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Seismic Investigation Report for Siting of a Potential On-Site CERCLA Waste Disposal Facility at the Paducah Gaseous Diffusion Plant Paducah, Kentucky

I-05306-0056

CLEARED FOR PUBLIC RELEASE

APPENDIX E

TECHNICAL MEMORANDUM FOR THE ACQUISITION OF SEISMIC AND GEOTECHNICAL DESIGN DATA

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August 2002

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ACRONYMS

BJC	Bechtel Jacobs Company LLC
^{14}C	carbon-14
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
DPT	direct-push technology
K_d	distribution coefficient
^{237}Np	neptunium-237
PGDP	Paducah Gaseous Diffusion Plant
SCPT	seismic cone penetrometer test
SPT	standard penetration test
^{99}Tc	technetium-99

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1. INTRODUCTION

Representatives and support staffs of the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency, and the Commonwealth of Kentucky, worked together to develop a field investigation program to address seismic issues associated with potentially siting a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) waste disposal facility at the Paducah Gaseous Diffusion Plant (PGDP). These planning efforts for conducting the Seismic Investigation Program at Site 3A are described in the *Seismic Assessment Plan for Siting of a Potential On-Site CERCLA Waste Disposal Facility at the Paducah Gaseous Diffusion Plant* (BJC 2001) and an evaluation of National Environmental Protection Act values (SAIC 2002a). The Seismic Investigation Program consisted of three primary tasks: the Paleoliquefaction Study, the Fault Study, and the Acquisition of Seismic and Geotechnical Design Data (hereafter referred to as the Geotechnical Study). These three tasks are documented in five technical memoranda.

The Geotechnical Study was comprised of two components: a regional investigation and a site-specific investigation. The regional investigation consisted of summarizing seismic and geotechnical data from previous studies conducted at the PGDP; because it did not include any fieldwork, it is not included in this technical memorandum. This technical memorandum documents the site-specific Geotechnical Study activities, specifically the deep boreholes, seismic cone penetrometer testing, and shallow boreholes, including the associated sample collection and laboratory analyses. The site-specific activities were conducted at Site 3A, which is located at the southern edge of PGDP on DOE property (Fig. E.1).

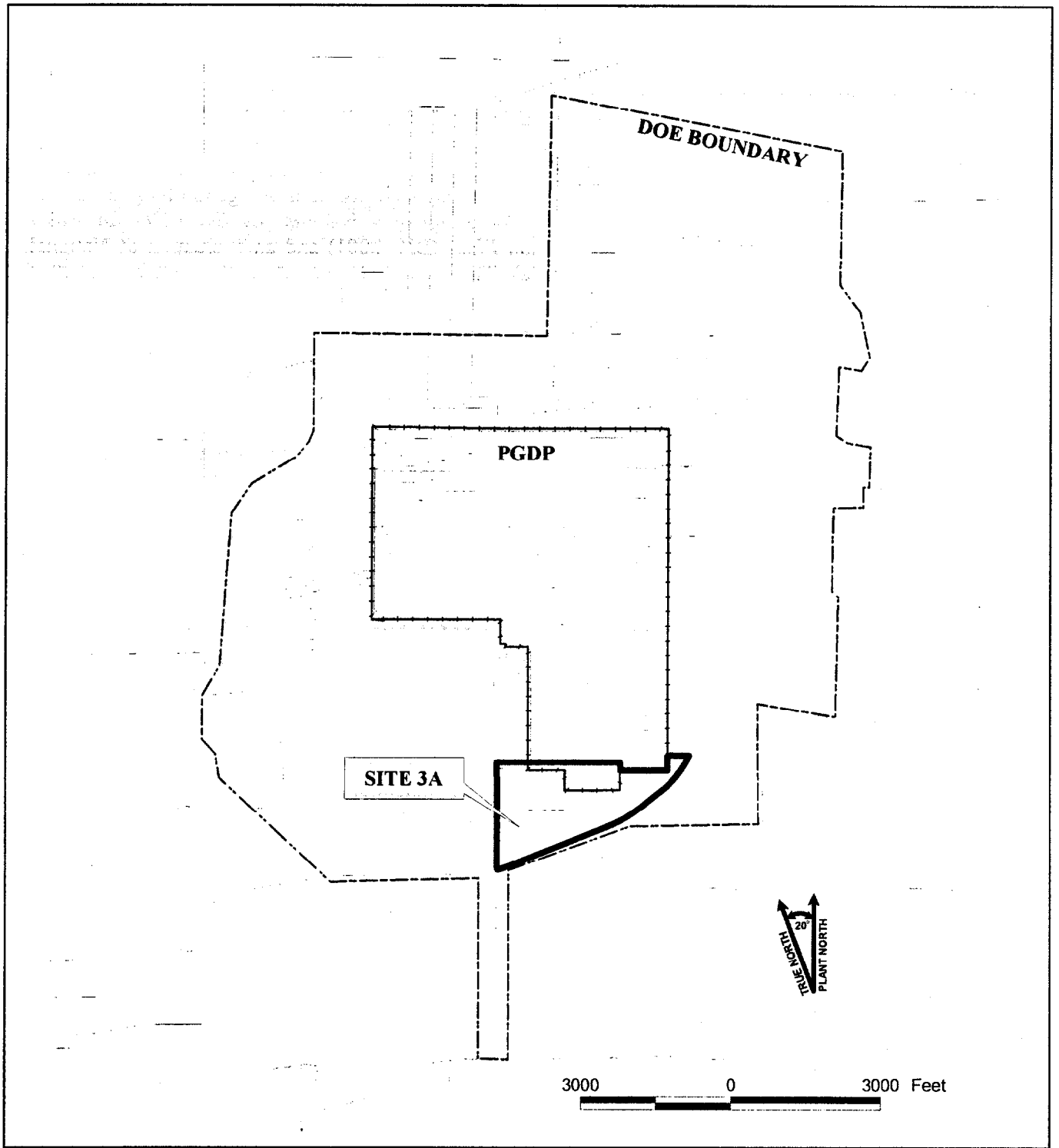
2. DEEP BOREHOLES

Deep boreholes were drilled to acquire seismic and geotechnical data. The purpose of these activities was to gather data that could subsequently be used to determine the peak ground acceleration and characteristics of ground motion for use in the design of a potential on-site CERCLA waste disposal facility. The data would also be used to determine if there is potential for future liquefaction at Site 3A. These activities also provided information regarding the variability of the lithology underlying Site 3A.

2.1 PLANNED ACTIVITIES

The planned deep borehole activities are described in Sect. 4.2.1 of Part II of the Seismic Assessment Plan as follows (BJC 2001a):

> ...The first deep borehole will be drilled to bedrock (approximately 350 ft), using a Rotosonic drilling technique, which will provide a continuous core (4-in. borehole). A downhole geophysical survey (natural gamma log) of the entire borehole will be conducted. The core and gamma log will be evaluated to select specific depths for collecting soil samples in an adjacent, second borehole. The core also will be photographed and archived. The Rotosonic technique does not allow collection of seismic velocity data, standard penetration testing, or undisturbed soil samples.



LEGEND:

FENCE
ROAD
STREAM

DOE BOUNDARY
SITE 3A BOUNDARY

U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS

BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER
US GOVERNMENT CONTRACT DE-AC-05-98OR22700
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

SAIC

Science Applications International Corporation
P.O. Box 2502
Oak Ridge, Tennessee 37831

Fig. E.1. Location of Site 3A.

FIGURE No. c5ac90001sk529.apr
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A second deep borehole will be drilled to bedrock (approximately 350 ft) using a mud rotary technique. This second borehole will be located approximately 10 ft from the first (Rotosonic) borehole. From 0 to 75 ft, continuous disturbed soil samples will be collected using standard penetration testing and split spoon samplers. From 75 to 150 ft, disturbed soil samples will be collected using standard penetration testing and split spoon samplers at 15-ft intervals. These soil samples (collected from 0 to 150 ft deep) will be analyzed for ^{14}C age dating and measurement of geotechnical index properties (e.g., specific gravity, grain size, Atterberg limits, and moisture content). Undisturbed samples will be collected using Shelby tubes for measuring physical soil properties (e.g., in-place density, vertical permeability, triaxial compressive strength, and one-dimensional consolidation) and assessment of contaminant transport properties [e.g., contaminant partitioning coefficient, or distribution coefficient (K_d)]. The K_d values will be measured for ^{99}Tc and ^{237}Np. Of the undisturbed soil samples taken in the deep borehole, it is assumed that three Shelby tube samples will be taken in the upper 75 ft and three samples will be attempted below 75 ft. The top 75 feet of the mud rotary borehole will be sampled in the same way as described for the shallow boreholes... A downhole seismic survey of the entire length of the mud rotary borehole will be conducted to determine shear wave velocities for use in liquefaction analyses, deformation studies, and ground motion modeling....

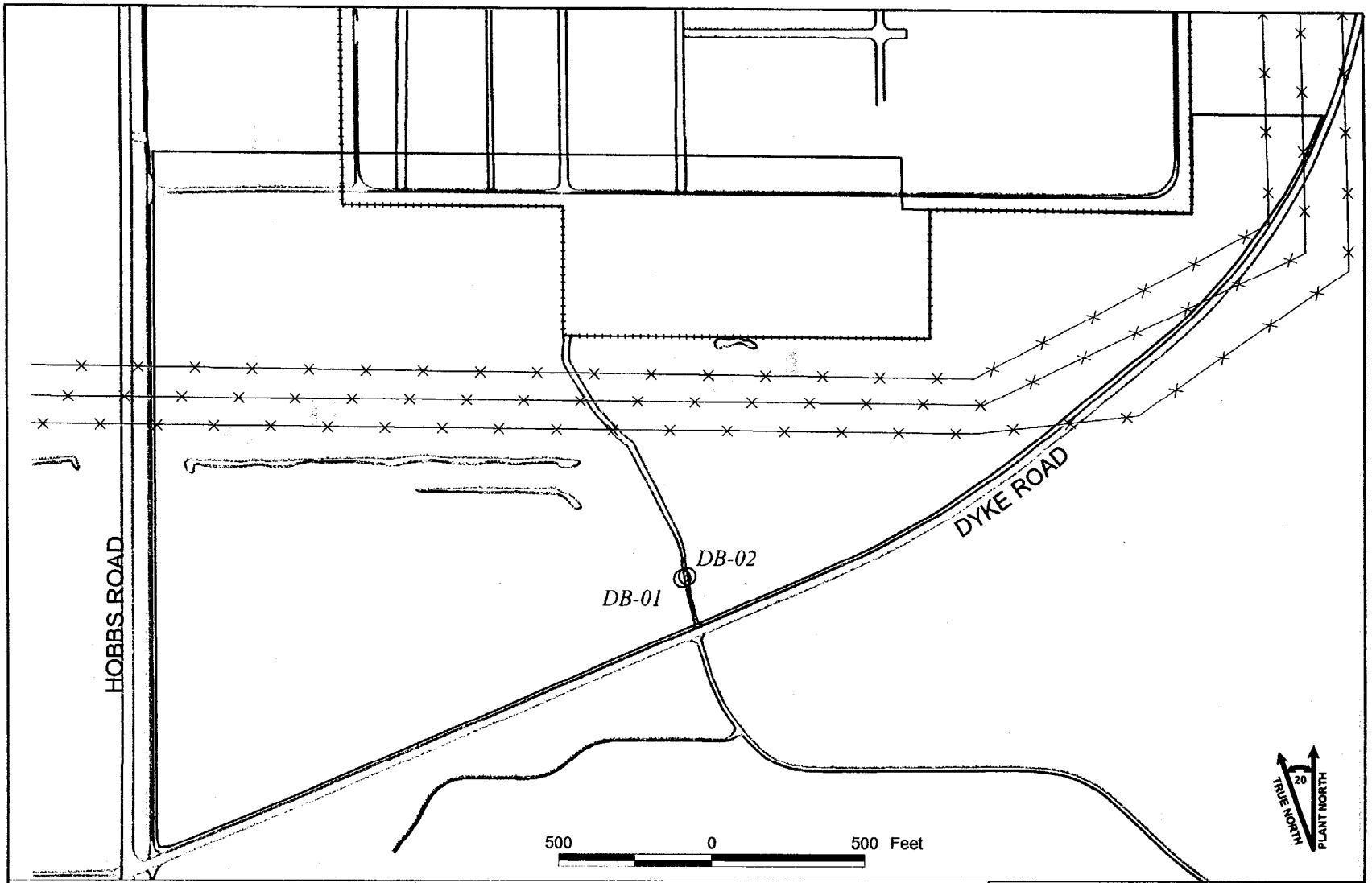
...On completion of drilling and logging activities, boreholes will be plugged and abandoned in accordance with applicable regulations. The drill cuttings from the Rotosonic borehole will be spread at the drill site. The drilling mud and cuttings from the mud rotary borehole will also be spread at the drill site...

2.2 SUMMARY OF WORK PERFORMED

The deep borehole activities were conducted by SAIC Engineering, Inc. Drilling activities were conducted by SAIC's subcontractor, Miller Government Services. Geophysical logging surveys were conducted by Miller's subcontractor, Blackhawk GeoServices. SAIC is under subcontract to Bechtel Jacobs Company LLC (BJC), DOE's Management and Integration contractor.

The first deep borehole (DB-01) was drilled to a depth of 359 ft in the south-central portion of Site 3A (Fig.E.2) using the Rotosonic/Versasonic drilling method. Attachment E-I contains the lithologic log of the borehole. Bedrock was not encountered at this depth. The continuous 4-in. diameter core was placed in wooden boxes for long-term storage and photographed. A downhole geophysical survey (i.e., natural gamma log) of the entire borehole was conducted (Attachment E-II). The borehole was plugged and abandoned in accordance with applicable regulations using a Portland cement grout. The uncontaminated drilling fluids were safely disposed near the drill site. The core and gamma logs were evaluated to select specific depths for collecting soil samples in the second deep borehole.

The second deep borehole (DB-02) was drilled near DB-01 (Fig.E.2) using mud rotary drilling techniques. This borehole was drilled to the top of the bedrock at a depth of 400 ft. Attachment E-I contains the lithologic log of the borehole. Numerous samples were collected from this borehole. From 0 to 75 ft, continuous soil samples were collected using split spoon and Shelby tube samplers. Split spoon samples were taken in accordance with Standard Penetration Test (SPT) procedures (ASTM D 1586). A Foremost Mobile SPT Automatic hammer (140-lb hammer falling 30 in.) was used to drive the sampler. From 75 to 150 ft, soil samples were collected at approximately 20-ft intervals. Additional samples were collected at depths of 175 and 185 ft. Table E.1 contains a sampling summary. A downhole geophysical survey (i.e., compression-wave and shear-wave velocity log) of the upper 380 ft of borehole was conducted (Attachment E-II); the bottom 20 ft of the hole could not be logged, because the unconsolidated sediments were sloughing, or caving, into the hole. The borehole was plugged and abandoned in accordance with applicable regulations using a Portland cement grout. The uncontaminated drilling fluids and cuttings were safely disposed near the drill site.



LEGEND

ROAD

PGDP BOUNDARY

BOUNDARY OF SITE 3A

OVERHEAD POWER LINE

DB-01 DEEP BORING LOCATION

U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS
BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER
US GOVERNMENT CONTRACT DE-AC-05-98OR22700
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

SAIC
Science Applications
International Corporation
P.O. Box 2502
Oak Ridge, Tennessee 37831

Fig. E.2. Location of deep borings.

FIGURE No. c5ac90001sk509r1.apr
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Table E.1. DB-02 sampling summary

Boring	Collection method	Depth interval (ft bgs)	Sample number	Comments[a]
DB-02	Shelby tube[b]	4 – 6	CCGTDB02ST01	
		6 – 8	CCGTDB02ST02	
		38 – 40	CCGTDB02ST03	
		40 – 42	Not applicable	Shelby tube attempted; no recovery.
		66 – 68	Not applicable	Shelby tube attempted; no recovery.
		71 – 73	CCGTDB02ST04	
		73 – 75	CCGTDB02ST05	
		91 – 93	Not applicable	Shelby tube attempted; no recovery.
		93 – 95	CCGTDB02ST06	
		95 – 97	CCGTDB02ST07	
		111 – 113	CCGTDB02ST08	
		113 – 115	CCGTDB02ST09	
		131 – 133	CCGTDB02ST10	
		133 – 135	CCGTDB02ST11	
		186 – 188	Not applicable	Shelby tube attempted; no recovery.
	Split spoon[c]	0 – 2	CCGTDB02SS01	Sample archived, not sent to lab.
		2 – 4	CCGTDB02SS02	Sample archived, not sent to lab.
		8 – 10	CCGTDB02SS03	
		10 – 12	CCGTDB02SS04	Sample archived, not sent to lab.
		12 – 14	CCGTDB02SS05	Sample archived, not sent to lab.
		14 – 16	CCGTDB02SS06	Sample archived, not sent to lab.
		16 – 18	CCGTDB02SS07	
		18 – 20	CCGTDB02SS08	Sample archived, not sent to lab.
		20 – 22	CCGTDB02SS09	Sample archived, not sent to lab.
		22 – 24	CCGTDB02SS10	Sample archived, not sent to lab.
		24 – 26	CCGTDB02SS11	
		26 – 28	CCGTDB02SS12	Sample archived, not sent to lab.
		28 – 30	CCGTDB02SS13	Sample archived, not sent to lab.
		30 – 32	CCGTDB02SS14	
		32 – 34	CCGTDB02SS15	Sample archived, not sent to lab.
		34 – 36	CCGTDB02SS16	Sample archived, not sent to lab.
		36 – 38	CCGTDB02SS17	
		42 – 44	CCGTDB02SS18	Sample archived, not sent to lab.
		44 – 46	CCGTDB02SS19	
		46 – 48	CCGTDB02SS20	Sample archived, not sent to lab.
		48 – 50	CCGTDB02SS21	
		50 – 52	CCGTDB02SS22	Sample archived, not sent to lab.
		52 – 54	CCGTDB02SS23	Sample archived, not sent to lab.
		54 – 56	CCGTDB02SS24	
		56 – 58	CCGTDB02SS25	Sample archived, not sent to lab.
		58 – 60	CCGTDB02SS26	Sample archived, not sent to lab.
		60 – 62	CCGTDB02SS27	
		62 – 64	CCGTDB02SS28	Sample archived, not sent to lab.
		64 – 66	CCGTDB02SS29	Sample archived, not sent to lab.
		69 – 71	CCGTDB02SS30	
		89 – 91	CCGTDB02SS31	
		109 – 111	CCGTDB02SS32	
		129 – 131	CCGTDB02SS33	Sample archived, not sent to lab.
		149 – 151	CCGTDB02SS34	Sample archived, not sent to lab.
		174 – 176	CCGTDB02SS35	Sample archived, not sent to lab.
		184 – 186	CCGTDB02SS36	Sample archived, not sent to lab.

[a]Unless otherwise indicated, samples were sent to the laboratory for the analysis described in footnotes A and B.

[b]Undisturbed samples were collected using Shelby tubes for measuring physical soil properties (e.g., in-place density, vertical permeability, triaxial compressive strength, and one-dimensional consolidation) and assessment of contaminant transport properties (e.g., contaminant partitioning coefficient or "K_d"). The K_d values were measured for technetium-99 and neptunium-237.

[c]Disturbed soil samples were collected using split spoons and analyzed for ^{14}C age dating and measurement of geotechnical index properties (e.g., specific gravity, grain size, Atterberg limits, and moisture content).

After they were plugged and abandoned, the two borehole locations were surveyed by a land surveyor licensed in the Commonwealth of Kentucky. The elevations and coordinates are presented in Table E.2.

Table E.2. Deep boring summary

Deep boring no.	Drilling method	Elevation[a] (ft msl)	PGDP coordinates[b] Northing (ft)	PGDP coordinates[b] Easting (ft)	Lat/Long coordinates Northing	Lat/Long coordinates Easting	Total depth (ft)	Date drilled
DB-01	Rotosonic	397.36	-7132.19	-3062.74	37°05′56.69"	88°48′49.79"	359.0	Feb. 18–21, 2002
DB-02	Mud rotary	397.64	-7124.92	-3046.72	37°05′56.70"	88°48′49.58"	400.3	Mar. 5–22, 2002

[a]Basis for elevations is the U.S. Coast and Geodetic Survey (USC&GS) North American Vertical Datum of 1988.
[b]Basis for coordinates is the USC&GS North American Datum of 1983. Coordinates are presented using both the standard and PGDP coordinate system.
msl = mean sea level

2.3 DEVIATIONS FROM PLANNED ACTIVITIES

During this study, there were three deviations from the Seismic Assessment Plan (BJC 2001a).

First, the plan called for both boreholes to be drilled to bedrock, which was believed to be approximately 350 ft deep. The first borehole (DB-01) was drilled to a depth of 359 ft. Bedrock was not encountered and, because of the limitations of the drilling rig, the boring was not advanced below 359 ft. However the second deep borehole (DB-02), which was drilled approximately 17 ft east of DB-01 with a different rig, encountered bedrock at a depth of 400 ft. This deviation did not reduce the quality of the study. As planned, the entire borehole was cored and logged. The second borehole indicated no significant lithology changes between the depths of 359 and 400 ft.

Second, the plan called for the compression-wave and shear-wave velocity log to be conducted throughout the length of the mud rotary borehole (DB-02). Although the hole was drilled to a depth of 400 ft, the sloughing/caving of the uncased hole caused problems during the final stages of drilling and logging; therefore, the logging tools were advanced only to a depth of approximately 380 ft. This deviation did not reduce the quality of the study. There were no significant lithology changes between the depths of 380 ft and 400 ft, so the shear-wave velocity information for the unlogged portion was extrapolated from the adjacent (overlying) sediments.

Third, no carbonized material was collected from the deep boreholes for ^{14}C analysis, because none was found above the Paleocene-aged Porters Creek Clay where it would be useful in dating the strata.

2.4 DATA ACQUIRED

As previously indicated, the following information was recorded: lithologic logs (Attachment E-I), continuous cores of deep borehole DB-01, natural gamma log of deep borehole DB-01 (Attachment E-II), and shear-wave velocity log of deep borehole DB-02 (Attachment E-III). The geotechnical results from the laboratory are in Attachment E-IV of this technical memorandum. The disturbed soil samples, which were collected using split spoon samples, were analyzed for geotechnical index properties (e.g., specific gravity, grain size, Atterberg limits, and moisture content). The undisturbed soils samples, which were collected using Shelby tubes, were used for measuring physical soil properties (e.g., in-place density, vertical permeability, triaxial compressive strength, and one-dimensional consolidation) and assessing contaminant transport properties (e.g., contaminant partitioning coefficient, or "K_d"). The K_d values were

measured for technetium-99 (^{99}Tc) and neptunium-237 (^{237}Np). Table E.1 summarizes the soil samples that were collected.

In the original work plan, 10 soil samples were to be analyzed for index properties; a total of 12 soil samples were actually analyzed from the deep borehole. Similarly, 5 Shelby tube samples were planned to be tested for physical soil properties; a total of 8 samples were actually tested. Untested samples were placed into archive storage.

2.5 SUMMARY OF RESULTS

This study met its intended objectives. Two deep boreholes were drilled and abandoned in accordance with applicable state regulations. A gamma log and downhole seismic survey were successfully completed. Disturbed and undisturbed samples were collected and successfully analyzed at the laboratory for geotechnical properties. The information obtained will be useful to support liquefaction analyses, deformation studies, ground motion modeling, and design activities.

3. SEISMIC CONE PENETROMETER TESTING

Seismic cone penetrometer testing (SCPT) was conducted at Site 3A to better define the local stratigraphy and obtain in-situ geotechnical property and seismic velocity measurements.

3.1 PLANNED ACTIVITIES

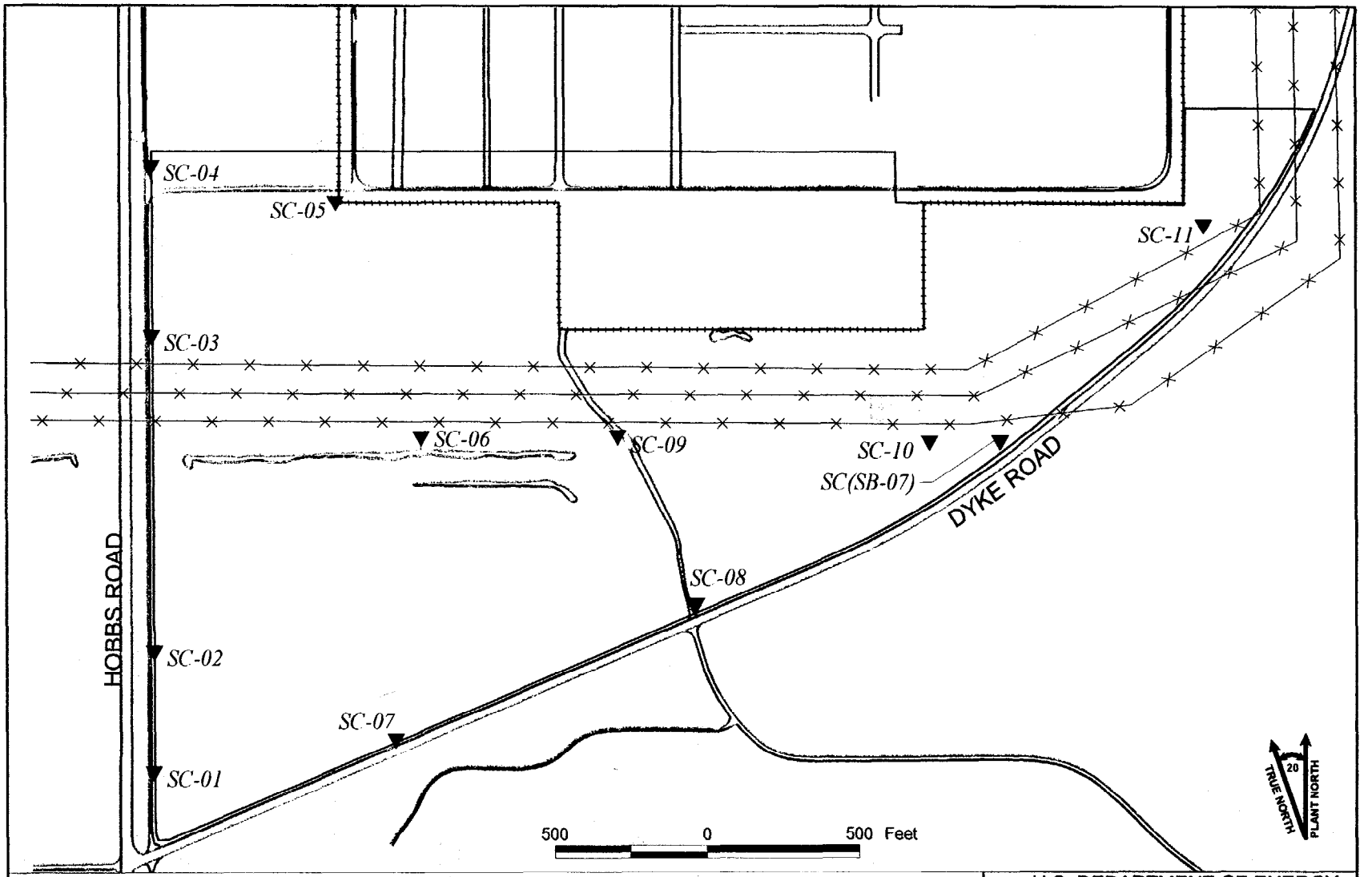
The planned SCPT activities are described in Sect. 4.2.2 of Part II of the Seismic Assessment Plan as follows (BJC 2001a).

> Eleven SCPT soundings will be conducted at Site 3A. The results of this activity will be used for conceptual/preliminary design of a potential on-site CERCLA waste disposal facility...One of SCPT locations coincides with the deep boreholes for correlation purposes. The SCPT sounding will be pushed to a depth of approximately 50 ft; refusal (i.e., when the rig is unable to push the seismic cone penetrometer further into the earth) is anticipated when the SCPT soundings have reached the Porters Creek Clay. (The top of the Porters Creek Clay at nearby monitoring well MW 120 is approximately 50 to 55 ft deep.) If the SCPT is unsuccessful, then one additional shallow boring may be drilled...No soil or organic samples will be collected from the SCPT soundings. The SCPT will be used to collect continuous tip, sleeve, and pore pressure measurements. Pore pressure dissipation tests will be conducted at four depths in varying lithologies with different permeabilities to obtain the potential of the sediments to liquefy and the competency of the clays. Shear and compressive wave velocities will be measured at 3-ft intervals throughout the depth of each SCPT sounding...

3.2 SUMMARY OF WORK PERFORMED

The SCPT activities were performed by SAIC and its subcontractor, Gregg In Situ, Inc. SAIC is under subcontract to BJC, DOE's Management and Integration contractor.

SCPT soundings were completed at the 11 planned locations (SC-01 through SC-11) and 1 additional location (location of SB-07) (Fig.E.3). Attachment E-V contains the SCPT report, which describes field equipment and procedures, data collection and interpretation, and logs/plots of the test



LEGEND

ROAD

PGDP BOUNDARY

BOUNDARY OF SITE 3A

OVERHEAD POWER LINE

SC-01 SCPT LOCATION

U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS
BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER US GOVERNMENT CONTRACT DE-AC-05-98OR22700
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

SAIC
Science Applications International Corporation
P.O. Box 2502
Oak Ridge, Tennessee 37831

Fig. E.3. Location of SCPTs.

FIGURE No. c5ac90001sk510r1.apr
DATE 05-20-02

results. Each sounding was plugged and abandoned in accordance with applicable regulations using a Portland cement grout. No drilling fluids or soil cuttings were generated. The elevations and coordinates of each SCPT sounding are listed in Table E.3.

Table E.3. SCPT sounding summary

SCPT no.	Elevation[a] (ft msl)	PGDP Coordinates[b] Northing (ft)	PGDP Coordinates[b] Easting (ft)	Lat/Long Coordinates[b] Northing	Lat/Long Coordinates[b] Easting	Total depth (ft)	Date sounding was made
SC-01	386.53	-7775.68	-4784.36	37°05′56.54"	88°49′12.48"	59.1	Feb. 15, 2002
SC-02	385.80	-7389.56	-4781.87	37°06′00.12"	88°49′10.82"	61.4	Feb. 14, 2002
SC-03	383.84	-6386.62	-4788.10	37°06′09.46"	88°49′06.65"	52.0	Feb. 14, 2002
SC-04	382.82	-5840.36	-4787.12	37°06′14.53"	88°49′04.33"	70.0	Feb. 14, 2002
SC-05	381.88	-5955.73	-4182.17	37°06′11.41"	88°48′57.80"	54.1	Feb. 15, 2002
SC-06	385.19	-6712.04	-3903.01	37°06′03.44"	88°48′57.76"	51.0	Mar. 6, 2002
SC-07	400.96	-7673.28	-3989.31	37°05′54.80"	88°49′02.83"	49.1	Mar. 5, 2002
SC-08	397.53	-7242.44	-3001.44	37°05′55.46"	88°48′49.55"	69.0	Feb. 13, 2002
SC-09A	394.97	-6708.42	-3258.15	37°06′01.29"	88°48′50.27"	66.0	Feb. 13, 2002
SC-10	392.10	-6727.13	-2636.95	37°05′59.01"	88°48′43.14"	38.0	Mar. 6, 2002
SC-11	384.42	-6031.39	-1338.14	37°06′01.07"	88°48′25.14"	34.9	Mar. 7, 2002
SB-07	390.24	-6723.80	-2004.60	37°05′56.90"	88°48′35.79"	17.7	Mar. 7, 2002

[a]Basis for elevations is the U.S. Coast and Geodetic Survey (USC&GS) North American Vertical Datum of 1988.
[b]Basis for coordinates is the USC&GS North American Datum of 1983. Coordinates are presented using both the standard and PGDP coordinate system.
msl = mean sea level

3.3 DEVIATIONS FROM PLANNED ACTIVITIES

During the SCPT activities, there were three deviations from the Seismic Assessment Plan (BJC 2001a).

Heavy rainfall and wet ground conditions created accessibility problems at many drilling locations. Because the mud rotary drilling equipment was mounted on conventional trucks with rubber tires and a track-mounted rig was used to conduct the final SCPTs, location SB-07 was converted from a shallow (mud rotary) boring to an SCPT. This allowed the track-mounted equipment to be used to minimize disturbance of soil and surface vegetation and to minimize potential health and safety concerns associated with towing vehicles from muddy areas. Based on the currently envisioned layout of the potential disposal facility, SB-07 is located outside of the footprint of the disposal cell (i.e., this boring is located in the area of the support facilities). This deviation did not reduce the quality of the study. Use of the SCPT allowed the subsurface lithology to be recorded.

Compressive wave velocities were recorded but not reported because of the shallow water table at the site. This derivation did not affect the quality of the study because soil amplification factor calculations used shear-wave velocities, not compression-wave velocities. Compression-wave velocities measured in deep borehole DB-02 allowed calibration of the p-wave seismic reflection date.

In the Seismic Assessment Plan, refusal was anticipated when the SCPT soundings had reached the Porters Creek Clay, approximately 50 to 55 ft deep. While this is generally the case, sounding SC-09 encountered refusal at the beginning of the sounding. Therefore, an adjacent sounding, SC-90A, was drilled to replace it. Sounding SC-10 (at location 560L2) encountered refusal in a very dense sand/gravel deposit at a depth of 38 ft and could not be completed deeper. Similarly, sounding SC-11 (at location of planned borehole SB-04) encountered refusal in a very dense sand/gravel deposit at a depth of 35 ft and could not be completed deeper. Sounding SB-07 encountered refusal in a very dense sand/gravel at a

depth of 18 ft; a second attempt at this sounding encountered refusal at 16.5 ft and could not be completed deeper. These deviations did not adversely affect meeting the data objectives of this study. Sufficient seismic velocity data were obtained from other SCPT soundings to obtain a suitable profile for Site 3A. Depth to top of the Porters Creek Clay was visible in the shear-wave seismic reflection survey and in soil borings across the site.

3.4 DATA ACQUIRED

The results of the SCPT activities are presented in Attachment E-V of this technical memorandum.

3.5 SUMMARY OF RESULTS

This study met its intended objectives. Twelve SCPTs were advanced and abandoned in accordance with applicable state regulations. Geotechnical and geophysical properties were measured at each of the eleven locations. The information obtained will be useful to support liquefaction analyses, deformation studies, ground motion modeling, and design activities.

4. SHALLOW BOREHOLES

Shallow boreholes were drilled to acquire geotechnical and stratigraphic information for use in the design of any potential on-site CERCLA waste disposal facility and to determine if there is potential for future liquefaction at Site 3A. These activities also provided information regarding the variability of the lithology underlying Site 3A.

4.1 PLANNED ACTIVITIES

The planned shallow borehole activities are described in Sect. 4.2.3 of Part II of the Seismic Assessment Plan as follows (BJC 2001a):

> Seven shallow boreholes (plus one contingent shallow borehole) will be drilled at Site 3A using a hollow-stem auger...These boreholes will be drilled 20 ft into the Porters Creek Clay. The top of the Porters Creek Clay at nearby monitoring well MW 120 is approximately 50 to 55 ft deep. Therefore, these boreholes will be drilled to a total depth of approximately 75 ft. For correlation purposes, four of the shallow borings will coincide with the SCPT sounding locations and are referred to as "primary" borings. The remaining borings are referred to as "secondary" borings. If the SCPT described in Sect. 4.2.2 is unsuccessful (i.e., refusal is encountered before the desired depths), then one additional shallow boring may be drilled as a contingent borehole....
>
> Standard penetration tests will be conducted continuously throughout the depth of the shallow boreholes. Disturbed soil samples will be collected for ^{14}C age dating and measurement of geotechnical index properties (e.g., specific gravity, grain size, Atterberg limits, and moisture content) and assessment of contaminant transport properties (e.g., contaminant partitioning coefficient, or "K_d"). Undisturbed samples will be collected in Shelby tube samplers for measurement of physical soil properties (e.g., in-place density, vertical permeability, triaxial compressive strength, and one-dimensional consolidation). The K_d values will be measured for ^{99}Tc and ^{237}Np. The collection of up to 28 undisturbed soil samples (in Shelby tube samples) from the shallow boreholes is now planned, but not all of these samples will be analyzed. An attempt will be made to collect four samples from each of the four primary boreholes (those co-located with the SCPTs, or CCGT-SB01 through CCGT-SB04) for a total of 16 samples, and an

attempt will be made to collect three samples from each of the four remaining secondary shallow boreholes (CCGT-SB05 through CCGT-SB08), for a total of 12 samples. Of the 28 undisturbed soil samples, approximately 22 will be analyzed. (Testing for all of the primary samples and one-half of the secondary samples is assumed.) Samples that are collected, but not planned to be analyzed, may be used for geotechnical laboratory testing in situations where the original samples do not have sufficient volume or if soil material types vary...

4.2 SUMMARY OF WORK PERFORMED

The shallow borehole activities were conducted by SAIC Engineering, Inc. Drilling activities were conducted by SAIC's subcontractor, Miller Government Services. SAIC is under subcontract to BJC, DOE's Management and Integration contractor.

Five shallow boreholes (SB-01, SB-02, SB-03, SB05, and SB-06) were drilled at the planned locations (Fig.E.4) using mud rotary drilling techniques. Attachment E-I contains the lithologic logs of the boreholes. Continuous soil samples were collected from these boreholes using split spoon and Shelby tube samplers. Split spoon samples were taken in accordance with the SPT (ASTM D 1586) using a Foremost Mobile Automatic Hammer. Table E.4 contains a soil sampling summary. In addition to the planned samples, three organic samples were collected from split spoon samples in borings SB-03 and SB-06 and analyzed for ^{14}C age dating. Each borehole was plugged and abandoned in accordance with applicable regulations using a Portland cement grout. The uncontaminated drilling fluids and cuttings were safely disposed near the drill sites.

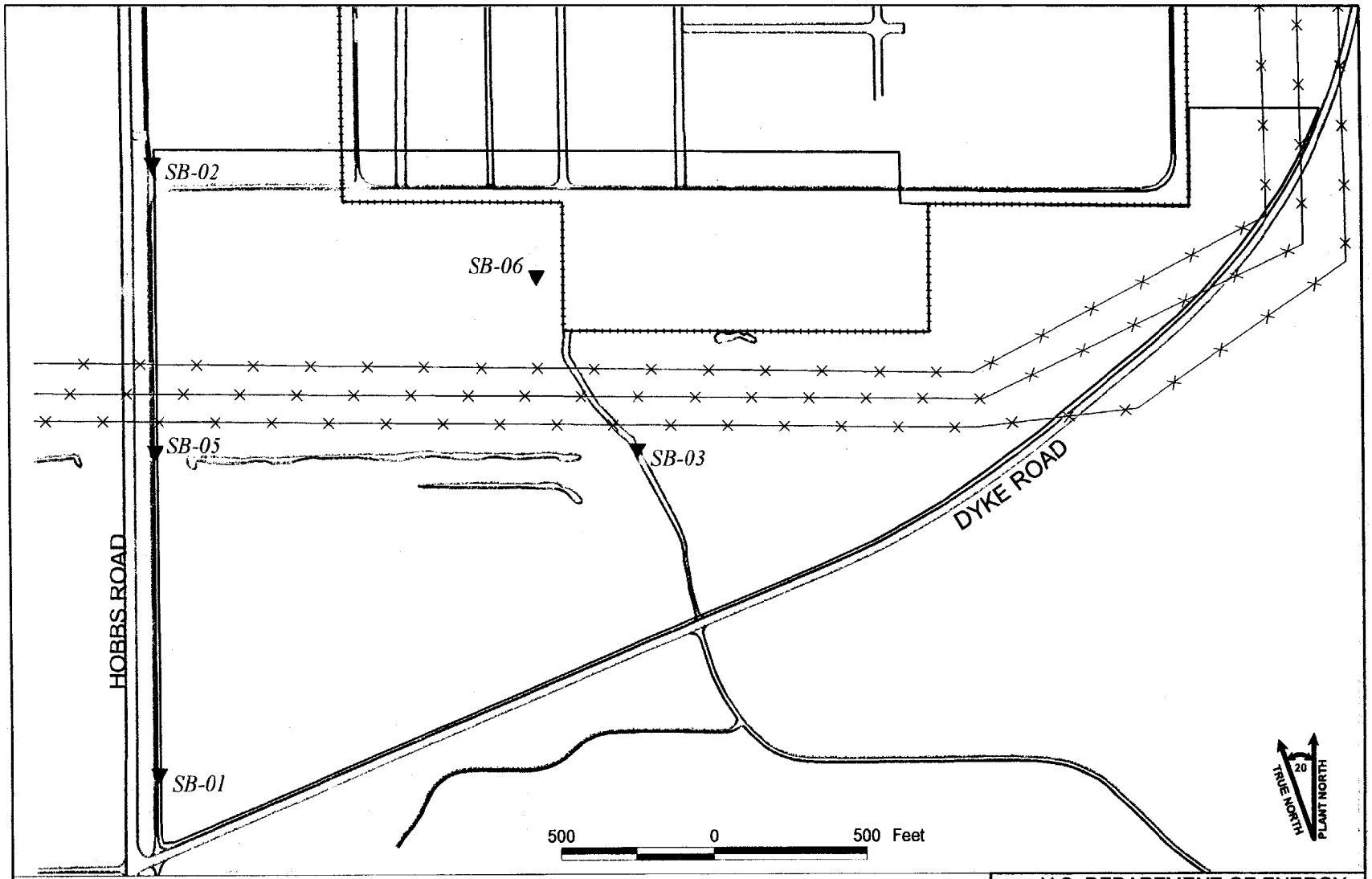
After they were plugged and abandoned, each borehole location was surveyed by a land surveyor licensed in the Commonwealth of Kentucky. The elevations and coordinates are presented in Table E.5.

4.3 DEVIATIONS FROM PLANNED ACTIVITIES

During this study, there were four deviations from the Seismic Assessment Plan (BJC 2001a).

First, the plan called for use of a hollow stem auger to drill the shallow boreholes. Because procedures for conducting SPTs require the use of mud rotary drilling techniques (ASTM D 1586), it was necessary to modify the drilling technique. This modification was incorporated into the planned work prior to initiating any drilling activities. This deviation did not reduce the quality of the study.

Second, the plan called for all boreholes to be drilled 20 ft into the Porters Creek Clay, which was estimated to be approximately 50 to 55 ft deep. Some boreholes penetrated less than 20 ft of the Porters Creek because representative lithologic samples were available and collected in the upper 20 ft of the formation. Table E.4 includes a comparison, for each borehole, of the depth to the Porters Creek Clay and the total depth. One borehole (SB-02) was drilled 30 ft into the Porters Creek Clay, two boreholes (SB-03 and SB-05) were drilled at least 18 ft into the Porters Creek Clay, and two boreholes (SB-02 and SB-06) were drilled 12 to 13 ft into the Porters Creek Clay. This deviation did not reduce the quality of the study. Information regarding the depth and thickness of the Porters Creek Clay near the middle of Site 3A was obtained from the two deep borings. The hardness of the clay created sampling problems; more than one Shelby tube sampler was crushed during attempts to collect undisturbed soil samples from the Porters Creek Clay. Therefore, the investigation team concluded that it was appropriate to cease drilling prior to reaching the planned 20 ft depth of penetration into the Porters Creek Clay.



LEGEND

ROAD

PGDP BOUNDARY

BOUNDARY OF SITE 3A

OVERHEAD POWER LINE

SB-01 SHALLOW BORING LOCATION

U.S. DEPARTMENT OF ENERGY
DOE OAK RIDGE OPERATIONS
PADUCAH GASEOUS DIFFUSION PLANT

BECHTEL JACOBS
BECHTEL JACOBS COMPANY LLC
MANAGED FOR THE US DEPARTMENT OF ENERGY UNDER
US GOVERNMENT CONTRACT DE-AC-05-98OR22700
Oak Ridge, Tennessee • Paducah, Kentucky • Portsmouth, Ohio

SAIC
Science Applications International Corporation
P.O. Box 2502
Oak Ridge, Tennessee 37831

Fig. E.4. Location of shallow borings.

FIGURE No. c5ac90001sk508r1.apr
DATE 05-20-02

Table E.4. Shallow boring sampling summary

Boring	Collection method	Depth interval (ft bgs)	Sample number	Comments[a]
SB01	Shelby Tube[b]	6 – 8	CCGTSB01ST01	
		8 – 10	CCGTSB01ST02	
		34 – 36	CCGTSB01ST03	Tube crushed, sample not collected.
		36 – 38	CCGTSB01ST04	No recovery, sample not collected.
		46 – 48	CCGTSB01ST05	
		48 – 50	CCGTSB01ST06	
	Split Spoon[c]	0 – 2	CCGTSB01SS01	Sample archived, not sent to lab.
		2 – 4	CCGTSB01SS02	Sample archived, not sent to lab.
		4 – 6	CCGTSB01SS03	
		10 – 12	CCGTSB01SS04	
		12 – 14	CCGTSB01SS05	Sample archived, not sent to lab.
		14 – 16	CCGTSB01SS06	Sample archived, not sent to lab.
		16 – 18	CCGTSB01SS07	Sample archived, not sent to lab.
		18 – 20	CCGTSB01SS08	
		20 – 22	CCGTSB01SS09	Sample archived, not sent to lab.
		22 – 24	CCGTSB01SS10	Sample archived, not sent to lab.
		24 – 26	CCGTSB01SS11	
		26 – 28	CCGTSB01SS12	Sample archived, not sent to lab.
		28 – 30	CCGTSB01SS13	Sample archived, not sent to lab.
		30 – 32	CCGTSB01SS14	Sample archived, not sent to lab.
		32 – 34	CCGTSB01SS15	
		38 – 40	CCGTSB01SS16	Sample archived, not sent to lab.
		40 – 42	CCGTSB01SS17	Sample archived, not sent to lab.
		42 – 44	CCGTSB01SS18	Sample archived, not sent to lab.
		44 – 46	CCGTSB01SS19	
		50 – 52	CCGTSB01SS20	Sample archived, not sent to lab.
SB02	Shelby Tube[b]	6 – 8	CCGTSB02ST01	
		8 – 10	CCGTSB02ST02	
		34 – 36	CCGTSB02ST03	
		36 – 38	CCGTSB02ST04	
		62 – 64	CCGTSB02ST05	
		64 – 66	CCGTSB02ST06	
	Split Spoon[c]	0 – 2	CCGTSB02SS01	Sample archived, not sent to lab.
		2 – 4	CCGTSB02SS02	Sample archived, not sent to lab.
		4 – 6	CCGTSB02SS03	
		10 – 12	CCGTSB02SS04	Sample archived, not sent to lab.
		12 – 14	CCGTSB02SS05	
		14 – 16	CCGTSB02SS06	Sample archived, not sent to lab.
		16 – 18	CCGTSB02SS07	Sample archived, not sent to lab.
		18 – 20	CCGTSB02SS08	Sample archived, not sent to lab.
		20 – 22	CCGTSB02SS09	
		22 – 24	CCGTSB02SS10	Sample archived, not sent to lab.
		24 – 26	CCGTSB02SS11	Sample archived, not sent to lab.
		26 – 28	CCGTSB02SS12	Sample archived, not sent to lab.
		28 – 30	CCGTSB02SS13	Sample archived, not sent to lab.
		30 – 32	CCGTSB02SS14	Sample archived, not sent to lab.
		32 – 34	CCGTSB02SS15	
		38 – 40	CCGTSB02SS16	Sample archived, not sent to lab.
		40 – 42	CCGTSB02SS17	Sample archived, not sent to lab.
		42 – 44	CCGTSB02SS18	Sample archived, not sent to lab.
		44 – 46	CCGTSB02SS19	
		46 – 48	CCGTSB02SS20	Sample archived, not sent to lab.
		48 – 50	CCGTSB02SS21	Sample archived, not sent to lab.
		50 – 52	CCGTSB02SS22	
		52 – 54	CCGTSB02SS23	Sample archived, not sent to lab.
		54 – 56	CCGTSB02SS24	
		56 – 58	CCGTSB02SS25	Sample archived, not sent to lab.

Table E.4. Shallow boring sampling summary (continued)

Boring	Collection method	Depth interval (ft bgs)	Sample number	Comments[a]
SB02 (continued)	Split Spoon[c] (continued)	58 – 60	CCGTSB02SS26	Sample archived, not sent to lab.
		60 – 62	CCGTSB02SS27	
SB03	Shelby Tube[b]	8 – 10	CCGTSB03ST01	
		10 – 12	CCGTSB03ST02	
		38 – 40	CCGTSB03ST03	
		40 – 42	CCGTSB03ST04	
		54 – 56	CCGTSB03ST05	Tube crushed, sample not collected.
		56 – 58	CCGTSB03ST06	
		64 – 65	CCGTSB03ST07	
		66 – 67	CCGTSB03ST08	
	Split Spoon[c]	0 – 2	CCGTSB03SS01	Sample archived, not sent to lab.
		2 – 4	CCGTSB03SS02	Sample archived, not sent to lab.
		4 – 6	CCGTSB03SS03	Sample archived, not sent to lab.
		6 – 8	CCGTSB03SS04	
		12 – 14	CCGTSB03SS05	Sample archived, not sent to lab.
		14 – 16	CCGTSB03SS06	Sample archived, not sent to lab.
		16 – 18	CCGTSB03SS07	
		18 – 20	CCGTSB03SS08	Sample archived, not sent to lab.
		20 – 22	CCGTSB03SS09	Sample archived, not sent to lab.
		22 – 23.5	CCGTSB03SS10	Sample archived, not sent to lab.
		24 – 26	CCGTSB03SS11	
		26 – 27	CCGTSB03SS12	Sample archived, not sent to lab.
		28 – 30	CCGTSB03SS13	Sample archived, not sent to lab.
		30 – 32	CCGTSB03SS14	Sample archived, not sent to lab.
		32 – 34	CCGTSB03SS15	Sample archived, not sent to lab.
		34 – 36	CCGTSB03SS16	Sample archived, not sent to lab.
		36 – 38	CCGTSB03SS17	
		42 – 44	CCGTSB03SS18	Sample archived, not sent to lab.
		44 – 46	CCGTSB03SS19	
		46 – 48	CCGTSB03SS20	Sample archived, not sent to lab.
		48 – 49.5	CCGTSB03SS21	Sample archived, not sent to lab.
		50 – 52	CCGTSB03SS22	Sample archived, not sent to lab.
		52 – 54	CCGTSB03SS23	
		58 – 60	CCGTSB03SS24	Sample archived, not sent to lab.
		60 – 62	CCGTSB03SS25	Sample archived, not sent to lab.
		62 – 64	CCGTSB03SS26	
		68 – 70	CCGTSB03SS27	Sample archived, not sent to lab.
SB05	Shelby Tube[b]	8 – 10	CCGTSB05ST01	
		10 – 12	CCGTSB05ST02	
		32 – 34	CCGTSB05ST03	
		34 – 36	CCGTSB05ST04	
		44 – 46	CCGTSB05ST05	
		46 – 48	CCGTSB05ST06	
		54 – 56	CCGTSB05ST07	
		56 – 58	CCGTSB05ST08	
	Split Spoon[c]	0 – 2	CCGTSB05SS01	Sample archived, not sent to lab.
		2 – 4	CCGTSB05SS02	Sample archived, not sent to lab.
		4 – 6	CCGTSB05SS03	Sample archived, not sent to lab.
		6 – 8	CCGTSB05SS04	
		12 – 14	CCGTSB05SS05	Sample archived, not sent to lab.
		14 – 16	CCGTSB05SS06	
		16 – 18	CCGTSB05SS07	Sample archived, not sent to lab.
		18 – 20	CCGTSB05SS08	Sample archived, not sent to lab.
		20 – 22	CCGTSB05SS09	Sample archived, not sent to lab.
		22 – 24	CCGTSB05SS10	
		24 – 26	CCGTSB05SS11	Sample archived, not sent to lab.
		26 – 28	CCGTSB05SS12	Sample archived, not sent to lab.
		28 – 30	CCGTSB05SS13	Sample archived, not sent to lab.

Table E.4. Shallow boring sampling summary (continued)

Boring	Collection method	Depth interval (ft bgs)	Sample number	Comments[a]
SB05 (continued)	Split Spoon[c] (continued)	30 – 32	CCGTSB05SS14	
		36 – 38	CCGTSB05SS15	Sample archived, not sent to lab.
		38 – 40	CCGTSB05SS16	Sample archived, not sent to lab.
		40 – 42	CCGTSB05SS17	Sample archived, not sent to lab.
		42 – 44	CCGTSB05SS18	
		48 – 50	CCGTSB05SS19	
		50 – 52	CCGTSB05SS20	Sample archived, not sent to lab.
		52 – 54	CCGTSB05SS21	
		58 – 60	CCGTSB05SS22	Sample archived, not sent to lab.
		60 – 62	CCGTSB05SS23	Sample archived, not sent to lab.
SB06	Shelby Tube[b]	4 – 6	CCGTSB06ST01	
		8 – 10	CCGTSB06ST02	
		48 – 50	CCGTSB06ST03	
		50 – 52	CCGTSB06ST04	No recovery, sample not collected.
		52 – 54	CCGTSB06ST05	
	Split Spoon[c]	0 – 2	CCGTSB06SS01	Sample archived, not sent to lab.
		2 – 4	CCGTSB06SS02	Sample archived, not sent to lab.
		6 – 8	CCGTSB06SS03	
		10 – 12	CCGTSB06SS04	Sample archived, not sent to lab.
		12 – 14	CCGTSB06SS05	Sample archived, not sent to lab.
		14 – 16	CCGTSB06SS06	
		16 – 18	CCGTSB06SS07	Sample archived, not sent to lab.
		18 – 20	CCGTSB06SS08	Sample archived, not sent to lab.
		20 – 22	CCGTSB06SS09	Sample archived, not sent to lab.
		22 – 24	CCGTSB06SS10	
		24 – 26	CCGTSB06SS11	Sample archived, not sent to lab.
		26 – 28	CCGTSB06SS12	Sample archived, not sent to lab.
		28 – 30	CCGTSB06SS13	Sample archived, not sent to lab.
		30 – 32	CCGTSB06SS14	
		32 – 34	CCGTSB06SS15	Sample archived, not sent to lab.
		34 – 36	CCGTSB06SS16	Sample archived, not sent to lab.
		36 – 38	CCGTSB06SS17	Sample archived, not sent to lab.
		38 – 40	CCGTSB06SS18	
		40 – 42	CCGTSB06SS19	Sample archived, not sent to lab.
		42 – 44	CCGTSB06SS20	
		44 – 46	CCGTSB06SS21	Sample archived, not sent to lab.
		46 – 48	CCGTSB06SS22	
		54 – 56	CCGTSB06SS23	
		56 – 58	CCGTSB06SS24	Sample archived, not sent to lab.

[a]Unless otherwise indicated, samples were sent to the laboratory for the analysis described in footnotes b and c.

[b]Undisturbed samples will be collected using Shelby tubes for measuring physical soil properties (e.g., in-place density, vertical permeability, triaxial compressive strength, and one-dimensional consolidation) and assessment of contaminant transport properties (e.g., contaminant partitioning coefficient, or "K_d"). The K_d values will be measured for ^{99}Tc and ^{237}Np.

[c]Disturbed soil samples were collected using split spoons and analyzed for ^{14}C age dating and measurement of geotechnical index properties (e.g., specific gravity, grain size, Atterberg limits, and moisture content).

Table E.5. Shallow boring summary

Boring no.	Drilling method	Elevation (ft msl)[a]	PGDP coordinates[b] Northing (ft)	PGDP coordinates[b] Easting (ft)	Lat/long coordinates[b] Northing	Lat/long coordinates[b] Easting	Total depth (ft)	Depth to top of clay[c] (ft)	Date drilled
SB-01	Mud rotary	386.53	-7775.97	-4783.36	37°05′56.53"	88°49′12.47"	52.0	22	Mar. 9–10, 2002
SB-02	Mud rotary	383.06	-5836.05	-4791.38	37°06′14.58"	88°49′04.36"	66.0	53	Feb. 25–Mar. 6, 2002
SB-03	Mud rotary	394.21	-6743.77	-3207.73	37°06′00.79"	88°48′49.83"	70.0	51	Feb. 13–Mar. 19, 2002
SB-05	Mud rotary	385.42	-6752.60	-4787.58	37°06′06.05"	88°49′08.19"	62.0	44	Feb. 21–23, 2002
SB-06	Mud rotary	388.20	-6196.14	-3535.97	37°06′06.99"	88°48′51.32"	58.0	45	Mar. 11–14, 2002

[a]Basis for elevations is the U.S. Coast and Geodetic Survey (USC&GS) North American Vertical Datum of 1988.
[b]Basis for coordinates is the USC&GS North American Datum (NAD) of 1983. Coordinates are presented using both standard latitude/longitude and PGDP coordinate systems.
[c]Porters Creek Clay
msl = mean sea level

Third, heavy rainfall and wet ground conditions created accessibility problems at the drilling locations. The mud rotary drilling equipment was mounted on conventional trucks with rubber tires. In order to minimize disturbance of soil and surface vegetation and to minimize potential health and safety concerns associated with towing vehicles from muddy areas, alternative drilling methods were used at the locations of SB-04 and SB-07. A track-mounted rig was used to conduct the final SCPT soundings and direct-push technology (DPT) boreholes at Site 3A. Because this rig was readily available, it was used to install an SCPT sounding in lieu of a shallow boring at location SB-07. Additionally, it was used to install a DPT borehole in lieu of a shallow boring at location SB-04, which was a primary boring location paired with SCPT SC-11. Based on the currently envisioned layout of the potential disposal facility, both of these borings are located outside of the footprint of the disposal cell (i.e., these borings are located in the area of the support facilities). This deviation did not reduce the quality of the study. These alternative drilling/boring methods allowed the subsurface lithology to be recorded. Although soil samples were not collected using split spoons and Shelby tubes, a continuous core was collected and logged from the DPT borehole. Additional information regarding the SCPT sounding conducted at location SB-07 is presented in Sect. 4.2 of this technical memorandum. For additional information regarding the DPT borehole conducted at location SB-04, please refer to the technical memorandum for the site-specific Fault Study (follow-up activities) (SAIC 2002b).

Fourth, three organic samples were collected from split spoon samples from borings SB-03 and SB-06 for ^{14}C age dating, although more had been planned. This deviation provided additional data on age of the deposits at Site 3A and, therefore, enhanced the study.

4.4 DATA ACQUIRED

As previously indicated, the following information was recorded: lithologic logs (Attachment E-I) and the continuous core from the DPT borehole at location SB-04 with photographs (SAIC 2002b). The geotechnical results from the laboratory are in Attachment E-VI of this technical memorandum. The disturbed soil samples, which were collected using split spoons, were analyzed for geotechnical index properties (i.e., specific gravity, grain size, Atterberg limits, and moisture content). The undisturbed soil samples, which were collected using Shelby tubes, were used for measuring physical soil properties (i.e., in-place density, vertical permeability, triaxial compressive strength, and one-dimensional consolidation) and assessing contaminant transport properties (i.e., contaminant partitioning coefficient, or "K_d"). The K_d values were measured for ^{99}Tc and ^{237}Np. Table E.4 summarizes the soil samples that were collected.

In the original work plan, 52 soil samples were to be analyzed for index properties; a total of 36 samples were actually tested. Similarly 22 Shelby tube samples were planned to be analyzed for physical properties; a total of 25 samples were actually tested. Untested samples were placed into archive storage.

There were fewer index property samples tested than planned because borehole SB-04 was completed as a DPT borehole, borehole SB-07 was completed as a SCPT sounding and borehole SB-08 was a contingency borehole that was not needed. The samples tested provided sufficient data to adequately characterize the different soil zones encountered at Site 3A.

Organic samples were collected from the split spoon samplers. The results of these samples are summarized in Table E.6, and Attachment E-VI contains the laboratory results of the ^{14}C age dating analysis.

Table E.6. Summary of organic sampling and ^{14}C age dating

Sample number	Location	Sample depth	Measured radiocarbon age[a]	Conventional radiocarbon age[a]
CCGTSB03C04	SB-03	4 ft	4,190 ± 40 BP	4,240 ± 40 BP
CCGTSB03C36	SB-03	36 ft	7,230 ± 40 BP	7,280 ± 40 BP
CCGTSB06C11	SB-06	10.9 ft	6,790 ± 40 BP	6,830 ± 40 BP

[a] Dates are reported as radiocarbon years before present (BP), where "present" is defined as 1950 A.D.

4.5 SUMMARY OF RESULTS

This study met its intended objectives. Five shallow borings were drilled and abandoned in accordance with applicable state regulations. Two other planned borings were replaced with a suitable SCPT sounding or DPT borehole. Lithology samples were collected and described. Geotechnical properties of disturbed and undisturbed samples were successfully measured in the laboratory. Carbonized material was dated using ^{14}C analysis. The information obtained will be useful to support liquefaction analyses, deformation studies, ground motion modeling, design activities, and dating strata.

5. REFERENCES

ASTM (American Society for Testing and Materials) 1999. "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils," Designation: D1586-99, Conshohocken, PA, March.

BJC (Bechtel Jacobs Company LLC) 2001. *Seismic Assessment Plan for Siting of a Potential On-Site CERCLA Waste Disposal Facility at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, BJC/PAD-207, Final, Bechtel Jacobs Company LLC, Kevil, KY, September.

SAIC (SAIC Engineering, Inc.) 2002a. *NEPA Considerations: Site-Specific and Regional Fault Studies and Acquisition of Seismic and Geotechnical Data*, SAIC, Kevil, KY, February 8.

SAIC 2002b. *Technical Memorandum for the Site-Specific Fault Study*, SAIC, Kevil, KY, May 10.

ATTACHMENT E-I

LITHOLOGIC LOGS OF DEEP AND SHALLOW BOREHOLES

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LITHOLOGIC LOG	BORING/WELL NO: DB01	PAGE 1 of 12
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Stiles
Drill Start (time/date): 13:30 on 02-18-02	Drill End (time/date): 15:12 on 02-21-02	Borehole Dia: 6 inch with 4-inch core
Drill Method/Rig Type: Versa-Sonic		Total Depth: 359 ft
Logged By: Kenneth Davis (SAIC)	Coordinates: E -3062.74 N -7132.19	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
							Gravely, Silt (ML), brown (10YR4/3), firm, slightly moist		Ground elevation = 397.36 ft amsl Roadbase, 60% Silt, 40% Gravel (1-2 inch diameter)
		1	3.7	NA	--	--	Silt (ML), medium plasticity, light brownish yellow (10YR6/4) mottled with light gray (10YR7/1), firm, moist		25-30% clay; possibly laminated
5		2	4.8	NA	--	--	Silt (ML) as above, but light brownish gray (10YR6/2) Silt (ML) as above, but pale brown (10YR6/3) mottled with light gray (10YR7/1)		
10		3	6.6	NA	--	--	Clay (CL) medium plasticity, pale brown (10YR6/3) mottled with light gray (10YR7/1), firm, moist Clay (CL) as above, but yellowish brown (10YR5/4), moderately soft grading downward to brownish yellow (10YR6/6) mottled with yellow (10YR7/6) and light gray (10YR7/1), soft		30-35% silt
15		4	6.3	NA	--	--	Clay (CL) as above, but yellow (10YR7/6) mottled with light gray (10YR7/1), firm		
20		5	11.0	NA	--	--	Clay (CL) as above, but brownish yellow (10YR6/6) mottled with light gray (10YR7/1) Clay (CL) as above		Trace medium to coarse Gravel (up to 1.5-inch diameter) from 21-24 ft bgs, rounded to subrounded, chert
25							Clay (CL), medium plasticity, light gray (10YR7/1) mottled with brownish yellow (10YR6/6), grading downward from firm to soft, moist		30-35% silt
							Clay (CL), medium plasticity, light gray (10YR7/1), firm, moist		30-35% silt Trace medium gravel (up to 0.4-inch diameter), subrounded
30									

LITHOLOGIC LOG	BORING/WELL NO: DB01	PAGE 2 of 12
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Stiles
Drill Start (time/date): 13:30 on 02-18-02	Drill End (time/date): 15:12 on 02-21-02	Borehole Dia: 6 inch with 4-inch core
Drill Method/Rig Type: Versa-Sonic		Total Depth: 359 ft
Logged By: Kenneth Davis (SAIC)	Coordinates: E -3062.74 N -7132.19	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/ SAFETY VOC	HEALTH/ SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
							Clay (CL) as above, but light gray (10YR7/1) mottled with brownish yellow (10YR6/6)		Trace coarse gravel (up to 1-inch diameter), subrounded to rounded
							Clay (CL) as above		
35		6	8.0	NA	–	–	Silt (ML), medium plasticity, brownish yellow (10YR6/6) mottled with light gray (10YR7/1), moderately-firm-to-firm, moist		25-30% clay
40							Silt (ML) as above, but light gray (10YR7/1)		
							Silt (ML) as above		Trace medium to coarse gravel (up to 1.5-inch diameter), rounded to well rounded
							Sandy Silt (ML), medium plasticity, mottled light gray (10YR7/1) and yellow (10YR7/6), firm, moist		40% fine sand (subangular, quartz); 10% Clay
		7	11.5	NA	–	–	Silt (ML), medium plasticity, yellow (10YR7/8), firm, moist		30% clay; contains blebs of poorly graded, fine sand, rounded, quartz and trace opaque minerals
							Silt (ML), medium plasticity, yellow (10YR7/8) mottled with light gray (10YR7/1), firm, moist		35% Clay; Trace medium gravel (up to 0.5-inch diameter), poorly graded, rounded
45							Silty Sand (SM), nonplastic, yellow (10YR7/8) mottled with light gray (10YR7/1), moderately firm, moist to wet		55% medium to coarse sand (moderate grading, rounded to subangular); 30% silt; 15% gravel
							Clay (CL), medium to high plasticity, gray (7.5YR6/1), firm, moist		20% Silt, massive
50							Silt (ML), medium plasticity, light gray (10YR7/1) mottled with very pale brown (10YR7/4), firm, moist		25% clay; contains blebs of fine sand (60%), subangular and silt (40%) with some manganese staining
							Silty Gravel with Sand (GM), nonplastic, very pale brown (10YR7/4), loose, wet		Well graded: 50% gravel (up to 1-inch diameter, subrounded); 30% medium to coarse sand; 20% Silt
							Clay (CL), medium plasticity, light gray (10YR7/1), firm, moist		30% Silt; 10% sand (fine)
		8	10.0	NA	–	–	Well Graded Gravel with Clay and Sand (GW-GC), nonplastic, brown (10YR5/3), consolidated/firm, moist		50% fine to medium gravel (up to 0.75-inch diameter), subrounded to rounded, chert; 30% fine to medium sand, subangular to rounded, quartz); 20% clay
55							Well Graded Gravel with Silt and Sand (GW-GM), nonplastic, light yellowish brown (10YR6/4), loose, wet		60% fine to medium gravel (up to 0.75-inch diameter), subrounded to rounded, chert; 30% medium to coarse sand, subangular to rounded, quartz and feldspar; 10% silt
							Well Graded Gravel with Clay and Sand (GW-GC), nonplastic, grayish brown (10YR5/2), consolidated/firm, moist		60% medium to coarse gravel (up to 1.25-inch diameter), subrounded to rounded, chert; 20% coarse sand, subangular, chert; 20% clay
							Silt (ML), medium plasticity, yellow (10YR7/6) laminated with gray (10YR6/1), firm, moist		20% clay
60							Silt (ML) as above		

LITHOLOGIC LOG	BORING/WELL NO: DB01	PAGE 3 of 12
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Stiles
Drill Start (time/date): 13:30 on 02-18-02	Drill End (time/date): 15:12 on 02-21-02	Borehole Dia: 6 inch with 4-inch core
Drill Method/Rig Type: Versa-Sonic		Total Depth: 359 ft
Logged By: Kenneth Davis (SAIC)	Coordinates: E -3062.74 N -7132.19	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
							Silt (ML) as above		
							Clay (CL), low plasticity, gray (10YR6/1), hard, slightly moist		
65		9	10.0	NA	–	–	Clay (CL), medium plasticity, very dark grayish brown (10YR3/2), firm, moist		
70							Clay (CL) as above but hard, dry		
75		10	9.5	NA	–	–	Clay (CL), medium plasticity, very dark grayish brown (10YR3/2), firm, moist		
80									
85		11	8.8	NA	–	–	Clay (CL), medium plasticity, very dark gray (10YR3/1), firm to hard, slightly moist		Friable
90							Clay (CL) as above		

LITHOLOGIC LOG	BORING/WELL NO: DB01	PAGE 4 of 12
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Stiles
Drill Start (time/date): 13:30 on 02-18-02	Drill End (time/date): 15:12 on 02-21-02	Borehole Dia: 6 inch with 4-inch core
Drill Method/Rig Type: Versa-Sonic		Total Depth: 359 ft
Logged By: Kenneth Davis (SAIC)	Coordinates: E -3062.74 N -7132.19	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
95		12	10.2	NA	--	--	Clay (CL), medium plasticity, very dark gray (10YR3/1), firm to hard, slightly moist		Breaks along horizontal laminations
100		13	11.0	NA	--	--	Clay (CL) as above		Trace (2-5%) mica (muscovite)
105									
110		14	9.6	NA	--	--	Clay (CL) as above		
115									
120							Clay (CL) as above		

LITHOLOGIC LOG	BORING/WELL NO: DB01	PAGE 5 of 12
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Stiles
Drill Start (time/date): 13:30 on 02-18-02	Drill End (time/date): 15:12 on 02-21-02	Borehole Dia: 6 inch with 4-inch core
Drill Method/Rig Type: Versa-Sonic		Total Depth: 359 ft
Logged By: Kenneth Davis (SAIC)	Coordinates: E -3062.74 N -7132.19	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
125		15	9.8	NA	–	–	Clay (CL), medium plasticity, very dark gray (10YR3/1), firm to hard, slightly moist		Trace (2-5%) mica (muscovite), friable
130		16	10.5	NA	–	–	Clay (CL) as above		
140							Clay (CL) as above		
145		17	20.8	NA	–	–	Clay (CL) as above but moderately-firm-to-soft, moist		
150									

LITHOLOGIC LOG	BORING/WELL NO: DB01	PAGE 6 of 12
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Stiles
Drill Start (time/date): 13:30 on 02-18-02	Drill End (time/date): 15:12 on 02-21-02	Borehole Dia: 6 inch with 4-inch core
Drill Method/Rig Type: Versa-Sonic		Total Depth: 359 ft
Logged By: Kenneth Davis (SAIC)	Coordinates: E -3062.74 N -7132.19	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
							Clay (CL), medium plasticity, very dark gray (10YR3/1), moderately firm to soft, moist		Trace (2-5%) mica (muscovite), friable
							Clay (CL) as above but with laminations of glauconite sand (SP-SC)		
							grading downward to		
155							Glauconite Silt (ML), medium plasticity, black (10YR2/1), firm to hard, moist		30% clay
							Silty Sand (SM), fine, subangular, glauconite, medium plasticity, dark grayish brown (10YR4/2), firm, moist		40% silt
160							Clay (CL), plastic, black (10YR2/1), firm, moist		With 1-inch bed of glauconite fine Sand (SP), poorly graded, subangular
165							Poorly Graded Sand (SP), very fine, subangular, light greenish gray (GLEY2 7/1), soft, moist		
170		18	18.7	NA	–	–	Poorly Graded Sand (SP), fine to very fine, subrounded to rounded, nonplastic, light greenish gray (GLEY2 7/1), firm, moist		
							Interbedded Clay (CL), medium plasticity, very dark greenish gray (GLEY2 3/1), hard, moist AND Poorly Graded Sand (SP), fine to very fine, subrounded to rounded, light greenish gray (GLEY2 7/1), moist		
175							Poorly Graded Sand (SP), fine to very fine, subrounded to rounded, light greenish gray (GLEY2 7/1), firm, moist		Sand appears to be predominately quartz but contains abundant glauconite. Apparent organic-rich horizons at 174.9 ft bgs and 178.4 to 179.0 ft bgs
180							Interlaminated Poorly Graded Sand (SP), very fine, quartz, light gray (10YR7/1), Clay (CL), dark grayish brown (10YR4/2)		

LITHOLOGIC LOG	BORING/WELL NO: DB01	PAGE 7 of 12
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Stiles
Drill Start (time/date): 13:30 on 02-18-02	Drill End (time/date): 15:12 on 02-21-02	Borehole Dia: 6 inch with 4-inch core
Drill Method/Rig Type: Versa-Sonic		Total Depth: 359 ft
Logged By: Kenneth Davis (SAIC)	Coordinates: E -3062.74 N -7132.19	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
185							Interlaminated Clay (CL), dark grayish brown (10YR4/2) AND Poorly Graded Sand (SP), very fine, quartz, light gray (10YR7/1), medium plasticity, firm, moist		60% clay; 40% sand
							Interlaminated Clay (CL) AND Poorly Graded Sand (SP), as above		80% clay; 20% sand
		19	23.8	NA	–	–			
190							Interlaminated Clay (CL) AND Poorly Graded Sand (SP), as above		
195							Clayey Sand (SC), very fine to fine, poorly graded, medium plasticity, grayish brown (10YR5/2), firm, moist		20% clay
							Clay (CL), plastic, black (10YR2/1), hard, moist		
							Interlaminated Clay (CL), dark grayish brown (10YR4/2) AND Poorly Graded Sand (SP), very fine, quartz, light gray (10YR7/1), medium plasticity, firm, moist		50% clay; 50% sand
							Interlaminated Clay (CL) AND Sand (SP), as above		
200									
205							Clay (CL), plastic, black (10YR2/1), firm, moist		20% very fine sand, quartz
		20	20.5	NA	–	–			
							Clay (CL) as above		
210							Sandy Lean Clay (CL)		50% clay; 50% very fine sand, quartz

LITHOLOGIC LOG	BORING/WELL NO: DB01	PAGE 8 of 12
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Stiles
Drill Start (time/date): 13:30 on 02-18-02	Drill End (time/date): 15:12 on 02-21-02	Borehole Dia: 6 inch with 4-inch core
Drill Method/Rig Type: Versa-Sonic		Total Depth: 359 ft
Logged By: Kenneth Davis (SAIC)	Coordinates: E -3062.74 N -7132.19	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
							Sandy Lean Clay (CL), medium plasticity, very dark gray (10YR3/1) moderately firm, moist		50% clay; 45% very fine sand, quartz; trace (5%) gravel
							Clay (CL), medium plasticity, black (10YR2/1) firm, moist		Fine sand laminations make up 10%
215							Clay (CL) as above but sand laminations increasing towards base		Fine sand laminations increase to 50% at base
							Poorly Graded Sand (SP), very fine, quartz, slightly plastic, gray (10YR5/1) firm, moist		
							Silt (ML) with some sand (very fine) laminations, low plasticity, gray (10YR6/1) and very dark gray (10YR3/1), firm, moist		
220									
							Silt (ML), low plasticity, gray (10YR6/1), firm, moist		10% mica (muscovite); abundant carbonized plant fossils
225									
		21	21.5	NA	–	–			
230									
							Silt (ML), medium plasticity, gray (10YR5/1), firm, moist		10-15% mica (muscovite), carbonized plant fossils not evident.
235									
							Silt (ML), low to medium plasticity, laminated gray (10YR5/1) and light gray (10YR7/1), firm, moist		
240							Silt (ML), medium plasticity, very dark gray (10YR3/1), firm, moist		Massive

LITHOLOGIC LOG	BORING/WELL NO: DB01	PAGE 9 of 12
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Stiles
Drill Start (time/date): 13:30 on 02-18-02	Drill End (time/date): 15:12 on 02-21-02	Borehole Dia: 6 inch with 4-inch core
Drill Method/Rig Type: Versa-Sonic		Total Depth: 359 ft
Logged By: Kenneth Davis (SAIC)	Coordinates: E -3062.74 N -7132.19	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
							Silt (ML), medium plasticity, very dark gray (10YR3/1), firm, moist		Massive
245		22	11.8	NA	–	–	Silt (ML), medium plasticity, laminated gray (10YR5/1) and light gray (10YR7/1), firm, moist		
250							Silt (ML) as above		Trace coarse gravel (up to 1.25-inch diameter), rounded
255							Silt (ML) as above but moderately firm		
							Silty Sand (SM), fine, rounded, poorly graded, quartz, gray (7.5YR6/1), soft, wet		30% silt
260		23	19.1	NA	–	–	Silty Sand (SM) as above		
							Laminated Clay (CL) AND Poorly Graded Sand (SP), fine, rounded, quartz, medium plasticity, gray (10YR5/1) and light gray (10YR7/1), firm, moist		70% clay; 30% sand. Note: some glauconite present
265							Poorly Graded Sand (SP), subangular to subrounded, quartz, nonplastic, light gray (10YR7/1), soft, wet		
270							Laminated Silt (ML) AND Poorly Graded Sand (SP), very fine, subangular, quartz, low plasticity, gray (10YR5/1) and light gray (10YR7/1), firm, moist		70% silt; 30% sand. Some glauconite present

LITHOLOGIC LOG	BORING/WELL NO: DB01	PAGE 10 of 12
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Stiles
Drill Start (time/date): 13:30 on 02-18-02	Drill End (time/date): 15:12 on 02-21-02	Borehole Dia: 6 inch with 4-inch core
Drill Method/Rig Type: Versa-Sonic		Total Depth: 359 ft
Logged By: Kenneth Davis (SAIC)	Coordinates: E -3062.74 N -7132.19	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
							Laminated Silt (ML) AND Poorly Graded Sand (SP), very fine, subangular, quartz, low plasticity, gray (10YR5/1) and light gray (10YR7/1), firm, moist		70% silt; 30% sand. Some glauconite present
275							Poorly Graded Sand (SP), very fine, subangular, quartz, with some clay laminations, light gray (10YR7/1) with some gray (10YR5/1), firm, wet		15-20% clay laminations
280		24	19.8	NA	–	–	Laminated Silt (ML) AND Poorly Graded Sand (SP), very fine, low plasticity, black (10YR2/1) and light gray (10YR7/1), firm, moist WITH frequent Clay (CL) interbeds (2 to 6 inches thick), plastic, black (10YR2/1), firm, moist		
285									
290							Interlaminated Clay (CL), plastic, dark gray (10YR4/1), firm, moist AND Poorly Graded Sand (SP), very fine, subangular to subrounded, quartz, nonplastic, light gray (10YR7/1), loose/soft, moist		65% clay; 35% sand
295							Poorly Graded Sand (SP), very fine to fine, subangular to subrounded, quartz, nonplastic, light gray (10YR7/1), WITH infrequent interbeds of Clay (CL), 2 to 4 inches thick, plastic, dark gray (10YR4/1); soft, wet		85% sand; 15% clay
		25	19.8	NA	–	–			
300							Poorly Graded Sand (SP), WITH interbeds of Clay (CL) as above		60% sand; 40% clay

LITHOLOGIC LOG	BORING/WELL NO: DB01	PAGE 11 of 12
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Stiles
Drill Start (time/date): 13:30 on 02-18-02	Drill End (time/date): 15:12 on 02-21-02	Borehole Dia: 6 inch with 4-inch core
Drill Method/Rig Type: Versa-Sonic		Total Depth: 359 ft
Logged By: Kenneth Davis (SAIC)	Coordinates: E -3062.74 N -7132.19	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
							Poorly Graded Sand (SP), very fine to fine, subangular to subrounded, quartz, nonplastic, light gray (10YR7/1), WITH infrequent interbeds of Clay (CL), 2 to 4 inches thick, plastic, dark gray (10YR4/1); soft, wet		60% sand; 40% clay
305							Interbedded Clay (CL) (60%), in 2- to 8-inch beds, plastic, dark gray (10YR4/1), very firm, moist AND Poorly Graded Sand (SP) (40%), in 2- to 14-inch beds, very fine to fine, subangular to subrounded, nonplastic, light gray (10YR7/1), loose/soft, wet		Clay contains 10% fine sand. clay breaks with fine laminations. Some sand laminations present in clay.
							Clay (CL), plastic, dark gray (10YR4/1), very firm, moist		10% fine sand
310							Poorly Graded Sand (SP), fine, rounded to subrounded, quartz, nonplastic, light gray (10YR7/1), soft, wet		Trace (2-5%) opaque minerals. Sparse clay interbeds (up to 2 inches thick)
315							Clay (CL), plastic, dark brown (10YR3/3), firm, moist		20% fine Sand. Contains few sand laminations
							Poorly Graded Sand (SP), fine, rounded to subrounded, quartz, nonplastic, light gray (10YR7/1), soft, wet		Trace (2-5%) opaque minerals
320		26	19.2	NA	–	–	Interbedded Poorly Graded Sand (SP), fine, rounded to subrounded, quartz, nonplastic, light gray (10YR7/1), soft, wet AND Clay (CL), plastic, dark brown (10YR3/3), firm, moist		Sand contains trace (2-5%) opaque minerals. Clay contains 20% fine sand. Bedding is approximately 6 inches thick
							Silt (ML), medium to low plasticity, dark brown (10YR3/2), firm, moist		At 323.2 ft bgs: gravel layer, subangular, up to 1.75-inch diameter, fine-grained limestone
325							Silt (ML), low plasticity, dark grayish brown (10YR4/2), soft-to-firm, moist		Trace fine sand
330							Poorly Graded Sand (SP), very fine to fine, subangular to subrounded, quartz		

LITHOLOGIC LOG	BORING/WELL NO: DB01	PAGE 12 of 12
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Stiles
Drill Start (time/date): 13:30 on 02-18-02	Drill End (time/date): 15:12 on 02-21-02	Borehole Dia: 6 inch with 4-inch core
Drill Method/Rig Type: Versa-Sonic		Total Depth: 359 ft
Logged By: Kenneth Davis (SAIC)	Coordinates: E -3062.74 N -7132.19	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
335									
340		27	19.7	NA	--	--	Poorly Graded Sand (SP), very fine to fine, subangular to subrounded, quartz, nonplastic, light gray (10YR7/1) and gray (10YR6/1), soft/loose, wet		5-10 % mica (muscovite) and 1-2% opaque minerals. Some mica-rich horizons. Rare silt laminations. Some pyrite-cemented concretions
345									
350									
355		28	15.3	NA	--	--	Poorly Graded Sand (SP), very fine, subangular to subrounded, quartz with approximately 5% mica, nonplastic, light gray (10YR7/1), soft/loose, wet		Some mica-rich horizons, otherwise massive
									Total Depth = 359 ft

Prepared by: Kenneth R. Davis Kenneth R. Davis Date 07-19-02

Checked by: Michelle R. Blanton M. Blanton Date 07/23/02

Approved by: Bruce J. Haas Bruce J. Haas Date 07/29/02

LITHOLOGIC LOG	BORING/WELL NO: DB02	PAGE 1 of 7
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley and William Oatts
Drill Start (time/date): 11:25 on 03-05-02	Drill End (time/date): 12:30 on 03-22-02	Borehole Dia: 6 inch
Drill Method/Rig Type: Mud Rotary by CME-55 to 73 ft and CME-75 to 400.3 ft		Total Depth: 400.3 ft
Logged By: K. Davis and T. Campbell	Coordinates: E -3046.72 N -7124.92	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS01	1.8	10-16-11-10 (27)	--	--	Limestone dense gravel aggregate		Ground elevation = 397.64 ft amsl
							Clayey Gravel with Sand, light brown (5YR5/6), firm moist		Gravel is subangular
		SS02	1.7	8-5-22-32 (27)	--	--	Silt (ML), medium plasticity, light brownish gray (10YR6/2) mottled with brownish yellow (10YR6/8), firm, moist		20% clay
5		ST01	2.1	NA	--	--	Silt (ML) as above		
		ST02	2.0	NA	--	--	Silt (ML) as above		
		SS03	1.9	4-6-7-8 (13)	--	--	Silt (ML), medium plasticity, light yellowish brown (10YR6/4), firm, moist		
10		SS04	2.0	3-5-8-8 (13)	--	--	Silt (ML) as above, but 10% Clay		
		SS05	1.7	1-4-7-7 (11)	--	--	Silt (ML) as above, but mottled pale brown (10YR6/3) and light gray (10YR7/1)		10% clay
15		SS06	2.0	3-4-7-8 (11)	--	--	Silt (ML) as above		10% clay
		SS07	2.2	2-4-6-7 (10)	--	--	Silt (ML) as above, but mottled yellow (10YR7/6) and light gray (10YR7/1)		10% clay
		SS08	1.9	3-5-8-10 (13)	--	--	Silt (ML) as above, but yellow (10YR7/6) mottled with light gray (10YR7/1) grading downward to Silt (ML), medium plasticity, light grey (10YR7/1) mottled with yellow (10YR7/6), firm, moist		10% clay No Clay
20		SS09	1.9	3-3-5-6 (8)	--	--	Silt (ML), medium plasticity, light gray (10YR7/1), firm, moist		5% medium sand
		SS10	2.2	4-5-6-8 (11)	--	--	Silt (ML) as above, but light gray (10YR7/1) mottled with yellow (10YR7/6) grading downward to yellow (10YR7/8) mottled with reddish yellow (7.5YR6/6)		
25		SS11	2.3	4-5-7-7 (12)	--	--	Silt (ML), medium plasticity, light gray (10YR7/1) mottled with reddish yellow (7.5YR6/6) and yellow (10YR7/6), firm, moist		10-15% very fine sand. Note: reddish yellow areas have 20-25% clay
		SS12	2.2	4-4-7-6 (11)	--	--	Silt (ML), medium plasticity, light gray (10YR7/1) mottled with yellow (10YR7/6), firm, moist		5% fine to coarse gravel (up to 1.25 inch diameter), rounded, chert and fine-grained sandstone
							Clayey Sand (SC), colored as above, firm, moist		80% fine sand, rounded, quartz; 20% clay
30		SS13	2.2	5-19-14-10 (33)	--	--	Silt with Sand and Gravel (ML) low plasticity, light gray (10YR7/1) grading downward to light yellowish brown (10YR6/4), firm, moist		10% fine sand; 10% fine to medium gravel (up to 0.5 inch diameter), rounded

LITHOLOGIC LOG	BORING/WELL NO: DB02	PAGE 2 of 7
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley and William Oatts
Drill Start (time/date): 11:25 on 03-05-02	Drill End (time/date): 12:30 on 03-22-02	Borehole Dia: 6 inch
Drill Method/Rig Type: Mud Rotary by CME-55 to 73 ft and CME-75 to 400.3 ft		Total Depth: 400.3 ft
Logged By: K. Davis and T. Campbell	Coordinates: E -3046.72 N -7124.92	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS14	2.3	3-6-7-10 (13)	--	--	Silt with Sand and Gravel (ML), low plasticity, light gray (10YR7/1), firm, moist		10% fine sand; 10% fine to medium gravel (up to 0.5 inch diameter), rounded
		SS15	1.9	4-7-8-10 (15)	--	--	Silt with Sand and Gravel (ML), medium plasticity, light gray (10YR7/1) mottled with reddish yellow (7.5YR6/6), firm, moist		10% fine sand, rounded; 10% gravel (up to 1.0 inch diameter), rounded, chert
35		SS16	2.1	5-7-11-12 (18)	--	--	Clay (CL), medium plasticity, light gray (10YR7/1) with some reddish yellow (7.5YR6/6) mottling, firm, moist		
		SS17	2.2	3-5-10-8 (15)	--	--	Clay (CL) as above		Trace gravel
40		ST03	1.7	NA	--	--	Clay (CL) as above		
		Shelby Tube Attempt	0.0	NA					
		SS18	2.2	6-10-13-18 (23)	--	--	Lean Clay with Sand (CL), medium plasticity, firm, moist Poorly Graded Sand (SP),very fine, light gray (10YR7/1) with some reddish yellow (7.5 YR7/6) mottling, soft, wet Clay (CL), plastic, light gray (7.5YR7/1), firm, moist Poorly Graded Sand (SP), medium to coarse, firm, moist		40% very fine sand, quartz Quartz with trace feldspar and trace opaque minerals 5% gravel, rounded, chert Rounded, quartz Attempted Shelby tube but had no recovery. Followed by split spoon sample.
45		SS19	2.2	2-6-7-10 (13)	--	--	Poorly Graded Sand (SP), nonplastic, very pale brown (10YR7/4), firm, moist grading downward to Clayey Sand with Gravel, medium plasticity, light gray (10YR7/2), firm, moist Clay (CL), plastic, light gray (10YR7/1), firm, moist		50% fine sand, rounded, quartz; 30% clay; 10% fine gravel (up to 0.25 inch diameter), rounded, chert
		SS20	1.6	1-0-5-8 (5)	--	--	Clay (CL), plastic, gray (10YR6/1), firm, moist		Some sand laminations (2-5%), poorly graded (SP), very fine, quartz
50		SS21	2.4	4-6-7-10 (13)	--	--	Clay (CL) as above with trace very fine sand and trace mica (muscovite?)		
		SS22	2.2	4-4-15-21 (19)	--	--	Clay (CL), plastic, light gray (10YR7/1) with streaks of reddish yellow (7.5YR7/6), firm, moist grading downward to Clay (CL) as above but brownish yellow (10YR6/8) Gravely Silt (ML), nonplastic, brownish yellow, firm, moist		Some sand laminations, poorly graded (SP), very fine, quartz; ~10% very fine sand within clay More frequent sand laminations, ~20% of mass
		SS23	1.6	14-16-8-21 (24)	--	--	Clay (CL), plastic, light gray (10YR7/1), firm, moist Well Graded Sand with Gravel (SW), nonplastic, very pale brown (10YR7/1), loose, wet Clay (CL), plastic, light gray (10YR7/1), soft to firm, moist Poorly Graded Sand (SP), nonplastic, soft, wet		80% fine to coarse Sand, rounded to well rounded, quartz; 20% fine Gravel (up to 0.25 inch diameter) 20% very fine Sand Fine Sand, rounded, quartz with trace opaque minerals
55		SS24	2.3	21-35-42-51 (77)	--	--	Poorly Graded Sand (SP), fine, grading downward to Well Graded Sand (SW), fine to very coarse; nonplastic, light gray (10YR7/2), soft/loose, moist Poorly Graded Sand (SP), nonplastic, soft/loose, moist Poorly Graded Sand with Silt and Gravel (SP-SM)		Quartz with trace accessory minerals Rounded Rounded to subangular, 9% fine Gravel, rounded, chert 90% fine sand, 10% coarse sand, rounded, quartz 65-70% fine sand, 20% gravel, rounded, 10-15% silt
		SS25	1.6	32-37-53-9 (90)	--	--	Well Graded Sand with Silt (SW-SM), nonplastic, yellowish brown (10YR5/8), dense/some limonite and hematite cementation, wet		75-80% fine to coarse sand, rounded to subangular, quartz and some chert; 10-15% Silt; 10% fine Gravel (up to 0.5 inch diameter), angular to rounded. Note: some angular gravel has a black coating - suggesting gravel was not broken during sampling
60		SS26	1.6	19-21-5-13 (26)	--	--	Poorly Graded Gravel (GP), fine (up to 0.25 inch diameter), rounded to subangular, chert		Hematite cementation at 59.5-59.6 ft bgs

LITHOLOGIC LOG	BORING/WELL NO: DB02	PAGE 3 of 7
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley and William Oatts
Drill Start (time/date): 11:25 on 03-05-02	Drill End (time/date): 12:30 on 03-22-02	Borehole Dia: 6 inch
Drill Method/Rig Type: Mud Rotary by CME-55 to 73 ft and CME-75 to 400.3 ft		Total Depth: 400.3 ft
Logged By: K. Davis and T. Campbell	Coordinates: E -3046.72 N -7124.92	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS27	1.7	6-7-6-4 (13)	–	–	Well Graded Sand (SW) grading downward to Well Graded Gravel (GW); nonplastic, pale brown (10YR6/3), loose, wet		Medium to coarse sand, rounded to subrounded, quartz and chert; 90% fine gravel, 10% coarse sand, rounded to subrounded, chert
		SS28	2.2	6-21-28-56 (49)	–	–	Well Graded Gravel (GW) as above; Clay (CL), medium plasticity, very dark gray (10YR3/1), firm, dry		
65		SS29	2.3	14-19-24-33 (43)	–	–	Clay (CL), medium plasticity, dark gray (10YR4/1), firm, slightly moist		Friable
		Shelby Tube Attempt	NA	NA	–	–			Shelby tube separated from sample rods. Eventually recovered Shelby tube - but no sample.
70		SS30	2.2	14-22-30-40 (52)	–	–	Clay (CL), medium plasticity, dark gray (10YR4/1), firm, slightly moist		5-10% mica, friable
		ST04	0.8	NA	–	–	No sample accessible for description		
75		ST05	0.9	NA	–	–	No sample accessible for description		
80									
85									
90		SS31	1.9	8-21-30-41 (51)	–	–	Clay (CL), low plasticity, very dark brown (10YR2/2), firm to hard, slightly moist		~20% silt, massive

LITHOLOGIC LOG	BORING/WELL NO: DB02	PAGE 4 of 7
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley and William Oatts
Drill Start (time/date): 11:25 on 03-05-02	Drill End (time/date): 12:30 on 03-22-02	Borehole Dia: 6 inch
Drill Method/Rig Type: Mud Rotary by CME-55 to 73 ft and CME-75 to 400.3 ft		Total Depth: 400.3 ft
Logged By: K. Davis and T. Campbell	Coordinates: E -3046.72 N -7124.92	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS31					Clay (CL), low plasticity, very dark brown (10YR2/2), firm-to-hard, slightly moist		~20% Silt, massive
		Shelby Tube Attempt	1.2	NA	--	--	No sample accessible for description. Shelby tube sample not retained for analysis.		
		ST06	1.6	NA	--	--	No sample accessible for description.		
95		ST07	1.2	NA	--	--	No sample accessible for description.		
100									
105									
110		SS32	2.1	15-21-25-30 (46)	--	--	Clay (CL), medium plasticity, very dark greenish gray (GLEY1 3/1), hard, slightly moist		20% silt; 20% mica
		ST08	1.5	NA	--	--	No sample accessible for description.		
115		ST09	0.9	NA	--	--	Only very small sample accessible for description. Clay (CL), low plasticity, very dark greenish gray (GLEY1 3/1), slightly moist		30% silt; 5% mica
120									

LITHOLOGIC LOG	BORING/WELL NO: DB02	PAGE 5 of 7
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley and William Oatts
Drill Start (time/date): 11:25 on 03-05-02	Drill End (time/date): 12:30 on 03-22-02	Borehole Dia: 6 inch
Drill Method/Rig Type: Mud Rotary by CME-55 to 73 ft and CME-75 to 400.3 ft		Total Depth: 400.3 ft
Logged By: K. Davis and T. Campbell	Coordinates: E -3046.72 N -7124.92	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
125									
130		SS33	2.0	17-21-31-40 (52)	–	–	Silt (ML), nonplastic, dark gray (N3), hard, dry		Trace mica, friable
		ST10	0.8	NA	–	–	Silt (ML) as above		
135		ST11	0.9	NA	–	–	Silt (ML) as above		
140									
145									
150		SS34	2.0	9-12-17-24 (29)	–	–	Silt (ML) as above		

LITHOLOGIC LOG	BORING/WELL NO: DB02	PAGE 6 of 7
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley and William Oatts
Drill Start (time/date): 11:25 on 03-05-02	Drill End (time/date): 12:30 on 03-22-02	Borehole Dia: 6 inch
Drill Method/Rig Type: Mud Rotary by CME-55 to 73 ft and CME-75 to 400.3 ft		Total Depth: 400.3 ft
Logged By: K. Davis and T. Campbell	Coordinates: E -3046.72 N -7124.92	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS34	2.0	9-12-17-24 (29)	--	--	Silt (ML) as above		
155									
160									
165									
170									
175		SS35	0.4	50/4 in. (Refusal)	--	--	Poorly Graded Sand with Silt (SP-SM), medium dark gray (N4) to light gray (N7), wet		75% fine sand, subangular to subrounded; 25% silt; trace black (N1) minerals (possibly phosphate or glauconite - most likely glauconite), fine grained, subangular to angular
180									

LITHOLOGIC LOG	BORING/WELL NO: DB02	PAGE 7 of 7
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley and William Oatts
Drill Start (time/date): 11:25 on 03-05-02	Drill End (time/date): 12:30 on 03-22-02	Borehole Dia: 6 inch
Drill Method/Rig Type: Mud Rotary by CME-55 to 73 ft and CME-75 to 400.3 ft		Total Depth: 400.3 ft
Logged By: K. Davis and T. Campbell	Coordinates: E -3046.72 N -7124.92	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
185		SS36	2.0	6-19-30-46 (49)	--	--	Thinly laminated Clayey Silt (ML), gray (N3) to grayish black (N2), AND Poorly Graded Sand (SP), gray (N8); nonplastic to medium plasticity, moist		Clayey silt contains 20-50% clay with trace of mica. Sand is very fine grained.
		Shelby Tube Attempt	--	NA	--	--			Shelby tube sample failed. Pushed 1 ft but Shelby tube nearly lost. Total depth = 400.3 ft
190									

Prepared by: Kenneth R. Davis — Kenneth R. Davis — 07-19-02 Date

Checked by: Michelle R. Blanton — Michelle R. Blanton — 07/23/02 Date

Approved by: Bruce J. Haas — Bruce J. Haas — 07/29/02 Date

LITHOLOGIC LOG	BORING/WELL NO: SB01	PAGE 1 of 2
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley
Drill Start (time/date): 10:45 on 03-09-02	Drill End (time/date): 17:00 on 03-10-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by CME-55		Total Depth: 52 ft
Logged By: T. Cambell	Coordinates: E -4783.36 N -7775.97	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS01	1.2	9-12-15-21 (27)	--	--	Fill – asphalt, sand, concrete		Ground elevation = 386.53 ft amsl
		SS02	0	13-8-14-17 (22)	--	--			No recovery
5		SS03	1.4	1-3-3-3 (6)	--	--	Silt (ML), nonplastic, pale yellowish brown (10R6/2) to light olive gray (5Y6/1), hard, moist		Trace fine sand; Trace clay
		ST01	2.0	NA	--	--	Silt (ML) as above		
		ST02	2.0	NA	--	--	Silt (ML) as above		
10		SS04	1.6	3-3-3-6 (6)	--	--	Silt (ML), nonplastic, pale yellowish brown (10YR6/2) with trace dark yellowish orange (10YR6/6), hard, moist		Trace fine, subangular sand; trace fine, subangular to subrounded gravel
		SS05	2.0	3-4-4-5 (8)	--	--	Silt (ML) as as above but with more distinct mottling		Trace manganese oxide; No gravel
15		SS06	2.0	4-6-8-12 (14)	--	--	Silt (ML) as as above Poorly graded sand with silt (SP-SM), pale yellowish brown (10YR6/2) to light brown (5YR5/6), moist		Fine sand, subangular to subrounded 20% Silt Note: 2.0 ft recovered but 1.0 ft is cave-in from uphole
		SS07	1.6	2-8-10-12 (18)	--	--	Poorly Graded Sand (SP), light brown (5YR5/6), moist		Trace fine to coarse, angular to rounded gravel Trace fine, subrounded to rounded sand
20		SS08	1.5	9-9-18-23 (27)	--	--	Poorly Graded Sand (SP) as above		Increased sand and silt content above 19.5 ft (no gravel); gravel present below 19.5 ft
		SS09	1.1	15-27-22-10 (49)	--	--	Well Graded Gravel with Sand (G-W), light brown (5YR5/6) to dark yellowish brown (10YR4/6), wet		40% fine to coarse, subangular to subrounded sand, angular to subrounded gravel
		SS10	2.0	4-4-8-10 (12)	--	--	Silt (ML), nonplastic, mostly grayish red (10R4/2) with iron stained dusky red (5R3/4) to dark reddish brown (10R3/4) laminae, hard, dry to moist		
25		SS11	2.0	6-8-12-15 (20)	--	--	Silt (ML) as above		Friable; shearing while sampling; some early shears filled with iron oxide; some shears high angle, some horizontal
		SS12	2.0	7-11-15-20 (26)	--	--	Silt (ML) as above with trace light brown (5YR5/6), moist		Trace mica No iron oxide
30		SS13	2.0	9-11-15-18 (26)	--	--	Silt (ML) as above		

LITHOLOGIC LOG	BORING/WELL NO: SB01	PAGE 2 of 2
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley
Drill Start (time/date): 10:45 on 03-09-02	Drill End (time/date): 17:00 on 03-10-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by CME-55		Total Depth: 52 ft
Logged By: T. Cambell	Coordinates: E -4783.36 N -7775.97	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS14	2.0	9-17-23-35 (40)	--	--	Silt (ML), nonplastic, mostly grayish red (10R4/2) with trace light brown (5YR5/6), hard, moist		Friable
		SS15	2.0	10-16-28-33 (44)	--	--	Silt (ML), thinly laminated brownish gray (5YR4/1), light brown (5YR5/6), and dark yellowish orange (10YR6/6), hard		Trace mica; Iron oxide stained horizontal fractures in sampler shoe
35		ST03	0.6	NA	--	--			Pushed 0.9 ft with 1500 psi downpressure; bottom of sample tube crushed; sample discarded
		ST04	0	NA	--	--			Pushed 1.3 ft with 1700 psi downpressure Sample tube lost in hole, discarded after recovery
		SS16	0	8-31-43-36 (74)	--	--	Gravel and Silt from above, disturbed		Tripped sampler rods prior to collecting this sample Sample was from cave-in; discarded
40		SS17	2.0	9-13-18-26 (31)	--		Silt (ML), medium dark gray (N4) with trace dark yellowish orange (10YR6/6) iron oxide, hard, dry		Porters Creek Clay, but probably not top of formation, Friable, Some early shear fractures filled
		SS18	2.0	12-20-25-31 (45)			Silt (ML) as above		Vertical shear filled with iron oxide at 42.6-42.9 ft; separate shear zone sample collected
45		SS19	2.0	11-18-22-28 (40)			Silt (ML), olive black (5Y2/1), hard, dry		Friable; trace dark yellowish orange (10YR6/6) in sampler; shoe appears as horizontal laminae
		ST05	1.5	NA			Silt (ML) as above but with no dark yellowish orange (10YR6/6) laminae		Pushed 1.4 ft with 1000 psi downpressure
		ST06	1.5	NA			Silt (ML) as above		Pushed 1.5 ft with 1000 psi downpressure
50		SS20	2.0	12-20-22-32 (42)			Silt (ML) as above		Total Depth = 52.0 ft

Prepared by: Kenneth R. Davis — Kenneth R. Davis — 07-19-02 Date

Checked by: Michelle R. Blanton — 07/23/02 Date

Approved by: Bruce J. Haas — 07/29/02 Date

LITHOLOGIC LOG	BORING/WELL NO: SB02	PAGE 1 of 3
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: William Oatts
Drill Start (time/date): 09:50 on 02-25-02	Drill End (time/date): 17:20 on 03-06-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by Ingersoll Rand A-300 to 16', CME-75 to 66'		Total Depth: 66 ft
Logged By: K. Davis and E.F. Johnstone	Coordinates: E -4791.38 N -5836.05	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS01	1.4	6-9-13-11 (22)	–	–	Silty Gravel (GM), nonplastic, light brown (7.5YR6/4), dry		Ground elevation = 363.06 ft amsl Fill: 60% gravel, 40% silt
							Crushed cement		Fill
							Silty Gravel (GM), as 0.0-1.0 ft		Fill
							Silty Gravel (GM) as above		Fill
		SS02	1.2	1-4-3-4 (7)	–	–	Silt (ML), low plasticity, gray (10YR6/1), firm, moist		
5		SS03	1.5	2-2-3-3 (5)	–	–	Silt (ML) as above, but light gray (10YR7/1) mottled with very pale brown (10YR7/4)		
		ST01	1.9	NA	–	–	Silt (ML), med. plasticity, light gray (10YR7/1), firm, moist		
		ST02	1.6	NA	–	–	Silt (ML), low plasticity, light gray (10YR7/1) mottled with very pale brown (10YR7/1), firm, moist		
10		SS04	1.7	1-2-3-4 (5)	–	–	Silt (ML) as above		
		SS05	2.0	2-4-4-6 (8)	–	–	Silt (ML), medium plasticity, light gray (10YR7/1) mottled with pale brown (10YR6/3), firm, moist		30% clay 1-2% coarse sand
15		SS06	1.9	0-2-6-6 (8)	–	–	Silt (ML) as above but predominately pale brown (10YR6/3)		
		SS07	1.4	4-10-11-16 (21)	–	–	Poorly Graded Sand (SP) Gravely Silt (ML), low plasticity, gray (10YR6/1), moist		Coarse, well rounded quartz 40% gravel, up to 1.5-inch diameter, rounded
		SS08	1.7	6-11-15-20 (26)	–	–	Well Graded Gravel with Silt (GW-GM) Poorly Graded Sand (SP), nonplastic, yellow (10YR7/6), firm, moist		50% gravel, up to 1.25-inch diameter
20							Poorly Graded Sand (SP) as above		
		SS09	1.7	10-37-36-34 (73)	–	–	Well Graded Sand with Gravel (SW), low plasticity, light yellowish brown (10YR6/4), moist		40% coarse sand 35% gravel 15% silt 10% clay
		SS10	1.6	11-14-25-26 (39)	–	–	Well Graded Sand with Gravel (SW), nonplastic, pale brown (10YR6/3), moist		40% coarse sand 40% gravel 10% silt 10% clay
							Sand with Gravel (SW) as above		
25		SS11	1.7	9-9-4-6 (13)	–	–	Silt (ML), medium plasticity, light gray (10YR7/1) mottled with yellow (10YR7/6), firm, moist		
		SS12	0.6	2-2-6-6 (8)	–	–	Well Graded Gravel (GW)		Gravel thought to be from 22-24 ft interval
30		SS13	1.3	6-4-3-3 (7)	–	–	Silt (ML), medium plasticity, very pale brown (10YR7/4), soft, moist		80% silt; 20% clay

LITHOLOGIC LOG	BORING/WELL NO: SB02	PAGE 2 of 3
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: William Oatts
Drill Start (time/date): 09:50 on 02-25-02	Drill End (time/date): 17:20 on 03-06-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by Ingersoll Rand A-300 to 16', CME-75 to 66'		Total Depth: 66 ft
Logged By: K. Davis and E.F. Johnstone	Coordinates: E -4791.38 N -5836.05	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS14	2.0	2-3-2-4 (5)	--	--	Silt (ML), medium plasticity, light gray (10YR7/1) with some mottling of brownish yellow (10YR6/6), firm, moist		70% silt; 20% clay; 10% fine sand
		SS15	2.0	5-4-4-8 (8)	--	--	Silt (ML) as above but brownish yellow (10YR6/8) with some light gray (10YR7/1) lamination		
35		ST03	2.3	NA	--	--	Silt (ML), medium plasticity, brownish yellow (10YR6/6), firm, moist		70% silt; 30% fine sand, poorly graded
		ST04	2.0	NA	--	--	Silt (ML) as above		
		SS16	2.0	7-21-27-26 (48)	--	--	Silt (ML), medium plasticity, light gray (10YR7/1), firm, moist		75% silt 20% fine sand 5% gravel, 0.3-inch diameter
40		SS17	2.0	4-2-3-5 (5)	--	--	Poorly Graded Sand (SP), fine, light yellowish brown (10YR6/4), soft, wet		
							Sandy Lean Clay (CL), plastic, reddish yellow (7.5YR6/6), firm, moist		68% Clay 30% very fine Gravel 2% medium Gravel, 1-inch diameter
		SS18	2.0	8-39-32-27 (71)	--	--	Gravelly Lean Clay (CL), firm, moist		Angular, chert gravel
							Poorly Graded Sand with Gravel (SP)		
							Poorly Graded Sand (SP)		85% very fine to fine sand, rounded, quartz 15% gravel, 0.75-inch diameter
45		SS19	2.0	10-16-10-10 (26)	--	--	Poorly Graded Sand (SP), nonplastic, light gray (10YR7/1), soft, wet Grading downward to Well Graded Sand (SW)		Fine quartz sand, rounded TO Fine to coarse (chert) sand, rounded to subangular
							Sandy Silt with Gravel (ML), low plasticity, light gray 10YR7/1), very soft, wet		20% fine sand, rounded, 15% fine gravel, up to 0.5-inch diameter, subangular to angular, chert
							Poorly Graded Sand (SP), nonplastic, soft, wet		Fine to v. fine sand, quartz with 5-7% accss. minerals
		SS20	1.2	8-4-6-9 (10)	--	--	Clayey Sand (SC),plastic, light gray (10YR7/2), firm, moist grading downward to		70% fine sand, rounded, quartz with trace accss. minerals (feldspars and opaques) 30% clay
							Poorly Graded Sand (SP), nonplastic, very pale brown (10YR7/3), soft, moist		Fine sand, rounded, quartz with trace accss. Minerals (feldspars and opaques)
50		SS21	1.7	10-25-25-24 (50)	--	--	Poorly Graded Sand (SP), nonplastic, light gray (10YR7/2) at top grading to to reddish yellow (7.5YR6/6) at bottom, firm, wet		Trace gravel, 0.75-inch diameter, angular, chert
		SS22	1.5	1-8-11-24 (19)	--	--	Poorly Graded Sand with Clay (SP-SC), light brown (5YR5/6), soft, wet		Fine to medium sand, subangular, quartz
		SS23	2.0	6-10-12-18 (22)	--	--	Poorly Graded Sand with Clay (SP-SC), light brown (5YR5/6), firm, wet		Fine to medium sand, subangular, quartz
							Lean Clay (CL), grayish black (N2), firm, moist		Note: a few pieces of subangular, chert gravel at top
55		SS24	2.0	12-17-24-31 (41)	--	--	Lean Clay (CL), grayish black (N2), firm, moist		
		SS25	1.0	30-52/0.3' (refusal)	--	--	Lean Clay (CL), grayish black (N2), firm, moist		
60		SS26	2.0	12-19-19-26 (38)			Lean Clay (CL), grayish black (N2), firm, moist		

LITHOLOGIC LOG	BORING/WELL NO: SB02	PAGE 3 of 3
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: William Oatts
Drill Start (time/date): 09:50 on 02-25-02	Drill End (time/date): 17:20 on 03-06-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by Ingersoll Rand A-300 to 16', CME-75 to 66'		Total Depth: 66 ft
Logged By: K. Davis and E.F. Johnstone	Coordinates: E -4791.38 N -5836.05	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS27	2.0	8-17-23-29 (40)	--	--	Lean Clay (CL), grayish black (N2), firm, moist		
		ST05	1.5	NA	--	--	Lean Clay (CL), grayish black (N2)		Bottom of Shelby tube crushed
65		ST06	1.2	NA	--	--	Lean Clay (CL), grayish black (N2)		Bottom of Shelby tube crushed Total Depth = 66.0 ft
70									

Prepared by: Kenneth R. Davis — Kenneth R. Davis — 07-19-02 Date

Checked by: Michelle R. Blanton — Michelle R. Blanton — 07/23/02 Date

Approved by: Bruce J. Haas — Bruce J. Haas — 09/29/02 Date

LITHOLOGIC LOG	BORING/WELL NO: SB03	PAGE 1 of 3
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley
Drill Start (time/date): 13:55 on 02-13-02	Drill End (time/date): 16:25 on 03-19-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by Ingersoll Rand A-300		Total Depth: 70 ft
Logged By: T. Campbell	Coordinates: E -3207.73 N -6743.77	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
							Cement		Ground elevation = 394.21 ft amsl
		SS01	1.7	15-12-4-5 (16)	--	--	Silty Clay (CL-ML), nonplastic, moderate yellowish brown (10YR5/4), firm, dry to moist		40% silt
		SS02	2.0	6-20-20-10 (40)	--	--	Silty Clay (CL), medium plasticity, moderate yellowish brown (10YR5/4) with trace light brown (5YR5/6), firm, damp		Approximately 25% silt Few fine sand lenses
5		SS03	1.0	7-9-11-10 (20)	--	--	Silty Clay (CL), medium plasticity, dark yellowish orange (10YR6/6) and very pale orange (10YR8/2), firm, moist		Approximately 25% silt; few fine sand lenses; recovered 2 ft but upper part of sample was cement; from up-hole; discarded.
		SS04	2.0	2-3-5-8 (8)	--	--	Silty Clay (CL-ML), low plasticity, moderate yellowish brown (10YR5/4) to pale yellowish brown (10YR8/2), firm, dry		Approximately 40% silt; trace fine sand; trace brown organics (2%).
		ST01	1.4	NA	--	--	Silty Clay (CL-ML) as above		
10		ST02	1.9	NA	--	--	Clay (CL), low to moderate plasticity, moderate yellowish brown (10YR5/4), firm, dry		Approximately 20% silt
		SS05	2.0	6-6-5-8 (11)	--	--	Clay (CL), high plasticity, colored as above, dry to moist		Organics from 13.5-13.8 ft
15		SS06	2.0	3-5-9-10 (14)	--	--	Clayey Silt (ML-CL), low plasticity, dark yellowish orange (10YR6/6) and pale yellowish brown (10YR8/2), firm		Approximately 40% clay; trace very fine sand.
		SS07	2.0	5-7-9-12 (16)	--	--	Clayey Silt (ML-CL), nonplastic, moderate yellowish brown (10YR5/4), firm, dry to moist		Approximately 40% clay. Increasing clay content with depth; trace very fine sand; trace fine gravel.
20		SS08	2.0	6-8-8-11 (16)	--	--	Silty Clay (CL-ML), medium plasticity, dark yellowish orange (10YR6/6) and pale yellowish brown (10YR8/2), dry to moist		Approximately 30% silt; trace fine, subangular gravel, quartz and iron-cemented nodules
		SS09	2.0	6-6-8-11 (14)	--	--	Clay (CL), medium plasticity, dark yellowish orange (10YR6/6) and pale yellowish brown (10YR8/2)		Sparse silt; trace fine, subangular gravel; trace very fine sand at base
		SS10	1.1	6-8-8 (16)	--	--	Clay (CL) as above		Gravel content increases from top to bottom; some iron-cemented nodules present
25		SS11	2.0	7-11-28-33 (39)	--	--	Clay (CL) as above Poorly Graded Sand with Silt (SP-SM), pale yellowish brown (10YR8/2) (becomes light brown below 25.7 ft), moist		Fine, subangular to angular sand; 30% silt Trace fine gravel
		SS12	0.8	16 - 50/5" (refusal)	--	--	Poorly Graded Sand with Gravel (SP), dark yellowish orange (10YR6/6)		Fine, subrounded sand; trace silt; trace clay
30		SS13	0.2	3-6-6-7 (12)	--	--	Poorly Graded Sand with Silt (SP-SM), dark yellowish orange (10YR6/6), moist		Very fine sand; 40% silt; 10% clay

LITHOLOGIC LOG	BORING/WELL NO: SB03	PAGE 2 of 3
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley
Drill Start (time/date): 13:55 on 02-13-02	Drill End (time/date): 16:25 on 03-19-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by Ingersoll Rand A-300		Total Depth: 70 ft
Logged By: T. Campbell	Coordinates: E -3207.73 N -6743.77	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS14	2.0	3-4-5-8 (9)	--	--	Sandy Clay (CL), dark yellowish orange (10YR6/6) to pale yellowish brown (10YR6/2), dry to moist		20% very fine sand; trace fine gravel
		SS15	0.7	4-4-5-7 (9)	--	--	Poorly Graded Sand with Silt (SP-SM), dark yellowish orange (10YR6/6), interbedded with Clay (CL), pale yellow brown (10YR6/2), stiff, moist		Fine to medium sand; 25% silt
35		SS16	2.0	2-2-4-5 (6)	--	--	Silt with Sand (ML), light brown (5YR5/6), soft, moist Silty Clay (ML-CL), medium plasticity, grayish orange (10YR7/4) to very light gray (N8), firm		30% very fine sand 20% silt; Organics (~5%) from 34.6-35.5 ft; trace manganese oxide
		SS17	2.0	2-4-5-7 (9)	--	--	Clay (CL), moderately plastic, dark yellowish orange (10YR6/6), firm, moist		10% silt Organics (~5%) from 37.8-38.0 ft
40		ST03	2.0	NA	--	--	Clay (CL) as above		Increase to 30% silt
		ST04	1.5	NA	--	--	Clay (CL) as above		20% silt
		SS18	2.0	7-4-3-7 (7)	--	--	Silty Clay (CL), medium plasticity, light brownish gray (5YR6/1), firm to stiff, moist		20% silt; fine gravel layer 43.1-43.3 ft becoming sandy (fine grained) below 43.7 ft
45		SS19	2.0	1-3-5-5 (8)	--	--	Silty Clay (CL) as above Clayey Sand (SC), nonplastic, colored as above with light brown (5YR5/6) mottling		Trace very fine sand Very fine sand; 40% clay, 20% silt; trace fine gravel
		SS20	2.0	2-4-4-6 (8)	--	--	Thinly laminated Silty Sand (SM) and Clayey Sand (SC), dark yellowish orange (10YR6/6) (sand) to pale yellowish brown (10YR6/2), moist		Note: thin (<1.25 inch thick) partings of dark yellowish orange
50		SS21	2.0	1-3-50/5" (refusal)	--	--	Silty Clay (CL),medium plasticity, light brownish gray (5YR6/1) with few dark yellowish orange (10YR6/6) laminae, stiff Poorly Graded Gravel with Sand (GP), light brown (5YR5/6), wet		30% clay Trace fine sand Gravel up to 0.6" diameter Note: pushed 1.5 ft but recovered 2.0 ft
		SS22	2.0	9-7-9-17 (16)	--	--	Poorly Graded Gravel with Sand (GP) as above Clay (CL), laminated dark yellowish orange (10YR6/6) and medium gray (N5), hard, dry		Gravel at top of sampler may be from up hole. Iron cement from 50.7-51.0 ft Trace silt and fine sand; Friable
		SS23	2.0	9-12-17-20 (29)	--	--	Clay (CL) as above but becoming medium dark gray (N4) below 53.2 ft		
55		ST05	NA	NA	--	--	Clay (CL) as above		Pushed 1.4 ft at 1600 psi down pressure Shelby tube crushed, no sample
		ST06	1.6	NA	--	--	Clay (CL) as above		
60		SS24	2.0	12-16-23-28 (39)	--	--	Clayey Silt (ML-CL), nonplastic, olive black (5Y2/1), hard, dry		35% clay; Trace very fine sand; Friable

LITHOLOGIC LOG	BORING/WELL NO: SB03	PAGE 3 of 3
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley
Drill Start (time/date): 13:55 on 02-13-02	Drill End (time/date): 16:25 on 03-19-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by Ingersoll Rand A-300		Total Depth: 70 ft
Logged By: T. Campbell	Coordinates: E -3207.73 N -6743.77	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS25	2.0	12-17-21-31 (38)	–	–	Clayey Silt (ML-CL), nonplastic, olive black (5Y2/1), hard, dry		35% clay Trace very fine sand Friable
		SS26	2.0	12-21-34-37 (55)	–	–	Silt (ML), nonplastic, colored as above, hard		With very fine to fine quartz sand; trace mica below 63.5 ft; driller reports easier drilling
65		ST07	1.0	NA	–	–	Silt (ML), dark gray (N3), very hard, dry		10% clay; Friable
		ST08	1.0	NA	–	–	Silt (ML) as above		
70		SS27	1.0	–	–	–	Silt (ML), nonplastic, olive black (5Y2/1), hard, dry to moist		Trace very fine sand; Total Depth = 70.0 ft

Prepared by: Kenneth R Davis — Kenneth R. Davis — 07-19-02 Date

Checked by: M R Blanton — Michelle R. Blanton — 07/23/02 Date

Approved by: Bruce J. Haas — Bruce J. Haas — 07/29/02 Date

LITHOLOGIC LOG	BORING/WELL NO: SB05	PAGE 1 of 3
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: William Oatts
Drill Start (time/date): 07:35 on 02-21-02	Drill End (time/date): 17:10 on 02-23-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by Ingersoll Rand A-300		Total Depth: 62 ft
Logged By: T. Cambell	Coordinates: E -4787.58 N -6752.60	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS01	1.6	5-6-7-10 (13)	–	–	Fill – asphalt at surface, then sand, concrete, road gravel mix		Ground elevation = 385.42 ft amsl
		SS02	1.7	3-3-2-4 (5)	–	–	Fill as above		Trace gravel in top of sample from up hole
							Silty Clay (ML-CL), medium plasticity, light olive gray (5Y6/1) to dark greenish gray (5GY4/1), firm, moist		40% Clay Few thin very fine sand laminae
5		SS03	1.7	0-2-2-4 (4)	–	–	Silty Clay (CL), light olive gray (5Y6/1), soft, moist		Note: sampler dropped 0.5 ft when seated. 40% Silt, 10% fine Sand Few fine Sand lenses
							Silty Clay (CL) as above, mottled with dark yellowish orange (10YR6/6)		30% Silt, 20% fine Sand
		SS04	1.8	1-3-3-4 (6)	–	–	Sandy Clay (CL), and Sandy Silt (ML), nonplastic, colors as above, soft		30% fine Sand Laminated
		ST01	2.0	NA	–	–			
10		ST02	1.5	NA	–	–			
		SS05	2.0	2-4-6-7 (10)	–	–	Silt (ML), nonplastic, pale yellowish brown (10YR6/2) to moderate yellowish brown (10YR5/4), moist		25% fine sand Trace medium sand 10% clay
							Silt (ML) as above		
15		SS06	1.8	13-27-34-50 (61)	–	–	Poorly Graded Sand with Silt (SP-SM), pale yellowish brown (10YR6/2), hard, moist		40% silt Very fine sand grading to silt Friable
		SS07	1.0	11-30-34-42 (64)	–	–	Silt (ML), nonplastic, pale yellowish brown (10YR6/2), hard, moist		10% fine sand
							Silt (ML) as above		
		SS08	1.5	18-14-14-18 (28)	–	–	Well Graded Gravel with Sand (GW), light brown (5YR5/6), moist		Grades from fine to coarse, subrounded sand to angular to subrounded gravel 30% sand, 10% silt
20							Well Graded Gravel with Sand (GW) as above		
		SS09	1.4	10-7-4-11 (11)	–	–	Sandy clay (CL), grayish orange (10YR7/4) to light brown (5YR5/6), moist		30% sand Trace subangular to subrounded gravel Trace silt
		SS10	1.0	2-3-10-11 (13)	–	–	Poorly graded gravel with sand (GP), as 18.7-21.0 ft, except grayish red (10R4/2), moderate reddish brown (10R4/6), and light brown (5YR5/6), moist		
25		SS11	1.7	6-9-8-11 (17)	–	–	Poorly Graded Sand (SP), fine grained, angular to subangular, dark yellowish orange (10YR6/6) to light brown (10YR5/6), wet		10% silt Gravel at top of sample may be from up hole but rig losing water and chattering
		SS12	1.7	10-21-27-28 (48)	–	–	Poorly graded gravel with sand (GW), mostly dark yellowish orange (10YR6/6) with trace grayish red (10R4/6), moist to wet		Grades from fine to coarse sand to gravel, angular to rounded 40% sand Trace silt and clay nodules Some weak iron cement
30		SS13	1.6	8-14-8-2 (22)	–	–	Grading to well graded gravel with clay (GW-GC), light brown (5YR5/6)		Gravel is quartz and chert

LITHOLOGIC LOG	BORING/WELL NO: SB05	PAGE 2 of 3
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: William Oatts
Drill Start (time/date): 07:35 on 02-21-02	Drill End (time/date): 17:10 on 02-23-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by Ingersoll Rand A-300		Total Depth: 62 ft
Logged By: T. Cambell	Coordinates: E -4787.58 N -6752.60	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS14	2.0	0-1-2-4 (3)	--	--	Clayey Silt (ML/CL), low plasticity, grayish orange (10YR7/4) to pale yellowish brown (10YR6/2), firm, moist		Sampler dropped 0.5 ft when seated Becoming sandy (to 20%) at base
		ST03	--	NA	--	--	Poorly Graded Sand and Silt (SP-ML), nonplastic, colors as above, moist		50% each, sand and silt Fine sand, subangular to subrounded
35		ST04	--	NA	--	--	Poorly Graded Sand with Silt (SP-SM), low to medium plasticity, pale yellowish brown (10YR6/2), trace fine gravel, soft, moist		Fine sand, angular to subangular 25% silt Trace fine gravel
		SS15	2.0	3-3-3-3 (6)	--	--	Lean Clay with Sand (CL), low to medium plasticity, pale yellowish brown (10R6/2), soft, moist		30% fine sand, subangular 20% silt Trace fine gravel
		SS16	2.0	0-2-5-6 (7)	--	--	Lean Clay with Sand, as above		Sampler dropped 0.5 ft when seated. Trace fine to coarse gravel
40		SS17	1.4	1-4-10-14 (14)	--	--	Lean Clay with Sand as above Clayey Gravel (GC), moderate reddish brown (10R4/6), moist		Grades from fine to coarse, subangular to subrounded sand to gravel. Gravel is generally flat and elongated 15% sand
		SS18	1.1	3-3-6-7 (9)	--	--	Sandy Lean Clay with Gravel (CL), medium dark gray (N4) and moderate reddish brown (10YR4/6), moist		50% fine to coarse, subrounded to rounded Gravel, quartz and chert 15% fine sand
45		ST05	1.8	NA	--	--	Sandy silt (ML), nonplastic, medium dark gray (N4) to dark yellowish orange (10YR6/6), moist		25% silt Fine sand
		ST06	1.6	NA	--	--	Silt (ML), non-plastic, dark gray (N3) with trace discontinuous dark yellowish orange (10YR6/6), hard		Thin sandy laminae
		SS19	2.0	7-13-20-23 (33)	--	--	Silt (ML), trace clay, nonplastic, dark gray (N3), homogeneous, hard, moist		Trace clay Trace mica Homogeneous
		SS20	2.0	10-15-20-26 (35)	--	--	Silt (ML) as above but without clay		Trace fine sand
		SS21	1.3	0-5-15-29 (20)	--	--	Silt (ML) as above		Friable Low blowcounts indicated disturbed interval at top of sample (top 0.7 ft disturbed). Sampler penetrated 0.6 ft under weight of hammer.
		ST07	1.3	NA	--	--	Silt (ML), nonplastic, dark gray (N3), hard moist		Trace fine sand Homogenous and friable
		ST08	1.3	NA	--	--	Silt (ML) as above		
		SS22	2.0	11-18-25-28 (43)	--	--	Silt (ML) as above		

LITHOLOGIC LOG	BORING/WELL NO: SB05	PAGE 3 of 3
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: William Oatts
Drill Start (time/date): 07:35 on 02-21-02	Drill End (time/date): 17:10 on 02-23-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by Ingersoll Rand A-300		Total Depth: 62 ft
Logged By: T. Cambell	Coordinates: E -4787.58 N -6752.60	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS23	2.0	8-15-21-27 (36)	--	--	Silt (ML) as above		Total Depth = 62.0 ft
65									

Prepared by: Kenneth R. Davis — Kenneth R. Davis — 07-19-02 Date

Checked by: Michelle R. Blanton — Michelle R. Blanton — 07/23/02 Date

Approved by: Bruce J. Haas — Bruce J. Haas — 07/29/02 Date

LITHOLOGIC LOG	BORING/WELL NO: SB06	PAGE 1 of 2
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley
Drill Start (time/date): 14:46 on 03-11-02	Drill End (time/date): 11:50 on 03-14-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by CME-55		Total Depth: 58 ft
Logged By: K. Davis and F. Johnstone	Coordinates: E -3535.97 N -6196.14	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
									Ground elevation = 388.20 ft amsl
		SS01	1.4	3-4-4-5 (8)	--	--	Silt (ML), low plasticity, light gray (10YR7/2), firm, moist		Small roots and organic material in upper 0.4 ft. Trace mica
		SS02	1.7	4-5-6-8 (11)	--	--	Silt (ML) as above, grading downward from light gray (10YR7/2) to light gray (10YR7/1)		No mica present
5		ST01	1.9	NA	--	--	Silt (ML), medium plasticity, light gray (10YR7/1), firm, moist		20% clay
		SS03	2.0	2-3-4-5 (7)	--	--	Silt (ML) as above		Attempted to collect Shelby tube over interval but got no recovery. Followed with split spoon sample over interval.
		ST02	2.0	NA	--	--	Silt (ML) as above		
10		SS04	2.0	2-4-4-5 (8)	--	--	Silt (ML) as above, grading downward from light gray (10YR7/2) to very pale brown (10YR7/3)		Small sticks/roots in sample at 10.9 ft bls
		SS05	2.0	3-3-5-5 (8)	--	--	Silt (ML) as above, very pale brown (10YR7/3)		
15		SS06	1.9	3-4-5-5 (9)	--	--	Silt (ML), medium plasticity, light gray (10YR7/1) mottled with very pale brown (10YR7/3), firm, moist		Trace very coarse sand, subangular, chert
		SS07	1.9	2-5-6-7 (11)	--	--	Silt (ML) as above		20% clay; trace coarse sand
		SS08	2.0	0-3-5-13 (8)	--	--	Silt (ML), plastic, light yellowish brown (10YR6/4), soft, moist		10-20% clay
							Lean Clay (CL), plastic, light gray (10YR7/1), firm, moist		30% Silt; trace fine gravel (0.25 inch diameter), rounded, chert
20							Lean Clay with Gravel (CL), medium plasticity, yellow (10YR7/6), firm, moist		30% gravel, well graded (up to 1 inch diameter), rounded to subangular, chert; 10% silt
		SS09	2.0	6-8-8-10 (16)	--	--	Lean Clay with Gravel (CL), medium plasticity, yellow (10YR7/6) mottled with light gray (10YR7/1), firm, moist		20% gravel; 10% silt
		SS10	2.0	4-5-7-11 (12)	--	--	Lean Clay with Gravel (CL) as above, but with 10-35% fine to medium sand, rounded, quartz		Sand percentage increases from top to bottom. Reddish yellow (7.5YR6/8) sand blebs near bottom.
							Lean Clay (CL), medium plasticity, light gray (10YR7/1), firm, moist		30% silt
25		SS11	2.0	5-9-12-15 (21)	--	--	Silt (ML), medium plasticity, light gray (10YR7/1), firm, moist		Trace medium gravel (up to 0.5 inch diameter), rounded, chert
							Silt (ML), nonplastic, brownish yellow (10YR6/8), firm, slightly moist		Trace fine sand, rounded, quartz; Trace medium gravel (up to 0.5 inch diameter), subangular to angular, chert
							Poorly Graded Sand (SP), nonplastic, soft, moist		Med. sand, rounded, quartz, with hematite(?) coating
		SS12	1.8	20-29-30-35 (59)	--	--	Clayey Poorly Graded Sand (SP), low plasticity, brownish yellow (10YR6/6), firm, moist		Fine sand, rounded, quartz; 20% clay
							Well Graded Gravelly Sand with Clay (SW), low to medium plasticity, pale brown (10YR6/3), moist		Medium sand, quartz to medium gravel, chert, subangular to angular; 30% gravel; 20% clay
30		SS13	1.1	15-14-4-14 (18)	--	--	Well Graded Gravel with Clay (GW-GC), nonplastic, light gray (10YR7/2) grading downward to grayish brown (10YR5/2), wet		Medium sand, rounded, quartz, to coarse gravel (up to 1 inch diameter), subangular to rounded, chert; 25% sand, 15% clay. Note: gravel in bottom half of sample has a black stain

LITHOLOGIC LOG	BORING/WELL NO: SB06	PAGE 2 of 2
Facility: Paducah Gaseous Diffusion Plant, Paducah, KY		Site: Site 3A
Project No: DO 110	Client/Project: USDOE/PGDP Site 3A Seismic Assessment	
Contractor: SAIC	Drill Contractor: Miller Govt Services	Driller: Robert Tilley
Drill Start (time/date): 14:46 on 03-11-02	Drill End (time/date): 11:50 on 03-14-02	Borehole Dia: 4.5 inch
Drill Method/Rig Type: Mud Rotary by CME-55		Total Depth: 58 ft
Logged By: K. Davis and F. Johnstone	Coordinates: E -3535.97 N -6196.14	Protective Level: D

DEPTH (ft)	SAMPLE INTERVAL	SAMPLE NUMBER	SAMPLE RECOVERY (ft)	SPT RESULT 6"-6"-6"-6" (N)	HEALTH/SAFETY VOC	HEALTH/SAFETY RAD	LITHOLOGIC DESCRIPTION	GRAPH LOG	COMMENTS
		SS14	1.5	6-17-24-30 (41)	--	--	Well Graded Gravel (GW), nonplastic, light gray (10YR7/2), wet		60% fine to coarse Gravel (up to 1.25 inch diameter), angular to rounded, chert; 40% fine to coarse Sand, rounded, quartz
		SS15	1.4	2-9-22-25 (31)	--	--	Well Graded Gravel (GW) as above		
35		SS16	1.2	9-16-16-10 (32)	--	--	Well Graded Gravel (GW) as above, but yellow (10YR7/6)		Maximum gravel diameter is ~0.75 inches. Note: 0.1 ft thick clay-rich layer at 35 ft bls.
		SS17	1.4	2-9-4-9 (13)	--	--	Well Graded Gravel (GW) as above Poorly Graded Sand (SP), medium plasticity, firm, moist Lean Clay (CL), plastic, very pale brown (10YR7/3), firm, moist		Very fine sand, subangular, quartz; 20% clay
		SS18	1.2	6-7-5-14 (12)	--	--	Well Graded Sand with Silt and Gravel (SW-SC), light gray (10YR7/2), firm, moist Sandy Lean Clay with Gravel (CL), yellow (10YR7/6), firm, moist		Up to 1.5 inch diameter gravel, subangular Up to 0.5 inch diameter gravel, subangular Note: base of sample gravel-rich
40		SS19	1.5	6-15-23-20 (38)	--	--	Poorly Graded Sand, yellow (10YR7/6), soft, moist Well Graded Sand with Gravel (SW), yellow (10YR7/6), soft, moist		Up to 0.5 inch diameter gravel, subangular
		SS20	0.2	1-1-1-1 (2)	--	--	Well Graded Sand (SW), subrounded to angular, moderate yellowish brown (10YR5/4), very soft, moist		
45		SS21	1.5	7-29-9-4 (38)	--	--	Well Graded Gravel with Sand (GW), yellow (10YR7/6), soft, moist Lean Clay (CL), mottled olive gray (5YR4/1) and dark yellowish orange (10YR6/6), firm, moist		Subangular
		SS22	1.5	3-6-9-14 (15)	--	--	Lean Clay (CL), mottled olive gray (5YR4/1) and dark yellowish orange (10YR6/6), hard, moist		Note: thin (<1.25 inch thick) partings of dark yellowish orange
50		ST03	1.5	NA	--	--	Lean Clay (CL) as above		
		ST04	0.0	NA	--	--			Attempted Shelby Tube sample but had no recovery.
		ST05	1.0	NA	--	--	Lean Clay (CL) as above		
55		SS23	2.0	12-19-17-25 (36)	--	--	Lean Clay (CL), grayish black (N2), hard, moist		At 54 ft bls: apparent slickenside surface on 2 fractures with dips of ~ 45 degrees
		SS24	2.0	14-17-27-31 (44)	--	--	Lean Clay (CL), grayish black (N2), hard, moist		Total Depth = 58.0 ft

Prepared by: Kenneth R. Davis Kenneth R. Davis Date 07-19-02

Checked by: Michelle R. Blanton Date 07/23/02

Approved by: Bruce J. Haas Date 07/29/02

ATTACHMENT E-II

NATURAL GAMMA LOG REPORT FOR DEEP BORING DB-01

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BLACKHAWK
GeoServices
Southeast Region

GEOPHYSICAL WELL LOGGING REPORT

Site 3A, Borehole DB01
Paducah Gaseous Diffusion Plant

Paducah, Kentucky

Blackhawk GeoServices Project No. 2902MIL

Prepared for

Miller Government Services
107 Helton Drive, P.O. Box 706
Lawrenceburg, Tennessee 38464

Prepared by

Blackhawk GeoServices
706 S. Illinois Ave., Suite D-104
Oak Ridge, Tennessee 37830
(865) 483-0200

April 29, 2002

GEOPHYSICAL WELL LOGGING REPORT

SITE 3A BOREHOLE DB01
PADUCAH GASEOUS DIFFUSION PLANT (PGDP)
PADUCAH, KENTUCKY

Project No: 2902MIL
04/24/02

1.0 Introduction

Blackhawk GeoServices – Southeast Region performed geophysical well logging using the natural gamma method at the Site 3A Borehole DB01 at the Paducah Gaseous Diffusion Plant (PGDP) on February 22, 2002. The primary objective of the survey was to provide a lithologic correlation between the gamma data and continuous core descriptions from the geologist's log. The borehole location was along a gravel road that trends northeast from Dyke Road. This location roughly corresponds with Station 175 of p-wave seismic Line 5A. Logging was conducted within the drill pipe from the total depth of ~359 feet below ground surface upward toward the surface. For the purposes of data quality assurance (QA), a repeat log was conducted as the gamma probe was lowered to the bottom of the borehole.

2.0 Geophysical Logging Equipment

This section discusses the borehole logging system used to investigate the PGDP Site 3A borehole and gives a brief description of natural gamma theory.

Mt. Sopris MGX-I. The geophysical logging system used to conduct the investigation was a Mt. Sopris Instruments, Model MGX-I using a 2-inch-diameter natural gamma probe. The logging system was coupled to a laptop personal computer (PC). The integrated real-time system allowed for continuous monitoring of subsurface conditions while logging progressed.

The MGX-I system consists of the geophysical unit, probe, and a tripod installed with a pulley centered over the borehole to be logged. The MGX-I includes a depth encoder that sends a direct current pulse to the logging unit at a selected depth interval. Each time a pulse is received, the system records a natural gamma radiation response in counts per second (CPS).

Natural Gamma Theory. The natural gamma probe measures the radioactivity of geologic formations, which is useful for determining lithology in sedimentary environments and changes in bedrock types. Gamma radiation emissions are primarily generated from the naturally occurring radioactive decay of potassium (K), uranium (U), and thorium (Th). As the gamma rays pass through a sodium-iodide (NaI), thallium activated detector crystal, a photon is emitted by the crystal. The "flash" of this photon is detected by a photo-multiplier, and is "counted" as a gamma ray. For the PDGP type of application, gamma counts are generally considered directly proportional to the amount of clay present in the formation. Gamma ray counts in wells installed through large cavities or zones of significant sluffing can be misleading because of the increased amount of drilling mud or sand pack locally.

3.0 Field Procedures

Following system field checks at PGDP, the gamma probe was lowered into the well until the depth marker was flush with the top of casing. Based on the PGDP well-logging objectives, the depth encoder and system were set up to record data at 0.1-meter (3.9-inch) intervals. The depth counter was then zeroed, and data were acquired as the probe was lowered to the bottom of the well. The measured depth was checked against the geologist's log to verify that the probe had reached the total depth of the well. These initial gamma data, as the probe was lowered, are presented as the "Repeat Log" in the figures section.

Production gamma logging was conducted from the bottom of the well toward the surface. The production and repeat gamma logs were reviewed as a measure of QA. The repeatability testing results show excellent correlation between the two data sets. The Speed (S) for the production gamma logging was ~6.0 feet/minute, and the Time Constant (T_c) was 1 second. For the repeat log, (S) was ~8.0 feet/minute.

4.0 Data Processing and Results

Geophysical logging data were imported into an Excel® spreadsheet where data corrections and conversions performed. Data processing consisted of the following key steps:

- Readings were trimmed at the start and end of the log to eliminate stationary readings.
- System Lag (L) and was determined and corrected values applied to the vertical position. ($L_{corr} = 0.1$ feet; $L = ST_c/60$ $S = 6.1$, $T_c = 1$)
- Vertical position was adjusted so that 0.0 feet below ground surface (bgs) corresponded with the NaI crystal at the ground surface. ($P_{corr} = 0.33$ feet)
- Applied correction of 1.79 for steel casing. (8-inch diameter hole, 0.25-inch casing thickness)
- Applied correction of 1.296 for readings below water table. Water table was approximately 20 feet bgs.
- Converted Counts per Second (CPS) to API Units. A conversion factor used was 1 API = 1.25 CPS. (Note: This is a necessary correction to provide standardized units for comparison with gamma logs acquired with different instrumentation.)

Following data processing, the data were imported into CorelDraw® software for graphical presentation.

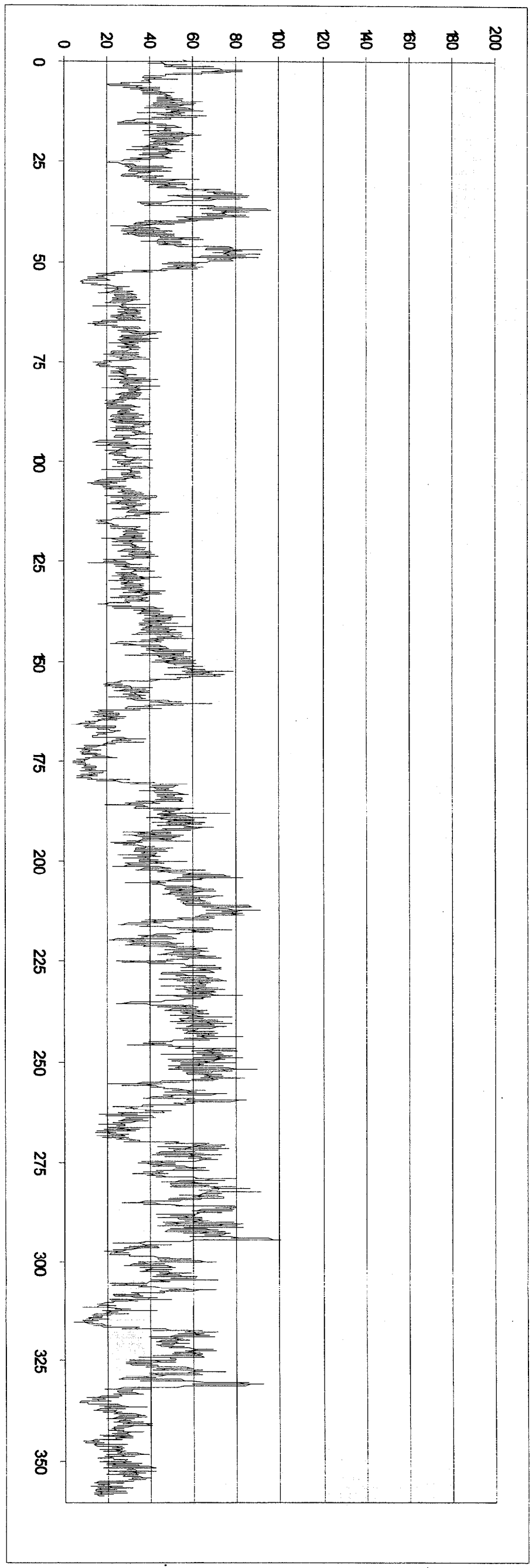
4.1 Natural Gamma Logs (Figures 1 through 4)

Figures 1 through 4 represent the entire Natural Gamma Log Raw Field Data, Repeated Raw Field Data, Corrected/Processed Counts per Second, and Corrected/Processed API Units, respectively. The Raw Field Log and the Repeated Raw Field Log are the readings directly from the geophysical logging system, with no post-processing or corrections added to the data. The first 5 post-processing steps were applied to Figure 3. Figure 4 includes all 6 post processing steps including the conversion from CPS to API units. Figure 4 was used to generate the lithologic correlation figures described below (Figures 5A-5D).

4.2 Interpreted Lithologic Correlations (Figures 5A through 5D)

Figures 5A through 5D present the Corrected Natural Gamma Plot in 100-foot intervals. The Lithologic Log provided by the SAIC, Kevil, KY office was used for the correlation. Actual lithologic descriptions shown on Figures 5A-5D are generalized from the log and intended to represent most of the significant changes in subsurface conditions rather than identifying subtle changes (e.g., thin beds, changes in color, and changes in grain size). Actual horizon depths shown on Figures 5A-5D are also generalized from those shown on the lithologic log, and in some cases adjusted based on the natural gamma log data.

Generally good correlation exists between the natural gamma and lithologic logs, with an average of less than 1.0 feet of variation occurring between the interpreted horizons from both.



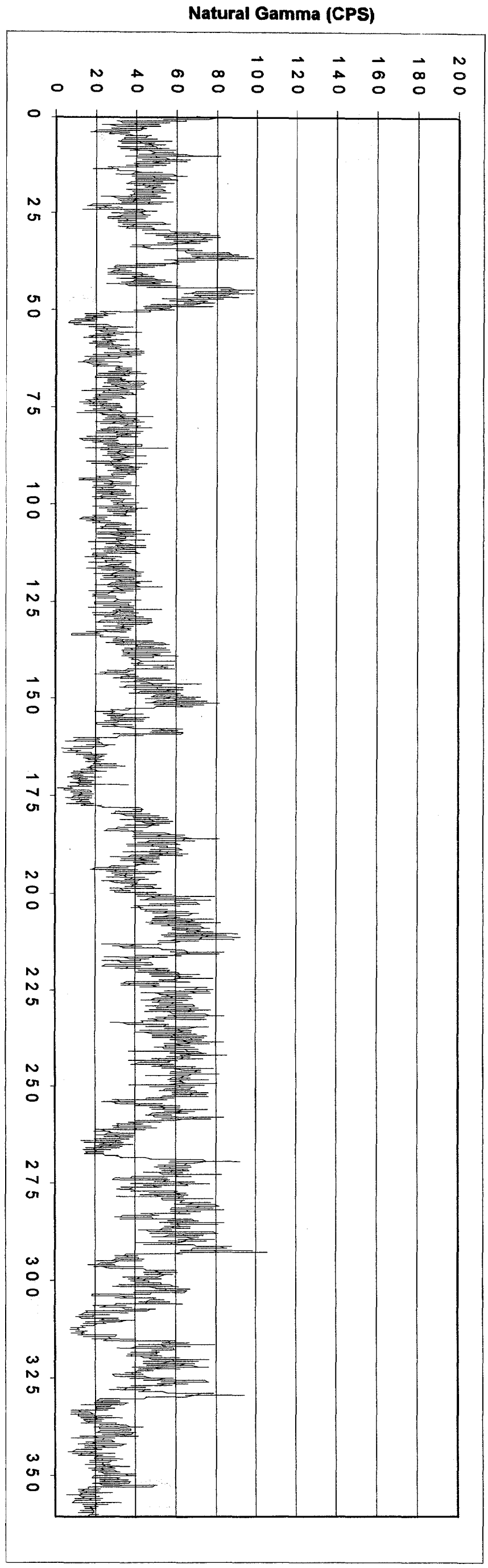
BLACKHAWK GeoServices Southeast Region

Natural Gamma Plot - Site 3A Borehole DB01
Raw Field Data CPS: 0-360 ft bgs
Paducah Gaseous Diffusion Plant
Paducah, Kentucky
Miller Government Services

Figure: 1

Project No. 2902MIL

File: gamma_3A_sbh_raw field_0-360.cdr



Gamma Plot - Site 3A Borehole DB01

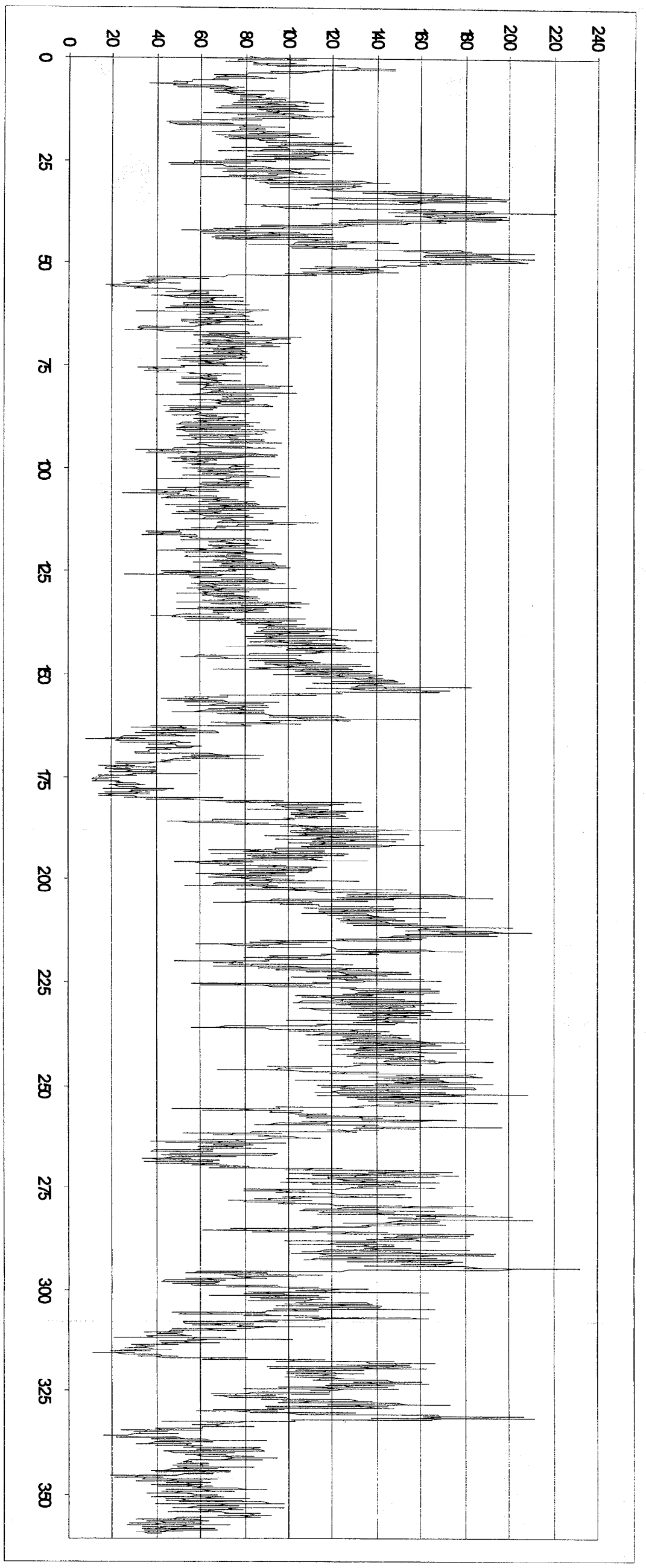
BLACKHAWK GeoServices Southeast Region

Natural Gamma Plot - Site 3A Borehole DB01
Repeated Raw Field Data CPS: 0-360 ft bgs
Paducah Gaseous Diffusion Plant
Paducah, Kentucky
Miller Government Services

Figure: 2

Project No. 2902MIL

File: gamma_3A_sbh_raw field_repeat_0-360.cdr



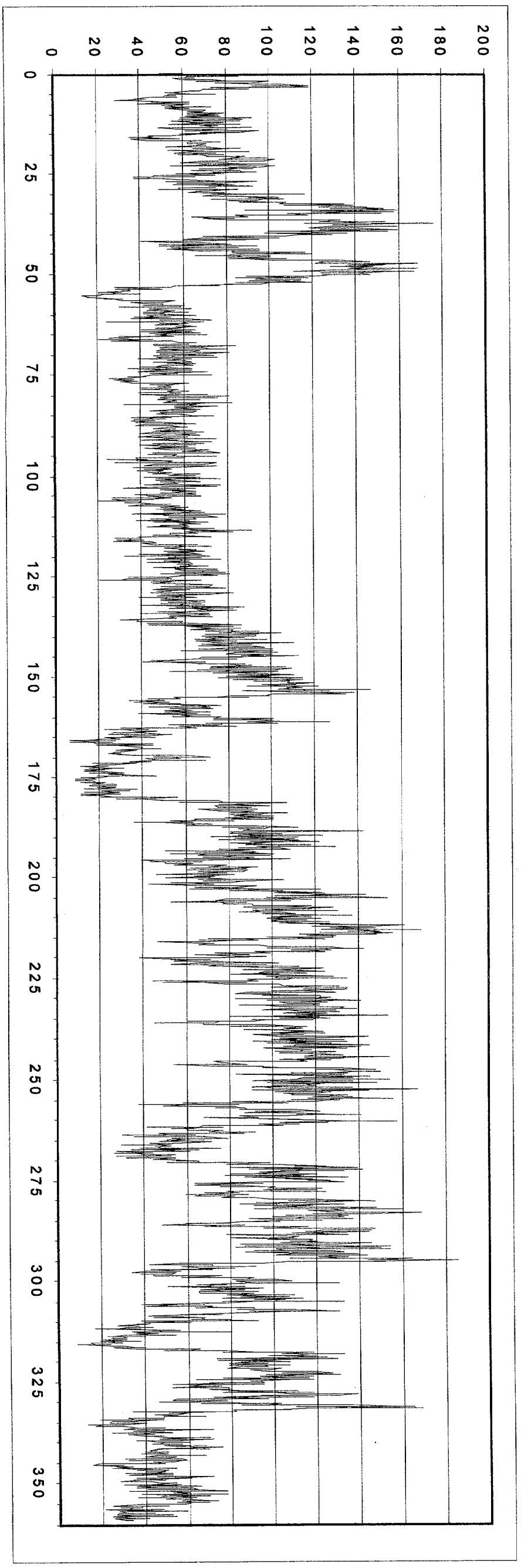
BLACKHAWK GeoServices Southeast Region

Natural Gamma Plot - Site 3A Borehole DB01
Corrected CPS: 0-360 ft bgs
Paducah Gaseous Diffusion Plant
Paducah, Kentucky
Miller Government Services

Figure: 3

Project No. 2902MIL

File: gamma_3A_sbh_CPS _0-360.cdr



Gamma Plot - Site 3A Borehole DB01

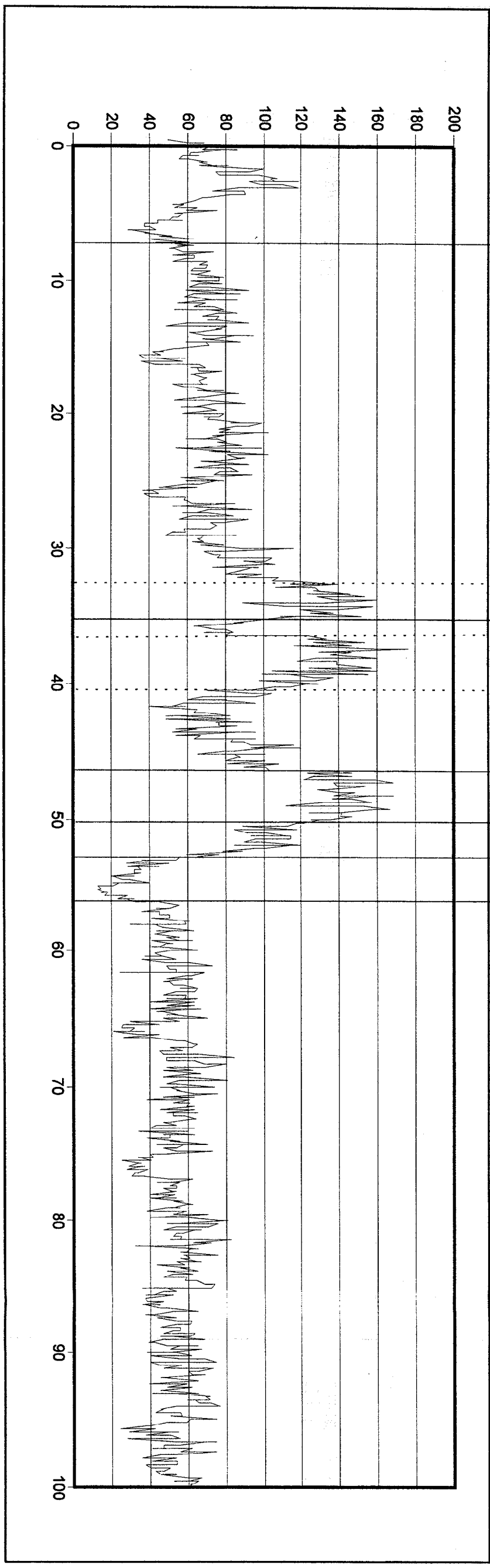
BLACKHAWK GeoServices Southeast Region

Natural Gamma Plot - Site 3A Borehole DB01
Corrected API Units: 0-360 ft bgs
Paducah Gaseous Diffusion Plant
Paducah, Kentucky
Miller Government Services

Figure: 4

Project No. 2902MIL

File: gamma_3A_sbh_corrected _0-360.cdr



Description from Lithologic Log

Silt (ML), medium plasticity, light brownish yellow (10YR6/4) mottled with light gray (10YR7/1), firm, moist

Clay (CL), medium plasticity, pale brown (10YR6/3) mottled with light gray (10YR7/1), firm, moist

Increase in Clay (CL) content

Silt (ML), medium plasticity, brownish yellow (10YR6/6) mottled with light gray(10YR7/1), moderately-firm-to-firm, moist

Inferred Clay (CL)

Silt (ML), medium plasticity, brownish yellow (10YR6/6) mottled with light gray(10YR7/1), moderately-firm-to-firm, moist

Clay (CL), medium-to-high plasticity, gray (7.5YR6/1), firm, moist

Silt (ML), medium plasticity, light gray (10YR7/1) mottled with very pale brown (10YR7/4), firm, moist

Well graded gravel with Silt and Sand (GW-Gm), nonplastic, light yellow brown (10YR6/4), loose, wet

Silt (ML), medium plasticity, yellow (10YR7/6) laminated with gray ((10YR6/1), firm, moist;

GRADING TO

Clay (CL), medium plasticity, very dark gray (10YR3/1), firm-to-hard, slightly moist

Explanation

——— Interpreted depth to horizons from continuous core data

- - - - - - Inferred horizon depth not shown on continuous core data

Note: Lithologic Log Provided by SAIC, Kevil, Ky.

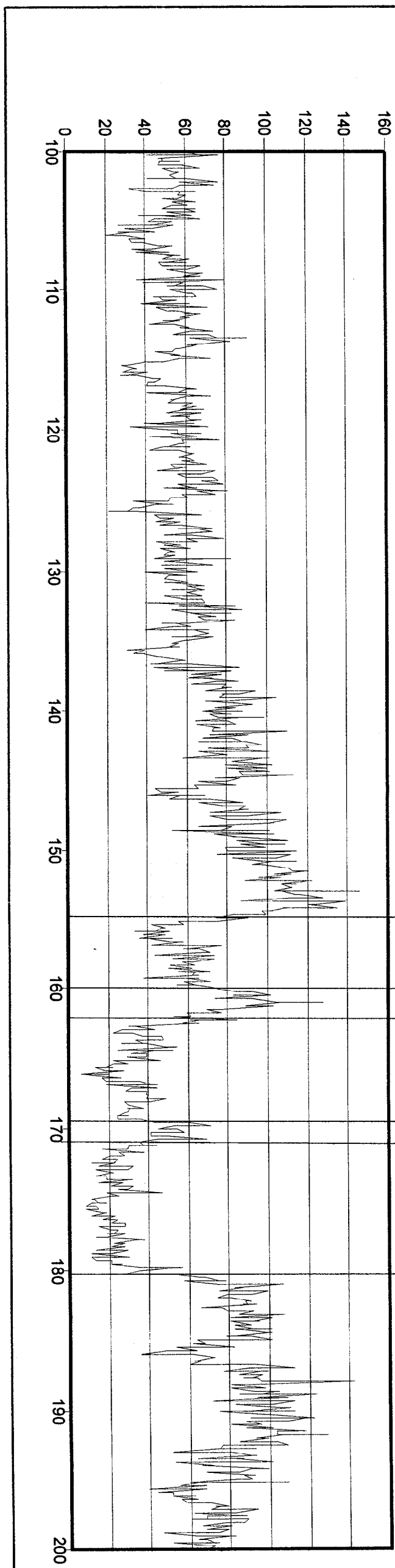
BLACKHAWK GeoServices Southeast Region

Natural Gamma Plot - Site 3A Borehole DB01
Corrected API Units: 0-100 ft bgs
Paducah Gaseous Diffusion Plant
Paducah, Kentucky
Miller Government Services

Figure: 5A

Project No. 2902MIL

File: gamma_3A_sbh_0-100.cdr



Description from Lithologic Log
Same as Above
Silty Sand (SM), fine, subangular, glauconite, medium plasticity, dark grayish brown (10YR4/2), firm, moist
Clay (CL), plastic, black (10YR2/1), firm, moist
Poorly Graded Sand (SP), very fine, subangular, light greenish gray (GLEY2 7/1), soft, moist
Interbedded Clay (CL), medium plasticity, very dark greenish gray (GLEY2 3/1), hard, moist **AND** Poorly Graded Sand (SP), fine to very fine, subrounded to rounded, light greenish gray (GLEY2 7/1), moist
Poorly Graded Sand (SP), fine to very fine, subrounded, light greenish gray (GLEY2 7/1), firm, moist
Interlaminated Clay (CL), dark grayish brown (10YR4/2) AND Poorly Graded Sand (SP), very fine, quartz, light gray (10YR7/1): overall medium plasticity, firm, moist

Explanation

Interpreted depth to horizons from continuous core data

Note: Lithologic Log Provided by SAIC, Kevil, Ky.

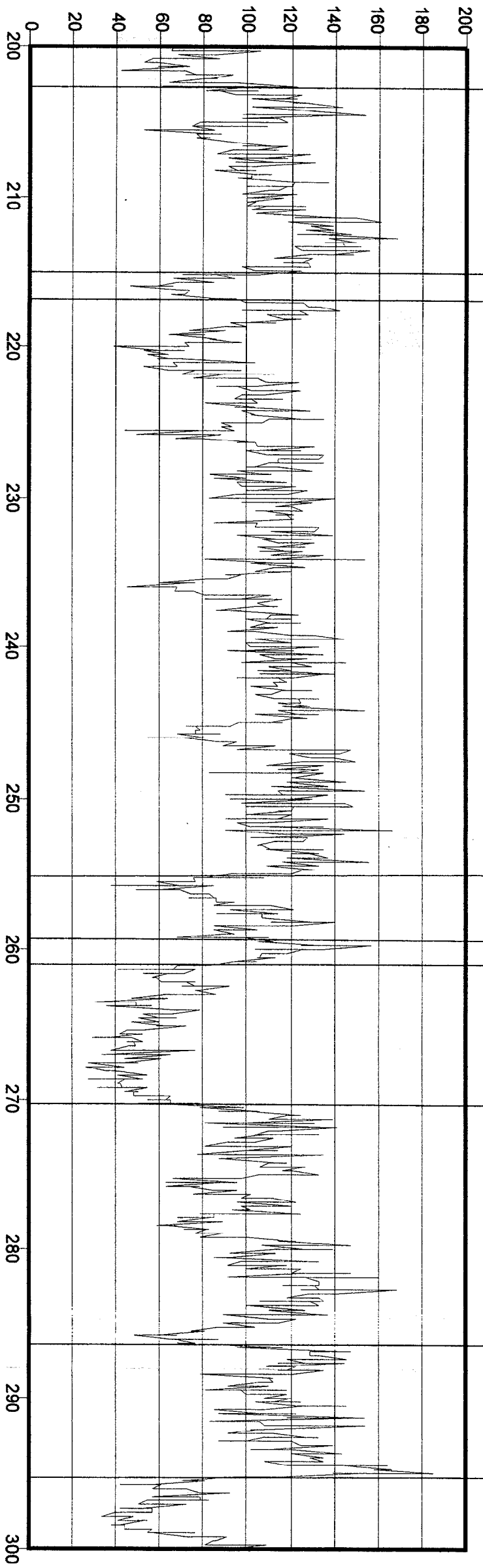
BLACKHAWK GeoServices Southeast Region

Natural Gamma Plot - Site 3A Borehole DB01
Corrected API Units: 100-200 ft bgs
Paducah Gaseous Diffusion Plant
Paducah, Kentucky
Miller Government Services

Figure: 5B

Project No. 2902MIL

File: gamma_3A_sbh_100-200.cdr



Description from Lithologic Log

Same as above

Clay (CL), plastic, black (10YR2/1), firm, moist

Poorly Graded Sand (SP), very fine, quartz, slightly plastic, gray (10YR5/1), firm, moist

Silt (ML), low plasticity, gray (10YR6/1), firm, moist

Silty Sand (SM), fine, rounded, poorly graded, quartz, gray (7.5YR6/1), soft, wet

Laminated Clay (CL) **AND** Poorly Graded Sand (SP), fine, rounded, quartz, medium plasticity, gray (10YR5/1) and light gray (10YR7/1), firm, moist

Poorly Graded Sand (SP), subangular to subrounded, quartz, nonplastic, light gray (10YR7/1), soft, wet

Laminated Silt (ML) **AND** Poorly Graded Sand (SP), very fine, subangular, quartz, low plasticity, gray (10YR5/1) and light gray (10YR7/1), firm, moist

Interlaminated Clay (CL), plastic, dark gray (10YR4/1), firm, moist **AND** Poorly Graded Sand (SP), very fine, subangular to subrounded, quartz, nonplastic, light gray (10YR7/1), loose/soft, moist

Poorly Graded Sand (SP), very fine to fine, subangular to subrounded, quartz, nonplastic, light gray (10YR7/1), **WITH** infrequent interbeds of Clay (CL), 2 to 4 inches thick, plastic, dark gray (10YR4/1), soft, wet

Explanation

Interpreted depth to horizons from continuous core data

Note: Lithologic Log Provided by SAIC, Kevil, Ky.

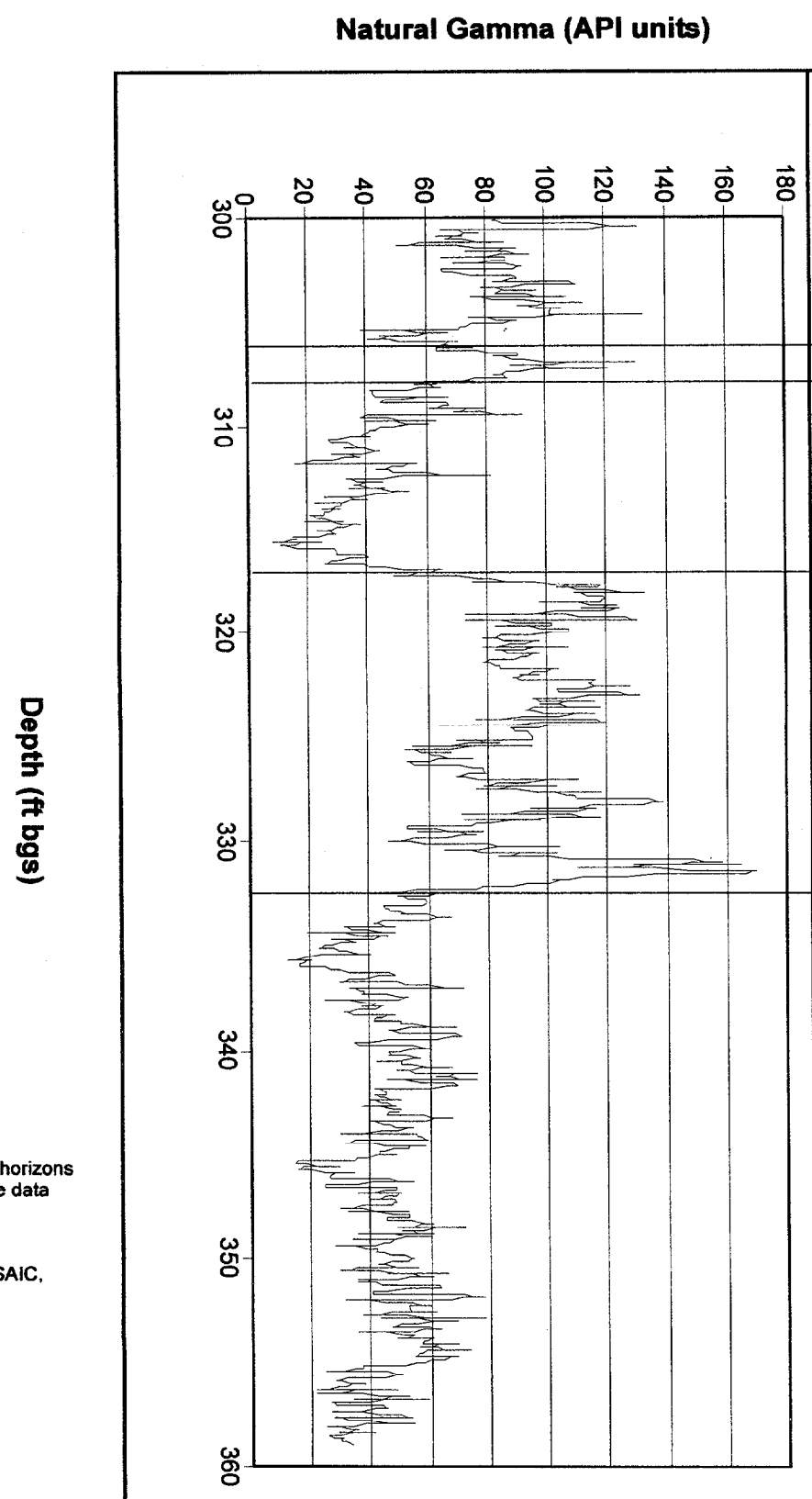
BLACKHAWK GeoServices Southeast Region

Natural Gamma Plot - Site 3A Borehole DB01
Corrected API Units: 200-300 ft bgs
Paducah Gaseous Diffusion Plant
Paducah, Kentucky
Miller Government Services

Figure: 5C

Project No. 2902MIL

File: gamma_3A_sbh_200-300.cdr



Description from Lithologic Log
Same as above
Clay (CL), plastic, dark gray (10YR4/1), very firm, moist
Poorly Graded Sand (SP), fine, rounded to subrounded, quartz, nonplastic, light gray (10TR7/1), soft, wet
Clay (CL), plastic, dark brown (10YR3/3), firm, moist
Poorly Graded Sand (SP), very fine to fine, subangular to subrounded, quartz, nonplastic, light gray (10YR7/1) and gray (10YR6/1), soft/loose, wet

Explanation

Interpreted depth to horizons from continuous core data

Note: Lithologic Log Provided by SAIC, Kevil, Ky.

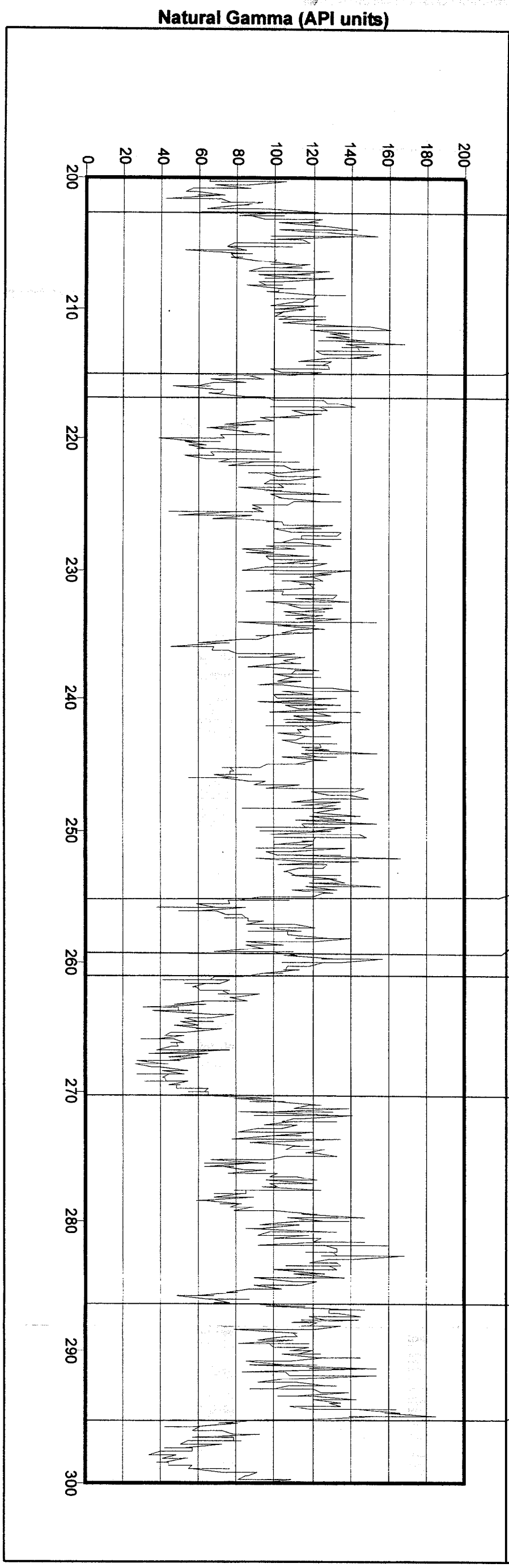
BLACKHAWK GeoServices Southeast Region

Natural Gamma Plot - Site 3A Borehole DB01
Corrected API Units: 300-360 ft bgs
Paducah Gaseous Diffusion Plant
Paducah, Kentucky
Miller Government Services

Figure: 5D

Project No. 2902MIL

File: gamma_3A_sbh_300-360.cdr



Description from Lithologic Log

Same as above

Clay (CL), plastic, black (10YR2/1), firm, moist

Poorly Graded Sand (SP), very fine, quartz, slightly plastic, gray (10YR5/1), firm, moist

Silt (ML), low plasticity, gray (10YR6/1), firm, moist

Silty Sand (SM), fine, rounded, poorly graded, quartz, gray (7.5YR6/1), soft, wet

Laminated Clay (CL) **AND** Poorly Graded Sand (SP), fine, rounded, quartz, medium plasticity, gray (10YR5/1) and light gray (10YR7/1), firm, moist

Poorly Graded Sand (SP), subangular to subrounded, quartz, nonplastic, light gray (10YR7/1), soft, wet

Laminated Silt (ML) **AND** Poorly Graded Sand (SP), very fine, subangular, quartz, low plasticity, gray (10YR5/1) and light gray (10YR7/1), firm, moist

Interlaminated Clay (CL), plastic, dark gray (10YR4/1), firm, moist **AND** Poorly Graded Sand (SP), very fine, subangular to subrounded, quartz, nonplastic, light gray (10YR7/1), loose/soft, moist

Poorly Graded Sand (SP), very fine to fine, subangular to subrounded, quartz, nonplastic, light gray (10YR7/1), **WITH** infrequent interbeds of Clay (CL), 2 to 4 inches thick, plastic, dark gray (10YR4/1), soft, wet

Explanation

Interpreted depth to horizons from continuous core data

Note: Lithologic Log Provided by SAIC, Kevil, Ky.

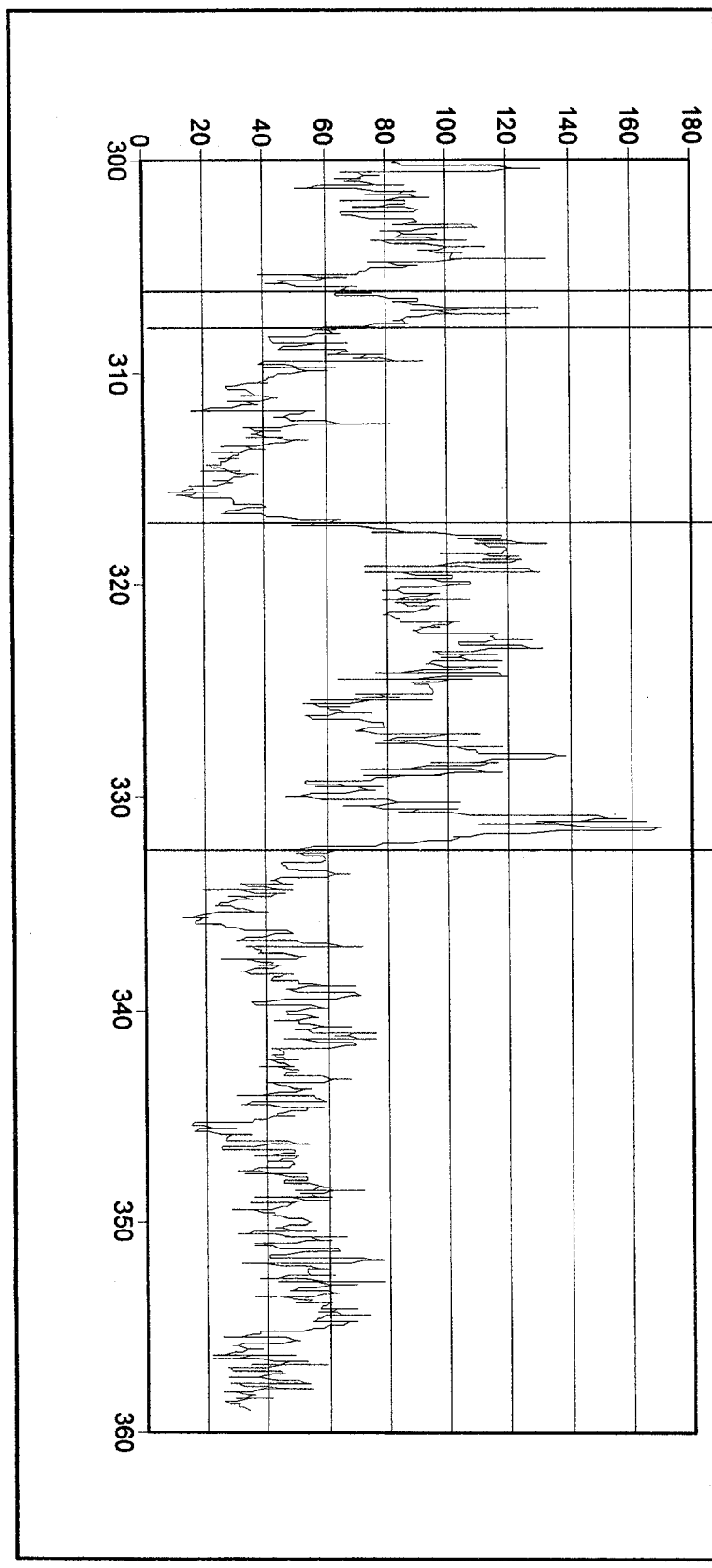
BLACKHAWK GeoServices Southeast Region

Natural Gamma Plot - Site 3A Borehole DB01
Corrected API Units: 200-300 ft bgs
Paducah Gaseous Diffusion Plant
Paducah, Kentucky
Miller Government Services

Figure: 5C

Project No. 2902MIL

File: gamma_3A_sbh_200-300.cdr



Description from Lithologic Log
Same as above
Clay (CL), plastic, dark gray (10YR4/1), very firm, moist
Poorly Graded Sand (SP), fine, rounded to subrounded, quartz, nonplastic, light gray (10TR7/1), soft, wet
Clay (CL), plastic, dark brown (10YR3/3), firm, moist
Poorly Graded Sand (SP), very fine to fine, subangular to subrounded, quartz, nonplastic, light gray (10YR7/1) and gray (10YR6/1), soft/loose, wet

Explanation

——— Interpreted depth to horizons from continuous core data

Note: Lithologic Log Provided by SAIC, Kevil, Ky.

BLACKHAWK GeoServices Southeast Region

Natural Gamma Plot - Site 3A Borehole DB01
Corrected API Units: 300-360 ft bgs
Paducah Gaseous Diffusion Plant
Paducah, Kentucky
Miller Government Services

Figure: 5D

Project No. 2902MIL

File: gamma_3A_sbh_300-360.cdr

Two horizons that were not present in the lithologic log are included on Figure 5A. Both features occur between 32 and 48 feet and are interpreted as clay horizons, due to similar natural gamma responses in correlated clay layers throughout the section. These inferred horizons are drawn with dashed blue lines, and horizons that were correlated between the natural gamma and the lithologic log are drawn with solid blue lines.

ATTACHMENT E-III

SHEAR-WAVE VELOCITY LOG REPORT FOR DEEP BORING DB-02

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GEOVision

geophysical services
a division of Blackhawk Geometrics

PADUCAH GASEOUS DIFFUSION PLANT

SITE 3A, BOREHOLE DB02

SUSPENSION P & S VELOCITIES

April 30, 2002

PADUCAH GASEOUS DIFFUSION PLANT
SITE 3A, BOREHOLE DB02
SUSPENSION P & S VELOCITIES

Prepared for

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Project 2326

April 30, 2002
Report 2326-01

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APPENDIX A: OYO Model 170 suspension velocity logging system NIST traceable calibration procedure

INTRODUCTION

OYO suspension velocity measurements were performed in borehole DB02, located at the Paducah Gaseous Diffusion Plant, Site 3A. Suspension logging data acquisition was performed on March 23, 2002 by Rob Steller of GEOVision Geophysical Services. The work was performed under subcontract with Miller Government Services, LLC.

This report describes the field measurements, data analysis, and results of this work.

SCOPE OF WORK

This report presents the results of suspension velocity measurements collected on on March 23, 2002, in the uncased borehole designated DB02, as detailed below. The purpose of these studies was to supplement stratigraphic information obtained by Miller's soil sampling program and to acquire shear wave velocities and compressional wave velocities as a function of depth, which, in turn, can be used in earthquake risk analysis.

BOREHOLE DESIGNATION	DATE LOGGED	COORDINATES	
		NORTHING	EASTING
DB02	3/23/02	NA	NA

Table 1. Borehole locations and logging dates

The OYO Model 170 Suspension Logging Recorder and Suspension Logging Probe were used to obtain in-situ horizontal shear and compressional wave velocity measurements at 1.64 ft intervals. The acquired data was analyzed and a profile of velocity versus depth was produced for both compressional and horizontally polarized shear waves.

A detailed reference for the velocity measurement techniques used in this study is:

> Guidelines for Determining Design Basis Ground Motions, Report TR-102293, Electric Power Research Institute, Palo Alto, California, November 1993, Sections 7 and 8.

SUSPENSION INSTRUMENTATION

Suspension soil velocity measurements were performed using the Model 170 Suspension Logging system, manufactured by OYO Corporation. This system directly determines the average velocity of a 3.28 ft high segment of the soil column surrounding the borehole of interest by measuring the elapsed time between arrivals of a wave propagating upward through the soil column. The receivers that detect the wave, and the source that generates the wave, are moved as a unit in the borehole producing relatively constant amplitude signals at all depths.

The suspension system probe consists of a combined reversible polarity solenoid horizontal shear-wave source (S_H) and compressional-wave source (P), joined to two biaxial receivers by a flexible isolation cylinder, as shown in Figure 1. The separation of the two receivers is 3.28 ft, allowing average wave velocity in the region between the receivers to be determined by inversion of the wave travel time between the two receivers. The total length of the probe as used in this survey is 22 ft, with the center point of the receiver pair 15.4 ft above the bottom end of the probe. The probe receives control signals from, and sends the amplified receiver signals to, instrumentation on the surface via an armored 7 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data.

The entire probe is suspended by the cable and centered in the borehole by nylon "whiskers", therefore, source motion is not coupled directly to the borehole walls; rather, the source motion creates a horizontally propagating impulsive pressure wave in the fluid filling the borehole and surrounding the source. This pressure wave is converted to P and S_H-waves in the surrounding soil and rock as it impinges upon the borehole wall. These waves propagate through the soil and rock surrounding the borehole, in turn causing a pressure wave to be generated in the fluid surrounding the receivers as the soil waves pass their location. Separation of the P and S_H-waves at the receivers is performed using the following steps:

1. Orientation of the horizontal receivers is maintained parallel to the axis of the source, maximizing the amplitude of the recorded SH-wave signals.
2. At each depth, S_H-wave signals are recorded with the source actuated in opposite directions, producing S_H-wave signals of opposite polarity, providing a characteristic S_H-wave signature distinct from the P-wave signal.
3. The 10.30 ft separation of source and receiver 1 permits the P-wave signal to pass and damp significantly before the slower S_H-wave signal arrives at the receiver. In faster soils or rock, the isolation cylinder is extended to allow greater separation of the P- and S_H-wave signals.
4. In saturated soils, the received P-wave signal is typically of much higher frequency than the received S_H-wave signal, permitting additional separation of the two signals by low pass filtering.
5. Direct arrival of the original pressure pulse in the fluid is not detected at the receivers because the wavelength of the pressure pulse in fluid is significantly greater than the dimension of the fluid annulus surrounding the probe (meter versus centimeter scale), preventing significant energy transmission through the fluid medium.

In operation, a distinct, repeatable pattern of impulses is generated at each depth as follows:

1. The source is fired in one direction producing dominantly horizontal shear with some vertical compression, and the signals from the horizontal receivers situated parallel to the axis of motion of the source are recorded.
2. The source is fired again in the opposite direction and the horizontal receiver signals are recorded.
3. The source is fired again and the vertical receiver signals are recorded. The repeated source pattern facilitates the picking of the P and S_H-wave arrivals; reversal of the source changes the polarity of the S_H-wave pattern but not the P-wave pattern.

The data from each receiver during each source activation is recorded as a different channel on the recording system. The Model 170 has six channels (two simultaneous recording channels), each with a 12 bit 1024 sample record. The recorded data is displayed on a CRT display and on paper tape output as six channels with a common time scale. Data is stored on 3.5 inch floppy diskettes for further processing. Up to 8 sampling sequences can be summed to improve the signal to noise ratio of the signals.

Review of the displayed data on the CRT or paper tape allows the operator to set the gains, filters, delay time, pulse length (energy), sample rate, and summing number to optimize the quality of the data before recording. Verification of the calibration of the Model 170 digital recorder was performed prior to, and following field work on this project, using a NIST traceable frequency source and counter, as outlined in Appendix A.

SUSPENSION MEASUREMENT PROCEDURES

The borehole was logged as an uncased borehole filled with bentonite based drilling mud. The borehole probe was positioned with the mid-point of the receiver spacing at grade, and the mechanical and electronic depth counters were set to zero. Typically, data is collected at 3.28 ft intervals, providing complete coverage of the borehole by the 3.28 ft spacing between the two receivers. In this survey, in order to provide redundant data, data was collected at 1.64 ft intervals, providing double coverage of the entire borehole. The probe was lowered to the bottom of the borehole, then raised to the surface, stopping at 1.64 ft intervals to collect data, as summarized below.

Borehole condition was good, with no obstructions encountered on either of the runs in the borehole. The suspension probe was checked on the surface and on the first run down at depth of 164.0 ft, and all functions were normal. A full system check upon completion of the field work indicated that all functions were normal upon completion as well.

At each measurement depth the measurement sequence of two opposite horizontal records and one vertical record was performed, and the gains were adjusted as required. The data from each depth was printed on paper tape, checked, and recorded on diskette before moving to the next depth.

Upon completion of the measurements, the probe zero depth indication at grade was verified prior to removal from the borehole.

BOREHOLE NUMBER	RUN NUMBER	DEPTH RANGE (FEET)	DEPTH AS DRILLED (FEET)	LOST TO SLOUGH/COLLAPSE (FEET)	SAMPLE INTERVAL (FEET)	DATE LOGGED
DB02	1	374 – 57.4 (STEEL CASE TO 59 FT)	400.3	10.9	1.64	3/23/02
DB02	2	65.6 – 3.3 (STEEL CASE REMOVED)	400.3	NA	1.64	3/23/02

Table 2. Logging dates and depth ranges

SUSPENSION DATA ANALYSIS

The recorded digital records were analyzed to locate the first minima on the vertical axis records, indicating the arrival of P-wave energy. The difference in travel time between receiver 1 and receiver 2 (R1-R2) arrivals was used to calculate the P-wave velocity for that 3.28 ft segment of the soil column. When observable, P-wave arrivals on the horizontal axis records were used to verify the velocities determined from the vertical axis data.

A separate and independent determination of P-wave velocity was calculated from the travel time over the 10.30 ft interval from source to receiver 1 (S-R1) and plotted for quality assurance of the velocity derived from the travel time between receivers. In this analysis, the depth values as recorded were increased by 6.79 ft to correspond to the mid-point of the 10.30 ft S-R1 interval, as illustrated in Figure 1. Travel times were obtained by picking the first break of the P-wave signal at receiver 1 and subtracting 3.84 milliseconds, the calculated and experimentally verified delay from source trigger pulse (beginning of record) to source impact. This delay corresponds to the duration of acceleration of the solenoid before impact.

The recorded digital records were studied to establish the presence of clear S_H-wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the S_H-wave signals from the 'normal' and 'reverse' source pulses are very nearly inverted images of each other. Digital FFT - IFFT lowpass filtering was used to remove the higher frequency P-wave signal from the S_H-wave signal. Different filter cutoffs were used to separate P- and S_H-waves at different depths, ranging from 400 Hz in the slowest zones to 3000 Hz in the regions of highest velocity. At each depth, the filter frequency was selected to be at least twice the fundamental frequency of the S_H-wave signal being filtered.

Generally, the first maxima was picked for the 'normal' signals and the first minima for the 'reverse' signals, although other points on the waveform were used if the first pulse was distorted. The absolute arrival time of the 'normal' and 'reverse' signals may vary by +/- 0.2 milliseconds, due to differences in the actuation time of the solenoid source caused by constant mechanical bias in the source or by borehole inclination. This variation does not affect the R1-R2 velocity determinations, as the differential time is measured between arrivals of waves created by the same source actuation. The final velocity value is the average of the values obtained from the 'normal' and 'reverse' source actuations.

As with the P-wave data, a separate and independent determination of S_H-wave velocity was calculated from the travel time over the 10.30 ft interval from source to receiver 1 and plotted for verification of the velocity derived from the travel time between receivers. In this analysis, the depth values were increased by 6.79 ft to correspond to the mid-point of the 10.30 ft S-R1 interval. Travel times were obtained by picking the first break of the S_H-wave signal at the near receiver and subtracting 3.84 milliseconds, the calculated and experimentally verified delay from the beginning of the record at the source trigger pulse to source impact.

Figure 2 shows an example of R1 - R2 measurements on a sample filtered record. In Figure 2, the time difference over the 3.28 ft interval of 1.81 milliseconds for the horizontal signals is equivalent to an S_H-wave velocity of 1813 ft/sec. Whenever possible, time differences were determined from several phase points on the S_H-waveform records to verify the data obtained from the first arrival of the S_H-wave pulse. Figure 3 displays the same record before filtering of the S_H-waveform record with an 2500 Hz FFT - IFFT digital lowpass filter, illustrating the presence of higher frequency P-wave energy at the beginning of the record, and distortion of the lower frequency S_H-wave by residual P-wave signal.

SUSPENSION RESULTS

Suspension R1-R2 P- and S_H-wave velocities are plotted in Figure 4, with indications of major stratigraphic transitions that correspond to significant changes in the velocity profile. The suspension velocity data presented in this figure is presented in Table 3. P- and S_H-wave velocity data from R1-R2 analysis and quality assurance analysis of S-R1 data are plotted together in Figure 5 to aid in visual comparison. It must be noted that R1-R2 data is an average velocity over a 3.28 ft segment of the soil column; S-R1 data is an average over 10.30 ft, creating a significant smoothing relative to the R1-R2 plots. S-R1 data are presented in tabular format in Table 4. Good correspondence between the shape of the P- and S_H-wave velocity curves is observed for all these data sets. The velocities derived from S-R1 and R1-R2 data are in excellent agreement, providing verification of the higher resolution R1-R2 data.

Calibration procedures and records for the suspension measurement system are presented in Appendix A.

SUMMARY

Discussion of Suspension Results

Both P- and S_H-wave velocities were measured using the Suspension Method in a single uncased land boring at depths up to 374.0 ft below grade at Paducah Site 3A. The borehole was located in a quiet rural location and no significant signal contamination from cultural vibration was observed.

Significant stratigraphic elements from the core logs correspond to large changes in the velocity profile, confirming the depth profile of the data.

Quality Assurance

These velocity measurements were performed using industry-standard or better methods for both measurements and analyses. All work was performed under GEOVision quality assurance procedures, which include:

- Use of NIST-traceable calibrations, where applicable, for field and laboratory instrumentation
- Use of standard field data logs
- Use of independent verification of data by comparison of receiver-to-receiver and source-to-receiver velocities
- Independent review of calculations and results by a registered professional engineer, geologist, or geophysicist.

Data Reliability

P- and S_H-wave velocity measurement using the Suspension Method gives average velocities over a 3.28 ft interval of depth. This high resolution results in the scatter of values shown in the graphs. Individual measurements are very reliable with estimated precision of +/- 10%. Standardized field procedures and quality assurance checks add to the reliability of these data.

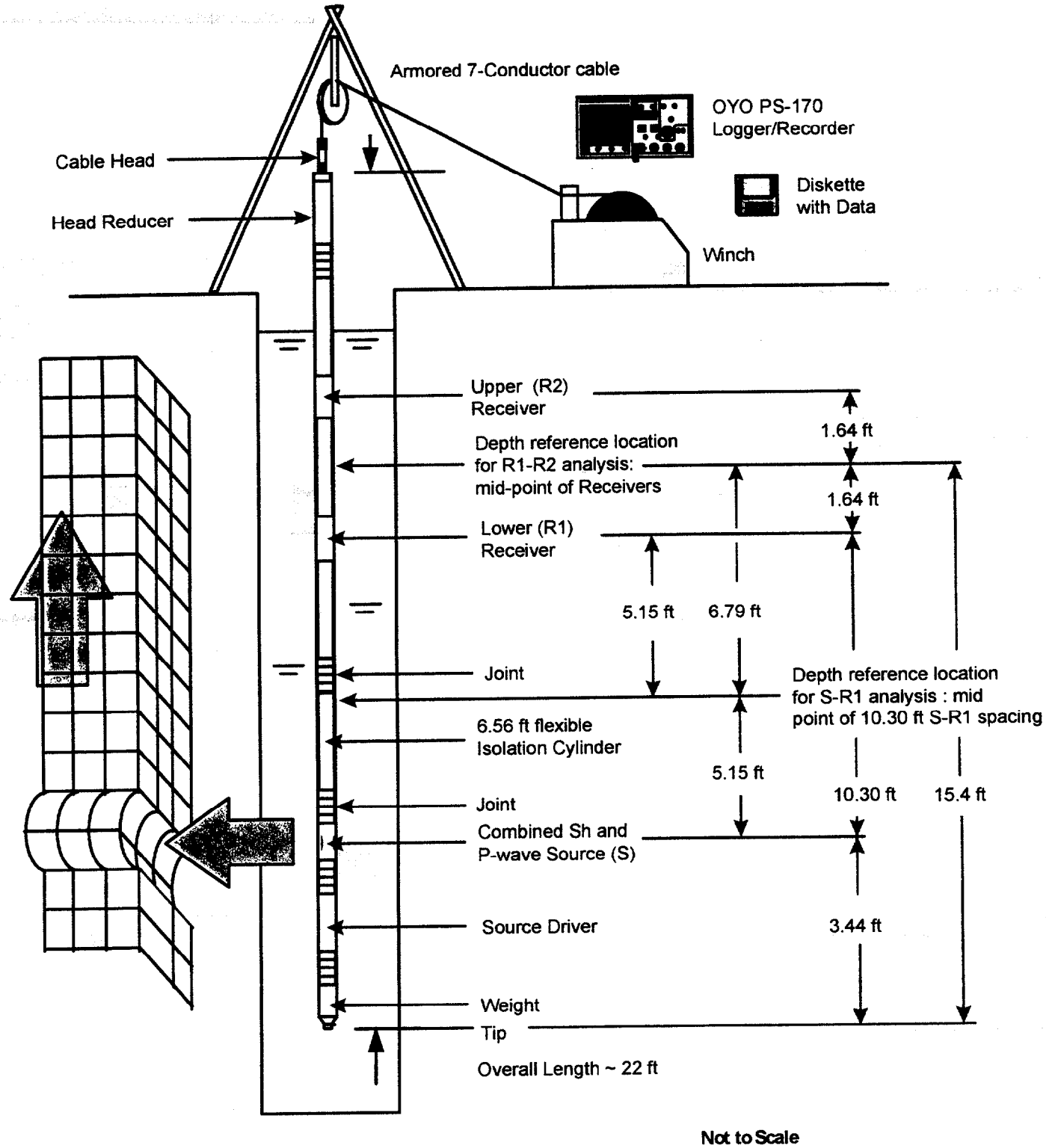

Figure 1. Concept illustration of P-S logging system

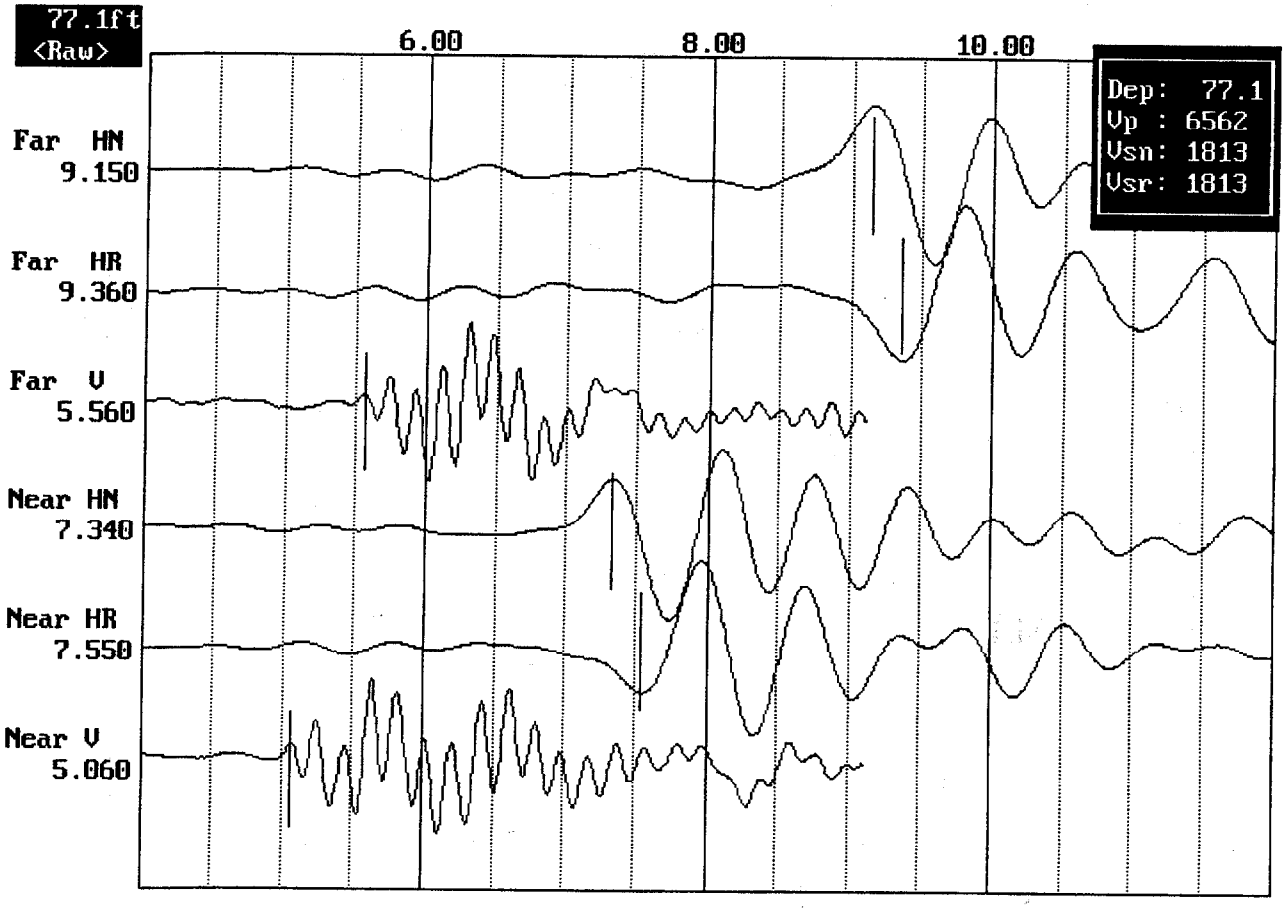

Figure 2. Example of filtered (2500 Hz lowpass) record

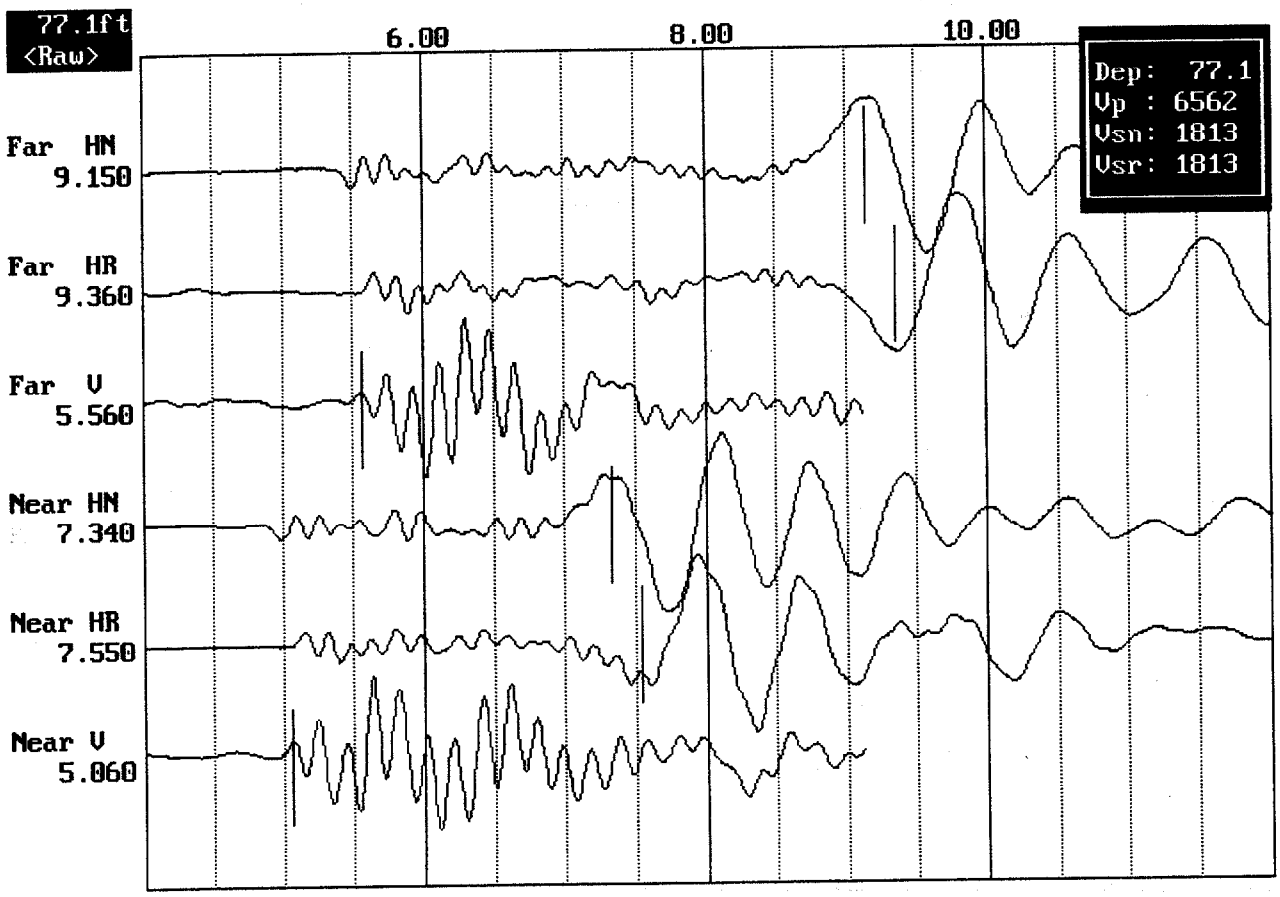

Figure 3. Example of unfiltered record

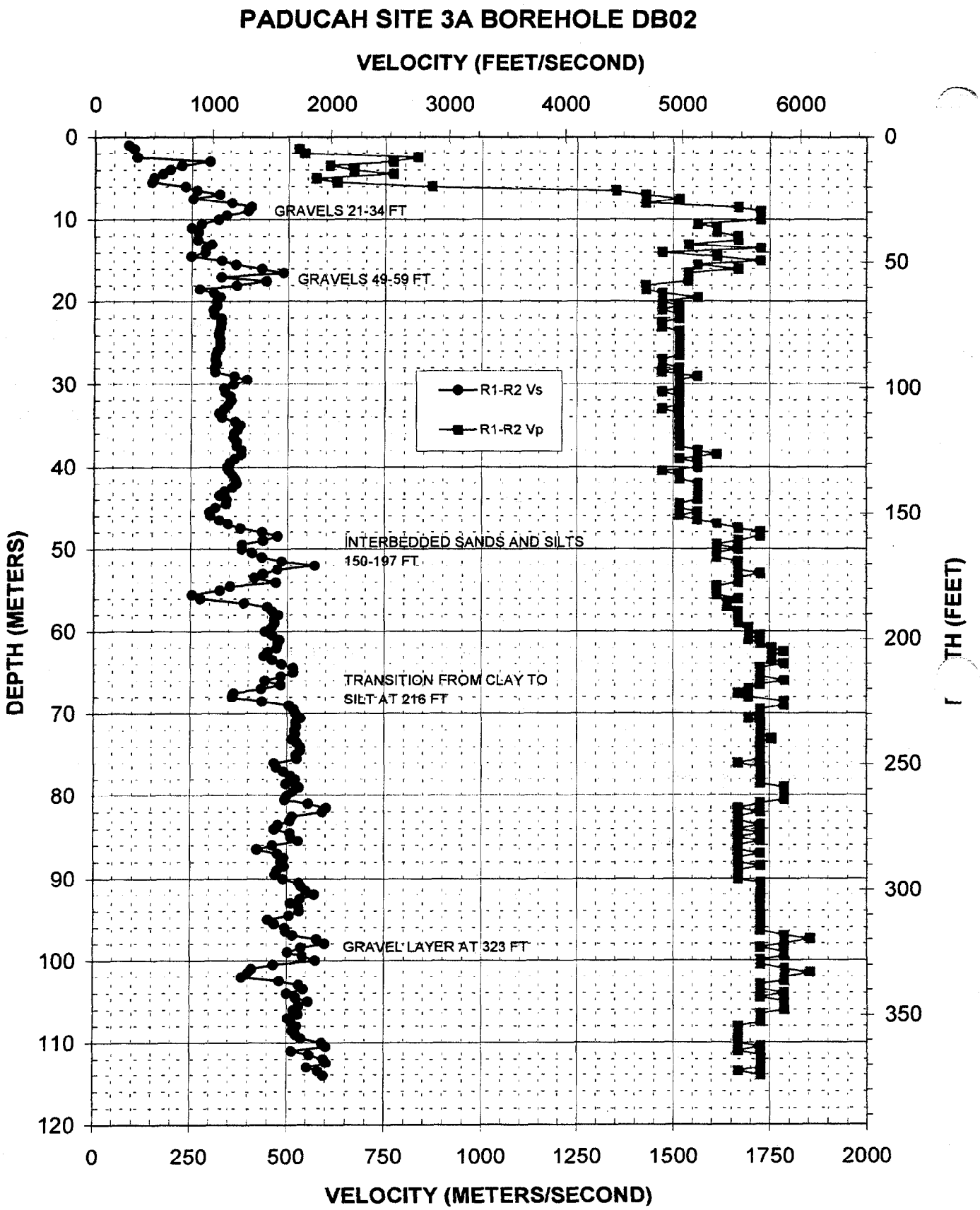

Figure 4. Borehole DB02, Suspension P- and S_H-wave velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	$V\text{-}S_H$ (m/sec)	V-P (m/sec)	$V\text{-}S_H$ (ft/sec)	V-P (ft/sec)
1.0	3.3	32.55	32.35		20.65	20.90	9.85	86		281	
1.5	4.9	31.60	31.65	11.85	22.20	21.00	9.95	100	526	327	1727
2.0	6.6			11.45	22.55	21.45	9.60		541		1773
2.5	8.2	32.05	31.80	10.20	22.60	22.70	9.00	108	833	354	2734
3.0	9.8	26.80	25.25	9.80	23.40	21.90	8.50	296	769	972	2524
3.5	11.5	26.40	26.10	9.60	21.75	21.75	7.95	222	606	729	1988
4.0	13.1	25.65	25.55	9.00	20.50	20.30	7.50	192	667	631	2187
4.5	14.8	24.90	24.40	8.55	19.40	18.45	7.25	175	769	573	2524
5.0	16.4	23.50	23.70	8.20	16.70	17.25	6.45	151	571	495	1875
5.5	18.0	21.95	20.75	7.85	14.90	14.10	6.25	146	625	479	2051
6.0	19.7	15.25	16.10	7.20	11.15	11.60	6.05	233	870	763	2853
6.5	21.3	14.84	15.94	6.82	10.72	12.44	6.08	262	1351	861	4434
7.0	23.0	15.96	16.88	6.72	12.94	13.68	6.02	322	1429	1055	4687
7.5	24.6	17.08	17.44	6.70	13.26	13.36	6.04	253	1515	831	4971
8.0	26.2	16.60	17.18	6.68	13.84	14.30	5.98	355	1429	1163	4687
8.5	27.9	17.48	17.36	6.56	14.98	14.92	5.96	405	1667	1328	5468
9.0	29.5	17.66	17.88	6.54	15.18	15.32	5.96	397	1724	1302	5657
9.5	31.2	18.36	18.48	6.58	15.34	15.62	6.00	340	1724	1116	5657
10.0	32.8	18.52	18.60	6.40	15.40	15.46	5.82	319	1724	1048	5657
10.5	34.4	18.48	18.52	6.44	14.80	14.94	5.80	275	1563	904	5126
11.0	36.1	18.74	18.94	6.42	14.72	14.94	5.80	249	1613	818	5292
11.5	37.7	18.82	18.92	6.48	15.06	15.20	5.86	267	1613	877	5292
12.0	39.4			6.41			5.81		1667	0	5468
12.5	41.0	19.05	19.05	6.65	15.40	15.15	6.05	265	1667	869	5468
13.0	42.7	18.40	18.15	7.15	15.10	14.80	6.50	301	1538	987	5047
13.5	44.3	20.54	20.72	6.60	17.12	17.14	6.02	286	1724	937	5657
14.0	45.9	18.70	20.20	6.60	15.12	16.76	5.92	285	1471	935	4825
14.5	47.6	18.66	18.10	6.52	14.46	14.24	5.90	248	1613	814	5292
15.0	49.2	17.22	17.22	6.54	14.24	14.10	5.96	328	1724	1076	5657
15.5	50.9	16.70	17.34	6.58	14.38	14.18	5.94	365	1563	1197	5126
16.0	52.5	17.08	16.66	6.60	14.94	14.18	6.00	433	1667	1420	5468
16.5	54.1	16.40	16.30	6.80	14.55	14.05	6.15	488	1538	1600	5047
17.0	55.8	16.05	15.85	6.60	13.10	12.70	5.95	328	1538	1076	5047
17.5	57.4	16.10	15.95	6.55	13.65	13.90	5.90	444	1538	1458	5047
18.0	59.1	16.25	16.35	6.70	13.50	13.65	6.00	367	1429	1204	4687
18.5	60.7	17.10	17.24	6.70	13.40	13.52	6.00	270	1429	884	4687
19.0	62.3	16.62	16.78	6.68	13.36	13.52	6.00	307	1471	1006	4825
19.5	64.0	16.44	16.60	6.66	13.36	13.50	6.02	324	1563	1062	5126
20.0	65.6	16.46	16.58	6.70	13.28	13.40	6.02	314	1471	1032	4825
20.5	67.3	16.46	16.60	6.66	13.30	13.44	6.00	316	1515	1038	4971
21.0	68.9	16.36	16.52	6.66	13.10	13.26	5.98	307	1471	1006	4825
21.5	70.5	16.34	16.46	6.66	13.10	13.24	6.00	310	1515	1016	4971
22.0	72.2	16.16	16.30	6.66	13.10	13.26	6.00	328	1515	1076	4971
22.5	73.8	16.18	16.32	6.68	13.12	13.28	6.00	328	1471	1076	4825
23.0	75.5	16.24	16.38	6.68	13.18	13.32	6.00	327	1471	1072	4825
23.5	77.1	16.28	16.42	6.66	13.18	13.32	6.00	323	1515	1058	4971
24.0	78.7	16.36	16.52	6.66	13.24	13.40	6.00	321	1515	1052	4971
24.5	80.4	16.40	16.54	6.68	13.32	13.44	6.02	324	1515	1062	4971
25.0	82.0	16.46	16.60	6.68	13.38	13.52	6.02	325	1515	1065	4971
25.5	83.7	16.50	16.66	6.68	13.42	13.56	6.02	324	1515	1062	4971

Table 3. Borehole DB02, Suspension R1-R2 depth, pick times, and velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	V-S_H (m/sec)	V-P (m/sec)	V-S_H (ft/sec)	V-P (ft/sec)
26.0	85.3	16.20	16.36	6.66	13.06	13.20	6.00	317	1515	1042	4971
26.5	86.9	15.96	16.08	6.66	12.76	12.90	6.00	313	1515	1028	4971
27.0	88.6	15.88	16.02	6.66	12.68	12.82	5.98	313	1471	1025	4825
27.5	90.2	15.78	15.94	6.66	12.62	12.78	5.98	316	1471	1038	4825
28.0	91.9	15.62	15.78	6.64	12.40	12.56	5.98	311	1515	1019	4971
28.5	93.5	15.48	15.62	6.66	12.28	12.42	5.98	313	1471	1025	4825
29.0	95.1	15.22	15.38	6.64	12.46	12.62	6.00	362	1563	1189	5126
29.5	96.8	15.08	15.24	6.64	12.56	12.70	5.98	395	1515	1297	4971
30.0	98.4	15.36	15.50	6.66	12.58	12.70	6.00	358	1515	1176	4971
30.5	100.1	15.62	15.76	6.64	12.62	12.78	5.98	334	1515	1097	4971
31.0	101.7	15.60	15.72	6.66	12.62	12.78	5.98	338	1471	1108	4825
31.5	103.3	15.36	15.54	6.64	12.52	12.68	5.98	351	1515	1151	4971
32.0	105.0	15.24	15.38	6.64	12.42	12.56	5.98	355	1515	1163	4971
32.5	106.6	15.24	15.38	6.64	12.34	12.50	5.98	346	1515	1135	4971
33.0	108.3	15.20	15.36	6.64	12.22	12.38	5.96	336	1471	1101	4825
33.5	109.9	15.12	15.24	6.62	12.02	12.14	5.96	323	1515	1058	4971
34.0	111.5	14.98	15.12	6.64	11.94	12.10	5.98	330	1515	1083	4971
34.5	113.2	14.76	14.92	6.62	12.02	12.18	5.96	365	1515	1197	4971
35.0	114.8	14.62	14.76	6.62	11.98	12.12	5.96	379	1515	1243	4971
35.5	116.5	14.64	14.80	6.62	11.94	12.10	5.96	370	1515	1215	4971
36.0	118.1	14.70	14.86	6.62	11.94	12.08	5.96	361	1515	1184	4971
36.5	119.8	14.78	14.94	6.62	12.00	12.16	5.96	360	1515	1180	4971
37.0	121.4	14.76	14.92	6.64	12.04	12.20	5.98	368	1515	1206	4971
37.5	123.0	14.84	15.02	6.56	12.12	12.30	5.90	368	1515	1206	4971
38.0	124.7	14.86	15.00	6.52	12.22	12.38	5.88	380	1563	1247	5126
38.5	126.3	14.84	15.00	6.50	12.22	12.36	5.88	380	1613	1247	5292
39.0	128.0	14.94	15.04	6.50	12.18	12.30	5.84	364	1515	1193	4971
39.5	129.6	15.02	15.14	6.58	12.16	12.30	5.94	351	1563	1151	5126
40.0	131.2	15.12	15.28	6.58	12.24	12.34	5.94	344	1563	1127	5126
40.5	132.9	15.26	15.38	6.64	12.40	12.52	5.96	350	1471	1147	4825
41.0	134.5	15.12	15.28	6.64	12.34	12.48	5.98	358	1515	1176	4971
41.5	136.2	15.26	15.40	6.64	12.52	12.66	5.98	365	1515	1197	4971
42.0	137.8	15.54	15.64	6.62	12.80	12.94	5.98	368	1563	1206	5126
42.5	139.4	15.80	16.00	6.64	13.04	13.16	6.00	357	1563	1172	5126
43.0	141.1	16.16	16.20	6.62	13.16	13.26	5.98	337	1563	1105	5126
43.5	142.7	16.24	16.34	6.62	13.16	13.26	5.98	325	1563	1065	5126
44.0	144.4	16.12	16.26	6.62	13.20	13.34	5.98	342	1563	1124	5126
44.5	146.0	15.88	16.06	6.60	12.98	13.10	5.94	341	1515	1120	4971
45.0	147.6	15.70	15.82	6.60	12.50	12.64	5.94	313	1515	1028	4971
45.5	149.3	15.36	15.46	6.56	11.98	12.14	5.92	299	1563	979	5126
46.0	150.9	15.02	15.16	6.54	11.70	11.84	5.88	301	1515	988	4971
46.5	152.6	14.60	14.72	6.52	11.50	11.64	5.88	324	1563	1062	5126
47.0	154.2	14.42	14.56	6.50	11.54	11.66	5.88	346	1613	1135	5292
47.5	155.8	14.48	14.62	6.48	11.84	11.98	5.88	379	1667	1243	5468
48.0	157.5	14.30	14.36	6.46	11.98	12.08	5.88	435	1724	1426	5657
48.5	159.1	14.30	14.38	6.48	12.18	12.28	5.90	474	1724	1555	5657
49.0	160.8	14.40	14.50	6.50	12.12	12.20	5.90	437	1667	1433	5468
49.5	162.4	14.64	14.76	6.52	12.02	12.16	5.90	383	1613	1257	5292
50.0	164.0	14.96	15.00	6.54	12.32	12.42	5.94	383	1667	1257	5468
50.5	165.7	14.94	15.06	6.52	12.52	12.60	5.90	410	1613	1345	5292

Table 3, continued. Borehole DB02, Suspension R1-R2 depth, pick times, and velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	$V\text{-}S_H$ (m/sec)	V-P (m/sec)	$V\text{-}S_H$ (ft/sec)	V-P (ft/sec)
51.0	167.3	15.14	15.26	6.54	12.84	12.96	5.92	435	1613	1426	5292
51.5	169.0	15.54	15.66	6.54	13.48	13.60	5.94	485	1667	1593	5468
52.0	170.6	15.72	15.78	6.54	13.96	14.04	5.94	571	1667	1875	5468
52.5	172.2	15.80	15.92	6.54	13.68	13.82	5.94	474	1667	1555	5468
53.0	173.9	15.66	15.74	6.50	13.34	13.48	5.92	437	1724	1433	5657
53.5	175.5	15.58	15.72	6.52	13.18	13.30	5.92	415	1667	1361	5468
54.0	177.2	15.30	15.48	6.50	13.18	13.34	5.90	469	1667	1540	5468
54.5	178.8	15.52	16.62	6.52	12.78	13.68	5.90	352	1613	1155	5292
55.0	180.4	15.36	15.48	6.52	12.32	12.38	5.90	326	1613	1069	5292
55.5	182.1	15.02	15.14	6.50	11.06	11.22	5.88	254	1613	833	5292
56.0	183.7	14.64	14.72	6.48	10.96	11.14	5.88	275	1667	904	5468
56.5	185.4	13.58	13.64	6.48	10.97	11.11	5.87	389	1639	1277	5378
57.0	187.0	13.21	13.27	6.48	10.96	11.06	5.87	448	1639	1471	5378
57.5	188.6	13.22	13.25	6.48	11.00	11.14	5.88	462	1667	1515	5468
58.0	190.3	13.11	13.22	6.48	11.01	11.13	5.88	477	1667	1566	5468
58.5	191.9	13.04	13.19	6.46	10.91	11.04	5.86	467	1667	1533	5468
59.0	193.6	13.03	13.16	6.44	10.90	11.00	5.84	466	1667	1530	5468
59.5	195.2	13.10	13.22	6.46	10.91	11.05	5.87	459	1695	1505	5561
60.0	196.9	13.20	13.29	6.46	10.93	11.05	5.87	443	1695	1455	5561
60.5	198.5	13.17	13.25	6.44	10.98	11.10	5.86	461	1724	1512	5657
61.0	200.1	13.01	13.20	6.45	10.94	11.10	5.86	480	1695	1574	5561
61.5	201.8	13.03	13.13	6.44	10.93	11.02	5.86	475	1724	1559	5657
62.0	203.4	13.02	13.15	6.41	10.91	11.03	5.84	473	1754	1551	5756
62.5	205.1	13.07	13.23	6.39	10.89	10.96	5.83	449	1786	1475	5859
63.0	206.7	12.93	13.07	6.42	10.69	10.77	5.85	441	1754	1445	5756
63.5	208.3	12.77	12.82	6.43	10.58	10.68	5.86	462	1754	1515	5756
64.0	210.0	12.80	12.98	6.42	10.76	10.90	5.86	485	1786	1593	5859
64.5	211.6	13.22	13.32	6.42	11.28	11.38	5.84	515	1724	1691	5657
65.0	213.3	13.70	13.86	6.46	11.78	11.90	5.88	515	1724	1691	5657
65.5	214.9	13.72	13.86	6.46	11.66	11.78	5.88	483	1724	1585	5657
66.0	216.5	13.82	13.88	6.44	11.54	11.64	5.88	442	1786	1452	5859
66.5	218.2	13.60	13.72	6.44	11.54	11.64	5.86	483	1724	1585	5657
67.0	219.8	13.34	13.45	6.44	11.02	11.16	5.85	434	1695	1423	5561
67.5	221.5	13.32	13.43	6.43	10.54	10.68	5.83	362	1667	1187	5468
68.0	223.1	13.04	13.13	6.42	10.25	10.35	5.83	359	1695	1178	5561
68.5	224.7	12.46	12.57	6.41	10.16	10.28	5.85	436	1786	1430	5859
69.0	226.4	12.09	12.21	6.41	10.11	10.23	5.85	505	1786	1657	5859
69.5	228.0	12.04	12.16	6.42	10.10	10.24	5.84	518	1724	1700	5657
70.0	229.7	12.02	12.13	6.43	10.09	10.23	5.85	522	1724	1713	5657
70.5	231.3	12.02	12.14	6.43	10.14	10.28	5.84	535	1695	1754	5561
71.0	232.9	12.06	12.19	6.42	10.15	10.27	5.84	522	1724	1713	5657
71.5	234.6	12.14	12.25	6.42	10.23	10.34	5.84	524	1724	1718	5657
72.0	236.2	12.19	12.32	6.42	10.26	10.40	5.84	519	1724	1704	5657
72.5	237.9	12.44	12.51	6.47	10.51	10.60	5.89	521	1724	1709	5657
73.0	239.5	12.38	12.48	6.46	10.42	10.54	5.89	513	1754	1682	5756
73.5	241.1	12.32	12.42	6.46	10.42	10.52	5.88	526	1724	1727	5657
74.0	242.8	12.34	12.46	6.46	10.48	10.58	5.88	535	1724	1754	5657
74.5	244.4	12.34	12.46	6.46	10.48	10.58	5.88	535	1724	1754	5657
75.0	246.1	12.48	12.60	6.46	10.60	10.66	5.88	524	1724	1718	5657
75.5	247.7	12.54	12.62	6.46	10.66	10.70	5.88	526	1724	1727	5657

Table 3, continued. Borehole DB02, Suspension R1-R2 depth, pick times, and velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	V-S_H (m/sec)	V-P (m/sec)	V-S_H (ft/sec)	V-P (ft/sec)
76.0	249.3	12.56	12.66	6.46	10.44	10.50	5.86	467	1667	1533	5468
76.5	251.0	12.62	12.74	6.42	10.52	10.60	5.84	472	1724	1548	5657
77.0	252.6	12.44	12.56	6.42	10.42	10.50	5.84	490	1724	1608	5657
77.5	254.3	12.54	12.64	6.42	10.58	10.66	5.84	508	1724	1665	5657
78.0	255.9	12.76	12.88	6.46	10.84	10.96	5.88	521	1724	1709	5657
78.5	257.5	13.02	13.14	6.44	11.00	11.14	5.86	498	1724	1632	5657
79.0	259.2	12.94	13.06	6.44	11.04	11.20	5.88	532	1786	1745	5859
79.5	260.8	12.64	12.86	6.46	10.74	10.88	5.90	515	1786	1691	5859
80.0	262.5	12.62	12.78	6.44	10.62	10.78	5.88	500	1786	1640	5859
80.5	264.1	12.40	12.52	6.44	10.38	10.50	5.88	495	1786	1624	5859
81.0	265.7	12.36	12.48	6.46	10.56	10.68	5.88	556	1724	1823	5657
81.5	267.4	12.08	12.16	6.46	10.42	10.50	5.86	602	1667	1976	5468
82.0	269.0	12.16	12.28	6.44	10.48	10.58	5.86	592	1724	1941	5657
82.5	270.7	12.28	12.32	6.50	10.30	10.40	5.90	513	1667	1682	5468
83.0	272.3	12.60	12.66	6.48	10.62	10.70	5.88	508	1667	1665	5468
83.5	274.0	12.58	12.68	6.46	10.46	10.60	5.88	476	1724	1562	5657
84.0	275.6	12.62	12.72	6.48	10.46	10.60	5.88	467	1667	1533	5468
84.5	277.2	12.50	12.64	6.44	10.54	10.66	5.86	508	1724	1665	5657
85.0	278.9	12.58	12.72	6.44	10.62	10.76	5.84	510	1667	1674	5468
85.5	280.5	12.60	12.74	6.44	10.70	10.86	5.86	529	1724	1736	5657
86.0	282.2	12.74	12.86	6.46	10.58	10.70	5.86	463	1667	1519	5468
86.5	283.8	12.82	12.92	6.46	10.46	10.56	5.86	424	1667	1390	5468
87.0	285.4	12.52	12.64	6.44	10.42	10.54	5.86	476	1724	1562	5657
87.5	287.1	12.32	12.42	6.44	10.28	10.40	5.84	493	1667	1616	5468
88.0	288.7	12.34	12.48	6.44	10.28	10.40	5.84	483	1667	1585	5468
88.5	290.4	12.20	12.30	6.44	10.16	10.28	5.86	493	1724	1616	5657
89.0	292.0	12.14	12.26	6.46	10.02	10.16	5.86	474	1667	1555	5468
89.5	293.6	12.12	12.22	6.44	9.98	10.10	5.84	469	1667	1540	5468
90.0	295.3	11.96	12.10	6.42	9.92	10.06	5.82	490	1667	1608	5468
90.5	296.9	11.78	11.90	6.42	9.90	10.02	5.84	532	1724	1745	5657
91.0	298.6	11.76	11.90	6.42	9.90	10.04	5.84	538	1724	1764	5657
91.5	300.2	11.86	12.02	6.40	10.04	10.20	5.82	549	1724	1803	5657
92.0	301.8	11.78	11.88	6.38	10.02	10.14	5.80	571	1724	1875	5657
92.5	303.5	11.76	11.86	6.40	9.88	10.00	5.82	535	1724	1754	5657
93.0	305.1	11.78	11.90	6.38	9.80	9.96	5.80	510	1724	1674	5657
93.5	306.8	11.58	11.72	6.36	9.68	9.86	5.78	532	1724	1745	5657
94.0	308.4	11.56	11.70	6.40	9.66	9.84	5.82	532	1724	1745	5657
94.5	310.0	11.34	11.48	6.40	9.36	9.50	5.82	505	1724	1657	5657
95.0	311.7	12.26	12.38	6.36	10.02	10.18	5.78	450	1724	1478	5657
95.5	313.3	12.12	12.28	6.36	9.96	10.16	5.78	467	1724	1533	5657
96.0	315.0	11.84	12.00	6.32	9.82	9.98	5.74	495	1724	1624	5657
96.5	316.6	11.72	11.88	6.32	9.70	9.88	5.74	498	1724	1632	5657
97.0	318.2	11.66	11.80	6.32	9.72	9.86	5.76	515	1786	1691	5859
97.5	319.9	11.64	11.82	6.30	9.90	10.10	5.76	578	1852	1896	6076
98.0	321.5	11.70	11.86	6.32	10.02	10.20	5.76	599	1786	1965	5859
98.5	323.2	11.92	12.10	6.32	10.04	10.26	5.74	538	1724	1764	5657
99.0	324.8	12.06	12.22	6.30	10.06	10.24	5.74	503	1786	1649	5859
99.5	326.4	11.94	12.04	6.30	10.10	10.18	5.74	541	1786	1773	5859
100.0	328.1	12.04	12.18	6.32	10.28	10.46	5.74	575	1724	1886	5657
100.5	329.7	12.26	12.40	6.34	9.92	10.44	5.76	465	1724	1526	5657

Table 3, continued. Borehole DB02, Suspension R1-R2 depth, pick times, and velocities

Depth		Pick Times						Velocity			
(m)	(feet)	Far-Hn (millisec)	Far-Hr (millisec)	Far-V (millisec)	Near-Hn (millisec)	Near-Hr (millisec)	Near-V (millisec)	$V\text{-}S_H$ (m/sec)	V-P (m/sec)	$V\text{-}S_H$ (ft/sec)	V-P (ft/sec)
101.0	331.4	12.18	12.28	6.34	9.72	9.86	5.78	410	1786	1345	5859
101.5	333.0	12.08	12.28	6.34	9.60	9.76	5.80	400	1852	1312	6076
102.0	334.6	12.16	12.30	6.38	9.56	9.70	5.82	385	1786	1262	5859
102.5	336.3	12.10	12.06	6.38	9.96	10.04	5.82	481	1786	1577	5859
103.0	337.9	12.08	12.26	6.40	10.18	10.40	5.82	532	1724	1745	5657
103.5	339.6	11.98	12.10	6.40	10.14	10.26	5.82	543	1724	1783	5657
104.0	341.2	12.12	12.24	6.40	10.14	10.22	5.84	500	1786	1640	5859
104.5	342.8	12.16	12.30	6.40	10.24	10.40	5.82	524	1724	1718	5657
105.0	344.5	12.14	12.24	6.38	10.30	10.48	5.82	556	1786	1823	5859
105.5	346.1	12.10	12.22	6.40	10.22	10.34	5.84	532	1786	1745	5859
106.0	347.8	12.34	12.46	6.40	10.44	10.50	5.84	518	1786	1700	5859
106.5	349.4	12.74	12.52	6.42	10.88	10.60	5.84	529	1724	1736	5657
107.0	351.0	12.52	12.70	6.44	10.52	10.72	5.86	503	1724	1649	5657
107.5	352.7	12.52	12.64	6.44	10.52	10.74	5.86	513	1724	1682	5657
108.0	354.3	12.74	12.74	6.46	10.78	10.90	5.86	526	1667	1727	5468
108.5	356.0	12.52	12.52	6.44	10.54	10.62	5.84	515	1667	1691	5468
109.0	357.6	12.42	12.52	6.44	10.50	10.62	5.84	524	1667	1718	5468
109.5	359.3	12.60	13.32	6.44	10.74	11.46	5.84	538	1667	1764	5468
110.0	360.9	12.68	13.28	6.42	10.98	11.60	5.82	592	1667	1941	5468
110.5	362.5	12.30	12.48	6.40	10.68	10.78	5.82	602	1724	1976	5657
111.0	364.2	12.66	13.66	6.42	10.76	11.66	5.82	513	1667	1682	5468
111.5	365.8	11.44	12.24	6.42	9.72	10.38	5.84	559	1724	1833	5657
112.0	367.5	11.62	11.62	6.42	9.86	10.02	5.84	595	1724	1953	5657
112.5	369.1	11.52	11.68	6.42	9.86	10.02	5.84	602	1724	1976	5657
113.0	370.7	11.64	11.78	6.44	9.84	9.96	5.86	552	1724	1813	5657
113.5	372.4	11.56	11.72	6.46	9.86	9.98	5.86	581	1667	1907	5468
114.0	374.0	11.48	11.56	6.48	9.74	9.94	5.90	595	1724	1953	5657

Table 3, continued. Borehole DB02, Suspension R1-R2 depth, pick times, and velocities

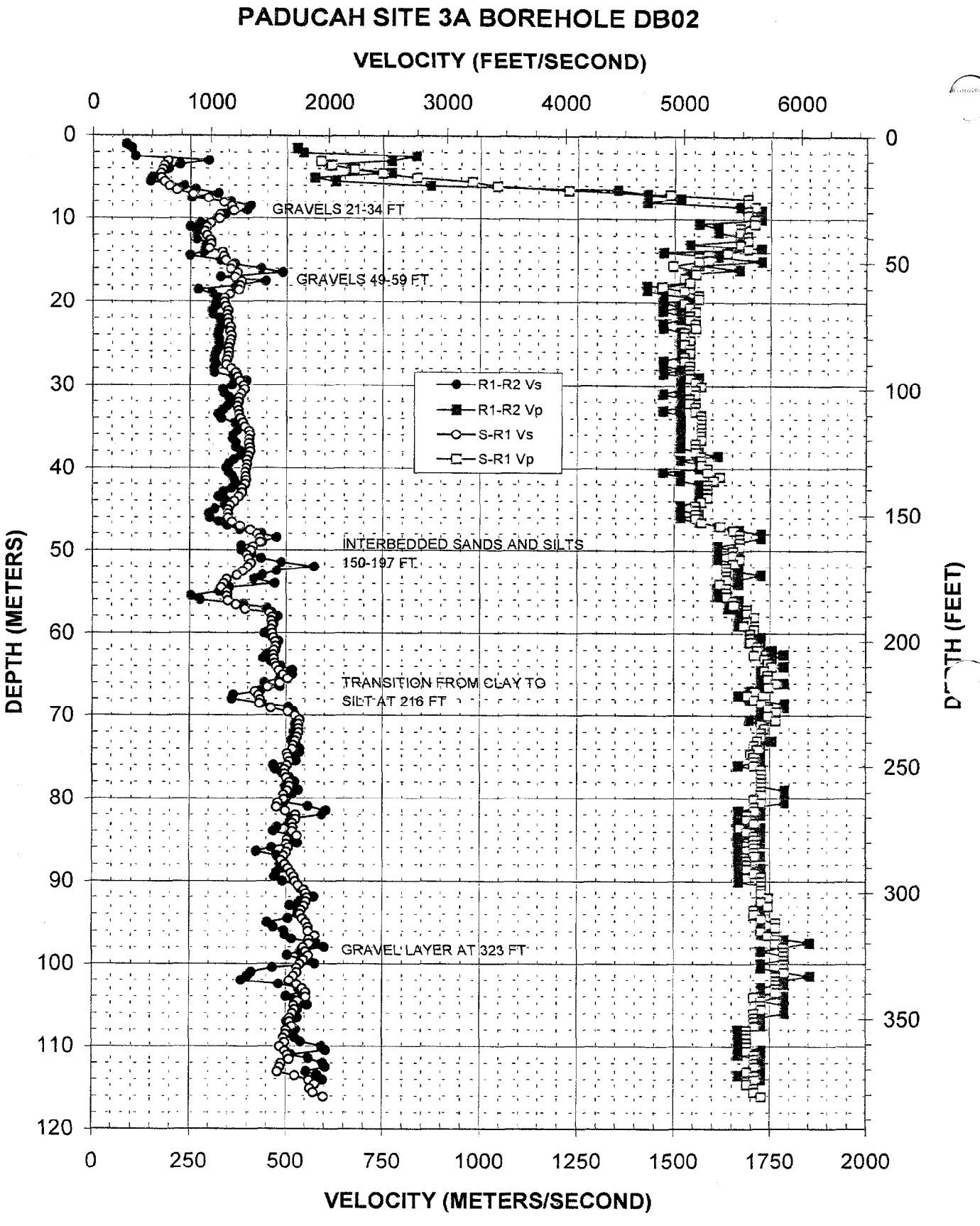

Figure 5. Borehole DB02, R1 - R2 high resolution analysis and S-R1 quality assurance analysis P- and SH-wave velocities

Depth	Velocity		Depth	Velocity	
	V-S_H	V-p		V- S_H	V-p
3.1	192	586	10.1	630	1922
3.6	182	614	11.7	597	2016
4.1	178	674	13.4	585	2211
4.6	174	746	15.0	570	2447
5.1	175	835	16.6	574	2740
5.6	183	978	18.3	600	3209
6.1	196	1043	19.9	643	3423
6.6	214	1227	21.6	703	4024
7.1	257	1488	23.2	844	4882
7.6	296	1688	24.8	971	5539
8.1	337	1688	26.5	1107	5539
8.6	358	1707	28.1	1173	5599
9.1	363	1688	29.8	1190	5539
9.6	328	1688	31.4	1075	5539
10.1	325	1707	33.0	1066	5599
10.6	304	1707	34.7	996	5599
11.1	293	1670	36.3	961	5480
11.6	289	1670	38.0	947	5480
12.1	294	1688	39.6	965	5539
12.6	303	1688	41.2	992	5539
13.1	304	1670	42.9	996	5480
13.6	298	1688	44.5	979	5539
14.1	334	1635	46.2	1095	5366
14.6	337	1562	47.8	1107	5125
15.1	341	1562	49.4	1119	5125
15.6	358	1495	51.1	1176	4906
16.1	354	1554	52.7	1160	5100
16.6	372	1554	54.4	1221	5100
17.1	366	1524	56.0	1201	5001
17.6	383	1539	57.6	1256	5050
18.1	379	1467	59.3	1244	4814
18.6	376	1524	60.9	1232	5001
19.1	352	1562	62.6	1156	5125
19.6	339	1562	64.2	1113	5125
20.1	339	1524	65.8	1113	5001
20.6	342	1539	67.5	1122	5050
21.1	348	1554	69.1	1142	5100
21.6	347	1539	70.8	1137	5050
22.1	348	1539	72.4	1142	5050
22.6	348	1554	74.0	1142	5100
23.1	355	1554	75.7	1165	5100
23.6	353	1524	77.3	1158	5001
24.1	356	1524	79.0	1168	5001
24.6	355	1539	80.6	1165	5050
25.1	353	1524	82.3	1158	5001
25.6	350	1539	83.9	1147	5050
26.1	350	1539	85.5	1147	5050
26.6	348	1524	87.2	1142	5001
27.1	345	1524	88.8	1132	5001
27.6	344	1539	90.5	1127	5050

Depth	Velocity		Depth	Velocity	
	V-S_H	V-p		V- S_H	V-p
28.1	356	1539	92.1	1168	5050
28.6	368	1539	93.7	1206	5050
29.1	374	1539	95.4	1226	5050
29.6	379	1554	97.0	1244	5100
30.1	389	1570	98.7	1275	5151
30.6	391	1554	100.3	1281	5100
31.1	383	1554	101.9	1256	5100
31.6	377	1539	103.6	1238	5050
32.1	376	1539	105.2	1232	5050
32.6	374	1554	106.9	1226	5100
33.1	376	1554	108.5	1232	5100
33.6	377	1570	110.1	1238	5151
34.1	381	1570	111.8	1250	5151
34.6	387	1570	113.4	1269	5151
35.1	391	1570	115.1	1281	5151
35.6	403	1570	116.7	1321	5151
36.1	405	1570	118.3	1328	5151
36.6	403	1570	120.0	1321	5151
37.1	403	1554	121.6	1321	5100
37.6	405	1554	123.3	1328	5100
38.1	406	1554	124.9	1331	5100
38.6	402	1570	126.5	1317	5151
39.1	398	1570	128.2	1307	5151
39.6	397	1570	129.8	1304	5151
40.1	395	1586	131.5	1297	5203
40.6	393	1586	133.1	1291	5203
41.1	394	1619	134.7	1294	5310
41.6	395	1602	136.4	1297	5256
42.1	393	1586	138.0	1291	5203
42.6	385	1586	139.7	1262	5203
43.1	385	1586	141.3	1262	5203
43.6	377	1586	142.9	1238	5203
44.1	366	1570	144.6	1201	5151
44.6	354	1554	146.2	1160	5100
45.1	349	1554	147.9	1145	5100
45.6	349	1554	149.5	1145	5100
46.1	349	1554	151.1	1145	5100
46.6	358	1570	152.8	1176	5151
47.1	379	1619	154.4	1244	5310
47.6	406	1653	156.1	1331	5422
48.1	424	1670	157.7	1392	5480
48.6	431	1670	159.4	1415	5480
49.1	433	1670	161.0	1419	5480
49.6	414	1670	162.6	1359	5480
50.1	409	1653	164.3	1341	5422
50.6	397	1653	165.9	1304	5422
51.1	403	1670	167.6	1321	5480
51.6	408	1653	169.2	1338	5422
52.1	401	1635	170.8	1314	5366
52.6	388	1635	172.5	1272	5366

Table 4. Borehole DB02, S - R1 quality assurance analysis P- and S_H-wave velicities

Depth	Velocity		Depth	Velocity	
	V-S_H	V-p		V- S_H	V-p
53.1	373	1635	174.1	1223	5366
53.6	347	1635	175.8	1137	5366
54.1	339	1619	177.4	1113	5310
54.6	332	1635	179.0	1089	5366
55.1	347	1635	180.7	1140	5366
55.6	346	1635	182.3	1135	5366
56.1	349	1653	184.0	1145	5422
56.6	369	1653	185.6	1212	5422
57.1	393	1688	187.2	1291	5539
57.6	456	1688	188.9	1497	5539
58.1	463	1707	190.5	1519	5599
58.6	462	1688	192.2	1515	5539
59.1	463	1679	193.8	1519	5509
59.6	462	1707	195.4	1515	5599
60.1	463	1697	197.1	1519	5569
60.6	467	1697	198.7	1533	5569
61.1	471	1697	200.4	1547	5569
61.6	473	1716	202.0	1551	5629
62.1	469	1716	203.6	1538	5629
62.6	467	1707	205.3	1533	5599
63.1	469	1735	206.9	1538	5692
63.6	470	1744	208.6	1542	5723
64.1	476	1754	210.2	1561	5755
64.6	482	1735	211.8	1580	5692
65.1	493	1744	213.5	1617	5723
65.6	504	1744	215.1	1654	5723
66.1	483	1764	216.8	1585	5788
66.6	451	1744	218.4	1480	5723
67.1	419	1707	220.0	1374	5599
67.6	428	1688	221.7	1404	5539
68.1	433	1707	223.3	1419	5599
68.6	430	1725	225.0	1411	5660
69.1	460	1744	226.6	1511	5723
69.6	504	1764	228.2	1654	5788
70.1	524	1744	229.9	1720	5723
70.6	535	1764	231.5	1755	5788
71.1	533	1725	233.2	1749	5660
71.6	533	1735	234.8	1749	5692
72.1	533	1725	236.5	1749	5660
72.6	528	1725	238.1	1731	5660
73.1	524	1716	239.7	1720	5629
73.6	519	1707	241.4	1703	5599
74.1	517	1716	243.0	1697	5629
74.6	502	1697	244.7	1648	5569
75.1	506	1707	246.3	1659	5599
75.6	508	1707	247.9	1667	5599
76.1	503	1707	249.6	1651	5599
76.6	497	1725	251.2	1630	5660
77.1	497	1725	252.9	1630	5660
77.6	500	1725	254.5	1640	5660

Depth	Velocity		Depth	Velocity	
	V-S_H	V-p		V- S_H	V-p
78.1	508	1725	256.1	1667	5660
78.6	508	1725	257.8	1667	5660
79.1	503	1725	259.4	1651	5660
79.6	494	1725	261.1	1620	5660
80.1	495	1707	262.7	1625	5599
80.6	479	1725	264.3	1570	5660
81.1	476	1707	266.0	1561	5599
81.6	498	1707	267.6	1635	5599
82.1	525	1688	269.3	1723	5539
82.6	525	1688	270.9	1723	5539
83.1	516	1707	272.5	1694	5599
83.6	518	1670	274.2	1700	5480
84.1	516	1688	275.8	1694	5539
84.6	529	1707	277.5	1734	5599
85.1	503	1707	279.1	1651	5599
85.6	502	1707	280.7	1646	5599
86.1	506	1707	282.4	1662	5599
86.6	502	1707	284.0	1646	5599
87.1	495	1707	285.7	1625	5599
87.6	488	1688	287.3	1600	5539
88.1	497	1688	288.9	1630	5539
88.6	505	1688	290.6	1656	5539
89.1	513	1707	292.2	1683	5599
89.6	520	1725	293.9	1706	5660
90.1	523	1725	295.5	1717	5660
90.6	532	1725	297.1	1746	5660
91.1	547	1725	298.8	1795	5660
91.6	551	1725	300.4	1807	5660
92.1	555	1744	302.1	1820	5723
92.6	551	1725	303.7	1807	5660
93.1	547	1744	305.3	1795	5723
93.6	540	1707	307.0	1770	5599
94.1	538	1707	308.6	1764	5599
94.6	543	1725	310.3	1782	5660
95.1	553	1764	311.9	1814	5788
95.6	559	1764	313.5	1833	5788
96.1	559	1725	315.2	1833	5660
96.6	575	1744	316.8	1887	5723
97.1	561	1764	318.5	1840	5788
97.6	561	1764	320.1	1840	5788
98.1	545	1784	321.8	1789	5853
98.6	551	1784	323.4	1807	5853
99.1	559	1784	325.0	1833	5853
99.6	545	1784	326.7	1789	5853
100.1	536	1784	328.3	1758	5853
100.6	529	1784	330.0	1734	5853
101.1	529	1784	331.6	1734	5853
101.6	520	1764	333.2	1706	5788
102.1	508	1764	334.9	1667	5788
102.6	529	1764	336.5	1734	5788

Table 4, continued. Borehole DB02, S - R1 quality assurance analysis P- and S_H-wave data

Depth	Velocity		Depth	Velocity	
	V-S_H	V-p		V- S_H	V-p
103.1	543	1764	338.2	1782	5788
103.6	551	1764	339.8	1807	5788
104.1	553	1707	341.4	1814	5599
104.6	530	1725	343.1	1740	5660
105.1	522	1725	344.7	1711	5660
105.6	523	1725	346.4	1717	5660
106.1	518	1707	348.0	1700	5599
106.6	511	1707	349.6	1678	5599
107.1	511	1707	351.3	1678	5599
107.6	516	1707	352.9	1694	5599
108.1	502	1688	354.6	1646	5539
108.6	500	1688	356.2	1640	5539
109.1	495	1688	357.8	1625	5539
109.6	497	1688	359.5	1630	5539
110.1	485	1688	361.1	1590	5539
110.6	498	1688	362.8	1635	5539
111.1	505	1707	364.4	1656	5599
111.6	508	1707	366.0	1667	5599
112.1	488	1707	367.7	1600	5599
112.6	485	1707	369.3	1590	5599
113.1	479	1688	371.0	1570	5539
113.6	523	1707	372.6	1717	5599
114.1	561	1707	374.2	1840	5599
114.6	575	1688	375.9	1887	5539
115.1	563	1707	377.5	1846	5599
115.6	571	1707	379.2	1873	5599
116.1	597	1725	380.8	1959	5660

Table 4, continued. Borehole DB02, S - R1 quality assurance analysis P- and S_H-wave data

APPENDIX A

OYO 170 VELOCITY LOGGING SYSTEM

NIST TRACEABLE

CALIBRATION PROCEDURE

CALIBRATION PROCEDURE FOR

GEOVision SEISMIC RECORDER/LOGGER

Reviewed 02/16/1999

Objective

The timing/sampling accuracy of seismic recorders or data loggers is required for several GEOVision field procedures including Seismic Refraction, Downhole Seismic Velocity Logging, and P-S Suspension Logging. This procedure describes the method for measuring the timing accuracy of a seismic data logger, such as the OYO Model 170 or the Geometrics Strataview. The objective of this procedure is to verify that the timing accuracy of the recorder is accurate to within 1%.

Frequency of Calibration

The calibration of each GEOVision seismic data logger is twelve (12) months. In the case of rented seismic data loggers, calibration must be performed prior to use.

Test Equipment Required

The following equipment is required. Item #2 must have current NIST traceable calibration.

1. Function generator, Krohn Hite 5400B or equivalent
2. Frequency counter, HP 5315A or equivalent
3. Test cables, from item 1 to item 2, and from item 1 to subject data logger.

Procedure

This procedure is designed to be performed using the accompanying Seismograph Calibration Data Sheet with the same revision number. All data must be entered and the procedure signed by the technician performing the test.

1. Record all identification data on the form provided.
2. Connect function generator to data logger (such as OYO Model 170) using test cable
3. Connect the function generator to the frequency counter using test cable.

4. Set up generator to produce a 100.0 Hz, 0.25 volt (amplitude is approximate, modify as necessary to yield less than full scale waveforms on logger display) peak square wave or sine wave. Verify frequency using the counter and initial space on the data sheet.

5. Initialize data logger and record a data record of at least 0.1 second using a 100 microsecond sample period.

6. Measure the recorded square wave frequency by measuring the duration of 9 cycles of data. This measurement can be made using the data logger display device, or by printing out a paper tape. If a paper tape can be printed, the resulting printout must be attached to this procedure. Record the data in the space provided.

7. Repeat steps 5 and 6 three more times using separate files.

Criteria

The duration for 9 cycles in any file must be 90.0 milliseconds plus or minus 0.9 milliseconds, corresponding to an average frequency for the nine cycles of 100.0 Hz plus or minus 1 Hz (obtained by dividing 9 cycles by the duration in milliseconds).

If the results are outside this range, the data logger must be marked with a GEOVision REJECT tag until it can be repaired and retested.

If results are acceptable affix label indicating the initials of the person performing the calibration, the date of calibration, and the due date for the next calibration (12 months).

Procedure Approval

Approved by:

JOHN G. DIEHL	VP
Name	Title
	2/16/99
Signature	Date

Client Approval (if required):

Name	Title
Signature	Date

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SEISMOGRAPH CALIBRATION DATA SHEET REVISION LOG

DATE	REVISION NUMBER	REASON FOR CHANGE	APPROVED
4/14/98	1.00	NEW GEOVISION PROCEDURE	JGD JGD
		(WAS AGBABIAN PROCEDURE)	
12/8/98	1.10	REVISED 0.25MV TO 0.25V BECAUSE	JGD JGD
		TEST APPARATUS INJECTS SIGNAL	
		AFTER GAIN AMPLIFIERS. ALSO	
		CORRECTED SPELLING ERRORS	
		(COORECT AND SEISMOGRAPG)	
2/16/99	1.20	REVISED "TEST EQUIPMENT	JGD JGD
		REQUIRED" SECTION TO ONLY REQUIRE	
		NIST TRACEABLE CALIBRATION FOR	
		THE FREQUENCY COUNTER. ALSO	
		ADDED INSTRUCTIONS FOR CREATING	
		CALIB. LABEL PER QA PROGRAM.	

Calibration Report

MICRO PRECISION CALIBRATION INC.
11562 Knott Street, Ste. 3, Garden Grove, CA 92841
Ph. 714-901-5659 Fax: 714-901-5649

Customer: **GEOVISION Corona CA 92882**

Account: **15214**

Instrument: **BB9414 Digital Universal Test Center**

Mfg: **Tenma**	Model: **72-5085**	Serial #: **MB00006378**
Size:	Resltn:	Location:

Cust Ctrl:	Dept:	P.O.: **2236-020220-2**
Job Number: **L16939**	Report Number: **115406**	Report Date: **022502**

Work Performed: **Inspected, cleaned, and calibrated.** Page 1 of 1

Parts Replaced: **None**

Received Condition: **In tolerance** Returned Condition: **In tolerance**

Function Tested	
Multimeter	Function Generator cont'
AC/DC Volts & Current	Amplitude
Resistance & Capacitance	Sine wave distortion& flatness
Power Supply	Square wave symmetry, rise & fall time
Voltage	Triangle wave linearity
Current	TTL rise & fall time, output level
Ripple	
Frequency Counter	
Frequency range & Accuracy	
Input Sensitivity	
Function Generator	
Frequency	

Ctrl #	Manufacture, Model #, & Description of standards used for calibration	Due Date	Traceability
L8100	L8100 Wavetek 4800A Multifunction Calibr	031202	35951031201
L1600	L1600 Hewlett Packard 34401A Multimeter	040502	97906
T1100	T1100 Hewlett Packard 53131A Counter	060402	100795
P5300	P5300 Tektronix THS710 Oscilloscope w/DMM	022003	114723
K4350	K4350 Hewlett Packard 8903A Audio Analyzer	053102	99604

Services provided conform to ANSI/NCSL Z540-1-1994 (Formerly Mil-Std 45662A) and ISO 10012-1:1992
All work performed complies with MPC Quality System QM 540-94, Rev 1a.

Environmental: 72 Deg F / 42% Rh

Uncertainty: Accuracy Ratio > 4:1

Cal Procedure: Manufacture Man

Technician: ERIC BRADLEY

Test Date: 022502

Cycle: 12

Due Date: 022503

QC 3

Quality Approval: _____

Form Cert 2-25-02

All standards used are either traceable to the National Institute of Standards or have intrinsic accuracy. All services performed have used proper manufacturer and industrial service techniques and are warranted for no less than (30) days. This report may not be reproduced in part without written permission of Micro Precision's Quality Assurance Manager.

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SEISMOGRAPH CALIBRATION DATA SHEET REV 2/16/99

INSTRUMENT DATA

SYSTEM MFR:	OYO	MODEL NO.:	3331
SERIAL NO.:	12004	CALIBRATION DATE:	2/26/02
BY:	R. STELLER	DUE DATE:	2/26/03
COUNTER MFR:	TENMA	MODEL NO.:	72-5085
SERIAL NO.:	MB00006378	CALIBRATION DATE:	2/25/02
BY:	MICRO PRECISION CAL	DUE DATE:	2/25/03
FCTN GEN MFR:	TENMA	MODEL NO.:	72-5085
SERIAL NO.:	MB00006378	CALIBRATION DATE:	2/25/02
BY:	MICROPRECISION CAL	DUE DATE:	2/25/03

SYSTEM SETTINGS:

GAIN:	10
FILTER:	20 KHZ
RANGE:	100 MSEC
DELAY:	0
STACK: 1 (STD)	1
PULSE:	1.6 MSEC
DISPLAY:	VARIABLE
SYSTEM: DATE = CORRECT DATE & TIME	2/26/02 1:54 PM

PROCEDURE:

SET FREQUENCY TO 100.0HZ SQUAREWAVE WITH AMPLITUDE APPROXIMATELY 0.25 VOLT PEAK. RECORD BOTH ON DISKETTE AND PAPER TAPE. ANALYZE AND PRINT WAVEFORMS FROM ANALYSIS UTILITY. ATTACH PAPER COPIES OF PRINTOUT AND PAPER TAPES TO THIS FORM. AVERAGE FREQUENCY MUST BE BETWEEN 99.0 AND 101.0 HZ.

AS FOUND 100.0 AS LEFT 100.0

WAVEFORM	FILE NO	FREQUENCY	TIME FOR 9 CYCLES Hn	TIME FOR 9 CYCLES Hr	TIME FOR 9 CYCLES V	AVERAGE FREQ.
SQUARE	101	100.0	90.0	90.0	90.0	100.0
SQUARE	102	100.0	90.0	90.0	90.0	100.0
SINE	103	100.0	90.0	89.9	40.0	100.1
SINE	104	100.0	89.9	90.0	90.1	100.0

CALIBRATED BY: ROBERT STELLER 2/26/02 [signature]

NAME DATE SIGNATURE

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geophysical services
a division of Blackhawk Geometrics

SEISMOGRAPH CALIBRATION DATA SHEET REV 2/16/99

INSTRUMENT DATA

SYSTEM MFR:	OYO	MODEL NO.:	3331
SERIAL NO.:	12004	CALIBRATION DATE:	4/14/02
BY:	R. STELLER	DUE DATE:	4/14/03
COUNTER MFR:	TENMA	MODEL NO.:	72 - 5085
SERIAL NO.:	MB 00006378	CALIBRATION DATE:	2/25/02
BY:	MICROPRECISION CAL	DUE DATE:	2/25/03
FCTN GEN MFR:	TENMA	MODEL NO.:	72 - 5085
SERIAL NO.:	MB00006378	CALIBRATION DATE:	2/25/02
BY:	MICROPRECISION CAL	DUE DATE:	2/25/03

SYSTEM SETTINGS:

GAIN:	10
FILTER:	20 KHZ
RANGE:	100 msec
DELAY:	0
STACK: 1 (STD)	1
PULSE:	1.6 msec
DISPLAY:	VARIABLE
SYSTEM: DATE = CORRECT DATE & TIME	4/14/02 2:36 pm

PROCEDURE:

SET FREQUENCY TO 100.0HZ SQUAREWAVE WITH AMPLITUDE APPROXIMATELY 0.25 VOLT PEAK. RECORD BOTH ON DISKETTE AND PAPER TAPE. ANALYZE AND PRINT WAVEFORMS FROM ANALYSIS UTILITY. ATTACH PAPER COPIES OF PRINTOUT AND PAPER TAPES TO THIS FORM. AVERAGE FREQUENCY MUST BE BETWEEN 99.0 AND 101.0 HZ.

AS FOUND 100.0 AS LEFT 100.0

WAVEFORM	FILE NO	FREQUENCY	TIME FOR 9 CYCLES Hn	TIME FOR 9 CYCLES Hr	TIME FOR 9 CYCLES V	AVERAGE FREQ.
SQUARE	101	100.0	90.0	90.0	90.0	100.0
SQUARE	102	100.0	90.0	90.0	90.0	100.0
~~SQUARE~~ SINE	103	100.0	90.0	90.0	90.0	100.0
SINE	104	100.0	90.0	90.0	90.0	100.0

CALIBRATED BY: ROBERT STELLER 4/14/02 [signature]
NAME DATE SIGNATURE

ATTACHMENT E-IV

GEOTECHNICAL LABORATORY ANALYTICAL RESULTS

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MOISTURE CONTENT

PROJECT NAME
Bechtel Jacobs Paducah

PROJECT NUMBER
783208.00410000

IT LAB SAMPLE NO.	CLIENT SAMPLE NO.	MOISTURE. % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846
ETDC-9997	CCGTSB01SS03	27.6	21.6	78.4
ETDC-9998	CCGTSB01SS04			
ETDC-9999	CCGTSB01SS08	13.3	11.7	88.3
ETDC-10000	CCGTSB01SS11	64.4	39.2	60.8
ETDC-10001	CCGTSB01SS15	55.4	35.7	64.3
ETDC-10002	CCGTSB01SS19	66.4	39.9	60.1
ETDC-10003	CCGTSB02SS03	24.6	19.7	80.3
ETDC-10004	CCGTSB02SS05	23.3	18.9	81.1
ETDC-10005	CCGTSB02SS09	14.6	12.7	87.3
ETDC-10006	CCGTSB02SS15	17.9	15.2	84.8
ETDC-10007	CCGTSB02SS19	21.6	17.7	82.3
ETDC-10008	CCGTSB02SS22	22.8	18.6	81.4
ETDC-10009	CCGTSB02SS24	56.9	36.2	63.8
ETDC-10010	CCGTSB02SS27	67.6	40.3	59.7
ETDC-10011	CCGTSB03SS04	23.7	19.2	80.8
ETDC-10012	CCGTSB03SS07	20.9	17.3	82.7
ETDC-10013	CCGTSB03SS11	14.3	12.5	87.5
ETDC-10014	CCGTSB03SS17	30.0	23.0	77.0
ETDC-10015	CCGTSB03SS19	62.6	38.5	61.5
ETDC10016	CCGTSB03SS23	21.3	17.6	82.4

ASTM D 2216 results are based on dry sample weight.
SW846 results are based on wet sample weight.
Solids content is determined by subtracting the SW846 moisture (%) from 100.

MOISTURE CONTENT

PROJECT NAME
Bechtel Jacobs Paducah

PROJECT NUMBER
783208.00410000

IT LAB SAMPLE NO.	CLIENT SAMPLE NO.	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846
ETDC-10017	CCGTSB03SS26	56.9	36.3	63.7
ETDC-10018	CCGTSB05SS04	26.9	21.2	78.8
ETDC-10019	CCGTSB05SS06	17.0	14.5	85.5
ETDC-10020	CCGTSB05SS10	15.0	13.0	87.0
ETDC-10021	CCGTSB05SS14	23.8	19.2	80.8
ETDC-10022	CCGTSB05SS18	23.7	19.2	80.8
ETDC-10023	CCGTSB05SS19	66.2	39.8	60.2
ETDC-10024	CCGTSB05SS21	62.3	38.4	61.6
ETDC-10029	CCGTSB06SS03	29.2	22.6	77.4
ETDC-10030	CCGTSB06SS06	22.0	18.0	82.0
ETDC-10031	CCGTSB06SS10	13.3	11.7	88.3
ETDC-10032	CCGTSB06SS14	16.3	14.0	86.0
ETDC-10033	CCGTSB06SS18	17.8	15.1	84.9
ETDC-10034	CCGTSB06SS20	11.2	10.1	89.9
ETDC-10035	CCGTSB06SS22	66.7	40.0	60.0
ETDC-10036	CCGTSB06SS23	18.8	15.8	84.2
ETDC-10037	CCGTDB02SS03	18.7	15.8	84.2
ETDC-10038	CCGTDB02SS07			
ETDC-10039	CCGTDB02SS11	21.7	17.8	82.2
ETDC10040	CCGTDB02SS14	19.9	16.6	83.4

ASTM D 2216 results are based on dry sample weight.
SW846 results are based on wet sample weight.
Solids content is determined by subtracting the SW846 moisture (%) from 100.

MOISTURE CONTENT

PROJECT NAME
Bechtel Jacobs Paducah

PROJECT NUMBER
783208.00410000

IT LAB SAMPLE NO.	CLIENT SAMPLE NO.	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846
ETDC-10041	CCGTDB02SS17	24.9	19.9	80.1
ETDC-10042	CCGTDB02SS19	21.5	17.7	82.3
ETDC-10043	CCGTDB02SS21	24.7	19.8	80.2
ETDC-10044	CCGTDB02SS24	18.7	15.8	84.2
ETDC-10045	CCGTDB02SS27	21.0	17.3	82.7
ETDC-10046	CCGTDB02SS30	61.4	38.0	62.0
ETDC-10047	CCGTDB02SS31	66.7	40.0	60.0
ETDC-10048	CCGTDB02SS32	60.0	37.5	62.5

ASTM D 2216 results are based on dry sample weight.
SW846 results are based on wet sample weight.
Solids content is determined by subtracting the SW846 moisture (%) from 100.

ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME:
Bechtel Jacobs Paducah

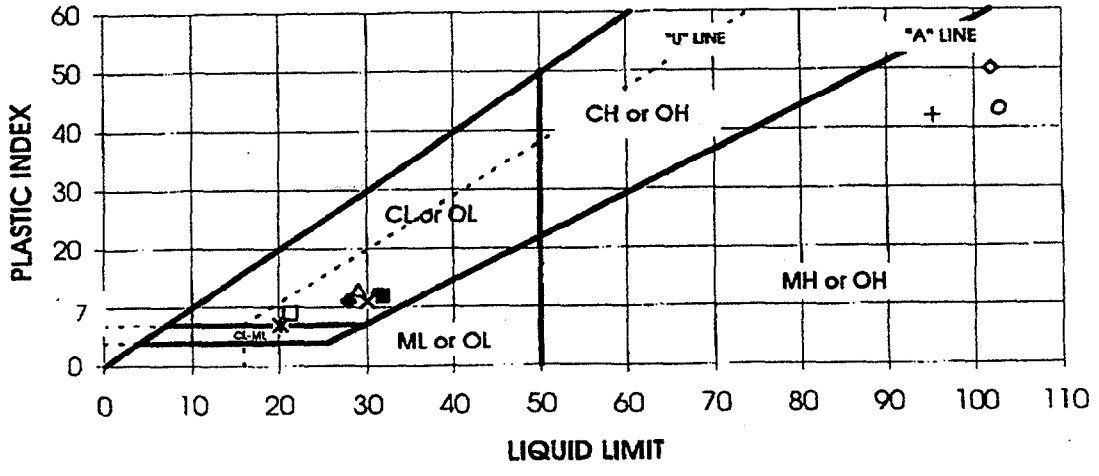
PROJECT NO.
783208.00410000

ATTERBERG LIMITS RESULTS

LAB SAMPLE NO.	FIELD SAMPLE NO.	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	USCS SYMBOL
ETDC-9997 ●	CCGTSB01SS03	31	19	12	CL
ETDC-9998 ◆	CCGTSB01SS04	28	17	11	CL
ETDC-9999 □	CCGTSB01SS08	21	12	9	CL
ETDC-10000 ◇	CCGTSB01SS11	102	53	50	MH
ETDC-10001 +	CCGTSB01SS15	95	53	42	MH
ETDC-10002 o	CCGTSB01SS19	103	60	43	MH
ETDC-10003 ■	CCGTSB02SS03	32	20	12	CL
ETDC-10004	CCGTSB02SS05	30	19	11	CL
ETDC-10005	CCGTSB02SS09	29	16	13	CL
ETDC-10006	CCGTSB02SS15	20	13	7	CL-ML

*NP=Nonplastic

PLASTICITY CHART



ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME:
Bechtel Jacobs Paducah

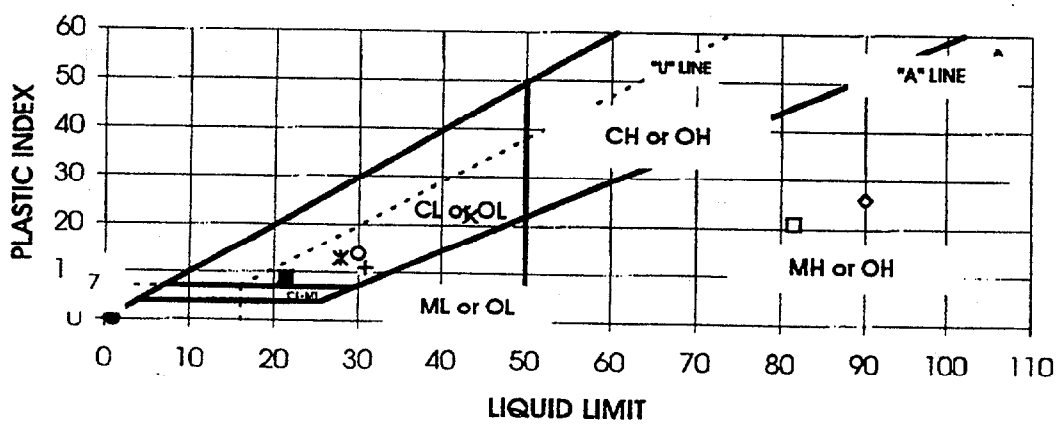
PROJECT NO.
783208.00410000

ATTERBERG LIMITS RESULTS

LAB SAMPLE NO.	FIELD SAMPLE NO.	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	USCS SYMBOL
ETDC-10007 ●	CCGTSB02SS19	NP	NP	NP	NP
ETDC-10008 ◆	CCGTSB02SS22	NP	NP	NP	NP
ETDC-10009 □	CCGTSB02SS24	81	60	21	MH
ETDC-10010 ◇	CCGTSB02SS27	90	65	26	MH
ETDC-10011 +	CCGTSB03SS04	31	20	11	CL
ETDC-10012 o	CCGTSB03SS07	30	16	14	CL
ETDC-10013 ■	CCGTSB03SS11	21	12	9	CL
ETDC-10014	CCGTSB03SS17	43	21	22	CL
ETDC-10015	CCGTSB03SS19	106	50	56	MH
ETDC-10016	CCGTSB03SS23	28	15	13	CL

*NP=Nonplastic

PLASTICITY CHART



ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME:
Bechtel Jacobs Paducah

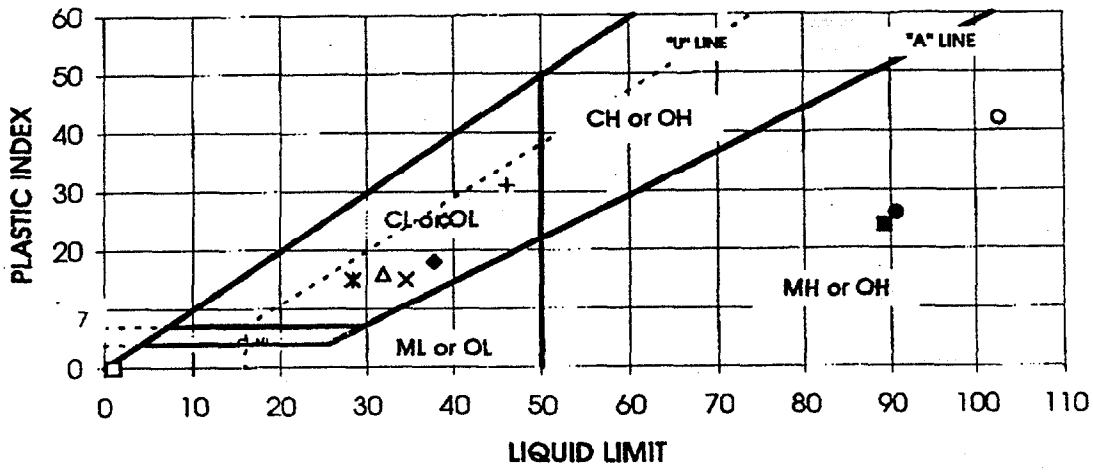
PROJECT NO.
783208.00410000

ATTERBERG LIMITS RESULTS

LAB SAMPLE NO.	FIELD SAMPLE NO.	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	USCS SYMBOL
ETDC-10017 ●	CCGTSB03SS26	91	65	26	MH
ETDC-10018 ◆	CCGTSB05SS04	38	20	18	CL
ETDC-10019 □	CCGTSB05SS06	NP	NP	NP	NP
ETDC-10021 ◇	CCGTSB05SS14	39	14	25	CL
ETDC-10022 +	CCGTSB05SS18	46	15	31	CL
ETDC-10023 ○	CCGTSB05SS19	103	61	42	MH
ETDC-10024 ■	CCGTSB05SS21	89	65	24	MH
ETDC-10029 x	CCGTSB06SS03	35	20	15	CL
ETDC-10030 ▲	CCGTSB06SS06	32	16	16	CL
ETDC10031 ★	CCGTSB06SS10	28	13	15	CL

*NP=Nonplastic

PLASTICITY CHART



ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME:
Bechtel Jacobs Paducah

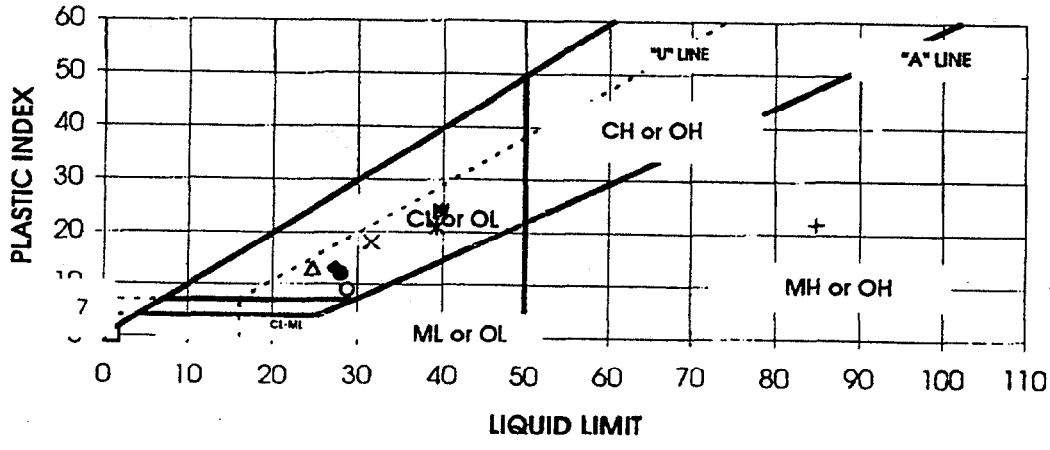
PROJECT NO.
783208.00410000

ATTERBERG LIMITS RESULTS

LAB SAMPLE NO.	FIELD SAMPLE NO.	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	USCS SYMBOL
ETDC-10032 ●	CCGTSB06SS14	28	16	12	CL
ETDC-10033 ◆	CCGTSB06SS18	27	14	13	CL
ETDC-10034 □	CCGTSB06SS20	Insuffient sample			
ETDC-10035 ◇	CCGTSB06SS22	117	50	67	MH
ETDC-10036 +	CCGTSB06SS23	85	63	22	MH
ETDC-10037 ○	CCGTDB02SS03	29	20	9	CL
ETDC-10038 ■	CCGTDB02SS07	40	16	24	CL
ETDC-10039 x	CCGTDB02SS11	32	14	18	CL
ETDC-10040 ▲	CCGTDB02SS14	25	12	13	CL
ETDC10041 ★	CCGTDB02SS17	39	18	21	CL

*NP=Nonplastic

PLASTICITY CHART



ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME:
Bechtel Jacobs Paducah

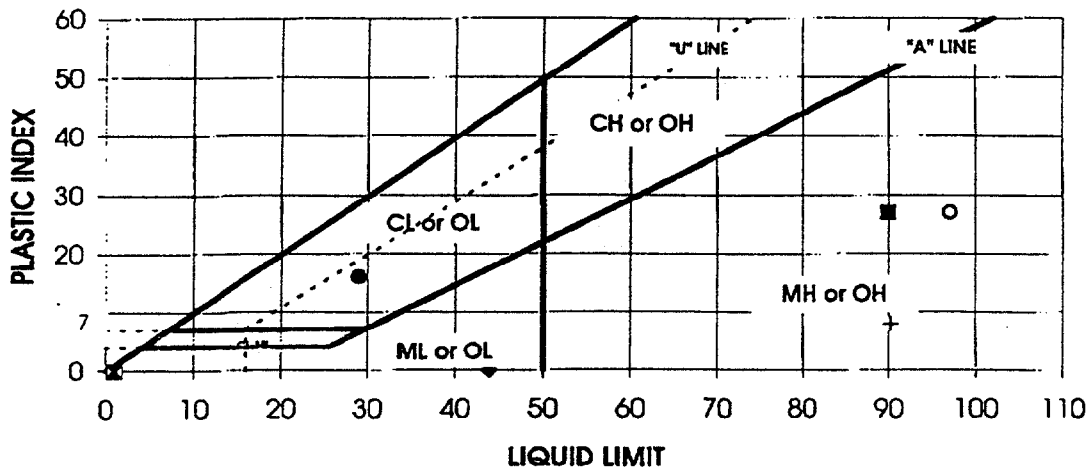
PROJECT NO.
783208.00410000

ATTERBERG LIMITS RESULTS

LAB SAMPLE NO.	FIELD SAMPLE NO.	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	USCS SYMBOL
ETDC-10042 ●	CCGTDB02SS19	29	13	16	CL
ETDC-10043 ◆	CCGTDB02SS21	44	NP	NP	NP
ETDC-10044 □	CCGTDB02SS24	NP	NP	NP	NP
ETDC-10045 ◇	CCGTDB02SS27	Insufficient sample			
ETDC-10046 +	CCGTDB02SS30	90	82	8	MH
ETDC-10047 ○	CCGTDB02SS31	97	70	27	MH
ETDC-10048 ■	CCGTDB02SS32	90	63	27	MH
x					
▲					
★					

*NP=Nonplastic

PLASTICITY CHART



SPECIFIC GRAVITY
ASTM D 854

PROJECT NAME:
Bechtel Jacobs Paducah

PROJECT NUMBER:
783208.00410000

IT LAB SAMPLE NO.	CLIENT SAMPLE NO.	SPECIFIC GRAVITY
ETDC-9997	CCGTSB01SS03	2.6813
ETDC-9998	CCGTSB01SS04	2.6298
ETDC-9999	CCGTSB01SS08	2.6705
ETDC-10000	CCGTSB01SS11	2.5821
ETDC-10001	CCGTSB01SS15	2.6491
ETDC-10002	CCGTSB01SS19	2.5628
ETDC-10003	CCGTSB02SS03	2.6769
ETDC-10004	CCGTSB02SS05	2.6825
ETDC-10005	CCGTSB02SS09	2.6227
ETDC-10006	CCGTSB02SS15	2.6698
ETDC-10007	CCGTSB02SS19	2.6700
ETDC-10008	CCGTSB02SS22	2.6686
ETDC-10009	CCGTSB02SS24	2.5848
ETDC-10010	CCGTSB02SS27	2.6028
ETDC-10011	CCGTSB03SS04	2.6977
ETDC-10012	CCGTSB03SS07	2.4683
ETDC-10013	CCGTSB03SS11	2.6614
ETDC-10014	CCGTSB03SS17	2.5485
ETDC-10015	CCGTSB03SS19	2.2488
ETDC-10016	CCGTSB03SS23	2.3817

SPECIFIC GRAVITY
ASTM D 854

PROJECT NAME:
Bechtel Jacobs Paducah

PROJECT NUMBER:
783208.00410000

IT LAB SAMPLE NO.	CLIENT SAMPLE NO.	SPECIFIC GRAVITY
ETDC-10017	CCGTSB03SS26	2.0442
ETDC-10018	CCGTSB05SS04	2.6445
ETDC-10019	CCGTSB05SS06	2.0675
ETDC-10020	CCGTSB05SS10	2.3635
ETDC-10021	CCGTSB05SS14	2.4570
ETDC-10022	CCGTSB05SS18	Insufficient sample
ETDC-10023	CCGTSB05SS19	2.2404
ETDC-10024	CCGTSB05SS21	2.2337
ETDC-10029	CCGTSB06SS03	2.6487
ETDC-10030	CCGTSB06SS06	2.6420
ETDC-10031	CCGTSB06SS10	2.6460
ETDC-10032	CCGTSB06SS14	2.6067
ETDC-10033	CCGTSB06SS18	2.6411
ETDC-10034	CCGTSB06SS20	Insufficient sample
ETDC-10035	CCGTSB06SS22	2.4983
ETDC-10036	CCGTSB06SS23	2.5048
ETDC-10037	CCGTDB02SS03	2.6173
ETDC-10038	CCGTDB02SS07	2.6276
ETDC-10039	CCGTDB02SS11	2.6267
ETDC-10040	CCGTDB02SS14	2.6274

SPECIFIC GRAVITY
ASTM D 854

PROJECT NAME:
Bechtel Jacobs Paducah

PROJECT NUMBER:
783208.00410000

IT LAB SAMPLE NO.	CLIENT SAMPLE NO.	SPECIFIC GRAVITY
ETDC-10041	CCGTDB02SS17	2.6991
ETDC-10042	CCGTDB02SS19	2.6044
ETDC-10043	CCGTDB02SS21	2.6613
ETDC-10044	CCGTDB02SS24	2.6358
ETDC-10045	CCGTDB02SS27	2.7770
ETDC-10046	CCGTDB02SS30	2.5341
ETDC-10047	CCGTDB02SS31	2.5219
ETDC-10048	CCGTDB02SS32	2.5147

Jana White
Bechtel Jacobs Company
March 29, 2002
IT Project ID: Bechtel Jacobs Paducah
IT Project No.: 783208.00410000

IT GEOTECHNICAL
LABORATORY
OAK RIDGE, TN
(865) 482-6497

BULK DENSITY/DRY DENSITY
EM-1110-2-1906, APPENDIX II

PROJECT NAME: Bechtel Jacobs Pad PROJECT NUMBER: 783208.00410000

ETDC SAMPLE NUMBER:	CLIENT SAMPLE NUMBER:	AVERAGE LENGTH, INCHES:	AVERAGE DIAMETER, INCHES:	WET WEIGHT, GRAMS:	MOISTURE CONTENT, %:	BULK DENSITY, PCF:	DRY DENSITY, PCF:
ETDC-9932	CCGTSB03ST01	2.5243	2.8487	545.45	23.0	129.2	105.0
ETDC-9933	CCGTSB03ST02	1.6473	2.9087	252.67	20.9	88.0	72.8
ETDC-9934	CCGTSB03ST03	2.8785	2.8593	614.55	23.0	126.7	103.0
ETDC-9935	CCGTSB03ST04	2.8570	2.8510	594.78	25.9	124.3	98.7
ETDC-9936	CCGTSB03ST06	1.6465	2.8538	252.67	59.8	91.4	57.2
ETDC-9937	CCGTSB03ST07	1.3797	2.8700	225.33	59.6	96.2	60.3
ETDC-9938	CCGTSB03ST08	3.3220	2.8877	531.77	56.1	93.1	59.7

Moisture content calculated by ASTM D 2216 based on sample dry weight.
Bulk density is the weight of wet sample divided by the volume of the wet sample (as-received).
Dry density is the weight of the dry sample solids divided by the volume of the original sample.

BULK DENSITY/DRY DENSITY
EM-1110-2-1906, APPENDIX II

PROJECT NAME: Bechtel Jacobs Paducah

PROJECT NUMBER: 783208.00410000

ETDC SAMPLE NUMBER:	CLIENT SAMPLE NUMBER:	AVERAGE LENGTH, INCHES:	AVERAGE DIAMETER, INCHES:	WET WEIGHT GRAMS:	MOISTURE CONTENT, %.	BULK DENSITY, PCF:	DRY DENSITY, PCF:
ETDC-9956	CCGTSB05ST01	2.5667	2.8237	535.56	22.8	127.0	103.4
ETDC-9957	CCGTSB05ST08	4.0195	2.8617	646.7	60.8	95.3	59.3
ETDC-9958	CCGTSB05ST04	2.6072	2.8585	591.09	15.8	134.6	116.2
ETDC-9959	CCGTSB05ST05	1.3647	2.8677	219.03	60.3	94.7	59.1
ETDC-9960	CCGTSB02ST02	1.7592	2.8443	373.82	22.5	127.4	104.0
ETDC-9961	CCGTSB02ST01	2.4710	2.8040	497.37	28.6	124.2	96.6
ETDC-9962	CCGTSB05ST07	2.6485	2.8848	426.97	59.1	94.0	59.1
ETDC-9963	CCGTSB05ST06	0.7500	2.5000	86.31	75.3	89.3	51.0
ETDC-9964	CCGTSB05ST02	2.1927	2.8385	468.72	23.6	128.7	104.1
ETDC-9965	CCGTSB05ST03	2.3497	2.8447	534.55	13.8	136.4	119.8
ETDC-9979	CCGTDB02ST07	1.9445	2.8758	301.14	57.8	90.8	57.6
ETDC-9980	CCGTDB02ST08	0.7500	2.5000	95.33	54.6	98.7	63.8
ETDC-9981	CCGTDB02ST09	3.7505	2.8730	623.35	57.8	97.7	61.9
ETDC-9982	CCGTDB02ST10	2.6747	2.8802	463.74	57.8	101.4	64.2
ETDC-9983	CCGTDB02ST11	1.9832	2.8760	334.00	50.8	98.8	65.5
ETDC-9984	CCGTSB01ST01	2.2557	2.8367	474.94	28.5	126.9	98.8
ETDC-9985	CCGTSB01ST02	2.4663	2.8243	523.31	20.4	129.0	107.1
ETDC-9986	CCGTSB02ST03	2.6120	2.8337	578.77	17.8	133.9	113.6
ETDC-9988	CCGTSB01ST05	2.5623	2.8445	404.48	57.3	94.6	60.2
ETDC-9989	CCGTSB02ST05	2.2802	2.8602	362.75	63.2	94.3	57.8

Moisture content calculated by ASTM D 2216 based on sample dry weight.

Bulk density is the weight of wet sample divided by the volume of the wet sample (as-received).

Dry density is the weight of the dry sample solids divided by the volume of the original sample.

BULK DENSITY/DRY DENSITY
EM-1110-2-1906, APPENDIX II

PROJECT NAME:
Bechtel Jacobs Paducah

PROJECT NUMBER:
783208.00410000

ETDC SAMPLE NUMBER:	CLIENT SAMPLE NUMBER:	AVERAGE LENGTH, INCHES:	AVERAGE DIAMETER, INCHES:	WET WEIGHT, GRAMS:	MOISTURE CONTENT, %:	BULK DENSITY, PCF:	DRY DENSITY, PCF:
ETDC-9990	CCGTSB01ST06	3.0440	2.8603	488.43	59.6	95.1	59.6
ETDC-9992	CCGTDB02ST01	2.1852	2.8748	545.91	25.6	146.7	116.8
ETDC-9993	CCGTDB02ST03	2.5682	2.8732	565.05	21.4	129.3	106.5
ETDC-9995	CCGTDB02ST05	2.6668	2.8858	423.97	61.5	92.6	57.4
ETDC-10025	CCGTSB06ST03	1.6475	2.8603	277.95	58.4	100.0	63.1
ETDC-10027	CCGTSB06ST01	2.8572	2.8122	586.09	26.8	125.8	99.2

Moisture content calculated by ASTM D 2216 based on sample dry weight.
Bulk density is the weight of wet sample divided by the volume of the wet sample (as-received).
Dry density is the weight of the dry sample solids divided by the volume of the original sample.

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB01SS03

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-9997

Specific Gravity: 2.6513

Moisture Content = 27.6%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	99.9%
	#10	2.000	99.8%

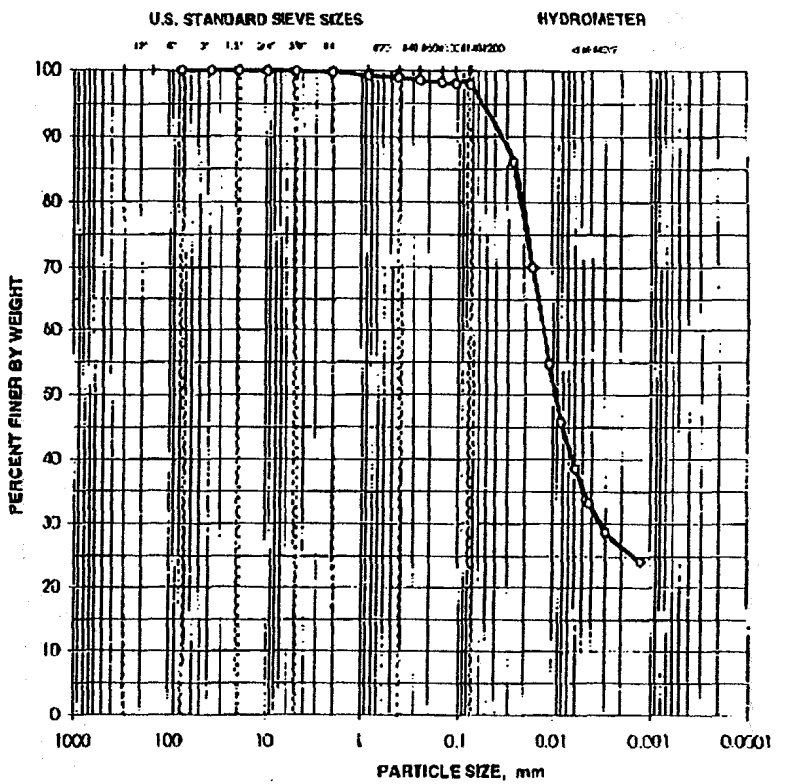
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	99.2%
	#40	0.425	98.9%
	#60	0.250	98.5%
	#100	0.149	98.2%
	#140	0.106	98.0%
	#200	0.075	97.9%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.02626	86.1%
	0.01662	70.0%
	0.01095	54.7%
	0.00832	45.7%
	0.00593	38.6%
	0.00432	33.2%
	0.00294	28.7%
	0.00128	24.2%

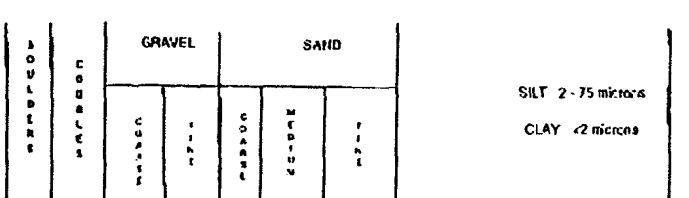
0.1% Gravel 2.0% Sand 97.9% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB01SS03

IT LAB SAMPLE NO.: ETDC-9997



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB01SS04

Project No. 783208.00410000

IT Lab Sample No. ETDC-9998

Specific Gravity = 2.6298

Moisture Content = 22.9%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	99.6%
	#10	2.000	99.2%

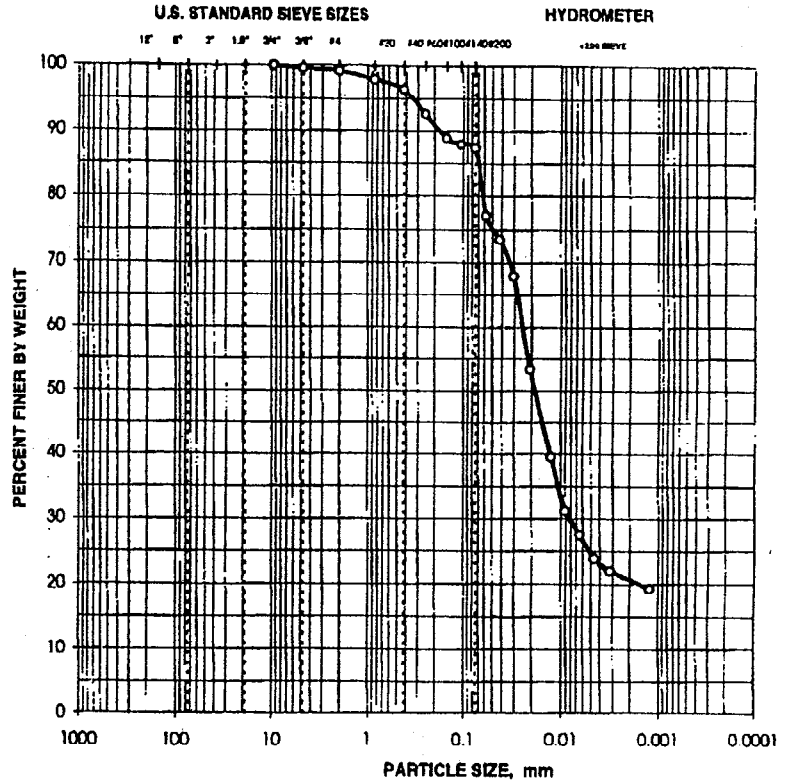
	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	97.9%
	#40	0.425	96.4%
	#60	0.250	92.6%
	#100	0.149	88.9%
	#140	0.106	88.0%
	#200	0.075	87.4%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER	0.05824	77.2%
	0.04215	73.5%
	0.03048	68.0%
	0.02069	53.3%
	0.01260	39.5%
	0.00917	31.2%
	0.00651	27.6%
	0.00465	23.9%
	0.00320	22.0%
	0.00124	19.3%

0.4% Gravel 12.2% Sand 87.4% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB01SS04

IT LAB SAMPLE NO.: ETDC-9998

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB01SS08

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-9999

Specific Gravity: 2.6710

Moisture Content = 13.3%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	99.0%
	0.375"	9.500	92.0%
	#4	4.750	84.7%
	#10	2.000	79.9%

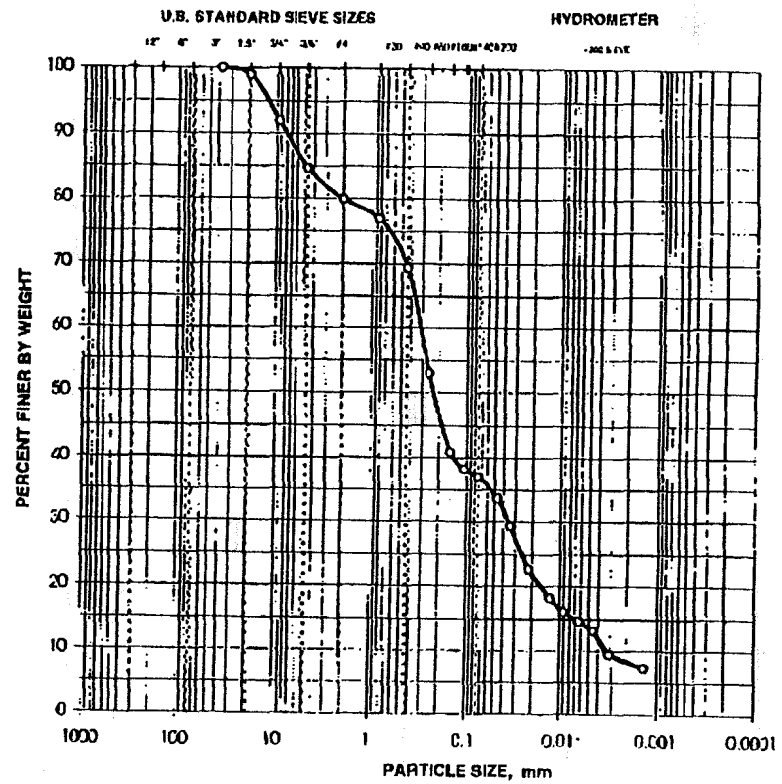
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	76.9%
	#40	0.425	69.4%
	#60	0.250	52.9%
	#100	0.149	40.9%
	#140	0.106	39.3%
	#200	0.075	37.1%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.04629	33.6%
	0.03344	29.3%
	0.02184	22.7%
	0.01263	18.3%
	0.00916	16.1%
	0.00644	14.6%
	0.00457	13.2%
	0.00313	9.5%
	0.00135	7.3%

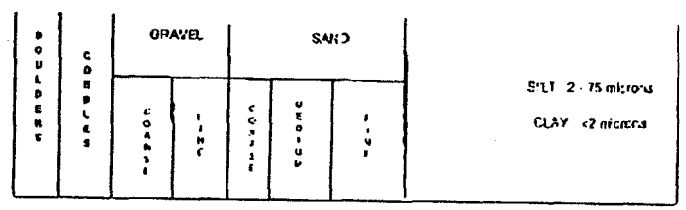
15.3% Gravel 47.6% Sand 37.1% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB01SS08

IT LAB SAMPLE NO.: ETDC-9999



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB01SS11

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10000

Specific Gravity: 2.5821

Moisture Content = 64.4%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	-19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	100.0%

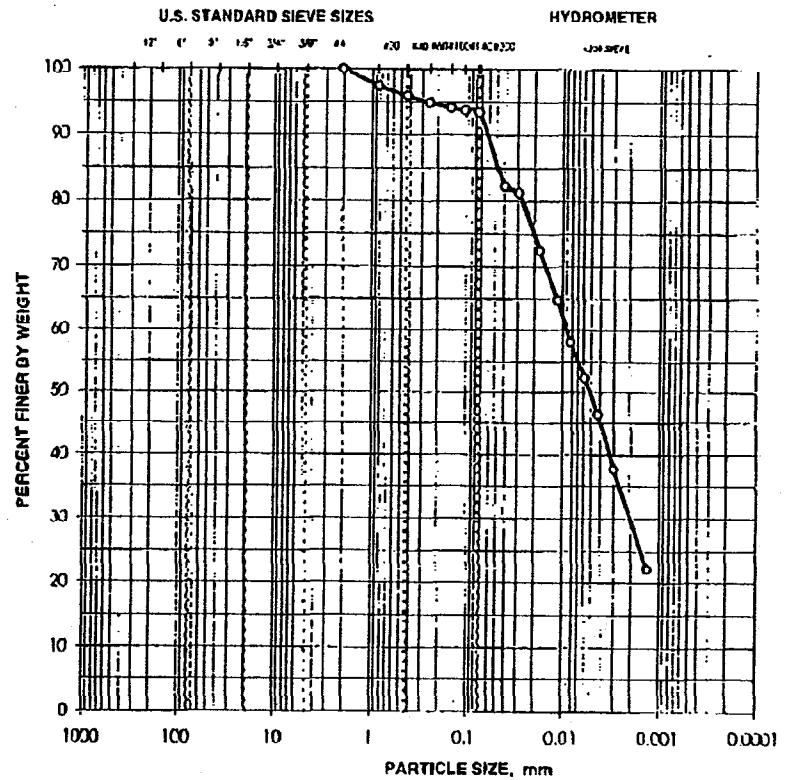
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	97.3%
	#40	0.425	95.9%
	#60	0.250	94.9%
	#100	0.149	94.1%
	#140	0.106	93.8%
	#200	0.075	93.5%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.04069	82.2%
	0.02856	81.2%
	0.01739	72.5%
	0.01135	64.8%
	0.00829	58.0%
	0.00593	52.2%
	0.00429	46.4%
	0.00299	37.7%
	0.00134	22.2%

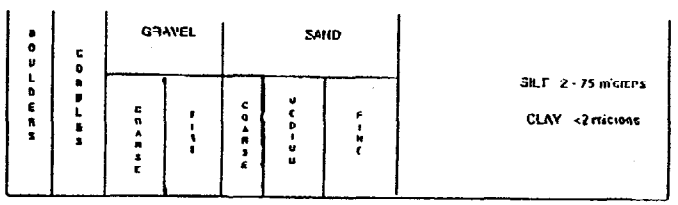
0.0% Gravel 6.5% Sand 93.5% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB01SS11

IT LAB SAMPLE NO.: ETDC-10000



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB01SS11

Project No.: 783208.0041.0000

IT Lab Sample No.: ETDC-10001

Specific Gravity: 2.6491

Moisture Content = 55.4%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	97.3%

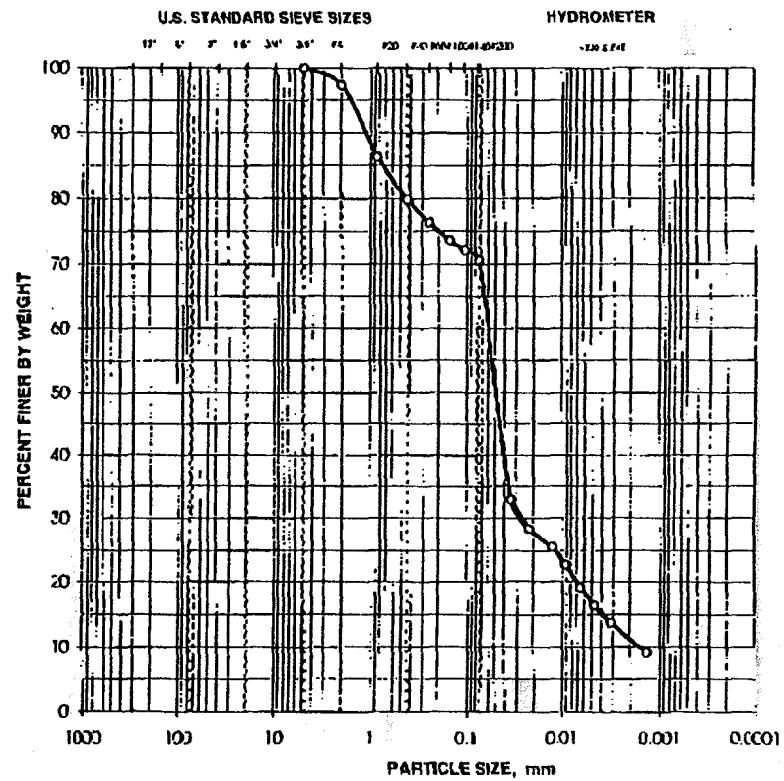
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	86.3%
	#40	0.425	79.7%
	#60	0.250	76.3%
	#100	0.149	73.6%
	#140	0.106	72.1%
	#200	0.075	70.6%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.04881	32.8%
	0.03451	32.8%
	0.02218	28.3%
	0.01290	25.5%
	0.00921	22.8%
	0.00652	19.1%
	0.00464	16.4%
	0.00318	13.7%
	0.00137	9.1%

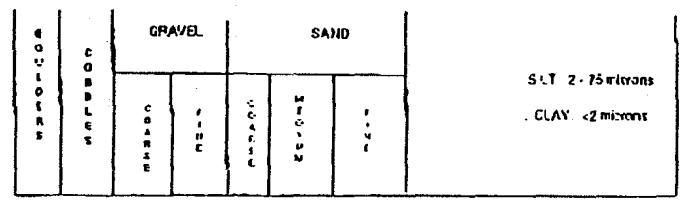
0.0% Gravel 29.4% Sand 70.6% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB01SS11

IT LAB SAMPLE NO.: ETDC-10001



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB01SS19

Project No. 783208.00410000

IT Lab Sample No. ETDC-10002
Corrected results

Specific Gravity : 2.5628

Moisture Content = 66.4%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	100.0%

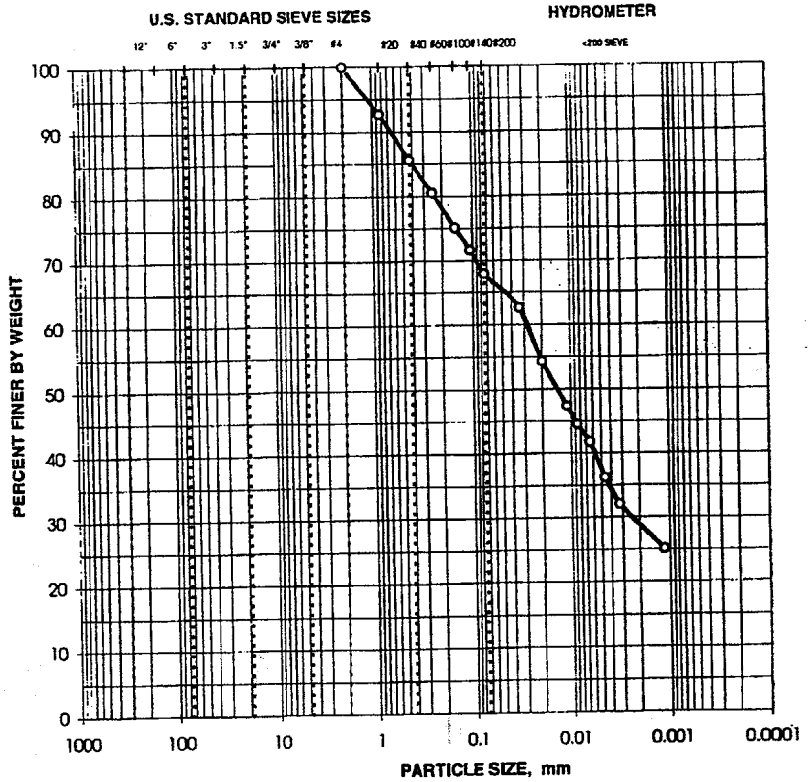
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	92.6%
	#40	0.425	85.6%
	#60	0.250	80.5%
	#100	0.149	75.1%
	#140	0.106	71.6%
	#200	0.075	67.9%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.03350	62.7%
	0.01975	54.3%
	0.01100	47.3%
	0.00863	44.6%
	0.00645	41.8%
	0.00461	36.2%
	0.00322	32.0%
	0.00114	25.1%

0.0% Gravel 32.1% Sand 67.9% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB01SS19

IT LAB SAMPLE NO.: ETDC-10002
Corrected

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Project No. 783208.00410000

Client Sample No. CCGTS302SS03

IT Lab Sample No. ETDC-10003

Specific Gravity 2.6769

Moisture Content = 24.6%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	99.6%
	#4	4.750	99.6%
	#10	2.000	99.2%

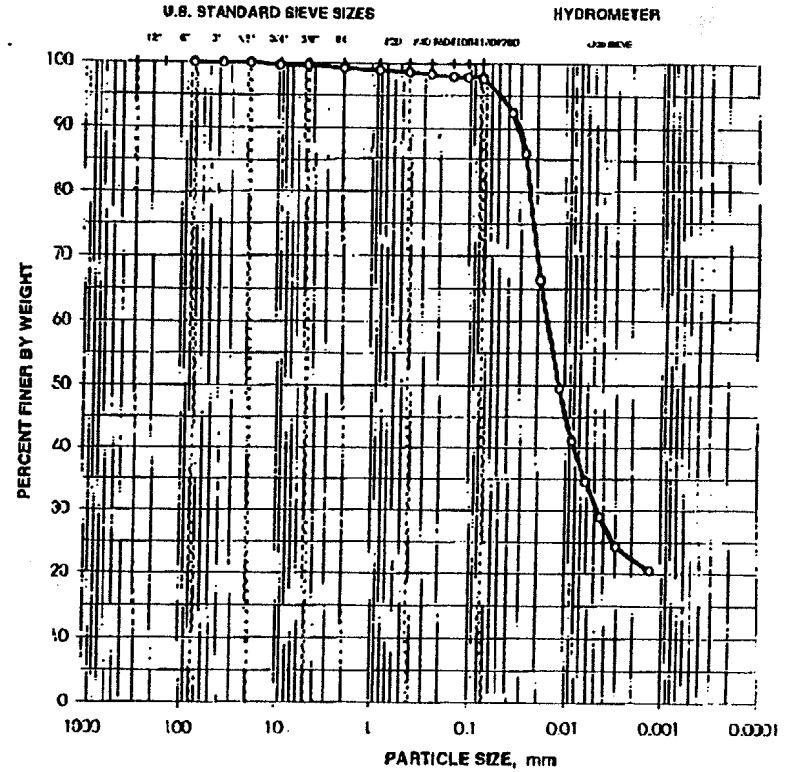
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	98.9%
	#40	0.425	98.6%
	#60	0.250	98.3%
	#100	0.149	97.9%
	#140	0.106	97.8%
	#200	0.075	97.7%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.03663	92.4%
	0.02696	85.9%
	0.01852	66.3%
	0.01169	49.5%
	0.00852	41.1%
	0.00618	34.5%
	0.00440	28.9%
	0.00300	24.3%
	0.00132	20.5%

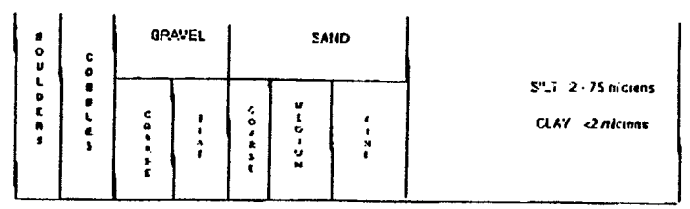
0.4% Gravel 1.9% Sand 97.7% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB02SS03

IT LAB SAMPLE NO.: ETDC-10003



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB02SS05

Project No. 783208.03410003

IT Lab Sample No. ETDC-10004

Specific Gravity = 2.6325

Moisture Content = 23.3%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	100.0%

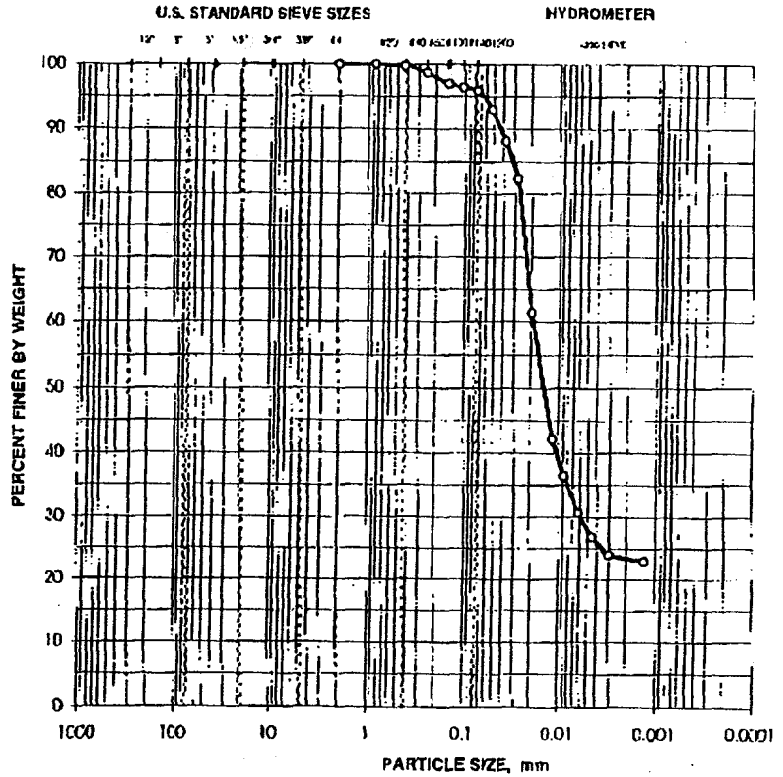
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	100.0%
	#40	0.425	99.8%
	#60	0.250	98.6%
	#100	0.149	97.0%
	#140	0.106	96.4%
	#200	0.075	95.9%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.05233	92.9%
	0.03512	88.2%
	0.02781	62.4%
	0.01940	61.3%
	0.01167	42.2%
	0.00870	36.4%
	0.00628	30.7%
	0.00444	26.8%
	0.00303	24.0%
	0.00131	23.0%

0.0% Gravel 4.1% Sand 95.9% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB02SS05

IT LAB SAMPLE NO.: ETDC-10004

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB02SS09

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10005

Specific Gravity: 2.6227

Moisture Content = 14.6%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	87.9%
	#4	4.750	78.0%
	#10	2.000	67.7%

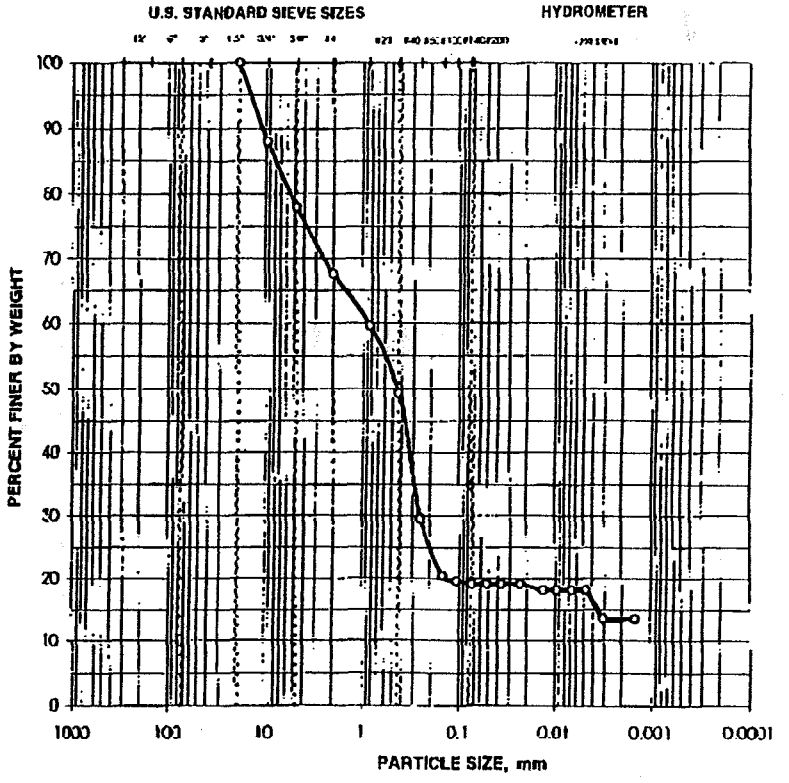
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	59.6%
	#40	0.425	49.3%
	#60	0.250	29.5%
	#100	0.149	20.5%
	#140	0.106	19.6%
	#200	0.075	19.4%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.07317	19.1%
	0.05174	19.1%
	0.03659	19.1%
	0.02314	19.1%
	0.01341	18.2%
	0.00948	18.2%
	0.00670	18.2%
	0.00468	18.2%
	0.00336	13.7%
	0.00145	13.7%

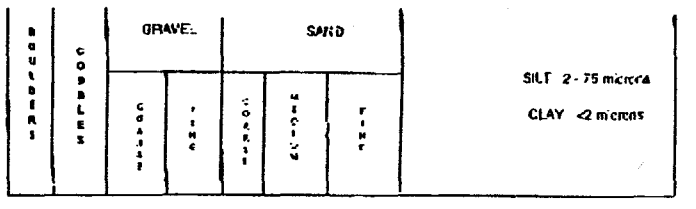
22.0% Gravel 58.6% Sand 19.4% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB02SS09

IT LAB SAMPLE NO.: ETDC-10005



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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB02SS15

Project No. 783208.00410000

IT Lab Sample No. ETDC-10006

Specific Gravity : 2.6698

Moisture Content = 17.9%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	99.4%
	#10	2.000	98.8%

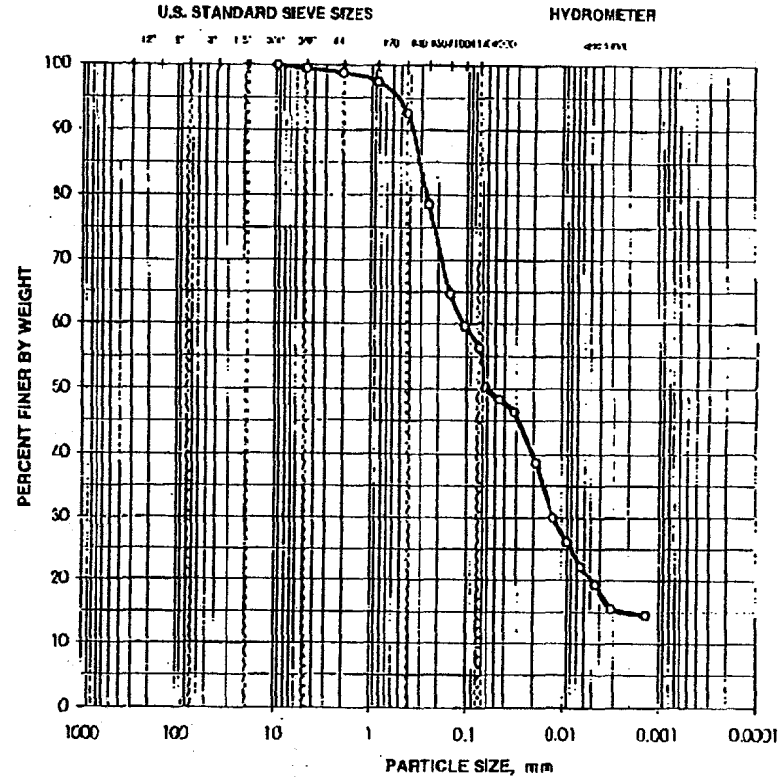
	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	97.4%
	#40	0.425	92.6%
	#60	0.250	78.6%
	#100	0.149	64.7%
	#140	0.106	59.7%
	#200	0.075	56.3%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER	0.06431	50.3%
	0.04568	48.3%
	0.03259	46.4%
	0.01930	38.7%
	0.01261	30.0%
	0.00902	26.1%
	0.00645	22.2%
	0.00457	19.3%
	0.00312	15.5%
	0.00135	14.5%

0.6% Gravel 43.0% Sand 56.3% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB02SS15

IT LAB SAMPLE NO.: ETDC-10006

SOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB02SS19

Project No.: 783208.00410030

IT Lab Sample No.: ETDC-10007

Specific Gravity: 2.6700

Moisture Content = 21.6%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	97.2%
	0.375"	9.500	90.5%
	#4	4.750	81.5%
	#10	2.000	73.6%

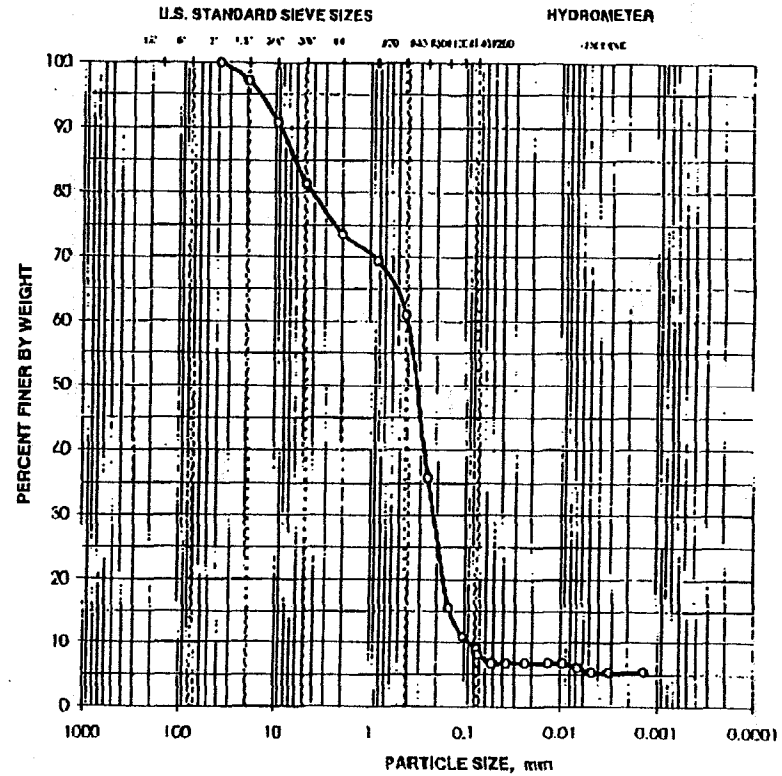
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	69.4%
	#40	0.425	61.0%
	#60	0.250	35.6%
	#100	0.149	15.6%
	#140	0.106	11.0%
	#200	0.075	8.9%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.07300	8.1%
	0.05198	6.7%
	0.03675	6.7%
	0.02325	6.7%
	0.01342	6.7%
	0.00949	6.7%
	0.00673	6.1%
	0.00480	5.4%
	0.00319	5.4%
	0.00138	5.4%

18.5% Gravel 72.5% Sand 8.9% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB02SS19

IT LAB SAMPLE NO.: ETDC-10007

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB02SS22

Project No. 783208.00410000

IT Lab Sample No. ETDC-10008

Specific Gravity = 2.6686

Moisture Content = 22.8%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	100.0%

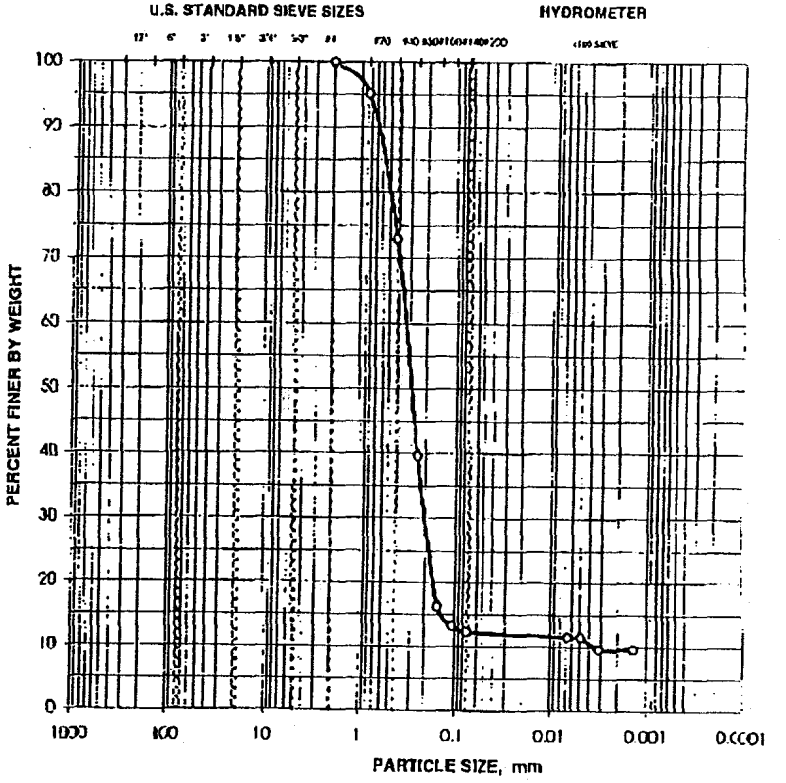
	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.650	95.1%
	#40	0.425	72.9%
	#60	0.250	39.6%
	#100	0.149	16.2%
	#140	0.106	13.2%
	#200	0.075	12.4%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.00666	11.6%
	0.00488	11.6%
	0.00317	9.7%
	0.00137	9.7%

0.0% Gravel 87.6% Sand 12.4% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB02SS22

IT LAB SAMPLE NO.: ETDC-10008

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTS9025S24

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10009

Specific Gravity: 2.5948

Moisture Content = 55.9%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	99.9%

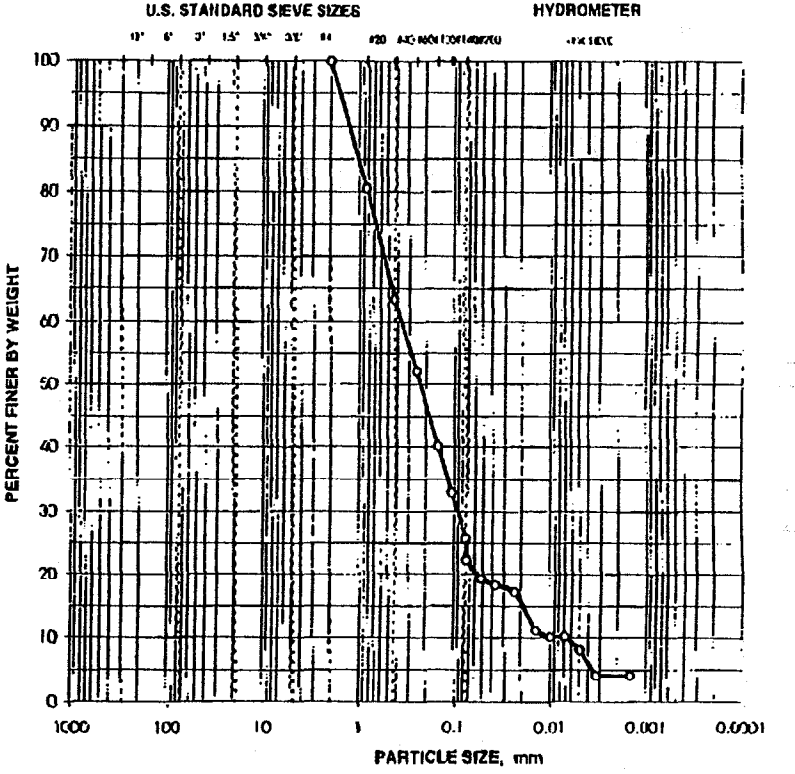
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	80.6%
	#40	0.425	63.3%
	#60	0.250	52.1%
	#100	0.149	40.1%
	#140	0.106	32.9%
	#200	0.075	25.7%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.07316	22.3%
	0.05221	19.2%
	0.03699	18.2%
	0.02348	17.2%
	0.01380	11.1%
	0.00979	10.1%
	0.00692	10.1%
	0.00487	8.1%
	0.00350	4.1%
	0.00167	4.1%

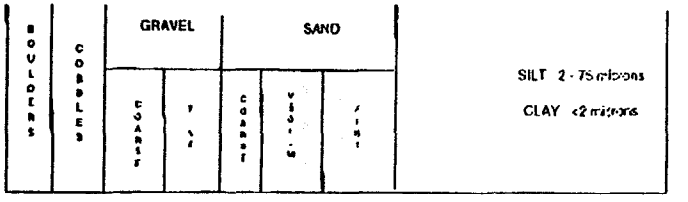
0.0% Gravel 74.3% Sand 25.7% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB02SS24

IT LAB SAMPLE NO.: ETDC-10009



;423 482 1890 # 13/ 47

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah — Client Sample No.: CCGTSB02SS27

Project No.: 783208.00410000 — IT Lab Sample No.: ETDC-10010

Specific Gravity = 2.6028 — Moisture Content = 67.6% based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	99.9%

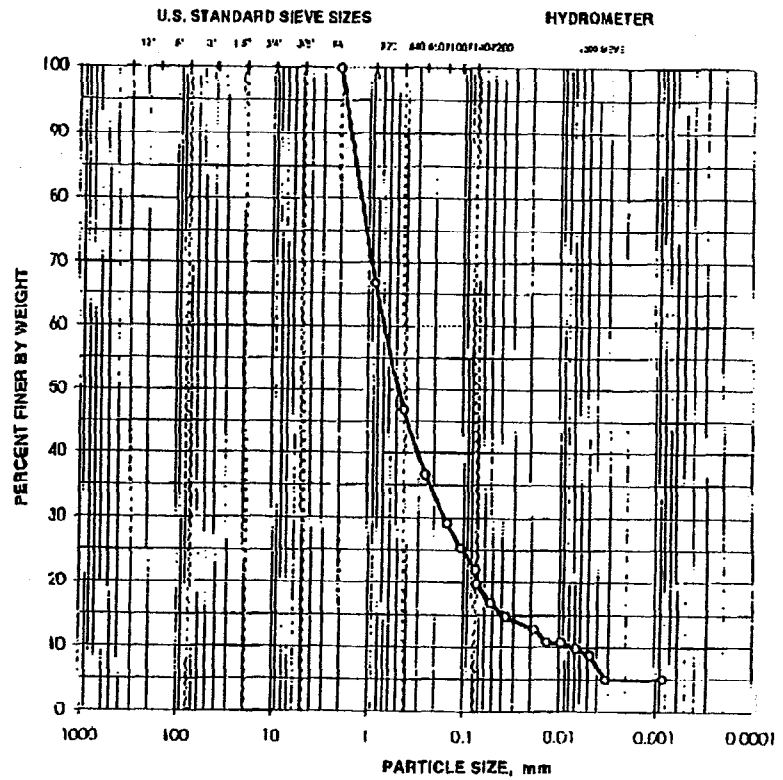
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	66.7%
	#40	0.425	46.9%
	#60	0.250	36.7%
	#100	0.149	29.2%
	#140	0.106	25.3%
	#200	0.075	22.0%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.07255	19.7%
	0.05167	16.8%
	0.03680	14.8%
	0.01840	12.6%
	0.01358	10.8%
	0.00960	10.8%
	0.00679	9.9%
	0.00478	8.9%
	0.00330	4.9%
	0.00084	4.9%

0.0% Gravel — 78.0% Sand — 22.0% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB02SS27 — IT LAB SAMPLE NO.: ETDC-10010

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

423 482 1690 # 14/ 47

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB03SS04

Project No. 783208.0041000D

IT Lab Sample No. ETDC-10011

Specific Gravity = 2.6977

Moisture Content = 23.7%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	99.9%
	#10	2.000	99.8%

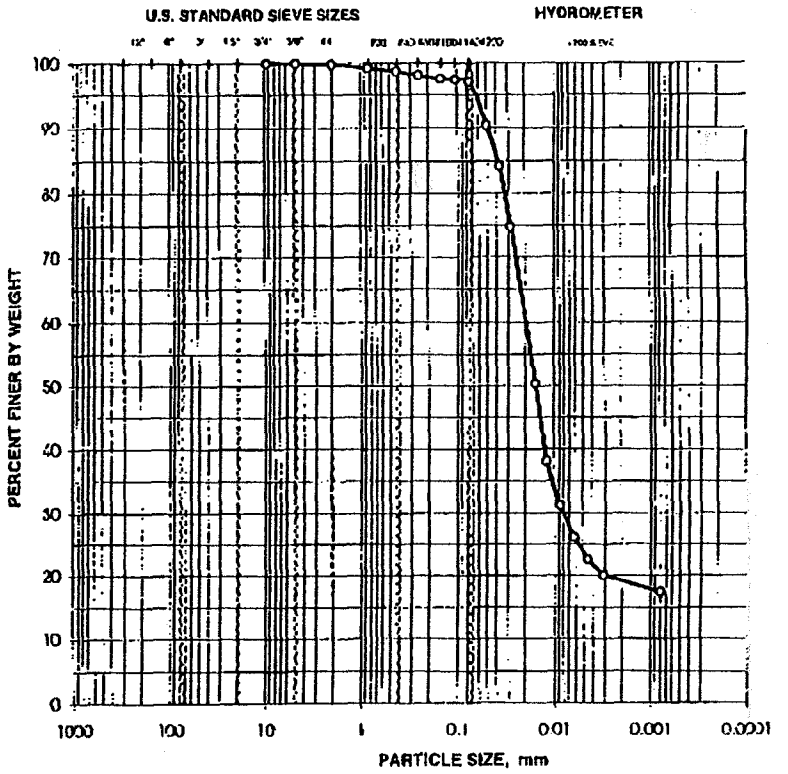
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	99.2%
	#40	0.425	98.7%
	#60	0.250	98.1%
	#100	0.149	97.6%
	#140	0.106	97.3%
	#200	0.075	97.1%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.06034	90.3%
	0.03701	84.2%
	0.02781	74.7%
	0.01571	50.4%
	0.01206	38.2%
	0.00878	31.3%
	0.00625	26.1%
	0.00447	22.6%
	0.00308	20.0%
	0.00079	17.4%

0.1% Gravel 2.9% Sand 97.1% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB03SS04

IT LAB SAMPLE NO.: ETDC-10011

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB03SS07

Project No. 783208.00410000

IT Lab Sample No. ETDC-10012
Corrected

Specific Gravity : 2.4683

Moisture Content = 20.9%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	99.8%
	#4	4.750	99.7%
	#10	2.000	98.8%

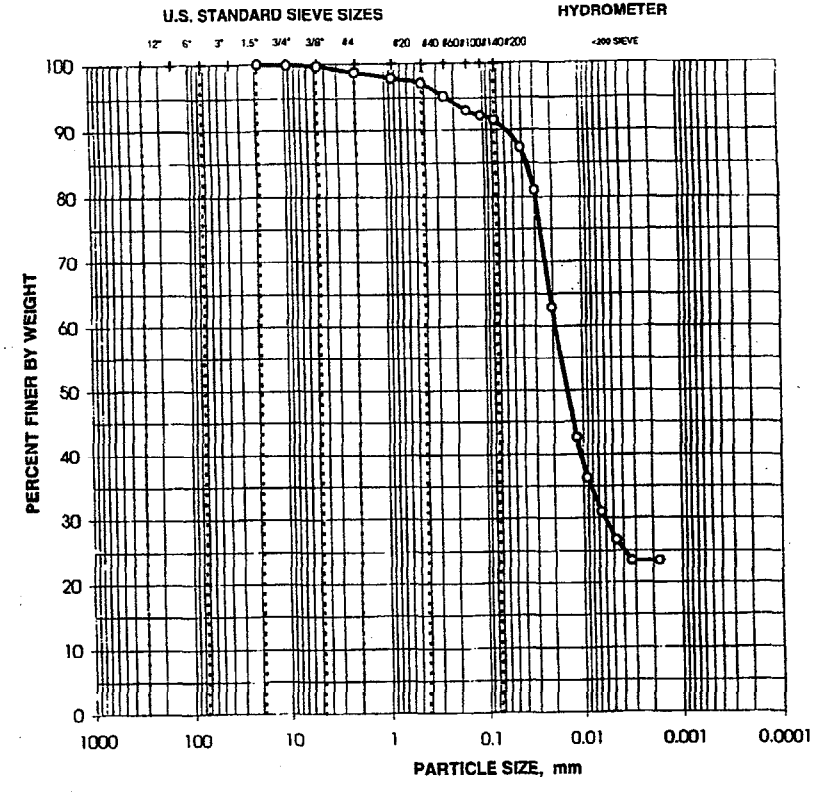
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	97.9%
	#40	0.425	97.1%
	#60	0.250	95.2%
	#100	0.149	93.0%
	#140	0.106	92.2%
	#200	0.075	91.5%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.04167	87.4%
	0.03031	81.0%
	0.02059	62.9%
	0.01160	42.6%
	0.00917	36.2%
	0.00660	30.9%
	0.00470	26.6%
	0.00330	23.4%
	0.00173	23.4%

0.3% Gravel 8.2% Sand 91.5% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB03SS07

IT LAB SAMPLE NO.: ETDC-10012
Corrected

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTS803SS11

Project No: 783208.90410000

IT Lab Sample No.: ETDC-10013

Specific Gravity: 2.6614

Moisture Content = 14.3%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	99.0%
	#4	4.750	96.0%
	#10	2.000	93.6%

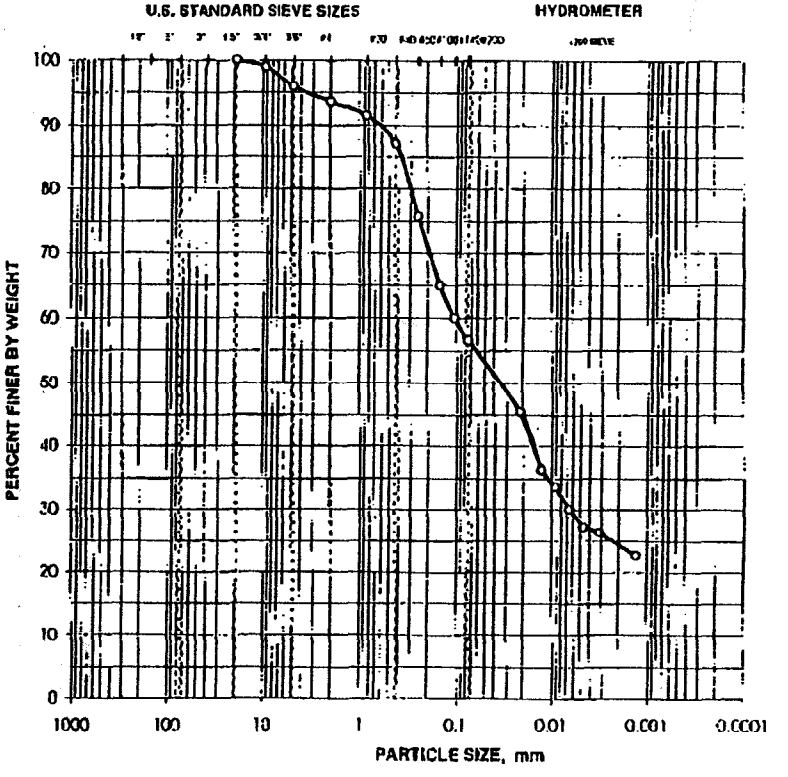
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	91.5%
	#40	0.425	87.0%
	#60	0.250	75.8%
	#100	0.149	65.0%
	#140	0.106	60.0%
	#200	0.075	55.5%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.02148	45.5%
	0.01264	36.6%
	0.00939	33.7%
	0.00649	30.1%
	0.00465	27.3%
	0.00323	26.4%
	0.00133	22.8%

4.0% Gravel 39.4% Sand 55.5% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTS803SS11

IT LAB SAMPLE NO.: ETDC-10013

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah — Client Sample No. CCGTS803SS17

Project No. 783208.00410000 — IT Lab Sample No. ETDC-10014

Specific Gravity = 2.5485

Moisture Content = 30.0%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	100.0%

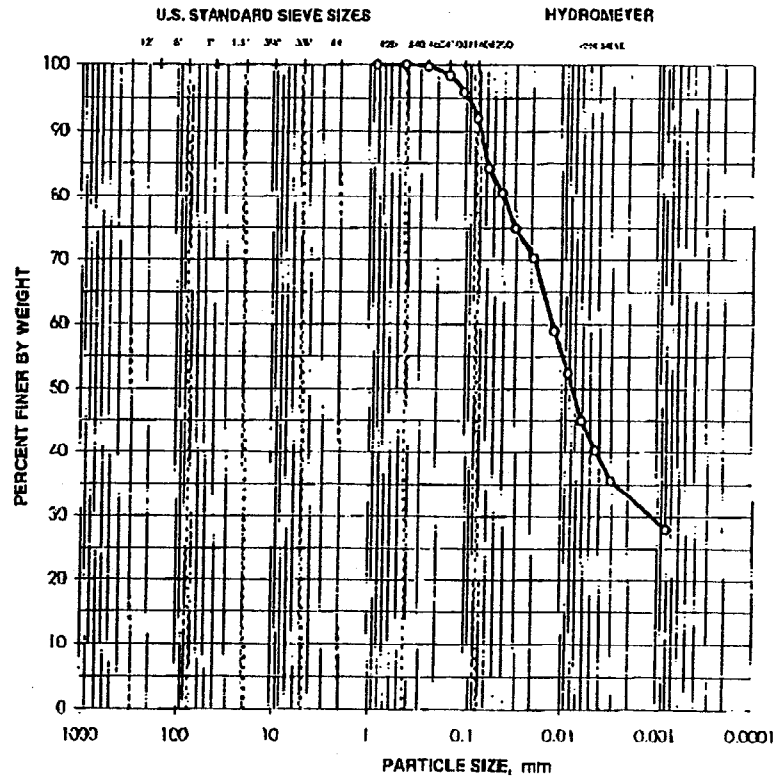
	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	100.0%
	#40	0.425	100.0%
	#60	0.250	99.7%
	#100	0.149	98.4%
	#140	0.106	96.0%
	#200	0.075	92.0%

HYDROMETER ANALYSIS

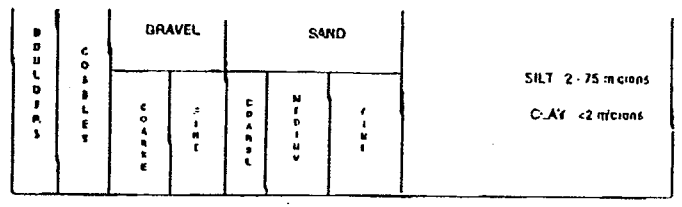
	Diameter mm	Percent Finer
HYDROMETER	0.05688	84.3%
	0.04123	80.5%
	0.03002	74.9%
	0.01936	70.2%
	0.01177	59.0%
	0.00844	52.4%
	0.00616	44.9%
	0.00443	40.3%
	0.00309	35.6%
	0.00081	28.1%

0.0% Gravel 6.0% Sand 92.0% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTS803SS17 — IT LAB SAMPLE NO.: ETDC-10014



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB03SS19

Project No. 783208.00410000

IT Lab Sample No. ETDC-10015
Corrected

Specific Gravity : 2.2488

Moisture Content = 62.6%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	99.6%

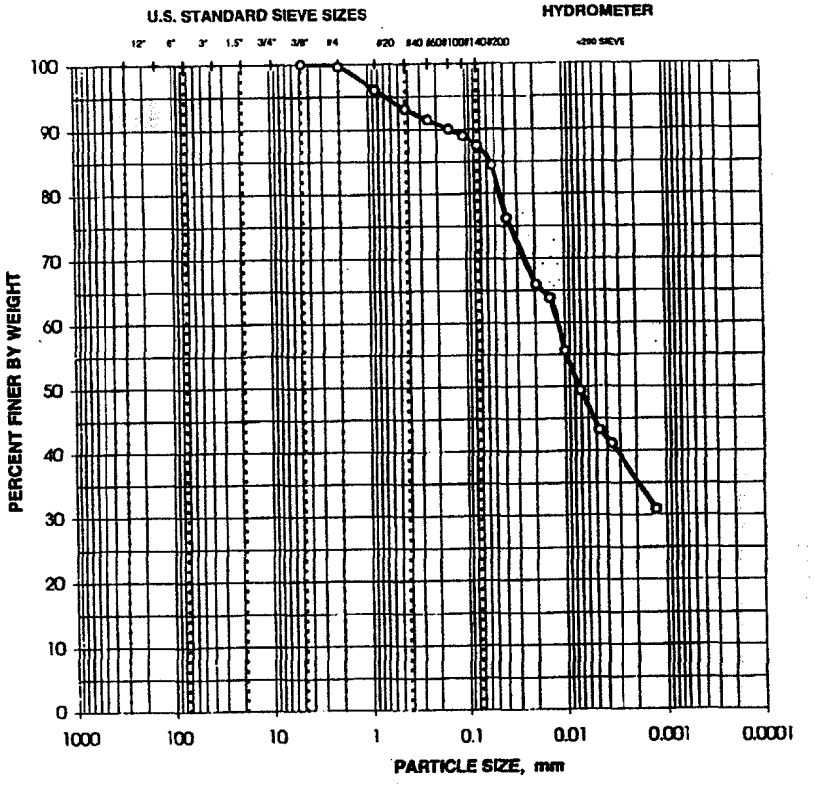
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	96.0%
	#40	0.425	93.1%
	#60	0.250	91.5%
	#100	0.149	90.0%
	#140	0.106	89.0%
	#200	0.075	87.4%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.05311	84.4%
	0.03810	76.2%
	0.01936	65.9%
	0.01419	63.8%
	0.00999	55.6%
	0.00712	49.4%
	0.00471	43.2%
	0.00360	41.2%
	0.00127	30.9%

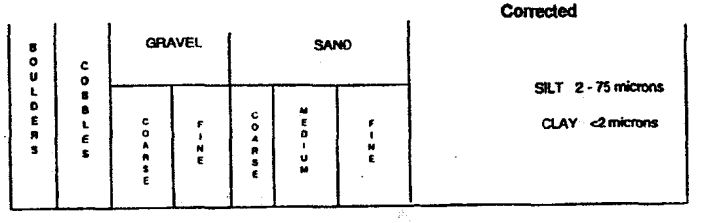
0.0% Gravel 12.6% Sand 87.4% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB03SS19

IT LAB SAMPLE NO.: ETDC-10015
Corrected



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB03SS23

Project No. 783208.00410000

IT Lab Sample No. ETDC-10016
Corrected

Specific Gravity : 2.3817

Moisture Content = 21.3%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	98.7%
	#4	4.750	98.5%
	#10	2.000	98.3%

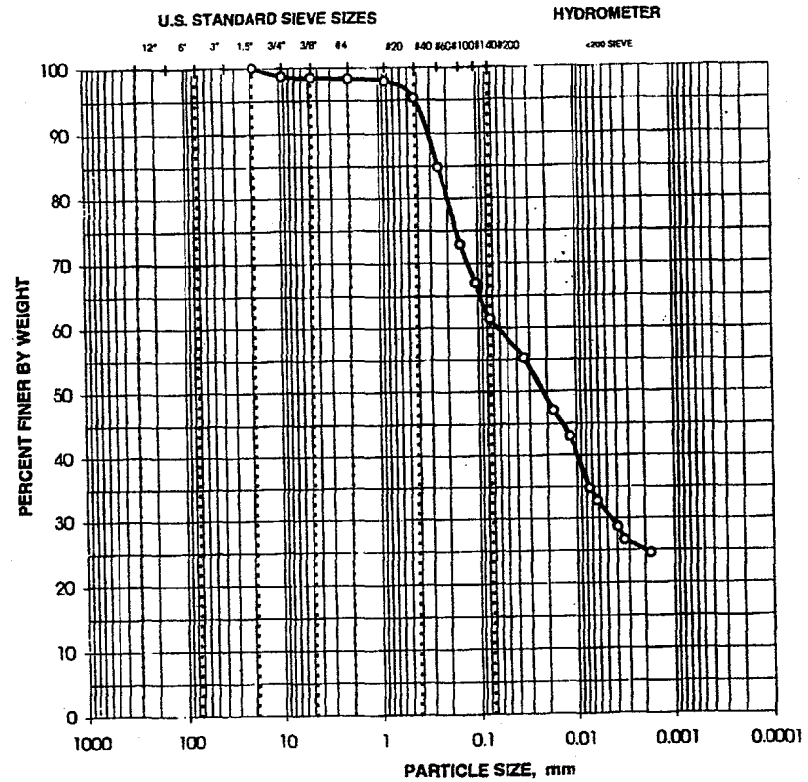
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	97.9%
	#40	0.425	95.3%
	#60	0.250	84.8%
	#100	0.149	72.9%
	#140	0.106	67.0%
	#200	0.075	61.4%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.03401	55.2%
	0.01747	47.0%
	0.01185	42.9%
	0.00751	34.8%
	0.00621	32.7%
	0.00390	28.6%
	0.00335	26.6%
	0.00176	24.5%

1.5% Gravel 37.1% Sand 61.4% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB03SS23

IT LAB SAMPLE NO.: ETDC-10016
Corrected

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB03SS26

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10017

Specific Gravity - 2.0462

Moisture Content = 56.9%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	100.0%

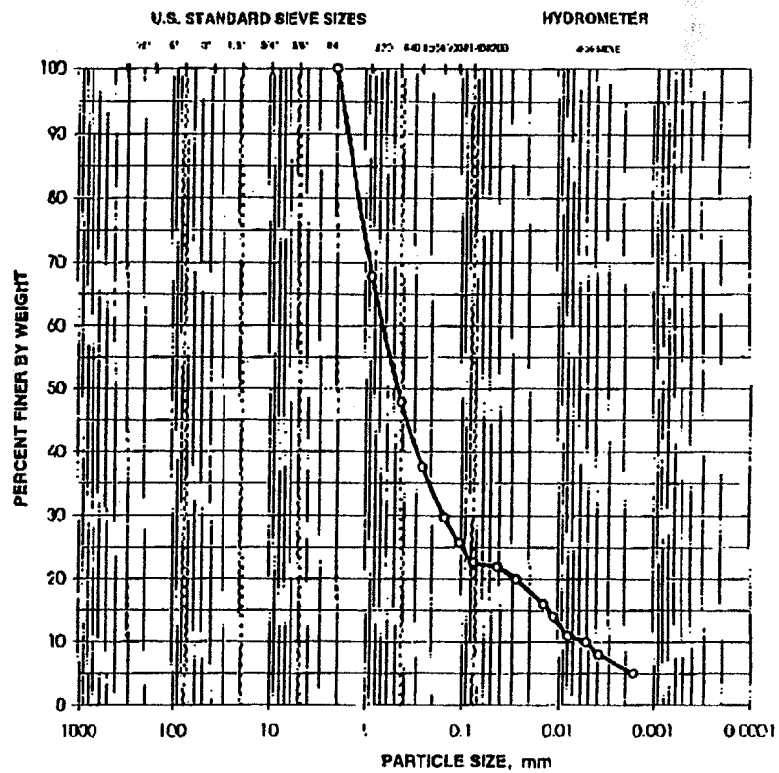
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	67.7%
	#40	0.425	47.8%
	#60	0.250	37.5%
	#100	0.149	29.7%
	#140	0.106	25.8%
	#200	0.075	22.7%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.04256	22.0%
	0.02712	20.0%
	0.01445	16.0%
	0.01127	14.0%
	0.00793	11.0%
	0.00516	10.0%
	0.00383	8.0%
	0.00163	5.0%

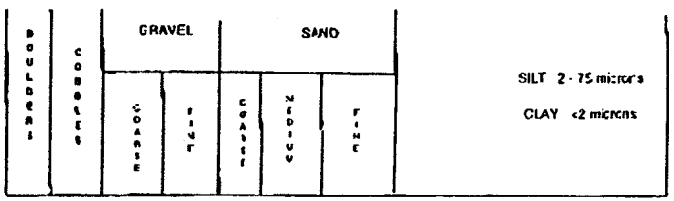
0.0% Gravel 77.3% Sand 22.7% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB03SS26

IT LAB SAMPLE NO.: ETDC-10017



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah — Client Sample No. CCGTS905SS04

Project No. 783208.00410000 — IT Lab Sample No. ETDC-10018

Specific Gravity = 2.6445 — Moisture Content = 26.9% based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	99.1%
	#4	4.750	98.0%
	#10	2.000	97.4%

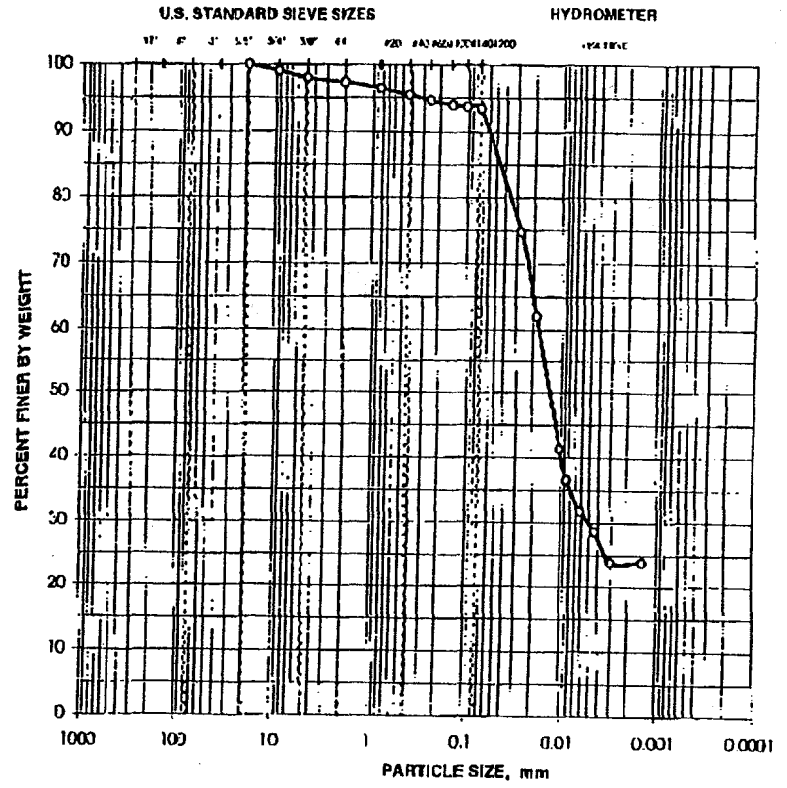
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	96.4%
	#40	0.425	95.5%
	#60	0.250	94.7%
	#100	0.149	94.0%
	#140	0.106	93.7%
	#200	0.075	93.4%

HYDROMETER ANALYSIS

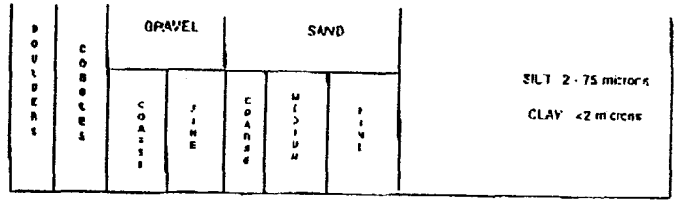
HYDROMETER	Diameter mm	Percent Finer
	0.02735	74.8%
	0.01872	62.0%
	0.01045	41.4%
	0.00869	36.6%
	0.00627	31.8%
	0.00446	28.6%
	0.00298	23.9%
	0.00139	23.9%

2.0% Gravel 4.6% Sand 93.4% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB05SS04 — IT LAB SAMPLE NO.: ETDC-10018



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB05SS06

Project No. 783208.00410000

IT Lab Sample No. ETDC-10019
Corrected

Specific Gravity : 2.0675

Moisture Content = 17.0%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	99.8%

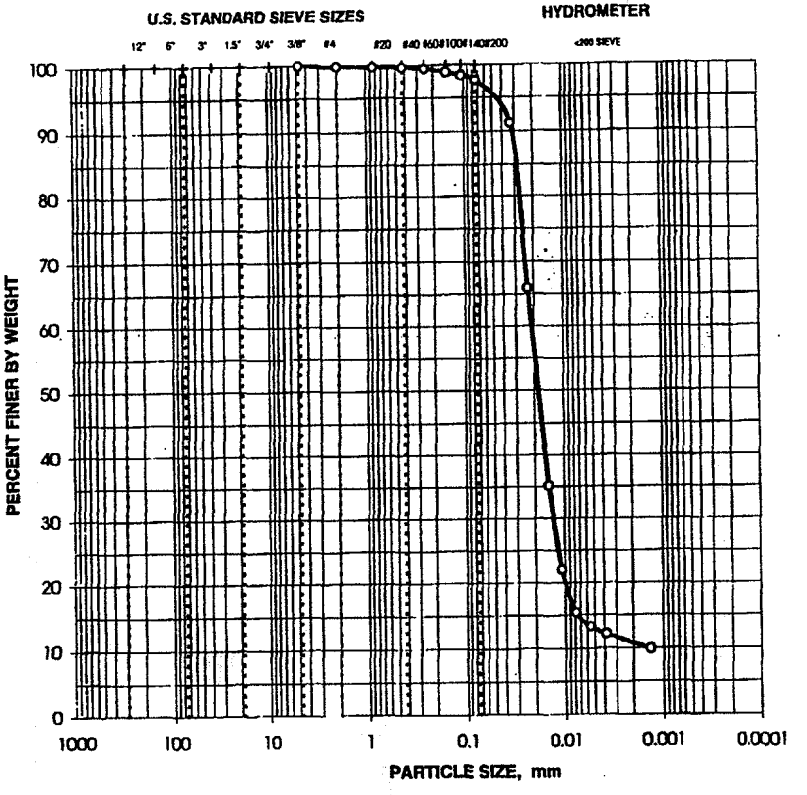
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	99.7%
	#40	0.425	99.6%
	#60	0.250	99.4%
	#100	0.149	98.9%
	#140	0.106	98.3%
	#200	0.075	97.6%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.03295	91.2%
	0.02305	65.9%
	0.01471	35.2%
	0.01080	22.0%
	0.00777	15.4%
	0.00552	13.2%
	0.00384	12.1%
	0.00135	9.9%

0.0% Gravel 2.4% Sand 97.6% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB05SS06

IT LAB SAMPLE NO.: ETDC-10019
Corrected

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB05SS10

Project No.: 783208.0040000

IT Lab Sample No.: ETDC-10020

Specific Gravity = 2.3635

Moisture Content = 15.0%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	90.3%
	0.375"	9.500	79.3%
	#4	4.750	69.8%
	#10	2.000	63.7%

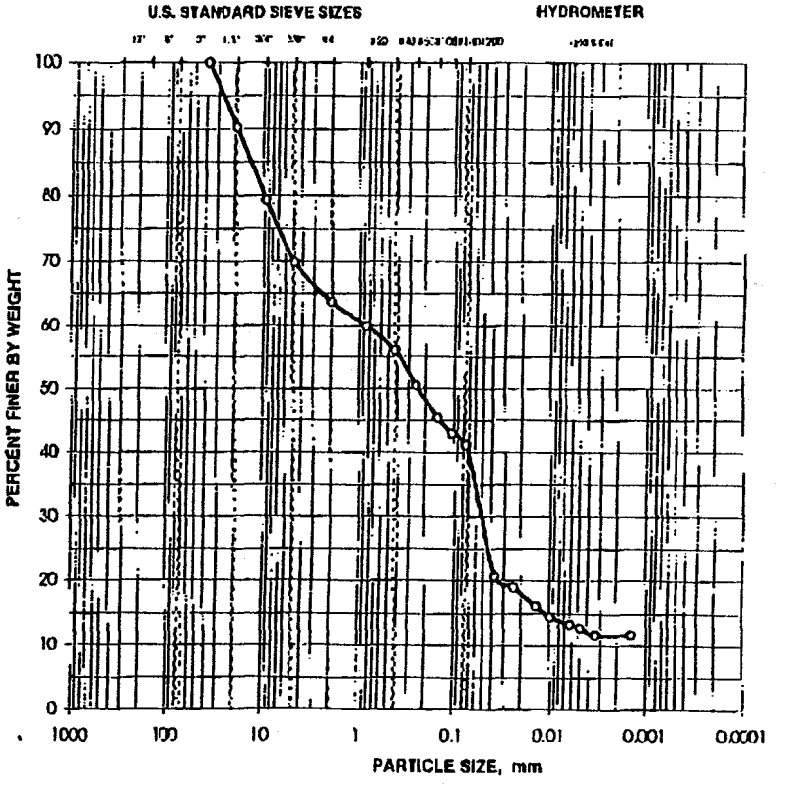
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	59.9%
	#40	0.425	56.0%
	#60	0.250	50.5%
	#100	0.149	45.4%
	#140	0.106	42.9%
	#200	0.075	41.1%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.05149	23.4%
	0.03702	20.6%
	0.02350	18.9%
	0.01367	16.2%
	0.00978	14.5%
	0.00613	13.4%
	0.00477	12.6%
	0.00336	11.7%
	0.00142	11.7%

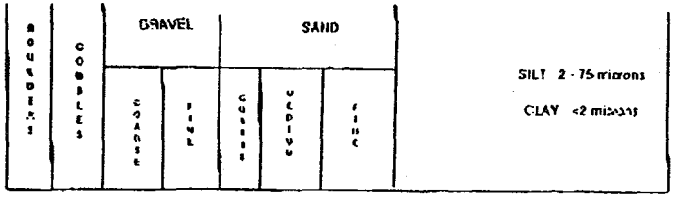
30.2% Gravel 28.7% Sand 41.1% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB05SS10

IT LAB SAMPLE NO.: ETDC-10020



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB05SS14

Project No. 783208.00410000

IT Lab Sample No. ETDC-10021
Corrected

Specific Gravity : 2.4570

Moisture Content = 23.8%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	95.3%
	0.375"	9.500	88.0%
	#4	4.750	84.5%
	#10	2.000	81.7%

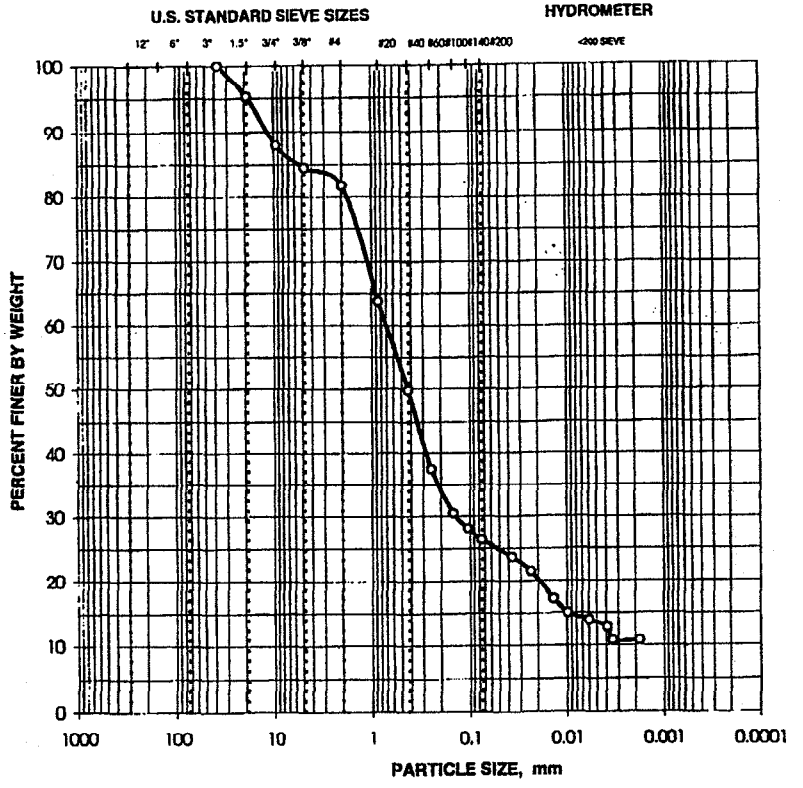
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	63.7%
	#40	0.425	49.8%
	#60	0.250	37.5%
	#100	0.149	30.5%
	#140	0.106	28.2%
	#200	0.075	26.3%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.03692	23.6%
	0.02352	21.5%
	0.01373	17.2%
	0.00978	15.0%
	0.00597	13.9%
	0.00390	12.9%
	0.00342	10.7%
	0.00180	10.7%

15.5% Gravel 58.2% Sand 26.3% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB05SS14

IT LAB SAMPLE NO.: ETDC-10021
Corrected

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB05SS18

Project No. 783208.00410000

IT Lab Sample No. ETDC-10022
Corrected

Specific Gravity : 2.65
assumed for calculations

Moisture Content = 23.7%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	87.7%
	0.375"	9.500	80.7%
	#4	4.750	78.4%
	#10	2.000	73.4%

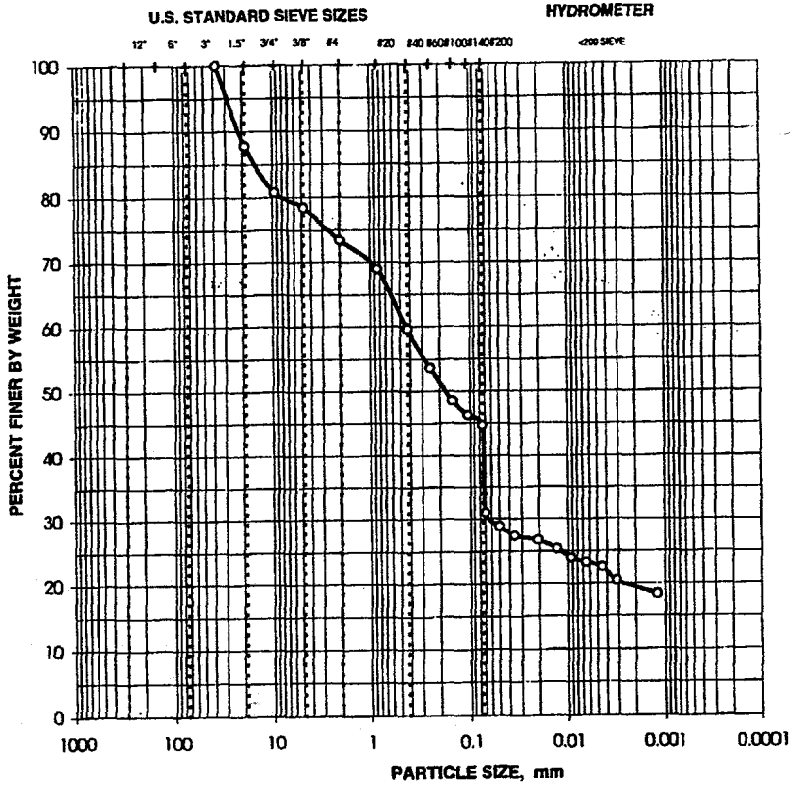
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	68.9%
	#40	0.425	59.6%
	#60	0.250	53.6%
	#100	0.149	48.5%
	#140	0.106	46.2%
	#200	0.075	44.6%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.06991	31.0%
	0.04996	28.9%
	0.03555	27.4%
	0.02061	26.7%
	0.01314	25.3%
	0.00926	23.9%
	0.00649	23.2%
	0.00446	22.5%
	0.00315	20.4%
	0.00121	18.3%

21.6% Gravel 33.7% Sand 44.6% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB05SS18

IT LAB SAMPLE NO.: ETDC-10022
Corrected

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTSB05SS19

Project No. 783208.00410000

IT Lab Sample No. ETDC-10023
Corrected

Specific Gravity : 2.2404

Moisture Content = 66.2%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	100.0%

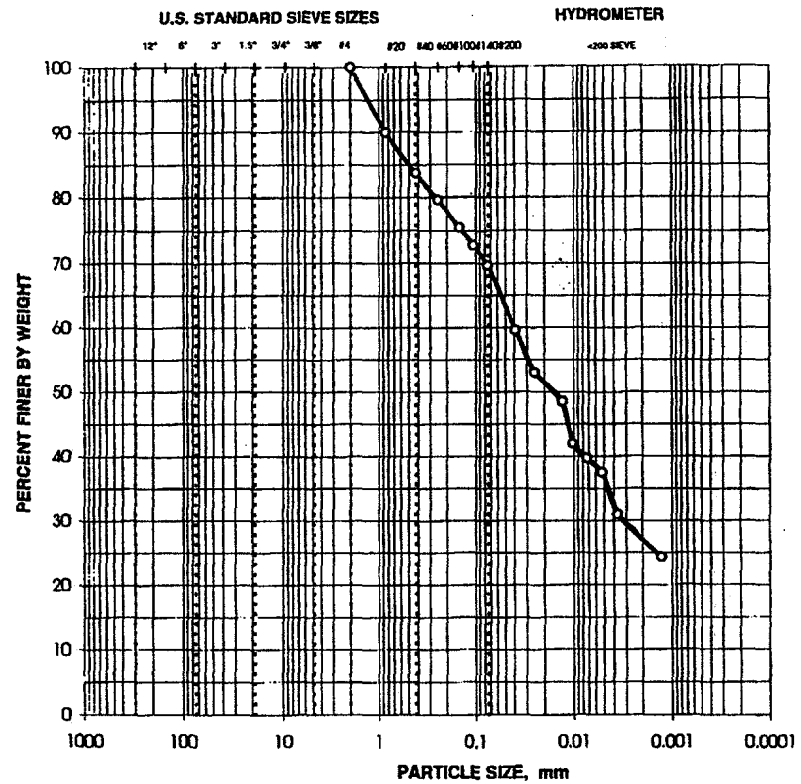
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	90.0%
	#40	0.425	83.7%
	#60	0.250	79.6%
	#100	0.149	75.5%
	#140	0.106	72.7%
	#200	0.075	69.6%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.03932	59.6%
	0.02506	53.0%
	0.01331	48.5%
	0.01040	41.9%
	0.00737	39.7%
	0.00523	37.5%
	0.00366	30.9%
	0.00129	24.3%

0.0% Gravel 30.4% Sand 69.6% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB05SS19

IT LAB SAMPLE NO.: ETDC-10023
Corrected

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTS805SS21

Project No. 783208.00410000

IT Lab Sample No. ETDC-10024
Corrected

Specific Gravity : 2.2337

Moisture Content = 62.3%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	100.0%

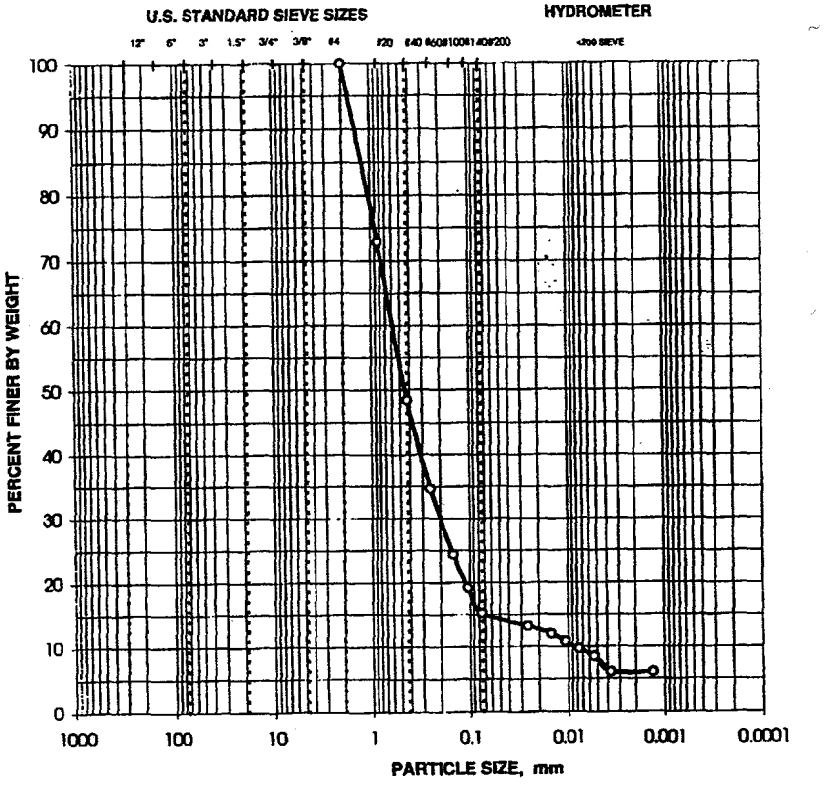
	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	72.9%
	#40	0.425	48.5%
	#60	0.250	34.6%
	#100	0.149	24.4%
	#140	0.106	19.2%
	#200	0.075	15.3%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.02607	13.2%
	0.01511	12.0%
	0.01072	10.8%
	0.00760	9.6%
	0.00539	8.4%
	0.00371	6.0%
	0.00131	6.0%

0.0% Gravel 84.7% Sand 15.3% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB05SS21

IT LAB SAMPLE NO.: ETDC-10024
Corrected

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTS606SS03

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10029

Specific Gravity: 2.6487

Moisture Content = 29.2%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	99.8%

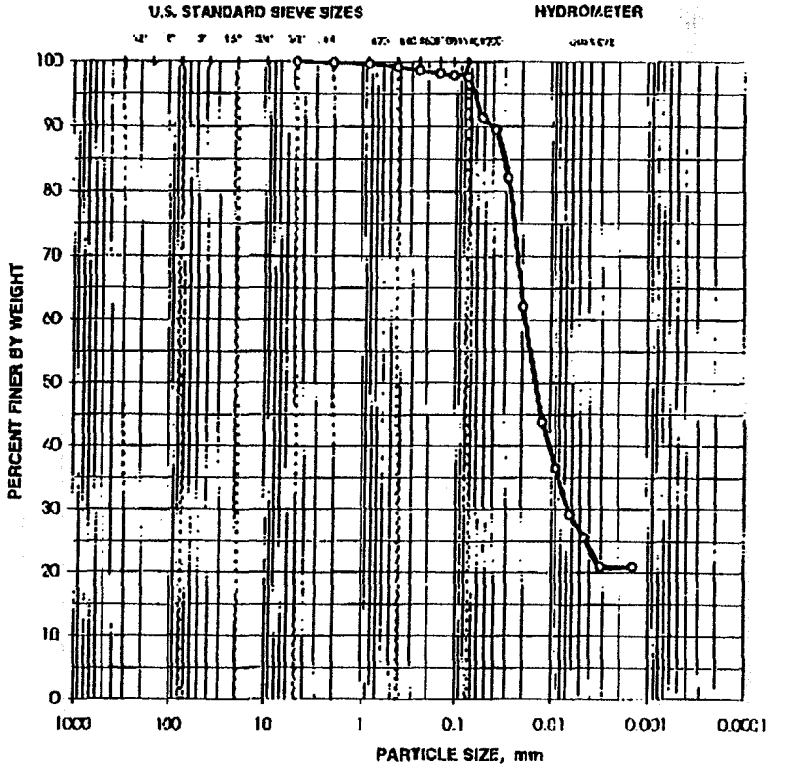
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	99.6%
	#40	0.425	99.2%
	#60	0.250	98.6%
	#100	0.149	98.2%
	#140	0.106	97.9%
	#200	0.075	97.7%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.02788	82.1%
	0.01954	62.0%
	0.01223	43.8%
	0.00887	36.5%
	0.00638	29.2%
	0.00456	25.5%
	0.00310	21.0%
	0.00141	21.0%

0.0% Gravel 2.3% Sand 97.7% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB06SS03

IT LAB SAMPLE NO.: ETDC-10029

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB06SS06

Project No.: 783206.00410000

IT Lab Sample No.: ETDC-10030

Specific Gravity = 2.6420

Moisture Content = 22.0%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	98.5%
	#4	4.750	97.9%
	#10	2.000	97.5%

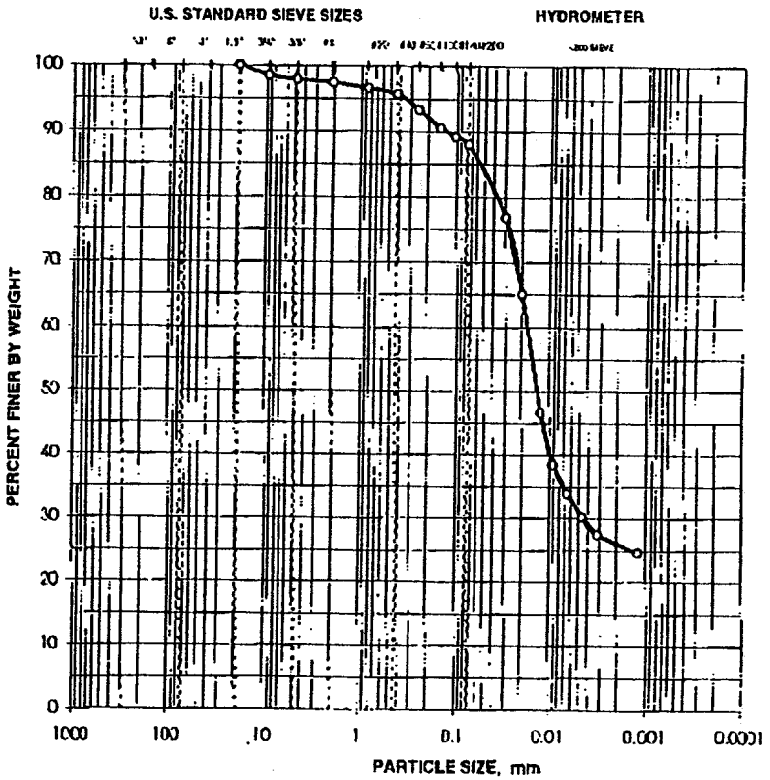
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	96.6%
	#40	0.425	95.7%
	#60	0.250	93.3%
	#100	0.149	90.5%
	#140	0.106	89.2%
	#200	0.075	88.1%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.02986	76.9%
	0.02008	65.0%
	0.01256	46.7%
	0.00918	38.6%
	0.00652	33.9%
	0.00460	30.2%
	0.00319	27.5%
	0.00123	24.7%

2.1% Gravel 9.9% Sand 88.1% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB06SS06

IT LAB SAMPLE NO.: ETDC-10030

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB06SS10

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10031

Specific Gravity: 2.6460

Moisture Content = 13.3%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	98.7%
	0.375"	9.500	95.4%
	#4	4.750	92.6%
	#10	2.000	90.9%

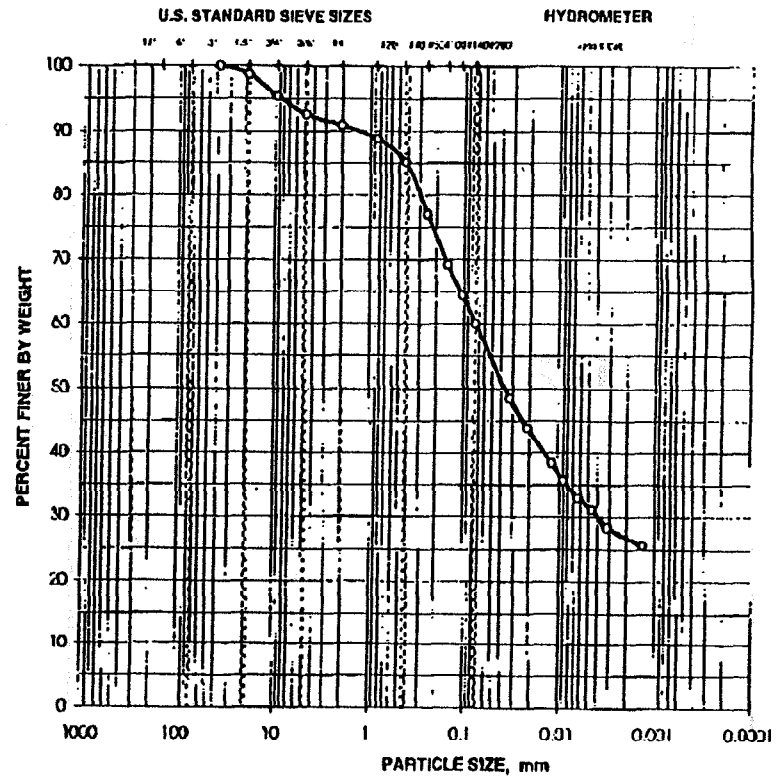
	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	88.8%
	#40	0.425	85.2%
	#60	0.250	77.1%
	#100	0.149	69.2%
	#140	0.106	64.5%
	#200	0.075	60.1%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.03290	48.5%
	0.02118	43.9%
	0.01174	38.4%
	0.00891	35.7%
	0.00638	32.9%
	0.00453	31.1%
	0.00317	28.4%
	0.00133	25.6%

7.4% Gravel 32.5% Sand 60.1% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB06SS10

IT LAB SAMPLE NO.: ETDC-10031

BOULDERS	COBBLES	GRAVEL		SAND			SILT 2 - 75 microns CLAY <2 microns
		COARSE	FINE	COARSE	MEDIUM	FINE	

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB06SS14

Project No.: 78320B.004 10000.

IT Lab Sample No.: ETDC-10032

Specific Gravity - 2.6067

Moisture Content = 16.3%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	89.2%
	0.375"	9.500	63.6%
	#4	4.750	45.7%
	#10	2.000	31.8%

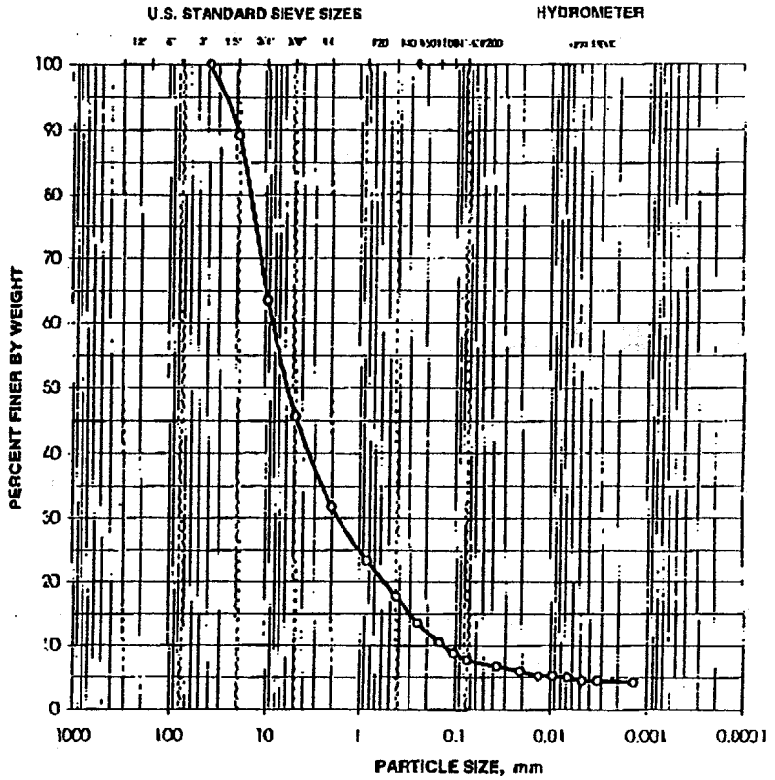
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	23.4%
	#40	0.425	17.7%
	#60	0.250	13.5%
	#100	0.149	10.5%
	#140	0.106	8.8%
	#200	0.075	7.7%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.07140	7.2%
	0.05059	7.0%
	0.03591	6.7%
	0.02069	6.0%
	0.01336	5.2%
	0.00945	5.2%
	0.00670	5.0%
	0.00476	4.5%
	0.00330	4.5%
	0.00138	4.2%

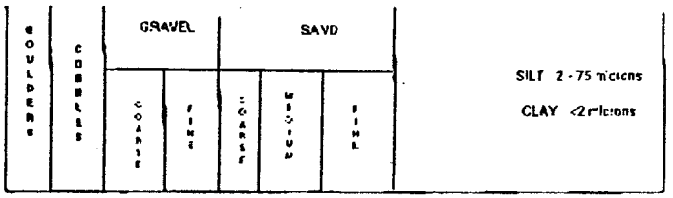
54.3% Gravel 38.0% Sand 7.7% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB06SS14

IT LAB SAMPLE NO.: ETDC-10032



;423 482 1890 # 32/ 47

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB06SS18

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10033

Specific Gravity = 2.6411

Moisture Content = 17.8%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	97.7%
	0.375"	9.500	86.3%
	#4	4.750	78.6%
	#10	2.000	73.7%

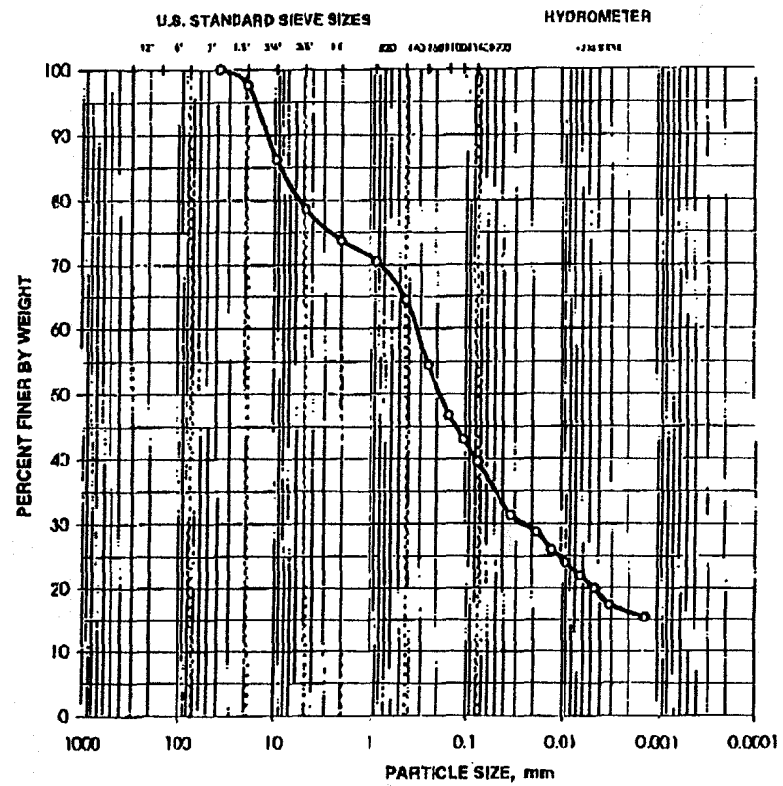
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	70.5%
	#40	0.425	64.4%
	#60	0.250	54.5%
	#100	0.149	46.7%
	#140	0.106	43.0%
	#200	0.075	39.5%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.06681	35.4%
	0.04685	34.0%
	0.03357	31.4%
	0.01822	28.7%
	0.01260	26.0%
	0.00902	24.0%
	0.00635	22.0%
	0.00454	20.0%
	0.00315	17.3%
	0.00134	15.3%

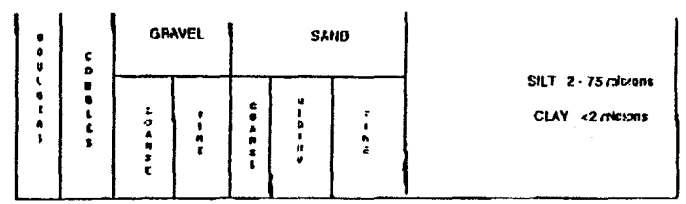
21.4% Gravel 39.1% Sand 39.5% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB06SS18

IT LAB SAMPLE NO.: ETDC-10033



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PARTICLE-SIZE DISTRIBUTION
ASTM D 422

Project Name Bechtel Jacobs Paducah

Project No. 783208.00410000

Field Sample No. CCGTSB06SS20

IT Lab Sample No. ETDC-10034

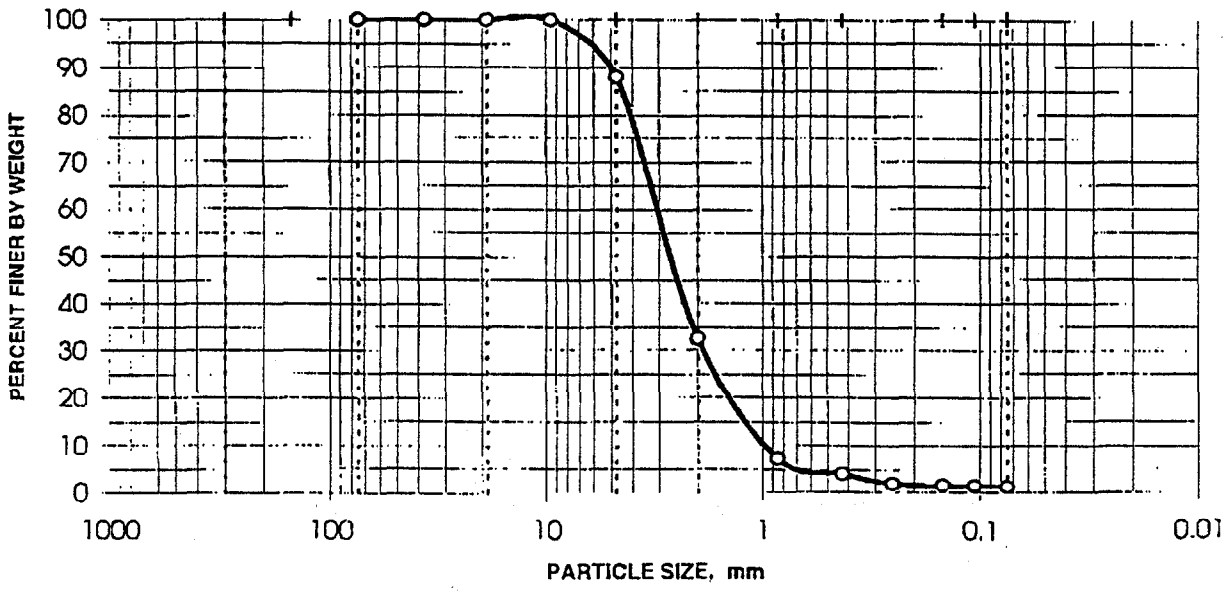
Moisture Content = 11.2%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	88.0%
	#10	2.000	32.6%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	7.2%
	#40	0.425	4.0%
	#60	0.250	1.9%
	#100	0.149	1.5%
	#140	0.106	1.4%
	#200	0.075	1.2%

DISTRIBUTION CURVE



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah — Client Sample No. CCGTS808SS22

Project No. 783205.00410000 — IT Lab Sample No. ETDC-10035

Specific Gravity : 2.4953 — Moisture Content = 66.7% based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	100.0%

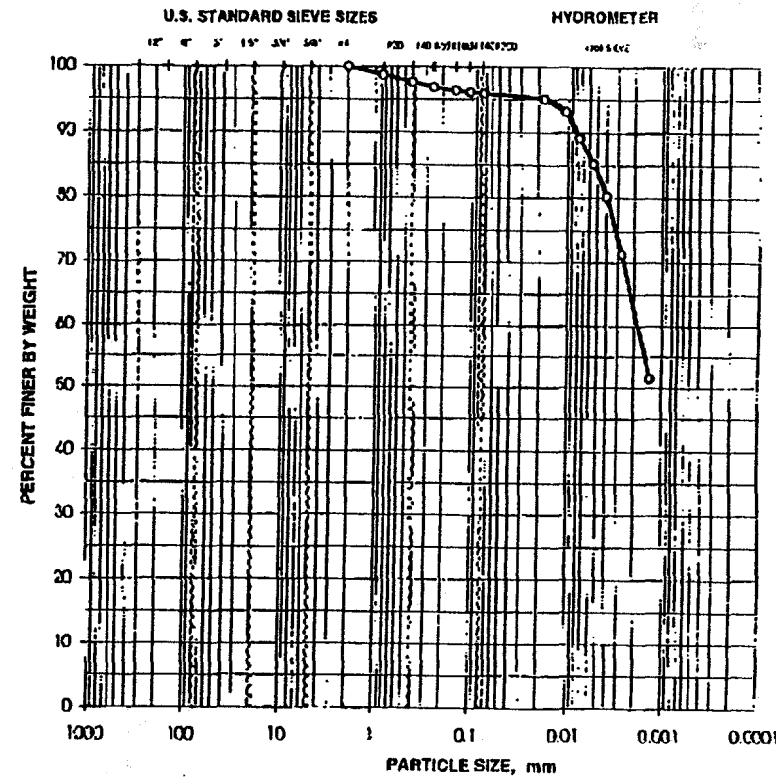
	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	98.6%
	#40	0.425	97.6%
	#60	0.250	95.9%
	#100	0.149	95.4%
	#140	0.106	95.2%
	#200	0.075	95.9%

HYDROMETER ANALYSIS

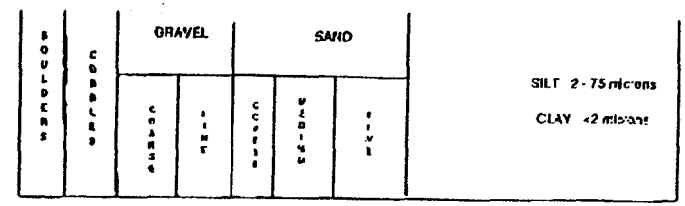
	Diameter mm	Percent Finer
HYDROMETER		
	0.01793	95.1%
	0.01049	93.1%
	0.00756	89.2%
	0.00542	85.2%
	0.00392	80.2%
	0.00271	71.3%
	0.00135	51.5%

0.0% Gravel 4.1% Sand 95.9% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTS808SS22 — IT LAB SAMPLE NO.: ETDC-10035



;423 482 1890 # 35/ 47

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTSB06SS23

Project No.: 785208.00410000

IT Lab Sample No.: ETDC-10036

Specific Gravity: 2.5048

Moisture Content = 18.8%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	100.0%

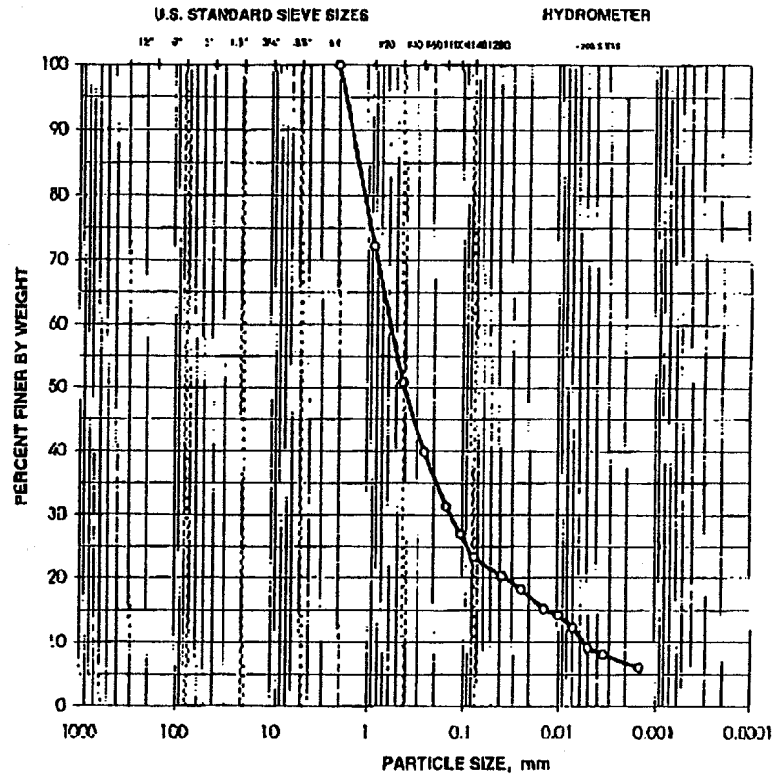
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	72.2%
	#40	0.425	50.9%
	#60	0.250	39.8%
	#100	0.149	31.4%
	#140	0.106	27.0%
	#200	0.075	23.4%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.05344	21.3%
	0.03792	20.2%
	0.02407	18.2%
	0.01405	15.2%
	0.00985	14.2%
	0.00699	12.1%
	0.00499	9.1%
	0.00347	8.1%
	0.00145	6.1%

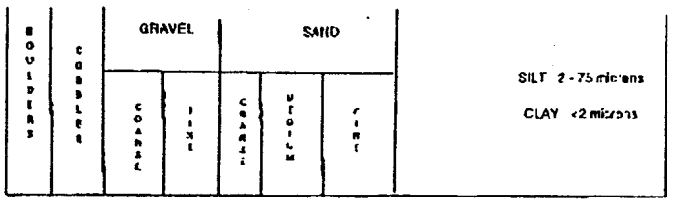
0.0% Gravel 76.6% Sand 23.4% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTSB06SS23

IT LAB SAMPLE NO.: ETDC-10036



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTD602SS03

Project No.: 783208.C0410000

IT Lab Sample No.: ETDC-10037

Specific Gravity: 2.6173

Moisture Content = 18.7%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	99.7%
	#4	4.750	99.5%
	#10	2.000	98.9%

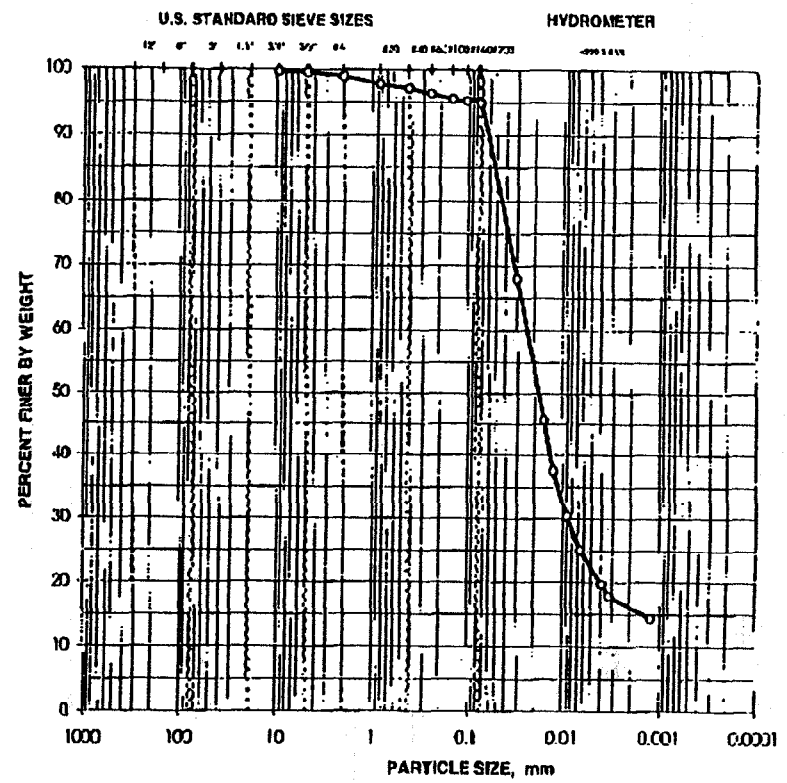
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	97.8%
	#40	0.425	97.2%
	#60	0.250	96.4%
	#100	0.149	95.6%
	#140	0.106	95.3%
	#200	0.075	94.9%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.04167	73.3%
	0.03001	68.0%
	0.01582	45.6%
	0.01250	37.6%
	0.00906	30.4%
	0.00653	25.0%
	0.00390	19.7%
	0.00324	17.9%
	0.00123	14.3%

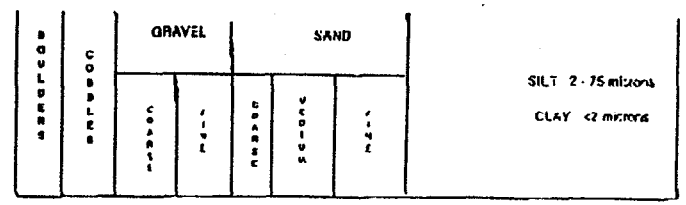
0.5% Gravel 4.6% Sand 94.9% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTD302SS03

IT LAB SAMPLE NO.: ETDC-10037



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTDB02SS07

Project No. 783208.00410000

IT Lab Sample No. ETDC-10038

Specific Gravity = 2.6276

Moisture Content = 24.3%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	99.9%
	#10	2.000	99.6%

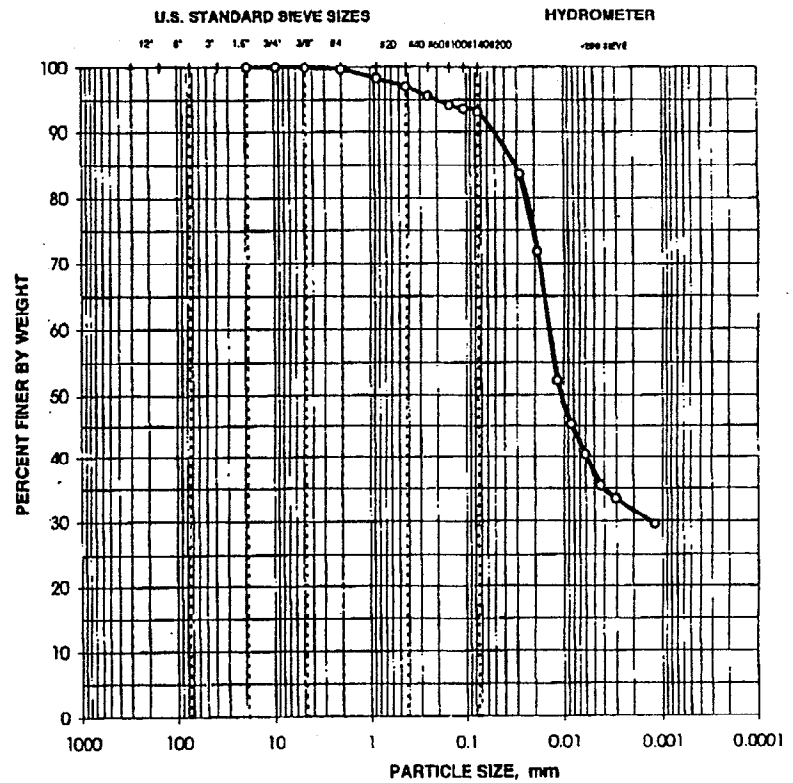
	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.860	98.3%
	#40	0.425	97.0%
	#60	0.250	95.6%
	#100	0.149	94.2%
	#140	0.106	93.6%
	#200	0.075	93.1%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.03823	90.6%
	0.02797	83.7%
	0.01867	71.8%
	0.01172	52.2%
	0.00848	45.3%
	0.00611	40.4%
	0.00440	35.4%
	0.00306	33.5%
	0.00121	29.5%

0.1% Gravel 6.8% Sand 93.1% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTDB02SS07

IT LAB SAMPLE NO.: ETDC-10038

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Project No.: 783208.00410000

Client Sample No.: CCGTDB02SS11

IT Lab Sample No.: ETDC-10039

Specific Gravity = 2.6267

Moisture Content = 21.7%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	99.4%
	#4	4.750	97.7%
	#10	2.000	95.9%

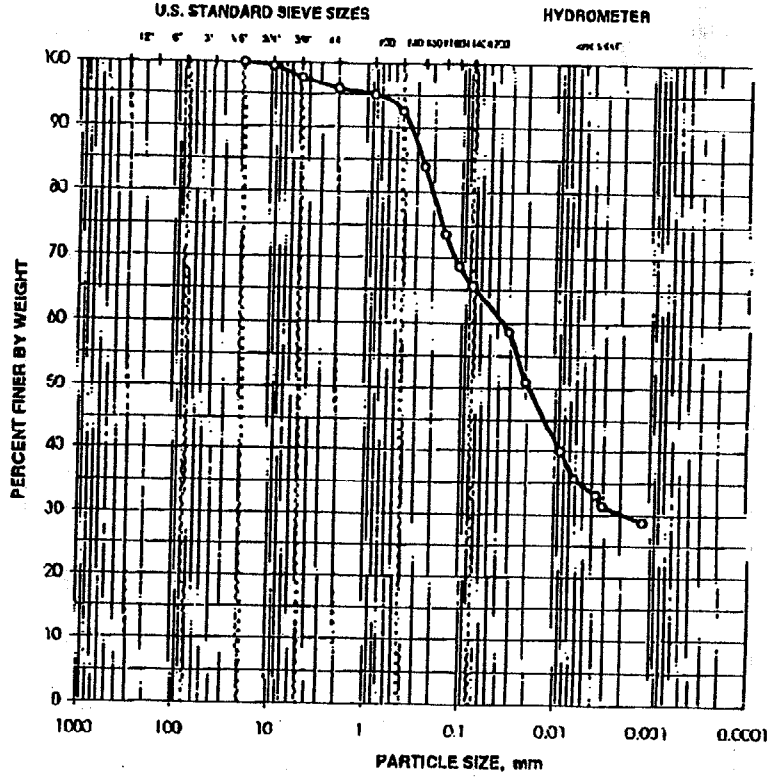
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	95.0%
	#40	0.425	92.5%
	#60	0.250	83.9%
	#100	0.149	73.6%
	#140	0.106	68.6%
	#200	0.075	65.6%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.05002	63.7%
	0.04324	60.5%
	0.03082	56.6%
	0.02023	51.0%
	#N/A	43.3%
	0.00367	39.9%
	0.00626	35.7%
	0.00367	33.1%
	0.00311	31.4%
	0.00119	28.9%

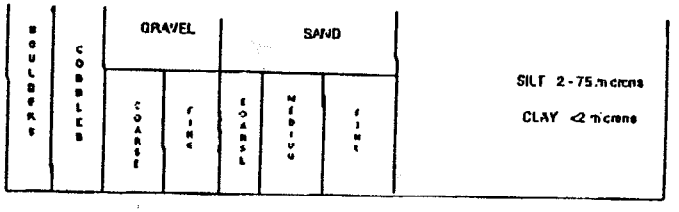
2.4% Gravel 32.1% Sand 65.6% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTDB02SS11

IT LAB SAMPLE NO.: ETDC-10039



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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTDB02SS14

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10040

Specific Gravity: 2.6274

Moisture Content = 19.9%
Based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	97.2%
	#4	4.750	95.0%
	#10	2.000	93.8%

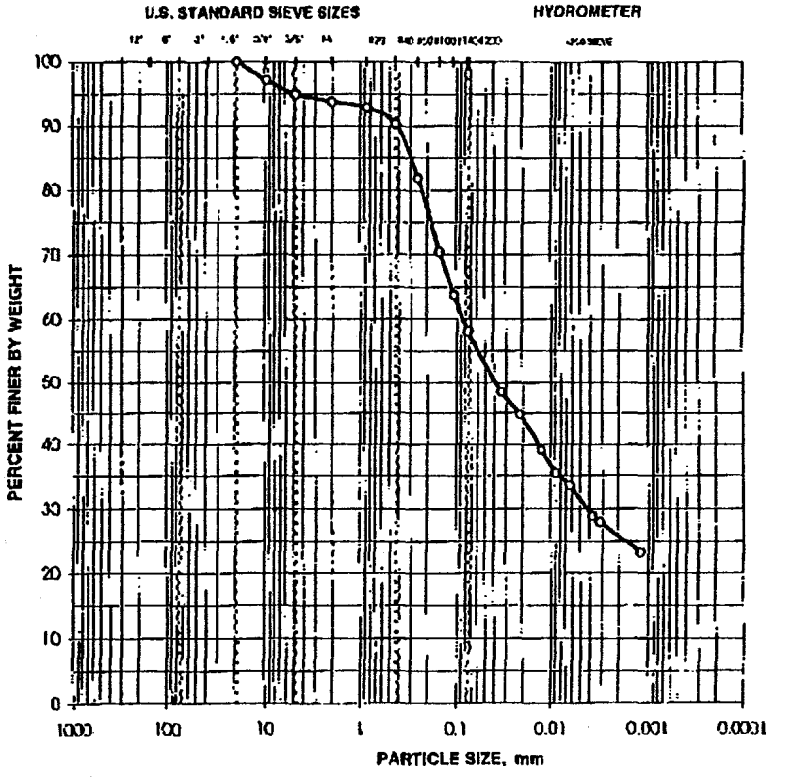
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	92.9%
	#40	0.425	90.3%
	#60	0.250	81.9%
	#100	0.149	70.4%
	#140	0.106	63.7%
	#200	0.075	58.0%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.06481	56.9%
	0.04626	54.0%
	0.03348	48.4%
	0.02118	44.7%
	0.01250	39.1%
	0.00895	35.4%
	0.00638	33.5%
	0.00377	28.9%
	0.00315	27.9%
	0.00120	23.3%

5.0% Gravel 37.0% Sand 58.0% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTDB02SS14

IT LAB SAMPLE NO.: ETDC-10040

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTDB02SS17

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10041

Specific Gravity = 2.6991

Moisture Content = 24.9%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	99.9%
	#4	4.750	99.6%
	#10	2.000	99.5%

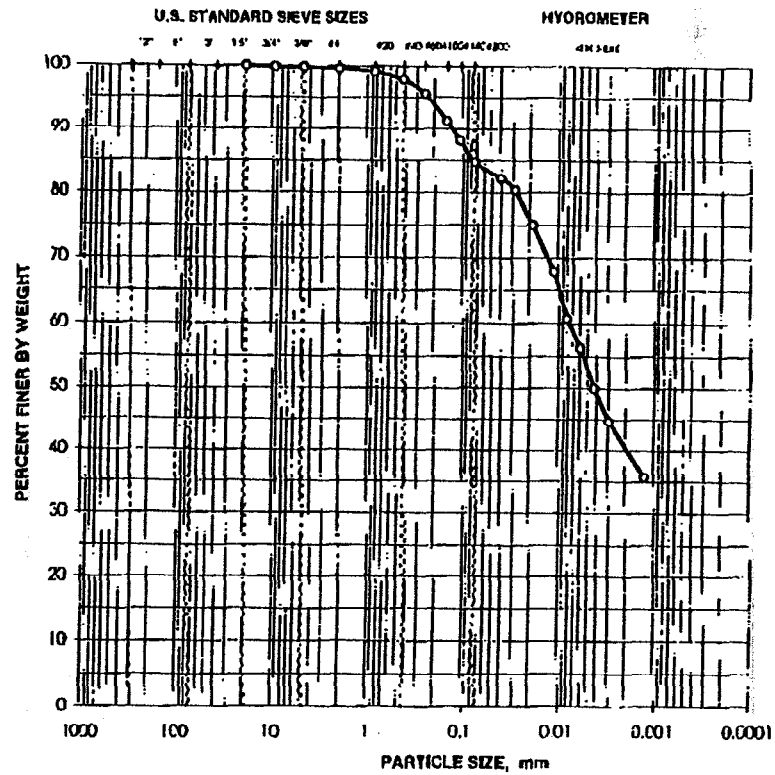
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	99.1%
	#40	0.425	97.6%
	#60	0.250	95.6%
	#100	0.149	91.3%
	#140	0.106	88.1%
	#200	0.075	84.7%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.05568	82.2%
	0.04008	82.2%
	0.02852	80.4%
	0.01860	75.0%
	0.01118	67.9%
	0.00816	60.7%
	0.00590	56.3%
	0.00421	50.0%
	0.00296	44.7%
	0.00126	35.7%

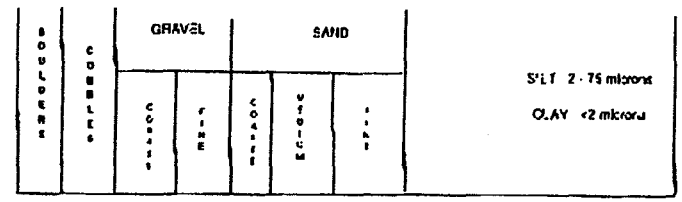
0.2% Gravel 15.1% Sand 84.7% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTDB02SS17

IT LAB SAMPLE NO.: ETDC-10041



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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTD802SS19

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10042

Specific Gravity: 2.6044

Moisture Content = 21.5%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	97.7%
	0.375"	9.500	96.2%
	#4	4.750	92.9%
	#10	2.000	87.2%

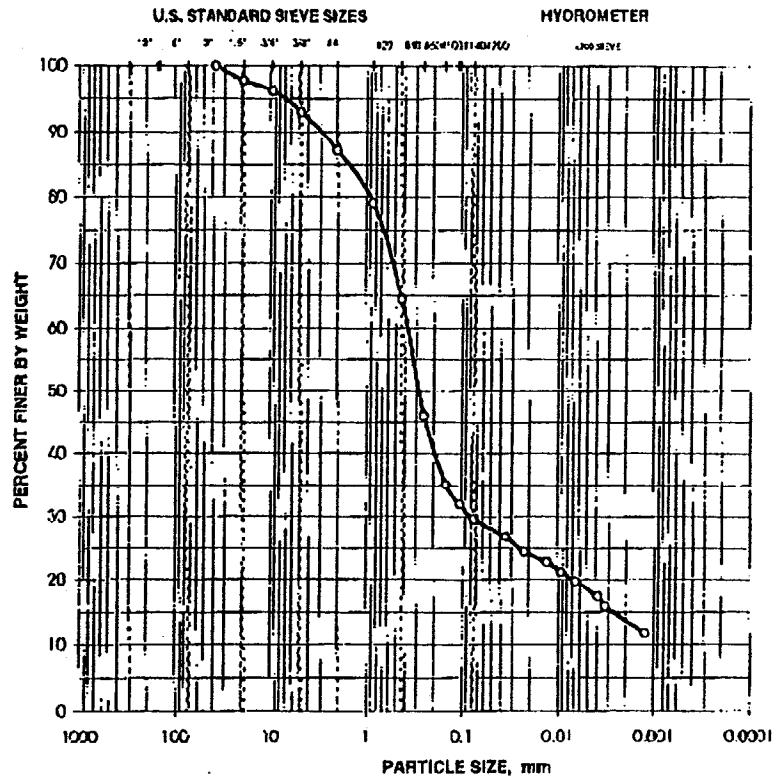
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	79.1%
	#40	0.425	64.4%
	#60	0.250	45.0%
	#100	0.149	35.1%
	#140	0.106	32.0%
	#200	0.075	29.6%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.03598	26.8%
	0.02245	24.4%
	0.01304	22.9%
	0.00927	21.3%
	0.00659	19.7%
	0.00385	17.3%
	0.00324	15.8%
	0.00124	11.8%

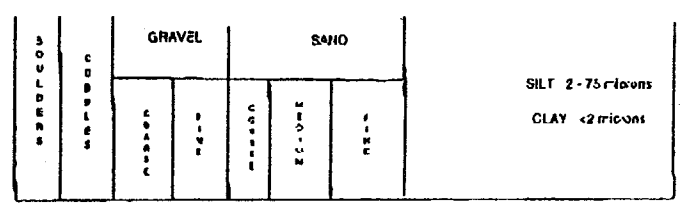
7.1% Gravel 63.3% Sand 29.6% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTD802SS19

IT LAB SAMPLE NO.: ETDC-10042



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTDB02SS21

Project No. 783208.00410000

IT Lab Sample No. ETDC-10043

Specific Gravity = 2.6613

Moisture Content = 24.7%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	99.9%
	#10	2.000	99.9%

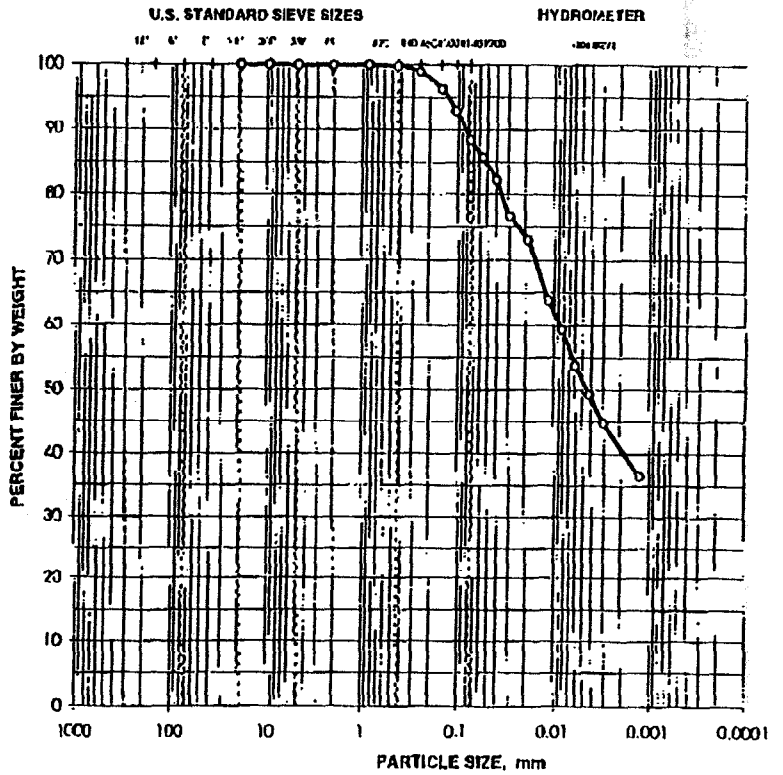
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	99.9%
	#40	0.425	99.7%
	#60	0.250	98.6%
	#100	0.149	95.3%
	#140	0.106	92.9%
	#200	0.075	88.4%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.05595	85.6%
	0.04033	82.1%
	0.02941	76.7%
	0.01904	73.0%
	0.01148	63.9%
	0.00628	59.3%
	0.00600	53.8%
	0.00427	49.3%
	0.00297	44.7%
	0.00126	36.5%

0.1% Gravel 11.5% Sand 88.4% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTDB02SS21

IT LAB SAMPLE NO.: ETDC-10043

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTDB02SS24

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10044

Specific Gravity: 2.6358

Moisture Content = 18.7%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	96.8%
	#4	4.750	91.4%
	#10	2.000	86.6%

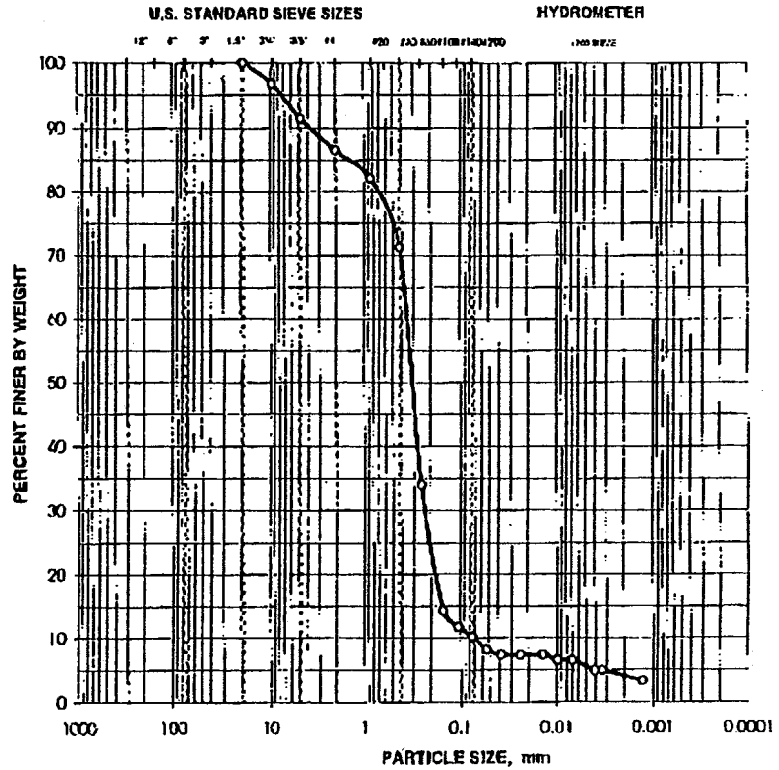
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	82.1%
	#40	0.425	71.2%
	#60	0.250	34.0%
	#100	0.149	14.3%
	#140	0.106	11.7%
	#200	0.075	10.1%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.05342	8.1%
	0.03791	7.3%
	0.02397	7.3%
	0.01384	7.3%
	0.00982	6.5%
	0.00694	6.5%
	0.00485	4.9%
	0.00335	4.9%
	0.00128	3.2%

8.6% Gravel 61.3% Sand 10.1% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTDB02SS24

IT LAB SAMPLE NO.: ETDC-10044

BOULDERS	COBBLES	GRAVEL		SAND			SILT 2 - 75 microns CLAY <2 microns
		COARSE	FINE	COARSE	MEDIUM	FINE	

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PARTICLE-SIZE DISTRIBUTION
ASTM D 422

Project Name Bechtel Jacobs Paducah

Project No. 783208.00410000

Field Sample No. CCGTDB02SS27

IT Lab Sample No. ETDC-10045

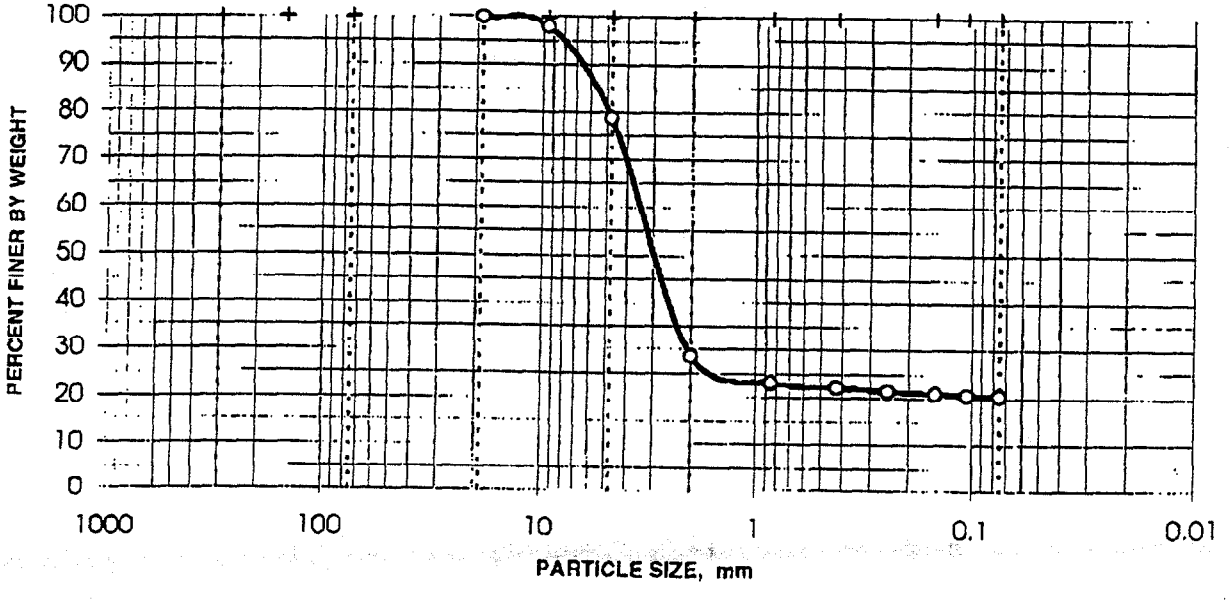
Moisture Content = 21.0%
based on dry sample weight

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	98.0%
	#4	4.750	78.7%
	#10	2.000	28.6%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	23.1%
	#40	0.425	22.3%
	#60	0.250	21.5%
	#100	0.149	20.9%
	#140	0.106	20.7%
	#200	0.075	20.5%

DISTRIBUTION CURVE



PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name Bechtel Jacobs Paducah

Client Sample No. CCGTDB02SS30

Project No. 783238.00410000

IT Lab Sample No. ETDC-10046

Specific Gravity : 2.5341

Moisture Content = 61.4%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	100.0%

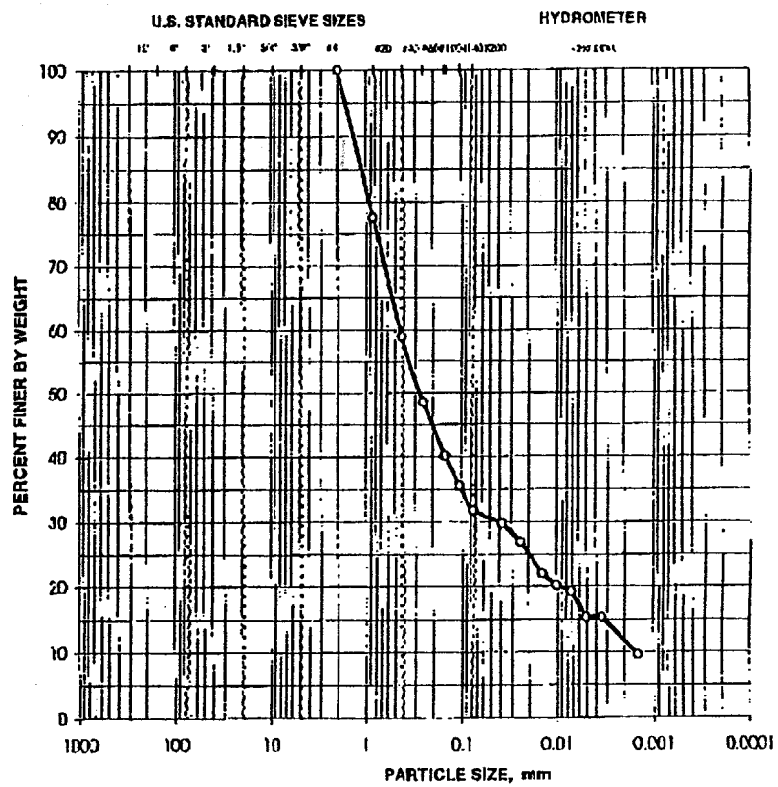
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	77.6%
	#40	0.425	58.9%
	#60	0.250	48.5%
	#100	0.149	40.1%
	#140	0.106	35.6%
	#200	0.075	31.7%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.03807	29.7%
	0.02427	26.6%
	0.01422	22.0%
	0.01013	20.1%
	0.00719	19.2%
	0.00508	15.3%
	0.00347	15.3%
	0.00145	9.6%

0.0% Gravel 68.3% Sand 31.7% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTDB02SS30

IT LAB SAMPLE NO.: ETDC-10046

BOULDERS	COBBLES	GRAVEL		SAND			SILT 2 - 75 microns CLAY <2 microns
		COARSE	FINE	COARSE	MEDIUM	FINE	

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTDB02SS31

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10047

Specific Gravity: 2.5219

Moisture Content = 65.7%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	99.6%
	#4	4.750	99.5%
	#10	2.000	99.4%

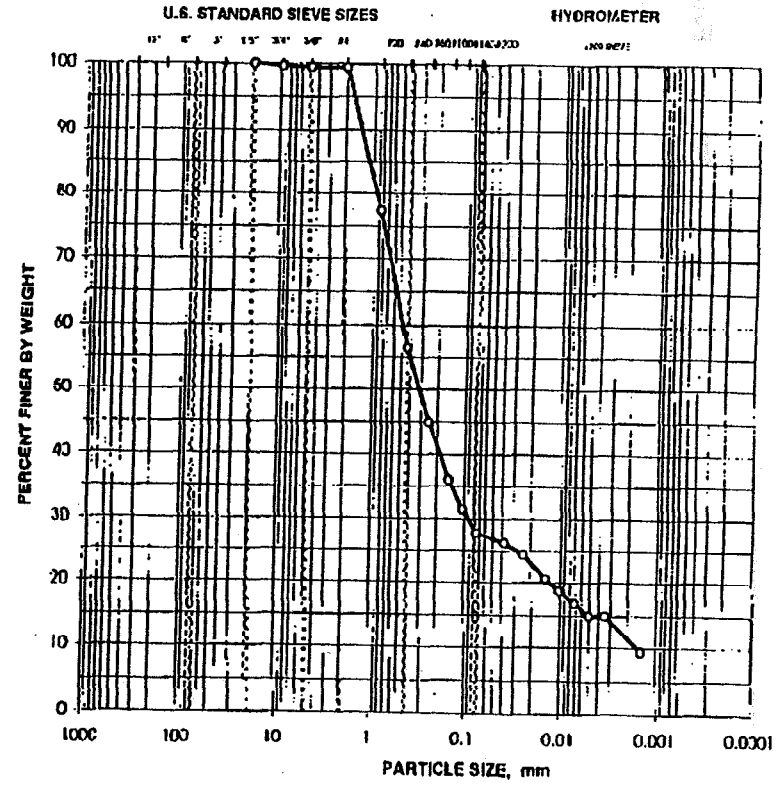
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	77.3%
	#40	0.425	56.5%
	#60	0.250	44.9%
	#100	0.149	36.0%
	#140	0.106	31.4%
	#200	0.075	27.8%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.07585	30.0%
	0.05405	28.1%
	0.03837	26.2%
	0.02445	24.3%
	0.01428	20.6%
	0.01017	16.7%
	0.00713	16.8%
	0.00508	15.0%
	0.00347	15.0%
	0.00145	9.4%

0.5% Gravel 71.7% Sand 27.8% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTDB02SS31

IT LAB SAMPLE NO.: ETDC-10047

BOULDERS	COBBLES	GRAVEL		SAND			
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT 2 - 75 microns CLAY <2 microns

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name: Bechtel Jacobs Paducah

Client Sample No.: CCGTDB02SS32

Project No.: 783208.00410000

IT Lab Sample No.: ETDC-10048

Specific Gravity: 2.5148

Moisture Content = 60.0%
based on dry sample weight

SIEVE ANALYSIS

COARSE	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	100.0%
	0.75"	19.000	100.0%
	0.375"	9.500	100.0%
	#4	4.750	100.0%
	#10	2.000	99.9%

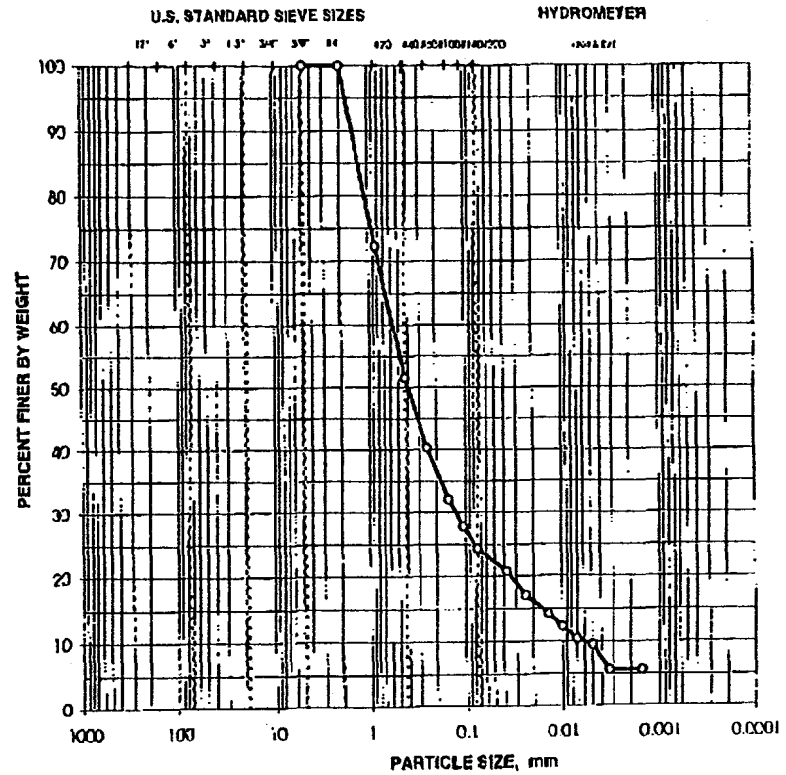
FINE	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	72.2%
	#40	0.425	51.6%
	#60	0.250	40.4%
	#100	0.149	32.0%
	#140	0.106	27.7%
	#200	0.075	24.3%

HYDROMETER ANALYSIS

HYDROMETER	Diameter mm	Percent Finer
	0.03765	20.8%
	0.02407	17.0%
	0.01405	14.2%
	0.00993	12.3%
	0.00701	10.4%
	0.00492	9.4%
	0.00336	5.7%
	0.00154	5.7%

0.0% Gravel 75.7% Sand 24.3% Silt/Clay

Bechtel Jacobs Paducah



CLIENT SAMPLE NO.: CCGTDB02SS32

IT LAB SAMPLE NO.: ETDC-10048

BOULDERS	COBBLES	GRAVEL		SAND			SILT 2 - 75 microns CLAY <2 microns
		COARSE	FINE	COARSE	MEDIUM	FINE	

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HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

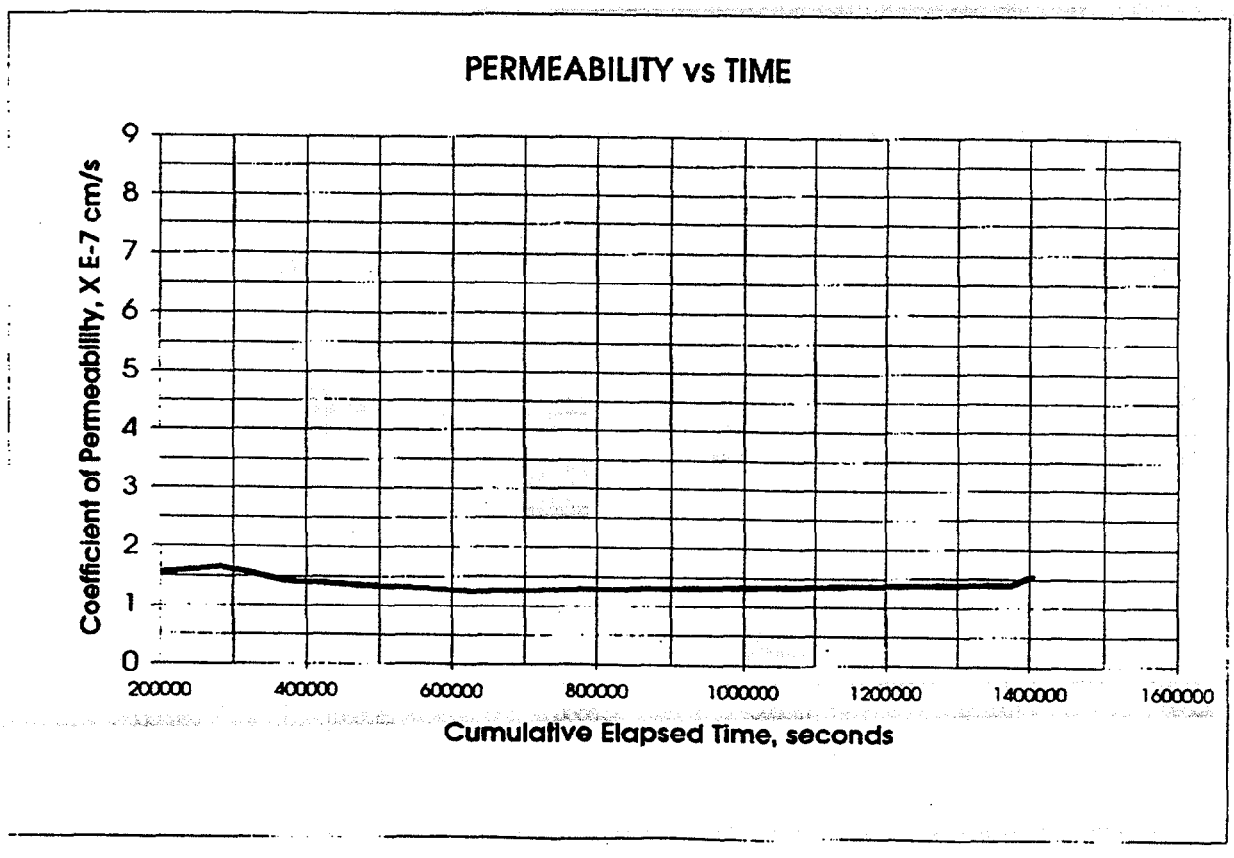
PROJECT NAME: Bechtel Jacobs Paducah
PROJECT NO. 783208.00410000

CLIENT SAMPLE NO. CCGTSB01ST01
IT LAB SAMPLE NO. ETDC-9984

	INITIAL	FINAL
Specimen diameter, cm	7.21	
Specimen length, cm	5.73	
Wet weight of specimen, g.	474.94	381.73
Specimen cross-sect. area, cm	40.7731	
Water content, %	28.5	24.7
Wet unit weight, pcf	126.9	
Dry unit weight, pcf	98.8	
Estimated degree of saturation	111.9	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	12.3
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	3.0
Total backpressure, psi	3.0

Coefficient of Permeability, cm/s 1.4E-07



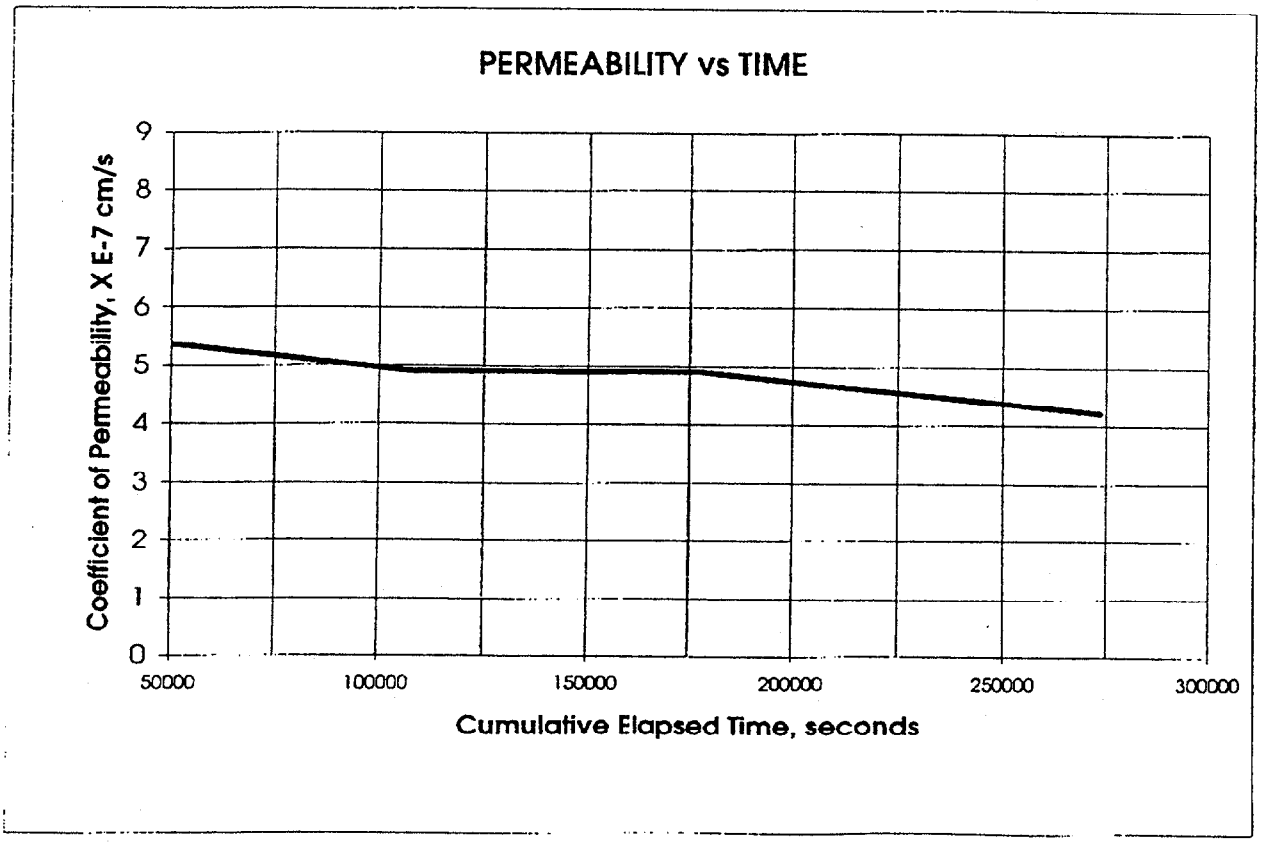
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB01ST02
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9985

	INITIAL	FINAL
Specimen diameter, cm	7.17	
Specimen length, cm	6.26	
Wet weight of specimen, g.	523.31	
Specimen cross-sect. area, cm	40.4193	
Water content, %	20.4	
Wet unit weight, pcf	129.0	
Dry unit weight, pcf	107.1	
Estimated degree of saturatior	99.5	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	11.2
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	3.0
Total backpressure, psi	5.0

Coefficient of Permeability, cm/s 4.9E-07



HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

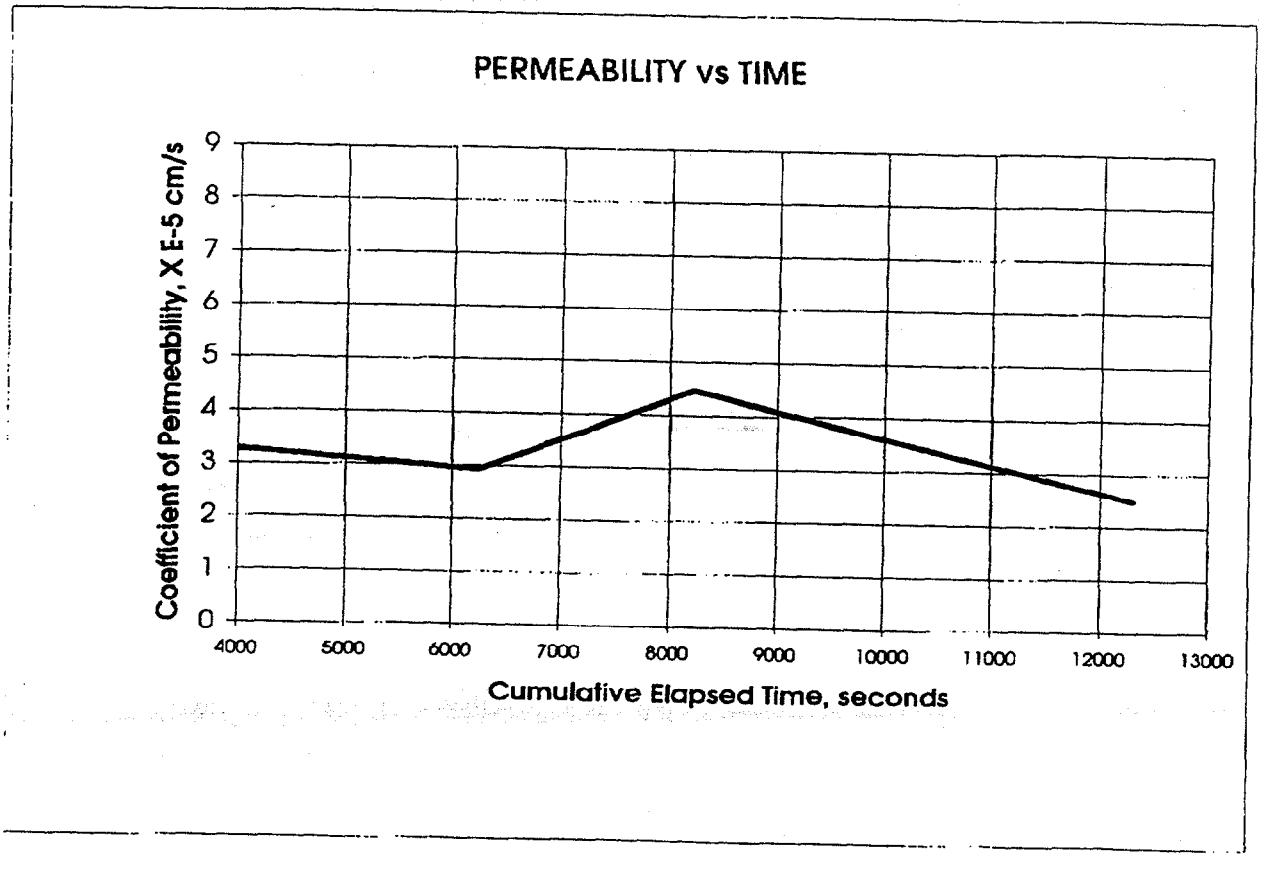
PROJECT NAME: Bechtel Jacobs Paducah
PROJECT NO. 783208.00410000

CLIENT SAMPLE NO. CCGTSB01ST05
IT LAB SAMPLE NO. ETDC-9988

	INITIAL	FINAL
Specimen diameter, cm	7.23	
Specimen length, cm	6.51	
Wet weight of specimen, g.	404.48	
Specimen cross-sect. area, cm	40.9986	
Water content, %	57.3	
Wet unit weight, pcf	94.6	
Dry unit weight, pcf	60.2	
Estimated degree of saturatior	86.8	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	5.4
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	2.5
Total backpressure, psi	12.5

Coefficient of Permeability, cm/s 3.3E-05



HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

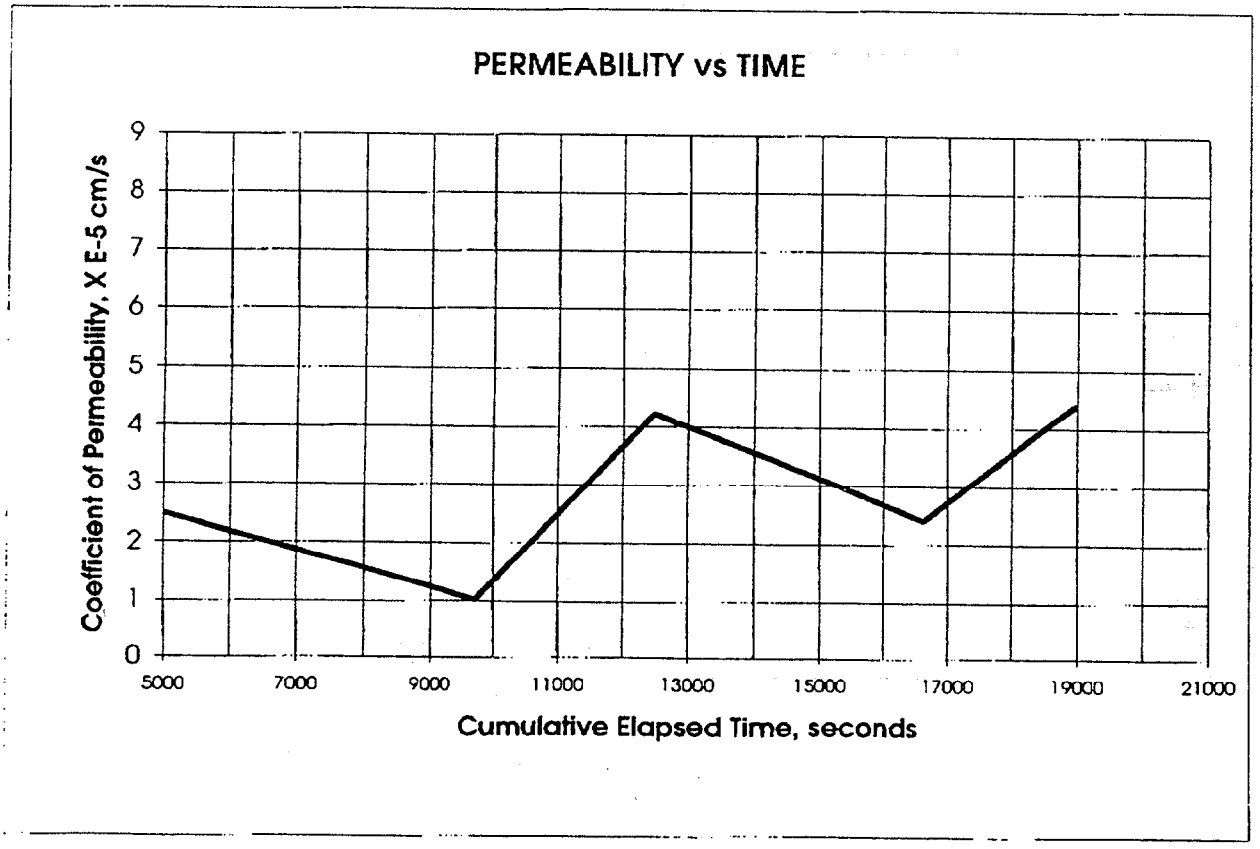
PROJECT NAME: Bechtel Jacobs Paducah
PROJECT NO. 783208.00410000

CLIENT SAMPLE NO. CCGTSB01ST06
IT LAB SAMPLE NO. ETDC-9990

	INITIAL	FINAL
Specimen diameter, cm	7.27	
Specimen length, cm	7.73	
Wet weight of specimen, g.	488.43	
Specimen cross-sect. area, cm	41.4563	
Water content, %	59.6	
Wet unit weight, pcf	95.1	
Dry unit weight, pcf	59.6	
Estimated degree of saturatior	89.0	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	4.6
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	2.5
Total backpressure, psi	12.5

Coefficient of Permeability, cm/s 3.0E-05



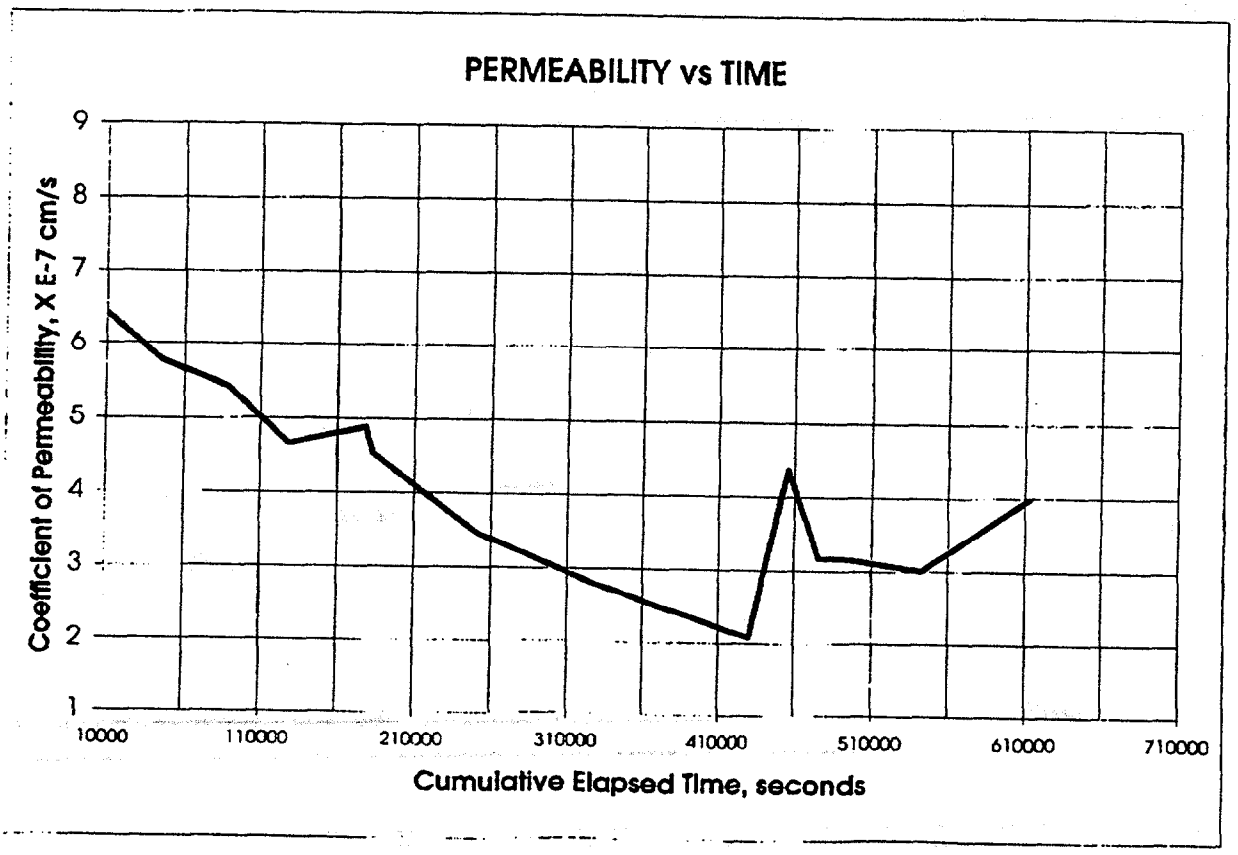
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB02ST01
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9961

	INITIAL	FINAL
Specimen diameter, cm	7.12	
Specimen length, cm	6.28	
Wet weight of specimen, g.	497.37	256.5
Specimen cross-sect. area, cm	39.8394	
Water content, %	28.6	27.0
Wet unit weight, pcf	124.2	
Dry unit weight, pcf	96.5	
Estimated degree of saturatior	106.3	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	22.4
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	4.0
Total backpressure, psi	3.0

Coefficient of Permeability, cm/s 3.3E-07



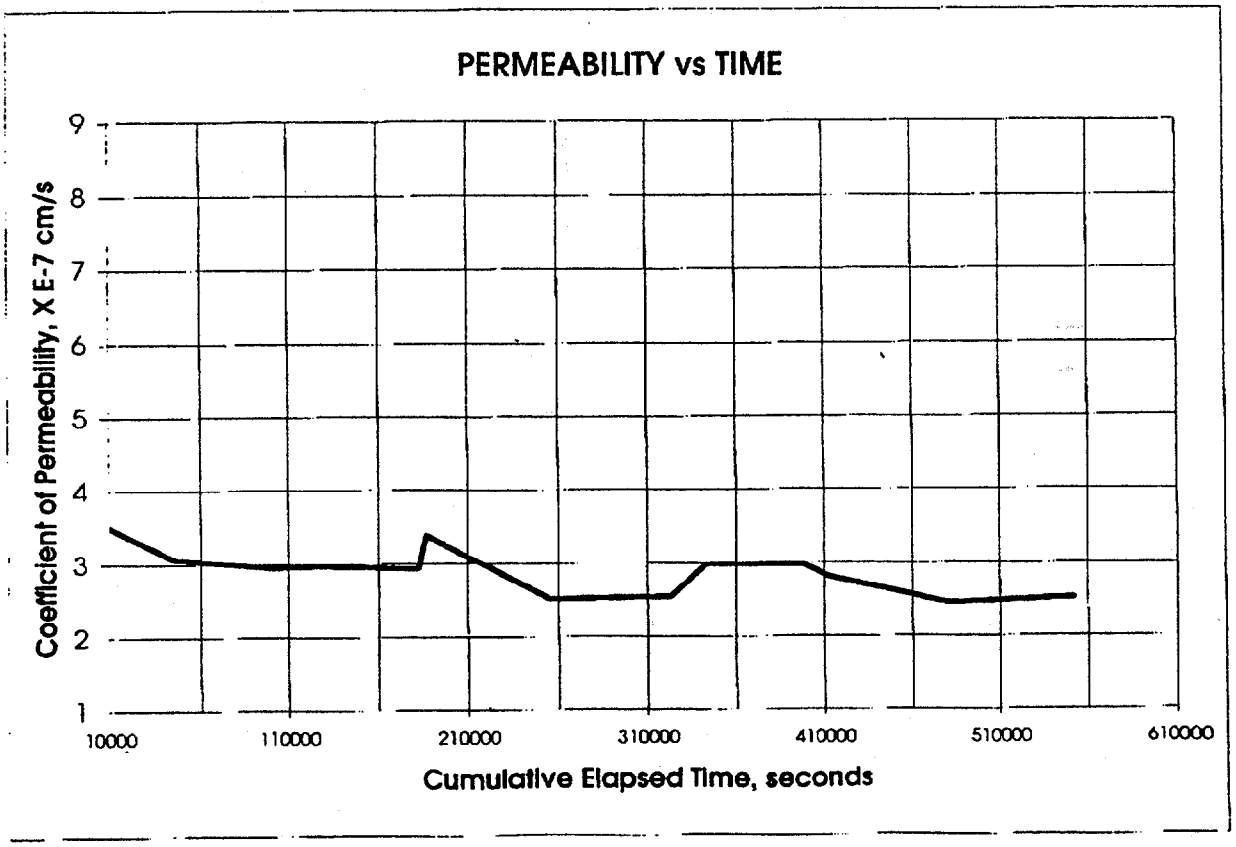
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB02ST02
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9960

	INITIAL	FINAL
Specimen diameter, cm	7.22	
Specimen length, cm	4.47	
Wet weight of specimen, g.	373.82	274.83
Specimen cross-sect. area, cm	40.9938	
Water content, %	22.5	23.0
Wet unit weight, pcf	127.4	
Dry unit weight, pcf	104.0	
Estimated degree of saturatior	101.0	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	31.5
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	4.0
Total backpressure, psi	4.0

Coefficient of Permeability, cm/s 2.7E-07



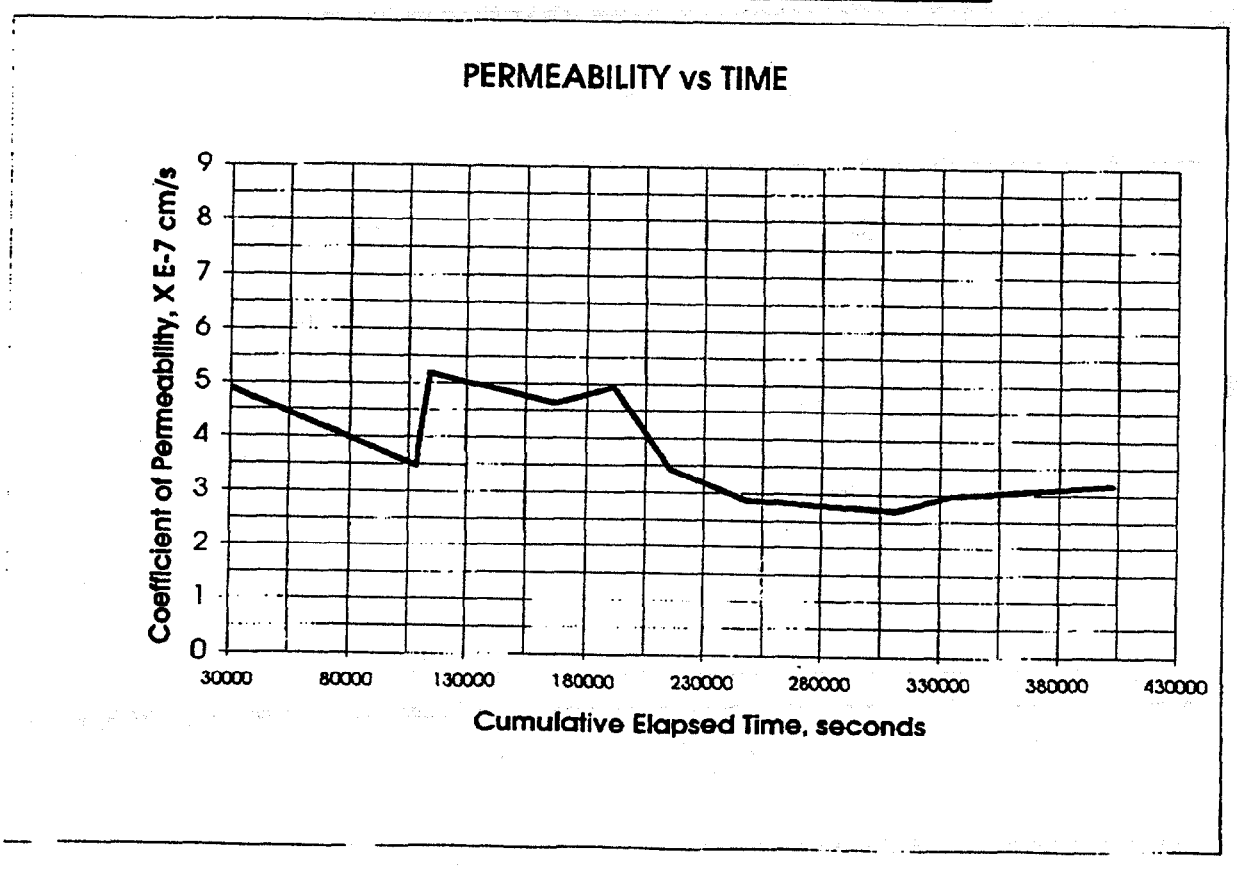
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB02ST03
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9986

	INITIAL	FINAL
Specimen diameter, cm	7.20	
Specimen length, cm	6.63	
Wet weight of specimen, g.	578.77	287.15
Specimen cross-sect. area, cm	40.6869	
Water content, %	17.8	18.5
Wet unit weight, pcf	133.9	
Dry unit weight, pcf	113.6	
Estimated degree of saturatior	103.6	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	21.2
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	4.0
Total backpressure, psi	26.0

Coefficient of Permeability, cm/s 2.9E-07



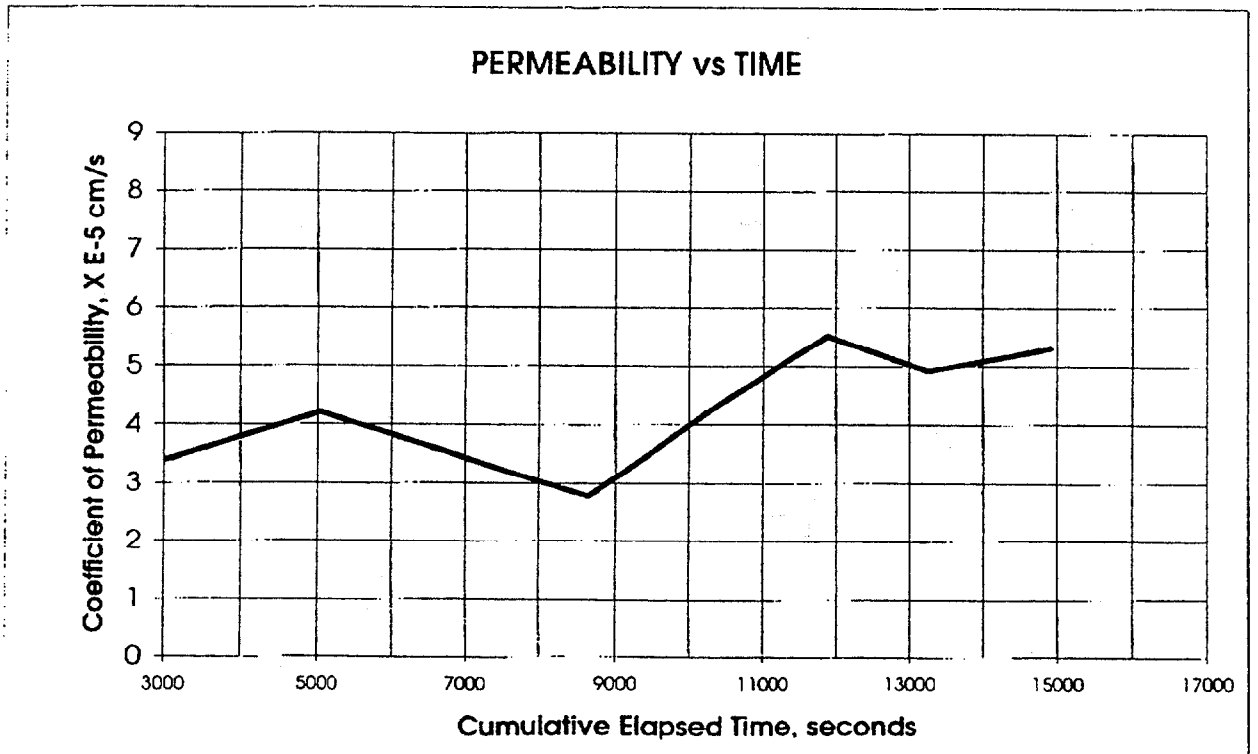
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB02ST05
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9989

	INITIAL	FINAL
Specimen diameter, cm	7.26	
Specimen length, cm	5.79	
Wet weight of specimen, g.	362.75	
Specimen cross-sect. area, cm	41.4515	
Water content, %	63.2	
Wet unit weight, pcf	94.3	
Dry unit weight, pcf	57.8	
Estimated degree of saturatior	89.9	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	6.1
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	2.5
Total backpressure, psi	16.5

Coefficient of Permeability, cm/s 5.0E-05



HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

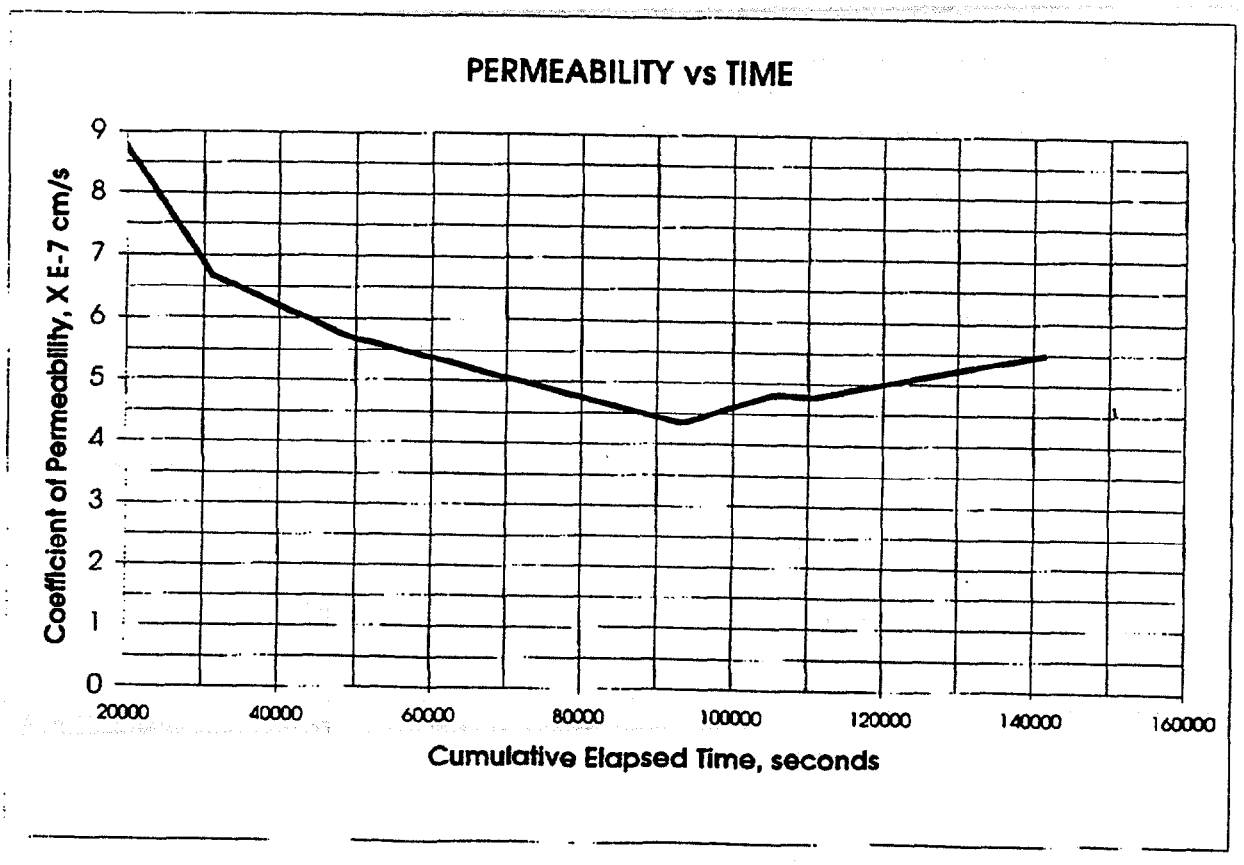
PROJECT NAME: Bechtel Jacobs Paducah
PROJECT NO. 783208.00410000

CLIENT SAMPLE NO. CCGTDB02ST07
IT LAB SAMPLE NO. ETDC-9979

	INITIAL	FINAL
Specimen diameter, cm	7.30	
Specimen length, cm	4.94	
Wet weight of specimen, g.	90.82	310.33
Specimen cross-sect. area, cm	41.9068	
Water content, %	57.8	64.6
Wet unit weight, pcf	27.4	
Dry unit weight, pcf	17.4	
Estimated degree of saturatior	18.0	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	28.5
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	4.0
Total backpressure, psi	56.0

Coefficient of Permeability, cm/s 4.9E-07



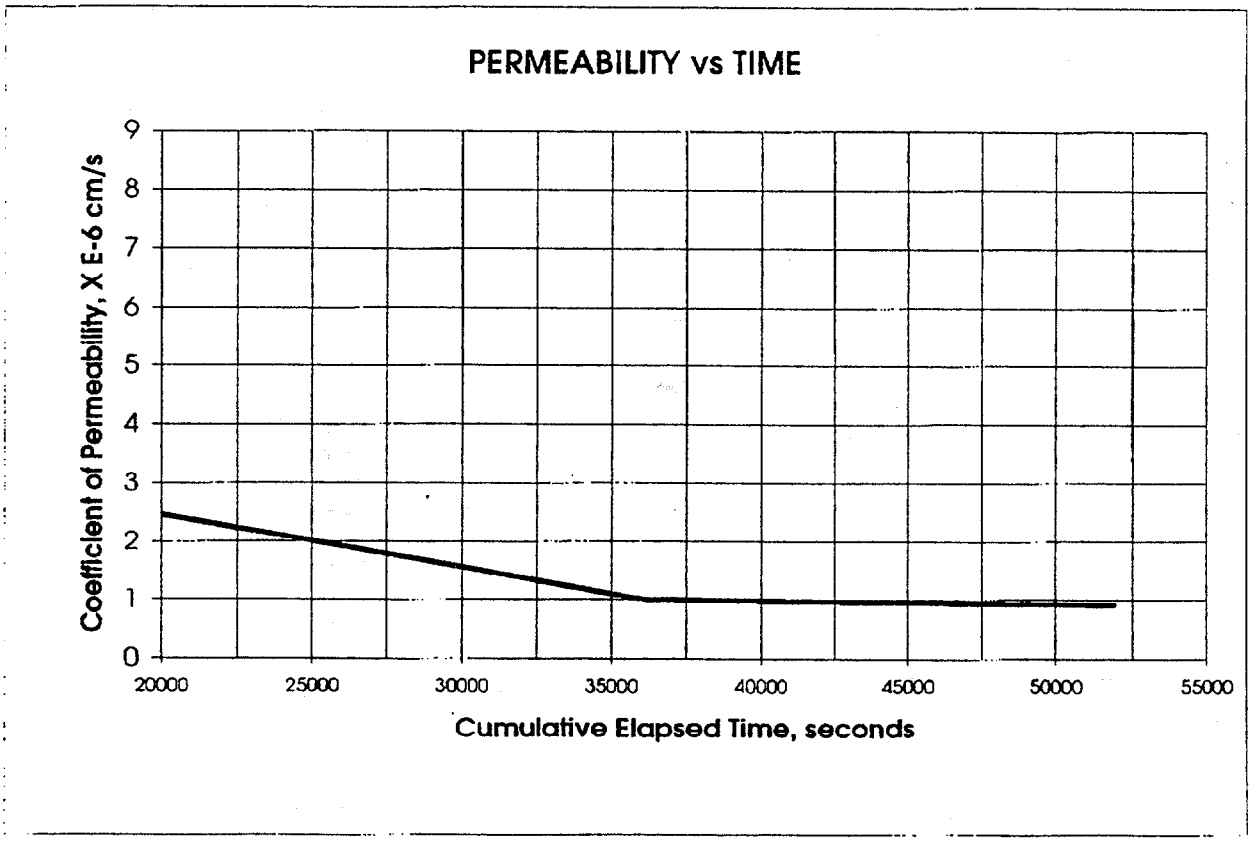
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTDB02ST09
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9981

	INITIAL	FINAL
Specimen diameter, cm	7.30	
Specimen length, cm	9.53	
Wet weight of specimen, g.	623.35	
Specimen cross-sect. area, cm	41.8243	
Water content, %	57.8	
Wet unit weight, pcf	97.7	
Dry unit weight, pcf	61.9	
Estimated degree of saturatior	91.6	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	29.6
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	6.0
Total backpressure, psi	70.0

Coefficient of Permeability, cm/s 1.4E-06



HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

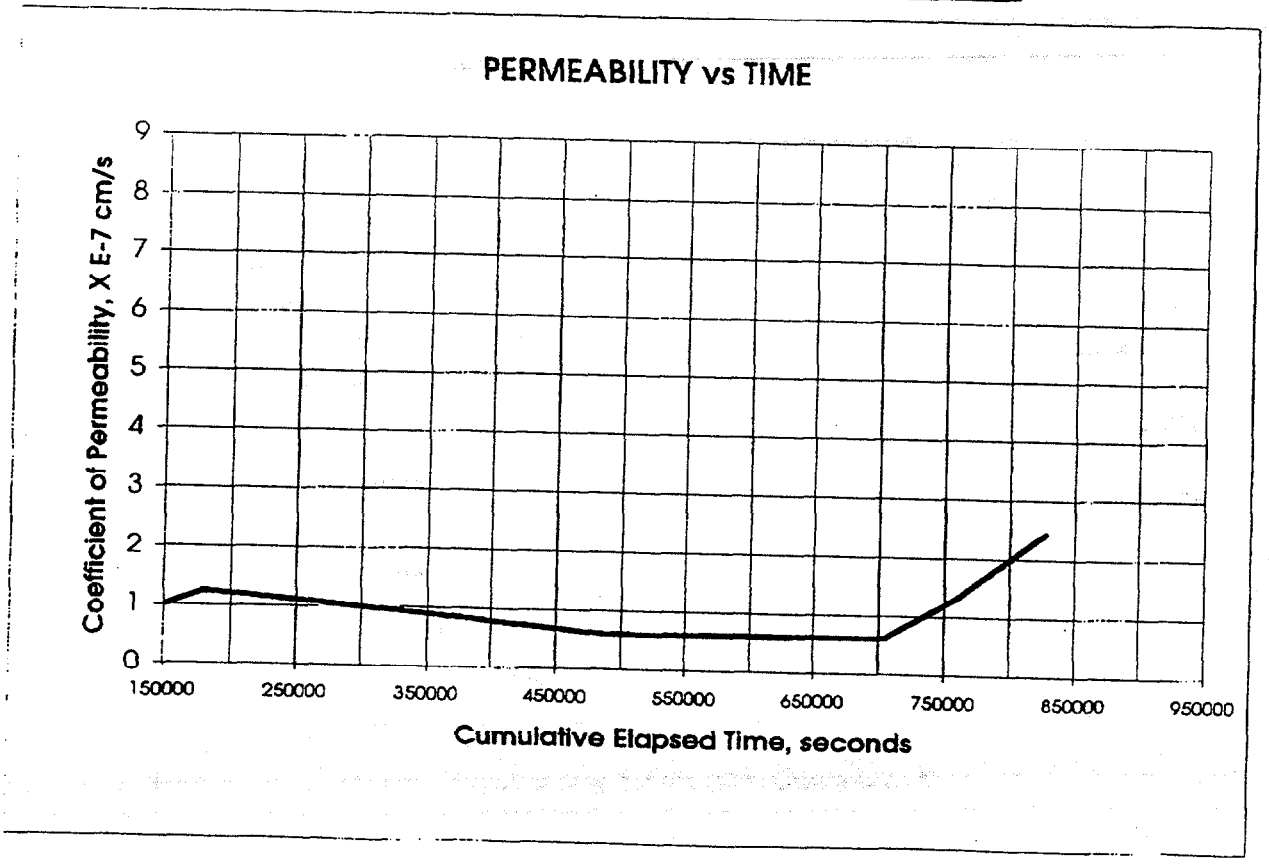
PROJECT NAME: Bechtel Jacobs Paducah
PROJECT NO. 783208.00410000

CLIENT SAMPLE NO. CCGTDB02ST10
IT LAB SAMPLE NO. ETDC-9982

	INITIAL	FINAL
Specimen diameter, cm	7.32	
Specimen length, cm	6.79	
Wet weight of specimen, g.	463.74	
Specimen cross-sect. area, cm	42.0332	
Water content, %	57.8	
Wet unit weight, pcf	101.4	
Dry unit weight, pcf	64.2	
Estimated degree of saturatior	97.3	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	20.7
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	4.0
Total backpressure, psi	76.0

Coefficient of Permeability, cm/s 1.9E-07



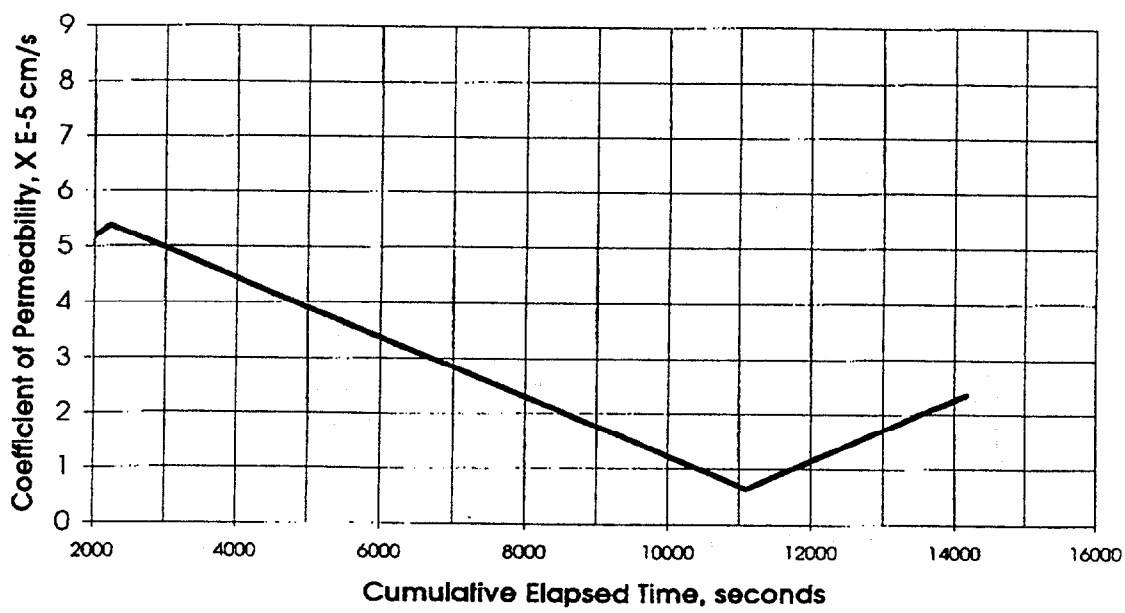
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTDB02ST11
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9983

	INITIAL	FINAL
Specimen diameter, cm	7.31	
Specimen length, cm	5.04	
Wet weight of specimen, g.	334	
Specimen cross-sect. area, cm	41.9117	
Water content, %	50.8	
Wet unit weight, pcf	98.8	
Dry unit weight, pcf	65.5	
Estimated degree of saturatior	88.3	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	7.0
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	2.5
Total backpressure, psi	79.5

Coefficient of Permeability, cm/s 3.2E-05



Jana White
Bechtel Jacobs Company
March 29, 2002
IT Project ID: Bechtel Jacobs Paducah
IT Project No.: 783208.00410000

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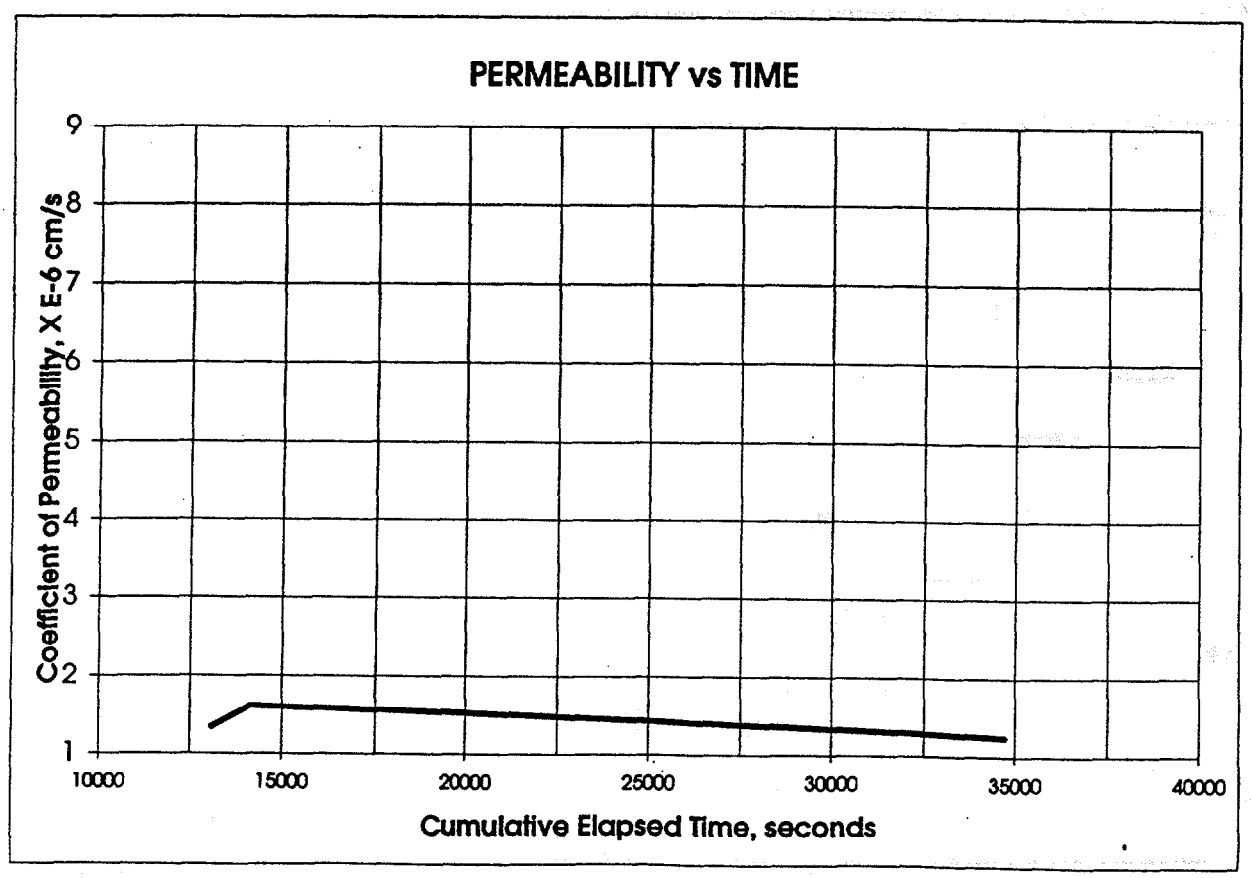
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB03ST01
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9932

	INITIAL	FINAL
Specimen diameter, cm	7.24	
Specimen length, cm	6.41	
Wet weight of specimen, g.	545.45	
Specimen cross-sect. area, cm	41.1188	
Water content, %	23.0	
Wet unit weight, pcf	129.2	
Dry unit weight, pcf	105.0	
Estimated degree of saturatior	106.0	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	16.5
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	3.5
Total backpressure, psi	5.5

Coefficient of Permeability, cm/s 1.4E-06



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IT Project No.: 783208.00410000

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ASTM D 5084

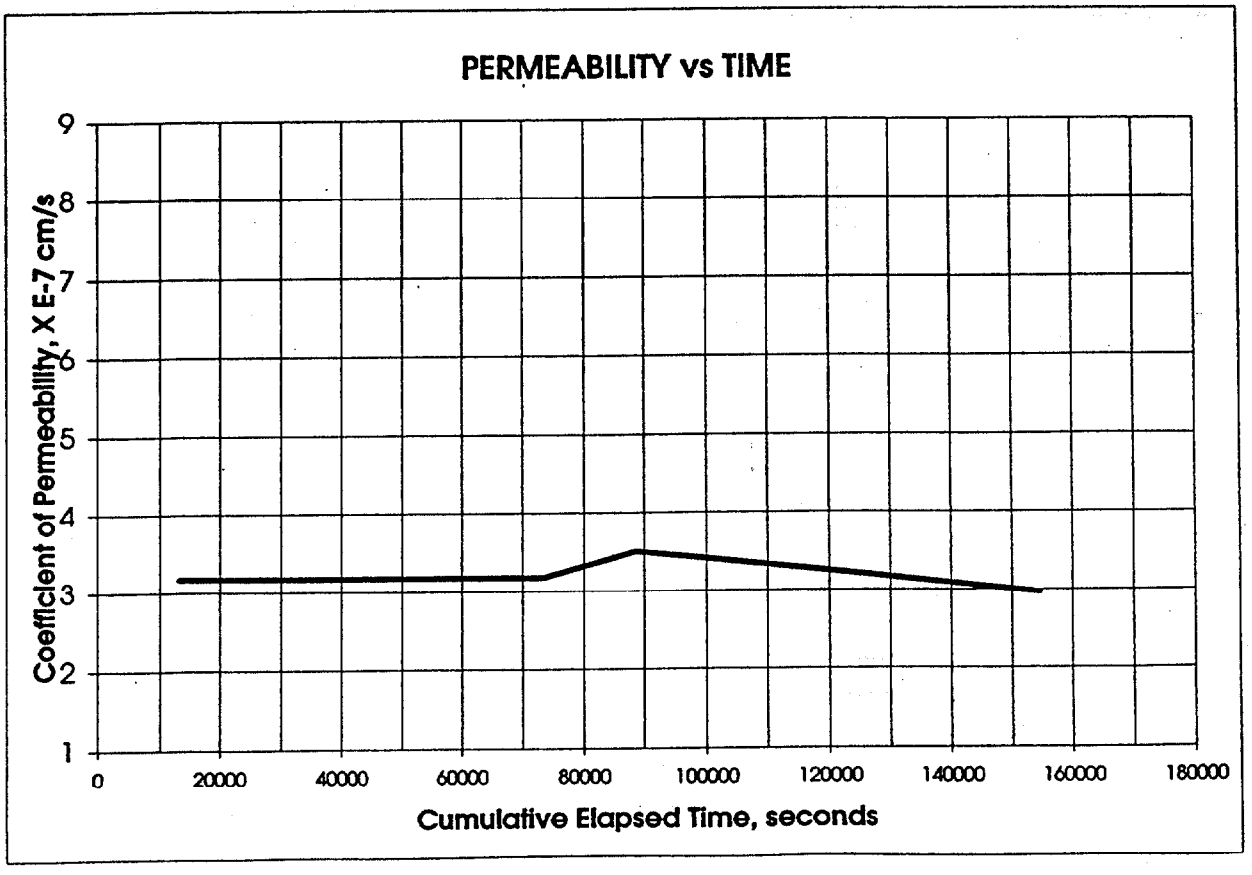
PROJECT NAME: Bechtel Jacobs Paducah
PROJECT NO. 783208.00410000

CLIENT SAMPLE NO. CCGTSB03ST02
IT LAB SAMPLE NO. ETDC-9933

	INITIAL	FINAL
Specimen diameter, cm	7.39	
Specimen length, cm	5.52	
Wet weight of specimen, g.	473.63	
Specimen cross-sect. area, cm	42.8692	
Water content, %	20.9	
Wet unit weight, pcf	125.0	
Dry unit weight, pcf	103.4	
Estimated degree of saturatior	92.2	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	25.5
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	4.0
Total backpressure, psi	5.5

Coefficient of Permeability, cm/s 3.2E-07



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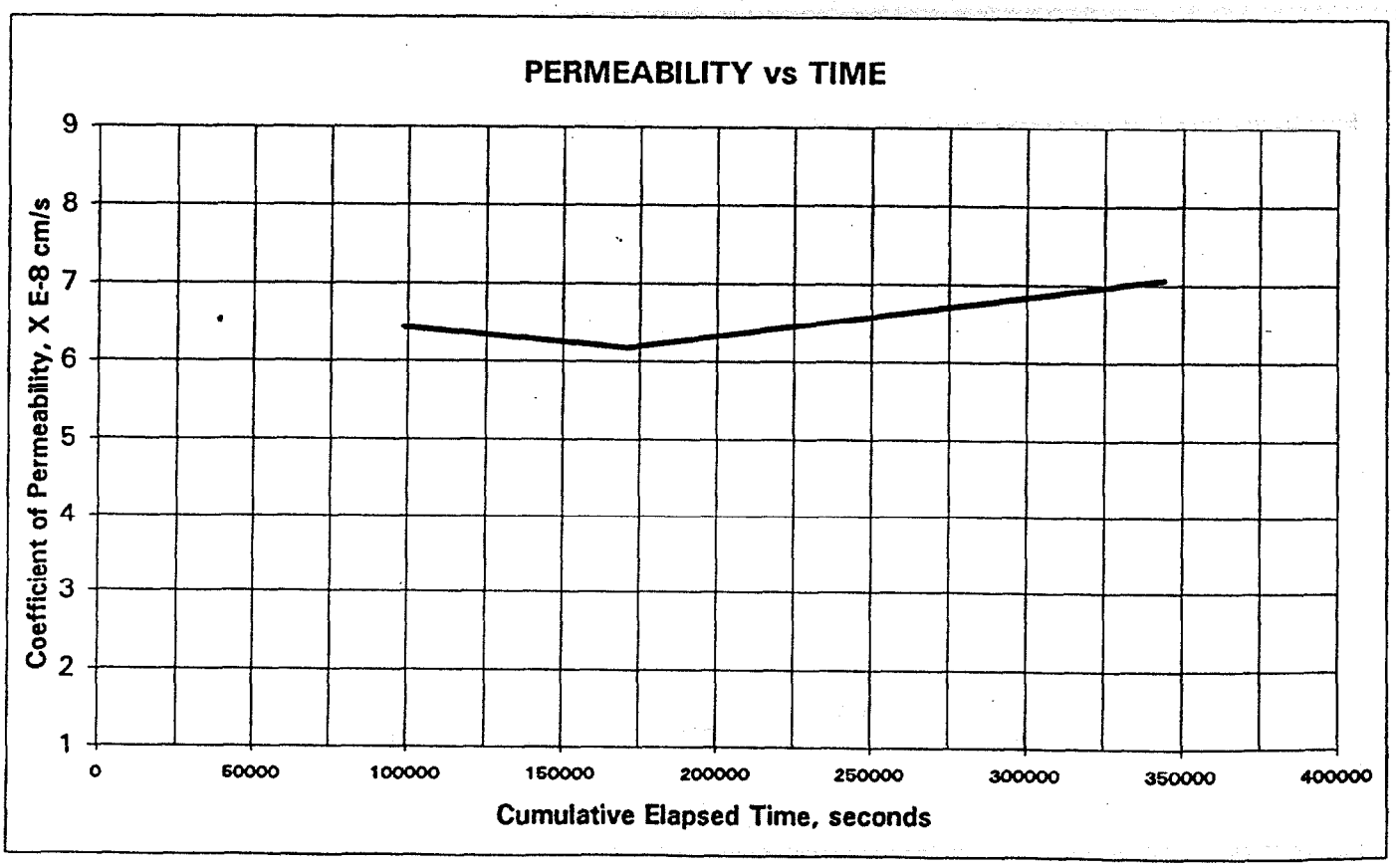
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB03ST03
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9934

	INITIAL	FINAL
Specimen diameter, cm	7.26	
Specimen length, cm	7.31	
Wet weight of specimen, g.	614.55	
Specimen cross-sect. area, cm^2	41.4273	
Water content, %	23.0	
Wet unit weight, pcf	126.7	
Dry unit weight, pcf	103.0	
Estimated degree of saturation, %	100.5	
Estimated spec. gravity of solids	2.65	

Hydraulic gradient	14.4
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	3.5
Total backpressure, psi	26.5

Coefficient of Permeability, cm/s 6.6E-08



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March 29, 2002
IT Project ID: Bechtel Jacobs Paducah
IT Project No.: 783208.00410000

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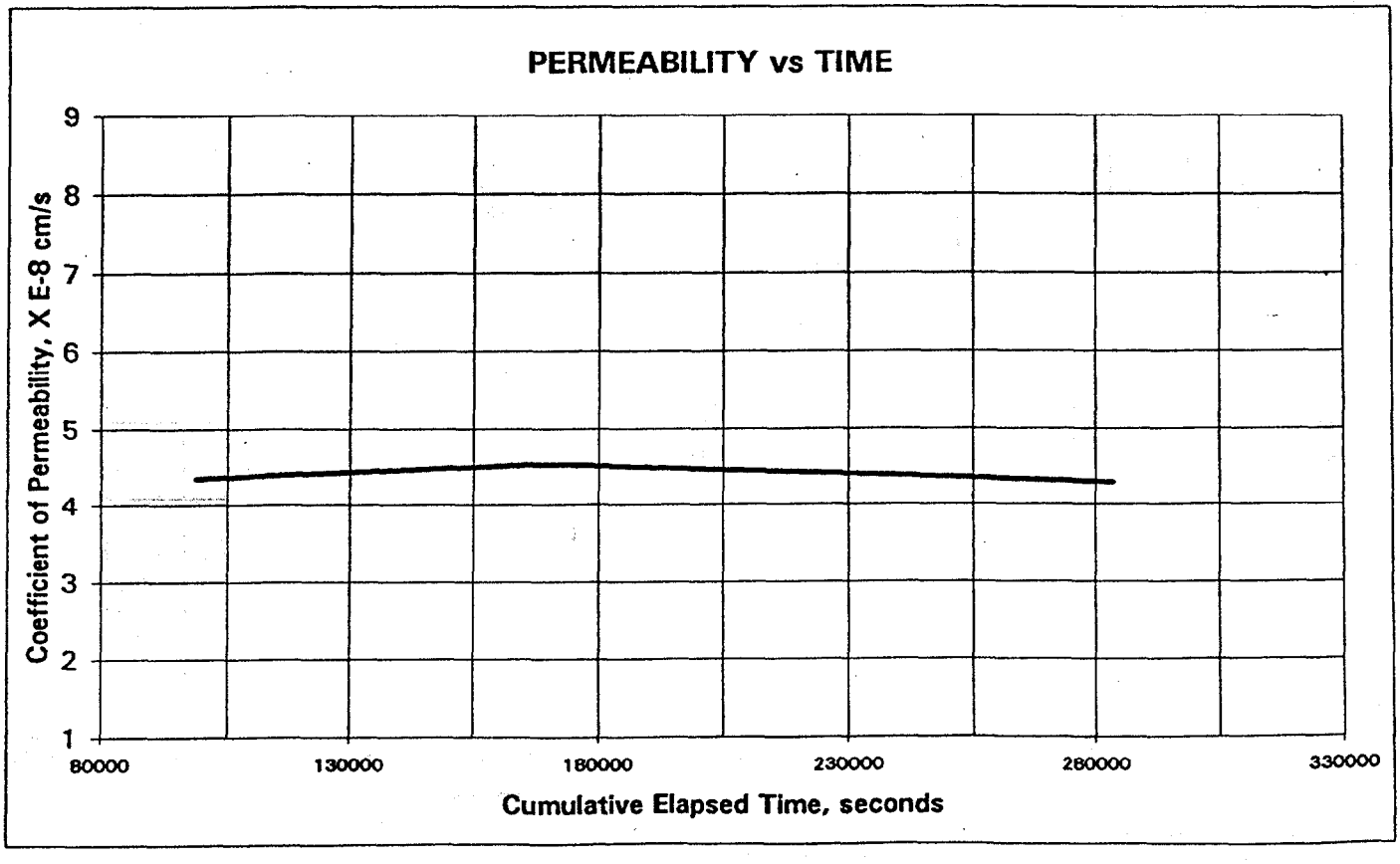
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB03ST04
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9935

	INITIAL	FINAL
Specimen diameter, cm	7.24	
Specimen length, cm	7.26	
Wet weight of specimen, g.	594.78	
Specimen cross-sect. area, cm^2	41.1862	
Water content, %	25.9	
Wet unit weight, pcf	124.2	
Dry unit weight, pcf	98.7	
Estimated degree of saturation, %	101.5	
Estimated spec. gravity of solids	2.65	

Hydraulic gradient	38.8
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	6.0
Total backpressure, psi	27.0

Coefficient of Permeability, cm/s 4.4E-08



Jana White
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IT Project ID: Bechtel Jacobs Paducah
IT Project No.: 783208.00410000

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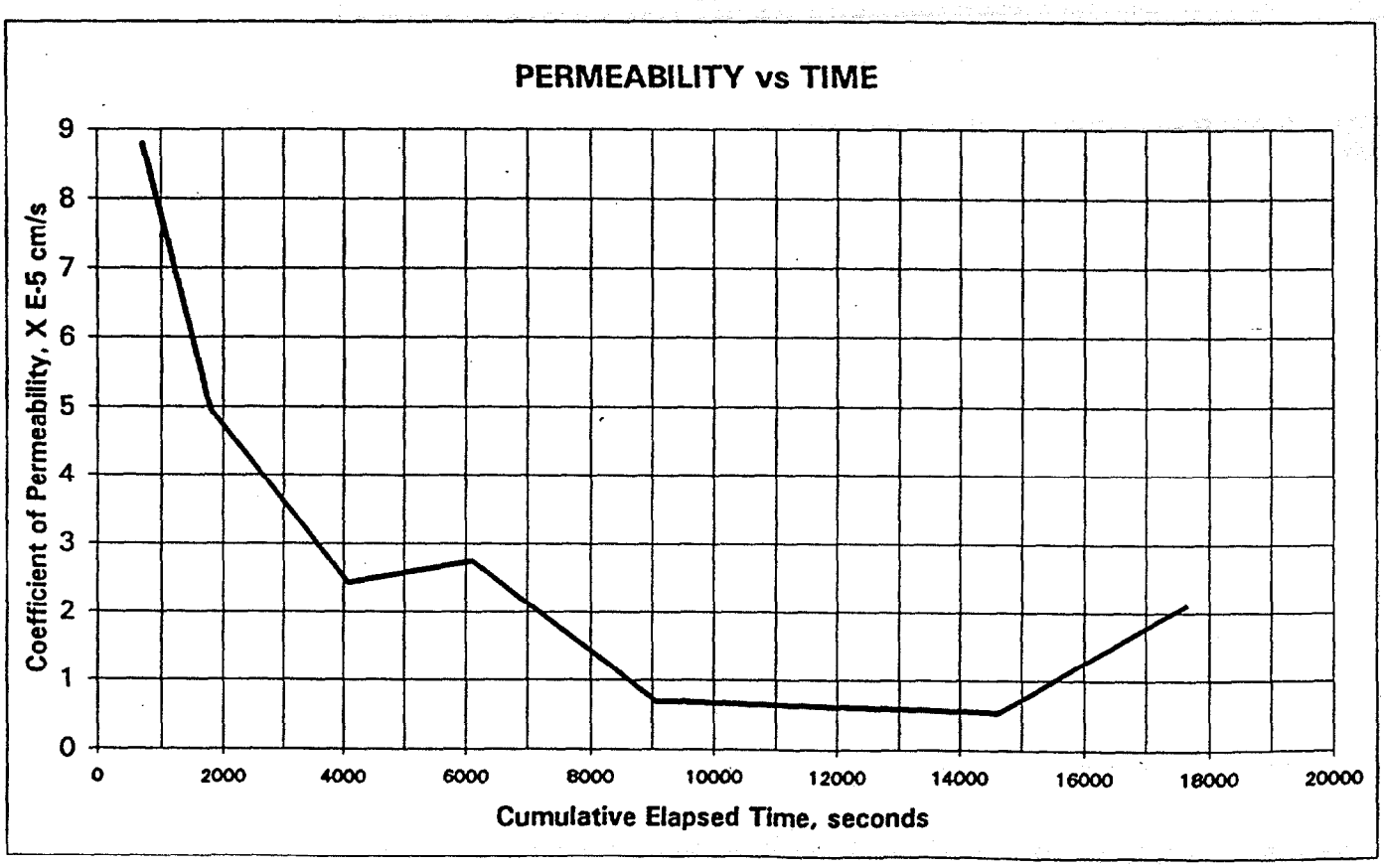
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB03ST06
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9936

	INITIAL	FINAL
Specimen diameter, cm	7.25	
Specimen length, cm	4.18	
Wet weight of specimen, g.	252.67	
Specimen cross-sect. area, cm^2	41.2681	
Water content, %	59.8	
Wet unit weight, pcf	91.4	
Dry unit weight, pcf	57.2	
Estimated degree of saturation, %	83.7	
Estimated spec. gravity of solids	2.65	

Hydraulic gradient	8.4
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	2.5
Total backpressure, psi	28.5

Coefficient of Permeability, cm/s 1.1E-05



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March 29, 2002
IT Project ID: Bechtel Jacobs Paducah
IT Project No.: 783208.00410000

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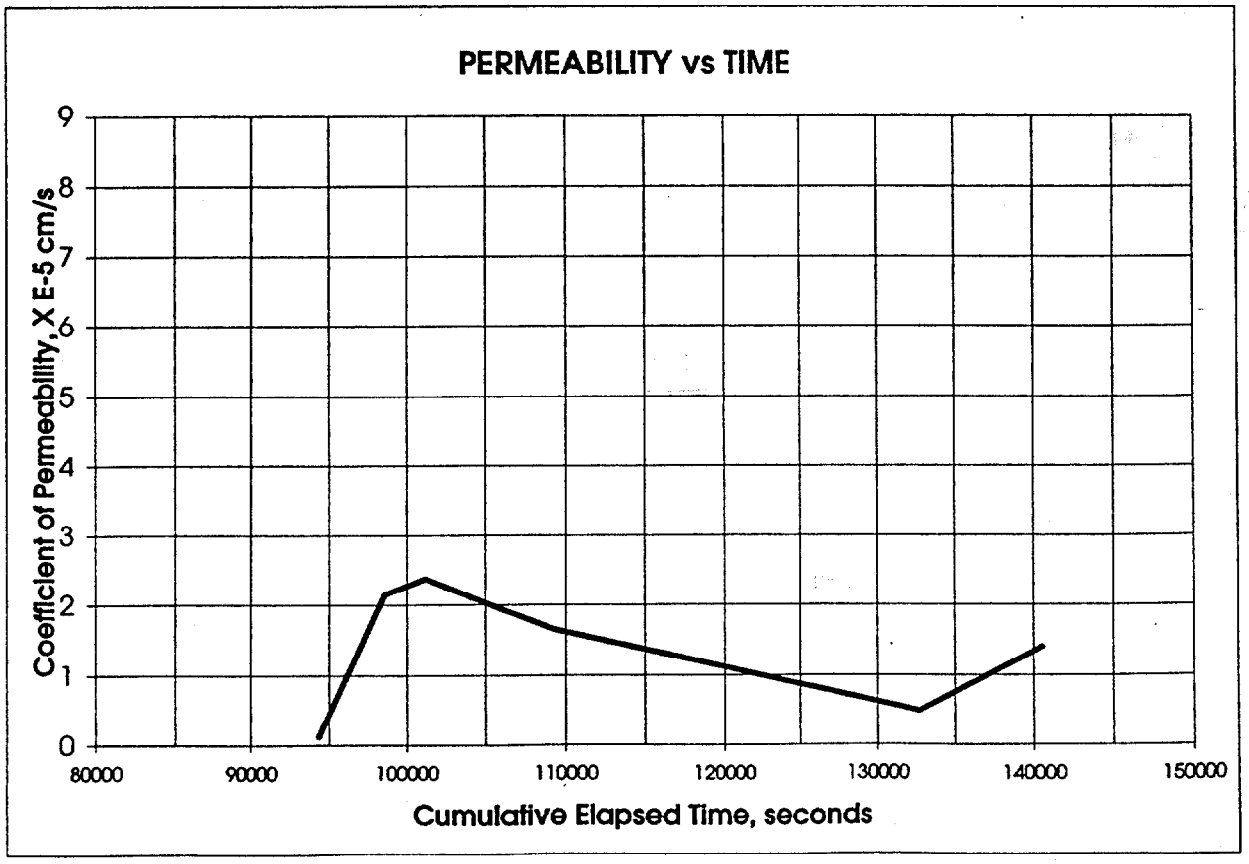
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB03ST08
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9938

	INITIAL	FINAL
Specimen diameter, cm	7.33	
Specimen length, cm	8.44	
Wet weight of specimen, g.	531.77	
Specimen cross-sect. area, cm	42.2524	
Water content, %	56.1	
Wet unit weight, pcf	93.1	
Dry unit weight, pcf	59.7	
Estimated degree of saturatior	83.8	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	4.2
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	2.5
Total backpressure, psi	27.5

Coefficient of Permeability, cm/s 1.5E-05

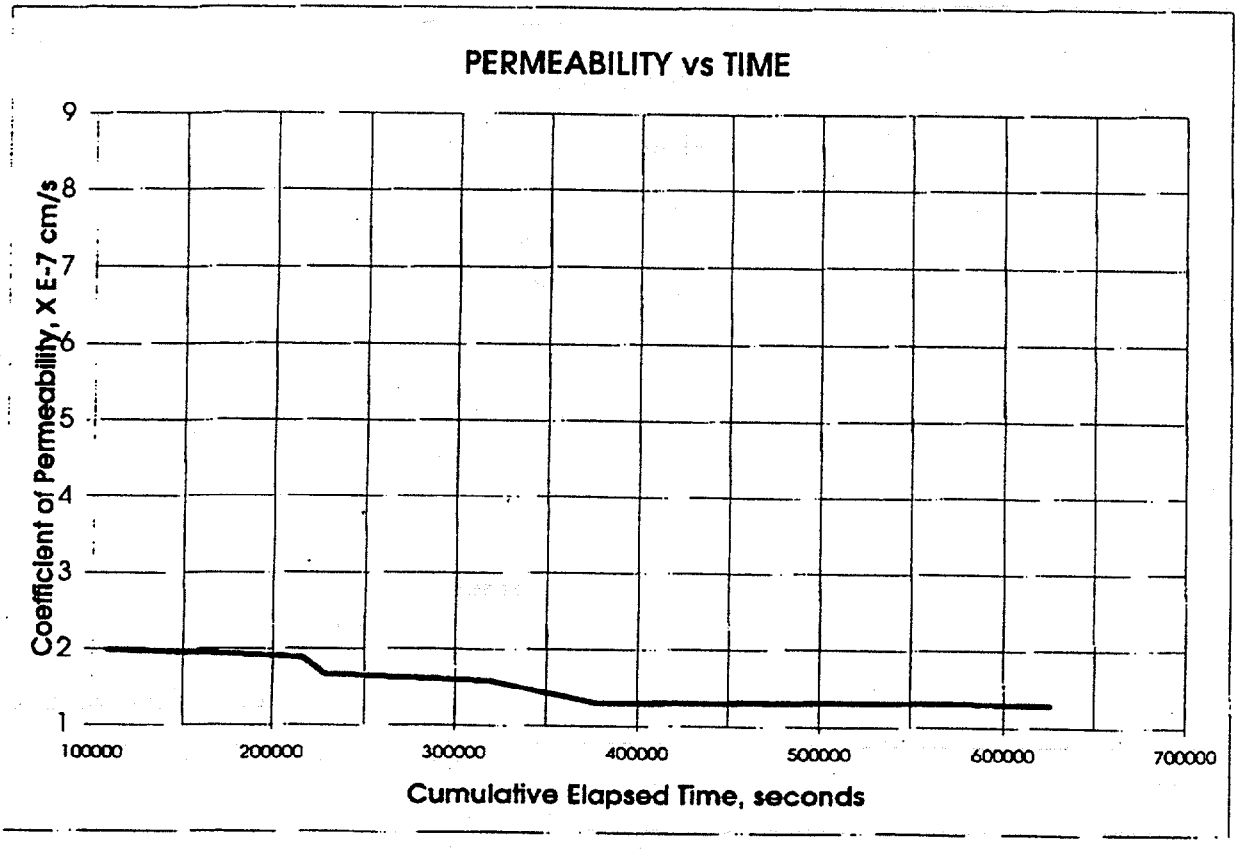


HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB05ST01
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9956

	INITIAL	FINAL		
Specimen diameter, cm	7.17			
Specimen length, cm	6.52		Hydraulic gradient	21.6
Wet weight of specimen, g.	535.56	252.21	Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm	40.4003		Max. consolidation stress, psi	4.0
Water content, %	22.8	23.0	Total backpressure, psi	4.0
Wet unit weight, pcf	126.9			
Dry unit weight, pcf	103.4			
Estimated degree of saturatior	100.7			
Estimated spec. gravity of solid	2.65			

Coefficient of Permeability, cm/s 1.4E-07

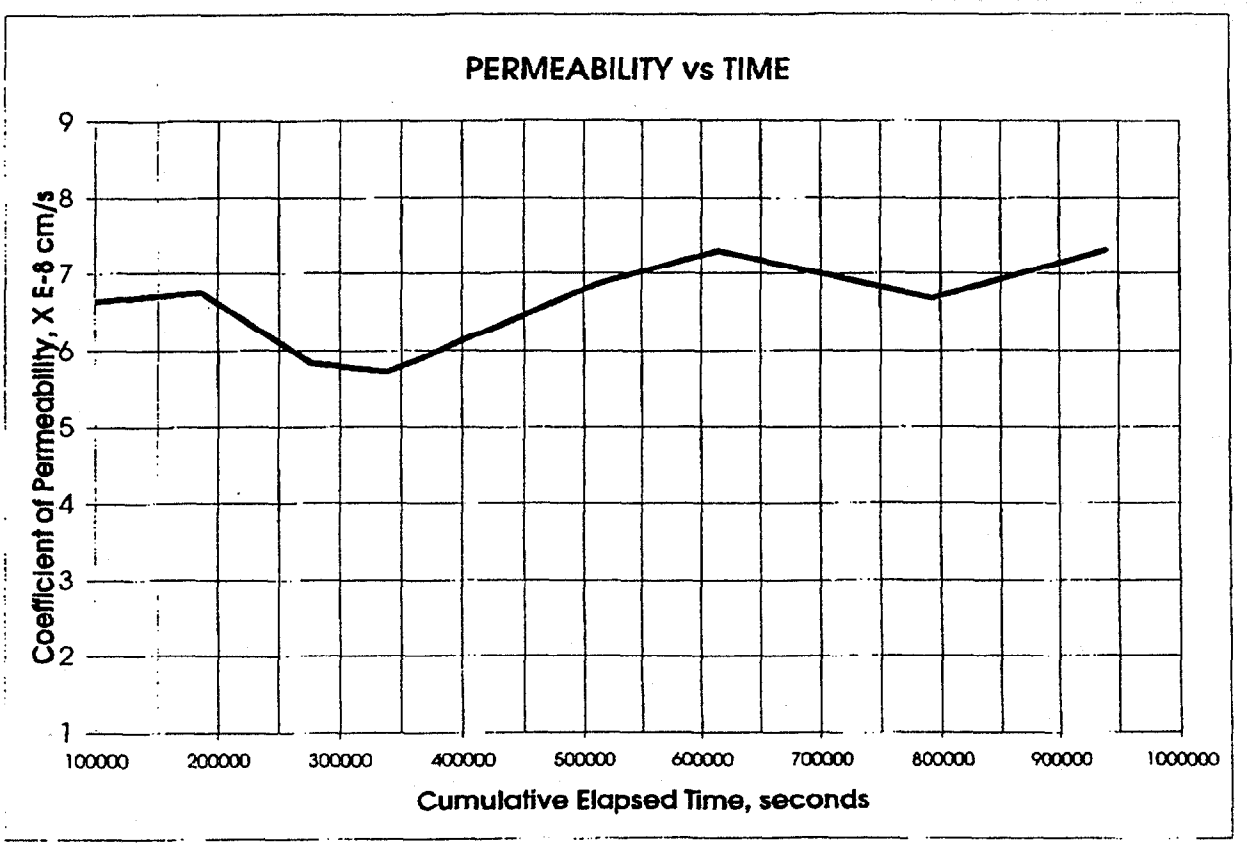


HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB05ST04
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9958

	INITIAL	FINAL		
Specimen diameter, cm	7.26			
Specimen length, cm	6.62		Hydraulic gradient	31.9
Wet weight of specimen, g.	591.09	262.76	Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm	41.4032		Max. consolidation stress, psi	5.0
Water content, %	15.8	15.5	Total backpressure, psi	27.0
Wet unit weight, pcf	134.6			
Dry unit weight, pcf	116.2			
Estimated degree of saturatior	99.0			
Estimated spec. gravity of solid	2.65			

Coefficient of Permeability, cm/s 7.0E-08



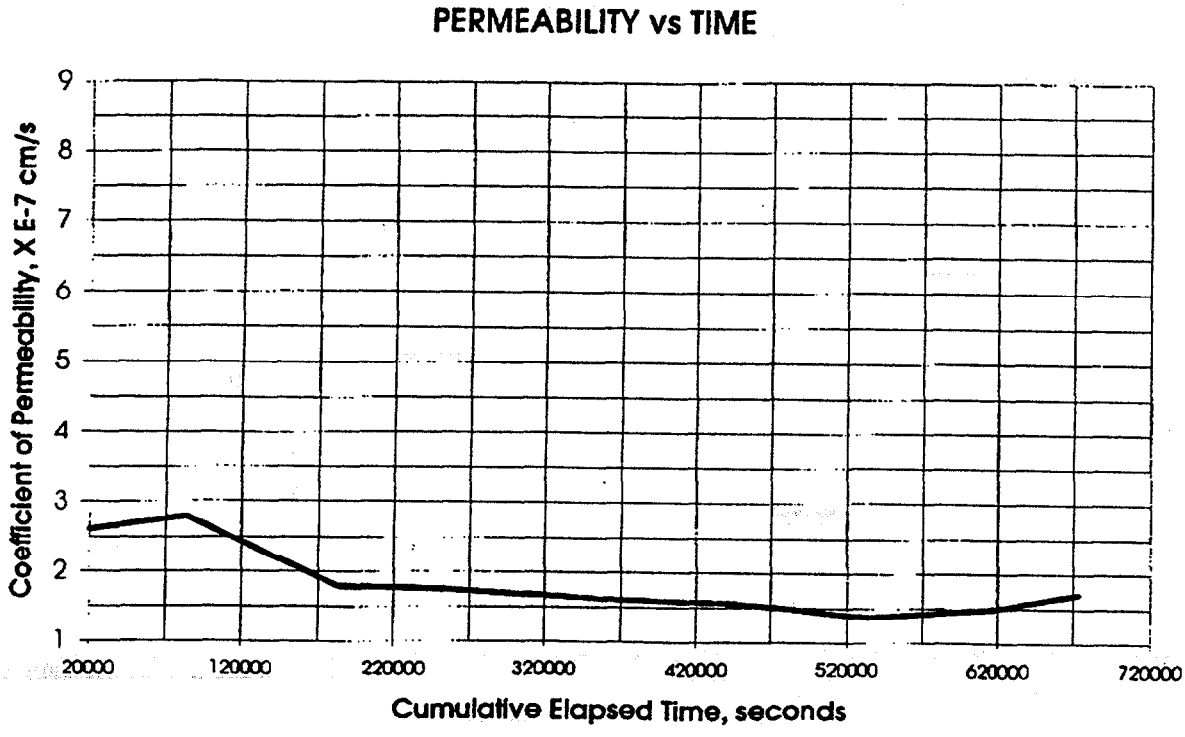
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB05ST02
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9964

	INITIAL	FINAL
Specimen diameter, cm	7.21	
Specimen length, cm	5.57	
Wet weight of specimen, g.	468.72	355.53
Specimen cross-sect. area, cm	40.8258	
Water content, %	23.6	23.5
Wet unit weight, pcf	128.7	
Dry unit weight, pcf	104.1	
Estimated degree of saturatior	106.2	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	31.6
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	4.5
Total backpressure, psi	5.0

Coefficient of Permeability, cm/s 1.5E-07

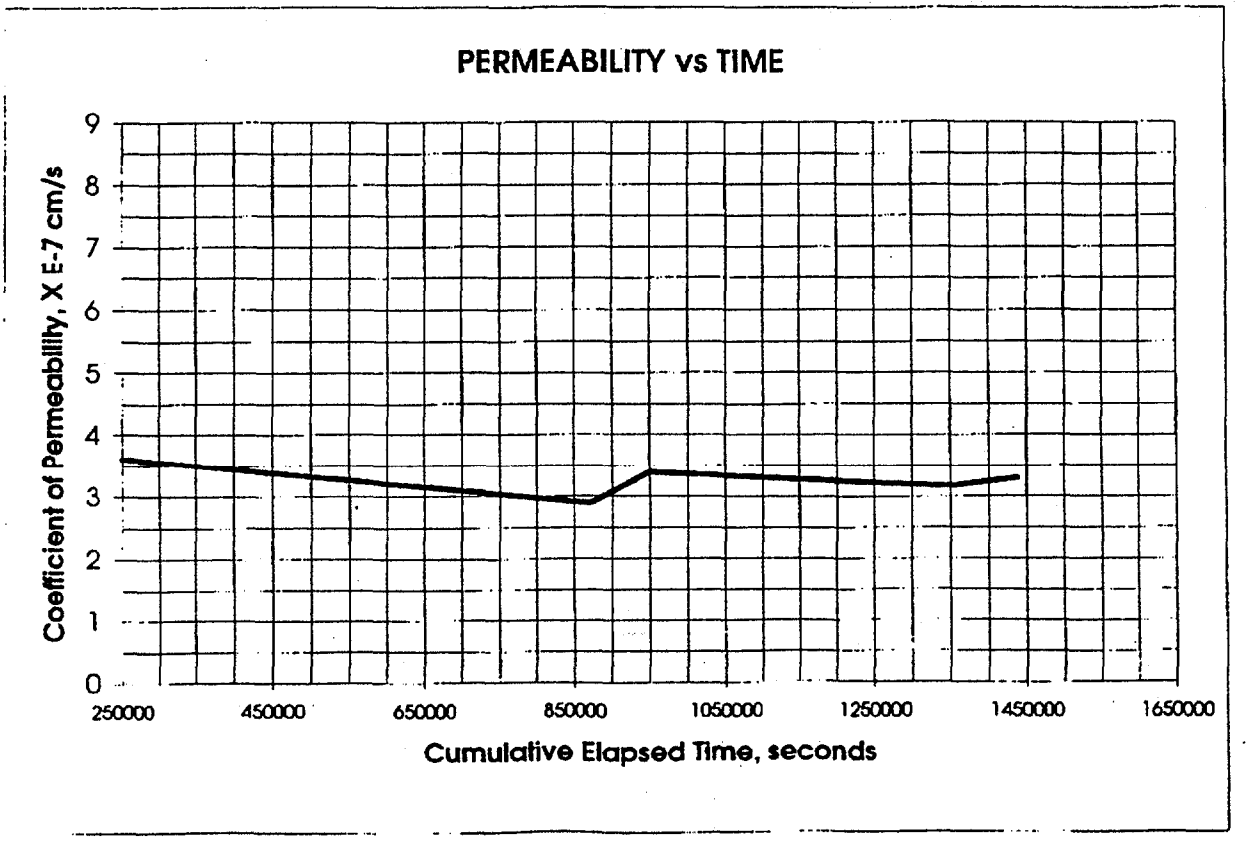


HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB05ST03
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9965

	INITIAL	FINAL		
Specimen diameter, cm	7.23			
Specimen length, cm	5.97		Hydraulic gradient	47.2
Wet weight of specimen, g.	534.55	252.84	Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm	41.0034		Max. consolidation stress, psi	6.0
Water content, %	13.8	16.1	Total backpressure, psi	24.0
Wet unit weight, pcf	136.4			
Dry unit weight, pcf	119.8			
Estimated degree of saturatior	96.3			
Estimated spec. gravity of solid	2.65			

Coefficient of Permeability, cm/s 3.2E-08



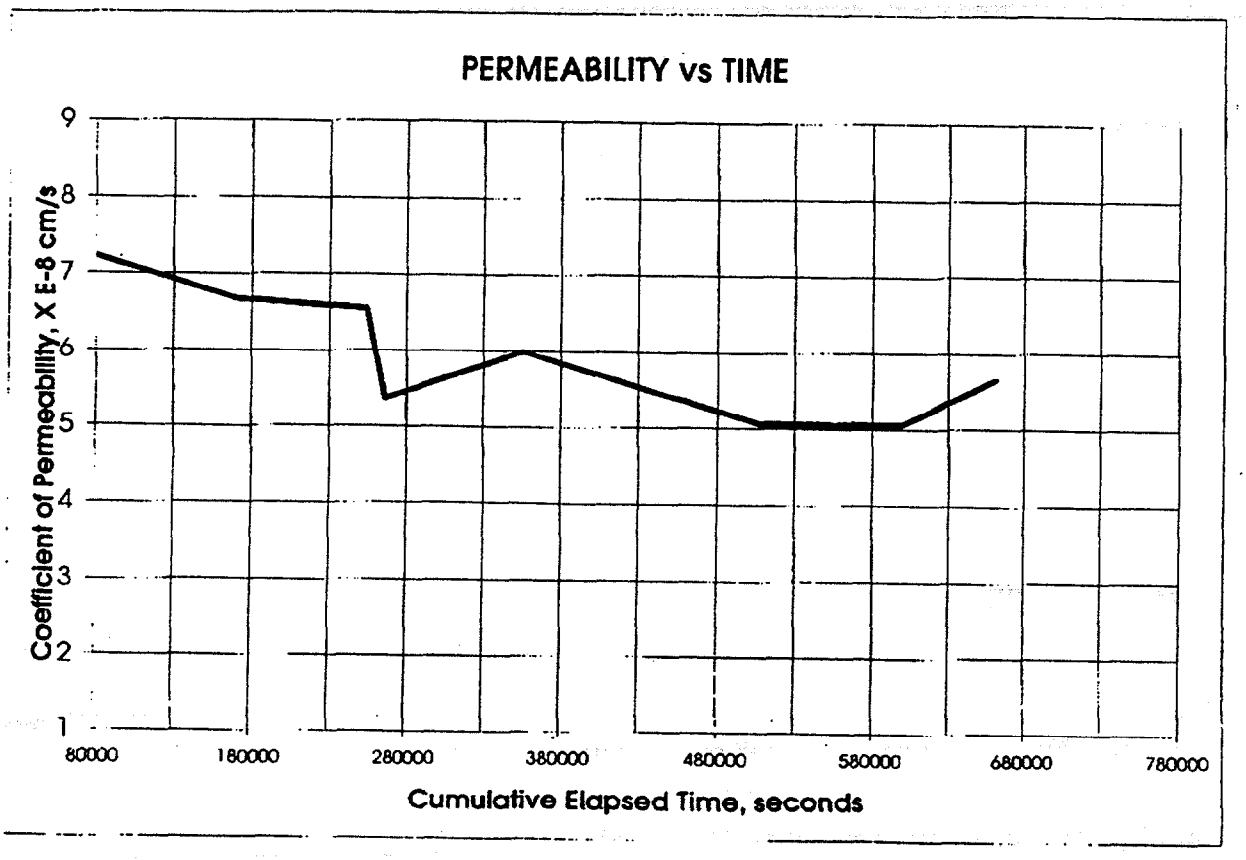
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB05ST05
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9959

	INITIAL	FINAL
Specimen diameter, cm	7.28	
Specimen length, cm	3.47	
Wet weight of specimen, g.	219.03	226.53
Specimen cross-sect. area, cm	41.6692	
Water content, %	60.3	76.9
Wet unit weight, pcf	94.7	
Dry unit weight, pcf	59.0	
Estimated degree of saturatior	88.7	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	60.9
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	5.0
Total backpressure, psi	20.0

Coefficient of Permeability, cm/s 5.4E-08



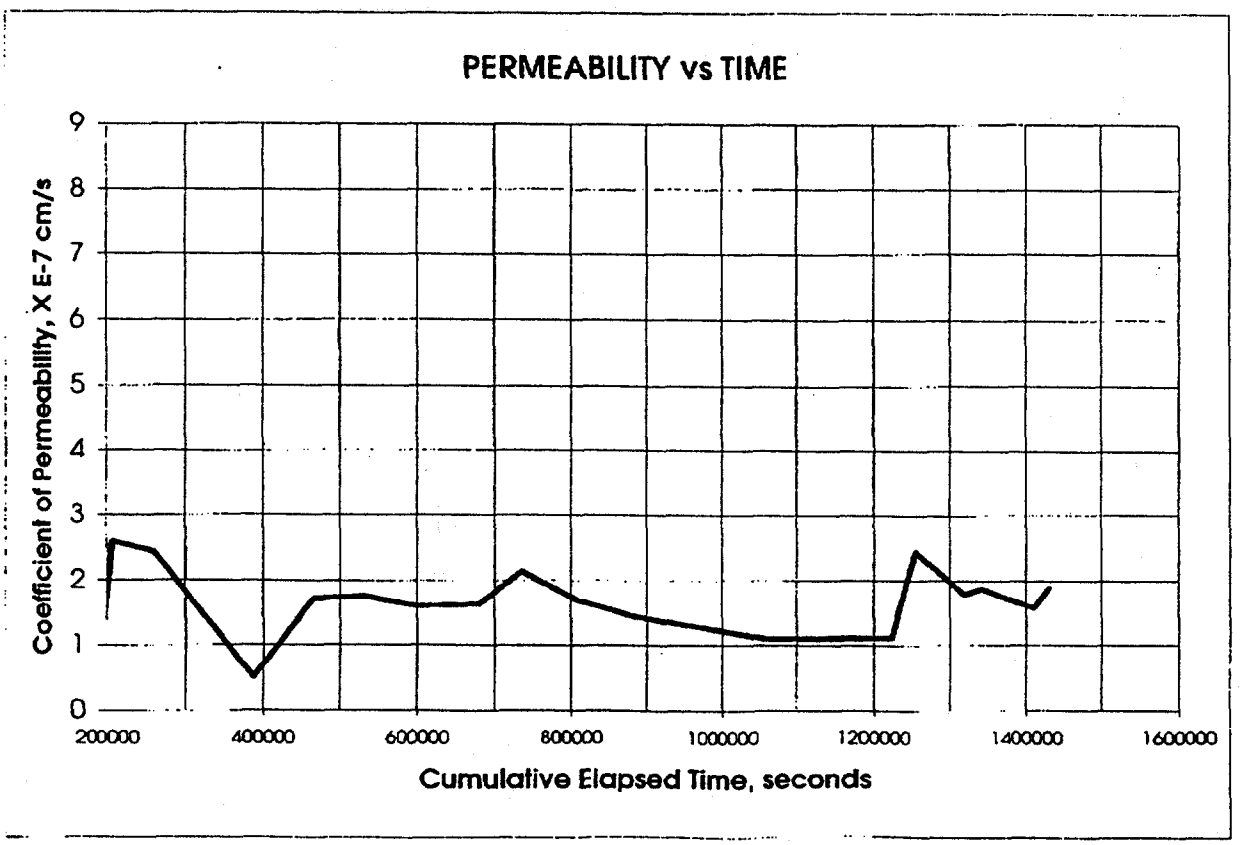
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB05ST07
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9962

	INITIAL	FINAL
Specimen diameter, cm	7.33	
Specimen length, cm	6.73	
Wet weight of specimen, g.	426.97	317.22
Specimen cross-sect. area, cm	42.1695	
Water content, %	59.1	66.4
Wet unit weight, pcf	94.0	
Dry unit weight, pcf	59.1	
Estimated degree of saturatior	86.9	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	41.8
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	6.0
Total backpressure, psi	29.5

Coefficient of Permeability, cm/s 1.8E-07



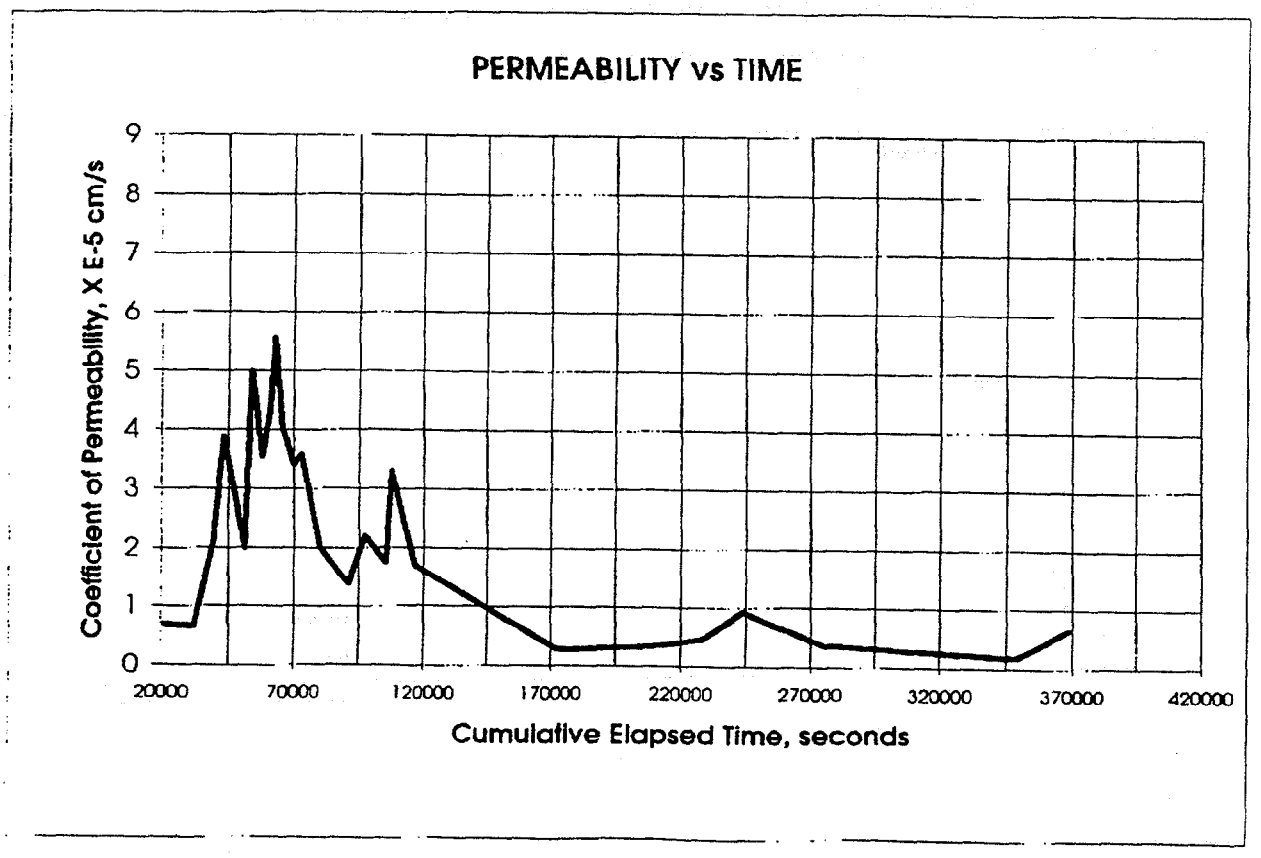
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB05ST08
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9957

	INITIAL	FINAL
Specimen diameter, cm	7.27	
Specimen length, cm	10.21	
Wet weight of specimen, g.	646.7	
Specimen cross-sect. area, cm	41.4950	
Water content, %	60.8	
Wet unit weight, pcf	95.3	
Dry unit weight, pcf	59.3	
Estimated degree of saturatior	90.0	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	3.4
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	2.5
Total backpressure, psi	27.5

Coefficient of Permeability, cm/s 1.8E-05



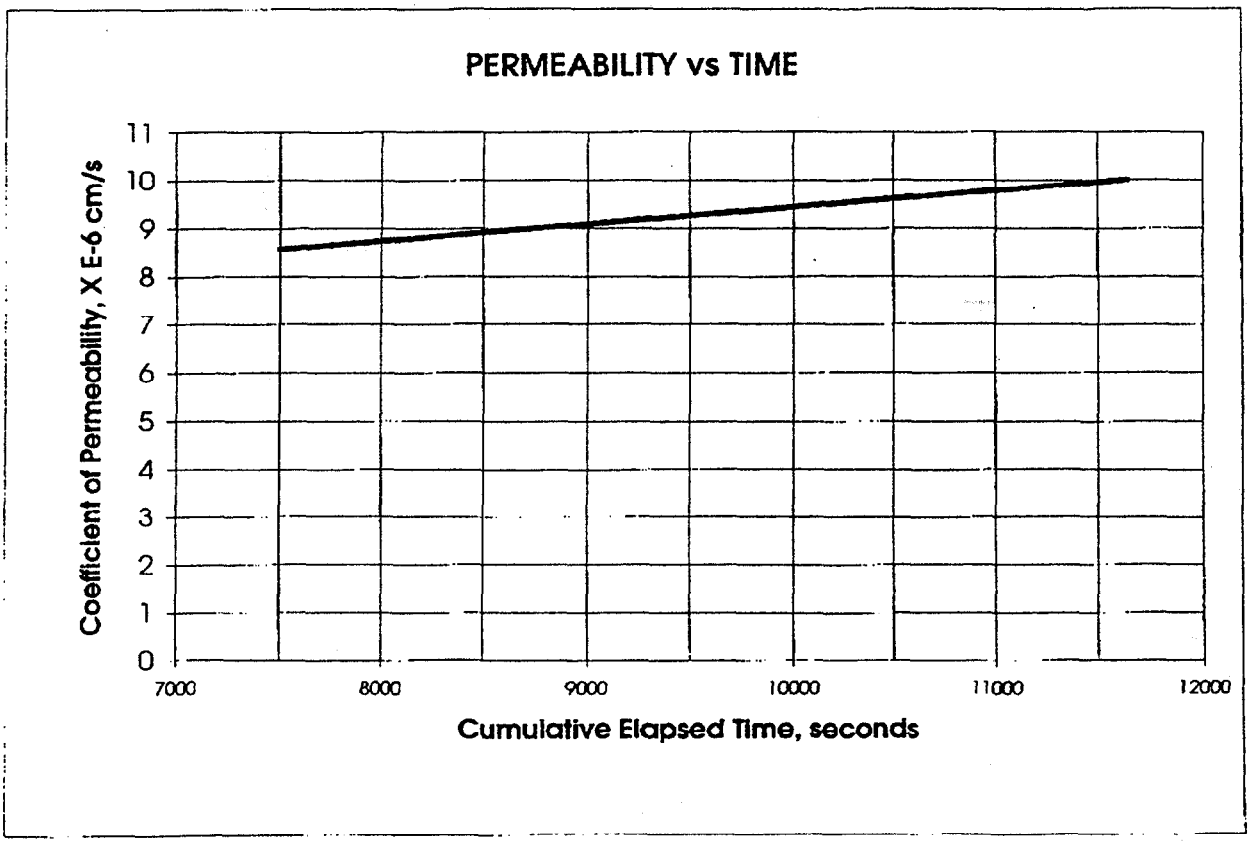
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTSB06ST01
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-10027

	INITIAL	FINAL
Specimen diameter, cm	7.14	
Specimen length, cm	7.26	
Wet weight of specimen, g.	586.09	
Specimen cross-sect. area, cm	40.0719	
Water content, %	26.8	
Wet unit weight, pcf	125.8	
Dry unit weight, pcf	99.2	
Estimated degree of saturatior	106.4	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	9.7
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	3.0
Total backpressure, psi	5.0

Coefficient of Permeability, cm/s 9.3E-06



HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

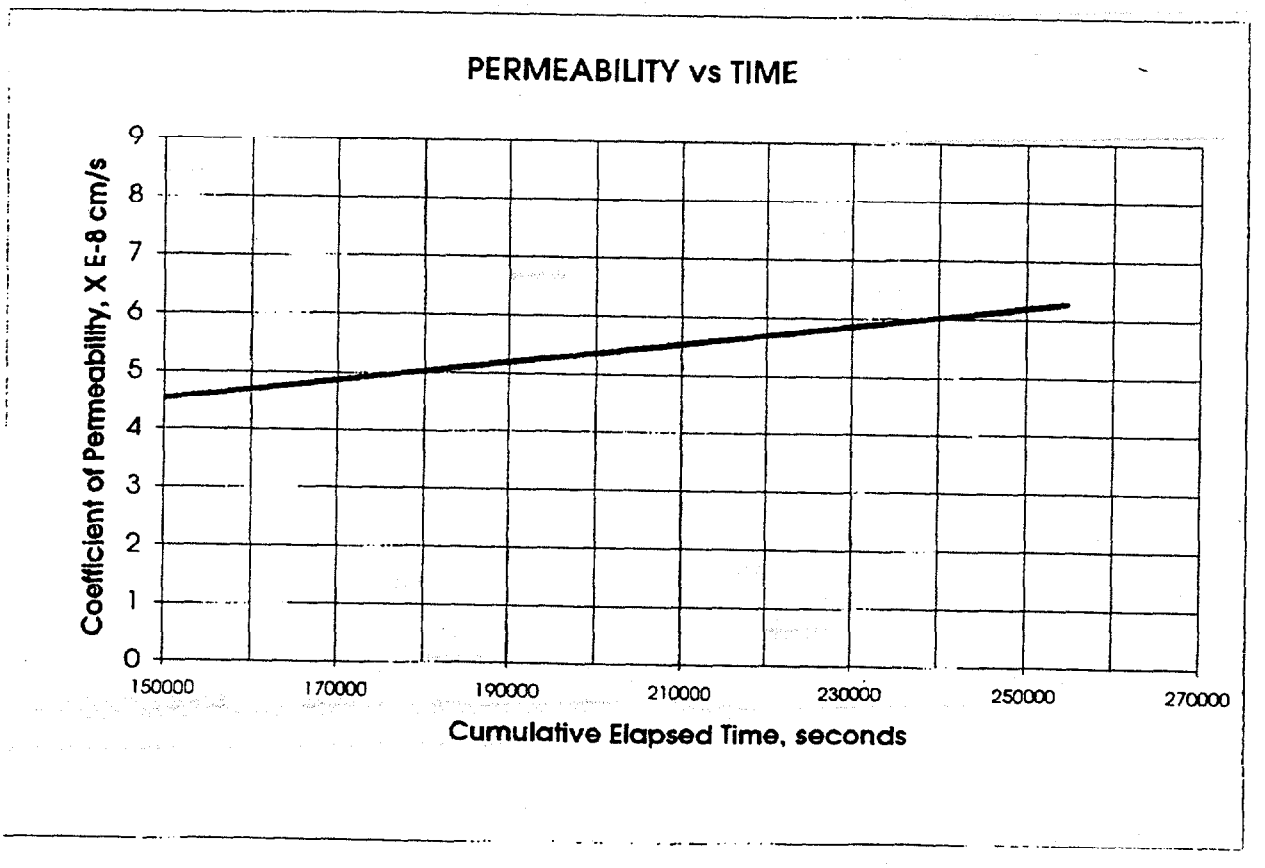
PROJECT NAME: Bechtel Jacobs Paducah
PROJECT NO. 783208.00410000

CLIENT SAMPLE NO. CCGTSB06ST03
IT LAB SAMPLE NO. ETDC-10025

	INITIAL	FINAL
Specimen diameter, cm	7.27	
Specimen length, cm	4.18	
Wet weight of specimen, g.	277.95	
Specimen cross-sect. area, cm	41.4563	
Water content, %	58.4	
Wet unit weight, pcf	100.0	
Dry unit weight, pcf	63.1	
Estimated degree of saturatior	95.6	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	25.2
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	3.5
Total backpressure, psi	21.5

Coefficient of Permeability, cm/s 5.4E-08



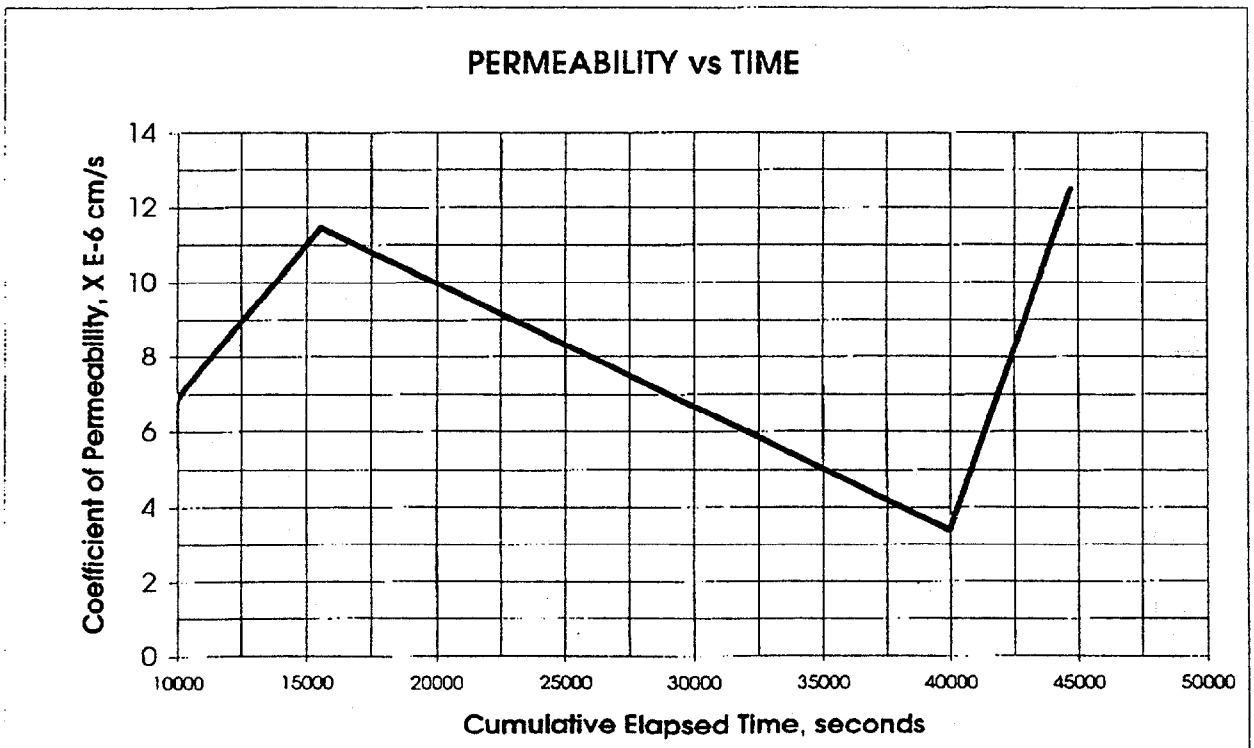
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTDB02ST01
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9992

	INITIAL	FINAL
Specimen diameter, cm	7.30	
Specimen length, cm	5.55	
Wet weight of specimen, g.	545.91	
Specimen cross-sect. area, cm	41.8757	
Water content, %	25.6	
Wet unit weight, pcf	146.6	
Dry unit weight, pcf	116.7	
Estimated degree of saturatior	162.7	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	6.3
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	2.5
Total backpressure, psi	4.5

Coefficient of Permeability, cm/s 8.4E-06



HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

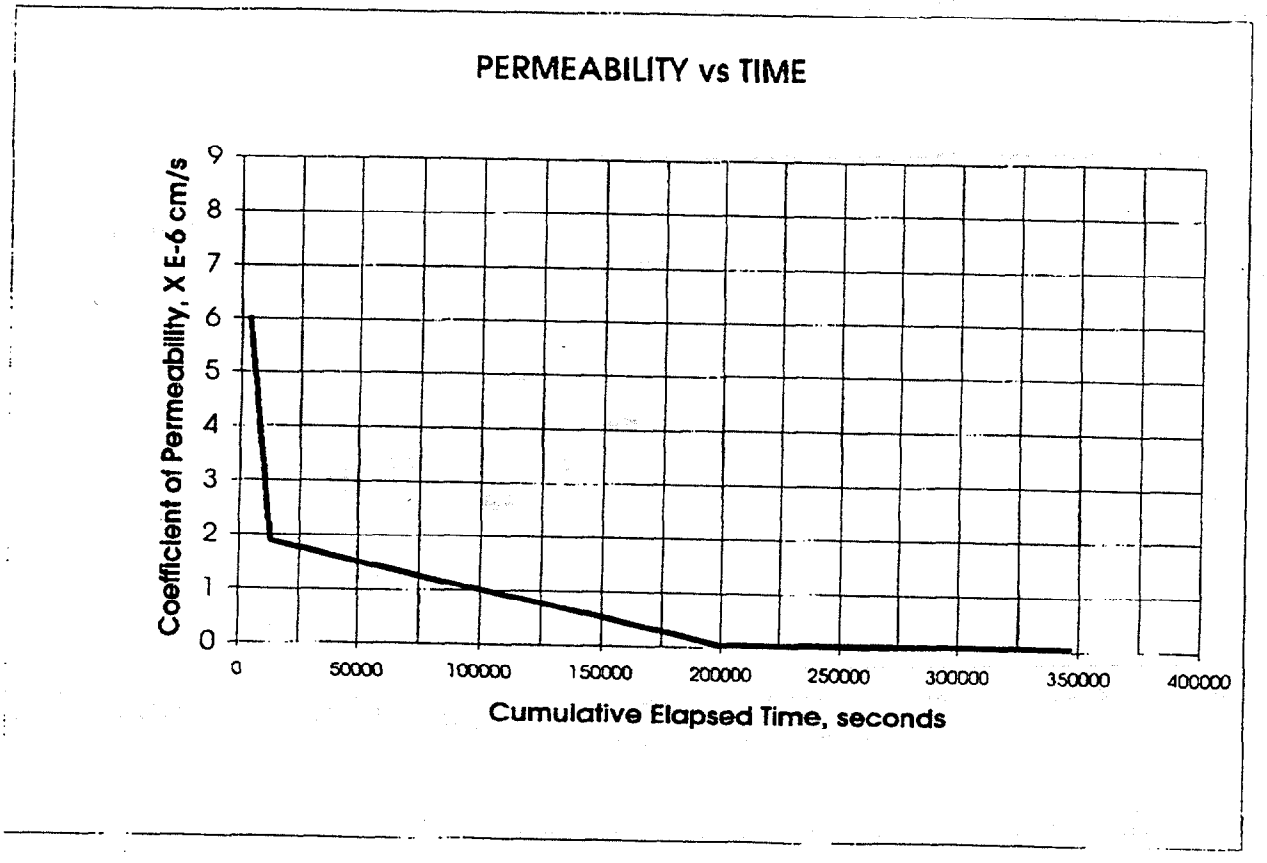
PROJECT NAME: Bechtel Jacobs Paducah
PROJECT NO. 783208.00410000

CLIENT SAMPLE NO. CCGTDB02ST03
IT LAB SAMPLE NO. ETDC-9993

	INITIAL	FINAL
Specimen diameter, cm	7.30	
Specimen length, cm	6.52	
Wet weight of specimen, g.	565.05	
Specimen cross-sect. area, cm	41.8291	
Water content, %	21.4	
Wet unit weight, pcf	129.3	
Dry unit weight, pcf	106.5	
Estimated degree of saturatior	102.5	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	21.6
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	4.0
Total backpressure, psi	8.0

Coefficient of Permeability, cm/s 2.0E-06



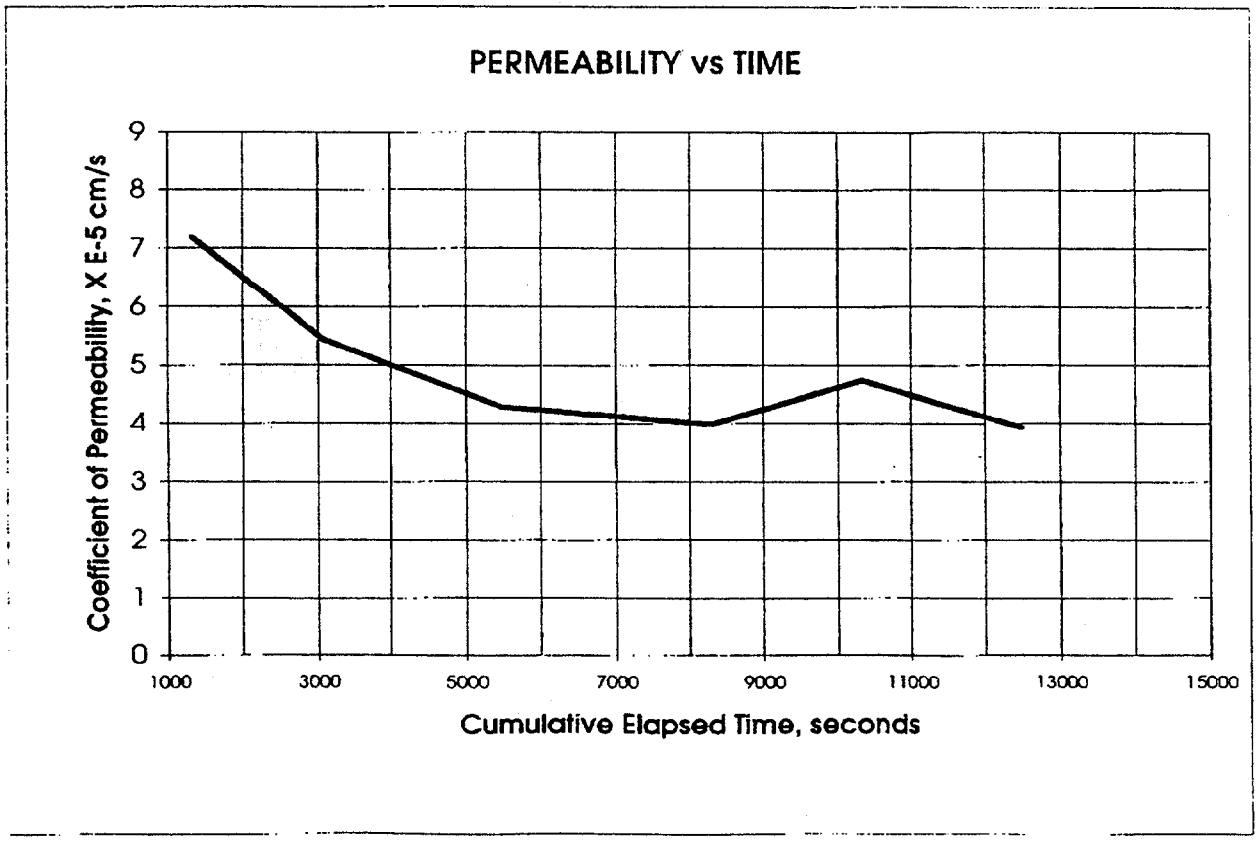
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	Bechtel Jacobs Paducah	CLIENT SAMPLE NO.	CCGTDB02ST05
PROJECT NO.	783208.00410000	IT LAB SAMPLE NO.	ETDC-9995

	INITIAL	FINAL
Specimen diameter, cm	7.33	
Specimen length, cm	6.77	
Wet weight of specimen, g.	423.97	
Specimen cross-sect. area, cm	42.1988	
Water content, %	61.5	
Wet unit weight, pcf	92.6	
Dry unit weight, pcf	57.4	
Estimated degree of saturation	86.4	
Estimated spec. gravity of solid	2.65	

Hydraulic gradient	5.2
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	2.5
Total backpressure, psi	12.5

Coefficient of Permeability, cm/s 4.2E-05



Distribution Ratio, ASTM D 4319

Summary of Results

Project: Bechtel Jacobs Paducah **Project Number: 783208.00410000**

Lab Sample No.	Client Sample No.	Contact Period, days	Neptunium-237 Distribution Ratio, Rd	RPD, %	Technetium-99 Distribution Ratio, Rd	RPD, %
ETDC-9998	CCGTSB01SS04	3	6.703		0.000	
		7	36.02		0.000	
		10	39.54		0.000	
		14	38.81		0.000	
ETDC-10005	CCGTSB02SS09	3	351.6		0.170	
		3	346.1	11.0	0.046	19.1
		3	351.8		0.000	
		7	422.9		0.112	
		7	421.4	11.4	0.131	21.5
		7	439.7		0.387	
		10	425.1		0.131	
		10	441.5	11.5	0.083	14.1
		10	432.1		0.239	
		14	367.4		0.121	
		14	351.6	9.7	0.160	15.5
		14	317.6		0.171	
ETDC10013	CCGTSB03SS11	3	16.72		0.000	
		7	41.71		0.000	
		10	42.57		0.000	
		14	60.33		0.000	
ETDC-10018	CCGTSB05SS04	3	66.08		0.145	
		7	109.9		0.072	
		10	458.8		0.103	
		14	346.9		0.310	
ETDC-10029	CCGTSB06SS03	3	23.43		0.000	
		7	29.09		0.000	
		10	36.49		0.214	
		14	25.90		0.041	
ETDC-10035	CCGTSB06SS22	3	171.3		0.000	
		7	207.9		0.000	
		10	222.7		0.000	
		14	265.1		0.000	

* Calculated negative values are rounded to zero.

Distribution Ratio, ASTM D 4319

Summary of Results

Project: Bechtel Jacobs Paducah **Project Number: 783208.00410000**

Lab Sample No.	Client Sample No.	Contact Period, days	Neptunium-237 Distribution Ratio, Rd	RPD, %	Technetium-99 Distribution Ratio, Rd	RPD, %
ETDC-10041	CCGTDB02SS17	3	56.16		0.000	
		7	139.6		0.000	
		10	179.1		0.000	
		14	139.8		0.196	
ETDC-10043	CCGTDB02SS21	3	19.53		0.000	
		7	37.56		0.000	
		10	51.10		0.000	
		14	52.71		0.000	
ETDC-10045	CCGTDB02SS27	3	107.7		0.108	
		7	97.51		0.350	
		10	125.2		0.285	
		14	124.6		0.000	
ETDC-10046	CCGTDB02SS30	3	16.71		0.380	
		7	15.05		1.03	
		10	16.53		0.994	
		14	11.71		2.25	
ETDC-10047	CCGTDB02SS31	3	499.3		0.952	
		7	90.89		0.722	
		10	74.01		0.319	
		14	71.40		0.546	
Blank A		3	0.000		0.000	
Blank B		7	0.039		0.073	
Blank C		10	0.000		0.057	
Blank D		14	0.000		0.056	

* *Calculated negative values are rounded to zero.*

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-9998A	ETDC-9998D	ETDC-9998G	ETDC-9998J
Client Sample No.	CCGTSB01SS04	CCGTSB01SS04	CCGTSB01SS04	CCGTSB01SS04
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	442	125	115	117
TPU, pCi/L	44.7	13.0	12.0	12.2
Am, pCi/L	598	915	925	923
Vs, ml	101.10	100.27	100.20	100.07
Wet sample wt., g.	25.08	25.04	25.05	25.00
Moisture, %	22.9	22.9	22.9	22.9
Wm, g	20.41	20.37	20.38	20.34
Rd	6.703	36.025	39.542	38.809

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-10005A	ETDC-10005B	ETDC-10005C	ETDC-10005D
Client Sample No.	CCGTSB02SS09	CCGTSB02SS09	CCGTSB02SS09	CCGTSB02SS09
Contact period	3 days	3 days	3 days	7 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	13.4	13.6	13.5	11.2
TPU, pCi/L	1.84	1.86	1.85	1.62
Am, pCi/L	1026.6	1026.4	1026.5	1028.8
Vs, ml	100.17	100.17	100.92	100.55
Wet sample wt., g.	25.01	25.03	25.00	25.03
Moisture, %	14.6	14.6	14.6	14.6
Wm, g	21.82	21.84	21.82	21.84
Rd	351.645	346.130	351.760	422.882

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-10005E	ETDC-10005F	ETDC-10005G	ETDC-10005H
Client Sample No.	CCGTSB02SS09	CCGTSB02SS09	CCGTSB02SS09	CCGTSB02SS09
Contact period	7 days	7 days	10 days	10 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	11.2	10.8	11.1	10.7
TPU, pCi/L	1.62	1.58	1.61	1.57
Am, pCi/L	1028.8	1029.2	1028.9	1029.3
Vs, ml	100.12	100.74	100.08	100.21
Wet sample wt., g.	25.01	25.02	25.01	25.02
Moisture, %	14.6	14.6	14.6	14.6
Wm, g	21.82	21.83	21.82	21.83
Rd	421.410	439.719	425.078	441.536

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-10005I	ETDC-10005J	ETDC-10005K	ETDC-10005L
Client Sample No.	CCGTSB02SS09	CCGTSB02SS09	CCGTSB02SS09	CCGTSB02SS09
Contact period	10 days	14 days	14 days	14 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	10.9	12.8	13.4	14.9
TPU, pCi/L	1.59	1.78	1.84	1.99
Am, pCi/L	1029.1	1027.2	1026.6	1025.1
Vs, ml	100.17	100.19	100.27	100.82
Wet sample wt., g.	25.08	25.08	25.04	25.03
Moisture, %	14.6	14.6	14.6	14.6
Wm, g	21.88	21.88	21.85	21.84
Rd	432.141	367.389	351.575	317.578

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-10013A	ETDC-10013D	ETDC-10013G	ETDC-10013J
Client Sample No.	CCGTSB03SS11	CCGTSB03SS11	CCGTSB03SS11	CCGTSB03SS11
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	224	103	101	73.3
TPU, pCi/L	22.9	10.8	10.6	7.83
Am, pCi/L	816	937	939	967
Vs, ml	100.43	100.40	100.20	100.22
Wet sample wt., g.	25.01	25.03	25.01	25.04
Moisture, %	14.3	14.3	14.3	14.3
Wm, g	21.88	21.90	21.88	21.91
Rd	16.720	41.708	42.574	60.333

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-10018A	ETDC-10018D	ETDC-10018G	ETDC-10018J
Client Sample No.	CCGTSB05SS04	CCGTSB05SS04	CCGTSB05SS04	CCGTSB05SS04
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	74.4	46.0	11.4	15.0
TPU, pCi/L	7.94	5.10	1.64	2.00
Am, pCi/L	966	994	1029	1025
Vs, ml	100.30	100.21	100.18	100.00
Wet sample wt., g.	25.00	25.01	25.00	25.00
Moisture, %	26.9	26.9	26.9	26.9
Wm, g	19.70	19.71	19.70	19.70
Rd	66.076	109.872	458.822	346.860

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-10029A	ETDC-10029D	ETDC-10029G	ETDC-10029J
Client Sample No.	CCGTSB06SS03	CCGTSB06SS03	CCGTSB06SS03	CCGTSB06SS03
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	188	157	129	173
TPU, pCi/L	19.3	16.2	13.4	17.8
Am, mCi/L	852	883	911	867
Vs, ml	100.02	100.18	100.10	100.10
Wet sample wt., g.	25.00	25.02	25.03	25.02
Moisture, %	29.2	29.2	29.2	29.2
Wm, g	19.35	19.37	19.37	19.37
Rd	23.426	29.095	36.489	25.905

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-10035A	ETDC-10035D	ETDC-10035G	ETDC-10035J
Client Sample No.	CCGTSB06SS22	CCGTSB06SS22	CCGTSB06SS22	CCGTSB06SS22
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	39.0	32.3	30.2	25.5
TPU, pCi/L	4.40	3.73	3.52	3.05
Am, mCi/L	1001	1008	1010	1015
Vs, ml	100.30	100.00	100.06	100.09
Wet sample wt., g.	25.05	25.01	25.04	25.04
Moisture, %	66.7	66.7	66.7	66.7
Wm, g	15.03	15.00	15.02	15.02
Rd	171.316	207.946	222.736	265.096

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-10041A	ETDC-10041D	ETDC-10041G	ETDC-10041J
Client Sample No.	CCGTDB02SS17	CCGTDB02SS17	CCGTDB02SS17	CCGTDB02SS17
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	85.0	36.0	28.3	35.9
TPU, pCi/L	9.00	4.10	3.33	4.09
Am, mCi/L	955	1004	1011.7	1004.1
Vs, ml	100.05	100.17	100.35	100.15
Wet sample wt., g.	25.00	25.00	25.02	25.02
Moisture, %	24.9	24.9	24.9	24.9
Wm, g	20.02	20.02	20.03	20.03
Rd	56.160	139.570	179.084	139.833

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-10043A	ETDC-10043D	ETDC-10043G	ETDC-10043J
Client Sample No.	CCGTDB02SS21	CCGTDB02SS21	CCGTDB02SS21	CCGTDB02SS21
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	212	122	92.4	90.0
TPU, pCi/L	21.7	12.7	9.74	9.50
Am, mCi/L	828	918	948	950
Vs, ml	100.32	100.30	100.18	100.27
Wet sample wt., g.	25.02	25.06	25.07	25.04
Moisture, %	24.7	24.7	24.7	24.7
Wm, g	20.06	20.10	20.10	20.08
Rd	19.528	37.555	51.103	52.709

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-10045A	ETDC-10045D	ETDC-10045G	ETDC-10045J
Client Sample No.	CCGTDB02SS27	CCGTDB02SS27	CCGTDB02SS27	CCGTDB02SS27
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	44.8	49.2	38.7	39.1
TPU, pCi/L	4.98	5.42	4.37	4.41
Am, mCi/L	995.2	990.8	1001.3	1000.9
Vs, ml	100.60	100.56	101.41	100.98
Wet sample wt., g.	25.10	25.13	25.36	25.10
Moisture, %	21.0	21.0	21.0	21.0
Wm, g	20.74	20.77	20.96	20.74
Rd	107.731	97.508	125.190	124.612

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-10046A	ETDC-10046D	ETDC-10046G	ETDC-10046J
Client Sample No.	CCGTDB02SS30	CCGTDB02SS30	CCGTDB02SS30	CCGTDB02SS30
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	290	313	293	370
TPU, pCi/L	29.5	31.8	29.8	37.5
Am, mCi/L	750	727	747	670
Vs, ml	100.23	100.37	100.55	100.25
Wet sample wt., g.	25.04	25.00	25.03	25.03
Moisture, %	61.4	61.4	61.4	61.4
Wm, g	15.51	15.49	15.51	15.51
Rd	16.708	15.051	16.530	11.706

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	ETDC-10047A	ETDC-10047D	ETDC-10047G	ETDC-10047J
Client Sample No.	CCGTDB02SS31	CCGTDB02SS31	CCGTDB02SS31	CCGTDB02SS31
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	13.7	71.4	86.0	89.2
TPU, pCi/L	1.87	7.64	9.10	9.42
Am, mCi/L	1026.3	968.6	954	950.8
Vs, ml	100.28	100.72	100.13	100.54
Wet sample wt., g.	25.08	25.06	25.02	25.02
Moisture, %	66.7	66.7	66.7	66.7
Wm, g	15.04	15.03	15.01	15.01
Rd	499.317	90.890	74.005	71.402

Sample species:	Np-237	Np-237	Np-237	Np-237
Lab Sample No.	Blank A	Blank B	Blank C	Blank D
Client Sample No.				
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	1040	1040	1040	1040
TPU, pCi/L	105	105	105	105
As, pCi/L	1050	1030	1040	1040
TPU, pCi/L	106	104	105	105
Am, mCi/L	-10	10	0	0
Vs, ml	100.60	100.10	100.56	100.02
Wet sample wt., g.	0	0	0	0
Moisture, %				
Wm, g	25.00	25.00	25.00	25.00
Rd	-0.038	0.039	0.000	0.000

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-9998A	ETDC-9998D	ETDC-9998G	ETDC-9998J
Client Sample No.	CCGTSB01SS04	CCGTSB01SS04	CCGTSB01SS04	CCGTSB01SS04
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	5310	5320	5120	5210
TPU, pCi/L	539	540	520	529
Am, pCi/L	-270	-280	-80	-170
Vs, ml	101.10	100.27	100.20	100.07
Wet sample wt., g.	25.08	25.04	25.05	25.00
Moisture, %	22.9	22.9	22.9	22.9
Wm, g	20.41	20.37	20.38	20.34
Rd	-0.252	-0.259	-0.077	-0.161

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-10005A	ETDC-10005B	ETDC-10005C	ETDC-10005D
Client Sample No.	CCGTSB02SS09	CCGTSB02SS09	CCGTSB02SS09	CCGTSB02SS09
Contact period	3 days	3 days	3 days	7 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	4860	4990	5040	4920
TPU, pCi/L	493	507	512	500
Am, pCi/L	180	50	0	120
Vs, ml	100.17	100.17	100.92	100.55
Wet sample wt., g.	25.01	25.03	25.00	25.03
Moisture, %	14.6	14.6	14.6	14.6
Wm, g	21.82	21.84	21.82	21.84
Rd	0.170	0.046	0.000	0.112

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-10005E	ETDC-10005F	ETDC-10005G	ETDC-10005H
Client Sample No.	CCGTSB02SS09	CCGTSB02SS09	CCGTSB02SS09	CCGTSB02SS09
Contact period	7 days	7 days	10 days	10 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	4900	4650	4900	4950
TPU, pCi/L	498	473	497	503
Am, pCi/L	140	390	140	90
Vs, ml	100.12	100.74	100.08	100.21
Wet sample wt., g.	25.01	25.02	25.01	25.02
Moisture, %	14.6	14.6	14.6	14.6
Wm, g	21.82	21.83	21.82	21.83
Rd	0.131	0.387	0.131	0.083

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-10005I	ETDC-10005J	ETDC-10005K	ETDC-10005L
Client Sample No.	CCGTSB02SS09	CCGTSB02SS09	CCGTSB02SS09	CCGTSB02SS09
Contact period	10 days	14 days	14 days	14 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	4790	4910	4870	4860
TPU, pCi/L	487	499	495	494
Am, pCi/L	250	130	170	180
Vs, ml	100.17	100.19	100.27	100.82
Wet sample wt., g.	25.08	25.08	25.04	25.03
Moisture, %	14.6	14.6	14.6	14.6
Wm, g	21.88	21.88	21.85	21.84
Rd	0.239	0.121	0.160	0.171

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-10013A	ETDC-10013D	ETDC-10013G	ETDC-10013J
Client Sample No.	CCGTSB03SS11	CCGTSB03SS11	CCGTSB03SS11	CCGTSB03SS11
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	5150	5270	5120	5180
TPU, pCi/L	523	535	520	526
Am, pCi/L	-110	-230	-80	-140
Vs, ml	100.43	100.40	100.20	100.22
Wet sample wt., g.	25.01	25.03	25.01	25.04
Moisture, %	14.3	14.3	14.3	14.3
Wm, g	21.88	21.90	21.88	21.91
Rd	-0.098	-0.200	-0.072	-0.124

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-10018A	ETDC-10018D	ETDC-10018G	ETDC-10018J
Client Sample No.	CCGTSB05SS04	CCGTSB05SS04	CCGTSB05SS04	CCGTSB05SS04
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	4900	4970	4940	4750
TPU, pCi/L	498	505	502	483
Am, pCi/L	140	70	100	290
Vs, ml	100.30	100.21	100.18	100.00
Wet sample wt., g.	25.00	25.01	25.00	25.00
Moisture, %	26.9	26.9	26.9	26.9
Wm, g	19.70	19.71	19.70	19.70
Rd	0.145	0.072	0.103	0.310

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-10029A	ETDC-10029D	ETDC-10029G	ETDC-10029J
Client Sample No.	CCGTSB06SS03	CCGTSB06SS03	CCGTSB06SS03	CCGTSB06SS03
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	5120	5130	4840	5000
TPU, pCi/L	520	521	492	508
Am, mCi/L	-80	-90	200	40
Vs, ml	100.02	100.18	100.10	100.10
Wet sample wt., g.	25.00	25.01	25.01	25.02
Moisture, %	29.2	29.2	29.2	29.2
Wm, g	19.35	19.36	19.36	19.37
Rd	-0.081	-0.091	0.214	0.041

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-10035A	ETDC-10035D	ETDC-10035G	ETDC-10035J
Client Sample No.	CCGTSB06SS22	CCGTSB06SS22	CCGTSB06SS22	CCGTSB06SS22
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	5090	5040	5090	5110
TPU, pCi/L	517	512	517	519
Am, mCi/L	-50	0	-50	-70
Vs, ml	100.30	100.00	100.06	100.90
Wet sample wt., g.	25.05	25.01	25.04	25.04
Moisture, %	66.7	66.7	66.7	66.7
Wm, g	15.03	15.00	15.02	15.02
Rd	-0.066	0.000	-0.065	-0.092

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-10041A	ETDC-10041D	ETDC-10041G	ETDC-10041J
Client Sample No.	CCGTDB02SS17	CCGTDB02SS17	CCGTDB02SS17	CCGTDB02SS17
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	5270	5170	5120	4850
TPU, pCi/L	535	525	520	493
Am, mCi/L	-230	-130	-80	190
Vs, ml	100.05	100.17	100.35	100.15
Wet sample wt., g.	25.00	25.00	25.02	25.02
Moisture, %	24.9	24.9	24.9	24.9
Wm, g	20.02	20.02	20.03	20.03
Rd	-0.218	-0.126	-0.078	0.196

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-10043A	ETDC-10043D	ETDC-10043G	ETDC-10043J
Client Sample No.	CCGTDB02SS21	CCGTDB02SS21	CCGTDB02SS21	CCGTDB02SS21
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	5370	5320	5250	5160
TPU, pCi/L	545	540	533	524
Am, mCi/L	-330	-280	-210	-120
Vs, ml	100.32	100.30	100.18	100.27
Wet sample wt., g.	25.02	25.06	25.07	25.04
Moisture, %	24.7	24.7	24.7	24.7
Wm, g	20.06	20.10	20.10	20.08
Rd	-0.307	-0.263	-0.199	-0.116

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-10045A	ETDC-10045D	ETDC-10045G	ETDC-10045J
Client Sample No.	CCGTDB02SS27	CCGTDB02SS27	CCGTDB02SS27	CCGTDB02SS27
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	4930	4700	4760	5040
TPU, pCi/L	501	478	484	512
Am, mCi/L	110	340	280	0
Vs, ml	100.60	100.56	101.41	100.98
Wet sample wt., g.	25.10	25.13	25.36	25.10
Moisture, %	21.0	21.0	21.0	21.0
Wm, g	20.74	20.77	20.96	20.74
Rd	0.108	0.350	0.285	0.000

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-10046A	ETDC-10046D	ETDC-10046G	ETDC-10046J
Client Sample No.	CCGTDB02SS30	CCGTDB02SS30	CCGTDB02SS30	CCGTDB02SS30
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	4760	4350	4370	3740
TPU, pCi/L	484	443	445	382
Am, mCi/L	280	690	670	1300
Vs, ml	100.23	100.37	100.55	100.25
Wet sample wt., g.	25.04	25.00	25.03	25.03
Moisture, %	61.4	61.4	61.4	61.4
Wm, g	15.51	15.49	15.51	15.51
Rd	0.380	1.028	0.994	2.247

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

Distribution Ratio, ASTM D 4319

Project: Bechtel Jacobs Paducah
Project Number: 783208.00410000

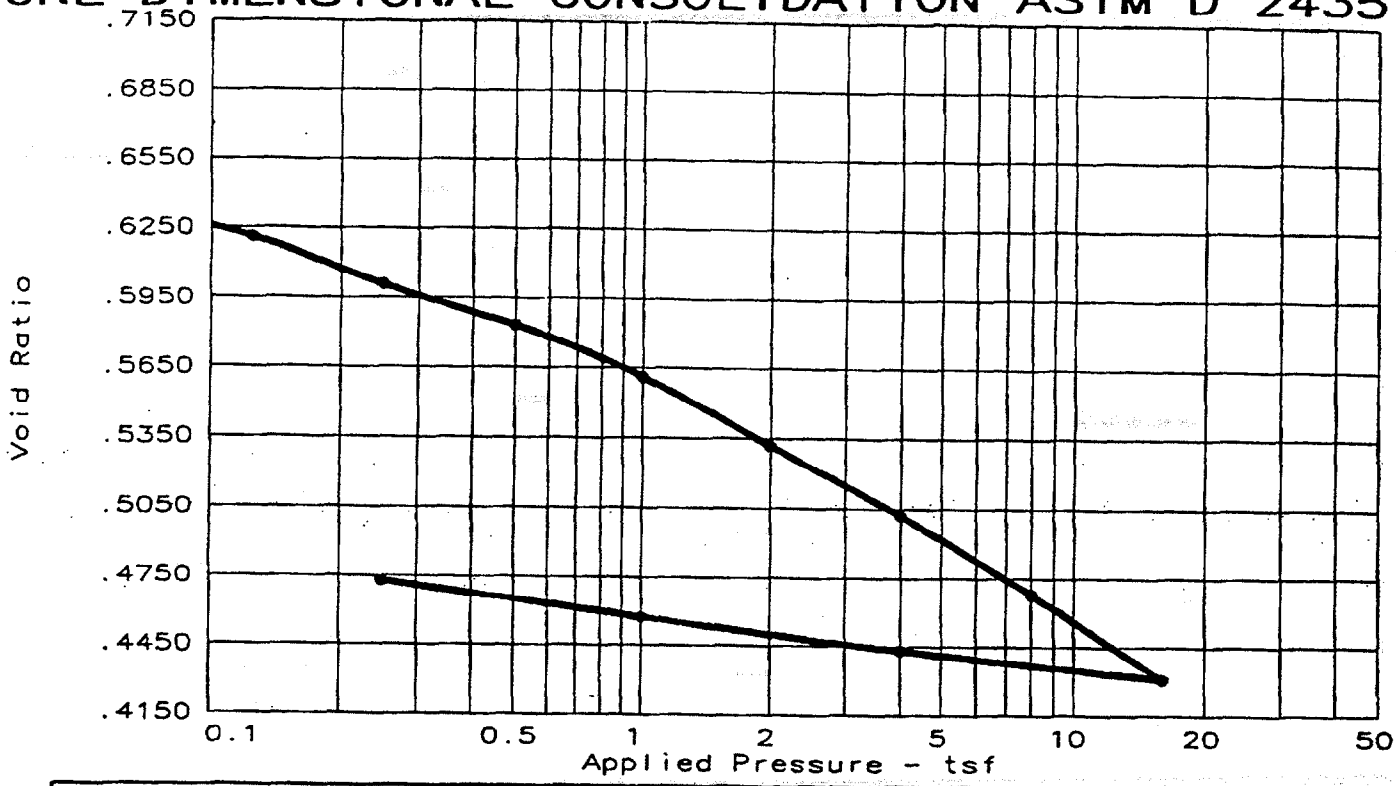
Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	ETDC-10047A	ETDC-10047D	ETDC-10047G	ETDC-10047J
Client Sample No.	CCGTDB02SS31	CCGTDB02SS31	CCGTDB02SS31	CCGTDB02SS31
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	4410	4550	4810	4660
TPU, pCi/L	449	463	489	474
Am, mCi/L	630	490	230	380
Vs, ml	100.28	100.72	100.13	100.54
Wet sample wt., g.	25.08	25.06	25.02	25.02
Moisture, %	66.7	66.7	66.7	66.7
Wm, g	15.04	15.03	15.01	15.01
Rd	0.952	0.722	0.319	0.546

Sample species:	Tc-99	Tc-99	Tc-99	Tc-99
Lab Sample No.	Blank A	Blank B	Blank C	Blank D
Client Sample No.				
Contact period	3 days	7 days	10 days	14 days
At, pCi/L	5040	5040	5040	5040
TPU, pCi/L	512	512	512	512
As, pCi/L	5140	4950	4970	4970
TPU, pCi/L	522	503	505	505
Am, mCi/L	-100	90	70	70
Vs, ml	100.60	100.10	100.56	100.02
Wet sample wt., g.	0	0	0	0
Moisture, %				
Wm, g	25.00	25.00	25.00	25.00
Rd	-0.078	0.073	0.057	0.056

At = Measured activity of contact fluid (blank), mCi/mL
TPU = Total Propogated Uncertainty of analytical result
As = Measured activity of contact fluid at equilibrium with sample media, pCi/mL
Am = Calculated activity of mineral fraction, pCi/g = At minus As
Vs = Volume of solution
Wm = Weight of mineral sample
Rd = distribution ratio

Rd = (Am)(Vs)/(As)(Wm) ml/g

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)								
No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.001						
3	0.25	0.002						
4	0.50	0.007						
5	1.00	0.011						
6	2.00	0.012						
7	4.00	0.021						
8	8.00	0.018						
9	16.00	0.018						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
100.7 %	25.5	100.8			2.65	0.57	0.12	0.6710

TEST RESULTS

Compression Index = 0.12

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9984
Client Sample No.: SB01ST01

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

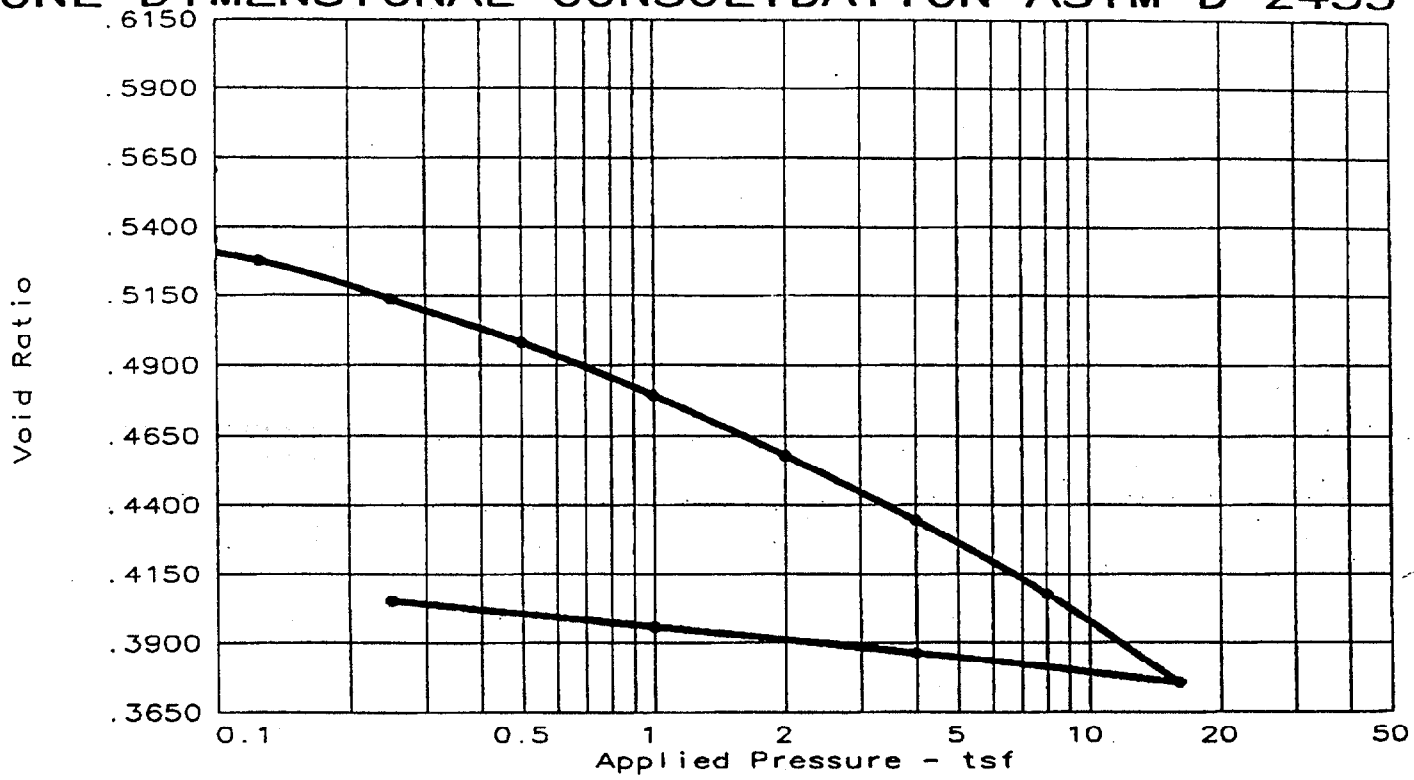
MATERIAL DESCRIPTION

Clayey silt

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

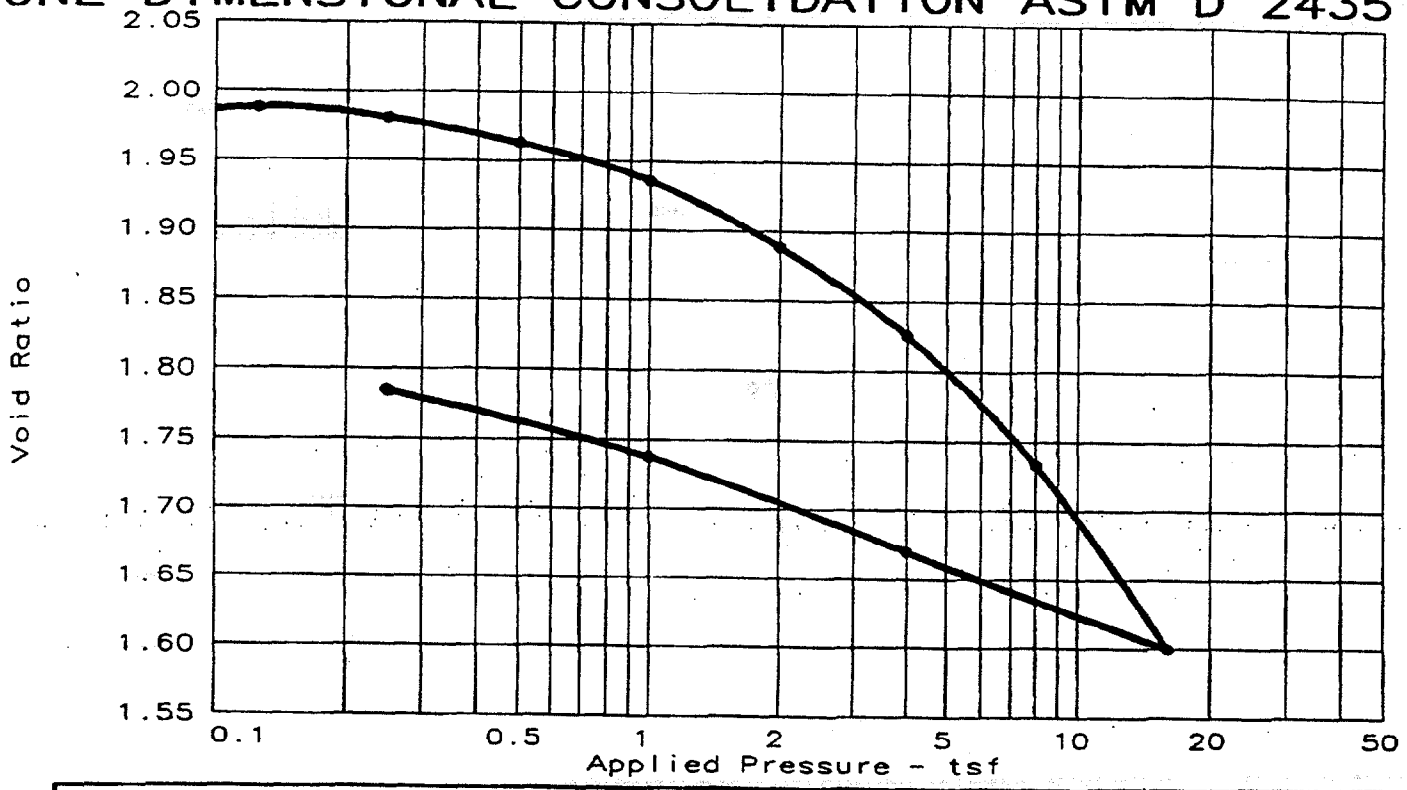


Coefficients of Consolidation (sq.in./min.)								
No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.001						
3	0.25	0.002						
4	0.50	0.005						
5	1.00	0.013						
6	2.00	0.012						
7	4.00	0.019						
8	8.00	0.018						
9	16.00	0.021						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
96.6 %	20.4	107.4			2.65	0.74	0.11	0.5610

TEST RESULTS	MATERIAL DESCRIPTION
Compression Index = 0.11	Clayey silt
ETDC Project Name: Bechtel Jacobs Paducah ETDC Project No.: 783208.0041000 ETDC Sample No.: 9985 Client Sample No.: SB01ST02	Remarks: Cv = Sq. root method
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435 IT Corp. - GEOTECHNICAL LABORATORY	Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

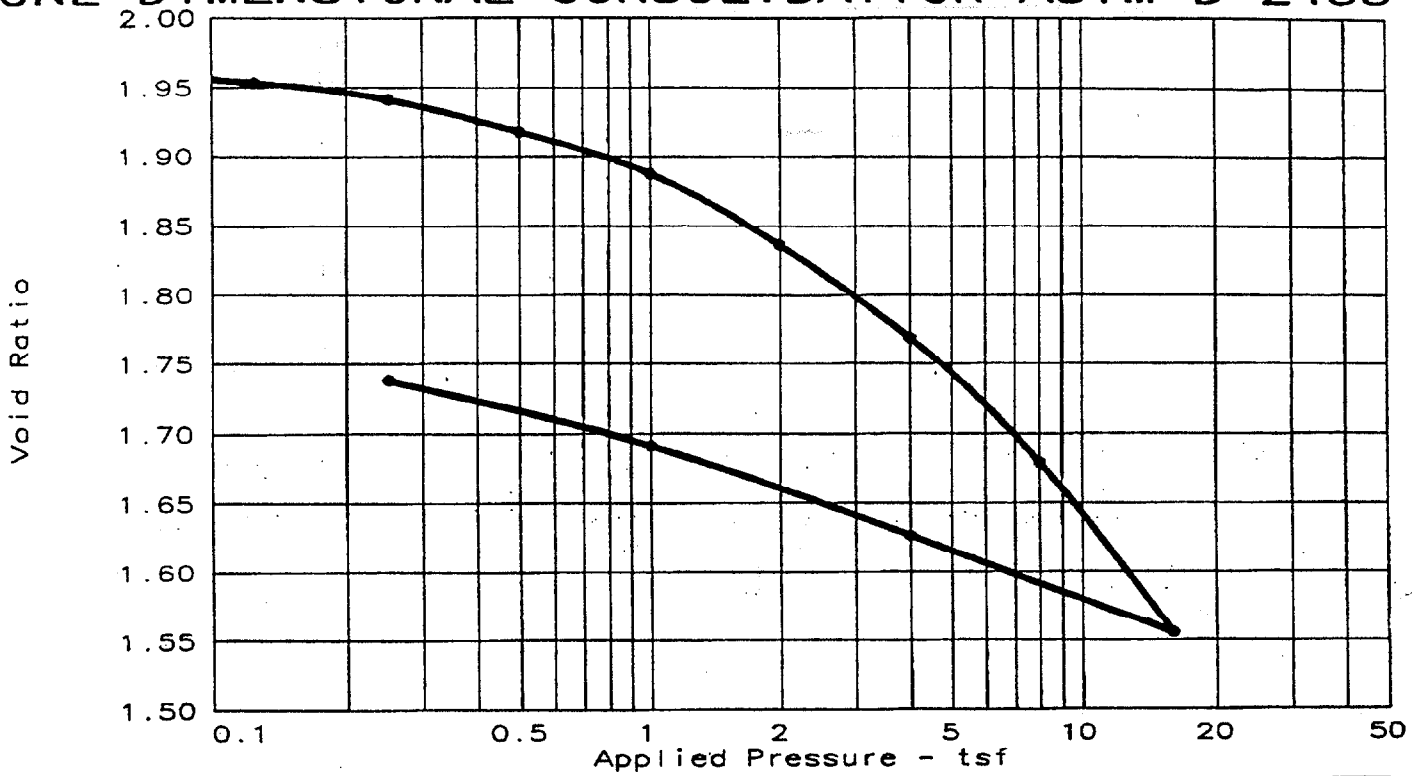


Coefficients of Consolidation (sq.in./min.)								
No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.25	0.075						
3	0.50	0.036						
4	1.00	0.124						
5	2.00	0.122						
6	4.00	0.122						
7	8.00	0.069						
8	16.00	0.033						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
76.5 %	57.3	56.8			2.65	7.35	0.44	1.9858

TEST RESULTS	MATERIAL DESCRIPTION
Compression Index = 0.44	Clayey silt
ETDC Project Name: Bechtel Jacobs Paducah ETDC Project No.: 783208.0041000 ETDC Sample No.: 9988 Client Sample No.: SB01ST05	Remarks: Cv = Sq. root method
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435 IT Corp. - GEOTECHNICAL LABORATORY	Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

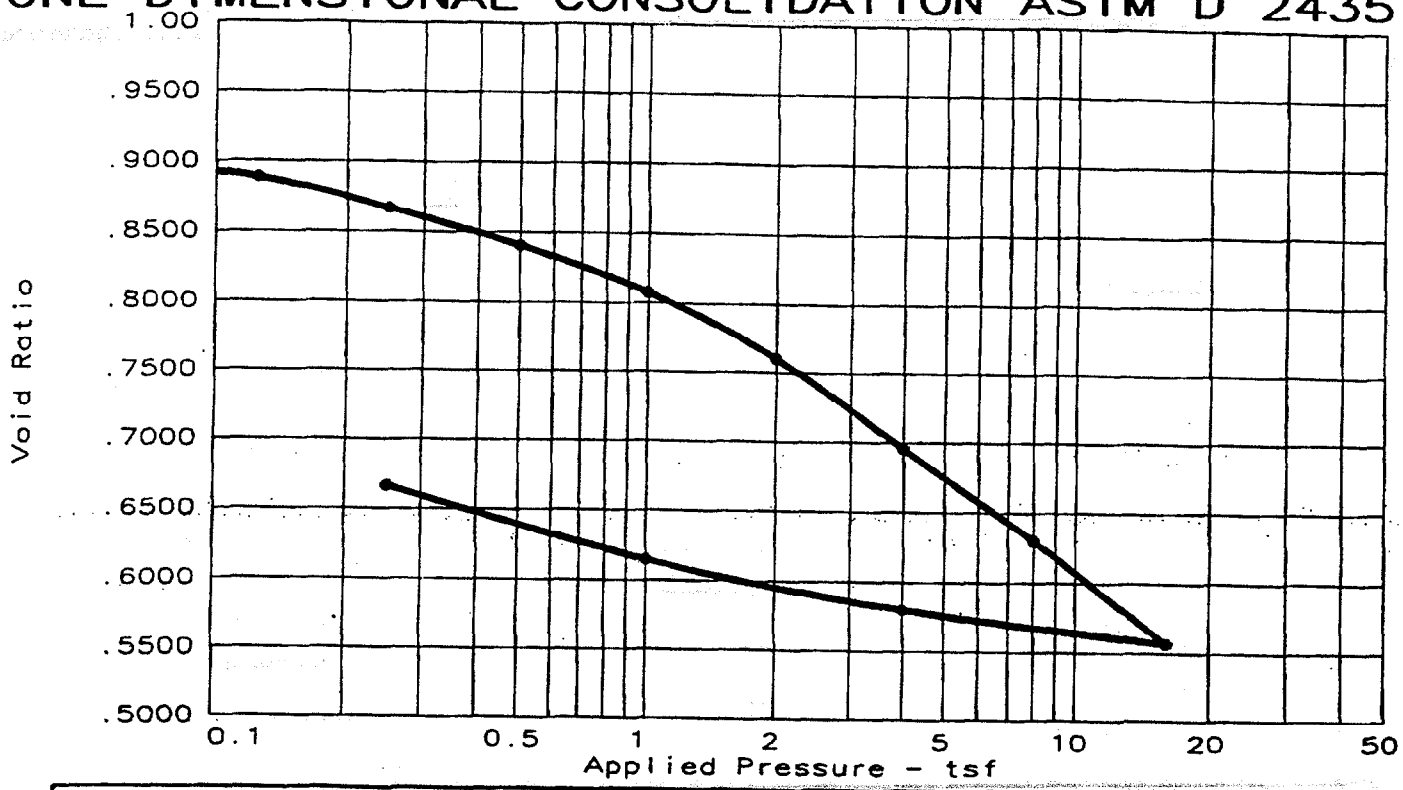


Coefficients of Consolidation (sq.in./min.)								
No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.25	0.079						
3	0.50	0.040						
4	1.00	0.157						
5	2.00	0.136						
6	4.00	0.134						
7	8.00	0.126						
8	16.00	0.032						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
80.8 %	59.6	56.4			2.65	7.34	0.41	1.9557

TEST RESULTS	MATERIAL DESCRIPTION
Compression Index = 0.41	Clayey silt
ETDC Project Name: Bechtel Jacobs Paducah ETDC Project No.: 783208.0041000 ETDC Sample No.: 9990 Client Sample No.: SB01ST06	Remarks: Cv = Sq. root method
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435 IT Corp. - GEOTECHNICAL LABORATORY	Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.113						
3	0.25	0.011						
4	0.50	0.020						
5	1.00	0.053						
6	2.00	0.057						
7	4.00	0.019						
8	8.00	0.013						
9	16.00	0.009						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
90.0 %	30.5	90.0			2.65	2.36	0.24	0.8974

TEST RESULTS

Compression Index = 0.24

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9961
Client Sample No.: SB02ST01

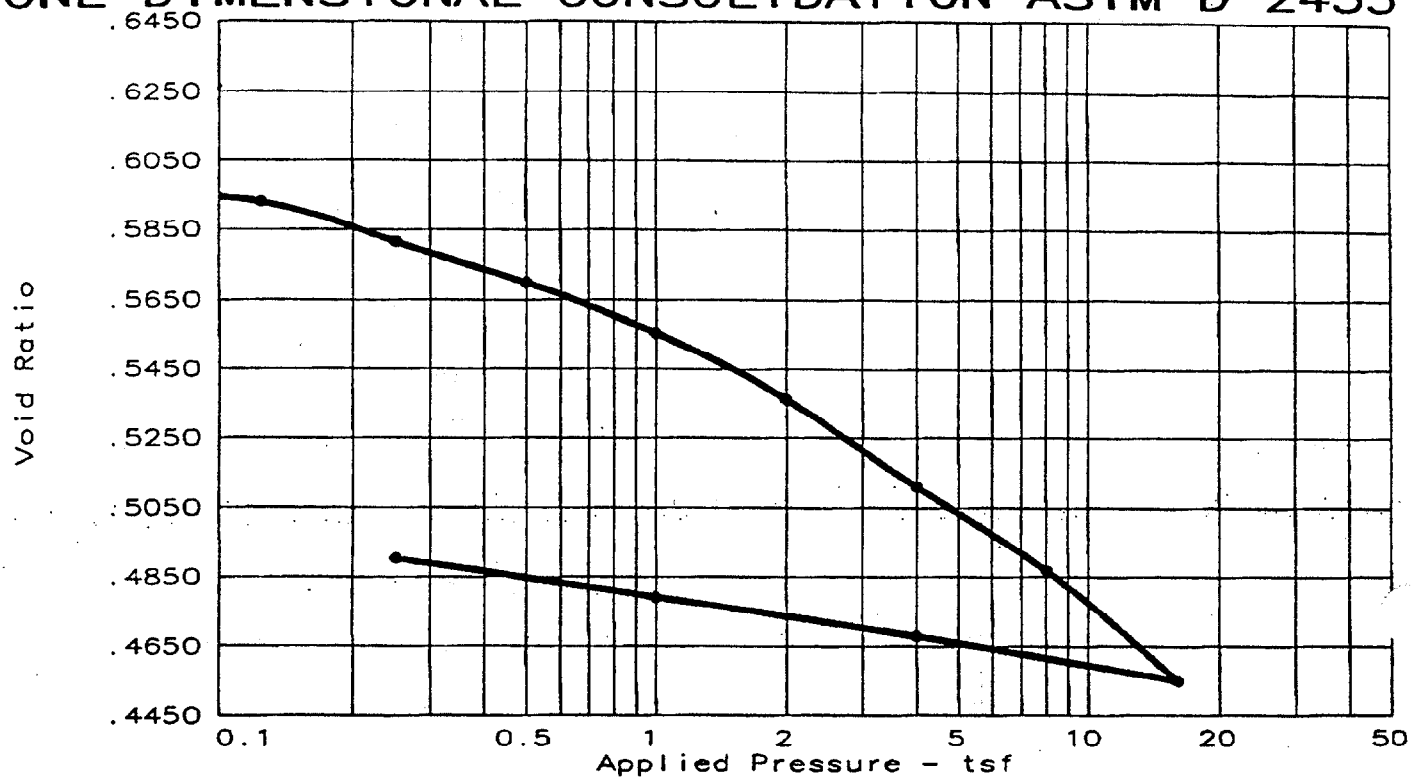
Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)								
No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.071						
3	0.25	0.014						
4	0.50	0.021						
5	1.00	0.040						
6	2.00	0.065						
7	4.00	0.033						
8	8.00	0.057						
9	16.00	0.029						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
94.2 %	22.3	102.3			2.65	0.93	0.11	0.6270

TEST RESULTS	MATERIAL DESCRIPTION
Compression Index = 0.11	Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9960
Client Sample No.: SB02ST02

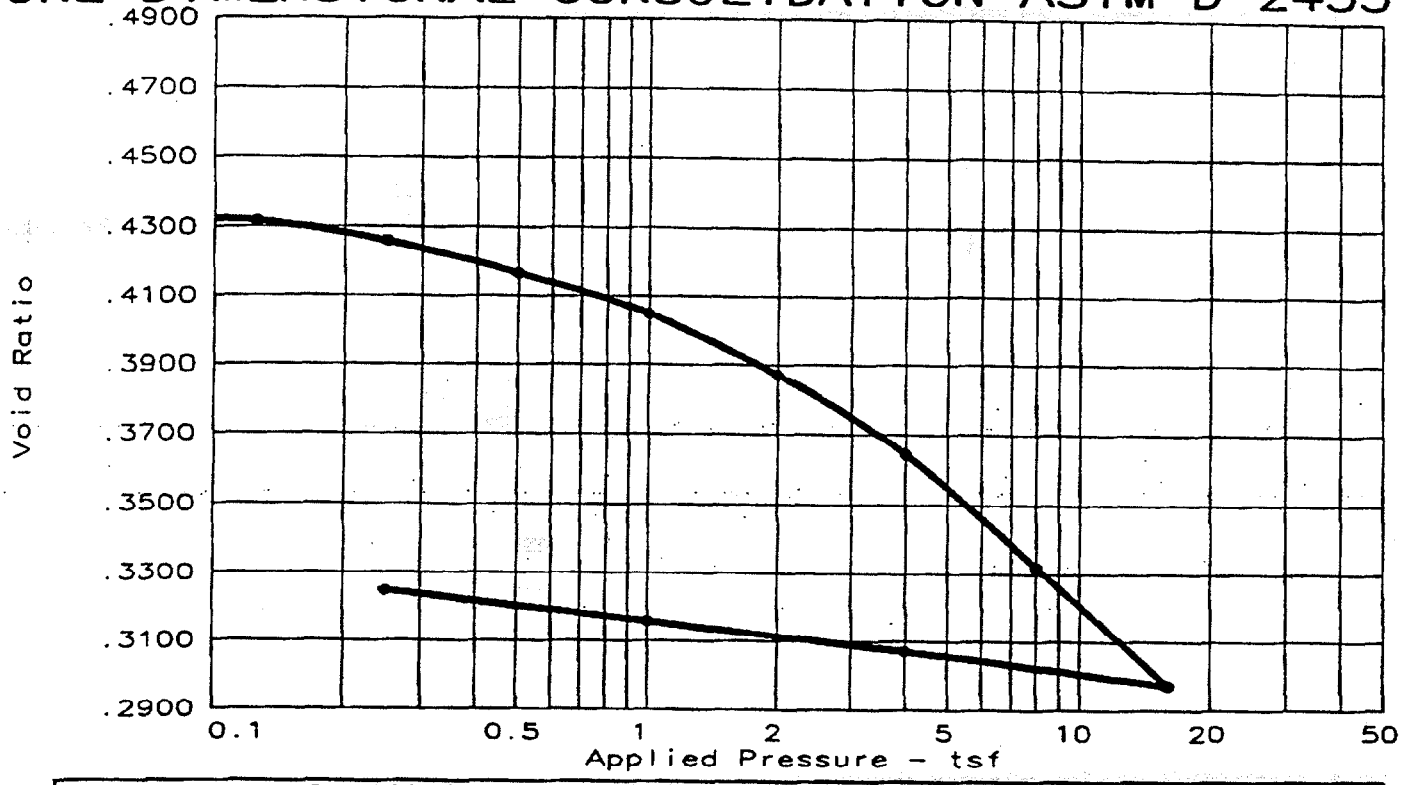
Remarks:
Cv = Sq. root method

Spec gravity assumed..

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.018						
3	0.25	0.016						
4	0.50	0.015						
5	1.00	0.021						
6	2.00	0.026						
7	4.00	0.027						
8	8.00	0.021						
9	16.00	0.022						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
107.9 %	17.8	115.3			2.65	3.97	0.12	0.4382

TEST RESULTS	MATERIAL DESCRIPTION
Compression Index = 0.12	Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9986
Client Sample No.: SB02ST03

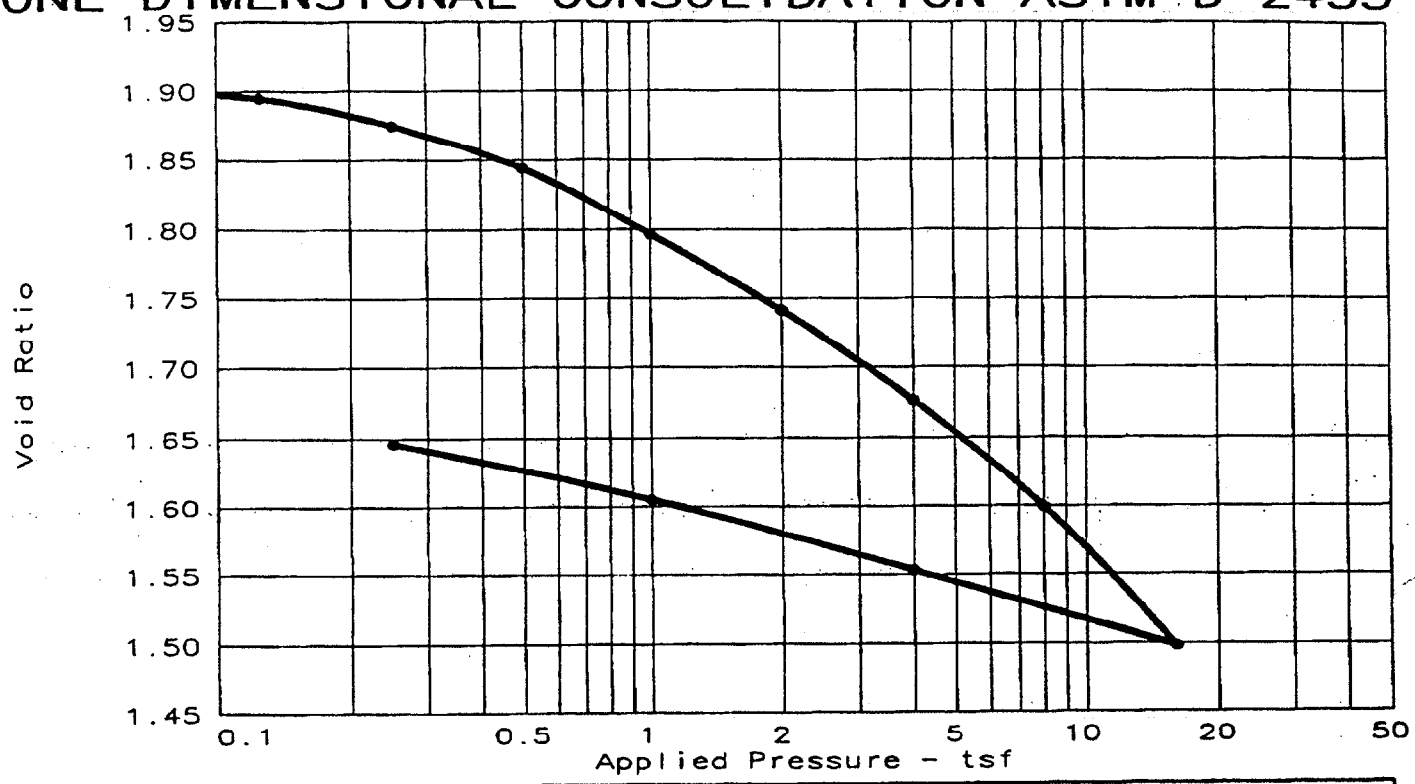
Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.046						
3	0.25	0.039						
4	0.50	0.153						
5	1.00	0.144						
6	2.00	0.138						
7	4.00	0.140						
8	8.00	0.134						
9	16.00	0.034						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
83.3 %	59.7	57.4			2.65	7.32	0.34	1.8994

TEST RESULTS

Compression Index = 0.34

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9989
Client Sample No.: SB02ST05

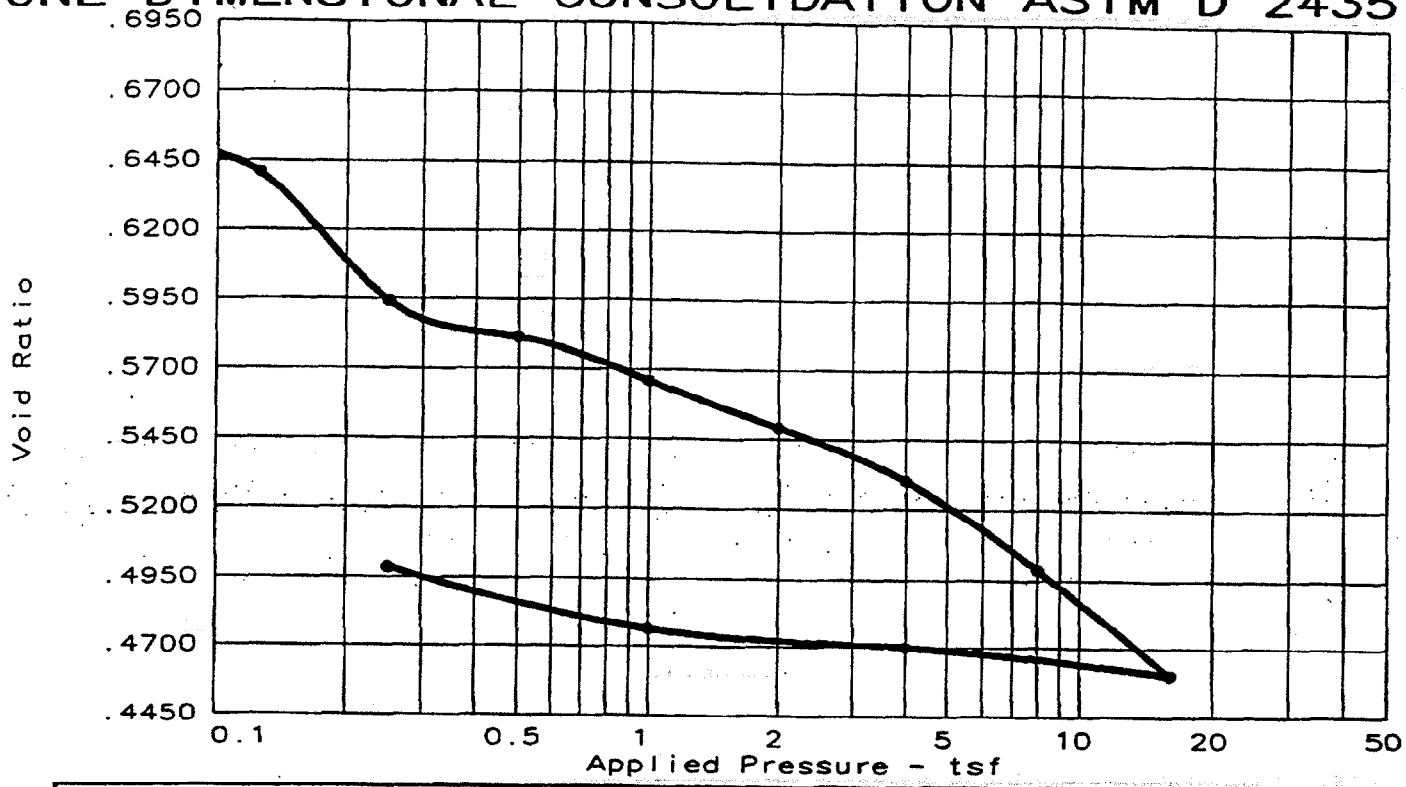
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.054						
3	0.25	0.066						
4	0.50	0.075						
5	1.00	0.031						
6	2.00	0.024						
7	4.00	0.080						
8	8.00	0.027						
9	16.00	0.061						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
90.0 %	23.0	100.3			2.65	1.02	0.13	0.6790

TEST RESULTS

C_v at 1.00 tsf applied = 0.031 sq. in./min.

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9932
Client Sample No.: SB03ST01

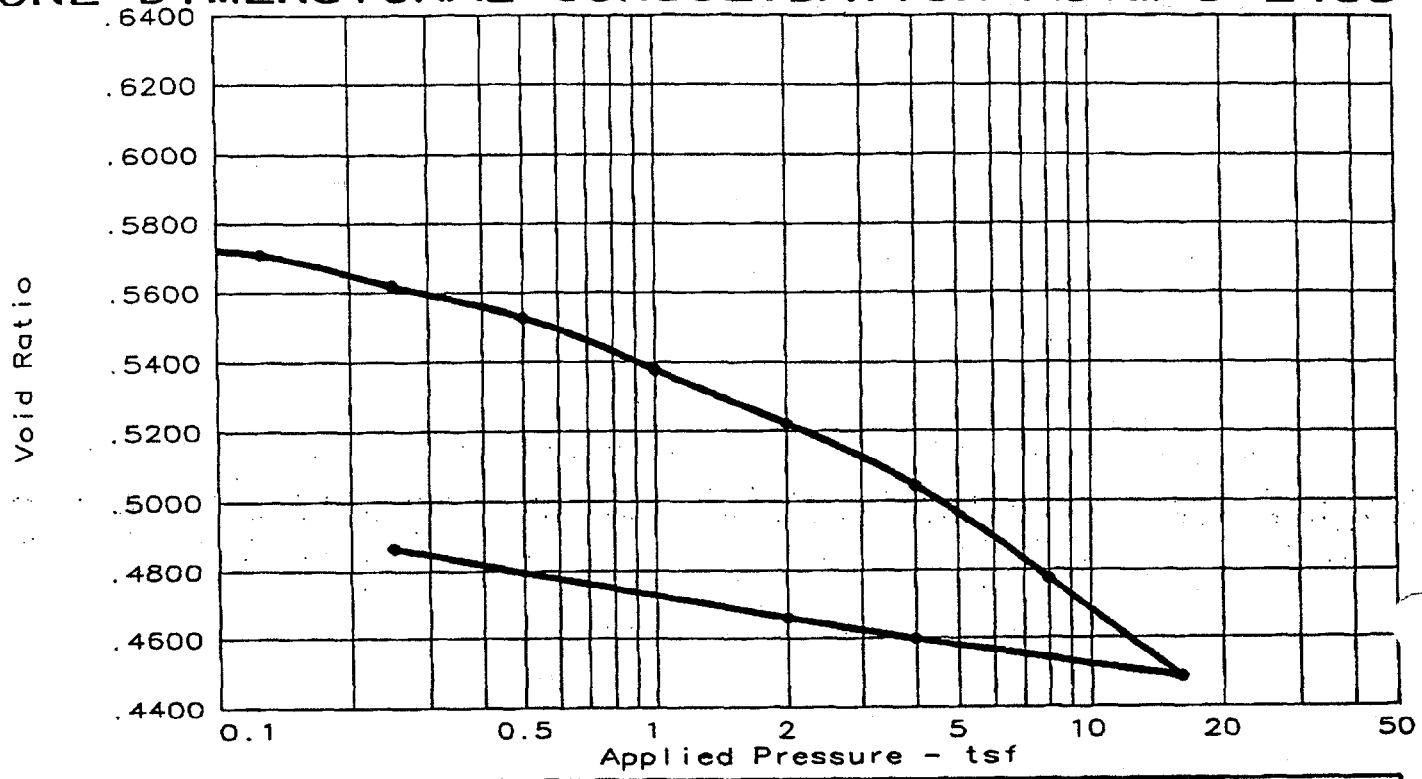
Remarks:
Cv = Sq root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.077						
3	0.25	0.014						
4	0.50	0.065						
5	1.00	0.026						
6	2.00	0.022						
7	4.00	0.075						
8	8.00	0.027						
9	16.00	0.058						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
93.3 %	20.9	103.7			2.65	4.39	0.10	0.5932

TEST RESULTS

Compression Index = 0.10

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9933
Client Sample No.: SB03ST02

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

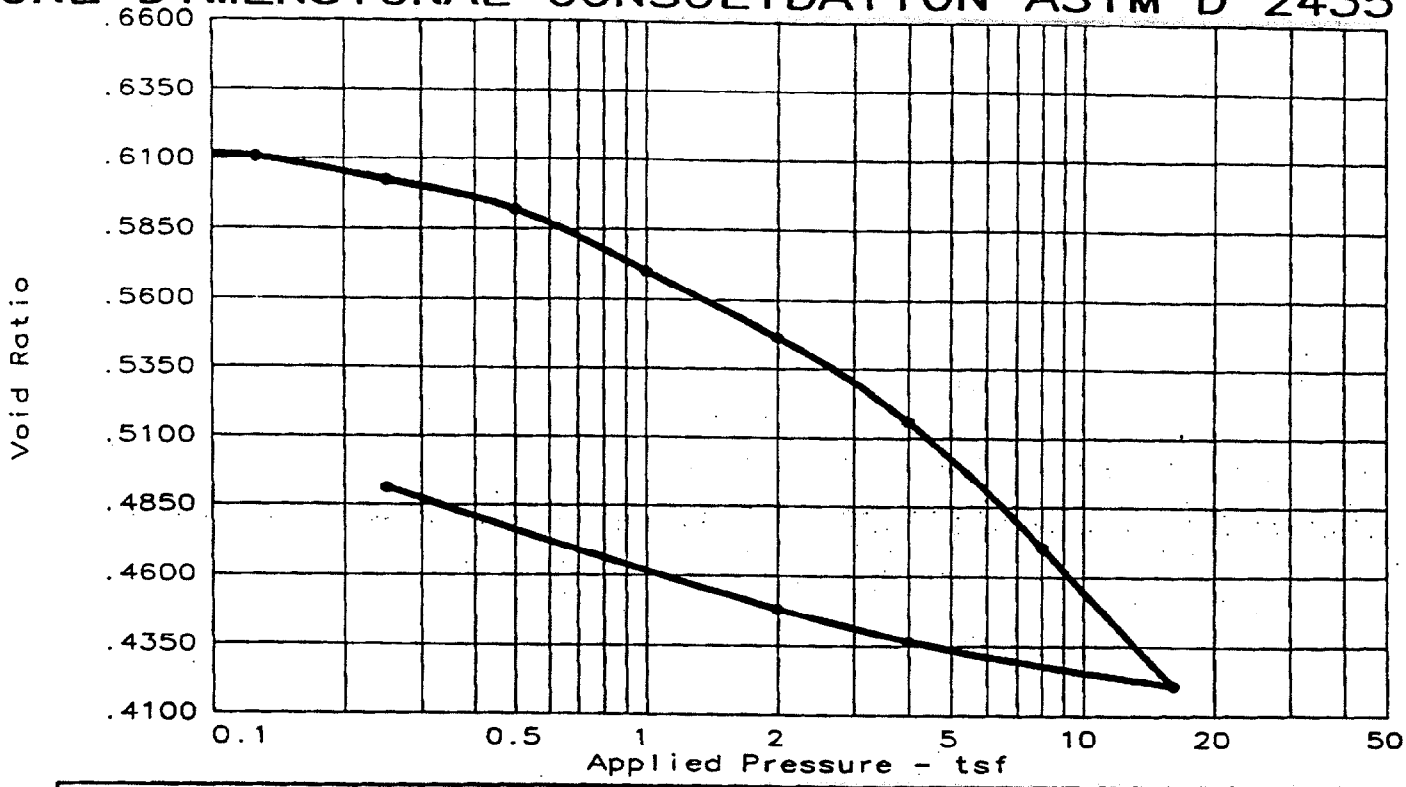
MATERIAL DESCRIPTION

Silty clay or clayey silt.

Remarks:
Cv = Sq root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)								
No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.055						
3	0.25	0.012						
4	0.50	0.049						
5	1.00	0.020						
6	2.00	0.030						
7	4.00	0.026						
8	8.00	0.012						
9	16.00	0.011						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
96.5 %	22.4	103.2			2.65	4.10	0.17	0.6161

TEST RESULTS

Compression Index = 0.17

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9934
Client Sample No.: SB03ST03

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

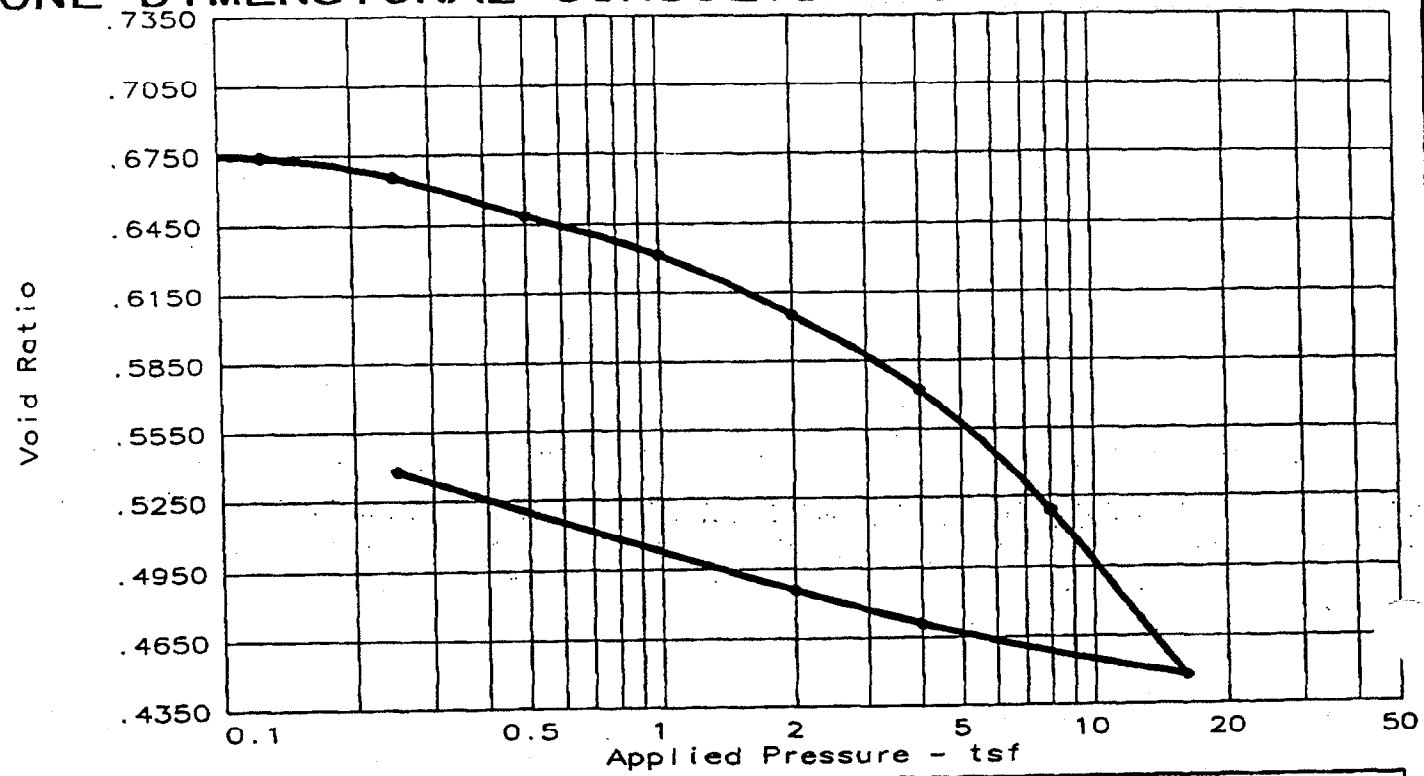
MATERIAL DESCRIPTION

Clayey silt

Remarks:
Cv = Sq root method

Specific grav. assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.061						
3	0.25	0.007						
4	0.50	0.005						
5	1.00	0.016						
6	2.00	0.013						
7	4.00	0.017						
8	8.00	0.012						
9	16.00	0.009						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
100.3 %	25.9	98.6			2.65	5.14	0.24	0.6847

TEST RESULTS

Compression Index = 0.24

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9935
Client Sample No.: SB03ST04

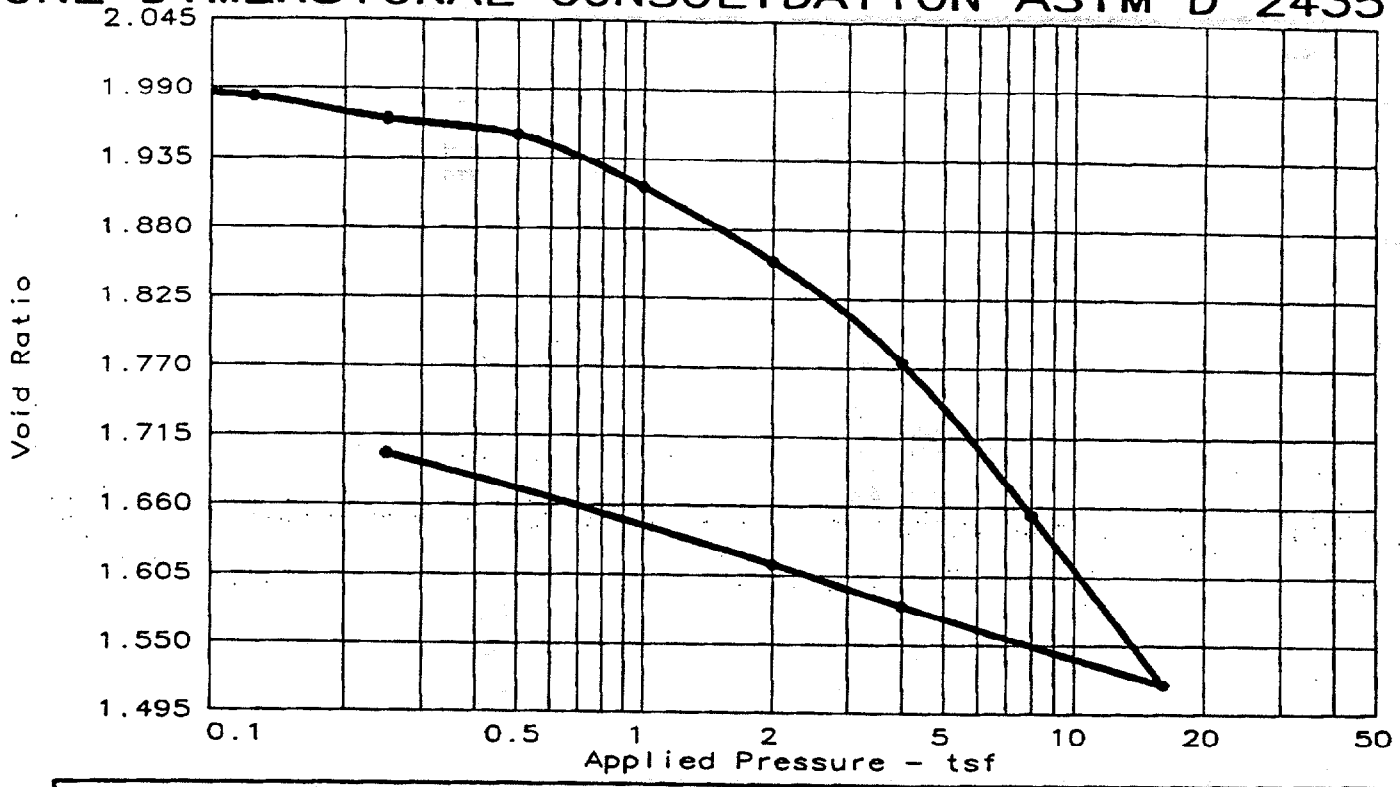
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)								
No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.004						
3	0.25	0.031						
4	0.50	0.100						
5	1.00	0.031						
6	2.00	0.073						
7	4.00	0.088						
8	8.00	0.027						
9	16.00	0.069						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
79.7 %	59.8	54.8			2.65	4.19	0.45	1.9887

TEST RESULTS	MATERIAL DESCRIPTION
Compression Index = 0.45	Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9936
Client Sample No.: SB03ST06

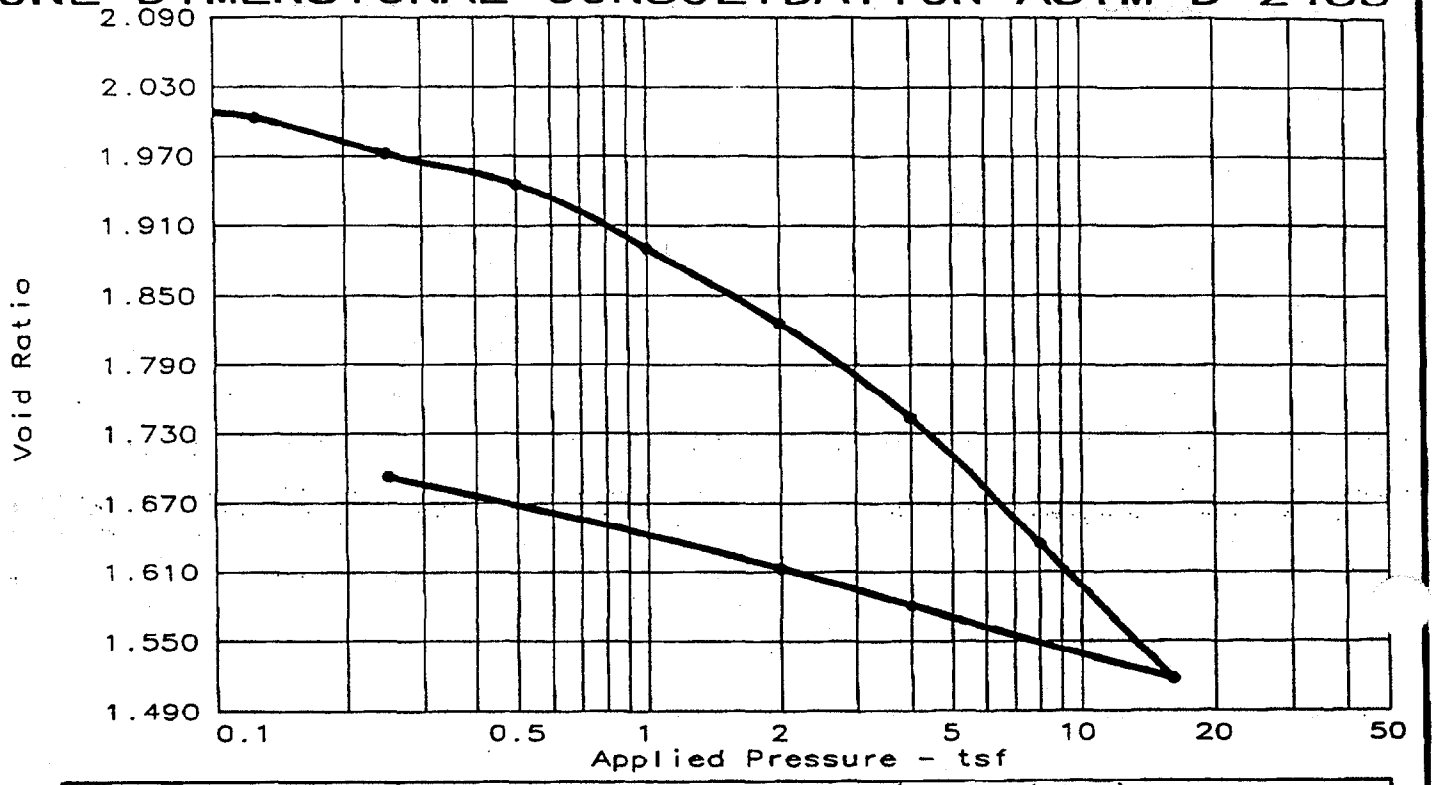
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.064						
3	0.25	0.036						
4	0.50	0.103						
5	1.00	0.031						
6	2.00	0.066						
7	4.00	0.086						
8	8.00	0.027						
9	16.00	0.068						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
78.0 %	59.6	56.0			2.65	1.53	0.39	2.0251

TEST RESULTS

Compression Index = 0.39

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9937
Client Sample No.: SB03ST07

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

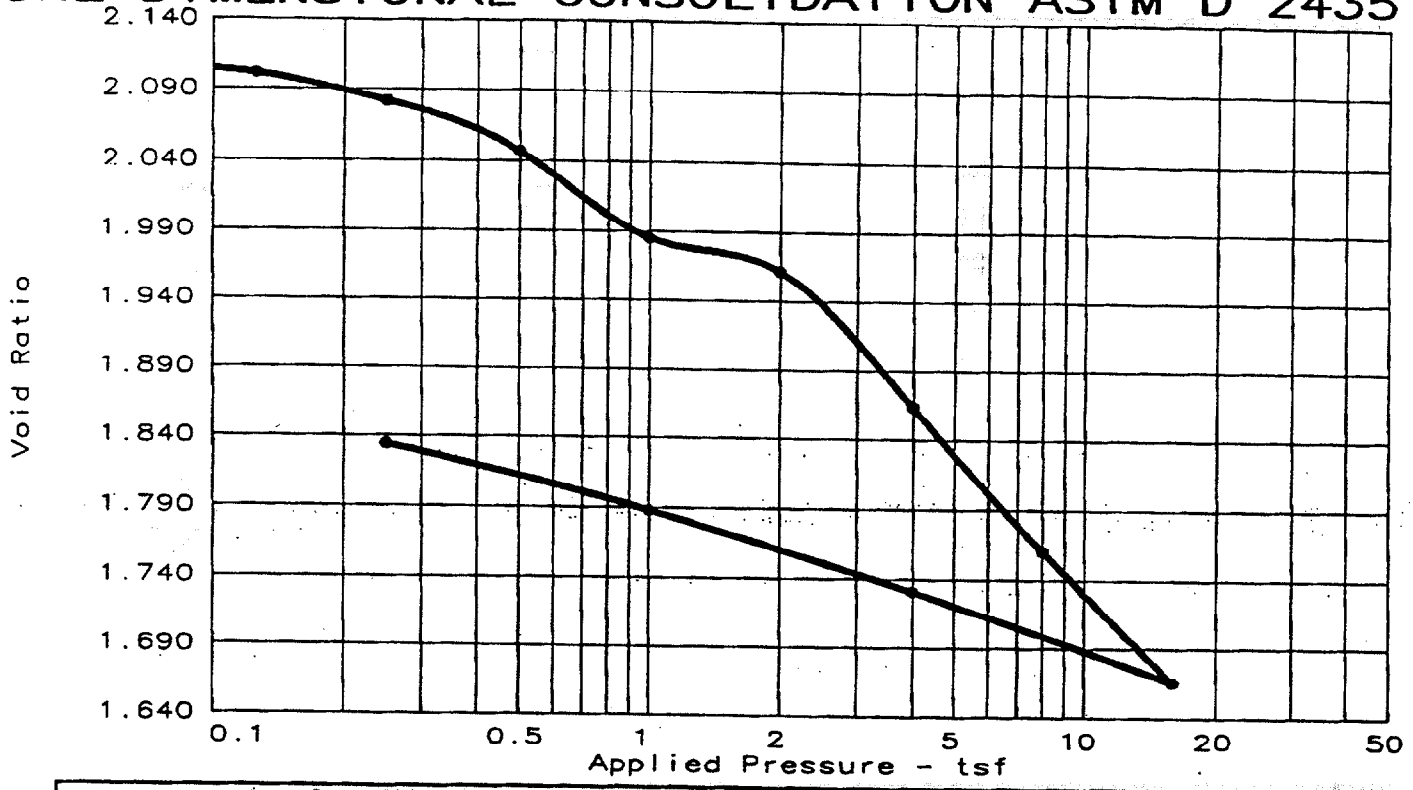
MATERIAL DESCRIPTION

Clayey silt

Remarks:
Cv = Sq root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.137						
3	0.25	0.109						
4	0.50	0.114						
5	1.00	0.140						
6	2.00	0.057						
7	4.00	0.030						
8	8.00	0.087						
9	16.00	0.071						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
70.3 %	56.1	54.0			2.65	1.81	0.32	2.1138

TEST RESULTS

Compression Index = 0.32

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9938
Client Sample No.: SB03ST08

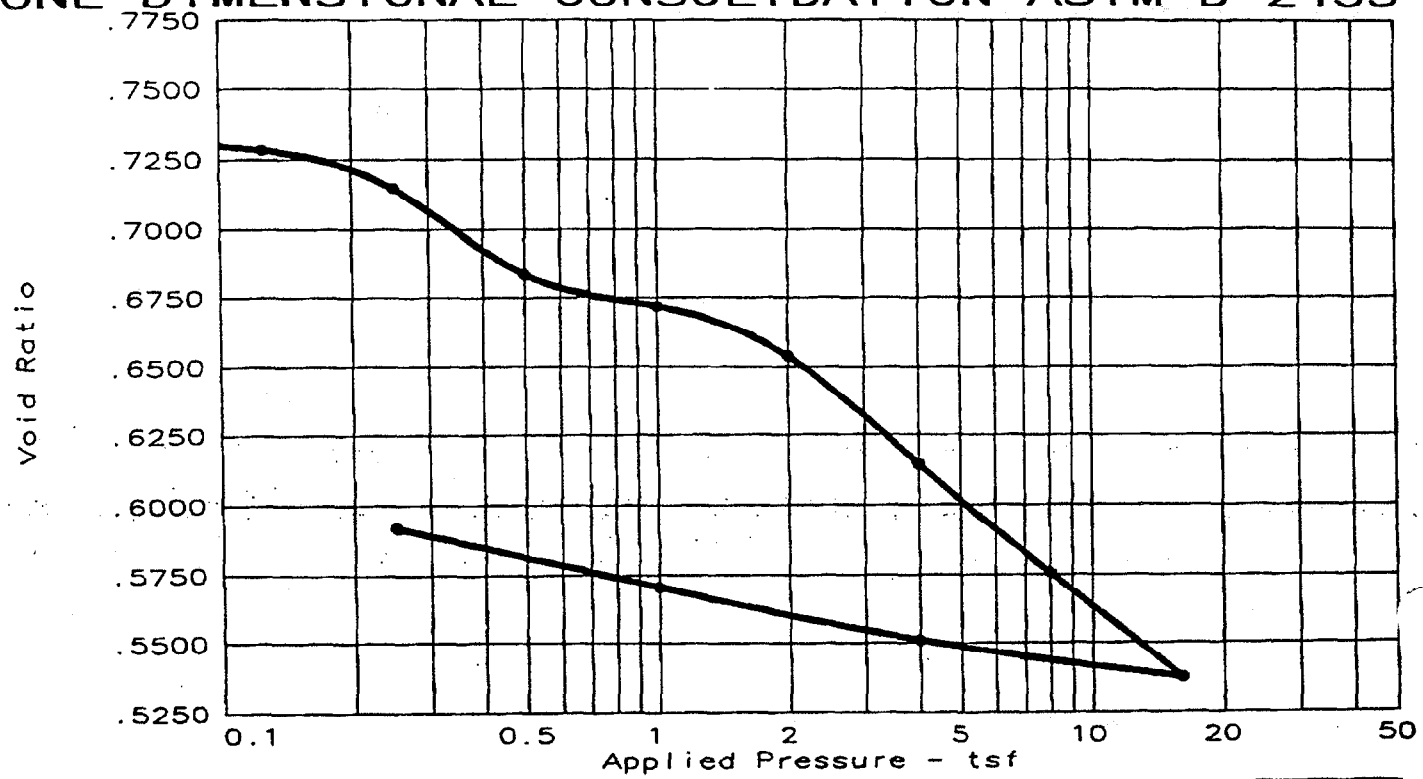
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)								
No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.025						
3	0.25	0.018						
4	0.50	0.005						
5	1.00	0.045						
6	2.00	0.047						
7	4.00	0.035						
8	8.00	0.025						
9	16.00	0.021						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
87.0 %	24.3	96.8			2.65	1.65	0.13	0.7389

TEST RESULTS

Compression Index = 0.13

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9964
Client Sample No.: SB05ST02

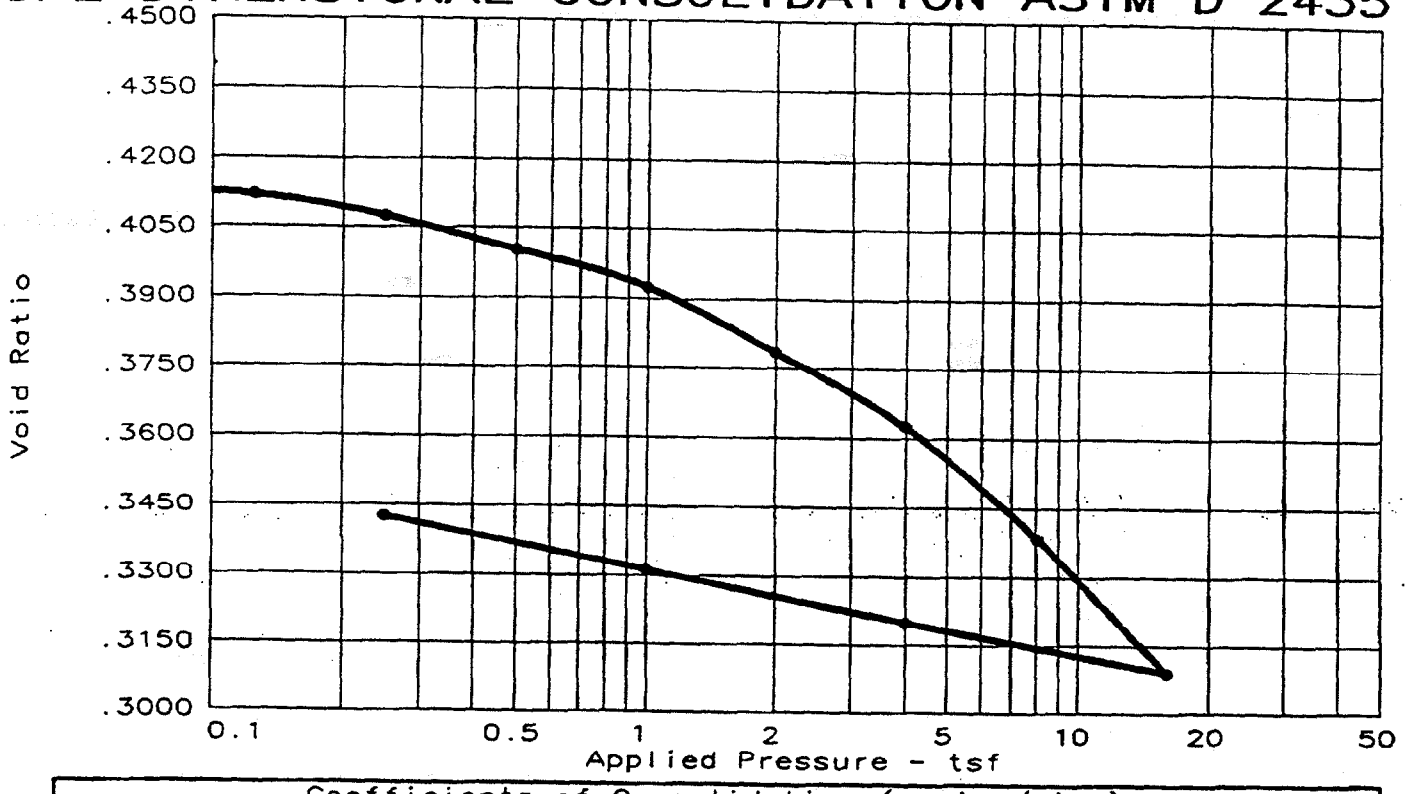
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.051						
3	0.25	0.026						
4	0.50	0.011						
5	1.00	0.062						
6	2.00	0.032						
7	4.00	0.079						
8	8.00	0.034						
9	16.00	0.024						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
91.3 %	15.2	113.9			2.65	4.85	0.10	0.4403

TEST RESULTS	MATERIAL DESCRIPTION
Compression Index = 0.10	Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9965
Client Sample No.: SB05ST03

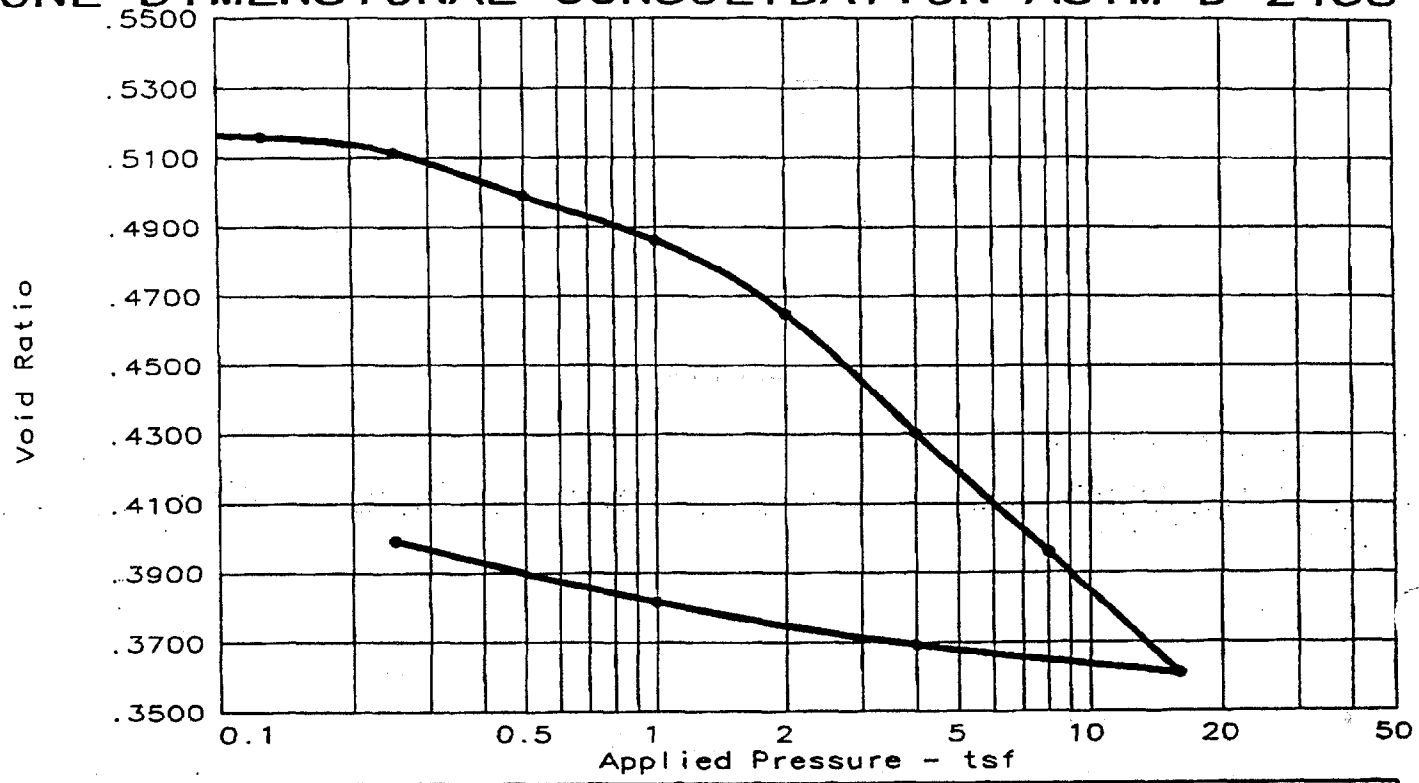
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.013						
3	0.25	0.064						
4	0.50	0.020						
5	1.00	0.108						
6	2.00	0.069						
7	4.00	0.012						
9	16.00	0.016						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
89.3 %	17.5	110.6			2.65	1.89	0.12	0.5206

TEST RESULTS

Compression Index = 0.12

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9958
Client Sample No.: SB05ST04

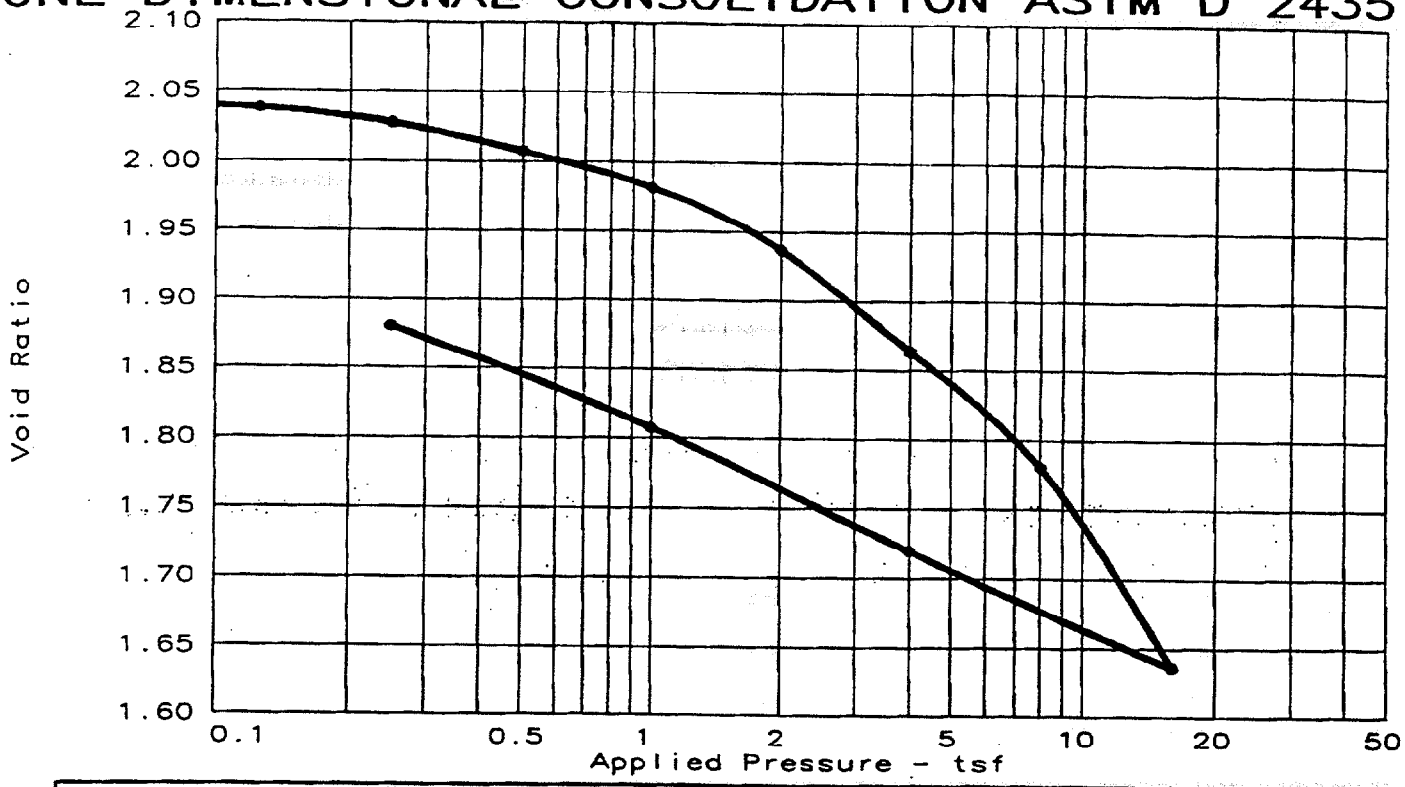
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.105						
3	0.25	0.089						
4	0.50	0.034						
5	1.00	0.090						
6	2.00	0.085						
7	4.00	0.032						
8	8.00	0.058						
9	16.00	0.017						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
79.5 %	60.6	57.4			2.65	8.00	0.48	2.0199

TEST RESULTS

Compression Index = 0.48

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9959
Client Sample No.: SB05ST05

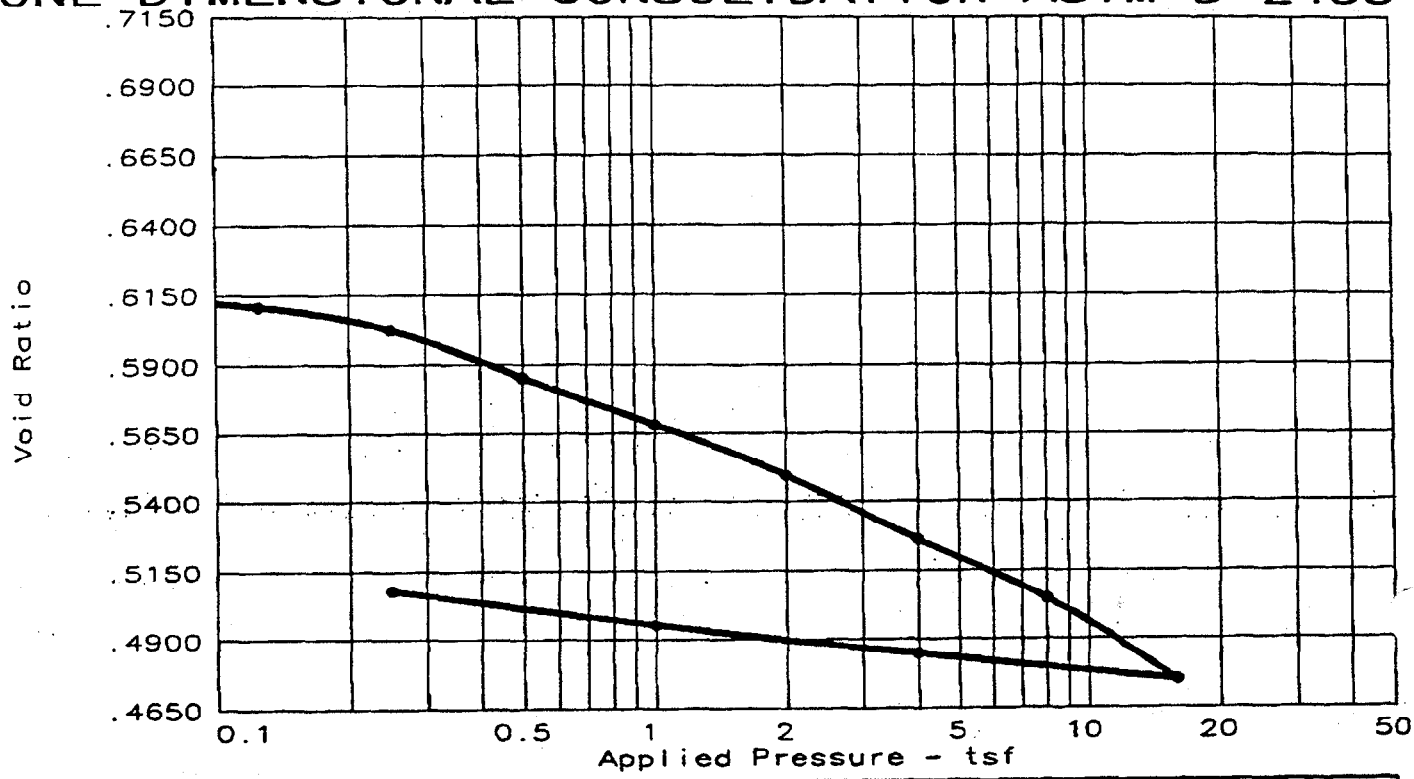
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.006						
3	0.25	0.032						
4	0.50	0.017						
5	1.00	0.022						
6	2.00	0.053						
7	4.00	0.030						
8	8.00	0.056						
9	16.00	0.028						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
91.5 %	22.8	100.1			2.65	8.00	0.10	0.6612

TEST RESULTS

Compression Index = 0.10

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9956
Client Sample No.: SB05ST01

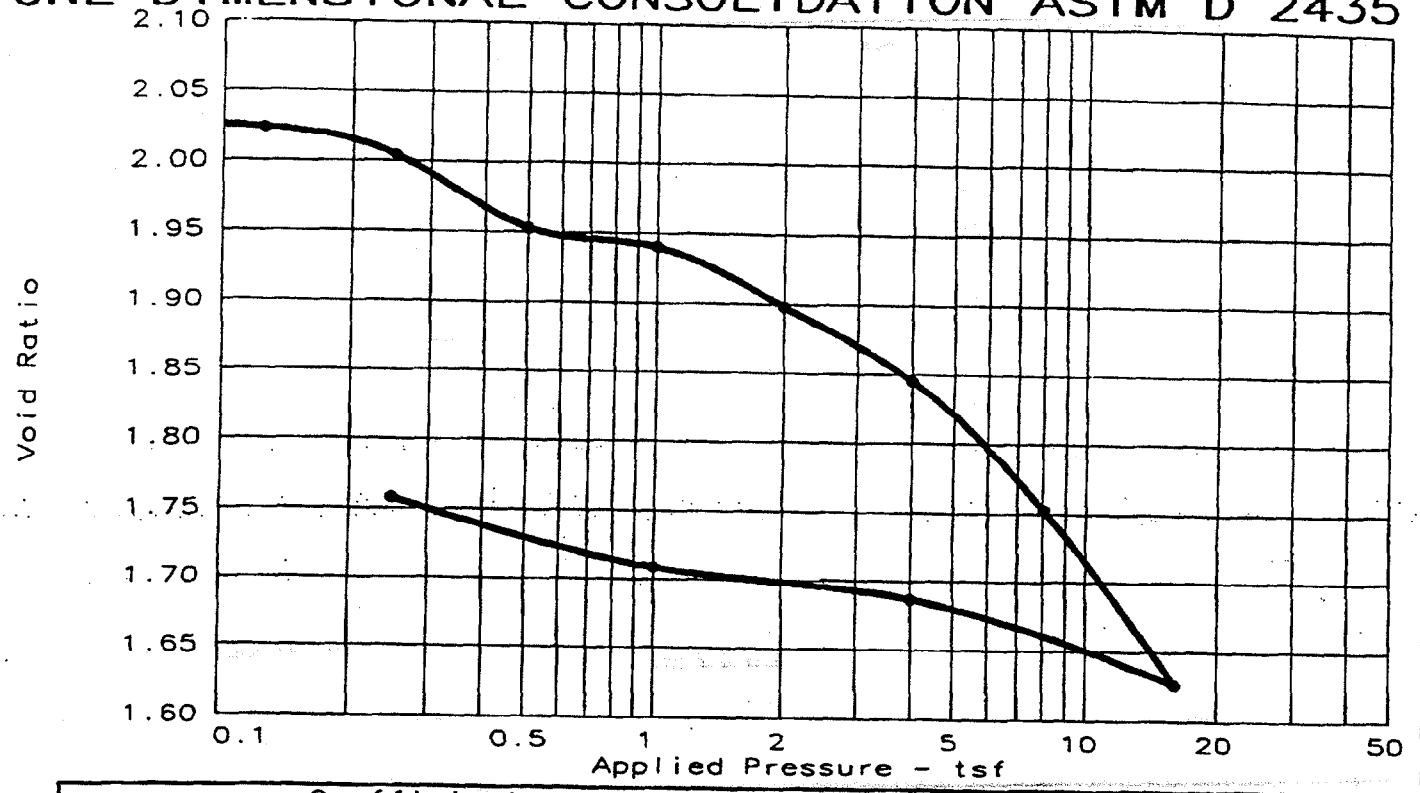
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.083						
3	0.25	0.037						
4	0.50	0.034						
5	1.00	0.073						
6	2.00	0.032						
7	4.00	0.079						
8	8.00	0.033						
9	16.00	0.022						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
78.6 %	60.6	55.6			2.65	3.43	0.42	2.0441

TEST RESULTS

Compression Index = 0.42

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9963
Client Sample No.: SB05ST06

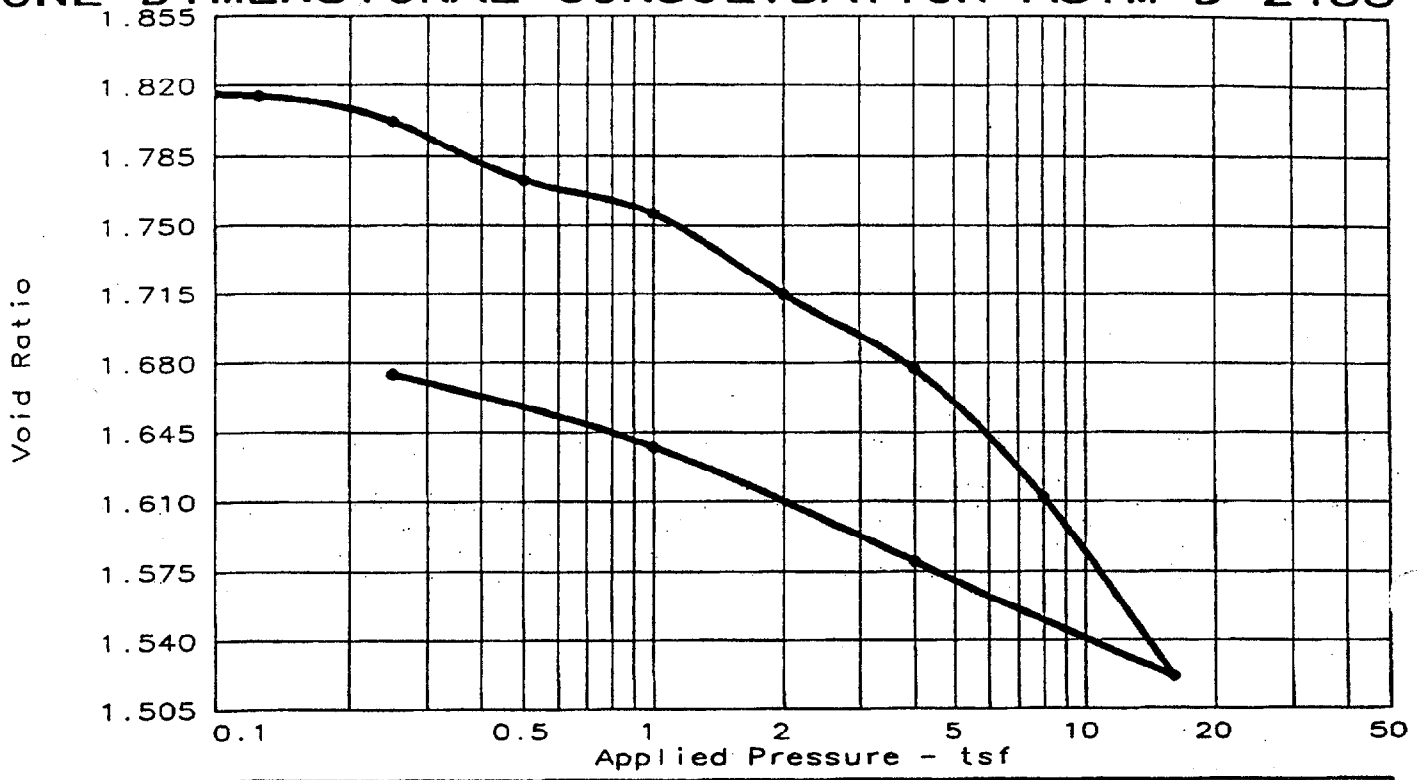
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



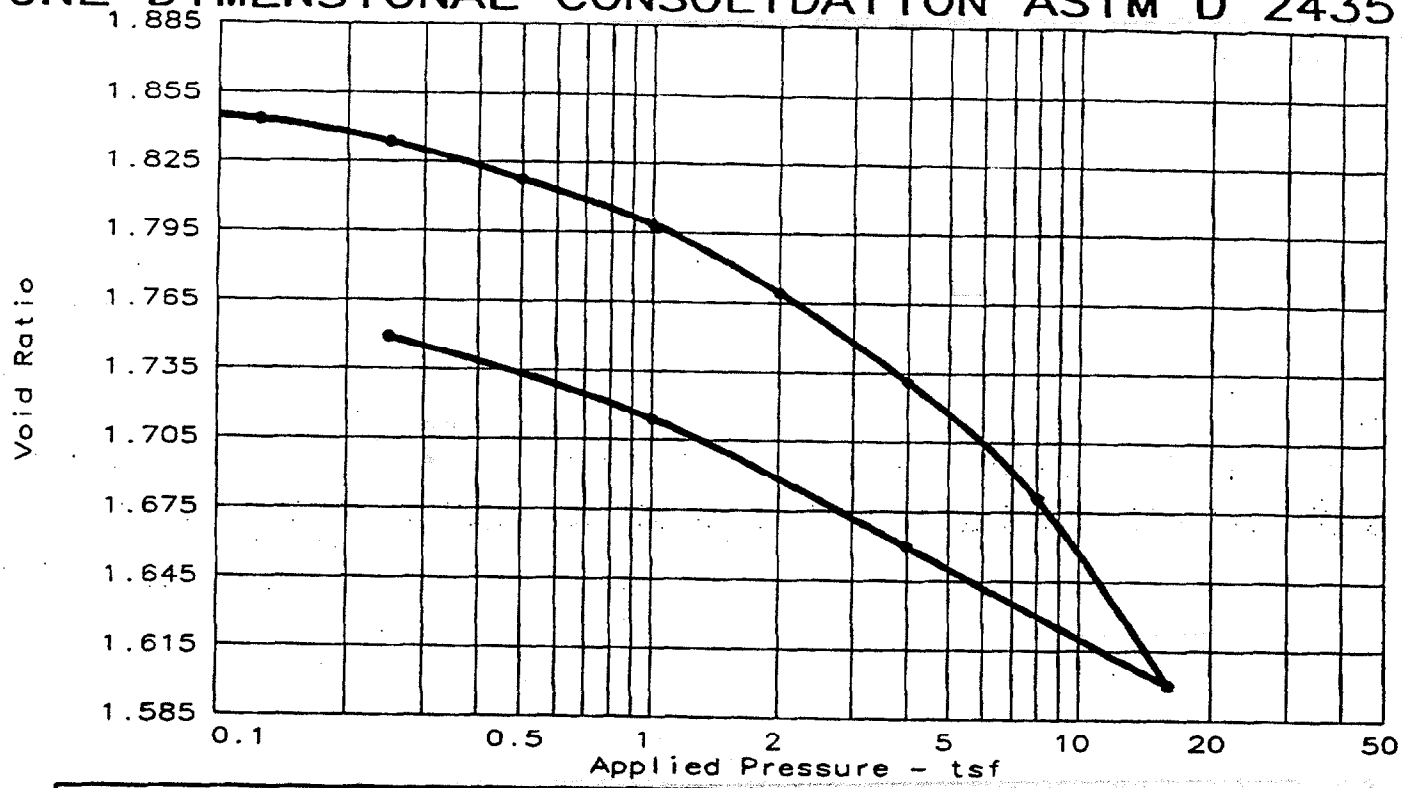
Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.084						
3	0.25	0.077						
4	0.50	0.076						
5	1.00	0.070						
6	2.00	0.031						
7	4.00	0.070						
8	8.00	0.034						
9	16.00	0.023						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
87.1 %	59.9	59.2			2.65	3.17	0.30	1.8234

TEST RESULTS	MATERIAL DESCRIPTION
Compression Index = 0.30	Clayey silt
ETDC Project Name: Bechtel Jacobs Paducah ETDC Project No.: 783208.0041000 ETDC Sample No.: 9962 Client Sample No.: SB05ST07	Remarks: Cv = Sq. root method
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435 IT Corp. - GEOTECHNICAL LABORATORY	Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)								
No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.143						
3	0.25	0.071						
4	0.50	0.034						
5	1.00	0.104						
6	2.00	0.106						
7	4.00	0.035						
8	8.00	0.076						
9	16.00	0.031						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
89.4 %	62.7	57.4			2.65	7.42	0.27	1.8569

TEST RESULTS

Compression Index = 0.27

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9957
Client Sample No.: SB05ST08

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

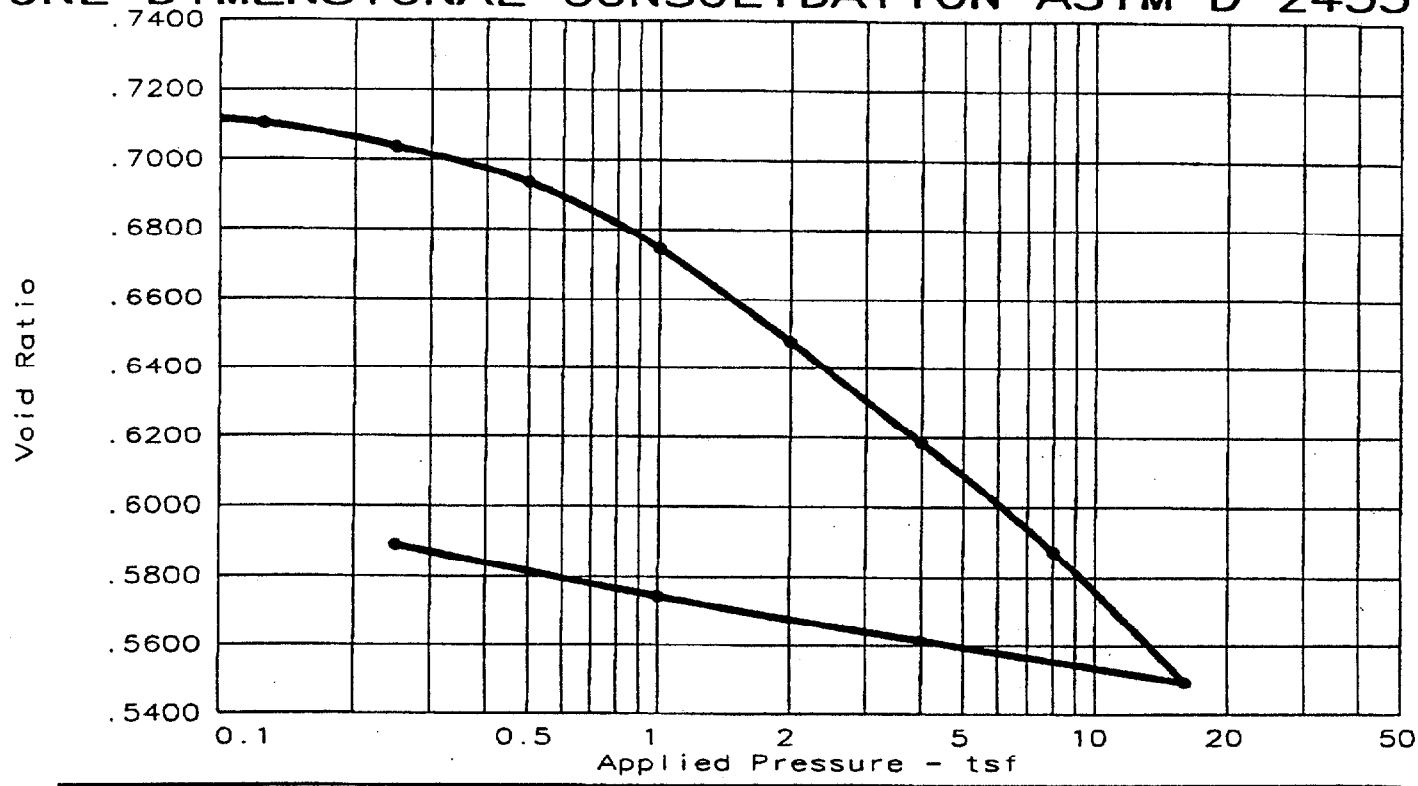
MATERIAL DESCRIPTION

Clayey silt

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)								
No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.060						
3	0.25	0.036						
4	0.50	0.098						
5	1.00	0.126						
6	2.00	0.100						
7	4.00	0.092						
8	8.00	0.133						
9	16.00	0.129						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
93.1 %	25.1	96.7			2.65	8.00	0.13	0.7135

TEST RESULTS

Compression Index = 0.13

MATERIAL DESCRIPTION

Silty clay

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 10027
Client Sample No.: SB06ST01

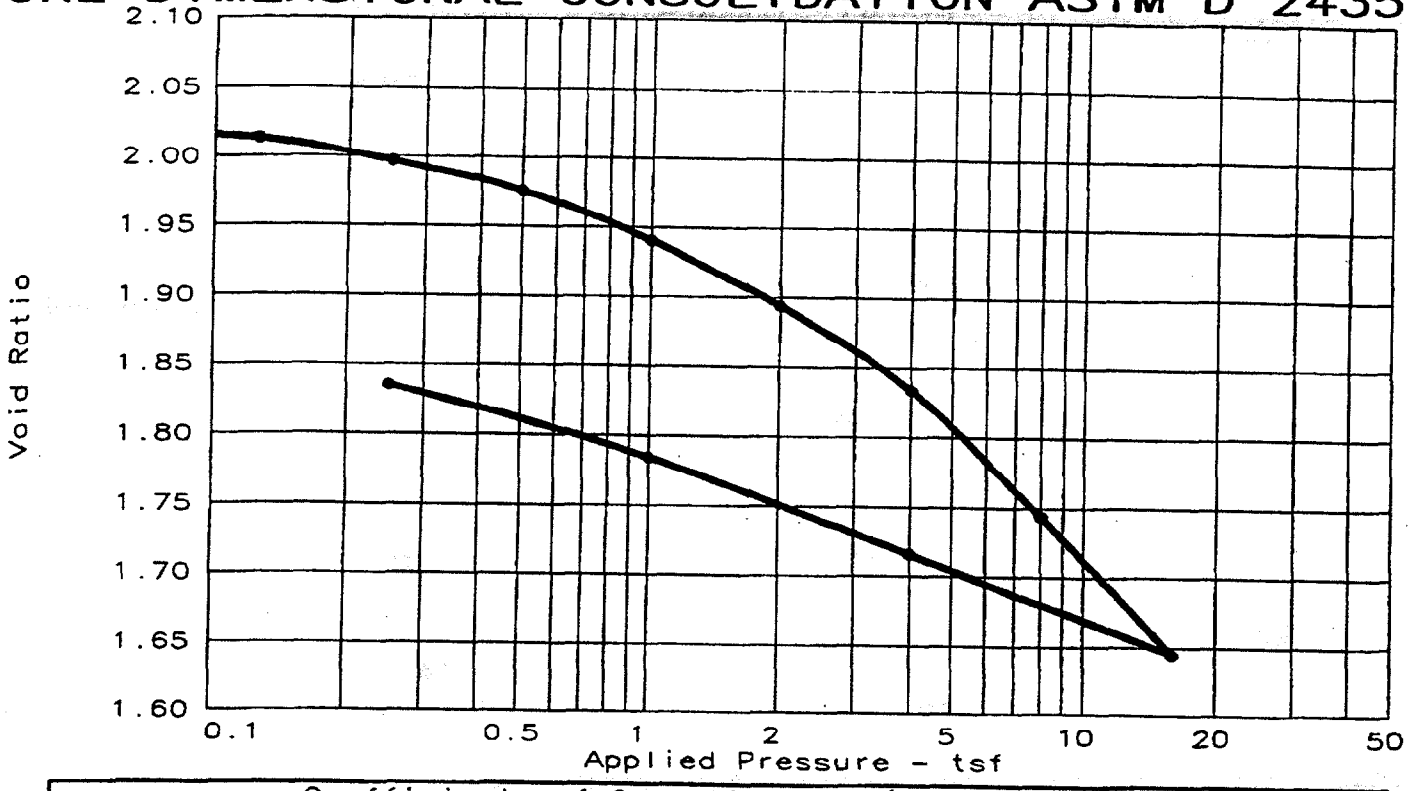
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.25	0.115						
3	0.50	0.040						
4	1.00	0.152						
5	2.00	0.115						
6	4.00	0.124						
7	8.00	0.032						
8	16.00	0.079						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
78.5 %	59.7	55.5			2.65	4.11	0.33	2.0154

TEST RESULTS

Compression Index = 0.33

MATERIAL DESCRIPTION

Silty clay

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 10025
Client Sample No.: SB06ST03

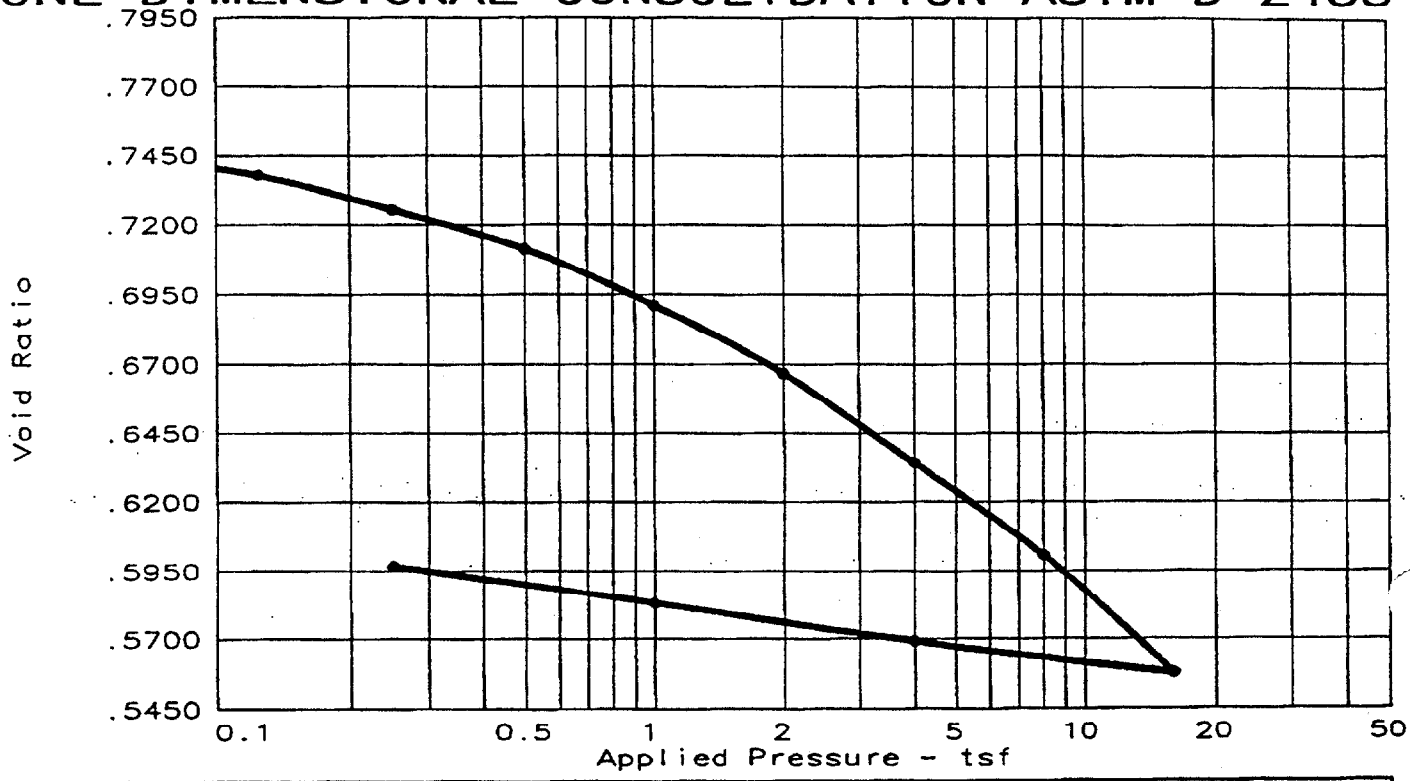
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.054						
3	0.25	0.035						
4	0.50	0.095						
5	1.00	0.105						
6	2.00	0.123						
7	4.00	0.125						
8	8.00	0.126						
9	16.00	0.038						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
264.3 %	74.8	68.0			2.65	8.00	0.14	0.7498

TEST RESULTS

Compression Index = 0.14

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9992
Client Sample No.: DB02ST01

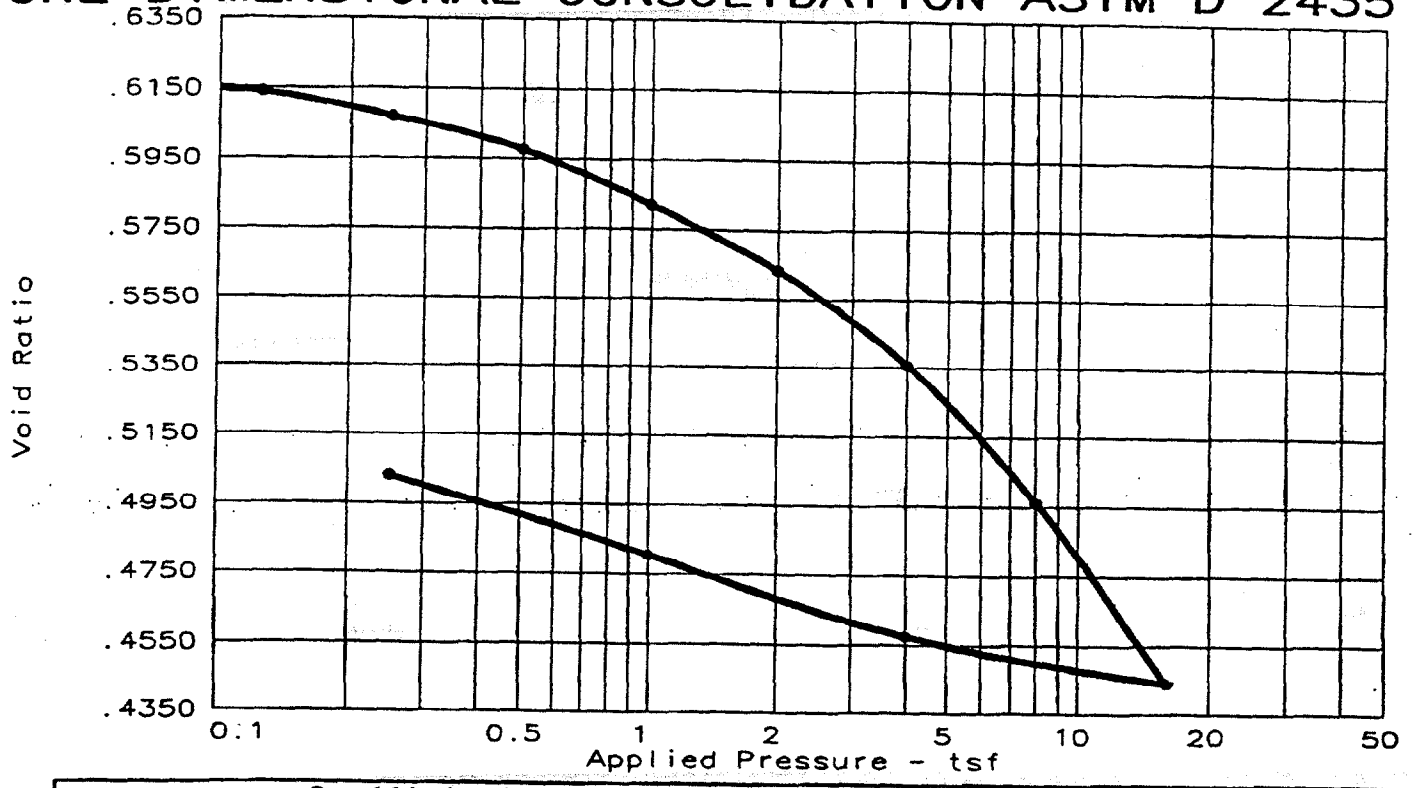
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.054						
3	0.25	0.036						
4	0.50	0.112						
5	1.00	0.104						
6	2.00	0.111						
7	4.00	0.083						
8	8.00	0.091						
9	16.00	0.081						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
96.6 %	22.5	102.3			2.65	7.30	0.17	0.6165

TEST RESULTS

Compression Index = 0.17

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9993
Client Sample No.: DB02ST03

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

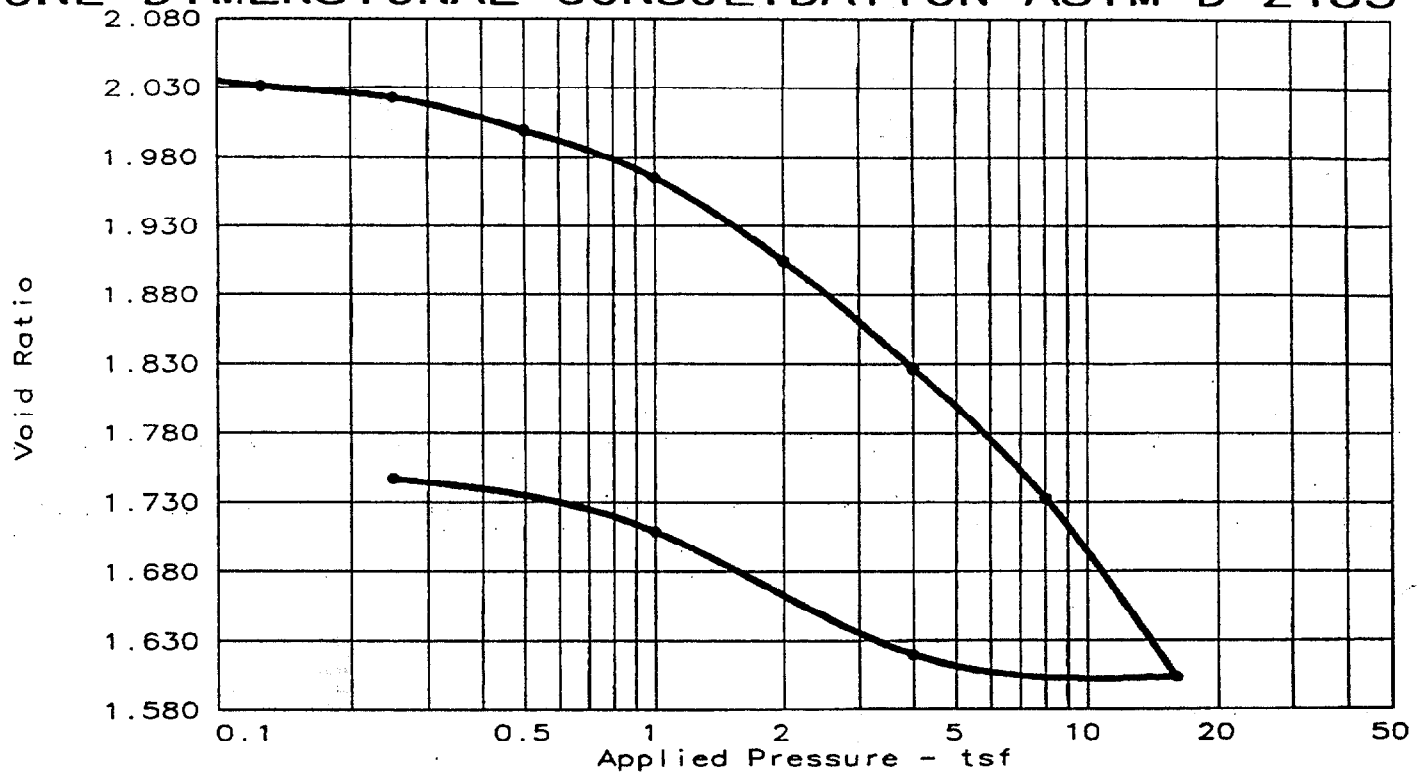
MATERIAL DESCRIPTION

Clayey silt

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.25	0.063						
3	0.50	0.039						
4	1.00	0.144						
5	2.00	0.146						
6	4.00	0.165						
7	8.00	0.137						
8	16.00	0.030						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
80.0 %	61.4	54.7			2.65	6.51	0.43	2.0346

TEST RESULTS	MATERIAL DESCRIPTION
Compression Index = 0.43	Clayey silt

ETDC Project Name: Bechtel Jacobs Paducoh
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9995
Client Sample No.: DB02ST05

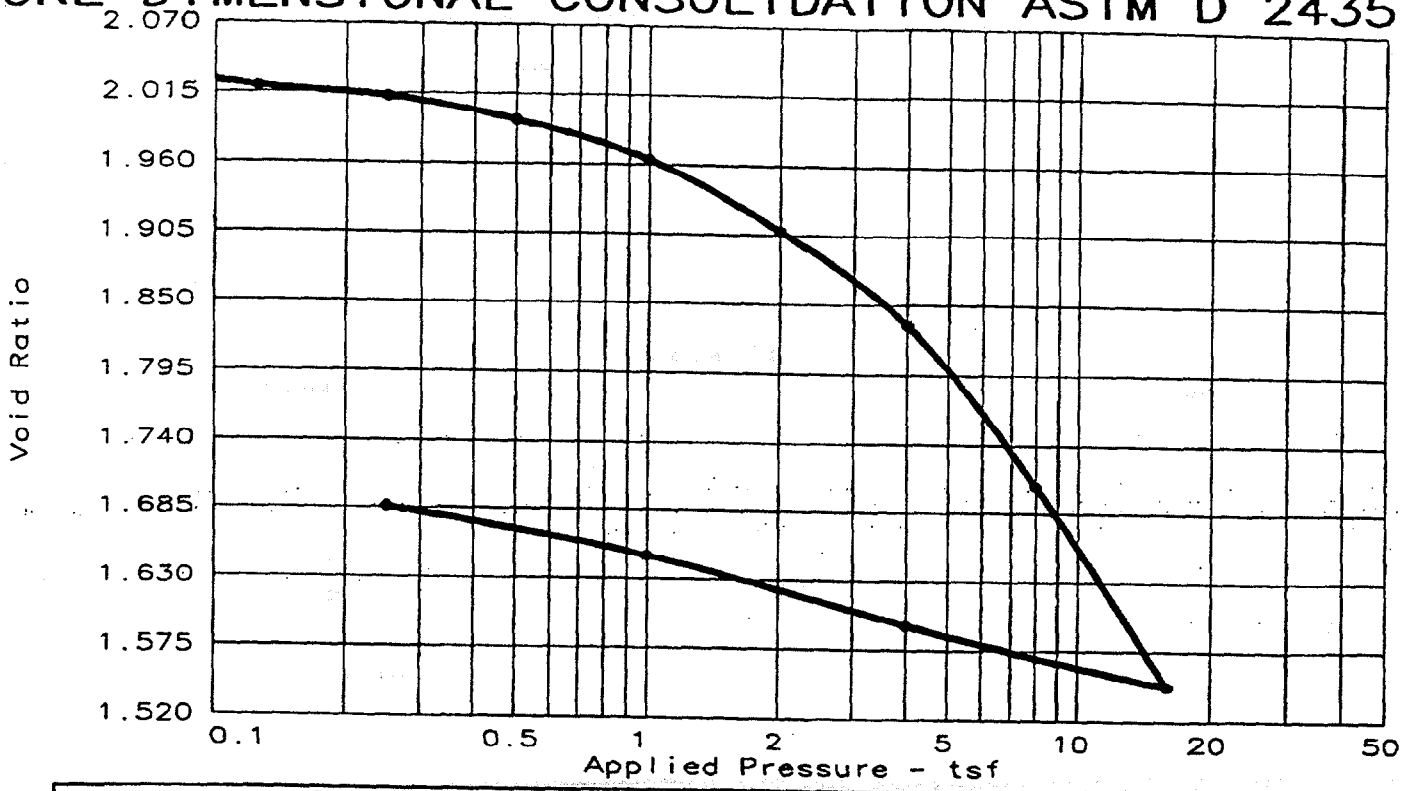
Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
3	0.25	0.029						
4	0.50	0.011						
5	1.00	0.073						
6	2.00	0.029						
7	4.00	0.075						
8	8.00	0.034						
9	16.00	0.022						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
75.4 %	58.2	54.3			2.65	4.88	0.53	2.0448

TEST RESULTS

Compression Index = 0.53

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9979
Client Sample No.: DB02ST07

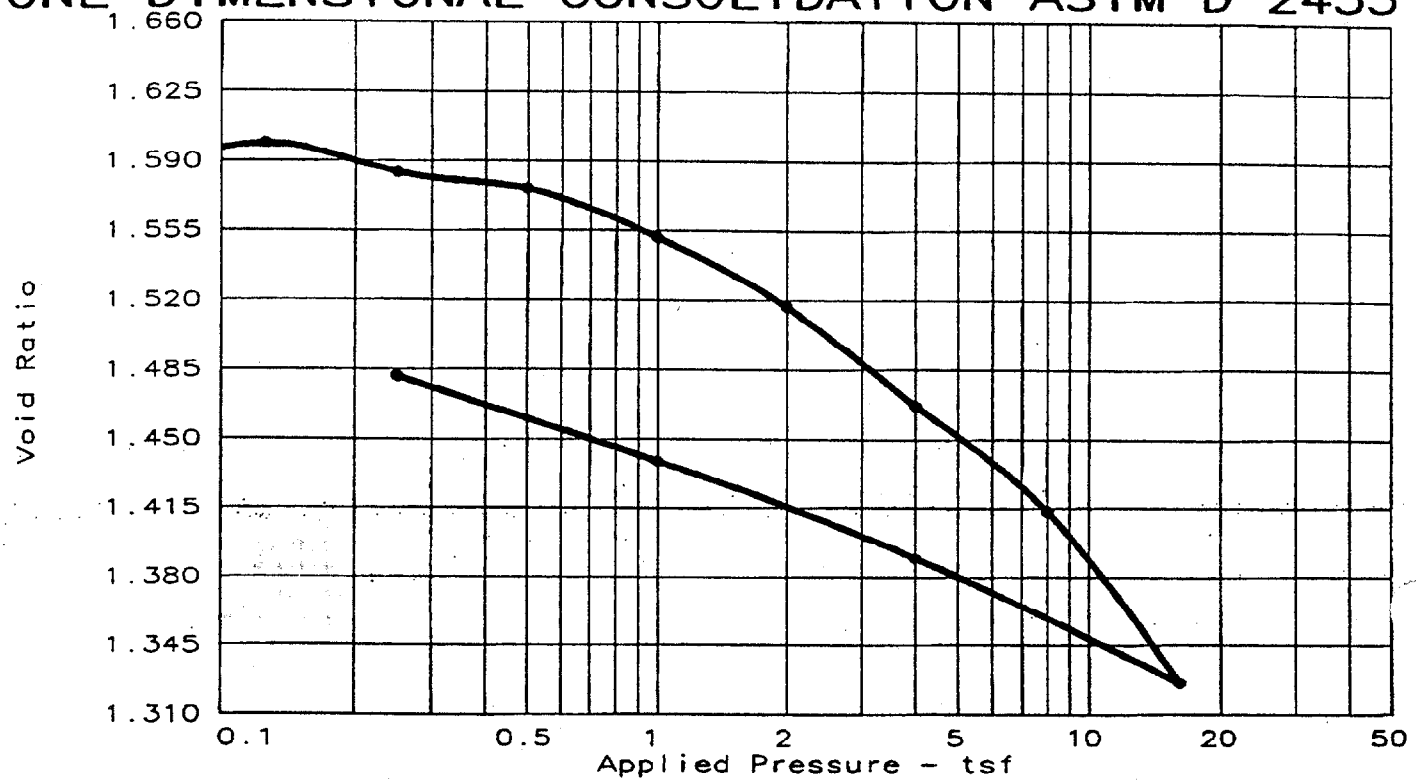
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

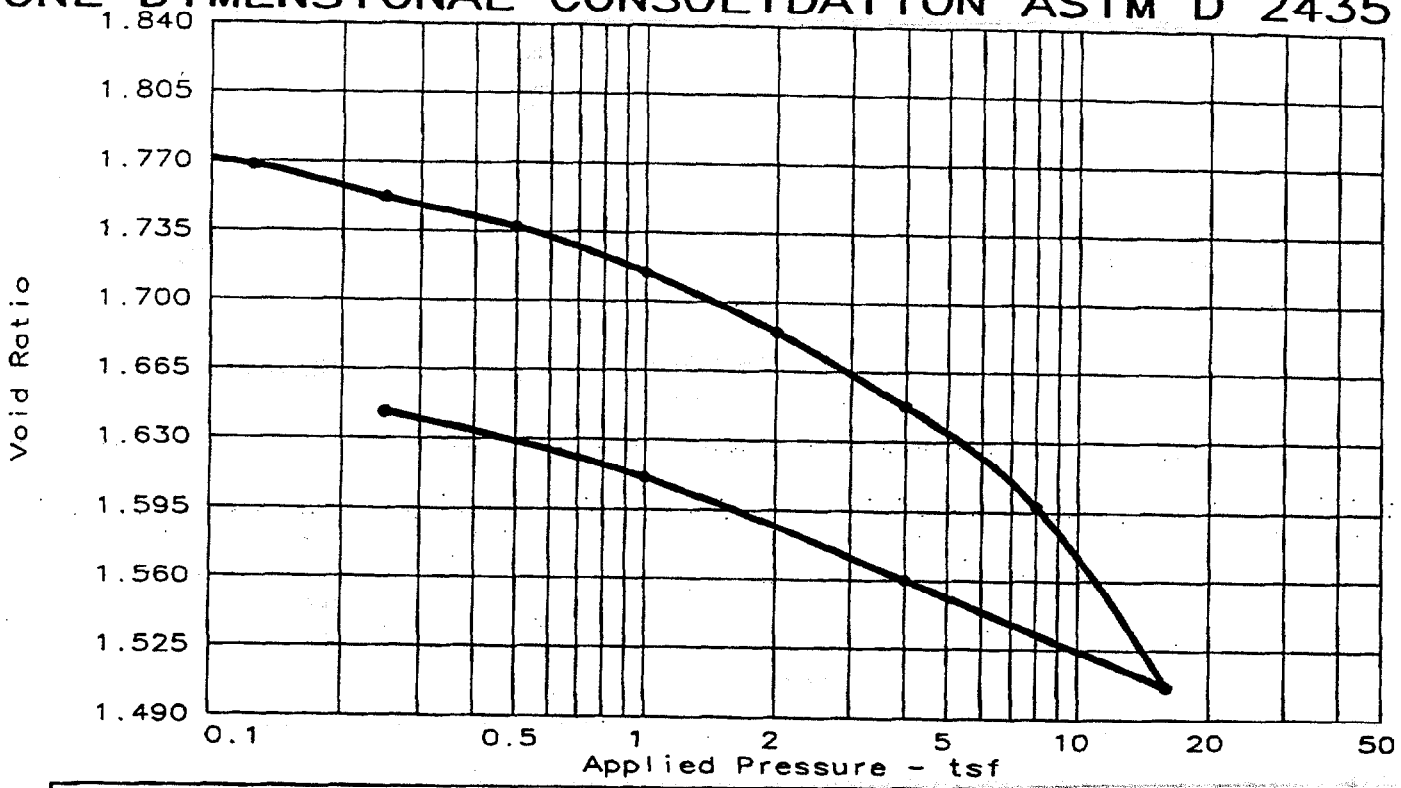


Coefficients of Consolidation (sq.in./min.)								
No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.25	0.001						
3	0.50	0.038						
4	1.00	0.029						
5	2.00	0.083						
6	4.00	0.033						
7	8.00	0.078						
8	16.00	0.016						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
90.7 %	54.6	63.7			2.65	1.83	0.29	1.5964

TEST RESULTS	MATERIAL DESCRIPTION
Compression Index = 0.29	Clayey silt
ETDC Project Name: Bechtel Jacobs Paducah ETDC Project No.: 783208.0041000 ETDC Sample No.: 9980 Client Sample No.: DB02ST08	Remarks: Cv = Sq. root method
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435 **IT Corp. - GEOTECHNICAL LABORATORY**	Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.024						
3	0.25	0.022						
4	0.50	0.019						
5	1.00	0.026						
6	2.00	0.028						
7	4.00	0.033						
8	8.00	0.028						
9	16.00	0.023						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
85.9 %	57.8	59.1			2.65	8.00	0.30	1.7833

TEST RESULTS

Compression Index = 0.30

MATERIAL DESCRIPTION

Clayey silt

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9981
Client Sample No.: DB02ST09

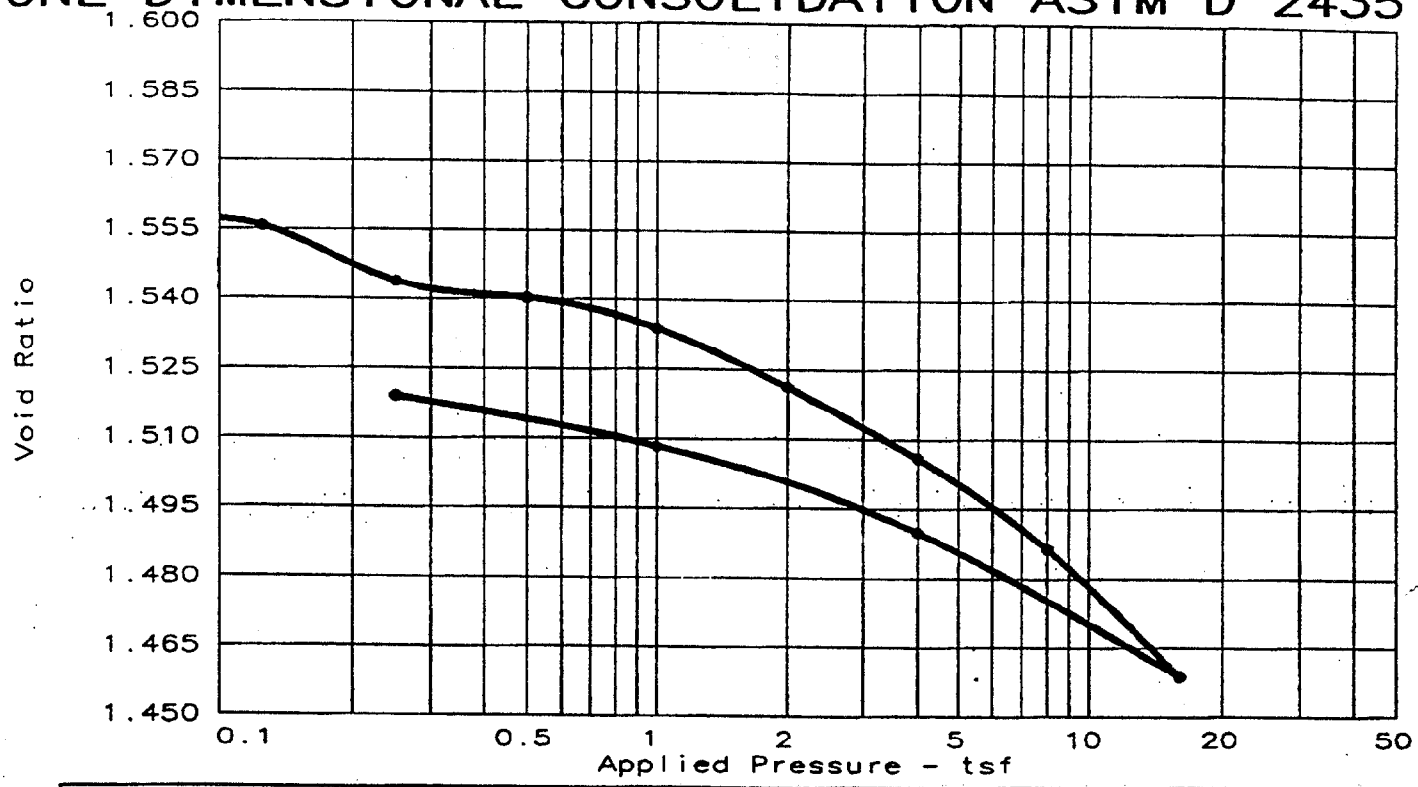
ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.029						
3	0.25	0.029						
4	0.50	0.015						
5	1.00	0.024						
6	2.00	0.022						
7	4.00	0.018						
8	8.00	0.021						
9	16.00	0.016						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
92.6 %	54.4	65.0			2.65	1.74	0.09	1.5568

TEST RESULTS

Compression Index = 0.09

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9982
Client Sample No.: DB02ST10

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

IT Corp. - GEOTECHNICAL LABORATORY

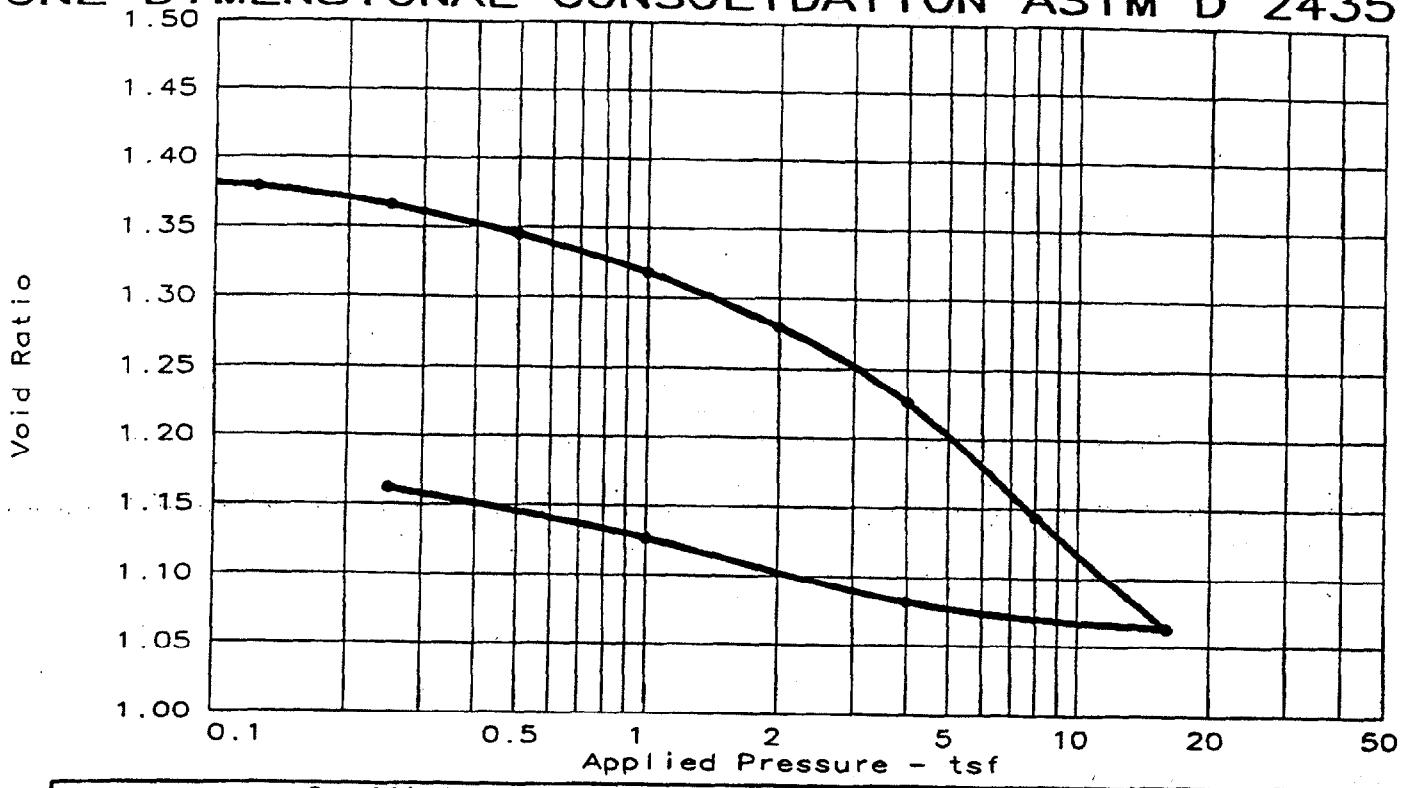
MATERIAL DESCRIPTION

Clayey silt

Remarks:
Cv = Sq. root method

Spec gravity assumed.

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435



Coefficients of Consolidation (sq.in./min.)

No.	Load	Cv	No.	Load	Cv	No.	Load	Cv
2	0.13	0.032						
3	0.25	0.023						
4	0.50	0.019						
5	1.00	0.028						
6	2.00	0.025						
7	4.00	0.028						
8	8.00	0.023						
9	16.00	0.020						

Natural Saturation	Natural Moisture	Dry Density	LL	PI	Sp.Gr.	Precons. press.	C_c	e_o
90.4 %	48.6	67.7			2.65	3.55	0.27	1.4237

TEST RESULTS

Compression Index = 0.27

ETDC Project Name: Bechtel Jacobs Paducah
ETDC Project No.: 783208.0041000
ETDC Sample No.: 9983
Client Sample No.: DB02ST11

ONE-DIMENSIONAL CONSOLIDATION ASTM D 2435

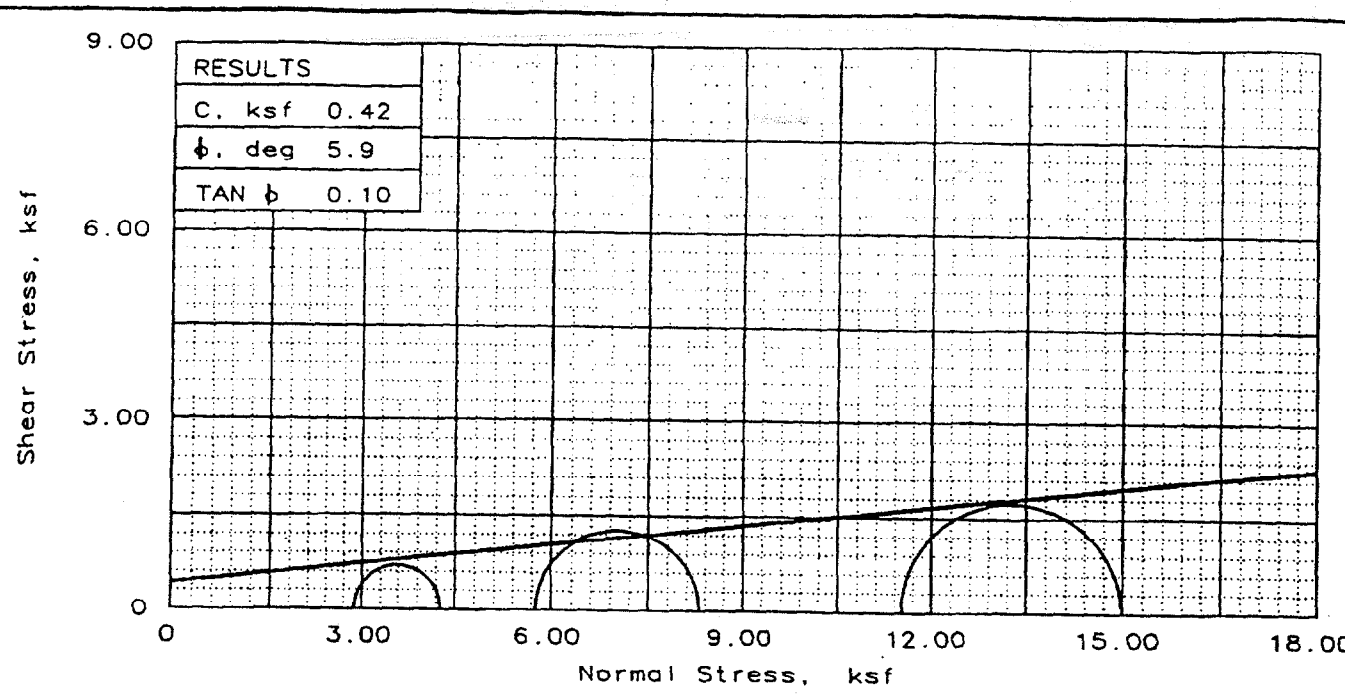
IT Corp. - GEOTECHNICAL LABORATORY

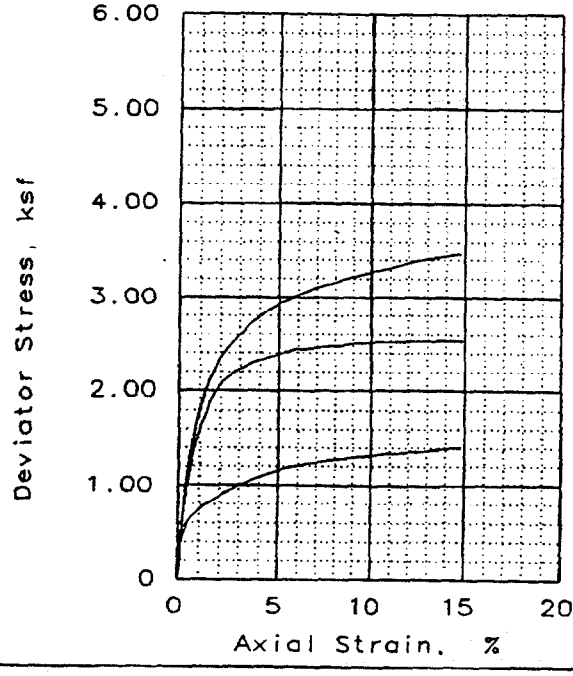
MATERIAL DESCRIPTION

Clayey silt

Remarks:
Cv = Sq. root method

Spec gravity assumed.





	SAMPLE NO.	1	2	3
INITIAL	WATER CONTENT, %	28.5	28.5	28.5
	DRY DENSITY, pcf	94.7	97.1	94.7
	SATURATION, %	101.0	107.1	101.0
	VOID RATIO	0.748	0.705	0.747
	DIAMETER, in	2.85	2.85	2.84
	HEIGHT, in	5.55	5.58	5.56
AT TEST	WATER CONTENT, %	27.1	25.4	27.9
	DRY DENSITY, pcf	94.7	97.1	94.7
	SATURATION, %	96.1	95.5	99.1
	VOID RATIO	0.748	0.705	0.747
	DIAMETER, in	2.85	2.85	2.84
	HEIGHT, in	5.55	5.58	5.56
Strain rate, in/min		0.028	0.028	0.028
BACK PRESSURE, ksf		0.00	0.00	0.00
CELL PRESSURE, ksf		5.76	11.52	2.88
FAILURE STRESS, ksf		2.54	3.47	1.40
PORE PRESSURE, ksf				
ULTIMATE STRESS, ksf		2.54	3.47	1.40
PORE PRESSURE, ksf				
σ_1 FAILURE, ksf		8.30	14.99	4.28
σ_3 FAILURE, ksf		5.76	11.52	2.88

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undistubed
DESCRIPTION: Clayey silt

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: Bechtel Jacobs Paducah

PROJECT: CERCLA Cell Seismic Assessment

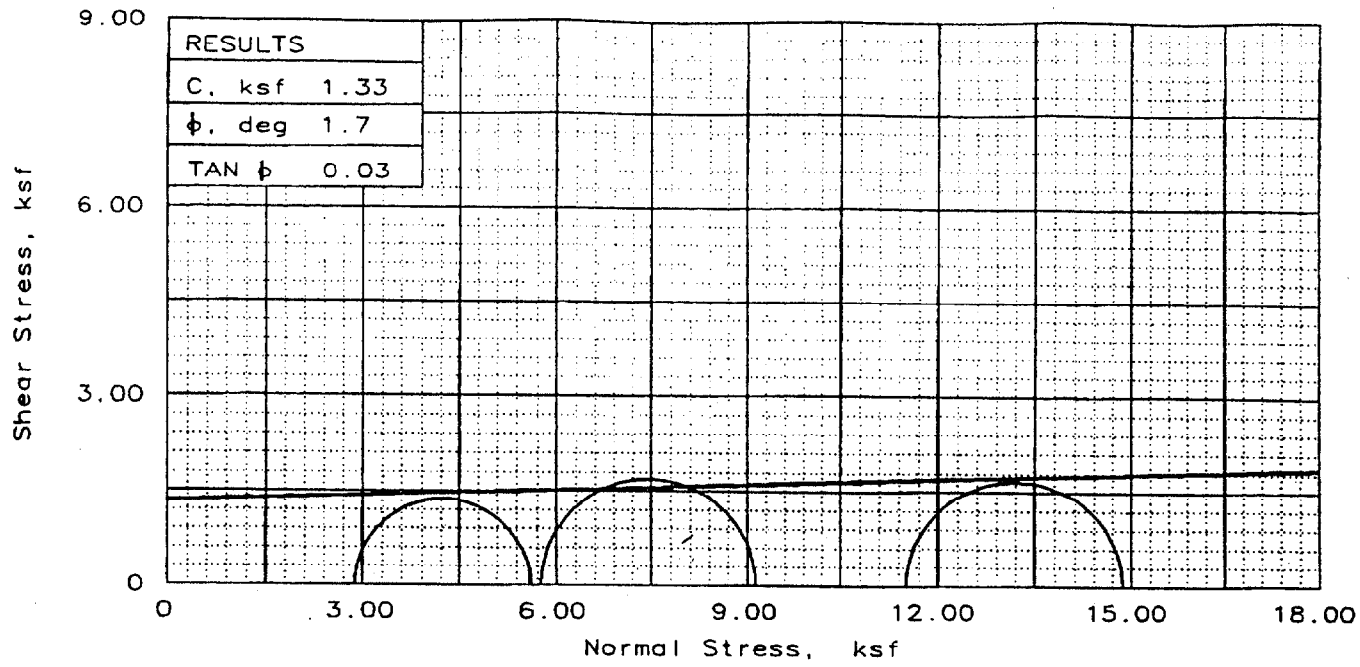
SAMPLE LOCATION: Lab sampl no. ETDC-9984
Client sample no. CCGTSB01ST01

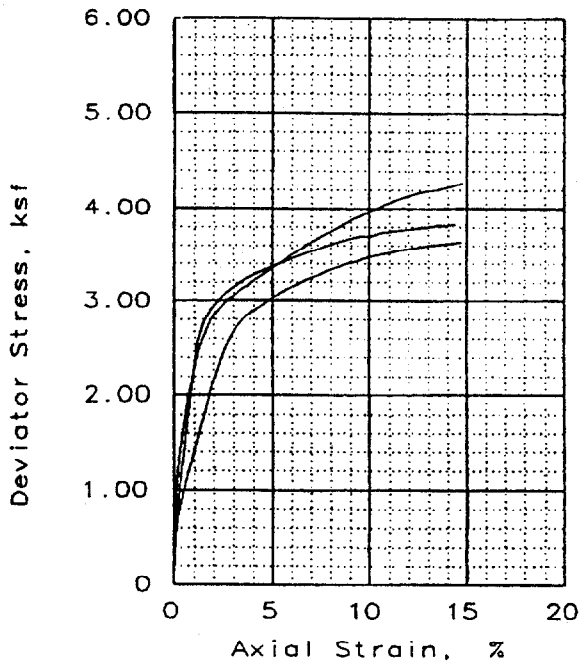
PROJ. NO.: 783208 DATE: 5/17/2002

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY

FIG. NO. 9984





	SAMPLE NO.	1	2	3
INITIAL	WATER CONTENT, %	22.2	22.2	22.2
	DRY DENSITY, pcf	102.2	102.3	106.2
	SATURATION, %	95.2	95.4	105.5
	VOID RATIO	0.618	0.618	0.558
	DIAMETER, in	2.84	2.84	2.84
	HEIGHT, in	5.60	5.73	5.58
AT TEST	WATER CONTENT, %	25.3	22.2	21.0
	DRY DENSITY, pcf	102.2	102.3	106.2
	SATURATION, %	108.2	95.1	99.9
	VOID RATIO	0.618	0.618	0.558
	DIAMETER, in	2.84	2.84	2.84
	HEIGHT, in	5.60	5.73	5.58
	Strain rate, in/min	0.028	0.028	0.028
	BACK PRESSURE, ksf	0.00	0.00	0.00
	CELL PRESSURE, ksf	2.88	5.76	11.52
	FAILURE STRESS, ksf	2.73	3.38	3.34
	PORE PRESSURE, ksf			
	ULTIMATE STRESS, ksf	3.64	3.83	4.27
	PORE PRESSURE, ksf			
	σ_1 FAILURE, ksf	5.61	9.14	14.86
	σ_3 FAILURE, ksf	2.88	5.76	11.52

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Clayey silt

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: Bechtel Jacobs Paducah

PROJECT: CERCLA Cell Seismic Assessment

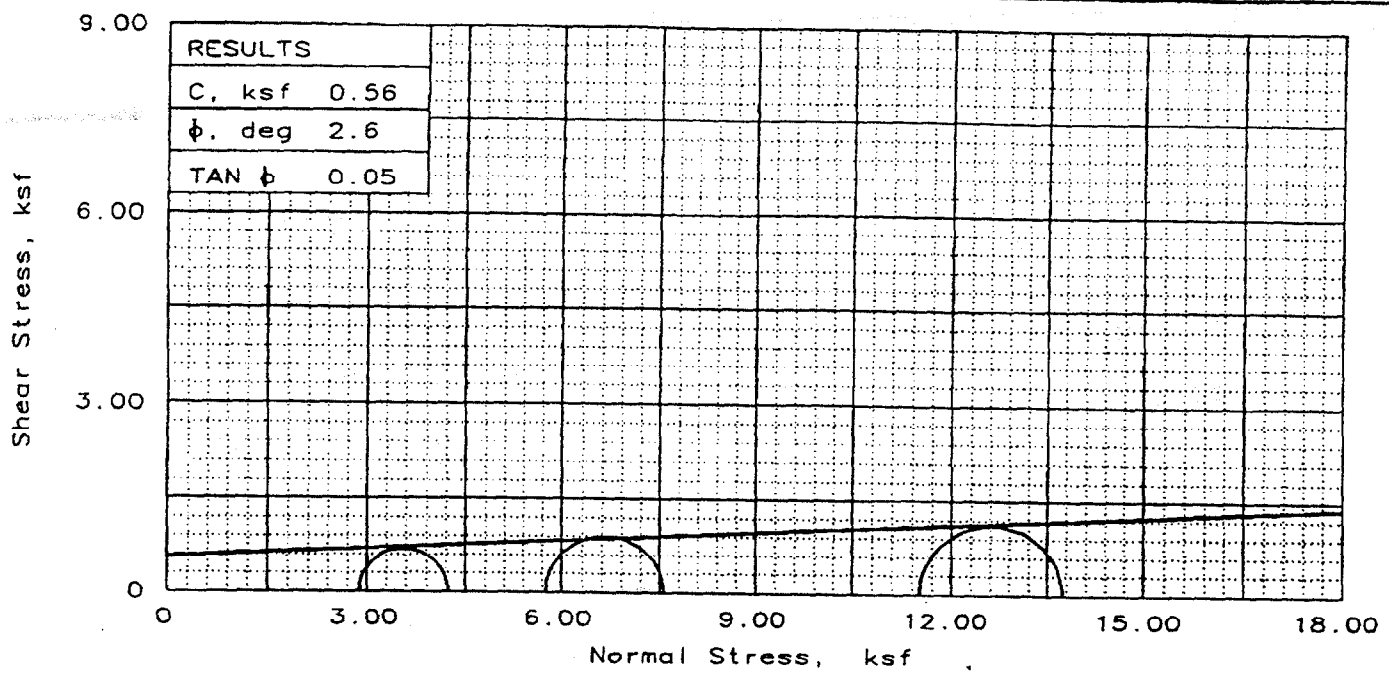
SAMPLE LOCATION: Lab sample no. ETDC-9985
Client sample no. CCGTSB01ST02

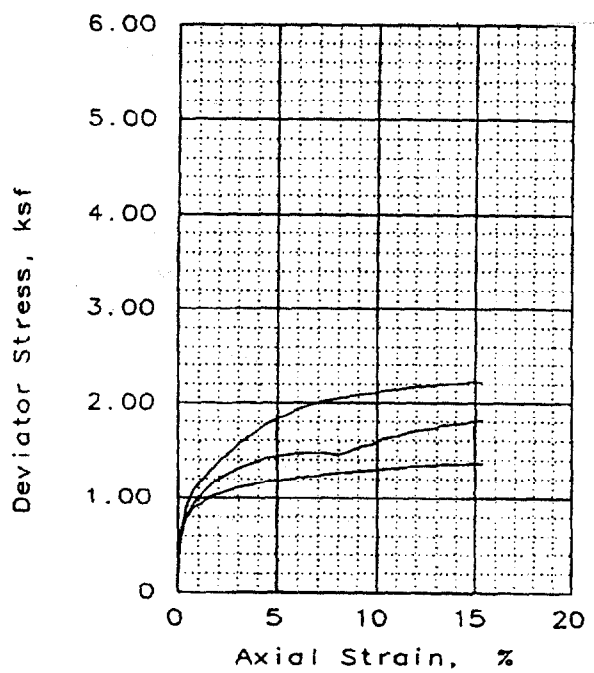
PROJ. NO.: 783208 DATE: 5/17/2002

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY

FIG. NO. 9985





	SAMPLE NO.	1	2	3
INITIAL	WATER CONTENT, %	30.5	30.5	30.5
	DRY DENSITY, pcf	96.2	94.3	97.9
	SATURATION, %	112.2	107.0	117.2
	VOID RATIO	0.720	0.755	0.689
	DIAMETER, in	2.81	2.79	2.79
	HEIGHT, in	5.36	5.37	5.39
AT TEST	WATER CONTENT, %	27.3	27.3	26.5
	DRY DENSITY, pcf	96.2	94.3	97.9
	SATURATION, %	100.5	96.0	101.9
	VOID RATIO	0.720	0.755	0.689
	DIAMETER, in	2.81	2.79	2.79
	HEIGHT, in	5.36	5.37	5.39
Strain rate, in/min		0.049	0.458	0.048
BACK PRESSURE, ksf		0.00	0.00	0.00
CELL PRESSURE, ksf		2.88	5.76	11.52
FAILURE STRESS, ksf		1.37	1.81	2.22
PORE PRESSURE, ksf				
ULTIMATE STRESS, ksf		1.37	1.81	2.22
PORE PRESSURE, ksf				
σ_1 FAILURE, ksf		4.25	7.57	13.74
σ_3 FAILURE, ksf		2.88	5.76	11.52

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Clayey SILT

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: Bechtel Jacobs Paducah

PROJECT: CERCLA Cell Seismic Assessment

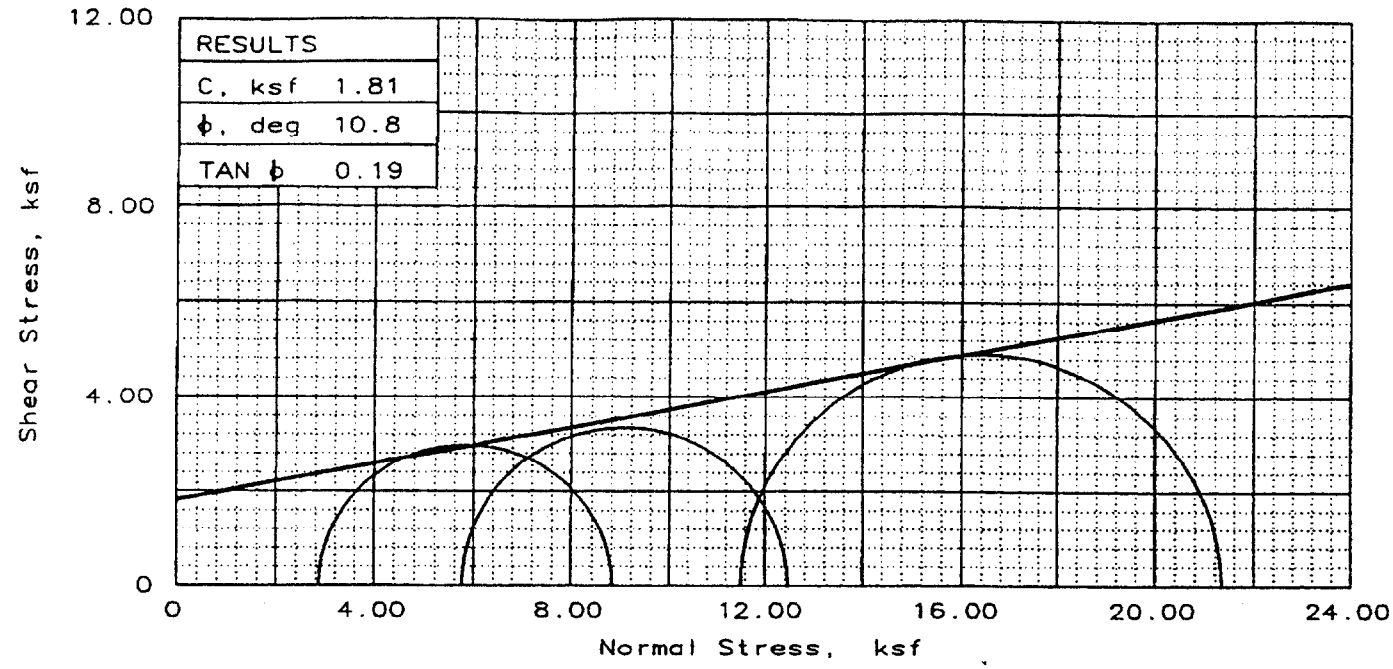
SAMPLE LOCATION: Lab sample no. ETDC-9961
Client sampl ID: CCGSB02ST01

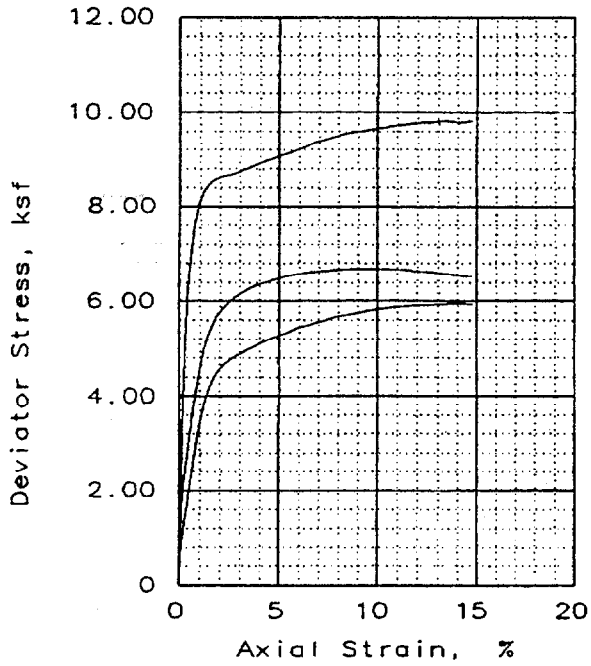
PROJ. NO.: 783208 DATE: 4/16/02

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY

FIG. NO. 9961





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	22.5	22.5	22.5
	DRY DENSITY, pcf	101.8	102.4	103.3
	SATURATION, %	95.5	96.9	99.2
	VOID RATIO	0.625	0.616	0.601
	DIAMETER, in	2.86	2.84	2.85
	HEIGHT, in	5.59	5.60	5.60
AT TEST	WATER CONTENT, %	21.5	23.0	21.1
	DRY DENSITY, pcf	101.8	102.4	103.3
	SATURATION, %	91.3	98.9	93.2
	VOID RATIO	0.625	0.616	0.601
	DIAMETER, in	2.86	2.84	2.85
	HEIGHT, in	5.59	5.60	5.60
Strain rate, in/min		0.048	0.048	0.048
BACK PRESSURE, ksf		0.00	0.00	0.00
CELL PRESSURE, ksf		2.88	5.76	11.52
FAILURE STRESS, ksf		5.95	6.69	9.82
PORE PRESSURE, ksf				
ULTIMATE STRESS, ksf		5.94		9.82
PORE PRESSURE, ksf				
σ_1 FAILURE, ksf		8.83	12.45	21.34
σ_3 FAILURE, ksf		2.88	5.76	11.52

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Clayey SILT

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: Bechtel Jacobs Paducah

PROJECT: CERCLA Cell Seismic Assessment

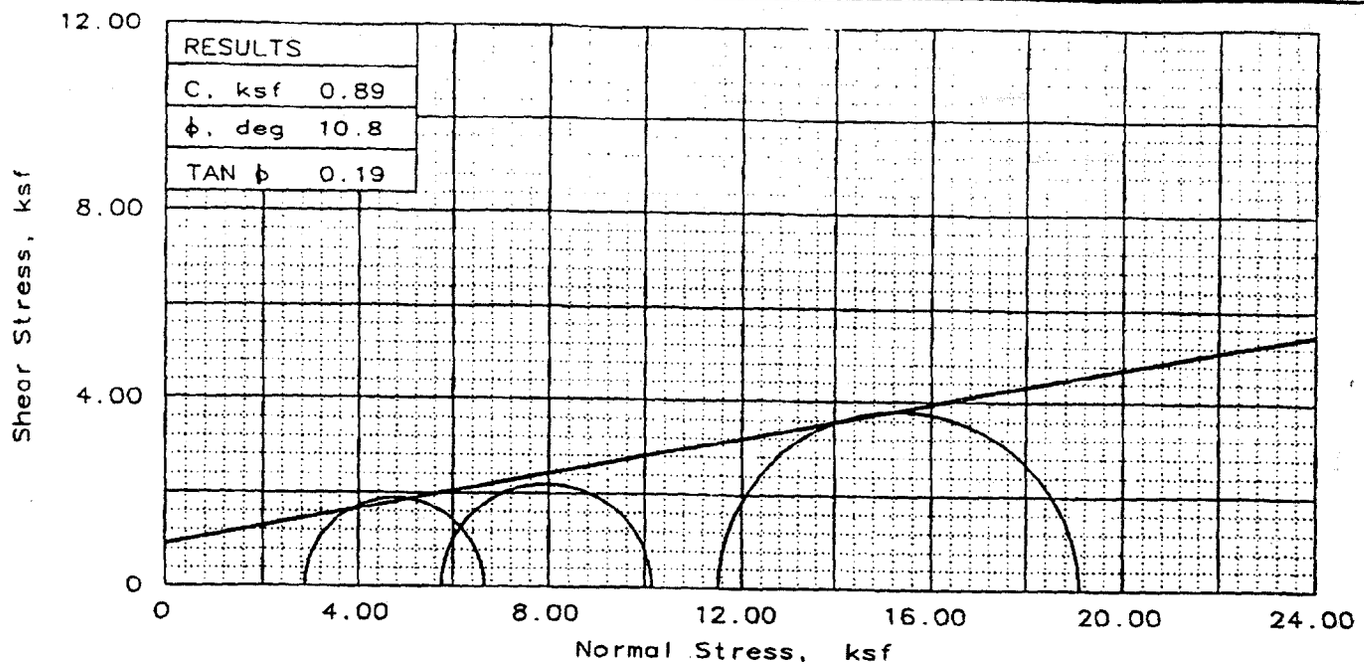
SAMPLE LOCATION: Lab sample no. ETDC-9960
Client sample ID CCGTSB02ST02

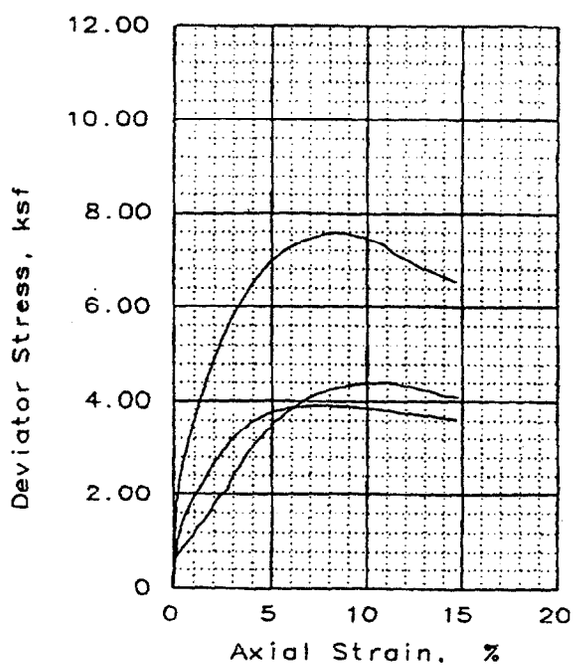
PROJ. NO.: 783208 DATE: 4/15/02

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY

FIG. NO. 9960





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	16.2	16.2	16.2
	DRY DENSITY, pcf	114.8	116.7	116.9
	SATURATION, %	97.6	103.2	103.6
	VOID RATIO	0.441	0.417	0.415
	DIAMETER, in	2.84	2.82	2.84
	HEIGHT, in	5.62	5.58	5.60
AT TEST	WATER CONTENT, %	19.2	17.6	17.4
	DRY DENSITY, pcf	114.8	116.7	116.9
	SATURATION, %	115.4	112.0	110.7
	VOID RATIO	0.441	0.417	0.415
	DIAMETER, in	2.84	2.82	2.84
	HEIGHT, in	5.62	5.58	5.60
Strain rate, in/min		0.028	0.028	0.028
BACK PRESSURE, ksf		0.00	0.00	0.00
CELL PRESSURE, ksf		2.88	5.76	11.52
FAILURE STRESS, ksf		3.78	4.39	7.59
PORE PRESSURE, ksf				
ULTIMATE STRESS, ksf		3.63	4.09	6.55
PORE PRESSURE, ksf				
σ_1 FAILURE, ksf		6.66	10.15	19.11
σ_3 FAILURE, ksf		2.88	5.76	11.52

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Clayey silt

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: Bechtel Jacobs Paducah

PROJECT: CERCLA Cell Seismic Assessment

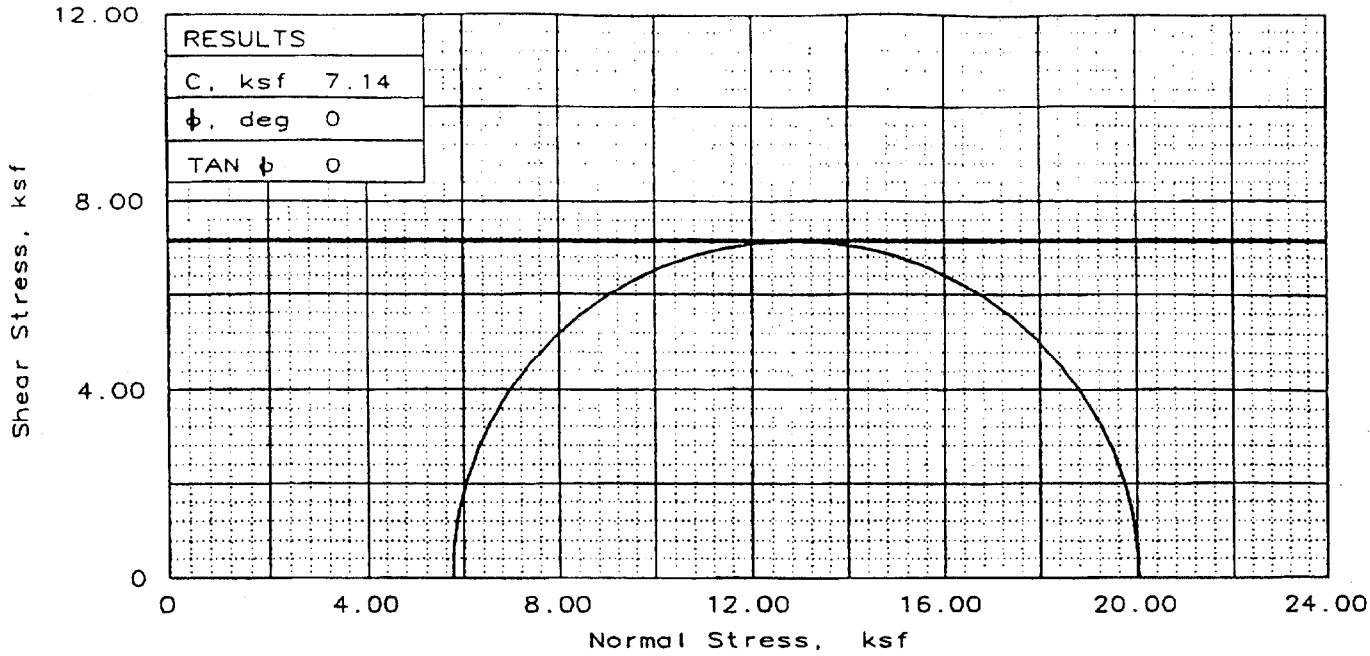
SAMPLE LOCATION: Lab sample no. ETDC-9986
Client sample no. CCGTSB02ST03

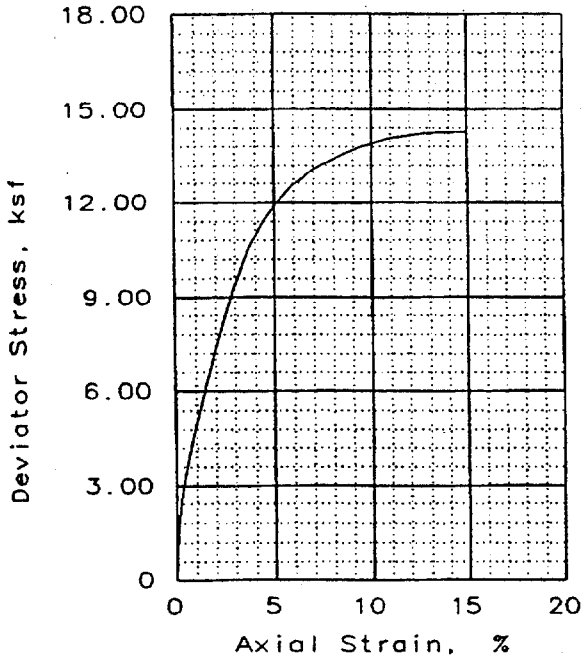
PROJ. NO.: 783208 DATE: 5/17/2002

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY

FIG. NO. 9986





SAMPLE NO.		1
INITIAL	WATER CONTENT, %	23.0
	DRY DENSITY, pcf	102.6
	SATURATION, %	99.7
	VOID RATIO	0.613
	DIAMETER, in	2.85
	HEIGHT, in	5.62
AT TEST	WATER CONTENT, %	18.2
	DRY DENSITY, pcf	102.6
	SATURATION, %	78.6
	VOID RATIO	0.613
	DIAMETER, in	2.85
	HEIGHT, in	5.62
Strain rate, in/min		0.042
BACK PRESSURE, ksf		0.00
CELL PRESSURE, ksf		5.76
FAILURE STRESS, ksf		14.27
PORE PRESSURE, ksf		
ULTIMATE STRESS, ksf		14.27
PORE PRESSURE, ksf		
σ_1 FAILURE, ksf		20.03
σ_3 FAILURE, ksf		5.76

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Silty clay

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS: Depth 8-9.4 ft.

CLIENT: Bechtel Jacobs Paducah

PROJECT: CERCLA Cell Seismic Assessment

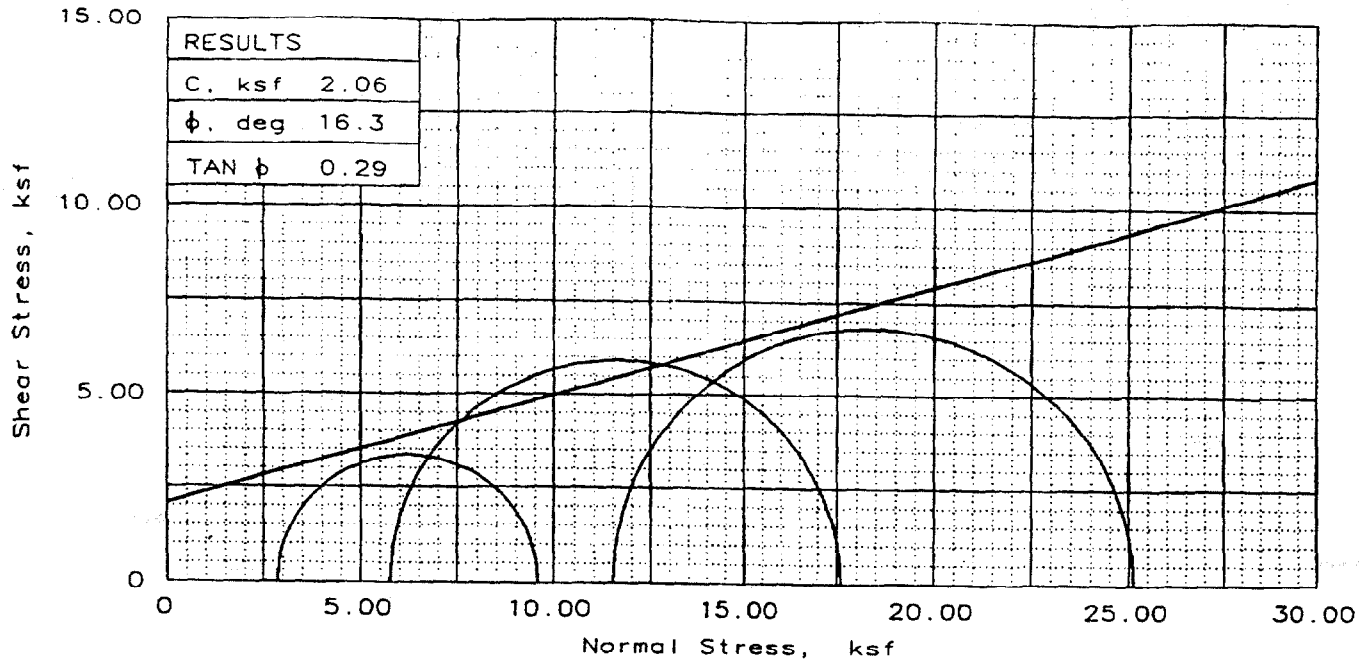
SAMPLE LOCATION: Lab sample no. ETDC-9932
Client no. CCGTSB03ST01

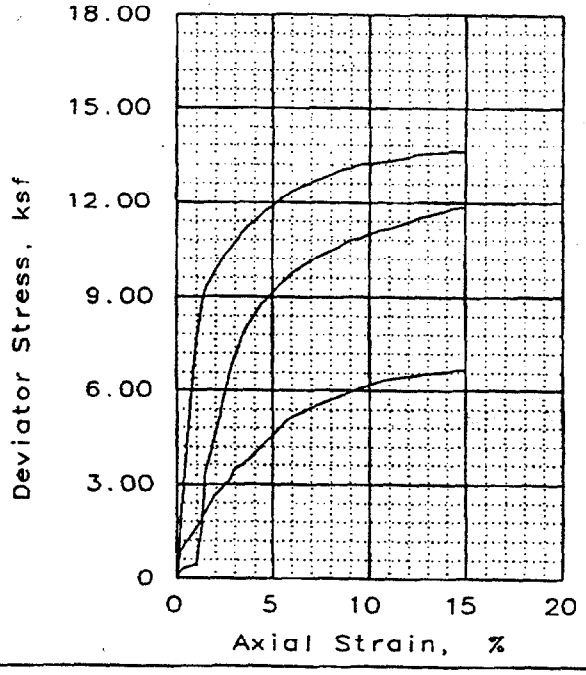
PROJ. NO.: 783208 DATE: 3/22/02

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY

FIG. NO. 9932





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	21.2	21.2	21.2
	DRY DENSITY, pcf	104.9	106.3	106.8
	SATURATION, %	97.4	101.0	102.5
	VOID RATIO	0.577	0.557	0.548
	DIAMETER, in	2.86	2.85	2.86
	HEIGHT, in	5.61	5.61	5.60
AT TEST	WATER CONTENT, %	22.8	20.6	19.3
	DRY DENSITY, pcf	104.9	106.3	106.8
	SATURATION, %	104.8	98.1	93.2
	VOID RATIO	0.577	0.557	0.548
	DIAMETER, in	2.86	2.85	2.86
	HEIGHT, in	5.61	5.61	5.60
Strain rate, in/min		0.056	0.040	0.040
BACK PRESSURE, ksf		0.00	0.00	0.00
CELL PRESSURE, ksf		2.88	5.76	11.52
FAILURE STRESS, ksf		6.70	11.85	13.61
PORE PRESSURE, ksf				
ULTIMATE STRESS, ksf		6.70	11.85	13.61
PORE PRESSURE, ksf				
σ_1 FAILURE, ksf		9.58	17.61	25.13
σ_3 FAILURE, ksf		2.88	5.76	11.52

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Silty clay

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS: Depth 10-11.9 ft.

Curve is "best-fit".

FIG. NO. 9933

CLIENT: Bechtel Jacobs Paducah

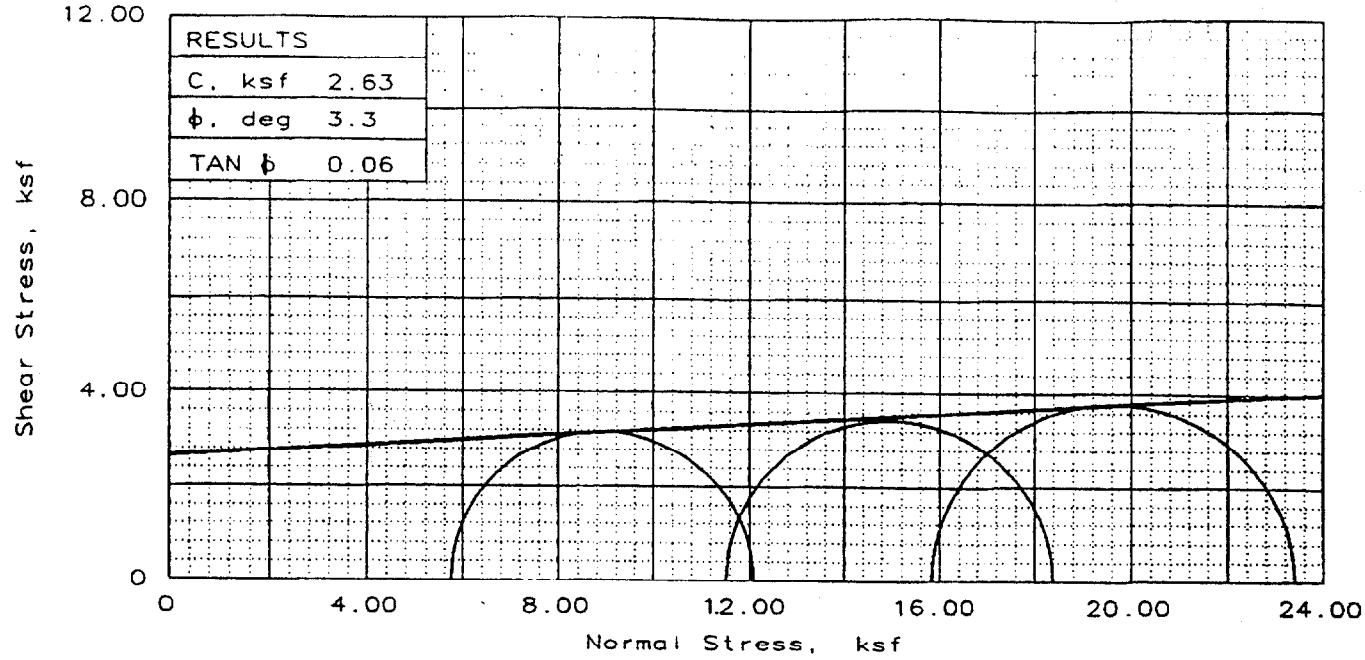
PROJECT: CERCLA Cell Seismic Assessment

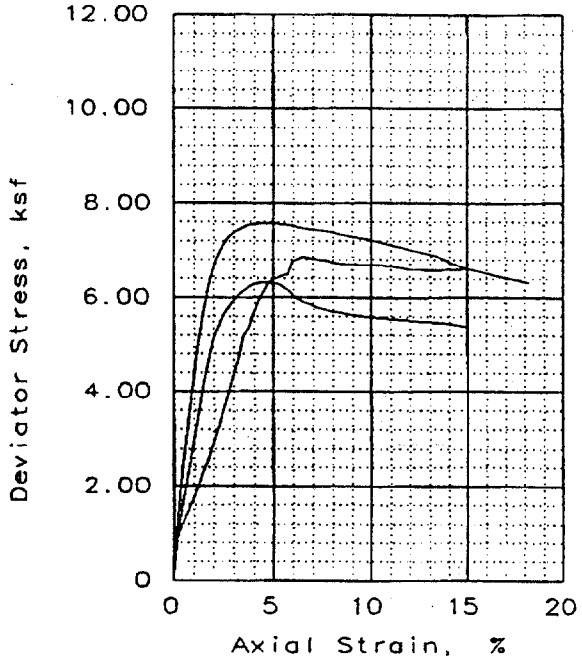
SAMPLE LOCATION: Lab sample no. ETDC-9933
Client no. CCGTSB03ST02

PROJ. NO.: 783208 DATE: 3/22/02

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	21.6	21.6	21.6
	DRY DENSITY, pcf	103.9	106.7	128.6
	SATURATION, %	96.5	103.8	199.6
	VOID RATIO	0.592	0.551	0.286
	DIAMETER, in	2.87	2.86	2.85
	HEIGHT, in	5.60	5.61	4.60
AT TEST	WATER CONTENT, %	23.9	20.6	22.9
	DRY DENSITY, pcf	103.9	106.7	128.6
	SATURATION, %	107.0	99.3	212.2
	VOID RATIO	0.592	0.551	0.286
	DIAMETER, in	2.87	2.86	2.85
	HEIGHT, in	5.60	5.61	4.60
Strain rate, in/min		0.040	0.040	0.040
BACK PRESSURE, ksf		0.00	0.00	0.00
CELL PRESSURE, ksf		5.76	11.52	15.84
FAILURE STRESS, ksf		6.33	6.86	7.57
PORE PRESSURE, ksf				
ULTIMATE STRESS, ksf		5.42	6.62	6.32
PORE PRESSURE, ksf				
σ_1 FAILURE, ksf		12.09	18.38	23.41
σ_3 FAILURE, ksf		5.76	11.52	15.84

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Silty clay

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS: Depth 38-40 ft.

Curve is "best-fit".

FIG. NO. 9934

CLIENT: Bechtels Jacobs Paducah

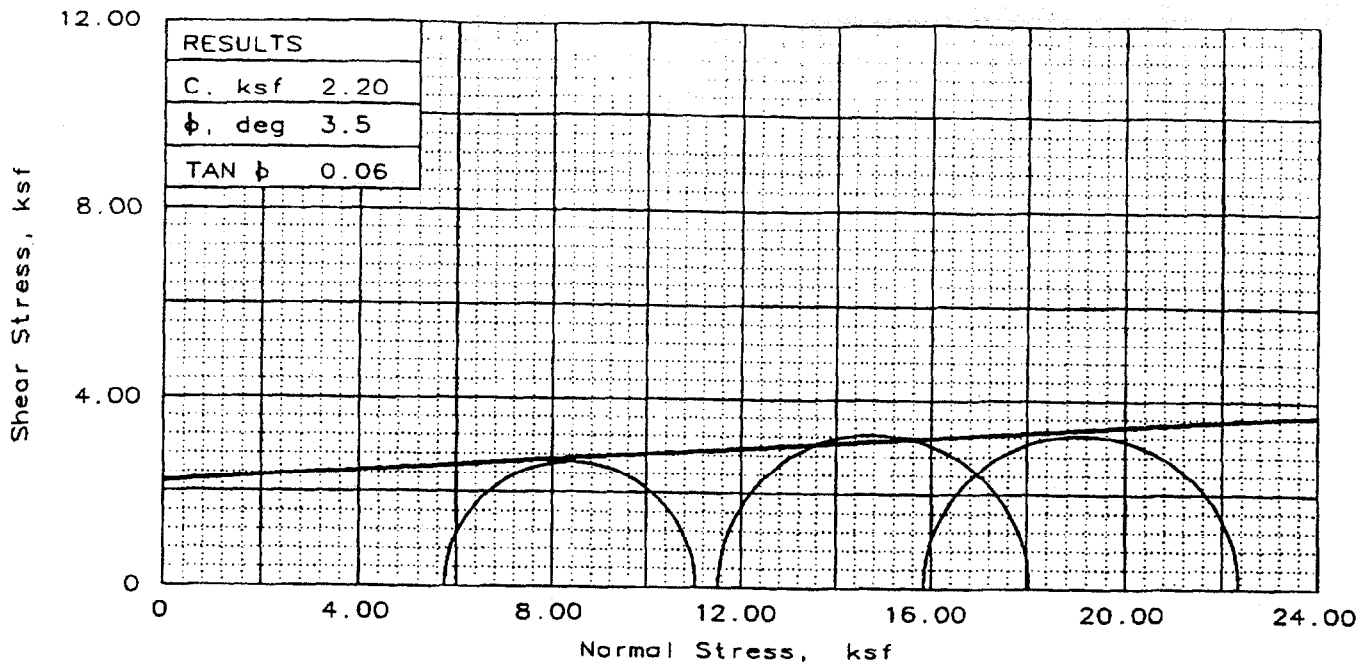
PROJECT: CERCLA Cell Seismic Assessment

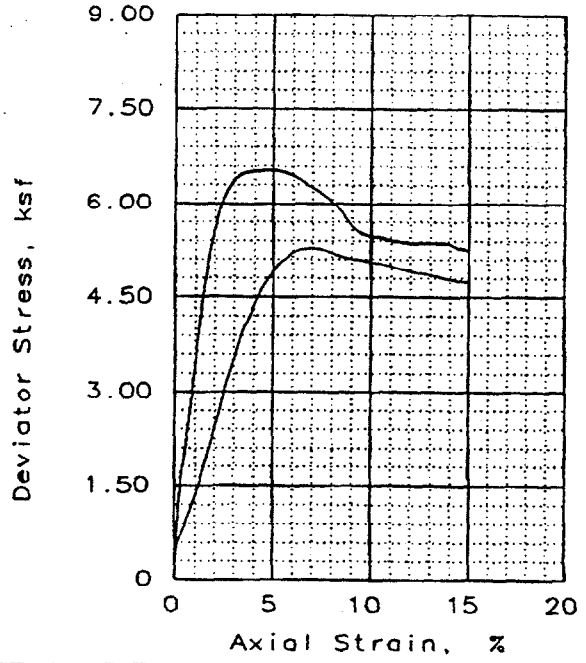
SAMPLE LOCATION: Lab sample no. ETDC-9934
Client no. CCGTSB03ST03

PROJ. NO.: 783208 DATE: 3/22/02

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	23.3	23.3	23.3
	DRY DENSITY, pcf	103.3	101.0	103.1
	SATURATION, %	102.8	96.9	102.2
	VOID RATIO	0.601	0.638	0.605
	DIAMETER, in	2.86	2.86	2.87
	HEIGHT, in	4.33	5.63	5.59
AT TEST	WATER CONTENT, %	24.3	24.5	24.4
	DRY DENSITY, pcf	103.3	101.0	103.1
	SATURATION, %	106.9	101.8	107.0
	VOID RATIO	0.601	0.638	0.605
	DIAMETER, in	2.86	2.86	2.87
	HEIGHT, in	4.33	5.63	5.59
Strain rate, in/min		0.045	0.045	0.045
BACK PRESSURE, ksf		0.00	0.00	0.00
CELL PRESSURE, ksf		5.76	11.52	15.84
FAILURE STRESS, ksf		5.28	6.53	6.51
PORE PRESSURE, ksf				
ULTIMATE STRESS, ksf		4.74	5.26	5.24
PORE PRESSURE, ksf				
σ_1 FAILURE, ksf		11.04	18.05	22.35
σ_3 FAILURE, ksf		5.76	11.52	15.84

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Silty clay

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS: Depth 40-42.3 ft.

Curve is "best-fit".

FIG. NO. 9935

CLIENT: Bechtel Jacobs Paducah

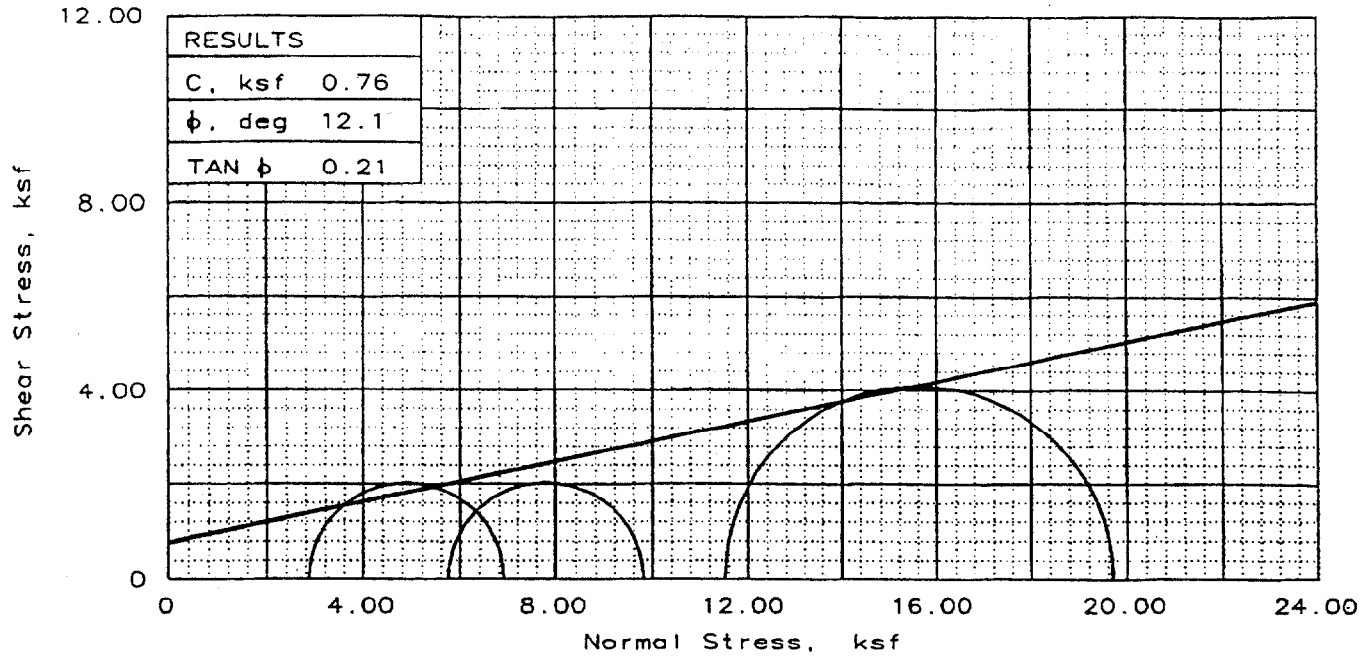
PROJECT: CERCLA Cell Seismic Assessment

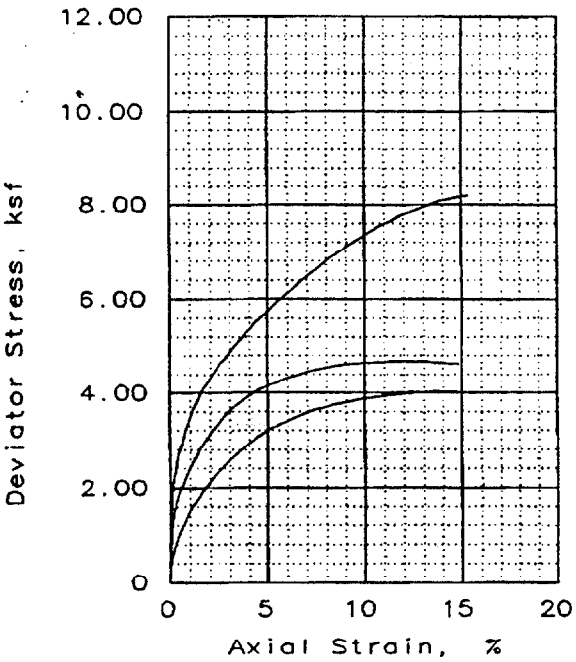
SAMPLE LOCATION: Lab sample no. ETDC-9935
Client no. CCGTSB03ST04

PROJ. NO.: 783208 DATE: 3/22/02

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	22.3	22.3	22.3
	DRY DENSITY, pcf	100.7	106.6	103.0
	SATURATION, %	91.8	106.9	97.4
	VOID RATIO	0.643	0.552	0.606
	DIAMETER, in	2.84	2.84	2.85
	HEIGHT, in	5.58	5.54	5.37
AT TEST	WATER CONTENT, %	22.8	23.7	22.0
	DRY DENSITY, pcf	100.7	106.6	103.0
	SATURATION, %	94.0	113.9	96.1
	VOID RATIO	0.643	0.552	0.606
	DIAMETER, in	2.84	2.84	2.85
	HEIGHT, in	5.58	5.54	5.37
Strain rate, in/min		0.047	0.046	0.046
BACK PRESSURE, ksf		0.00	0.00	0.00
CELL PRESSURE, ksf		2.88	5.76	11.52
FAILURE STRESS, ksf		4.03	4.05	8.19
PORE PRESSURE, ksf				
ULTIMATE STRESS, ksf		4.03	4.63	8.19
PORE PRESSURE, ksf				
σ_1 FAILURE, ksf		6.91	9.81	19.71
σ_3 FAILURE, ksf		2.88	5.76	11.52

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Clayey SILT

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS:

FIG. NO. 9956

CLIENT: Bechtel Jacobs

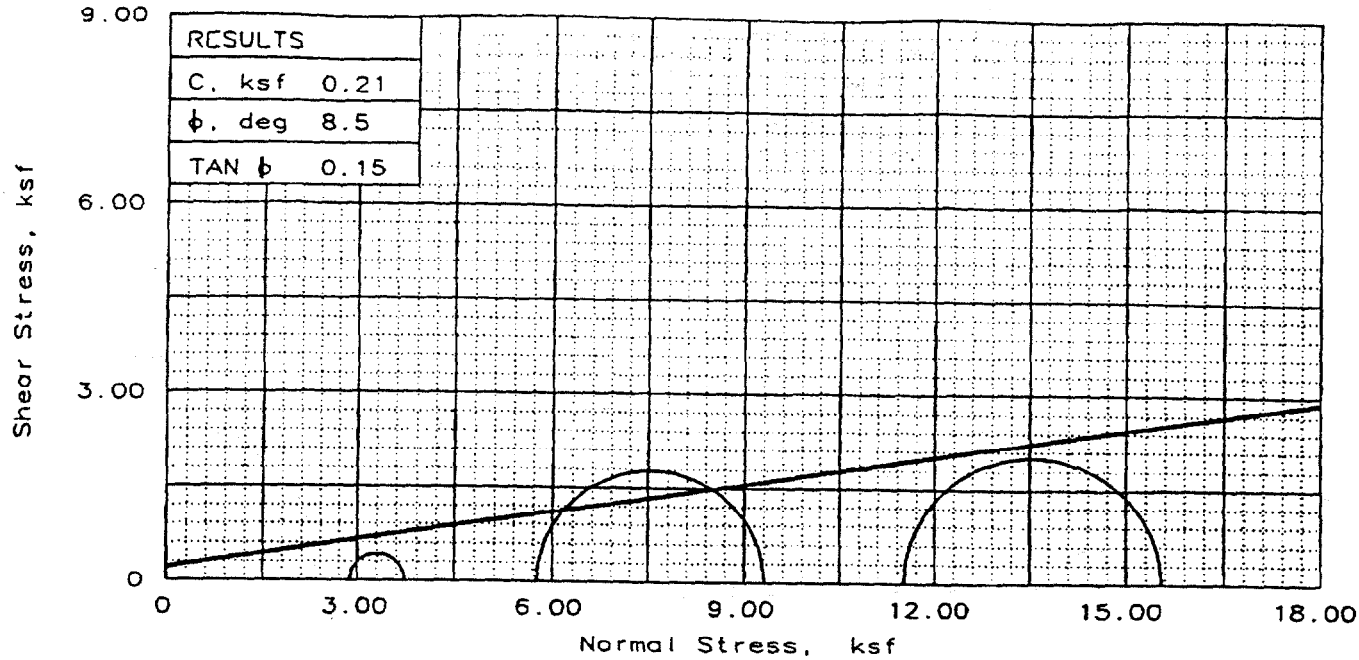
PROJECT: Paducah

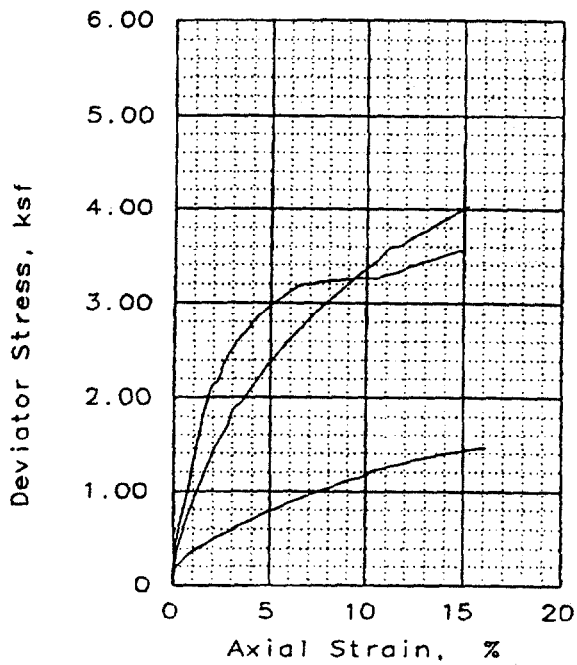
SAMPLE LOCATION: Lab sample no. ETDC-9956
Client sample ID CCGTSB05ST01

PROJ. NO.: 783208 DATE: 4/2/02

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	23.0	23.0	23.0
	DRY DENSITY, pcf	104.1	100.4	102.8
	SATURATION, %	103.4	94.2	100.1
	VOID RATIO	0.590	0.647	0.609
	DIAMETER, in	1.99	2.02	1.99
	HEIGHT, in	3.71	3.98	3.93
AT TEST	WATER CONTENT, %	25.7	25.0	23.6
	DRY DENSITY, pcf	104.1	100.4	102.8
	SATURATION, %	115.3	102.3	102.6
	VOID RATIO	0.590	0.647	0.609
	DIAMETER, in	1.99	2.02	1.99
	HEIGHT, in	3.71	3.98	3.93
Strain rate, in/min		0.040	0.039	0.040
BACK PRESSURE, ksf		0.00	0.00	0.00
CELL PRESSURE, ksf		2.88	5.76	11.52
FAILURE STRESS, ksf		0.85	3.55	4.03
PORE PRESSURE, ksf				
ULTIMATE STRESS, ksf		1.46	3.55	4.03
PORE PRESSURE, ksf				
σ_1 FAILURE, ksf		3.73	9.31	15.55
σ_3 FAILURE, ksf		2.88	5.76	11.52

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undistubed
DESCRIPTION: Clayey SILT

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: Bechtel Jacobs Paducah

PROJECT: CERCLA Cell Seismic Assessment

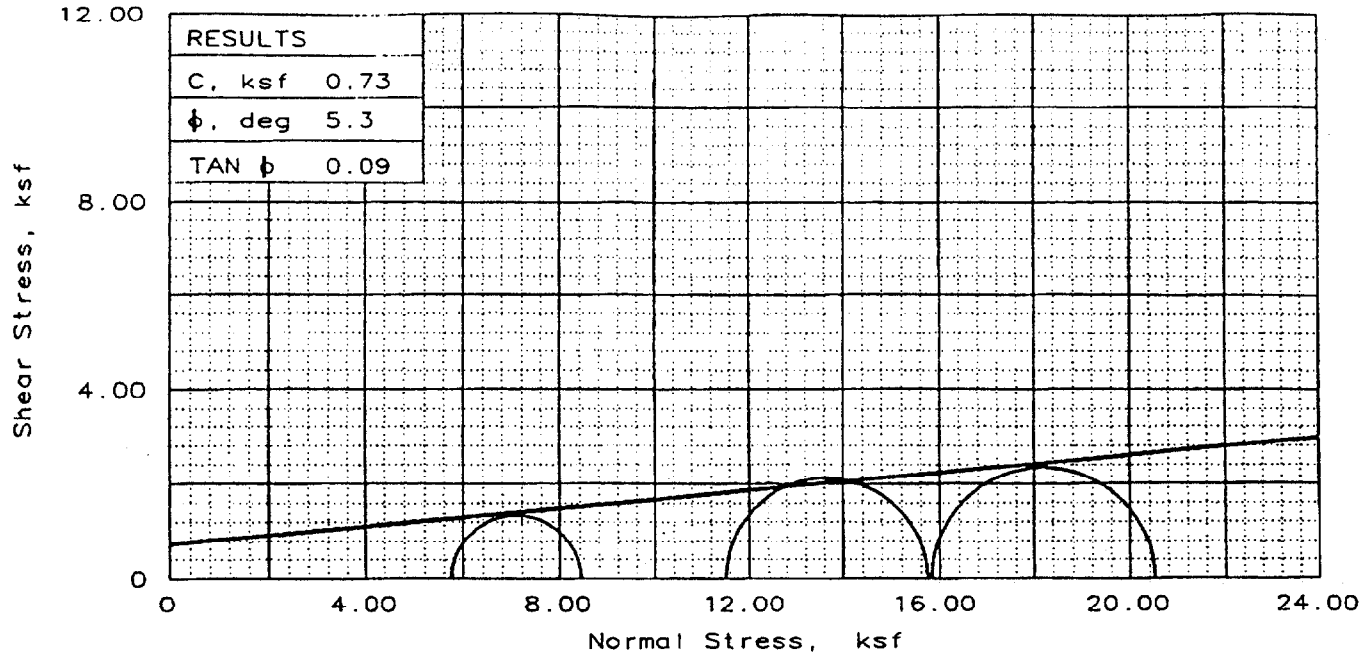
SAMPLE LOCATION: Lab sample no. ETDC-9964
Client sample IDL CCGTSB05ST02

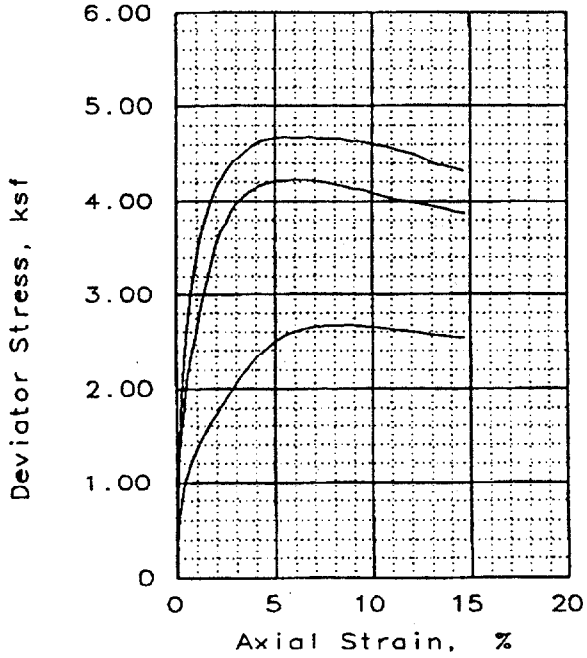
PROJ. NO.: 783208 DATE: 4/16/02

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY

FIG. NO. 9964





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	21.1	18.9	18.5
	DRY DENSITY, pcf	108.0	112.5	112.2
	SATURATION, %	104.8	106.2	103.3
	VOID RATIO	0.532	0.471	0.474
	DIAMETER, in	2.85	2.85	2.85
	HEIGHT, in	5.60	5.61	5.61
AT TEST	WATER CONTENT, %	21.1	18.9	18.5
	DRY DENSITY, pcf	108.0	112.5	112.2
	SATURATION, %	104.8	106.2	103.3
	VOID RATIO	0.532	0.471	0.474
	DIAMETER, in	2.85	2.85	2.85
	HEIGHT, in	5.60	5.61	5.61
Strain rate, in/min		0.028	0.028	0.028
BACK PRESSURE, ksf		0.00	0.00	0.00
CELL PRESSURE, ksf		5.76	11.52	15.84
FAILURE STRESS, ksf		2.67	4.23	4.68
PORE PRESSURE, ksf				
ULTIMATE STRESS, ksf		2.54	3.88	4.32
PORE PRESSURE, ksf				
σ_1 FAILURE, ksf		8.43	15.75	20.52
σ_3 FAILURE, ksf		5.76	11.52	15.84

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Clayey silt

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: Bechtel Jacobs Paducah

PROJECT: CERCLA Cell Seismic Assessment

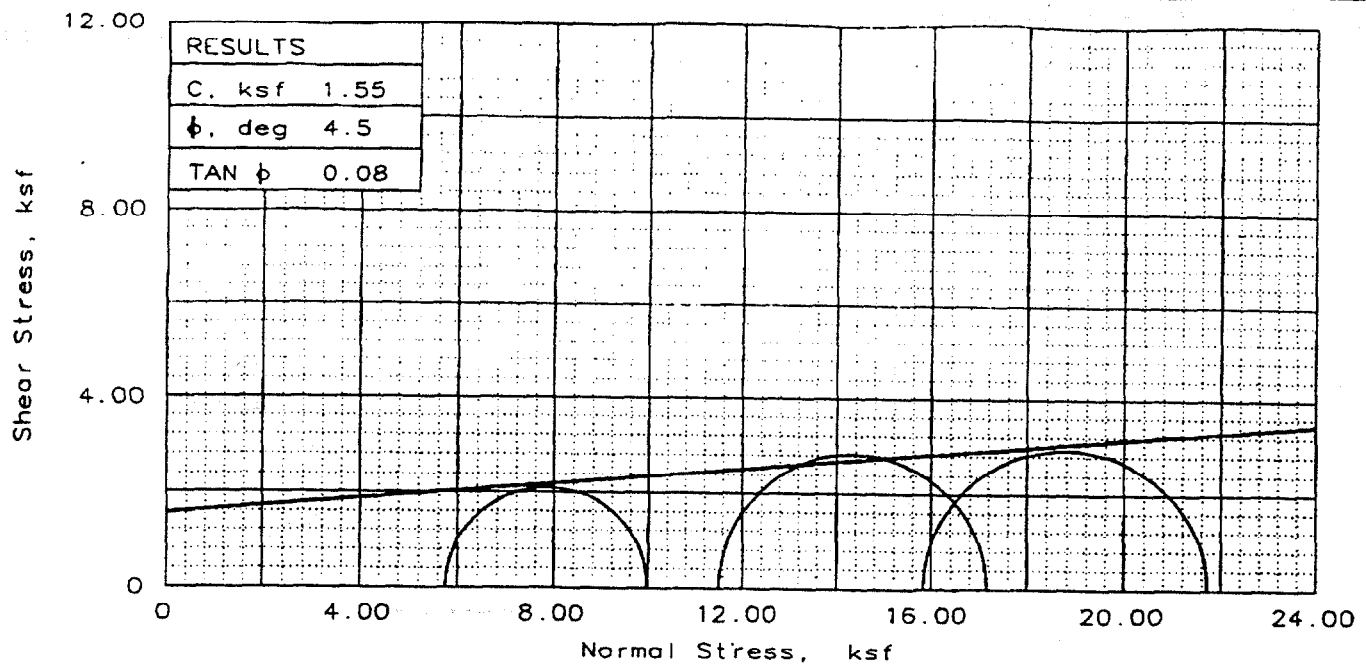
SAMPLE LOCATION: Lab sample no. ETDC-9965
Client sample no. CCGTSB05ST03

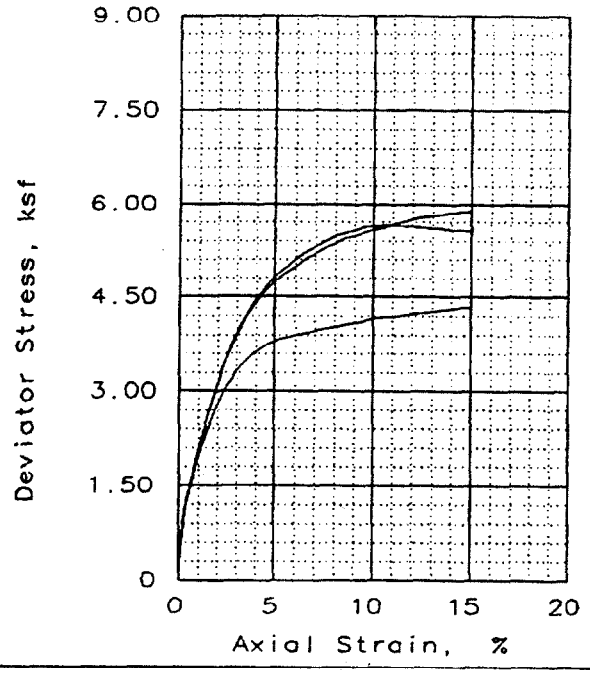
PROJ. NO.: 783208 DATE: 5/17/2002

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY

FIG. NO. 9965





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	16.0	16.0	16.0
	DRY DENSITY, pcf	118.8	114.1	118.8
	SATURATION, %	108.0	94.4	108.2
	VOID RATIO	0.393	0.450	0.392
	DIAMETER, in	2.04	2.09	2.04
	HEIGHT, in	4.01	3.98	4.01
AT TEST	WATER CONTENT, %	15.4	16.5	15.4
	DRY DENSITY, pcf	118.8	114.1	118.8
	SATURATION, %	103.8	97.5	104.0
	VOID RATIO	0.393	0.450	0.392
	DIAMETER, in	2.04	2.09	2.04
	HEIGHT, in	4.01	3.98	4.01
Strain rate, in/min				
BACK PRESSURE, ksf		0.00	0.00	0.00
CELL PRESSURE, ksf		5.76	11.52	15.84
FAILURE STRESS, ksf		4.21	5.66	5.88
PORE PRESSURE, ksf				
ULTIMATE STRESS, ksf		4.33	5.55	5.88
PORE PRESSURE, ksf				
σ_1 FAILURE, ksf		9.97	17.18	21.72
σ_3 FAILURE, ksf		5.76	11.52	15.84

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Clayey SILT

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: Bechtel Jacobs

PROJECT: Paducah

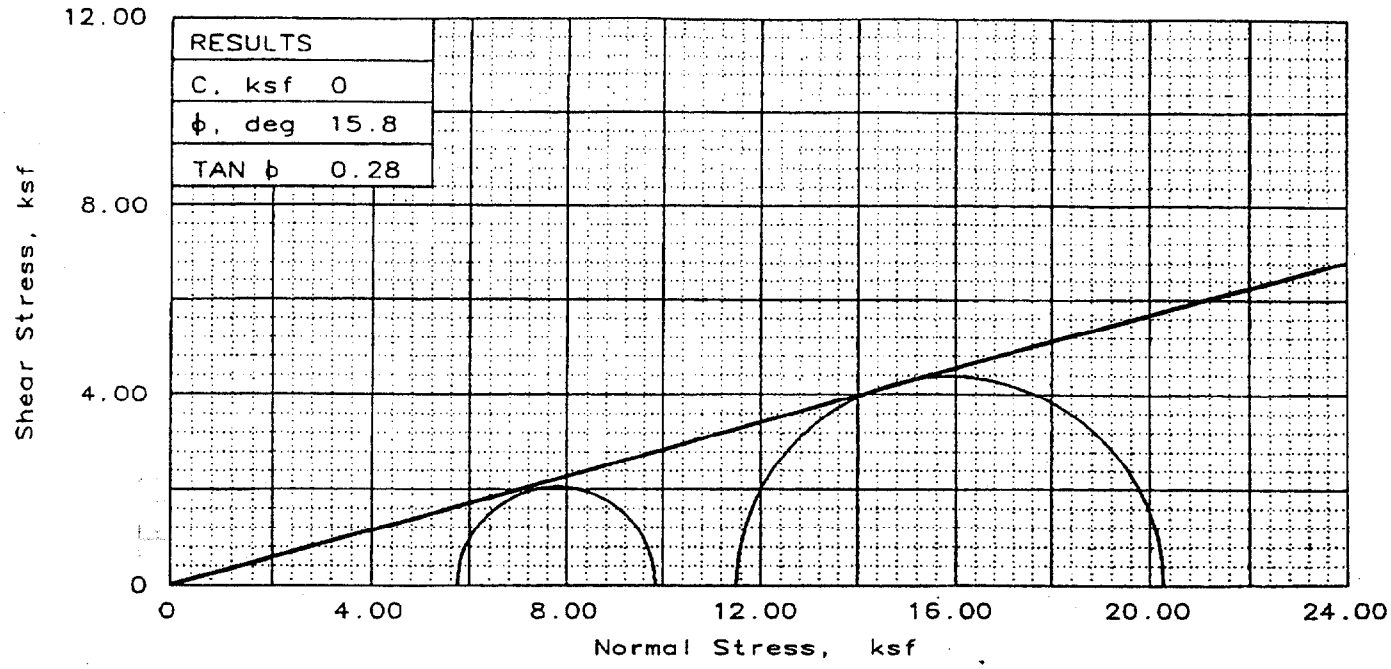
SAMPLE LOCATION: Lab sample no. ETDC-9958
Client sample ID CCGTSB05ST04

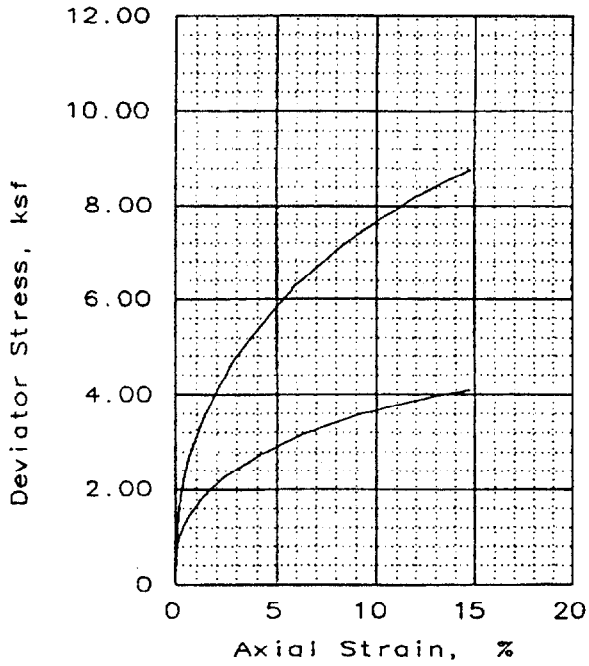
PROJ. NO.: 783208 DATE: 4/2/02

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY

FIG. NO. 9958





SAMPLE NO.		1	2
INITIAL	WATER CONTENT, %	26.8	26.8
	DRY DENSITY, pcf	95.7	96.5
	SATURATION, %	97.4	99.5
	VOID RATIO	0.729	0.714
	DIAMETER, in	2.84	2.82
	HEIGHT, in	5.59	5.57
AT TEST	WATER CONTENT, %	26.5	26.5
	DRY DENSITY, pcf	95.7	96.5
	SATURATION, %	96.5	98.4
	VOID RATIO	0.729	0.714
	DIAMETER, in	2.84	2.82
	HEIGHT, in	5.59	5.57
Strain rate, in/min		0.003	0.003
BACK PRESSURE, ksf		0.00	0.00
CELL PRESSURE, ksf		5.76	11.52
FAILURE STRESS, ksf		4.09	8.76
PORE PRESSURE, ksf			
ULTIMATE STRESS, ksf		4.09	8.76
PORE PRESSURE, ksf			
σ_1 FAILURE, ksf		9.85	20.28
σ_3 FAILURE, ksf		5.76	11.52

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Silty clay

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: Bechtel Jacobs Paducah

PROJECT: CERCLA Cell Seismic Assessment

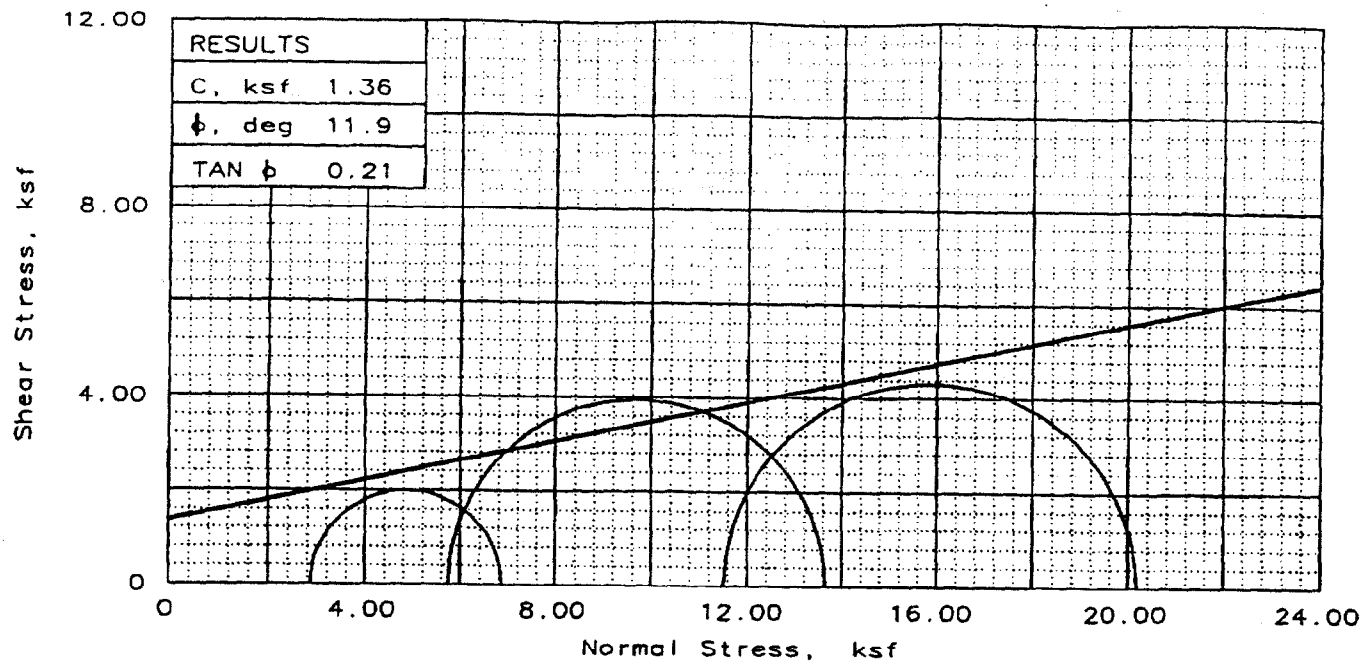
SAMPLE LOCATION: Lab sample no. ETDC-10027
Client sample no. CCGTSB06ST01

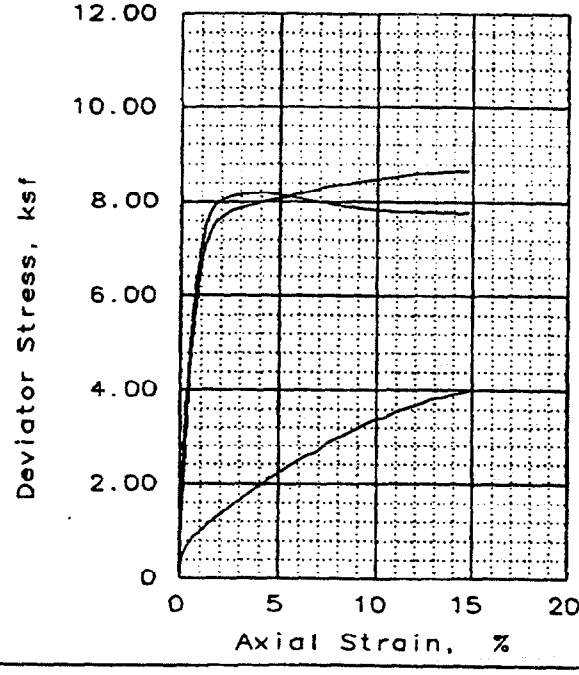
PROJ. NO.: 783208 DATE: 5/18/2002

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY

FIG. NO. 10027





SAMPLE NO.		1	2	3
INITIAL	WATER CONTENT, %	23.6	23.6	23.6
	DRY DENSITY, pcf	102.1	101.2	102.0
	SATURATION, %	100.7	98.6	100.7
	VOID RATIO	0.621	0.635	0.621
	DIAMETER, in	2.86	2.83	2.83
	HEIGHT, in	5.58	5.58	5.58
AT TEST	WATER CONTENT, %	25.8	24.6	24.4
	DRY DENSITY, pcf	102.1	101.2	102.0
	SATURATION, %	110.2	102.8	103.9
	VOID RATIO	0.621	0.635	0.621
	DIAMETER, in	2.86	2.83	2.83
	HEIGHT, in	5.58	5.58	5.58
Strain rate, in/min		0.028	0.028	0.028
BACK PRESSURE, ksf		0.00	0.00	0.00
CELL PRESSURE, ksf		2.88	5.76	11.52
FAILURE STRESS, ksf		3.99	7.90	8.67
PORE PRESSURE, ksf				
ULTIMATE STRESS, ksf		3.99		8.67
PORE PRESSURE, ksf				
σ_1 FAILURE, ksf		6.87	13.66	20.19
σ_3 FAILURE, ksf		2.88	5.76	11.52

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Clayey silt

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: Bechtel Jacobs Paducah

PROJECT: CERCLA Cell Seismic Assessment

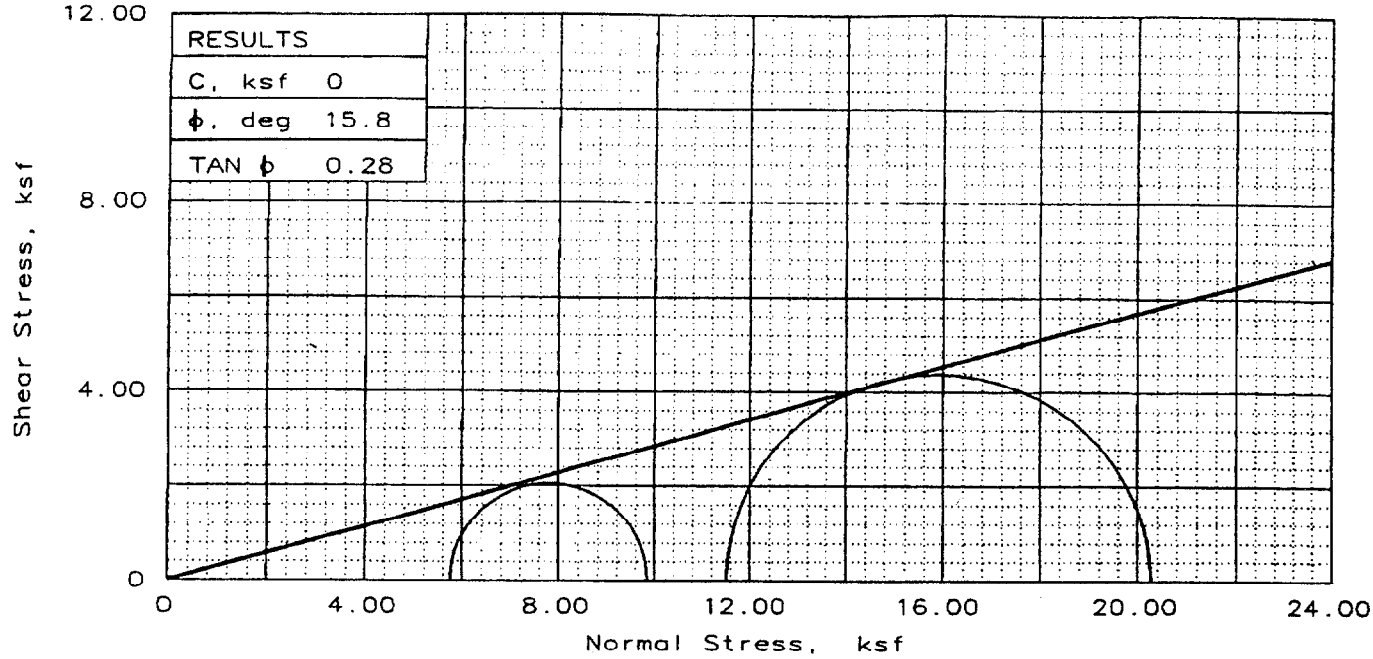
SAMPLE LOCATION: Lab sample no. ETDC-9992
Client sample no. CCGTDB02ST01

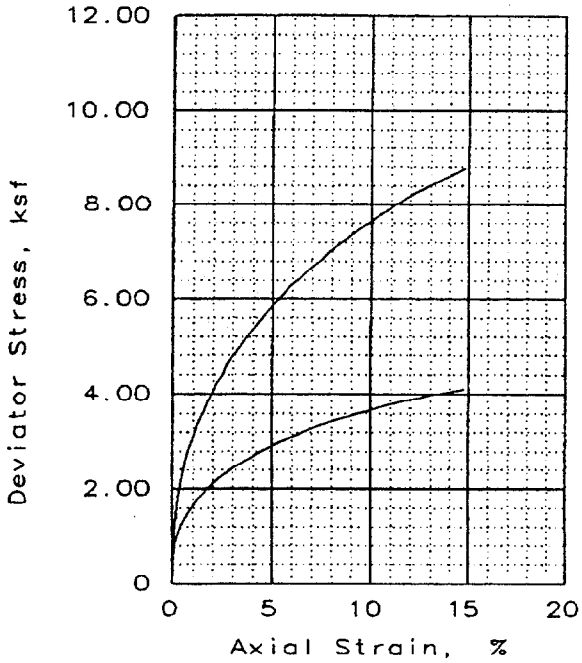
PROJ. NO.: 783208 DATE: 5/17/2002

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY

FIG. NO. 9992





SAMPLE NO.		1	2
INITIAL	WATER CONTENT, %	26.8	26.8
	DRY DENSITY, pcf	95.7	96.5
	SATURATION, %	97.4	99.5
	VOID RATIO	0.729	0.714
	DIAMETER, in	2.84	2.82
	HEIGHT, in	5.59	5.57
AT TEST	WATER CONTENT, %	26.5	26.5
	DRY DENSITY, pcf	95.7	96.5
	SATURATION, %	96.5	98.4
	VOID RATIO	0.729	0.714
	DIAMETER, in	2.84	2.82
	HEIGHT, in	5.59	5.57
Strain rate, in/min		0.003	0.003
BACK PRESSURE, ksf		0.00	0.00
CELL PRESSURE, ksf		5.76	11.52
FAILURE STRESS, ksf		4.09	8.76
PORE PRESSURE, ksf			
ULTIMATE STRESS, ksf		4.09	8.76
PORE PRESSURE, ksf			
σ_1 FAILURE, ksf		9.85	20.28
σ_3 FAILURE, ksf		5.76	11.52

TYPE OF TEST:
Unconsolidated undrained
SAMPLE TYPE: Undisturbed
DESCRIPTION: Silty clay

LL= PL= PI=
SPECIFIC GRAVITY= 2.65
REMARKS:

CLIENT: Bechtel Jacobs Paducah

PROJECT: CERCLA Cell Seismic Assessment

SAMPLE LOCATION: Lab sample no. ETDC-9993
Client sample no. CCGTDB02ST03

PROJ. NO.: 783208 DATE: 5/18/2002

TRIAXIAL SHEAR TEST REPORT

IT CORPORATION GEOTECHNICAL LABORATORY

FIG. NO. 9993

ATTACHMENT E-V

SEISMIC CONE PENETROMETER TESTING REPORT

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SCPT Designation Crosswalk

Gregg In-Situ Designation in Attachment E-V	DOE Designation
CCGT-SC01	SC-01
CCGT-02	SC-02
CCGT-03	SC-03
CCGT-04	SC-04
CCGT-SC05	SC-05
SCPT-340L2	SC-06
SCPT-340L3	SC-07
CCGT-08	SC-08
CCGT-SC09	SC-09
CCGT-SC09A	SC-09A
SCPT-560L2	SC-10
SCPT-SB04	SC-11
SCPT-SB07	SC(SB-07)
SCPT-SB07A	SC(SB-07A)

PRESENTATION OF CONE PENETRATION TEST DATA

UNITED STATES ENRICHMENT CORPORATION

GEOTECHNICAL INVESTIGATION

PADUCAH, KENTUCKY

FEBRUARY 2002

Prepared for:

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Augusta, Georgia 30901

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106 Butternut Road
Summerville, South Carolina 29483

April 24, 2002

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3.0 CONE PENETRATION TEST DATA AND INTERPRETATION

- 3.1 CPT Data
- 3.2 Pore Pressure Dissipations
- 3.3 CPT Interpretation Summary

4.0 SEISMIC TEST DATA AND INTERPRETATION

- 4.1 SEISMIC DATA AND INTERPRETATION

5.0 DATA DISKETTE

APPENDICES

- Appendix A Cone Penetration Test (CPT) Plots
- Appendix B Pore Pressure Dissipations
- Appendix C CPT Interpretations Methods and References
- Appendix D Seismic Data
- Appendix E Data Diskette

1.0 INTRODUCTION

This report contains the results of Cone Penetration Testing with seismic wave velocity measurements conducted at the United States Energy Center facility in Paducah, Kentucky. The program consisted of fourteen CPT soundings to depths ranging from 6.76 feet to 70.01 feet below the existing ground surface. The soundings included downhole seismic testing. Gregg In Situ's 25 Ton CPT rig and 22 Ton *RHINO* track rig with associated tooling were used for the CPT soundings. A data acquisition system collected information from the cone as it penetrated the soils. The scope of work was completed at the direction of SAIC personnel. The investigation program was conducted from February 13 to March 7, 2002. Other project assignments included soil sampling. This report addresses only the CPT and downhole seismic testing conducted.

2.0 FIELD EQUIPMENT AND PROCEDURES

2.1 Electric Cone Penetration Testing

The Cone Penetration Tests (CPT) were performed using GREGG IN SITU of Summerville, South Carolina using an integrated electronic cone system. The CPT soundings were performed in general accordance with ASTM D5778-95 and industry standards.

A 20-ton compression type cone was utilized at this site. The 20-ton cone has a tip area (A_c) of 15cm^2 and a friction sleeve area of 225 cm^2. A pore water pressure transducer and filter is located directly behind the cone tip. The 5.0 mm filter element is composed of a porous plastic and is saturated in glycerin under vacuum pressure prior to use. An illustration of the cone is shown in Figure 1.

The GREGG IN SITU cone is designed with an equal end area friction sleeve and a tip net area ratio, a, of 0.85 (based on A_c equal to 15cm^2). The net area ratio, a, has been verified in the laboratory by subjecting the cone to a known pressure then measuring the load recorded on the tip. The net area ratio can then be calculated by dividing the measured pressure on the tip by the known applied pressure.

The GREGG IN SITU cone was equipped with three geophones orientated along the X, Y and Z axis of the cone used for measuring shear and compression waves generated at the ground surface. The shear and compression wave forms generated were recorded by an electronic oscilloscope and stored by the data acquisition system. Compressive waves were not reported due to the shallow water table at the site.

The cone is capable of recording the following parameters at 2-cm and 2.5cm depth intervals:

Tip Resistance	(q_c)
Sleeve Friction	(f_s)
Dynamic Pore Pressure	(u_2)

Due to the inner geometry of the cone, the measured tip resistance (q_c) is influenced by the ambient pore water pressure. This effect is commonly referred to as the "unequal area effect". Therefore, a corrected total cone tip resistance (q_t) is utilized for CPT correlations, where:

$$q_t = q_c + (1-a) \times u_2$$

where: q_c is the recorded tip stress
a is the net area ratio (Based on Laboratory Measurements)
u_2 is the dynamic pore pressure measured just behind the tip

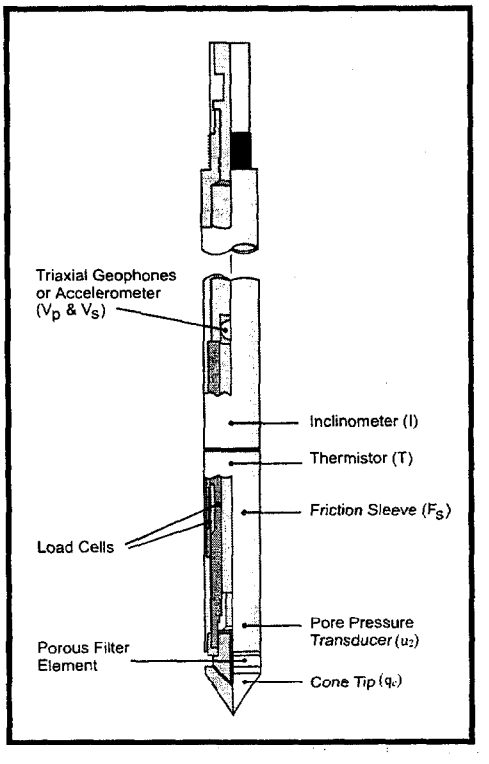


Figure 1
Gregg In Situ Cone Penetrometer
(Type 2 Shoulder Cone)

Complete sets of baseline readings were taken prior to and after the sounding to determine temperature shifts and any zero load offsets. Establishing temperature shifts and load offsets enables corrections to be made to the cone data where necessary.

The CPT soundings were advanced using GREGG IN SITU's 25 ton CPT rig and 22 Ton *RHINO* track rig and associated tooling.

3.0 CONE PENETRATION TEST DATA AND INTERPRETATION

3.1 CPT Data

The CPT testing program has been summarized in Table 1.

Table 1
CPT Testing Summary

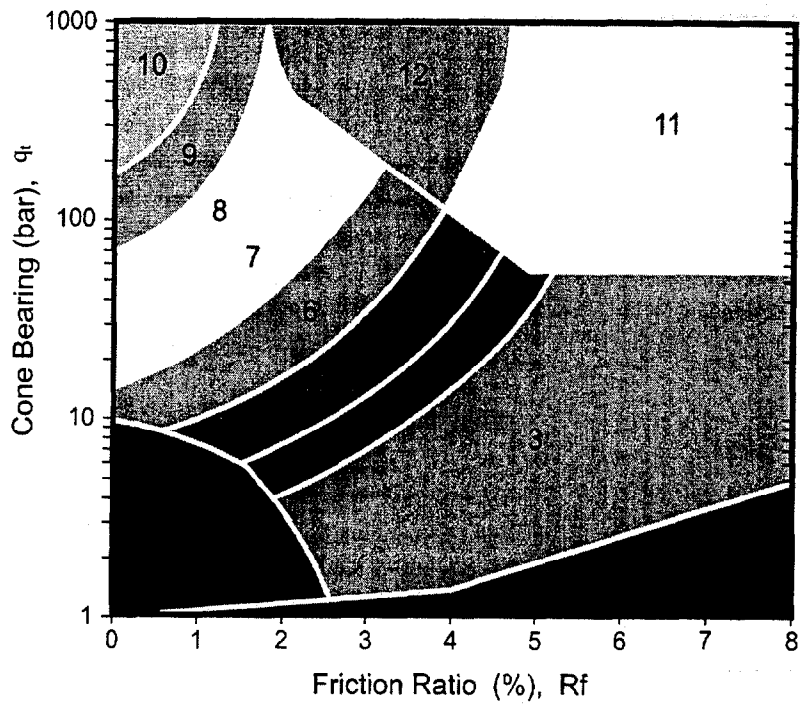
Sounding Number	Sounding Date	Total Depth (Feet)	Tested Parameters
CCGT-SC01	2/15/02	59.12	q_c, f_s, u_2, Seismic
CCGT-03	2/14/02	51.97	q_c, f_s, u_2, Seismic
CCGT-04	2/14/02	70.01	q_c, f_s, u_2, Seismic
CCGT-SC05	2/15/02	54.07	q_c, f_s, u_2, Seismic
CCGT-08	2/13/02	69.03	q_c, f_s, u_2, Seismic
CCGT-SC09	2/13/02	6.76	q_c, f_s, u_2, Seismic
CCGT-SC09A	2/13/02	66.01	q_c, f_s, u_2, Seismic
SCPT-SB04	3/07/02	34.86	q_c, f_s, u_2, Seismic
SCPT-SB07	3/07/02	17.72	q_c, f_s, u_2, Seismic
SCPT-SB07A	3/07/02	16.49	q_c, f_s, u_2, Seismic
SCPT-340L2	3/06/02	51.02	q_c, f_s, u_2, Seismic
SCPT-340L3	3/05/02	51.05	q_c, f_s, u_2, Seismic
SCPT-560L2	3/06/02	37.96	q_c, f_s, u_2, Seismic

The cone penetration test data and pore pressure measurements are presented in graphical form in Appendix A. Penetration depths are referenced to the existing ground surface at the time of the investigation.

The inferred stratigraphic profile at each CPT test location is included with this report. The stratigraphic soil type behavior interpretations are based on

relationships between q_t, f_s, and u_2. The friction ratio (f_s/q_t) is a calculated parameter that is indicative of soil behavior and is therefore used to identify the soil behavior type.

Generally, cohesive soils have high friction ratios, low cone bearing and generate large excess pore water pressures. Cohesionless soils have lower friction ratios, high cone bearing and generate little in the way of excess pore water pressures. In this report, the classification of soils is based on the correlations developed by Robertson (1990) shown in Figure 2.



Zone	q_t/N	Soil Behaviour Type
1	2	sensitive fine grained
2	1	organic material
3	1	clay
4	1.5	silty clay to clay
5	2	clayey silt to silty clay
6	2.5	sandy silt to clayey silt
7	3	silty sand to sandy silt
8	4	sand to silty sand
9	5	sand
10	6	gravelly sand to sand
11	1	very stiff fine grained *
12	2	sand to clayey sand *

* overconsolidated or cemented

Figure 2
Soil Behavior Type Classification Chart
(Robertson 1990)

3.2 PORE PRESSURE DISSIPATION TEST RESULTS

Pore water pressures are monitored in order to measure hydrostatic water pressures and approximate the depth to the groundwater table. Pore pressure dissipations were automatically recorded at 5-second intervals and where appropriate during pauses in the penetration. Often, complete dissipations are conducted at selected depths. Select pressure dissipations from the soundings advanced for this investigation have been included in Appendix B.

3.3 CPT INTERPRETATION SUMMARY

Generalized summaries have been generated for the soil parameters with respect to depth. These methods are based on general geotechnical engineering principles and current literature being published in the discipline of CPT technologies. These output files have are presented as both importable (ie. to spreadsheet) or printable files. A listing of definitions and interpretation methodologies is presented in the Appendix C.

The interpretations of soils encountered are conducted using correlations developed by Robertson, 1990. It should be noted that it is not always possible to clearly identify a soil type based on q_c, f_s and u_2. In these situations, experience and judgement and an assessment of the pore pressure dissipation test data should be used to infer the soil behavior type.

4.0 SEISMIC TEST DATA AND INTERPRETATION

The seismic equipment and procedures used in this investigation, in general, were as developed at the University of British Columbia and reported by Rice(1984), Laing (1985) and Robertson et al (1986). The procedure has been incorporated into the CPT test and conducted at select depth intervals as directed in the field.

Seismic shear waves were generated by striking a steel beam being held down by a hydraulic stabilizer on the CPT rig. The beam was 8.4 feet long, six inches wide and six inches deep. The beam was struck with a twenty-pound sledge hammer which automatically triggers an armed data acquisition system on the CPT rig.

For shear wave generation, the beam was struck in a horizontal direction, parallel to the active axis of the transducer, first from the right side of the rig and then from the left side. The wave traces were recorded using a digital oscilloscope onboard the data acquisition system. Each wave is inspected in the field and the procedure repeated if the signatures were questionable.

After each pair of shear waves traces were recorded, inspected and saved, the two traces were overlain on a digital oscilloscope screen and common arrival times, based in equivalent peaks, were selected.

Similarly, compressive waves were generated by striking a steel plate embedded in the ground. The plate was located approximately 5.5 feet from the sounding location. Analysis and interpretation were conducted as with the shear waveforms. Compression waveforms and velocities have not been included in this report as the data was determined to be void due to the shallow groundwater table encountered at the project site.

Seismic trace stacks plotting time versus depth, Wave Velocity Calculations and Profiles are included in Appendix D.

5.0 DATA DISKETTE

The enclosed data diskette contains the data files recorded and generated for this testing program. The following table details the different files.

Files on Data Diskette

File Extension	File Description
COR	Gregg format CPT file: Column 1: Depth (m) Column 2: Tip Resistance – q_c (tsf) Column 3: Sleeve Friction – f_s (tsf) Column 4: Dynamic Pore Pressure – u_2 (psi)
PPD	Pore Pressure Dissipation File
SRI	Interpretation File (Savannah River Format)
IFI	Interpretation File Importable

These files and parameters were generated for 023CS01.*, 023CS02.* etc. The Data Diskette is included in Appendix E.

APPENDIX A

STANDARD CPT PLOTS

GREGG

CPT SOUNDING SUMMARY

United States Energy Center

Paducah, Kentucky

Sounding	Date	Depth
CCGT-SC01	2/15/2002	59.12
CCGT-02	2/14/2002	61.42
CCGT-03	2/14/2002	51.97
CCGT-04	2/14/2002	70.01
CCGT-SC05	2/15/2002	54.07
CCGT-08	2/13/2002	69.03
CCGT-SC09	2/13/2002	6.76
CCGT-SC09A	2/13/2002	66.01
SCPT-340L2	3/6/2002	51.02
SCPT-340L3	3/5/2002	51.05
SCPT-560L2	3/6/2002	37.96
SCPT-SB04	3/7/2002	34.86
SCPT-SB07	3/7/2002	17.72
SCPT-SB07A	3/7/2002	16.49

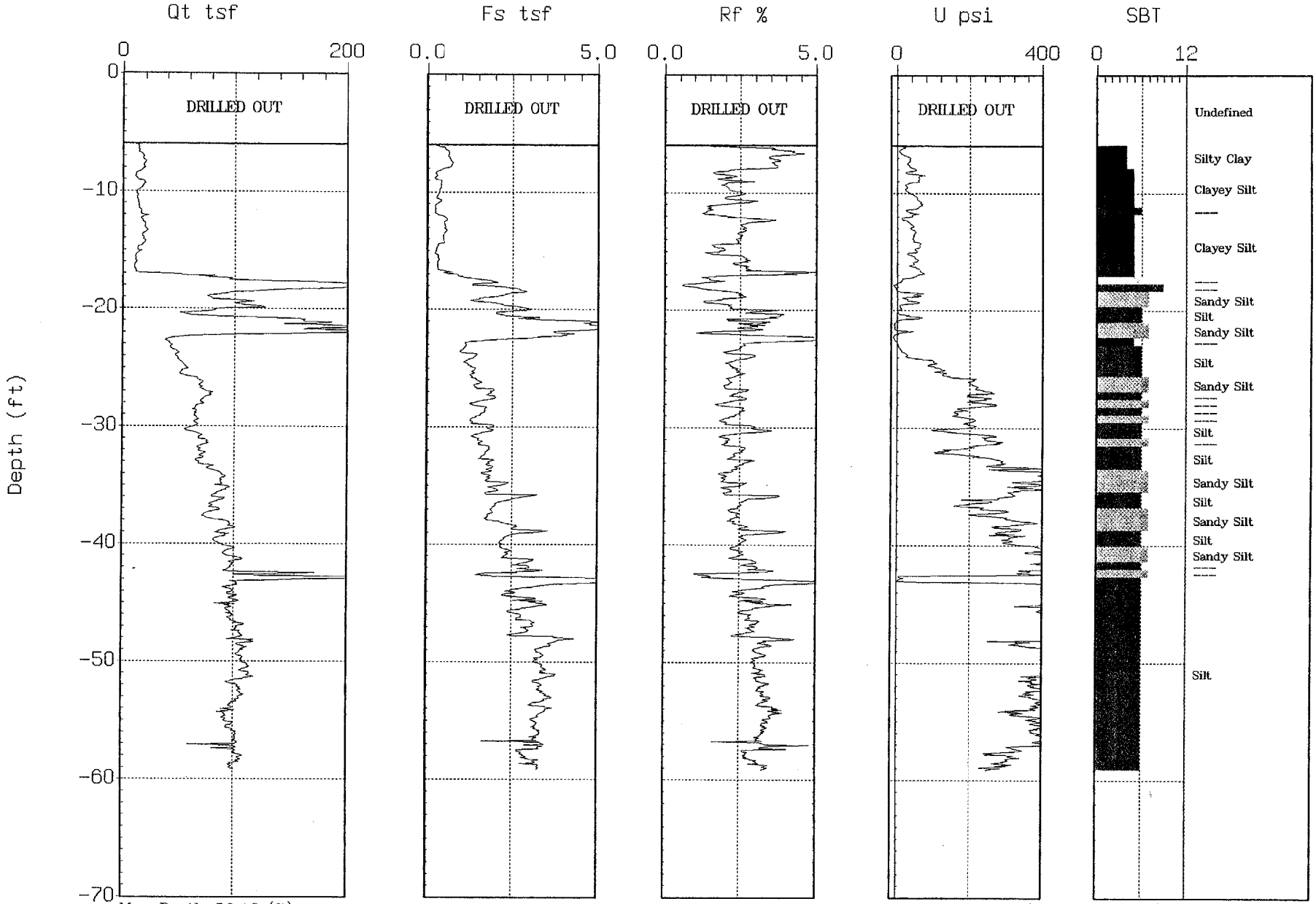
All depths referenced in feet from the existing ground surface.

GREGG

SAIC–Paducah

Sounding: CCGT-SC01
Location: USEC

Oversight: N. Kidd
Date: 02:15:02 09:34



Max. Depth: 59.12 (ft)

Depth Inc.: 0.066 (ft)

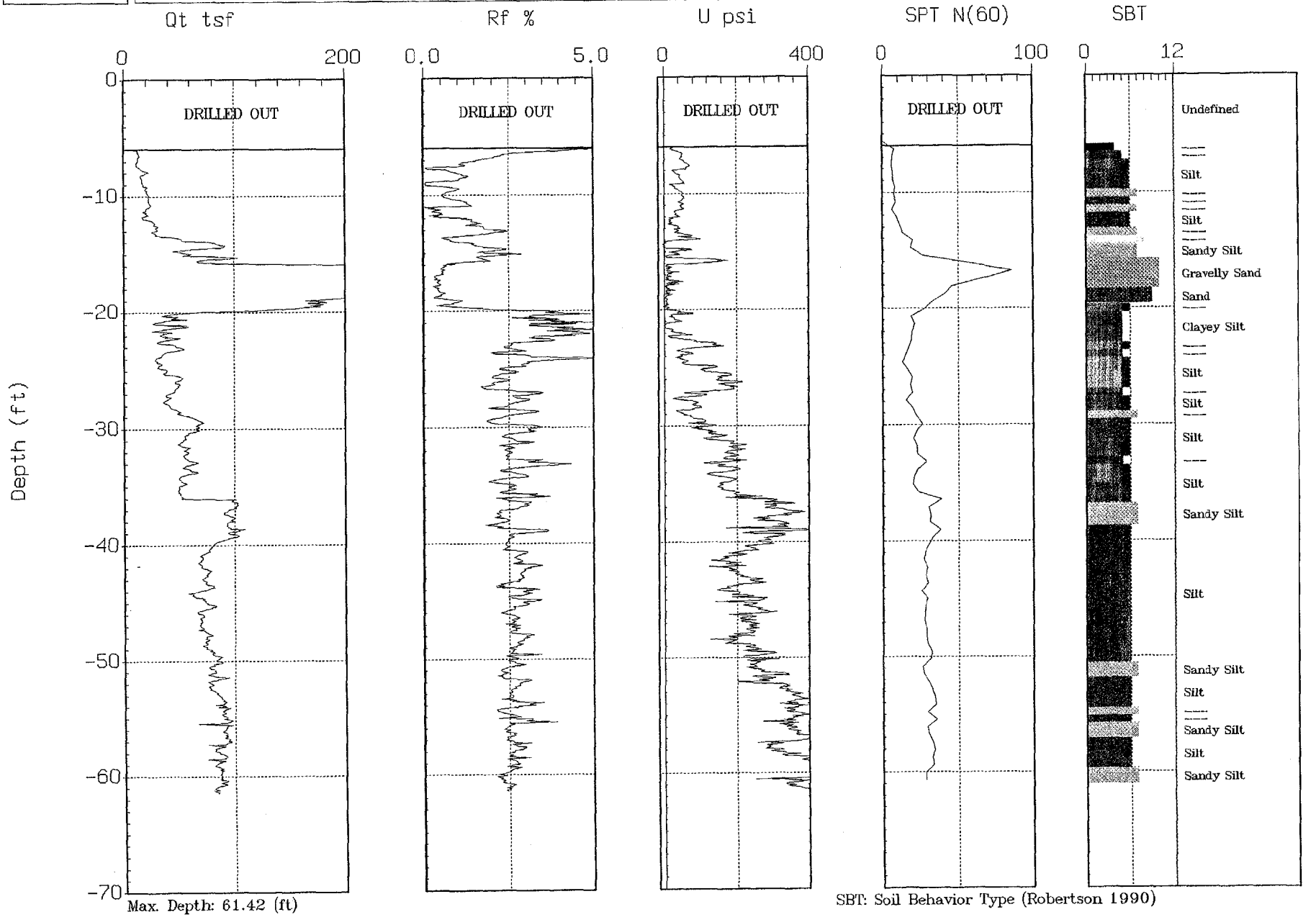
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC-Paducah

Sounding: CCGT-02
Location: USEC

Oversight: N. Kidd
Date: 02:14:02 15:02



Max. Depth: 61.42 (ft)

Depth Inc.: 0.066 (ft)

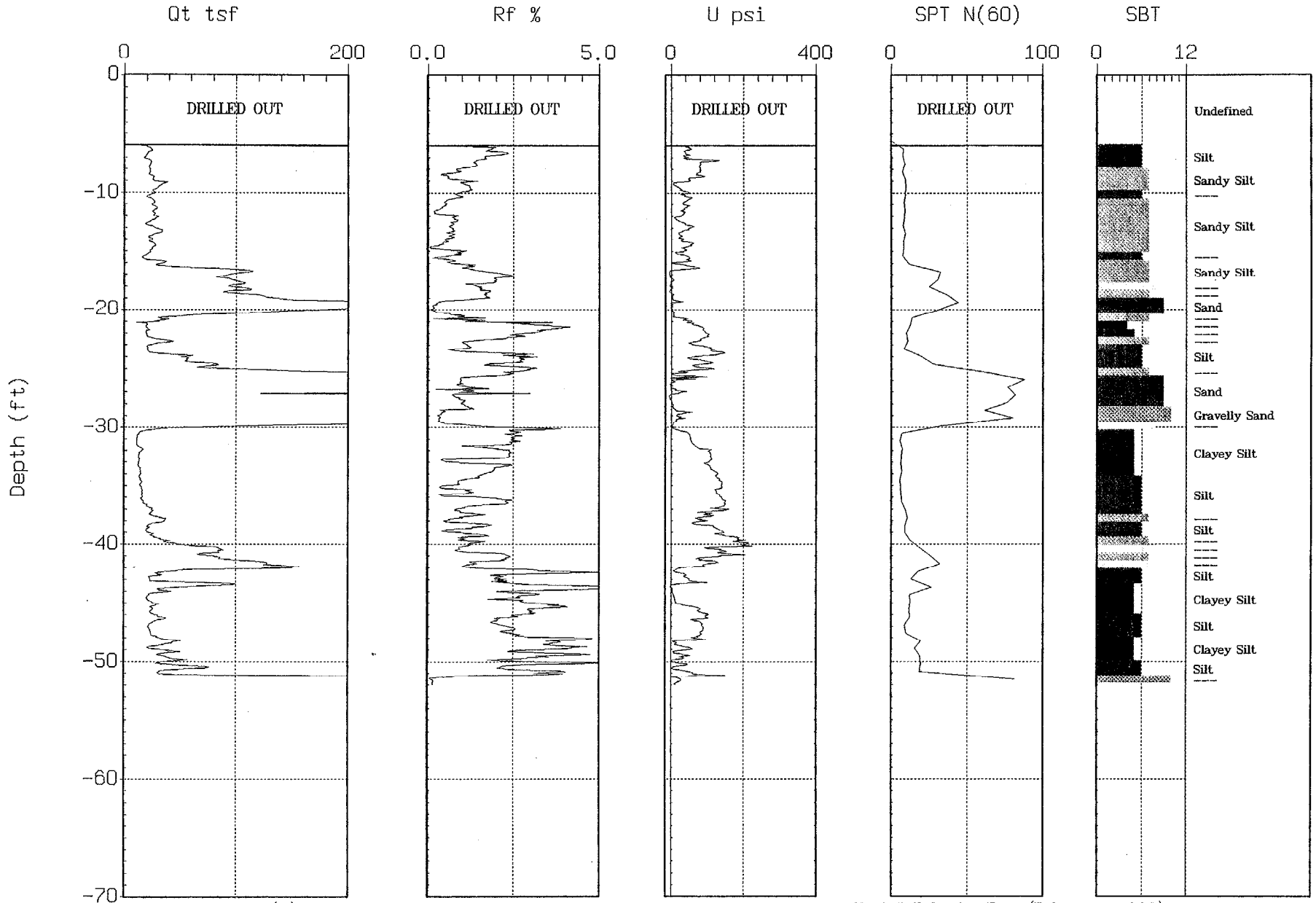
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC–Paducah

Sounding: CCGT-03
Location: USEC

Oversight: N. Kidd
Date: 02:14:02 12:41



Max. Depth: 51.97 (ft)

Depth Inc.: 0.066 (ft)

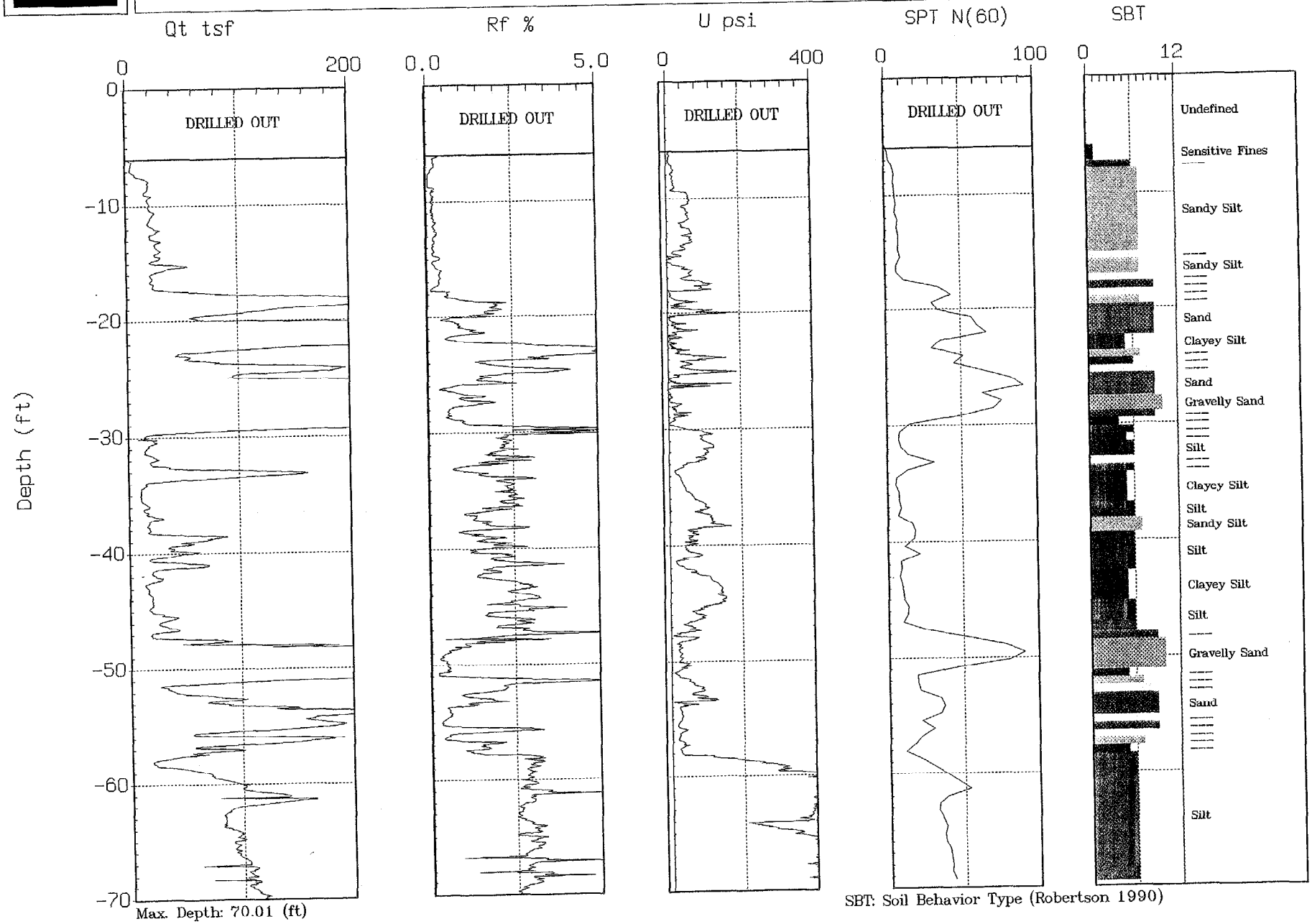
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC–Paducah

Sounding: CCGT-04
Location: USEC

Oversight: N. Kidd
Date: 02:14:02 09:18



Max. Depth: 70.01 (ft)

Depth Inc.: 0.066 (ft)

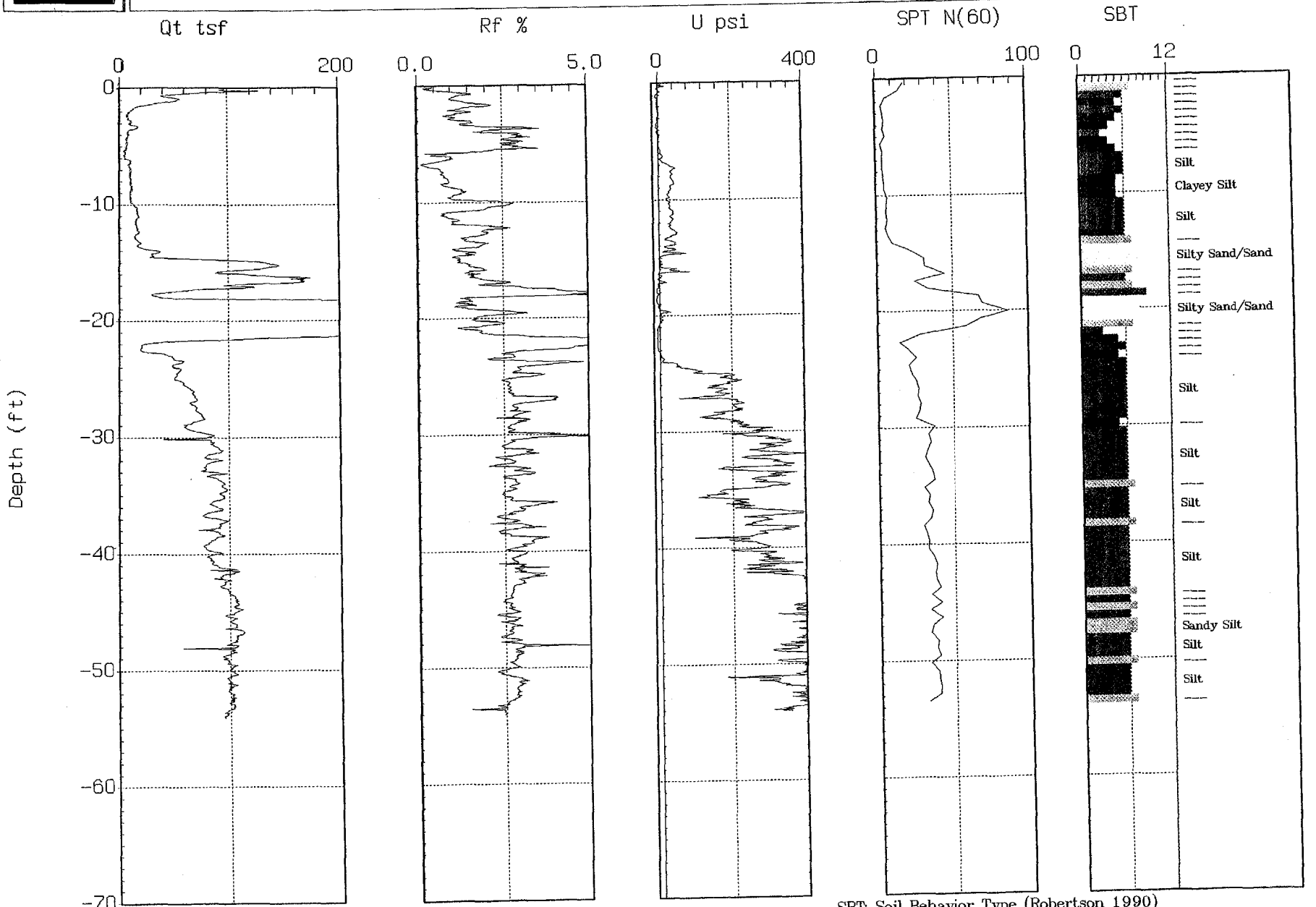
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC-Paducah

Sounding: GT-SC05
Location: USEC

Oversight: N. Kidd CC
Date: 02:15:02 12:41



Max. Depth: 54.07 (ft)

Depth Inc.: 0.066 (ft)

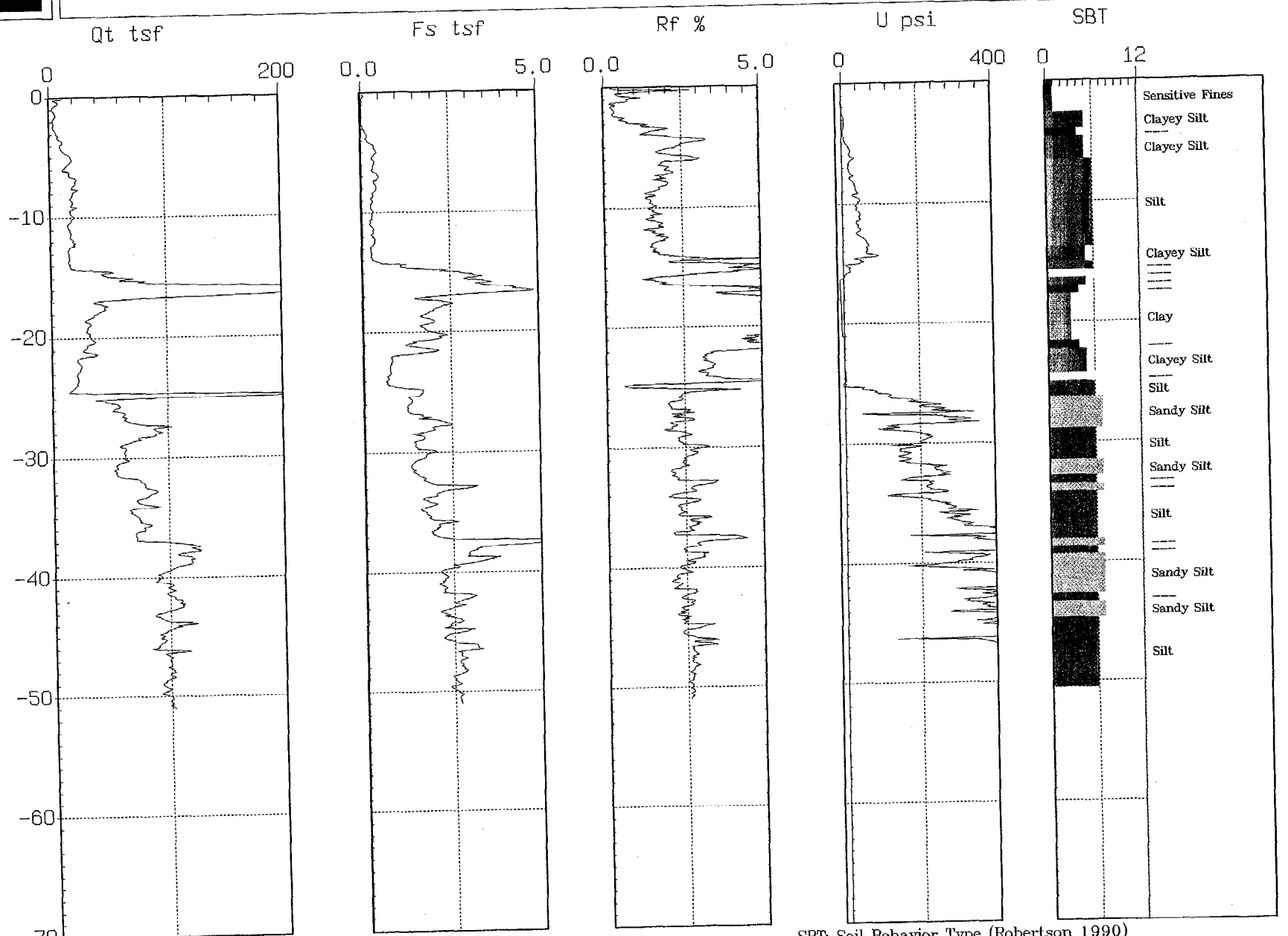
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC-Paducah

Sounding: SCPT-340L2 (SC06)
Location: USEC

Oversight: N. Kidd
Date: 03:06:02 06:05



Max. Depth: 51.02 (ft)

Depth Inc.: 0.082 (ft)

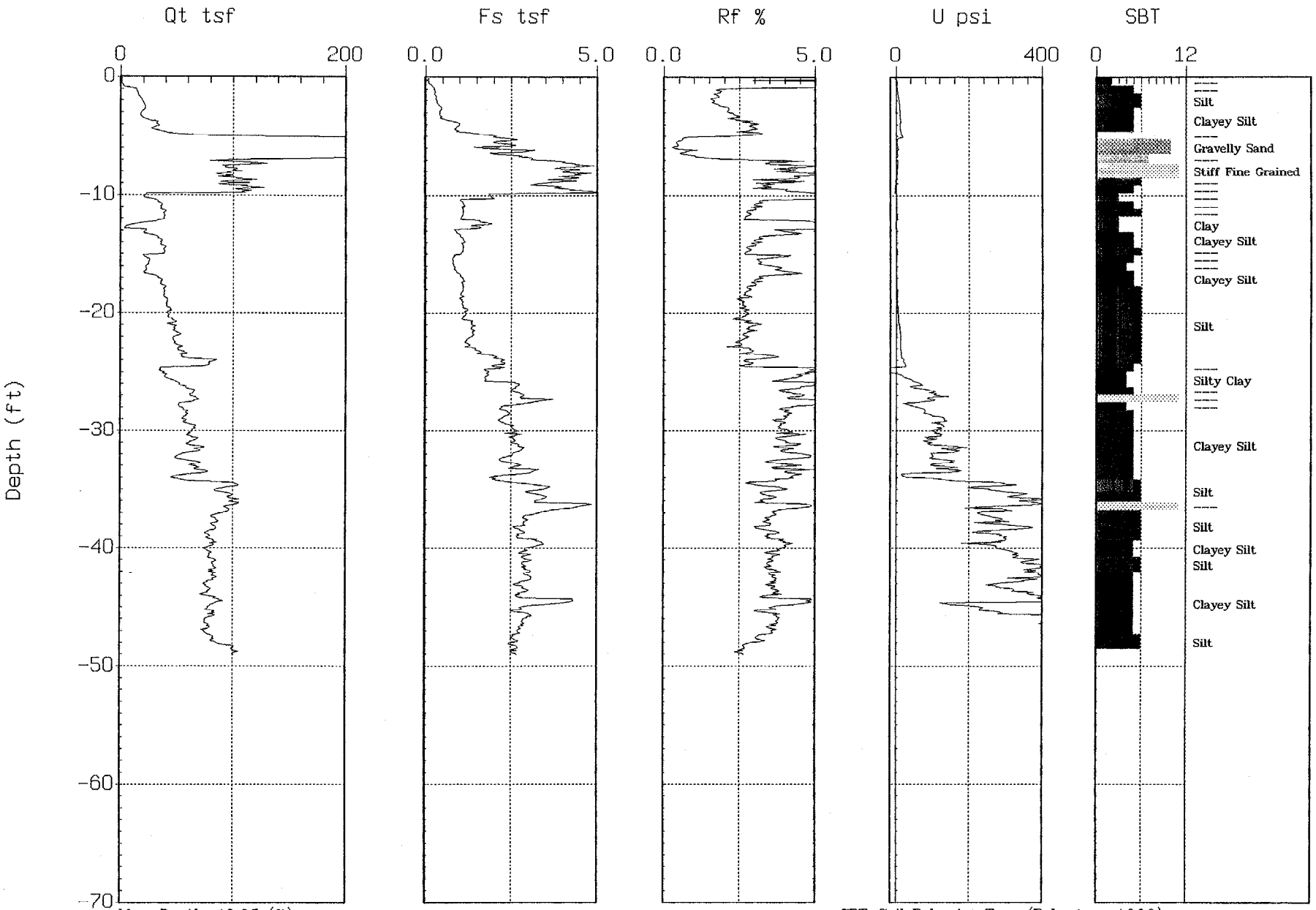
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC–Paducah

Sounding: SCPT-340L3 (SC-07)
Location: USEC

Oversight: N. Kidd
Date: 03:05:02 06:18



Max. Depth: 49.05 (ft)

Depth Inc.: 0.082 (ft)

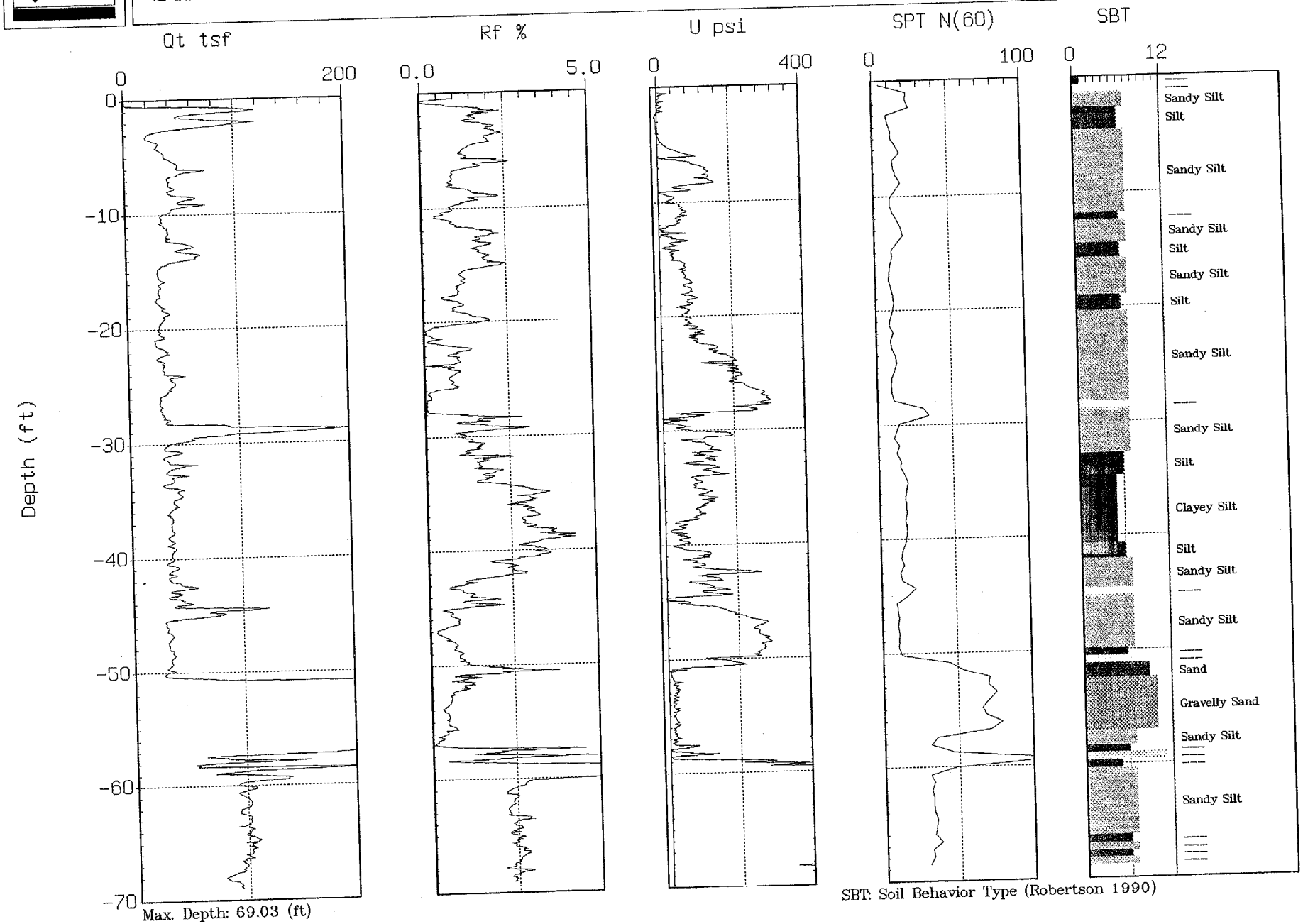
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC-Paducah

Sounding: CCGT-08
Location: USEC

Oversight: N. Kidd
Date: 02:13:02 14:42



Max. Depth: 69.03 (ft)

Depth Inc.: 0.066 (ft)

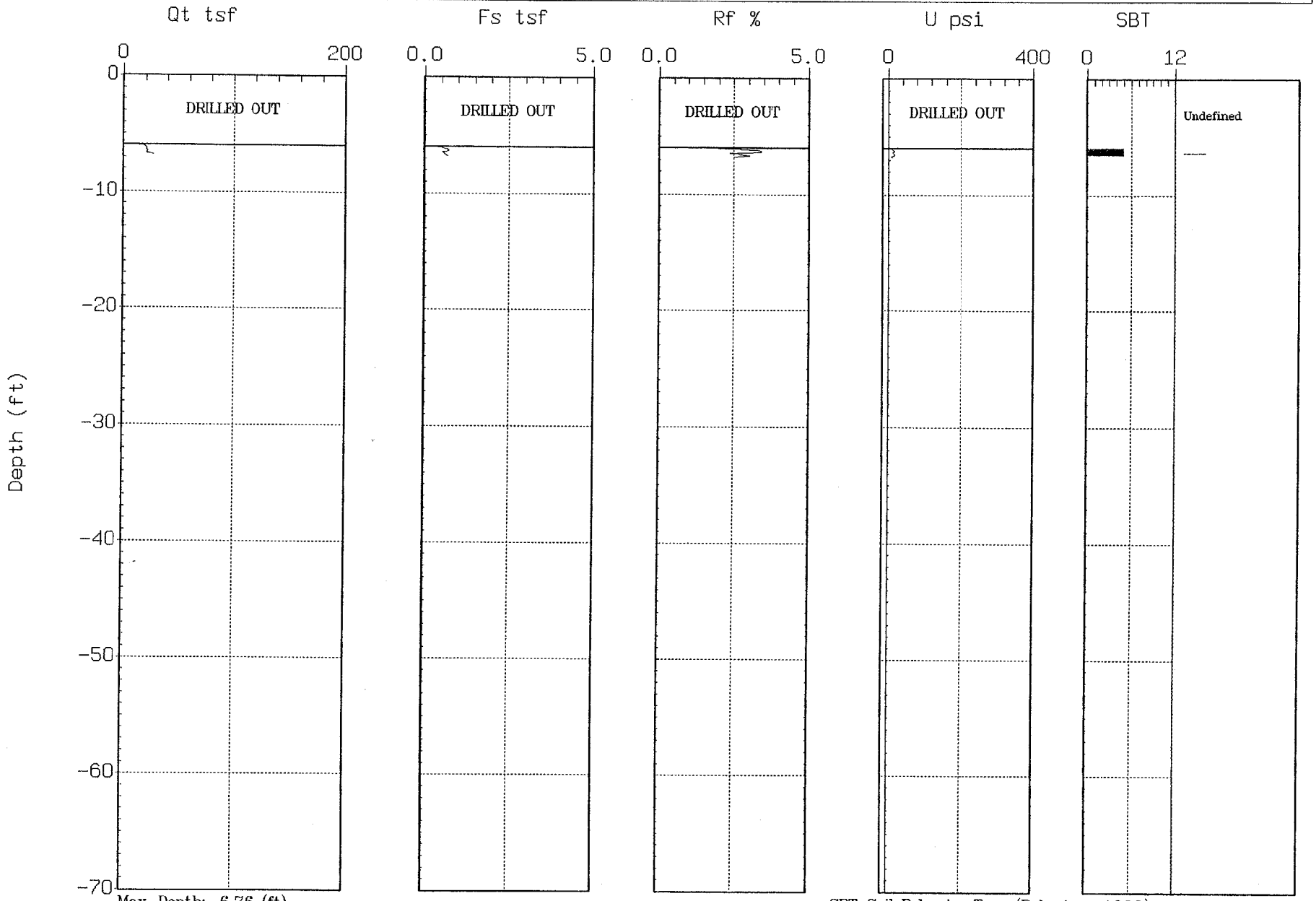
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC–Paducah

Sounding: CCGT-SC09
Location: USEC

Oversight: N. Kidd
Date: 02:13:02 09:05



Max. Depth: 6.76 (ft)

Depth Inc.: 0.066 (ft)

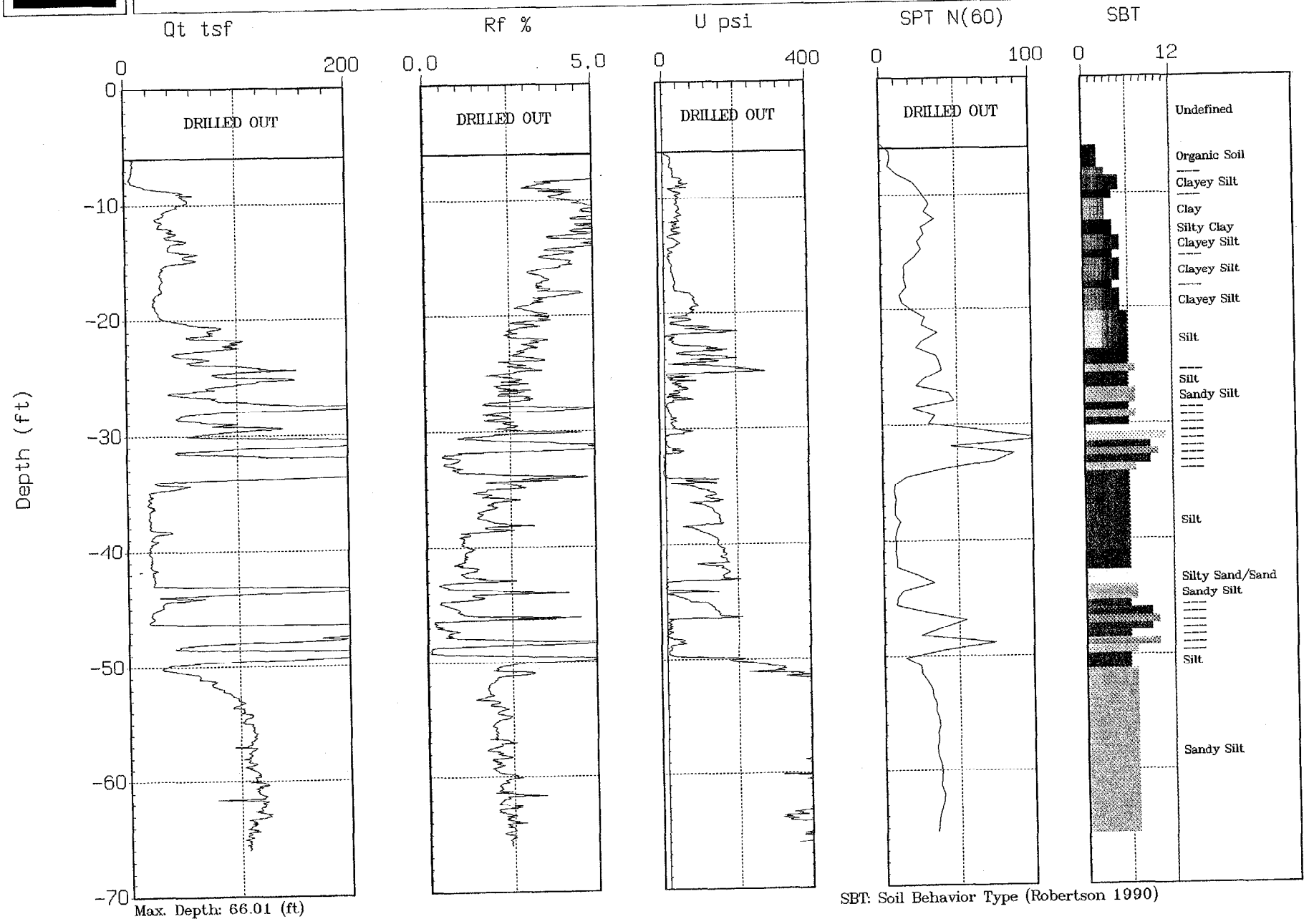
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC-Paducah

Sounding: CCGT-SC09A
Location: USEC

Oversight: N. Kidd
Date: 02:13:02 10:24



Max. Depth: 66.01 (ft)

Depth Inc.: 0.066 (ft)

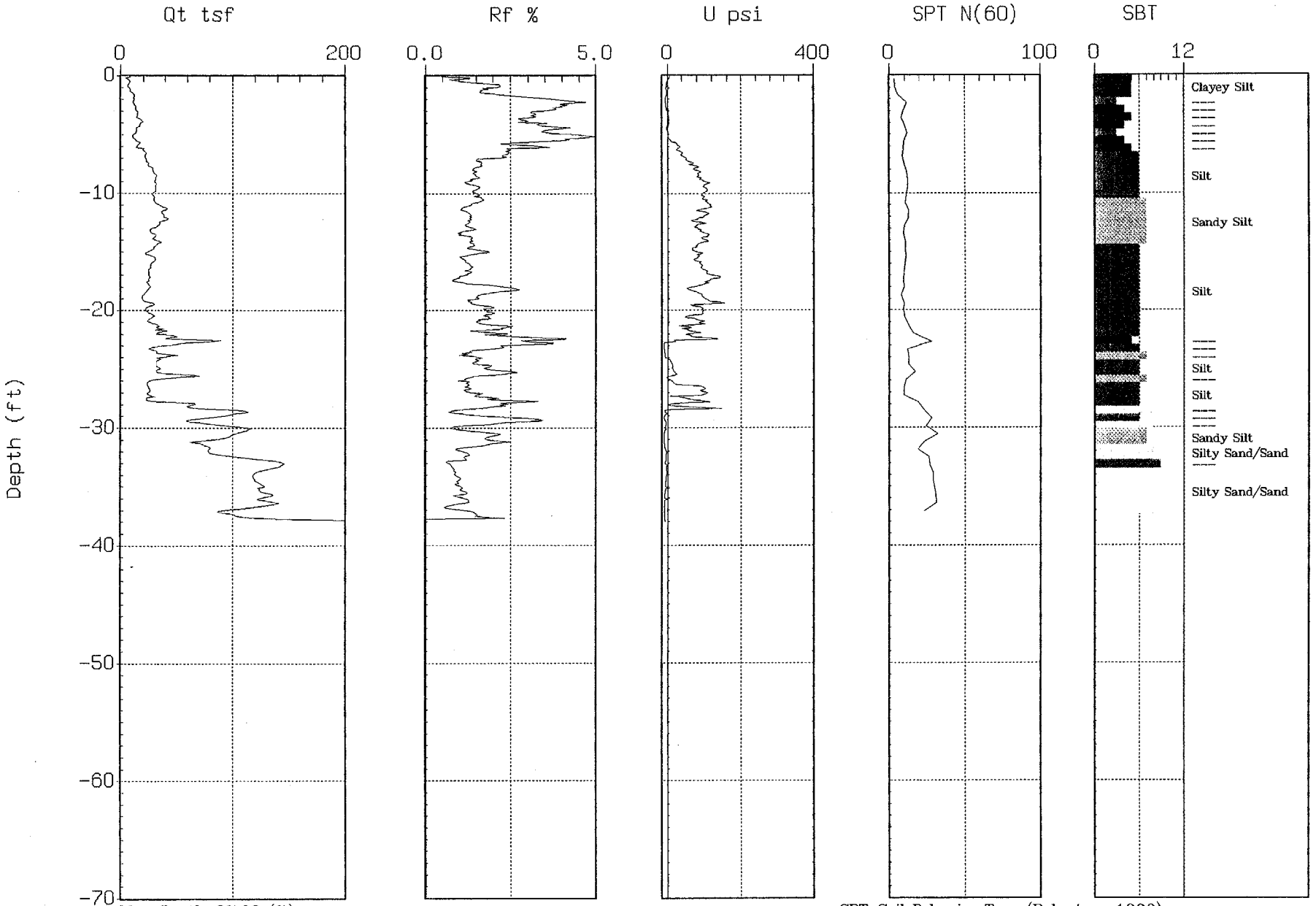
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC–Paducah

Sounding: SCPT-560L2 (SC-10)
Location: USEC

Oversight: N. Kidd
Date: 03:06:02 11:22



Max. Depth: 37.98 (ft)

Depth Inc.: 0.082 (ft)

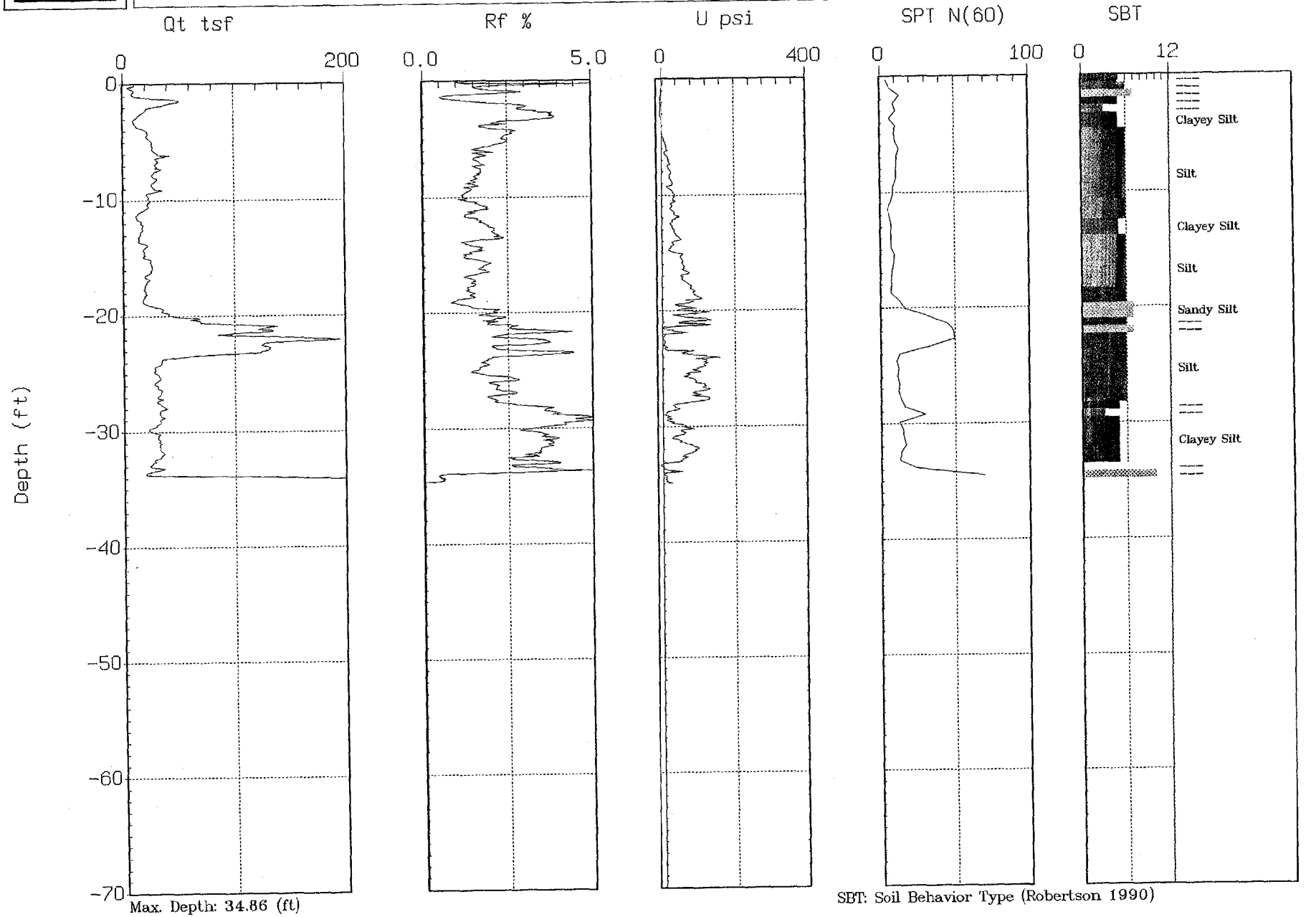
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC–Paducah

Sounding: SCPT-SB04
Location: USEC

Oversight: N. Kidd
Date: 03:07:02 12:21



Max. Depth: 34.86 (ft)

Depth Inc.: 0.082 (ft)

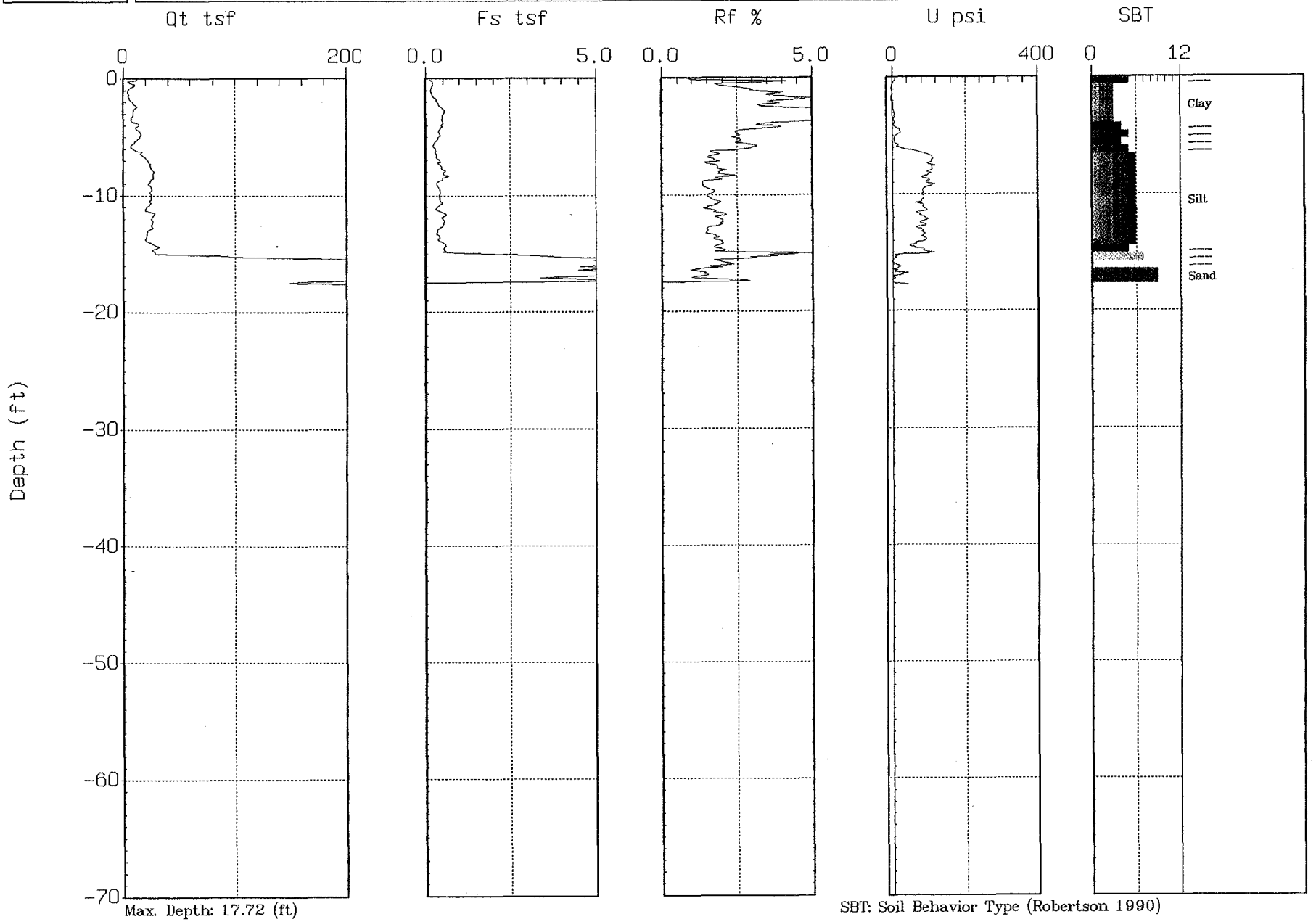
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC–Paducah

Sounding: SCPT-SB07
Location: USEC

Oversight: N. Kidd
Date: 03:07:02 06:11



Max. Depth: 17.72 (ft)

Depth Inc.: 0.082 (ft)

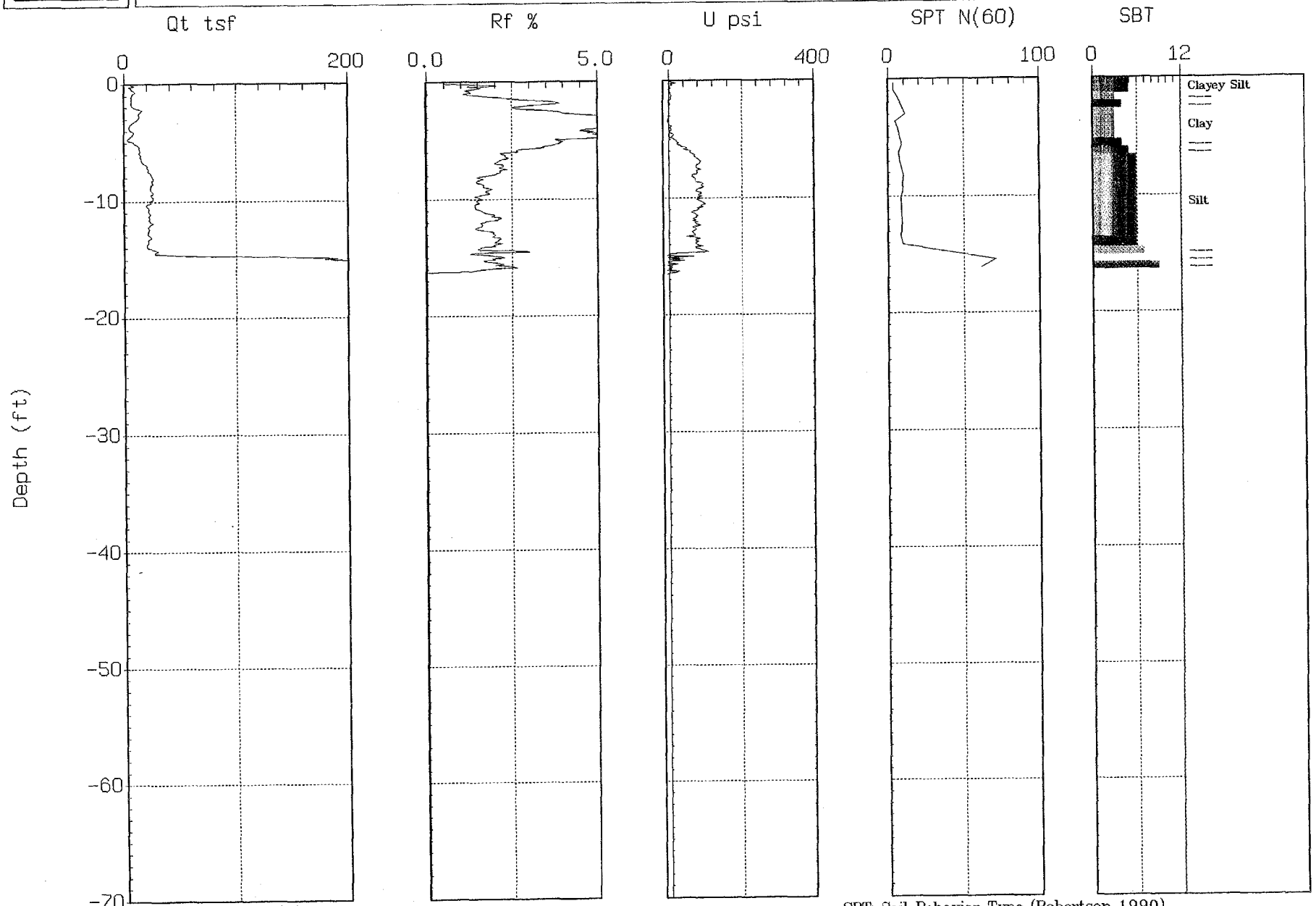
SBT: Soil Behavior Type (Robertson 1990)

GREGG

SAIC-Paducah

Sounding: SCPT-SB07A
Location: USEC

Oversight: N. Kidd
Date: 03:07:02 07:58



Max. Depth: 16.49 (ft)

Depth Inc.: 0.082 (ft)

SBT: Soil Behavior Type (Robertson 1990)

APPENDIX B

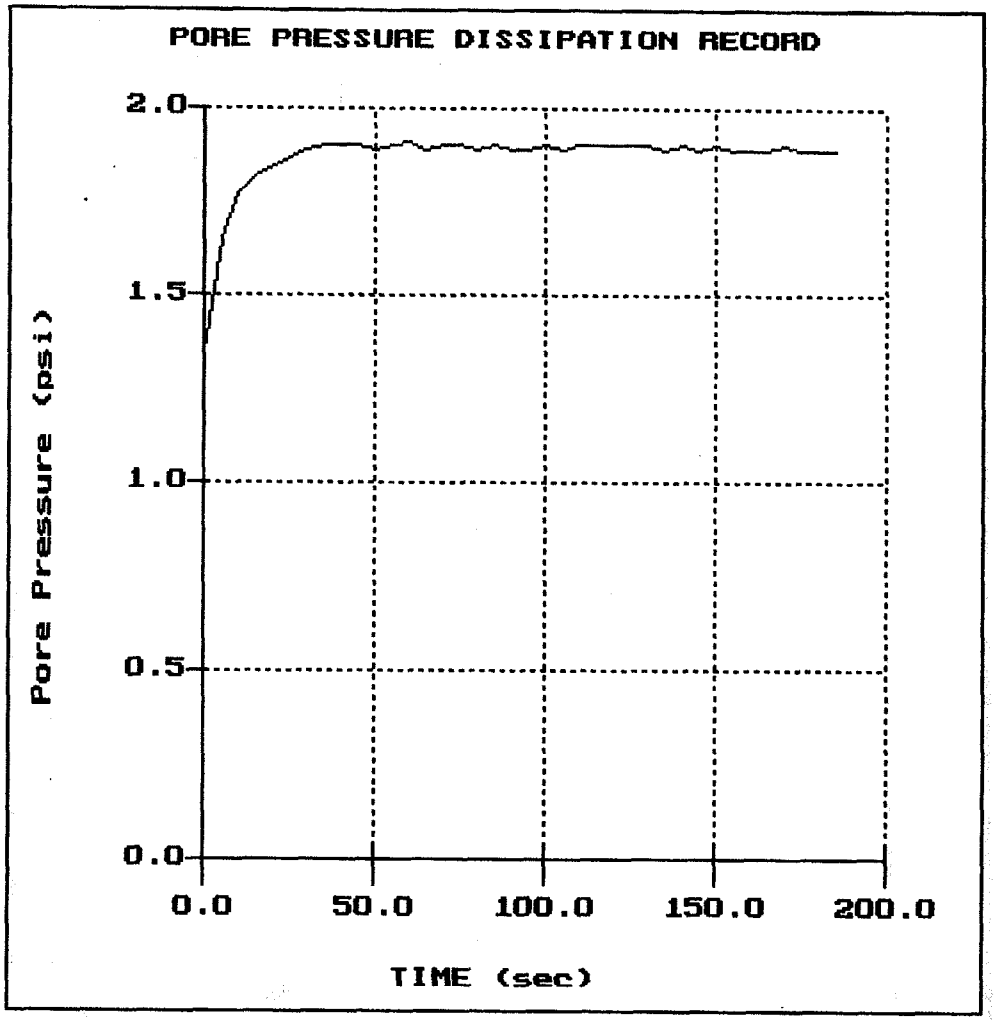
PORE PRESSURE DISSIPATIONS

GREGG

SAIC-PADUCAH

Sounding:CCGT-SC01
Location:USEC

Engineer:N. Kidd
Date:02:15:02 09:34

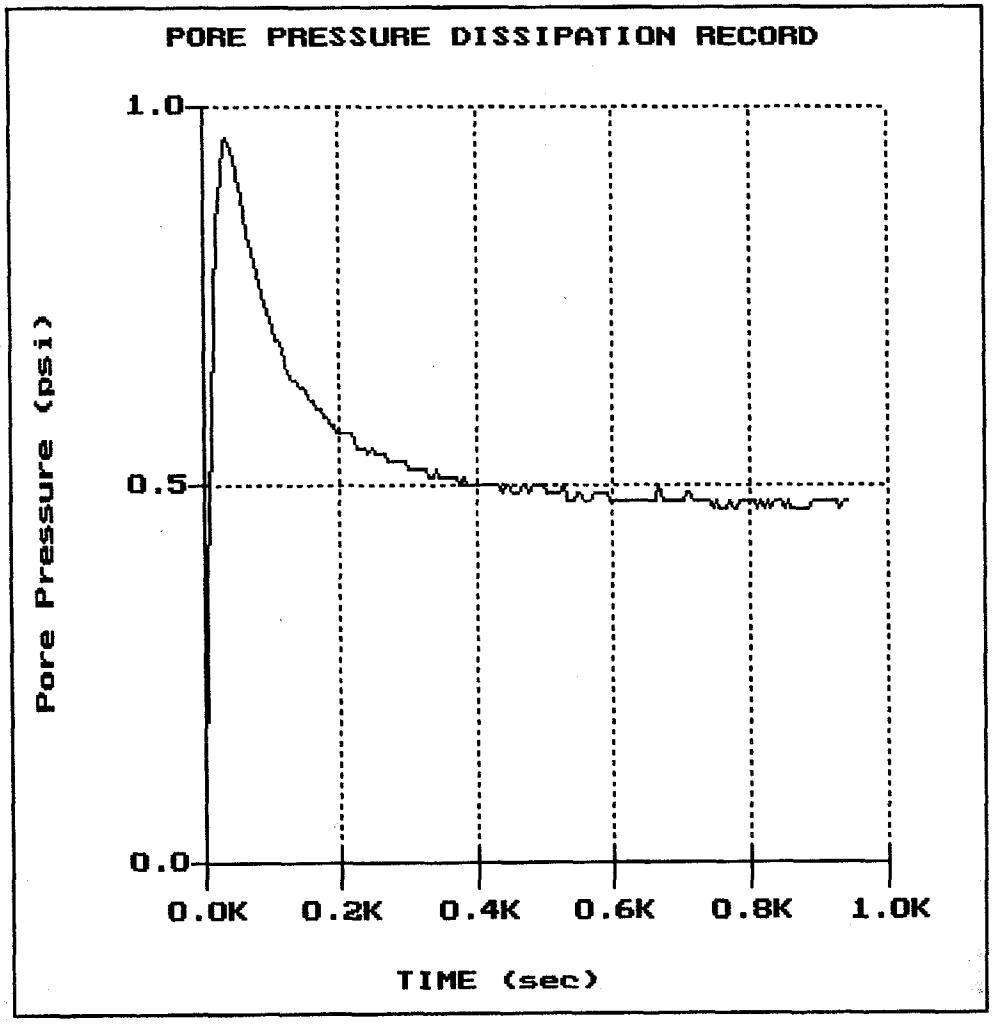


File: 023SC01.PPD
Depth (m): 1.88
(ft): 6.17
Duration : 185.0s
U-min: 1.34 0.0s
U-max: 1.91 60.0s

SAIC-PADUCAH

Sounding:CCGT-SC01
Location:USEC

Engineer:N. Kidd
Date:02:15:02 09:34

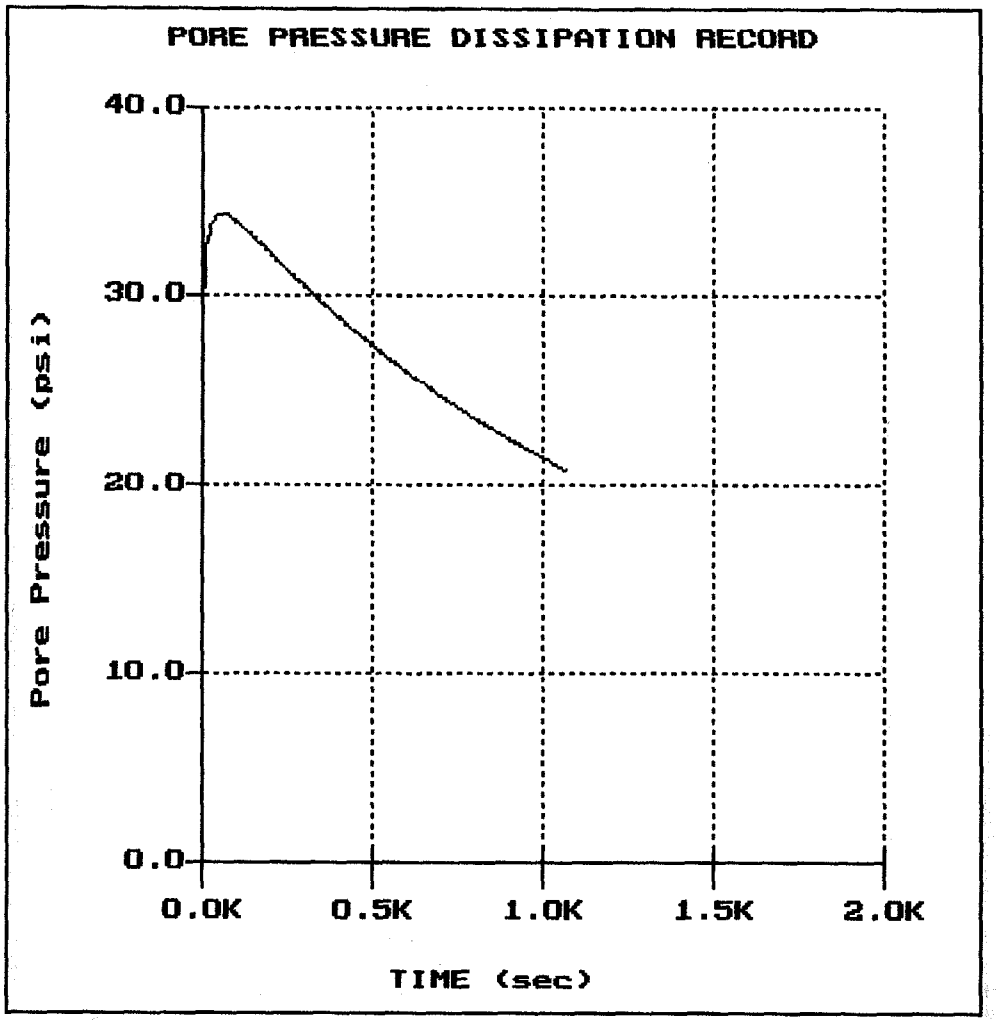


File: 023SC01.PPD
Depth (m): 5.50
(ft): 18.04
Duration : 940.0s
U-min: -0.27 0.0s
U-max: 0.96 35.0s

SAIC-PADUCAH

Sounding:CCGT-SC01
Location:USEC

Engineer:N. Kidd
Date:02:15:02 09:34

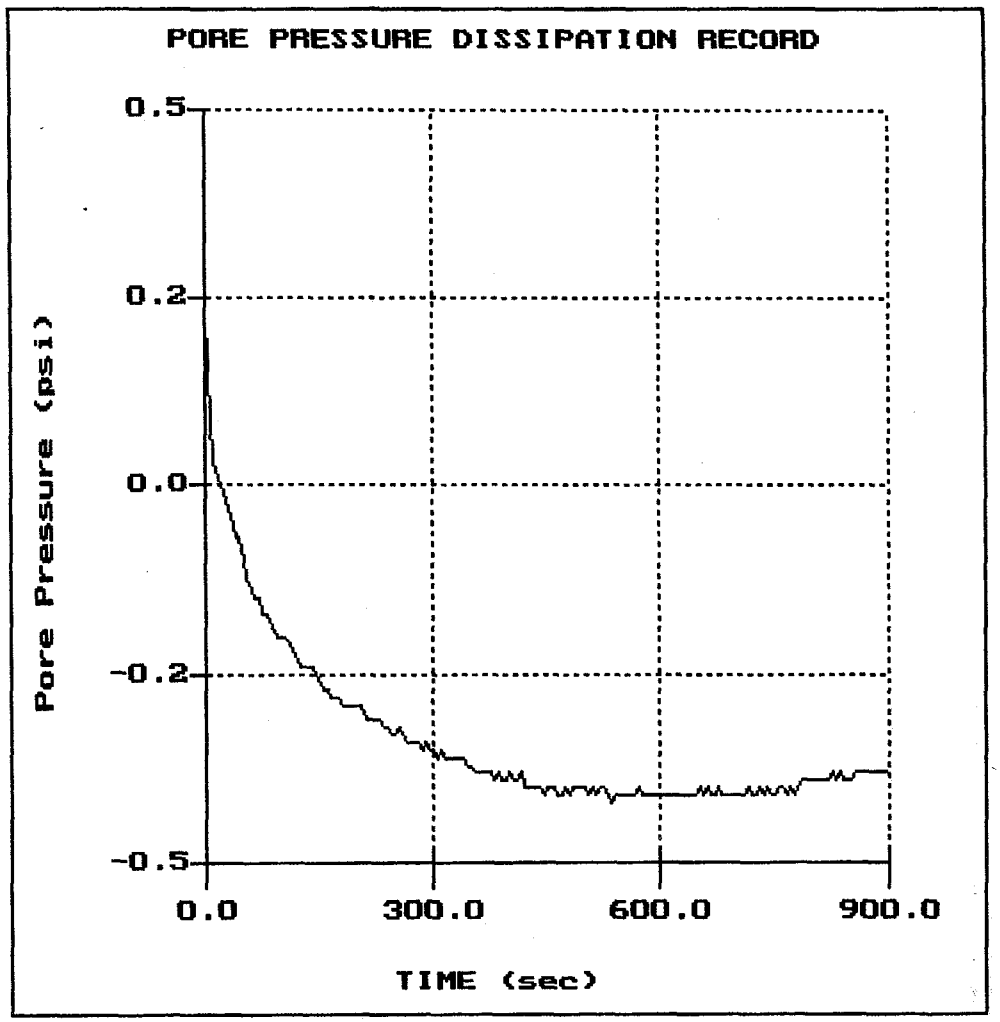


File: 023SC01.PPD
Depth (m): 14.66
(ft): 48.10
Duration : 1065.0s
U-min: 20.85 1065.0s
U-max: 34.32 60.0s

SAIC-PADUCAH

Sounding:CCGT-SC05
Location:USEC

Engineer:N. Kidd
Date:02:15:02 12:41

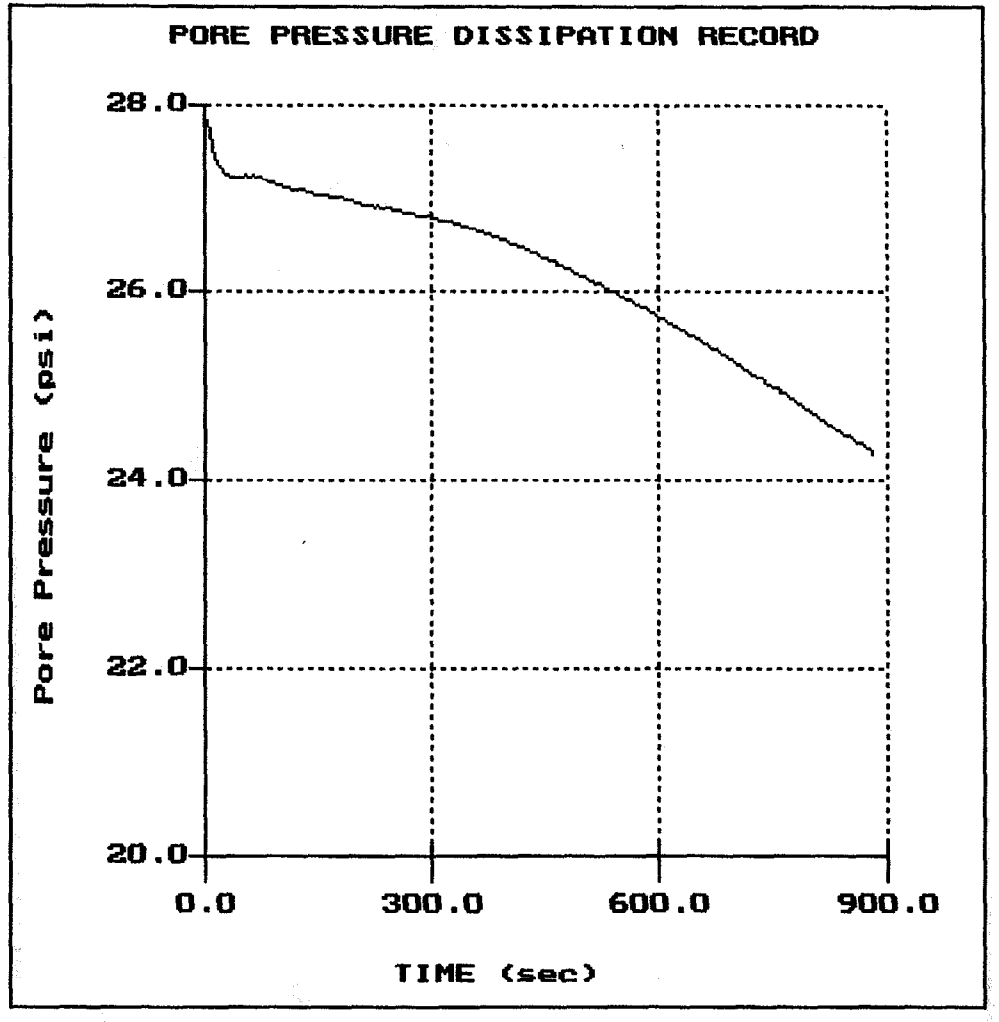


File: 023SC05.PPD
Depth (m): 5.36
(ft): 17.59
Duration : 895.0s
U-min: -0.42 535.0s
U-max: 0.24 0.0s

SAIC-PADUCAH

Sounding:CCGT-SC05
Location:USEC

Engineer:N. Kidd
Date:02:15:02 12:41

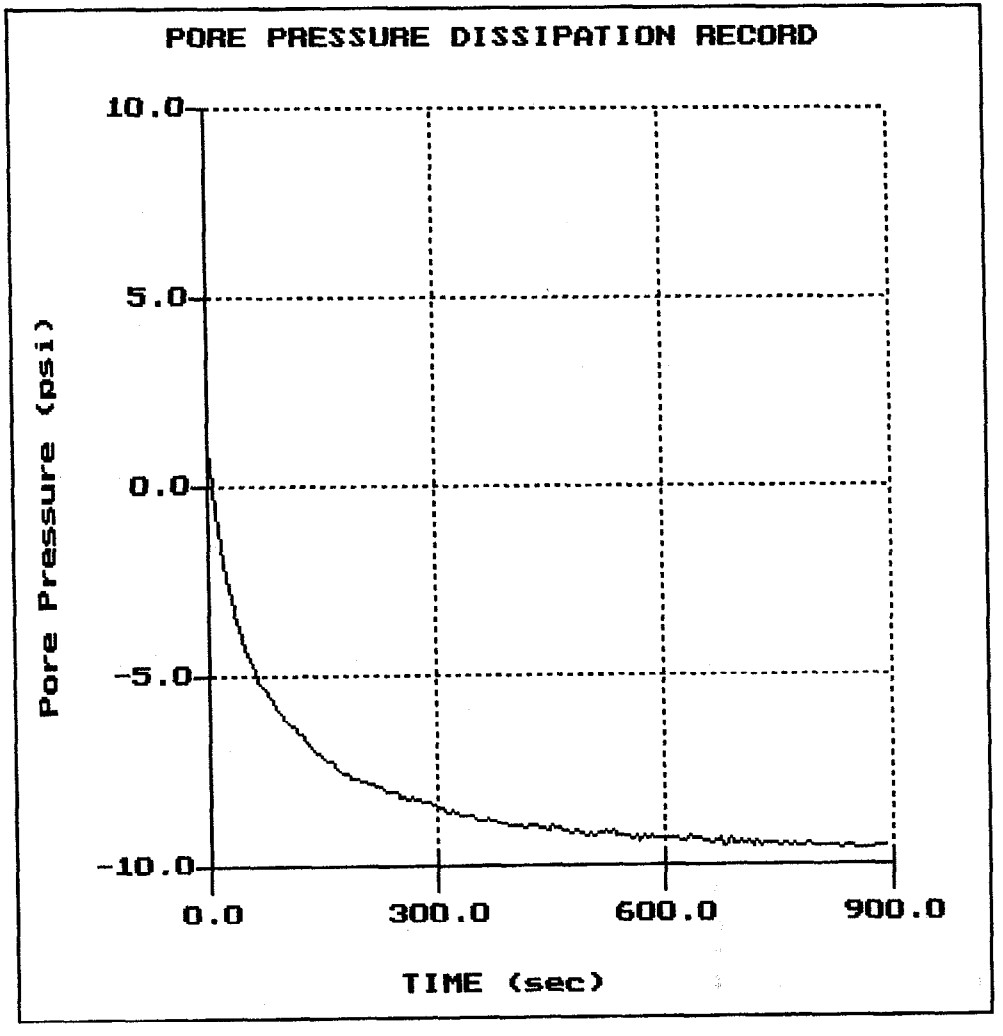


File: 023SC05.PPD
Depth (m): 15.56
(ft): 51.05
Duration : 880.0s
U-min: 24.29 880.0s
U-max: 27.82 5.0s

SAIC-PADUCAH

Sounding:SCPT-340L2
Location:USEC

Engineer:N. Kidd
Date:03:06:02 06:05

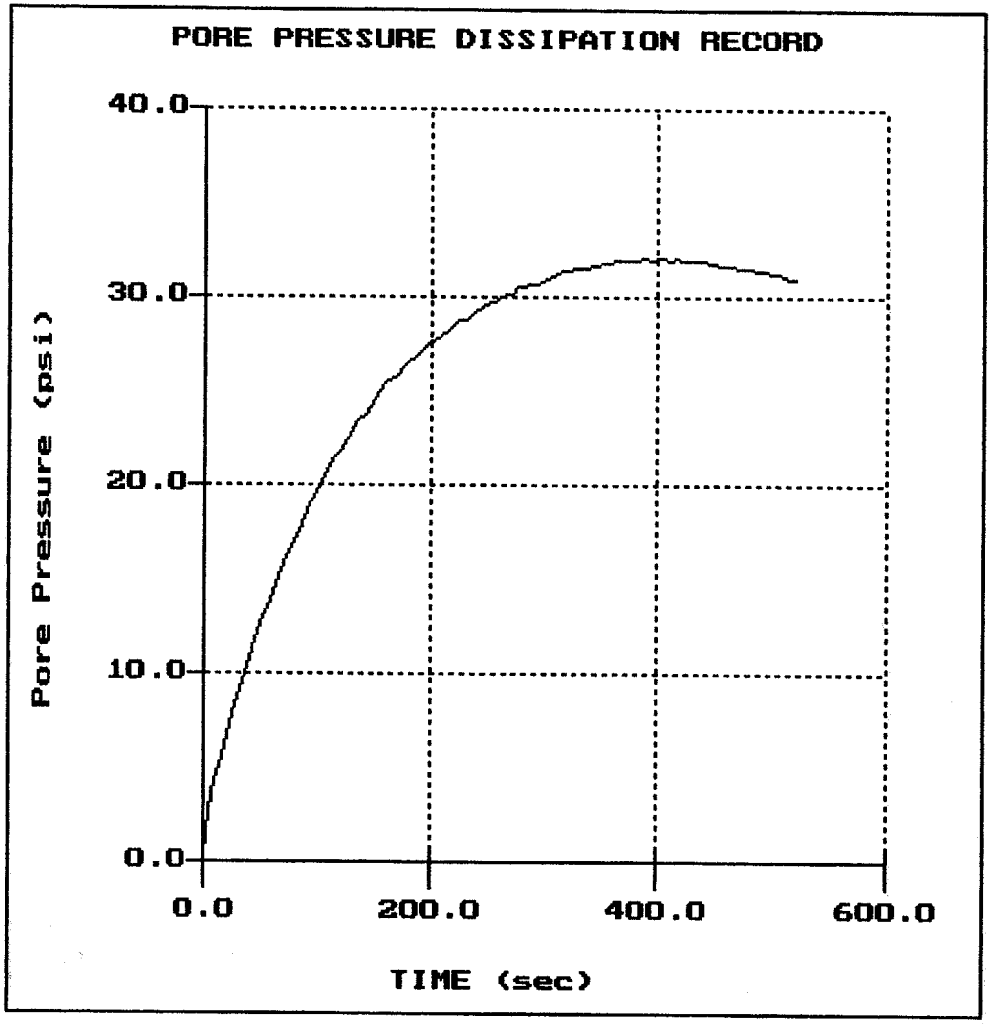


File: 023CS12.PPD
Depth (m): 4.93
(ft): 16.17
Duration : 890.0s
U-min: -9.58 860.0s
U-max: 1.10 0.0s

SAIC-PADUCAH

Sounding:SCPT-340L2
Location:USEC

Engineer:N. Kidd
Date:03:06:02 06:05

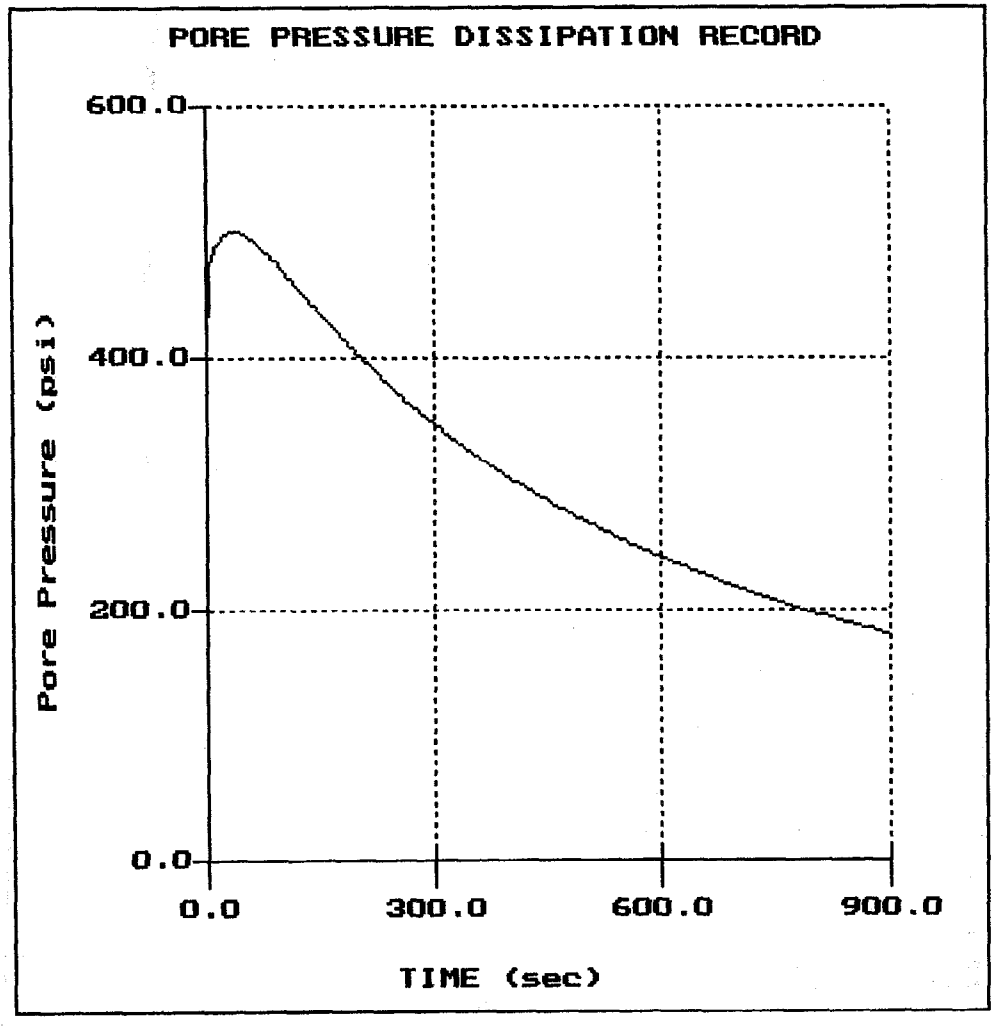


File: 023CS12.PPD
Depth (m): 7.68
(ft): 25.20
Duration : 520.0s
U-min: 0.26 0.0s
U-max: 32.08 405.0s

SAIC-PADUCAH

Sounding:SCPT-340L2
Location:USEC

Engineer:N. Kidd
Date:03:06:02 06:05

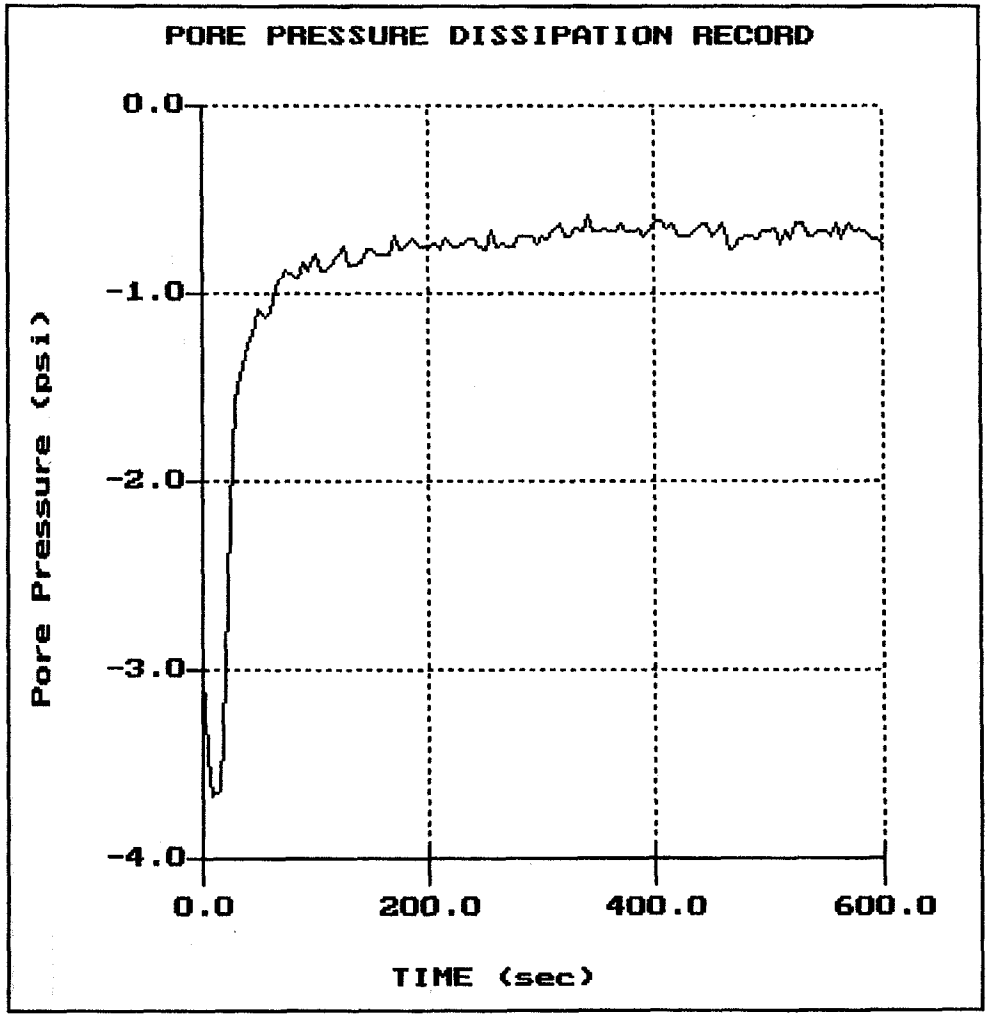


File: 023CS12.PPD
Depth (m): 11.45
(ft): 37.57
Duration : 895.0s
U-min: 181.23 895.0s
U-max: 500.04 35.0s

SAIC-PADUCAH

Sounding:SCPT-340L3
Location:USEC

Engineer:N. Kidd
Date:03:05:02 06:18

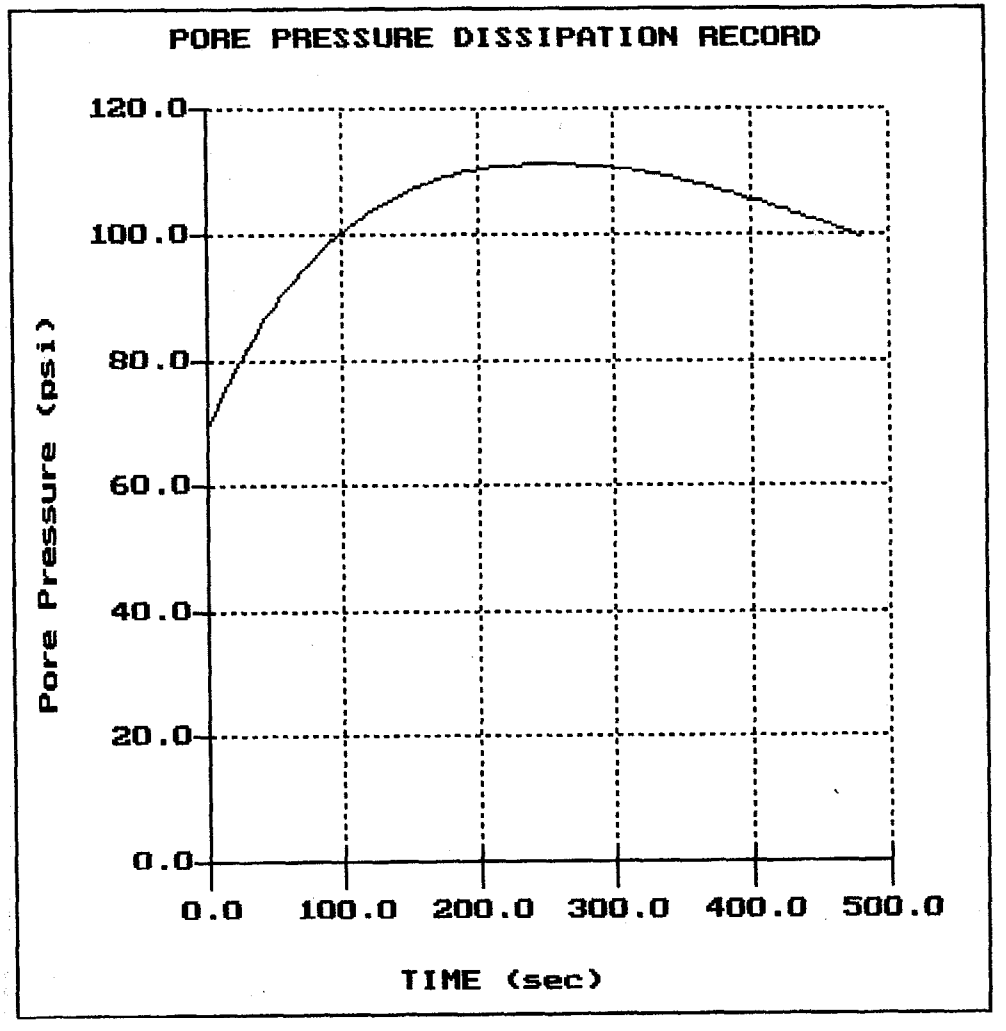


File: 023CS11.PPD
Depth (m): 3.10
(ft): 10.17
Duration : 600.0s
U-min: -3.66 10.0s
U-max: -0.59 340.0s

SAIC-PADUCAH

Sounding:SCPT-340-L3
Location:USEC

Engineer:N. Kidd
Date:03:05:02 10:11

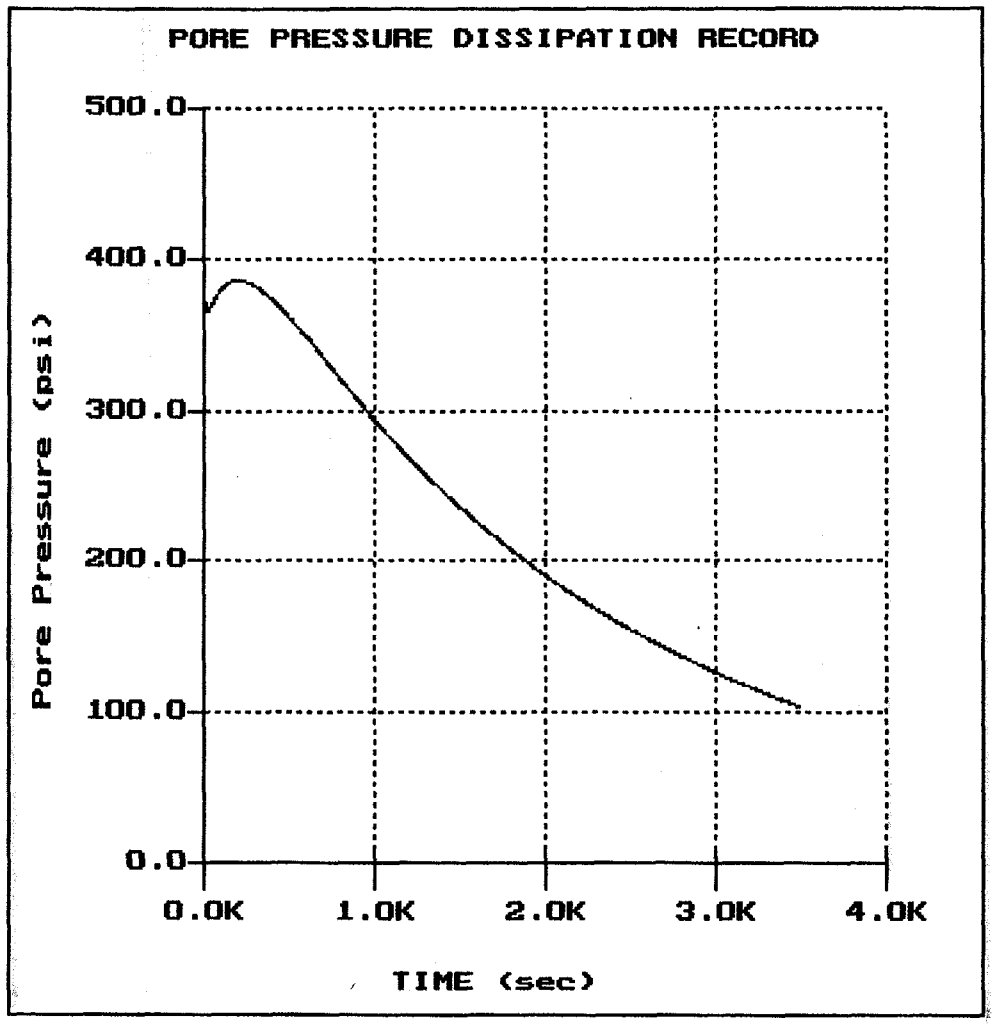


File: 023CS11C.PPD
Depth (m): 8.72
(ft): 28.61
Duration : 480.0s
U-min: 69.40 0.0s
U-max: 111.23 255.0s

SAIC-PADUCAH

Sounding:SCPT-340-L3
Location:USEC

Engineer:N. Kidd
Date:03:05:02 10:11

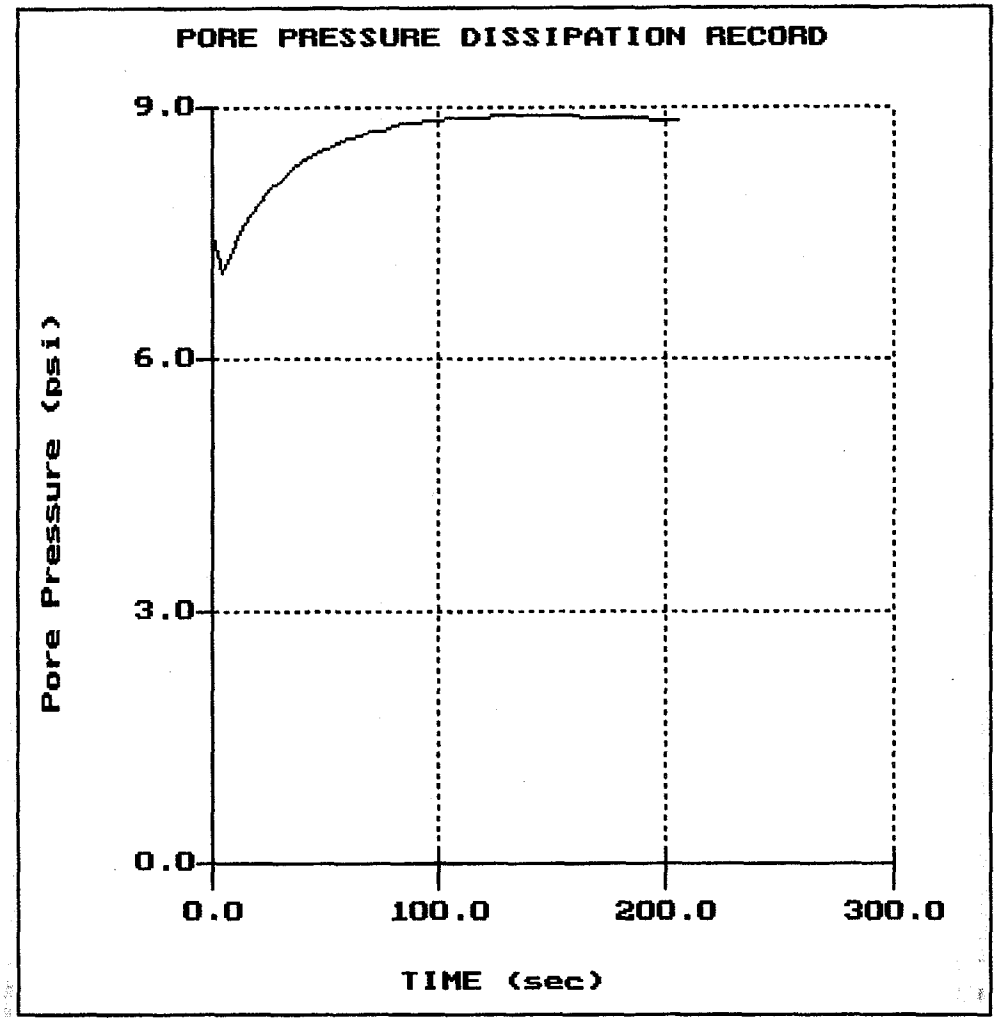


File: 023CS11C.PPD
Depth (m): 14.34
(ft): 47.05
Duration : 3500.0s
U-min: 102.23 3500.0s
U-max: 421.04 0.0s

SAIC-PADUCAH

Sounding:CCGT-08
Location:USEC

Engineer:N. Kidd
Date:02:13:02 14:42

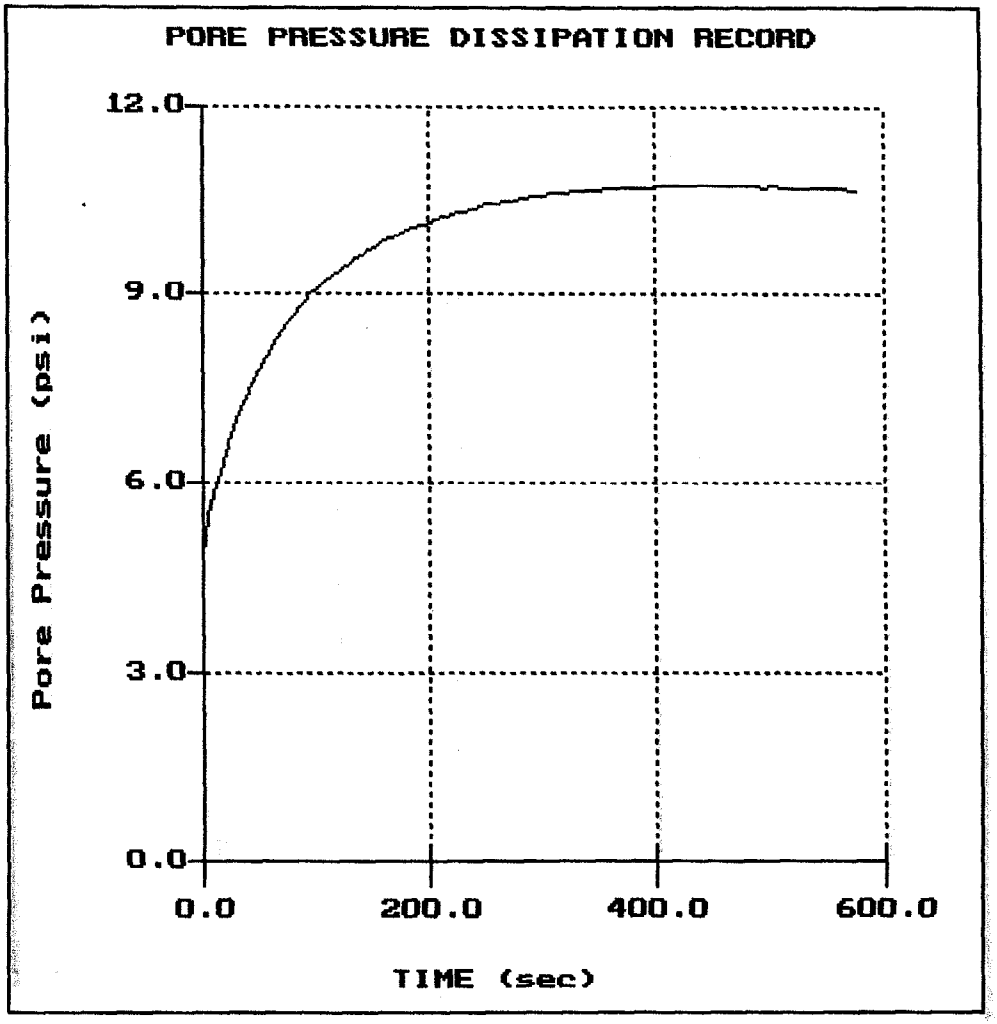


File: 023SC08.PPD
Depth (m): 6.40
(ft): 21.00
Duration : 205.0s
U-min: 7.03 5.0s
U-max: 8.91 145.0s

SAIC-PADUCAH

Sounding:CCGT-08
Location:USEC

Engineer:N. Kidd
Date:02:13:02 14:42

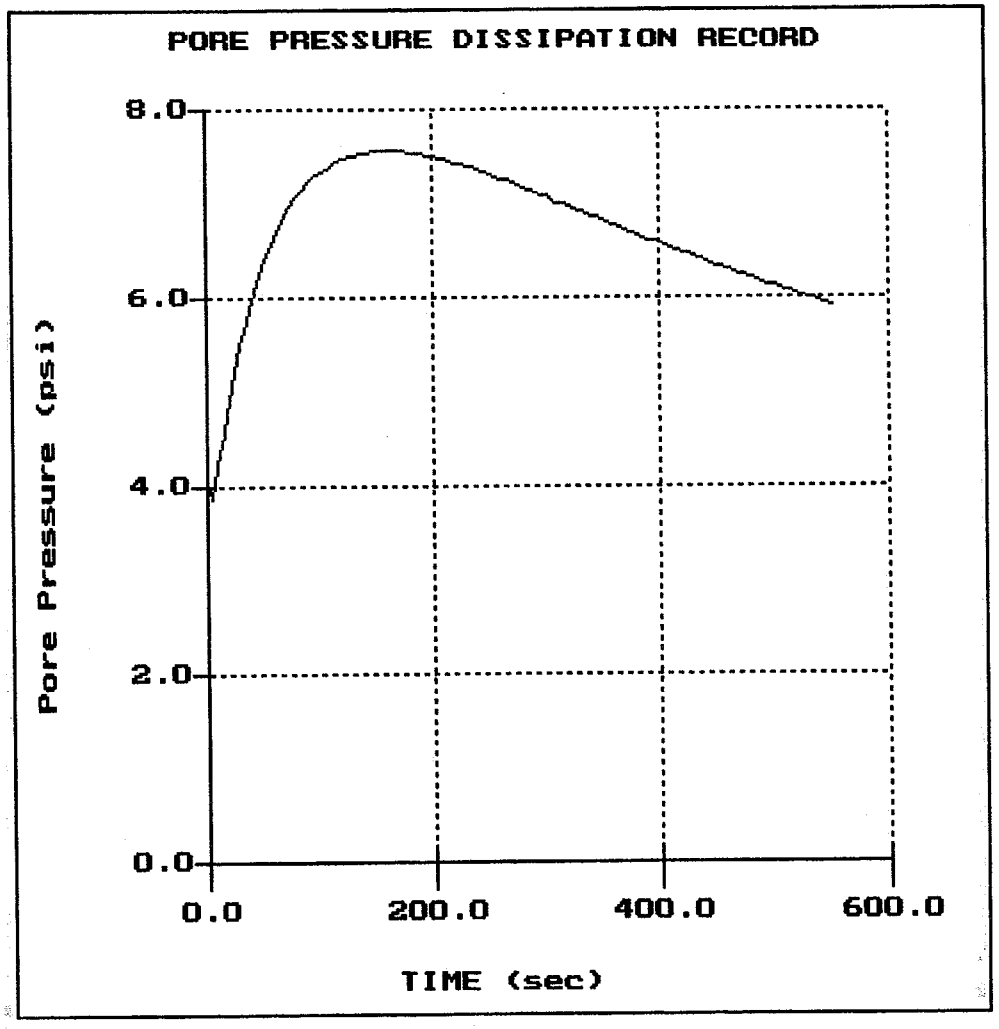


File: 023SC08.PPD
Depth (m): 9.16
(ft): 30.05
Duration : 575.0s
U-min: 4.85 0.0s
U-max: 10.75 460.0s

SAIC-PADUCAH

Sounding:CCGT-08
Location:USEC

Engineer:N. Kidd
Date:02:13:02 14:42

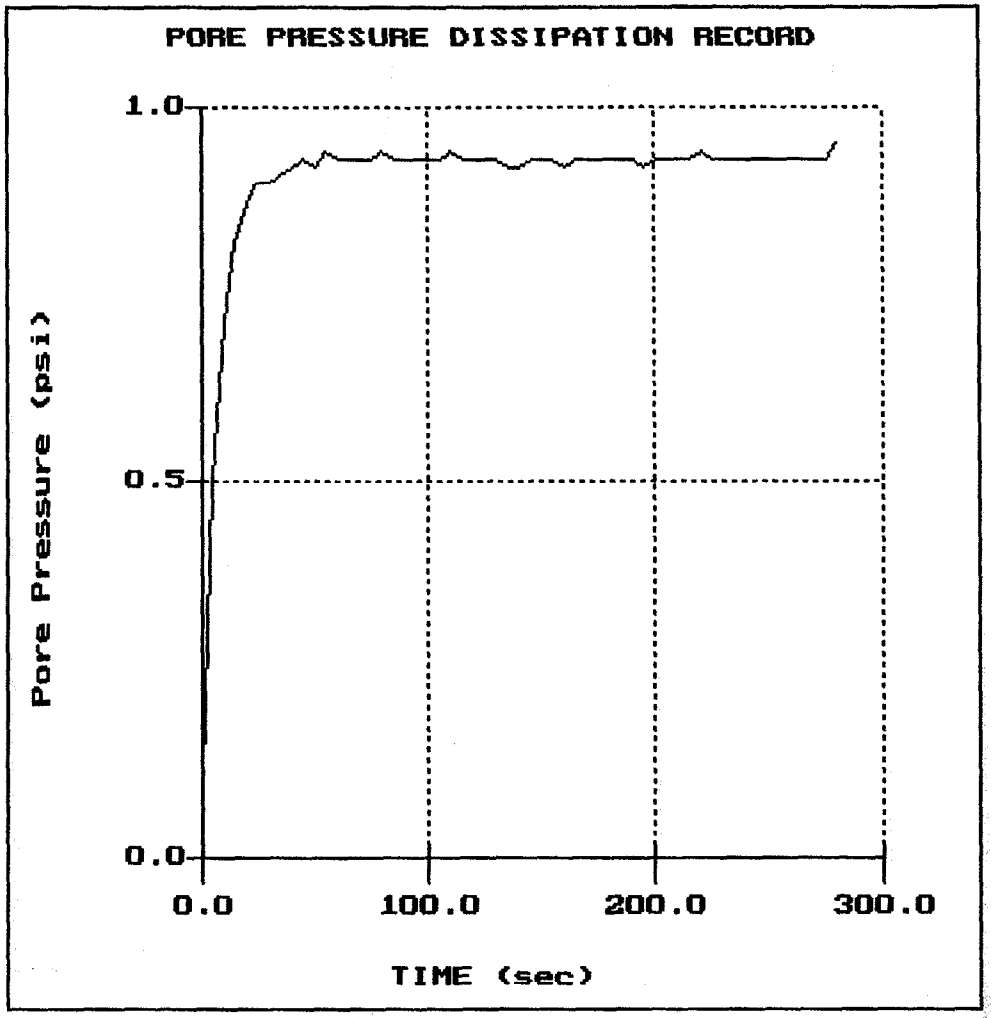


File: 023SC08.PPD
Depth (m): 11.90
(ft): 39.04
Duration : 550.0s
U-min: 3.87 5.0s
U-max: 7.56 170.0s

SAIC-PADUCAH

Sounding:CCGT-08
Location:USEC

Engineer:N. Kidd
Date:02:13:02 14:42

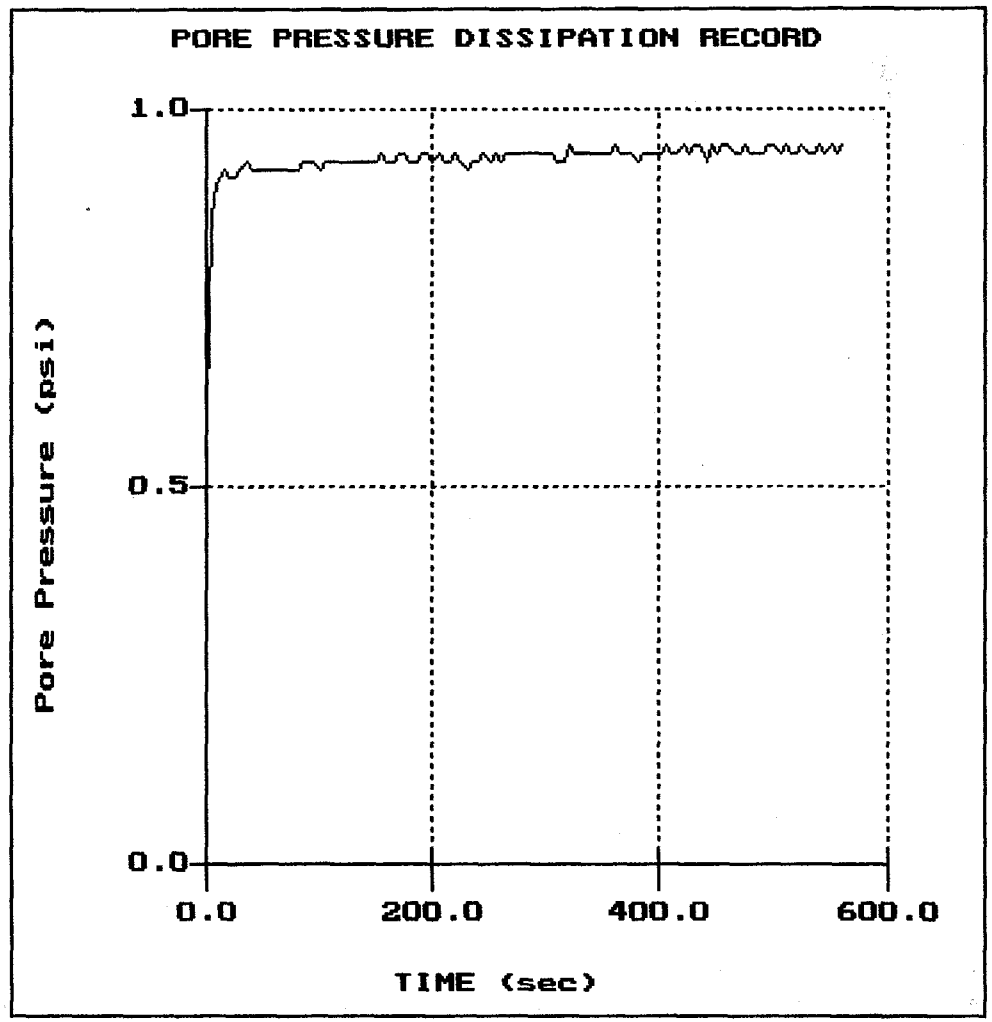


File: 023SC08.PPD
Depth (m): 15.56
(ft): 51.05
Duration : 280.0s
U-min: 0.10 0.0s
U-max: 0.95 280.0s

SAIC-PADUCAH

Sounding:CCGT-08
Location:USEC

Engineer:N. Kidd
Date:02:13:02 14:42

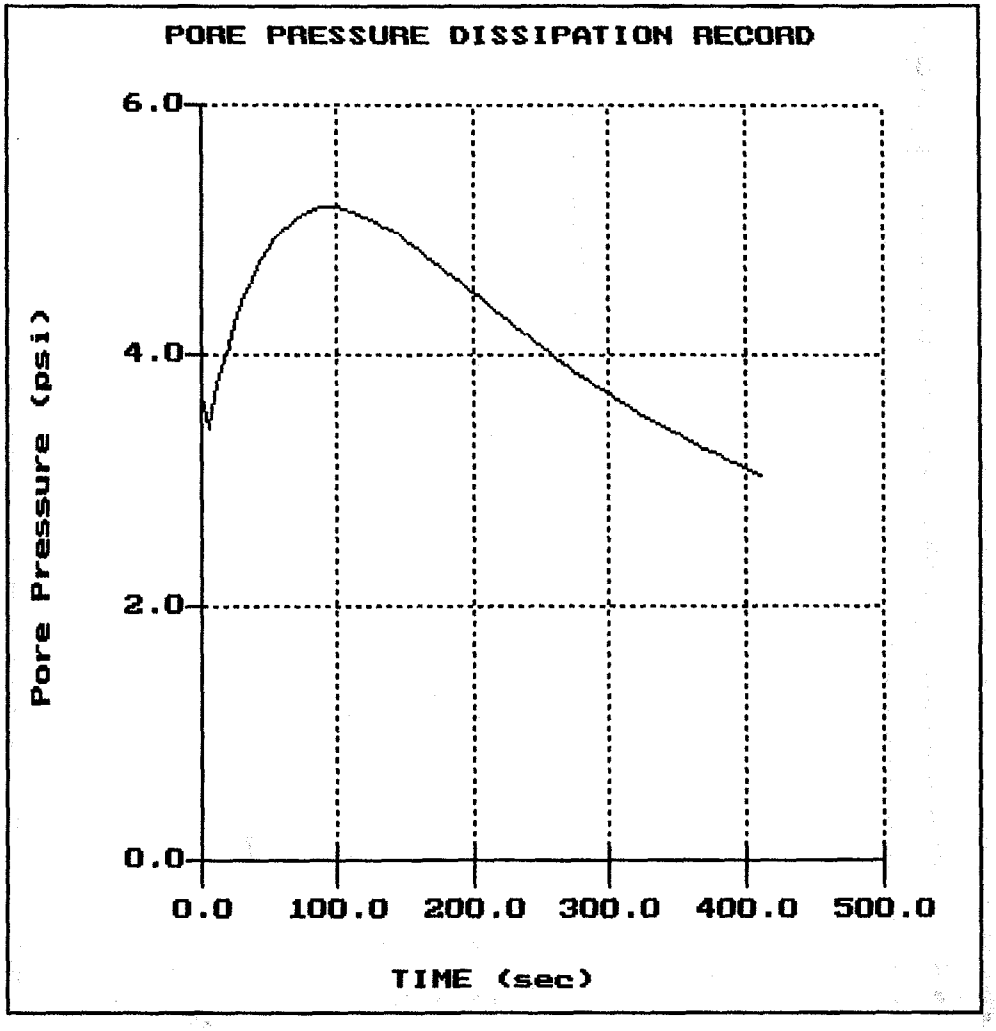


File: 023SC08.PPD
Depth (m): 15.74
(ft): 51.64
Duration : 560.0s
U-min: 0.59 0.0s
U-max: 0.95 560.0s

SAIC-PADUCAH

Sounding:CCGT-SC09
Location:USEC

Engineer:N. Kidd
Date:02:13:02 10:24

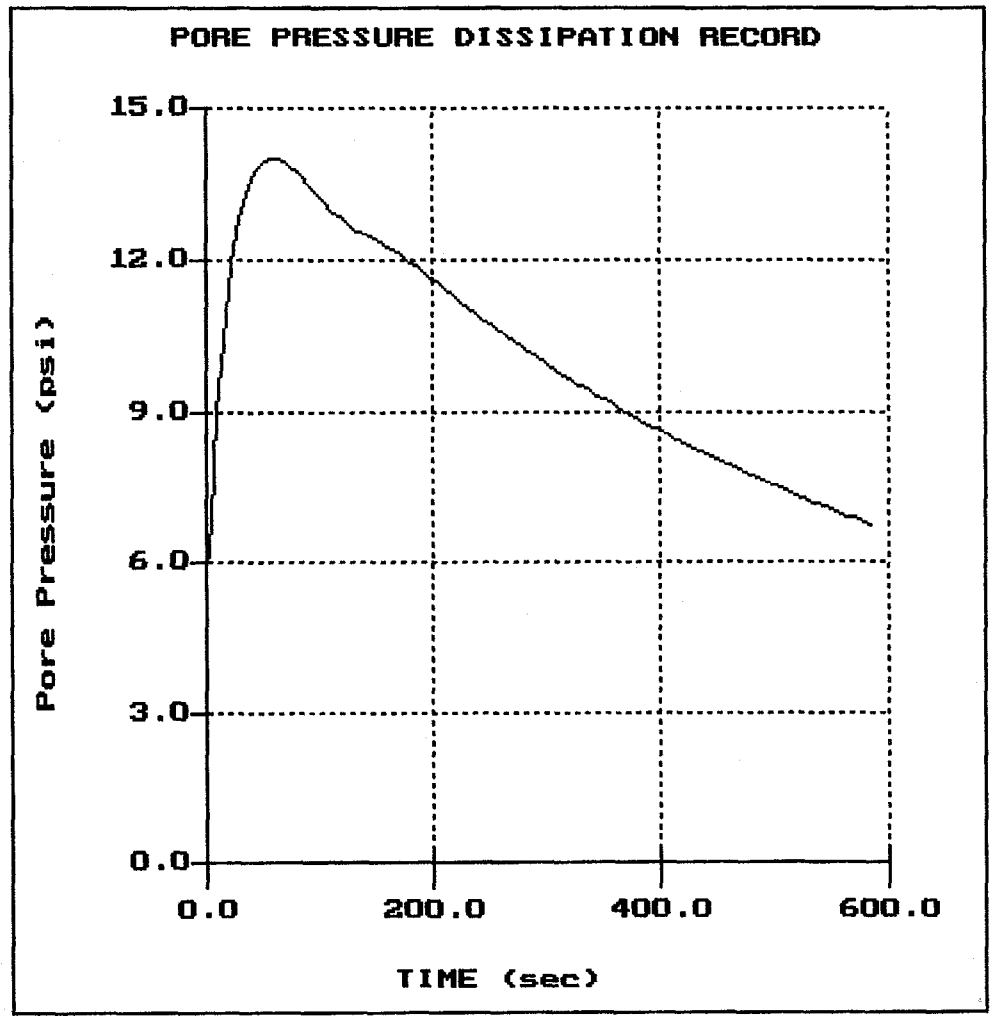


File: 023SC09A.PPD
Depth (m): 3.66
(ft): 12.01
Duration : 410.0s
U-min: 3.05 410.0s
U-max: 5.18 100.0s

SAIC-PADUCAH

Sounding:CCGT-SC09
Location:USEC

Engineer:N. Kidd
Date:02:13:02 10:24

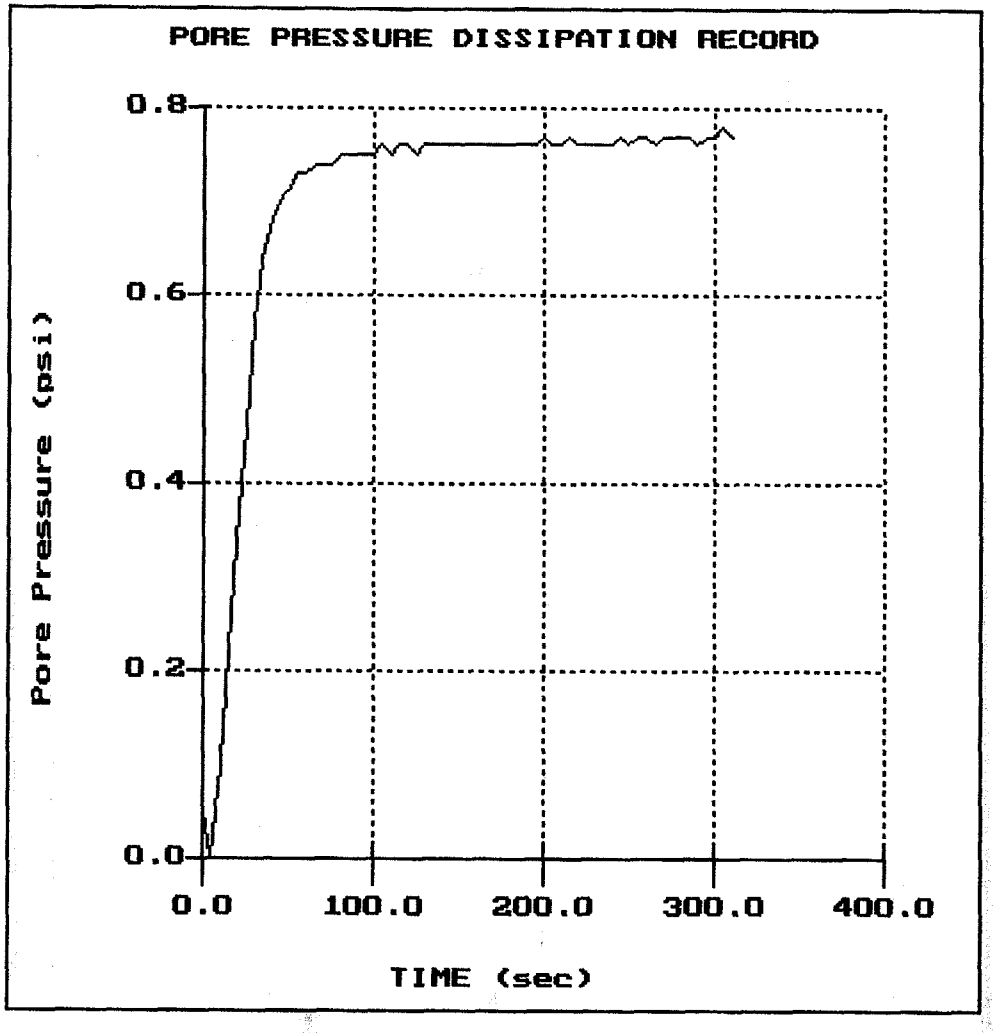


File: 023SC09A.PPD
Depth (m): 7.40
(ft): 24.28
Duration : 585.0s
U-min: 5.82 0.0s
U-max: 14.03 60.0s

SAIC-PADUCAH

Sounding:CCGT-SC09
Location:USEC

Engineer:N. Kidd
Date:02:13:02 10:24

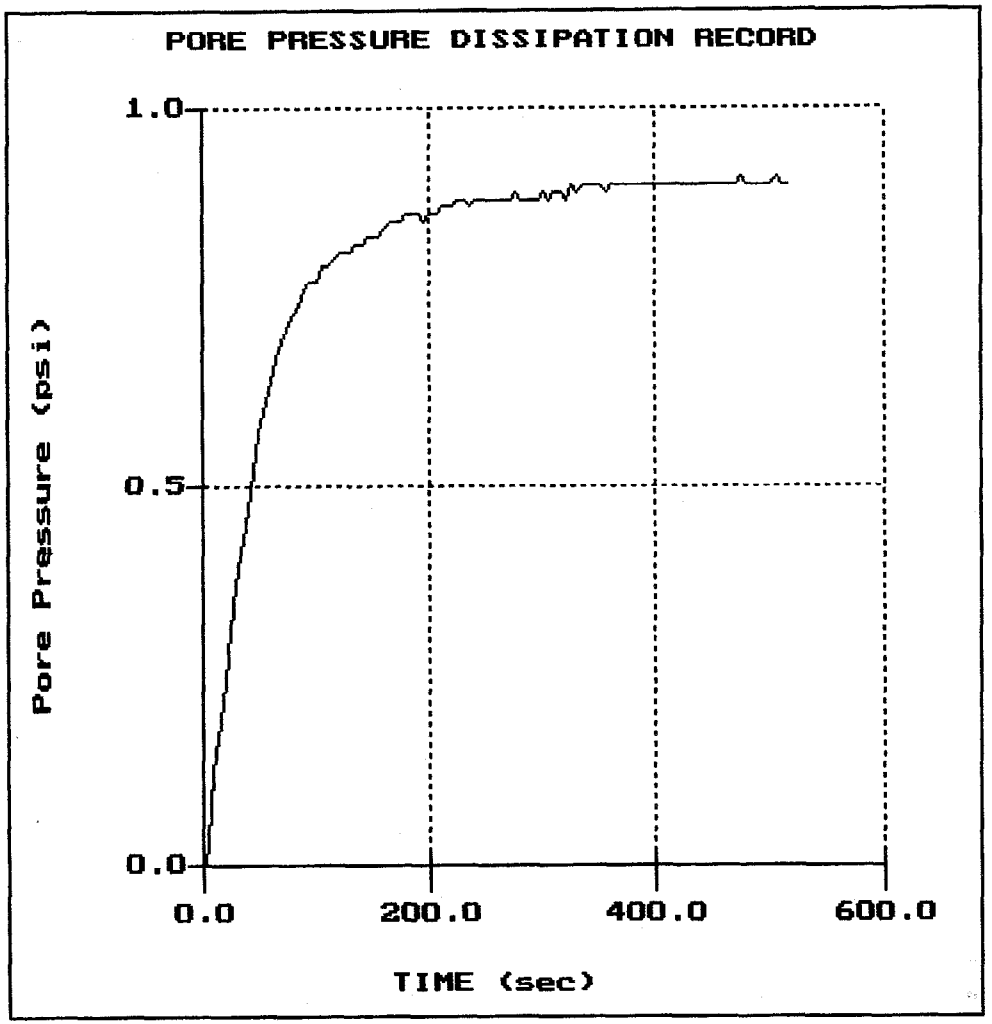


File: 023SC09A.PPD
Depth (m): 13.28
(ft): 43.57
Duration : 310.0s
U-min: -0.02 5.0s
U-max: 0.78 305.0s

SAIC-PADUCAH

Sounding:CCGT-SC09
Location:USEC

Engineer:N. Kidd
Date:02:13:02 10:24

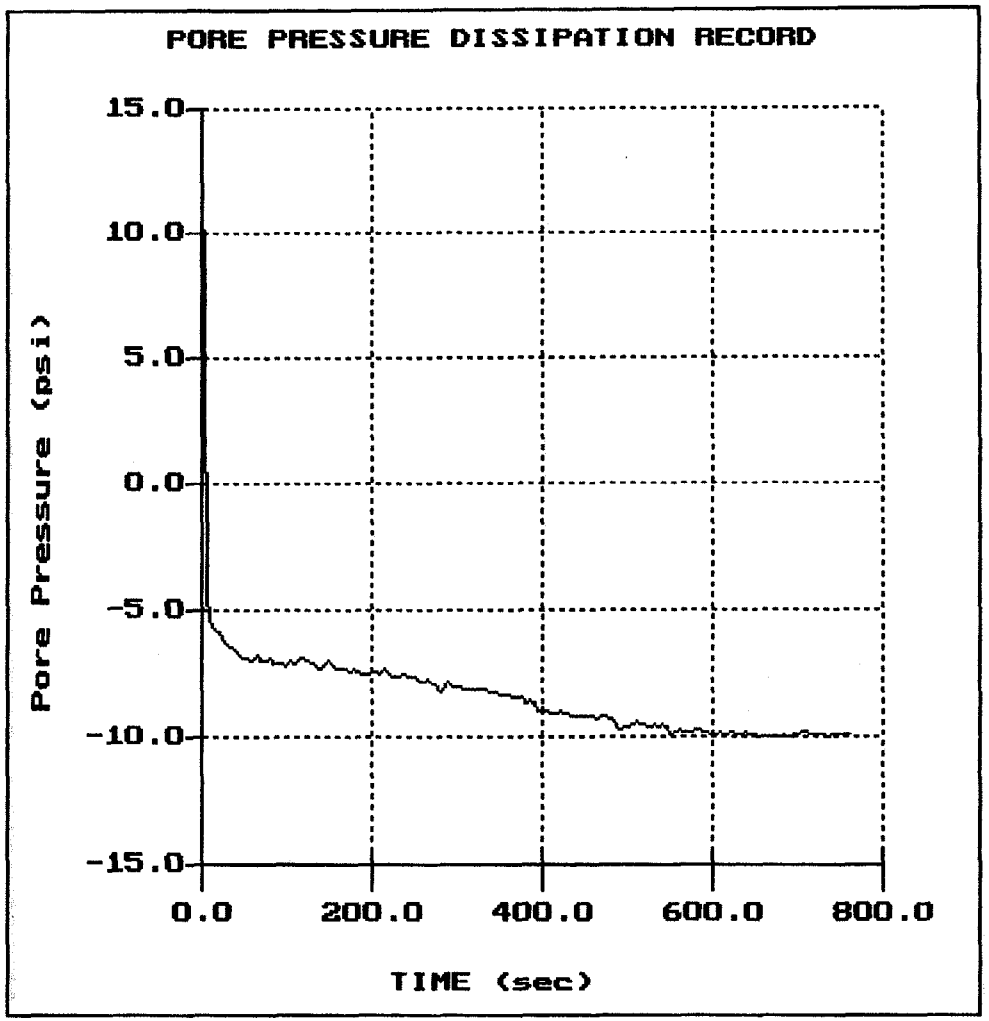


File: 023SC09A.PPD
Depth (m): 14.64
(ft): 48.03
Duration : 515.0s
U-min: -0.12 0.0s
U-max: 0.91 505.0s

SAIC-PADUCAH

Sounding:SCPT-560L2
Location:USEC

Engineer:N. Kidd
Date:03:06:02 11:22

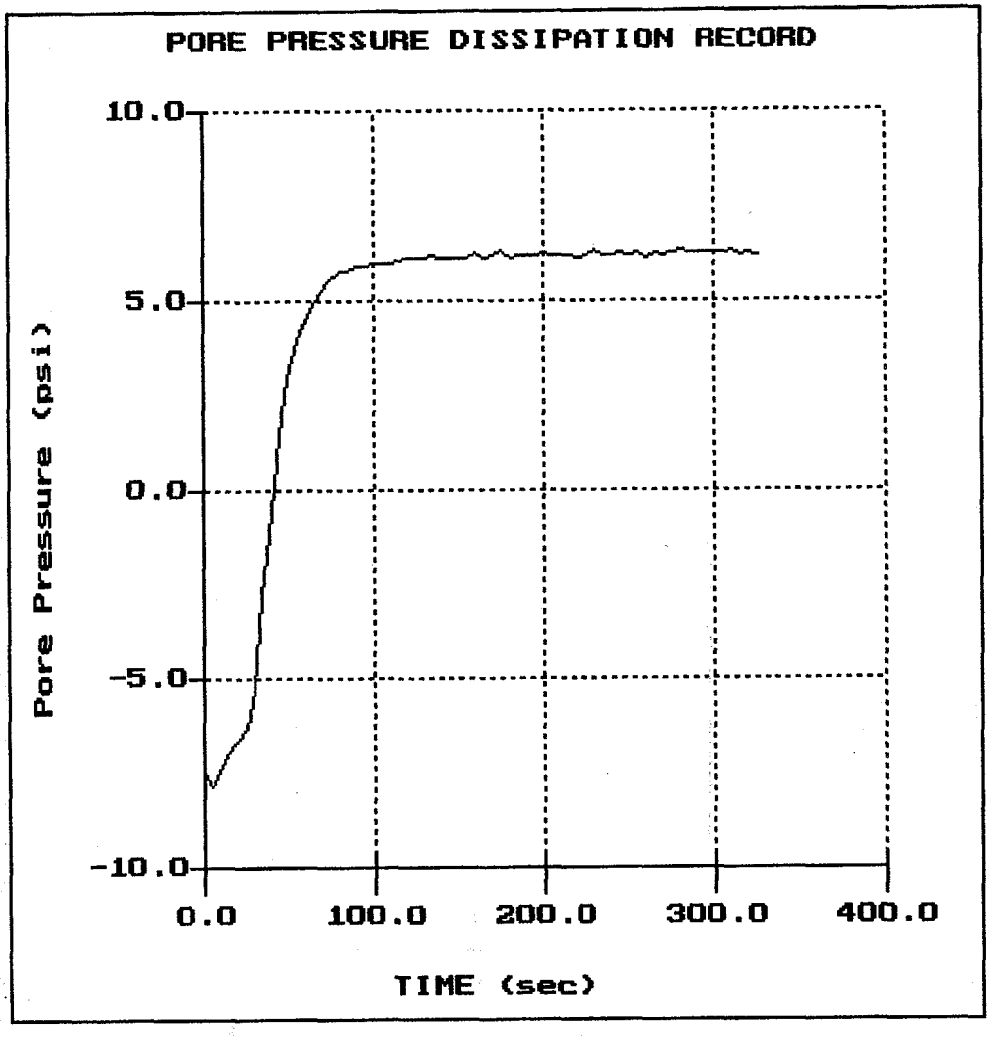


File: 023CS13.PPD
Depth (m): 6.90
(ft): 22.64
Duration : 760.0s
U-min: -10.05 675.0s
U-max: 18.41 0.0s

SAIC-PADUCAH

Sounding:SCPT-560L2
Location:USEC

Engineer:N. Kidd
Date:03:06:02 11:22



File: 023CS13.PPD
Depth (m): 8.75
(ft): 28.71
Duration : 325.0s
U-min: -7.83 5.0s
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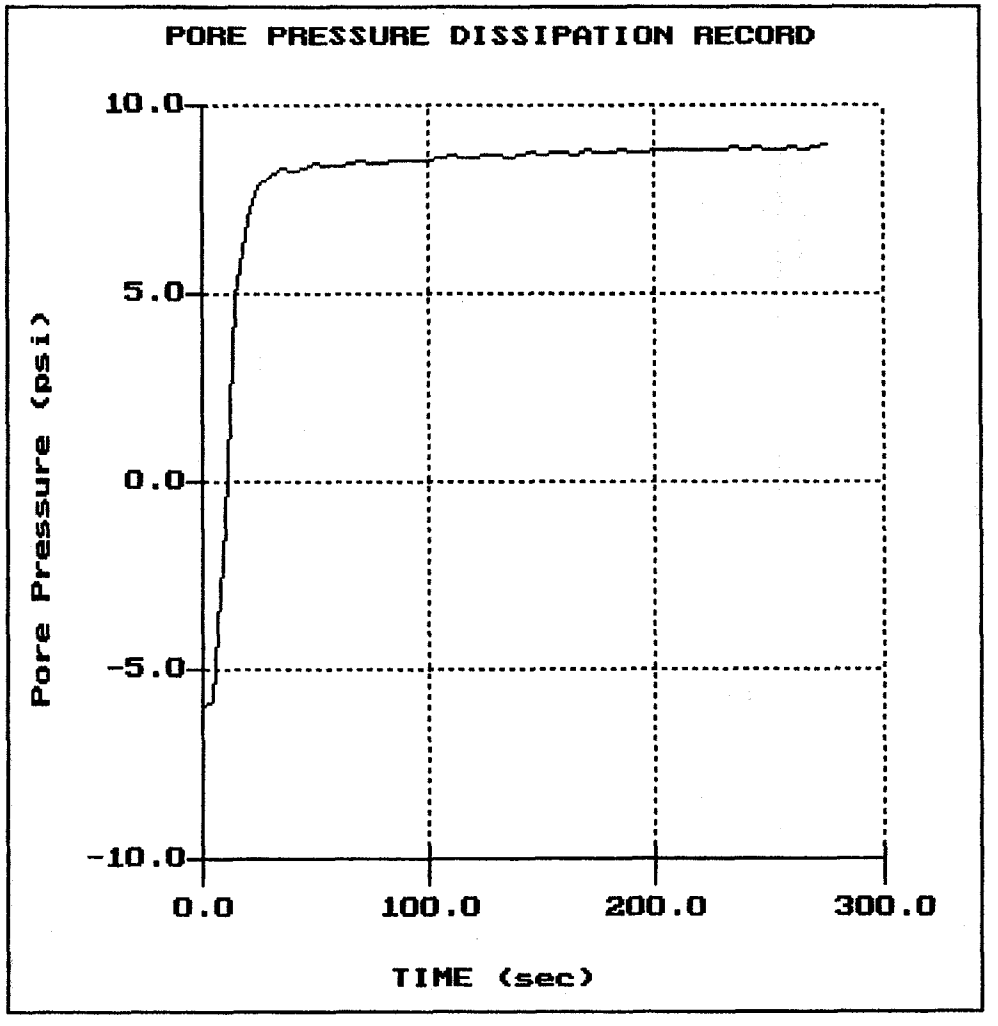
SAIC-PADUCAH

Sounding:SCPT-560L2
Location:USEC

Engineer:N. Kidd
Date:03:06:02 11:22



File: 023CS13.PPD
Depth (m): 10.68
(ft): 35.04
Duration : 275.0s
U-min: -5.98 0.0s
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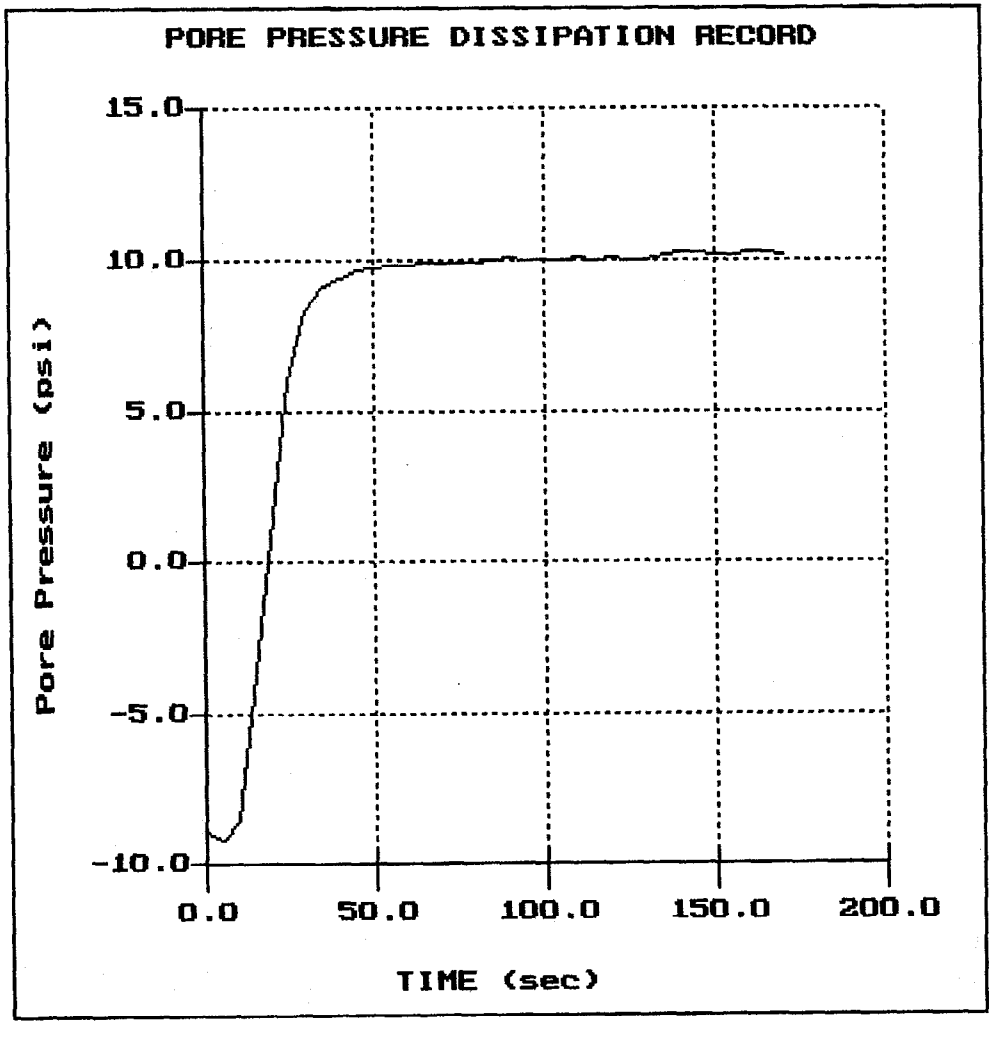
SAIC-PADUCAH

Sounding:SCPT-560L2
Location:USEC

Engineer:N. Kidd
Date:03:06:02 11:22

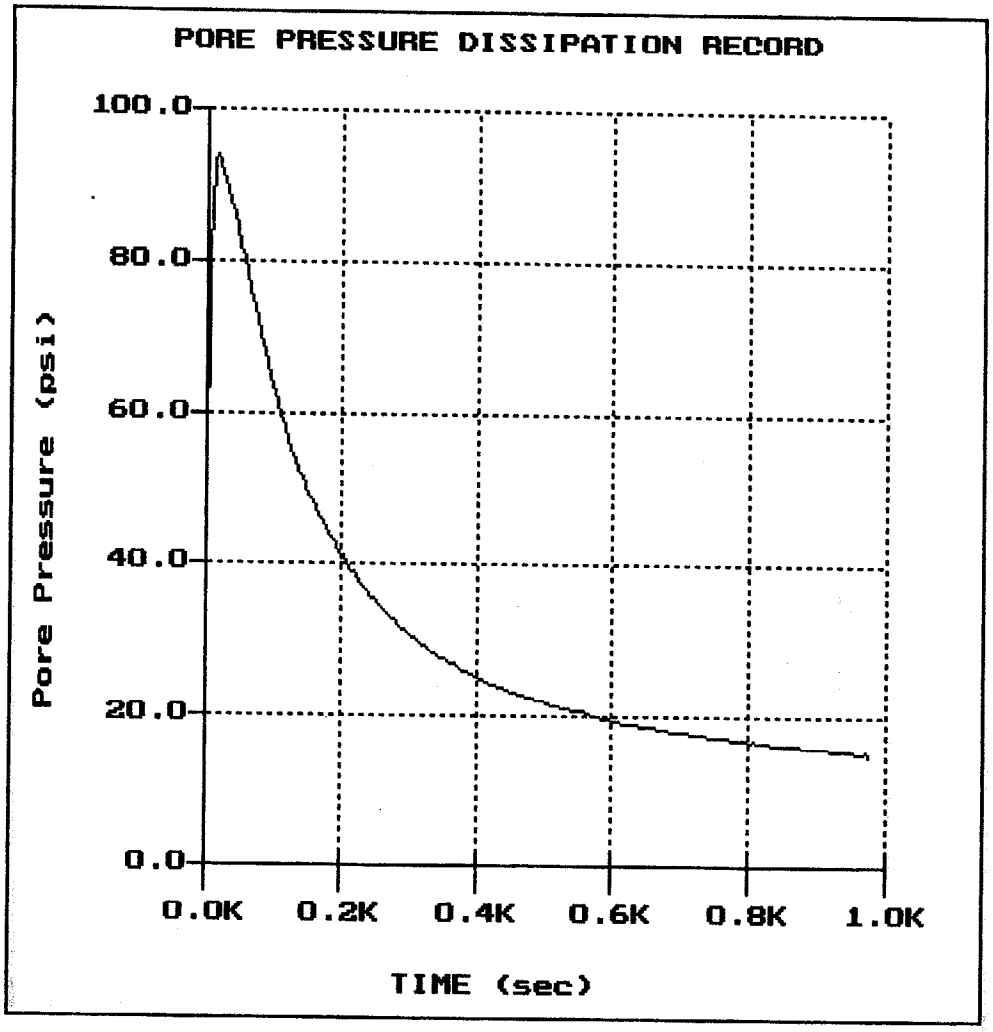


File: 023CS13.PPD
Depth (m): 11.57
(ft): 37.96
Duration : 170.0s
U-min: -9.26 5.0s
U-max: 10.19 165.0s

SAIC-PADUCAH

Sounding:SCPT-SB04
Location:USEC

Engineer:N. Kidd
Date:03:07:02 12:21



File: 023CS15.PPD
Depth (m): 6.50
(ft): 21.33
Duration : 975.0s
U-min: 14.51 975.0s
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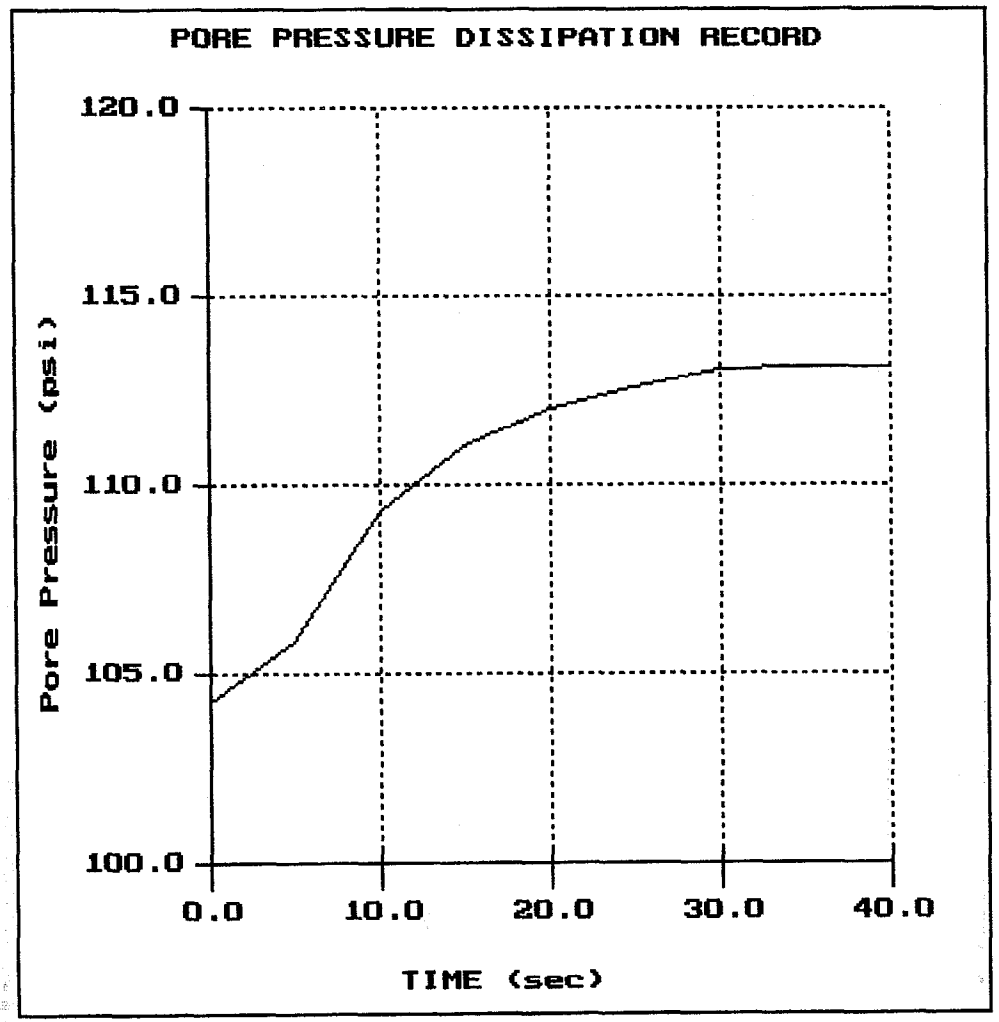
SAIC-PADUCAH

Sounding:SCPT-SB04
Location:USEC

Engineer:N. Kidd
Date:03:07:02 12:21

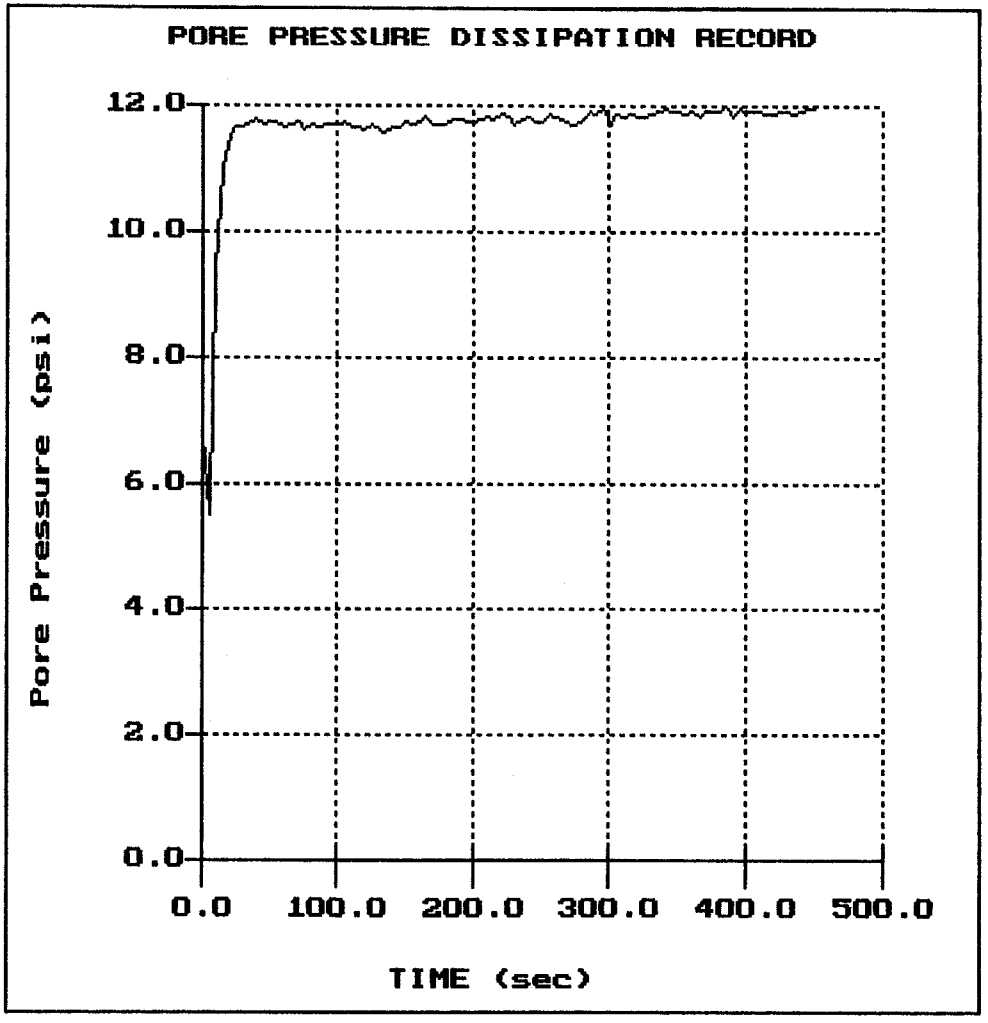


File: 023CS15.PPD
Depth (m): 8.00
(ft): 26.25
Duration : 40.0s
U-min: 104.27 0.0s
U-max: 113.12 35.0s

SAIC-PADUCAH

Sounding:SCPT-SB04
Location:USEC

Engineer:N. Kidd
Date:03:07:02 12:21

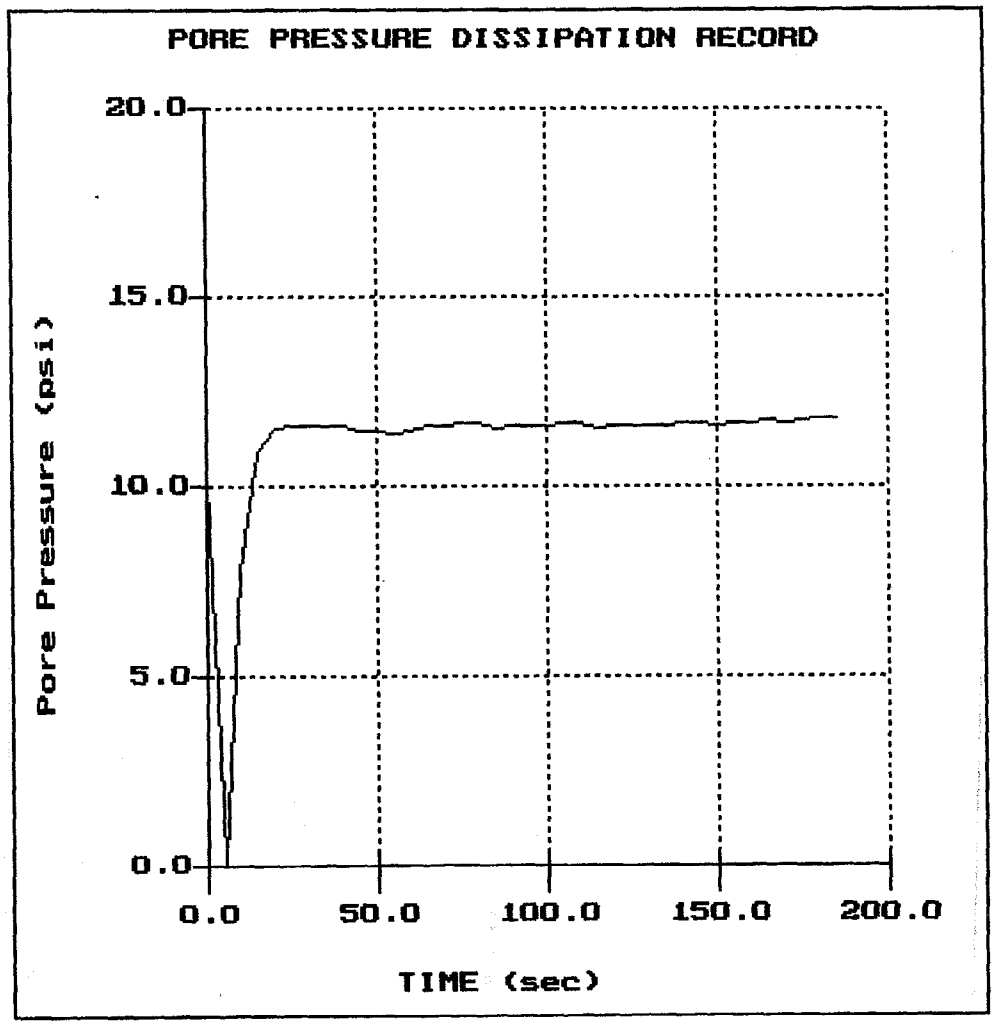


File: 023CS15.PPD
Depth (m): 10.45
(ft): 34.28
Duration : 455.0s
U-min: 5.49 5.0s
U-max: 12.82 455.0s

SAIC-PADUCAH

Sounding:SCPT-SB04
Location:USEC

Engineer:N. Kidd
Date:03:07:02 12:21

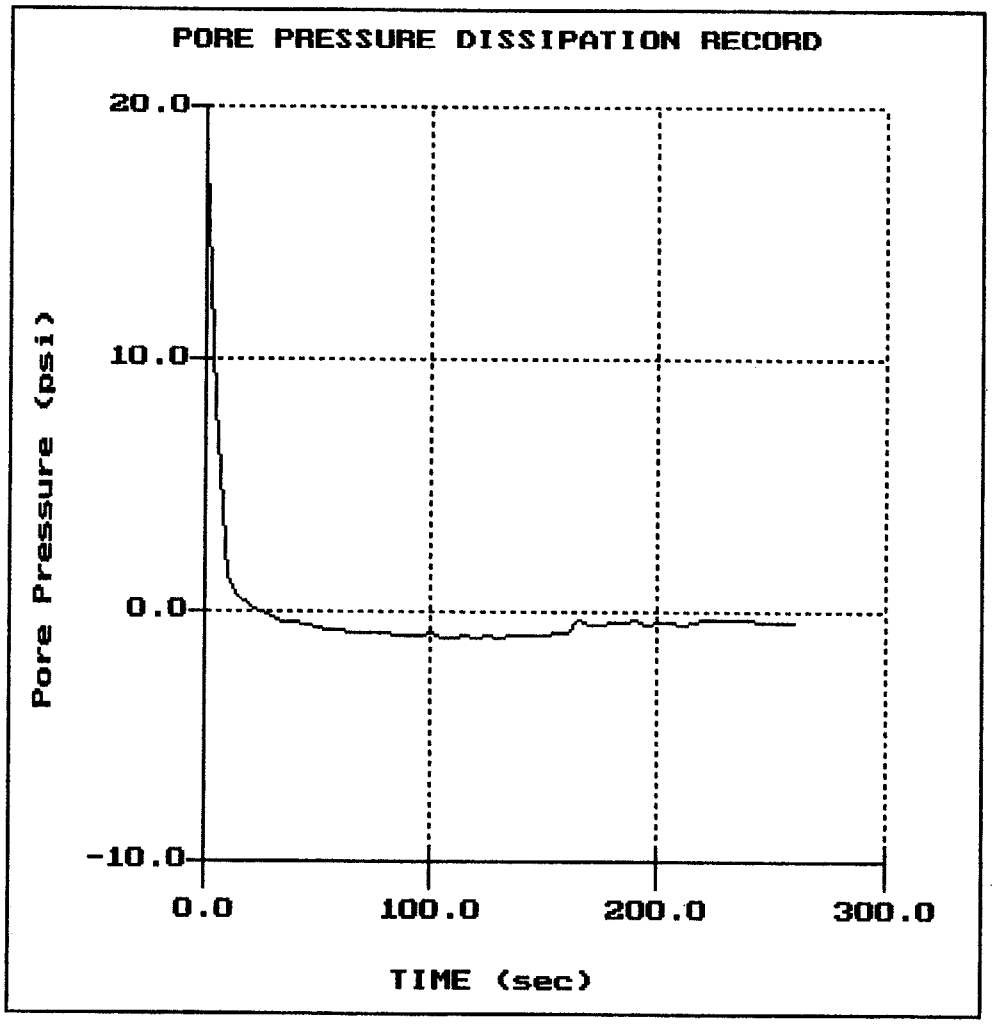


File: 023CS15.PPD
Depth (m): 10.62
(ft): 34.84
Duration : 185.0s
U-min: 0.04 5.0s
U-max: 11.84 185.0s

SAIC-PADUCAH

Sounding:SCPT-SB07
Location:USEC

Engineer:N. Kidd
Date:03:07:02 06:11



File: 023CS14.PPD
Depth (m): 5.40
(ft): 17.72
Duration : 260.0s
U-min: -1.04 110.0s
U-max: 18.17 0.0s

APPENDIX C

INTERPRETATION METHODS AND REFERENCES

GREGG

GREGG IN SITU's interpretation routine should be considered a calculator of current published CPT correlations and is subject to change to reflect the current state of practice. The interpreted values are not considered valid for all soil types. The interpretations are presented only as a guide for geotechnical use and should be carefully scrutinized for consideration in any geotechnical design. Reference to current literature is strongly recommended.

The CPT interpretations are based on values of tip, sleeve friction and pore pressure averaged over a user specified interval (typically 0.25m). Note that q_c is the recorded tip value and that q_t is the tip stress corrected for dynamic pore pressure effects. Since all GREGG IN SITU cones have equal end area friction sleeves, pore pressure corrections to sleeve friction, f_s, are not required.

The tip correction is: $q_t = q_c + (1-a) \bullet u_d$

where: q_t is the corrected tip load
q_c is the recorded tip load
u_d is the recorded dynamic pore pressure (typically in the u_2 position)
a is the Net Area Ratio for the cone (typically 0.85 for GREGG IN SITU cones)

Effective vertical overburden stresses are calculated based on a hydrostatic distribution of equilibrium pore pressures below the water table or from a user defined equilibrium pore pressure profile (this can be obtained from CPT pore pressure dissipation tests). The stress calculations use unit weights assigned to the Soil Behavior Type zones or from a user defined unit weight profile.

Details regarding the interpretation methods for all of the interpreted parameters are given in Table 1. The appropriate references referred to in Table 1 are listed in Table 2.

The estimated Soil Behavior Type is based on the charts developed by Robertson and Campanella shown in Figure 1.

Table 1 CPT Interpretation Methods

Interpreted Parameter	Description	Equation	Ref
Depth	mid layer depth		
Avg q_t	Averaged corrected tip (q_t)	$AvgQt = \frac{1}{n}\sum_{i=1}^{n} Qt_i$	
Avg f_s	Averaged sleeve friction (f_s)	$AvgFs = \frac{1}{n}\sum_{i=1}^{n} Fs_i$	
Avg R_f	Averaged friction ratio (R_f)	$AvgRf = 100\% \bullet \frac{AvgFs}{AvgQt}$	
Avg u_d	Averaged dynamic pore pressure (u_d)	$AvgUd = \frac{1}{n}\sum_{i=1}^{n} Ud_i$	
SBT	Soil Behavior Type as defined by Robertson and Campanella		1

CPT Interpretations

U.Wt.	Unit Weight of soil determined from: 1) uniform value or 2) value assigned to each SBT zone 3) user supplied unit weight profile		
TStress	Total vertical overburden stress at mid layer depth	$TStress = \sum_{i=1}^{n} \gamma_i h_i$ where γ_i is layer unit weight h_i is layer thickness	
EStress	Effective vertical overburden stress at mid layer depth	$EStress = TStress - Ueq$	
Ueq	Equilibrium pore pressure determined from: 1) hydrostatic from water table depth 2) user supplied profile		
Cn	SPT N_{60} overburden correction factor	$Cn=(\sigma_v')^{-0.5}$ where σ_v' *is in tsf* $0.5 < C_n < 2.0$	
N_{60}	SPT N value at 60% energy calculated from Qt/N ratios assigned to each SBT zone		3
$(N1)_{60}$	SPT N_{60} value corrected for overburden pressure	$N1_{60} = Cn \bullet N_{60}$	3
$\Delta(N1)_{60}$	Equivalent Clean Sand Correction to $(N1)_{60}$	$\Delta(N1)_{60} = \frac{K_{SPT}}{1 - K_{SPT}} \bullet (N1)_{60}$ Where: K_{SPT} is defined as: 0.0 for FC < 5% 0.0167 • (FC - 5) for 5% < FC < 35% 0.5 for FC > 35% FC - Fines Content in %	7
$(N1)_{60cs}$	Equivalent Clean Sand $(N1)_{60}$	$(N1)_{60cs} = (N1)_{60} + \Delta(N1)_{60}$	7
s_u	Undrained shear strength - Nkt is user defined.	$Su = \frac{Qt - \sigma_v}{N_{kt}}$	2
K	Coefficient of permeability (assigned to each SBT zone)		6
Bq	Pore pressure parameter	$Bq = \frac{\Delta u}{Qt - \sigma_v}$	2
Qtn	Normalized Qt for Soil Behavior Type classification as defined by Robertson, 1990	$Qtn = \frac{Qt - \sigma_v}{\sigma_v'}$	4
Rfn	Normalized Rf for Soil Behavior Type classification as defined by Robertson, 1990	$Rfn = 100\% \bullet \frac{f_s}{Qt - \sigma_v}$	4
SBTn	Normalized Soil Behavior Type (slightly modified from that published by Robertson, 1990. This version includes all the soil zones of the original non-normalized SBT chart - see Figure 1)		4
Qc1	Normalized Qt for seismic analysis	$q_{c1} = q_c \bullet (Pa/\sigma_v')^{0.5}$ where: Pa = atm. pressure	5
Qc1N	Dimensionless Normalized Qt1	$q_{c1N} = q_{c1} / Pa$ where: Pa = atm. pressure	

GREGG

ΔQc1N1	Equivalent clean sand correction	$\Delta qc1N = \frac{K_{CPT}}{1 - K_{CPT}} \bullet qc1N$ Where: K_{CPT} is defined as: 0.0 for FC < 5% 0.0267 • (FC - 5) for 5% < FC < 35% 0.5 for FC > 35% FC - Fines Content in %	5
Qc1Ncs	Clean Sand equivalent Qc1N	$qc1Ncs = qc1N + \Delta qc1N$	5
Ic	Soil index for estimating grain characteristics	$Ic = [(3.47 - \log Q)^2 + (\log F + 1.22)^2]^{0.5}$	5
FC	Fines content (%)	$FC=1.75(Ic^{3.25}) - 3.7$ $FC=100$ for $Ic > 3.5$ $FC=0$ for $Ic < 1.26$ $FC = 5\%$ if $1.64 < Ic < 2.6$ AND $Rfn<0.5$	8
PHI	Friction Angle	Campanella and Robertson Durunoglu and Mitchel Janbu	1
Dr	Relative Density	Ticino Sand Hokksund Sand Schmertmann 1976 Jamiolkowski - All Sands	1
OCR	Over Consolidation Ratio		1
State Parameter			9
CRR	Cyclic Resistance Ratio		7

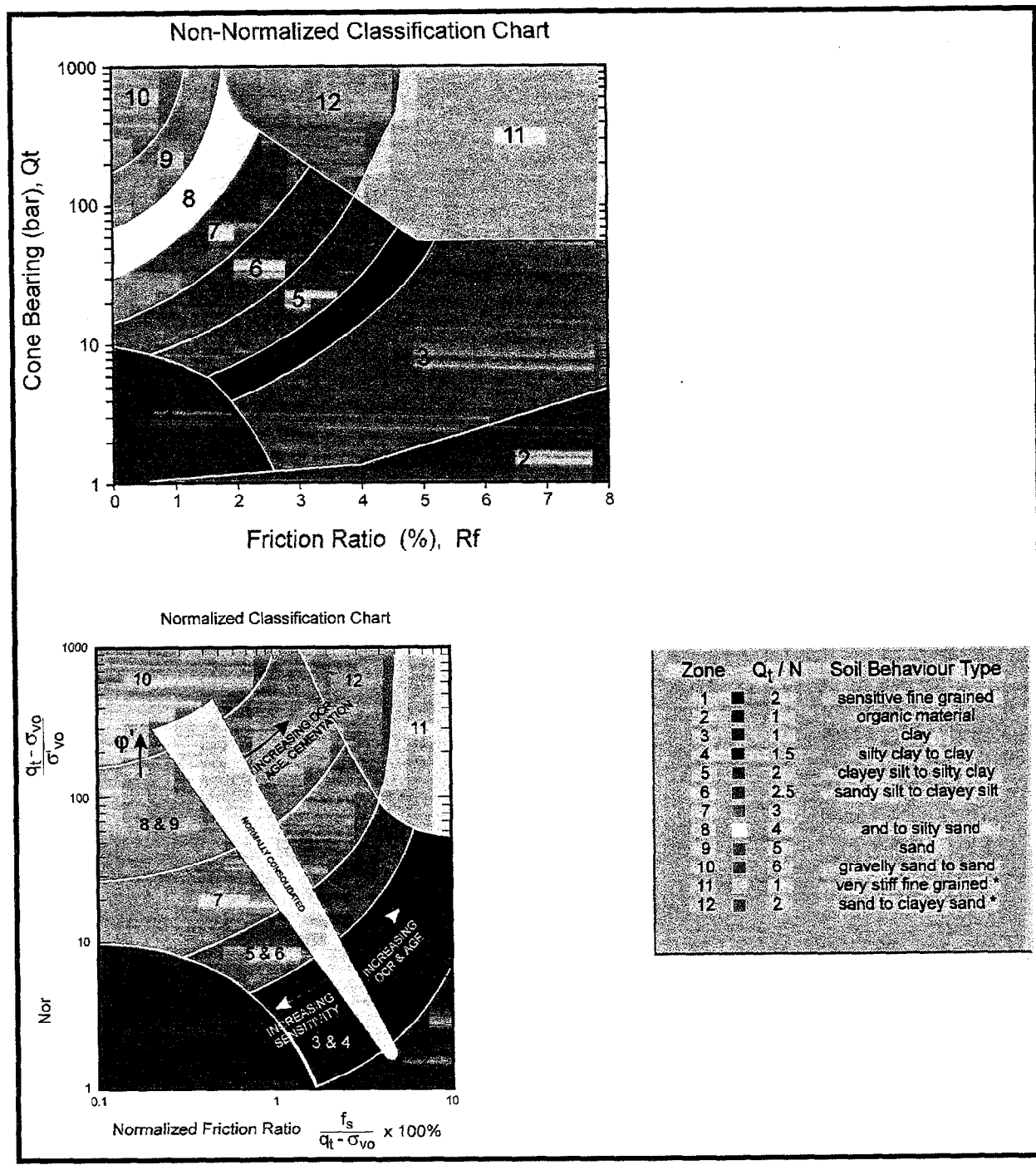


Figure 1
Non-Normalized and Normalized Soil Behavior Type
Classification Charts

GREGG

Table 2 References

No.	Reference
1	Robertson, P.K. and Campanella, R.G., 1986, "Guidelines for Use, Interpretation and Application of the CPT and CPTU", UBC, Soil Mechanics Series No. 105, Civil Eng. Dept., Vancouver, B.C., Canada
2	Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.
3	Robertson, P.K. and Campanella, R.G., 1989, "Guidelines for Geotechnical Design Using CPT and CPTU", UBC, Soil Mechanics Series No. 120, Civil Eng. Dept., Vancouver, B.C., Canada
4	Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27.
5	Robertson, P.K. and Fear, C.E., 1995, "Liquefaction of Sands and its Evaluation", Keynote Lecture, First International Conference on Earthquake Geotechnical Engineering, Tokyo, Japan.
6	GREGG IN SITU Internal Report
7	Robertson, P.K. and Wride, C.E., 1997, "Cyclic Liquefaction and its Evaluation Based on SPT and CPT", NCEER Workshop Paper, January 22, 1997
8	Wride, C.E. and Robertson, P.K., 1997, "Phase II Data Review Report (Massey and Kidd Sites, Fraser River Delta)", Volume 1 - Data Report (June 1997), University of Alberta.
9	Plewes, H.D., Davies, M.P. and Jefferies, M.G., 1992, "CPT Based Screening Procedure for Evaluating Liquefaction Susceptibility", 45th Canadian Geotechnical Conference, Toronto, Ontario, October 1992.

APPENDIX D

SEISMIC VELOCITY DATA

GREGG

GREGG

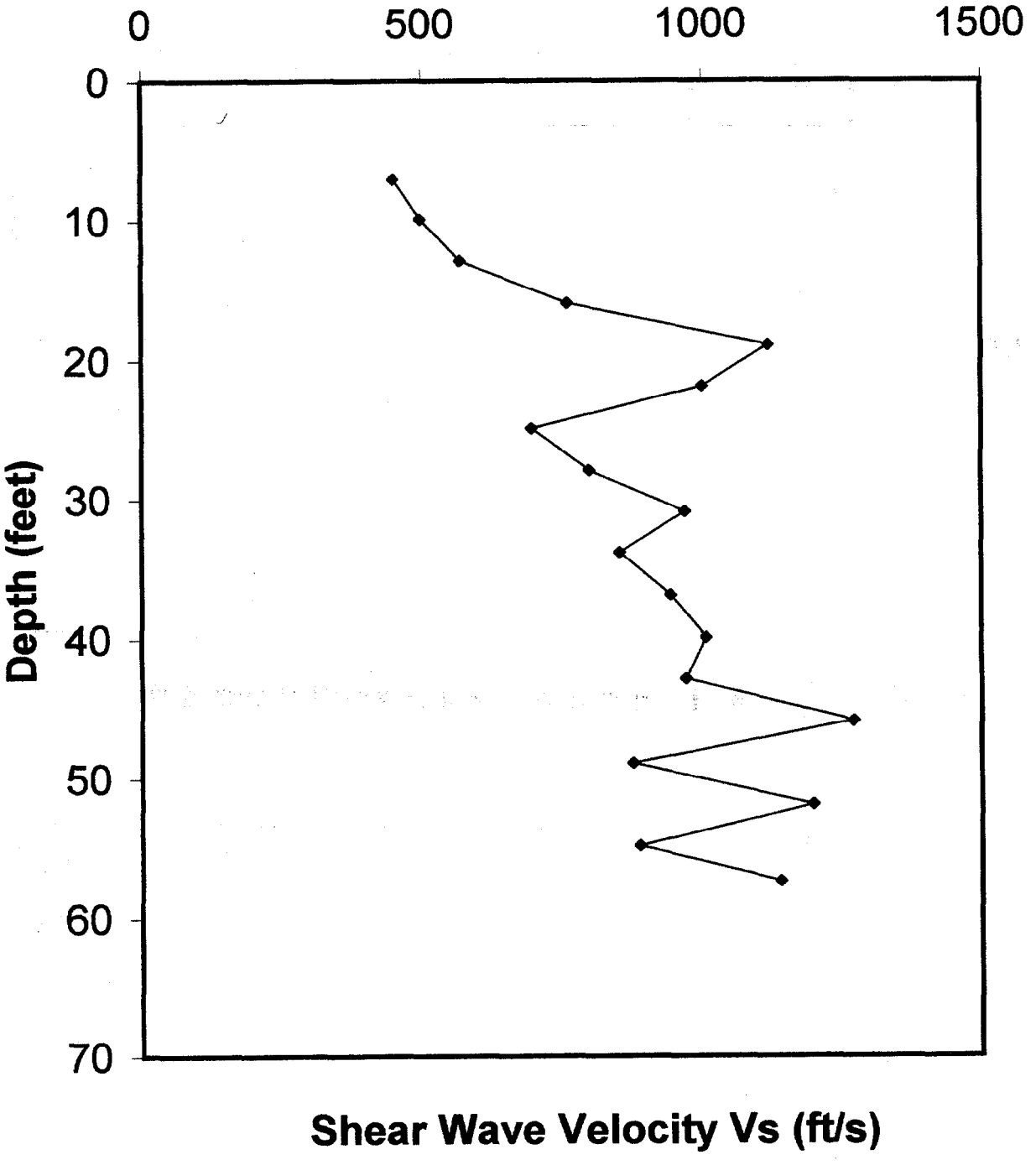
Shear Wave Velocity Calculations
Site 3A Seismic Assessment -- Paducah, Kentucky
CCGT-01

Geophone Offset: 0.66 Feet
Source Offset: 1.67 Feet

Test Depth (feet)	Geophone Depth (feet)	Ray Path (feet)	Incremental Distance (feet)	Time Interval (ms)	Interval Velocity (ft/s)	Interval Depth (feet)
6.17	5.51	5.76				
9.05	8.39	8.56	2.80	6.20	451.2	6.95
12.00	11.34	11.47	2.91	5.83	498.8	9.87
15.02	14.36	14.46	2.99	5.26	569.3	12.85
18.04	17.38	17.46	3.00	3.95	760.3	15.87
20.99	20.33	20.40	2.94	2.63	1117.3	18.86
24.01	23.35	23.41	3.01	3.01	1000.4	21.84
27.03	26.37	26.43	3.01	4.32	697.5	24.86
30.04	29.38	29.43	3.00	3.76	799.1	27.88
32.96	32.30	32.35	2.92	3.01	968.7	30.84
36.01	35.35	35.39	3.05	3.57	853.3	33.83
39.03	38.37	38.41	3.02	3.20	942.8	36.86
42.05	41.39	41.43	3.02	3.00	1005.8	39.88
44.97	44.31	44.35	2.92	3.01	969.4	42.85
48.08	47.42	47.45	3.11	2.45	1268.5	45.87
51.04	50.38	50.41	2.96	3.38	875.2	48.90
53.96	53.30	53.33	2.92	2.44	1196.1	51.84
56.97	56.31	56.34	3.01	3.39	887.5	54.81
59.11	58.45	58.48	2.14	1.88	1137.8	57.38

GREGG

Shear Wave Velocity Profile
Site 3A Seismic Assessment -- Paducah
CCGT-01



GREGG

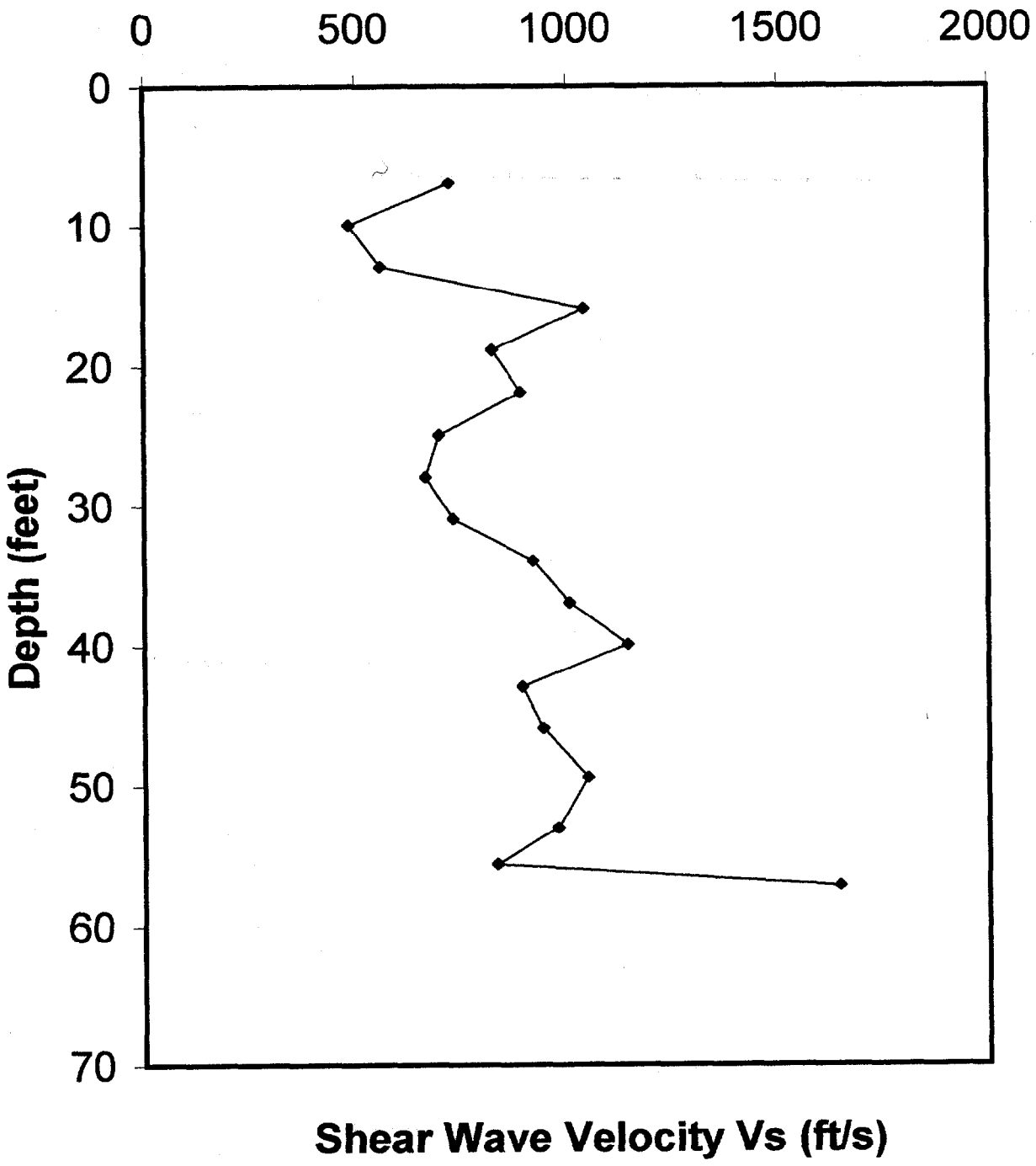
Shear Wave Velocity Calculations
Site 3A Seismic Assessment -- Paducah, Kentucky
CCGT-02

Geophone Offset: 0.66 Feet
Source Offset: 1.67 Feet

Test Depth (feet)	Geophone Depth (feet)	Ray Path (feet)	Incremental Distance (feet)	Time Interval (ms)	Interval Velocity (ft/s)	Interval Depth (feet)
6.04	5.38	5.64				
9.12	8.46	8.63	2.99	4.14	722.3	6.92
12.00	11.34	11.47	2.84	5.83	487.0	9.90
15.09	14.43	14.53	3.06	5.45	562.2	12.89
18.04	17.38	17.46	2.93	2.82	1040.4	15.91
20.99	20.33	20.40	2.94	3.57	823.1	18.86
24.01	23.35	23.41	3.01	3.38	890.9	21.84
27.03	26.37	26.43	3.01	4.32	697.5	24.86
30.04	29.38	29.43	3.00	4.52	664.7	27.88
33.06	32.40	32.45	3.02	4.13	730.2	30.89
36.01	35.35	35.39	2.95	3.20	920.8	33.88
39.03	38.37	38.41	3.02	3.00	1005.6	36.86
42.05	41.39	41.43	3.02	2.64	1142.9	39.88
45.07	44.41	44.45	3.02	3.38	892.8	42.90
48.08	47.42	47.45	3.01	3.19	943.0	45.92
52.02	51.36	51.39	3.94	3.76	1047.3	49.39
55.33	54.67	54.70	3.31	3.39	975.9	53.02
57.20	56.54	56.57	1.87	2.25	830.7	55.61
58.45	57.79	57.82	1.25	0.76	1644.0	57.17

GREGG

Shear Wave Velocity Profile
Site 3A Seismic Assessment -- Paducah
CCGT-02



GREGG

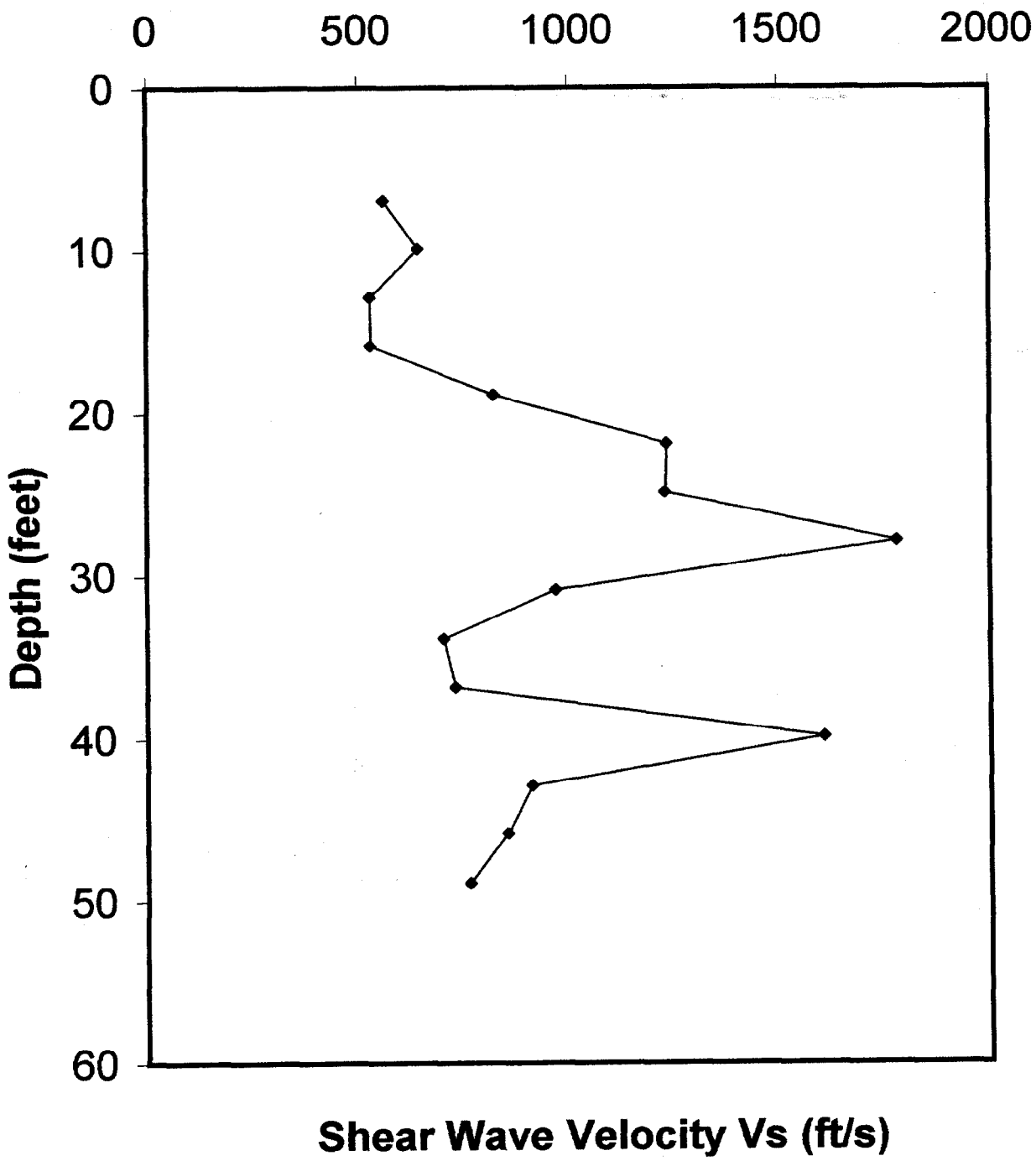
Shear Wave Velocity Calculations
Site 3A Seismic Assessment -- Paducah, Kentucky
CCGT-03

Geophone Offset: 0.66 Feet
Source Offset: 1.67 Feet

Test Depth (feet)	Geophone Depth (feet)	Ray Path (feet)	Incremental Distance (feet)	Time Interval (ms)	Interval Velocity (ft/s)	Interval Depth (feet)
6.10	5.44	5.69				
9.05	8.39	8.56	2.86	5.08	563.9	6.92
12.00	11.34	11.47	2.91	4.51	644.8	9.87
15.02	14.36	14.46	2.99	5.64	531.0	12.85
18.04	17.38	17.46	3.00	5.64	532.5	15.87
20.99	20.33	20.40	2.94	3.57	823.1	18.86
24.01	23.35	23.41	3.01	2.44	1234.1	21.84
27.03	26.37	26.43	3.01	2.45	1229.9	24.86
30.04	29.38	29.43	3.00	1.69	1777.9	27.88
32.96	32.30	32.35	2.92	3.01	968.7	30.84
36.01	35.35	35.39	3.05	4.32	705.2	33.83
39.03	38.37	38.41	3.02	4.13	730.5	36.86
42.05	41.39	41.43	3.02	1.88	1605.0	39.88
44.97	44.31	44.35	2.92	3.20	911.8	42.85
48.02	47.36	47.39	3.05	3.57	853.8	45.84
51.04	50.38	50.41	3.02	3.95	764.1	48.87

GREGG

Shear Wave Velocity Profile
Site 3A Seismic Assessment -- Paducah
CCGT-03



GREGG

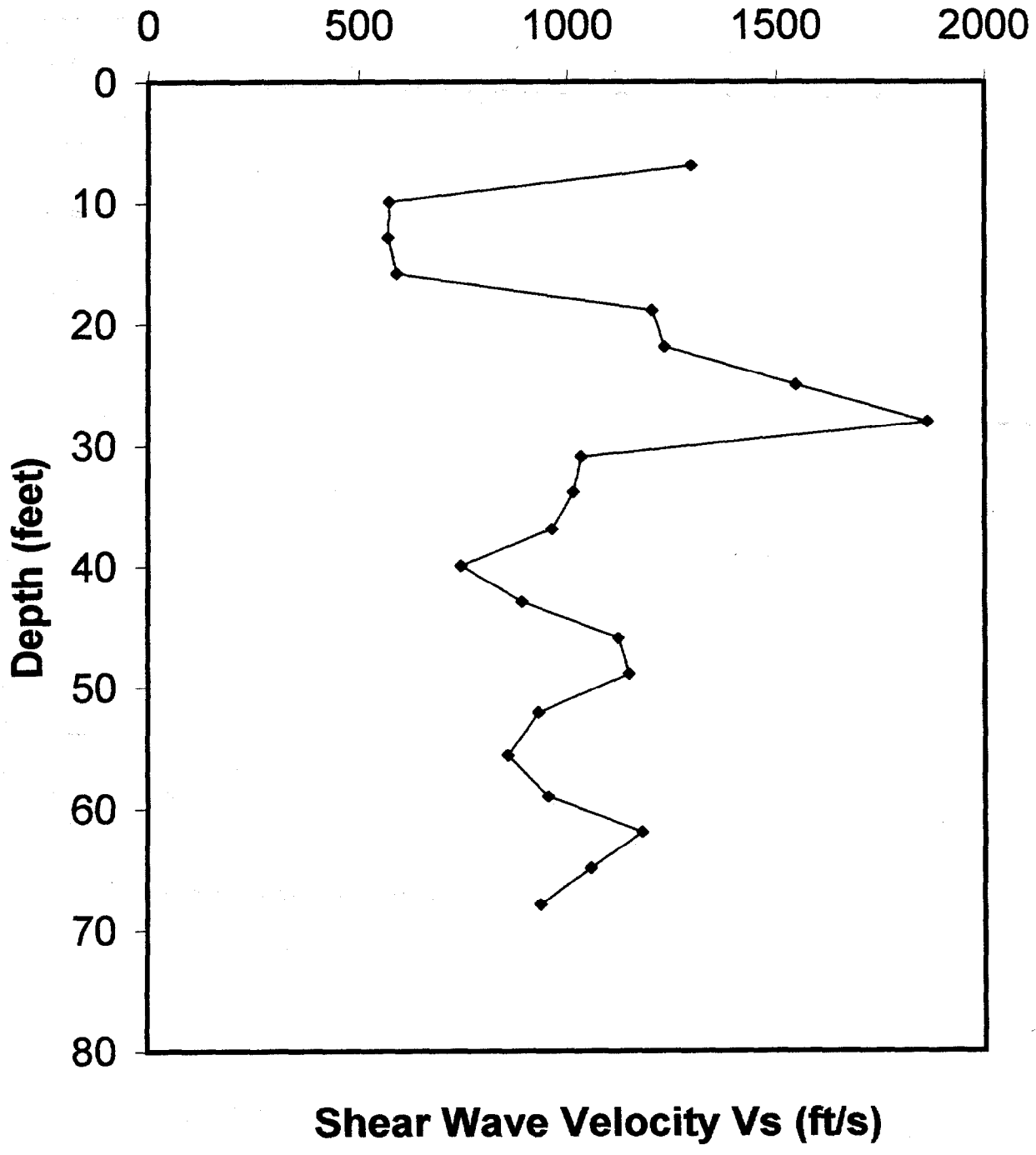
Shear Wave Velocity Calculations
Site 3A Seismic Assessment -- Paducah, Kentucky
CCGT-04

Geophone Offset: 0.66 Feet
Source Offset: 1.67 Feet

Test Depth (feet)	Geophone Depth (feet)	Ray Path (feet)	Incremental Distance (feet)	Time Interval (ms)	Interval Velocity (ft/s)	Interval Depth (feet)
6.04	5.38	5.64				
9.05	8.39	8.56	2.92	2.25	1298.6	6.89
12.00	11.34	11.47	2.91	5.08	572.4	9.87
15.02	14.36	14.46	2.99	5.26	569.3	12.85
18.04	17.38	17.46	3.00	5.08	591.2	15.87
20.99	20.33	20.40	2.94	2.44	1204.3	18.86
24.01	23.35	23.41	3.01	2.44	1234.1	21.84
27.22	26.56	26.62	3.20	2.07	1547.3	24.96
30.04	29.38	29.43	2.81	1.51	1864.2	27.97
32.96	32.30	32.35	2.92	2.82	1033.9	30.84
36.01	35.35	35.39	3.05	3.00	1015.4	33.83
39.10	38.44	38.48	3.09	3.20	964.6	36.90
42.05	41.39	41.43	2.95	3.95	746.2	39.92
45.07	44.41	44.45	3.02	3.38	892.8	42.90
48.02	47.36	47.39	2.95	2.63	1120.9	45.89
51.04	50.38	50.41	3.02	2.63	1147.6	48.87
54.37	53.71	53.74	3.33	3.57	932.3	52.05
58.09	57.43	57.46	3.72	4.33	858.7	55.57
61.14	60.48	60.51	3.05	3.19	955.7	58.96
64.03	63.37	63.40	2.89	2.45	1179.2	61.93
67.01	66.35	66.37	2.98	2.82	1056.4	64.86
70.00	69.34	69.36	2.99	3.19	937.0	67.85

GREGG

Shear Wave Velocity Profile
Site 3A Seismic Assessment -- Paducah
CCGT-04



GREGG

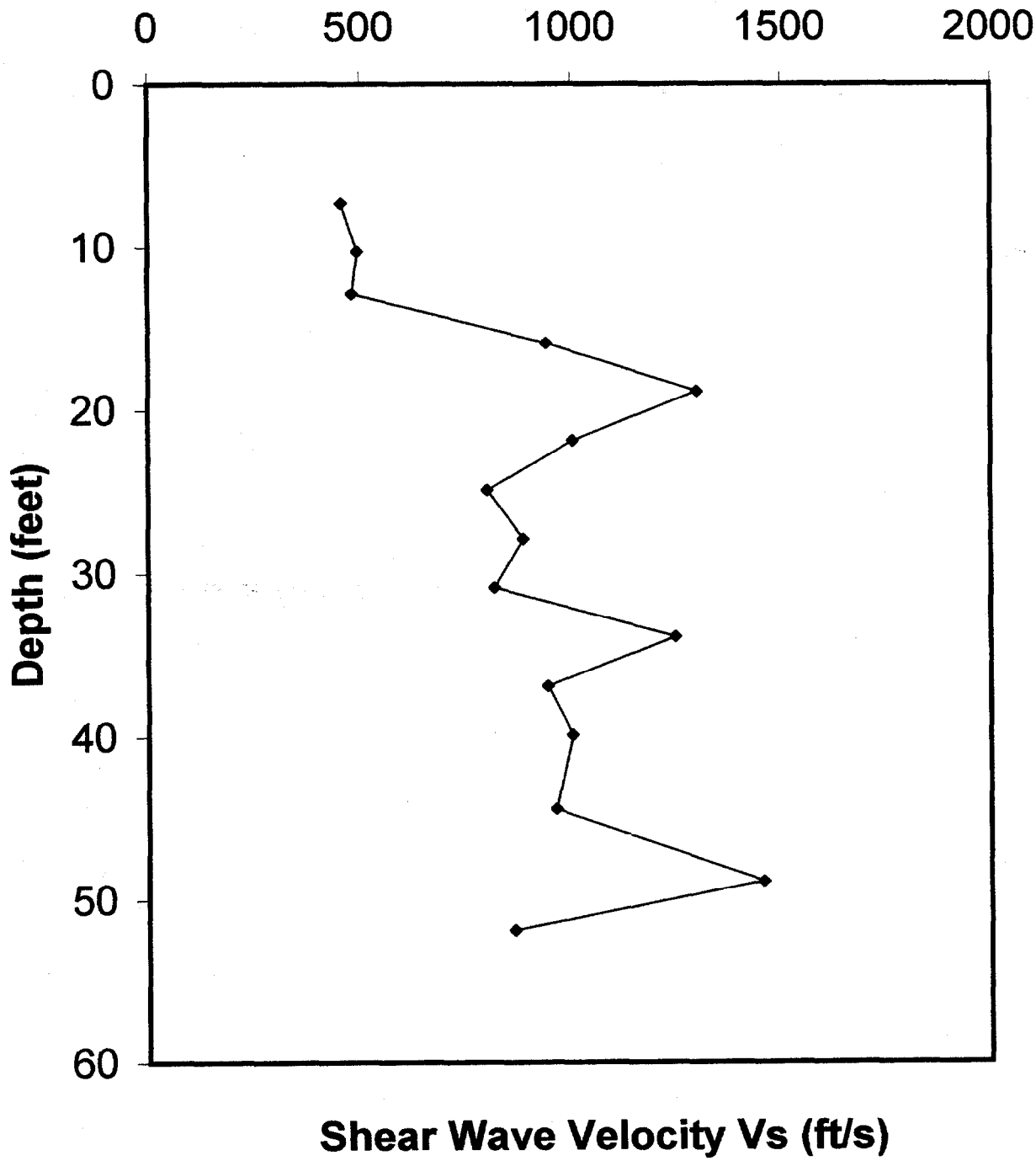
Shear Wave Velocity Calculations
Site 3A Seismic Assessment -- Paducah, Kentucky
CCGT-05

Geophone Offset: 0.66 Feet
Source Offset: 1.67 Feet

Test Depth (feet)	Geophone Depth (feet)	Ray Path (feet)	Incremental Distance (feet)	Time Interval (ms)	Interval Velocity (ft/s)	Interval Depth (feet)
6.04	5.38	5.64				
9.84	9.18	9.33	3.70	8.08	457.7	7.28
12.00	11.34	11.47	2.13	4.32	493.5	10.26
15.02	14.36	14.46	2.99	6.21	482.2	12.85
18.04	17.38	17.46	3.00	3.19	941.5	15.87
20.99	20.33	20.40	2.94	2.26	1300.2	18.86
24.01	23.35	23.41	3.01	3.00	1003.7	21.84
27.03	26.37	26.43	3.01	3.76	801.4	24.86
30.04	29.38	29.43	3.00	3.39	886.3	27.88
32.96	32.30	32.35	2.92	3.57	816.7	30.84
36.01	35.35	35.39	3.05	2.44	1248.5	33.83
39.03	38.37	38.41	3.02	3.20	942.8	36.86
42.05	41.39	41.43	3.02	3.01	1002.4	39.88
48.02	47.36	47.39	5.97	6.20	962.2	44.38
51.04	50.38	50.41	3.02	2.07	1458.1	48.87
53.96	53.30	53.33	2.92	3.38	863.5	51.84

GREGG

Shear Wave Velocity Profile
Site 3A Seismic Assessment -- Paducah
CCGT-05



GREGG

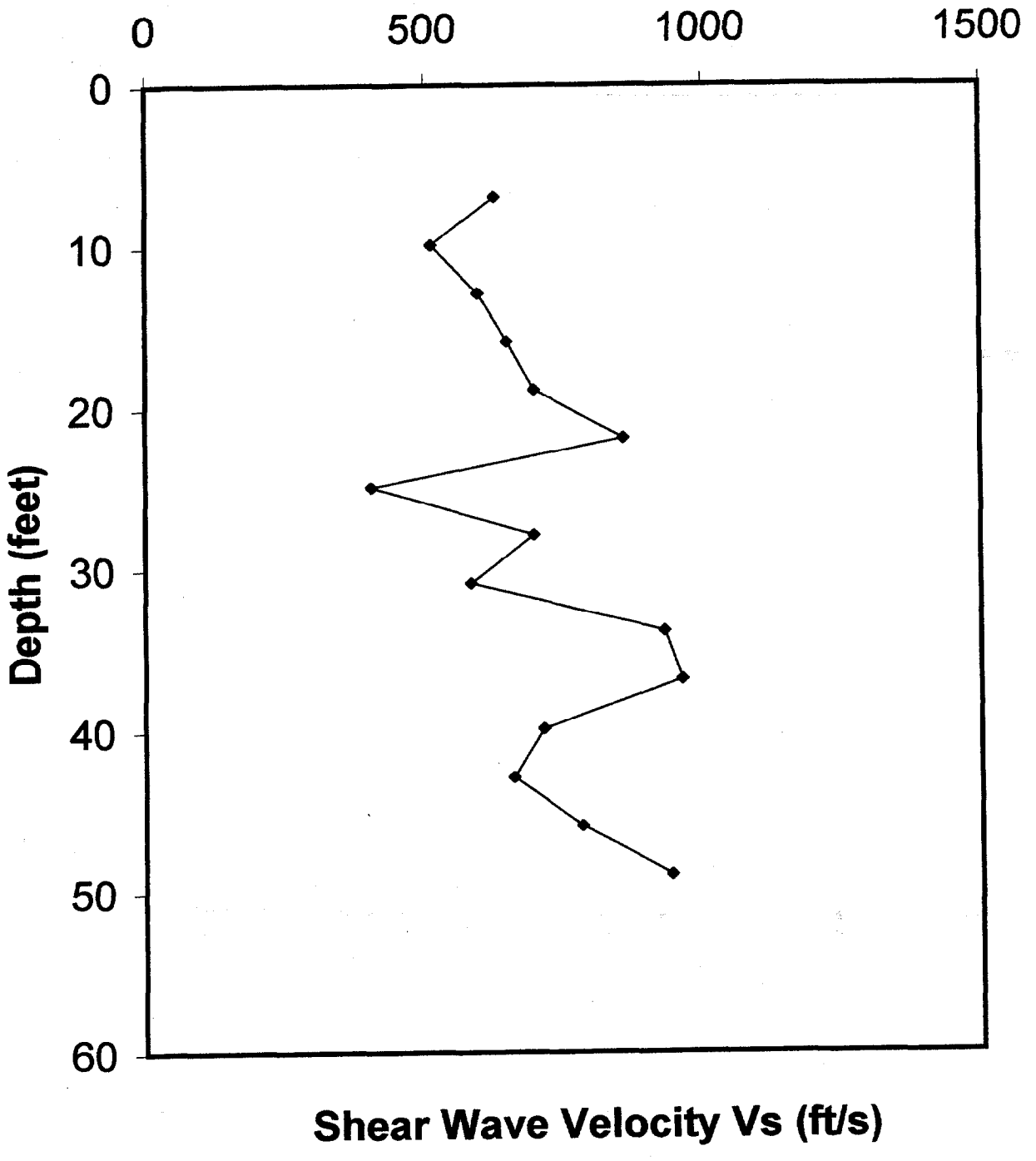
Shear Wave Velocity Calculations
Site 3A Seismic Assessment -- Paducah, Kentucky
SCPT-340L2 (SC-06)

Geophone Offset: 0.66 Feet
Source Offset: 0.46 Feet

Test Depth (feet)	Geophone Depth (feet)	Ray Path (feet)	Incremental Distance (feet)	Time Interval (ms)	Interval Velocity (ft/s)	Interval Depth (feet)
6.07	5.41	5.43				
9.02	8.36	8.38	2.94	4.70	626.2	6.89
12.04	11.38	11.39	3.02	5.87	513.9	9.87
14.99	14.33	14.34	2.95	4.94	596.8	12.86
18.04	17.38	17.39	3.05	4.70	648.7	15.86
20.99	20.33	20.34	2.95	4.23	697.2	18.86
24.01	23.35	23.36	3.02	3.52	857.8	21.84
27.06	26.40	26.41	3.05	7.52	405.5	24.88
30.01	29.35	29.36	2.95	4.23	697.3	27.88
33.03	32.37	32.38	3.02	5.17	584.1	30.86
35.98	35.32	35.33	2.95	3.17	930.5	33.85
39.03	38.37	38.38	3.05	3.17	962.1	36.85
42.05	41.39	41.40	3.02	4.23	713.9	39.88
45.00	44.34	44.35	2.95	4.47	659.9	42.87
48.12	47.46	47.47	3.12	3.99	781.9	45.90
51.00	50.34	50.35	2.88	3.06	941.1	48.90

GREGG

Shear Wave Velocity Profile
Site 3A Seismic Assessment -- Paducah
SCPT-340L2 (SC-06)



GREGG

Shear Wave Velocity Calculations

Site 3A Seismic Assessment -- Paducah, Kentucky

SCPT-340L3 (SC.07)

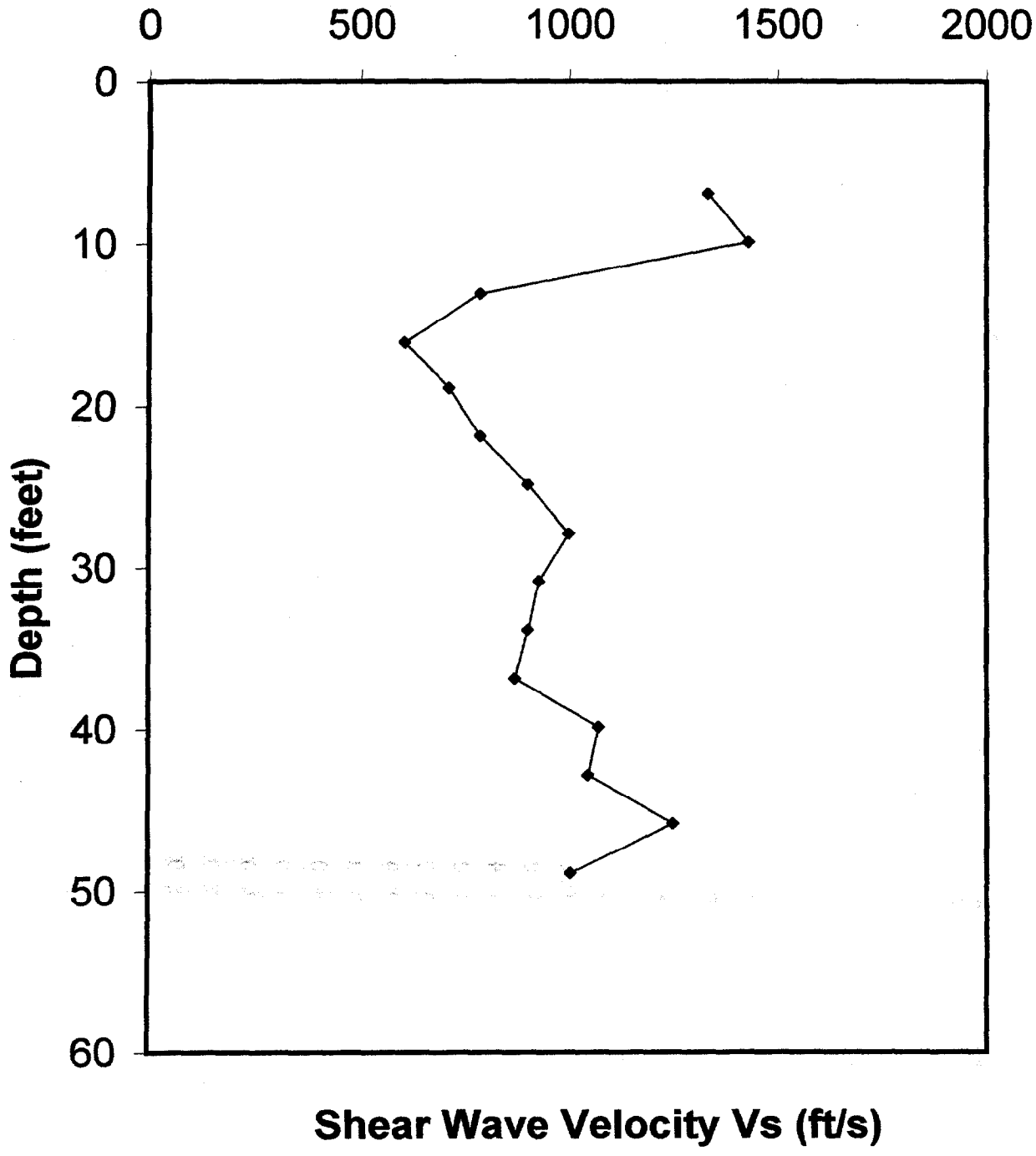
Geophone Offset: 0.66 Feet

Source Offset: 0.46 Feet

Test Depth (feet)	Geophone Depth (feet)	Ray Path (feet)	Incremental Distance (feet)	Time Interval (ms)	Interval Velocity (ft/s)	Interval Depth (feet)
6.07	5.41	5.43				
9.09	8.43	8.45	3.01	2.26	1333.2	6.92
12.04	11.38	11.39	2.95	2.06	1430.5	9.91
15.45	14.79	14.80	3.41	4.33	787.0	13.09
18.07	17.41	17.42	2.62	4.32	606.2	16.10
21.02	20.36	20.37	2.95	4.14	712.3	18.89
23.98	23.32	23.33	2.96	3.76	787.1	21.84
27.03	26.37	26.38	3.05	3.38	902.2	24.85
30.04	29.38	29.39	3.01	3.01	999.9	27.88
33.00	32.34	32.35	2.96	3.19	927.8	30.86
36.05	35.39	35.40	3.05	3.38	902.3	33.87
39.00	38.34	38.35	2.95	3.39	870.1	36.87
42.02	41.36	41.37	3.02	2.82	1070.9	39.85
44.97	44.31	44.32	2.95	2.82	1046.0	42.84
48.02	47.36	47.37	3.05	2.44	1249.9	45.84
51.04	50.38	50.39	3.02	3.01	1003.3	48.87

GREGG

Shear Wave Velocity Profile
Site 3A Seismic Assessment -- Paducah
SCPT-340L3 (SC-07)



GREGG

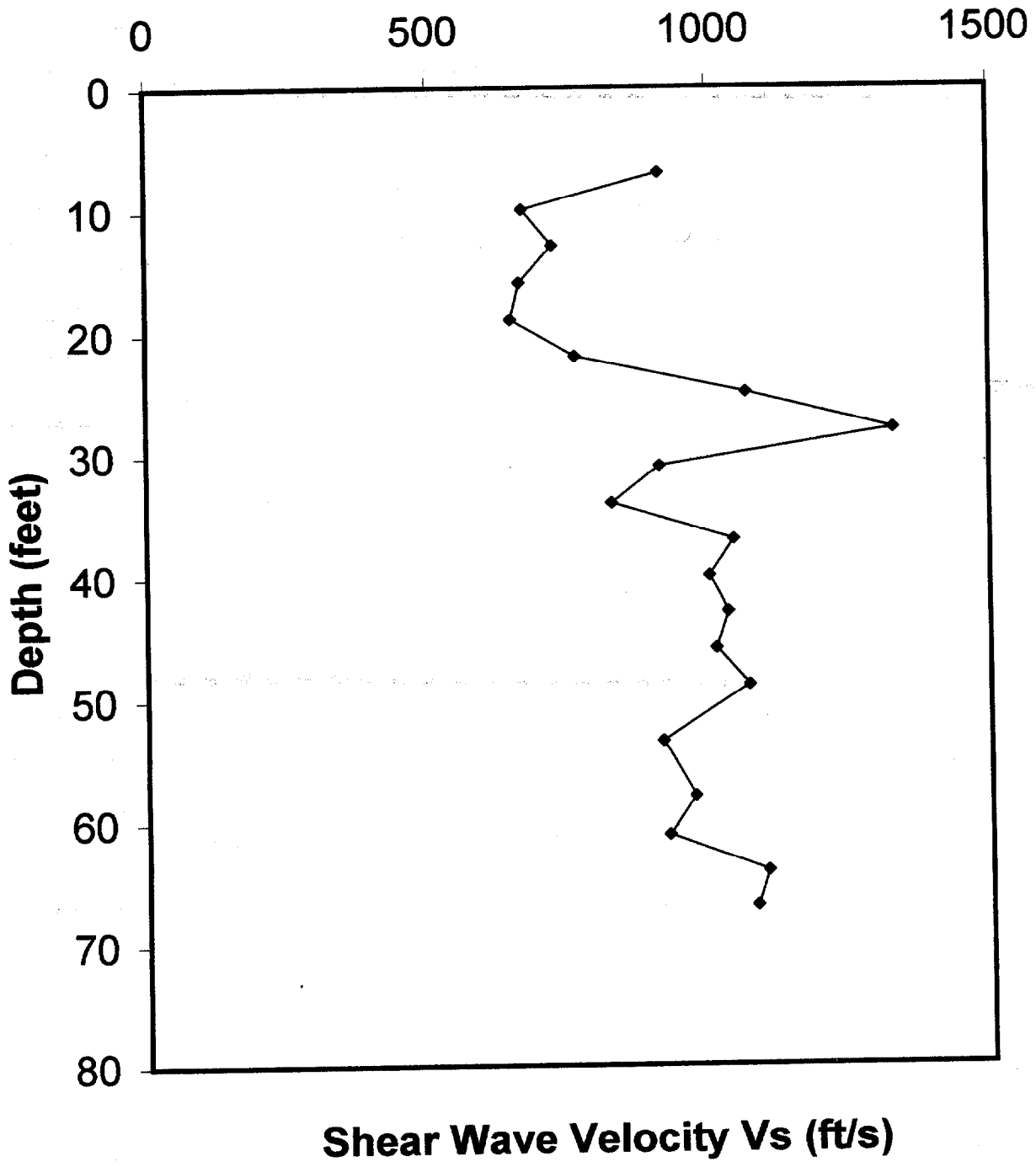
Shear Wave Velocity Calculations
Site 3A Seismic Assessment -- Paducah, Kentucky
CCGT-08

Geophone Offset: 0.66 Feet
Source Offset: 1.67 Feet

Test Depth (feet)	Geophone Depth (feet)	Ray Path (feet)	Incremental Distance (feet)	Time Interval (ms)	Interval Velocity (ft/s)	Interval Depth (feet)
6.04	5.38	5.64				
9.05	8.39	8.56	2.92	3.19	915.9	6.89
12.00	11.34	11.47	2.91	4.33	671.6	9.87
15.02	14.36	14.46	2.99	4.13	725.1	12.85
18.04	17.38	17.46	3.00	4.51	665.9	15.87
20.99	20.33	20.40	2.94	4.52	650.1	18.86
24.01	23.35	23.41	3.01	3.94	764.3	21.84
27.03	26.37	26.43	3.01	2.82	1068.5	24.86
30.04	29.38	29.43	3.00	2.26	1329.5	27.88
32.96	32.30	32.35	2.92	3.19	914.0	30.84
36.08	35.42	35.46	3.12	3.76	828.8	33.86
39.03	38.37	38.41	2.95	2.82	1045.0	36.90
42.05	41.39	41.43	3.02	3.01	1002.4	39.88
44.97	44.31	44.35	2.92	2.82	1034.7	42.85
48.02	47.36	47.39	3.05	3.01	1012.6	45.84
51.04	50.38	50.41	3.02	2.82	1070.3	48.87
57.07	56.41	56.44	6.03	6.58	916.0	53.40
59.99	59.33	59.36	2.92	3.00	972.9	57.87
63.47	62.81	62.84	3.48	3.76	925.2	61.07
65.96	65.30	65.33	2.49	2.26	1101.4	64.06
69.01	68.35	68.37	3.05	2.82	1081.2	66.83

GREGG

Shear Wave Velocity Profile
Site 3A Seismic Assessment -- Paducah
CCGT-08



GREGG

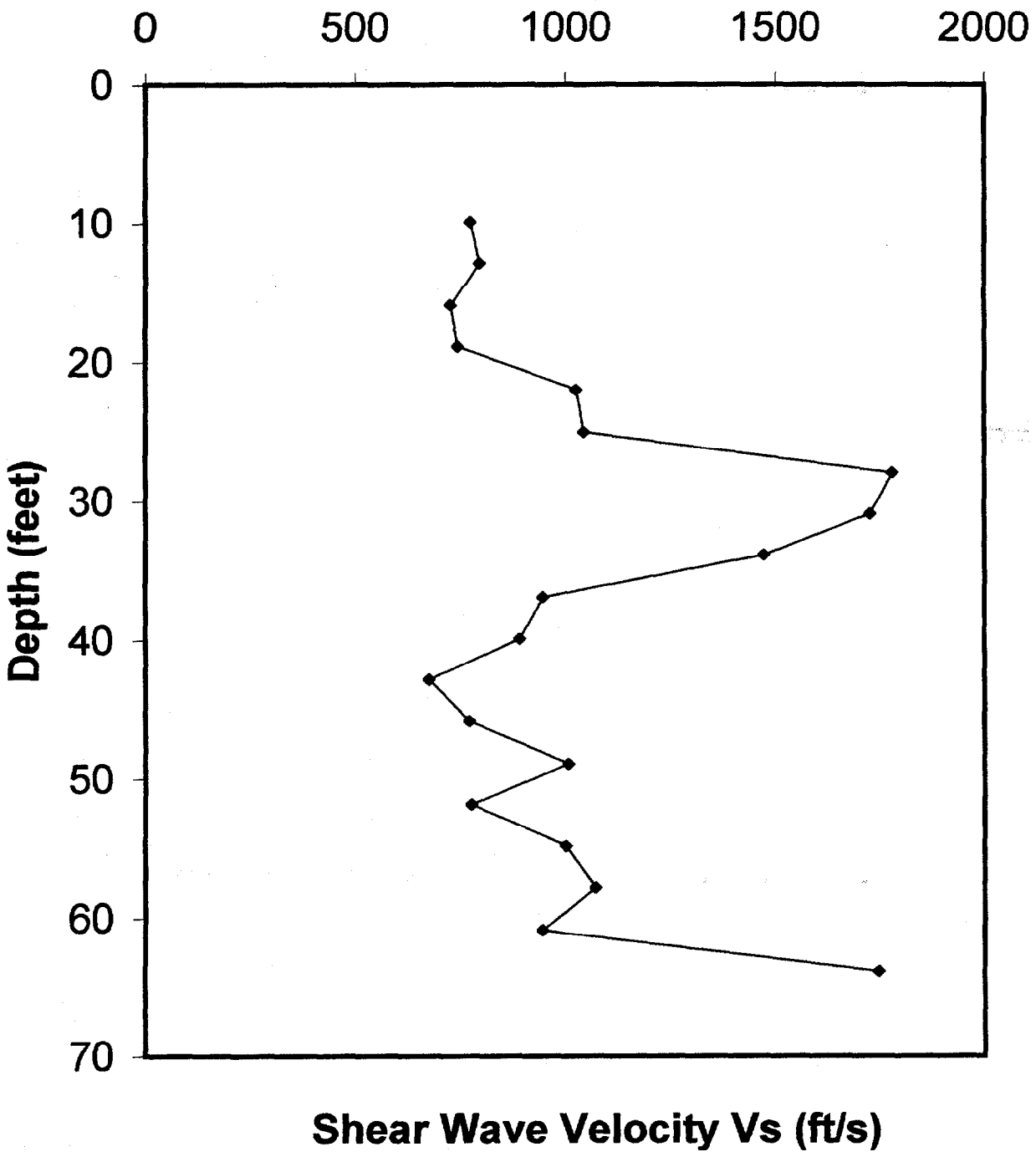
Shear Wave Velocity Calculations
Site 3A Seismic Assessment -- Paducah, Kentucky
CCGT-SC09A

Geophone Offset: 0.66 Feet
Source Offset: 1.67 Feet

Test Depth (feet)	Geophone Depth (feet)	Ray Path (feet)	Incremental Distance (feet)	Time Interval (ms)	Interval Velocity (ft/s)	Interval Depth (feet)
9.05	8.39	8.56				
12.00	11.34	11.47	2.91	3.76	773.4	9.87
15.02	14.36	14.46	2.99	3.76	796.4	12.85
18.04	17.38	17.46	3.00	4.13	727.2	15.87
20.99	20.33	20.40	2.94	3.95	743.9	18.86
24.27	23.61	23.67	3.27	3.19	1025.3	21.97
27.03	26.37	26.43	2.75	2.64	1043.1	24.99
30.04	29.38	29.43	3.00	1.69	1777.9	27.88
32.96	32.30	32.35	2.92	1.69	1725.3	30.84
36.01	35.35	35.39	3.05	2.07	1471.6	33.83
39.03	38.37	38.41	3.02	3.19	945.7	36.86
42.05	41.39	41.43	3.02	3.39	890.1	39.88
44.97	44.31	44.35	2.92	4.32	675.4	42.85
48.02	47.36	47.39	3.05	3.95	771.6	45.84
51.04	50.38	50.41	3.02	3.00	1006.1	48.87
53.96	53.30	53.33	2.92	3.76	776.2	51.84
56.97	56.31	56.34	3.01	3.01	999.5	54.81
59.99	59.33	59.36	3.02	2.82	1070.5	57.82
63.01	62.35	62.38	3.02	3.20	943.4	60.84
65.96	65.30	65.33	2.95	1.69	1745.0	63.83

GREGG

Shear Wave Velocity Profile
Site 3A Seismic Assessment -- Paducah
CCGT-SC09A



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Shear Wave Velocity Calculations

Site 3A Seismic Assessment -- Paducah, Kentucky

SCPT-560L2 (SC-10)

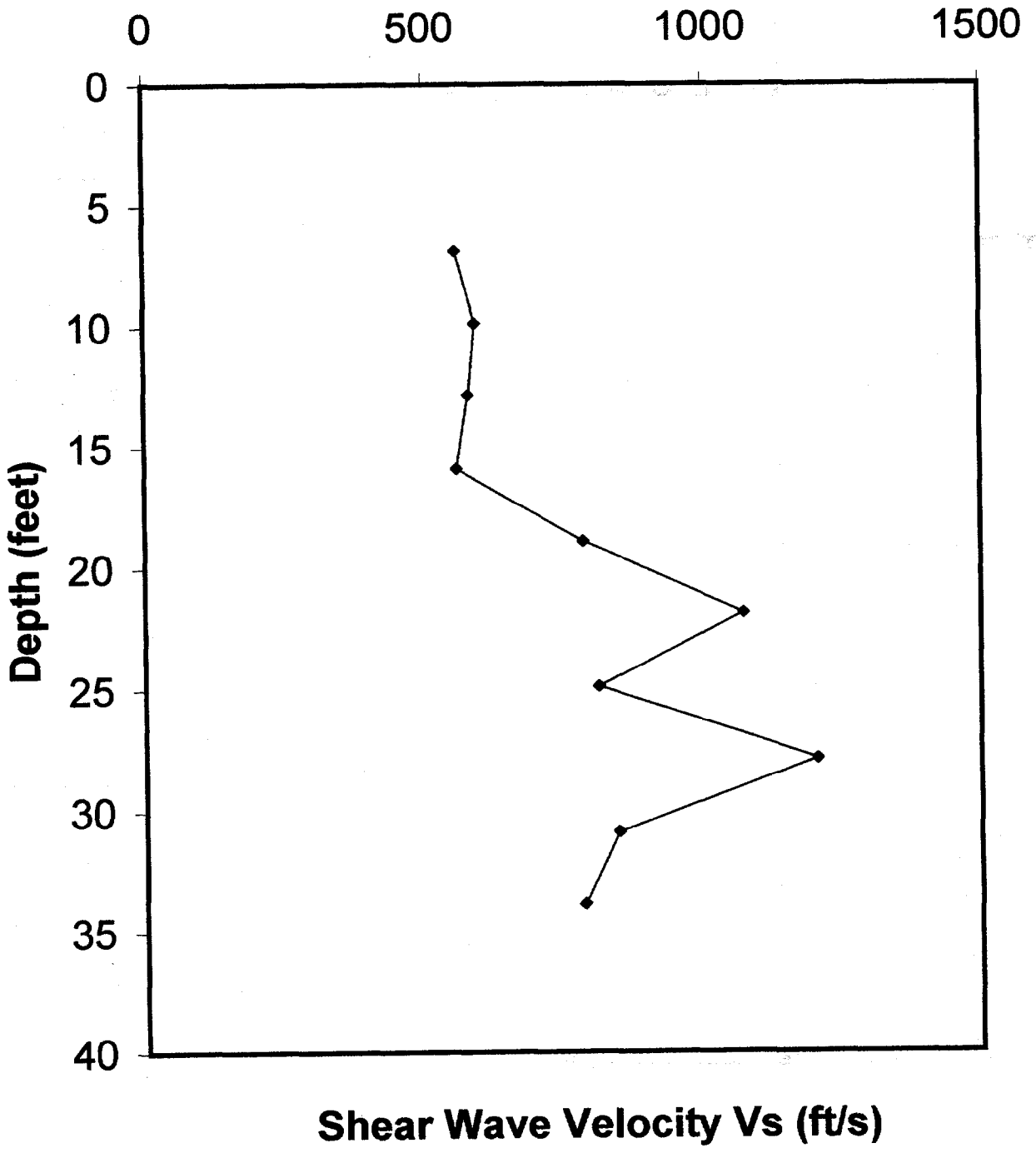
Geophone Offset: 0.66 Feet

Source Offset: 0.46 Feet

Test Depth (feet)	Geophone Depth (feet)	Ray Path (feet)	Incremental Distance (feet)	Time Interval (ms)	Interval Velocity (ft/s)	Interval Depth (feet)
6.07	5.41	5.43				
9.02	8.36	8.38	2.94	5.26	559.5	6.89
12.04	11.38	11.39	3.02	5.08	593.8	9.87
14.99	14.33	14.34	2.95	5.07	581.5	12.86
18.04	17.38	17.39	3.05	5.45	559.4	15.86
20.99	20.33	20.34	2.95	3.76	784.3	18.86
24.01	23.35	23.36	3.02	2.82	1070.7	21.84
27.06	26.40	26.41	3.05	3.76	811.0	24.88
30.01	29.35	29.36	2.95	2.45	1203.9	27.88
33.03	32.37	32.38	3.02	3.57	845.8	30.86
35.98	35.32	35.33	2.95	3.76	784.5	33.85

GREGG

Shear Wave Velocity Profile
Site 3A Seismic Assessment -- Paducah
SCPT-560L2 (SC-10)



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Shear Wave Velocity Calculations

Site 3A Seismic Assessment -- Paducah, Kentucky

SCPT-SB04

Geophone Offset: 0.66 Feet

Source Offset: 0.46 Feet

Test Depth (feet)	Geophone Depth (feet)	Ray Path (feet)	Incremental Distance (feet)	Time Interval (ms)	Interval Velocity (ft/s)	Interval Depth (feet)
6.07	5.41	5.43				
9.02	8.36	8.38	2.94	5.27	558.5	6.89
12.04	11.38	11.39	3.02	6.20	486.6	9.87
14.99	14.33	14.34	2.95	5.64	522.7	12.86
18.04	17.38	17.39	3.05	6.58	463.3	15.86
20.99	20.33	20.34	2.95	5.26	560.7	18.86
24.01	23.35	23.36	3.02	3.76	803.0	21.84
27.06	26.40	26.41	3.05	3.20	953.0	24.88
30.01	29.35	29.36	2.95	3.57	826.2	27.88
33.03	32.37	32.38	3.02	3.19	946.6	30.86
34.83	34.17	34.18	1.80	1.88	957.4	33.27

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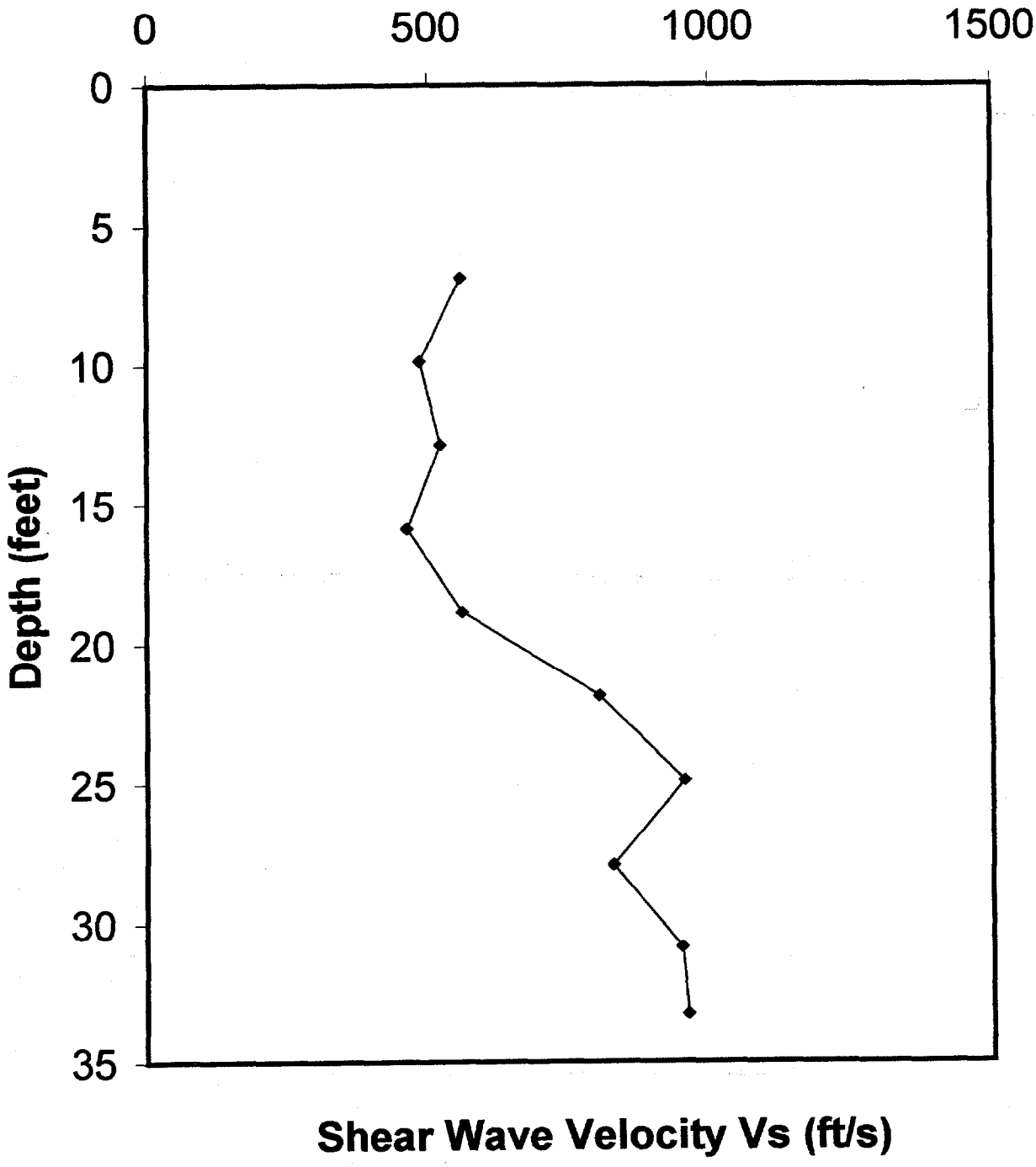
Shear Wave Velocity Profile
Site 3A Seismic Assessment -- Paducah
SCPT-SB04



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Shear Wave Velocity Calculations

Site 3A Seismic Assessment -- Paducah, Kentucky

SCPT-SB07

Geophone Offset: 0.66 Feet

Source Offset: 0.46 Feet

Test Depth (feet)	Geophone Depth (feet)	Ray Path (feet)	Incremental Distance (feet)	Time Interval (ms)	Interval Velocity (ft/s)	Interval Depth (feet)
6.13	5.47	5.49				
9.02	8.36	8.38	2.88	5.27	547.1	6.92
12.04	11.38	11.39	3.02	5.45	553.5	9.87
14.99	14.33	14.34	2.95	4.13	713.8	12.86
17.71	17.05	17.06	2.72	2.82	964.1	15.69

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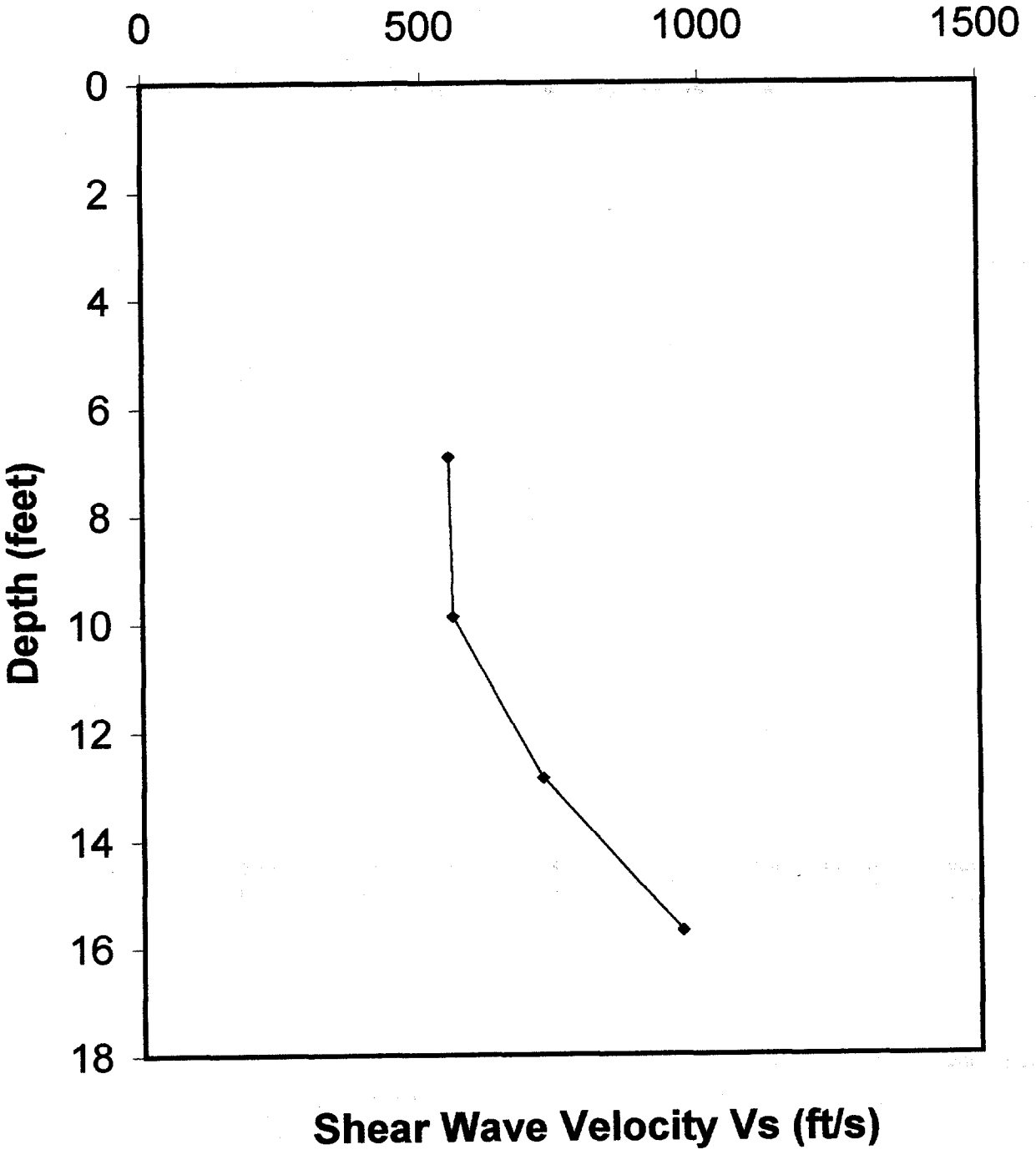
Shear Wave Velocity Profile
Site 3A Seismic Assessment -- Paducah
SCPT-SB07



APPENDIX E

DATA DISKETTE

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Electronic File Summary
United States Energy Center
Paducah, Kentucky

File	Sounding	Date	Depth
023CS01	CCGT-SC01	2/15/2002	59.12
023CS02	CCGT-02	2/14/2002	61.42
023CS03	CCGT-03	2/14/2002	51.97
023CS04	CCGT-04	2/14/2002	70.01
023CS05	CCGT-SC05	2/15/2002	54.07
023CS08	CCGT-08	2/13/2002	69.03
023CS09	CCGT-SC09	2/13/2002	6.76
023CS09A	CCGT-SC09A	2/13/2002	66.01
023CS11	SCPT-340L3	3/5/2002	51.05
023CS12	SCPT-340L2	3/6/2002	51.02
023CS13	SCPT-560L2	3/6/2002	37.96
023CS14	SCPT-SB07	3/7/2002	17.72
023CS14A	SCPT-SB07A	3/7/2002	16.49
023CS15	SCPT-SB04	3/7/2002	34.86

All depths referenced in feet from the existing ground surface.

ATTACHMENT E-VI

^{14}C AGE DATING LABORATORY ANALYSES

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Fax: 305 663 0964
beta@radiocarbon.com
www.radiocarbon.com

MR. DARDEN HOOD
Director

Mr. Ronald Hatfield
Mr. Christopher Patrick
Deputy Directors

April 29, 2002

INFORMATION ONLY

Ms. Kay Dabney
United States Enrichment Corporation
Paducah Gaseous Diffusion Plant
P.O. Box 1410
Paducah, KY 42001
USA

RE: Radiocarbon Dating Results For Samples CCFRD460-1, CCFRD560-1, CCFRD610-1, CCFRD736-1, CCFRD736-2, CCGTD440L2, CCGTD500L2, CCGTD620L3, CCGTD670L3, CCGTSB03C04, CCGTSB03C36, CCGTSB06C11

Dear Ms. Dabney:

Enclosed are the radiocarbon dating results for 12 samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses went normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Our invoice has been sent separately. Our copy is enclosed. Thank you for your prior efforts in arranging payment. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

UNIVERSITY BRANCH
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667 5167 FAX: 305/663-096
E MAIL: beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Ms. Kay Dabney

Report Date: 4/29/02

United States Enrichment Corporation

INFORMATION ONLY

Material Received: 4/12/02

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 166595	1160 +/- 40 BP	-23.0 o/oo	1190 +/- 40 BP
SAMPLE : CCFRD460-1			
ANALYSIS : AMS-Advance delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal AD 720 to 740 (Cal BP 1230 to 1210) AND Cal AD 760 to 960 (Cal BP 1190 to 990)			
Beta - 166596	9160 +/- 50 BP	-22.6 o/oo	9200 +/- 50 BP
SAMPLE : CCFRD560-1			
ANALYSIS : AMS-Advance delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal BC 8560 to 8280 (Cal BP 10510 to 10230)			
Beta - 166598	7230 +/- 40 BP	-23.4 o/oo	7260 +/- 40 BP
SAMPLE : CCFRD610-1			
ANALYSIS : AMS-Advance delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal BC 6220 to 6020 (Cal BP 8160 to 7970)			
Beta - 166599	11130 +/- 60 BP	-22.5 o/oo	11170 +/- 60 BP
SAMPLE : CCFRD736-1			
ANALYSIS : AMS-Advance delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal BC 11440 to 11290 (Cal BP 13390 to 13240) AND Cal BC 11270 to 11040 (Cal BP 13220 to 12990)			
Beta - 166600	10760 +/- 50 BP	-22.6 o/oo	10800 +/- 50 BP
SAMPLE : CCFRD736-2			
ANALYSIS : AMS-Advance delivery			
MATERIAL/PRETREATMENT : (organic sediment): acid washes			
2 SIGMA CALIBRATION : Cal BC 11040 to 10850 (Cal BP 12990 to 12800) AND Cal BC 10790 to 10690 (Cal BP 12740 to 12640)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By international convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

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4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663 0964
E MAIL . beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Ms. Kay Dabney

INFORMATION ONLY

Report Date: 4/29/02

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 166602 SAMPLE : CCGTD440L2 ANALYSIS : AMS-Advance delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 14750 to 14000 (Cal BP 16700 to 15950)	13540 +/- 60 BP	-23.3 o/oo	13570 +/- 60 BP
Beta - 166603 SAMPLE : CCGTD500L2 ANALYSIS : AMS-Advance delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 2400 to 2380 (Cal BP 4350 to 4330) AND Cal BC 2360 to 2120 (Cal BP 4300 to 4060) Cal BC 2100 to 2040 (Cal BP 4050 to 3990)	3770 +/- 50 BP	-23.5 o/oo	3790 +/- 50 BP
Beta - 166604 SAMPLE : CCGTD620L3 ANALYSIS : AMS-Advance delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 15100 to 14340 (Cal BP 17050 to 16300)	13850 +/- 60 BP	-22.2 o/oo	13900 +/- 60 BP
Beta - 166605 SAMPLE : CCGTD670L3 ANALYSIS : AMS-Advance delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 17220 to 16330 (Cal BP 19170 to 18280)	15620 +/- 70 BP	-22.2 o/oo	15670 +/- 70 BP
Beta - 166606 SAMPLE : CCGTSB03C04 ANALYSIS : AMS-Advance delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 2910 to 2860 (Cal BP 4860 to 4810) AND Cal BC 2810 to 2750 (Cal BP 4760 to 4700) Cal BC 2720 to 2700 (Cal BP 4670 to 4650)	4190 +/- 40 BP	-22.1 o/oo	4240 +/- 40 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By international convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

BETA

BETA ANALYTIC INC.

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E MAIL: beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Ms. Kay Dabney

INFORMATION ONLY

Report Date: 4/29/02

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 166607 SAMPLE : CCGTSB03C36 ANALYSIS : AMS-Advance delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 6220 to 6040 (Cal BP 8170 to 7990)	7230 +/- 40 BP	-21.9 o/oo	7280 +/- 40 BP
Beta - 166608 SAMPLE : CCGTSB06C11 ANALYSIS : AMS-Advance delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 5760 to 5650 (Cal BP 7710 to 7600)	6790 +/- 40 BP	-22.8 o/oo	6830 +/- 40 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By international convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

APPENDIX F

SOIL AMPLIFICATION FACTORS

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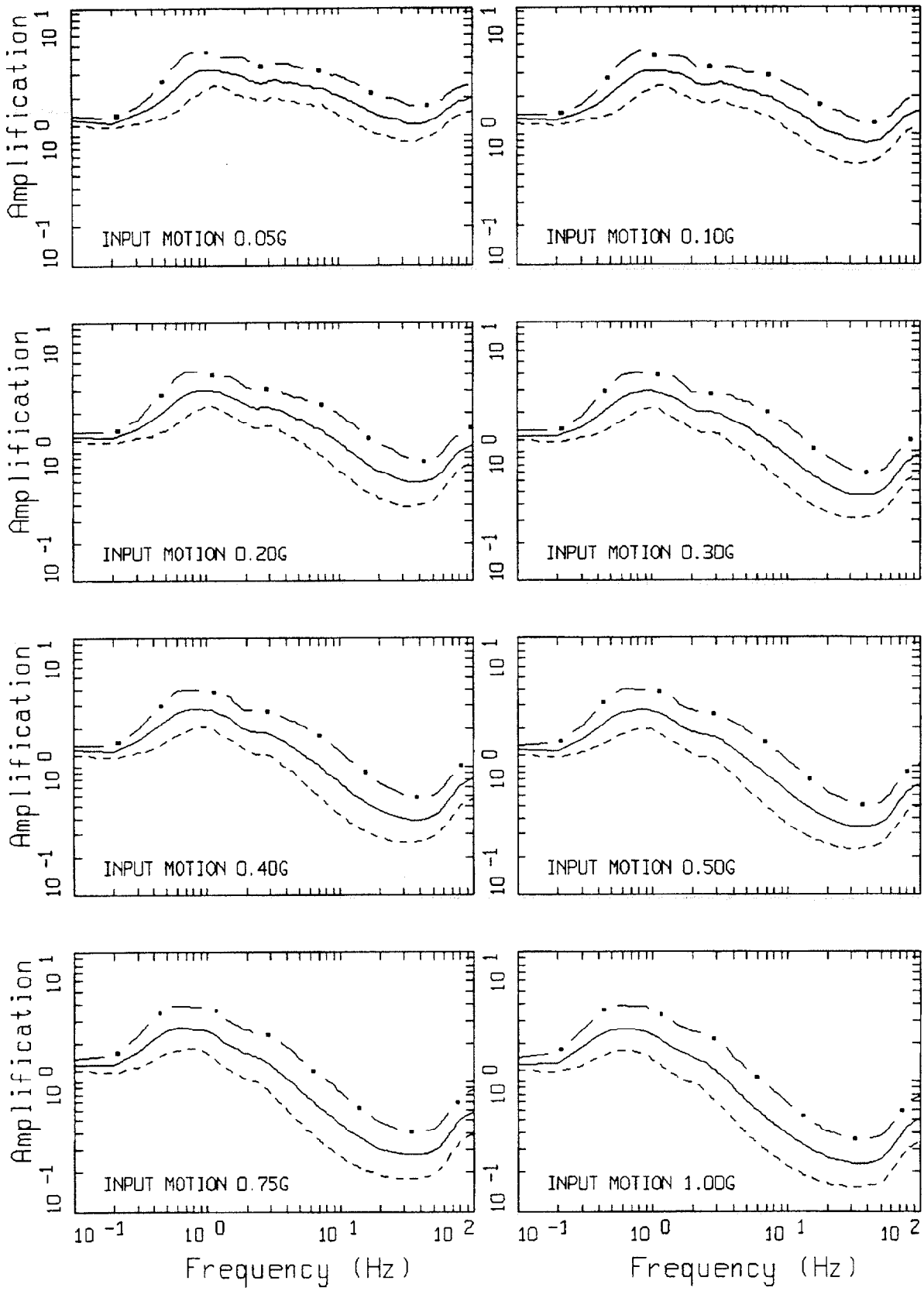
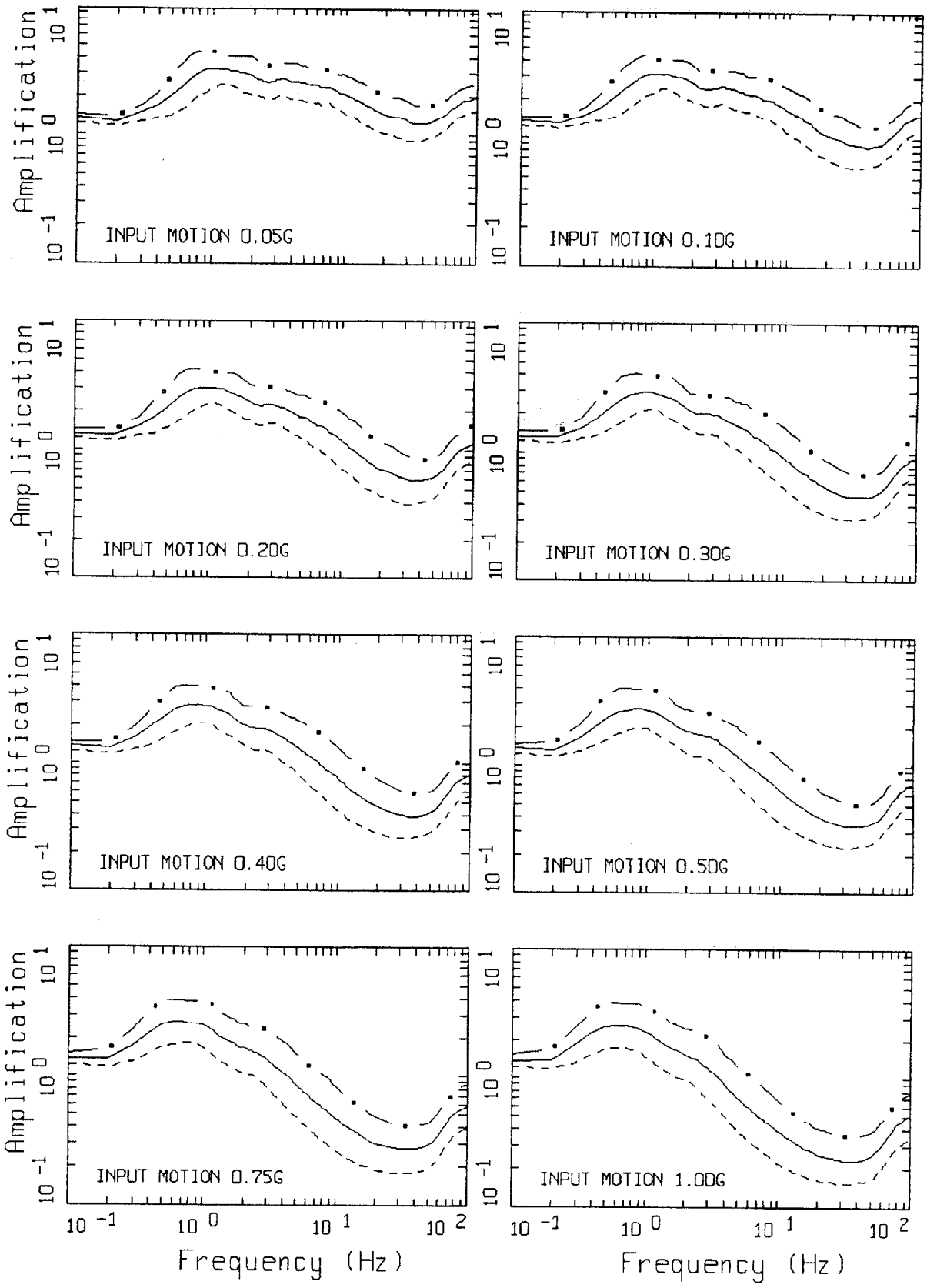
APPENDIX F-SECTION 1

SOIL AMPLIFICATION FACTORS AS A FUNCTION OF FREQUENCY FOR GIVEN PGA VALUES AT TOP OF ROCK



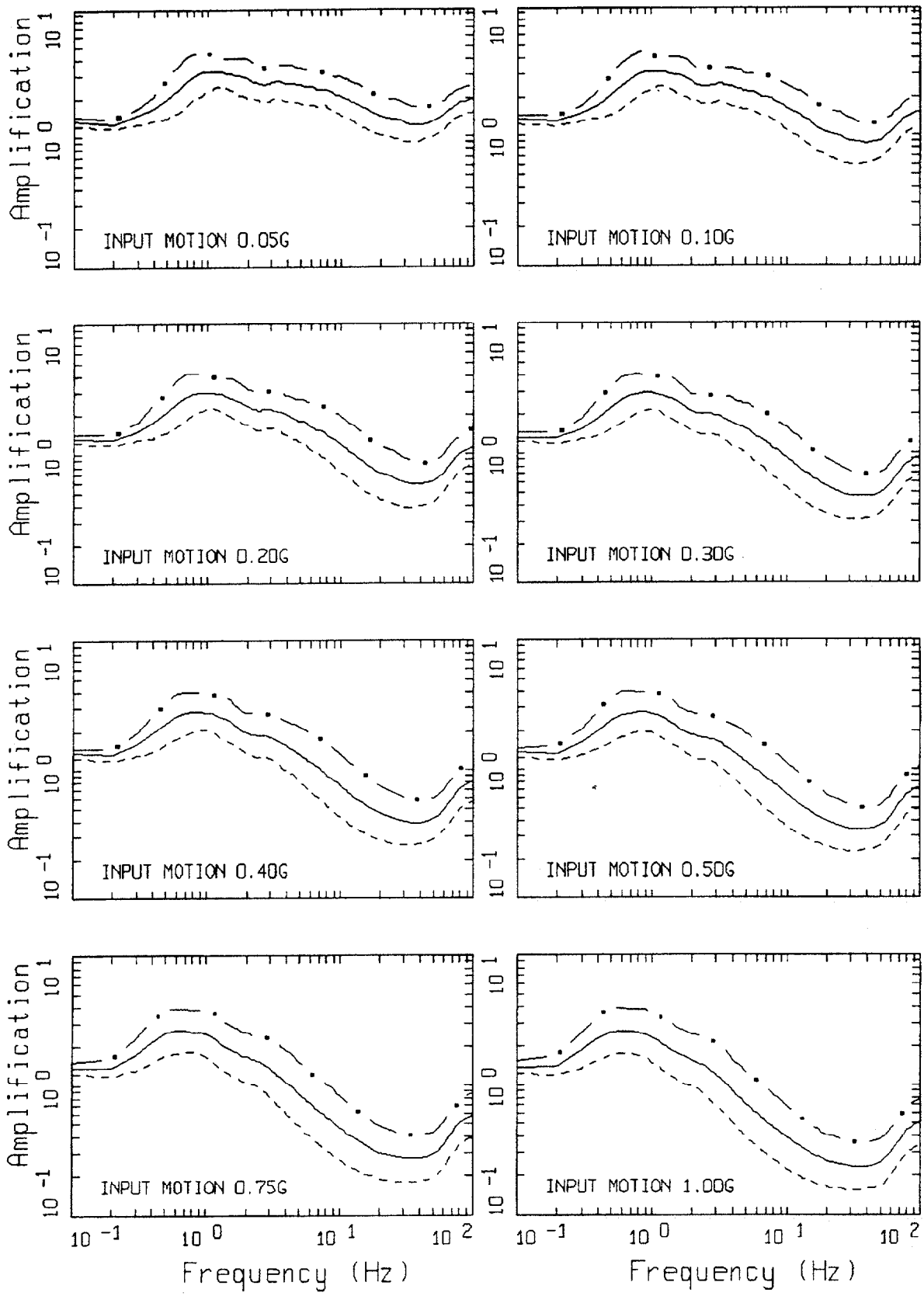
PADUCAH 2, EPRI NONLINEAR PROPERTIES

M = 5.5



PADUCAH 2, EPRI NONLINEAR PROPERTIES

M = 6.5



PADUCAH 2, EPRI NONLINEAR PROPERTIES

M = 7.5

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APPENDIX F-SECTION 2

ROCK SPECTRA TO SOIL SPECTRA AMPLIFICATION FACTORS AS A FUNCTION OF FREQUENCY

Note: To determine the top-of- soil PGA interpolate in the 100hz (highlighted yellow section) between a PSA(peak spectral acceleration) of 0.546878g with an amp value of 0.7599205 and a PSA of 0.8261898g with an amp value of 0.063636318 for a PSA of 0.712200g top-of-rock PGA(PSA =PGA at 100 Hz) yielding an amp value of 0.6808 for a top-of-rodk PGA gives a top-of-soil value PGA equal to 0.4849g.

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7.5 Mag Paducah

Frequency	Rock PSA (g)	Median Amp Factor	My PSA Values	PGA
0.5	3.175069E-02	1.845672E+00	2.033137E-02	5.000000E-02
0.5	4.889820E-02	1.920744E+00	4.066274E-02	1.000000E-01
0.5	8.309241E-02	2.034808E+00	8.132547E-02	2.000000E-01
0.5	1.163459E-01	2.138353E+00	1.219882E-01	3.000000E-01
0.5	1.506772E-01	2.233414E+00	1.626509E-01	4.000000E-01
0.5	1.817755E-01	2.289450E+00	2.033137E-01	5.000000E-01
0.5	2.627427E-01	2.351613E+00	3.049705E-01	7.500000E-01
0.5	3.421000E-01	2.322239E+00	4.066274E-01	1.000000E+00
1.0	4.861878E-02	3.149269E+00	3.334035E-02	5.000000E-02
1.0	7.760187E-02	3.066683E+00	6.668071E-02	1.000000E-01
1.0	1.334299E-01	2.958339E+00	1.333614E-01	2.000000E-01
1.0	1.877707E-01	2.851164E+00	2.000421E-01	3.000000E-01
1.0	2.438914E-01	2.719987E+00	2.667228E-01	4.000000E-01
1.0	2.947332E-01	2.606194E+00	3.334035E-01	5.000000E-01
1.0	4.271229E-01	2.392655E+00	5.001053E-01	7.500000E-01
1.0	5.568939E-01	2.156635E+00	6.668071E-01	1.000000E+00
2.5	7.574971E-02	2.442945E+00	5.805954E-02	5.000000E-02
2.5	1.281061E-01	2.287793E+00	1.161191E-01	1.000000E-01
2.5	2.260058E-01	2.042751E+00	2.322381E-01	2.000000E-01
2.5	3.215675E-01	1.866560E+00	3.483572E-01	3.000000E-01
2.5	4.203543E-01	1.726892E+00	4.644763E-01	4.000000E-01
2.5	5.098925E-01	1.633179E+00	5.805954E-01	5.000000E-01
2.5	7.431434E-01	1.410004E+00	8.708930E-01	7.500000E-01
2.5	9.718607E-01	1.242753E+00	1.161191E+00	1.000000E+00
5.0	9.613443E-02	2.349597E+00	8.337546E-02	5.000000E-02
5.0	1.732902E-01	2.040879E+00	1.667509E-01	1.000000E-01
5.0	3.152667E-01	1.654685E+00	3.335018E-01	2.000000E-01
5.0	4.545255E-01	1.393200E+00	5.002527E-01	3.000000E-01
5.0	5.987557E-01	1.170839E+00	6.670037E-01	4.000000E-01
5.0	7.295755E-01	1.009418E+00	8.337546E-01	5.000000E-01
5.0	1.070605E+00	7.807432E-01	1.250632E+00	7.500000E-01
5.0	1.405157E+00	6.417505E-01	1.667509E+00	1.000000E+00
10.0	1.083323E-01	1.909741E+00	9.927689E-02	5.000000E-02
10.0	2.136216E-01	1.503280E+00	1.985538E-01	1.000000E-01
10.0	4.065566E-01	1.071157E+00	3.971076E-01	2.000000E-01
10.0	5.976183E-01	8.338418E-01	5.956613E-01	3.000000E-01
10.0	7.962075E-01	6.809252E-01	7.942151E-01	4.000000E-01
10.0	9.766328E-01	5.849405E-01	9.927689E-01	5.000000E-01
10.0	1.447667E+00	4.483090E-01	1.489153E+00	7.500000E-01
10.0	1.910137E+00	3.707018E-01	1.985538E+00	1.000000E+00
25.0	9.627361E-02	1.443828E+00	1.205139E-01	5.000000E-02
25.0	2.232781E-01	9.809329E-01	2.410278E-01	1.000000E-01
25.0	4.641300E-01	6.505125E-01	4.820556E-01	2.000000E-01
25.0	7.091934E-01	5.057312E-01	7.230834E-01	3.000000E-01
25.0	9.666049E-01	4.199467E-01	9.641112E-01	4.000000E-01
25.0	1.201694E+00	3.684828E-01	1.205139E+00	5.000000E-01
25.0	1.817952E+00	2.946780E-01	1.807709E+00	7.500000E-01

25.0	2.424747E+00	2.509946E-01	2.410278E+00	1.000000E+00
34.0	8.494631E-02	1.455188E+00	1.168913E-01	5.000000E-02
34.0	2.076712E-01	9.398859E-01	2.337967E-01	1.000000E-01
34.0	4.471155E-01	6.216614E-01	4.675934E-01	2.000000E-01
34.0	6.943837E-01	4.864644E-01	7.013901E-01	3.000000E-01
34.0	9.556755E-01	4.058624E-01	9.351868E-01	4.000000E-01
34.0	1.195004E+00	3.573998E-01	1.168983E+00	5.000000E-01
34.0	1.823941E+00	2.874819E-01	1.753475E+00	7.500000E-01
34.0	2.444222E+00	2.456304E-01	2.337967E+00	1.000000E+00
100.0	5.158478E-02	2.121206E+00	5.000000E-02	
100.0	1.069183E-01	1.619114E+00	1.000000E-01	
100.0	2.143678E-01	1.196609E+00	2.000000E-01	
100.0	3.244475E-01	9.854512E-01	3.000000E-01	
100.0	4.405672E-01	8.476553E-01	4.000000E-01	
100.0	5.468780E-01	7.599205E-01	5.000000E-01	
100.0	8.261898E-01	6.263618E-01	7.500000E-01	
100.0	1.101662E+00	5.419517E-01	1.000000E+00	