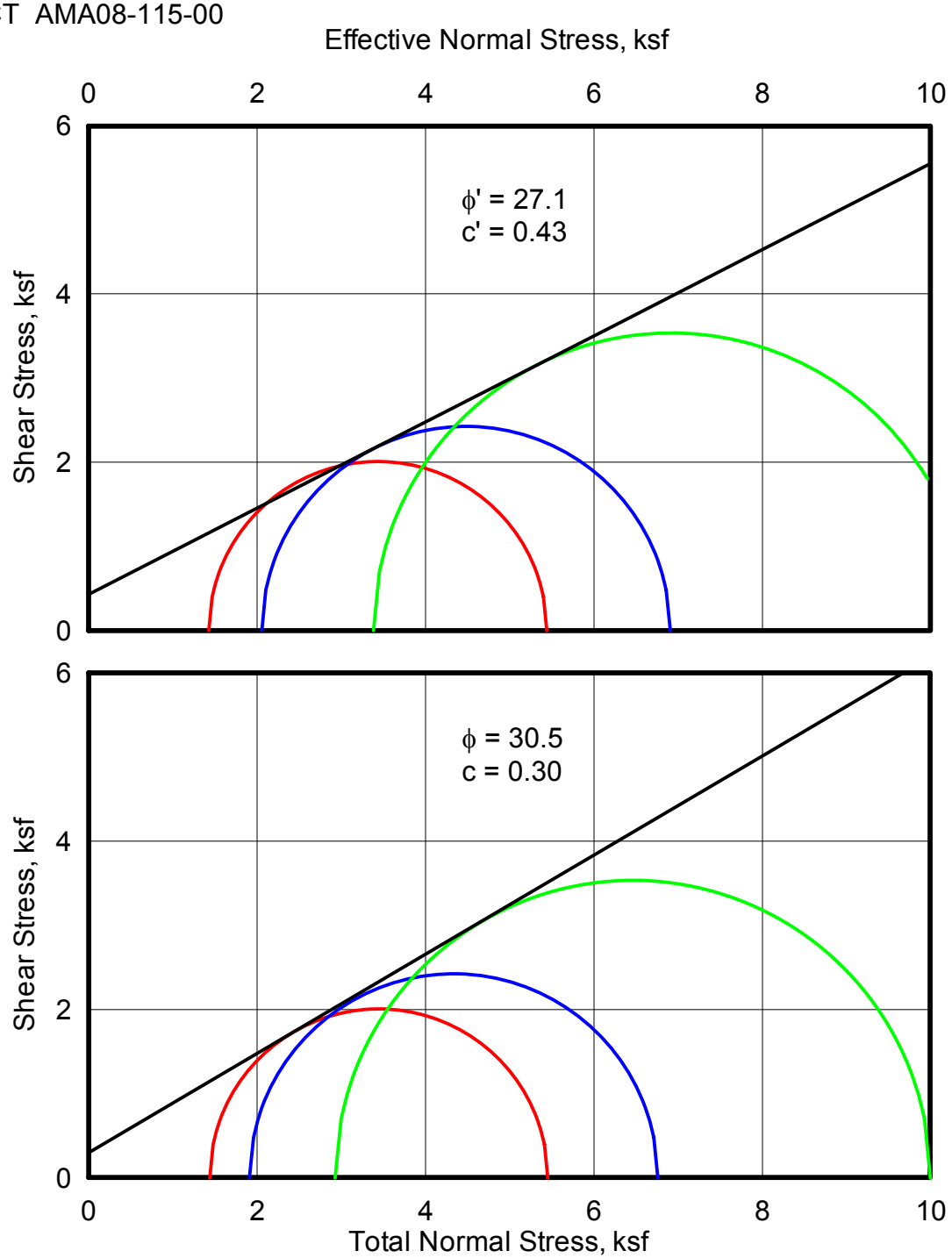
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-161, 6 TO 8 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 19.4
INITIAL DRY UNIT WEIGHT: 108.0 pcf
INITIAL VOID RATIO: 0.59
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 21.6
INITIAL DEGREE OF SATURATION: 90.3%
FINAL DEGREE OF SATURATION: 100.0%
LL = 43; PL = 21; PI = 22

FIGURE 194b

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MOHR'S CIRCLES

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LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

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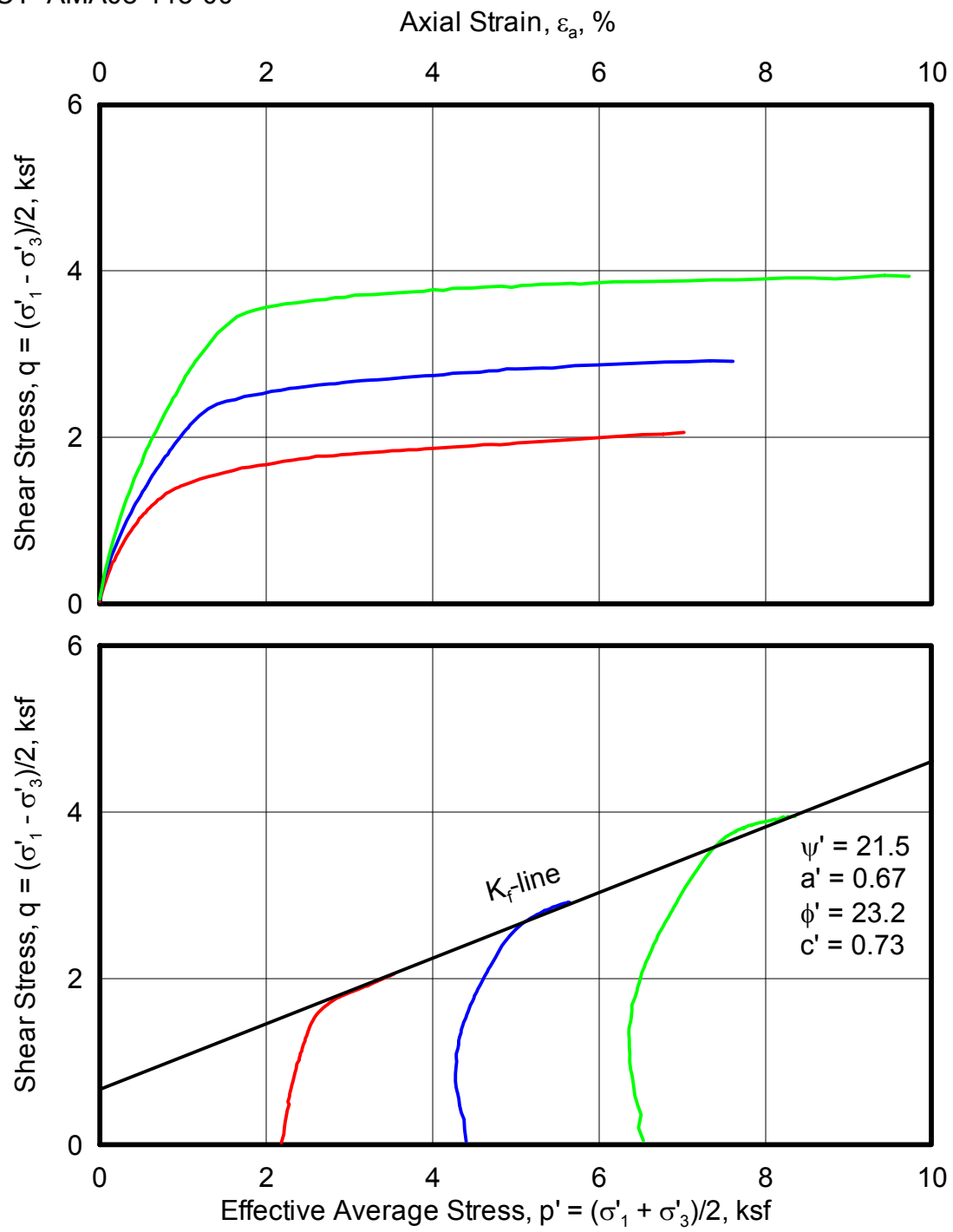

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-171, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 20.0
INITIAL DRY UNIT WEIGHT: 106.5 pcf
INITIAL VOID RATIO: 0.61
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.5
INITIAL DEGREE OF SATURATION: 89.8%
FINAL DEGREE OF SATURATION: 100.0%
LL = 51; PL = 24; PI = 27

FIGURE 195a

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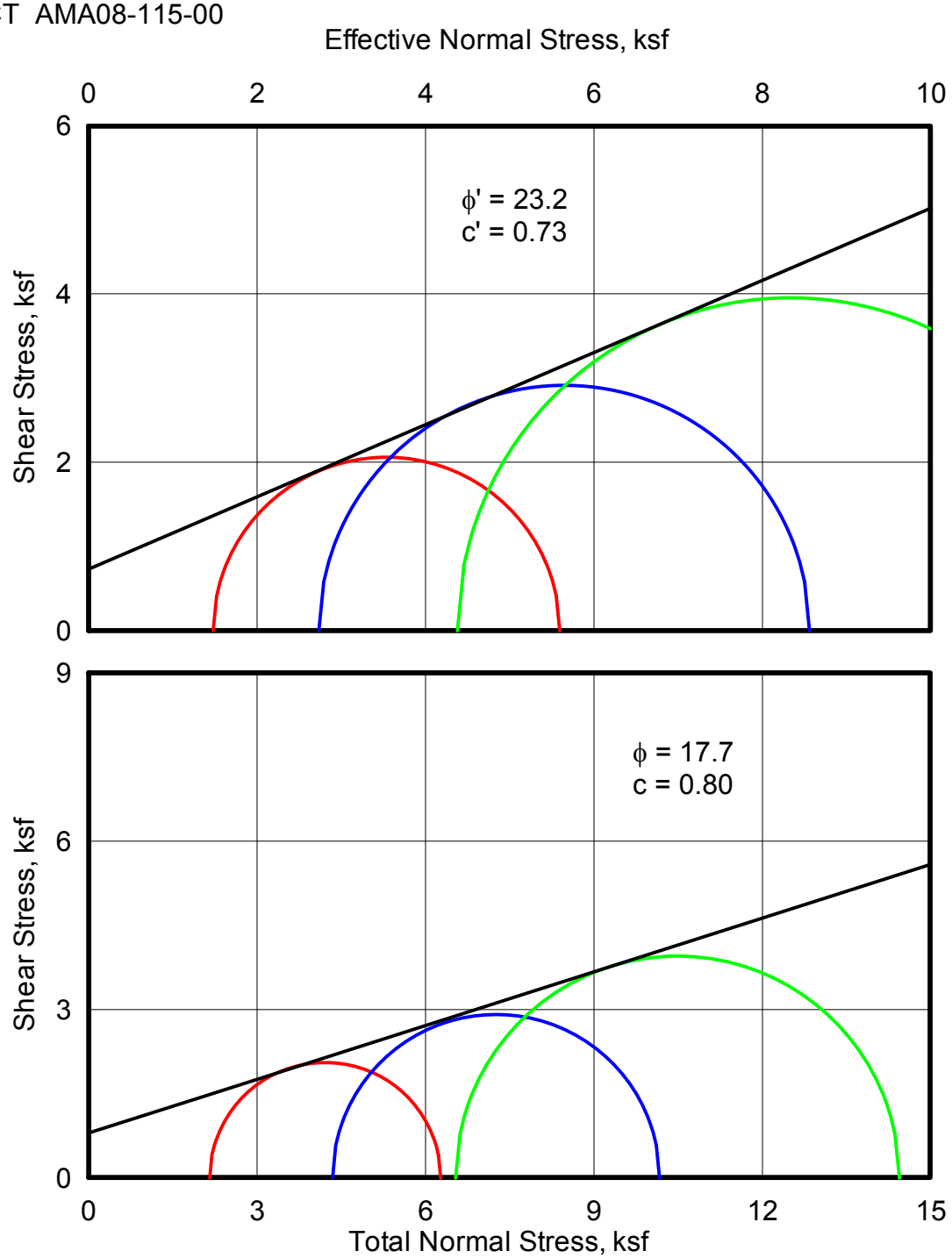
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-171, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 20.0
INITIAL DRY UNIT WEIGHT: 106.5 pcf
INITIAL VOID RATIO: 0.61
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.5
INITIAL DEGREE OF SATURATION: 89.8%
FINAL DEGREE OF SATURATION: 100.0%
LL = 51; PL = 24; PI = 27

FIGURE 195b

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MOHR'S CIRCLES

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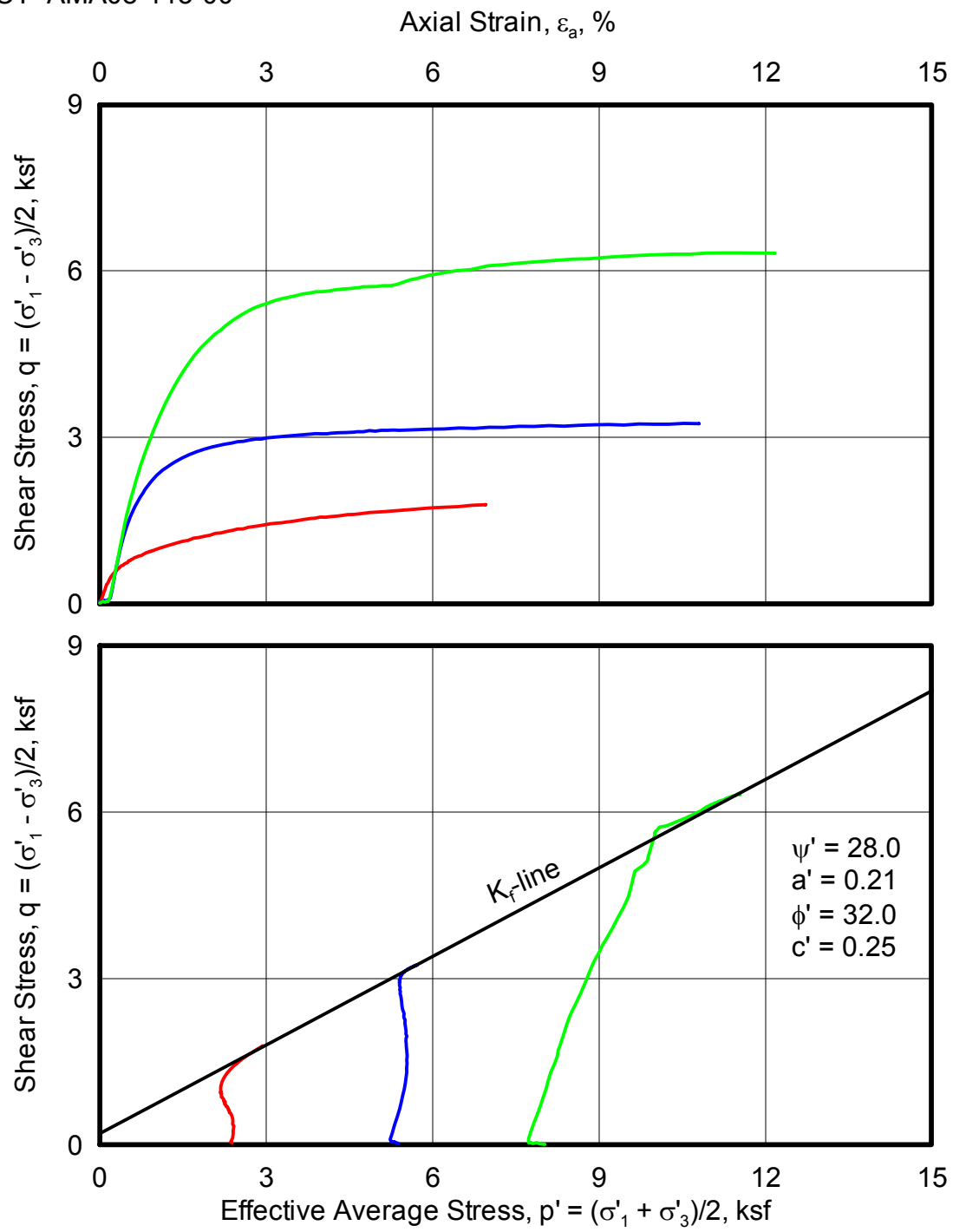
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-178, 20 TO 22 FEET

MATERIAL: CLAYEY SILT (ML)
INITIAL WATER CONTENT: 33.4
INITIAL DRY UNIT WEIGHT: 87.0 pcf
INITIAL VOID RATIO: 0.97
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 26.6
INITIAL DEGREE OF SATURATION: 94.4%
FINAL DEGREE OF SATURATION: 100.0%
LL = 38; PL = 25; PI = 13

FIGURE 196a

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STRESS PATH

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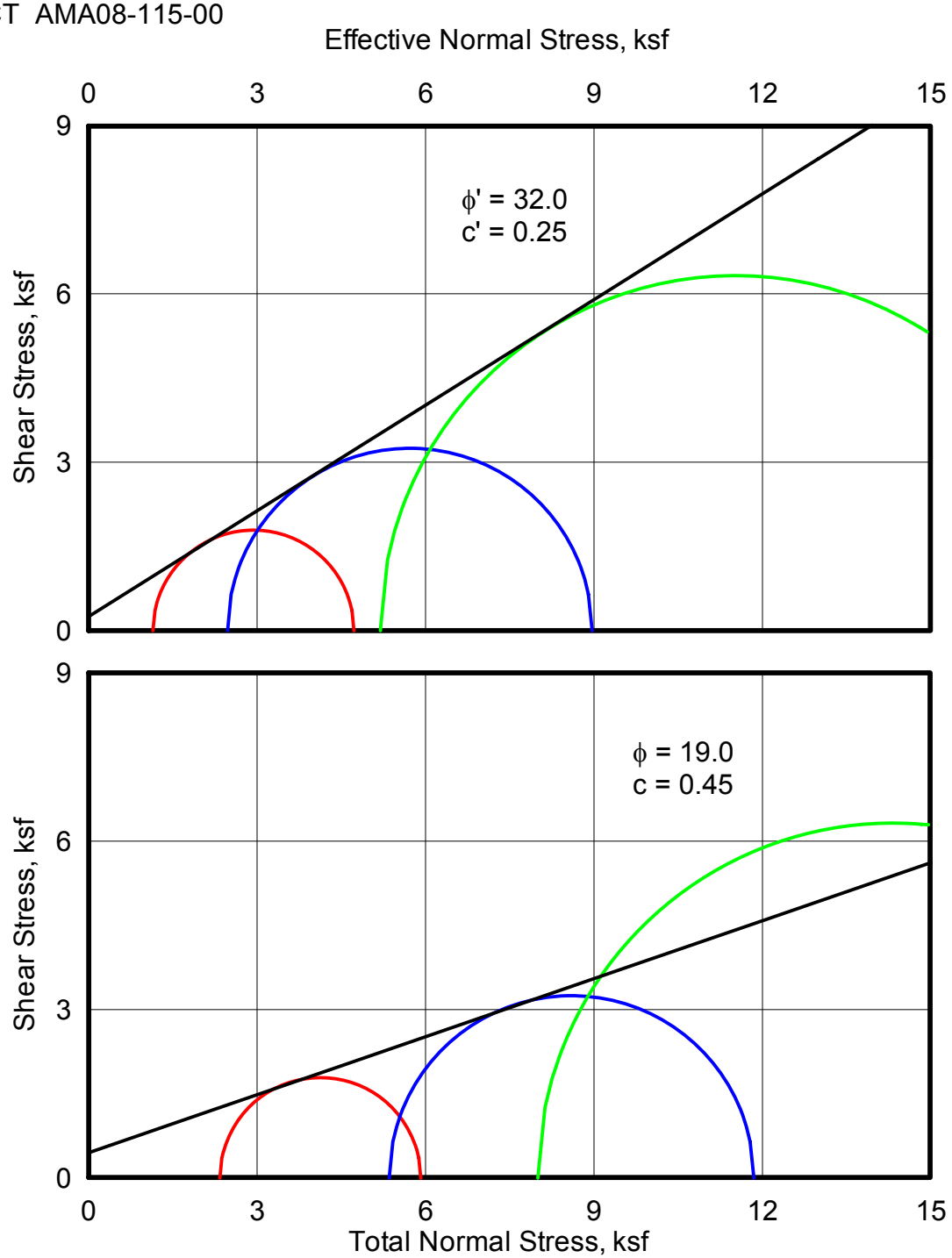
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-178, 20 TO 22 FEET

MATERIAL: CLAYEY SILT (ML)
INITIAL WATER CONTENT: 33.4
INITIAL DRY UNIT WEIGHT: 87.0 pcf
INITIAL VOID RATIO: 0.97
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 26.6
INITIAL DEGREE OF SATURATION: 94.4%
FINAL DEGREE OF SATURATION: 100.0%
LL = 38; PL = 25; PI = 13

FIGURE 196b

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LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

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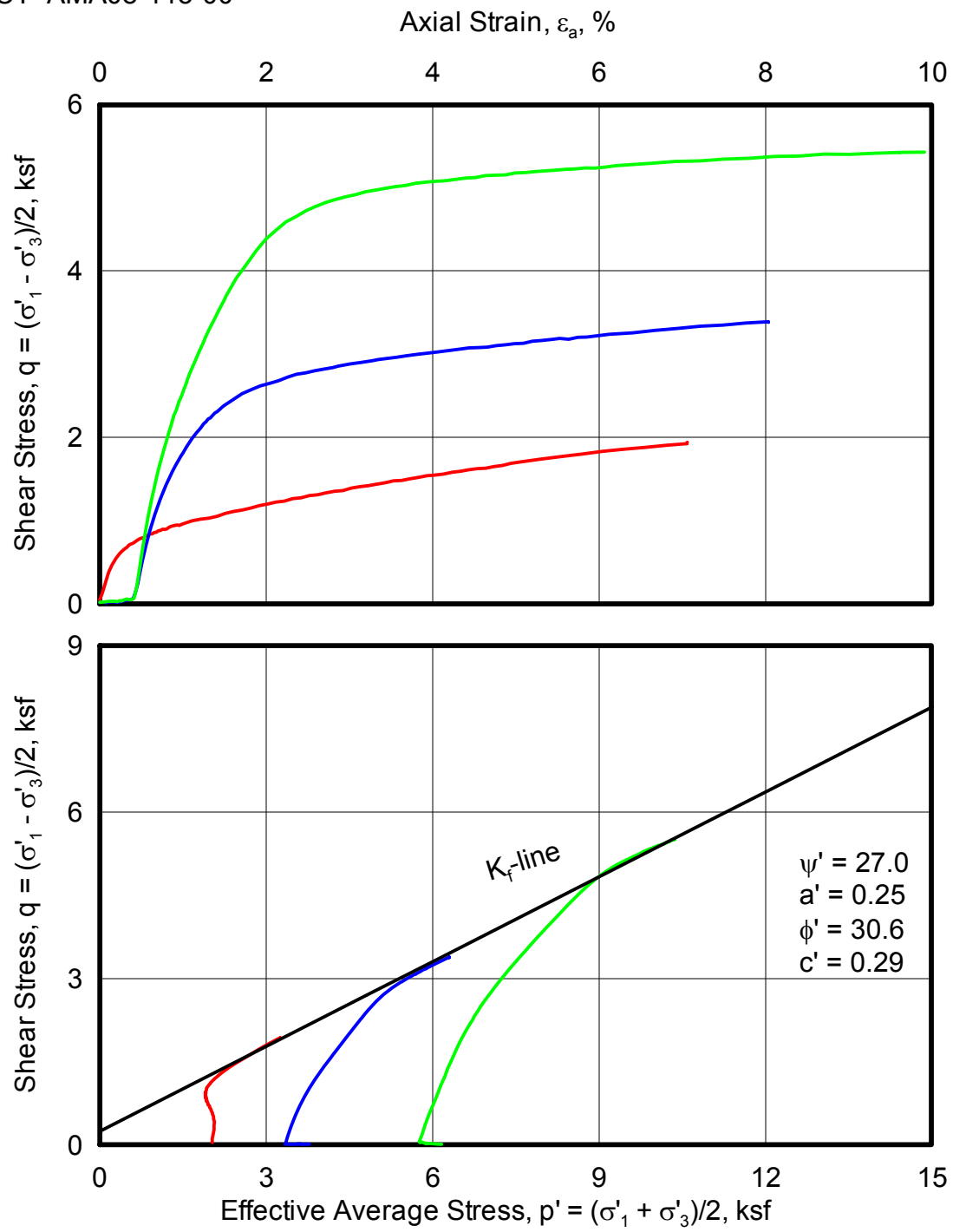

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH

BORING DP-182, 4 TO 6 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 23.6
INITIAL DRY UNIT WEIGHT: 104.8 pcf
INITIAL VOID RATIO: 0.66
SPECIFIC GRAVITY: 2.78 (assumed)

FINAL WATER CONTENT: 23.6
INITIAL DEGREE OF SATURATION: 100.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 32; PL = 20; PI = 12

FIGURE 197a

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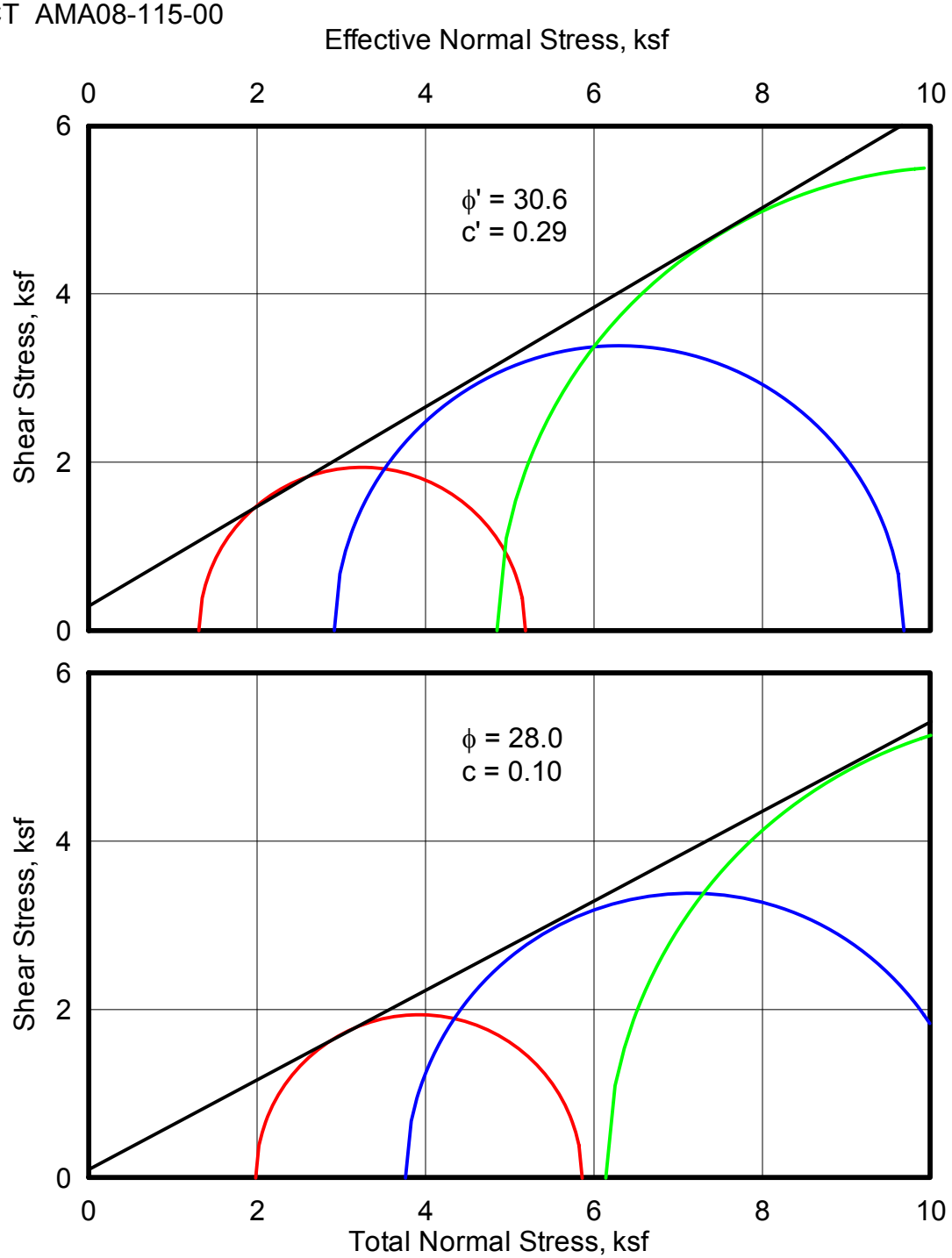
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-182, 4 TO 6 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 23.6
INITIAL DRY UNIT WEIGHT: 104.8 pcf
INITIAL VOID RATIO: 0.66
SPECIFIC GRAVITY: 2.78 (assumed)

FINAL WATER CONTENT: 23.6
INITIAL DEGREE OF SATURATION: 100.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 32; PL = 20; PI = 12

FIGURE 197b

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LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

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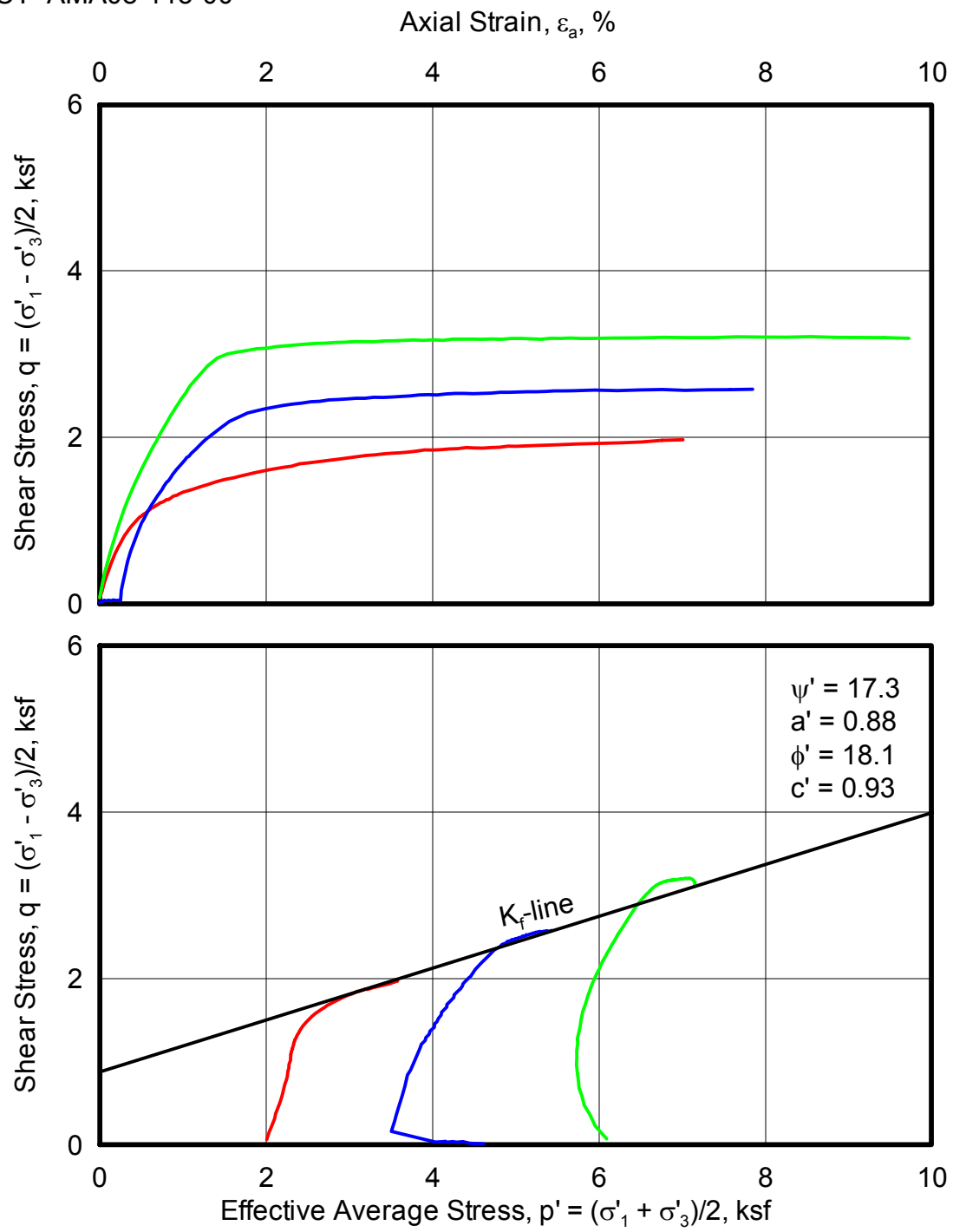

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-187, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.0
INITIAL DRY UNIT WEIGHT: 99.23 pcf
INITIAL VOID RATIO: 0.73
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 25.4
INITIAL DEGREE OF SATURATION: 86.8%
FINAL DEGREE OF SATURATION: 100.0%
LL = 56; PL = 23; PI = 33

FIGURE 198a

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STRESS PATH

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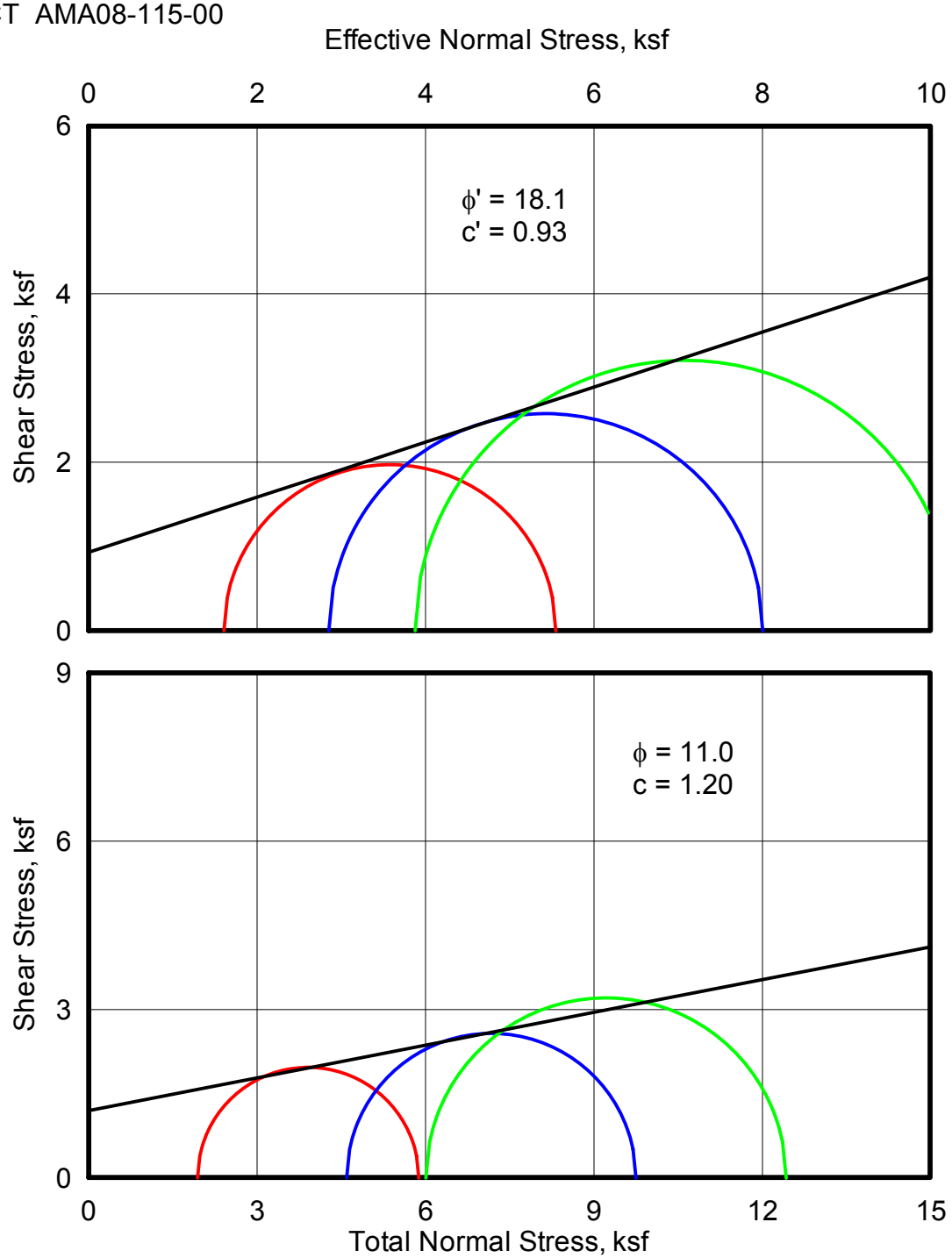
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-187, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.0
INITIAL DRY UNIT WEIGHT: 99.23 pcf
INITIAL VOID RATIO: 0.73
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 25.4
INITIAL DEGREE OF SATURATION: 86.8%
FINAL DEGREE OF SATURATION: 100.0%
LL = 56; PL = 23; PI = 33

FIGURE 198b

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MOHR'S CIRCLES

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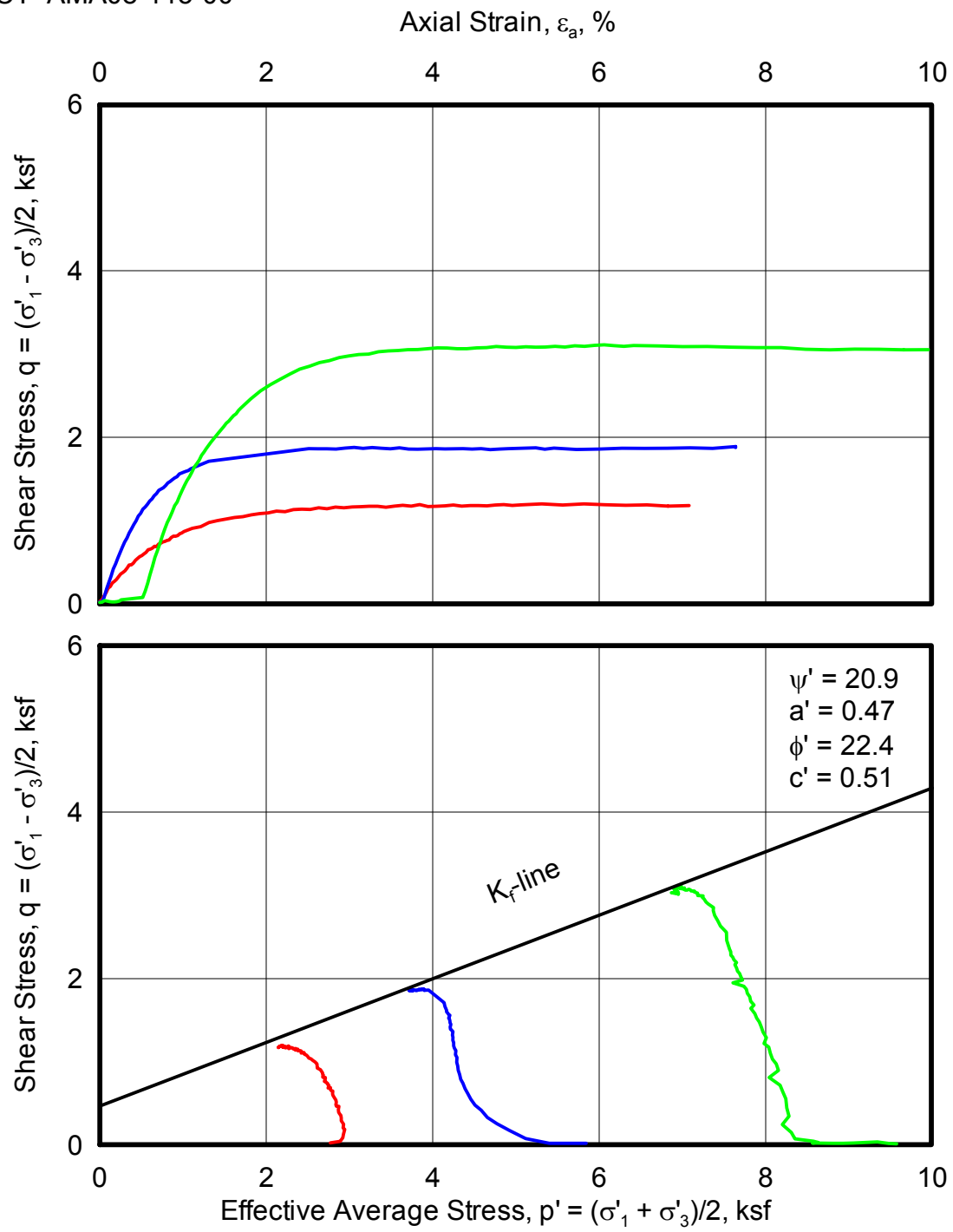
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-195, 30 TO 32 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 29.4
INITIAL DRY UNIT WEIGHT: 93.9 pcf
INITIAL VOID RATIO: 0.83
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.2
INITIAL DEGREE OF SATURATION: 97.5%
FINAL DEGREE OF SATURATION: 100.0%
LL = 51; PL = 23; PI = 28

FIGURE 199a

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STRESS PATH

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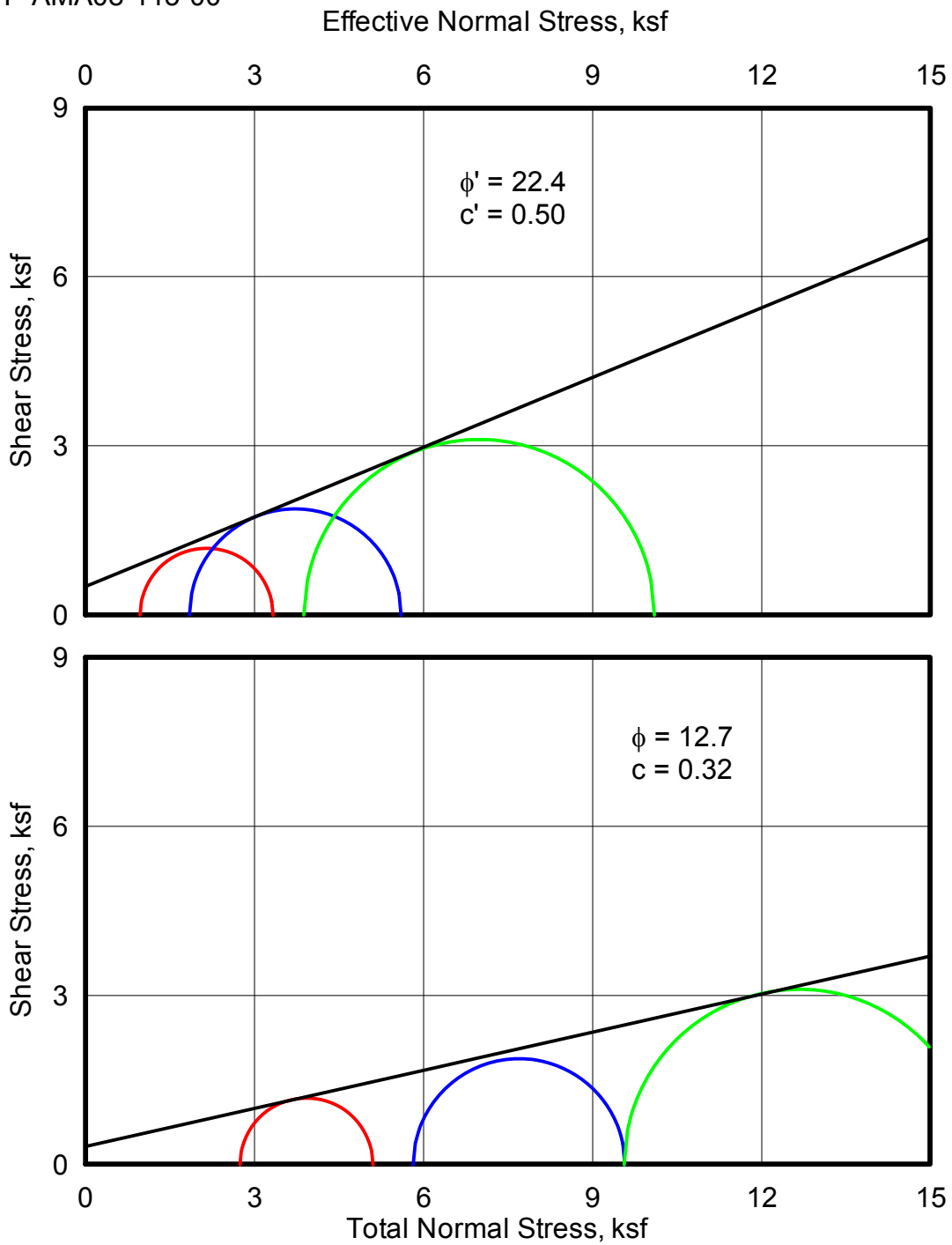
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-195, 30 TO 32 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 29.4
INITIAL DRY UNIT WEIGHT: 93.9 pcf
INITIAL VOID RATIO: 0.83
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.2
INITIAL DEGREE OF SATURATION: 97.5%
FINAL DEGREE OF SATURATION: 100.0%
LL = 51; PL = 23; PI = 28

FIGURE 199b

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MOHR'S CIRCLES

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LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

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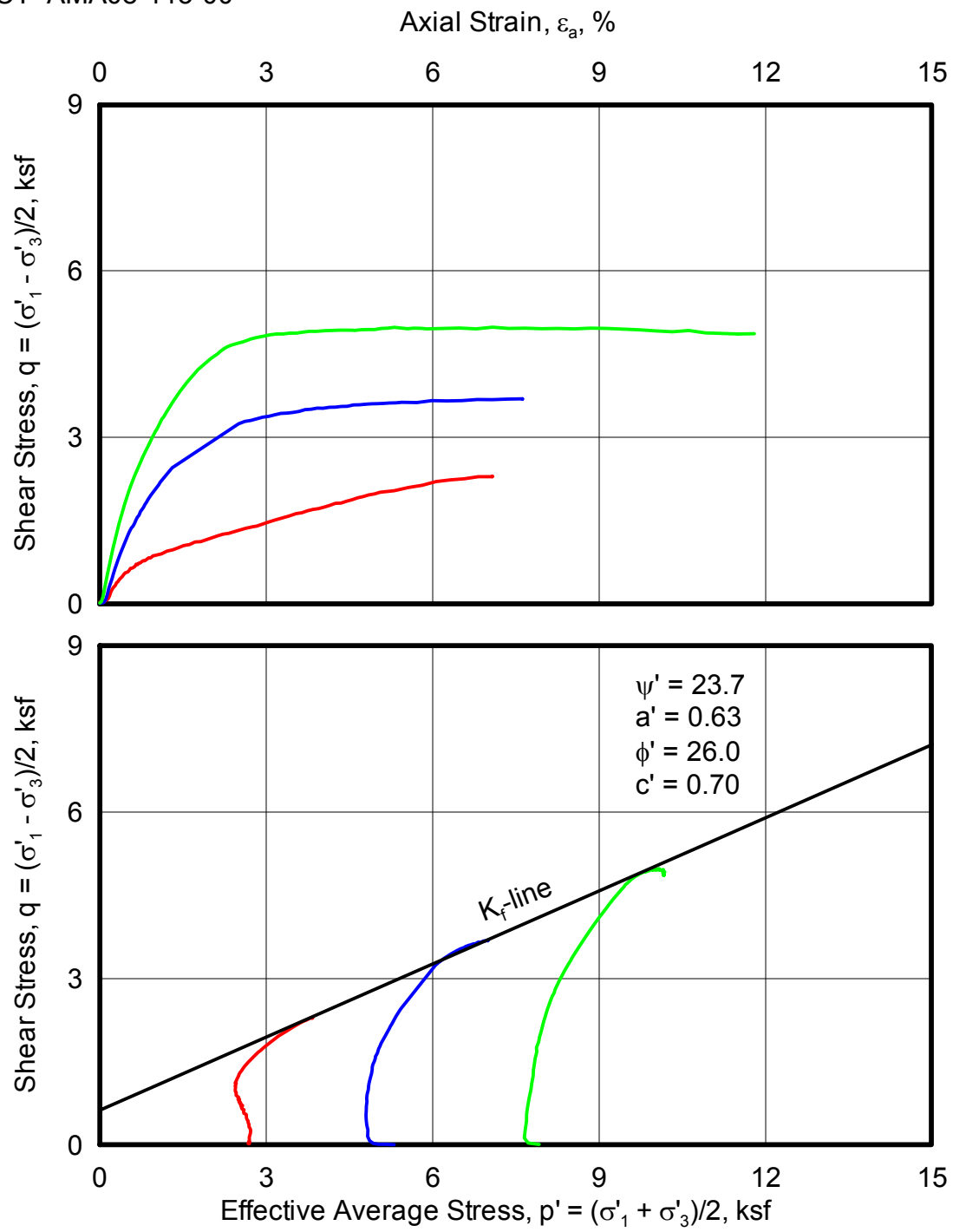

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-198, 20 TO 22 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 25.1
INITIAL DRY UNIT WEIGHT: 99.7 pcf
INITIAL VOID RATIO: 0.72
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 23.2
INITIAL DEGREE OF SATURATION: 95.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 47; PL = 22; PI = 25

FIGURE 200a

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STRESS PATH

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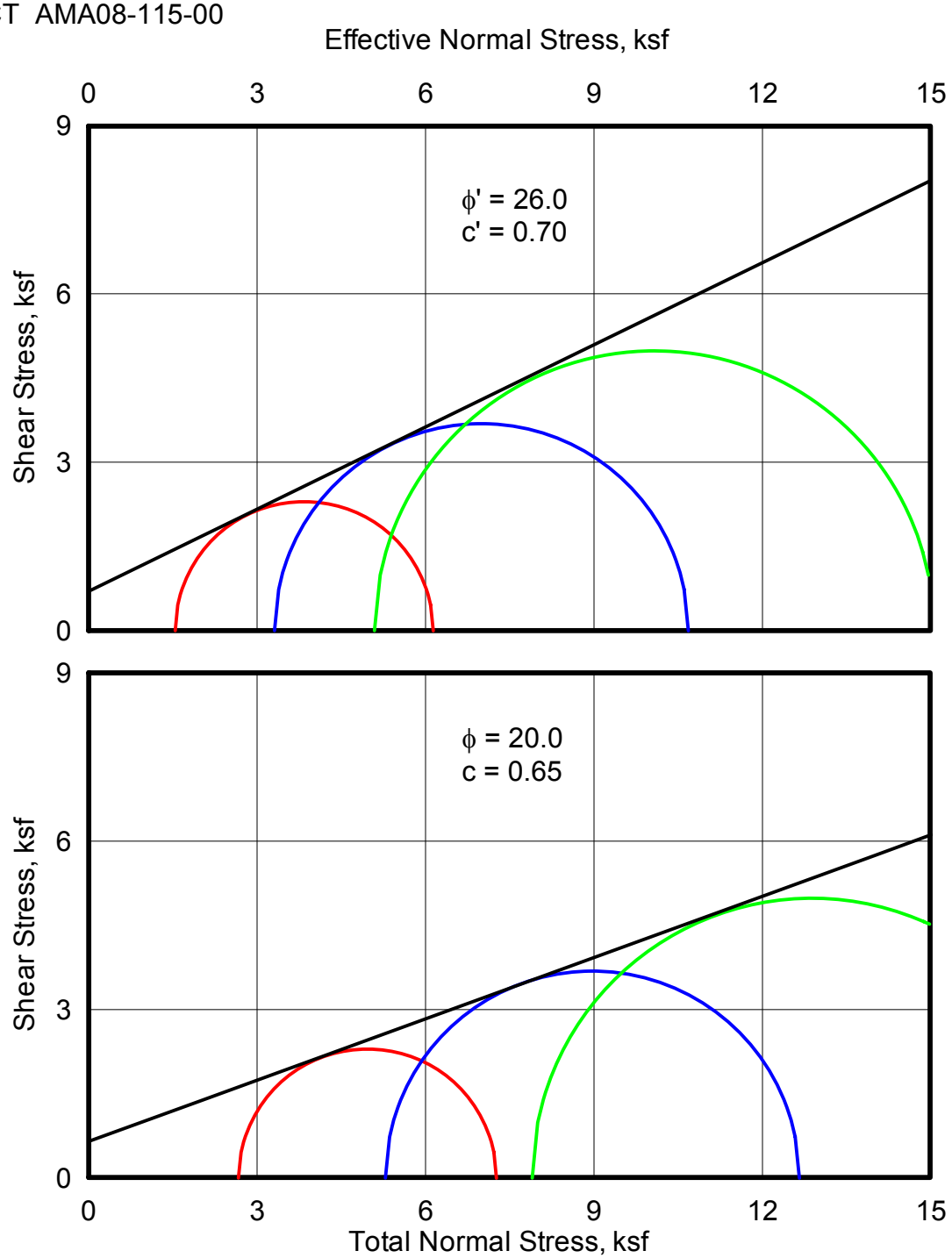
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-198, 20 TO 22 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 25.1
INITIAL DRY UNIT WEIGHT: 99.7 pcf
INITIAL VOID RATIO: 0.72
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 23.2
INITIAL DEGREE OF SATURATION: 95.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 47; PL = 22; PI = 25

FIGURE 200b

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MOHR'S CIRCLES

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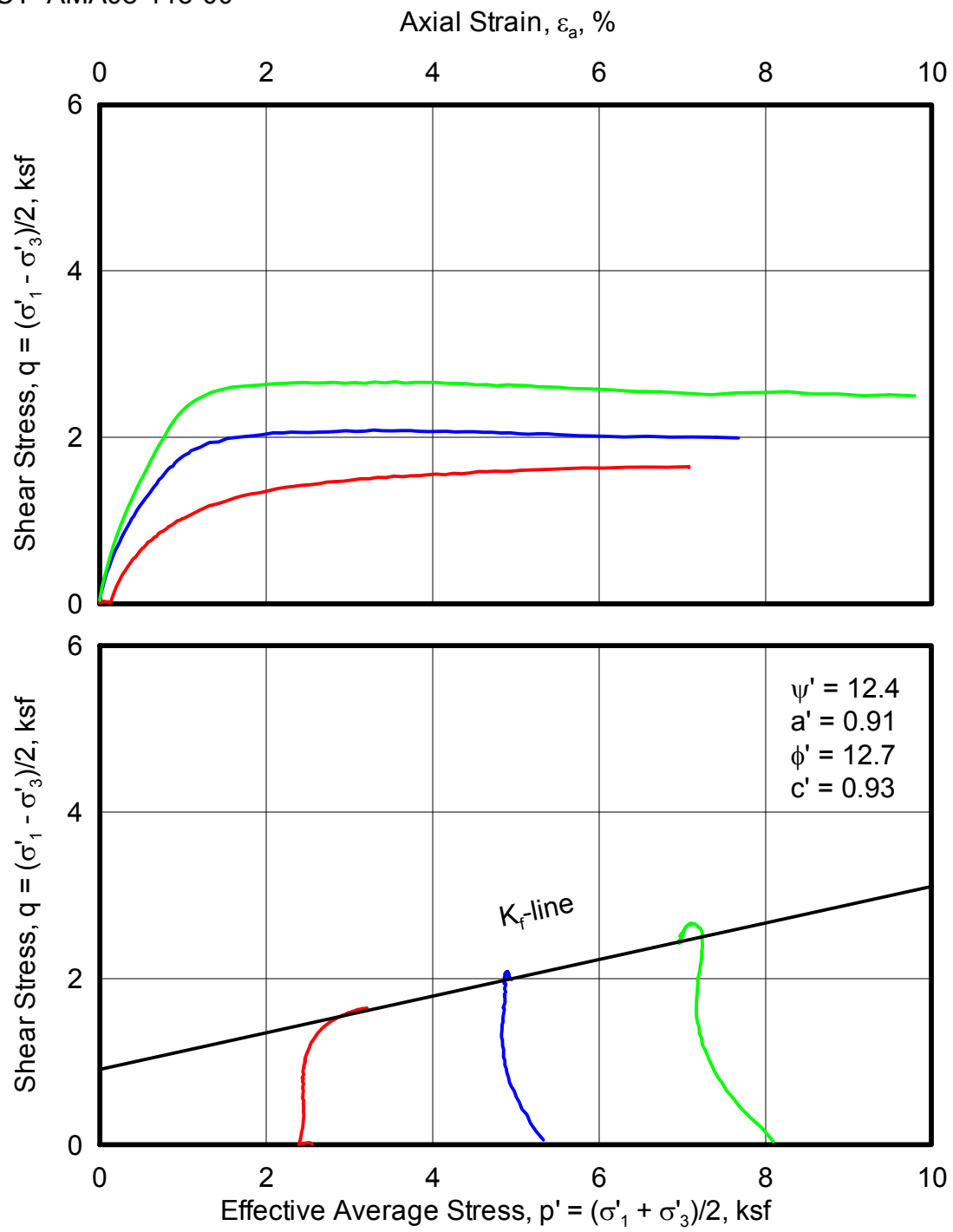
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-202, 30 TO 32 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 24.7
INITIAL DRY UNIT WEIGHT: 100.5 pcf
INITIAL VOID RATIO: 0.71
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.7
INITIAL DEGREE OF SATURATION: 96.1%
FINAL DEGREE OF SATURATION: 100.0%
LL = 64; PL = 24; PI = 40

FIGURE 201a

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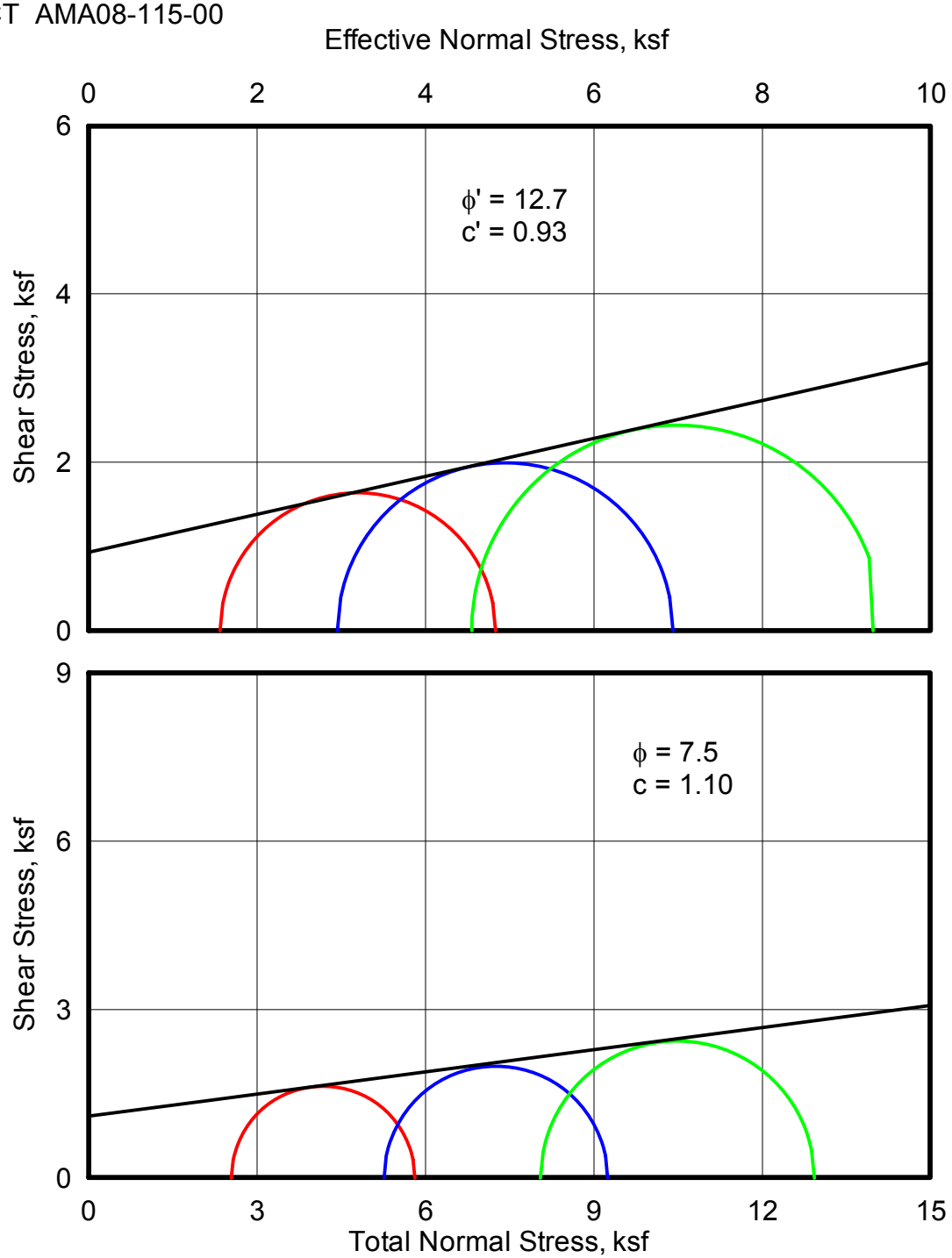
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-202, 30 TO 32 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 24.7
INITIAL DRY UNIT WEIGHT: 100.5 pcf
INITIAL VOID RATIO: 0.71
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.7
INITIAL DEGREE OF SATURATION: 96.1%
FINAL DEGREE OF SATURATION: 100.0%
LL = 64; PL = 24; PI = 40

FIGURE 201b

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MOHR'S CIRCLES

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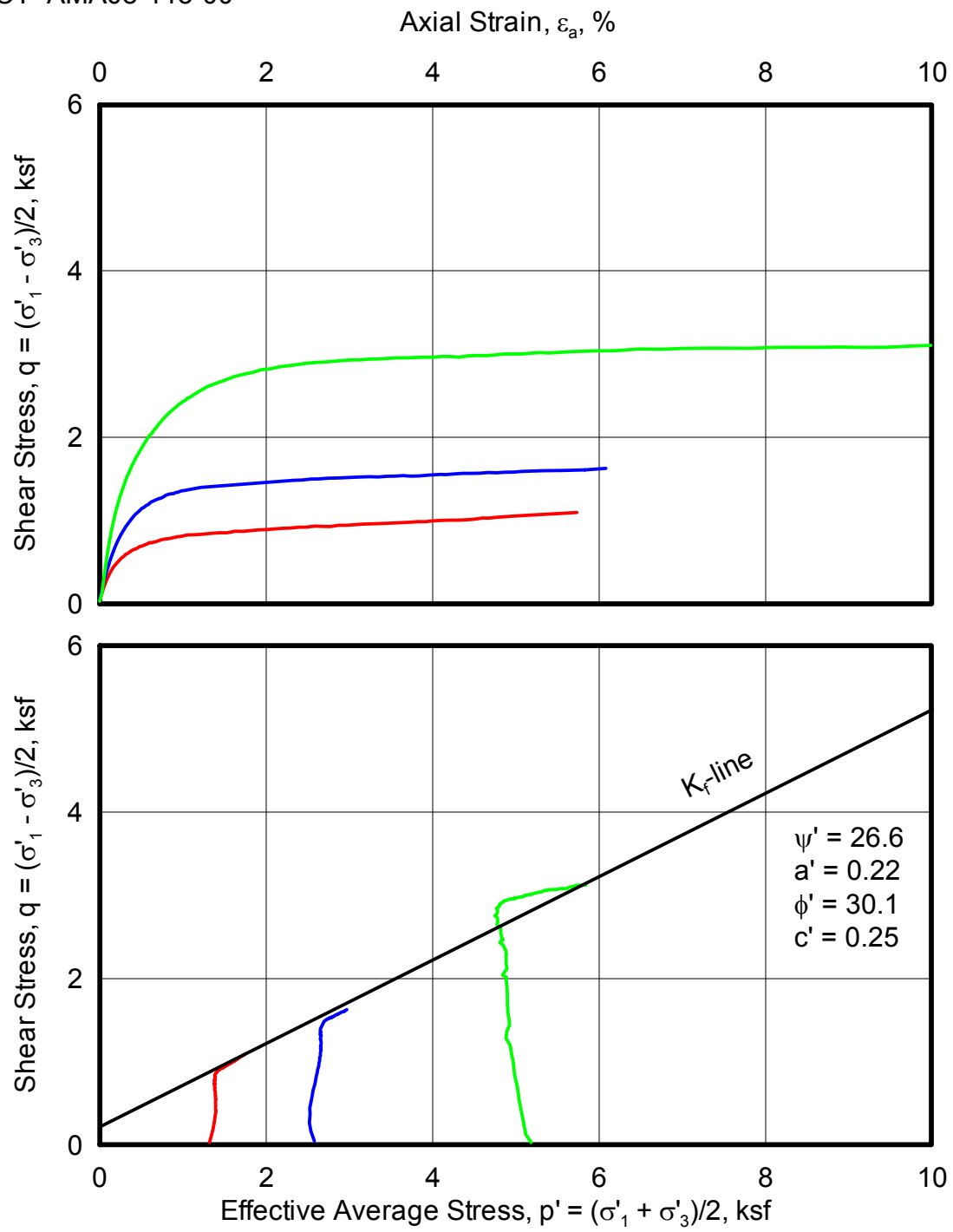
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-215, 20 TO 22 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 21.8
INITIAL DRY UNIT WEIGHT: 100.0 pcf
INITIAL VOID RATIO: 0.72
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.4
INITIAL DEGREE OF SATURATION: 83.6%
FINAL DEGREE OF SATURATION: 100.0%
LL = 39; PL = 19; PI = 20

FIGURE 202a

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STRESS PATH

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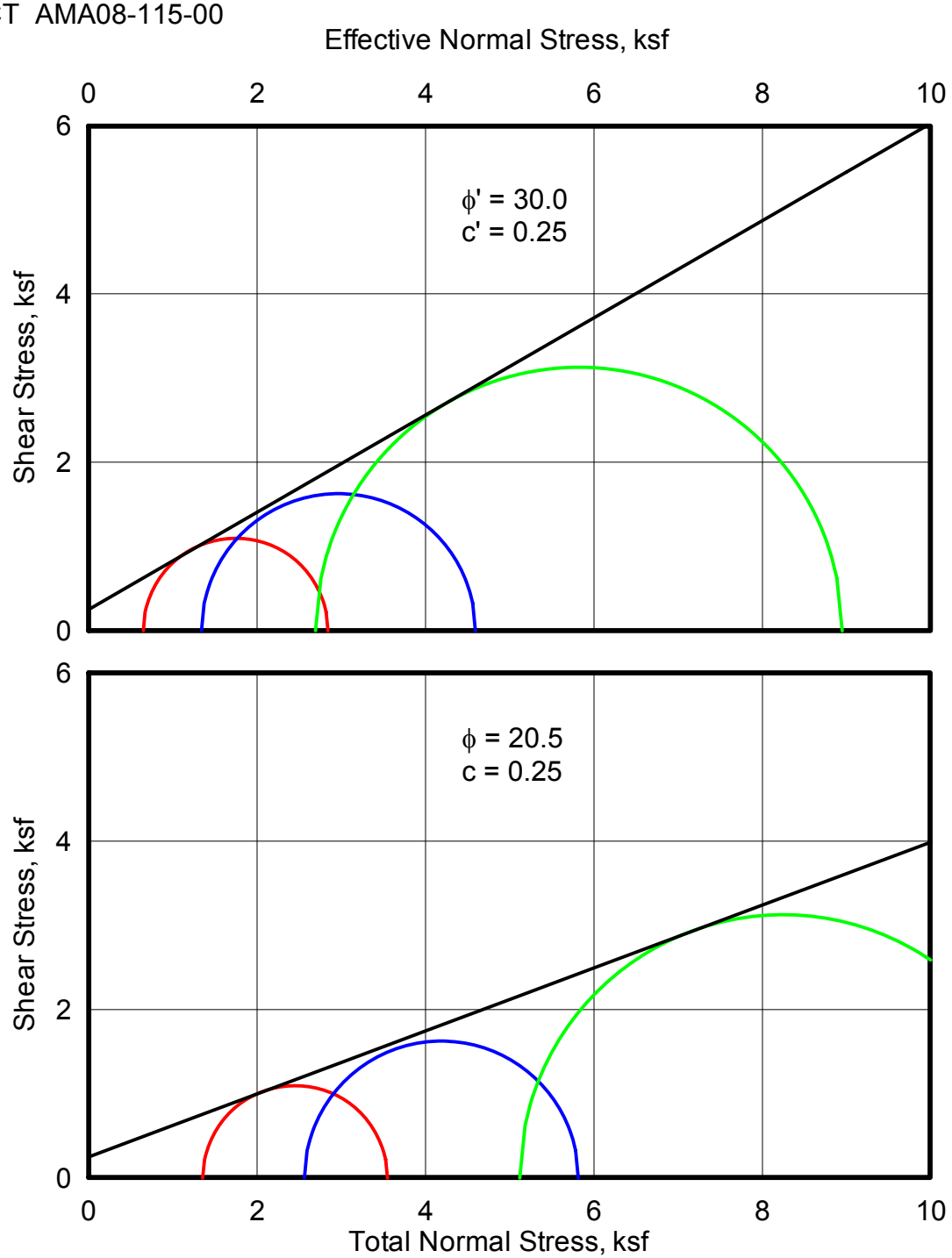
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-215, 20 TO 22 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 21.8
INITIAL DRY UNIT WEIGHT: 100.0 pcf
INITIAL VOID RATIO: 0.72
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.4
INITIAL DEGREE OF SATURATION: 83.6%
FINAL DEGREE OF SATURATION: 100.0%
LL = 39; PL = 19; PI = 20

FIGURE 202b

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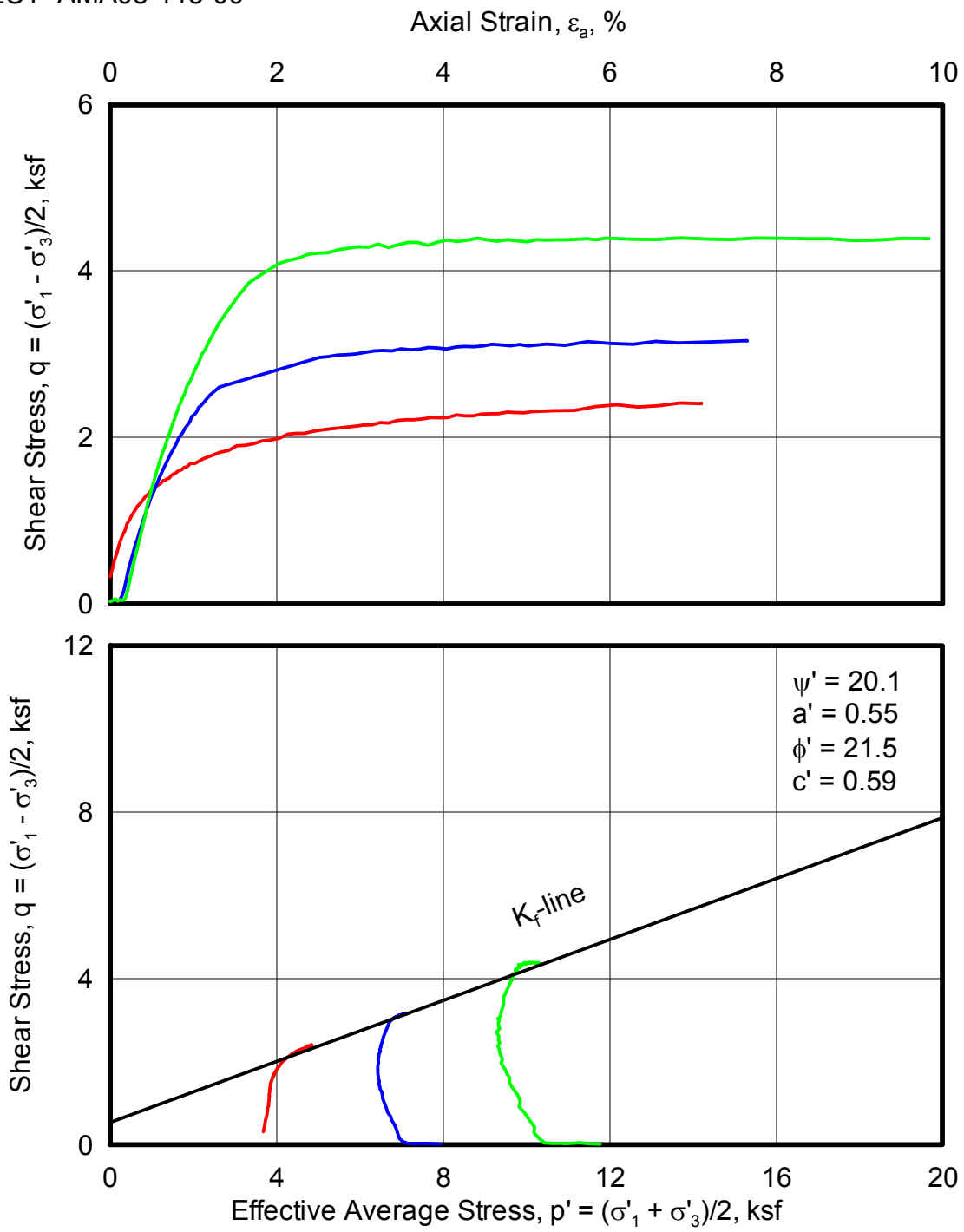
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-218, 40 TO 42 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 19.9
INITIAL DRY UNIT WEIGHT: 109.3 pcf
INITIAL VOID RATIO: 0.57
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 19.0
INITIAL DEGREE OF SATURATION: 91.5%
FINAL DEGREE OF SATURATION: 100.0%
LL = 45; PL = 16; PI = 29

FIGURE 203a

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STRESS PATH

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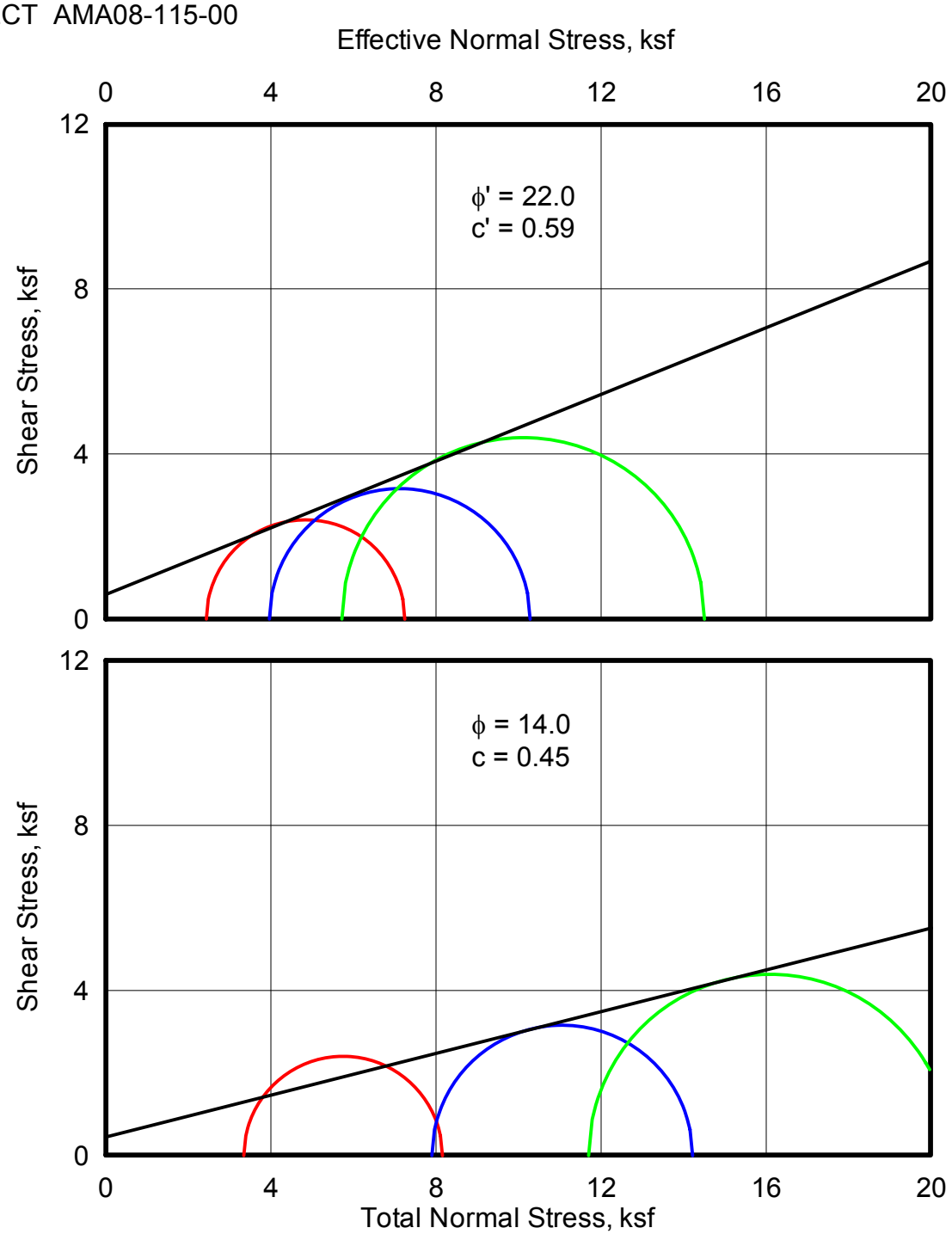
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-218, 40 TO 42 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 19.9
INITIAL DRY UNIT WEIGHT: 109.3 pcf
INITIAL VOID RATIO: 0.57
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 19.0
INITIAL DEGREE OF SATURATION: 91.5%
FINAL DEGREE OF SATURATION: 100.0%
LL = 45; PL = 16; PI = 29

FIGURE 203b

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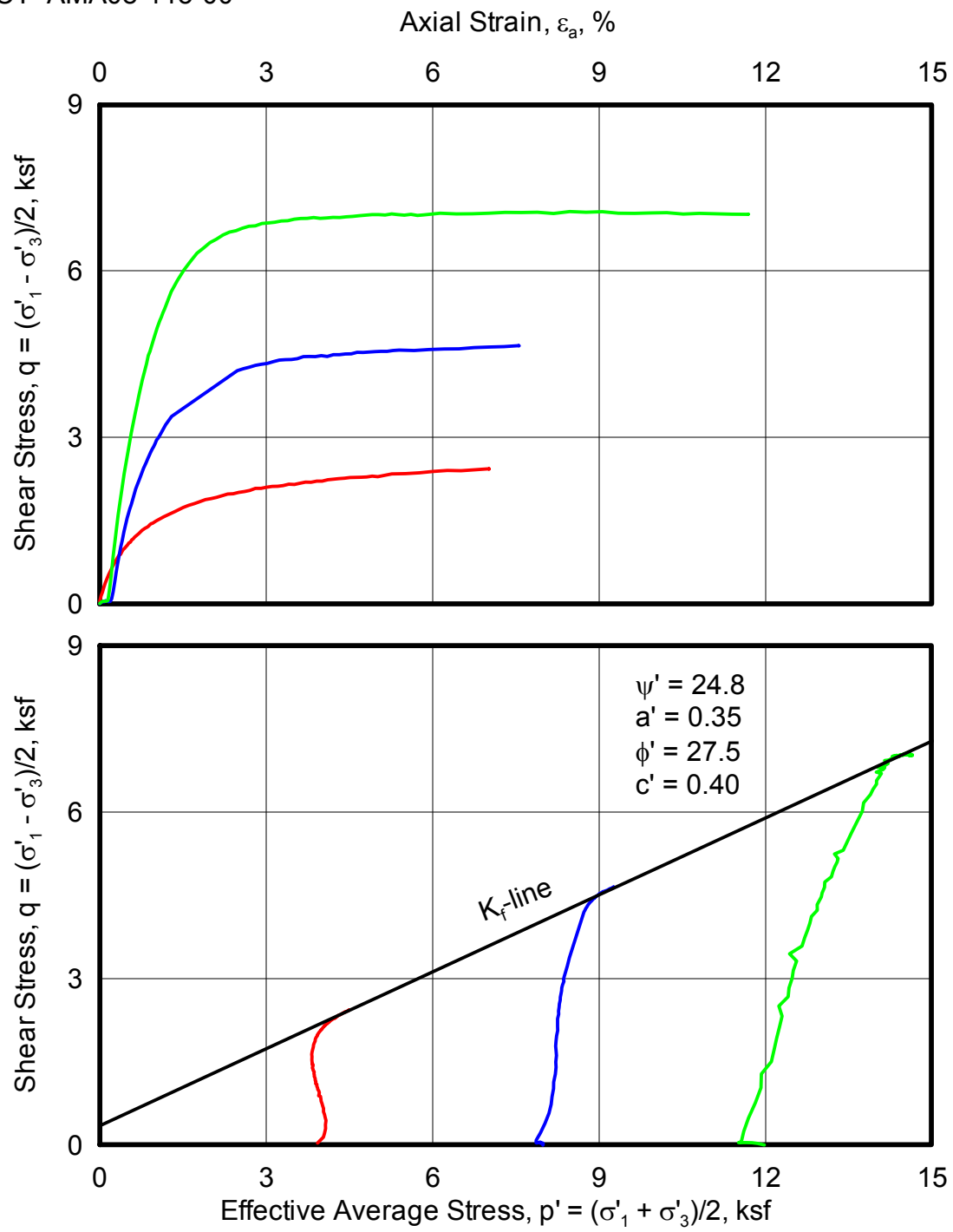
USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-221, 40 TO 42 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 20.1
INITIAL DRY UNIT WEIGHT: 109.2 pcf
INITIAL VOID RATIO: 0.57
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 17.0
INITIAL DEGREE OF SATURATION: 96.8%
FINAL DEGREE OF SATURATION: 100.0%
LL = 35; PL = 18; PI = 17

FIGURE 204a

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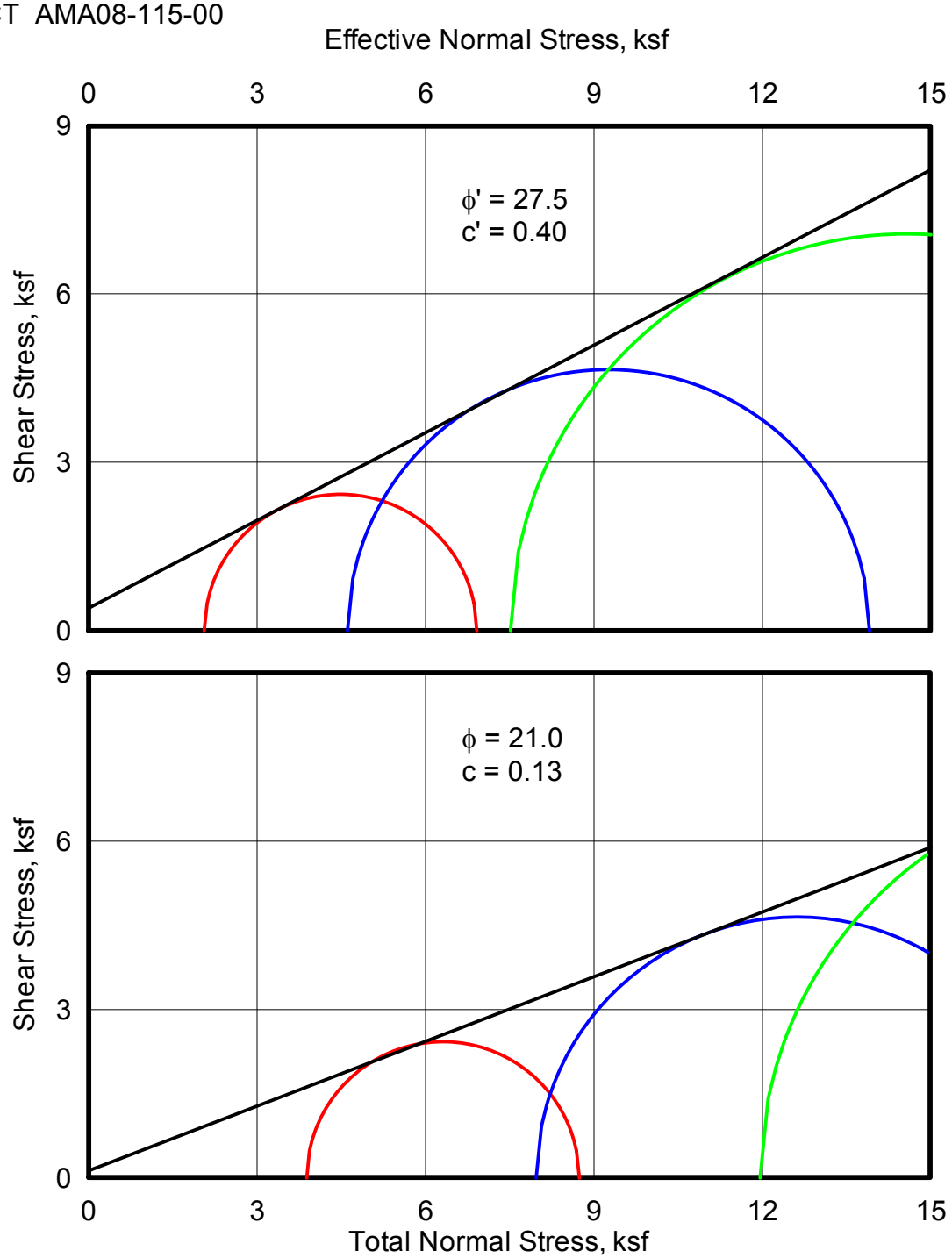
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-221, 40 TO 42 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 20.1
INITIAL DRY UNIT WEIGHT: 109.2 pcf
INITIAL VOID RATIO: 0.57
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 17.0
INITIAL DEGREE OF SATURATION: 96.8%
FINAL DEGREE OF SATURATION: 100.0%
LL = 35; PL = 18; PI = 17

FIGURE 204b

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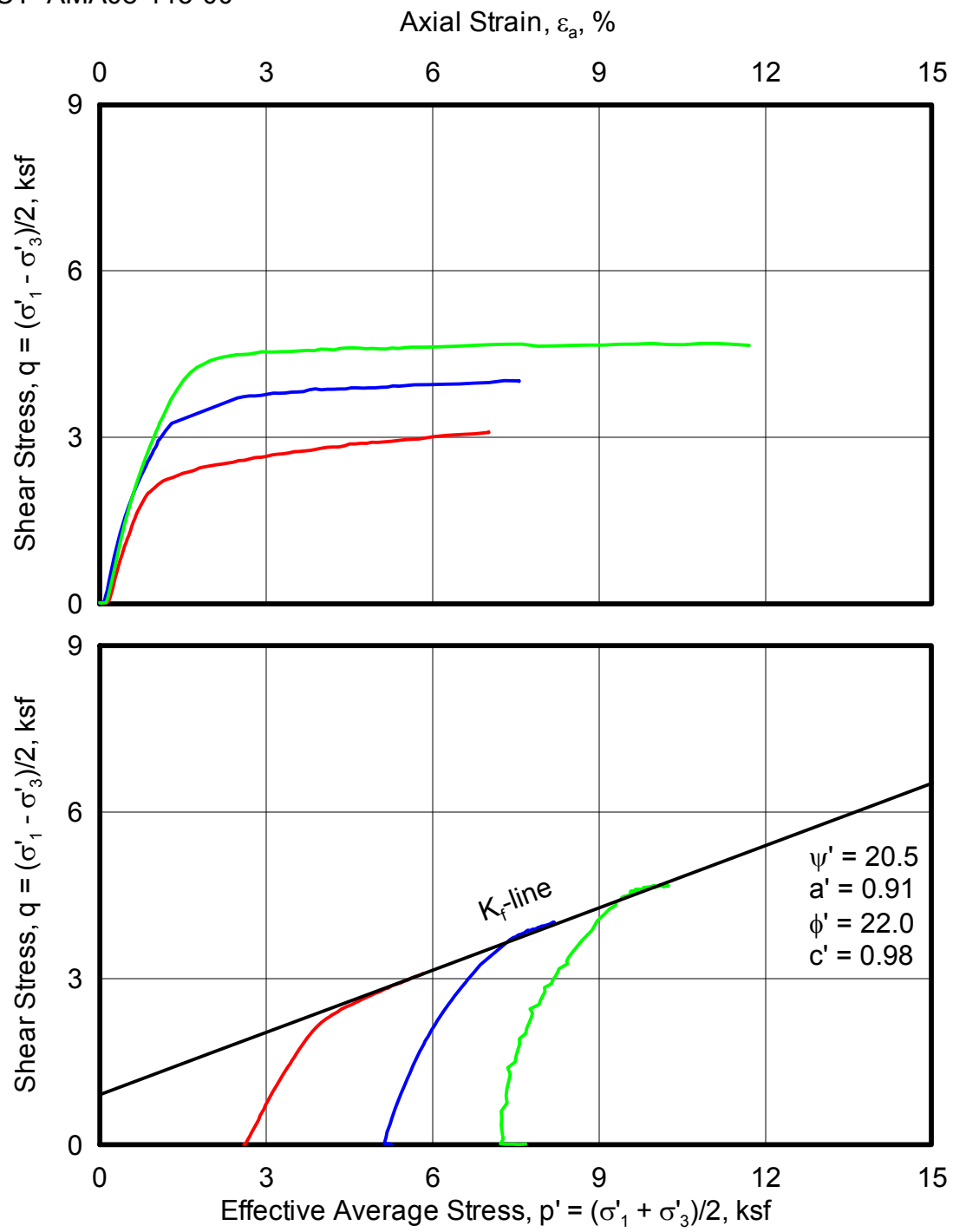
MOHR'S CIRCLES

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-227, 8 TO 10 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 16.2
INITIAL DRY UNIT WEIGHT: 108.4 pcf
INITIAL VOID RATIO: 0.58
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 21.1
INITIAL DEGREE OF SATURATION: 76.4%
FINAL DEGREE OF SATURATION: 100.0%
LL = 50; PL = 18; PI = 32

FIGURE 205a

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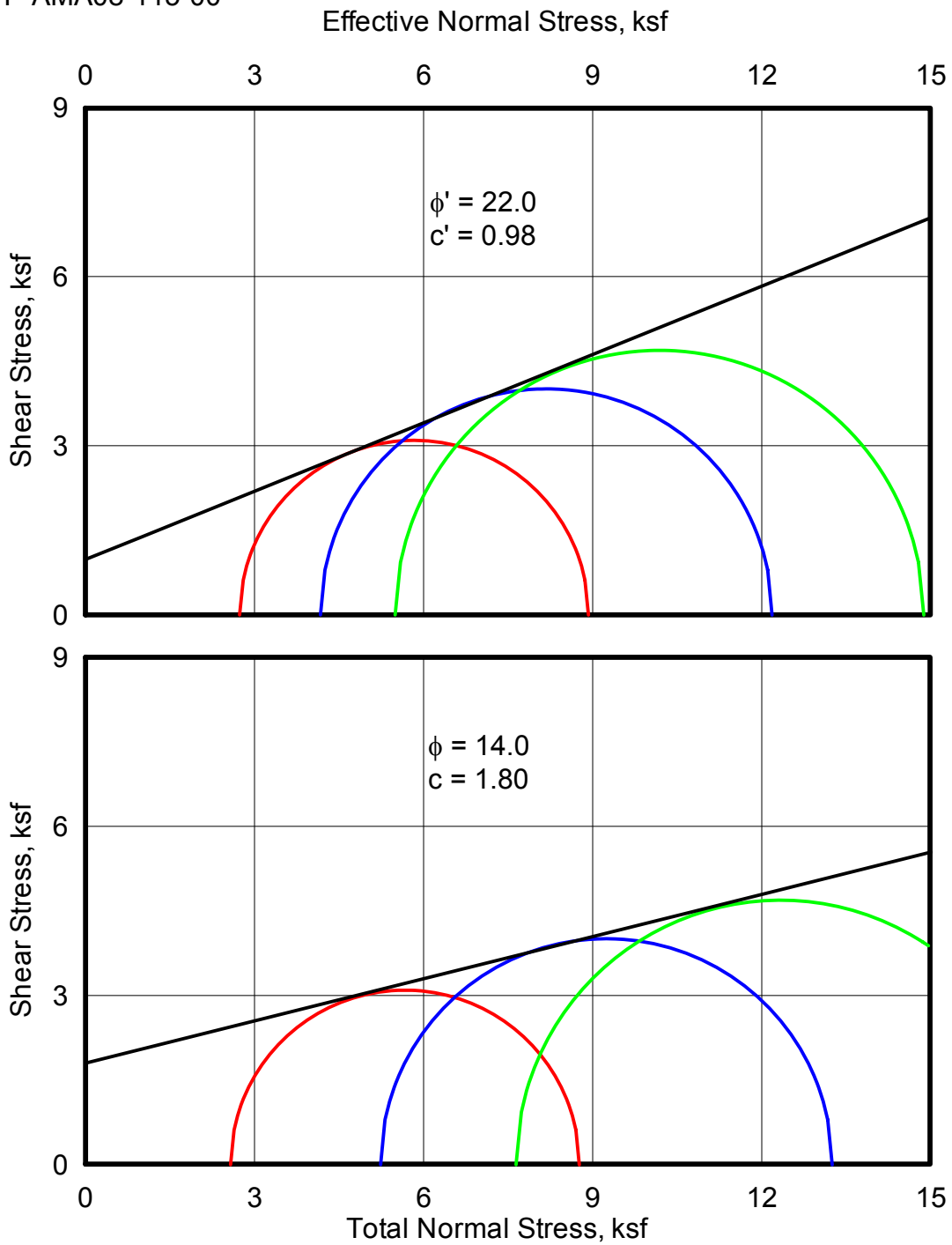
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-227, 8 TO 10 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 16.2
INITIAL DRY UNIT WEIGHT: 108.4 pcf
INITIAL VOID RATIO: 0.58
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.1
INITIAL DEGREE OF SATURATION: 76.4%
FINAL DEGREE OF SATURATION: 100.0%
LL = 50; PL = 18; PI = 32

FIGURE 205b

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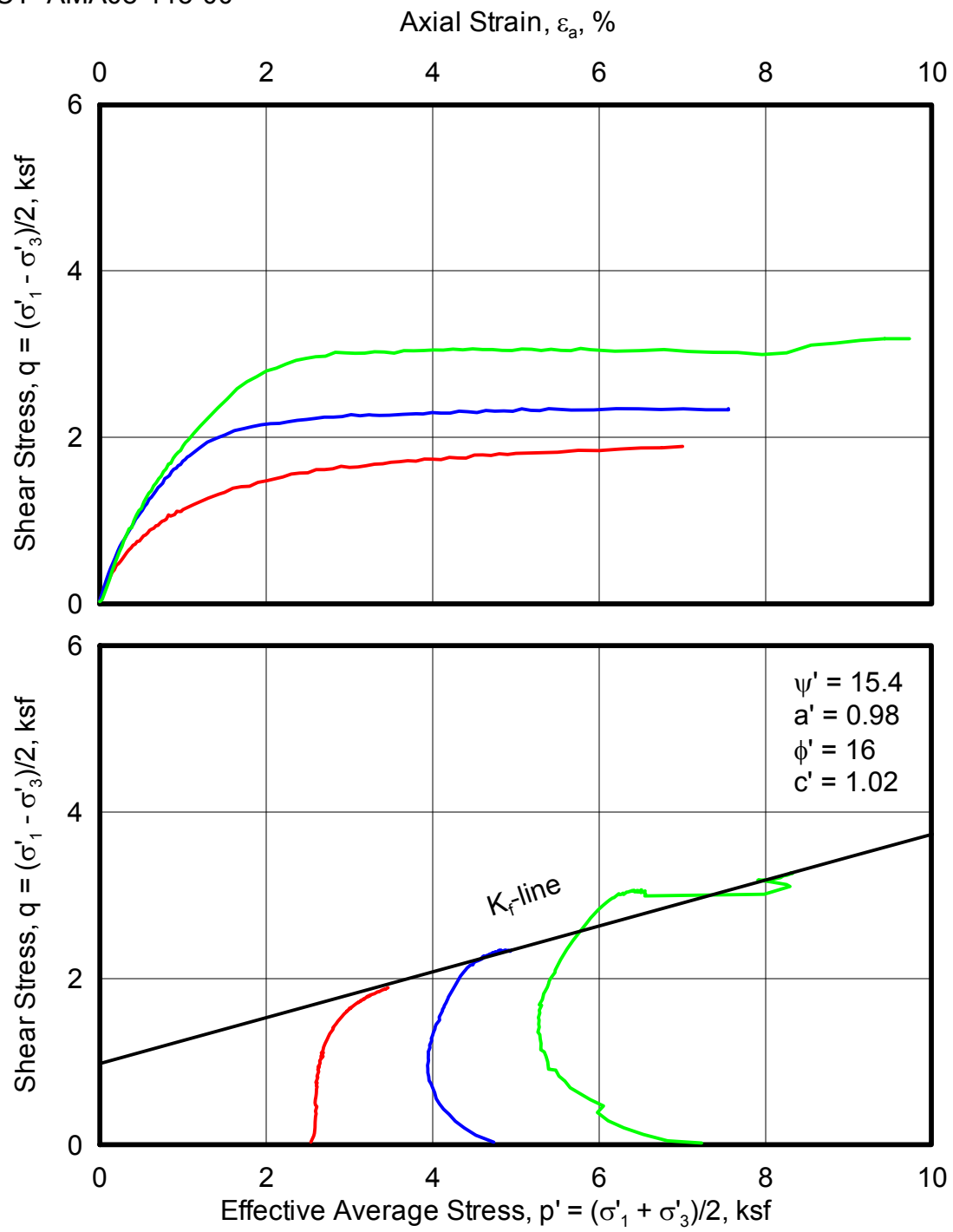
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-229, 30 TO 32 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 30.1
INITIAL DRY UNIT WEIGHT: 102.9 pcf
INITIAL VOID RATIO: 0.70
SPECIFIC GRAVITY: 2.8 (assumed)

FINAL WATER CONTENT: 20.3
INITIAL DEGREE OF SATURATION: 100.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 69; PL = 27; PI = 42

FIGURE 206a

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STRESS PATH

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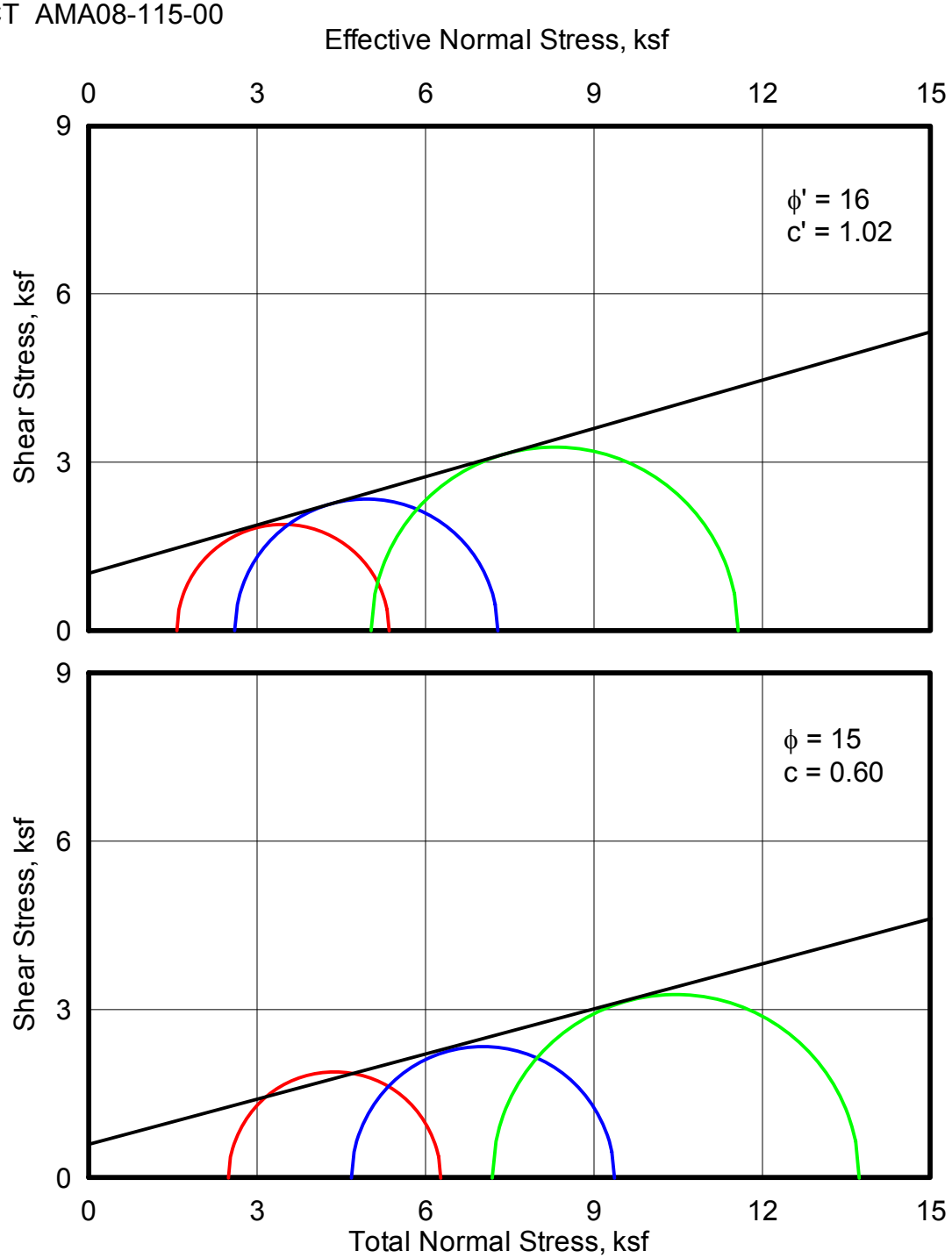
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-229, 30 TO 32 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 30.1
INITIAL DRY UNIT WEIGHT: 102.9 pcf
INITIAL VOID RATIO: 0.70
SPECIFIC GRAVITY: 2.8 (assumed)

FINAL WATER CONTENT: 20.3
INITIAL DEGREE OF SATURATION: 100.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 69; PL = 27; PI = 42

FIGURE 206b

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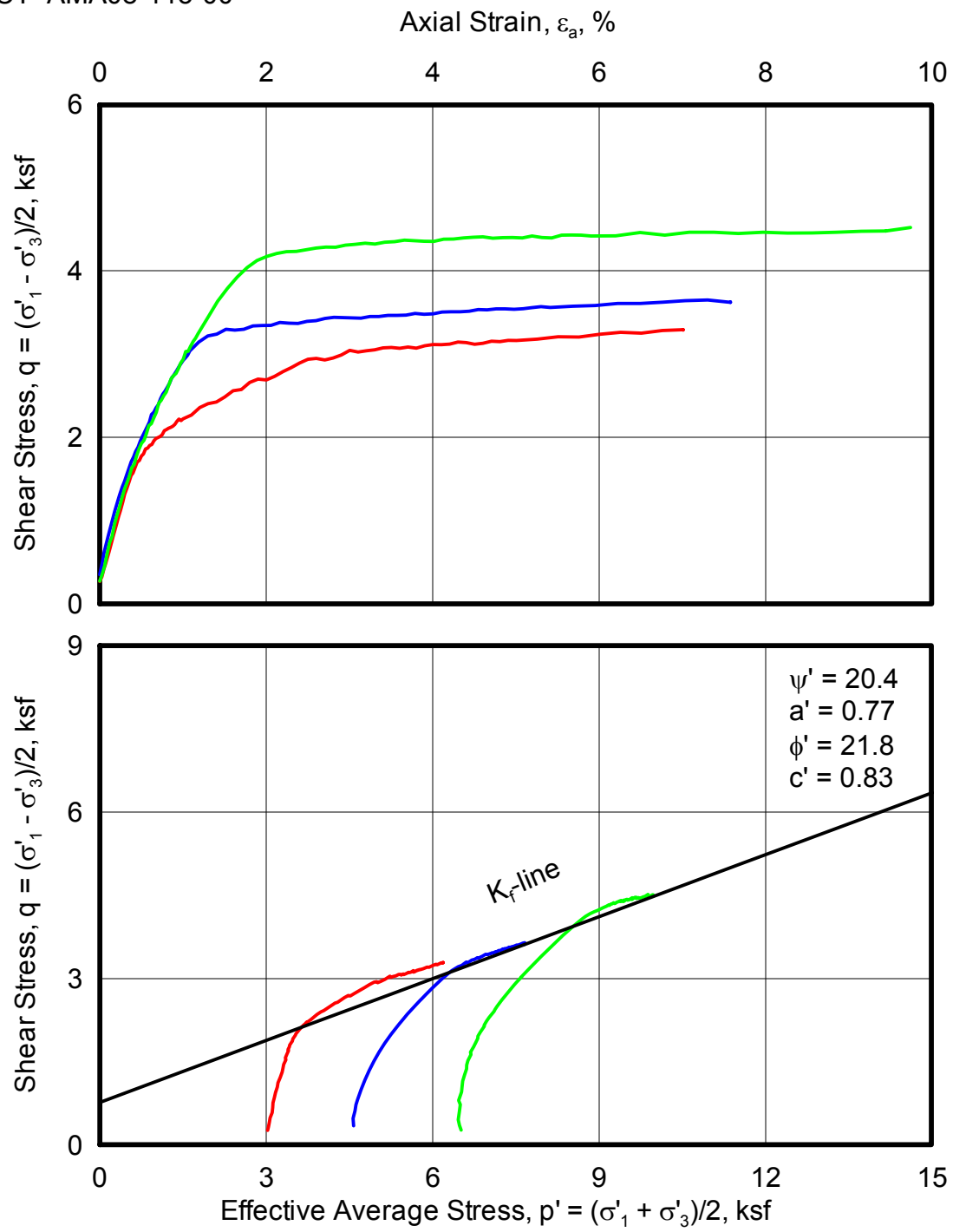
USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-233, 15 TO 17 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 18.9
INITIAL DRY UNIT WEIGHT: 107.8 pcf
INITIAL VOID RATIO: 0.59
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.3
INITIAL DEGREE OF SATURATION: 87.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 46; PL = 22; PI = 24

FIGURE 207a

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STRESS PATH

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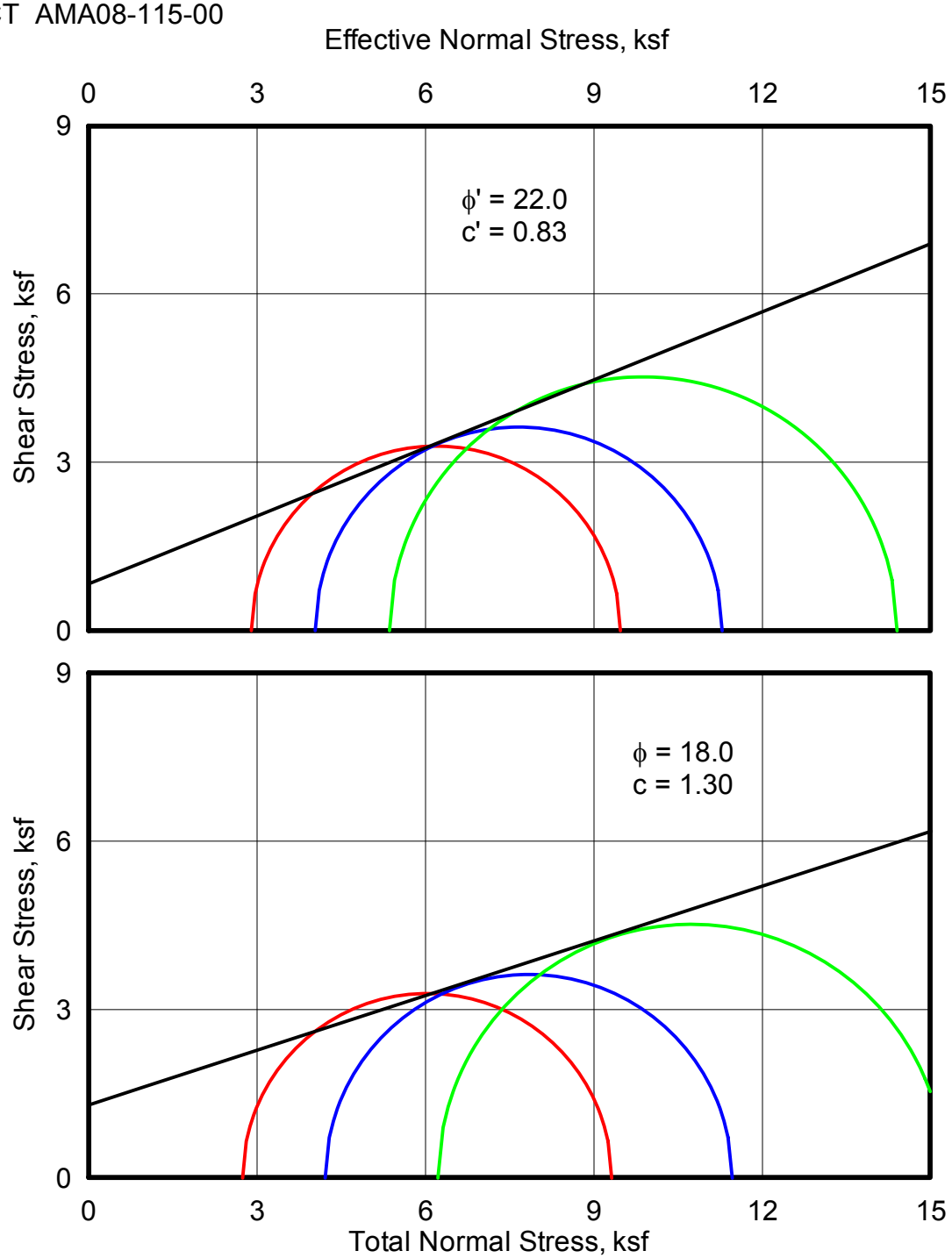
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-233, 15 TO 17 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 18.9
INITIAL DRY UNIT WEIGHT: 107.8 pcf
INITIAL VOID RATIO: 0.59
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.3
INITIAL DEGREE OF SATURATION: 87.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 46; PL = 22; PI = 24

FIGURE 207b

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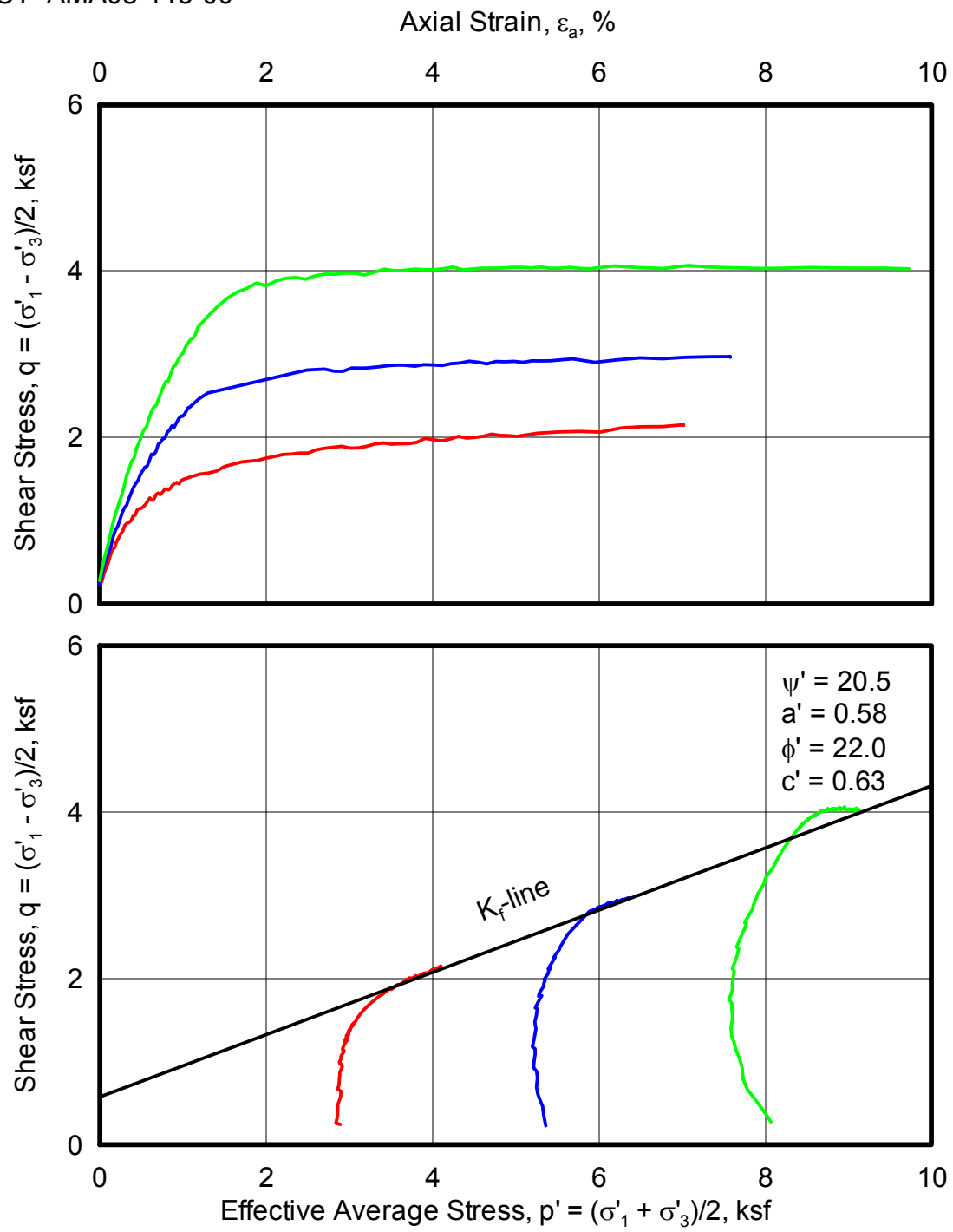
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-234, 40 TO 42 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 20.1
INITIAL DRY UNIT WEIGHT: 108.3 pcf
INITIAL VOID RATIO: 0.59
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 19.4
INITIAL DEGREE OF SATURATION: 91.3%
FINAL DEGREE OF SATURATION: 100.0%
LL = 46; PL = 18; PI = 28

FIGURE 208a

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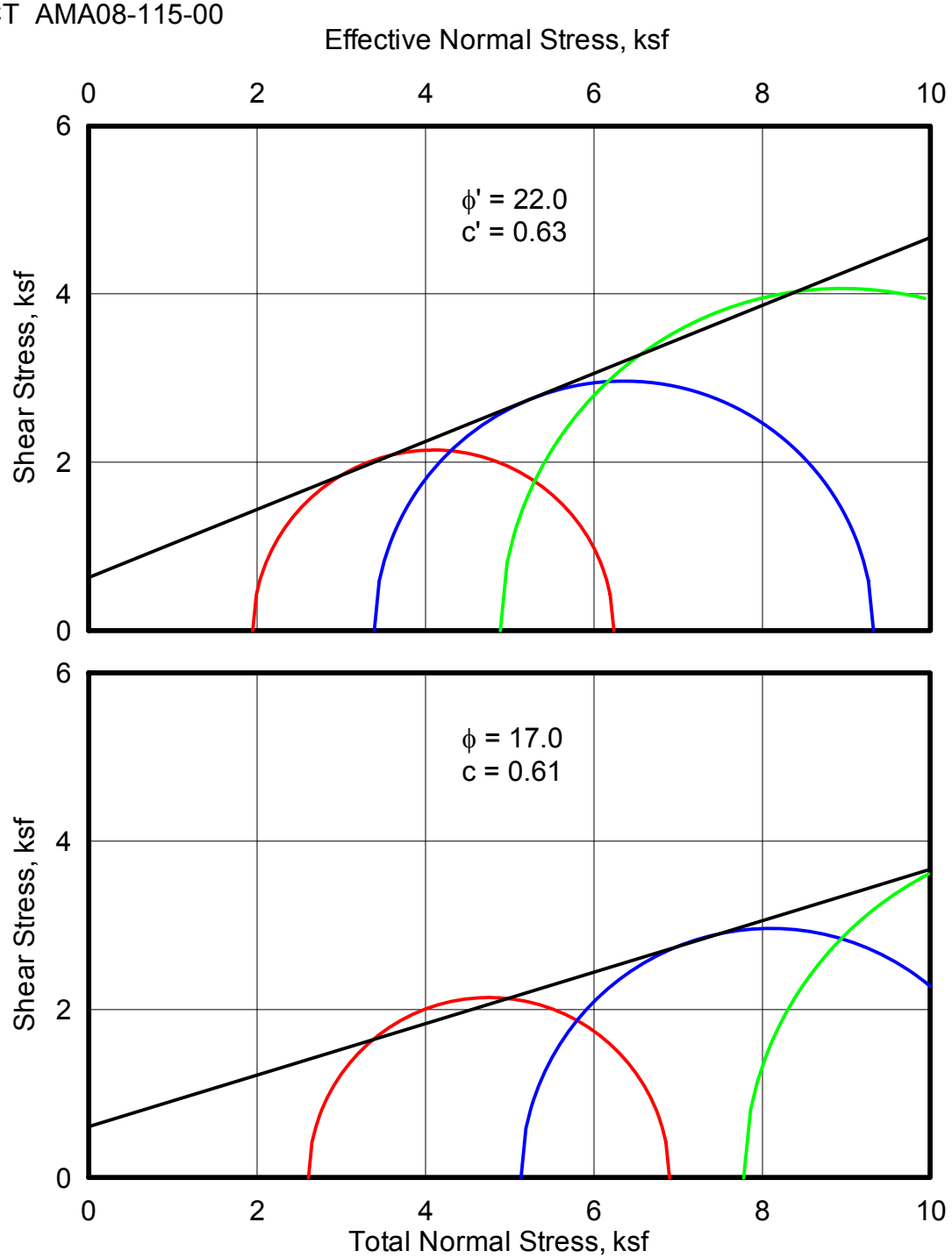
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-234, 40 TO 42 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 20.1
INITIAL DRY UNIT WEIGHT: 108.3 pcf
INITIAL VOID RATIO: 0.59
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 19.4
INITIAL DEGREE OF SATURATION: 91.3%
FINAL DEGREE OF SATURATION: 100.0%
LL = 46; PL = 18; PI = 28

FIGURE 208b

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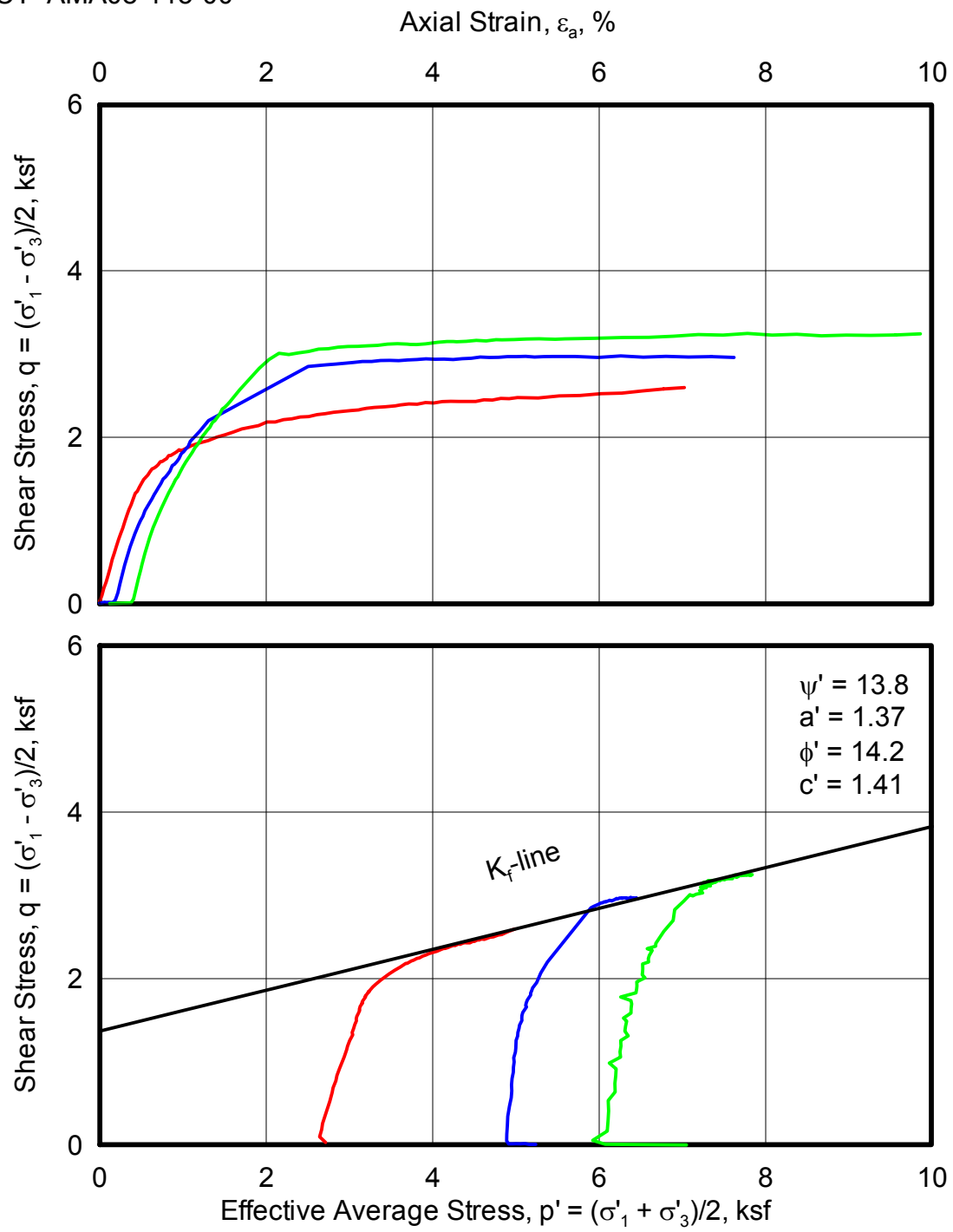
MOHR'S CIRCLES

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH

BORING DP-242, 6 TO 8 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 20.8
INITIAL DRY UNIT WEIGHT: 104.0 pcf
INITIAL VOID RATIO: 0.65
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 23.9
INITIAL DEGREE OF SATURATION: 87.9%
FINAL DEGREE OF SATURATION: 100.0%
LL = 69; PL = 23; PI = 46

FIGURE 209a

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STRESS PATH

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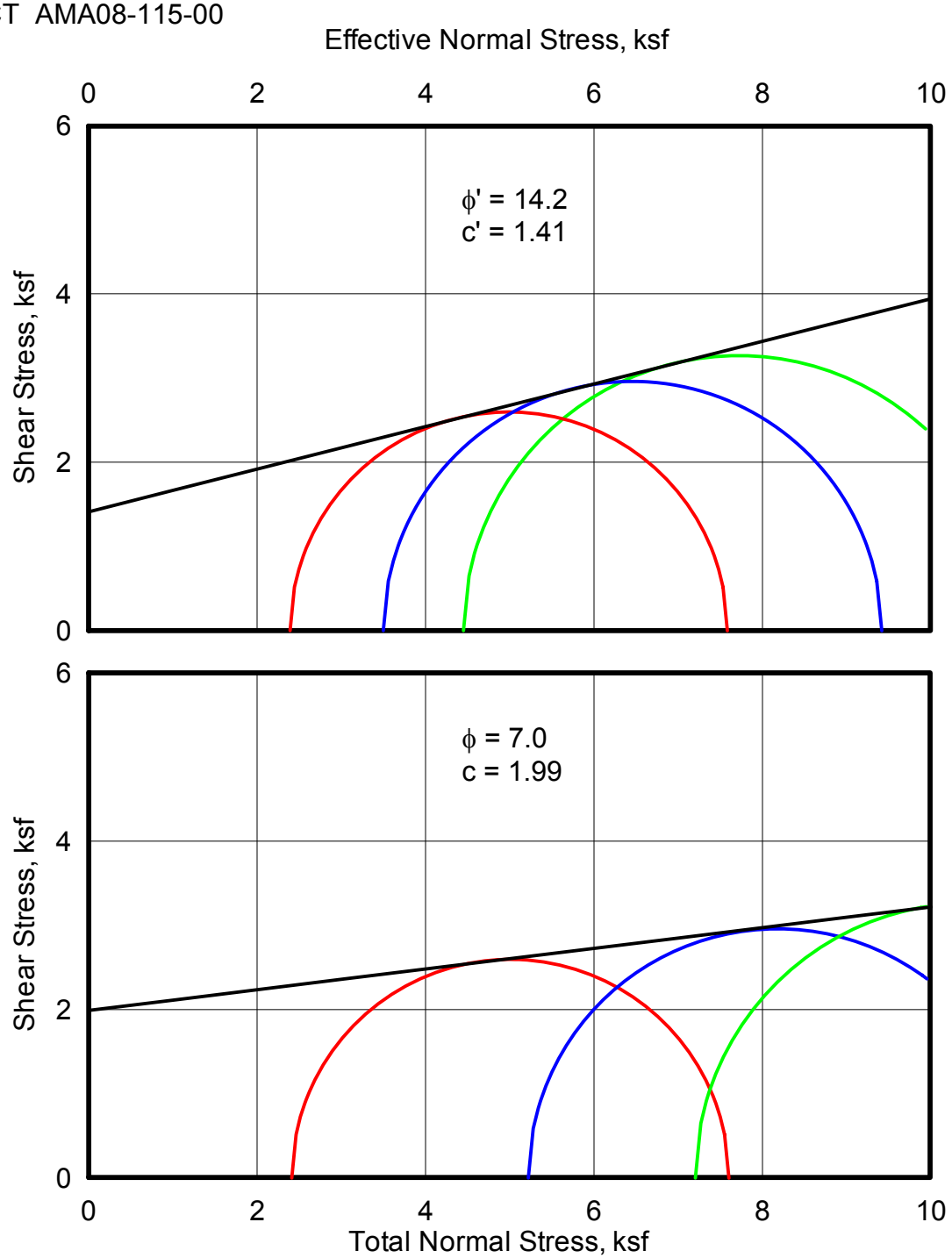
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-242, 6 TO 8 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 20.8
INITIAL DRY UNIT WEIGHT: 104.0 pcf
INITIAL VOID RATIO: 0.65
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 23.9
INITIAL DEGREE OF SATURATION: 87.9%
FINAL DEGREE OF SATURATION: 100.0%
LL = 69; PL = 23; PI = 46

FIGURE 209b

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MOHR'S CIRCLES

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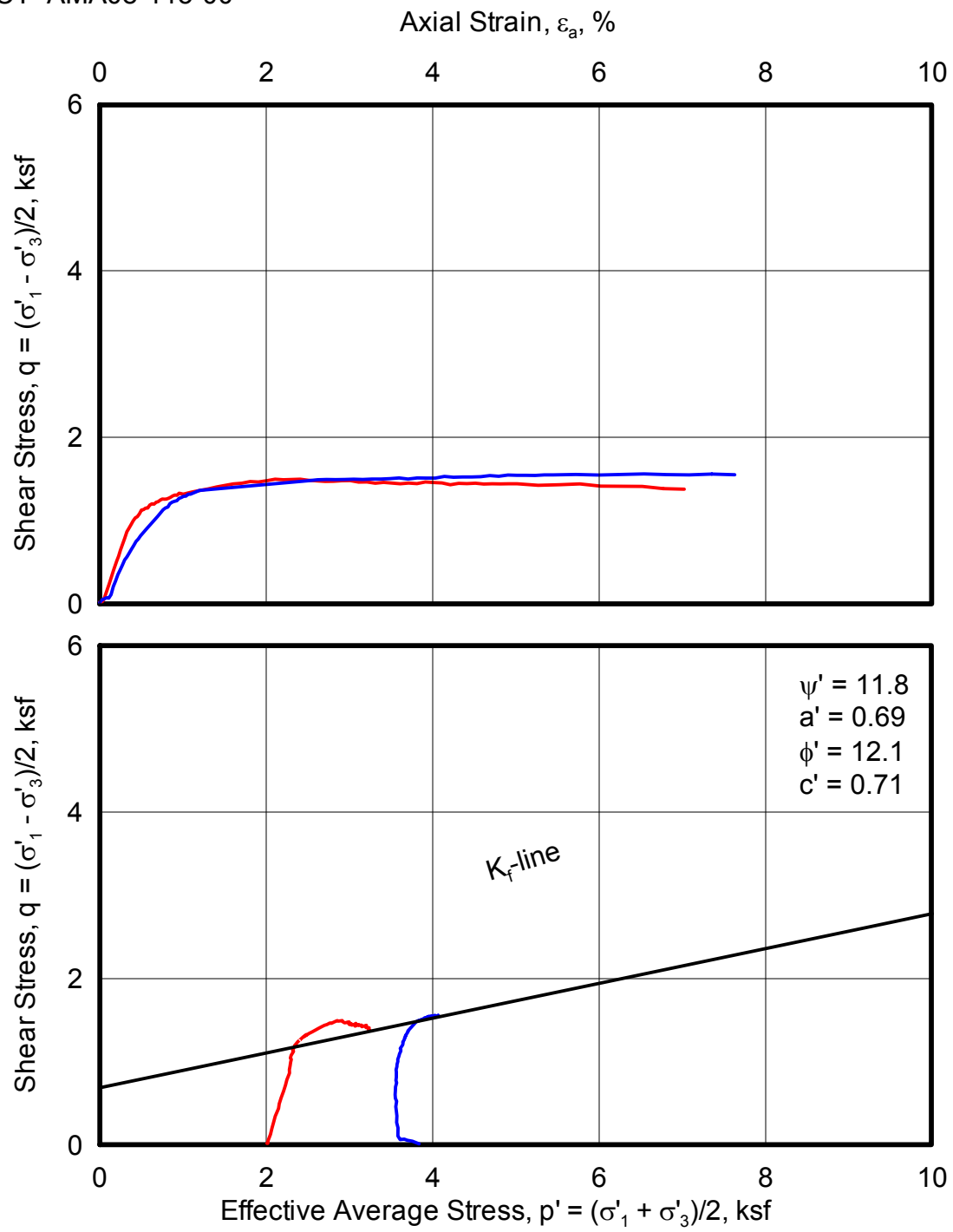
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-243, 6 TO 8 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 28.5
INITIAL DRY UNIT WEIGHT: 93.6 pcf
INITIAL VOID RATIO: 0.83
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 31.1
INITIAL DEGREE OF SATURATION: 94.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 83; PL = 26; PI = 57

FIGURE 210a

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STRESS PATH

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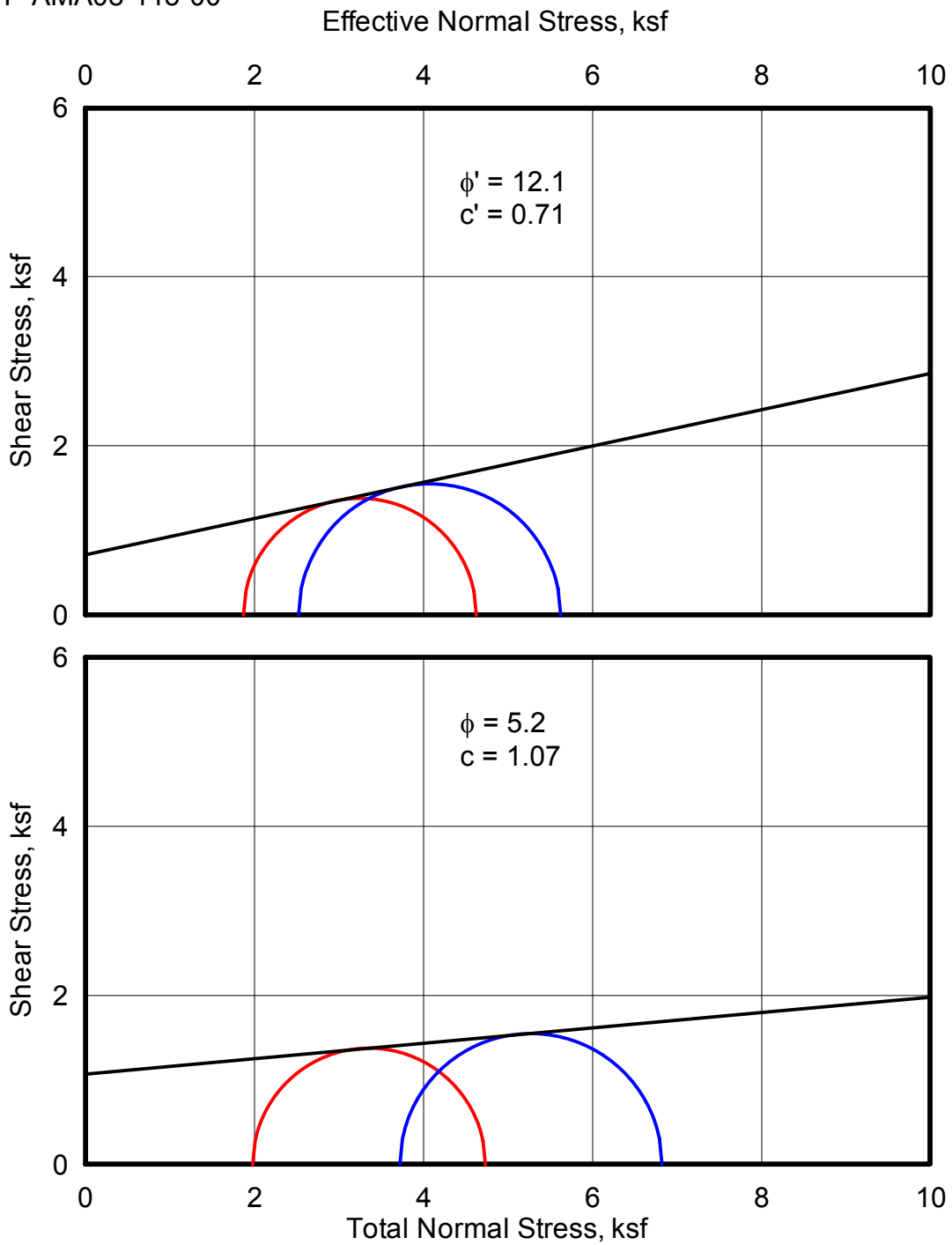
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-243, 6 TO 8 FEET

MATERIAL: FAT CLAY (CH)
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INITIAL VOID RATIO: 0.83
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 31.1
INITIAL DEGREE OF SATURATION: 94.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 83; PL = 26; PI = 57

FIGURE 210b

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MOHR'S CIRCLES

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CAMERON COUNTY, TEXAS

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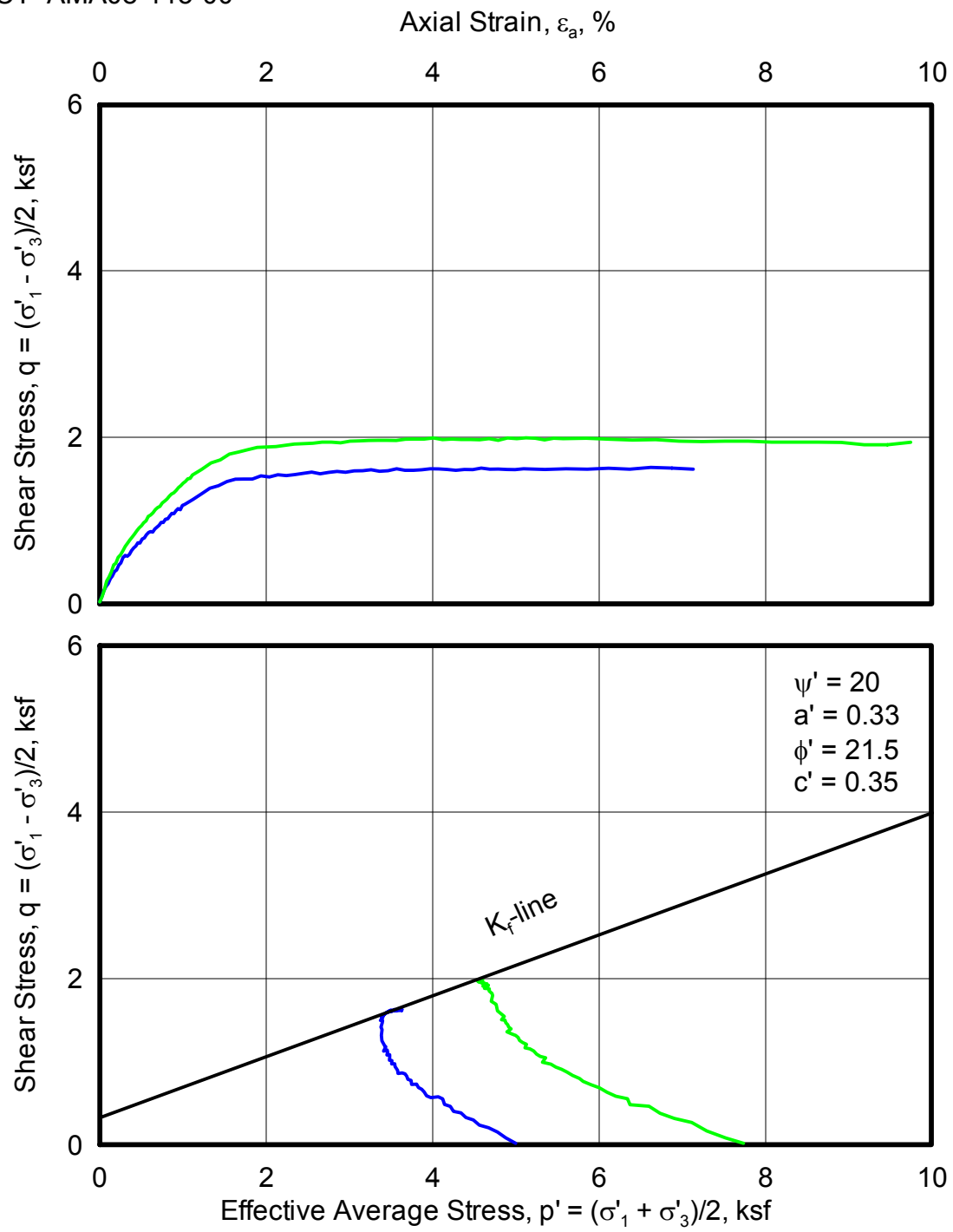

MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-244, 40 TO 42 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.0
INITIAL DRY UNIT WEIGHT: 104.4 pcf
INITIAL VOID RATIO: 0.65
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 26.1
INITIAL DEGREE OF SATURATION: 97.9%
FINAL DEGREE OF SATURATION: 100.0%
LL = 69; PL = 22; PI = 47

FIGURE 211a

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STRESS PATH

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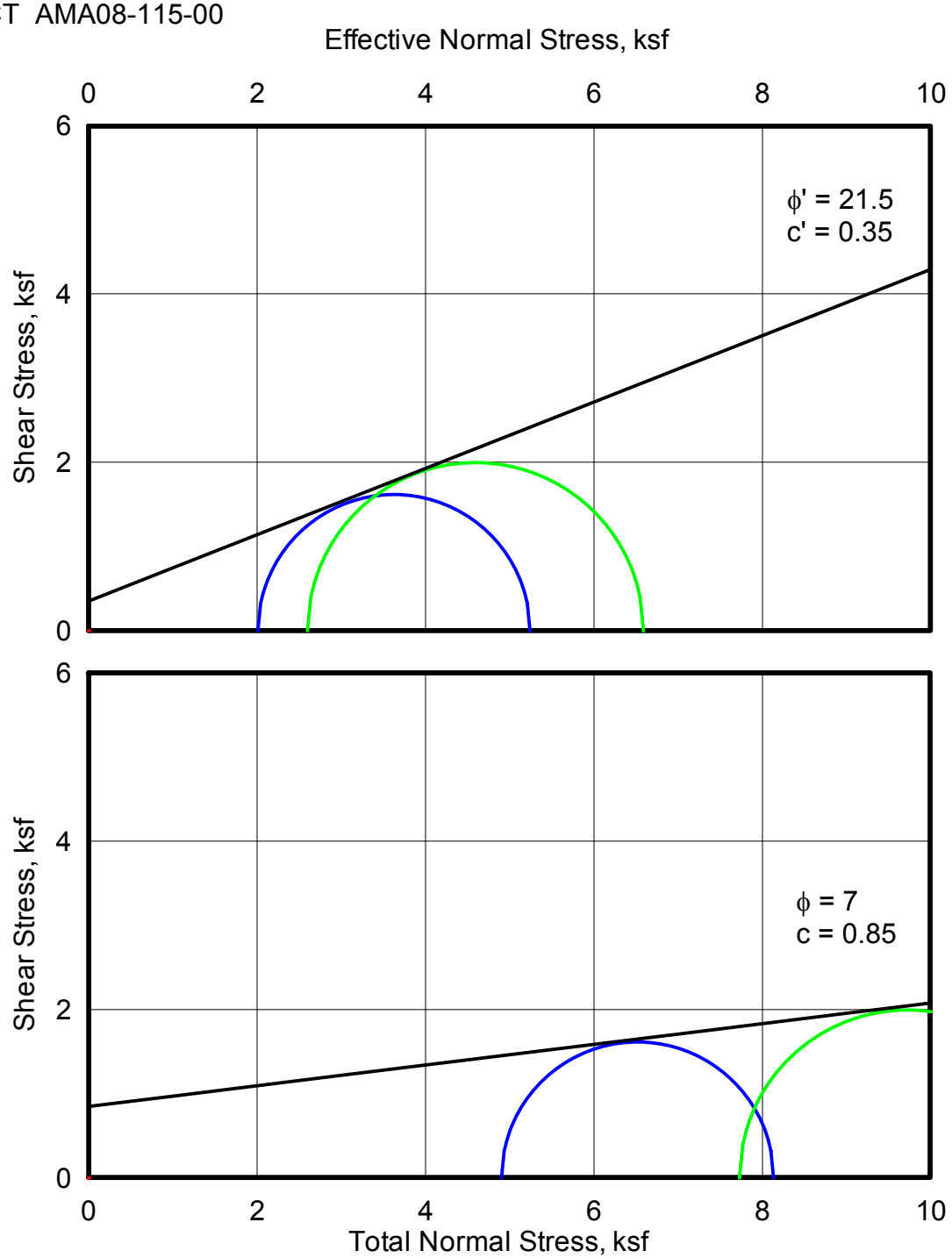
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-244, 40 TO 42 FEET

MATERIAL: FAT CLAY (CH)
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INITIAL VOID RATIO: 0.65
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FINAL WATER CONTENT: 26.1
INITIAL DEGREE OF SATURATION: 97.9%
FINAL DEGREE OF SATURATION: 100.0%
LL = 69; PL = 22; PI = 47

FIGURE 211b

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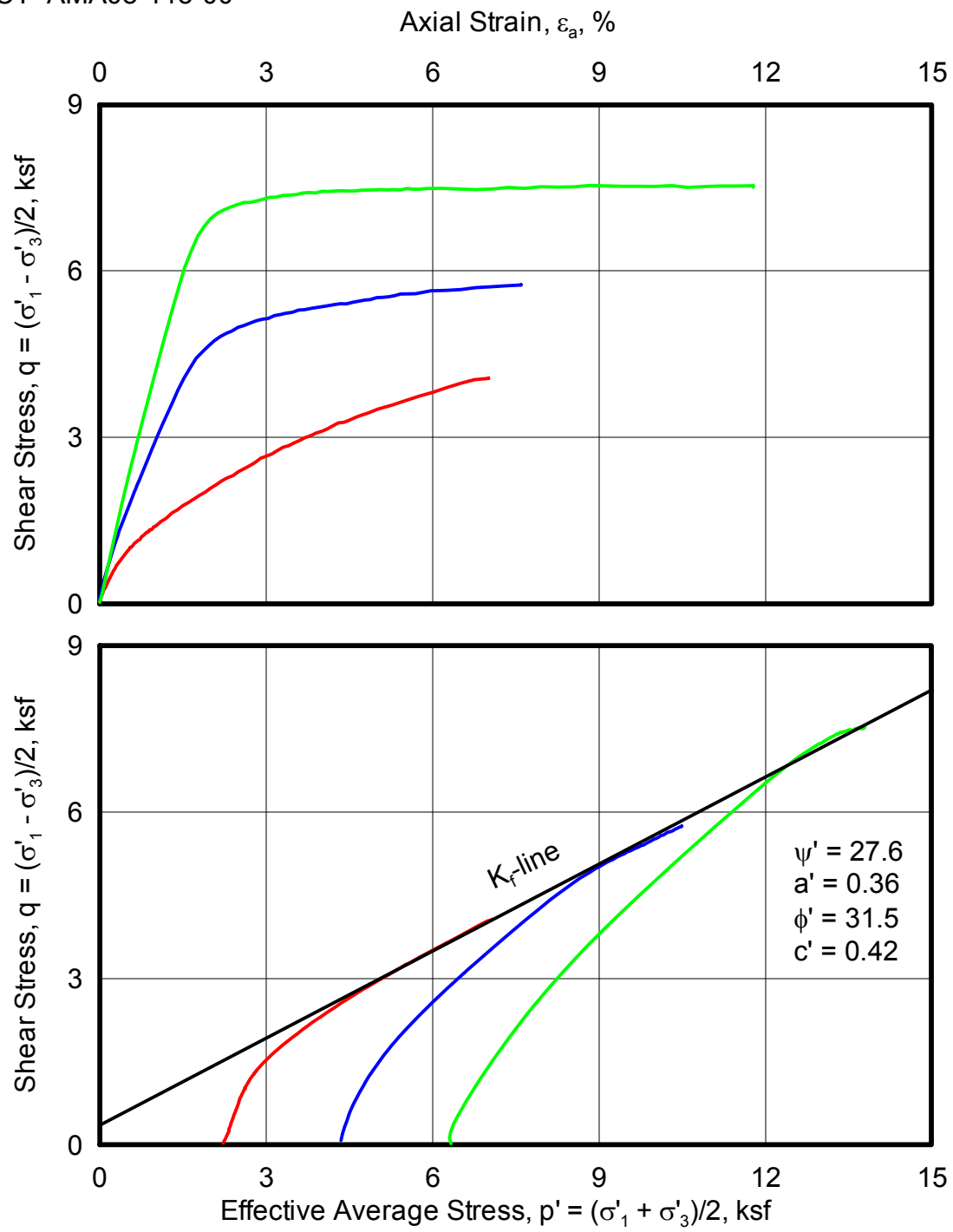
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-252,15 TO 17 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 11.4
INITIAL DRY UNIT WEIGHT: 112.8 pcf
INITIAL VOID RATIO: 0.52
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 16.3
INITIAL DEGREE OF SATURATION: 60.3%
FINAL DEGREE OF SATURATION: 100.0%
LL = 40; PL = 21; PI = 19

FIGURE 212a

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STRESS PATH

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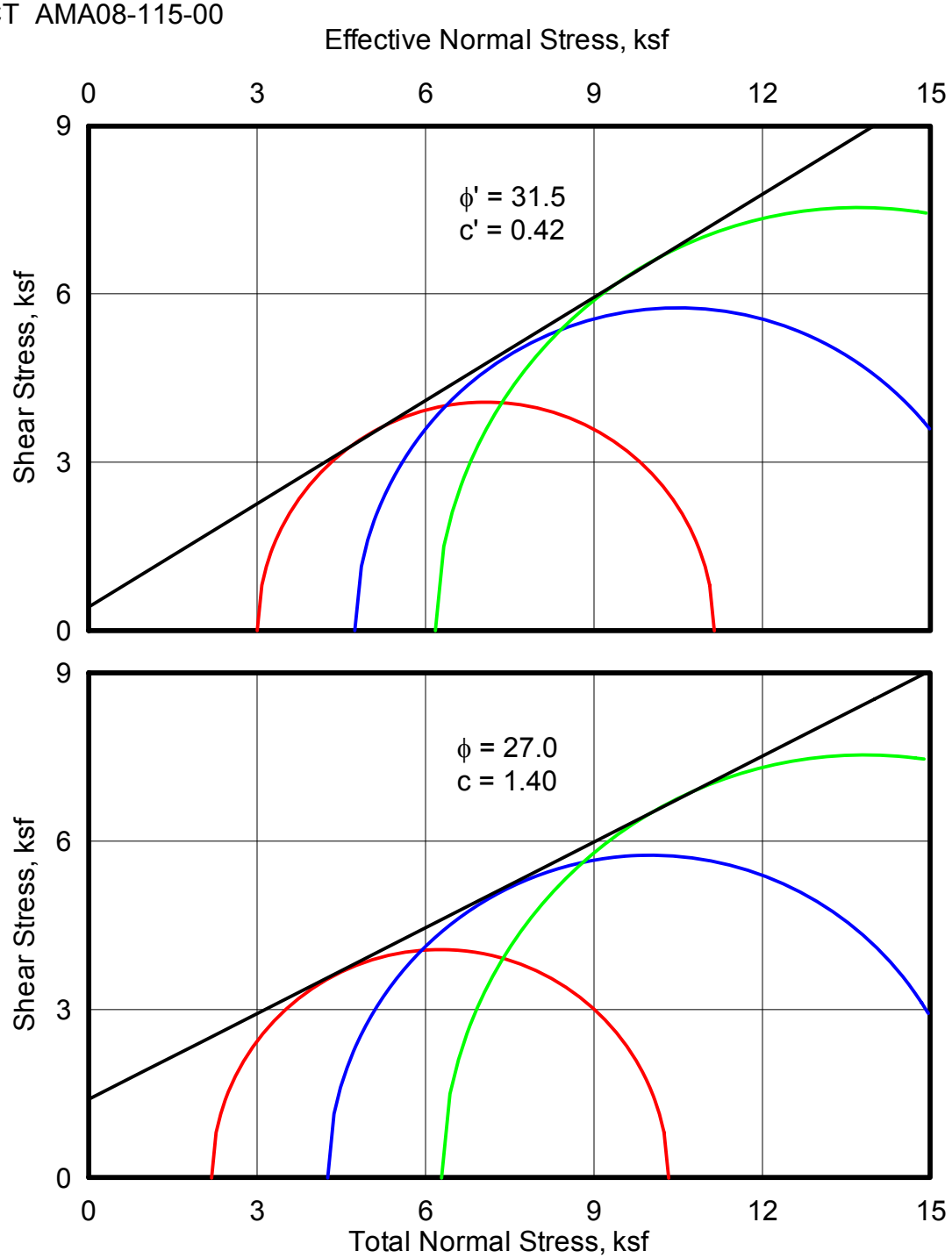
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-252,15 TO 17 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 11.4
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SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 16.3
INITIAL DEGREE OF SATURATION: 60.3%
FINAL DEGREE OF SATURATION: 100.0%
LL = 40; PL = 21; PI = 19

FIGURE 212b

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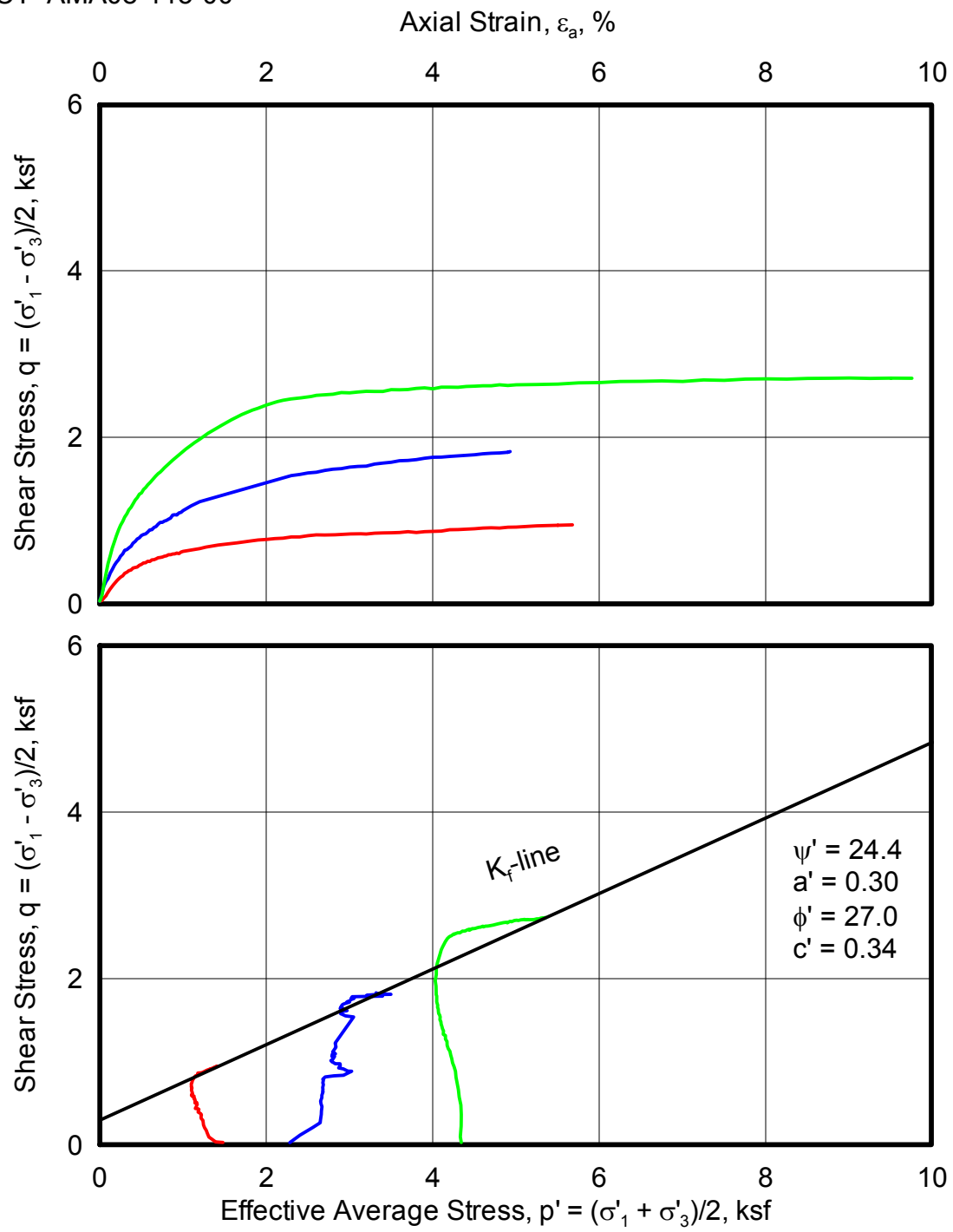
MOHR'S CIRCLES

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-280, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 26.2
INITIAL DRY UNIT WEIGHT: 95.6 pcf
INITIAL VOID RATIO: 0.80
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 25.9
INITIAL DEGREE OF SATURATION: 90.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 62; PL = 24; PI = 38

FIGURE 213a

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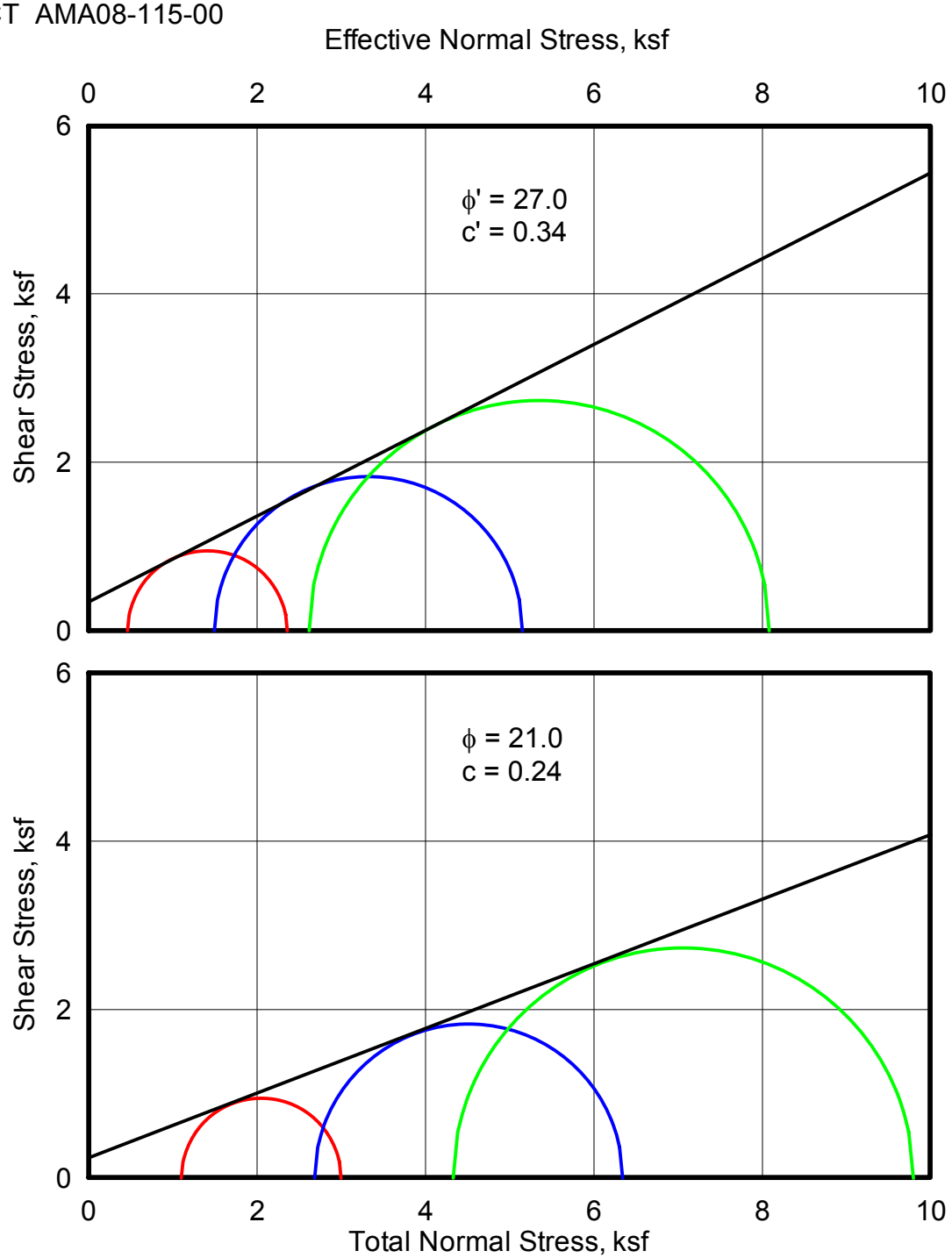
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-280, 15 TO 17 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 26.2
INITIAL DRY UNIT WEIGHT: 95.6 pcf
INITIAL VOID RATIO: 0.80
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 25.9
INITIAL DEGREE OF SATURATION: 90.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 62; PL = 24; PI = 38

FIGURE 213b

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MOHR'S CIRCLES

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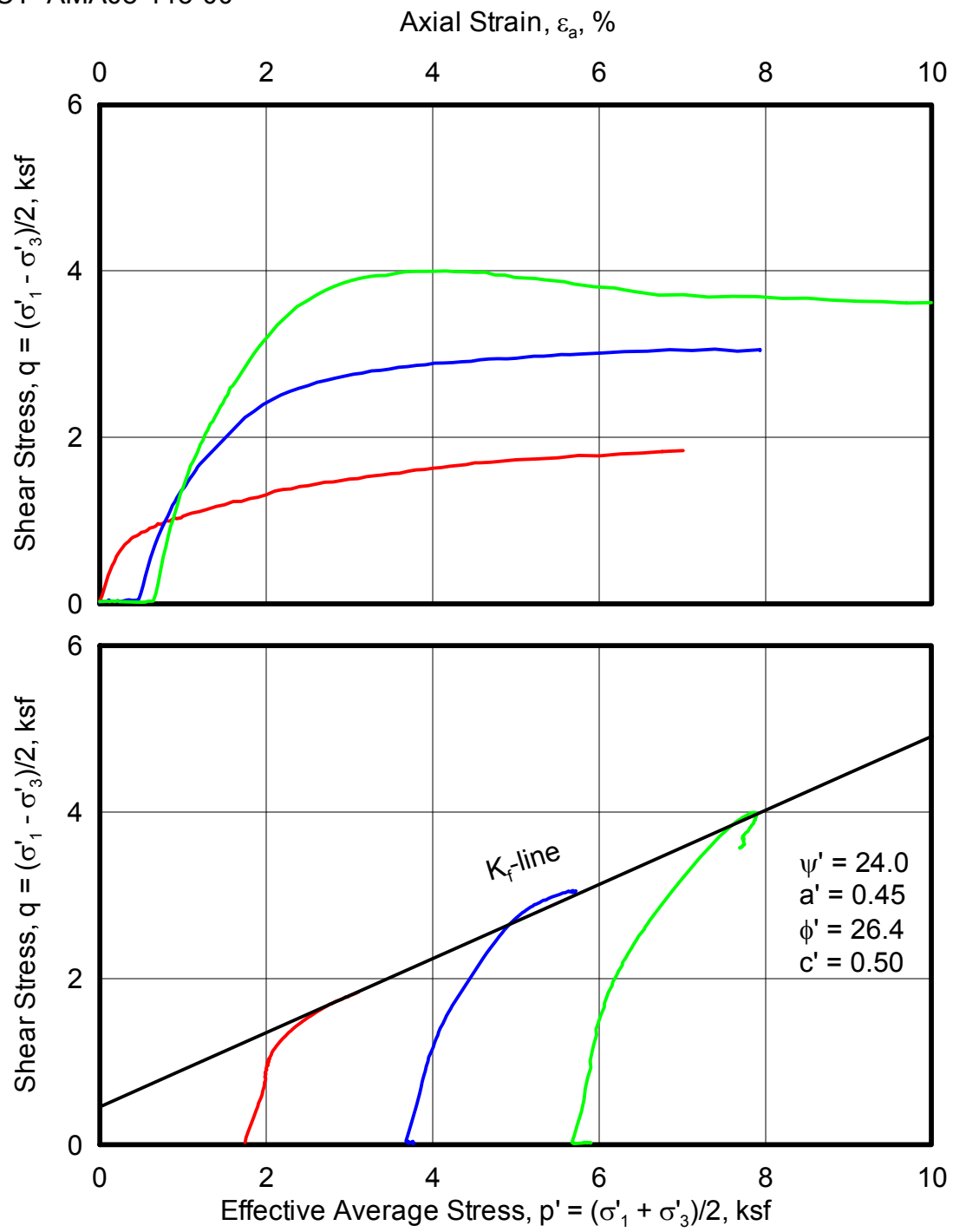
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-292, 10 TO 14 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 25.5
INITIAL DRY UNIT WEIGHT: 97.42 pcf
INITIAL VOID RATIO: 0.76
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.5
INITIAL DEGREE OF SATURATION: 91.9%
FINAL DEGREE OF SATURATION: 100.0%
LL = 61; PL = 23; PI = 38

FIGURE 214a

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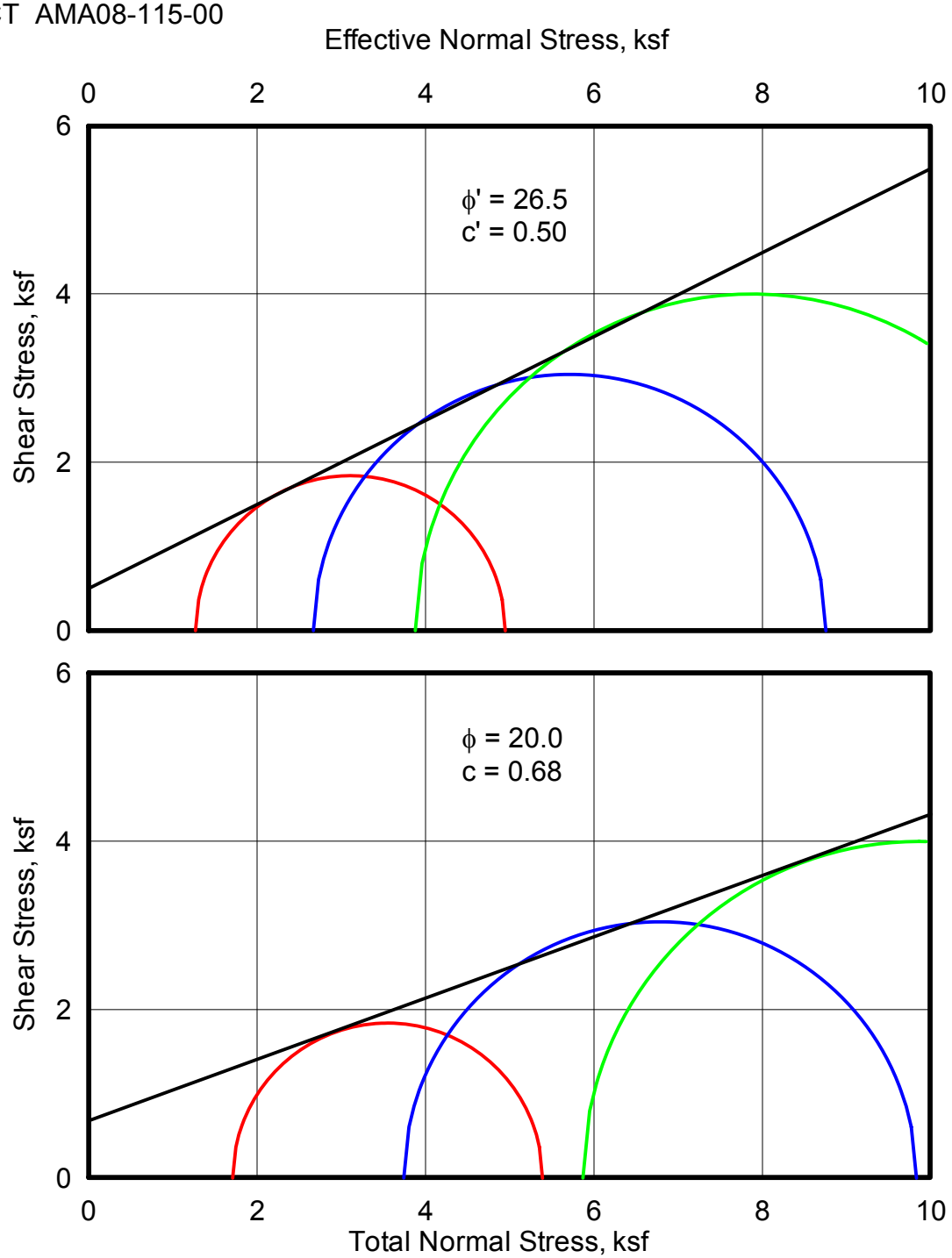
STRESS PATH

USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL UNDRAINEDCOMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-292, 10 TO 14 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 25.5
INITIAL DRY UNIT WEIGHT: 97.42 pcf
INITIAL VOID RATIO: 0.76
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.5
INITIAL DEGREE OF SATURATION: 91.9%
FINAL DEGREE OF SATURATION: 100.0%
LL = 61; PL = 23; PI = 38

FIGURE 214b

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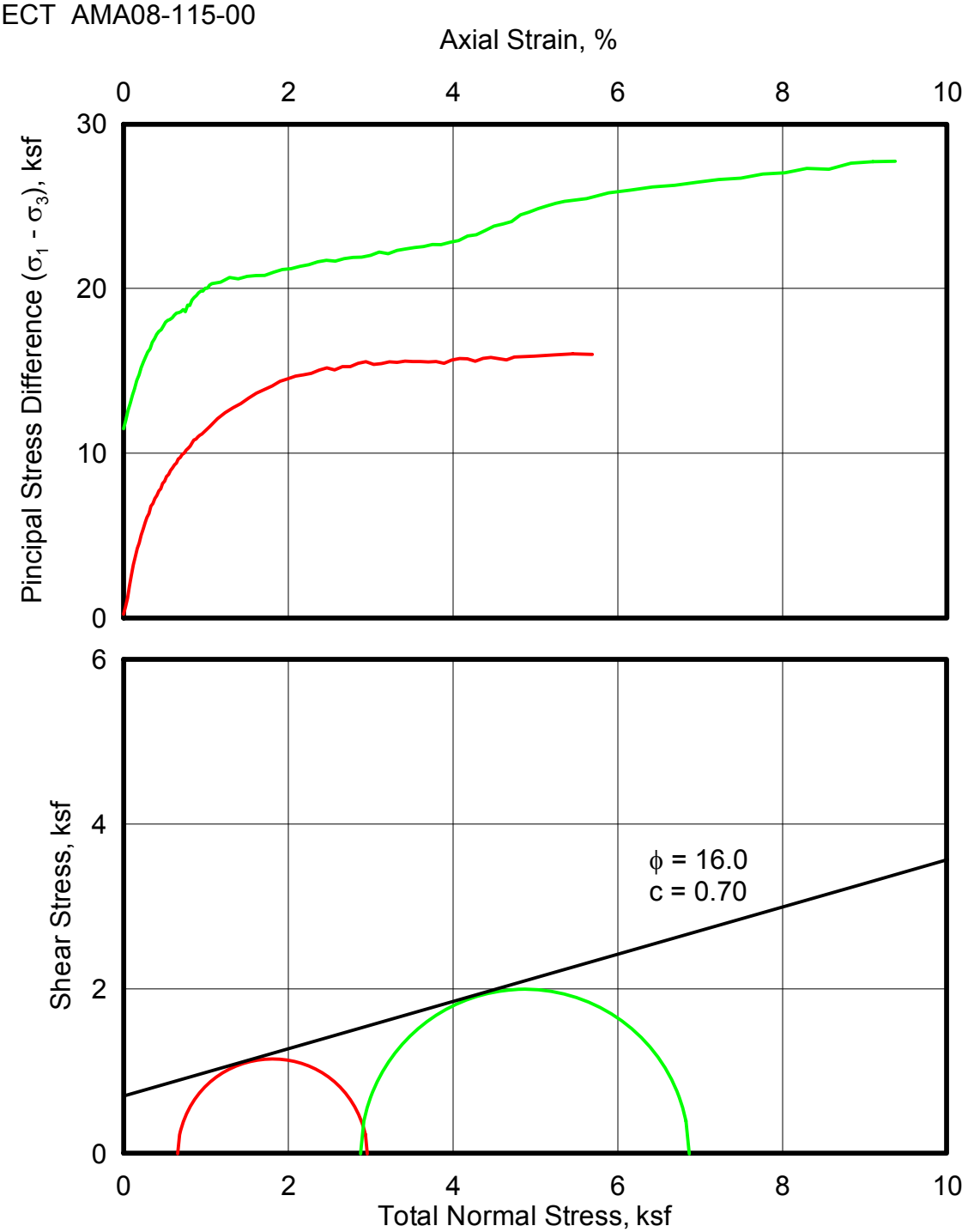
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-19, 4 TO 6 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 17.2
INITIAL DRY UNIT WEIGHT: 103.3 pcf
INITIAL VOID RATIO: 0.66
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 20.9
INITIAL DEGREE OF SATURATION: 71.2%
FINAL DEGREE OF SATURATION: 100.0%
LL = 52; PL = 22; PI = 30

FIGURE 215

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MOHR'S CIRCLES

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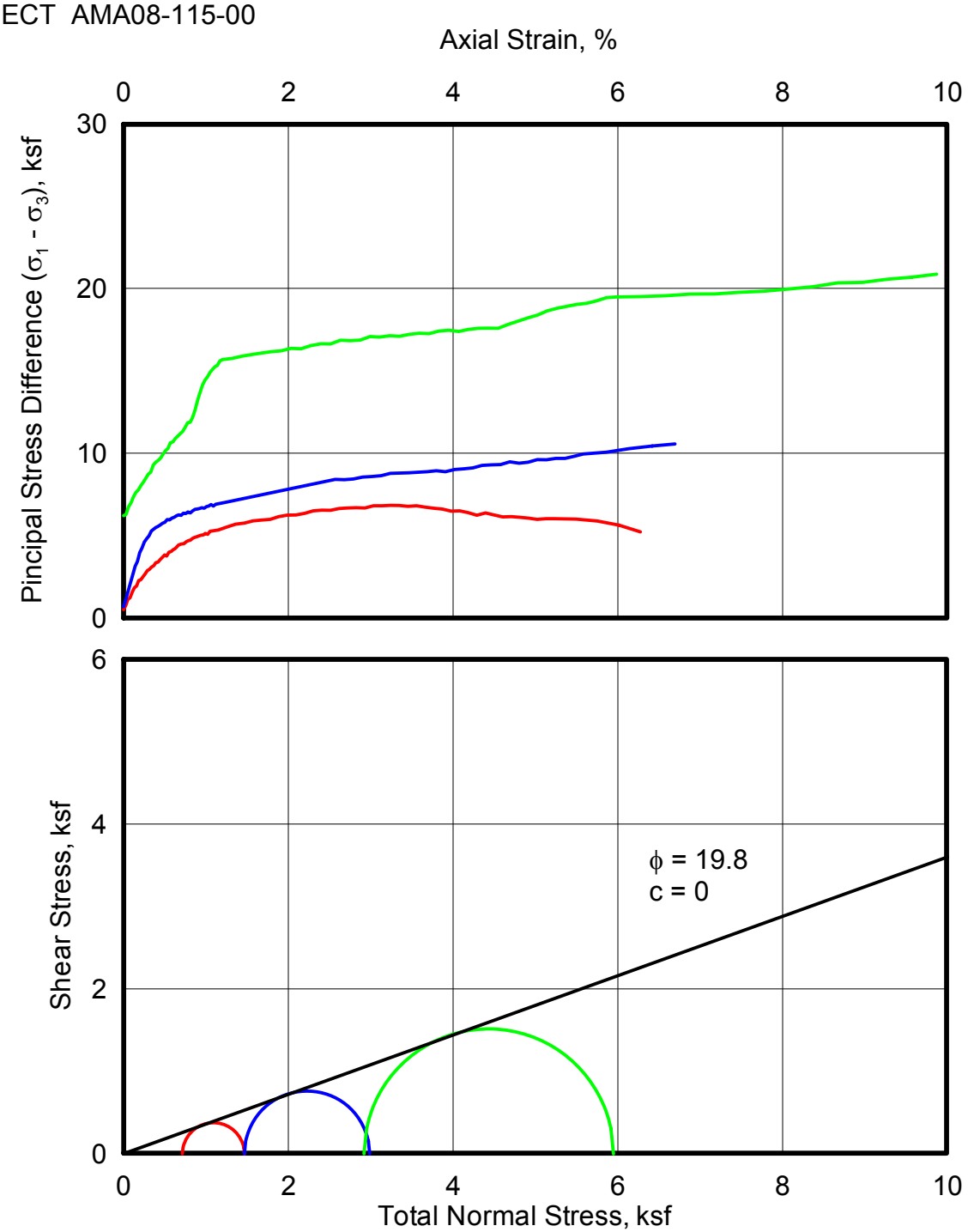
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-34, 4 TO 6 FEET

MATERIAL: FAT CLAY (CL)
INITIAL WATER CONTENT: 17.7
INITIAL DRY UNIT WEIGHT: 121.4 pcf
INITIAL VOID RATIO: 0.52
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 27.2
INITIAL DEGREE OF SATURATION: 100.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 59; PL = 22; PI = 37

FIGURE 216

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MOHR'S CIRCLES

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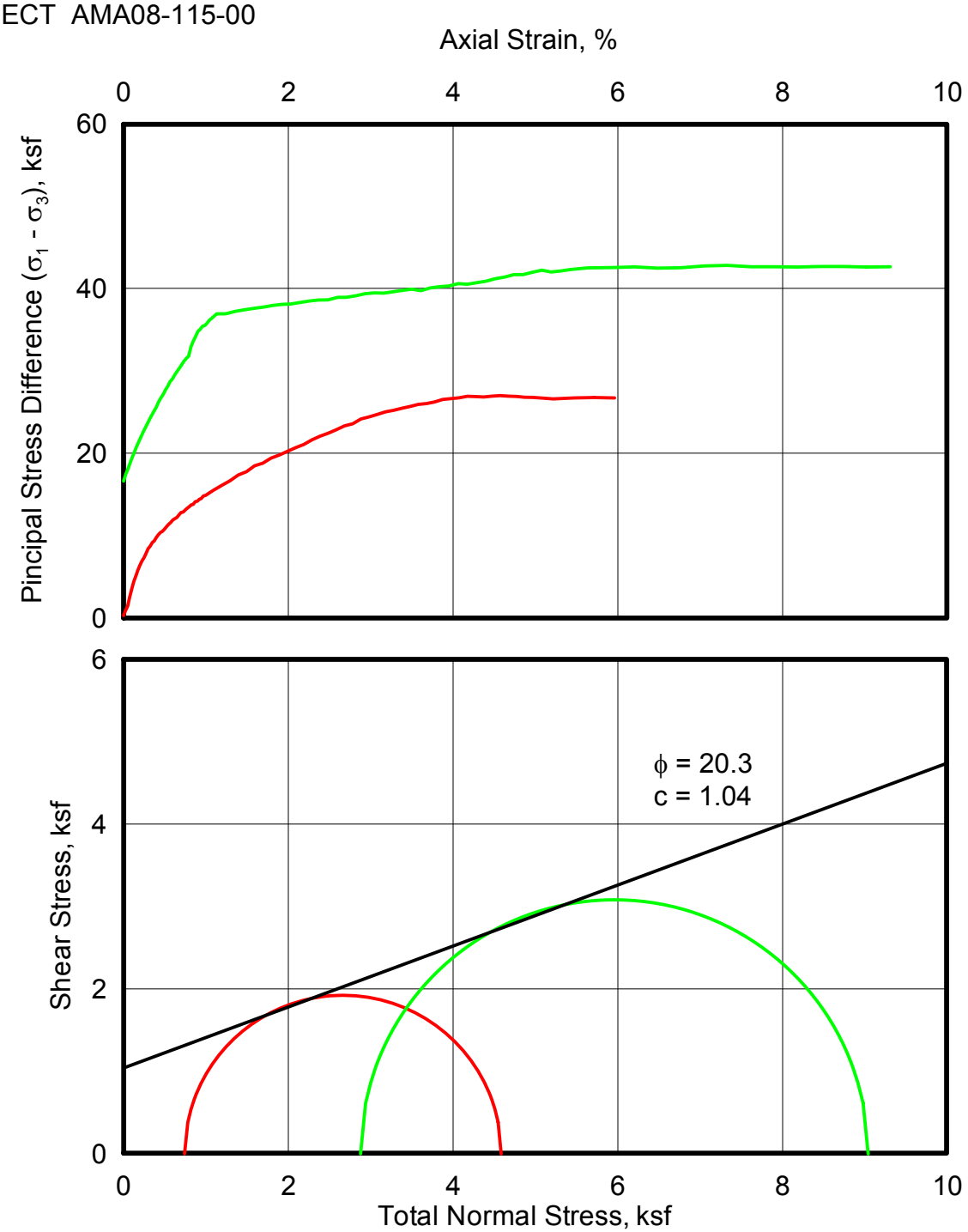
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-99, 8 TO 10 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 17.6
INITIAL DRY UNIT WEIGHT: 104.2 pcf
INITIAL VOID RATIO: 0.65
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 24.2
INITIAL DEGREE OF SATURATION: 74.5%
FINAL DEGREE OF SATURATION: 100.0%
LL = 46; PL = 21; PI = 25

FIGURE 217

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MOHR'S CIRCLES

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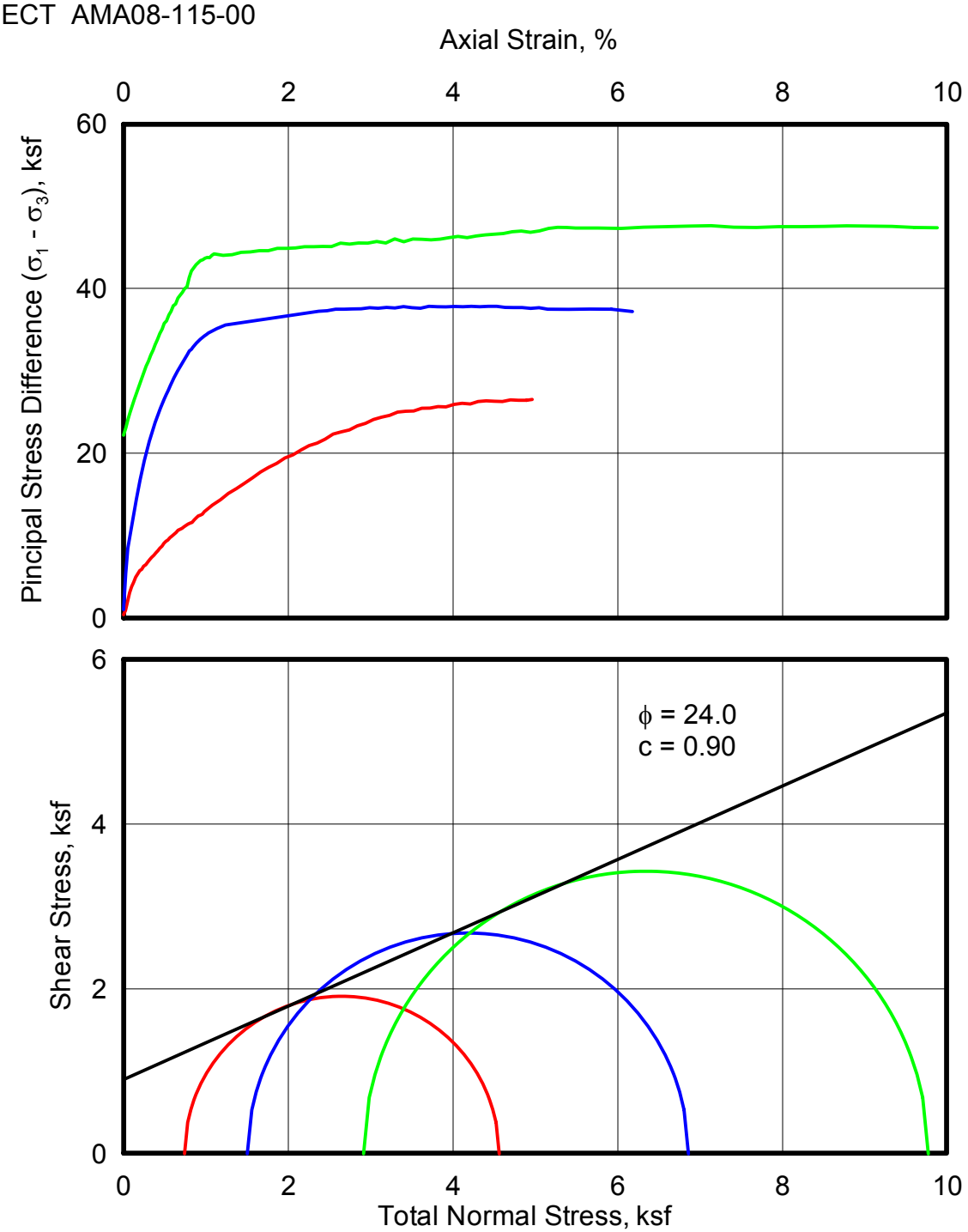
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-100, 8 TO 10 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 14.0
INITIAL DRY UNIT WEIGHT: 116.3 pcf
INITIAL VOID RATIO: 0.48
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 20.0
INITIAL DEGREE OF SATURATION: 80.6%
FINAL DEGREE OF SATURATION: 100.0%
LL = 41; PL = 17; PI = 24

FIGURE 218

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MOHR'S CIRCLES

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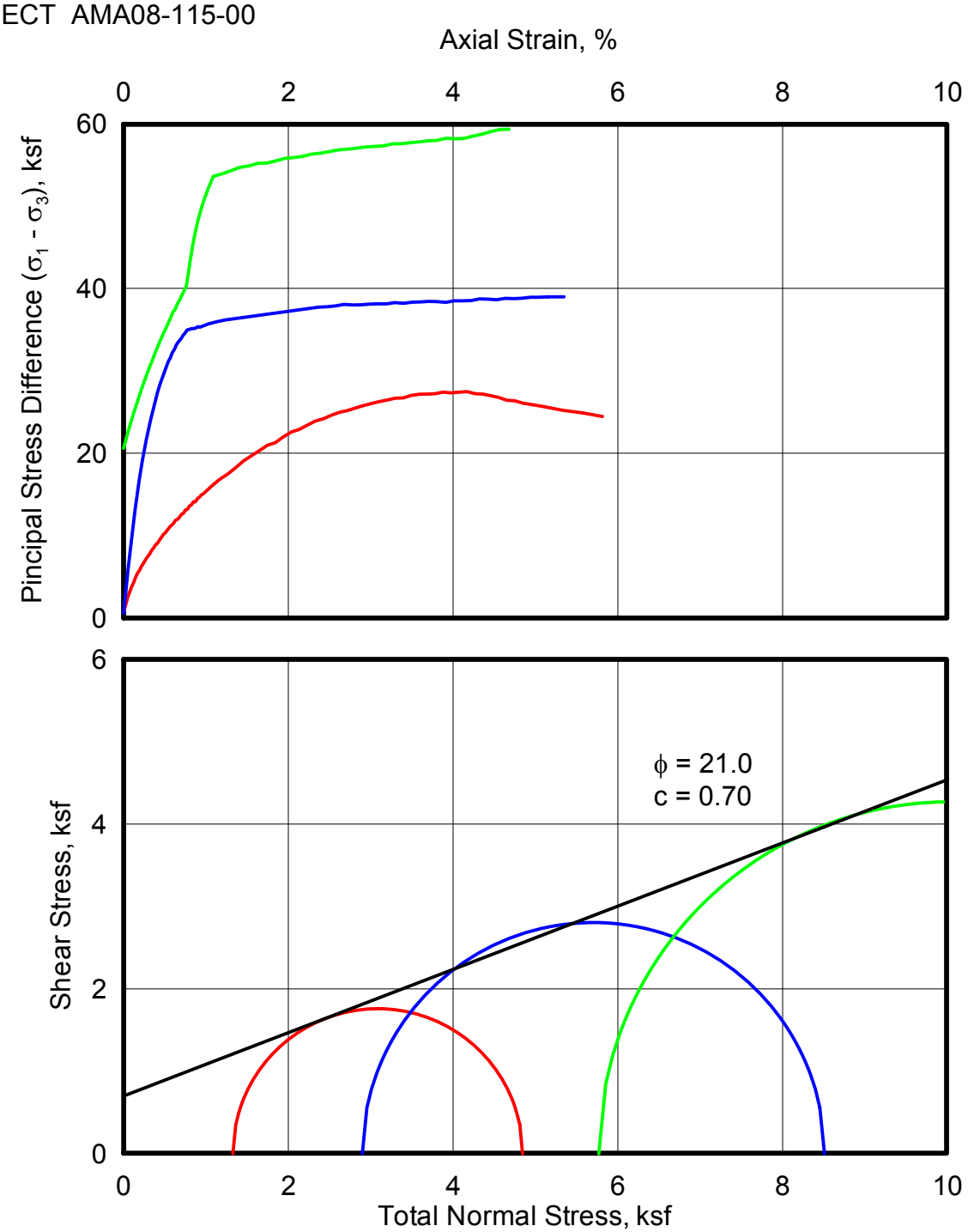
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-130, 20 TO 22 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 20.5
INITIAL DRY UNIT WEIGHT: 102.6 pcf
INITIAL VOID RATIO: 0.67
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 21.9
INITIAL DEGREE OF SATURATION: 83.8%
FINAL DEGREE OF SATURATION: 100.0%
LL = 49; PL = 21; PI = 28

FIGURE 219

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MOHR'S CIRCLES

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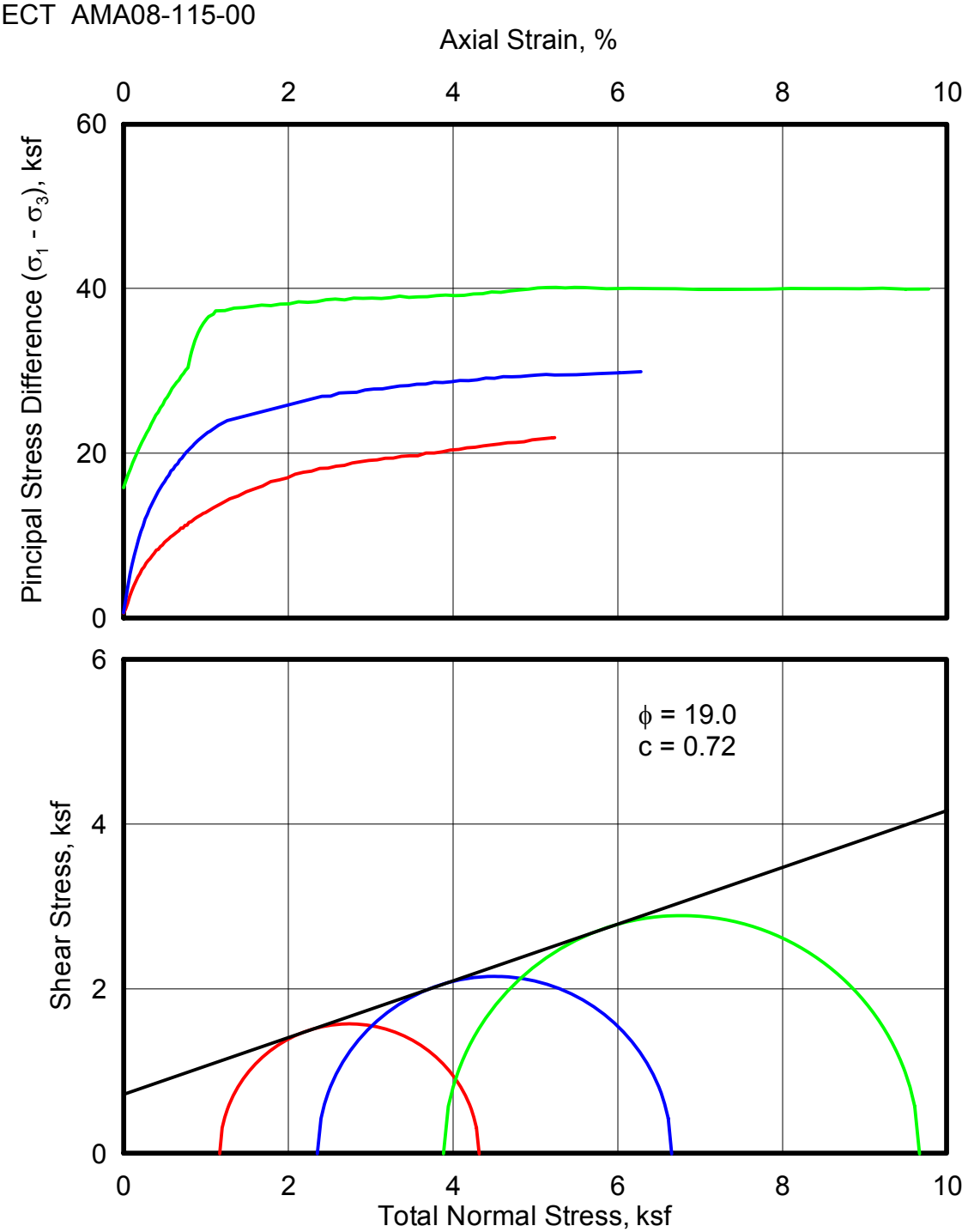
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-137, 15 TO 17 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 21.3
INITIAL DRY UNIT WEIGHT: 100.0 pcf
INITIAL VOID RATIO: 0.72
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 22.4
INITIAL DEGREE OF SATURATION: 81.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 50; PL = 21; PI = 29

FIGURE 220

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MOHR'S CIRCLES

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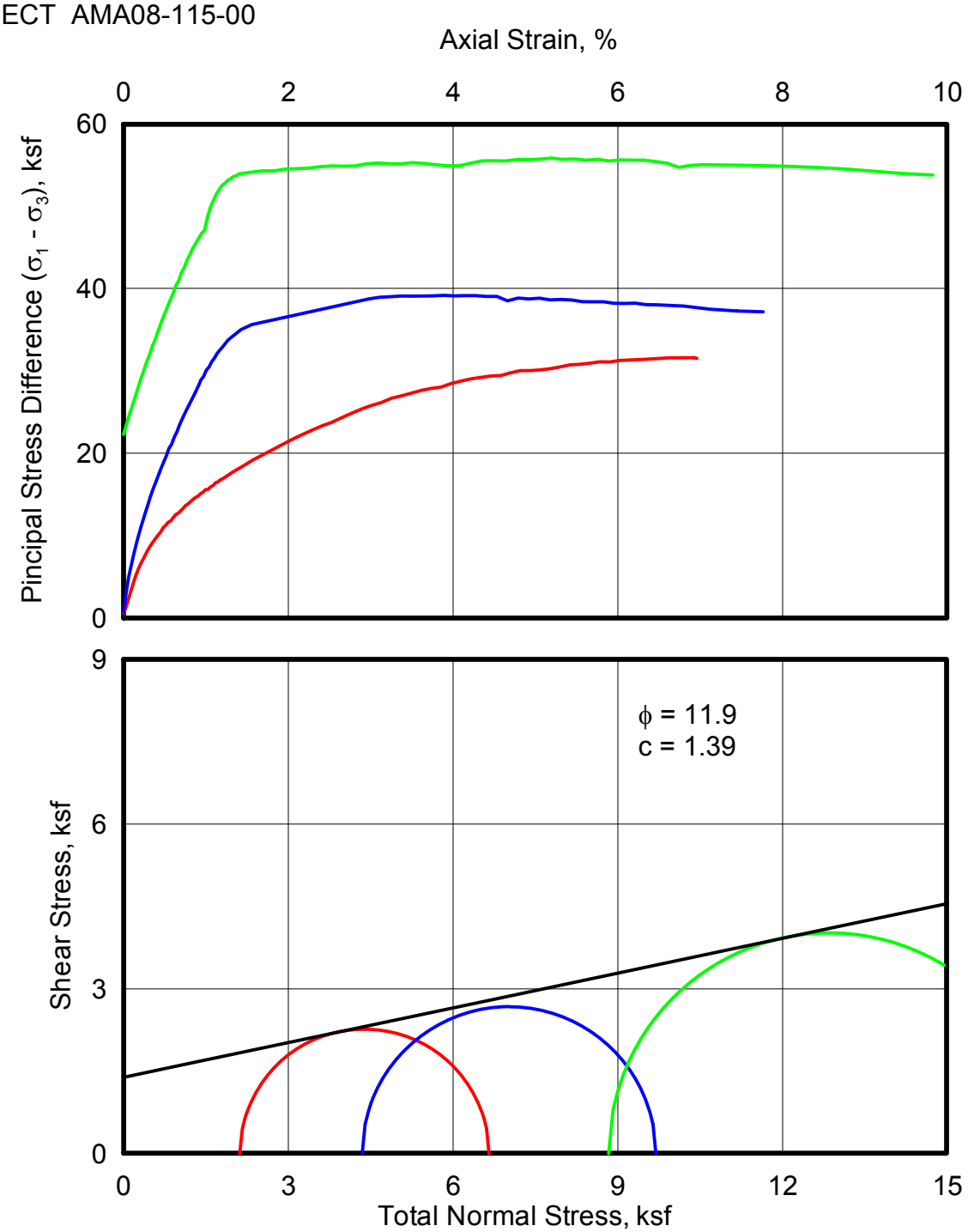
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-148, 40 TO 42 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 26.3
INITIAL DRY UNIT WEIGHT: 100.5 pcf
INITIAL VOID RATIO: 0.73
SPECIFIC GRAVITY: 2.79 (assumed)

FINAL WATER CONTENT: 25.2
INITIAL DEGREE OF SATURATION: 100.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 63; PL = 25; PI = 38

FIGURE 221

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MOHR'S CIRCLES

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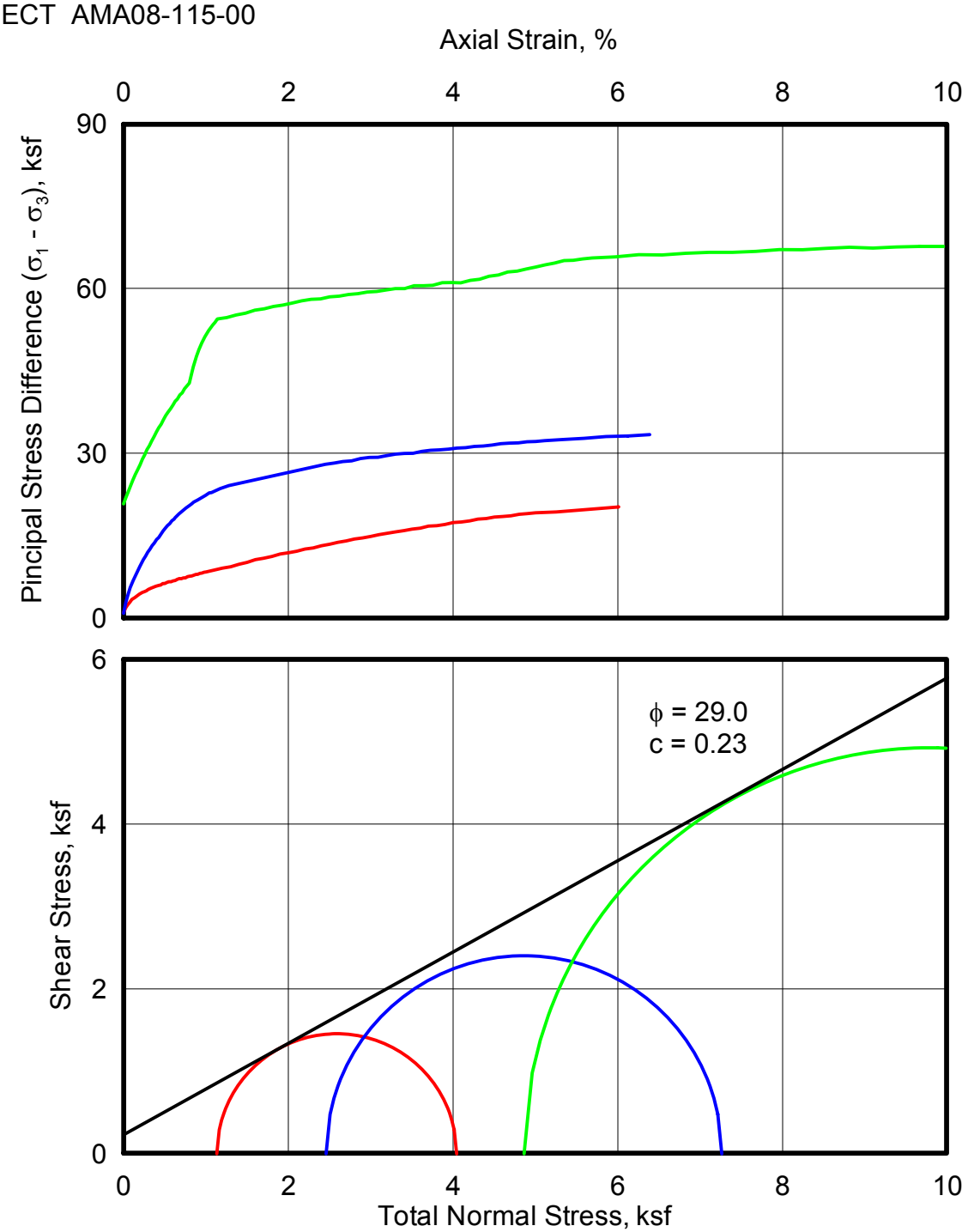
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-189, 20 TO 22 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 22.9
INITIAL DRY UNIT WEIGHT: 96.9 pcf
INITIAL VOID RATIO: 0.91
SPECIFIC GRAVITY: 2.96 (assumed)

FINAL WATER CONTENT: 25.0
INITIAL DEGREE OF SATURATION: 74.7%
FINAL DEGREE OF SATURATION: 100.0%
LL = 37; PL = 20; PI = 17

FIGURE 222

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MOHR'S CIRCLES

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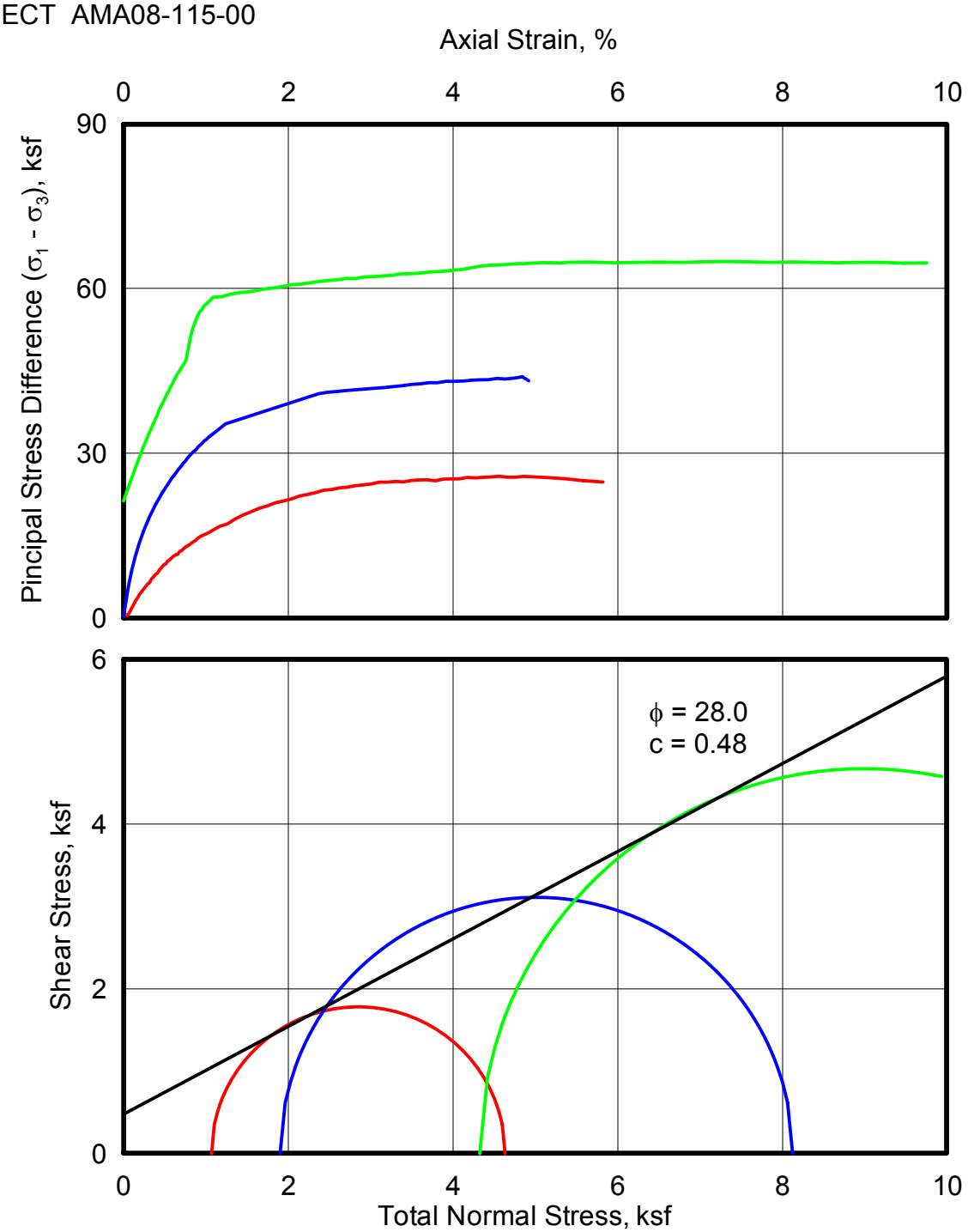
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-190, 15 TO 17 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 20.1
INITIAL DRY UNIT WEIGHT: 103.9 pcf
INITIAL VOID RATIO: 0.65
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 21.4
INITIAL DEGREE OF SATURATION: 85.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 40; PL = 18; PI = 22

FIGURE 223

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MOHR'S CIRCLES

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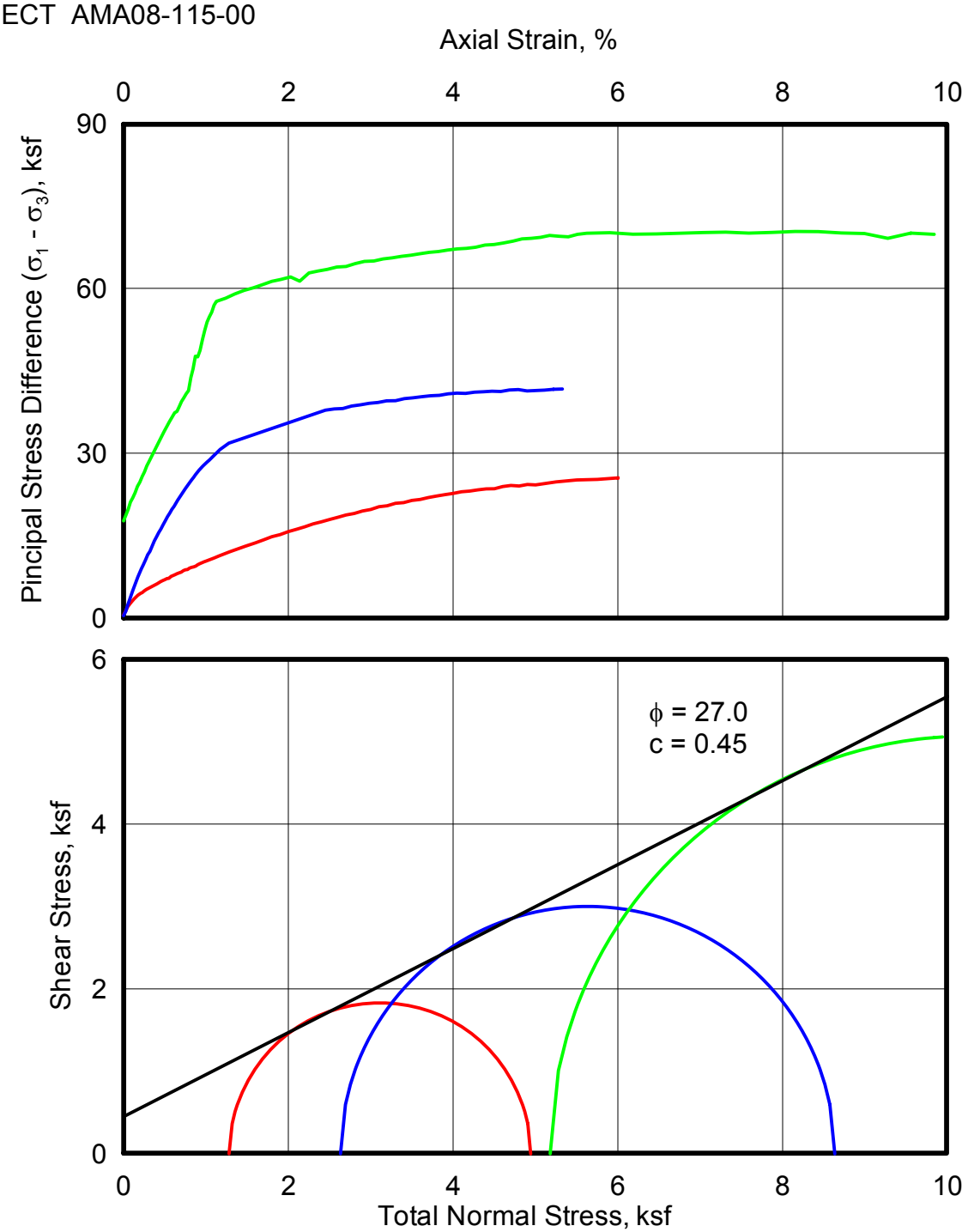
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-199, 20 TO 22 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 26.0
INITIAL DRY UNIT WEIGHT: 97.1 pcf
INITIAL VOID RATIO: 0.77
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 26.2
INITIAL DEGREE OF SATURATION: 92.9%
FINAL DEGREE OF SATURATION: 100.0%
LL = 47; PL = 22; PI = 25

FIGURE 224

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MOHR'S CIRCLES

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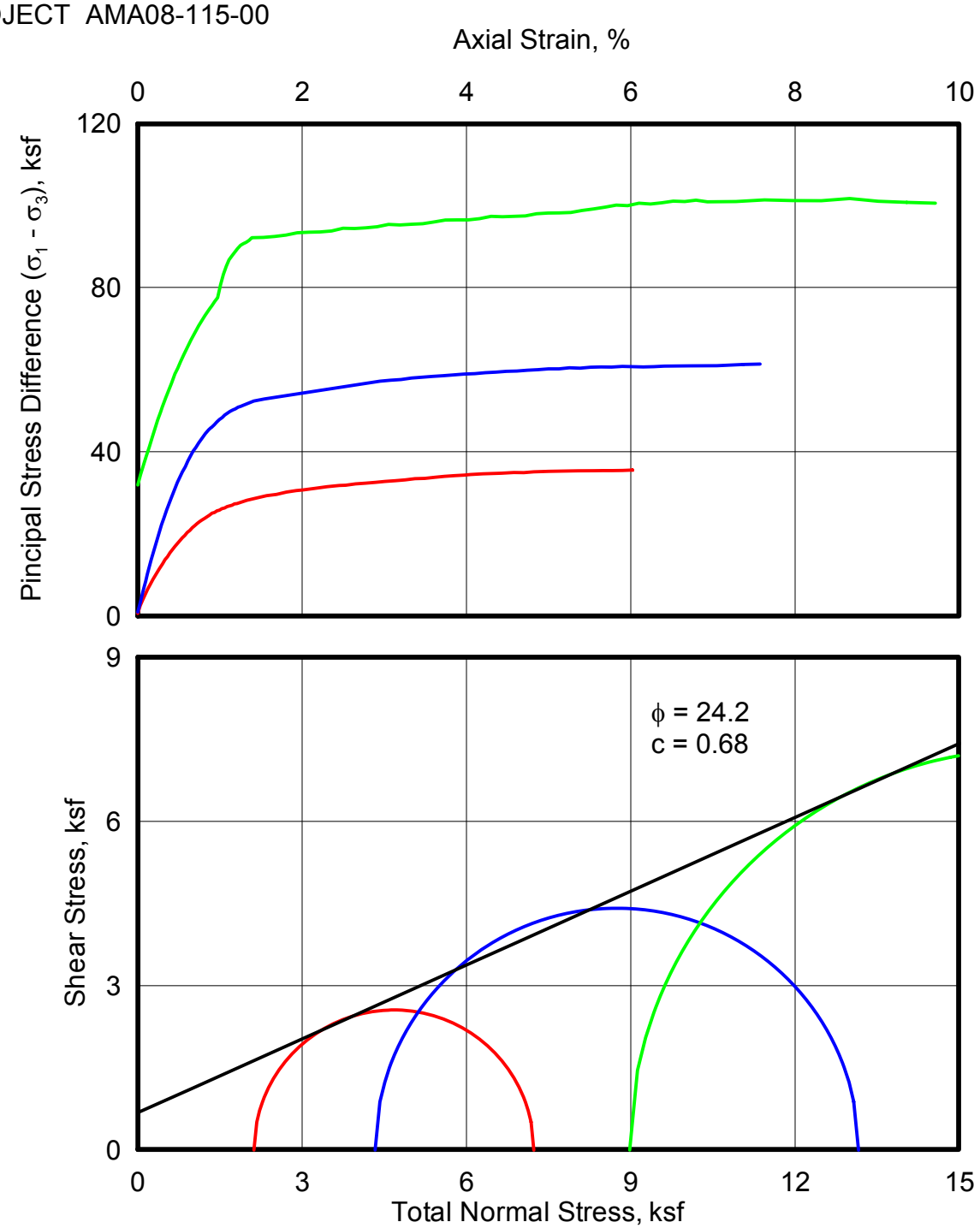
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-238, 40 TO 42 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 29.2
INITIAL DRY UNIT WEIGHT: 96.9 pcf
INITIAL VOID RATIO: 0.83
SPECIFIC GRAVITY: 2.84 (assumed)

FINAL WATER CONTENT: 27.7
INITIAL DEGREE OF SATURATION: 100.0%
FINAL DEGREE OF SATURATION: 100.0%
LL = 30; PL = 16; PI = 14

FIGURE 225

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MOHR'S CIRCLES

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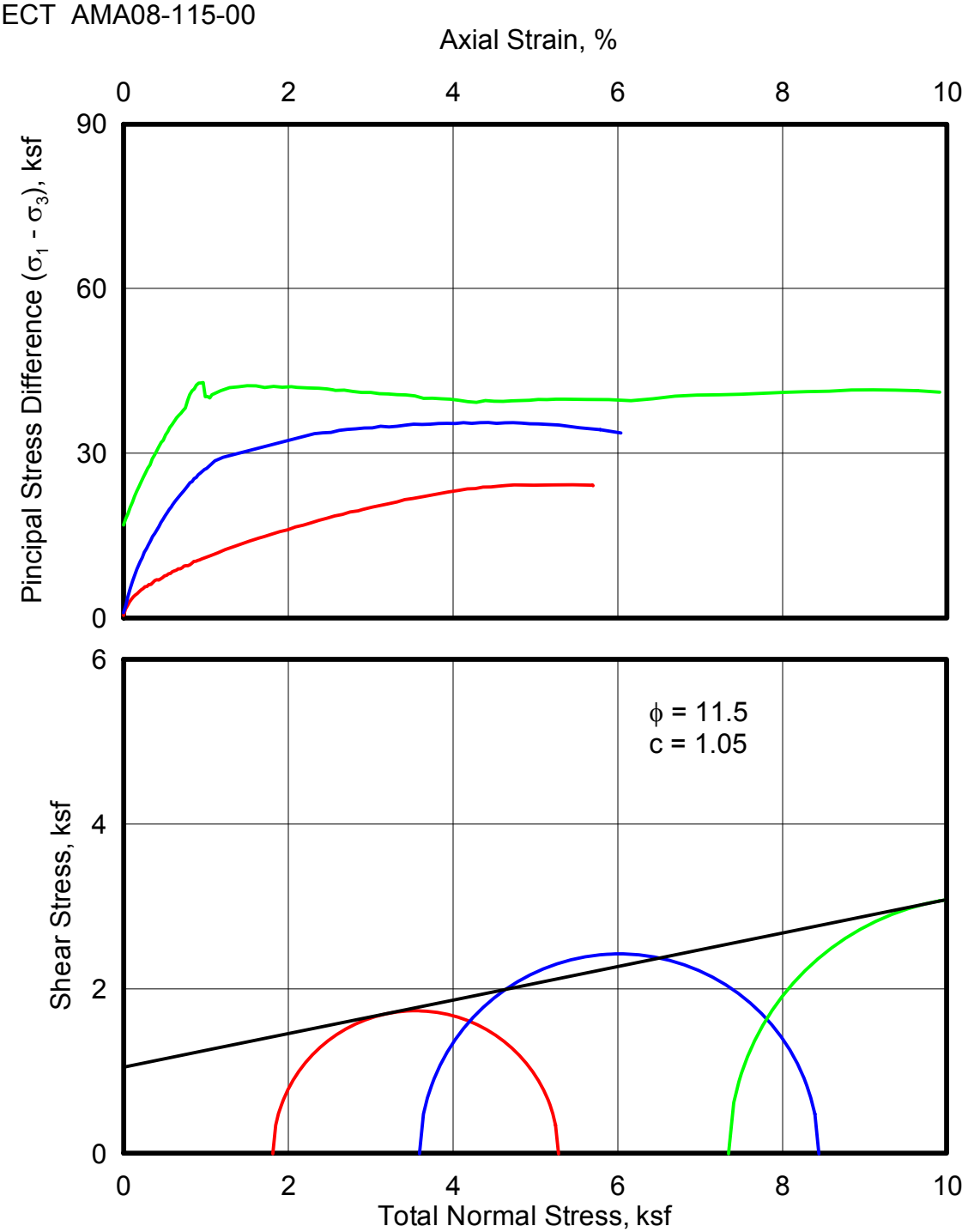
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-249, 30 TO 32 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 27.1
INITIAL DRY UNIT WEIGHT: 96.7 pcf
INITIAL VOID RATIO: 0.78
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 23.9
INITIAL DEGREE OF SATURATION: 96.1%
FINAL DEGREE OF SATURATION: 100.0%
LL = 54; PL = 24; PI = 30

FIGURE 226

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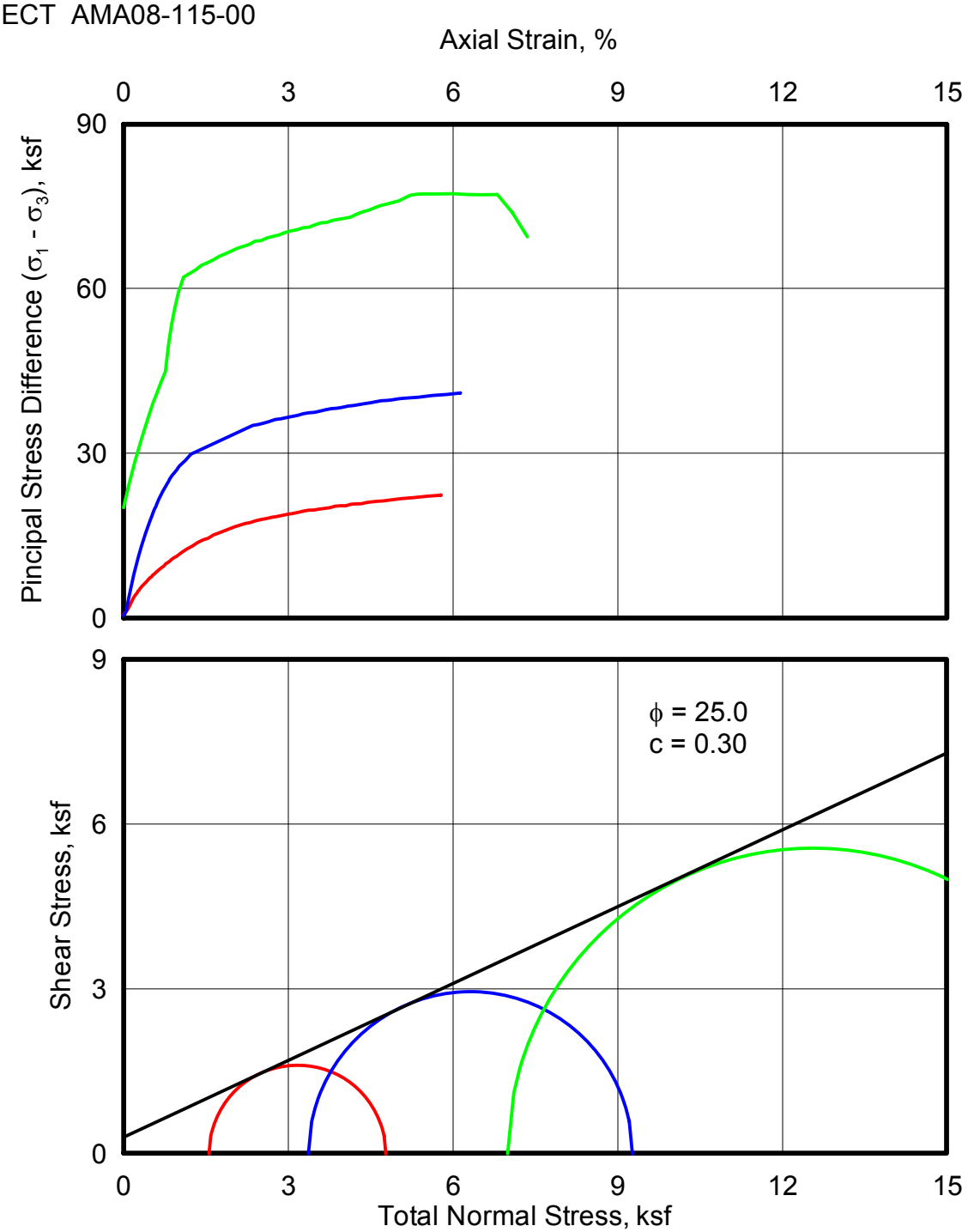
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

PROJECT AMA08-115-00



MULTI STAGE TRIAXIAL DRAINED COMPRESSION TEST RESULTS

ISOTROPICALLY CONSOLIDATED - STRESS PATH
BORING DP-269, 30 TO 32 FEET

MATERIAL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 28.2
INITIAL DRY UNIT WEIGHT: 94.4 pcf
INITIAL VOID RATIO: 0.82
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 21.4
INITIAL DEGREE OF SATURATION: 94.6%
FINAL DEGREE OF SATURATION: 100.0%
LL = 30; PL = 22; PI = 8

FIGURE 227

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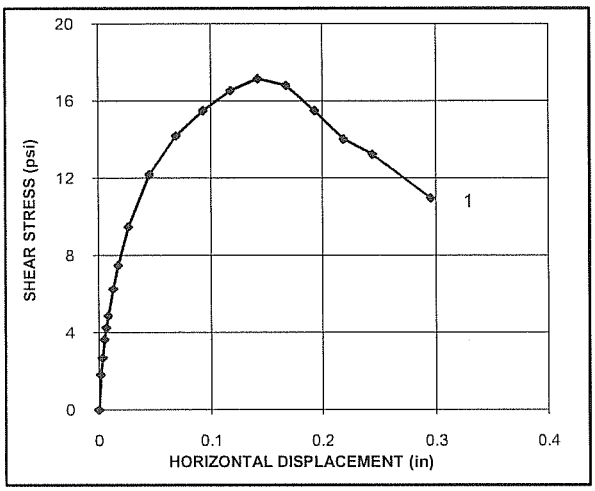
MOHR'S CIRCLES

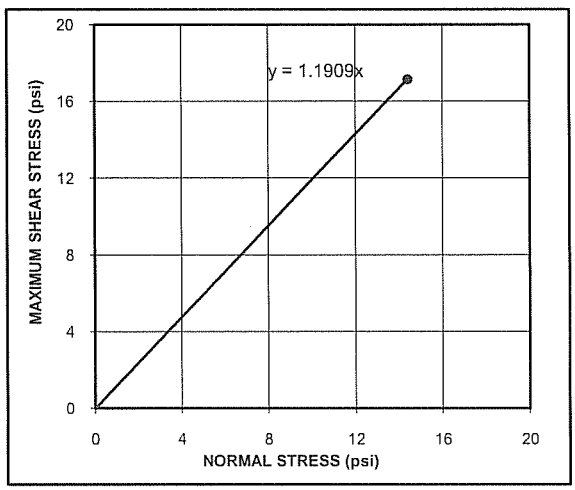
USIBWC LOWER RIO GRAND FLOOD CONTROL PROJECT
LEVEE SYSTEM FROM CAMERON COUNTY LINE OF THE DONNA
PUMP TO BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT
CAMERON COUNTY, TEXAS

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-20 S-7 DEPTH: 15.0 - 17.0'





ϕ = 50.0 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	14.4
t50 (minutes)	0.17
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	22.9
Wet Density (pcf)	122.1
Dry Density (pcf)	99.4
Void Ratio	0.696
Saturation (%)	88.7

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.001	1.82
0.003	2.69
0.005	3.65
0.006	4.26
0.008	4.86
0.012	6.26
0.017	7.48
0.026	9.48
0.045	12.18
0.069	14.19
0.093	15.49
0.118	16.54
0.142	17.15
0.168	16.80
0.193	15.49
0.219	14.01
0.244	13.23
0.295	10.96

17.1
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-228

DESCRIPTION Brown, SILTY CLAY, some fine sand.

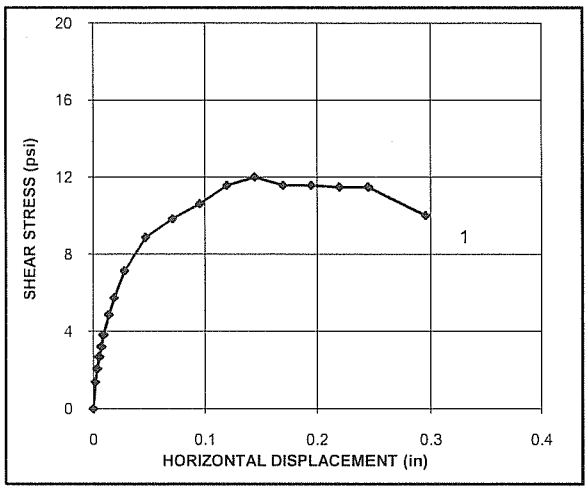
USCS (CL)

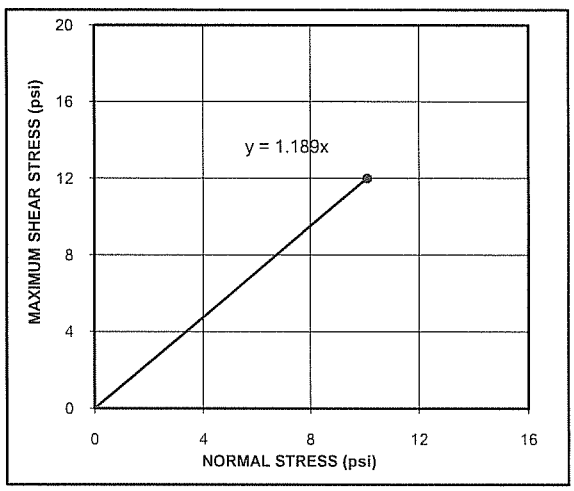
TECH	SW
DATE	12/15/08
CHECK	AK
REVIEW	MM

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-46 S-6 DEPTH: 10.0 - 12.0'





ϕ = 49.9 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	10.1
t50 (minutes)	0.23
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	26.6
Wet Density (pcf)	121.8
Dry Density (pcf)	96.2
Void Ratio	0.752
Saturation (%)	95.6

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.38
0.003	2.08
0.005	2.69
0.007	3.21
0.009	3.82
0.013	4.86
0.018	5.74
0.027	7.13
0.046	8.87
0.071	9.83
0.095	10.62
0.120	11.57
0.145	12.01
0.170	11.57
0.195	11.57
0.220	11.49
0.245	11.49
0.296	10.01

12.0
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-229

DESCRIPTION Brown, SITLY CLAY, and fine sand.

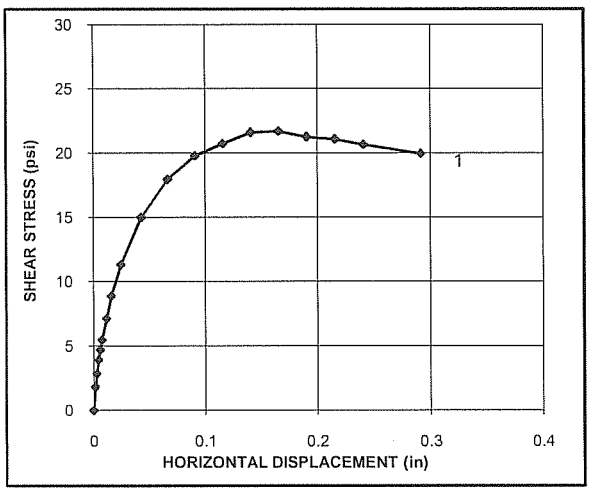
USCS (CL)

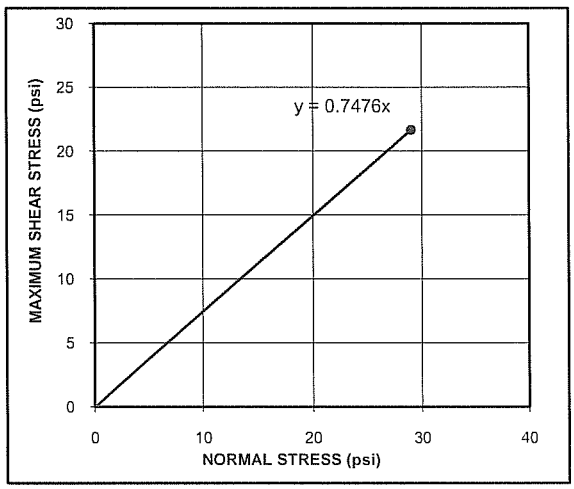
TECH	SW
DATE	12/09/08
CHECK	AK
REVIEW	[illegible]

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-60 S-10/S-11 **DEPTH:** 30.0 - 36.5'





ϕ = 36.8 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	29.0
t50 (minutes)	0.16
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	23.4
Wet Density (pcf)	126.5
Dry Density (pcf)	102.5
Void Ratio	0.623
Saturation (%)	100.0

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.001	1.82
0.003	2.86
0.004	3.91
0.006	4.69
0.008	5.47
0.012	7.13
0.016	8.87
0.025	11.31
0.043	14.97
0.067	17.93
0.091	19.76
0.116	20.72
0.140	21.59
0.165	21.68
0.191	21.24
0.216	21.07
0.241	20.63
0.291	19.94

21.7
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure. Please note, not enough material filled the direct shear ring, when sample was remolded to the required 90 pcf, more sample was added to ring.

FIGURE B-230

DESCRIPTION Brown, FINE SAND, and clayey silt.

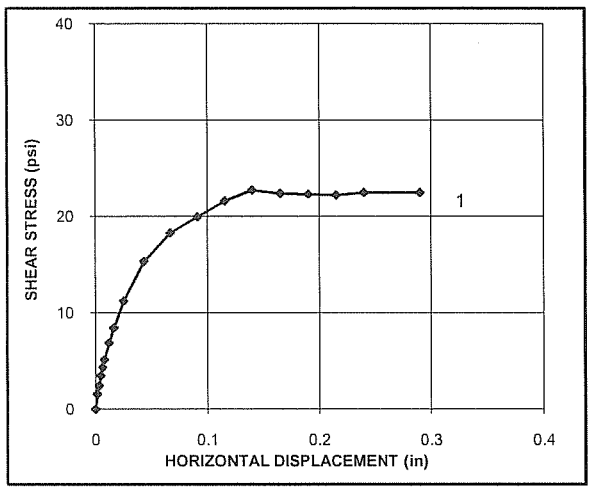
USCS (SM)

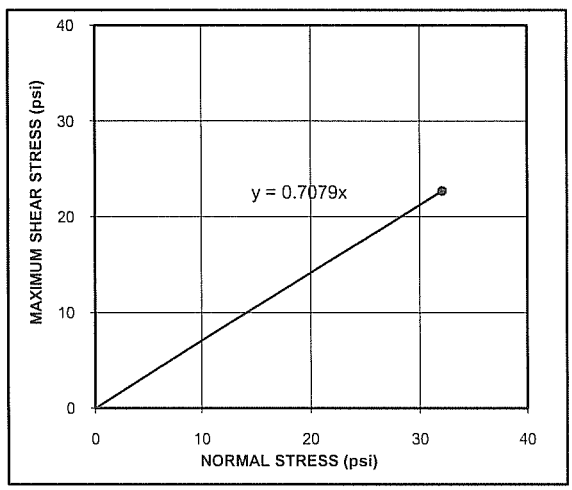
TECH	SW
DATE	12/15/08
CHECK	AK
REVIEW	PAM

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-66 S-10 DEPTH: 35.0 - 37.0'





ϕ = 35.3 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	32.1
t50 (minutes)	0.2
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	28.1
Wet Density (pcf)	124.9
Dry Density (pcf)	97.5
Void Ratio	0.728
Saturation (%)	104.0

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.55
0.003	2.43
0.005	3.47
0.006	4.34
0.008	5.13
0.012	6.87
0.016	8.44
0.025	11.22
0.043	15.32
0.067	18.28
0.091	19.94
0.115	21.59
0.140	22.72
0.165	22.38
0.190	22.29
0.215	22.20
0.240	22.46
0.290	22.46

22.7
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-231

DESCRIPTION Dark Gray, FINE SAND, and silty clay.

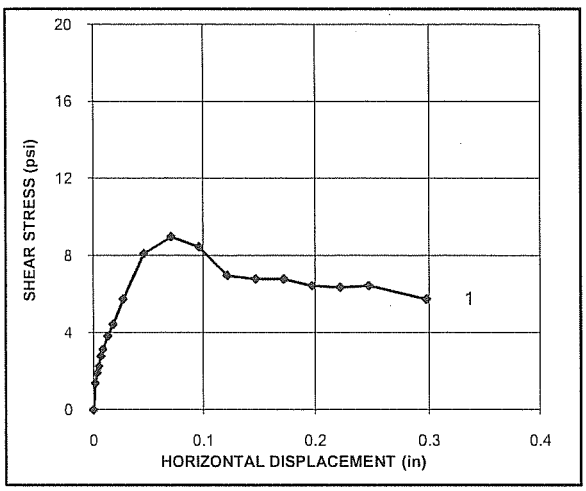
USCS (SC)

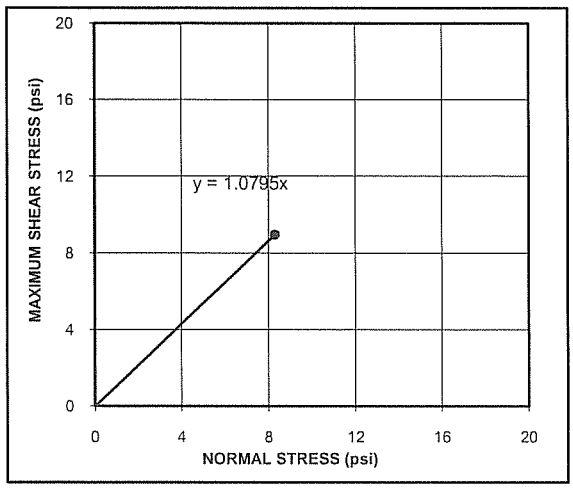
TECH	SW
DATE	12/09/08
CHECK	AK
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-71 S-5 **DEPTH:** 8.0 - 10.0'





ϕ = 47.2 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	8.3
t50 (minutes)	0.22
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	18.6
Wet Density (pcf)	119.3
Dry Density (pcf)	100.6
Void Ratio	0.675
Saturation (%)	74.3

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.38
0.003	1.90
0.005	2.25
0.007	2.77
0.009	3.12
0.014	3.82
0.018	4.43
0.028	5.74
0.047	8.09
0.071	8.96
0.096	8.44
0.122	6.96
0.147	6.78
0.172	6.78
0.197	6.43
0.222	6.35
0.247	6.43
0.298	5.74

9.0
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-232

DESCRIPTION Brown, FINE SAND, some clayey silt.

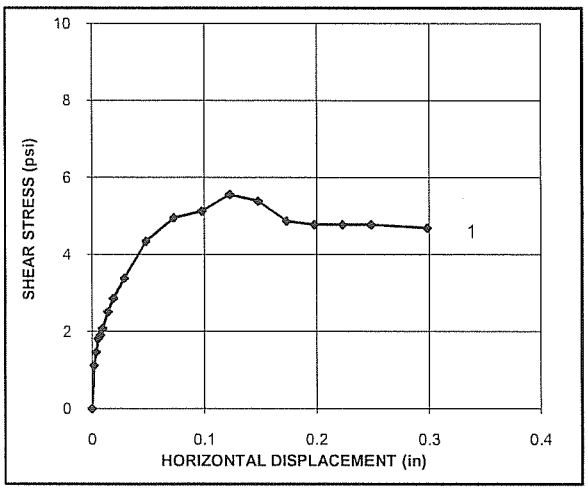
USCS (SM)

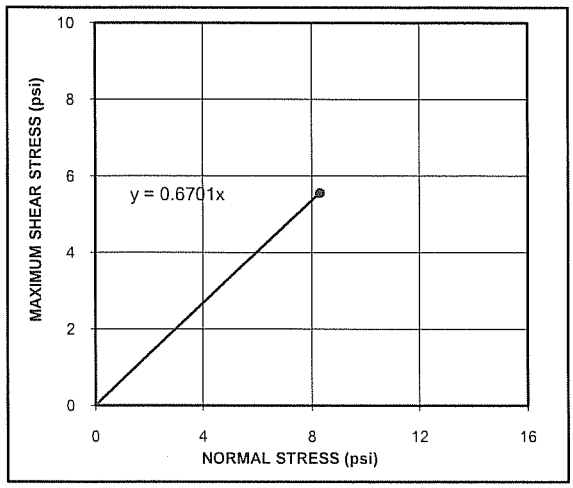
TECH	SW
DATE	12/08/08
CHECK	AK
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-80 S-6 DEPTH: 10.0 - 12.0'





ϕ = 33.8 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	8.3
t50 (minutes)	0.23
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	30.1
Wet Density (pcf)	120.0
Dry Density (pcf)	92.2
Void Ratio	0.829
Saturation (%)	98.2

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.12
0.004	1.47
0.005	1.82
0.007	1.90
0.009	2.08
0.014	2.51
0.019	2.86
0.029	3.38
0.048	4.34
0.073	4.95
0.098	5.13
0.123	5.56
0.148	5.39
0.173	4.86
0.198	4.78
0.223	4.78
0.248	4.78
0.298	4.69

5.6
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-233

DESCRIPTION Brown, FINE SAND, and silty clay.

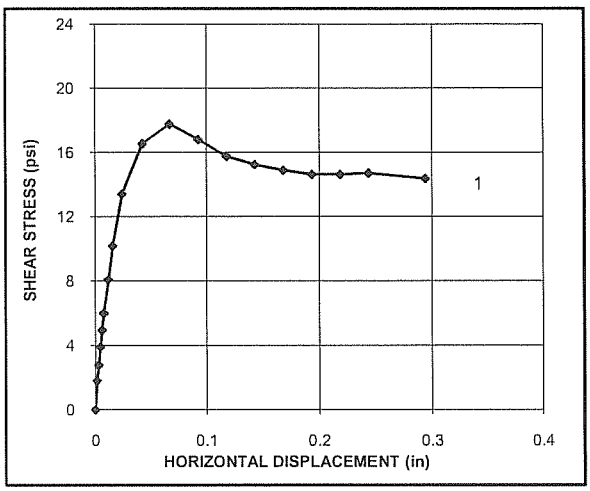
USCS (SC)

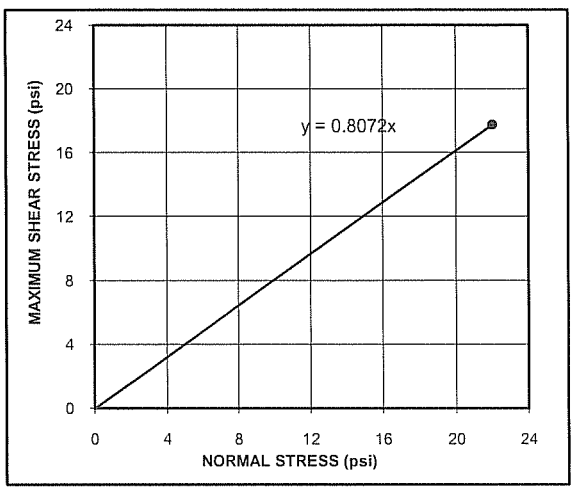
TECH	SW
DATE	12/08/08
CHECK	AK
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-104 S-9 DEPTH: 25.0 - 26.5'





ϕ = 38.9 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	22.0
t50 (minutes)	0.20
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	19.8
Wet Density (pcf)	119.8
Dry Density (pcf)	100.0
Void Ratio	0.686
Saturation (%)	78.1

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.001	1.82
0.003	2.77
0.004	3.91
0.006	4.95
0.008	6.00
0.012	8.09
0.016	10.18
0.024	13.40
0.043	16.54
0.067	17.76
0.093	16.80
0.118	15.76
0.143	15.23
0.169	14.88
0.194	14.62
0.219	14.62
0.244	14.71
0.294	14.36

17.8
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure. Please note, sample was remolded to the required 90 pcf @ received moisture content.

FIGURE B-234

DESCRIPTION Dark Gray, FINE SAND, and silty clay.

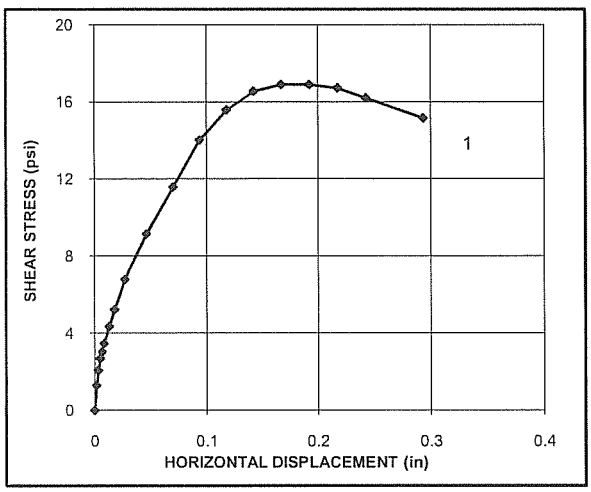
USCS (SC)

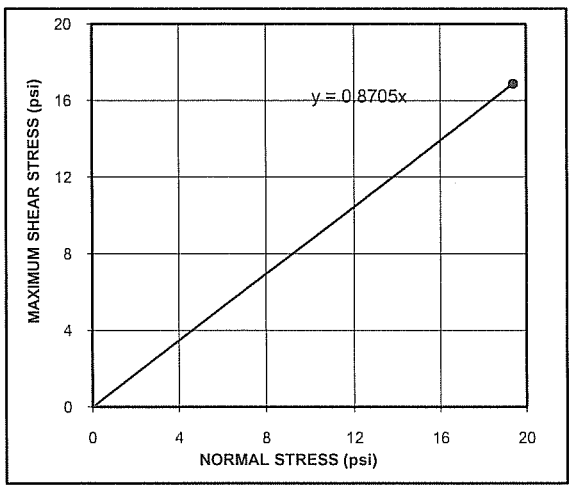
TECH	SW
DATE	12/16/08
CHECK	AL
REVIEW	[illegible]

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-120 S-8 DEPTH: 20.0 - 22.0'





ϕ = 41.0 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	19.4
t50 (minutes)	0.23
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	16.9
Wet Density (pcf)	127.1
Dry Density (pcf)	108.7
Void Ratio	0.550
Saturation (%)	82.8

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.29
0.003	2.08
0.005	2.69
0.007	3.04
0.009	3.47
0.013	4.34
0.018	5.21
0.027	6.78
0.046	9.13
0.070	11.57
0.094	14.01
0.118	15.58
0.143	16.54
0.168	16.89
0.193	16.89
0.218	16.71
0.243	16.19
0.293	15.15

16.9
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-235

DESCRIPTION Brown, CLAYEY SILT, some fine sand.

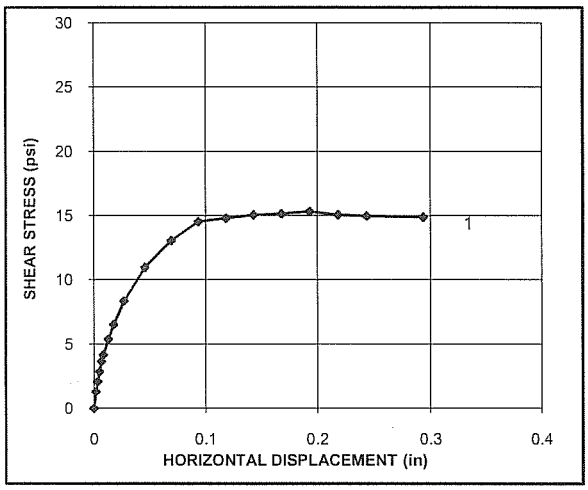
USCS (ML)

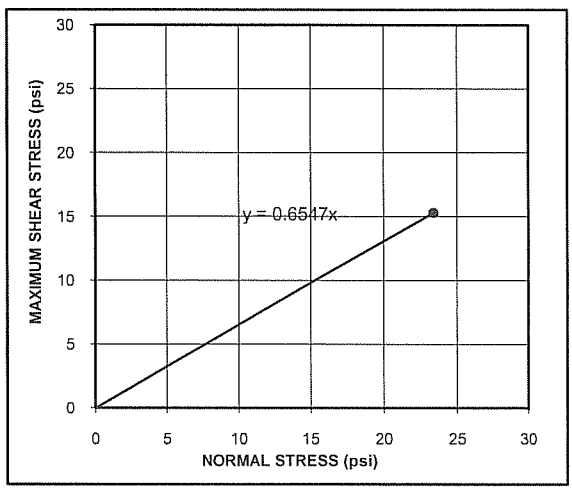
TECH	SW
DATE	12/12/08
CHECK	AK
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-124 S-9 DEPTH: 25.0 - 27.0'





ϕ = 33.2 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	23.4
t50 (minutes)	0.28
SPEED mm/min	0.300
Sample Diameter (in)	2.50
Moisture Content (%)	23.7
Wet Density (pcf)	124.9
Dry Density (pcf)	100.9
Void Ratio	0.670
Saturation (%)	95.6

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.29
0.003	2.08
0.005	2.86
0.007	3.65
0.008	4.17
0.013	5.39
0.017	6.52
0.026	8.35
0.045	10.96
0.069	13.05
0.094	14.54
0.119	14.80
0.143	15.06
0.168	15.15
0.193	15.32
0.218	15.06
0.243	14.97
0.294	14.88

15.3
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-236

DESCRIPTION Brown, FINE SAND, some clayey silt.

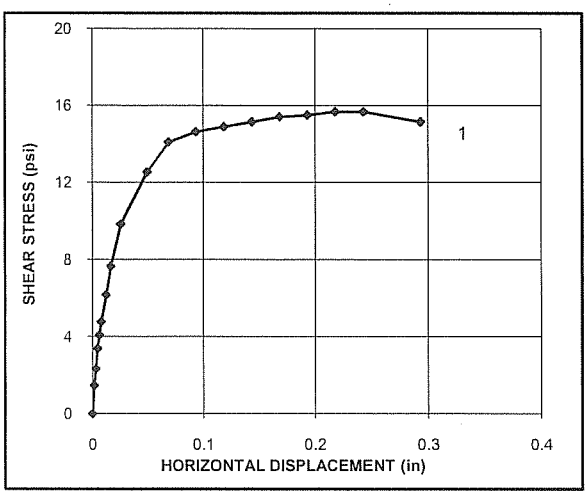
USCS (SM)

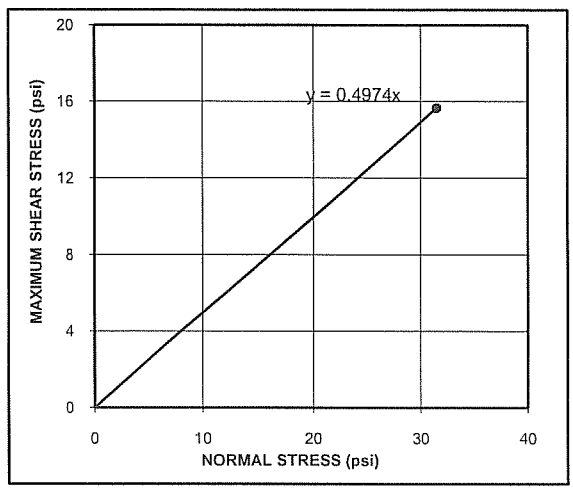
TECH	SW
DATE	12/09/08
CHECK	AK
REVIEW	[illegible]

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-151 S-11 DEPTH: 35.0 - 37.0'





ϕ = 26.4 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	31.5
t50 (minutes)	0.23
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	27.6
Wet Density (pcf)	122.6
Dry Density (pcf)	96.1
Void Ratio	0.753
Saturation (%)	98.8

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.47
0.003	2.34
0.005	3.38
0.006	4.08
0.008	4.78
0.012	6.17
0.017	7.65
0.026	9.83
0.050	12.53
0.069	14.10
0.094	14.62
0.119	14.88
0.143	15.15
0.168	15.41
0.193	15.49
0.218	15.67
0.243	15.67
0.293	15.15

15.7
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-237

DESCRIPTION Light Brown, SILTY CLAY, some fine sand.

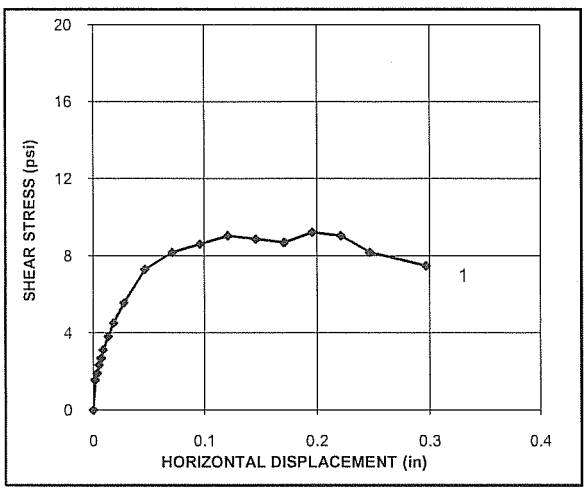
USCS (CL)

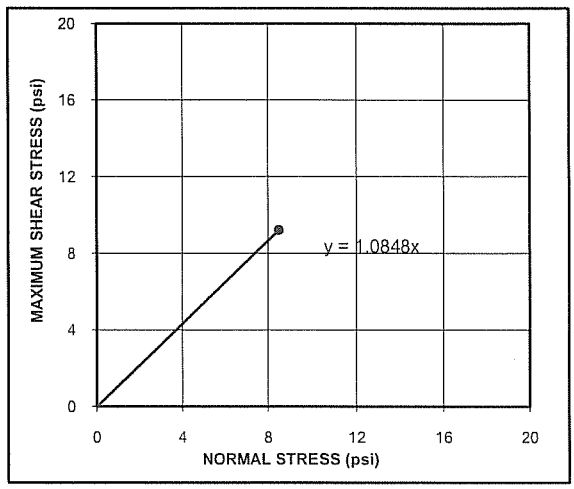
TECH	SW
DATE	12/08/08
CHECK	AJC
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-156 S-5 **DEPTH:** 8.0 - 10.0'





ϕ = 47.3 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	8.5
t50 (minutes)	0.17
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	27.2
Wet Density (pcf)	121.8
Dry Density (pcf)	95.8
Void Ratio	0.760
Saturation (%)	96.7

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.55
0.003	1.90
0.005	2.34
0.007	2.69
0.009	3.12
0.014	3.82
0.018	4.52
0.028	5.56
0.047	7.30
0.072	8.18
0.096	8.61
0.121	9.05
0.146	8.87
0.171	8.70
0.196	9.22
0.221	9.05
0.247	8.18
0.297	7.48

9.2
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-238

DESCRIPTION Brown, SILTY CLAY, some fine sand.

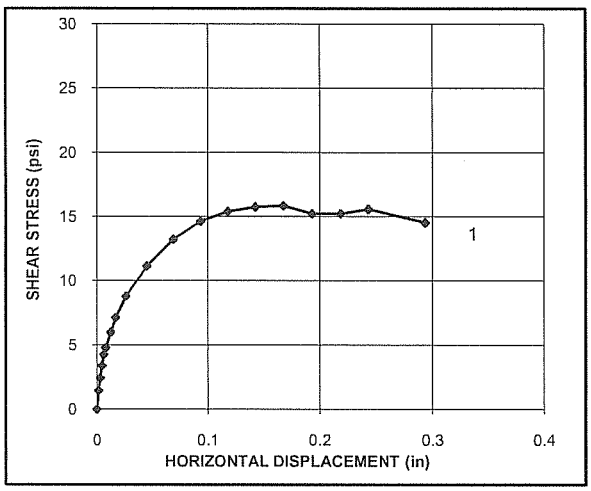
USCS (CL)

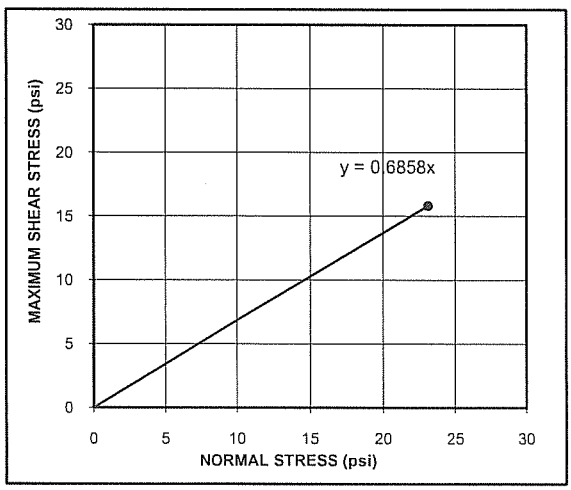
TECH	SW
DATE	12/09/08
CHECK	AK
REVIEW	AWM

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-159 S-9 DEPTH: 25.0 - 27.0'





ϕ = 34.4 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	23.1
t50 (minutes)	0.37
SPEED mm/min	0.240
Sample Diameter (in)	2.50
Moisture Content (%)	25.6
Wet Density (pcf)	123.3
Dry Density (pcf)	98.2
Void Ratio	0.717
Saturation (%)	96.4

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.47
0.003	2.43
0.005	3.38
0.006	4.26
0.008	4.78
0.013	6.00
0.017	7.13
0.026	8.79
0.045	11.14
0.069	13.23
0.094	14.62
0.118	15.41
0.143	15.76
0.168	15.84
0.193	15.23
0.218	15.23
0.243	15.58
0.294	14.54

15.8
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-239

DESCRIPTION Brown, FINE SAND, and silty clay.

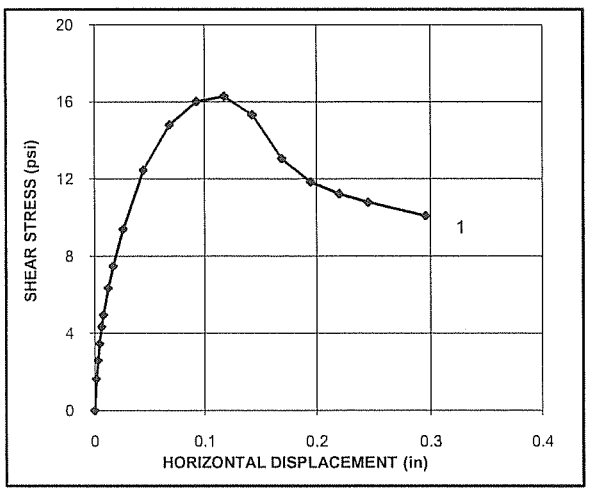
USCS (SC)

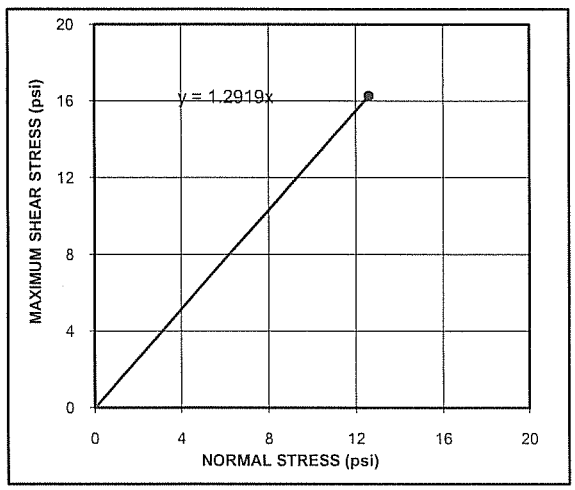
TECH	SW
DATE	12/10/08
CHECK	AK
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-169 S-5 **DEPTH:** 8.0 - 10.0'





ϕ = 52.3 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	**12.6**
t50 (minutes)	0.23
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	20.7
Wet Density (pcf)	126.4
Dry Density (pcf)	104.8
Void Ratio	0.609
Saturation (%)	91.6

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.001	1.64
0.003	2.60
0.005	3.47
0.006	4.34
0.008	4.95
0.012	6.35
0.017	7.48
0.026	9.40
0.045	12.44
0.069	14.80
0.093	16.02
0.118	16.28
0.143	15.32
0.169	13.05
0.195	11.83
0.220	11.22
0.245	10.79
0.296	10.09

16.3
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-240

DESCRIPTION Brown, CLAYEY SILT, some fine sand.

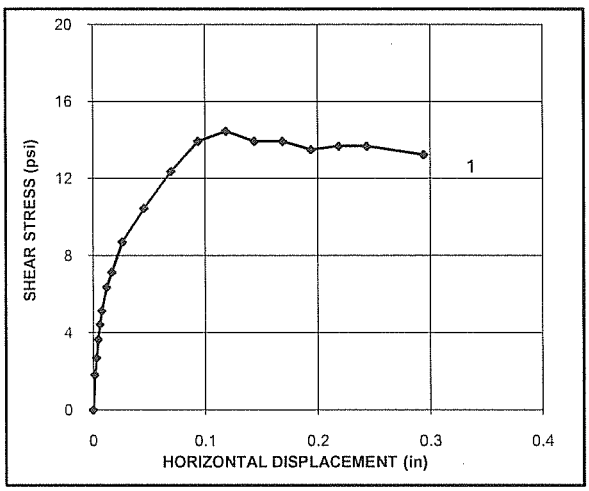
USCS (ML)

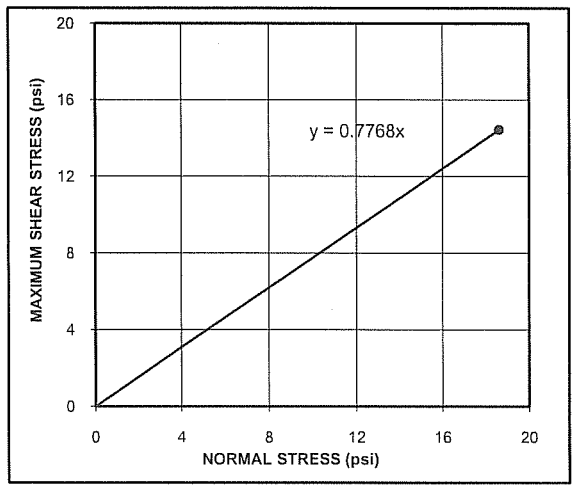
TECH	SW
DATE	12/10/08
CHECK	
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-173 S-8 **DEPTH:** 20.0 - 22.0'





ϕ = 37.8 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	**18.6**
t50 (minutes)	0.21
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	29.5
Wet Density (pcf)	121.9
Dry Density (pcf)	94.2
Void Ratio	0.790
Saturation (%)	100.8

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.001	1.82
0.003	2.69
0.005	3.65
0.006	4.43
0.008	5.13
0.012	6.35
0.017	7.13
0.026	8.70
0.046	10.44
0.070	12.36
0.094	13.93
0.119	14.45
0.144	13.93
0.169	13.93
0.194	13.49
0.219	13.66
0.244	13.66
0.294	13.23

14.4
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-241

DESCRIPTION Brown, SILTY CLAY, some fine sand.

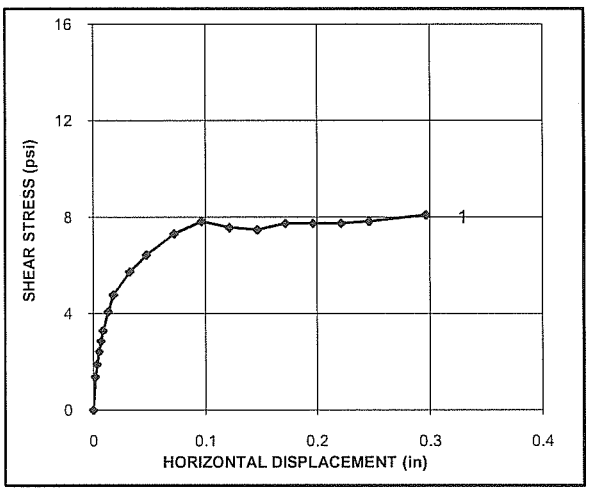
USCS (CL)

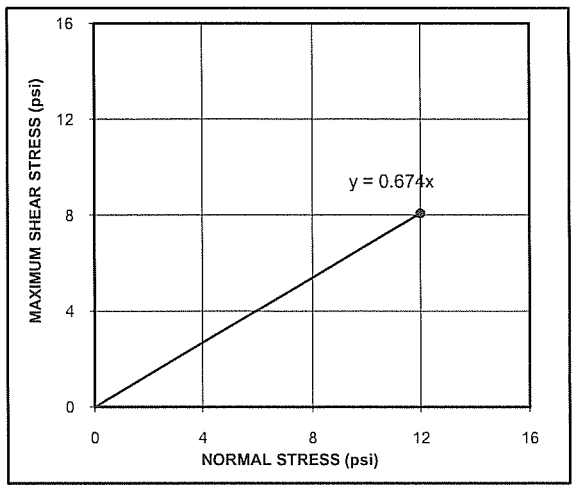
TECH	SW
DATE	12/11/08
CHECK	
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-179 S-7 DEPTH: 15.0 - 17.0'





ϕ = 34.0 ^{0}
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	12.0
t50 (minutes)	0.17
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	13.3
Wet Density (pcf)	101.8
Dry Density (pcf)	89.8
Void Ratio	0.876
Saturation (%)	41.1

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.38
0.003	1.90
0.005	2.43
0.007	2.86
0.009	3.30
0.013	4.08
0.018	4.78
0.033	5.74
0.047	6.43
0.072	7.30
0.097	7.83
0.122	7.57
0.147	7.48
0.172	7.74
0.197	7.74
0.222	7.74
0.247	7.83
0.297	8.09

8.1
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure. Please note, sample was remolded to the required 90 pcf @ received moisture content.

FIGURE B-242

DESCRIPTION Brown, FINE SAND, and silty clay.

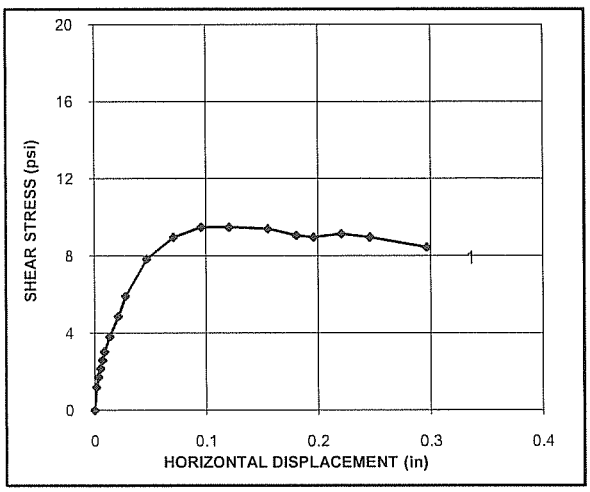
USCS (SC)

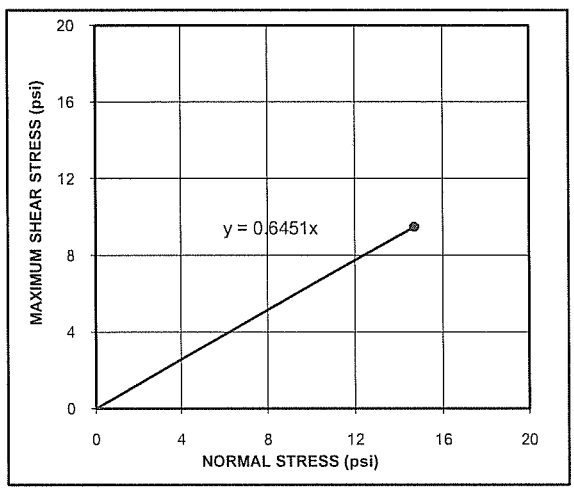
TECH	SW
DATE	12/16/08
CHECK	AK
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-181 S-7 DEPTH: 16.0 - 18.0'





ϕ = 32.8 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	14.7
t50 (minutes)	2.12
SPEED mm/min	0.036
Sample Diameter (in)	2.50
Moisture Content (%)	36.4
Wet Density (pcf)	117.5
Dry Density (pcf)	86.1
Void Ratio	0.957
Saturation (%)	102.7

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.21
0.003	1.73
0.005	2.16
0.007	2.60
0.009	3.04
0.014	3.82
0.021	4.86
0.028	5.91
0.047	7.83
0.071	8.96
0.096	9.48
0.121	9.48
0.156	9.40
0.181	9.05
0.196	8.96
0.221	9.13
0.246	8.96
0.296	8.44

9.5
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-243

DESCRIPTION Brown, SILTY CLAY, some fine sand.

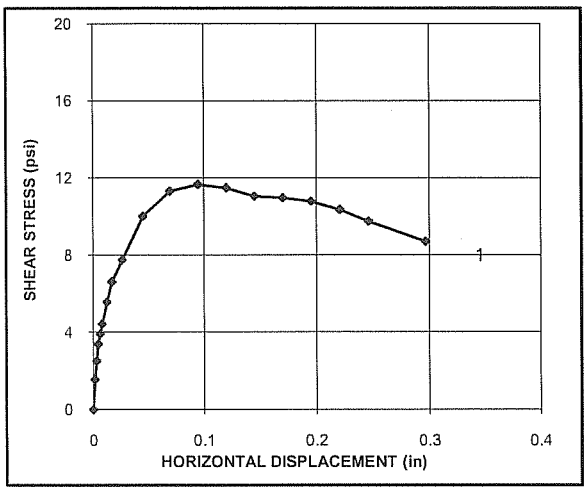
USCS (CL)

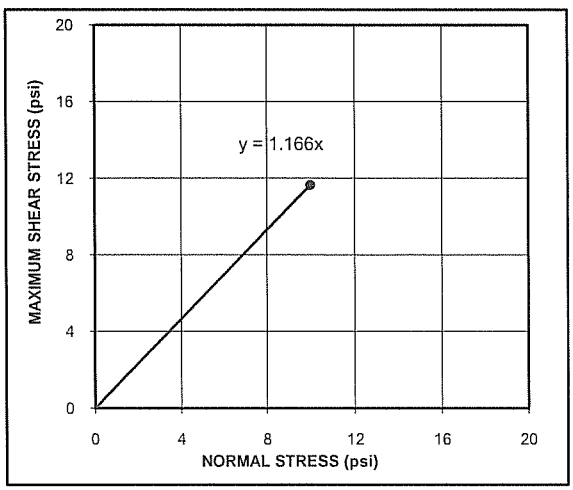
TECH	SW
DATE	12/11/08
CHECK	
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-189 S-6 DEPTH: 10.0 - 12.0'





ϕ = 49.4 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	10.0
t50 (minutes)	0.022
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	31.0
Wet Density (pcf)	120.1
Dry Density (pcf)	91.7
Void Ratio	0.838
Saturation (%)	99.8

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.55
0.003	2.51
0.005	3.38
0.006	3.91
0.008	4.43
0.013	5.56
0.017	6.61
0.027	7.74
0.046	10.01
0.070	11.31
0.095	11.66
0.120	11.49
0.145	11.05
0.170	10.96
0.195	10.79
0.221	10.35
0.246	9.74
0.296	8.70

Max Shear Stress: 11.7

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress:

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress:

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-244

DESCRIPTION Brown, SILTY CLAY, some fine sand.

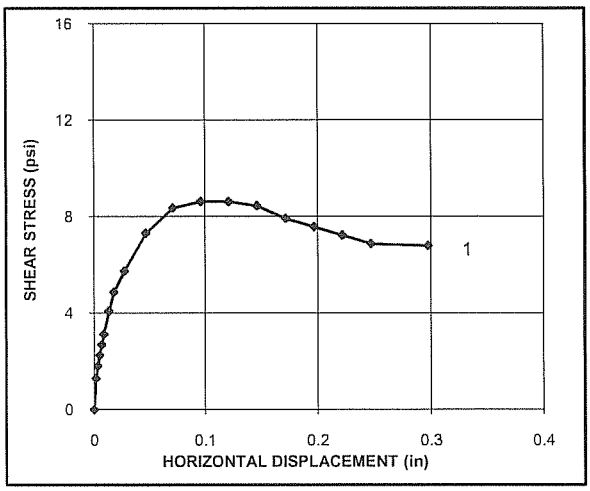
USCS (CL)

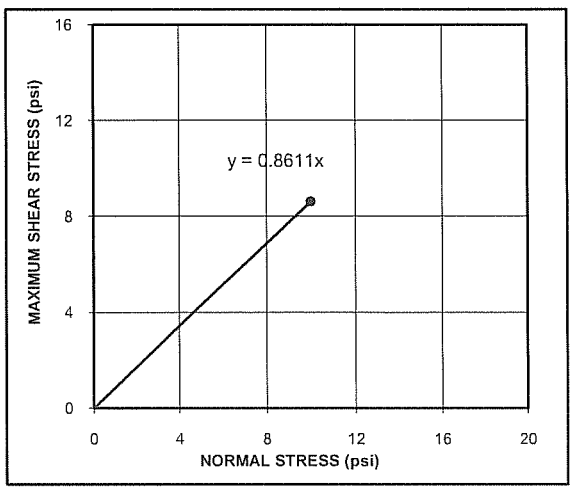
TECH	SW
DATE	12/11/08
CHECK	
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-190 S-6 DEPTH: 10.0 - 12.0'





ϕ = 40.7 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	**10.0**
t50 (minutes)	0.19
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	19.2
Wet Density (pcf)	120.3
Dry Density (pcf)	100.9
Void Ratio	0.671
Saturation (%)	77.3

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.29
0.003	1.82
0.005	2.25
0.007	2.69
0.009	3.12
0.013	4.08
0.018	4.86
0.028	5.74
0.047	7.30
0.071	8.35
0.096	8.61
0.121	8.61
0.146	8.44
0.172	7.91
0.197	7.57
0.222	7.22
0.247	6.87
0.297	6.78

8.6
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-245

DESCRIPTION Light Brown, CLAYEY SILT, and fine sand.

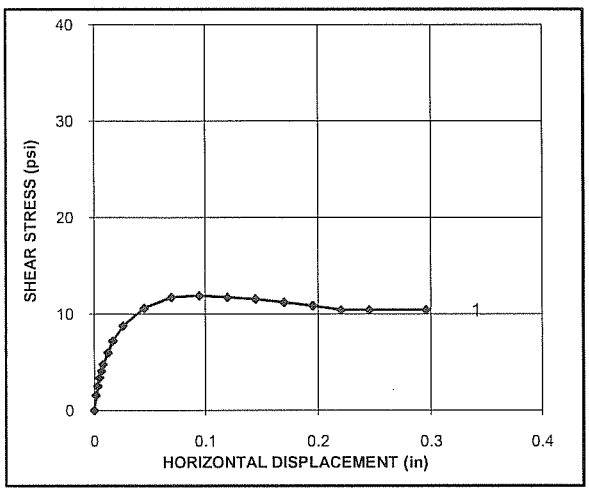
USCS (ML)

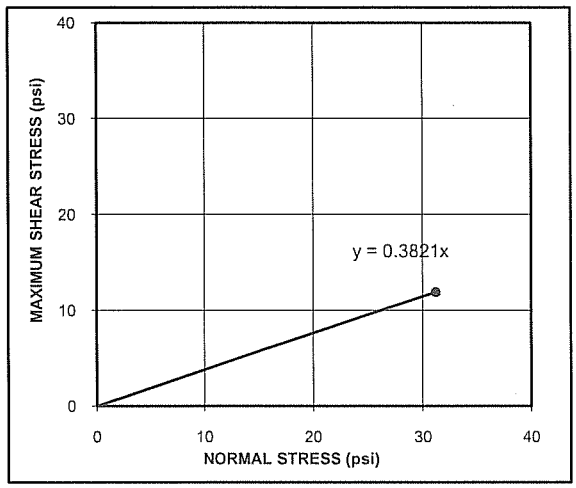
TECH	SW
DATE	12/15/08
CHECK	AK
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-195 S-11 DEPTH: 35.0 - 37.0'





ϕ = 20.9 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	**31.2**
t50 (minutes)	0.26
SPEED mm/min	0.300
Sample Diameter (in)	2.50
Moisture Content (%)	30.9
Wet Density (pcf)	121.5
Dry Density (pcf)	92.8
Void Ratio	0.849
Saturation (%)	99.9

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.55
0.003	2.51
0.005	3.38
0.006	4.08
0.008	4.78
0.013	6.00
0.017	7.22
0.026	8.79
0.045	10.62
0.070	11.75
0.095	11.92
0.120	11.75
0.145	11.57
0.170	11.22
0.195	10.88
0.221	10.44
0.246	10.44
0.296	10.44

11.9
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-246

DESCRIPTION Brown, SILTY CLAY, some fine sand.

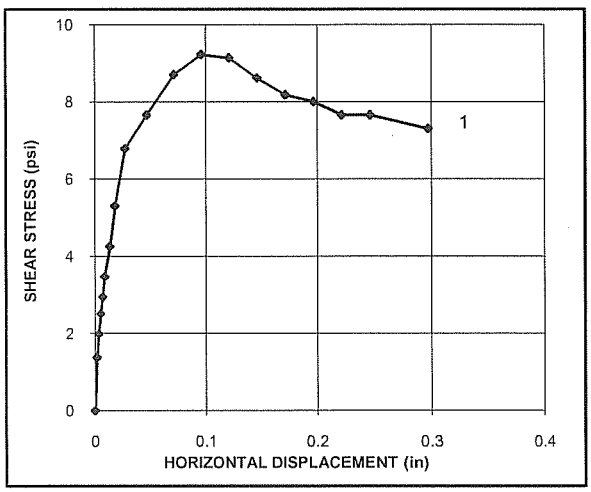
USCS (CL)

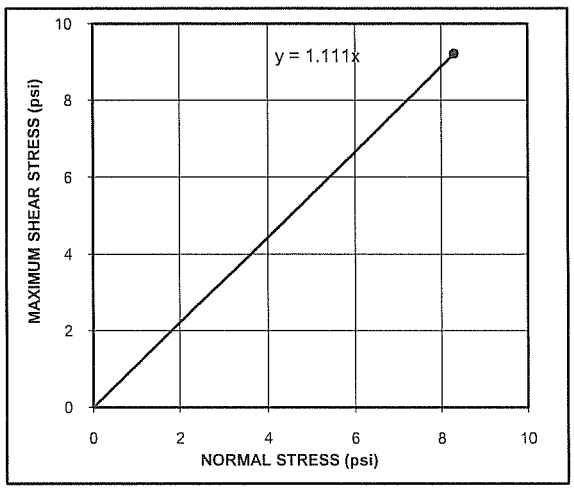
TECH	SW
DATE	12/12/08
CHECK	AK
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-197 S-6 **DEPTH:** 10.0-12.0'





ϕ = 48.0 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	8.3
t50 (minutes)	0.23
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	16.6
Wet Density (pcf)	118.8
Dry Density (pcf)	102.0
Void Ratio	0.653
Saturation (%)	68.4

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.38
0.003	1.99
0.005	2.51
0.007	2.95
0.009	3.47
0.013	4.26
0.018	5.30
0.027	6.78
0.047	7.65
0.071	8.70
0.096	9.22
0.121	9.13
0.146	8.61
0.172	8.18
0.197	8.00
0.222	7.65
0.247	7.65
0.297	7.30

9.2
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-247

DESCRIPTION Brown, SILTY CLAY, some fine sand.

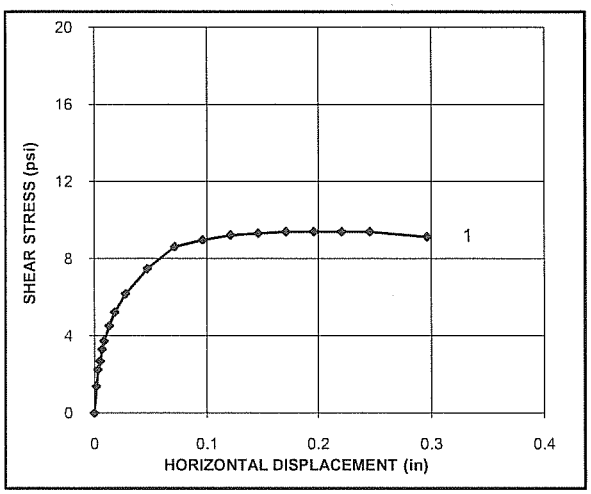
USCS (CL)

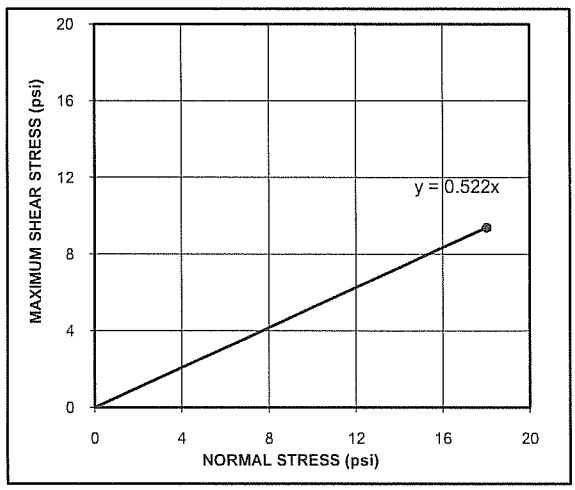
TECH	SW
DATE	12/16/08
CHECK	AH
REVIEW	PWM

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-220 S-8 DEPTH: 20.0 - 22.0'





ϕ = 27.6 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	18.0
t50 (minutes)	0.22
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	29.5
Wet Density (pcf)	117.6
Dry Density (pcf)	90.8
Void Ratio	0.852
Saturation (%)	93.2

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.38
0.003	2.25
0.005	2.69
0.007	3.30
0.009	3.73
0.013	4.52
0.018	5.21
0.027	6.17
0.047	7.48
0.071	8.61
0.096	8.96
0.121	9.22
0.146	9.31
0.171	9.40
0.196	9.40
0.221	9.40
0.246	9.40
0.296	9.13

9.4
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-248

DESCRIPTION Brown, SILTY CLAY, some fine sand.

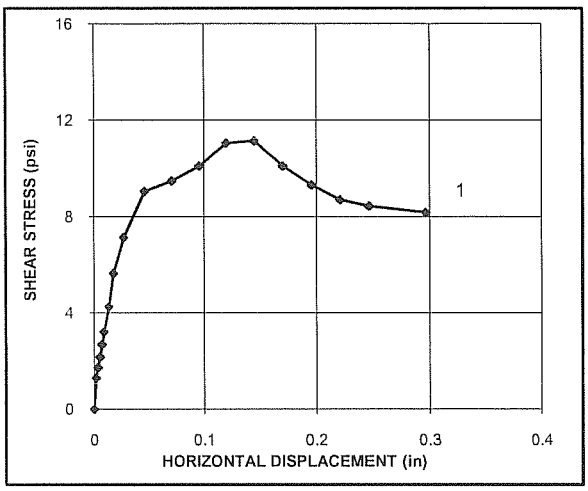
USCS (CL)

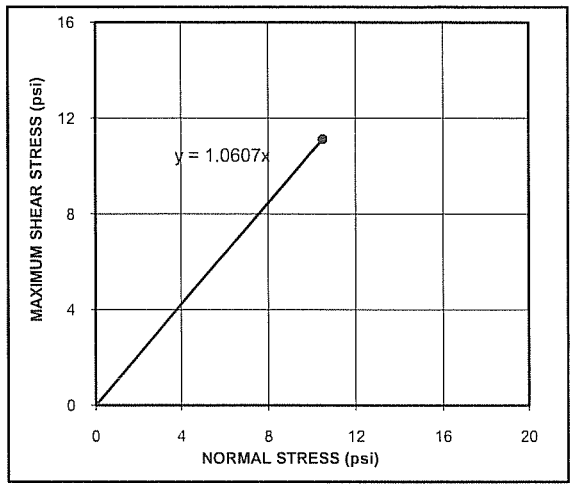
TECH	SW
DATE	12/12/08
CHECK	AK
REVIEW	[illegible]

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-228 S-6 DEPTH: 10.0 - 12.0'





ϕ = 46.7 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	10.5
t50 (minutes)	0.27
SPEED mm/min	0.300
Sample Diameter (in)	2.50
Moisture Content (%)	19.8
Wet Density (pcf)	125.5
Dry Density (pcf)	104.8
Void Ratio	0.605
Saturation (%)	88.1

663 1939 683 1960 (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.29
0.003	1.73
0.005	2.16
0.007	2.69
0.009	3.21
0.013	4.26
0.018	5.65
0.027	7.13
0.046	9.05
0.071	9.48
0.096	10.09
0.120	11.05
0.145	11.14
0.171	10.09
0.196	9.31
0.221	8.70
0.246	8.44
0.297	8.18

11.1
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-249

DESCRIPTION Brown, CLAYEY SILT, and fine sand.

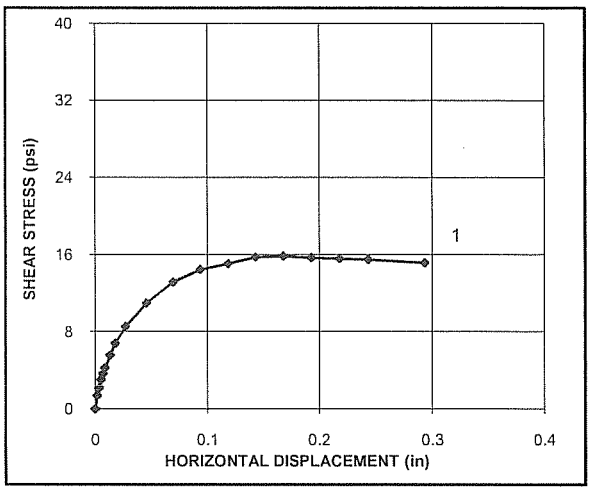
USCS (ML)

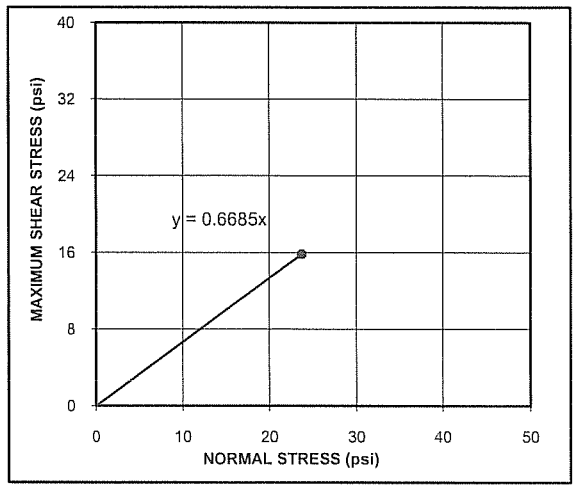
TECH	SW
DATE	12/22/08
CHECK	AK
REVIEW	[illegible]

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-229 S-9 **DEPTH:** 25.0 - 27.0'





ϕ = 33.8 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	23.7
t50 (minutes)	0.47
SPEED mm/min	0.180
Sample Diameter (in)	2.50
Moisture Content (%)	25.4
Wet Density (pcf)	121.3
Dry Density (pcf)	96.8
Void Ratio	0.738
Saturation (%)	92.7

663 1939 683 1960 (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.38
0.003	2.16
0.005	3.04
0.007	3.65
0.008	4.26
0.013	5.56
0.017	6.78
0.026	8.52
0.045	10.96
0.069	13.14
0.094	14.45
0.118	15.06
0.143	15.76
0.168	15.84
0.193	15.67
0.218	15.58
0.243	15.49
0.293	15.15

15.8
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-250

DESCRIPTION Light Gray, FINE SAND, and silty clay.

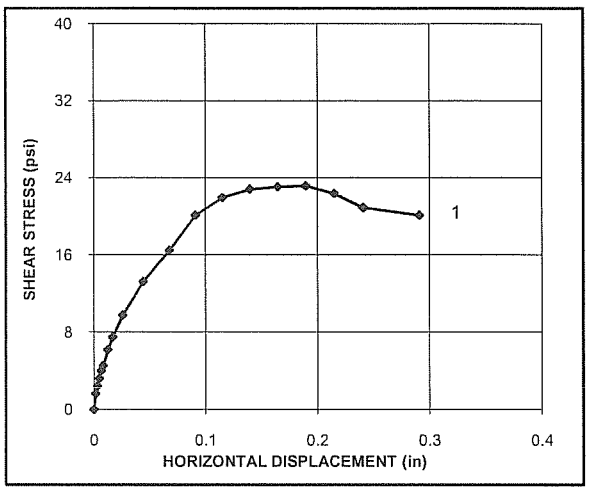
USCS (SC)

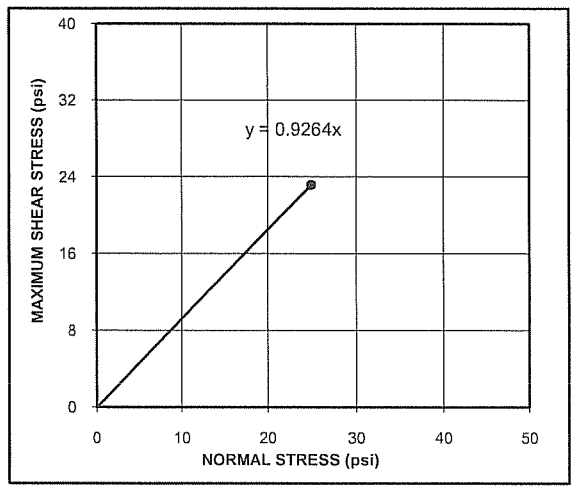
TECH	SW
DATE	12/19/08
CHECK	JBE
REVIEW	NWM

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-236 S-9 DEPTH: 25.0 - 27.0'





ϕ = 42.8 ^{0}
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	25.0
t50 (minutes)	0.20
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	22.3
Wet Density (pcf)	129.4
Dry Density (pcf)	105.8
Void Ratio	0.622
Saturation (%)	98.4

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.001	1.64
0.003	2.43
0.005	3.21
0.006	3.99
0.008	4.52
0.012	6.17
0.017	7.48
0.026	9.74
0.044	13.23
0.068	16.45
0.091	20.11
0.115	21.94
0.140	22.81
0.165	23.07
0.190	23.16
0.215	22.38
0.241	20.90
0.291	20.11

23.2
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-251

DESCRIPTION Brown, CLAYEY SILTY, and fine sand.

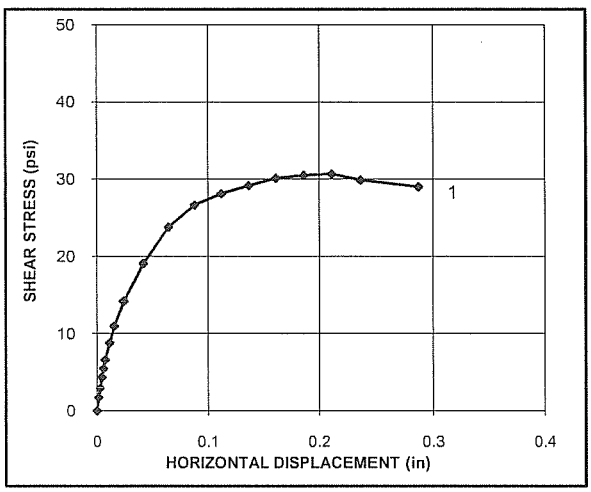
USCS (ML)

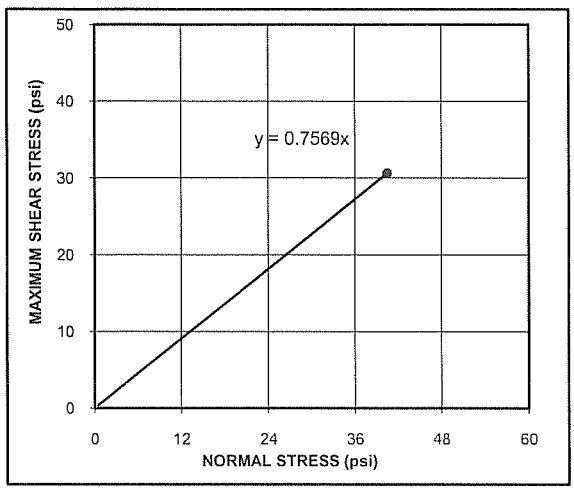
TECH	SW
DATE	12/22/08
CHECK	JBE
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-239 S-12 DEPTH: 40.0 - 42.0'





ϕ = 37.1 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	40.5
t50 (minutes)	0.12
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	22.4
Wet Density (pcf)	133.0
Dry Density (pcf)	108.7
Void Ratio	0.608
Saturation (%)	103.0

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.001	1.73
0.003	2.95
0.004	4.34
0.006	5.47
0.007	6.61
0.011	8.79
0.015	10.96
0.024	14.19
0.042	19.07
0.064	23.77
0.088	26.65
0.113	28.13
0.137	29.17
0.162	30.13
0.186	30.48
0.211	30.65
0.237	29.87
0.287	29.00

30.7
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-252

DESCRIPTION Light Brown, Clayey SILT, some fine sand, trace fine gravel.

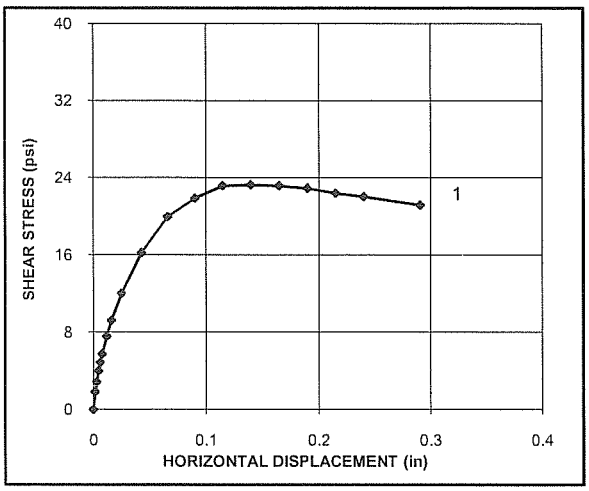
USCS (ML)

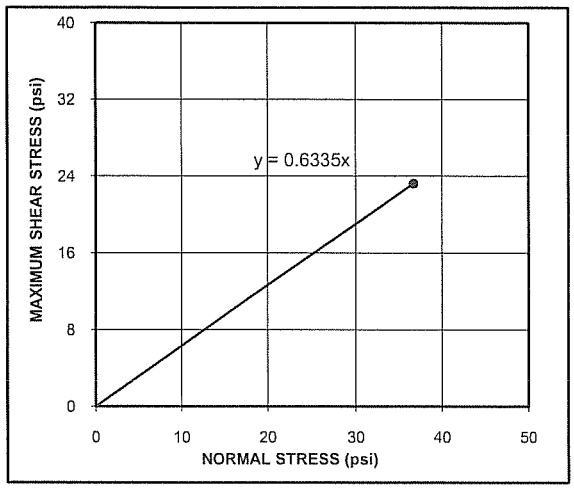
TECH	SW
DATE	12/18/08
CHECK	JBE
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-242 S-12 DEPTH: 40.0 - 42.0'





ϕ = 32.4 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	36.7
t50 (minutes)	0.26
SPEED mm/min	0.300
Sample Diameter (in)	2.50
Moisture Content (%)	27.2
Wet Density (pcf)	124.9
Dry Density (pcf)	98.2
Void Ratio	0.748
Saturation (%)	100.0

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.001	1.82
0.003	2.86
0.004	3.99
0.006	4.86
0.008	5.74
0.012	7.57
0.016	9.22
0.025	12.01
0.043	16.19
0.066	19.94
0.090	21.85
0.115	23.16
0.140	23.25
0.165	23.16
0.190	22.90
0.215	22.38
0.240	22.03
0.291	21.16

23.2
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-253

DESCRIPTION Light Brown, SILTY CLAY, some fine sand.

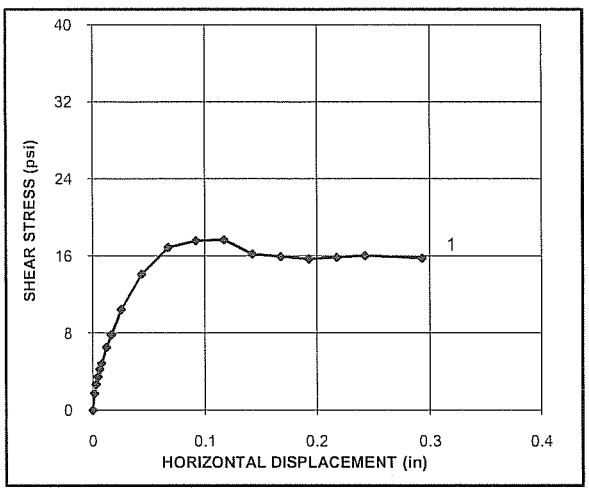
USCS (CL)

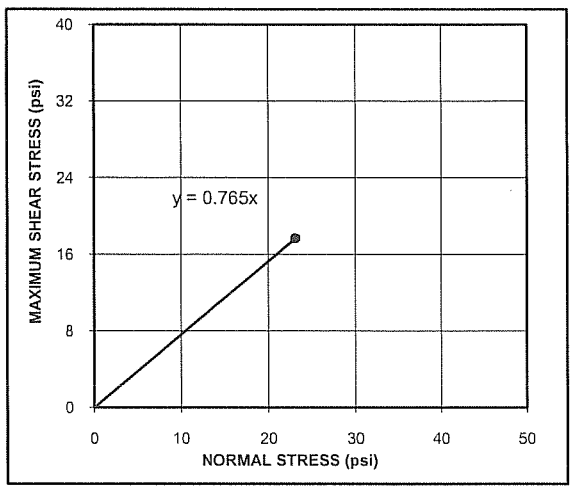
TECH	SW
DATE	12/19/08
CHECK	JDE
REVIEW	RJM

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-243 S-9 DEPTH: 25.0 - 27.0'





ϕ = 37.4 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	23.1
t50 (minutes)	0.24
SPEED mm/min	0.400
Sample Diameter (in)	2.50
Moisture Content (%)	18.9
Wet Density (pcf)	123.3
Dry Density (pcf)	103.7
Void Ratio	0.621
Saturation (%)	81.9

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.001	1.73
0.003	2.69
0.005	3.47
0.006	4.26
0.008	4.86
0.012	6.52
0.017	7.83
0.026	10.44
0.044	14.10
0.068	16.89
0.092	17.58
0.117	17.67
0.143	16.19
0.168	15.93
0.193	15.67
0.218	15.84
0.243	16.02
0.293	15.76

17.7
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-254

DESCRIPTION Light Brown, FINE SAND, some clayey silt.

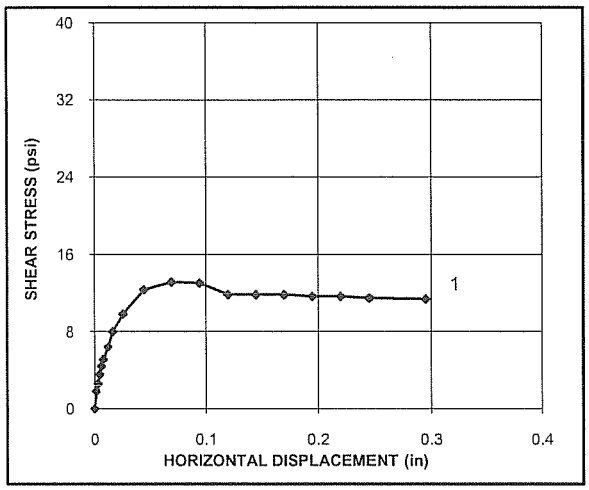
USCS (SM)

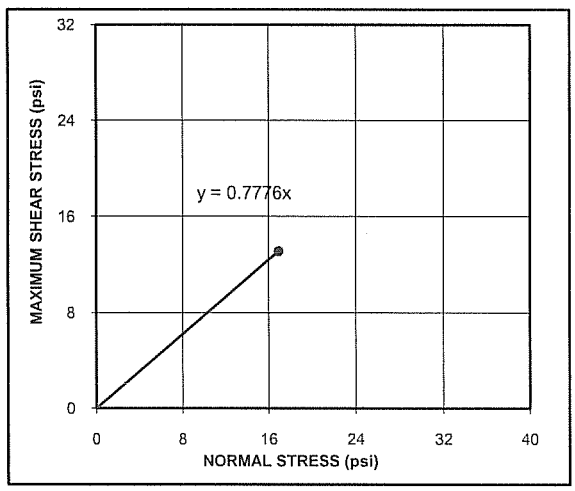
TECH	SW
DATE	12/19/08
CHECK	AH
REVIEW	[illegible]

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-248 S-8 DEPTH: 20.0 - 22.0'





ϕ = 37.9 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	**16.9**
t50 (minutes)	6.69
SPEED mm/min	0.036
Sample Diameter (in)	2.50
Moisture Content (%)	12.4
Wet Density (pcf)	110.6
Dry Density (pcf)	98.4
Void Ratio	0.709
Saturation (%)	47.0

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.001	1.82
0.003	2.60
0.005	3.56
0.006	4.43
0.008	5.13
0.012	6.43
0.017	8.00
0.026	9.83
0.045	12.36
0.069	13.14
0.094	13.05
0.120	11.83
0.145	11.83
0.170	11.83
0.195	11.66
0.220	11.66
0.245	11.49
0.295	11.40

13.1
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-255

DESCRIPTION Light Brown, CLAYEY SILT, and fine sand.

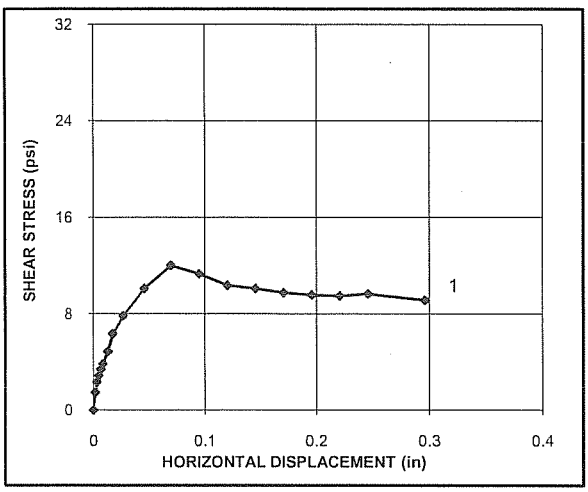
USCS (ML)

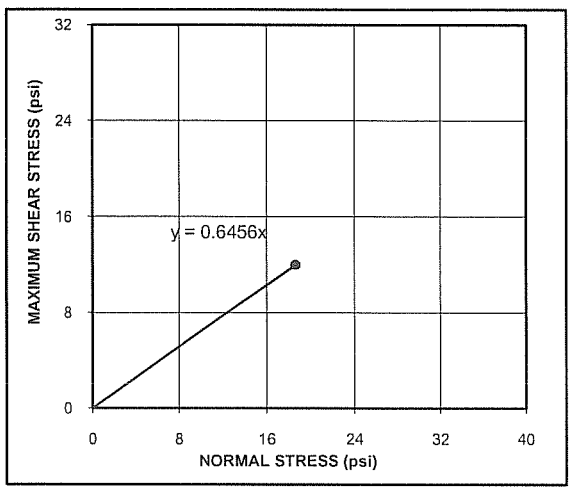
TECH	SW
DATE	12/22/08
CHECK	
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-250 S-9 DEPTH: 25.0 - 27.0'





ϕ = 32.8 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	18.6
t50 (minutes)	3.7
SPEED mm/min	0.060
Sample Diameter (in)	2.50
Moisture Content (%)	25.2
Wet Density (pcf)	122.1
Dry Density (pcf)	97.5
Void Ratio	0.724
Saturation (%)	93.7

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.002	1.47
0.003	2.34
0.005	2.86
0.007	3.38
0.009	3.82
0.013	4.86
0.017	6.35
0.027	7.83
0.046	10.09
0.070	12.01
0.095	11.31
0.121	10.35
0.146	10.09
0.171	9.74
0.196	9.57
0.221	9.48
0.246	9.66
0.296	9.13

12.0
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-256

DESCRIPTION Brown, CLAYEY SILT, some fine sand.

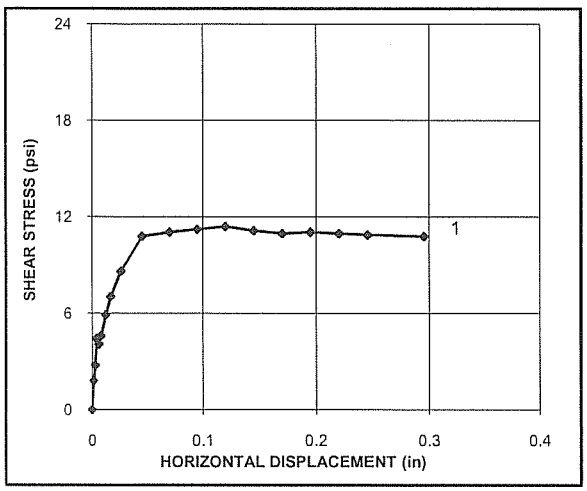
USCS (ML)

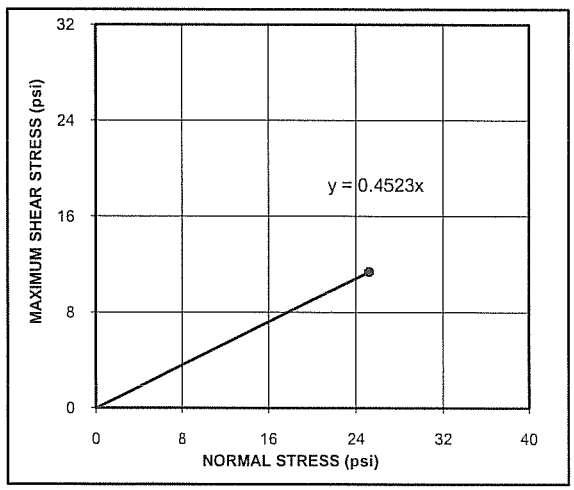
TECH	SW
DATE	12/22/08
CHECK	AK
REVIEW	TWN

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-265 S-10 DEPTH: 30.0 - 31.5'





ϕ = 24.3 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	25.2
t50 (minutes)	0.80
SPEED mm/min	0.120
Sample Diameter (in)	2.50
Moisture Content (%)	37.7
Wet Density (pcf)	114.8
Dry Density (pcf)	83.4
Void Ratio	1.017
Saturation (%)	99.9

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.001	1.82
0.003	2.77
0.004	4.43
0.006	4.08
0.008	4.60
0.013	5.91
0.017	7.04
0.026	8.61
0.045	10.79
0.070	11.05
0.095	11.22
0.120	11.40
0.145	11.14
0.170	10.96
0.195	11.05
0.220	10.96
0.245	10.88
0.295	10.79

11.4
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-257

DESCRIPTION Brown, SILTY CLAY, some fine sand.

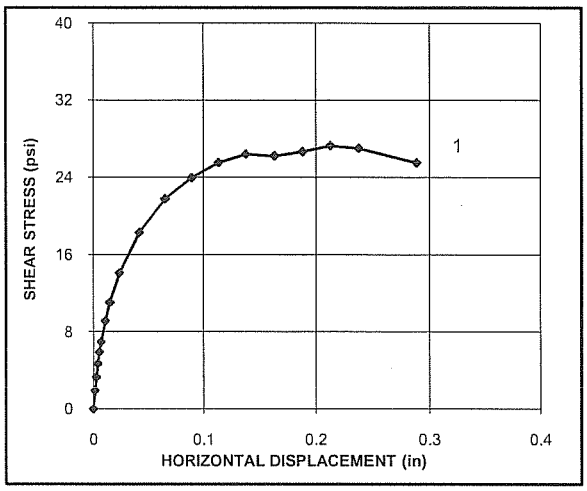
USCS (CL)

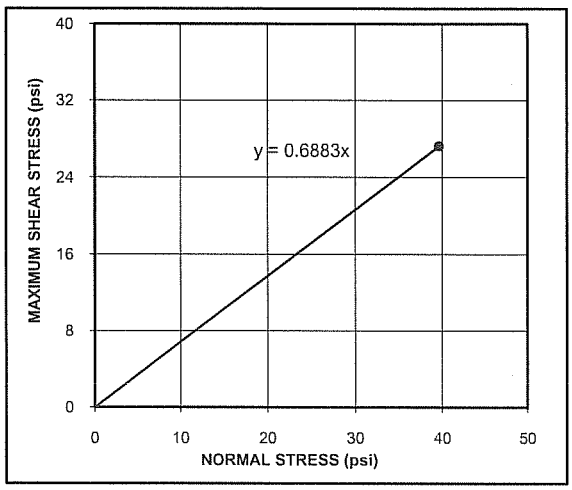
TECH	SW
DATE	12/30/08
CHECK	AW
REVIEW	

DIRECT SHEAR

ASTM D 3080

PROJECT NAME: RABA -KISTNER/DONNA PUMP TO BROWNVILLE LEVEE/TX
PROJECT NUMBER: 083-90218-001
SAMPLE ID: DP-268 S-12 DEPTH: 40.0 - 42.0'





ϕ = 34.5 °
C= 0.00 psi

SPECIMEN 1	
Normal Stress (psi)	39.6
t50 (minutes)	0.39
SPEED mm/min	0.240
Sample Diameter (in)	2.50
Moisture Content (%)	20.9
Wet Density (pcf)	129.5
Dry Density (pcf)	107.1
Void Ratio	0.604
Saturation (%)	95.4

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)
0.000	0.00
0.001	1.90
0.003	3.30
0.004	4.69
0.006	5.91
0.007	6.96
0.011	9.13
0.015	11.05
0.024	14.10
0.042	18.28
0.065	21.77
0.089	23.94
0.114	25.51
0.138	26.38
0.163	26.21
0.188	26.65
0.213	27.26
0.238	26.99
0.289	25.51

27.3
Max Shear Stress

SPECIMEN 2	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

SPECIMEN 3	
Normal Stress (psi)	-
t50 (minutes)	-
SPEED mm/min	-
Sample Diameter (in)	-
Moisture Content (%)	-
Wet Density (pcf)	-
Dry Density (pcf)	-
Void Ratio	-
Saturation (%)	-

HORIZONTAL DISPLACEMENT (in)	SHEAR STRESS (psi)

Max Shear Stress

REMARKS Per client request, one (1) specimen - inundate and run at overburden pressure.

FIGURE B-258

DESCRIPTION Light Brown, FINE SAND, some silty clay.

USCS (SC)

TECH	SW
DATE	12/19/08
CHECK	DPE
REVIEW	[illegible]

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/22/2008
Boring No.:	DP-2	**Unit Dry Weight (pcf):**	97.5
Sample No.:	7	**Initial Moisture (%):**	26.8
Depth:	20-22ft	**Final Moisture (%):**	28.9
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	4

Cell Pressure, psi:	56
Head Pressure, psi:	51
Tail Pressure, psi:	50
Height of Sample (L), cm:	9.88
Area of Sample (A), cm^2:	38.39
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	10/17/2008
Completion Technician:	k.dixon
Date Test Completed:	10/22/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
10/18/08	0743		0.2	21.8					
		29160			1.0	1.0	1.0	90.98	9.70E-08
	1549		1.2	20.8					
10/19/08	0706		0.0	22.1					
		29100			1.0	1.0	1.0	91.48	9.67E-08
	1511		1.0	21.1					
10/20/08	0646		0.4	21.7					
		14700			0.5	0.5	0.5	91.18	9.60E-08
	1051		0.9	21.2					
10/21/08	0732		0.0	21.8					
		20280			0.7	0.7	0.7	91.48	9.71E-08
	1310		0.7	21.1					
							Average k, cm/sec =		**9.70E-08**

FIGURE B-259

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/22/2008
Boring No.:	DP-11	**Unit Dry Weight (pcf):**	91.6
Sample No.:	2	**Initial Moisture (%):**	21.5
Depth:	2-4ft	**Final Moisture (%):**	25.1
Material:	Brown silty clay	**Scale No.:**	2
		Test Cell No.:	4

Cell Pressure, psi:	55
Head Pressure, psi:	50
Tail Pressure, psi:	49
Height of Sample (L), cm:	10.3
Area of Sample (A), cm^2:	40.39
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	10/24/2008
Completion Technician:	k.dixon
Date Test Completed:	10/27/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
10/25/08	0742		0.2	21.8					
		17340			4.1	4.1	4.1	87.88	6.86E-07
	1231		4.3	17.7					
	1243		0.0	22.1					
		14100			3.4	3.4	3.4	89.08	6.90E-07
	1638		3.4	18.7					
10/26/08	0659		0.1	22.0					
		18240			4.2	4.2	4.2	88.08	6.67E-07
	1203		4.3	17.8					
	1208		0.2	21.8					
		13740			3.3	3.3	3.3	88.68	6.91E-07
	1557		3.5	18.5					
							Average k, cm/sec =		**6.80E-07**

FIGURE B-260

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/22/2008
Boring No.:	DP-18	**Unit Dry Weight (pcf):**	102.9
Sample No.:	6	**Initial Moisture (%):**	20.4
Depth:	10-12ft	**Final Moisture (%):**	22.8
Material:	Brown clay trace silt seams	**Scale No.:**	2
		Test Cell No.:	5

Cell Pressure, psi:	60
Head Pressure, psi:	55
Tail Pressure, psi:	54
Height of Sample (L), cm:	8.51
Area of Sample (A), cm^2:	38.84
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	10/24/2008
Completion Technician:	k.dixon
Date Test Completed:	10/28/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
10/25/08	0659		0.3	21.7					
		32340			0.8	0.8	0.8	90.98	5.96E-08
	1558		1.1	20.9					
	1602		0.1	22.1					
		54180			1.4	1.4	1.4	90.98	6.22E-08
10/26/08	0705		1.5	20.7					
	0712		0.2	22.0					
		27600			0.7	0.7	0.7	91.48	6.07E-08
	1452		0.9	21.3					
10/27/08	0703		0.0	21.9					
		32400			0.8	0.8	0.8	91.48	5.91E-08
	1603		0.8	21.1					
							Average k, cm/sec =		**6.00E-08**

FIGURE B-261

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/22/2008
Boring No.:	DP-22	**Unit Dry Weight (pcf):**	104.3
Sample No.:	2	**Initial Moisture (%):**	15.6
Depth:	2-4ft	**Final Moisture (%):**	19.2
Material:	Brown silty clay with brown clay	**Scale No.:**	2
		Test Cell No.:	3

Cell Pressure, psi:	59
Head Pressure, psi:	54
Tail Pressure, psi:	53
Height of Sample (L), cm:	8.32
Area of Sample (A), cm^2:	39.23
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	10/28/2008
Completion Technician:	k.dixon
Date Test Completed:	11/2/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
10/29/08	0728		0.2	21.8					
		27240			3.4	3.4	3.4	88.58	2.99E-07
	1502		3.6	18.4					
10/30/08	0718		0.5	21.9					
		27000			3.4	3.4	3.4	88.38	3.02E-07
	1448		3.9	18.5					
10/31/08	0639		0.0	22.1					
		27060			3.4	3.4	3.4	89.08	2.99E-07
	1410		3.4	18.7					
11/01/08	0702		0.1	21.6					
		26160			3.3	3.3	3.3	88.58	3.02E-07
	1418		3.4	18.3					
							Average k, cm/sec =		**3.00E-07**

FIGURE B-262

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/22/2008
Boring No.:	DP-33	**Unit Dry Weight (pcf):**	103.2
Sample No.:	4	**Initial Moisture (%):**	20.7
Depth:	6-8ft	**Final Moisture (%):**	23.9
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	4

Cell Pressure, psi:	57
Head Pressure, psi:	52
Tail Pressure, psi:	51
Height of Sample (L), cm:	9.41
Area of Sample (A), cm^2:	39.49
B-value:	0.96
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	11/2/2008
Completion Technician:	k.dixon
Date Test Completed:	11/7/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
11/03/08	0723		0.1	21.7					
		86880			1.0	1.0	1.0	90.98	3.01E-08
11/04/08	0731		1.1	20.7					
		87120			1.0	1.0	1.0	88.98	3.07E-08
11/05/08	0743		2.1	19.7					
	0752		0.2	21.9					
		25740			0.3	0.3	0.3	91.78	3.03E-08
11/06/08	1501		0.5	21.6					
		61080			0.7	0.7	0.7	90.78	3.01E-08
	0759		1.2	20.9					
							Average k, cm/sec =		**3.00E-08**

FIGURE B-263

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/22/2008
Boring No.:	DP-37	**Unit Dry Weight (pcf):**	102.2
Sample No.:	4	**Initial Moisture (%):**	23.6
Depth:	6-8ft	**Final Moisture (%):**	27.2
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	3

Cell Pressure, psi:	59
Head Pressure, psi:	54
Tail Pressure, psi:	53
Height of Sample (L), cm:	9.56
Area of Sample (A), cm^2:	39.81
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	11/1/2008
Completion Technician:	k.dixon
Date Test Completed:	11/7/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
11/02/08	0718		0.3	22.2					
		86820			1.4	1.4	1.4	90.88	4.26E-08
11-3-089	0725		1.7	20.8					
	0729		0.0	22.2					
		86640			1.4	1.4	1.4	91.18	4.25E-08
11/04/08	0736		1.4	20.8					
	0741		0.2	21.9					
		87420			1.4	1.4	1.4	90.68	4.24E-08
11/05/08	0758		1.6	20.5					
	0800		0.1	21.8					
		86940			1.4	1.4	1.4	90.68	4.26E-08
11/06/08	0809		1.5	20.4					
							Average k, cm/sec =		**4.20E-08**

FIGURE B-264

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/22/2008
Boring No.:	DP-46	**Unit Dry Weight (pcf):**	105.4
Sample No.:	1	**Initial Moisture (%):**	18.9
Depth:	0.2ft	**Final Moisture (%):**	22.8
Material:	Brown clay trace silt pockets	**Scale No.:**	2
		Test Cell No.:	5

Cell Pressure, psi:	57
Head Pressure, psi:	52
Tail Pressure, psi:	51
Height of Sample (L), cm:	9.62
Area of Sample (A), cm^2:	38.71
B-value:	0.96
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	11/4/2008
Completion Technician:	k.dixon
Date Test Completed:	11/10/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
11/05/08	0649		0.4	21.9					
		87180			2.4	2.4	2.4	89.48	7.64E-08
11/06/08	0702		2.8	19.5					
	0706		0.0	21.8					
		87120			2.4	2.4	2.4	89.78	7.62E-08
11/07/08	0718		2.4	19.4					
	0722		0.2	21.8					
		86220			2.4	2.4	2.4	89.58	7.72E-08
11/08/08	0719		2.6	19.4					
	0727		0.1	21.7					
		86700			2.4	2.4	2.4	89.58	7.68E-08
11/09/08	0732		2.5	19.3					
							Average k, cm/sec =		**7.70E-08**

FIGURE B-265

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/23/2008
Boring No.:	DP-62	**Unit Dry Weight (pcf):**	111.6
Sample No.:	2	**Initial Moisture (%):**	16.4
Depth:	2-4ft	**Final Moisture (%):**	19.7
Material:	Brown clay with silt seams	**Scale No.:**	2
		Test Cell No.:	4

Cell Pressure, psi:	58
Head Pressure, psi:	53
Tail Pressure, psi:	52
Height of Sample (L), cm:	9.96
Area of Sample (A), cm^2:	38.71
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	11/17/2008
Completion Technician:	k.dixon
Date Test Completed:	11/22/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
11/18/08	0830		0.1	22.0					
		25260			0.9	0.9	0.9	91.38	1.00E-07
	1531		1.0	21.1					
11/19/08	0810		0.0	21.8					
		25920			0.9	0.9	0.9	91.28	9.79E-08
	1522		0.9	20.9					
11/20/08	0743		0.3	21.7					
		24960			0.9	0.9	0.9	90.88	1.02E-07
	1439		1.2	20.8					
11/21/08	0643		0.1	21.9					
		25680			0.9	0.9	0.9	91.28	9.88E-08
	1351		1.0	21.0					
							Average k, cm/sec =		**1.00E-07**

FIGURE B-266

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/26/2008
Boring No.:	DP-65	**Unit Dry Weight (pcf):**	91.0
Sample No.:	6	**Initial Moisture (%):**	31.3
Depth:	10-12ft	**Final Moisture (%):**	32.2
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	6

Cell Pressure, psi:	59
Head Pressure, psi:	54
Tail Pressure, psi:	53
Height of Sample (L), cm:	5.08
Area of Sample (A), cm^2:	39.76
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/17/2008
Completion Technician:	k.dixon
Date Test Completed:	12/26/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/18/08	1314		1.5	21.2					
		70860			0.3	0.3	0.3	89.78	6.02E-09
12/19/08	0855		1.8	20.9					
		260460			1.0	1.0	1.0	88.48	5.54E-09
12/22/08	0916		2.8	19.9					
		79880			0.3	0.3	0.3	87.18	5.50E-09
12/23/08	0729		3.1	19.6					
		76560			0.3	0.3	0.3	86.58	5.78E-08
12/24/08	0515		3.4	19.3					
							Average k, cm/sec =		**5.70E-08**

FIGURE B-267

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/22/2008
Boring No.:	DP-82	**Unit Dry Weight (pcf):**	98.8
Sample No.:	5	**Initial Moisture (%):**	24.9
Depth:	8-10ft	**Final Moisture (%):**	26.3
Material:	Brown clay trace silt seams	**Scale No.:**	2
		Test Cell No.:	3

Cell Pressure, psi:	59
Head Pressure, psi:	54
Tail Pressure, psi:	53
Height of Sample (L), cm:	9.86
Area of Sample (A), cm^2:	39.1
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	11/7/2008
Completion Technician:	k.dixon
Date Test Completed:	11/13/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
11/08/08	0826		0.2	21.7					
		84900			2.2	2.2	2.2	89.68	7.29E-08
11/09/08	0801		2.4	19.5					
	0803		0.0	21.9					
		85980			2.2	2.2	2.2	90.08	7.16E-08
11/10/08	0756		2.2	19.7					
	0802		0.0	21.7					
		85740			2.2	2.2	2.2	89.98	7.19E-08
11/11/08	0751		2.2	19.7					
	0756		0.1	21.8					
		87000			2.2	2.2	2.2	89.88	7.09E-08
11/12/08	0806		2.3	19.6					
							Average k, cm/sec =		**7.20E-08**

FIGURE B-268

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/23/2008
Boring No.:	DP-87	**Unit Dry Weight (pcf):**	107.2
Sample No.:	3	**Initial Moisture (%):**	16.0
Depth:	4-6ft	**Final Moisture (%):**	20.2
Material:	Brown clay with silt seams and pockets	**Scale No.:**	2
		Test Cell No.:	7

Cell Pressure, psi:	56
Head Pressure, psi:	51
Tail Pressure, psi:	50
Height of Sample (L), cm:	10.51
Area of Sample (A), cm^2:	38.9
B-value:	0.96
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	11/19/2008
Completion Technician:	k.dixon
Date Test Completed:	11/22/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
11/20/08	0649		0.0	21.9					
		17700			4.7	4.7	4.7	87.58	8.19E-07
	1144		4.7	17.2					
	1238		0.2	21.8					
		14340			3.8	3.8	3.8	88.18	8.12E-07
	1637		4.0	18.0					
11/21/08	0658		0.0	22.0					
		17580			4.6	4.6	4.6	87.78	8.05E-07
	1151		4.6	17.4					
	1157		0.1	21.9					
		15240			4.0	4.0	4.0	88.18	8.04E-07
	1611		4.1	17.9					
							Average k, cm/sec =		**8.10E-07**

FIGURE B-269

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/22/2008
Boring No.:	DP-92	**Unit Dry Weight (pcf):**	100.3
Sample No.:	2	**Initial Moisture (%):**	24.8
Depth:	2-4ft	**Final Moisture (%):**	26.9
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	4

Cell Pressure, psi:	59
Head Pressure, psi:	54
Tail Pressure, psi:	53
Height of Sample (L), cm:	7.07
Area of Sample (A), cm^2:	39.1
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	11.13-08
Completion Technician:	k.dixon
Date Test Completed:	11/18/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
11/14/08	0710		0.2	21.7					
		86580			1.2	1.2	1.2	90.68	2.76E-08
11/15/08	0713		1.4	20.5					
	0718		0.1	22.0					
		26100			0.4	0.4	0.4	91.88	3.02E-08
	1433		0.5	21.6					
		60660			0.8	0.8	0.8	90.68	2.63E-08
11/16/08	0724		1.3	20.8					
	0738		0.0	21.9					
		85980			1.2	1.2	1.2	91.08	2.77E-08
11/17/08	0731		1.2	20.7					
							Average k, cm/sec =		**2.80E-08**

FIGURE B-270

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/22/2008
Boring No.:	DP-99	**Unit Dry Weight (pcf):**	113.1
Sample No.:	6	**Initial Moisture (%):**	14.0
Depth:	10-12ft	**Final Moisture (%):**	18.6
Material:	Brown clay trace silt pockets	**Scale No.:**	2
		Test Cell No.:	5

Cell Pressure, psi:	56
Head Pressure, psi:	51
Tail Pressure, psi:	50
Height of Sample (L), cm:	8.255
Area of Sample (A), cm^2:	38.97
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	11/15/2008
Completion Technician:	k.dixon
Date Test Completed:	11/19/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
11/16/08	0722		0.3	21.7					
		27240			0.8	0.8	0.8	90.98	6.84E-08
	1456		1.1	20.9					
11/17/08	0706		0.0	22.1					
		32280			0.9	0.9	0.9	91.58	6.45E-08
	1604		0.9	21.2					
		54780			1.5	1.5	1.5	89.18	6.50E-08
11/18/08	0717		2.4	19.7					
	0728		0.1	22.0					
		32580			0.9	0.9	0.9	91.38	6.40E-08
	1631		1.0	21.1					
							Average k, cm/sec =		**6.50E-08**

FIGURE B-271

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/23/2008
Boring No.:	DP-106	**Unit Dry Weight (pcf):**	106.4
Sample No.:	4	**Initial Moisture (%):**	17.1
Depth:	6-8ft	**Final Moisture (%):**	21.9
Material:	Brown clay with brown silty clay	**Scale No.:**	2
		Test Cell No.:	3

Cell Pressure, psi:	58
Head Pressure, psi:	53
Tail Pressure, psi:	52
Height of Sample (L), cm:	8.84
Area of Sample (A), cm^2:	38.71
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	11/13/2008
Completion Technician:	k.dixon
Date Test Completed:	11/16/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
11/14/08	0712		0.1	22.0					
		18360			4.4	4.4	4.4	87.88	6.23E-07
	1218		4.5	17.6					
	1222		0.3	21.9					
		13920			3.5	3.5	3.5	88.48	6.49E-07
	1614		3.8	18.4					
11/15/08	0709		0.0	21.8					
		17460			4.3	4.3	4.3	87.88	6.40E-07
	1203		4.3	17.5					
	1230		0.1	21.9					
		15120			3.7	3.7	3.7	88.48	6.32E-07
	1642		3.8	18.2					
							Average k, cm/sec =		**6.40E-07**

FIGURE B-272

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	11/22/2008
Boring No.:	DP-112	**Unit Dry Weight (pcf):**	111.4
Sample No.:	5	**Initial Moisture (%):**	13.9
Depth:	8-10ft	**Final Moisture (%):**	18.1
Material:	Brown clay trace silt seams	**Scale No.:**	2
		Test Cell No.:	3

Cell Pressure, psi:	57
Head Pressure, psi:	52
Tail Pressure, psi:	51
Height of Sample (L), cm:	8.72
Area of Sample (A), cm^2:	38.52
B-value:	0.96
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	11/17/2008
Completion Technician:	k.dixon
Date Test Completed:	11/22/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
11/18/08	0753		0.0	22.1					
		24600			1.2	1.2	1.2	91.28	1.21E-07
	1443		1.2	20.9					
11/19/08	1128		0.3	21.9					
		12300			0.6	0.6	0.6	91.38	1.21E-07
	1453		0.9	21.3					
11/20/08	0649		0.1	22.0					
		24660			1.2	1.2	1.2	91.08	1.21E-07
	1340		1.3	20.8					
11/21/08	0718		0.2	21.9					
		16440			0.8	0.8	0.8	91.28	1.21E-07
	1152		1.0	21.1					
							Average k, cm/sec =		**1.20E-07**

FIGURE B-273

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/12/2008
Boring No.:	DP-118	**Unit Dry Weight (pcf):**	114.8
Sample No.:	2	**Initial Moisture (%):**	8.6
Depth:	2-4ft	**Final Moisture (%):**	12.9
Material:	Brown sandy silty clay	**Scale No.:**	2
		Test Cell No.:	5

Cell Pressure, psi:	53
Head Pressure, psi:	48
Tail Pressure, psi:	47
Height of Sample (L), cm:	9.97
Area of Sample (A), cm^2:	34.39
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/6/2008
Completion Technician:	k.dixon
Date Test Completed:	12/12/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/08/08	0853		0.2	22.8					
		1620			2.9	2.9	2.9	90.08	5.76E-06
	0920		3.1	19.9					
	1015		0.0	22.9					
		3360			5.7	5.7	5.7	87.58	5.62E-06
	1111		5.7	17.2					
12/09/08	0750		0.3	22.5					
		3840			5.8	5.8	5.8	86.78	5.04E-06
	0854		6.1	16.7					
	0915		0.4	22.3					
		2940			5.1	5.1	5.1	86.98	5.78E-06
	1004		5.5	16.8					
							Average k, cm/sec =		**5.60E-06**

FIGURE B-274

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/7/2009
Boring No.:	DP-122	**Unit Dry Weight (pcf):**	100.2
Sample No.:	6	**Initial Moisture (%):**	19.6
Depth:	10-12ft	**Final Moisture (%):**	25.3
Material:	Brown clay with silt and sand pockets	**Scale No.:**	2
		Test Cell No.:	6

Cell Pressure, psi:	58
Head Pressure, psi:	53
Tail Pressure, psi:	52
Height of Sample (L), cm:	8.75
Area of Sample (A), cm^2:	38.38
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/4/2009
Completion Technician:	k.dixon
Date Test Completed:	1/7/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/05/09	0730		0.0	22.1					
		7320			3.0	3.0	3.0	89.48	1.04E-06
	0932		3.0	19.1					
	1102		0.1	22.4					
		7080			3.0	3.0	3.0	89.68	1.08E-06
	1300		3.1	19.4					
01/06/09	0802		0.5	22.2					
		5940			2.6	2.6	2.6	89.28	1.12E-06
	0941		3.3	19.4					
	1054		0.2	22.0					
		8340			3.3	3.3	3.3	88.88	1.01E-06
	1313		3.5	18.7					
							Average k, cm/sec =		**1.10E-06**

FIGURE B-275

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/6/2008
Boring No.:	DP-129	**Unit Dry Weight (pcf):**	107.4
Sample No.:	3	**Initial Moisture (%):**	17.0
Depth:	4-6ft	**Final Moisture (%):**	21.1
Material:	Brown clay trace silt pockets and roots	**Scale No.:**	2
		Test Cell No.:	3

Cell Pressure, psi:	59
Head Pressure, psi:	54
Tail Pressure, psi:	53
Height of Sample (L), cm:	8.35
Area of Sample (A), cm^2:	37.23
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/1/2008
Completion Technician:	k.dixon
Date Test Completed:	12/5/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/02/08	1401		4.6	18.0					
		64680			1.1	1.1	1.1	82.68	4.61E-08
12/03/08	0759		5.7	16.9					
		23160			0.4	0.4	0.4	81.18	4.77E-08
	1425		6.1	16.5					
	1430		4.0	18.0					
		70080			1.2	1.2	1.2	83.18	4.62E-08
12/04/08	0958		5.2	16.8					
		18000			0.3	0.3	0.3	81.68	4.58E-08
12/05/08	1458		5.5	16.5					
							Average k, cm/sec =		**4.60E-08**

FIGURE B-276

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/7/2009
Boring No.:	DP-142	**Unit Dry Weight (pcf):**	95.6
Sample No.:	5	**Initial Moisture (%):**	26.3
Depth:	8-10ft	**Final Moisture (%):**	29.4
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	5

Cell Pressure, psi:	56
Head Pressure, psi:	51
Tail Pressure, psi:	50
Height of Sample (L), cm:	9.72
Area of Sample (A), cm^2:	40.71
B-value:	0.96
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/1/2009
Completion Technician:	k.dixon
Date Test Completed:	1/6/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/03/09	0659		0.2	22.6					
		88560			0.4	0.4	0.4	92.38	1.17E-08
01/04/09	0735		0.6	22.2					
	0742		0.1	23.1					
		21240			0.1	0.1	0.1	93.28	1.20E-08
	1353		0.2	23.0					
	1406		0.2	23.0					
		89820			0.4	0.4	0.4	92.78	1.15E-08
01/05/09	1503		0.6	22.6					
		89100			0.4	0.4	0.4	91.98	1.16E-08
01/06/09	1548		1.0	22.2					
							Average k, cm/sec =		**1.20E-08**

FIGURE B-277

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/5/2008
Boring No.:	DP-150	**Unit Dry Weight (pcf):**	101.6
Sample No.:	5	**Initial Moisture (%):**	22.6
Depth:	15-17ft	**Final Moisture (%):**	23.9
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	6

Cell Pressure, psi:	57
Head Pressure, psi:	52
Tail Pressure, psi:	51
Height of Sample (L), cm:	11
Area of Sample (A), cm^2:	40
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/1/2008
Completion Technician:	k.dixon
Date Test Completed:	12/5/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/01/08	0747		1.9	23.8					
		20400			0.2	0.2	0.2	92.08	2.93E-08
	1427		2.1	23.6					
		62760			0.6	0.6	0.6	91.28	2.88E-08
12/02/08	0753		2.7	23.0					
		21480			0.2	0.2	0.2	90.48	2.83E-08
	1351		2.9	22.8					
		73920			0.7	0.7	0.7	89.58	2.91E-08
12/03/08	1023		3.6	22.1					
							Average k, cm/sec =		**2.90E-08**

FIGURE B-278

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/7/2008
Boring No.:	DP-156	**Unit Dry Weight (pcf):**	101.1
Sample No.:	7	**Initial Moisture (%):**	22.6
Depth:	15-17ft	**Final Moisture (%):**	24.5
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	5

Cell Pressure, psi:	56
Head Pressure, psi:	51
Tail Pressure, psi:	50
Height of Sample (L), cm:	9.14
Area of Sample (A), cm^2:	41.23
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/1/2008
Completion Technician:	k.dixon
Date Test Completed:	12/6/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/02/08	0439		2.4	23.5					
		72180			0.9	0.9	0.9	90.58	3.05E-08
12/03/08	1242		3.3	22.6					
		66480			0.8	0.8	0.8	88.88	3.00E-08
12/04/08	0710		4.1	21.8					
		25200			0.3	0.3	0.3	87.78	3.01E-08
	1410		4.4	21.5					
		8280			0.1	0.1	0.1	87.38	3.06E-08
	1628		4.5	21.4					
							Average k, cm/sec =		**3.00E-08**

FIGURE B-279

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/17/2009
Boring No.:	DP-159	**Unit Dry Weight (pcf):**	101.4
Sample No.:	6	**Initial Moisture (%):**	20.3
Depth:	10-12ft	**Final Moisture (%):**	26.4
Material:	Brown clay trace silt	**Scale No.:**	2
		Test Cell No.:	6

Cell Pressure, psi:	57
Head Pressure, psi:	52
Tail Pressure, psi:	51
Height of Sample (L), cm:	9.22
Area of Sample (A), cm^2:	39.94
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/11/2009
Completion Technician:	k.dixon
Date Test Completed:	1/16/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/12/09	0728		0.3	22.6					
		87300			1.9	1.9	1.9	90.78	5.53E-08
01/13/09	0743		2.2	20.7					
	0802		0.0	23.1					
		88140			1.9	1.9	1.9	91.58	5.43E-08
01/14/09	0831		1.9	21.2					
	0846		0.1	23.0					
		87180			1.9	1.9	1.9	91.38	5.51E-08
01/15/09	0859		2.0	21.1					
	0906		0.0	22.8					
		87420			1.9	1.9	1.9	91.28	5.50E-08
01/16/09	0923		1.9	20.9					
							Average k, cm/sec =		**5.50E-08**

FIGURE B-280

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/16/2009
Boring No.:	DP-168	**Unit Dry Weight (pcf):**	97.1
Sample No.:	4	**Initial Moisture (%):**	26.1
Depth:	6-8ft	**Final Moisture (%):**	28.6
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	7

Cell Pressure, psi:	59
Head Pressure, psi:	54
Tail Pressure, psi:	53
Height of Sample (L), cm:	8.62
Area of Sample (A), cm^2:	38.78
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/11/2009
Completion Technician:	k.dixon
Date Test Completed:	1/15/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/12/09	0721		0.1	22.9					
		87660			2.4	2.4	2.4	90.78	6.88E-08
01/13/09	0742		2.5	20.5					
	1831		0.0	23.0					
		44220			1.2	1.2	1.2	92.18	5.54E-08
01/14/09	0648		1.2	21.8					
	0701		0.4	22.9					
		22080			0.6	0.6	0.6	92.28	6.54E-08
	1309		1.0	22.3					
	1421		0.2	22.8					
		87720			2.4	2.4	2.4	90.58	6.71E-08
01/15/09	1443		2.6	20.4					
							Average k, cm/sec =		**6.70E-08**

FIGURE B-281

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/21/2008
Boring No.:	DP-171	**Unit Dry Weight (pcf):**	104.6
Sample No.:	3	**Initial Moisture (%):**	20.5
Depth:	4-6ft	**Final Moisture (%):**	24.1
Material:	Brown clay with some silt pockets	**Scale No.:**	2
		Test Cell No.:	4

Cell Pressure, psi:	58
Head Pressure, psi:	53
Tail Pressure, psi:	52
Height of Sample (L), cm:	9.266
Area of Sample (A), cm^2:	40.84
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/16/2008
Completion Technician:	k.dixon
Date Test Completed:	12/21/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/17/08	1000		0.2	21.6					
		14280			0.6	0.6	0.6	91.18	1.05E-07
	1358		0.8	21.0					
12/18/08	0914		0.0	22.2					
		20940			0.9	0.9	0.9	91.68	1.06E-07
	1503		0.9	21.3					
12/19/08	0715		0.3	22.4					
		20280			0.8	0.8	0.8	91.68	9.76E-08
	1252		1.1	21.6					
12/20/08	0820		0.4	21.8					
		20520			0.8	0.8	0.8	90.98	9.72E-08
	1402		1.2	21.0					
							Average k, cm/sec =		**1.00E-07**

FIGURE B-282

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/6/2009
Boring No.:	DP-174	**Unit Dry Weight (pcf):**	109.4
Sample No.:	4	**Initial Moisture (%):**	15.1
Depth:	6-8FT	**Final Moisture (%):**	21.9
Material:	Brown clay with gravel and sand	**Scale No.:**	2
		Test Cell No.:	4

Cell Pressure, psi:	57
Head Pressure, psi:	52
Tail Pressure, psi:	51
Height of Sample (L), cm:	8.13
Area of Sample (A), cm^2:	38.39
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/3/2009
Completion Technician:	k.dixon
Date Test Completed:	1/6/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/04/09	0729		0.2	22.1					
		10920			3.1	3.1	3.1	89.18	6.74E-07
	1032		3.3	19.0					
	1105		0.3	22.3					
		10680			3.0	3.0	3.0	89.38	6.66E-07
	1403		3.3	19.3					
01/05/09	0808		0.1	22.2					
		9540			2.8	2.8	2.8	89.68	6.93E-07
	1047		2.9	19.4					
	1100		0.2	21.9					
		11940			3.3	3.3	3.3	88.78	6.59E-07
	1419		3.5	18.6					
							Average k, cm/sec =		**6.70E-07**

FIGURE B-283

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/15/2008
Boring No.:	DP-183	**Unit Dry Weight (pcf):**	96.6
Sample No.:	2	**Initial Moisture (%):**	26.0
Depth:	2-4ft	**Final Moisture (%):**	29.9
Material:	Brown silty clay	**Scale No.:**	2
		Test Cell No.:	3

Cell Pressure, psi:	58
Head Pressure, psi:	53
Tail Pressure, psi:	52
Height of Sample (L), cm:	9.78
Area of Sample (A), cm^2:	34.78
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/8/2008
Completion Technician:	k.dixon
Date Test Completed:	12/15/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/09/08	0908		0.3	21.3					
		4620			1.1	1.1	1.1	90.28	7.42E-07
	1025		1.4	20.2					
	1106		0.4	21.1					
		3720			0.9	0.9	0.9	90.18	7.54E-07
	1208		1.3	20.2					
12/10/08	0800		0.0	21.3					
		8400			2.0	2.0	2.0	89.68	7.47E-07
	1020		2.0	19.3					
	1037		0.8	22.0					
		9300			2.2	2.0	2.0	89.38	7.44E-07
	1312		3.0	19.8					
							Average k, cm/sec =		**7.50E-07**

FIGURE B-284

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/23/2008
Boring No.:	DP-187	**Unit Dry Weight (pcf):**	105.2
Sample No.:	4	**Initial Moisture (%):**	19.7
Depth:	6-8ft	**Final Moisture (%):**	22.3
Material:	Brown silty clay	**Scale No.:**	2
		Test Cell No.:	7

Cell Pressure, psi:	59
Head Pressure, psi:	54
Tail Pressure, psi:	53
Height of Sample (L), cm:	9.624
Area of Sample (A), cm^2:	36.26
B-value:	0.96
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/18/2008
Completion Technician:	k.dixon
Date Test Completed:	12/22/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/19/08	0835		0.1	22.1					
		10860			3.1	3.1	3.1	89.28	8.49E-07
	1136		3.2	19.0					
	1200		0.4	22.1					
		10980			3.0	3.0	3.0	89.08	8.14E-07
	1503		3.4	19.1					
12/20/08	0904		0.2	22.1					
		9900			2.8	2.8	2.8	89.48	8.39E-07
	1149		3.0	19.3					
	1155		0.4	21.8					
		12240			3.3	3.3	3.3	88.48	8.09-07
	1519		3.7	18.5					
							Average k, cm/sec =		**8.30E-07**

FIGURE B-285

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/17/2009
Boring No.:	DP-197	**Unit Dry Weight (pcf):**	104.2
Sample No.:	5	**Initial Moisture (%):**	20.2
Depth:	8-10ft	**Final Moisture (%):**	28.9
Material:	Brown clay trace silt pockets	**Scale No.:**	2
		Test Cell No.:	3

Cell Pressure, psi:	56
Head Pressure, psi:	51
Tail Pressure, psi:	50
Height of Sample (L), cm:	8.24
Area of Sample (A), cm^2:	39.49
B-value:	0.96
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/11/2009
Completion Technician:	k.dixon
Date Test Completed:	1/16/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/12/09	0716		0.0	22.8					
		21360			0.7	0.7	0.7	92.48	7.39E-08
	1312		0.7	22.1					
01/13/09	0649		0.3	22.9					
		87540			2.8	2.8	2.8	90.18	7.40E-08
01/14/09	0708		3.1	20.1					
	0712		0.1	22.8					
		87300			2.8	2.8	2.8	90.28	7.41E-08
01/15/09	0727		2.9	20.0					
	0731		0.0	22.7					
		31620			1.0	1.0	1.0	92.08	7.17E-08
	1618		1.0	21.7					
							Average k, cm/sec =		**7.30E-08**

FIGURE B-286

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/17/2009
Boring No.:	DP-202	**Unit Dry Weight (pcf):**	97.3
Sample No.:	12	**Initial Moisture (%):**	26.9
Depth:	40-41.5ft	**Final Moisture (%):**	30.1
Material:	Red-brown clay	**Scale No.:**	2
		Test Cell No.:	5

Cell Pressure, psi:	56
Head Pressure, psi:	51
Tail Pressure, psi:	50
Height of Sample (L), cm:	7.85
Area of Sample (A), cm^2:	41.61
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/11/2009
Completion Technician:	k.dixon
Date Test Completed:	1/16/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/12/09	0616		0.2	22.7					
		87240			0.4	0.4	0.4	92.48	9.35E-09
01/13/09	0630		0.6	22.3					
	0642		0.0	23.1					
		86940			0.4	0.4	0.4	93.08	9.32E-09
01/14/09	0651		0.4	22.7					
	0702		0.1	22.8					
		87360			0.4	0.4	0.4	92.68	9.32E-09
01/15/09	0718		0.5	22.4					
	0726		0.2	22.9					
		87420			0.4	0.4	0.4	92.68	9.31E-09
01/16/09	0743		0.6	22.5					
							Average k, cm/sec =		**9.30E-09**

FIGURE B-287

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/11/2009
Boring No.:	DP-215	**Unit Dry Weight (pcf):**	111.2
Sample No.:	3	**Initial Moisture (%):**	17.7
Depth:	4-6ft	**Final Moisture (%):**	22.8
Material:	Brown clay with some fine gravel	**Scale No.:**	2
		Test Cell No.:	3

Cell Pressure, psi:	59
Head Pressure, psi:	54
Tail Pressure, psi:	53
Height of Sample (L), cm:	9.97
Area of Sample (A), cm^2:	41.04
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/5/2009
Completion Technician:	k.dixon
Date Test Completed:	1/11/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/06/09	1006		0.0	22.1					
		14160			0.4	0.4	0.4	91.58	7.49E-08
	1402		0.4	21.7					
01/07/09	0916		0.2	22.4					
		20760			0.6	0.6	0.6	91.98	7.63E-08
	1502		0.8	21.8					
01/08/09	0720		0.5	22.3					
		20340			0.6	0.6	0.6	91.58	7.82E-08
	1259		1.1	21.7					
01/10/09	0825		0.1	21.8					
		20580			0.6	0.6	0.6	91.48	7.74E-08
	1408		0.7	21.2					
							Average k, cm/sec =		**7.70E-08**

FIGURE B-288

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/29/2008
Boring No.:	DP-218	**Unit Dry Weight (pcf):**	109.8
Sample No.:	7	**Initial Moisture (%):**	21.3
Depth:	15-17ft	**Final Moisture (%):**	23.8
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	8

Cell Pressure, psi:	57
Head Pressure, psi:	52
Tail Pressure, psi:	51
Height of Sample (L), cm:	9.21
Area of Sample (A), cm^2:	40.84
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/20/2008
Completion Technician:	k.dixon
Date Test Completed:	12/24/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/21/08	0746		1.1	23.8					
		14640			0.2	0.2	0.2	92.88	3.32E-08
	1150		1.3	23.6					
		14940			0.2	0.2	0.2	92.48	3.26E-08
	1559		1.5	23.4					
		60600			0.8	0.8	0.8	91.48	3.25E-08
12/22/08	0849		2.3	22.6					
		22440			0.3	0.3	0.3	90.38	3.33E-08
	1503		2.6	22.3					
							Average k, cm/sec =		**3.30E-08**

FIGURE B-289

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/26/2008
Boring No.:	DP-221	**Unit Dry Weight (pcf):**	106.7
Sample No.:	2	**Initial Moisture (%):**	21.1
Depth:	2-4ft	**Final Moisture (%):**	23.6
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	8

Cell Pressure, psi:	58
Head Pressure, psi:	53
Tail Pressure, psi:	52
Height of Sample (L), cm:	8.84
Area of Sample (A), cm^2:	39.29
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/20/2008
Completion Technician:	k.dixon
Date Test Completed:	12/26/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/21/08	0720		2.8	20.1					
		21540			0.2	0.2	0.2	87.48	2.39E-08
	1319		3.0	19.9					
		88920			0.8	0.8	0.8	86.48	2.34E-08
12/22/08	1401		3.8	19.1					
		91680			0.8	0.8	0.8	84.88	2.31E-08
12/23/08	1529		4.6	18.3					
12/24/08	0654		2.8	18.3					
		89460			0.8	0.8	0.8	85.08	2.36E-08
12/25/08	0745		3.6	17.5					
							Average k, cm/sec =		**2.30E-08**

FIGURE B-290

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/27/2008
Boring No.:	DP-226	**Unit Dry Weight (pcf):**	108.5
Sample No.:	3	**Initial Moisture (%):**	15.9
Depth:	4-6ft	**Final Moisture (%):**	19.2
Material:	Brown clay trace silt	**Scale No.:**	2
		Test Cell No.:	4

Cell Pressure, psi:	57
Head Pressure, psi:	52
Tail Pressure, psi:	51
Height of Sample (L), cm:	9.558
Area of Sample (A), cm^2:	36.84
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/19/2008
Completion Technician:	k.dixon
Date Test Completed:	12/26/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/20/08	0950		0.0	22.2					
		87180			1.2	1.2	1.2	91.43	3.91E-08
12/21/08	1003		1.2	21.1					
	1040		0.2	22.4					
		86280			1.2	1.2	1.2	91.38	3.95E-08
12/22/08	1038		1.3	21.3					
12/23/08	1117		0.3	22.6					
		80100			1.1	1.1	1.1	91.58	3.89E-08
12/24/08	0932		1.4	21.5					
12/25/08	0722		0.0	21.9					
		34200			0.5	0.5	0.5	91.78	3.99E-08
	1652		0.5	21.4					
							Average k, cm/sec =		**3.90E-08**

FIGURE B-291

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/17/2009
Boring No.:	DP-229	**Unit Dry Weight (pcf):**	109.7
Sample No.:	2	**Initial Moisture (%):**	11.7
Depth:	2-4ft	**Final Moisture (%):**	19.6
Material:	Brown clay with gravel,sand pockets and calcareous nods	**Scale No.:**	2
		Test Cell No.:	4

Cell Pressure, psi:	59
Head Pressure, psi:	54
Tail Pressure, psi:	53
Height of Sample (L), cm:	9.62
Area of Sample (A), cm^2:	36.36
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/11/2009
Completion Technician:	k.dixon
Date Test Completed:	1/16/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/12/09	1054		0.2	22.7					
		12480			3.3	3.3	3.3	89.58	7.81E-07
	1422		3.5	19.4					
01/13/09	0810		0.0	23.2					
		9420			2.8	2.8	2.8	90.78	8.66E-07
	1047		2.8	20.4					
01/14/09	0747		0.1	23.0					
		12000			3.3	3.3	3.3	89.98	8.08E-07
	1107		3.4	19.7					
01/15/09	0803		0.0	23.1					
		10980			3.0	3.0	3.0	90.48	7.99E-07
	1106		3.0	20.1					
							Average k, cm/sec =		**8.10E-07**

FIGURE B-292

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/13/2009
Boring No.:	DP-234	**Unit Dry Weight (pcf):**	101.8
Sample No.:	5	**Initial Moisture (%):**	24.1
Depth:	8-10ft	**Final Moisture (%):**	27.9
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	3

Cell Pressure, psi:	58
Head Pressure, psi:	53
Tail Pressure, psi:	52
Height of Sample (L), cm:	8.84
Area of Sample (A), cm^2:	39.29
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/4/2009
Completion Technician:	k.dixon
Date Test Completed:	1/12/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/05/09	0720		2.8	20.1					
		21540			0.2	0.2	0.2	87.44	2.39E-08
	1319		3.0	19.9					
		88920			0.8	0.8	0.8	86.44	2.34E-08
01/06/09	1401		3.8	19.1					
		91680			0.8	0.8	0.8	84.84	2.31E-08
01/07/09	1529		4.6	18.3					
01/10/09	0654		2.8	18.3					
		89460			0.8	0.8	0.8	85.04	2.37E-08
01/11/09	0745		3.6	17.5					
							Average k, cm/sec =		**2.35E-08**

FIGURE B-293

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/30/2008
Boring No.:	DP-242	**Unit Dry Weight (pcf):**	93.6
Sample No.:	9	**Initial Moisture (%):**	29.5
Depth:	25-27ft	**Final Moisture (%):**	32.1
Material:	Red brown clay	**Scale No.:**	2
		Test Cell No.:	5

Cell Pressure, psi:	59
Head Pressure, psi:	54
Tail Pressure, psi:	53
Height of Sample (L), cm:	9.68
Area of Sample (A), cm^2:	40.71
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/24/2008
Completion Technician:	k.dixon
Date Test Completed:	12/30/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/25/08	0720		2.8	20.9					
		21600			0.1	0.1	0.1	88.38	1.25E-08
	1320		2.9	20.8					
		88920			0.4	0.4	0.4	87.88	1.22E-08
12/26/08	1402		3.3	20.4					
		91080			0.4	0.4	0.4	87.08	1.20E-08
12/27/08	1520		3.7	20.0					
12/28/08	0652		2.8	20.0					
		89280			0.4	0.4	0.4	87.18	1.22E-08
12/29/08	0740		3.2	19.6					
							Average k, cm/sec =		**1.20E-08**

FIGURE B-294

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/2/2008
Boring No.:	DP-244	**Unit Dry Weight (pcf):**	104.8
Sample No.:	2	**Initial Moisture (%):**	18.2
Depth:	2-4ft	**Final Moisture (%):**	26.3
Material:	Brown clay trace dark brown clay	**Scale No.:**	2
		Test Cell No.:	4

Cell Pressure, psi:	60
Head Pressure, psi:	55
Tail Pressure, psi:	54
Height of Sample (L), cm:	9.558
Area of Sample (A), cm^2:	36.84
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/26/2008
Completion Technician:	k.dixon
Date Test Completed:	1/2/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/27/08	1135		0.1	22.4					
		78720			1.1	1.1	1.1	91.58	3.96E-08
12/28/08	0927		1.2	21.3					
	1017		0.2	22.0					
		80100			1.1	1.1	1.1	91.08	3.91E-08
12/29/08	0832		1.3	20.9					
		33480			0.5	0.5	0.5	89.48	4.33E-08
	1750		1.8	20.4					
12/30/08	0851		0.0	22.3					
		87240			1.2	1.2	1.2	91.48	3.90E-08
12/31/08	0805		1.2	21.1					
							Average k, cm/sec =		**4.00E-08**

FIGURE B-295

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/21/2009
Boring No.:	DP-252	**Unit Dry Weight (pcf):**	116.1
Sample No.:	2	**Initial Moisture (%):**	13.3
Depth:	2-4ft	**Final Moisture (%):**	20.1
Material:	Brown clay trace silt and fine sand	**Scale No.:**	2
		Test Cell No.:	5

Cell Pressure, psi:	58
Head Pressure, psi:	53
Tail Pressure, psi:	52
Height of Sample (L), cm:	8.71
Area of Sample (A), cm^2:	38.38
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/17/2009
Completion Technician:	k.dixon
Date Test Completed:	1/21/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/18/09	0834		0.1	22.6					
		11700			0.3	0.3	0.3	92.58	6.28E-08
	1149		0.4	22.3					
	1158		0.0	22.9					
		15600			0.4	0.4	0.4	92.88	6.26E-08
	1618		0.4	22.5					
01/19/09	0702		0.0	22.8					
		31200			0.8	0.8	0.8	92.38	6.30E-08
	1542		0.8	22.0					
01/20/09	0658		0.1	22.9					
		23400			0.6	0.6	0.6	92.58	6.28E-08
	1328		0.7	22.3					
							Average k, cm/sec =		**6.30E-08**

FIGURE B-296

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/20/2009
Boring No.:	DP-256	**Unit Dry Weight (pcf):**	100.4
Sample No.:	7	**Initial Moisture (%):**	25.4
Depth:	15-17ft	**Final Moisture (%):**	28.7
Material:	Brown clay	**Scale No.:**	2
		Test Cell No.:	3

Cell Pressure, psi:	57
Head Pressure, psi:	52
Tail Pressure, psi:	51
Height of Sample (L), cm:	7.68
Area of Sample (A), cm^2:	38.27
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/16/2009
Completion Technician:	k.dixon
Date Test Completed:	1/20/2009

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/17/09	0833		0.2	22.6					
		23340			0.3	0.3	0.3	92.48	2.79E-08
	1502		0.5	22.3					
01/18/09	0712		0.0	22.9					
		15300			0.2	0.2	0.2	93.08	2.82E-08
	1132		0.2	22.7					
		15720			0.2	0.2	0.2	92.68	2.75E-08
	1554		0.4	22.5					
01/19/09	0622		0.0	22.9					
		31140			0.4	0.4	0.4	92.88	2.77E-08
	1501		0.4	22.5					
							Average k, cm/sec =		**2.80E-08**

FIGURE B-297

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	12/24/2008
Boring No.:	DP-268	**Unit Dry Weight (pcf):**	95.2
Sample No.:	7	**Initial Moisture (%):**	30.2
Depth:	15-17ft	**Final Moisture (%):**	31.2
Material:	Brown silty clay	**Scale No.:**	2
		Test Cell No.:	3

Cell Pressure, psi:	54
Head Pressure, psi:	49
Tail Pressure, psi:	48
Height of Sample (L), cm:	9.43
Area of Sample (A), cm^2:	34.39
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	12/20/2008
Completion Technician:	k.dixon
Date Test Completed:	12/23/2008

k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
12/21/08	0940		0.6	20.2					
		7260			4.1	4.1	4.1	85.88	1.80E-06
	1141		4.7	16.1					
	1155		0.1	22.6					
		7980			4.2	4.2	4.2	88.68	1.63E-06
	1408		4.3	18.4					
12/22/08	0750		0.2	22.4					
		3960			2.1	2.1	2.1	90.48	1.61E-06
	0856		2.3	20.3					
	0930		0.4	21.6					
		6240			3.4	3.4	3.4	88.18	1.69E-06
	1114		3.8	18.2					
							Average k, cm/sec =		**1.70E-06**

FIGURE B-298

FLEXIBLE WALL CONSTANT HEAD PERMEABILITY TEST WORKSHEET (ASTM D 5084-03)

R-K Project No.:	AMA08-115-00	**Report Date:**	1/20/2009
Boring No.:	DP-278	**Unit Dry Weight (pcf):**	107.7
Sample No.:	3	**Initial Moisture (%):**	15.7
Depth:	4-6ft	**Final Moisture (%):**	22.5
Material:	Brown clay with some sand	**Scale No.:**	2
		Test Cell No.:	4

Cell Pressure, psi:	56
Head Pressure, psi:	51
Tail Pressure, psi:	50
Height of Sample (L), cm:	8.24
Area of Sample (A), cm^2:	39.56
B-value:	0.95
Permeant Fluid:	tap water
Setup Technician:	k.dixon
Date Test Started:	1/15/2009
Completion Technician:	k.dixon
Date Test Completed:	1/20/2009

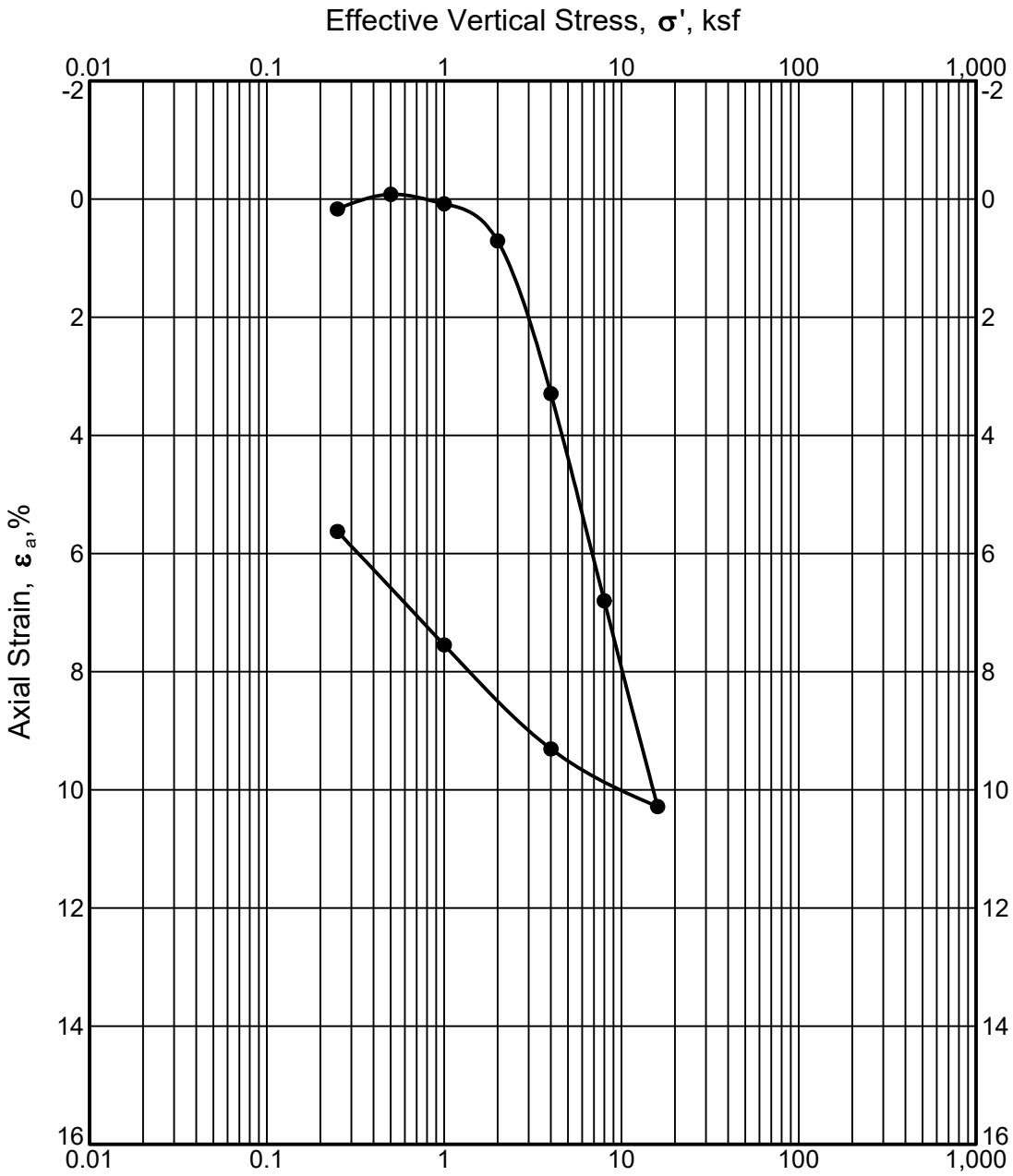
k = Q L / A t h

k = hydraulic conductivity (permeability), cm/sec
Q = Quantity of flow, taken as the average inflow and outflow, cm^3
L = Length of specimen along path of flow, cm
A = Cross sectional area of specimen, cm^2
t = Interval of time over which the flow Q occurs, sec
h = Difference in hydraulic head across the specimen, cm of water
[Average of consecutive (Tail-Burette Heads)] + (Head Press.-Tail Press.)

TEST DATA							CALCULATIONS		
Date	Time	Elapsed Time (t) (sec)	Burette Readings (ml)		Flow (ml)		Q, cm^3	h, cm	Permeability, cm/sec
			Head	Tail	In	Out			
01/16/09	0922		0.0	22.8					
		12300			0.5	0.5	0.5	92.68	9.14E-08
	1247		0.5	22.3					
01/17/09	0653		0.1	22.7					
		19680			0.8	0.8	0.8	92.18	9.18E-08
	1221		0.9	21.9					
01/18/09	0701		0.2	23.0					
		17220			0.7	0.7	0.7	92.48	9.16E-08
	1148		0.9	22.3					
01/19/09	1202		0.0	22.7					
		9840			0.4	0.4	0.4	92.68	9.14E-08
	1446		0.4	22.3					
							Average k, cm/sec =		**9.20E-08**

FIGURE B-299

PROJECT AMA08-115-00



ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-1, 2 to 4 FEET

MATERIAL: FILL: FAT CLAY (CH)
INITIAL WATER CONTENT: 14.81
INITIAL DRY DENSITY: 100.6 pcf
INITIAL VOID RATIO: 0.70
INITIAL DEGREE OF SATURATION: 58.1
SPECIFIC GRAVITY: 2.74 (assumed)

FINAL WATER CONTENT: 22.01
FINAL DRY DENSITY: 106.7 pcf
FINAL VOID RATIO: 0.60
FINAL DEGREE OF SATURATION: 100%
LL = 51; PL = 18; PI = 33

FIGURE B-300

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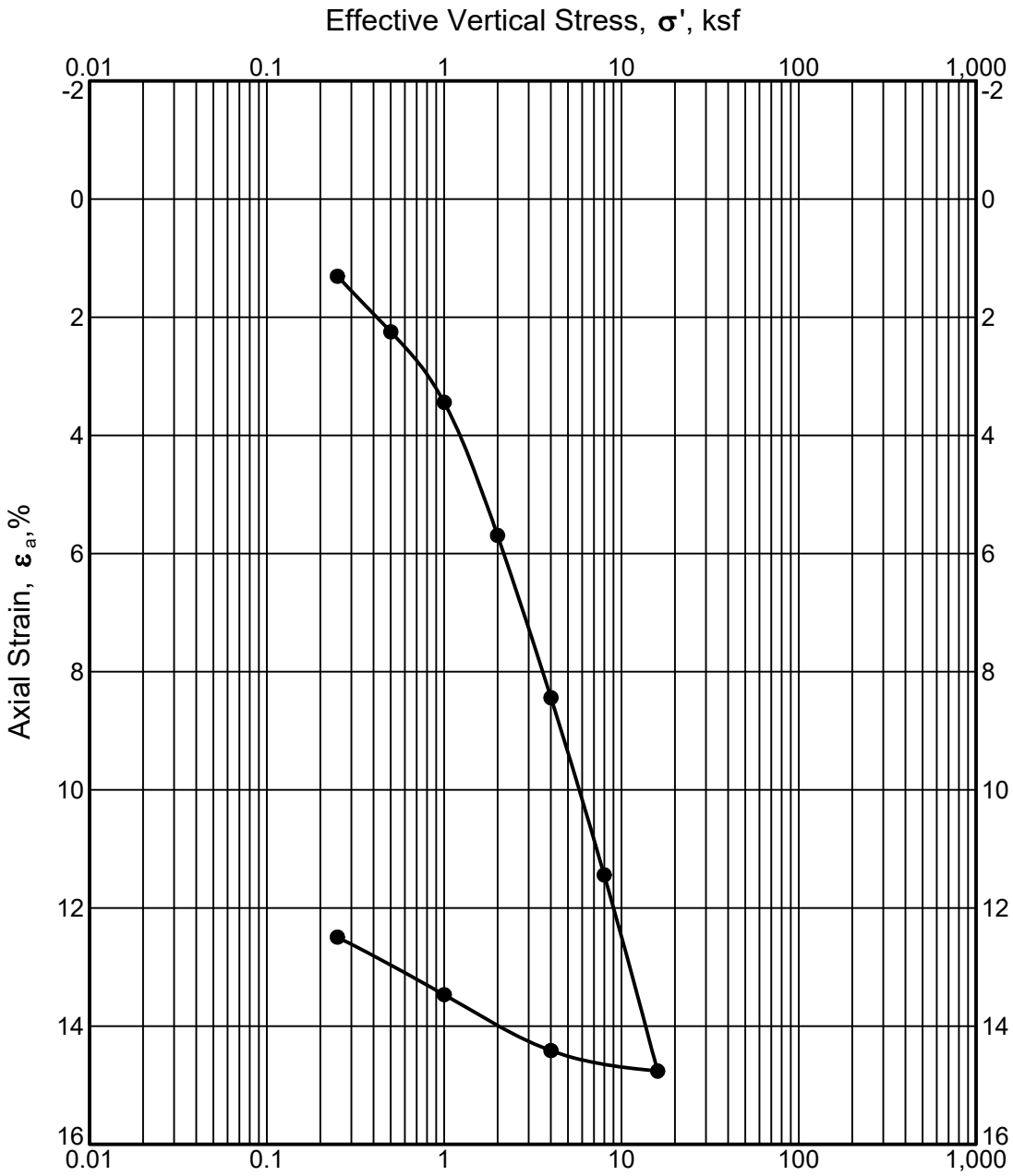

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-9, 6 to 8 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 28.51
INITIAL DRY DENSITY: 93.0 pcf
INITIAL VOID RATIO: 0.78
INITIAL DEGREE OF SATURATION: 96.9
SPECIFIC GRAVITY: 2.66 (assumed)

FINAL WATER CONTENT: 21.03
FINAL DRY DENSITY: 106.4 pcf
FINAL VOID RATIO: 0.56
FINAL DEGREE OF SATURATION: 100%
LL = 47; PL = 20; PI = 27

FIGURE B-301

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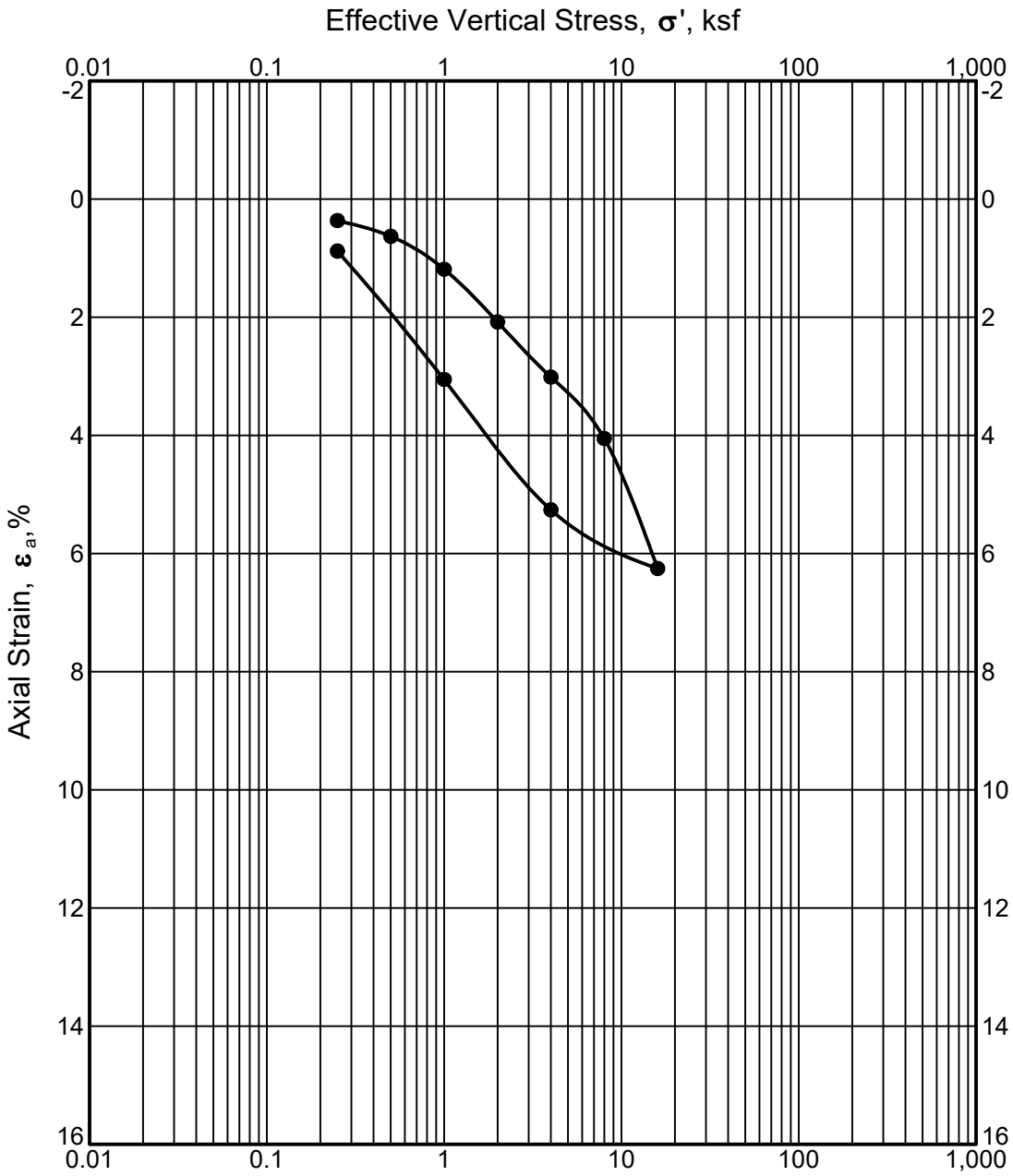

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-17, 2 to 4 FEET

MATERIAL: FILL: FAT CLAY (CH)
INITIAL WATER CONTENT: 18.06
INITIAL DRY DENSITY: 106.0 pcf
INITIAL VOID RATIO: 0.65
INITIAL DEGREE OF SATURATION: 77.7
SPECIFIC GRAVITY: 2.81 (assumed)

FINAL WATER CONTENT: 22.71
FINAL DRY DENSITY: 107.0 pcf
FINAL VOID RATIO: 0.64
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-302

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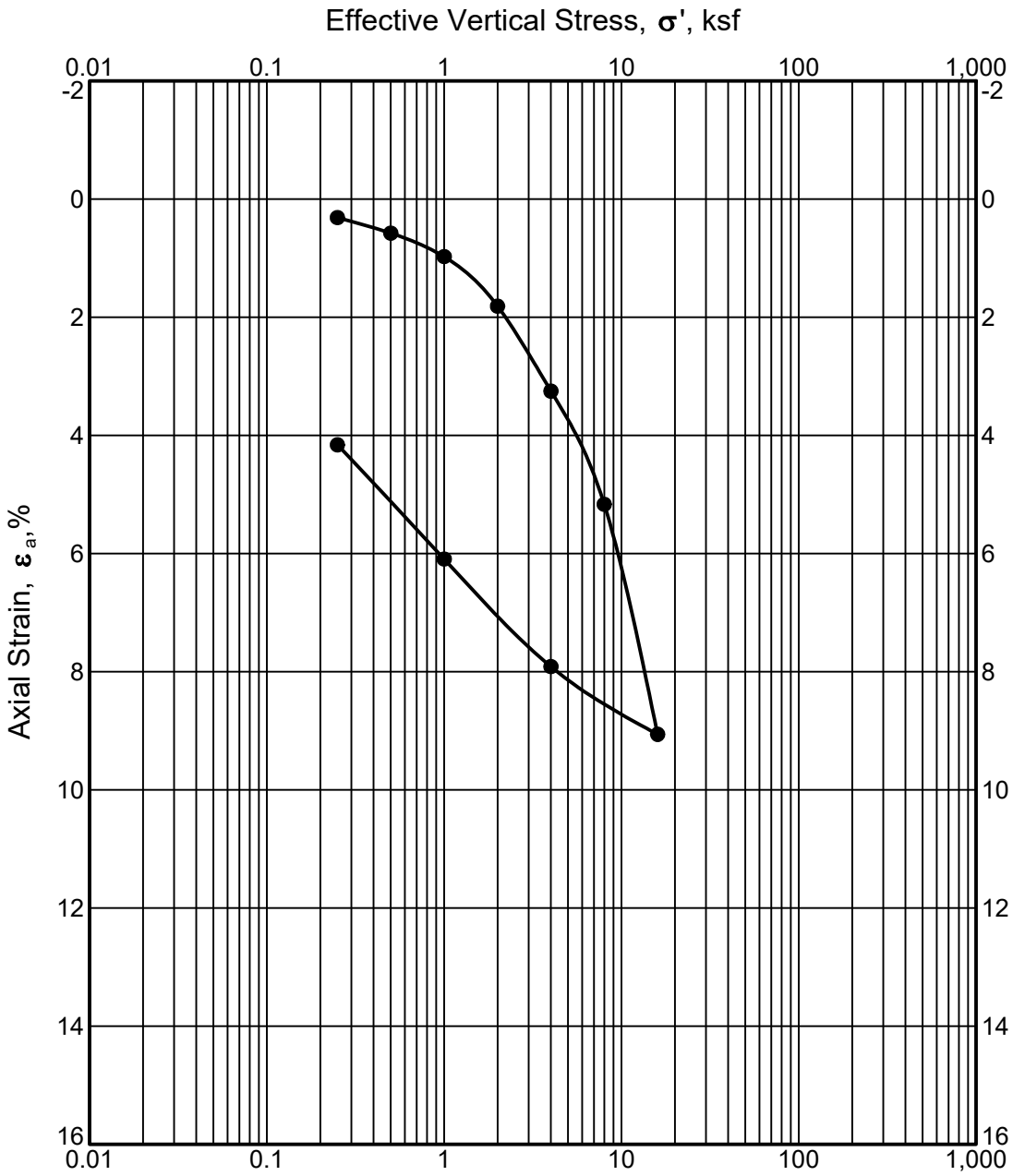

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-23, 2 to 4 FEET

MATERIAL: FILL: CLAYEY SAND (SC)
INITIAL WATER CONTENT: 25.64
INITIAL DRY DENSITY: 98.2 pcf
INITIAL VOID RATIO: 0.77
INITIAL DEGREE OF SATURATION: 92.8
SPECIFIC GRAVITY: 2.79 (assumed)

FINAL WATER CONTENT: 25.00
FINAL DRY DENSITY: 102.5 pcf
FINAL VOID RATIO: 0.70
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-303

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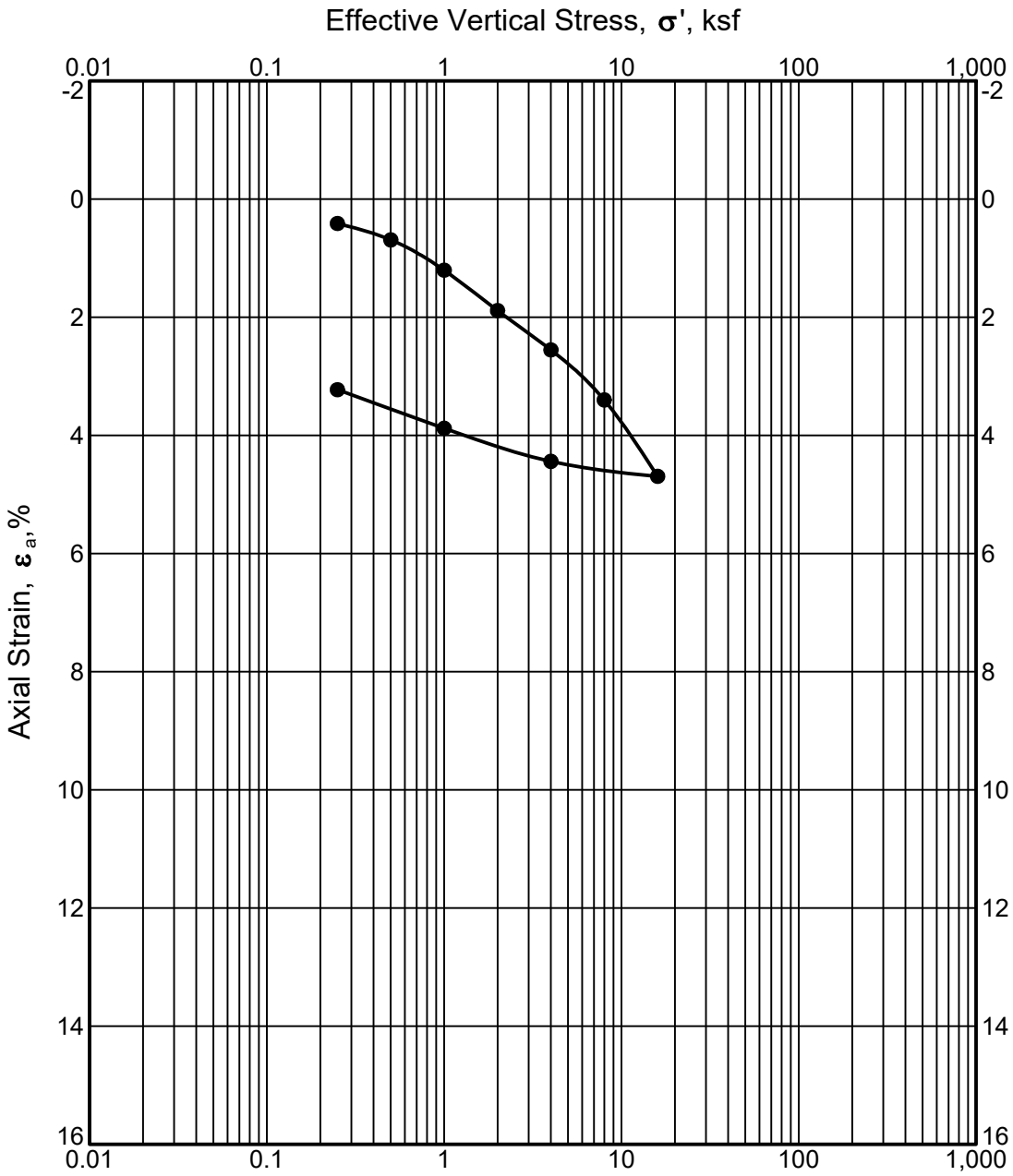

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-27, 8 to 10 FEET

MATERIAL: FILL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 19.99
INITIAL DRY DENSITY: 99.1 pcf
INITIAL VOID RATIO: 0.51
INITIAL DEGREE OF SATURATION: 93.4
SPECIFIC GRAVITY: 2.41 (assumed)

FINAL WATER CONTENT: 19.38
FINAL DRY DENSITY: 102.4 pcf
FINAL VOID RATIO: 0.47
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-304

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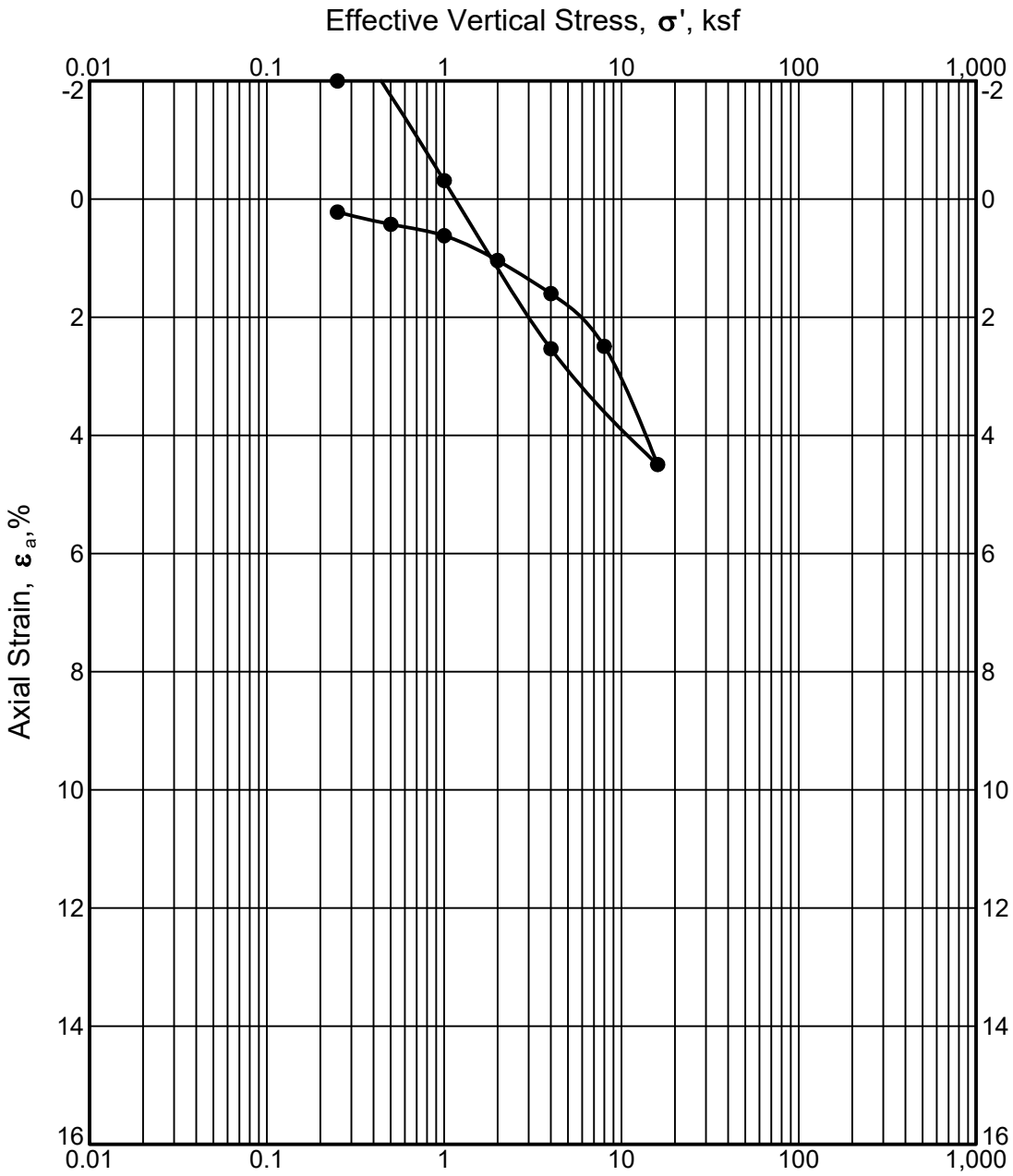

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-33, 4 to 6 FEET

MATERIAL: FILL: FAT CLAY (CH)
INITIAL WATER CONTENT: 19.95
INITIAL DRY DENSITY: 110.0 pcf
INITIAL VOID RATIO: 0.68
INITIAL DEGREE OF SATURATION: 86.7
SPECIFIC GRAVITY: 2.96 (assumed)

FINAL WATER CONTENT: 24.82
FINAL DRY DENSITY: 106.6 pcf
FINAL VOID RATIO: 0.74
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-305

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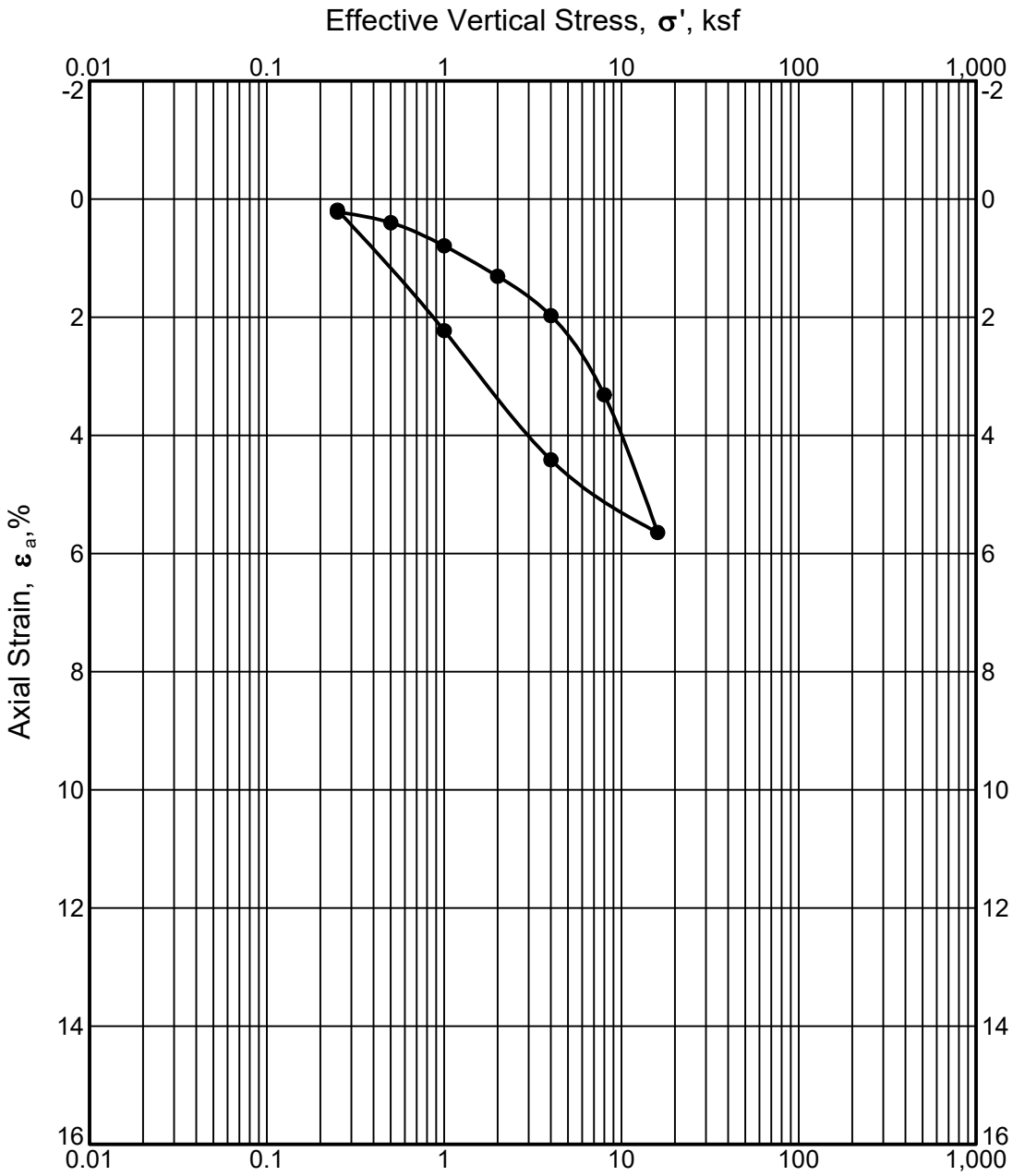
PROJECT AMA08-115-00



ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-40, 4 to 6 FEET

MATERIAL: FILL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 18.27
INITIAL DRY DENSITY: 107.6 pcf
INITIAL VOID RATIO: 0.55
INITIAL DEGREE OF SATURATION: 88.7
SPECIFIC GRAVITY: 2.67 (assumed)

FINAL WATER CONTENT: 22.45
FINAL DRY DENSITY: 104.3 pcf
FINAL VOID RATIO: 0.60
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-306

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R-K CONSOL STRAIN AMA08-115-00.GPJ RKCI WITH CU.GDT 2/15/09

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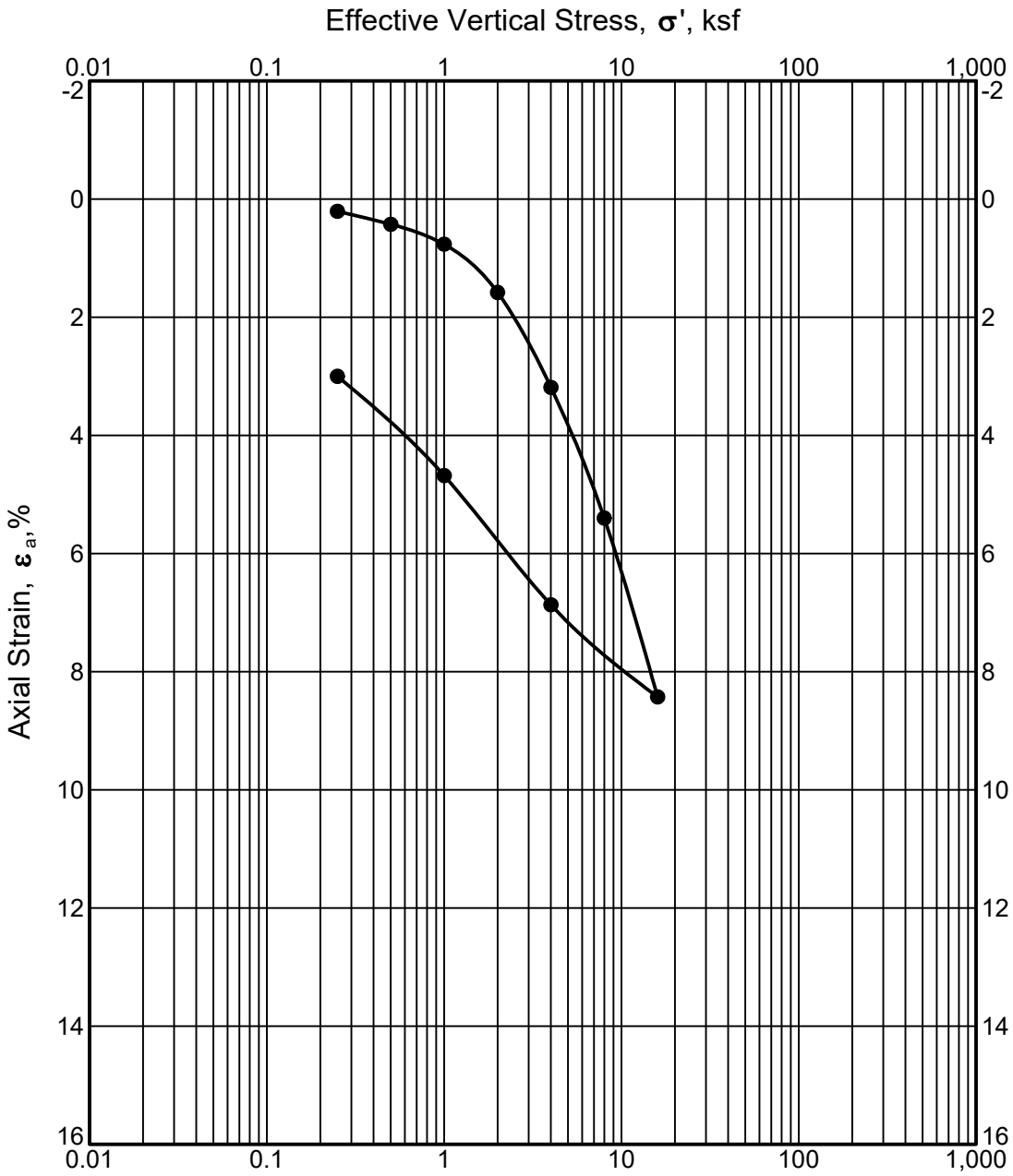

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-47, 20 to 22 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 28.45
INITIAL DRY DENSITY: 94.4 pcf
INITIAL VOID RATIO: 0.87
INITIAL DEGREE OF SATURATION: 92.5
SPECIFIC GRAVITY: 2.83 (assumed)

FINAL WATER CONTENT: 28.81
FINAL DRY DENSITY: 97.3 pcf
FINAL VOID RATIO: 0.81
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-307

Raba Kistner
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VERTICAL STRESS VS. STRAIN

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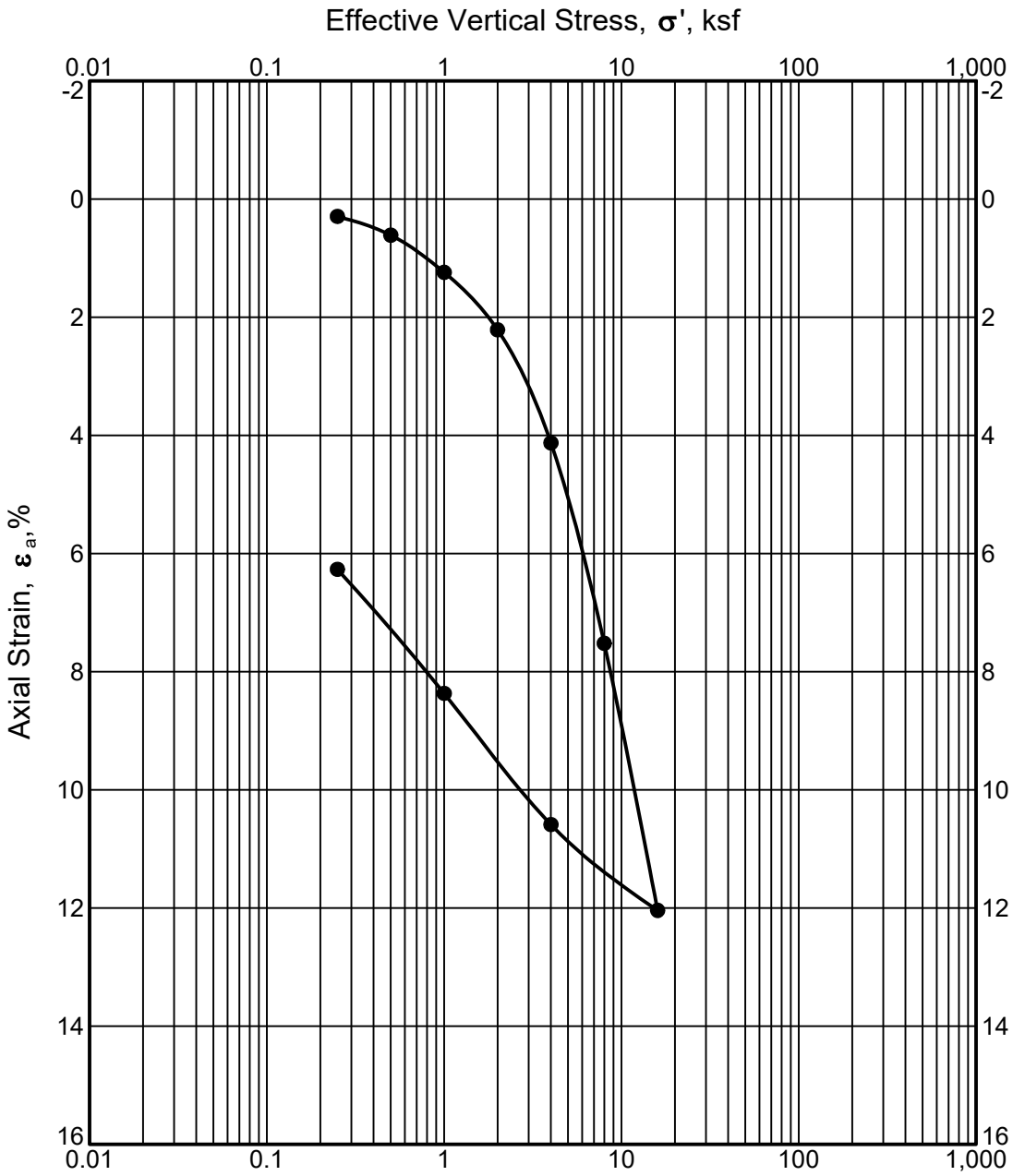

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-52, 8 to 10 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.09
INITIAL DRY DENSITY: 94.6 pcf
INITIAL VOID RATIO: 0.85
INITIAL DEGREE OF SATURATION: 76.2
SPECIFIC GRAVITY: 2.80 (assumed)

FINAL WATER CONTENT: 26.16
FINAL DRY DENSITY: 100.9 pcf
FINAL VOID RATIO: 0.73
FINAL DEGREE OF SATURATION: 100%
LL = 59; PL = 21; PI = 38

FIGURE B-308

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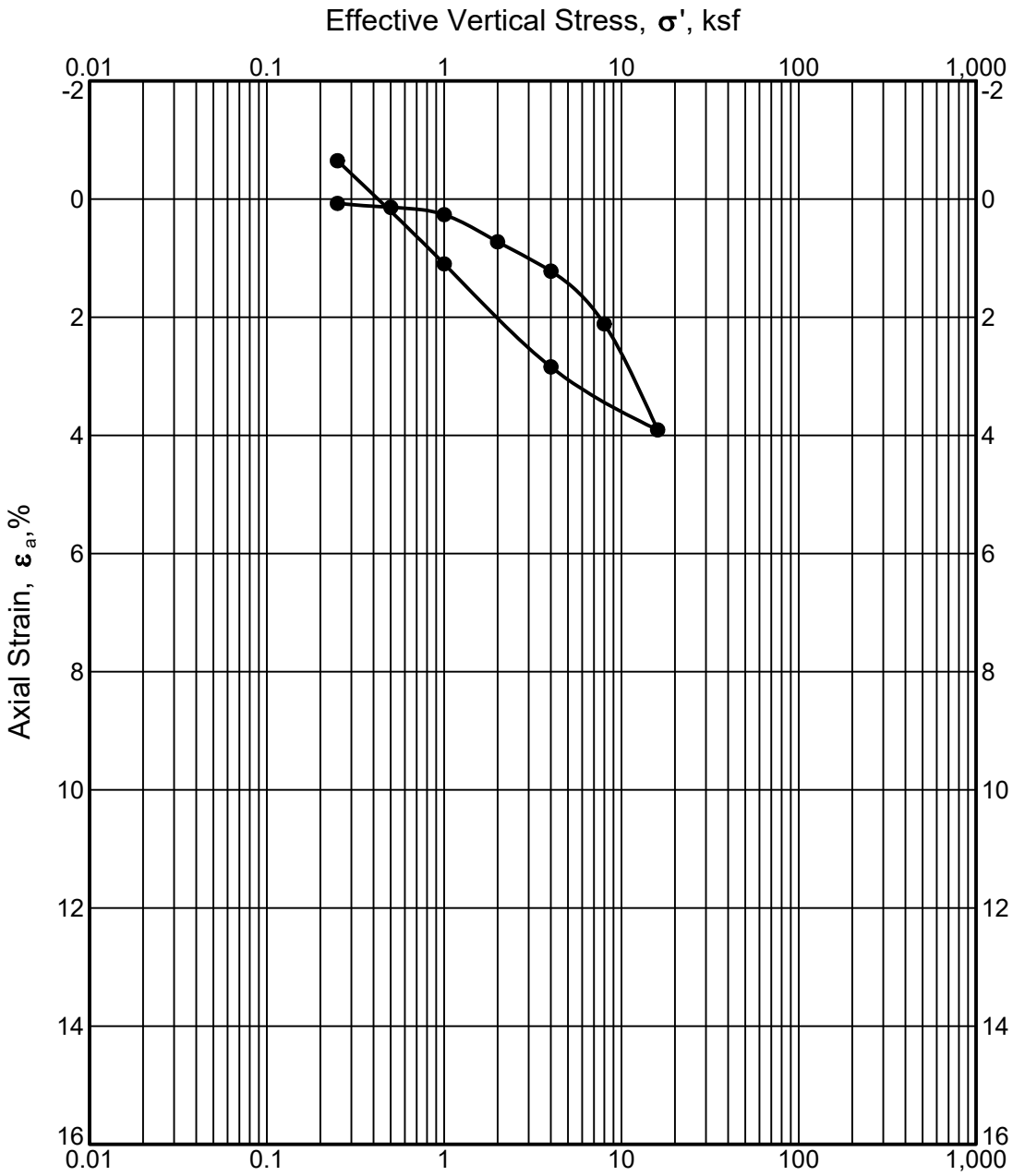

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-62, 0 to 2 FEET

MATERIAL: FILL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 19.55
INITIAL DRY DENSITY: 105.3 pcf
INITIAL VOID RATIO: 0.61
INITIAL DEGREE OF SATURATION: 86.9
SPECIFIC GRAVITY: 2.72 (assumed)

FINAL WATER CONTENT: 22.90
FINAL DRY DENSITY: 104.6 pcf
FINAL VOID RATIO: 0.62
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-309

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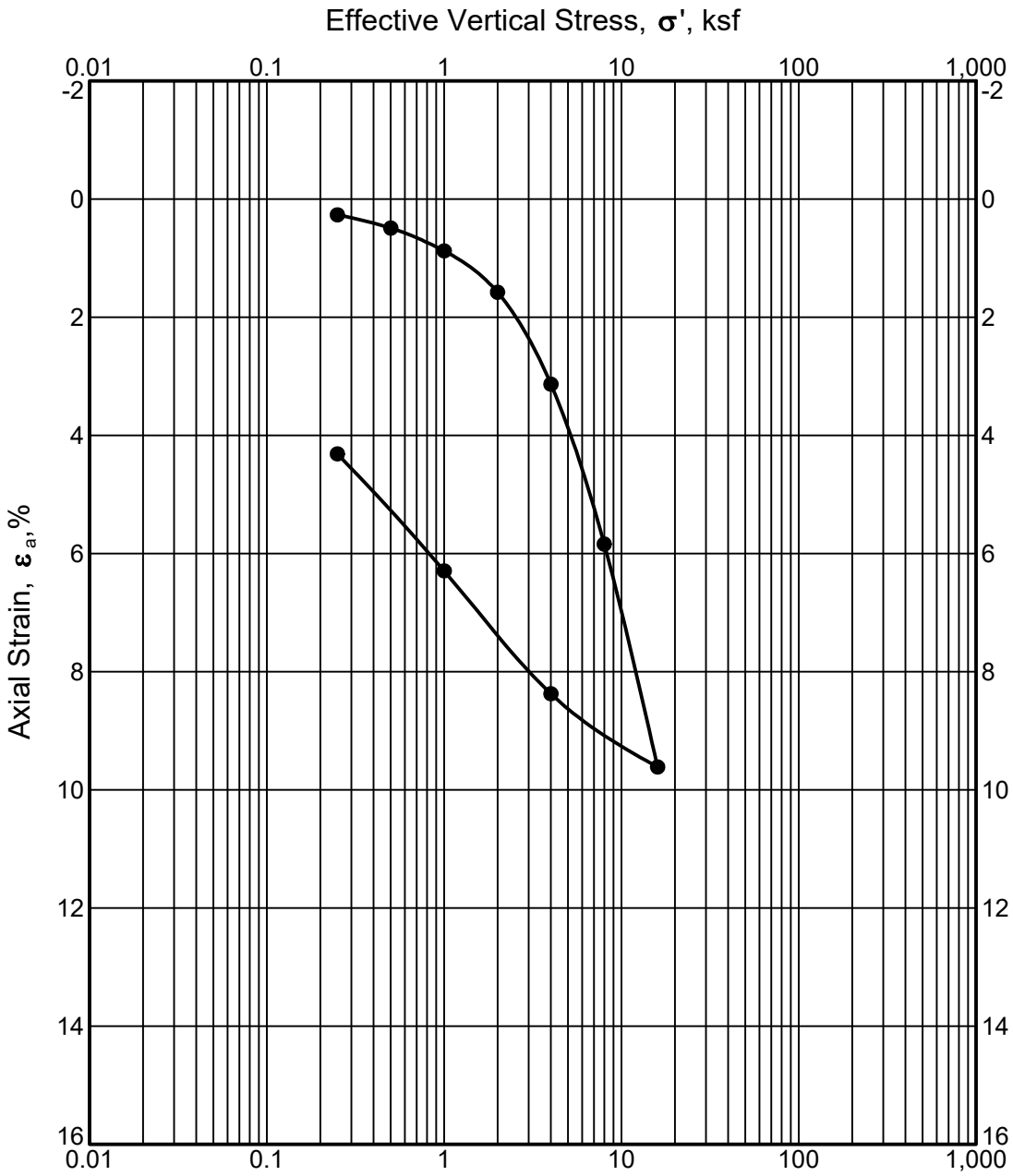

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-65, 8 to 10 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 27.31
INITIAL DRY DENSITY: 95.6 pcf
INITIAL VOID RATIO: 0.85
INITIAL DEGREE OF SATURATION: 91.2
SPECIFIC GRAVITY: 2.83 (assumed)

FINAL WATER CONTENT: 27.16
FINAL DRY DENSITY: 99.9 pcf
FINAL VOID RATIO: 0.77
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-310

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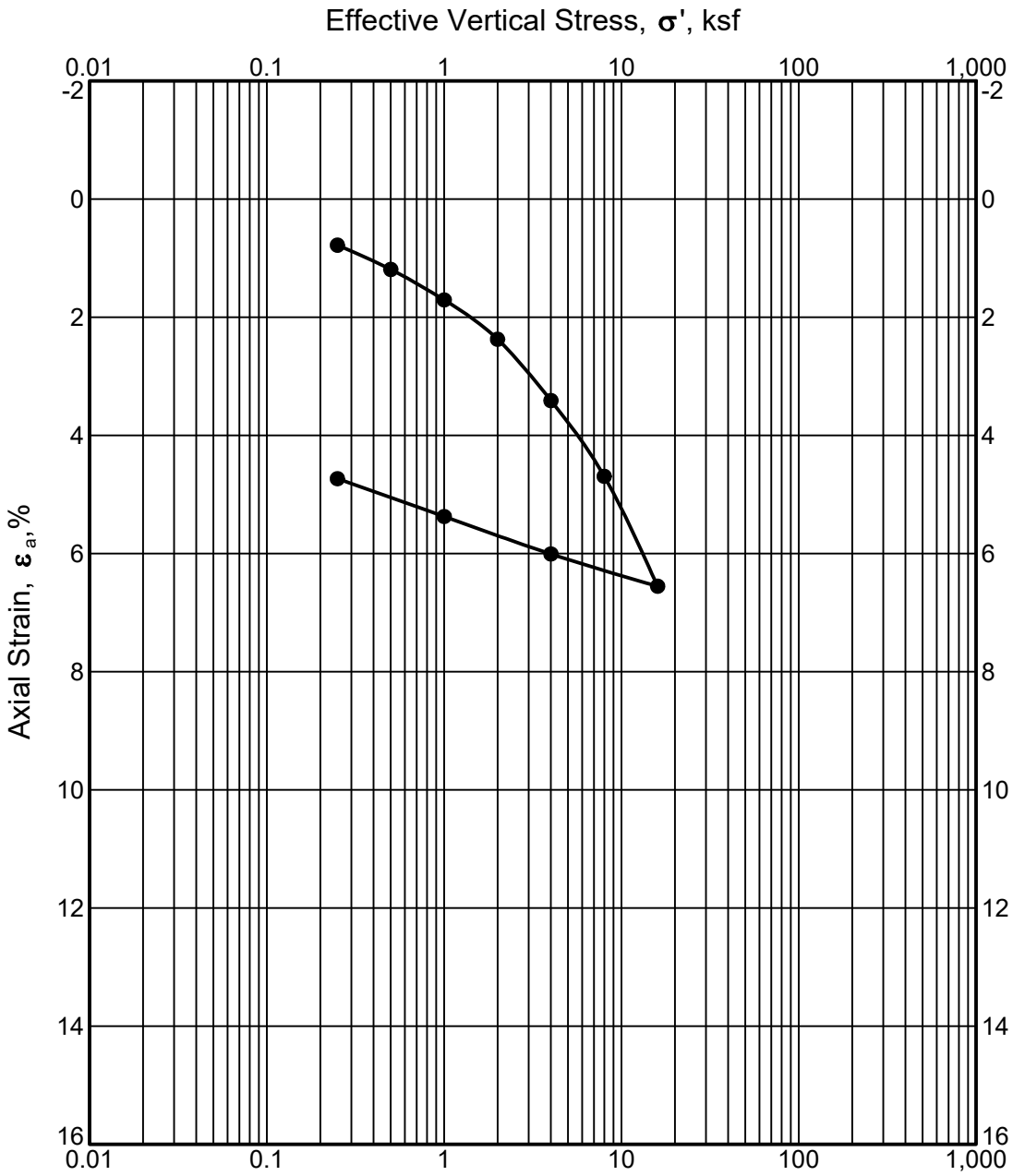

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-73, 4 to 6 FEET

MATERIAL: FILL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 17.49
INITIAL DRY DENSITY: 96.7 pcf
INITIAL VOID RATIO: 0.78
INITIAL DEGREE OF SATURATION: 61.8
SPECIFIC GRAVITY: 2.76 (assumed)

FINAL WATER CONTENT: 25.28
FINAL DRY DENSITY: 101.4 pcf
FINAL VOID RATIO: 0.70
FINAL DEGREE OF SATURATION: 100%
LL = 38; PL = 19; PI = 19

FIGURE B-311

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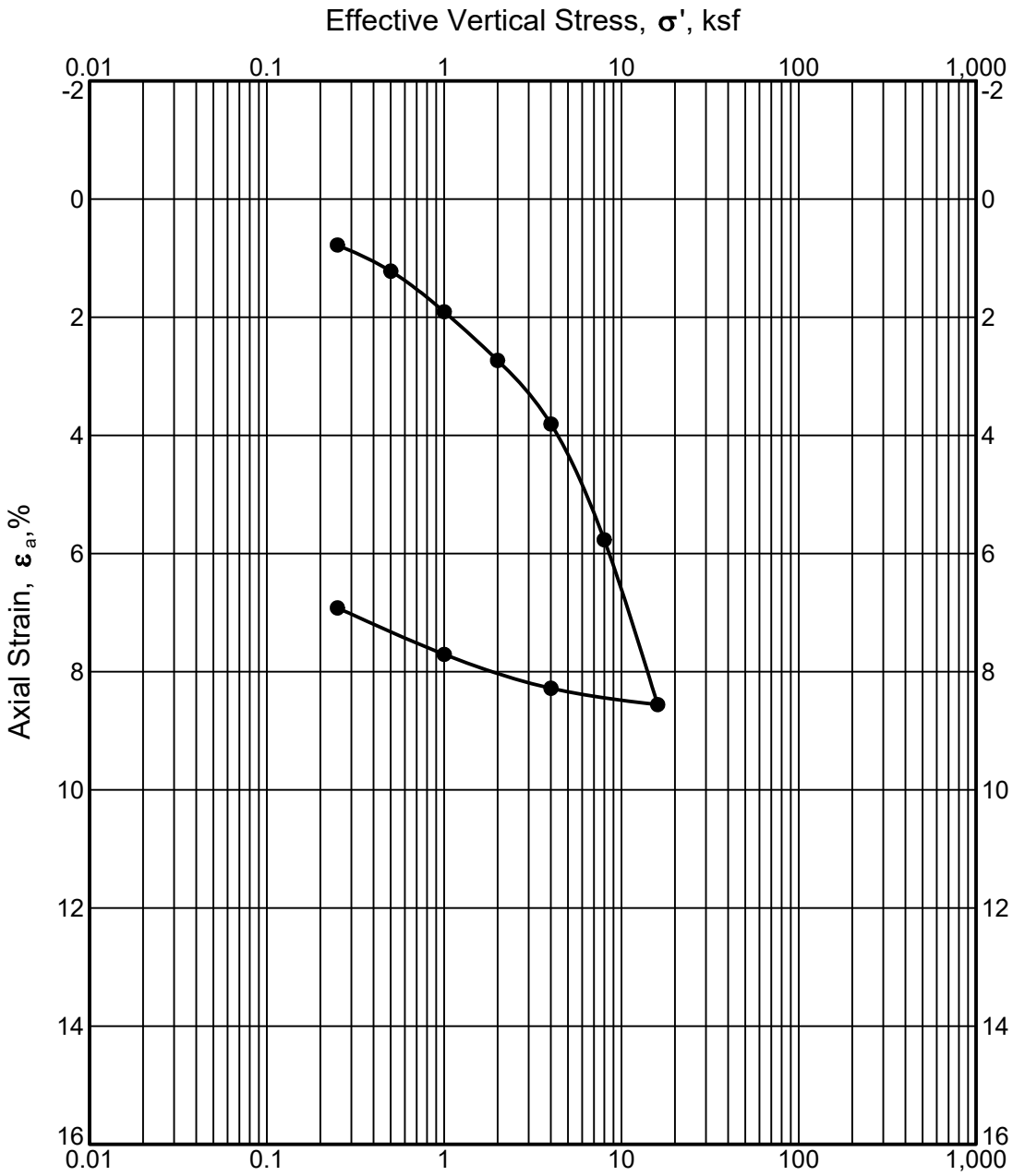

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-81, 8 to 10 FEET

MATERIAL: CLAY LEAN (CL)
INITIAL WATER CONTENT: 18.94
INITIAL DRY DENSITY: 97.6 pcf
INITIAL VOID RATIO: 0.77
INITIAL DEGREE OF SATURATION: 68.2
SPECIFIC GRAVITY: 2.77 (assumed)

FINAL WATER CONTENT: 23.35
FINAL DRY DENSITY: 104.9 pcf
FINAL VOID RATIO: 0.65
FINAL DEGREE OF SATURATION: 100%
LL = 37; PL = 20; PI = 17

FIGURE B-312

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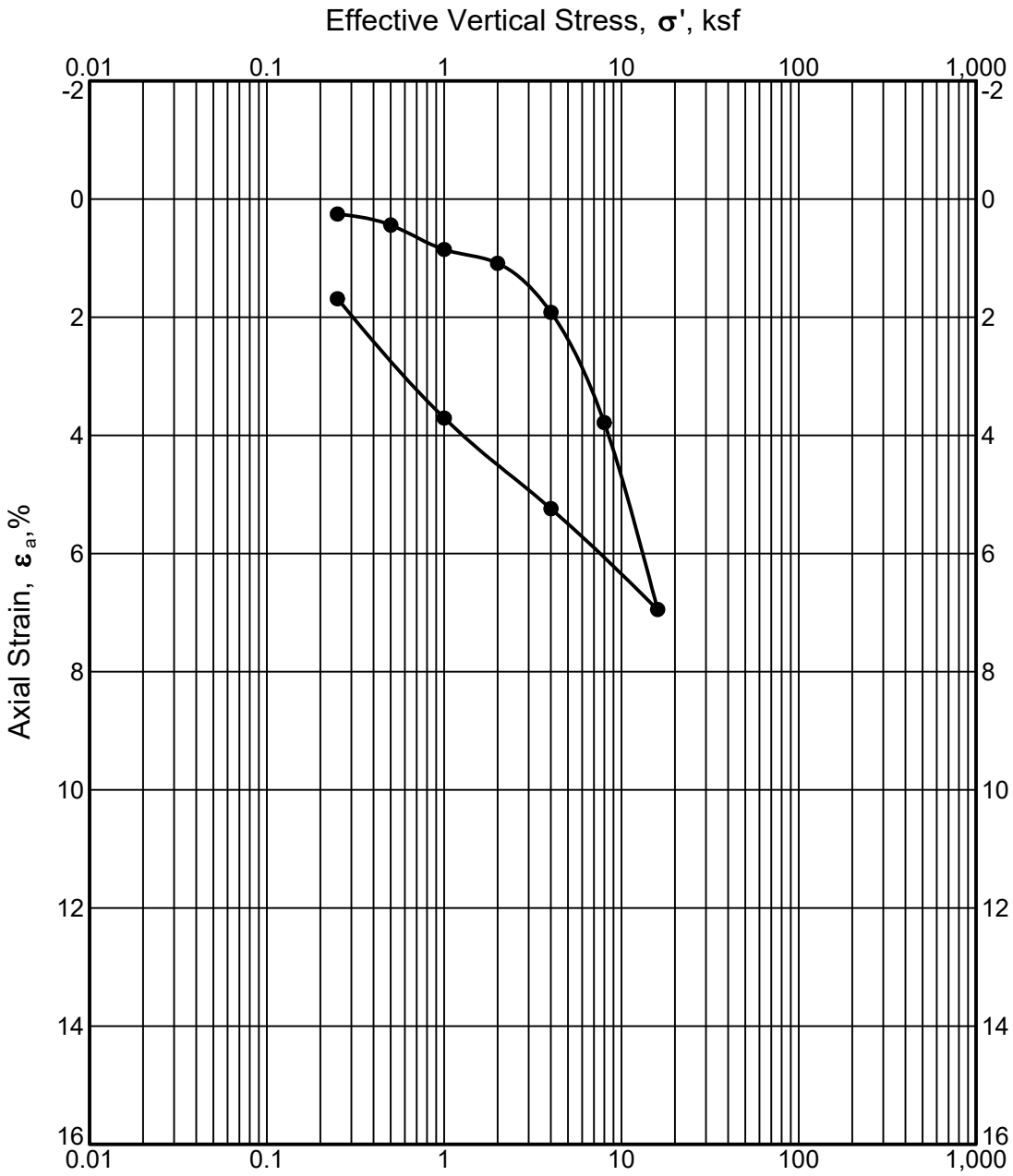

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-85, 6 to 8 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 26.81
INITIAL DRY DENSITY: 93.9 pcf
INITIAL VOID RATIO: 0.80
INITIAL DEGREE OF SATURATION: 91.0
SPECIFIC GRAVITY: 2.70 (assumed)

FINAL WATER CONTENT: 28.32
FINAL DRY DENSITY: 95.6 pcf
FINAL VOID RATIO: 0.77
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-313

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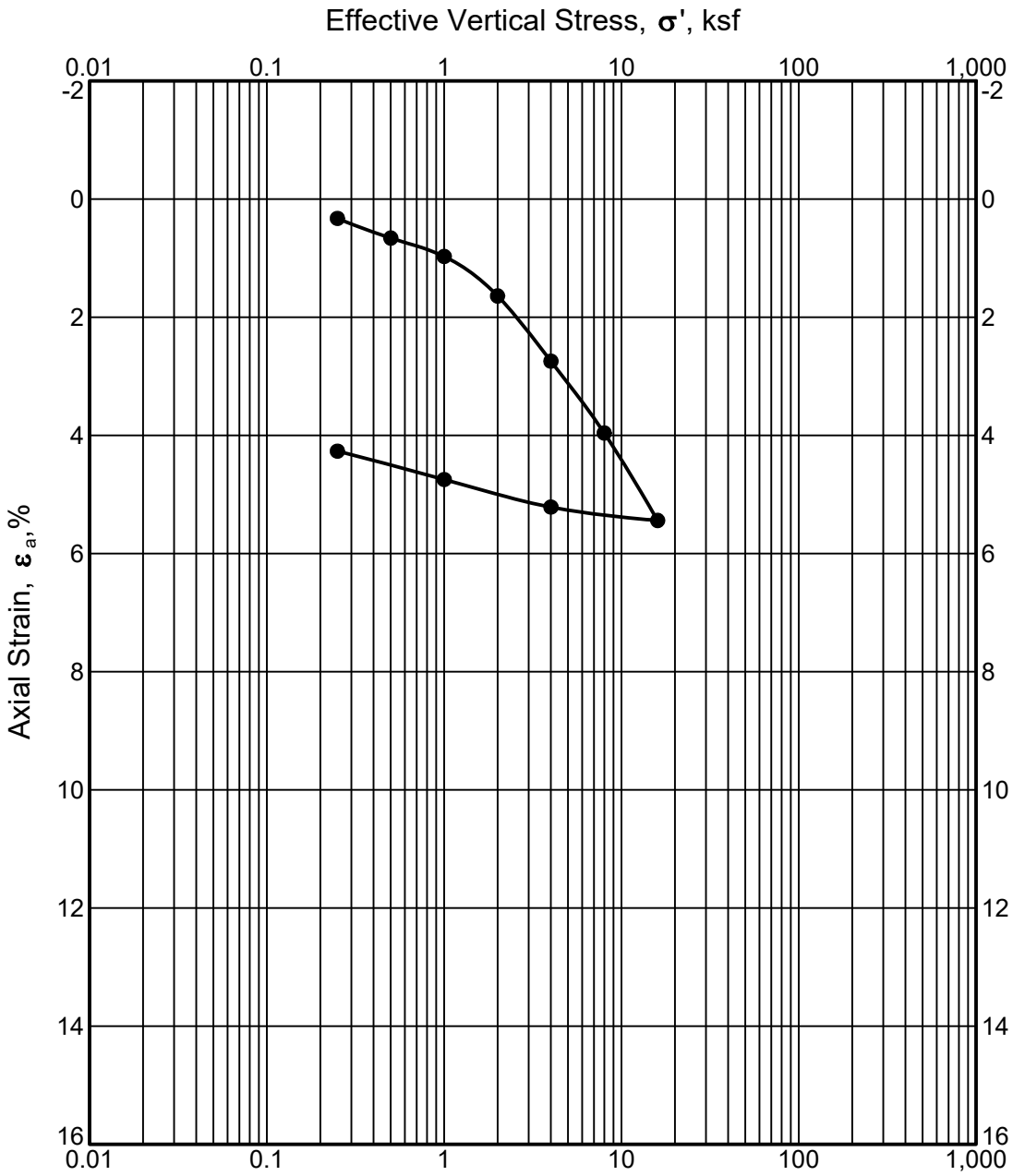

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-89, 8 to 10 FEET

MATERIAL: FILL: SILTY CLAY (CL-ML)
INITIAL WATER CONTENT: 19.42
INITIAL DRY DENSITY: 105.9 pcf
INITIAL VOID RATIO: 0.58
INITIAL DEGREE OF SATURATION: 90.0
SPECIFIC GRAVITY: 2.68 (assumed)

FINAL WATER CONTENT: 19.07
FINAL DRY DENSITY: 110.7 pcf
FINAL VOID RATIO: 0.51
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-314

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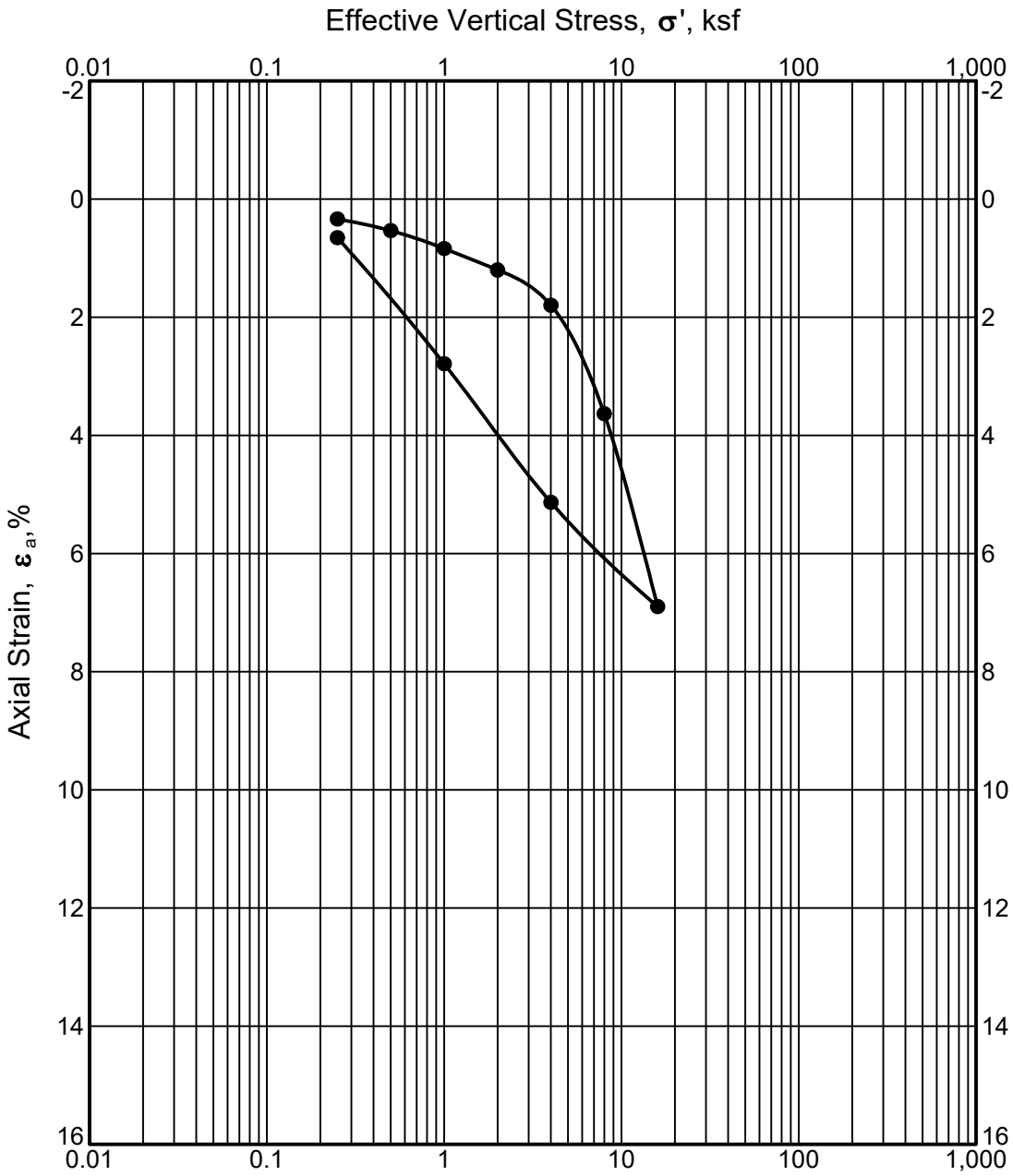

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-93, 6 to 8 FEET

MATERIAL: FILL: FAT CLAY (CH)
INITIAL WATER CONTENT: 27.94
INITIAL DRY DENSITY: 93.7 pcf
INITIAL VOID RATIO: 0.86
INITIAL DEGREE OF SATURATION: 90.5
SPECIFIC GRAVITY: 2.80 (assumed)

FINAL WATER CONTENT: 30.45
FINAL DRY DENSITY: 94.4 pcf
FINAL VOID RATIO: 0.85
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-315

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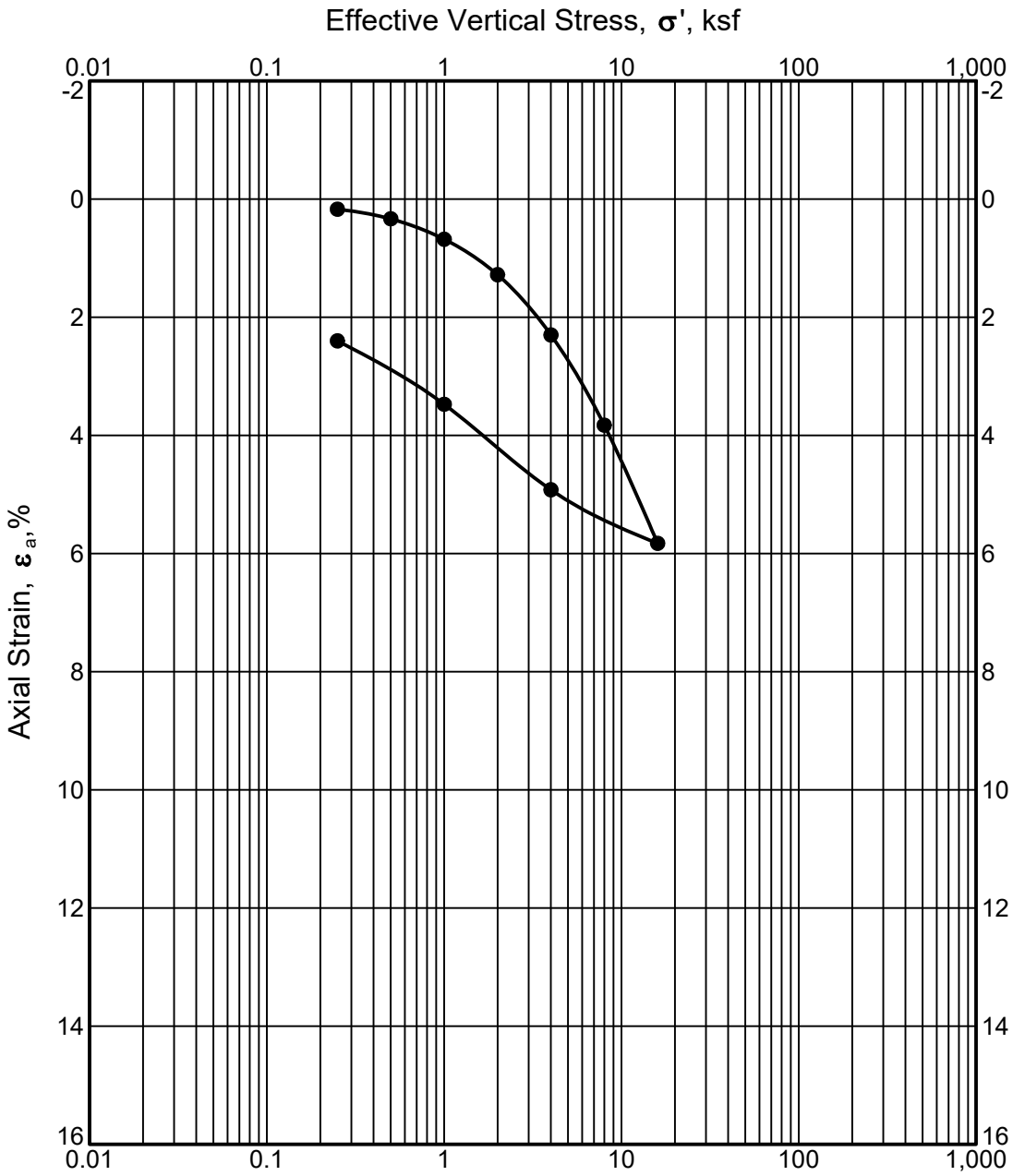

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-102, 6 to 8 FEET

MATERIAL: FILL: FAT CLAY (CH)
INITIAL WATER CONTENT: 17.43
INITIAL DRY DENSITY: 109.7 pcf
INITIAL VOID RATIO: 0.60
INITIAL DEGREE OF SATURATION: 81.5
SPECIFIC GRAVITY: 2.82 (assumed)

FINAL WATER CONTENT: 20.02
FINAL DRY DENSITY: 112.4 pcf
FINAL VOID RATIO: 0.56
FINAL DEGREE OF SATURATION: 100%
LL = 51; PL = 20; PI = 31

FIGURE B-316

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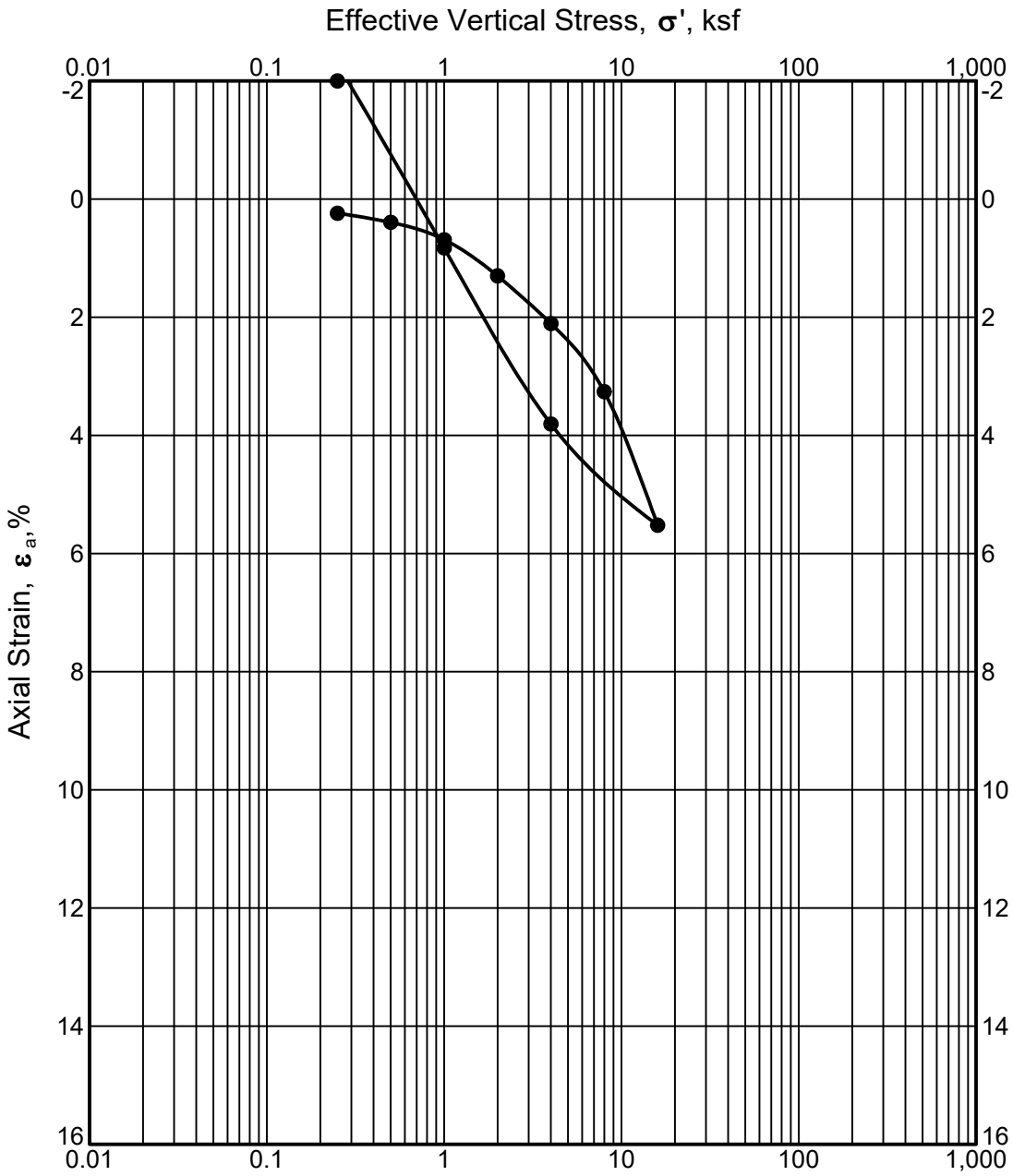

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-107, 2 to 4 FEET

MATERIAL: FILL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 24.16
INITIAL DRY DENSITY: 100.9 pcf
INITIAL VOID RATIO: 0.72
INITIAL DEGREE OF SATURATION: 93.6
SPECIFIC GRAVITY: 2.77 (assumed)

FINAL WATER CONTENT: 27.22
FINAL DRY DENSITY: 98.7 pcf
FINAL VOID RATIO: 0.75
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-317

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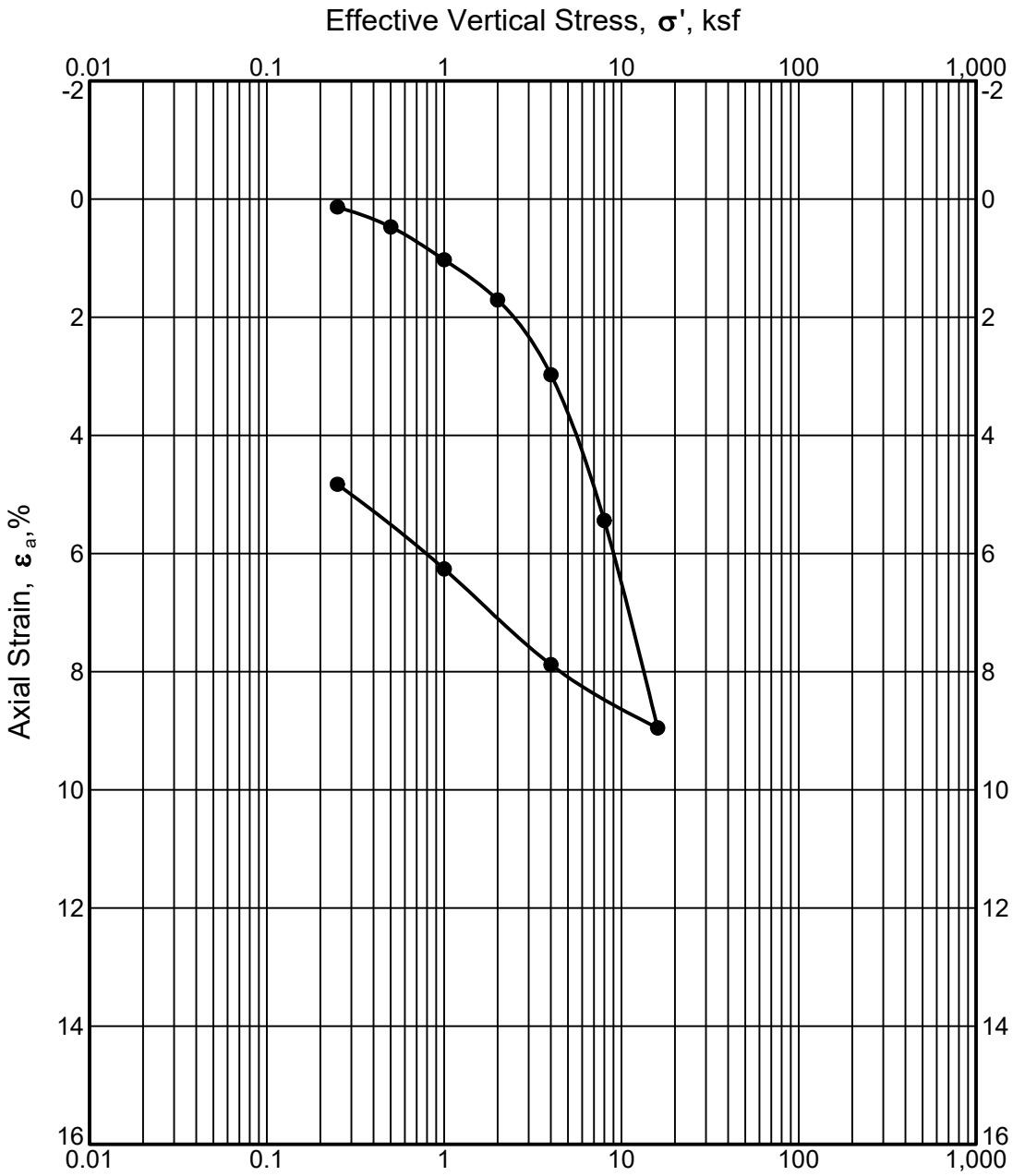

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-115, 8 to 10 FEET

MATERIAL: CLAY LEAN (CL)
INITIAL WATER CONTENT: 19.37
INITIAL DRY DENSITY: 103.4 pcf
INITIAL VOID RATIO: 0.66
INITIAL DEGREE OF SATURATION: 80.8
SPECIFIC GRAVITY: 2.75 (assumed)

FINAL WATER CONTENT: 21.07
FINAL DRY DENSITY: 108.7 pcf
FINAL VOID RATIO: 0.58
FINAL DEGREE OF SATURATION: 100%
LL = 40; PL = 16; PI = 24

FIGURE B-318

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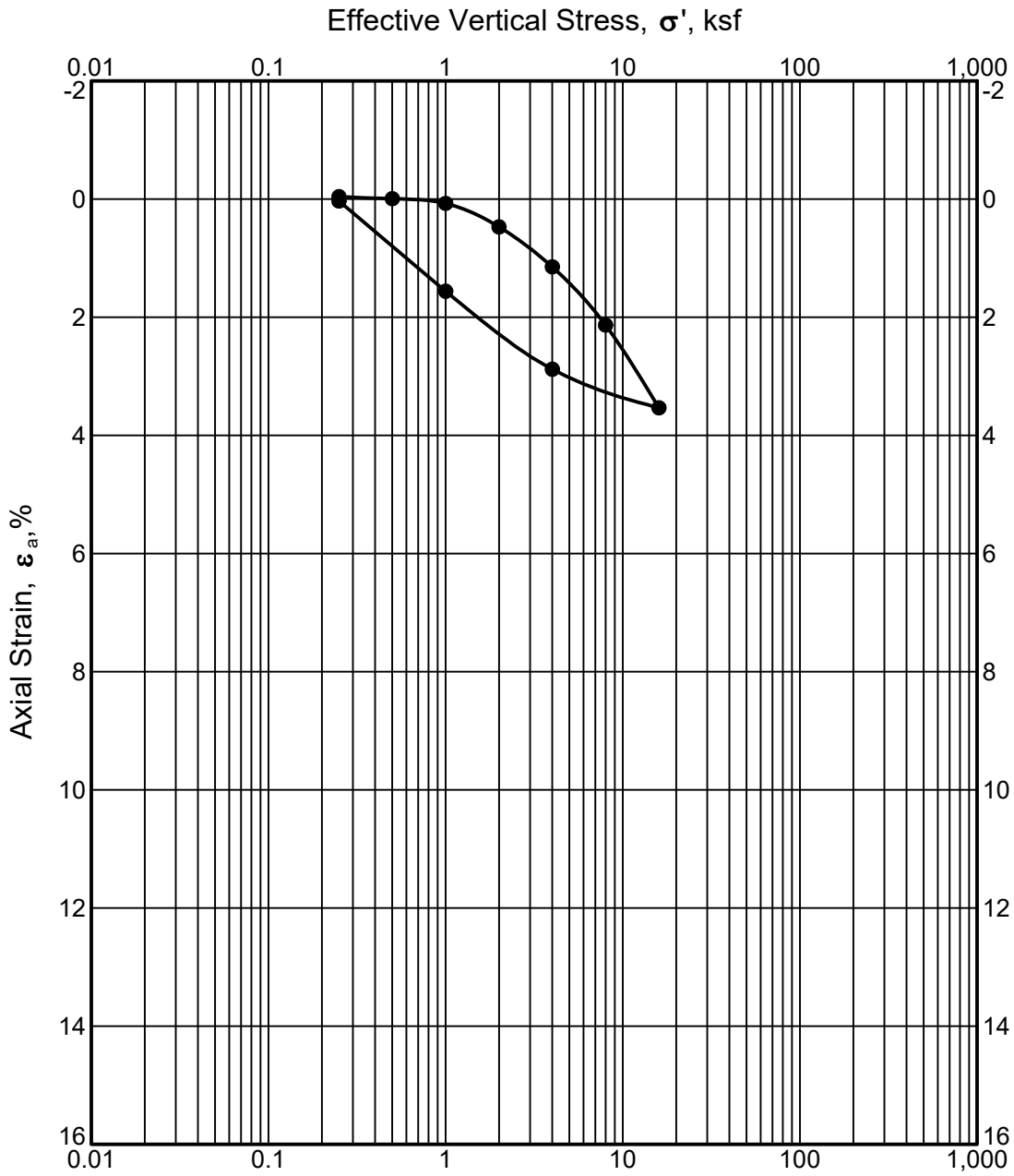

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-116, 8 to 10 FEET

MATERIAL: FILL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 14.98
INITIAL DRY DENSITY: 111.7 pcf
INITIAL VOID RATIO: 0.53
INITIAL DEGREE OF SATURATION: 77.8
SPECIFIC GRAVITY: 2.73 (assumed)

FINAL WATER CONTENT: 19.26
FINAL DRY DENSITY: 111.7 pcf
FINAL VOID RATIO: 0.53
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-319

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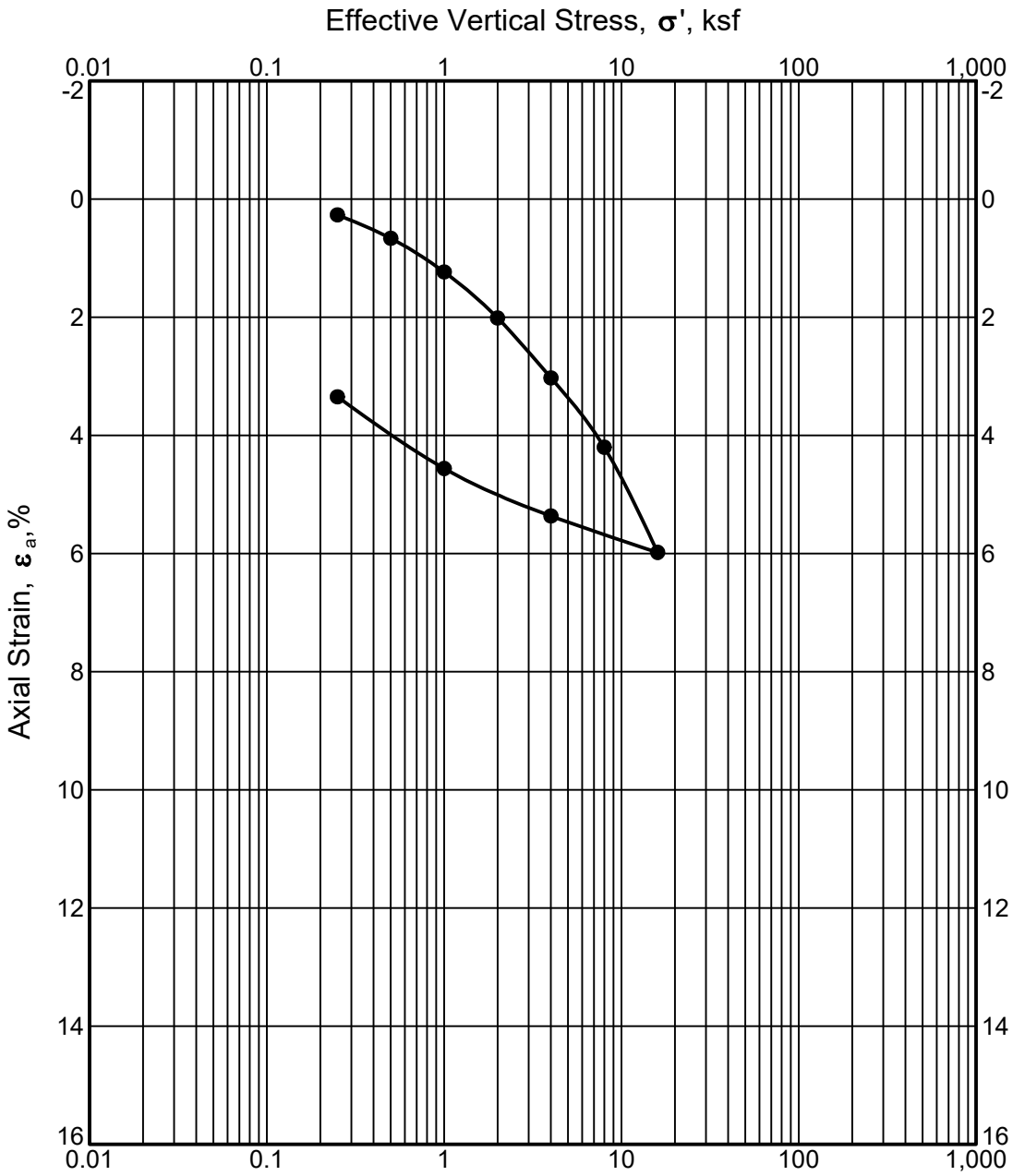

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-118, 10 to 12 FEET

MATERIAL: CLAY LEAN (CL)
INITIAL WATER CONTENT: 13.91
INITIAL DRY DENSITY: 101.2 pcf
INITIAL VOID RATIO: 0.65
INITIAL DEGREE OF SATURATION: 57.2
SPECIFIC GRAVITY: 2.68 (assumed)

FINAL WATER CONTENT: 22.25
FINAL DRY DENSITY: 104.7 pcf
FINAL VOID RATIO: 0.60
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-320

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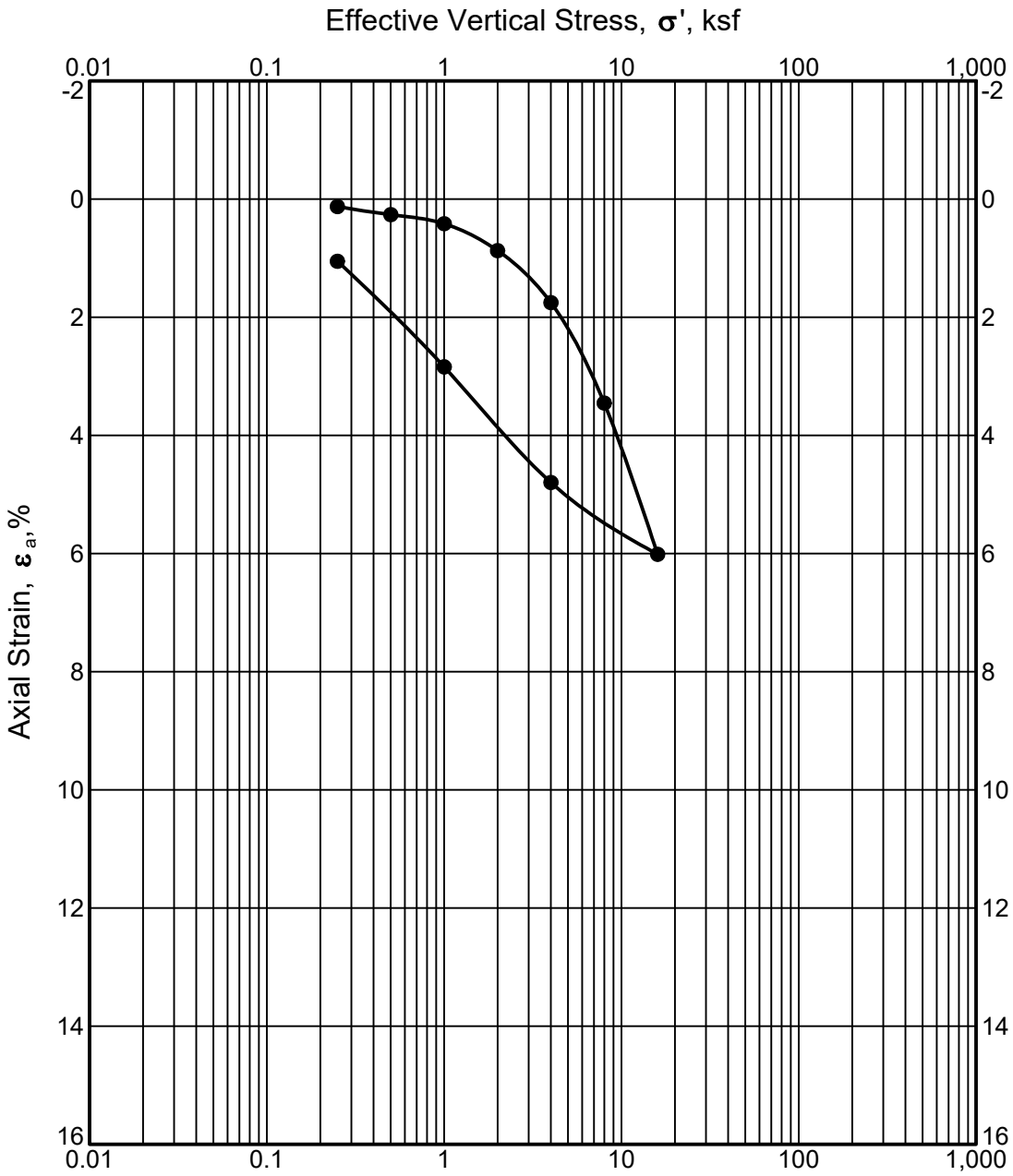

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-123, 4 to 6 FEET

MATERIAL: FILL: FAT CLAY (CH)
INITIAL WATER CONTENT: 21.63
INITIAL DRY DENSITY: 102.2 pcf
INITIAL VOID RATIO: 0.69
INITIAL DEGREE OF SATURATION: 86.6
SPECIFIC GRAVITY: 2.77 (assumed)

FINAL WATER CONTENT: 24.31
FINAL DRY DENSITY: 103.3 pcf
FINAL VOID RATIO: 0.67
FINAL DEGREE OF SATURATION: 100%
LL = 44; PL = 19; PI = 25

FIGURE B-321

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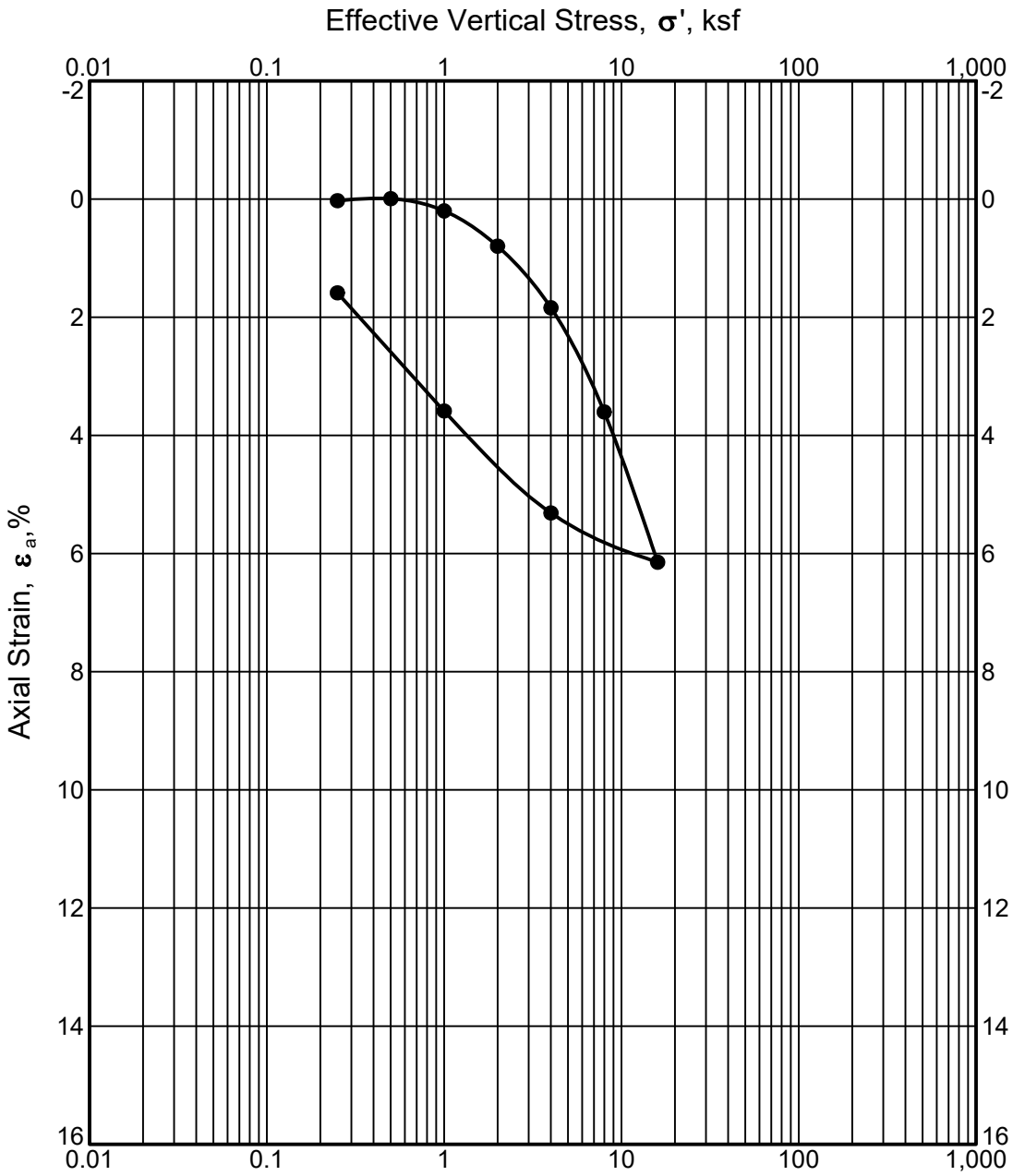

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-128, 6 to 8 FEET

MATERIAL: FILL: FAT CLAY (CH)
INITIAL WATER CONTENT: 17.11
INITIAL DRY DENSITY: 104.4 pcf
INITIAL VOID RATIO: 0.69
INITIAL DEGREE OF SATURATION: 69.8
SPECIFIC GRAVITY: 2.83 (assumed)

FINAL WATER CONTENT: 23.55
FINAL DRY DENSITY: 106.1 pcf
FINAL VOID RATIO: 0.67
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-322

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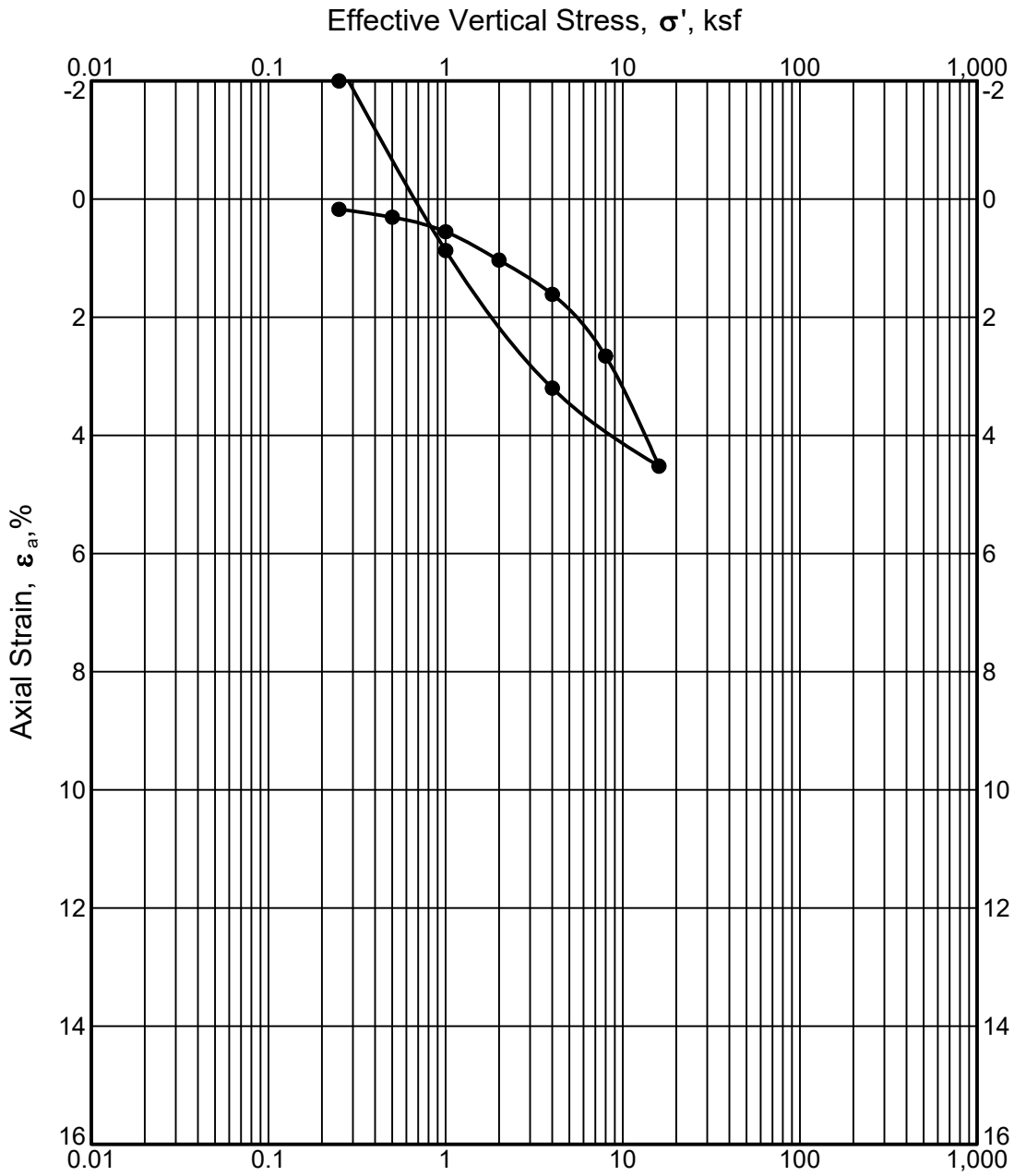

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-141, 4 to 6 FEET

MATERIAL: FILL: FAT CLAY (CH)
INITIAL WATER CONTENT: 20.23
INITIAL DRY DENSITY: 105.4 pcf
INITIAL VOID RATIO: 0.69
INITIAL DEGREE OF SATURATION: 83.4
SPECIFIC GRAVITY: 2.86 (assumed)

FINAL WATER CONTENT: 25.59
FINAL DRY DENSITY: 103.1 pcf
FINAL VOID RATIO: 0.73
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-323

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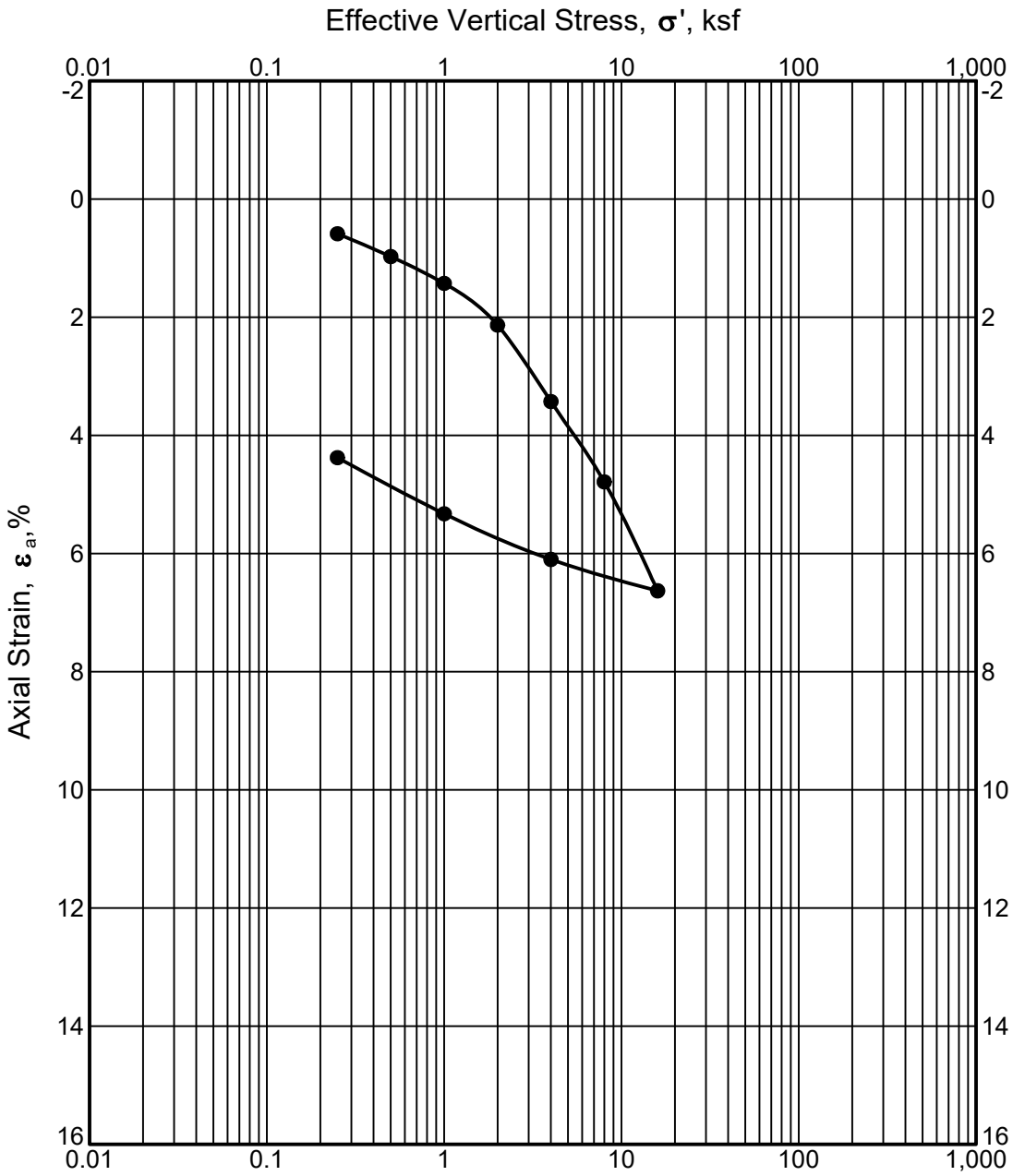

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-152, 6 to 8 FEET

MATERIAL: FILL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 15.31
INITIAL DRY DENSITY: 108.4 pcf
INITIAL VOID RATIO: 0.55
INITIAL DEGREE OF SATURATION: 75.1
SPECIFIC GRAVITY: 2.69 (assumed)

FINAL WATER CONTENT: 17.85
FINAL DRY DENSITY: 113.4 pcf
FINAL VOID RATIO: 0.48
FINAL DEGREE OF SATURATION: 100%
LL = 35; PL = 18; PI = 17

FIGURE B-324

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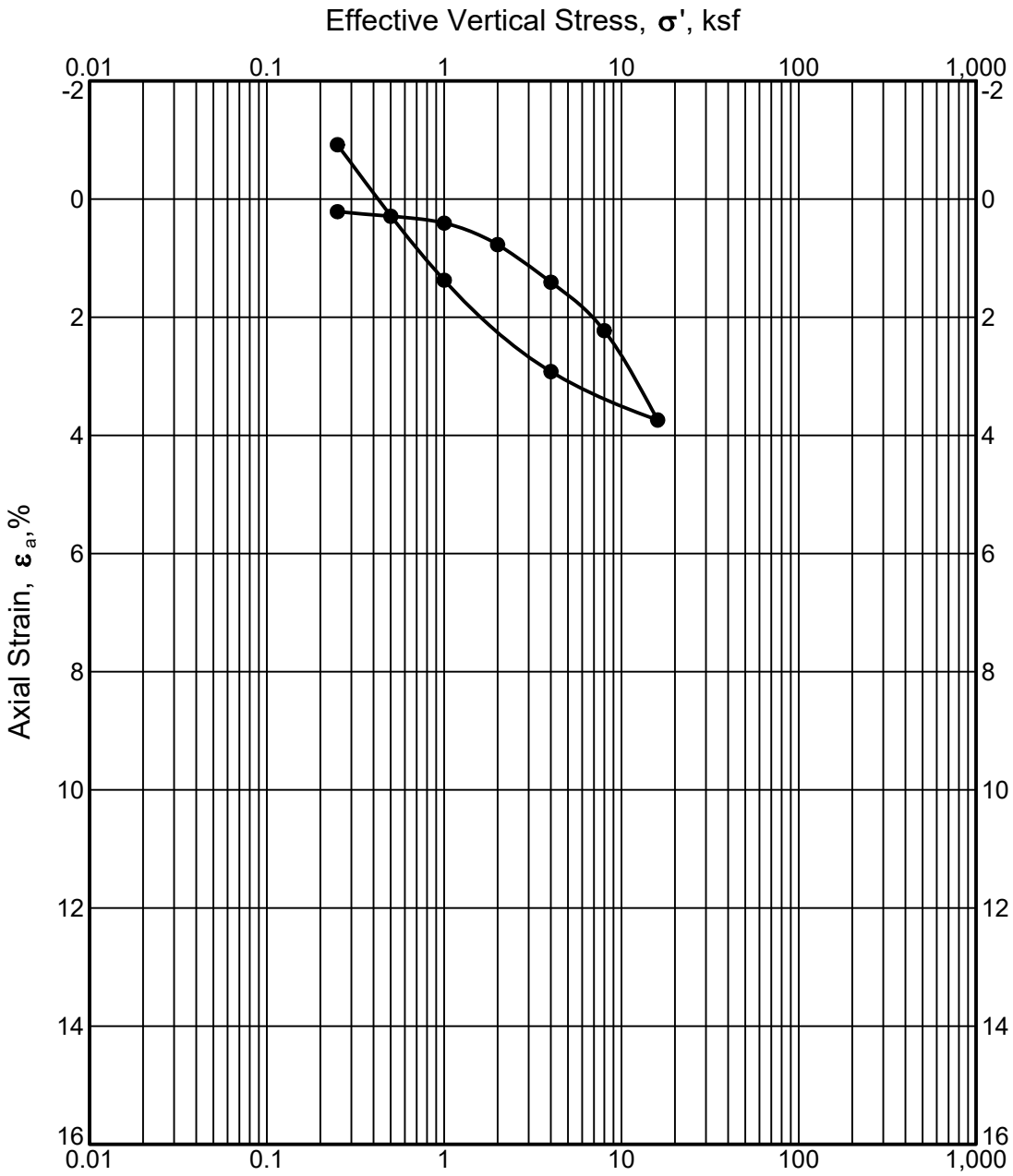

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-156, 4 to 6 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 18.41
INITIAL DRY DENSITY: 105.0 pcf
INITIAL VOID RATIO: 0.67
INITIAL DEGREE OF SATURATION: 77.1
SPECIFIC GRAVITY: 2.81 (assumed)

FINAL WATER CONTENT: 24.45
FINAL DRY DENSITY: 104.1 pcf
FINAL VOID RATIO: 0.69
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-325

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VERTICAL STRESS VS. STRAIN

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Cameron County, Texas

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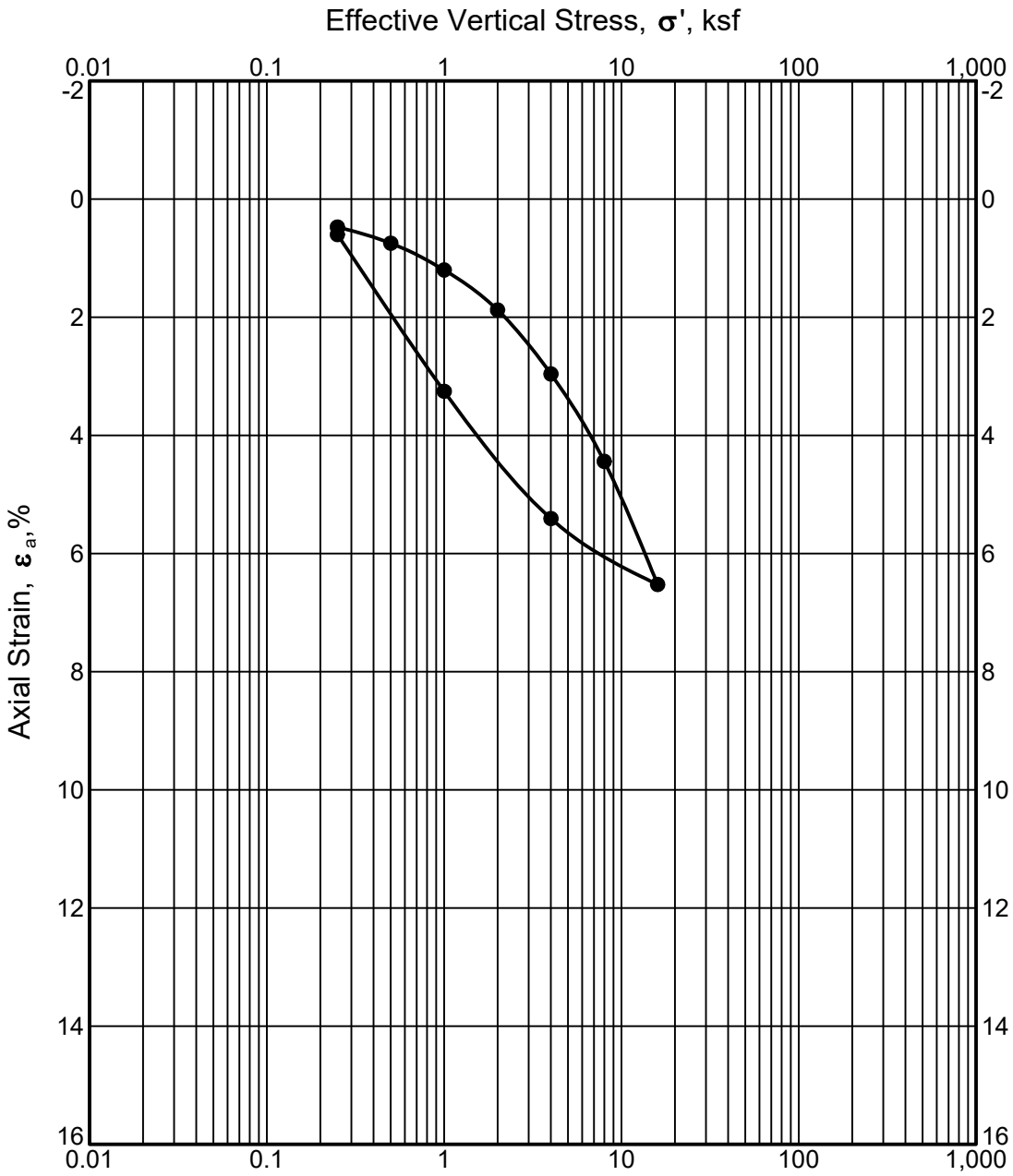
PROJECT AMA08-115-00



ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-159, 4 to 6 FEET

MATERIAL: FILL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 18.40
INITIAL DRY DENSITY: 104.9 pcf
INITIAL VOID RATIO: 0.64
INITIAL DEGREE OF SATURATION: 79.2
SPECIFIC GRAVITY: 2.76 (assumed)

FINAL WATER CONTENT: 22.93
FINAL DRY DENSITY: 105.5 pcf
FINAL VOID RATIO: 0.63
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-326

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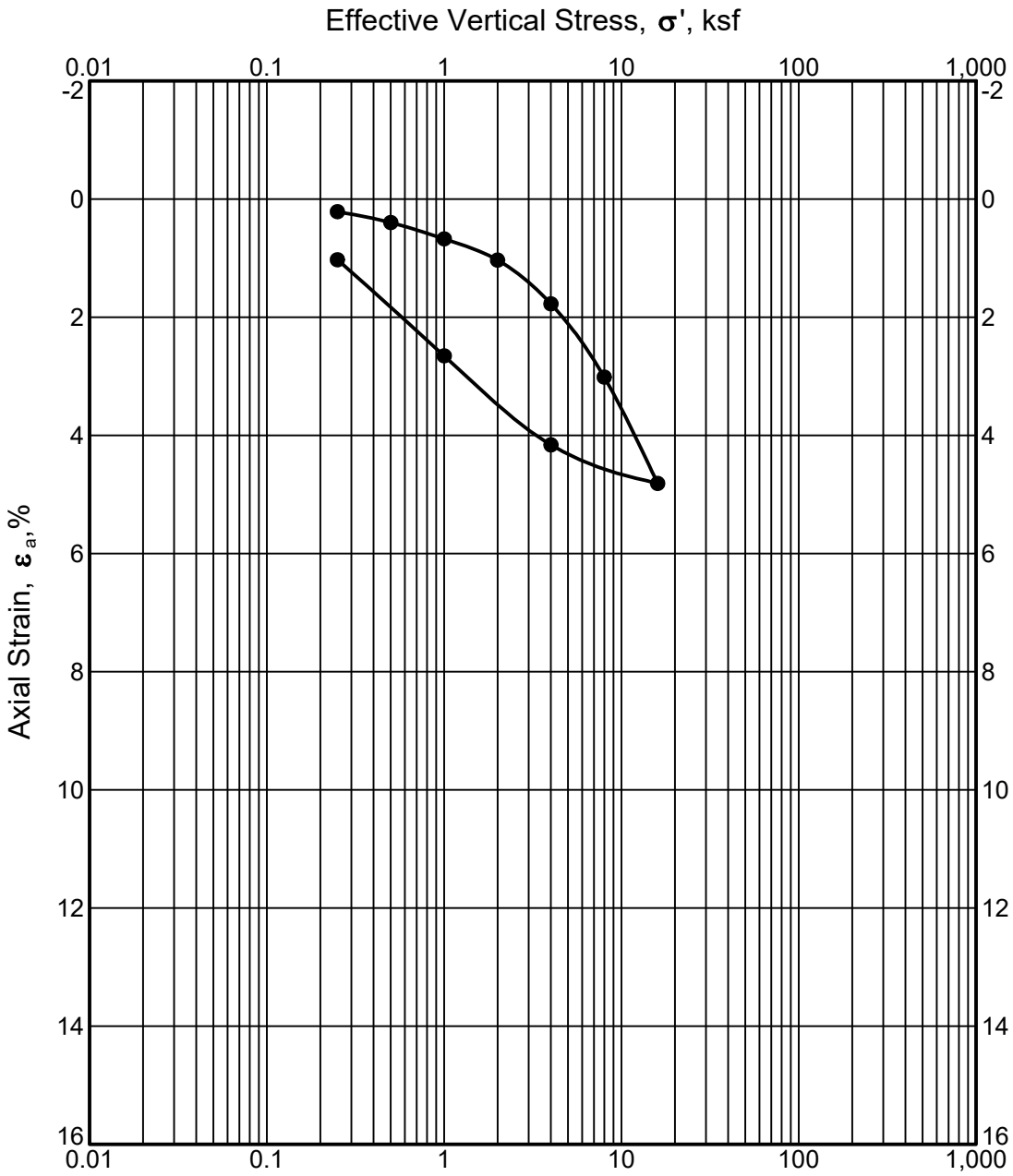

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-167, 4 to 6 FEET

MATERIAL: FILL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 21.71
INITIAL DRY DENSITY: 101.6 pcf
INITIAL VOID RATIO: 0.66
INITIAL DEGREE OF SATURATION: 88.5
SPECIFIC GRAVITY: 2.71 (assumed)

FINAL WATER CONTENT: 23.88
FINAL DRY DENSITY: 102.7 pcf
FINAL VOID RATIO: 0.65
FINAL DEGREE OF SATURATION: 100%
LL = 40; PL = 18; PI = 22

FIGURE B-327

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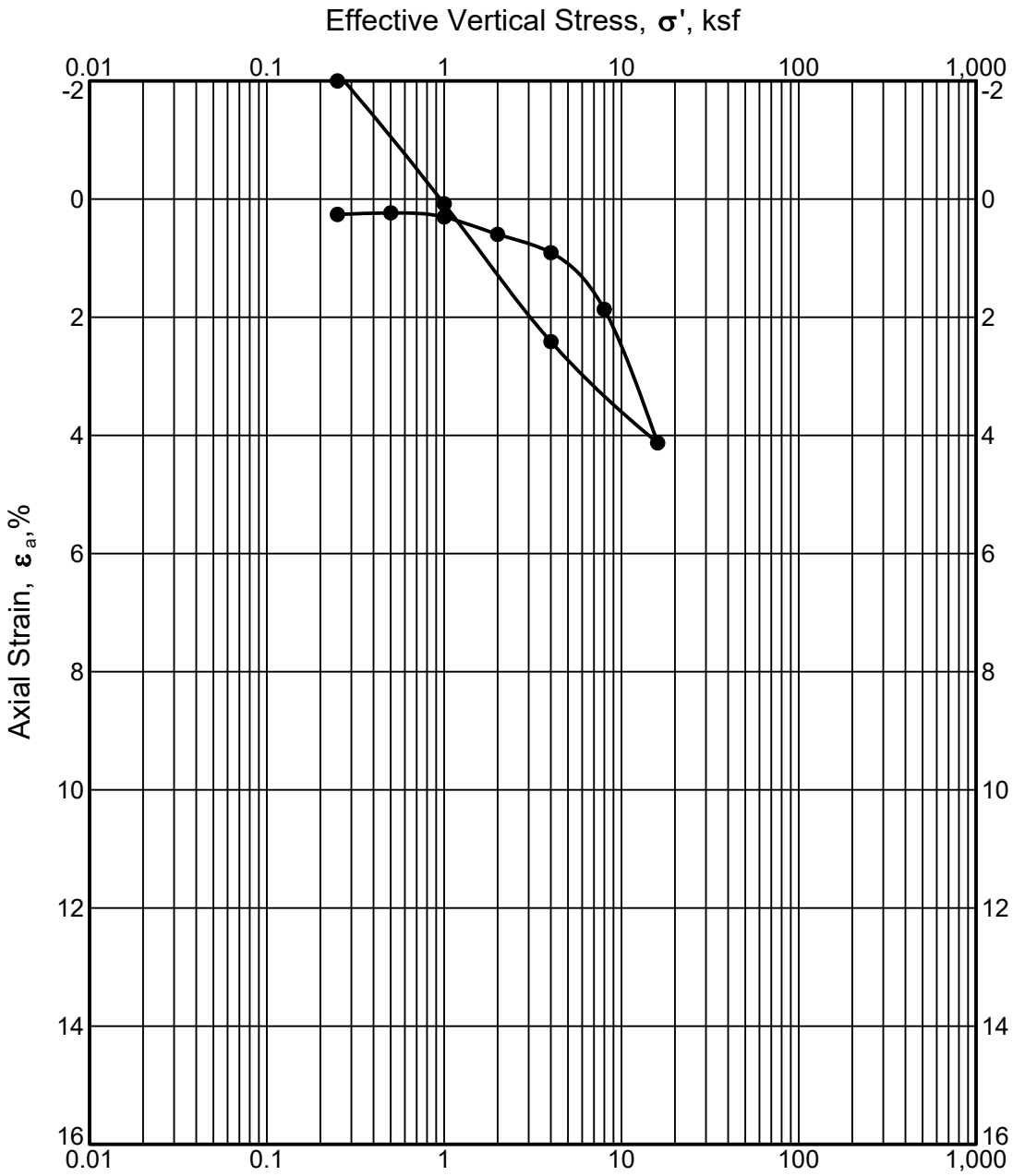

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-170, 2 to 4 FEET

MATERIAL: FILL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.57
INITIAL DRY DENSITY: 101.6 pcf
INITIAL VOID RATIO: 0.73
INITIAL DEGREE OF SATURATION: 90.7
SPECIFIC GRAVITY: 2.82 (assumed)

FINAL WATER CONTENT: 27.31
FINAL DRY DENSITY: 99.5 pcf
FINAL VOID RATIO: 0.77
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-328

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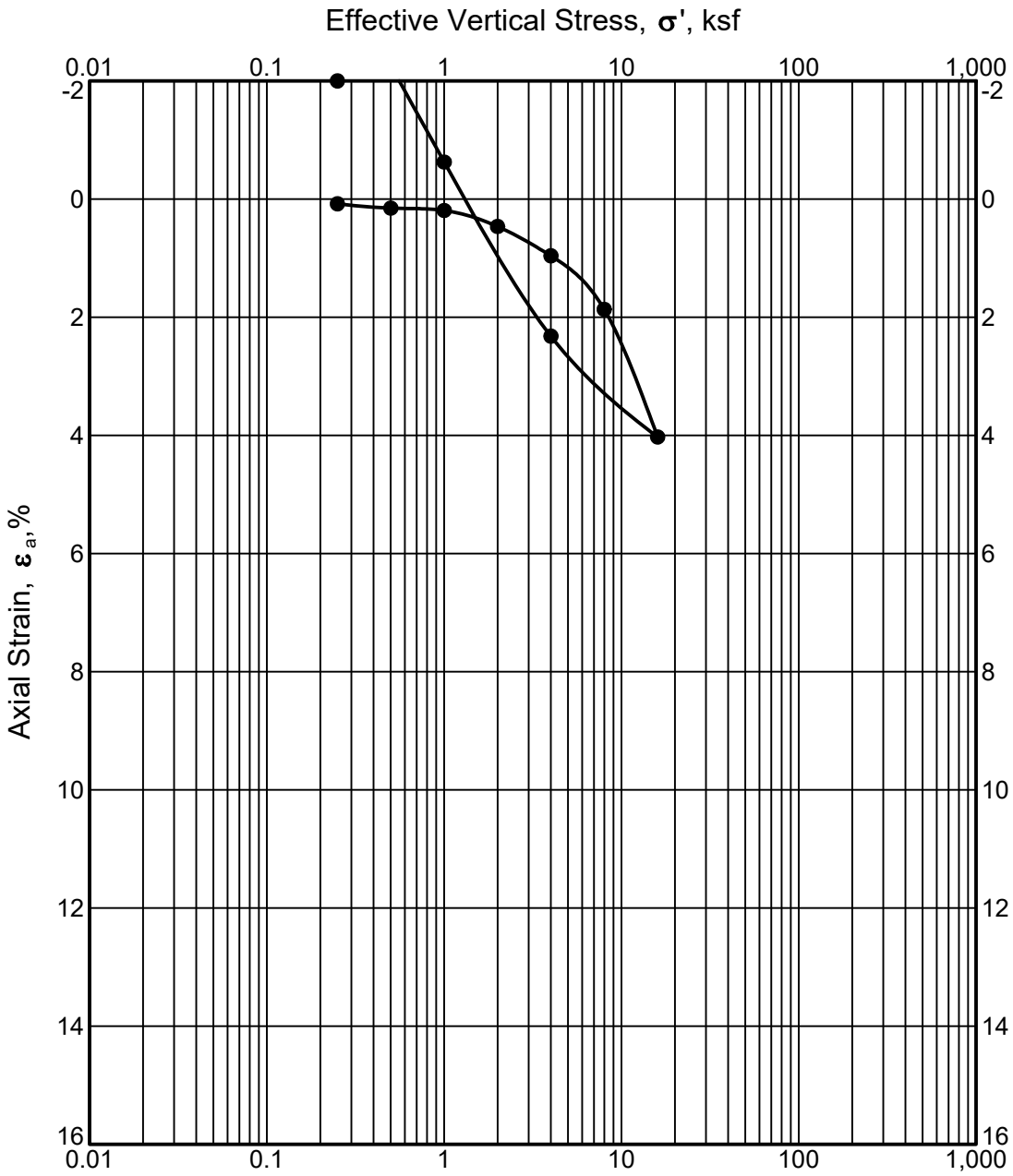
PROJECT AMA08-115-00



ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-175, 6 to 8 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 23.99
INITIAL DRY DENSITY: 103.1 pcf
INITIAL VOID RATIO: 0.72
INITIAL DEGREE OF SATURATION: 94.9
SPECIFIC GRAVITY: 2.84 (assumed)

FINAL WATER CONTENT: 27.63
FINAL DRY DENSITY: 99.3 pcf
FINAL VOID RATIO: 0.78
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-329

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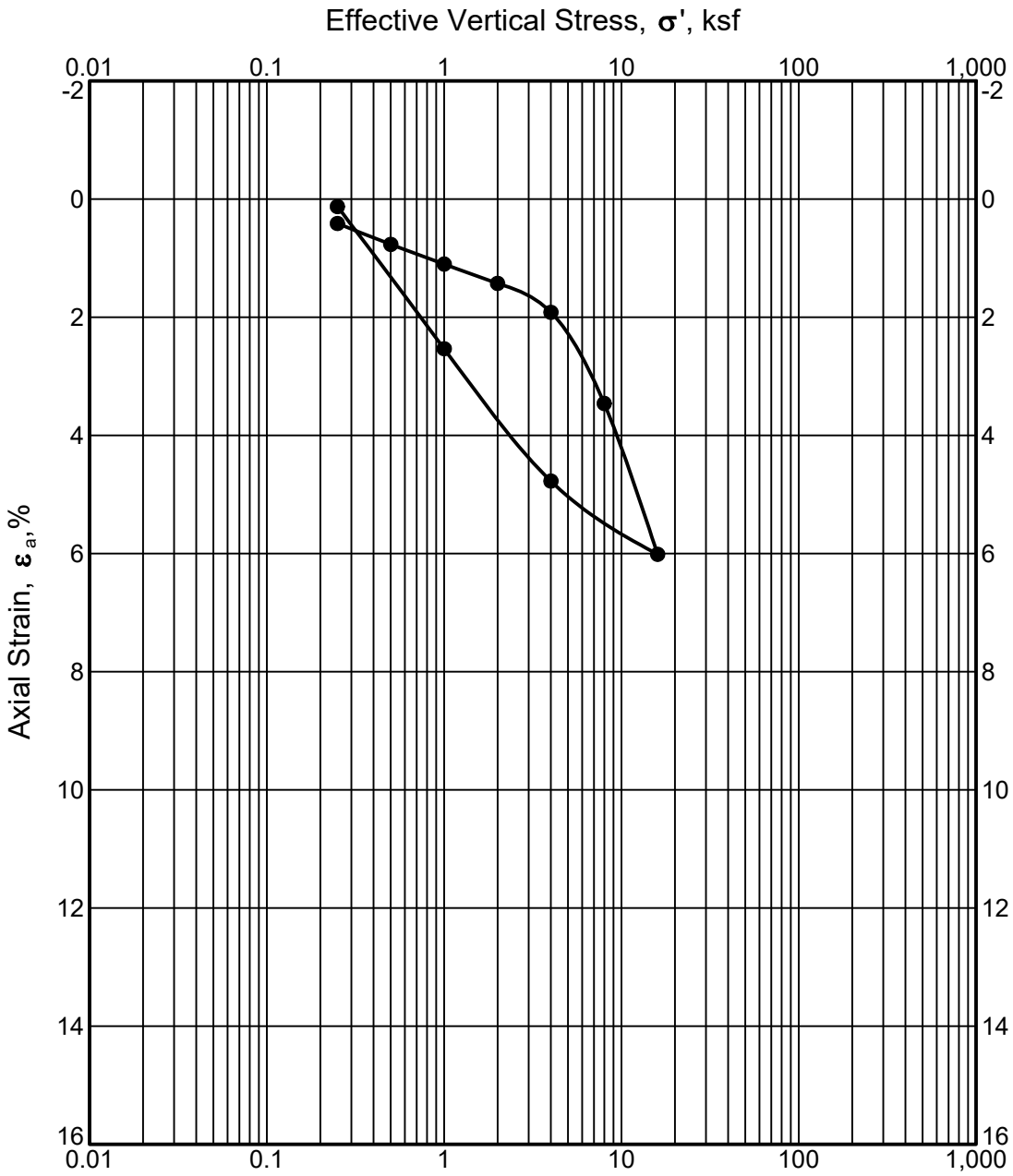
PROJECT AMA08-115-00



ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-181, 2 to 4 FEET

MATERIAL: FILL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 22.62
INITIAL DRY DENSITY: 101.4 pcf
INITIAL VOID RATIO: 0.77
INITIAL DEGREE OF SATURATION: 84.8
SPECIFIC GRAVITY: 2.87 (assumed)

FINAL WATER CONTENT: 26.60
FINAL DRY DENSITY: 101.6 pcf
FINAL VOID RATIO: 0.76
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-330

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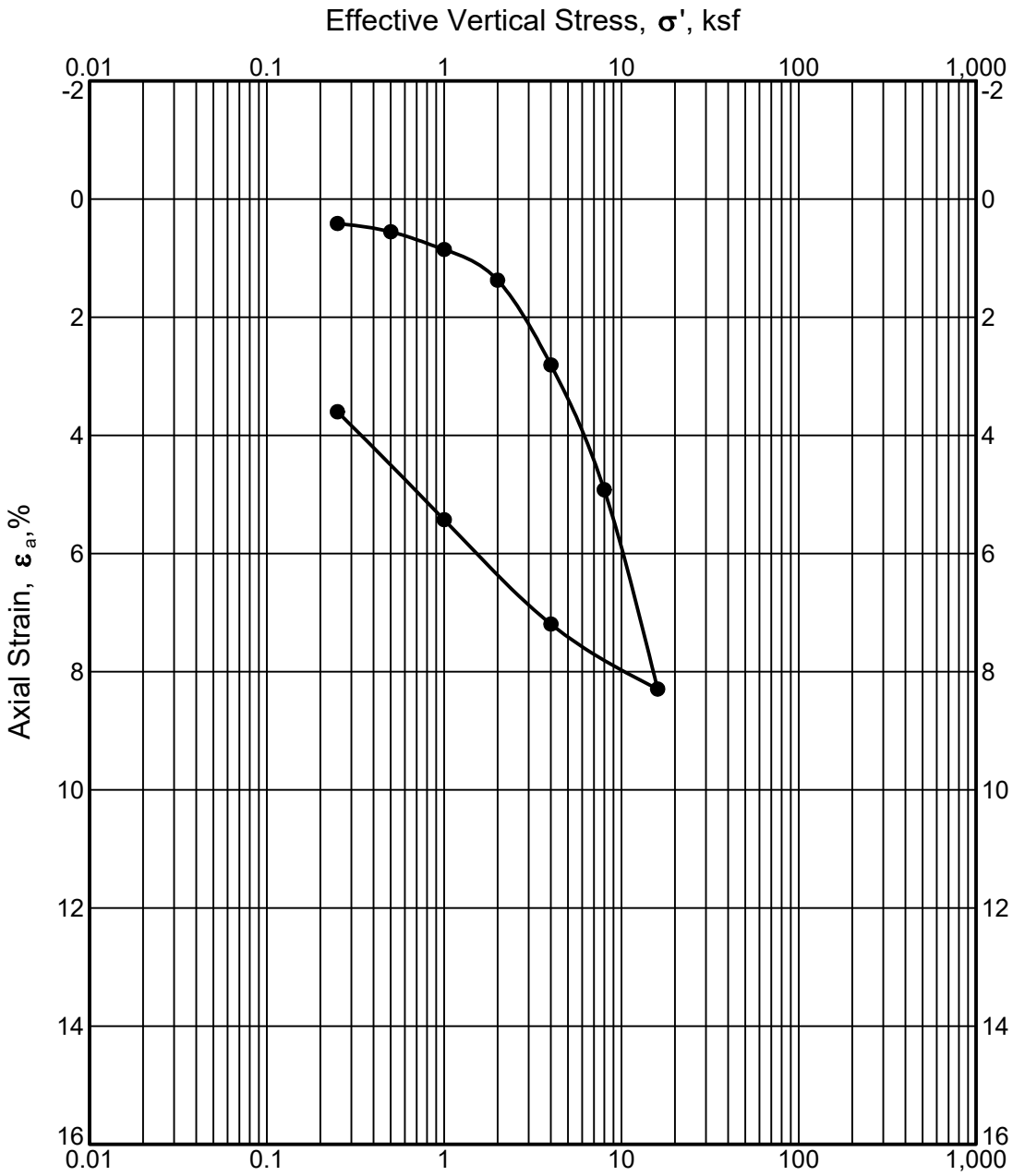
PROJECT AMA08-115-00



ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-187, 10 to 12 FEET

MATERIAL: CLAY LEAN (CL)
INITIAL WATER CONTENT: 23.08
INITIAL DRY DENSITY: 99.2 pcf
INITIAL VOID RATIO: 0.71
INITIAL DEGREE OF SATURATION: 88.2
SPECIFIC GRAVITY: 2.72 (assumed)

FINAL WATER CONTENT: 23.90
FINAL DRY DENSITY: 102.9 pcf
FINAL VOID RATIO: 0.65
FINAL DEGREE OF SATURATION: 100%
LL = 48; PL = 18; PI = 30

FIGURE B-331

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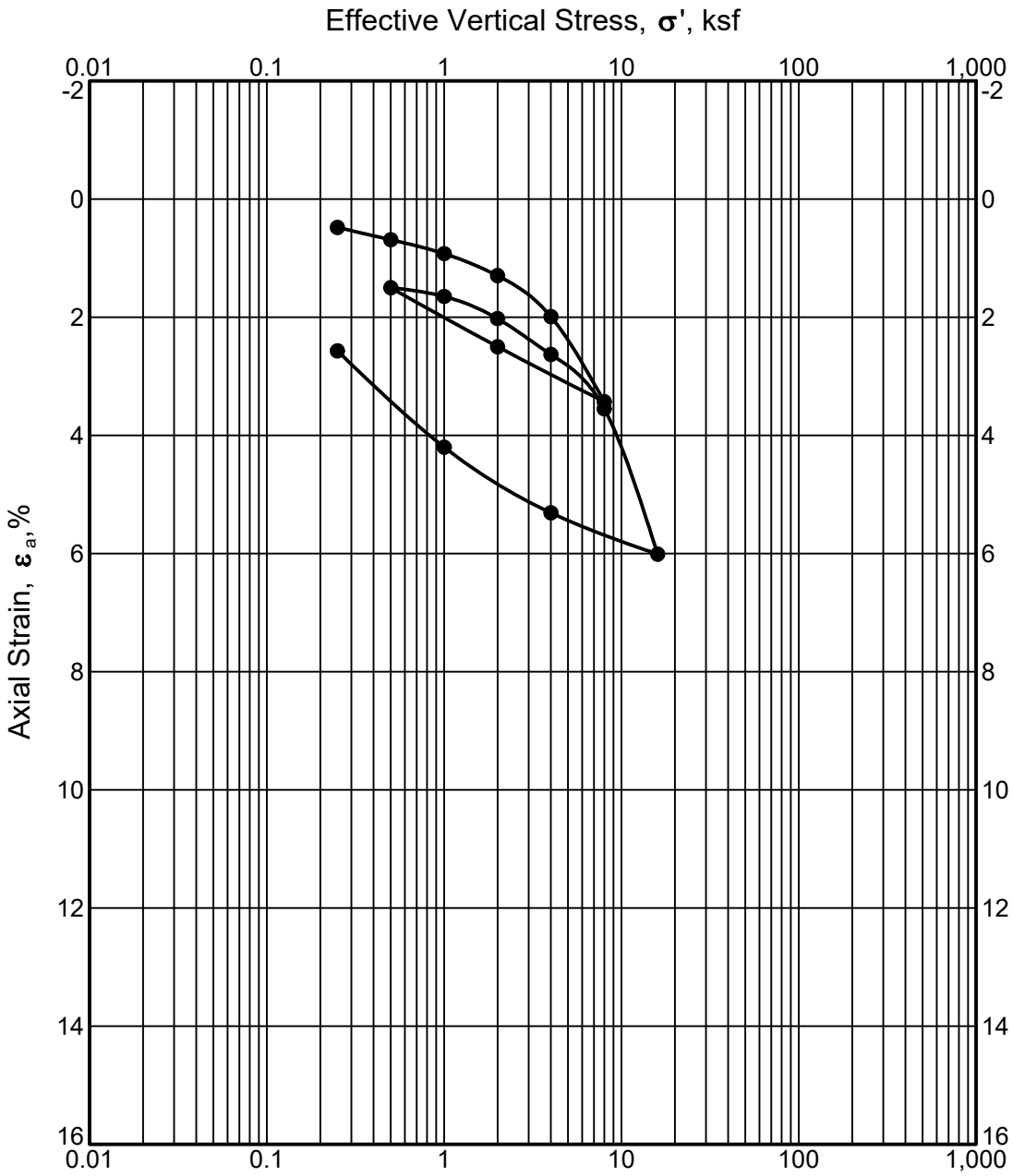
PROJECT AMA08-115-00



ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-197, 4 to 6 FEET

MATERIAL: FILL: FAT CLAY (CH)
INITIAL WATER CONTENT: 24.51
INITIAL DRY DENSITY: 99.0 pcf
INITIAL VOID RATIO: 0.72
INITIAL DEGREE OF SATURATION: 93.0
SPECIFIC GRAVITY: 2.73 (assumed)

FINAL WATER CONTENT: 24.17
FINAL DRY DENSITY: 102.6 pcf
FINAL VOID RATIO: 0.66
FINAL DEGREE OF SATURATION: 100%
LL = 55; PL = 20; PI = 35

FIGURE B-332

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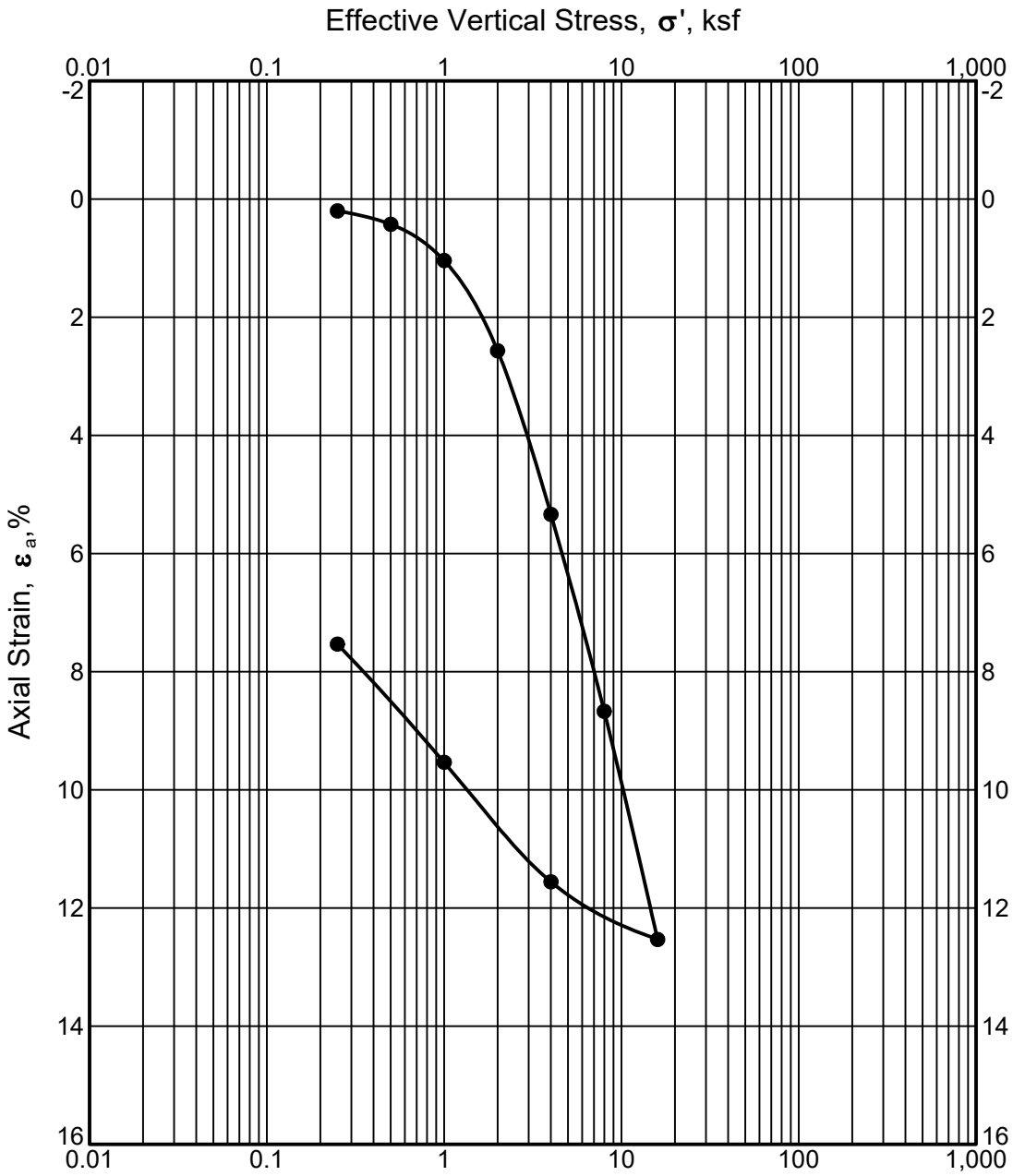

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-204, 10 to 12 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 28.75
INITIAL DRY DENSITY: 91.3 pcf
INITIAL VOID RATIO: 0.95
INITIAL DEGREE OF SATURATION: 86.3
SPECIFIC GRAVITY: 2.86 (assumed)

FINAL WATER CONTENT: 28.23
FINAL DRY DENSITY: 98.8 pcf
FINAL VOID RATIO: 0.81
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-333

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VERTICAL STRESS VS. STRAIN

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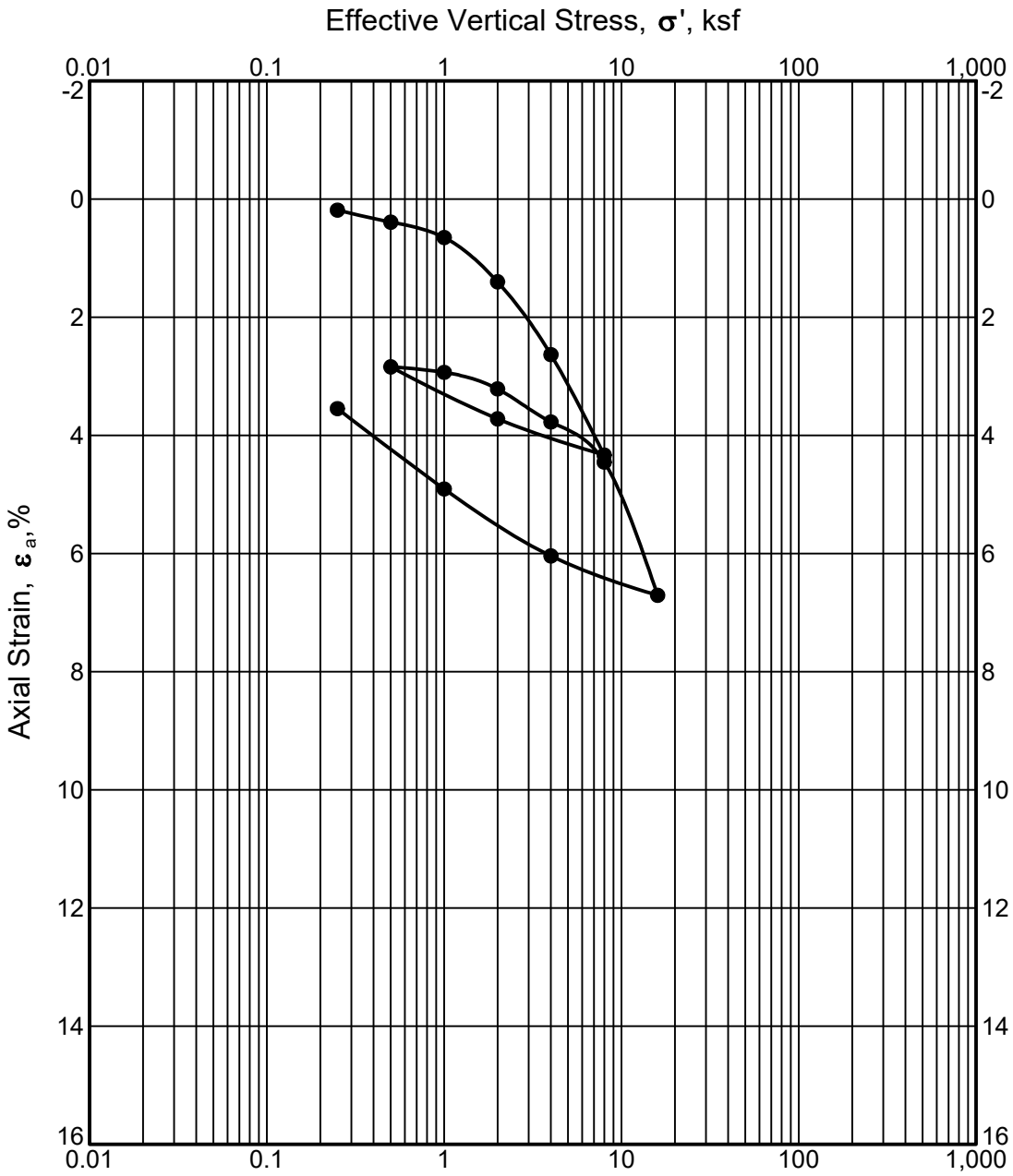

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-215, 8 to 10 FEET

MATERIAL: CLAY LEAN (CL)
INITIAL WATER CONTENT: 20.82
INITIAL DRY DENSITY: 105.6 pcf
INITIAL VOID RATIO: 0.58
INITIAL DEGREE OF SATURATION: 96.3
SPECIFIC GRAVITY: 2.67 (assumed)

FINAL WATER CONTENT: 19.50
FINAL DRY DENSITY: 109.6 pcf
FINAL VOID RATIO: 0.52
FINAL DEGREE OF SATURATION: 100%
LL = 41; PL = 18; PI = 23

FIGURE B-334

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VERTICAL STRESS VS. STRAIN

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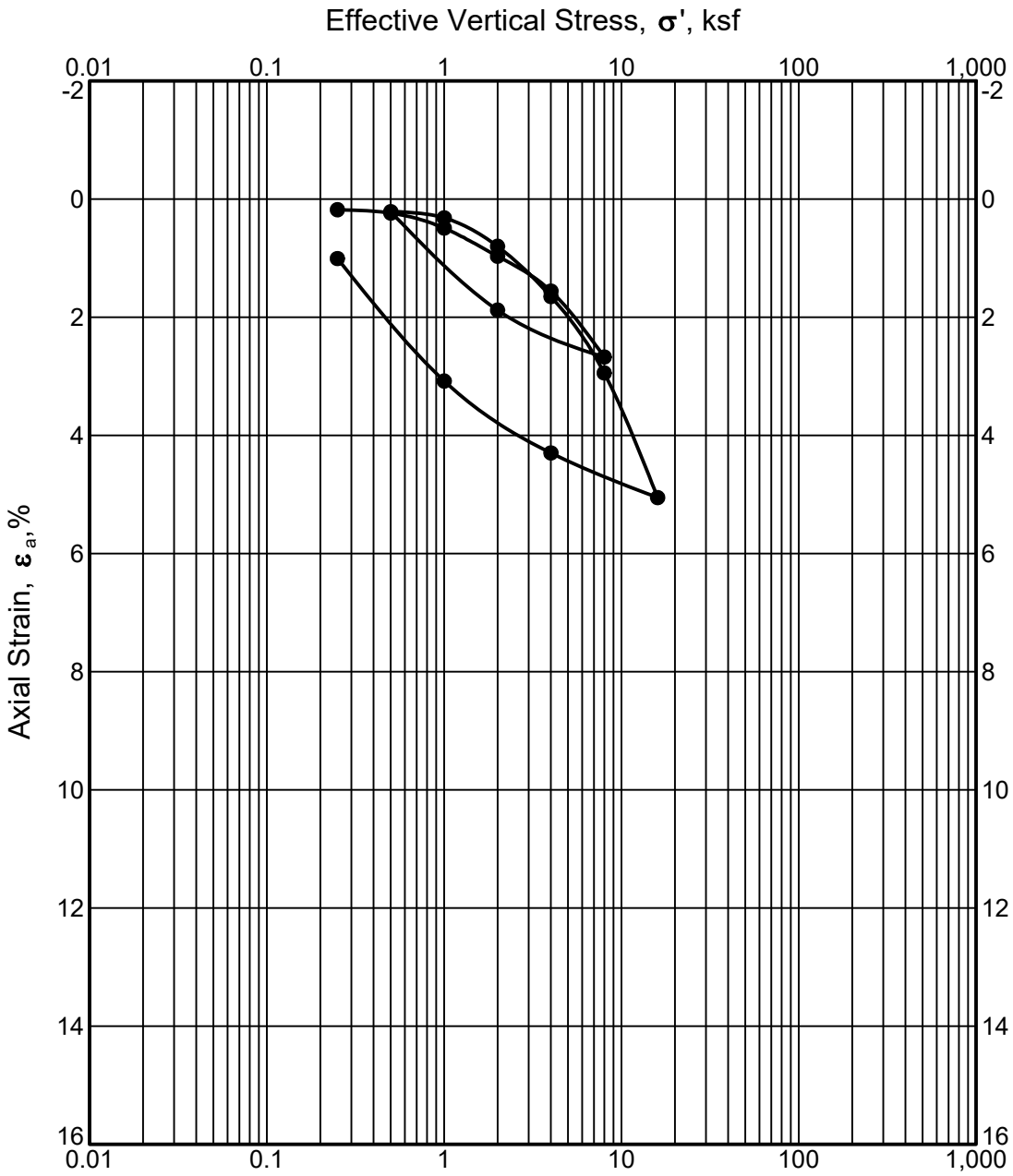

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-218, 4 to 6 FEET

MATERIAL: CLAY LEAN (CL)
INITIAL WATER CONTENT: 17.30
INITIAL DRY DENSITY: 106.4 pcf
INITIAL VOID RATIO: 0.60
INITIAL DEGREE OF SATURATION: 79.0
SPECIFIC GRAVITY: 2.72 (assumed)

FINAL WATER CONTENT: 21.28
FINAL DRY DENSITY: 107.6 pcf
FINAL VOID RATIO: 0.58
FINAL DEGREE OF SATURATION: 100%
LL = 53; PL = 19; PI = 34

FIGURE B-335

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VERTICAL STRESS VS. STRAIN

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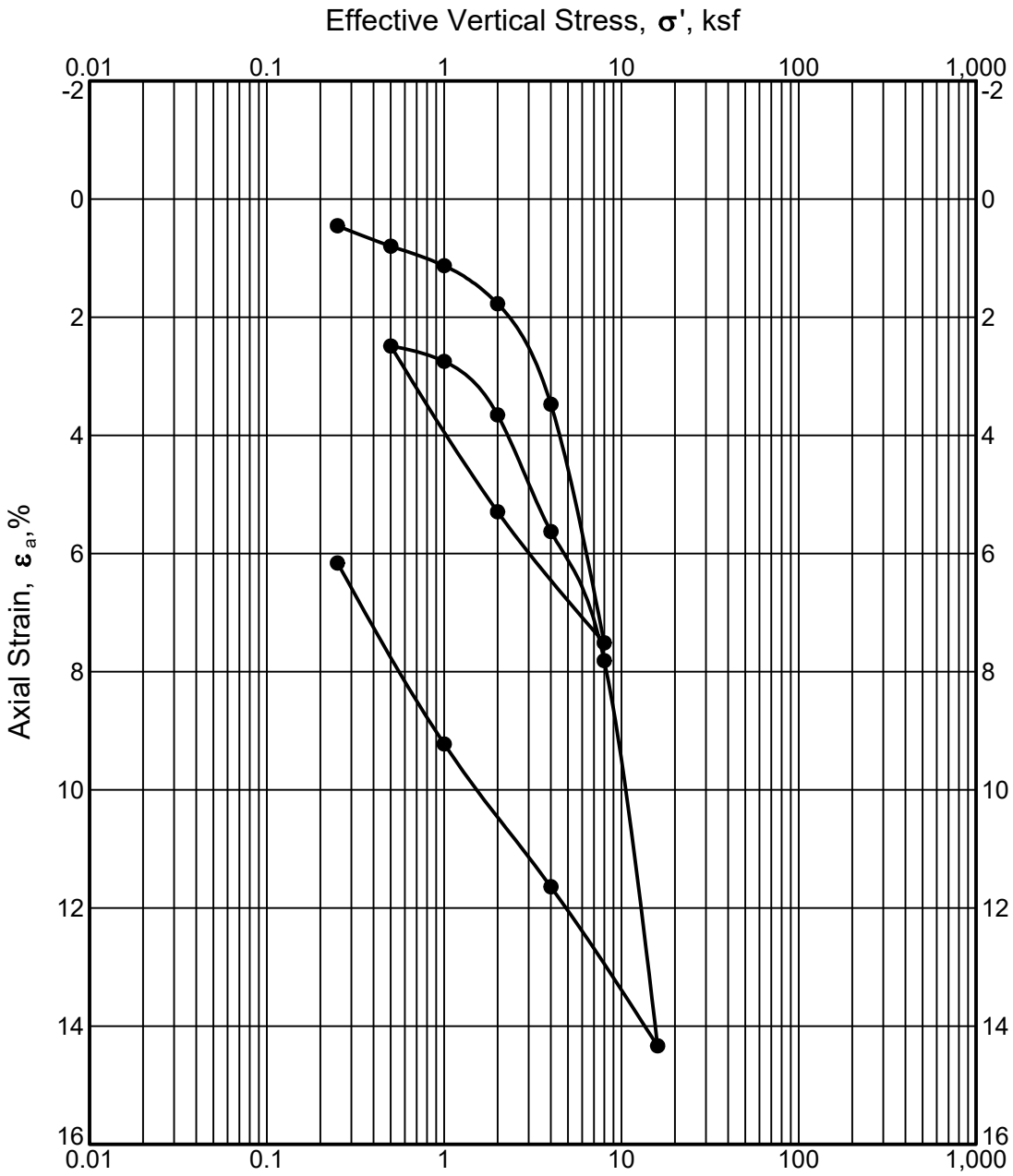

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-221, 8 to 10 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 32.95
INITIAL DRY DENSITY: 88.1 pcf
INITIAL VOID RATIO: 1.04
INITIAL DEGREE OF SATURATION: 91.3
SPECIFIC GRAVITY: 2.88 (assumed)

FINAL WATER CONTENT: 31.74
FINAL DRY DENSITY: 93.9 pcf
FINAL VOID RATIO: 0.91
FINAL DEGREE OF SATURATION: 100%
LL = 76; PL = 23; PI = 53

FIGURE B-336

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VERTICAL STRESS VS. STRAIN

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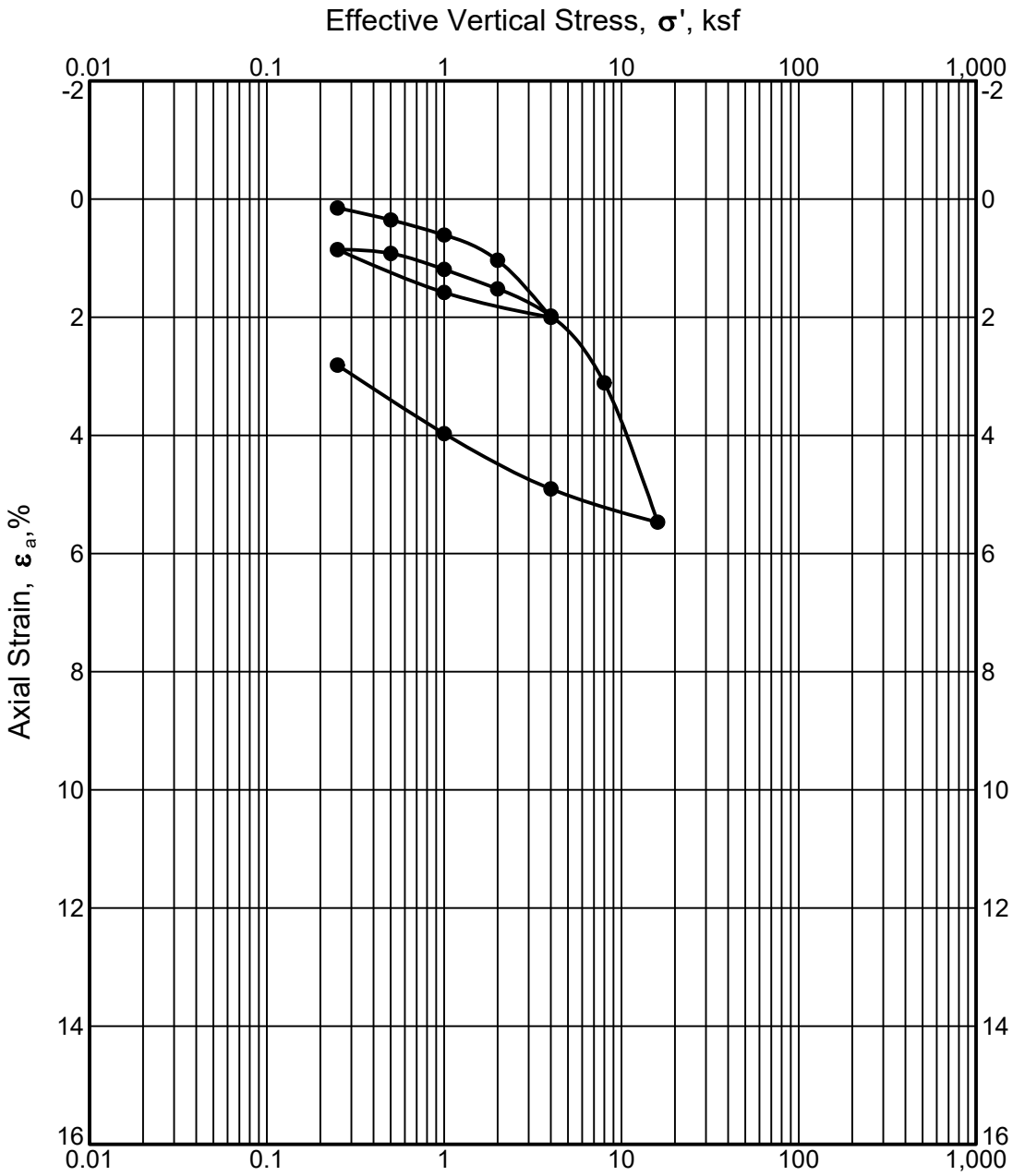

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-225, 10 to 12 FEET

MATERIAL: CLAY LEAN (CL)
INITIAL WATER CONTENT: 18.78
INITIAL DRY DENSITY: 108.7 pcf
INITIAL VOID RATIO: 0.52
INITIAL DEGREE OF SATURATION: 96.6
SPECIFIC GRAVITY: 2.68 (assumed)

FINAL WATER CONTENT: 17.98
FINAL DRY DENSITY: 112.8 pcf
FINAL VOID RATIO: 0.48
FINAL DEGREE OF SATURATION: 100%
LL = 50; PL = 16; PI = 34

FIGURE B-337

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VERTICAL STRESS VS. STRAIN

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Cameron County, Texas

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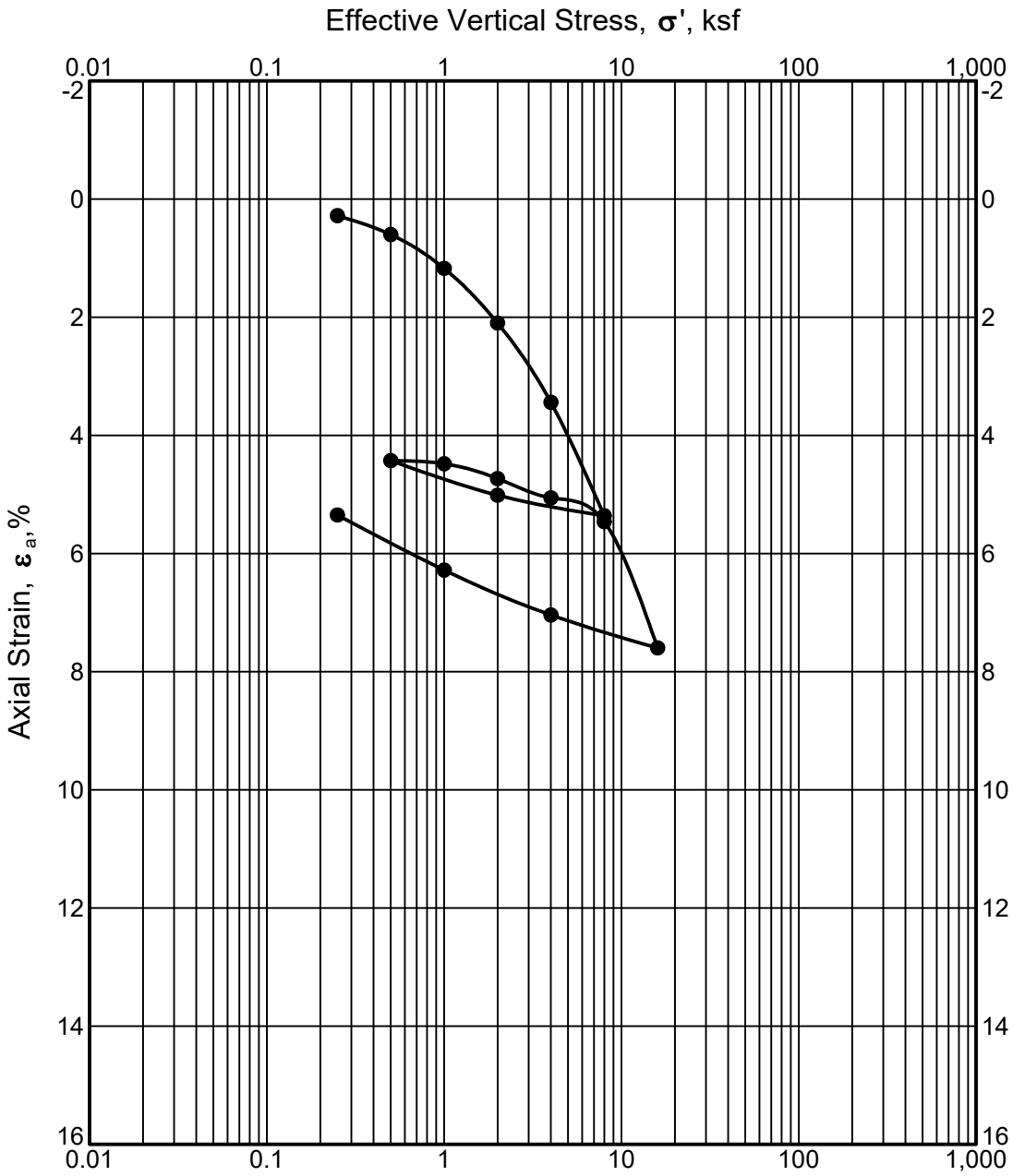

ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-231, 4 to 6 FEET

MATERIAL: FILL: LEAN CLAY (CL)
INITIAL WATER CONTENT: 12.15
INITIAL DRY DENSITY: 104.0 pcf
INITIAL VOID RATIO: 0.59
INITIAL DEGREE OF SATURATION: 54.9
SPECIFIC GRAVITY: 2.64 (assumed)

FINAL WATER CONTENT: 18.95
FINAL DRY DENSITY: 110.0 pcf
FINAL VOID RATIO: 0.50
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-338

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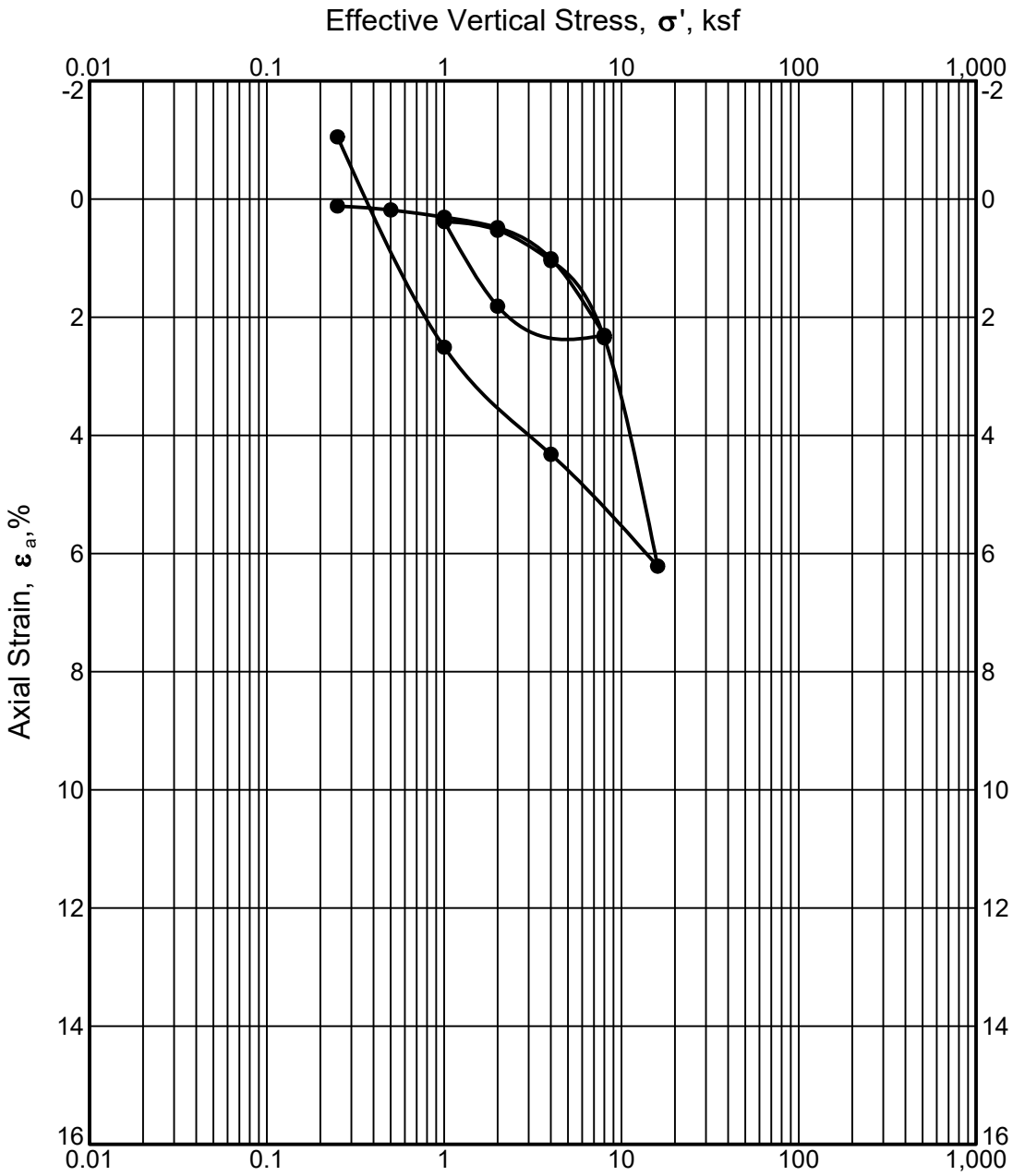
VERTICAL STRESS VS. STRAIN

The Lower Rio Grande Flood Control Project
Cameron County, Texas

PROJECT AMA08-115-00



ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-244, 10 to 12 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 25.89
INITIAL DRY DENSITY: 97.0 pcf
INITIAL VOID RATIO: 0.73
INITIAL DEGREE OF SATURATION: 95.1
SPECIFIC GRAVITY: 2.70 (assumed)

FINAL WATER CONTENT: 27.90
FINAL DRY DENSITY: 96.1 pcf
FINAL VOID RATIO: 0.75
FINAL DEGREE OF SATURATION: 100%
PLASTICITY NOT DETERMINED

FIGURE B-339

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VERTICAL STRESS VS. STRAIN

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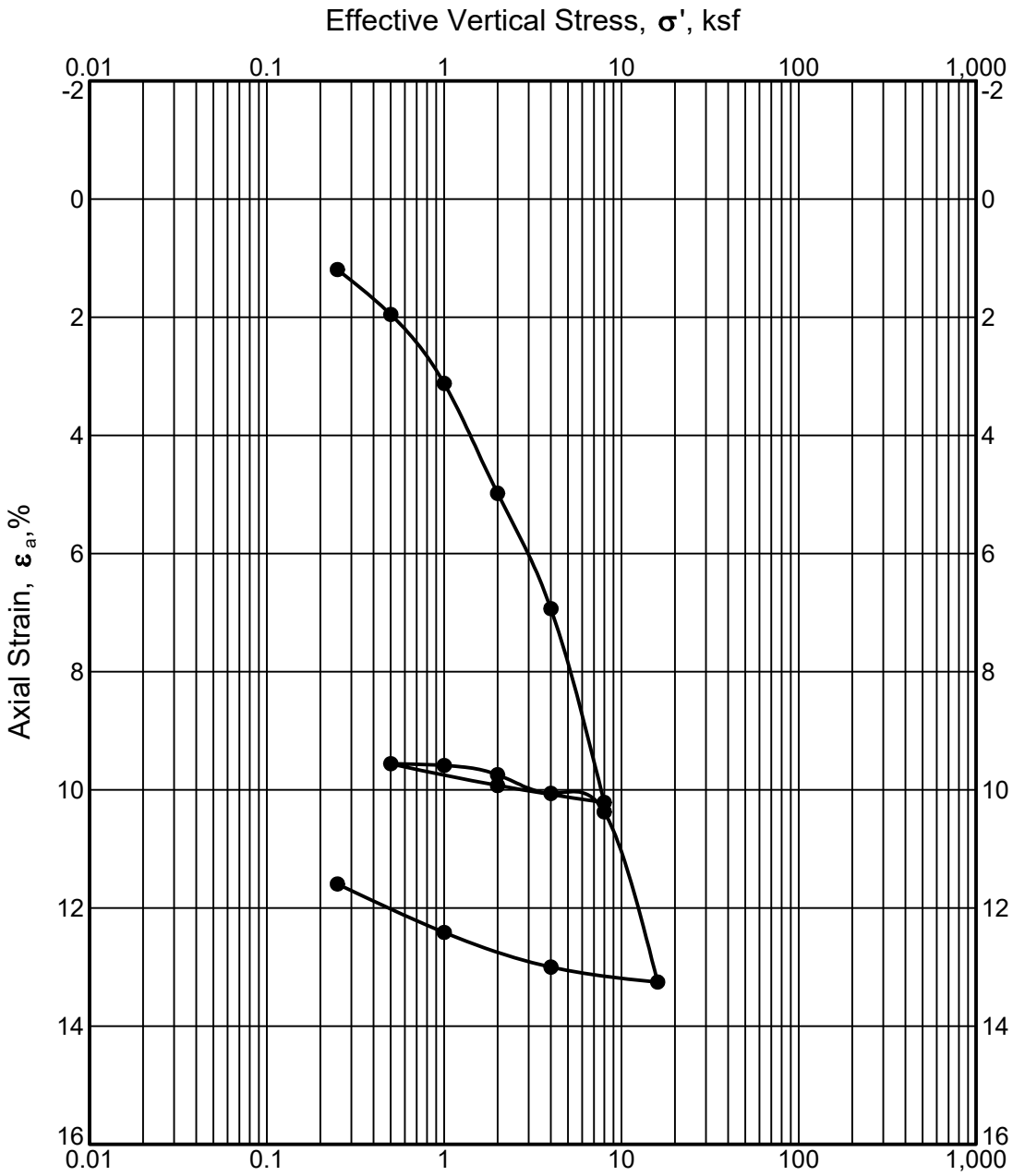
PROJECT AMA08-115-00



ONE-DIMENSIONAL INCREMENTAL CONSOLIDATION TEST RESULTS

BORING DP-270, 10 to 12 FEET

MATERIAL: FAT CLAY (CH)
INITIAL WATER CONTENT: 30.66
INITIAL DRY DENSITY: 90.5 pcf
INITIAL VOID RATIO: 0.83
INITIAL DEGREE OF SATURATION: 97.9
SPECIFIC GRAVITY: 2.66 (assumed)

FINAL WATER CONTENT: 23.33
FINAL DRY DENSITY: 102.4 pcf
FINAL VOID RATIO: 0.62
FINAL DEGREE OF SATURATION: 100%
LL = 37; PL = 22; PI = 15

FIGURE B-340

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VERTICAL STRESS VS. STRAIN

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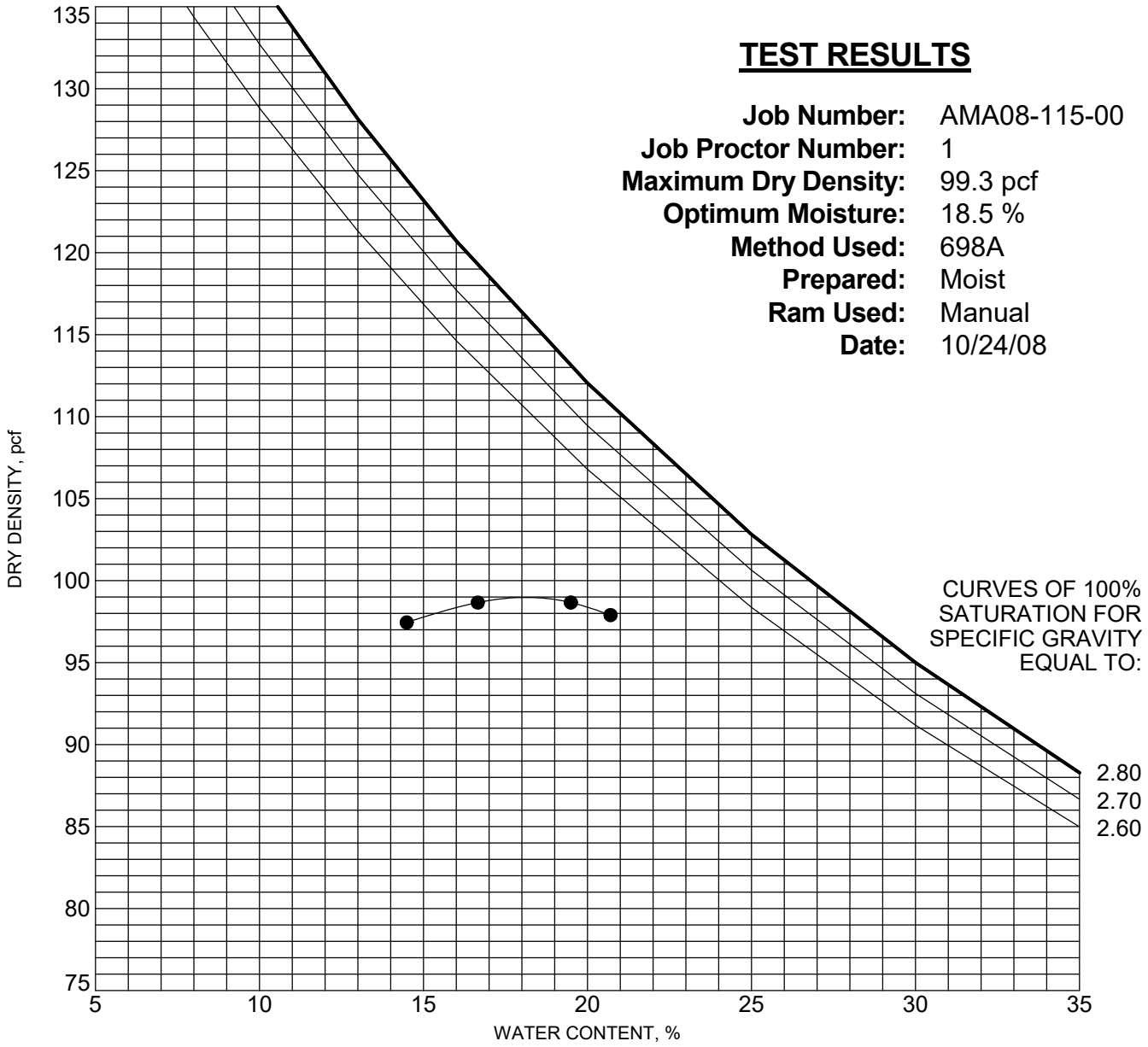

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	1
Maximum Dry Density:	99.3 pcf
Optimum Moisture:	18.5 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	10/24/08

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-342

NOTICE: Raba-Kistner Consultants, Inc. considers the data and information contained in this report to be proprietary. This information is intended only for the use of the recipient(s) named herein. Test results presented herein relate only to those items tested. This document and any information contained herein shall not be disclosed and shall not be duplicated or used in whole or in part for any purpose other than to validate test results without written approval from Raba-Kistner Consultants, Inc.

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MOISTURE-DENSITY RELATIONSHIP

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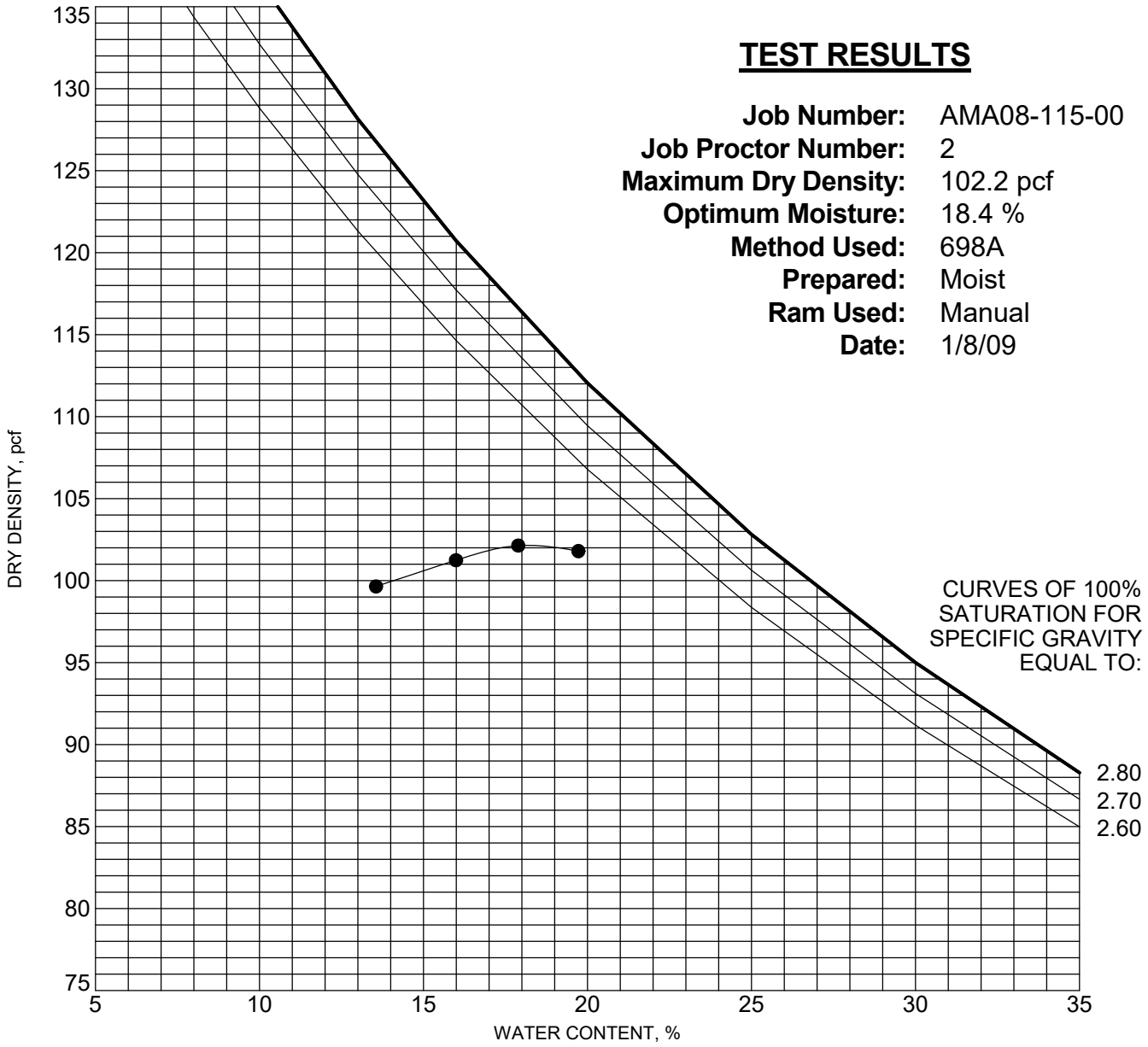
Cameron County, Texas



TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	2
Maximum Dry Density:	102.2 pcf
Optimum Moisture:	18.4 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	1/8/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-343

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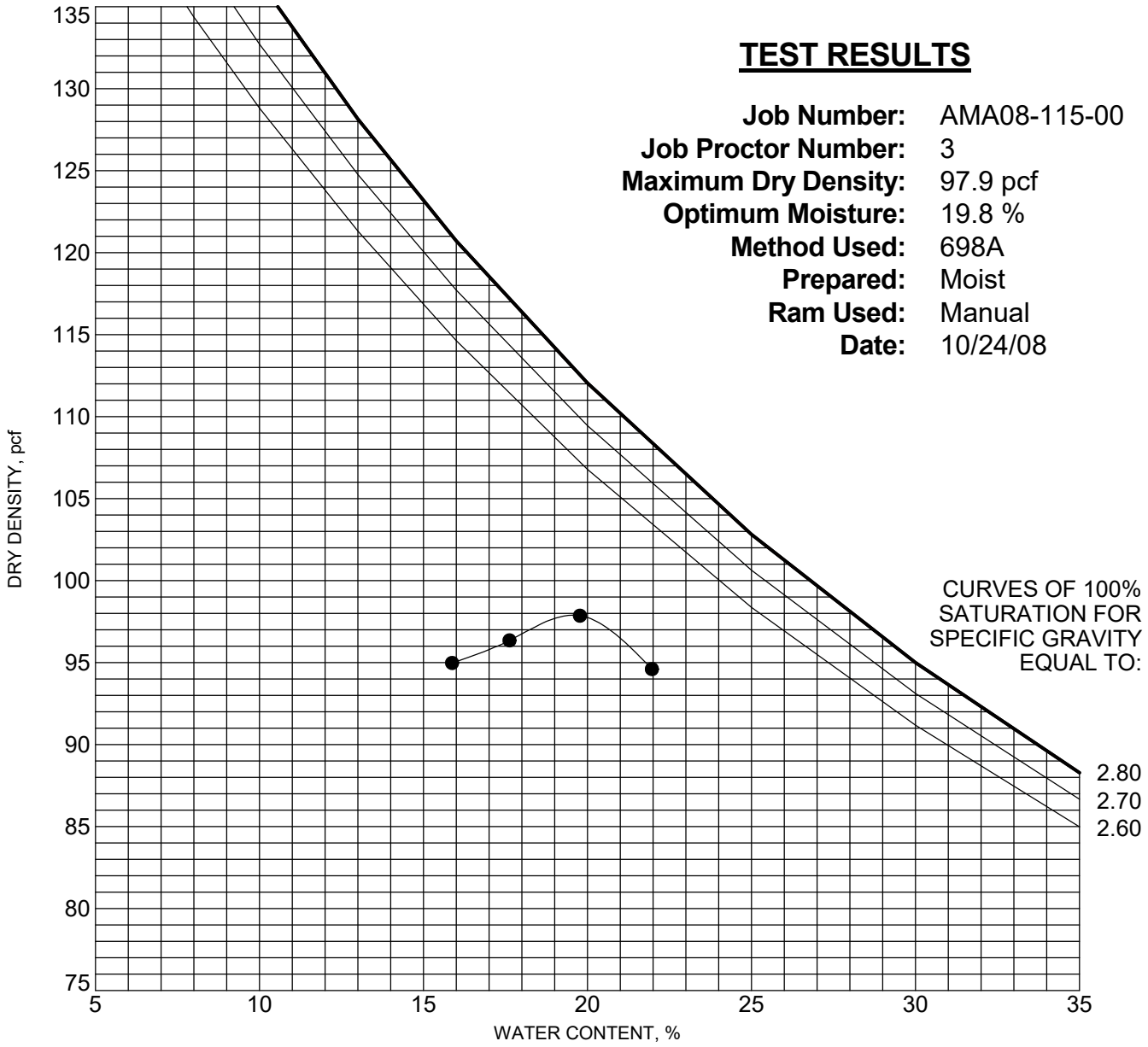
MOISTURE-DENSITY RELATIONSHIP

The Lower Rio Grande Flood Control Project
Cameron County, Texas



TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	3
Maximum Dry Density:	97.9 pcf
Optimum Moisture:	19.8 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	10/24/08

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-344

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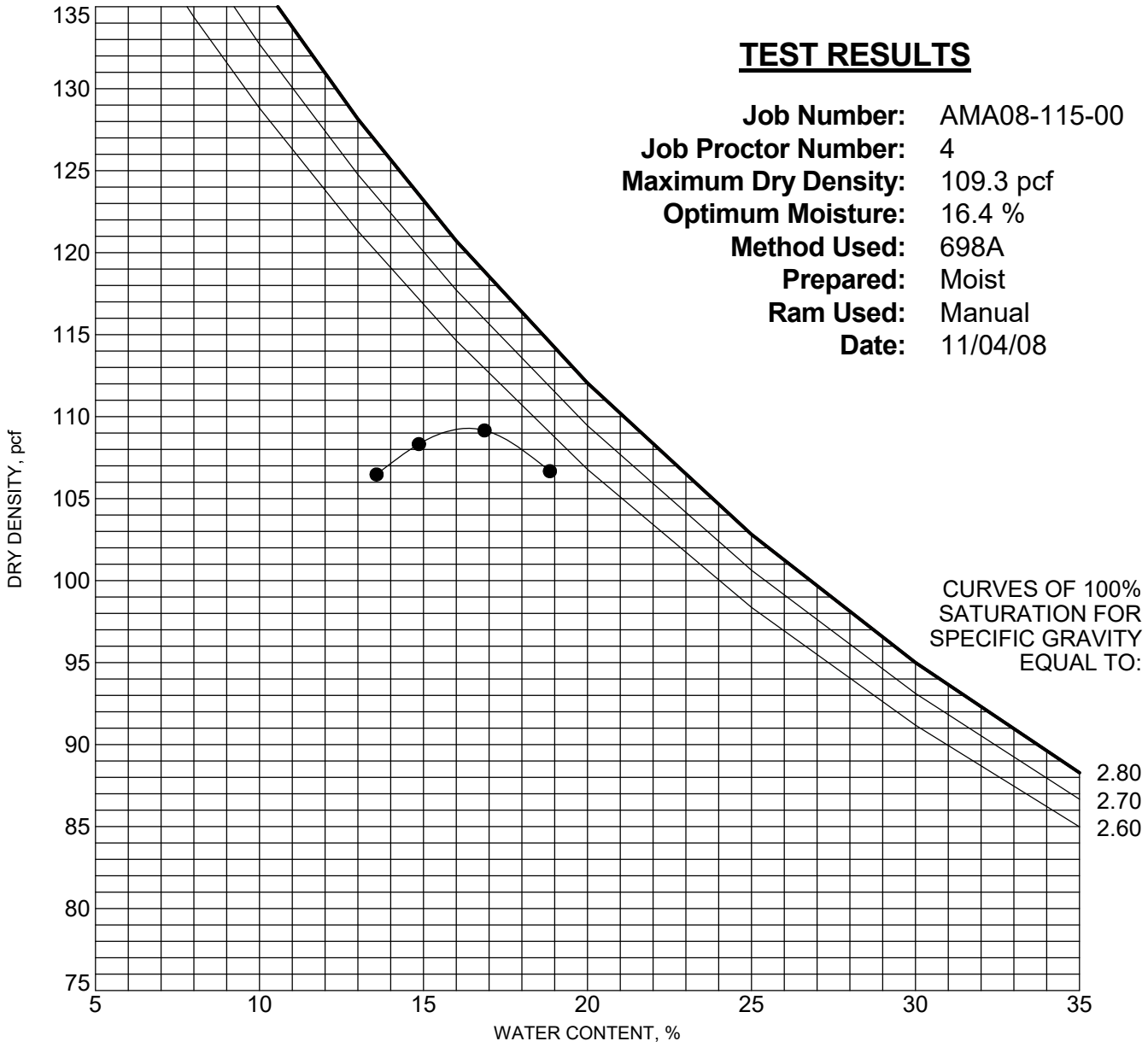

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	4
Maximum Dry Density:	109.3 pcf
Optimum Moisture:	16.4 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	11/04/08

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-345

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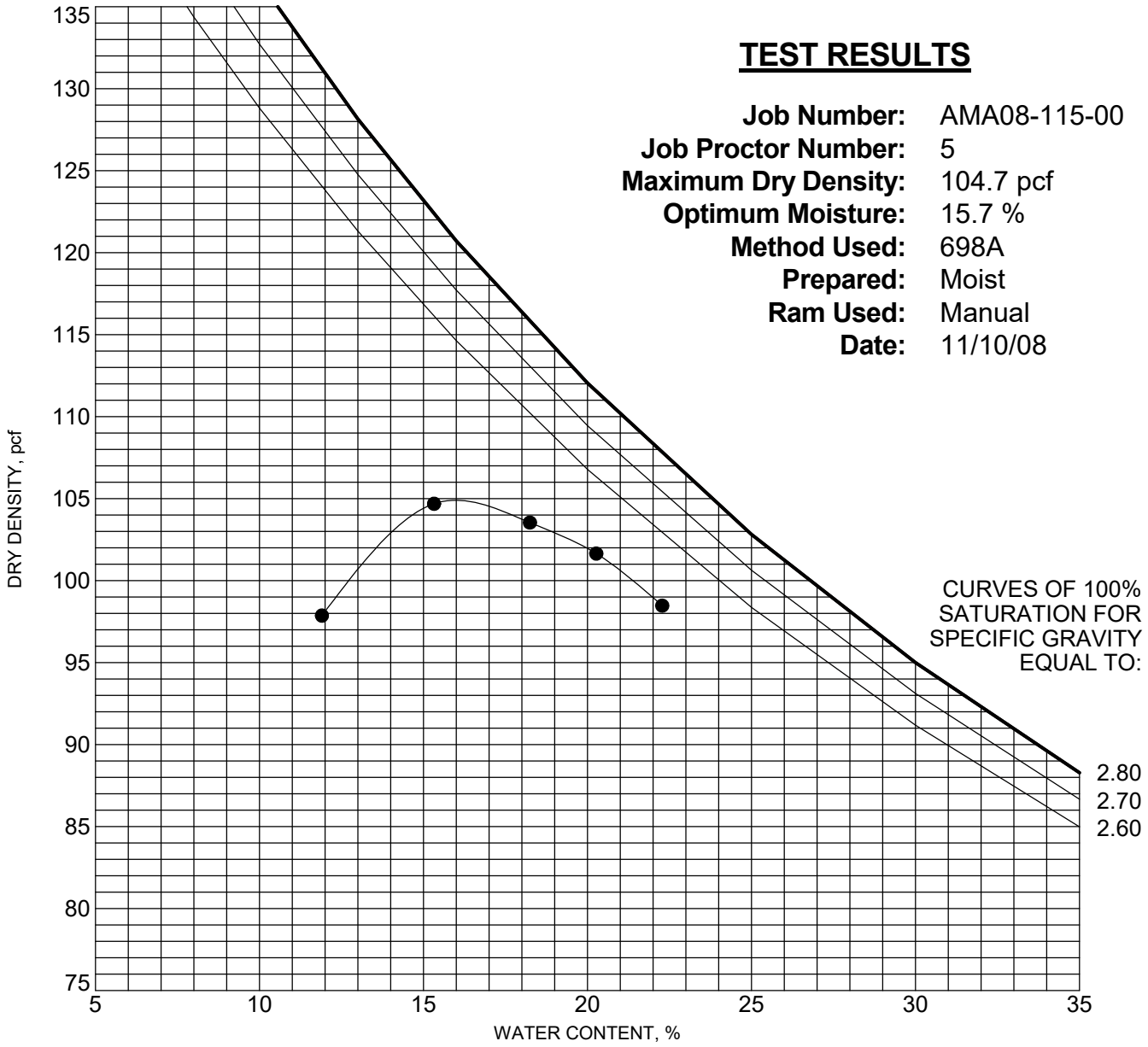

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	5
Maximum Dry Density:	104.7 pcf
Optimum Moisture:	15.7 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	11/10/08

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-346

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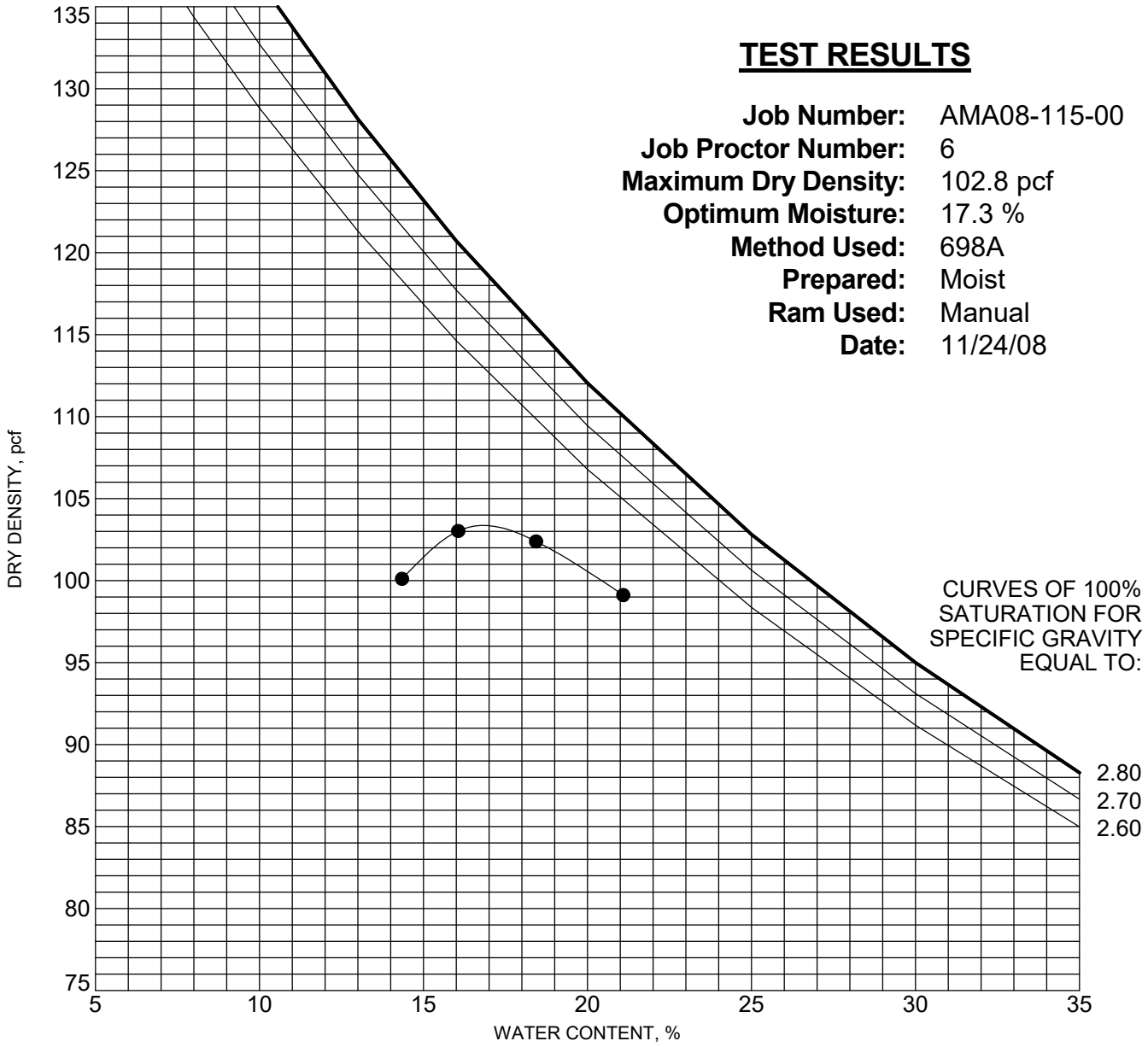

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	6
Maximum Dry Density:	102.8 pcf
Optimum Moisture:	17.3 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	11/24/08

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-347

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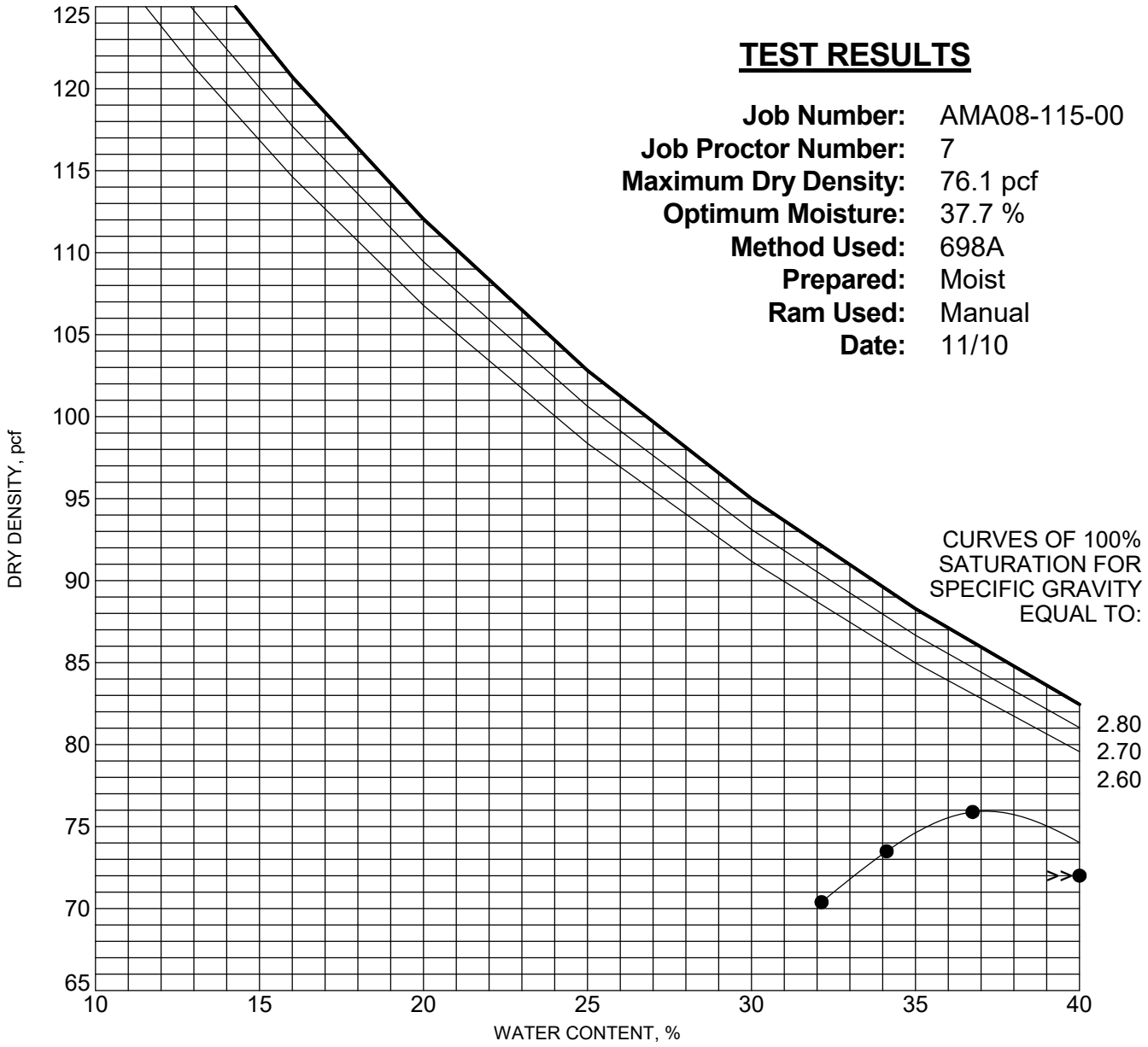

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	7
Maximum Dry Density:	76.1 pcf
Optimum Moisture:	37.7 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	11/10

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-348

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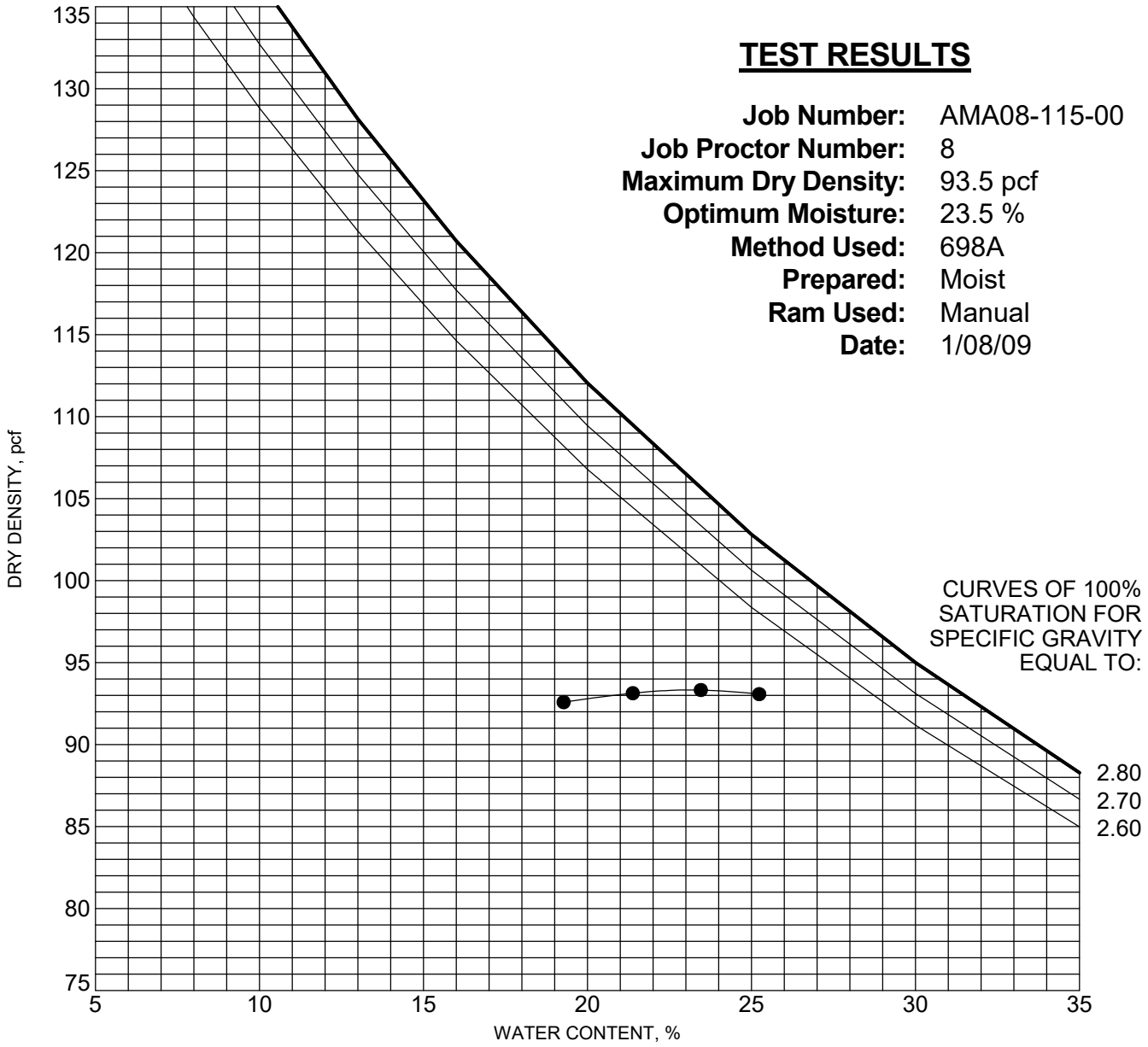

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	8
Maximum Dry Density:	93.5 pcf
Optimum Moisture:	23.5 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	1/08/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-349

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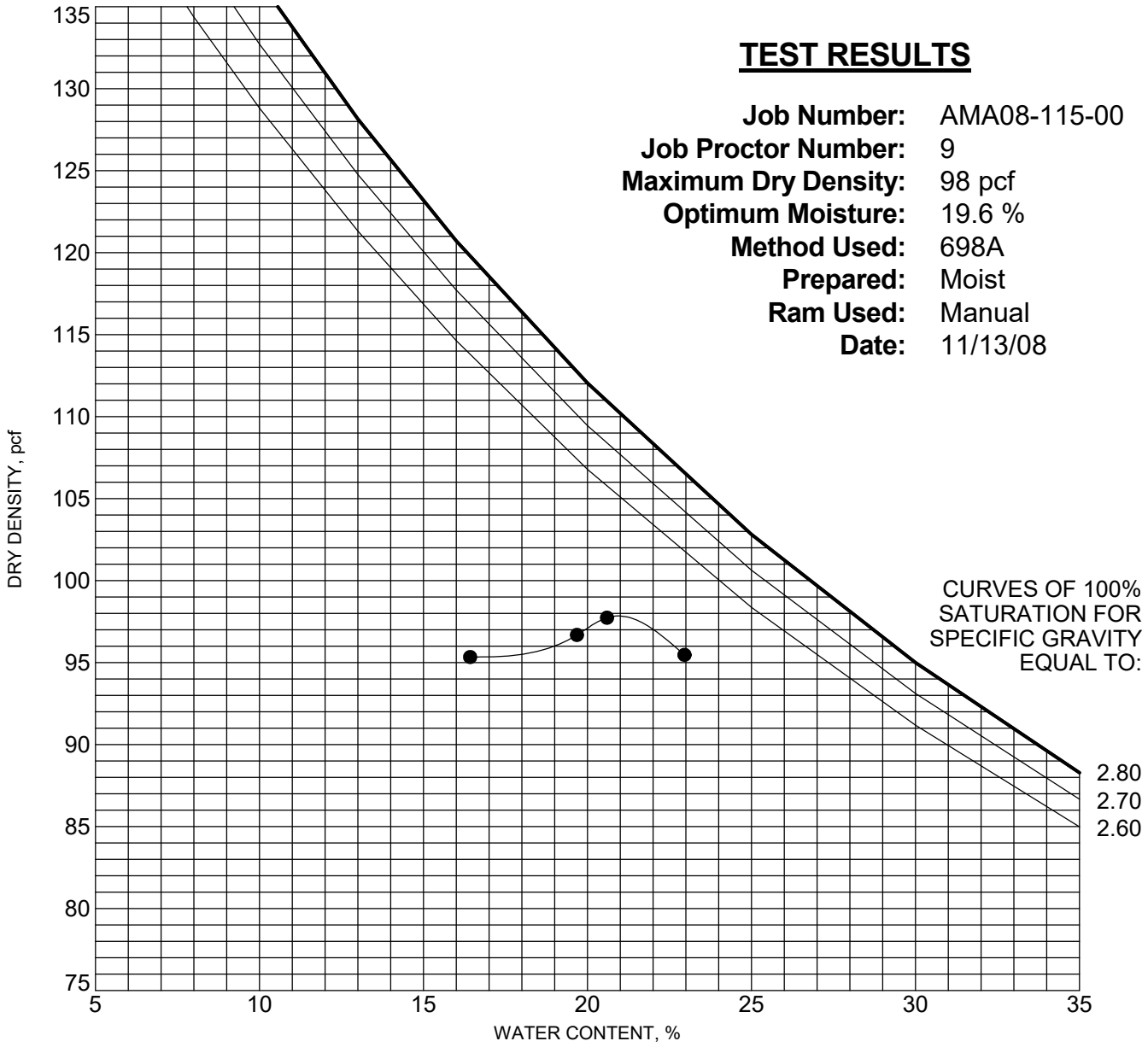

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	9
Maximum Dry Density:	98 pcf
Optimum Moisture:	19.6 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	11/13/08

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-350

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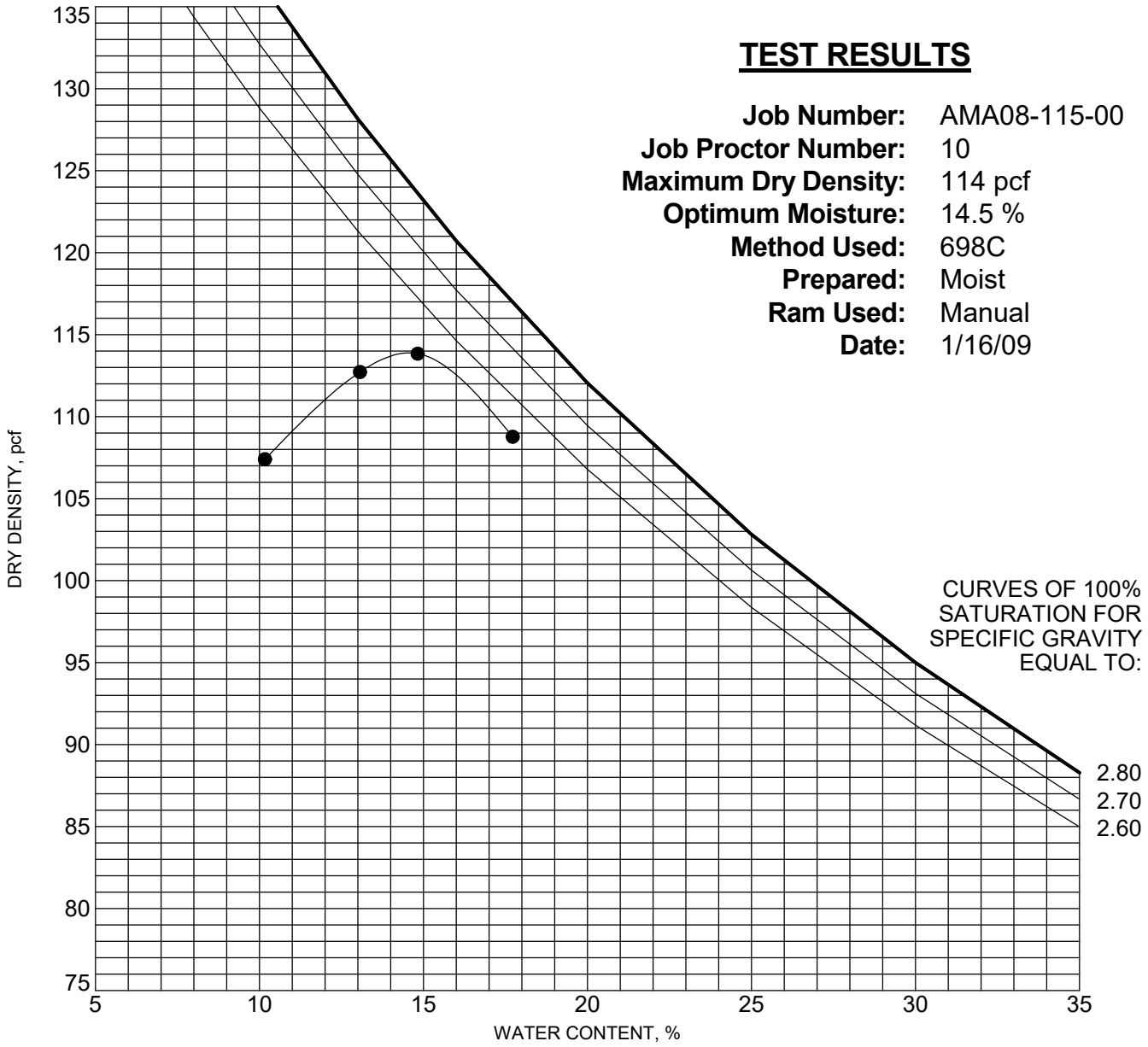

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	10
Maximum Dry Density:	114 pcf
Optimum Moisture:	14.5 %
Method Used:	698C
Prepared:	Moist
Ram Used:	Manual
Date:	1/16/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-351

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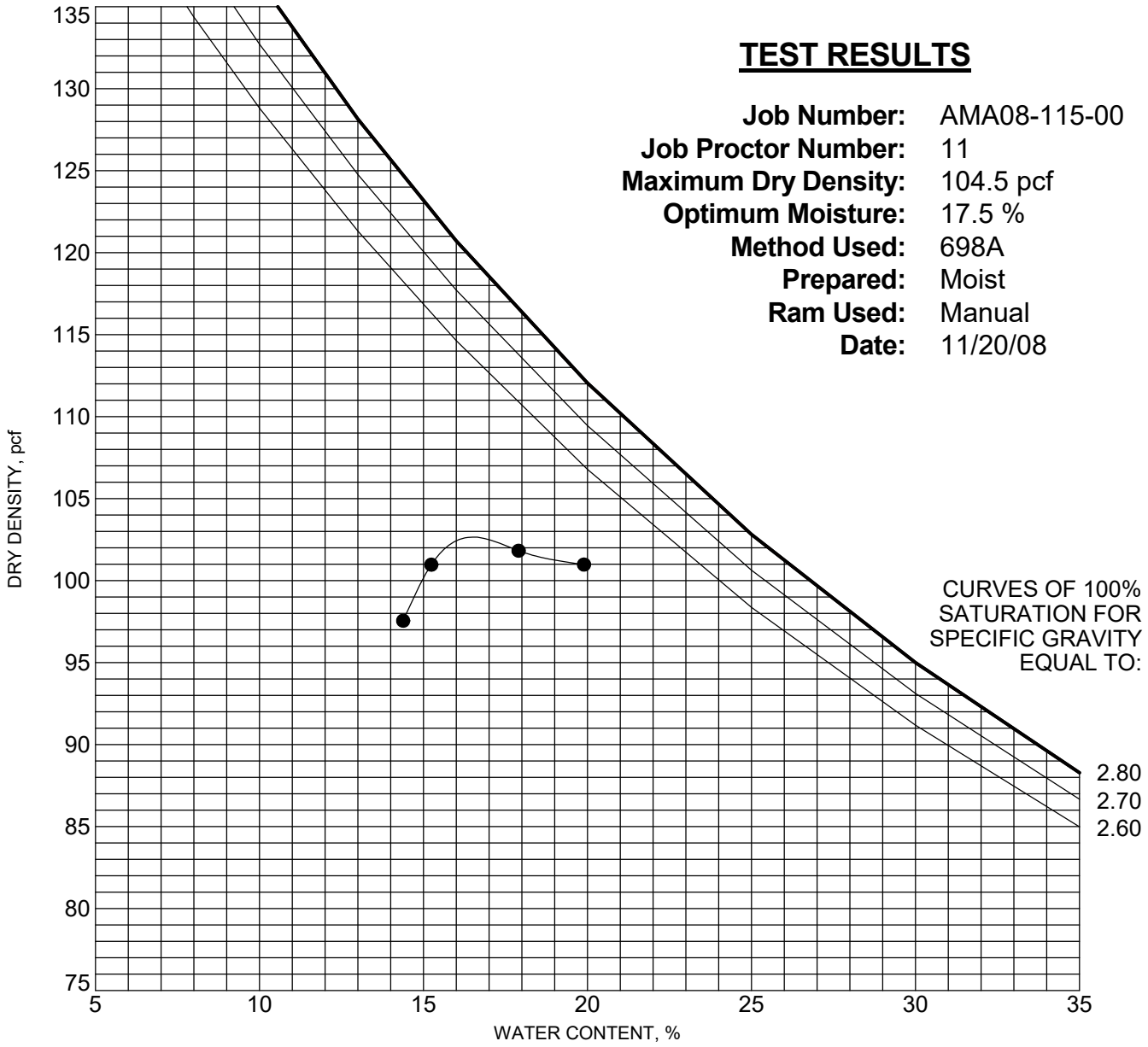

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	11
Maximum Dry Density:	104.5 pcf
Optimum Moisture:	17.5 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	11/20/08

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-352

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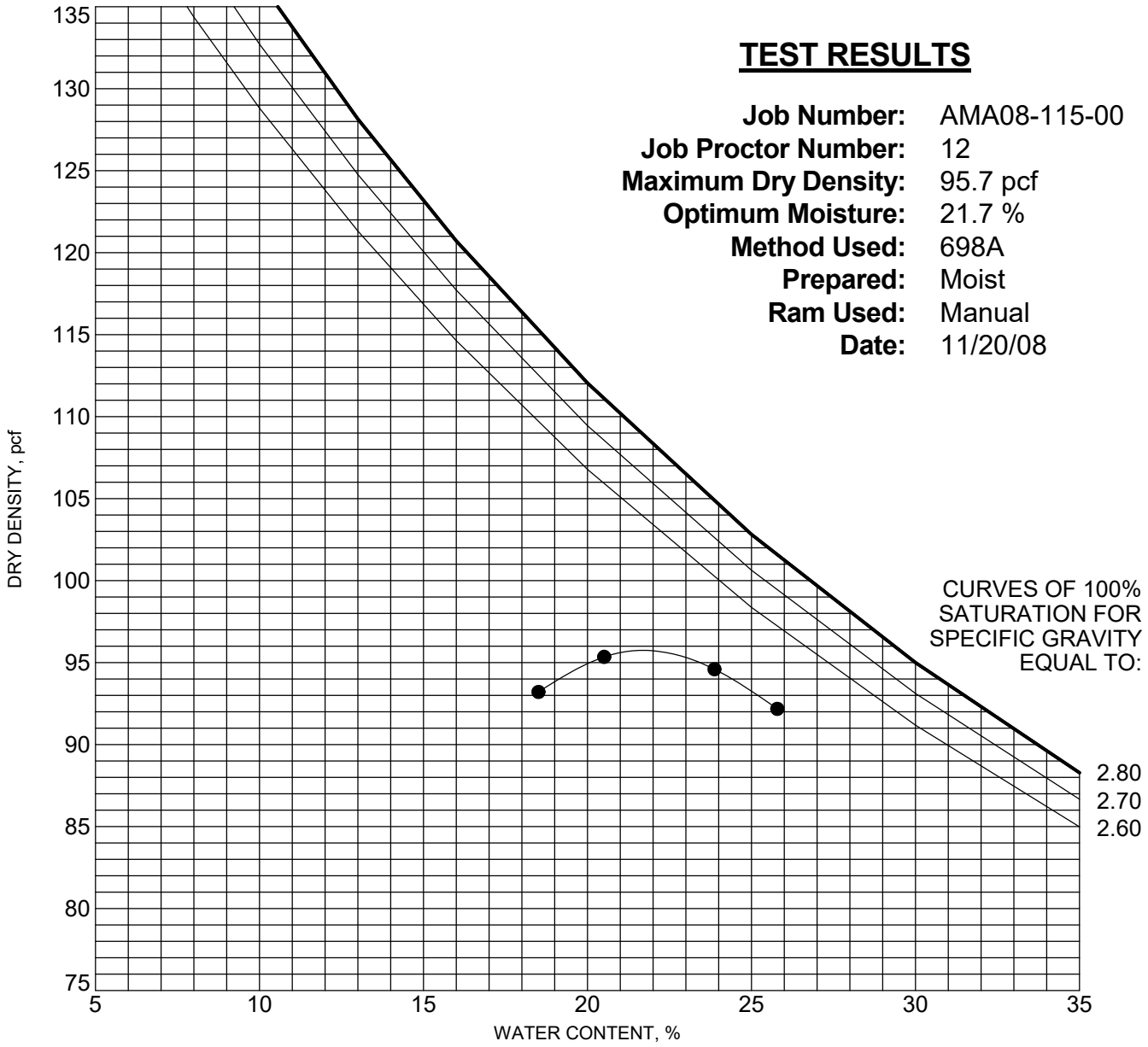

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	12
Maximum Dry Density:	95.7 pcf
Optimum Moisture:	21.7 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	11/20/08

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-353

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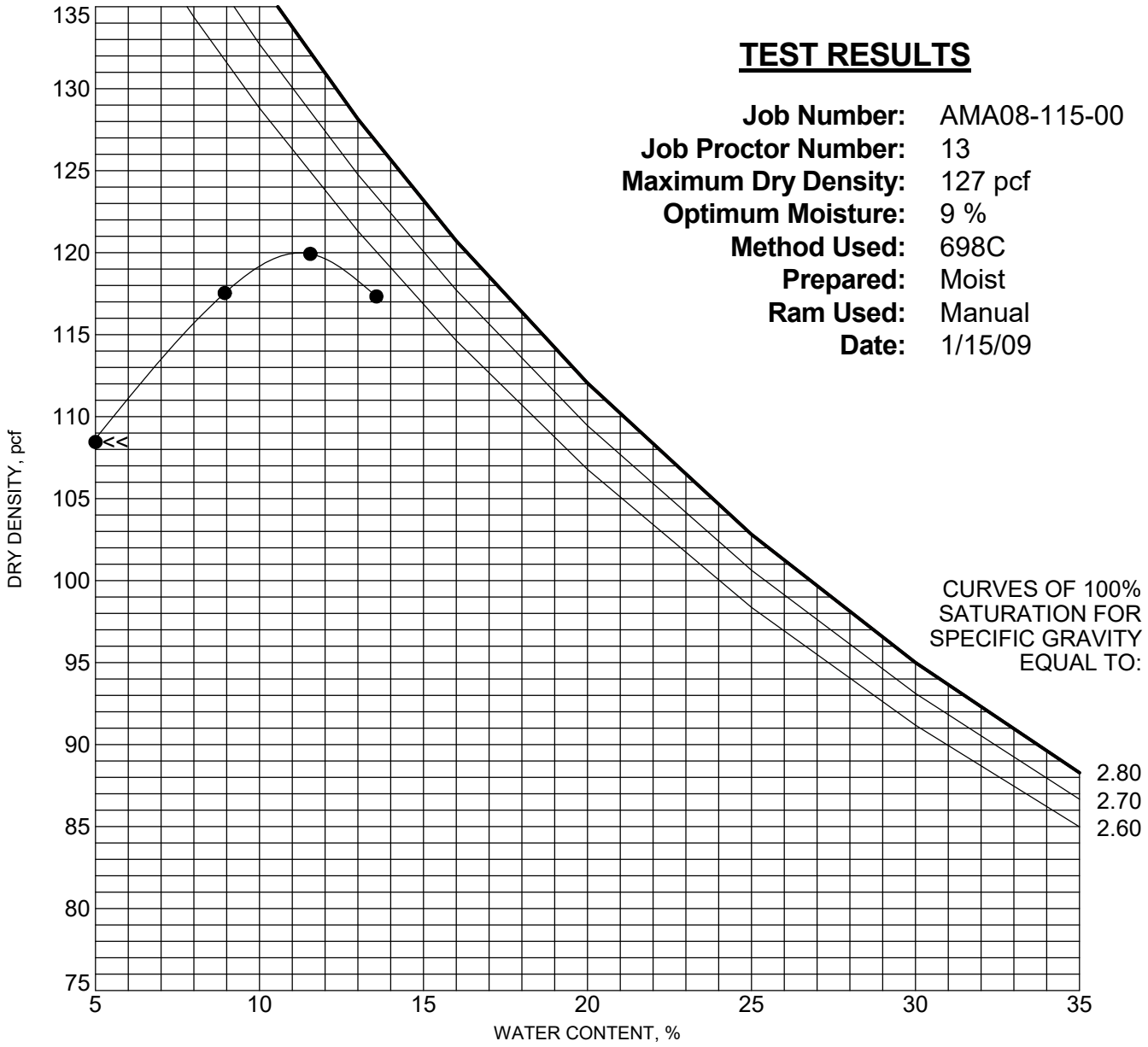

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	13
Maximum Dry Density:	127 pcf
Optimum Moisture:	9 %
Method Used:	698C
Prepared:	Moist
Ram Used:	Manual
Date:	1/15/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-354

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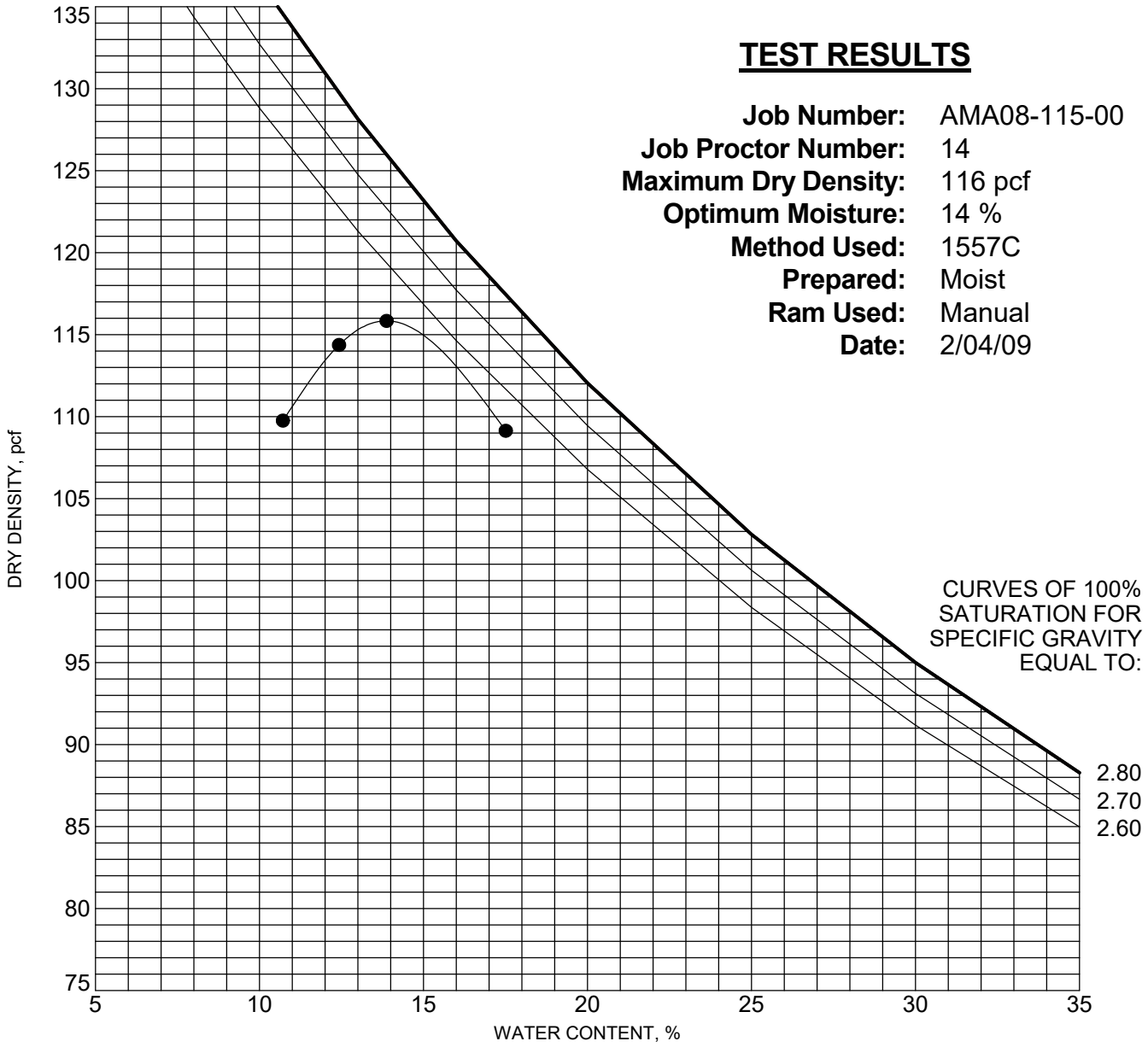

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	14
Maximum Dry Density:	116 pcf
Optimum Moisture:	14 %
Method Used:	1557C
Prepared:	Moist
Ram Used:	Manual
Date:	2/04/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-355

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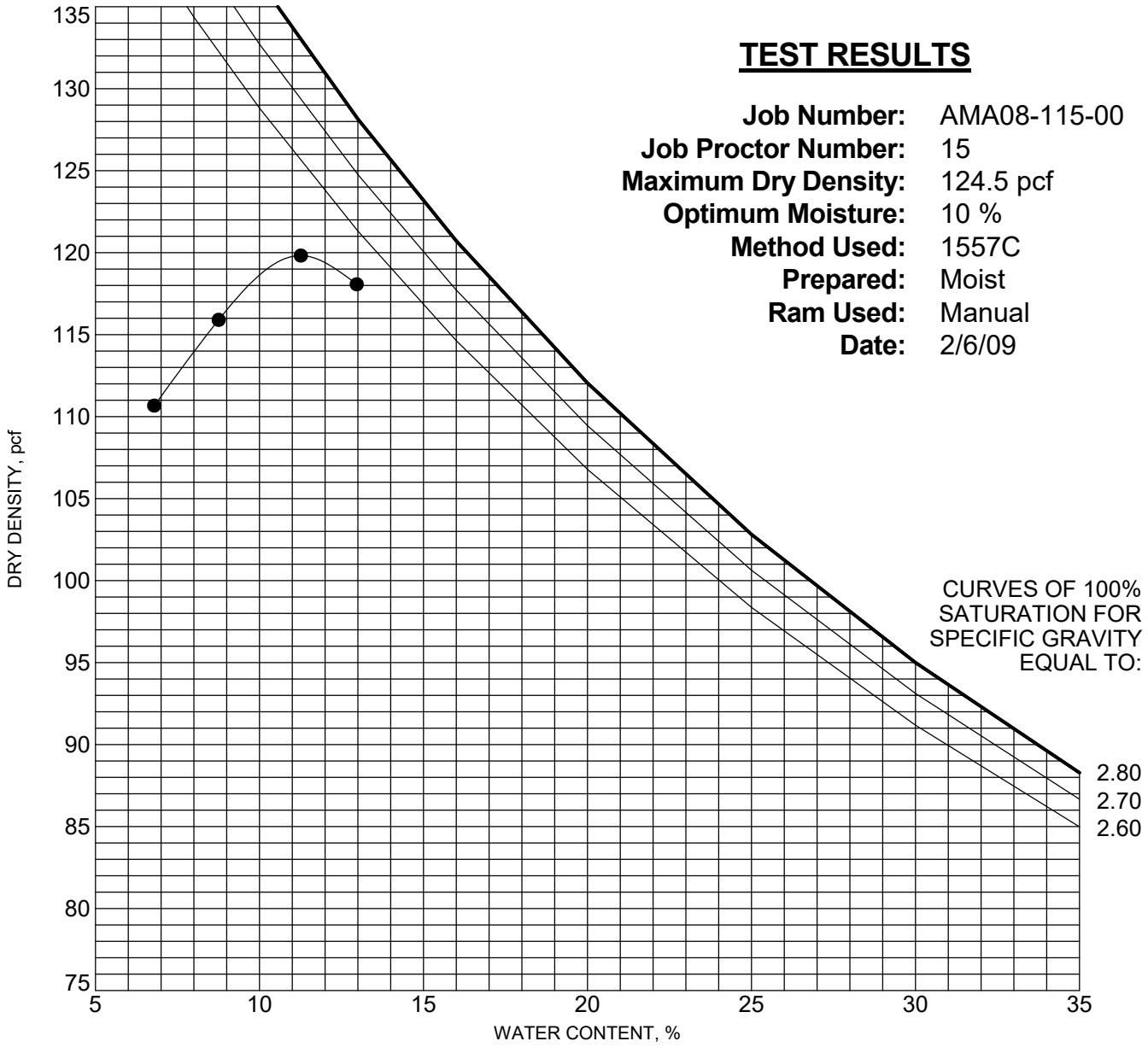

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	15
Maximum Dry Density:	124.5 pcf
Optimum Moisture:	10 %
Method Used:	1557C
Prepared:	Moist
Ram Used:	Manual
Date:	2/6/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-356

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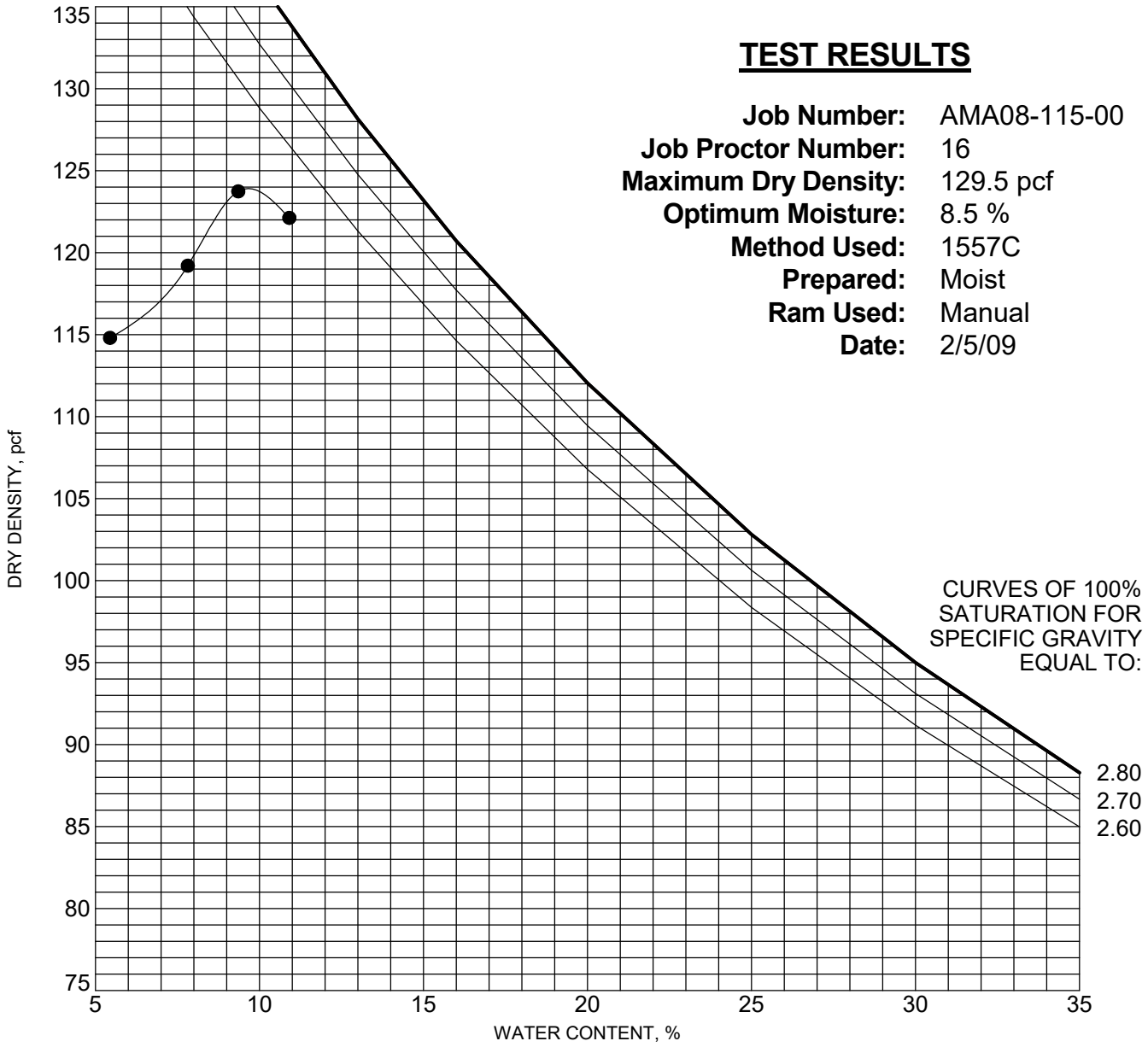

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	16
Maximum Dry Density:	129.5 pcf
Optimum Moisture:	8.5 %
Method Used:	1557C
Prepared:	Moist
Ram Used:	Manual
Date:	2/5/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-357

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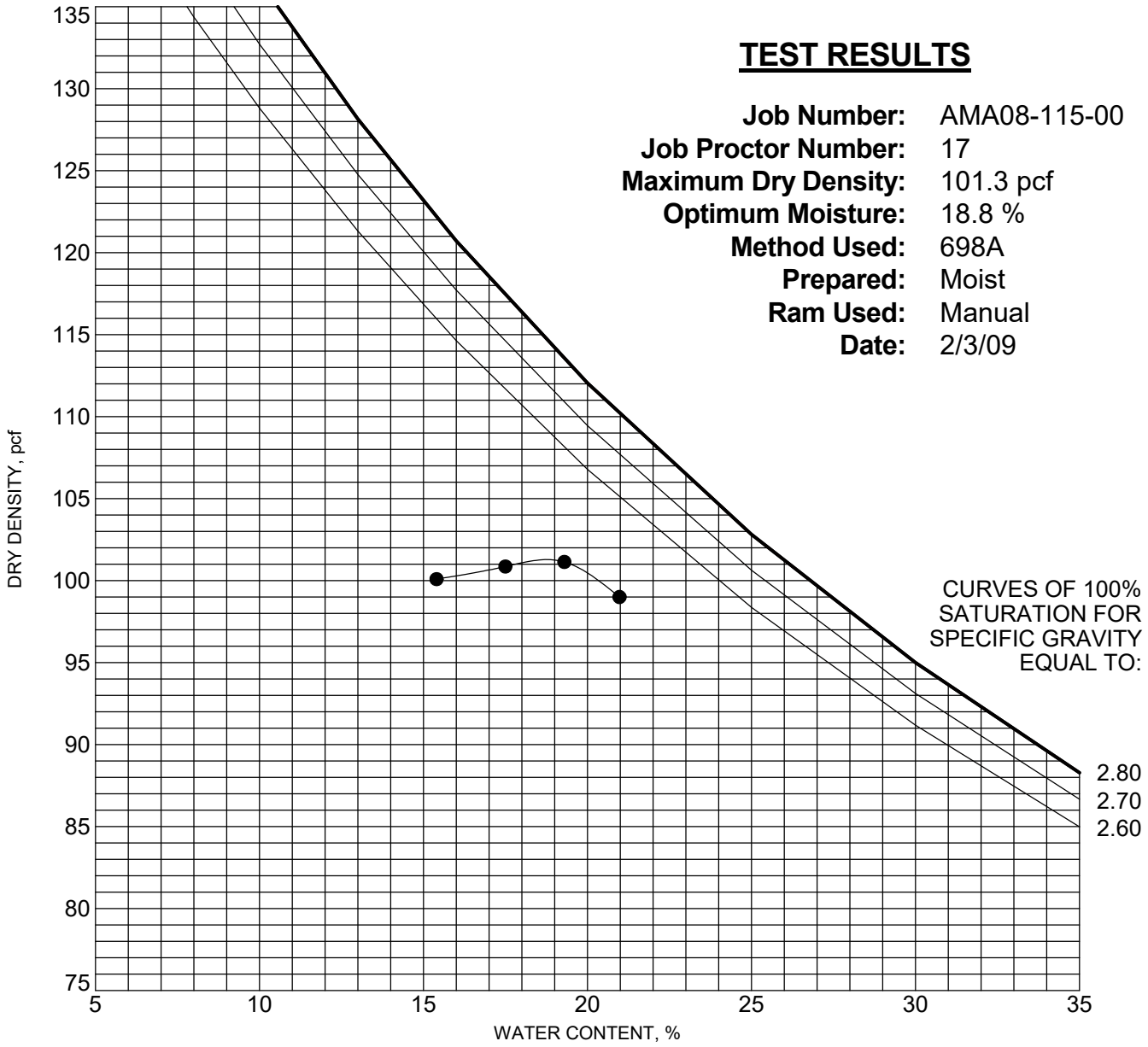

TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	17
Maximum Dry Density:	101.3 pcf
Optimum Moisture:	18.8 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	2/3/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-358

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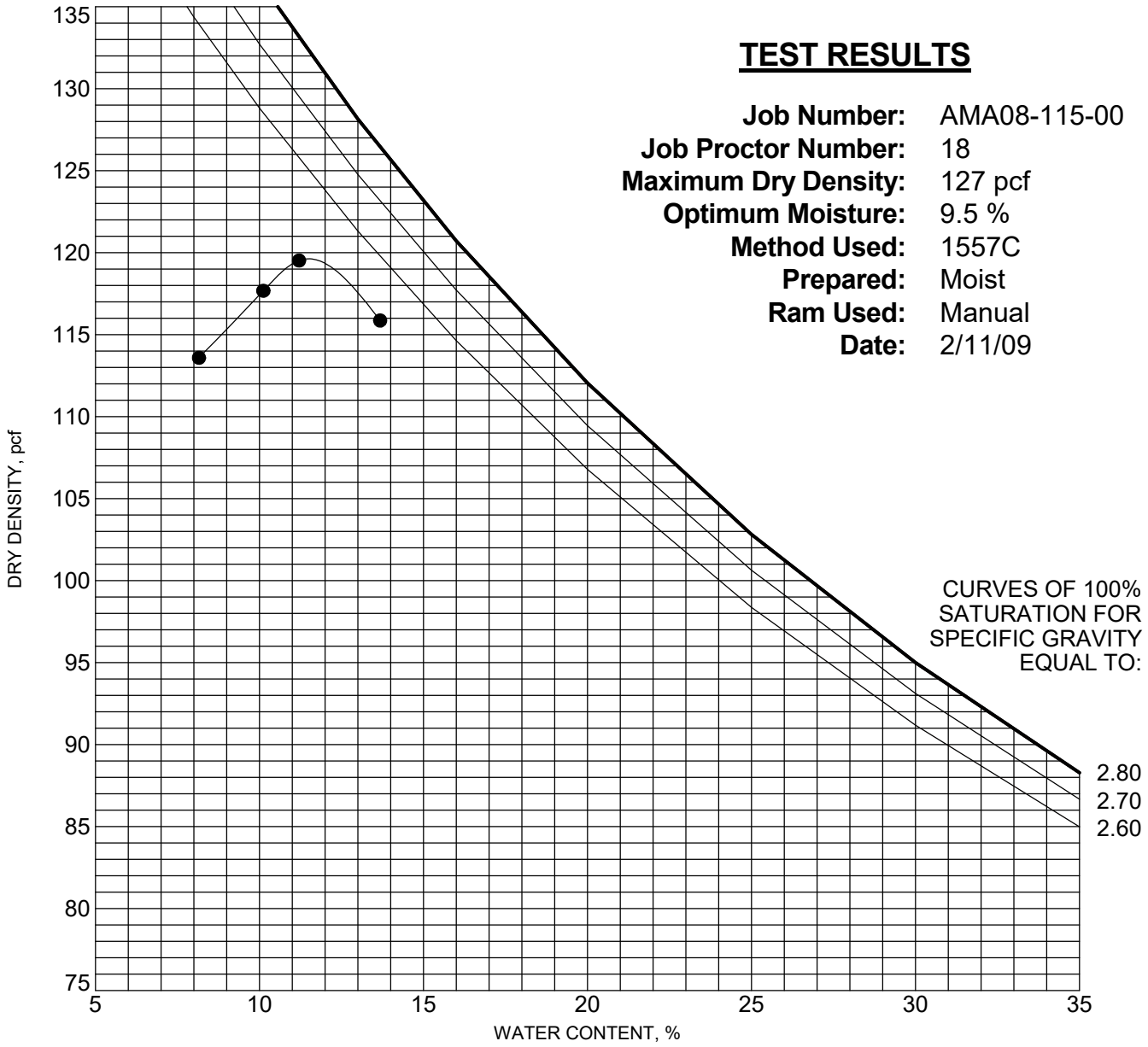
MOISTURE-DENSITY RELATIONSHIP

The Lower Rio Grande Flood Control Project
Cameron County, Texas



TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	18
Maximum Dry Density:	127 pcf
Optimum Moisture:	9.5 %
Method Used:	1557C
Prepared:	Moist
Ram Used:	Manual
Date:	2/11/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-359

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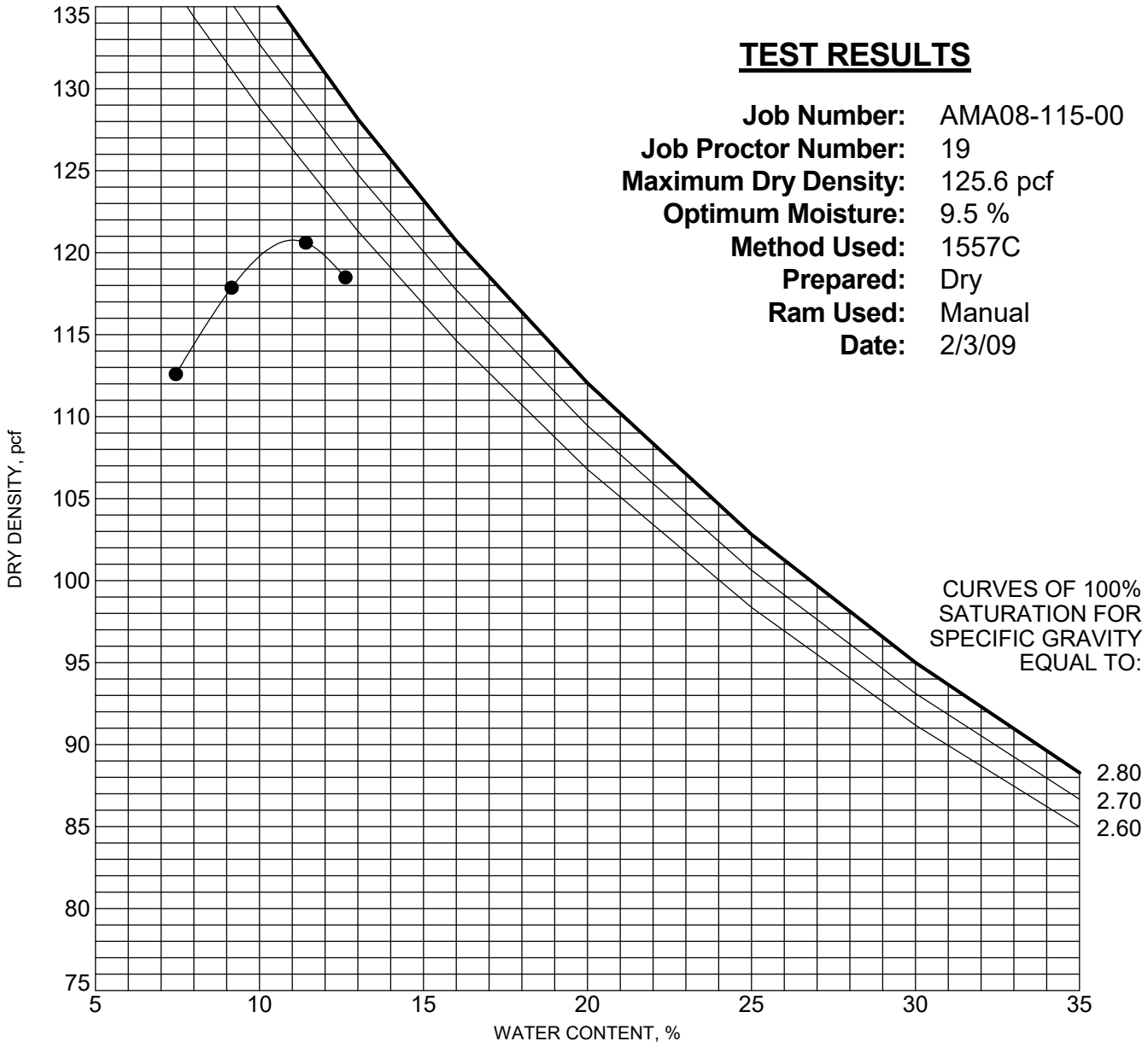
MOISTURE-DENSITY RELATIONSHIP

The Lower Rio Grande Flood Control Project
Cameron County, Texas



TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	19
Maximum Dry Density:	125.6 pcf
Optimum Moisture:	9.5 %
Method Used:	1557C
Prepared:	Dry
Ram Used:	Manual
Date:	2/3/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-360

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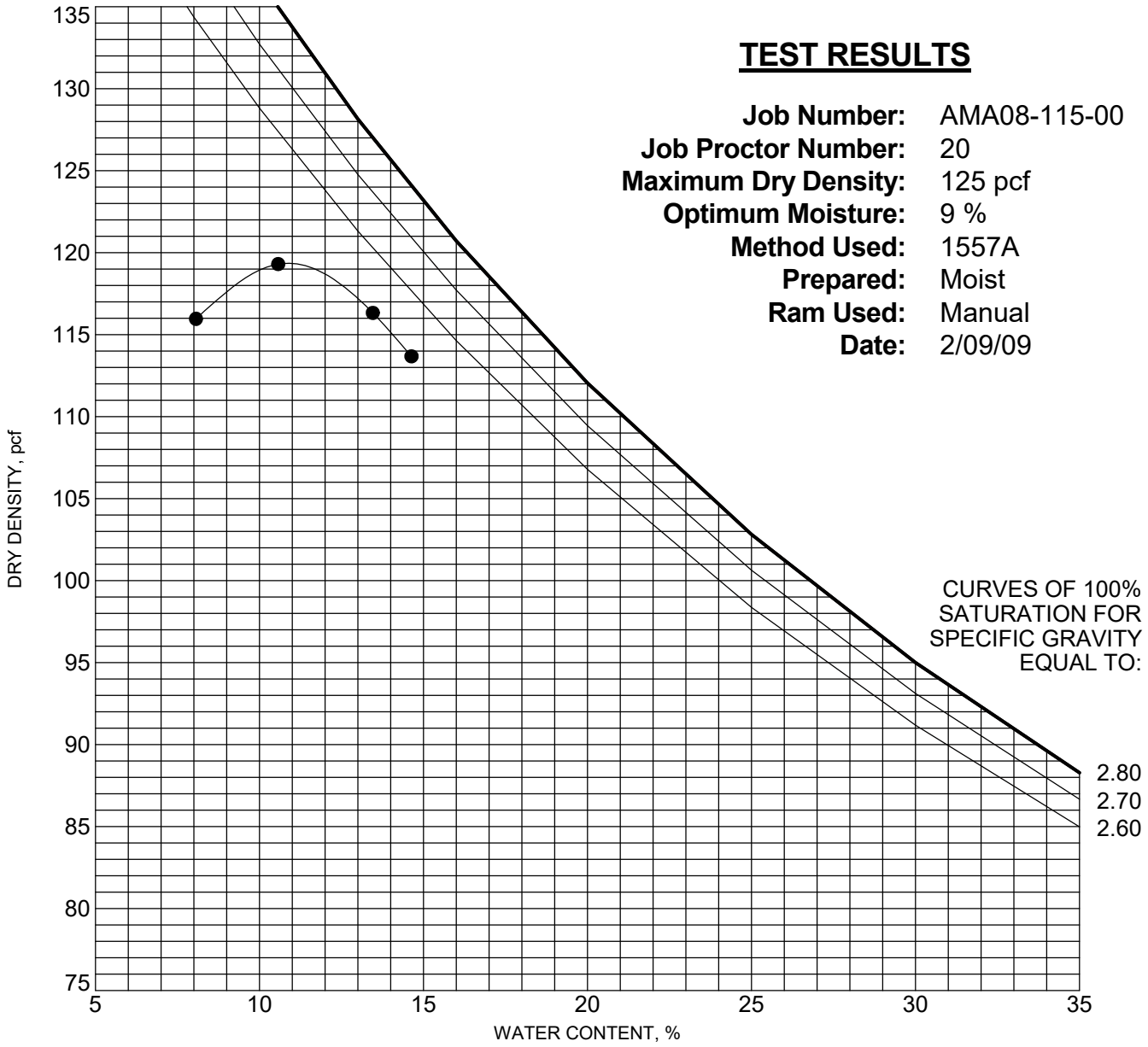
MOISTURE-DENSITY RELATIONSHIP

The Lower Rio Grande Flood Control Project
Cameron County, Texas



TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	20
Maximum Dry Density:	125 pcf
Optimum Moisture:	9 %
Method Used:	1557A
Prepared:	Moist
Ram Used:	Manual
Date:	2/09/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-361

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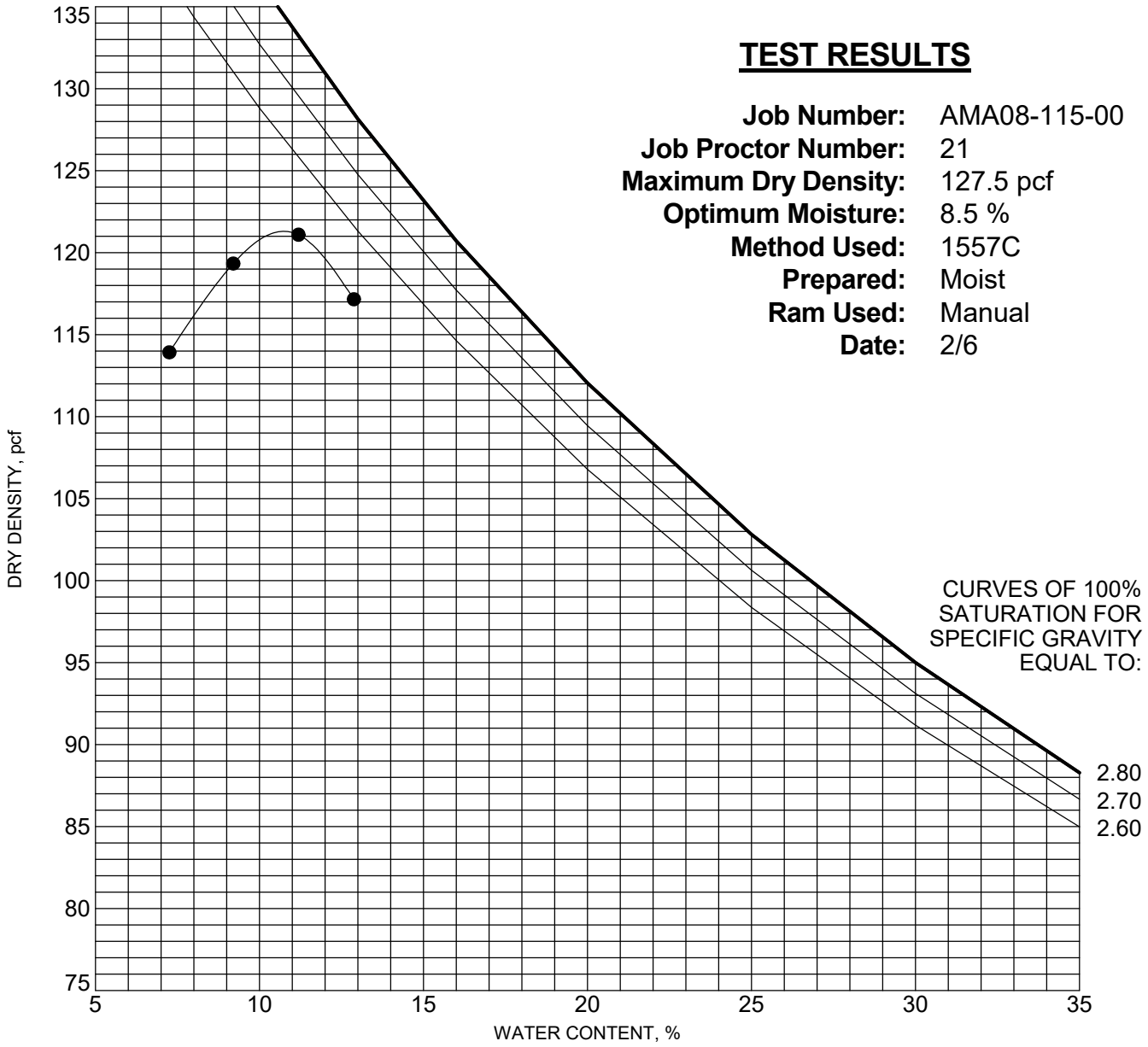
MOISTURE-DENSITY RELATIONSHIP

The Lower Rio Grande Flood Control Project
Cameron County, Texas



TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	21
Maximum Dry Density:	127.5 pcf
Optimum Moisture:	8.5 %
Method Used:	1557C
Prepared:	Moist
Ram Used:	Manual
Date:	2/6

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-362

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MOISTURE-DENSITY RELATIONSHIP

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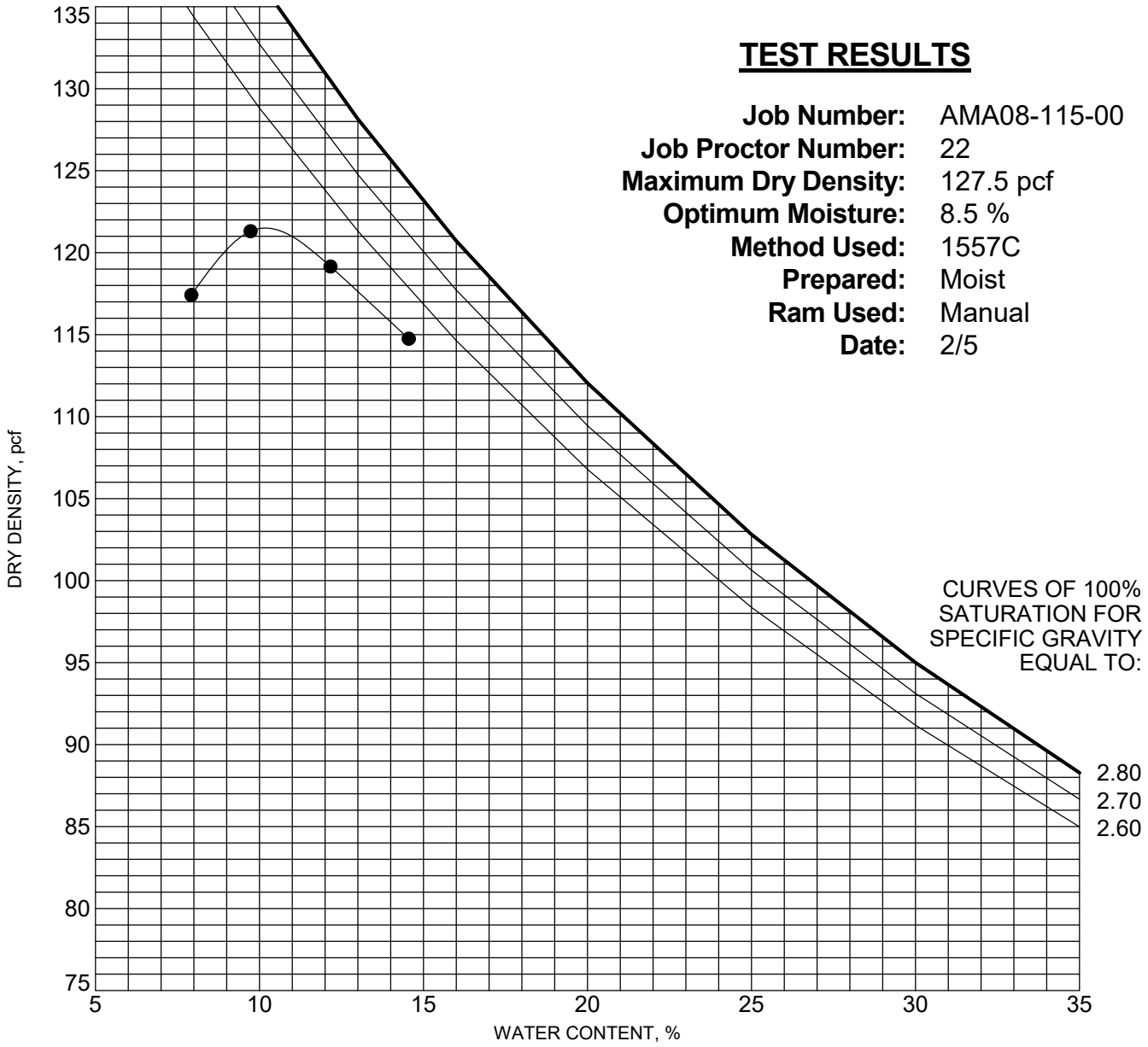
Cameron County, Texas



TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	22
Maximum Dry Density:	127.5 pcf
Optimum Moisture:	8.5 %
Method Used:	1557C
Prepared:	Moist
Ram Used:	Manual
Date:	2/5

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-363

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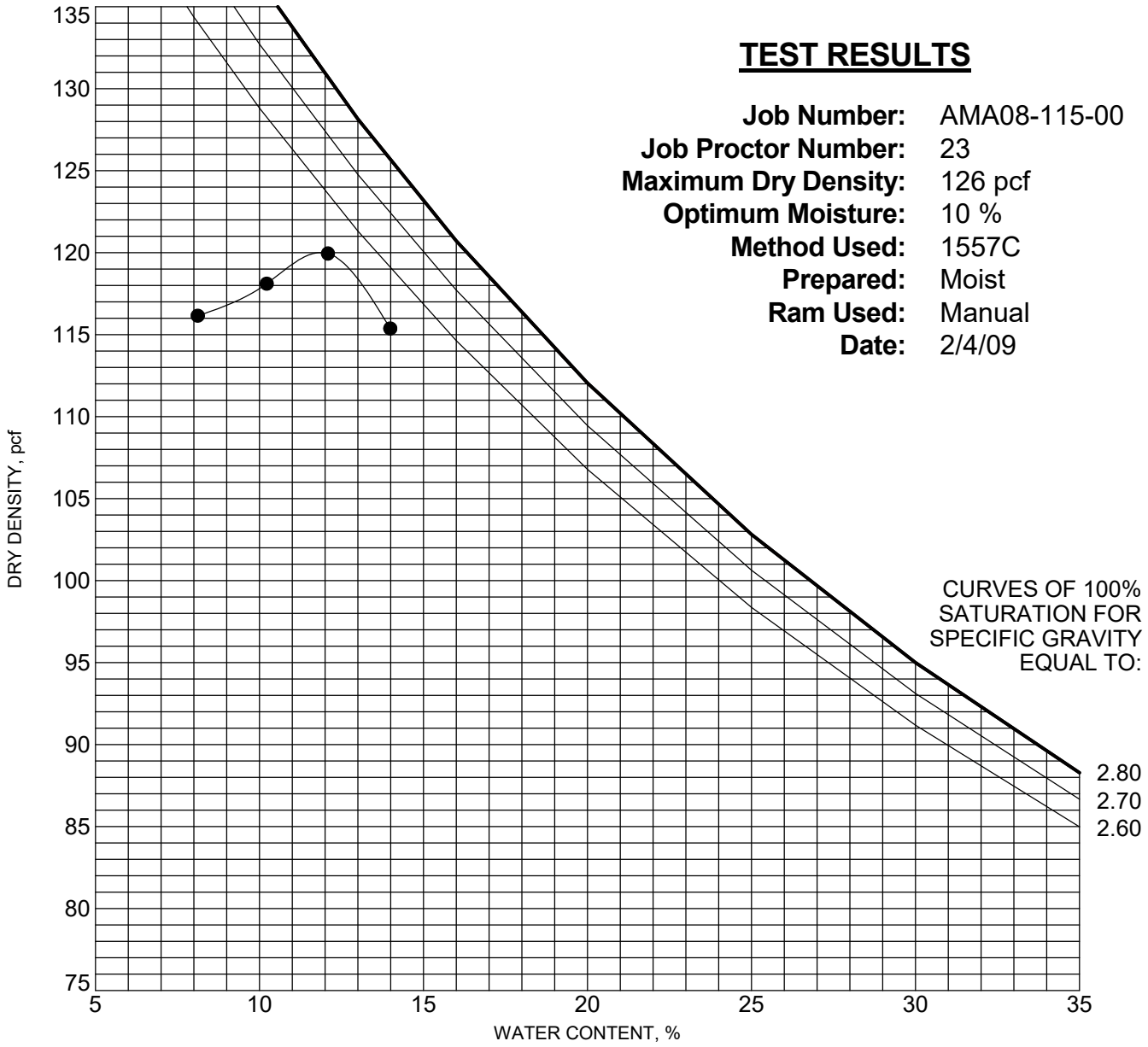
MOISTURE-DENSITY RELATIONSHIP

The Lower Rio Grande Flood Control Project
Cameron County, Texas



TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	23
Maximum Dry Density:	126 pcf
Optimum Moisture:	10 %
Method Used:	1557C
Prepared:	Moist
Ram Used:	Manual
Date:	2/4/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-364

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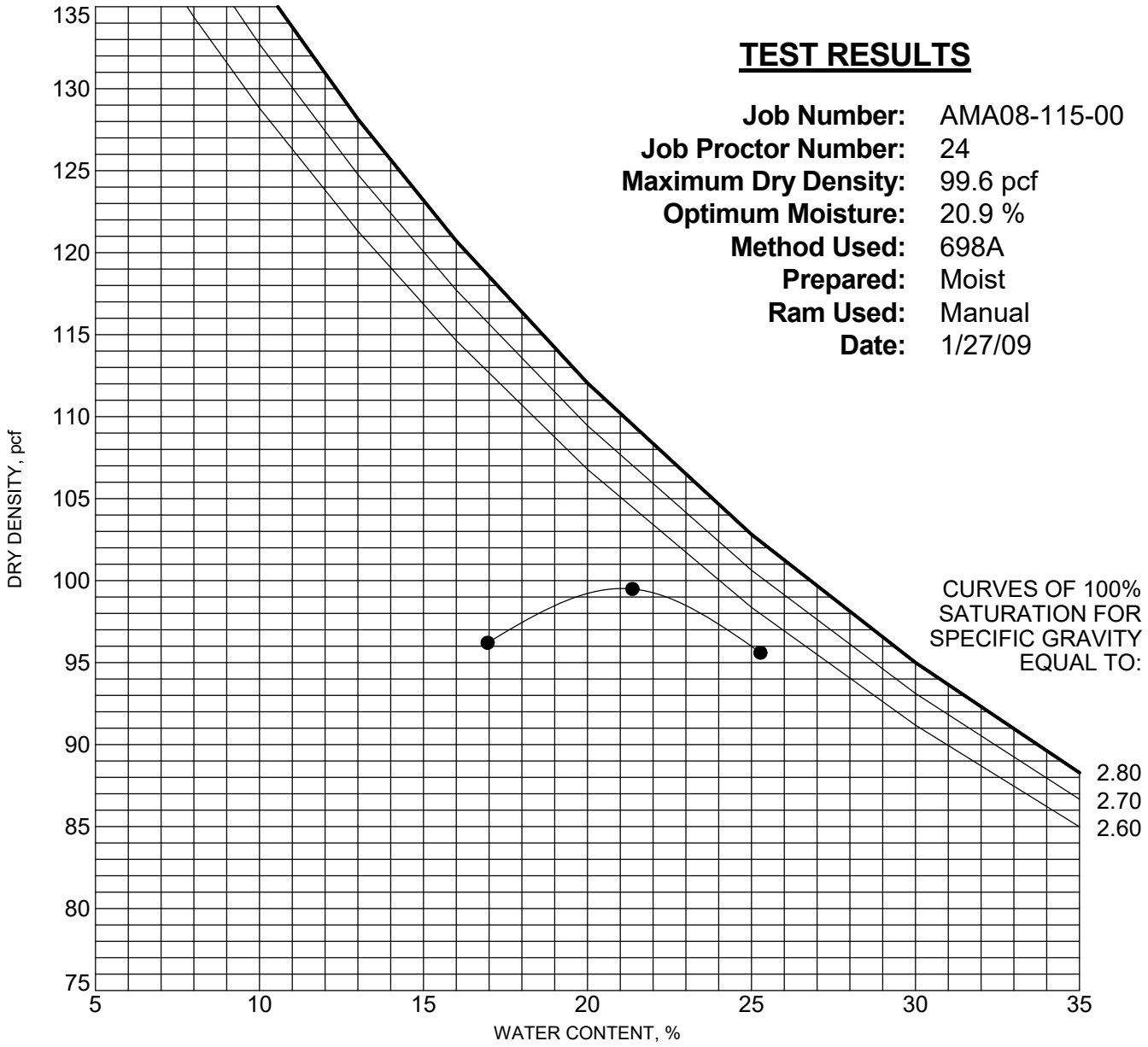
Cameron County, Texas



TEST RESULTS

Job Number:	AMA08-115-00
Job Proctor Number:	24
Maximum Dry Density:	99.6 pcf
Optimum Moisture:	20.9 %
Method Used:	698A
Prepared:	Moist
Ram Used:	Manual
Date:	1/27/09

As Recieved Moisture (%):	NM	**Liquid Limit:**	NM	**Passing No. 4 (%):**	NM
Specific Gravity (Gs):	NM	**Plastic Limit:**	NM	**Passing No. 200 (%):**	NM
Method Used (Gs):	N/A	**Plasticity Index:**	NM	**Lab No.:**	

Borrow Source Description:

Classification (ASTM D 2488): Insufficient Data

Classification (AASHTO M 145-95): Insufficient Data

FIGURE B-365

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NOTE: Although only 3 points were used to develop this moisture-density relationship, the results presented adequately define the maximum dry density and the optimum moisture content of the soil sample.

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MOISTURE-DENSITY RELATIONSHIP

The Lower Rio Grande Flood Control Project
Cameron County, Texas

Project Number: AMA08-115-00

Project Description: The Lower Rio Grande Flood Control Project
Cameron County, Texas

TEST REPORT, CRUMB TESTS (ASTM D6572)

The crumb test is used as an indicator of field performance of dispersive soils using the following evaluation of soil crumb reaction:

1 - No dispersion problem

2 - Possible dispersion problem

3 or 4 - Definite dispersion problem

Boring	Depth (feet)	2 minutes	1 hour	6 hours
DP-1	7 to 9	1	1	1
DP-6	8 to 10	1	1	1
DP-21	15 to 16.5	1	1	1
DP-25	6 to 8	1	1	1
DP-26	2 to 4	1	1	1
DP-46	2 to 4	1	1	1
DP-51	8 to 10	1	1	1
DP-66	10 to 12	1	1	1
DP-81	6 to 8	1	1	1
DP-96	6 to 8	1	1	1
DP-111	4 to 6	1	1	1
DP-116	6 to 8	1	1	1
DP-121	2 to 4	1	1	1
DP-126	8 to 10	2	2	1
DP-136	6 to 8	1	2	1
DP-151	8 to 10	2	1	1
DP-156	6 to 8	1	1	1

Boring	Depth (feet)	2 minutes	1 hour	6 hours
DP-156	10 to 12	1	1	1
DP-162	2 to 3.5	1	1	1
DP-162	15 to 16.5	1	1	1
DP-166	8 to 9.5	1	1	1
DP-177	6 to 8	1	1	1
DP-181	8 to 10	1	1	1
DP-186	15 to 16.5	1	1	1
DP-191	10 to 12	2	2	2
DP-196	6 to 8	1	1	1
DP-201	4 to 6	1	1	1
DP-206	6 to 8	1	1	1
DP-211	15 to 16.5	1	1	1
DP-216	8 to 10	1	1	1
DP-221	10 to 12	1	1	1
DP-226	10 to 12	1	1	1
DP-231	8 to 10	1	1	1
DP-236	2 to 4	1	1	1
DP-241	6 to 8	1	1	1
DP-246	6 to 8	1	1	1
DP-251	4 to 6	2	2	1
DP-256	10 to 12	1	1	1
DP-261	15 to 16.5	1	3	2
DP-266	6 to 8	1	1	1
DP-271	2 to 3.5	1	1	1
DP-281	4 to 6	1	1	1

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 4
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-4 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 35 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.326	D_1	1.441
Mass Moist Soil + Container (g)	386.95			116.50	H_2	2.326	D_2	1.442
Mass Dry Soil + Container (g)	370.64			93.63	H_3	2.325	D_3	1.441
Mass Container (g)	204.97			0.00	H_4	2.328	D_4	1.441
WATER CONTENT (%)	9.84			24.42	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	9.84	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.326	(in)	1.441
[ ] See attached data sheet(s) for additional water contents					(cm)	5.909	(cm)	3.661

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	102.85	116.50
Mass Dry Soil + Tare (g)	93.63	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	102.85	116.50

Summary of Initial Soil Properties

Initial Area (cm^2)	10.525	Initial Dry Unit Weight (pcf)	93.99
Initial Total Volume (cm^3)	62.191	Initial Moist Unit Weight (pcf)	103.24
Initial Mass Moist Soil (g)	102.85	Initial Void Ratio	0.83
Mass Dry Soil (g)	93.63	Initial Degree of Saturation (%)	32.75
Initial Moisture Content (%)	9.84	Pore Volume (cm^3)	28.14

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.086	5.909	0	10.525
After Saturation Phase	5.079	5.916	10.5	9.726
After Consolidation Phase	5.077	5.918	1.5	9.613
End of Test	5.076	5.919	0.0	9.615

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
4	8.43	10.01	0.98	0.83	127.07	90	25	1.07E-03
					114.77		23	
5	8.51	10.00	1.02	1.04	114.25	90	23	1.14E-03
					102.55		20	
6	8.45	10.03	0.99	1.28	124.97	89	25	1.05E-03
					111.67		22	
7	8.47	10.03	1.04	1.76	123.67	79	24	1.06E-03
					97.17		19	

Mean Hydraulic Conductivity, cm/sec

1.08E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.615	Final Dry Unit Weight (pcf)	102.71
Final Total Volume (cm^3)	56.910	Final Moist Unit Weight (pcf)	127.79
Final Mass Moist Soil (g)	116.50	Final Void Ratio	0.67
Mass Dry Soil (g)	93.63	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	24.42	Final Pore Volume (cm^3)	22.86

FIGURE B-368

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 4
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-7 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 35 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.517	D_1	1.441
Mass Moist Soil + Container (g)	363.91			131.27	H_2	2.516	D_2	1.442
Mass Dry Soil + Container (g)	349.07			104.27	H_3	2.517	D_3	1.441
Mass Container (g)	205.69			0.00	H_4	2.517	D_4	1.441
WATER CONTENT (%)	10.35			25.89	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.35	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.517	(in)	1.441
[ ] See attached data sheet(s) for additional water contents					(cm)	6.393	(cm)	3.661

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	115.06	131.27
Mass Dry Soil + Tare (g)	104.27	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	115.06	131.27

Summary of Initial Soil Properties

Initial Area (cm^2)	10.525	Initial Dry Unit Weight (pcf)	96.74
Initial Total Volume (cm^3)	67.284	Initial Moist Unit Weight (pcf)	106.76
Initial Mass Moist Soil (g)	115.06	Initial Void Ratio	0.77
Mass Dry Soil (g)	104.27	Initial Degree of Saturation (%)	36.74
Initial Moisture Content (%)	10.35	Pore Volume (cm^3)	29.37

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.220	6.393	0	10.525
After Saturation Phase	5.221	6.392	4.5	10.184
After Consolidation Phase	5.208	6.405	0.7	10.156
End of Test	5.214	6.399	0.0	10.145

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
3	9.47	10.61	1.01	1.03	90.54	80	17	2.25E-03
					72.64		14	
4	9.49	10.62	1.00	1.29	88.64	83	17	2.30E-03
					73.24		14	
5	9.53	10.64	1.00	1.54	86.13	83	17	2.36E-03
					71.53		14	
6	9.55	10.64	1.00	1.78	83.03	83	16	2.39E-03
					69.03		13	

Mean Hydraulic Conductivity, cm/sec

2.32E-03

Summary of Final Soil Properties

Final Area (cm^2)	10.145	Final Dry Unit Weight (pcf)	100.28
Final Total Volume (cm^3)	64.912	Final Moist Unit Weight (pcf)	126.24
Final Mass Moist Soil (g)	131.27	Final Void Ratio	0.71
Mass Dry Soil (g)	104.27	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	25.89	Final Pore Volume (cm^3)	27.00

FIGURE B-369

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 3
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-26 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 30 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.471	D_1	1.441
Mass Moist Soil + Container (g)	334.29			122.95	H_2	2.472	D_2	1.442
Mass Dry Soil + Container (g)	319.80			98.00	H_3	2.472	D_3	1.442
Mass Container (g)	208.99			0.00	H_4	2.472	D_4	1.441
WATER CONTENT (%)	13.08			25.46	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	13.08	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.472	(in)	1.442
[ ] See attached data sheet(s) for additional water contents					(cm)	6.278	(cm)	3.661

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	110.81	122.95
Mass Dry Soil + Tare (g)	98.00	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	110.81	122.95

Summary of Initial Soil Properties

Initial Area (cm^2)	10.529	Initial Dry Unit Weight (pcf)	92.55
Initial Total Volume (cm^3)	66.104	Initial Moist Unit Weight (pcf)	104.65
Initial Mass Moist Soil (g)	110.81	Initial Void Ratio	0.86
Mass Dry Soil (g)	98.00	Initial Degree of Saturation (%)	42.06
Initial Moisture Content (%)	13.08	Pore Volume (cm^3)	30.47

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.169	6.278	0	10.529
After Saturation Phase	5.164	6.283	11.5	9.662
After Consolidation Phase	5.162	6.285	0.4	9.636
End of Test	5.161	6.286	0.0	9.638

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
3	8.81	10.64	1.00	0.37	132.25	94	26	5.89E-04
					124.85		24	
4	8.74	10.72	1.00	0.51	155.79	95	30	5.61E-04
					147.79		29	
5	8.80	10.67	1.00	0.63	140.06	95	27	5.93E-04
					132.46		26	
6	8.85	10.63	1.00	0.74	126.13	95	24	5.96E-04
					119.53		23	

Mean Hydraulic Conductivity, cm/sec

5.85E-04

Summary of Final Soil Properties

Final Area (cm^2)	9.638	Final Dry Unit Weight (pcf)	100.98
Final Total Volume (cm^3)	60.584	Final Moist Unit Weight (pcf)	126.69
Final Mass Moist Soil (g)	122.95	Final Void Ratio	0.70
Mass Dry Soil (g)	98.00	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	25.46	Final Pore Volume (cm^3)	24.95

FIGURE B-370

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 2
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-66 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 35 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.024	D_1	1.441
Mass Moist Soil + Container (g)	403.46			103.58	H_2	2.026	D_2	1.442
Mass Dry Soil + Container (g)	387.25			82.64	H_3	2.024	D_3	1.441
Mass Container (g)	225.51			0.00	H_4	2.025	D_4	1.441
WATER CONTENT (%)	10.02			25.34	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.02	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.025	(in)	1.441
[ ] See attached data sheet(s) for additional water contents					(cm)	5.143	(cm)	3.661

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	90.92	103.58
Mass Dry Soil + Tare (g)	82.64	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	90.92	103.58

Summary of Initial Soil Properties

Initial Area (cm^2)	10.525	Initial Dry Unit Weight (pcf)	95.31
Initial Total Volume (cm^3)	54.130	Initial Moist Unit Weight (pcf)	104.86
Initial Mass Moist Soil (g)	90.92	Initial Void Ratio	0.80
Mass Dry Soil (g)	82.64	Initial Degree of Saturation (%)	34.39
Initial Moisture Content (%)	10.02	Pore Volume (cm^3)	24.08

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	4.781	5.143	0	10.525
After Saturation Phase	4.779	5.145	6.5	9.994
After Consolidation Phase	4.774	5.150	1.3	9.898
End of Test	4.773	5.151	0.0	9.900

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
2	9.07	10.97	1.00	0.49	146.77	93	31	7.03E-04
					137.17		29	
3	9.10	10.99	1.00	0.68	144.97	94	30	6.97E-04
					135.97		28	
4	9.11	11.00	0.98	0.86	144.27	94	30	6.89E-04
					135.37		28	
5	9.14	10.99	1.00	1.07	141.36	93	30	7.14E-04
					131.16		27	

Mean Hydraulic Conductivity, cm/sec

7.01E-04

Summary of Final Soil Properties

Final Area (cm^2)	9.900	Final Dry Unit Weight (pcf)	101.17
Final Total Volume (cm^3)	50.991	Final Moist Unit Weight (pcf)	126.81
Final Mass Moist Soil (g)	103.58	Final Void Ratio	0.70
Mass Dry Soil (g)	82.64	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	25.34	Final Pore Volume (cm^3)	20.94

FIGURE B-371

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 2
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-97 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 25 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.624	D_1	1.441
Mass Moist Soil + Container (g)	330.03			131.34	H_2	2.625	D_2	1.442
Mass Dry Soil + Container (g)	319.50			102.38	H_3	2.624	D_3	1.441
Mass Container (g)	209.27			0.00	H_4	2.626	D_4	1.441
WATER CONTENT (%)	9.55			28.29	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	9.55	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.625	(in)	1.441
[ ] See attached data sheet(s) for additional water contents					(cm)	6.667	(cm)	3.661

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	112.16	131.34
Mass Dry Soil + Tare (g)	102.38	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	112.16	131.34

Summary of Initial Soil Properties

Initial Area (cm^2)	10.525	Initial Dry Unit Weight (pcf)	91.08
Initial Total Volume (cm^3)	70.171	Initial Moist Unit Weight (pcf)	99.78
Initial Mass Moist Soil (g)	112.16	Initial Void Ratio	0.88
Mass Dry Soil (g)	102.38	Initial Degree of Saturation (%)	29.69
Initial Moisture Content (%)	9.55	Pore Volume (cm^3)	32.94

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.341	6.667	0	10.525
After Saturation Phase	5.342	6.666	6.0	10.081
After Consolidation Phase	5.340	6.668	2.2	9.923
End of Test	5.339	6.669	0.0	9.925

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
3	9.92	11.54	1.01	0.70	131.09	88	25	1.48E-03
					115.99		22	
4	10.94	12.56	1.00	0.91	129.99	89	24	1.43E-03
					115.99		22	
5	11.95	13.56	1.05	1.12	127.58	89	24	1.41E-03
					114.08		21	
6	12.97	14.58	1.05	1.33	126.98	90	24	1.40E-03
					113.68		21	

Mean Hydraulic Conductivity, cm/sec

1.43E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.925	Final Dry Unit Weight (pcf)	96.57
Final Total Volume (cm^3)	66.186	Final Moist Unit Weight (pcf)	123.88
Final Mass Moist Soil (g)	131.34	Final Void Ratio	0.78
Mass Dry Soil (g)	102.38	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	28.29	Final Pore Volume (cm^3)	28.96

FIGURE B-372

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 4
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-117 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 25 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.490	D_1	1.441
Mass Moist Soil + Container (g)	376.46			125.49	H_2	2.491	D_2	1.442
Mass Dry Soil + Container (g)	359.99			102.70	H_3	2.489	D_3	1.441
Mass Container (g)	208.69			0.00	H_4	2.491	D_4	1.442
WATER CONTENT (%)	10.89			22.19	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.89	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.490	(in)	1.442
[ ] See attached data sheet(s) for additional water contents					(cm)	6.325	(cm)	3.661

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	113.88	125.49
Mass Dry Soil + Tare (g)	102.70	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	113.88	125.49

Summary of Initial Soil Properties

Initial Area (cm^2)	10.529	Initial Dry Unit Weight (pcf)	96.27
Initial Total Volume (cm^3)	66.598	Initial Moist Unit Weight (pcf)	106.75
Initial Mass Moist Soil (g)	113.88	Initial Void Ratio	0.78
Mass Dry Soil (g)	102.70	Initial Degree of Saturation (%)	38.21
Initial Moisture Content (%)	10.89	Pore Volume (cm^3)	29.25

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.123	6.325	0	10.529
After Saturation Phase	5.119	6.329	13.0	9.537
After Consolidation Phase	5.119	6.329	0.6	9.491
End of Test	5.116	6.332	0.0	9.497

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
2	9.27	10.51	0.99	0.78	103.77	78	20	2.65E-03
					81.07		16	
3	9.30	10.55	1.08	1.10	102.78	82	20	2.59E-03
					84.68		17	
4	9.32	10.56	0.99	1.42	100.67	81	20	2.65E-03
					81.77		16	
5	9.35	10.56	1.00	1.75	96.56	80	19	2.72E-03
					77.16		15	

Mean Hydraulic Conductivity, cm/sec

2.65E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.497	Final Dry Unit Weight (pcf)	106.61
Final Total Volume (cm^3)	60.136	Final Moist Unit Weight (pcf)	130.28
Final Mass Moist Soil (g)	125.49	Final Void Ratio	0.61
Mass Dry Soil (g)	102.70	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	22.19	Final Pore Volume (cm^3)	22.79

FIGURE B-373

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 3
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-118 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 25 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.327	D_1	1.441
Mass Moist Soil + Container (g)	438.93			115.90	H_2	2.326	D_2	1.443
Mass Dry Soil + Container (g)	417.02			92.94	H_3	2.328	D_3	1.444
Mass Container (g)	208.36			0.00	H_4	2.326	D_4	1.441
WATER CONTENT (%)	10.50			24.70	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.50	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.327	(in)	1.442
[ ] See attached data sheet(s) for additional water contents					(cm)	5.910	(cm)	3.663

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	102.70	115.90
Mass Dry Soil + Tare (g)	92.94	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	102.70	115.90

Summary of Initial Soil Properties

Initial Area (cm^2)	10.540	Initial Dry Unit Weight (pcf)	93.15
Initial Total Volume (cm^3)	62.291	Initial Moist Unit Weight (pcf)	102.93
Initial Mass Moist Soil (g)	102.70	Initial Void Ratio	0.84
Mass Dry Soil (g)	92.94	Initial Degree of Saturation (%)	34.25
Initial Moisture Content (%)	10.50	Pore Volume (cm^3)	28.50

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.009	5.910	0	10.540
After Saturation Phase	5.008	5.911	11.5	9.638
After Consolidation Phase	5.004	5.915	0.7	9.591
End of Test	5.003	5.916	0.0	9.593

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	9.41	10.84	0.94	0.25	113.53	87	23	1.72E-03
					98.63		20	
2	9.41	10.90	1.00	0.49	114.75	88	23	1.45E-03
					100.95		20	
3	9.42	10.91	1.00	0.72	113.05	89	23	1.44E-03
					100.45		20	
4	9.43	10.92	1.00	0.93	111.25	89	22	1.42E-03
					99.05		20	

Mean Hydraulic Conductivity, cm/sec

1.51E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.593	Final Dry Unit Weight (pcf)	102.24
Final Total Volume (cm^3)	56.749	Final Moist Unit Weight (pcf)	127.49
Final Mass Moist Soil (g)	115.90	Final Void Ratio	0.68
Mass Dry Soil (g)	92.94	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	24.70	Final Pore Volume (cm^3)	22.95

FIGURE B-374

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 4
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-122 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.260	D_1	1.441
Mass Moist Soil + Container (g)	327.38			115.98	H_2	2.261	D_2	1.442
Mass Dry Soil + Container (g)	316.47			92.32	H_3	2.264	D_3	1.441
Mass Container (g)	209.00			0.00	H_4	2.262	D_4	1.440
WATER CONTENT (%)	10.15			25.63	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.15	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.262	(in)	1.441
[ ] See attached data sheet(s) for additional water contents					(cm)	5.745	(cm)	3.660

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	101.69	115.98
Mass Dry Soil + Tare (g)	92.32	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	101.69	115.98

Summary of Initial Soil Properties

Initial Area (cm^2)	10.522	Initial Dry Unit Weight (pcf)	95.35
Initial Total Volume (cm^3)	60.445	Initial Moist Unit Weight (pcf)	105.02
Initial Mass Moist Soil (g)	101.69	Initial Void Ratio	0.80
Mass Dry Soil (g)	92.32	Initial Degree of Saturation (%)	34.87
Initial Moisture Content (%)	10.15	Pore Volume (cm^3)	26.88

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	4.955	5.745	0	10.522
After Saturation Phase	4.956	5.744	6.5	10.003
After Consolidation Phase	4.954	5.746	0.6	9.960
End of Test	4.954	5.746	0.0	9.960

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
2	9.42	10.91	1.00	0.58	119.15	87	24	1.43E-03
					104.15		21	
3	9.44	10.92	1.01	0.86	117.14	88	24	1.42E-03
					102.64		21	
4	9.46	10.93	1.02	1.11	115.34	88	23	1.44E-03
					102.04		21	
5	9.46	10.95	1.00	1.34	115.25	89	23	1.35E-03
					102.65		21	

Mean Hydraulic Conductivity, cm/sec

1.41E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.960	Final Dry Unit Weight (pcf)	100.71
Final Total Volume (cm^3)	57.226	Final Moist Unit Weight (pcf)	126.52
Final Mass Moist Soil (g)	115.98	Final Void Ratio	0.70
Mass Dry Soil (g)	92.32	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	25.63	Final Pore Volume (cm^3)	23.66

FIGURE B-375

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 2
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-124 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 30 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.353	D_1	1.441
Mass Moist Soil + Container (g)	319.70			116.26	H_2	2.356	D_2	1.442
Mass Dry Soil + Container (g)	310.52			95.00	H_3	2.354	D_3	1.442
Mass Container (g)	208.83			0.00	H_4	2.352	D_4	1.444
WATER CONTENT (%)	9.03			22.37	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	9.03	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.354	(in)	1.442
[ ] See attached data sheet(s) for additional water contents					(cm)	5.979	(cm)	3.663

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	103.58	116.26
Mass Dry Soil + Tare (g)	95.00	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	103.58	116.26

Summary of Initial Soil Properties

Initial Area (cm^2)	10.540	Initial Dry Unit Weight (pcf)	94.12
Initial Total Volume (cm^3)	63.013	Initial Moist Unit Weight (pcf)	102.62
Initial Mass Moist Soil (g)	103.58	Initial Void Ratio	0.82
Mass Dry Soil (g)	95.00	Initial Degree of Saturation (%)	30.13
Initial Moisture Content (%)	9.03	Pore Volume (cm^3)	28.47

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.070	5.979	0	10.540
After Saturation Phase	5.053	5.996	15.0	9.407
After Consolidation Phase	5.065	5.984	0.8	9.322
End of Test	5.064	5.985	0.0	9.324

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	7.59	9.16	0.93	0.39	130.07	82	26	2.39E-03
					106.97		21	
2	7.51	9.15	1.01	0.78	132.99	83	26	2.21E-03
					110.89		22	
3	7.56	9.16	0.96	1.16	128.18	83	25	2.32E-03
					106.08		21	
4	7.56	9.15	1.01	1.54	125.48	83	25	2.30E-03
					103.98		21	

Mean Hydraulic Conductivity, cm/sec

2.31E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.324	Final Dry Unit Weight (pcf)	106.29
Final Total Volume (cm^3)	55.800	Final Moist Unit Weight (pcf)	130.07
Final Mass Moist Soil (g)	116.26	Final Void Ratio	0.62
Mass Dry Soil (g)	95.00	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	22.37	Final Pore Volume (cm^3)	21.25

FIGURE B-376

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 2
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-126 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 30 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.332	D_1	1.441
Mass Moist Soil + Container (g)	440.53			121.09	H_2	2.331	D_2	1.440
Mass Dry Soil + Container (g)	419.38			96.31	H_3	2.331	D_3	1.443
Mass Container (g)	205.16			0.00	H_4	2.330	D_4	1.441
WATER CONTENT (%)	9.87			25.73	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	9.87	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.331	(in)	1.441
[ ] See attached data sheet(s) for additional water contents					(cm)	5.921	(cm)	3.661

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	105.82	121.09
Mass Dry Soil + Tare (g)	96.31	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	105.82	121.09

Summary of Initial Soil Properties

Initial Area (cm^2)	10.525	Initial Dry Unit Weight (pcf)	96.48
Initial Total Volume (cm^3)	62.318	Initial Moist Unit Weight (pcf)	106.01
Initial Mass Moist Soil (g)	105.82	Initial Void Ratio	0.78
Mass Dry Soil (g)	96.31	Initial Degree of Saturation (%)	34.83
Initial Moisture Content (%)	9.87	Pore Volume (cm^3)	27.30

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.049	5.921	0	10.525
After Saturation Phase	5.049	5.921	5.0	10.135
After Consolidation Phase	5.048	5.922	0.6	10.091
End of Test	5.046	5.924	0.0	10.095

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	9.48	11.52	0.91	0.08	157.71	97	31	2.80E-04
					153.31		30	
2	9.49	11.58	1.00	0.14	156.83	98	31	2.05E-04
					153.63		30	
3	9.52	11.47	1.07	0.19	143.79	98	28	2.01E-04
					140.89		28	
4	9.54	11.40	1.00	0.25	139.66	98	28	2.08E-04
					136.66		27	

Mean Hydraulic Conductivity, cm/sec

2.05E-04

Summary of Final Soil Properties

Final Area (cm^2)	10.095	Final Dry Unit Weight (pcf)	100.55
Final Total Volume (cm^3)	59.798	Final Moist Unit Weight (pcf)	126.41
Final Mass Moist Soil (g)	121.09	Final Void Ratio	0.71
Mass Dry Soil (g)	96.31	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	25.73	Final Pore Volume (cm^3)	24.78

FIGURE B-377

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 4
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-165 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 30 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	1.907	D_1	1.441
Mass Moist Soil + Container (g)	321.91			97.54	H_2	1.909	D_2	1.442
Mass Dry Soil + Container (g)	312.42			75.85	H_3	1.908	D_3	1.441
Mass Container (g)	212.64			0.00	H_4	1.910	D_4	1.441
WATER CONTENT (%)	9.51			28.59	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	9.51	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	1.909	(in)	1.441
[ ] See attached data sheet(s) for additional water contents					(cm)	4.848	(cm)	3.661

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	83.07	97.54
Mass Dry Soil + Tare (g)	75.85	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	83.07	97.54

Summary of Initial Soil Properties

Initial Area (cm^2)	10.525	Initial Dry Unit Weight (pcf)	92.81
Initial Total Volume (cm^3)	51.023	Initial Moist Unit Weight (pcf)	101.64
Initial Mass Moist Soil (g)	83.07	Initial Void Ratio	0.85
Mass Dry Soil (g)	75.85	Initial Degree of Saturation (%)	30.78
Initial Moisture Content (%)	9.51	Pore Volume (cm^3)	23.44

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	4.635	4.848	0	10.525
After Saturation Phase	4.654	4.829	3.0	10.229
After Consolidation Phase	4.667	4.816	0.5	10.158
End of Test	4.650	4.833	0.0	10.195

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	9.55	11.00	0.95	0.38	121.54	85	26	1.55E-03
					103.24		22	
2	9.65	11.21	1.03	0.72	127.37	88	27	1.24E-03
					111.77		24	
3	9.65	11.21	0.99	1.04	126.47	88	27	1.23E-03
					111.17		24	
4	9.68	11.23	1.00	1.36	123.97	88	27	1.21E-03
					109.17		23	

Mean Hydraulic Conductivity, cm/sec

1.31E-03

Summary of Final Soil Properties

Final Area (cm^2)	10.195	Final Dry Unit Weight (pcf)	96.12
Final Total Volume (cm^3)	49.268	Final Moist Unit Weight (pcf)	123.59
Final Mass Moist Soil (g)	97.54	Final Void Ratio	0.79
Mass Dry Soil (g)	75.85	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	28.59	Final Pore Volume (cm^3)	21.69

FIGURE B-378

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 4
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-166 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 20 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.272	D_1	1.442
Mass Moist Soil + Container (g)	414.09			120.89	H_2	2.274	D_2	1.441
Mass Dry Soil + Container (g)	396.92			95.29	H_3	2.274	D_3	1.444
Mass Container (g)	225.39			0.00	H_4	2.276	D_4	1.440
WATER CONTENT (%)	10.01			26.86	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.01	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.274	(in)	1.442
[ ] See attached data sheet(s) for additional water contents					(cm)	5.776	(cm)	3.662

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	104.83	120.89
Mass Dry Soil + Tare (g)	95.29	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	104.83	120.89

Summary of Initial Soil Properties

Initial Area (cm^2)	10.533	Initial Dry Unit Weight (pcf)	97.78
Initial Total Volume (cm^3)	60.836	Initial Moist Unit Weight (pcf)	107.57
Initial Mass Moist Soil (g)	104.83	Initial Void Ratio	0.76
Mass Dry Soil (g)	95.29	Initial Degree of Saturation (%)	36.43
Initial Moisture Content (%)	10.01	Pore Volume (cm^3)	26.19

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.018	5.776	0	10.533
After Saturation Phase	5.014	5.780	1.0	10.463
After Consolidation Phase	5.010	5.784	0.7	10.416
End of Test	5.010	5.784	0.0	10.416

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	9.64	11.16	0.97	0.35	125.36	85	25	1.90E-03
					106.86		21	
2	9.48	11.23	1.01	0.69	141.23	87	28	1.53E-03
					123.33		25	
3	9.49	11.25	1.00	1.02	140.13	88	28	1.57E-03
					122.93		25	
4	9.50	11.25	1.02	1.34	138.23	88	28	1.54E-03
					121.43		24	

Mean Hydraulic Conductivity, cm/sec

1.64E-03

Summary of Final Soil Properties

Final Area (cm^2)	10.416	Final Dry Unit Weight (pcf)	98.74
Final Total Volume (cm^3)	60.245	Final Moist Unit Weight (pcf)	125.27
Final Mass Moist Soil (g)	120.89	Final Void Ratio	0.74
Mass Dry Soil (g)	95.29	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	26.86	Final Pore Volume (cm^3)	25.59

FIGURE B-379

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 2
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-177 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 30 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.323	D_1	1.446
Mass Moist Soil + Container (g)	341.38			116.68	H_2	2.320	D_2	1.448
Mass Dry Soil + Container (g)	330.81			94.95	H_3	2.321	D_3	1.446
Mass Container (g)	225.39			0.00	H_4	2.323	D_4	1.445
WATER CONTENT (%)	10.03			22.88	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.03	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.322	(in)	1.446
[ ] See attached data sheet(s) for additional water contents					(cm)	5.897	(cm)	3.673

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	104.47	116.68
Mass Dry Soil + Tare (g)	94.95	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	104.47	116.68

Summary of Initial Soil Properties

Initial Area (cm^2)	10.598	Initial Dry Unit Weight (pcf)	94.84
Initial Total Volume (cm^3)	62.502	Initial Moist Unit Weight (pcf)	104.35
Initial Mass Moist Soil (g)	104.47	Initial Void Ratio	0.81
Mass Dry Soil (g)	94.95	Initial Degree of Saturation (%)	34.03
Initial Moisture Content (%)	10.03	Pore Volume (cm^3)	27.98

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.091	5.897	0	10.598
After Saturation Phase	5.083	5.905	13.5	9.570
After Consolidation Phase	5.080	5.908	0.7	9.521
End of Test	5.080	5.908	0.0	9.521

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	9.44	10.93	0.97	0.35	122.55	84	24	1.88E-03
					102.45		20	
2	9.47	10.95	1.00	0.70	120.24	84	24	1.74E-03
					100.84		20	
3	9.05	10.92	1.01	1.17	146.06	82	29	1.95E-03
					119.96		24	
4	9.49	10.98	0.99	1.45	117.15	86	23	1.65E-03
					101.05		20	

Mean Hydraulic Conductivity, cm/sec

1.80E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.521	Final Dry Unit Weight (pcf)	105.37
Final Total Volume (cm^3)	56.252	Final Moist Unit Weight (pcf)	129.49
Final Mass Moist Soil (g)	116.68	Final Void Ratio	0.63
Mass Dry Soil (g)	94.95	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	22.88	Final Pore Volume (cm^3)	21.73

FIGURE B-380

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 3
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-183 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 30 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.358	D_1	1.441
Mass Moist Soil + Container (g)	342.47			116.65	H_2	2.360	D_2	1.443
Mass Dry Soil + Container (g)	330.95			94.66	H_3	2.361	D_3	1.443
Mass Container (g)	209.25			0.00	H_4	2.359	D_4	1.445
WATER CONTENT (%)	9.47			23.23	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	9.47	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.360	(in)	1.443
[ ] See attached data sheet(s) for additional water contents					(cm)	5.993	(cm)	3.665

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	103.62	116.65
Mass Dry Soil + Tare (g)	94.66	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	103.62	116.65

Summary of Initial Soil Properties

Initial Area (cm^2)	10.551	Initial Dry Unit Weight (pcf)	93.45
Initial Total Volume (cm^3)	63.233	Initial Moist Unit Weight (pcf)	102.30
Initial Mass Moist Soil (g)	103.62	Initial Void Ratio	0.84
Mass Dry Soil (g)	94.66	Initial Degree of Saturation (%)	31.10
Initial Moisture Content (%)	9.47	Pore Volume (cm^3)	28.81

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.095	5.993	0	10.551
After Saturation Phase	5.111	5.977	14.5	9.401
After Consolidation Phase	5.080	6.008	0.9	9.389
End of Test	5.080	6.008	0.0	9.389

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	9.41	11.22	0.93	0.27	141.44	89	28	1.04E-03
					125.44		25	
2	9.29	11.15	0.98	0.46	143.56	92	28	6.97E-04
					132.46		26	
3	9.31	11.15	1.02	0.64	141.05	93	28	6.88E-04
					130.55		26	
4	9.32	11.14	0.98	0.82	138.95	93	27	6.71E-04
					128.65		25	

Mean Hydraulic Conductivity, cm/sec

6.85E-04

Summary of Final Soil Properties

Final Area (cm^2)	9.389	Final Dry Unit Weight (pcf)	104.76
Final Total Volume (cm^3)	56.408	Final Moist Unit Weight (pcf)	129.10
Final Mass Moist Soil (g)	116.65	Final Void Ratio	0.64
Mass Dry Soil (g)	94.66	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	23.23	Final Pore Volume (cm^3)	21.99

FIGURE B-381

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 4
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-188 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 25 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery : [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.400	D_1	1.440
Mass Moist Soil + Container (g)	323.74			116.66	H_2	2.408	D_2	1.442
Mass Dry Soil + Container (g)	313.33			87.21	H_3	2.397	D_3	1.441
Mass Container (g)	209.62			0.00	H_4	2.392	D_4	1.445
WATER CONTENT (%)	10.04			33.77	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.04	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.399	(in)	1.442
[ ] See attached data sheet(s) for additional water contents					(cm)	6.094	(cm)	3.663

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	95.96	116.66
Mass Dry Soil + Tare (g)	87.21	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	95.96	116.66

Summary of Initial Soil Properties

Initial Area (cm^2)	10.536	Initial Dry Unit Weight (pcf)	84.79
Initial Total Volume (cm^3)	64.209	Initial Moist Unit Weight (pcf)	93.30
Initial Mass Moist Soil (g)	95.96	Initial Void Ratio	1.02
Mass Dry Soil (g)	87.21	Initial Degree of Saturation (%)	26.93
Initial Moisture Content (%)	10.04	Pore Volume (cm^3)	32.50

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	4.856	6.094	0	10.536
After Saturation Phase	4.856	6.094	6.0	10.050
After Consolidation Phase	4.851	6.099	0.4	10.028
End of Test	4.851	6.099	0.0	10.028

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	10.42	11.63	0.98	0.16	102.46	90	21	1.25E-03
					92.16		19	
2	10.44	11.60	0.91	0.34	98.55	87	20	1.36E-03
					85.95		18	
3	10.42	11.63	1.02	0.50	100.56	90	21	1.27E-03
					90.06		19	
4	10.43	11.63	1.02	0.66	98.56	90	20	1.29E-03
					88.46		18	

Mean Hydraulic Conductivity, cm/sec

1.29E-03

Summary of Final Soil Properties

Final Area (cm^2)	10.028	Final Dry Unit Weight (pcf)	89.01
Final Total Volume (cm^3)	61.160	Final Moist Unit Weight (pcf)	119.08
Final Mass Moist Soil (g)	116.66	Final Void Ratio	0.93
Mass Dry Soil (g)	87.21	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	33.77	Final Pore Volume (cm^3)	29.45

FIGURE B-382

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 2
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-197 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 25 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery : [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.545	D_1	1.456
Mass Moist Soil + Container (g)	358.50			128.18	H_2	2.546	D_2	1.448
Mass Dry Soil + Container (g)	344.95			101.38	H_3	2.545	D_3	1.454
Mass Container (g)	209.65			0.00	H_4	2.547	D_4	1.452
WATER CONTENT (%)	10.01			26.44	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.01	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.546	(in)	1.453
[ ] See attached data sheet(s) for additional water contents					(cm)	6.466	(cm)	3.689

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	111.53	128.18
Mass Dry Soil + Tare (g)	101.38	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	111.53	128.18

Summary of Initial Soil Properties

Initial Area (cm^2)	10.690	Initial Dry Unit Weight (pcf)	91.55
Initial Total Volume (cm^3)	69.126	Initial Moist Unit Weight (pcf)	100.72
Initial Mass Moist Soil (g)	111.53	Initial Void Ratio	0.88
Mass Dry Soil (g)	101.38	Initial Degree of Saturation (%)	31.47
Initial Moisture Content (%)	10.01	Pore Volume (cm^3)	32.26

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.232	6.466	0	10.690
After Saturation Phase	5.227	6.471	11.0	9.872
After Consolidation Phase	5.228	6.470	0.4	9.840
End of Test	5.228	6.470	0.0	9.840

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	9.83	11.46	0.98	0.31	133.29	85	25	1.80E-03
					113.09		22	
2	9.65	11.49	1.00	0.57	144.75	88	28	1.35E-03
					127.95		24	
3	9.67	11.49	0.98	0.82	142.15	88	27	1.35E-03
					125.75		24	
4	9.69	11.50	1.00	1.06	138.34	89	26	1.29E-03
					123.14		24	

Mean Hydraulic Conductivity, cm/sec

1.45E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.840	Final Dry Unit Weight (pcf)	99.40
Final Total Volume (cm^3)	63.667	Final Moist Unit Weight (pcf)	125.69
Final Mass Moist Soil (g)	128.18	Final Void Ratio	0.73
Mass Dry Soil (g)	101.38	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	26.44	Final Pore Volume (cm^3)	26.80

FIGURE B-383

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 3
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-206 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 25 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery : [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.052	D_1	1.454
Mass Moist Soil + Container (g)	330.76			101.15	H_2	2.054	D_2	1.456
Mass Dry Soil + Container (g)	320.30			80.31	H_3	2.051	D_3	1.455
Mass Container (g)	212.88			0.00	H_4	2.053	D_4	1.450
WATER CONTENT (%)	9.74			25.95	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	9.74	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.053	(in)	1.454
[ ] See attached data sheet(s) for additional water contents					(cm)	5.213	(cm)	3.693

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	88.13	101.15
Mass Dry Soil + Tare (g)	80.31	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	88.13	101.15

Summary of Initial Soil Properties

Initial Area (cm^2)	10.709	Initial Dry Unit Weight (pcf)	89.80
Initial Total Volume (cm^3)	55.828	Initial Moist Unit Weight (pcf)	98.55
Initial Mass Moist Soil (g)	88.13	Initial Void Ratio	0.91
Mass Dry Soil (g)	80.31	Initial Degree of Saturation (%)	29.37
Initial Moisture Content (%)	9.74	Pore Volume (cm^3)	26.63

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	4.661	5.213	0	10.709
After Saturation Phase	4.666	5.208	11.5	9.727
After Consolidation Phase	4.666	5.208	1.4	9.609
End of Test	4.666	5.208	0.0	9.609

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
2	9.46	11.46	0.95	0.30	150.70	97	32	2.37E-04
					146.80		31	
3	9.45	11.51	1.19	0.38	154.72	98	33	2.08E-04
					151.22		32	
4	9.47	11.48	1.00	0.43	147.70	98	32	1.80E-04
					144.90		31	
5	9.49	11.48	1.00	0.48	143.50	98	31	1.75E-04
					140.90		30	

Mean Hydraulic Conductivity, cm/sec

2.00E-04

Summary of Final Soil Properties

Final Area (cm^2)	9.609	Final Dry Unit Weight (pcf)	100.18
Final Total Volume (cm^3)	50.046	Final Moist Unit Weight (pcf)	126.18
Final Mass Moist Soil (g)	101.15	Final Void Ratio	0.71
Mass Dry Soil (g)	80.31	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	25.95	Final Pore Volume (cm^3)	20.84

FIGURE B-384

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 3
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-208 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 25 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery : [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.516	D_1	1.448
Mass Moist Soil + Container (g)	314.51			123.99	H_2	2.469	D_2	1.450
Mass Dry Soil + Container (g)	304.65			98.18	H_3	2.479	D_3	1.448
Mass Container (g)	209.60			0.00	H_4	2.485	D_4	1.449
WATER CONTENT (%)	10.37			26.29	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.37	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.487	(in)	1.449
[ ] See attached data sheet(s) for additional water contents					(cm)	6.318	(cm)	3.680

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	108.36	123.99
Mass Dry Soil + Tare (g)	98.18	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	108.36	123.99

Summary of Initial Soil Properties

Initial Area (cm^2)	10.635	Initial Dry Unit Weight (pcf)	91.22
Initial Total Volume (cm^3)	67.189	Initial Moist Unit Weight (pcf)	100.68
Initial Mass Moist Soil (g)	108.36	Initial Void Ratio	0.88
Mass Dry Soil (g)	98.18	Initial Degree of Saturation (%)	32.34
Initial Moisture Content (%)	10.37	Pore Volume (cm^3)	31.49

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.166	6.318	0	10.635
After Saturation Phase	5.163	6.321	11.5	9.764
After Consolidation Phase	5.157	6.327	0.7	9.722
End of Test	5.157	6.327	0.0	9.722

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	9.46	11.00	0.96	0.30	126.86	85	25	1.99E-03
					107.26		21	
2	9.38	11.07	1.00	0.59	136.51	87	26	1.60E-03
					118.71		23	
3	9.41	11.08	1.01	0.86	133.50	87	26	1.64E-03
					116.20		23	
4	9.44	11.11	0.99	1.12	131.60	88	26	1.54E-03
					115.50		22	

Mean Hydraulic Conductivity, cm/sec

1.69E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.722	Final Dry Unit Weight (pcf)	99.64
Final Total Volume (cm^3)	61.510	Final Moist Unit Weight (pcf)	125.84
Final Mass Moist Soil (g)	123.99	Final Void Ratio	0.72
Mass Dry Soil (g)	98.18	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	26.29	Final Pore Volume (cm^3)	25.81

FIGURE B-385

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 2
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-233 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 25 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery : [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.797	D_1	1.449
Mass Moist Soil + Container (g)	348.41			134.82	H_2	2.795	D_2	1.447
Mass Dry Soil + Container (g)	336.01			110.25	H_3	2.805	D_3	1.444
Mass Container (g)	208.82			0.00	H_4	2.820	D_4	1.450
WATER CONTENT (%)	9.75			22.28	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	9.75	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.804	(in)	1.448
[ ] See attached data sheet(s) for additional water contents					(cm)	7.123	(cm)	3.677

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	121.00	134.82
Mass Dry Soil + Tare (g)	110.25	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	121.00	134.82

Summary of Initial Soil Properties

Initial Area (cm^2)	10.617	Initial Dry Unit Weight (pcf)	91.02
Initial Total Volume (cm^3)	75.621	Initial Moist Unit Weight (pcf)	99.89
Initial Mass Moist Soil (g)	121.00	Initial Void Ratio	0.89
Mass Dry Soil (g)	110.25	Initial Degree of Saturation (%)	30.25
Initial Moisture Content (%)	9.75	Pore Volume (cm^3)	35.53

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.432	7.123	0	10.617
After Saturation Phase	5.434	7.121	19.5	9.200
After Consolidation Phase	5.433	7.122	1.7	9.079
End of Test	5.433	7.122	0.0	9.079

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
3	10.05	13.06	0.99	0.92	229.90	91	42	1.33E-03
					208.40		38	
4	10.08	13.10	1.00	1.20	229.41	91	42	1.34E-03
					209.61		39	
5	10.12	13.12	0.90	1.46	225.20	91	41	1.26E-03
					205.60		38	
6	10.15	13.13	1.00	1.75	223.19	91	41	1.33E-03
					202.39		37	

Mean Hydraulic Conductivity, cm/sec

1.32E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.079	Final Dry Unit Weight (pcf)	106.45
Final Total Volume (cm^3)	64.656	Final Moist Unit Weight (pcf)	130.17
Final Mass Moist Soil (g)	134.82	Final Void Ratio	0.61
Mass Dry Soil (g)	110.25	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	22.28	Final Pore Volume (cm^3)	24.57

FIGURE B-386

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 2
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-252 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 25 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.449	D_1	1.467
Mass Moist Soil + Container (g)	149.93			125.68	H_2	2.453	D_2	1.469
Mass Dry Soil + Container (g)	139.39			90.78	H_3	2.452	D_3	1.478
Mass Container (g)	38.91			0.00	H_4	2.449	D_4	1.470
WATER CONTENT (%)	10.49			38.45	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.49	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.451	(in)	1.471
[ ] See attached data sheet(s) for additional water contents					(cm)	6.225	(cm)	3.736

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	100.30	125.68
Mass Dry Soil + Tare (g)	90.78	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	100.30	125.68

Summary of Initial Soil Properties

Initial Area (cm^2)	10.964	Initial Dry Unit Weight (pcf)	83.03
Initial Total Volume (cm^3)	68.252	Initial Moist Unit Weight (pcf)	91.74
Initial Mass Moist Soil (g)	100.30	Initial Void Ratio	1.07
Mass Dry Soil (g)	90.78	Initial Degree of Saturation (%)	27.02
Initial Moisture Content (%)	10.49	Pore Volume (cm^3)	35.24

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.083	6.225	0	10.964
After Saturation Phase	5.099	6.209	3.0	10.698
After Consolidation Phase	5.033	6.275	0.2	10.823
End of Test	5.033	6.275	0.0	10.823

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	13.40	14.76	0.99	0.22	112.11	86	22	8.09E-04
					96.21		19	
2	13.41	14.75	1.00	0.44	111.50	86	22	7.68E-04
					96.10		19	
3	13.41	14.74	1.00	0.66	109.10	86	22	7.64E-04
					93.90		19	
4	13.44	14.75	0.99	0.86	107.09	87	21	7.33E-04
					92.79		18	

Mean Hydraulic Conductivity, cm/sec

7.68E-04

Summary of Final Soil Properties

Final Area (cm^2)	10.823	Final Dry Unit Weight (pcf)	83.45
Final Total Volume (cm^3)	67.913	Final Moist Unit Weight (pcf)	115.53
Final Mass Moist Soil (g)	125.68	Final Void Ratio	1.06
Mass Dry Soil (g)	90.78	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	38.45	Final Pore Volume (cm^3)	34.90

FIGURE B-387

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 2
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-253 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 25 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.302	D_1	1.454
Mass Moist Soil + Container (g)	166.32			122.63	H_2	2.306	D_2	1.451
Mass Dry Soil + Container (g)	154.37			97.38	H_3	2.306	D_3	1.452
Mass Container (g)	38.70			0.00	H_4	2.302	D_4	1.452
WATER CONTENT (%)	10.33			25.93	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.33	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.304	(in)	1.452
[ ] See attached data sheet(s) for additional water contents					(cm)	5.852	(cm)	3.689

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	108.19	122.63
Mass Dry Soil + Tare (g)	97.38	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	108.19	122.63

Summary of Initial Soil Properties

Initial Area (cm^2)	10.687	Initial Dry Unit Weight (pcf)	97.21
Initial Total Volume (cm^3)	62.540	Initial Moist Unit Weight (pcf)	108.00
Initial Mass Moist Soil (g)	108.19	Initial Void Ratio	0.77
Mass Dry Soil (g)	97.38	Initial Degree of Saturation (%)	39.84
Initial Moisture Content (%)	11.10	Pore Volume (cm^3)	27.13

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.220	5.852	0	10.687
After Saturation Phase	5.209	5.863	3.5	10.445
After Consolidation Phase	5.205	5.867	1.5	10.339
End of Test	5.205	5.867	0.0	10.339

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	9.40	10.90	0.88	0.34	121.85	84	23	1.66E-03
					102.35		20	
2	9.39	10.89	1.00	0.69	120.15	84	23	1.66E-03
					101.15		19	
3	9.40	10.91	1.01	1.03	119.95	85	23	1.58E-03
					101.45		19	
4	9.42	10.92	0.84	1.29	115.45	87	22	1.34E-03
					100.15		19	

Mean Hydraulic Conductivity, cm/sec

1.56E-03

Summary of Final Soil Properties

Final Area (cm^2)	10.339	Final Dry Unit Weight (pcf)	100.21
Final Total Volume (cm^3)	60.662	Final Moist Unit Weight (pcf)	126.20
Final Mass Moist Soil (g)	122.63	Final Void Ratio	0.71
Mass Dry Soil (g)	97.38	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	25.93	Final Pore Volume (cm^3)	25.25

FIGURE B-388

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 3
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-278 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 30 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.					H_1	2.240	D_1	1.440
Mass Moist Soil + Container (g)	310.85				H_2	2.241	D_2	1.442
Mass Dry Soil + Container (g)	301.50				H_3	2.243	D_3	1.441
Mass Container (g)	208.78				H_4	2.239	D_4	1.441
WATER CONTENT (%)	10.08			N/A	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.08	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.241	(in)	1.441
[ ] See attached data sheet(s) for additional water contents					(cm)	5.692	(cm)	3.660

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	104.84	119.11
Mass Dry Soil + Tare (g)	95.24	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	104.84	119.11

Summary of Initial Soil Properties

Initial Area (cm^2)	10.522	Initial Dry Unit Weight (pcf)	99.28
Initial Total Volume (cm^3)	59.884	Initial Moist Unit Weight (pcf)	109.29
Initial Mass Moist Soil (g)	104.84	Initial Void Ratio	0.73
Mass Dry Soil (g)	95.24	Initial Degree of Saturation (%)	38.03
Initial Moisture Content (%)	10.08	Pore Volume (cm^3)	25.25

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	4.956	5.692	0	10.522
After Saturation Phase	4.957	5.691	3.0	10.281
After Consolidation Phase	4.957	5.691	0.2	10.265
End of Test	4.953	5.695	0.0	10.274

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	9.38	10.82	0.98	0.45	116.23	80	23	2.50E-03
					93.43		19	
2	9.43	10.77	0.98	0.88	107.60	79	22	2.64E-03
					85.40		17	
3	9.45	10.75	1.00	1.33	101.89	78	21	2.70E-03
					79.29		16	
4	9.49	10.79	0.99	1.77	101.89	78	21	2.66E-03
					79.59		16	

Mean Hydraulic Conductivity, cm/sec

2.63E-03

Summary of Final Soil Properties

Final Area (cm^2)	10.274	Final Dry Unit Weight (pcf)	101.62
Final Total Volume (cm^3)	58.504	Final Moist Unit Weight (pcf)	127.10
Final Mass Moist Soil (g)	119.11	Final Void Ratio	0.69
Mass Dry Soil (g)	95.24	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	25.07	Final Pore Volume (cm^3)	23.87

FIGURE B-389

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 3
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-280 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 25 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.483	D_1	1.385
Mass Moist Soil + Container (g)	356.96			125.20	H_2		D_2	
Mass Dry Soil + Container (g)	342.78			104.27	H_3		D_3	
Mass Container (g)	205.81			0.00	H_4		D_4	
WATER CONTENT (%)	10.35			20.07	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.35	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.483	(in)	1.385
[ ] See attached data sheet(s) for additional water contents					(cm)	6.307	(cm)	3.518

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	115.07	125.20
Mass Dry Soil + Tare (g)	104.27	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	115.07	125.20

Summary of Initial Soil Properties			
Initial Area (cm^2)	9.720	Initial Dry Unit Weight (pcf)	106.19
Initial Total Volume (cm^3)	61.301	Initial Moist Unit Weight (pcf)	117.19
Initial Mass Moist Soil (g)	115.07	Initial Void Ratio	0.62
Mass Dry Soil (g)	104.27	Initial Degree of Saturation (%)	46.16
Initial Moisture Content (%)	10.35	Pore Volume (cm^3)	23.38

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.213	6.307	0	9.720
After Saturation Phase	5.213	6.307	5.0	9.342
After Consolidation Phase	5.212	6.308	0.2	9.329
End of Test	5.212	6.308	0.0	9.329

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	8.94	10.50	0.94	0.35	123.17	86	24	2.07E-03
					106.07		20	
2	8.85	10.53	1.00	0.68	130.60	89	25	1.63E-03
					115.60		22	
3	8.88	10.54	1.00	0.98	126.20	89	24	1.61E-03
					112.00		21	
4	8.90	10.54	0.87	1.27	123.29	88	24	1.74E-03
					108.69		21	

Mean Hydraulic Conductivity, cm/sec

1.76E-03

Summary of Final Soil Properties			
Final Area (cm^2)	9.329	Final Dry Unit Weight (pcf)	110.62
Final Total Volume (cm^3)	58.845	Final Moist Unit Weight (pcf)	132.83
Final Mass Moist Soil (g)	125.20	Final Void Ratio	0.55
Mass Dry Soil (g)	104.27	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	20.07	Final Pore Volume (cm^3)	20.93

FIGURE B-390

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 4
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-282 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 30 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.447	D_1	1.441
Mass Moist Soil + Container (g)	359.09			123.37	H_2	2.449	D_2	1.442
Mass Dry Soil + Container (g)	345.37			101.50	H_3	2.447	D_3	1.443
Mass Container (g)	209.01			0.00	H_4	2.448	D_4	1.440
WATER CONTENT (%)	10.06			21.55	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.06	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.448	(in)	1.442
[ ] See attached data sheet(s) for additional water contents					(cm)	6.217	(cm)	3.661

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	111.71	123.37
Mass Dry Soil + Tare (g)	101.50	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	111.71	123.37

Summary of Initial Soil Properties

Initial Area (cm^2)	10.529	Initial Dry Unit Weight (pcf)	96.79
Initial Total Volume (cm^3)	65.462	Initial Moist Unit Weight (pcf)	106.53
Initial Mass Moist Soil (g)	111.71	Initial Void Ratio	0.77
Mass Dry Soil (g)	101.50	Initial Degree of Saturation (%)	35.76
Initial Moisture Content (%)	10.06	Pore Volume (cm^3)	28.55

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.171	6.217	0	10.529
After Saturation Phase	5.169	6.219	13.0	9.543
After Consolidation Phase	5.168	6.220	1.3	9.446
End of Test	5.167	6.221	0.0	9.448

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
5	9.80	11.06	0.99	2.47	102.38	82	20	2.62E-03
					84.28		16	
6	9.80	11.08	0.98	2.74	101.98	84	20	2.55E-03
					85.98		17	
7	9.84	11.07	0.99	3.04	97.17	83	19	2.71E-03
					80.27		16	
8	9.85	11.04	1.00	3.33	93.26	82	82	2.83E-03
					76.46		15	

Mean Hydraulic Conductivity, cm/sec

2.68E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.448	Final Dry Unit Weight (pcf)	107.80
Final Total Volume (cm^3)	58.776	Final Moist Unit Weight (pcf)	131.03
Final Mass Moist Soil (g)	123.37	Final Void Ratio	0.59
Mass Dry Soil (g)	101.50	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	21.55	Final Pore Volume (cm^3)	21.87

FIGURE B-391

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 4
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-293 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 40 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.442	D_1	1.441
Mass Moist Soil + Container (g)	341.14			123.35	H_2	2.441	D_2	1.441
Mass Dry Soil + Container (g)	329.11			98.18	H_3	2.442	D_3	1.443
Mass Container (g)	209.86			0.00	H_4	2.442	D_4	1.442
WATER CONTENT (%)	10.09			25.64	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.09	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.442	(in)	1.442
[ ] See attached data sheet(s) for additional water contents					(cm)	6.202	(cm)	3.662

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	108.08	123.35
Mass Dry Soil + Tare (g)	98.18	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	108.08	123.35

Summary of Initial Soil Properties

Initial Area (cm^2)	10.533	Initial Dry Unit Weight (pcf)	93.82
Initial Total Volume (cm^3)	65.324	Initial Moist Unit Weight (pcf)	103.29
Initial Mass Moist Soil (g)	108.08	Initial Void Ratio	0.83
Mass Dry Soil (g)	98.18	Initial Degree of Saturation (%)	33.43
Initial Moisture Content (%)	10.09	Pore Volume (cm^3)	29.62

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.146	6.202	0	10.533
After Saturation Phase	5.158	6.190	9.0	9.821
After Consolidation Phase	5.139	6.209	0.7	9.804
End of Test	5.139	6.209	0.0	9.804

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	9.53	11.14	0.97	0.22	123.08	89	24	1.31E-03
					109.68		21	
2	9.53	11.15	1.00	0.44	122.79	90	24	1.24E-03
					109.99		21	
3	9.54	11.15	0.98	0.66	120.78	89	24	1.24E-03
					107.68		21	
4	9.55	11.16	1.00	0.87	119.78	89	23	1.22E-03
					106.98		21	

Mean Hydraulic Conductivity, cm/sec

1.25E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.804	Final Dry Unit Weight (pcf)	100.68
Final Total Volume (cm^3)	60.873	Final Moist Unit Weight (pcf)	126.50
Final Mass Moist Soil (g)	123.35	Final Void Ratio	0.71
Mass Dry Soil (g)	98.18	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	25.64	Final Pore Volume (cm^3)	25.17

FIGURE B-392

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 4
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-296 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 30 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.267	D_1	1.448
Mass Moist Soil + Container (g)	388.38			118.80	H_2	2.286	D_2	1.449
Mass Dry Soil + Container (g)	372.43			96.40	H_3	2.296	D_3	1.446
Mass Container (g)	209.28			0.00	H_4	2.274	D_4	1.445
WATER CONTENT (%)	9.78			23.25	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	9.78	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.281	(in)	1.447
[ ] See attached data sheet(s) for additional water contents					(cm)	5.793	(cm)	3.675

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	105.82	118.80
Mass Dry Soil + Tare (g)	96.40	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	105.82	118.80

Summary of Initial Soil Properties

Initial Area (cm^2)	10.609	Initial Dry Unit Weight (pcf)	97.91
Initial Total Volume (cm^3)	61.462	Initial Moist Unit Weight (pcf)	107.48
Initial Mass Moist Soil (g)	105.82	Initial Void Ratio	0.75
Mass Dry Soil (g)	96.40	Initial Degree of Saturation (%)	35.68
Initial Moisture Content (%)	9.78	Pore Volume (cm^3)	26.41

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.008	5.793	0	10.609
After Saturation Phase	5.010	5.791	7.5	10.016
After Consolidation Phase	5.012	5.789	0.6	9.965
End of Test	5.012	5.789	0.5	9.925

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
1	9.29	10.46	0.97	0.37	98.15	80	20	2.31E-03
					78.25		16	
2	9.27	10.49	0.99	0.68	100.27	84	20	1.99E-03
					83.77		17	
3	9.29	10.50	0.99	1.00	96.56	83	19	2.05E-03
					79.86		16	
4	9.30	10.53	0.87	1.26	96.17	84	19	1.87E-03
					80.87		16	

Mean Hydraulic Conductivity, cm/sec

2.06E-03

Summary of Final Soil Properties

Final Area (cm^2)	9.925	Final Dry Unit Weight (pcf)	104.73
Final Total Volume (cm^3)	57.460	Final Moist Unit Weight (pcf)	129.08
Final Mass Moist Soil (g)	118.80	Final Void Ratio	0.64
Mass Dry Soil (g)	96.40	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	23.25	Final Pore Volume (cm^3)	22.41

FIGURE B-393

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

Project: The Lower Rio Grande Flood Control Project
Location: Cameron County, Texas
R-K Project #: AMA08-115-00

Test Type

[ ] Method A; [ ] Method B; [X] Method C; Cell No. 2
[ ] Method D; [ ] Method E; Permeant Liquid Used: Tap Water

Specific Gravity: 2.75
[ ] Measured [X] Assumed

Sample

Boring No: DP-299 Tube: Spoon: [X] Constant Effort Blows/Tamps per Layer: 25
Sample No: Comp [ ] Field Extruded Ramper Weight (lbf): 0.75 No. of Layers: 3
Depth (ft): 30 [ ] Remolded [X] Remolded Tamper Force (lbf): Drop in Inches: 1

Method of trimming periphery: [ ] "Casagrande" Lathe ; [ ] Cutting Shoe ; [ ] Wire Saw; [ ] Other
Method of trimming ends: [ ] Wire Saw & Sharp (knife) Straight Edge; [ ] Wire Saw & Straight Edge; [ ] Wire Saw

Water Content (W)	Initial - Trimming Location			Final, W_{at}	Initial Soil Measurements (inches)			
	Top (W1)	Bottom (W2)	Sides (W3)	(see below)	Height		Diameter	
Container No.				--	H_1	2.286	D_1	1.447
Mass Moist Soil + Container (g)	395.44			114.45	H_2	2.287	D_2	1.448
Mass Dry Soil + Container (g)	378.11			86.93	H_3	2.287	D_3	1.446
Mass Container (g)	209.31			0.00	H_4	2.284	D_4	1.447
WATER CONTENT (%)	10.27			31.65	Average Height		Average Diameter	
Avg. Initial Water Content, W4 (%)	10.27	Final W_{at}:	[ ] Slice ;	[X] Whole Spec.	(in)	2.286	(in)	1.447
[ ] See attached data sheet(s) for additional water contents					(cm)	5.806	(cm)	3.675

Soil Masses	Initial	Final
Container No.		
Mass Moist Soil + Tare (g)	95.86	114.45
Mass Dry Soil + Tare (g)	86.93	
Mass Tare (g)	0.00	
Mass Moist Soil, M_i or M_f (g)	95.86	114.45

Summary of Initial Soil Properties

Initial Area (cm^2)	10.609	Initial Dry Unit Weight (pcf)	88.10
Initial Total Volume (cm^3)	61.603	Initial Moist Unit Weight (pcf)	97.14
Initial Mass Moist Soil (g)	95.86	Initial Void Ratio	0.95
Mass Dry Soil (g)	86.93	Initial Degree of Saturation (%)	29.76
Initial Moisture Content (%)	10.27	Pore Volume (cm^3)	29.99

Run Calc1

Run Calc 2

	Piston Height (in)	Sample Length (cm)	Observed Δ Volume (cm^3)	Sample Area (cm^2)
Initial	5.016	5.806	0	10.609
After Saturation Phase	5.015	5.807	4.0	10.298
After Consolidation Phase	5.018	5.804	1.2	10.197
End of Test	5.021	5.801	0.0	10.191

Run	Eff. Consol Pressure Top (psi)	Eff. Consol Pressure Bottom (psi)	Outflow: Inflow Ratio	Outflow (pore volumes)	Head Loss (cm)	% Initial Head Loss	Hydraulic Gradient	Hydraulic Conductivity (cm/sec)
3	9.49	11.48	1.00	0.24	154.00	98	31	1.67E-04
					151.40		30	
4	9.53	11.52	0.92	0.27	151.40	98	30	1.49E-04
					149.10		30	
5	9.51	11.49	1.00	0.31	148.39	98	30	1.59E-04
					145.99		29	
6	9.53	11.47	1.00	0.35	143.18	98	29	1.48E-04
					140.98		28	

Mean Hydraulic Conductivity, cm/sec

1.56E-04

Summary of Final Soil Properties

Final Area (cm^2)	10.191	Final Dry Unit Weight (pcf)	91.79
Final Total Volume (cm^3)	59.124	Final Moist Unit Weight (pcf)	120.84
Final Mass Moist Soil (g)	114.45	Final Void Ratio	0.87
Mass Dry Soil (g)	86.93	Final Degree of Saturation (%)	100.00
Final Moisture Content (%)	31.65	Final Pore Volume (cm^3)	27.51

FIGURE B-394

APPENDIX C

Material Properties

Material: FILL: FAT CLAY (CH)
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 400 psf
Friction Angle: 15 degrees
B_bar value: 1

Material: SILTY SAND (SM)
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 29 degrees
B_bar value: 0

Material: SAND (SP)
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 32 degrees
B_bar value: 0

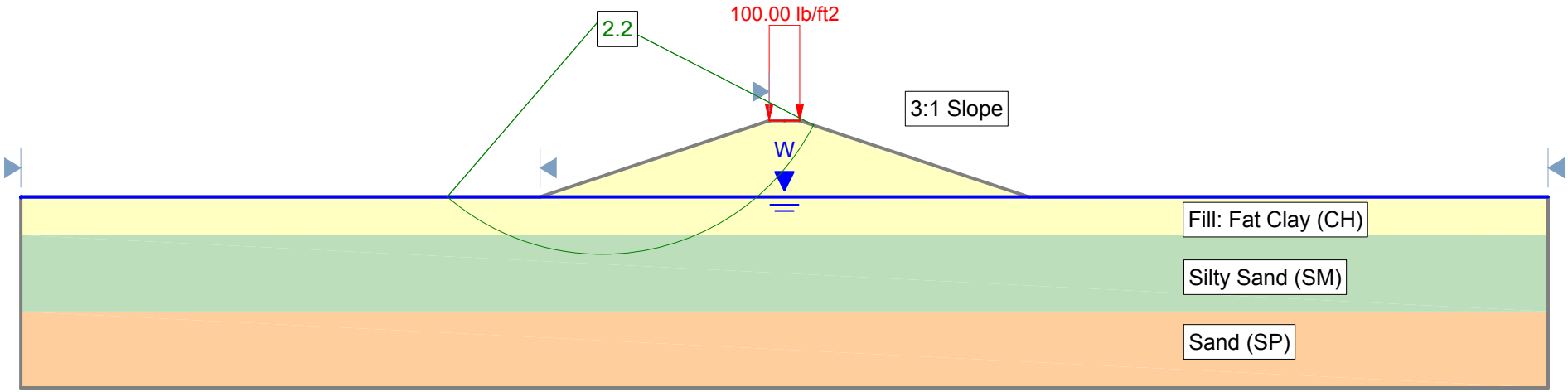


FIGURE C-2

STABILITY ANALYSIS – CASE 1
END OF CONSTRUCTION
THE LOWER RIO GRANDE FLOOD CONTROL PROJECT
CAMERON COUNTY, TEXAS

Material Properties

Material: FILL: FAT CLAY (CH)
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 400 psf
Friction Angle: 15 degrees
B_bar value: 1

Material: SILTY SAND (SM)
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 29 degrees
B_bar value: 0

Material: SAND (SP)
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 32 degrees
B_bar value: 0

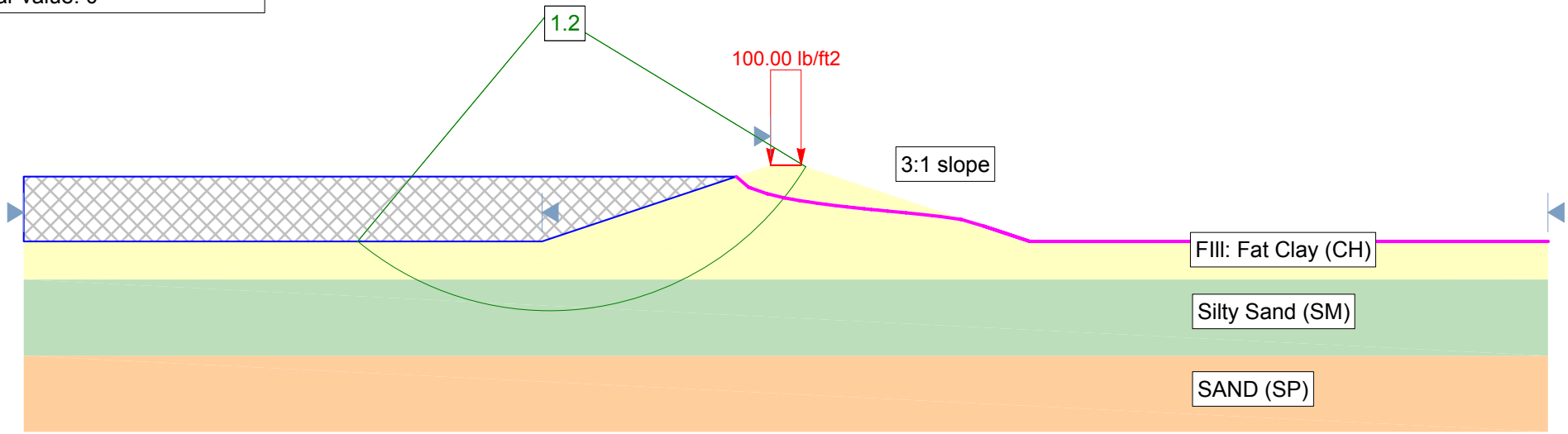


FIGURE C-3

STABILITY ANALYSIS – CASE 1
SUDDEN DRAWDOWN
THE LOWER RIO GRANDE FLOOD CONTROL PROJECT
CAMERON COUNTY, TEXAS

Material Properties

Material: FILL: FAT CLAY (CH)
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 400 psf
Friction Angle: 15 degrees
B_bar value: 1

Material: SILTY SAND (SM)
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 29 degrees
B_bar value: 0

Material: SAND (SP)
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 32 degrees
B_bar value: 0

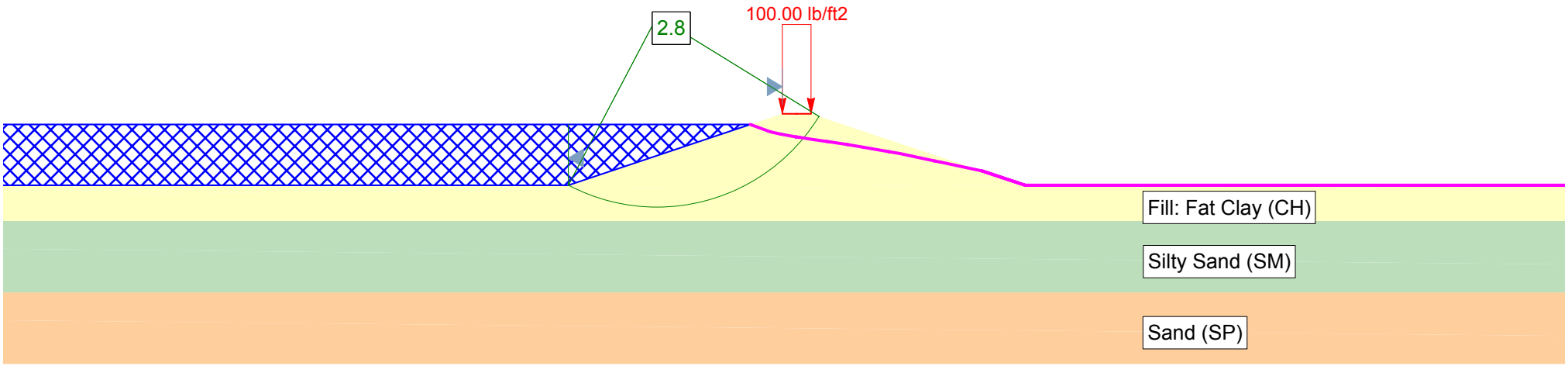


FIGURE C-4

STABILITY ANALYSIS – CASE 1
STEADY STATE
THE LOWER RIO GRANDE FLOOD CONTROL PROJECT
CAMERON COUNTY, TEXAS

Material Properties

Material: FILL: LEAN CLAY (CL)
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 250 psf
Friction Angle: 30 degrees
B_bar value: 1

Material: FILL: SILT (ML)
Strength Type: Mohr-Coulomb
Unit Weight: 110 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
B_bar value: 0

Material: FAT CLAY (CH)
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 450 psf
Friction Angle: 12 degrees
B_bar value: 1

Material: LEAN CLAY (CL)
Strength Type: Mohr-Coulomb
Unit Weight: 115 lb/ft3
Cohesion: 300 psf
Friction Angle: 22 degrees
B_bar value: 1

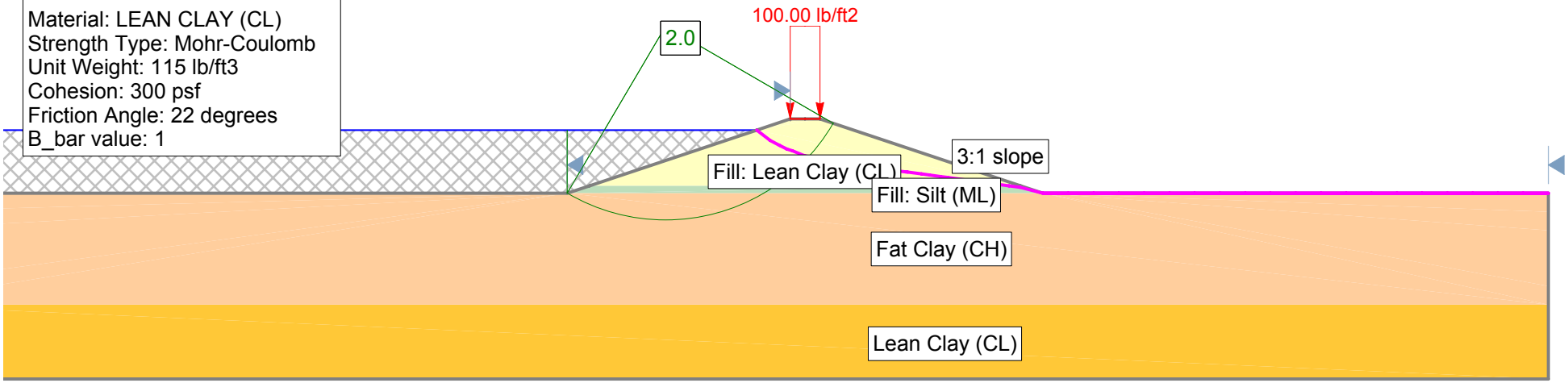


FIGURE C-5

STABILITY ANALYSIS – CASE 2
SUDDEN DRAWDOWN
THE LOWER RIO GRANDE FLOOD CONTROL PROJECT
CAMERON COUNTY, TEXAS

Material Properties

Material: FILL: FAT CLAY (CH)
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 400 psf
Friction Angle: 15 degrees
B_bar value: 1

Material: FAT CLAY (CH)
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3
Cohesion: 450 psf
Friction Angle: 12 degrees
B_bar value: 1

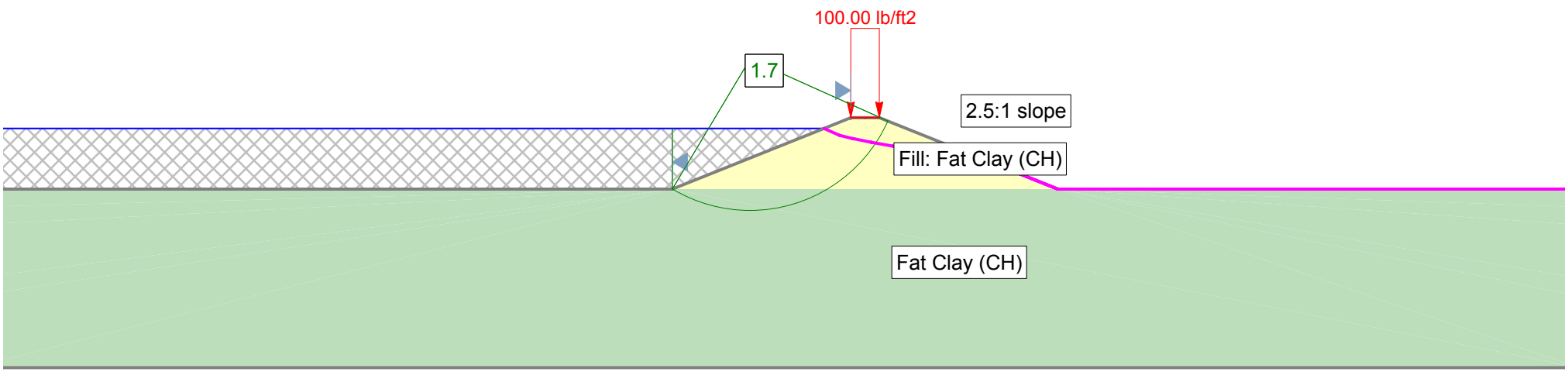
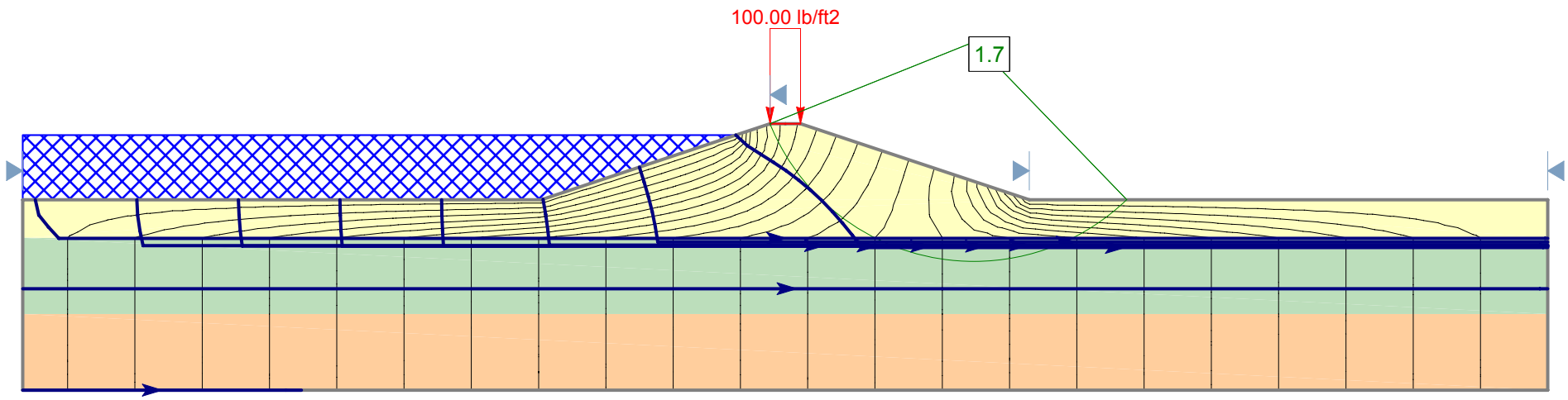


FIGURE C-6

STABILITY ANALYSIS – CASE 4
SUDDEN DRAWDOWN
THE LOWER RIO GRANDE FLOOD CONTROL PROJECT
CAMERON COUNTY, TEXAS

Groundwater Analysis
Maximum Number of Iterations: 500
Iteration Tolerance: 1e-006



SEEPAGE ANALYSIS – CASE 1
STEADY STATE
THE LOWER RIO GRANDE FLOOD CONTROL PROJECT
CAMERON COUNTY, TEXAS

FIGURE C-7

Groundwater Analysis
Maximum Number of Iterations: 500
Iteration Tolerance: 1e-006

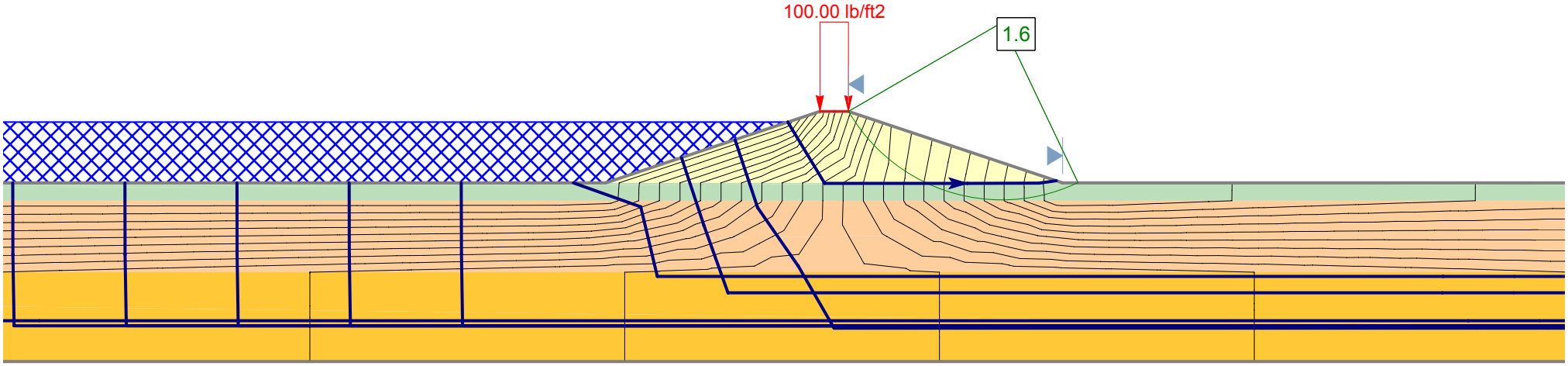


FIGURE C-8

SEEPAGE ANALYSIS – CASE 2
STEADY STATE
THE LOWER RIO GRANDE FLOOD CONTROL PROJECT
CAMERON COUNTY, TEXAS

Groundwater Analysis
Maximum Number of Iterations: 500
Iteration Tolerance: 1e-006

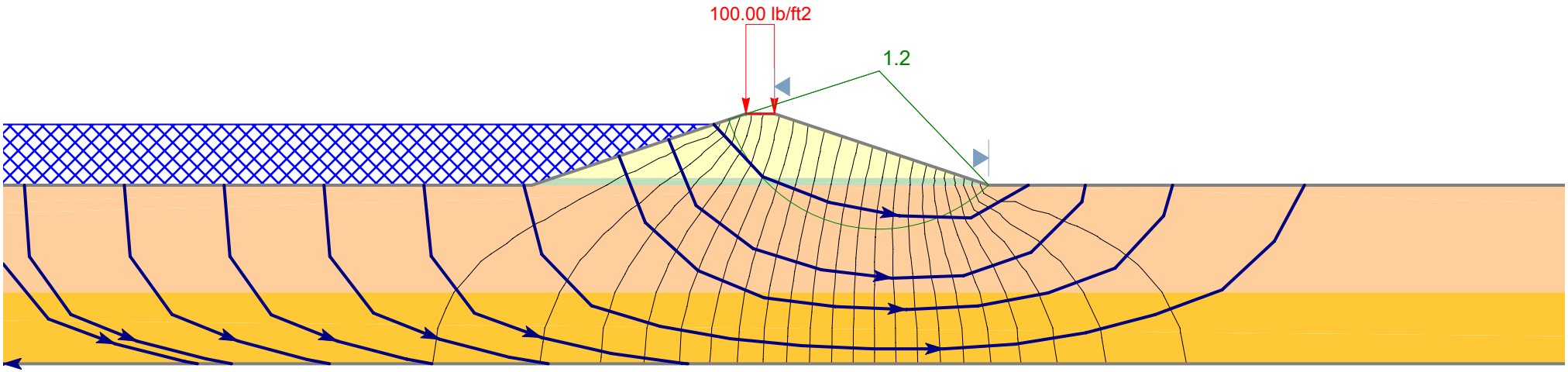


FIGURE C-9

SEEPAGE ANALYSIS – CASE 3
STEADY STATE
THE LOWER RIO GRANDE FLOOD CONTROL PROJECT
CAMERON COUNTY, TEXAS

Groundwater Analysis
Maximum Number of Iterations: 500
Iteration Tolerance: 1e-006

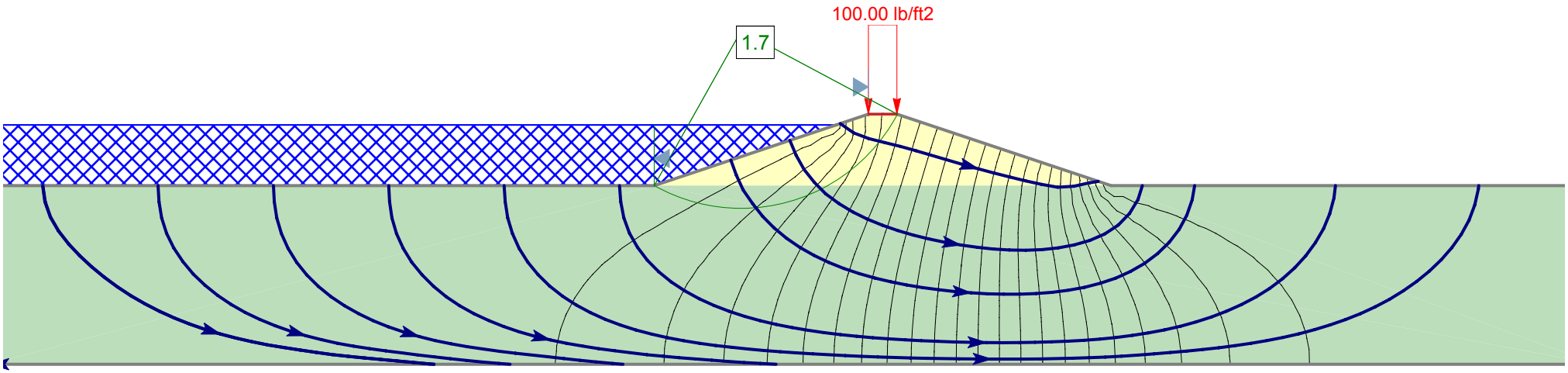
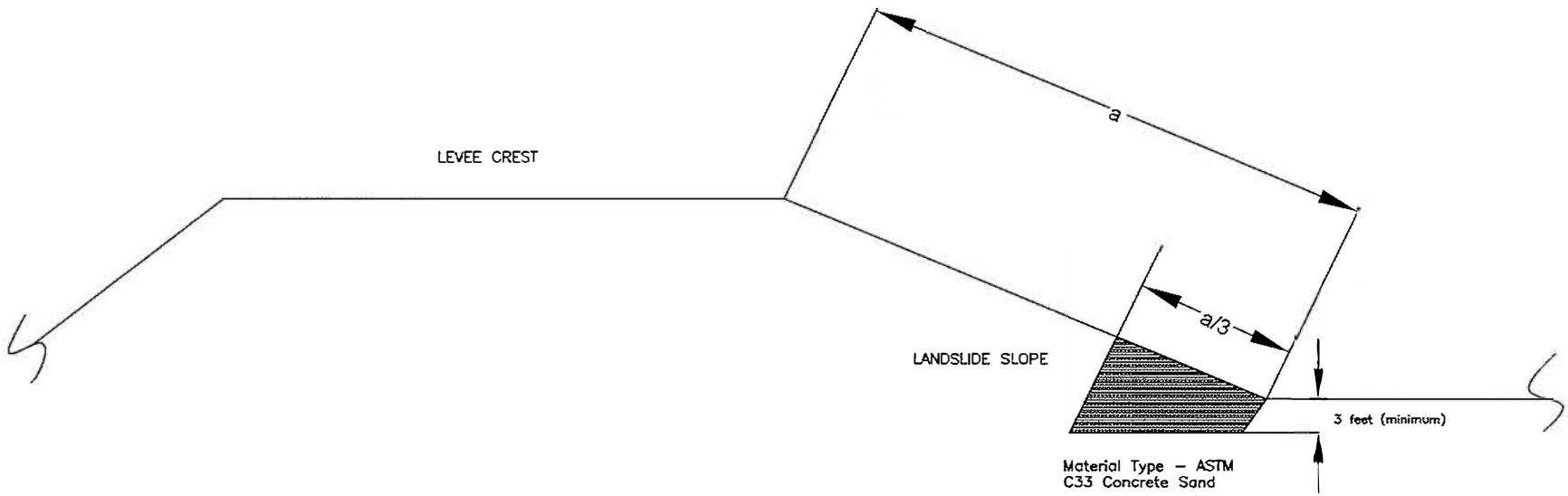


FIGURE C-10

SEEPAGE ANALYSIS – CASE 4
STEADY STATE
THE LOWER RIO GRANDE FLOOD CONTROL PROJECT
CAMERON COUNTY, TEXAS



Raba Kistner
TBPE FIRM REGISTRATION NO. F-3257

Engineering • Testing • Environmental
Facilities • Infrastructure

STANDARD DETAIL - TOE DRAIN

THE LOWER RIO GRANDE FLOOD CONTROL PROJECT
FROM CAMERON COUNTY LINE OF DONNA PUMP TO
BROWNSVILLE LEVEE REACH TO ITS EASTMOST LIMIT

PROJECT No.:
AMA08-115-00

FIGURE C-11