Exhibit U –
Franklin Farm
Geotechnical Report

Franklin Farm Geotechnical Report

PRELIMINARY GEOTECHNICAL INVESTIGATION
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

Report To

Denmon Engineering
Monroe, Louisiana

January 24, 2008

Denmon Engineering
114 Venable Lane
Monroe, Louisiana 71203

Report No. 070556

Attention: Randy Denmon, P.E.

Preliminary Geotechnical Investigation
Richland Parish Megasite
Richland Parish, Louisiana

Gentlemen:

Submitted here is the report of our preliminary geotechnical investigation for the above-captioned project. This investigation was authorized on July 19, 2007, by Mr. Randy Denmon.

We appreciate the opportunity to be of service. If you should have any questions concerning this report, please do not hesitate to call us.

Very truly yours,

BURNS COOLEY DENNIS, INC.

Richard L. Curtis, P.E.

Larry A. Cooley, P.E.

LAC/RLC/khb
Copies Submitted: (4)

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1.0 INTRODUCTION

1.1 Project Description

The Northeast Louisiana Economic Alliance is exploring alternatives for developing a site for a large manufacturing facility. The site being explored is an approximately 1,400-acre parcel located north of Interstate 20 and U.S. Highway 80 near Holly Ridge, Louisiana. The general site location is shown on Figure 1 of this report. State Route 183 borders the property to the east, Smalling Road borders the property to the north, and Jaggers Lane borders the property to the west. Drainage is generally to the south with West Fork Creek running through the northern and eastern portions of the site as shown on USGS Topographic mapping. Based on a review of available USGS topographic information, we estimate that the ground surface within the property ranges from approximately El. 85 ft to El. 80 ft. Details regarding specific structure sizes, structure locations, finished grades, and other site grading requirements have not been established at this time.

Our understanding of a "Megasite" development for possible manufacturing is based on experience with the Nissan automotive project in Mississippi and numerous other site studies for potential large industrial projects. We anticipate that the facility will include a large building pad area of approximately 1.5 million to 2 million sq ft. We expect that the facility can consist of a moderately to heavily loaded structure, including various shallow pits of limited area and relatively large 20-ft or so deep vaults. Relatively heavy and dynamically loaded machinery may also be utilized. Plans would likely be to obtain borrow fill materials from the site if an adequate quantity of suitable soils could be located. A detention basin is likely, and could potentially be located within borrow area(s). Railroad spur track(s) will likely be constructed near the facility. An elevated water storage tank and water and wastewater treatment plants will also likely be situated adjacent to the facility. An electrical substation may also be located within the site to serve the powerhouse of the facility. A plan illustrating the approximate site boundaries on the USGS Topographic map is presented on Figure 2 of this report.

1.2 Purposes

The specific purposes of this investigation were:

1) to make forty (40) exploratory soil borings to completion depths of 25 ft, 50 ft and 125 ft spaced evenly across the site;

2) to verify field classifications and to evaluate pertinent physical properties of the soils encountered in the borings by visual examination of the soil samples and routine laboratory testing; and

6) after analysis of the soil boring and laboratory test data, to provide preliminary recommendations for support of a large manufacturing facility and other geotechnical-related design issues.

2.0 FIELD EXPLORATION

2.1 General

Forty exploratory soil borings were made to depths of 25 ft, 50 ft, and 125 ft by Burns Cooley Dennis, Inc. Denmon Engineering provided a drawing showing the approximate site boundaries superimposed upon an aerial photograph. Widely spaced boring locations were chosen to provide a general understanding of the subsurface stratigraphy across the project site. A hand-held global positioning system device was utilized to determine approximate boring locations in the field. The ground surface elevations were not determined. The approximate boring locations are superimposed upon the USGS topographic map presented on Figure 2 of this report.

All soils were classified in general accordance with the Unified Soil Classification System. A synopsis of the Unified Soil Classification System is presented on Figure 3 to assist in interpreting the soil symbols depicted by the graphic logs and stick log profiles. Graphic log representations of Borings 1 through 40 are presented as Figures A-1 through A-42 in Appendix A.

2.2 Drilling Methods and Piezometer Installation

The borings were advanced full-depth using rotary wash drilling procedures. Drilling fluid levels were not considered indicative of groundwater conditions and, therefore, were not monitored. The groundwater conditions were monitored during the course of our investigation by setting temporary piezometers in the boreholes for Borings 1, 5, 18, 36 and 40. The temporary piezometers consisted of PVC pipe with slots cut in the lower 2 ft of the pipe and were set to the bottoms of the boreholes. The temporary piezometers were removed from the boreholes at the end of our field investigation and the boreholes were grouted full-depth as described subsequently in this section.

2.3 Sampling Methods

Split-spoon samples of the soils encountered were obtained at approximate 2.5-ft to 5-ft depth intervals by driving a standard 2-in. OD split-spoon sampler 18 in. into the soil with a 140-lb hammer falling freely a distance of 30 inches. The split-spoon samples were obtained within the depth intervals illustrated as crossed rectangular symbols under the "Samples" column of the graphic boring log. Standard penetration test (SPT) blow counts resulting from split-spoon sampling are recorded under the "Blows Per Ft" column of the graphic log.

2.4 Field Classifications, Sample Preservation, and Borehole Completion

All soils encountered during drilling were examined and classified in the field by a geotechnical engineering technician. Representative portions of each split-spoon sample were sealed in pint-sized jars to provide material for visual examination and testing in the laboratory. In accordance with Louisiana Department of Transportation and Development requirements, the boreholes were filled from bottom-to-top with pumped-in bentonite-cement grout after completion of drilling and sampling.

3.0 LABORATORY TESTING

3.1 General

An evaluation of the classification, strength and volume change properties of the subsurface soils encountered in the borings was considered to be of primary importance for this investigation. These properties were evaluated by visual examination, the standard penetration test results and from results of the laboratory tests described in the following paragraphs. In addition to the laboratory tests described, all samples were visually examined and classified in the laboratory by a geotechnical engineer.

3.2 Classification Tests

3.2.1 Atterberg Limit Tests. The classifications and volume change properties of fine-grained soils encountered in the borings were investigated by means of 45 sets of Atterberg liquid and plastic limit tests. The results of the liquid and plastic limit tests are plotted as small crosses interconnected by dashed lines in the data section of the graphic boring logs. In accordance with the Unified Soil Classification System, fine-grained soils are classified as either clays or silts of low or high plasticity based on the results of liquid and plastic limit tests. The numerical difference between the liquid limit and plastic limit is defined as the plasticity index (PI). The magnitudes of the liquid limit and plasticity index and the proximity of the natural water content to the plastic limit are indicators of the potential for a fine-grained soil to shrink or swell upon changes in moisture content or to consolidate under loading. They also qualitatively provide an indication of the strength and permeability of fine-grained soils.

3.2.2 Grain Size Tests. The grain size characteristics of the coarse-grained soils were investigated by means of 17 mechanical sieve analyses and 22 determinations of the percent passing the No. 200 sieve. The results of the sieve analyses are presented as grain size distribution curves on Figures B-1 through B-17 in Appendix B. The percent passing the No. 200 sieve resulting from both the full and partial sieve analyses are tabulated in the far right column of the graphic boring logs.

3.3 Water Content Tests

One-hundred and fifteen (115) water content tests were performed to corroborate field classifications and to extend the usefulness of the standard penetration tests and plasticity data. The results of the water content tests are plotted as small shaded circles in the data section of the graphic boring logs. The water content data have been interconnected on the graphic logs to show continuous profiles with depth within the intervals that the tests were performed.

3.4 Strength Properties

The strength properties of the soils encountered were evaluated from standard penetration test results, field and laboratory consistency and relative density estimates, and from the water content and plasticity data.

4.0 GEOLOGY AND GENERAL GROUNDWATER CONDITIONS

4.1 Regional Geology

4.1.1 Geologic Setting. Richland Parish is located in the Gulf Coastal Plain physiographic province of the Mississippi Embayment. Sediments exposed at the surface in the study area are Pleistocene Braided Stream Terraces. The near surface deposits consist of the above sediments and are underlain, in turn, by the Eocene age sediments belonging to the Claiborne group and the Paleocene Midway group of the Tertiary system. Deposits deeper and older than Eocene and Paleocene are not considered relevant to this study (Figure 9).

The topography of the region reflects the surface geology and drainage patterns, which are the results of erosion of Pleistocene age sediments that are present in the region. The site is located on Macon Ridge a north-south trending ridge that is higher than the surrounding fluvial deposits (Figure 10). Macon Ridge is an area of low relief incised by rivers and small streams with their valleys being filled with alluvial and colluvial sediments. The general geology of the project area is illustrated by the geology map presented on Figure 11. The bedrock in Richland Parish is considered to be the Eocene age deposits of the Claiborne Group assigned to the Cockfield formation. The major subsurface structural feature identified in the area is the Monroe uplift. This feature is about 80 miles in diameter and is centered in northeastern Louisiana, southeastern Arkansas, and west-central Mississippi.

The Richland Parish site is located in the central division of an elongated lowland extending from Cairo, Illinois to the Gulf of Mexico which is generally known as the Mississippi River Alluvial Valley. The Tensas Basin lies at the southern end of this division between the Mississippi River and Macon Ridge. Sediments deposited in the alluvial valley are closely associated with the rising and falling of sea level during the Pleistocene Epoch. This change in sea level lowered the base level of the Mississippi Valley rivers and their tributaries allowing scouring and finally deposition of sands, gravels, and cobbles within channels cutting through older alluvial deposits. This resulted in the building of alluvial fans at the mouths of tributary streams and the aggrading or alluviation of the valley. This lowering of sea level also allowed interstream divides to develop and permitted tributary streams to develop their trenches within the alluvial valley. In the Central Divisions, the Arkansas River was cutting a trench west of Macon Ridge along the western margin of the valley while the Mississippi River, at about the same time, was cutting a trench along the eastern valley wall. With melting of the continental ice caps, sea level began to rise causing valley slopes to decrease. This allowed streams to lose their sediment carrying capacity which allowed deposition of their sediment load. This alluviation gradually changed the alluvial valley streams and rivers from a many channel, braided regime to a single channel meandering regime. Macon Ridge is underlain by braided stream deposits that extend to the surface.

4.1.2 Braided Stream Substratum and Topstratum. The deposits that underlie Macon Ridge are generally divided into two units which are defined as a fine-grained topstratum and a coarse-grained substratum. The following paragraphs describe the topstratum and substratum units (Figure 12).

Topstratum As sea level approached its present level, upland tributary streams lost their sediment carrying capacity. This adjustment allowed accelerated deposition of material and the building of alluvial fans at the tributary stream entrance into the valley. The outbuilding and upbuilding of the fan decreased the supply of gravel and increased the deposition of finer material farther out into the alluvial valley creating a cone shaped wedge of material with its apex at the stream entrance into the valley. These deposits were laid down by aggrading streams associated with the earlier development of the Arkansas River deposits within the central division of the alluvial valley. Braided stream deposits occur on Macon Ridge where the project site is located. The braided stream top stratum deposits generally consists of a blanket of well-oxidized, tan or brown silts and clays (CL, CH, ML).

Substratum The substratum consists of a wedge of coarse-grained material deposited during the earlier stage of valley alluviation and continued until streams lost their capacity to carry coarse-grained materials due to the valley slope adjustments. The substratum material is predominately sand and gravel but cobbles may be found near the base of the unit. Immediately below the top stratum the braided deposits consist of fairly well-sorted, fine-grained to medium-grained sands. These are typically tan to brown in color and can locally contain areas of fine-grained channel fill or lacustrine deposits.

4.1.3 Seismic Activity. Richland Parish is located in Zone 1 of the Seismic Activity Map of the Contiguous United States. This zone is identified as an area of minor seismic activity. However, the Parish lies within an area that has been influenced in the past by seismic activity of the New Madrid fault zone. A review was made of the seismic map produced by the U.S. Geological Survey based on work by Algermissen, et. al., in 1990 which shows contours of horizontal acceleration in bedrock due to seismic activity. The map indicates that Richland Parish has a 90 percent probability of not experiencing a seismic event exceeding a horizontal acceleration of 0.06g within a given 250-year period (Figure 13). In historic times, there has been no earthquake activity in the Parish. However, there have been a number of events that have occurred in the state of Louisiana. The closest event recorded was an earthquake in Vicksburg, Mississippi, in 1941. In 1811-1812, at least four major earthquakes occurred in the New Madrid seismic zone over a period of three months with a maximum intensity ranging from X to XII or a magnitude (Mb) ranging from 7.0 to 7.3. This event was felt over most of the central and eastern United States and in northern Louisiana where it is estimated to have had an intensity of V-VI. Stevenson and McCulloh summarized the Louisiana earthquake data in an article published in 2001.

4.2 Site Geology and Soil Conditions

The site is located near the community of Holly Ridge along Highway 183 one mile north of Highway 80. Physiographically, the site is located within the Macon Ridge of the central division of the Mississippi Alluvial Valley. The general geology of the project area is illustrated by the geology map provided on Figure 11. Macon Ridge ranges up to about 20 ft to 25 ft higher than the adjacent backs swamp area to the east. The ridge is a Pleistocene relict-alluvial fan deposited by a braided regime of the Arkansas River during early valley alluviation. The sediments at the site within the ridge consist of a fine-grained topstratum which averages about 10 ft thick. The material types found within the alluvial fan topstratum are clays (CH), silty clays (CL) and silts (ML). The top stratum layer is persistent across both gathering channels and interfluve areas (braid bars). In channels that are apparent from surface evidence, the fine-grained sediments are mostly slightly organic, horizontally bedded, slack-water accumulations of clays and silts. The topstratum on portions of Macon Ridge, and probably at the site, is composed partly of weathered loess. These topstratum materials overlie an older, thicker sequence of substratum sands and gravels that characterized the braided channels when they were active. The substratum sands and gravel overlie the Cockfield Formation of the Tertiary Claiborne Group. The Cockfield Formation in the general area of the site consists of lignitic clays, silts, and sands with some sideritic glauconite. The Cockfield is not exposed at the surface in the vicinity of the site.

The soil survey of Richland Parish prepared by the U.S. Department of Agriculture, Natural Resources Conservation Service shows the distribution of soil types at the Richland Site (Figures 14 and 15). The soil type covering over 50 percent of the site is described as Gilbert-Egypt silt loam (Gm), a poorly drained, low permeability soil that often contains perched water. The soils covering the bottomlands of the streams are Forestdale silt loam (Fr) and Gilbert silt loam (Gk). The Forestdale silty clay loam covers about 26 percent of the site area and is a poorly drained soil with very low permeability containing swelling clays in some areas. The Gilbert silt loam covers about 6 percent of the site area and is poorly drained with low permeability. Other soil types shown on the soils map include Deerford silt loam (Da), Dexter silt loam (De), Foley silt loam (Fe), Gigger silt loam (Ge), Necessity silt loam (Ne), and Necessity-Gilbert silt loam (Ng). The Dexter silt loam is a well drained, moderately permeable soil and the Gigger silt loam is moderately well drained with low permeability. All the other soils are poorly drained and have low permeability.

4.3 General Groundwater Conditions

The groundwater aquifers in the project area are of Eocene age and Quaternary age (Figure 9). Regional geology exerts control over the subsurface movement of water by influencing the direction of flow, the rate of movement and the volume of water transmitted through the area. Groundwater generally moves in the direction of the regional dip except where altered by geologic structures or by high withdrawal of the groundwater by wells for industrial or municipalities' usage.

Rainfall is the principal source of water for aquifer recharge with an estimated 3 to 5 percent of the total precipitation reaching some form of groundwater storage. Another source is recharge by streams during periods of high water, although much of this gain is lost during low water conditions when outflow from the aquifer maintains stream flow. A third source of water is the slow interchange between aquifers that are geologically connected or by seepage across confining beds separating aquifers. The site is located within the surface outcrop area of the Pleistocene Braided Stream Terraces. The principal water-bearing units in the area belong to the aquifers found within the Claiborne and Wilcox Groups. Primary aquifers that supply fresh water are found in the deposits of the Sparta and Cockfield formations. Also, fresh groundwater may be obtained in minor amounts from the Pleistocene Braided Stream Terraces and nearby Holocene floodplain deposits.

Sediments of the Sparta aquifer were deposited as a plain formed by deltaic and fluvial processes that were operating in the area during Eocene time. The aquifer is composed of several sand beds that have varying degrees of hydraulic interconnection. Thick beds of clean sands are found near the base of the aquifer with increasing amounts of inter-bedded silt, clay and lignite grading upward. The Sparta Formation is not exposed at the surface in the project area. The Sparta aquifer is recharged by direct infiltration in its outcrop area and by leakage from other aquifers. Generally, groundwater movement is eastward towards the Mississippi River Valley. The Sparta aquifer is confined down dip by the clays of the overlying Cook Mountain Formation and the clays of the Cane River Formation. Water quality is generally good with the water from the aquifer being soft and having low iron content. Hydraulic conductivity varies from 25 to 100 feet per day. The Sparta is the principal source of groundwater in north central Louisiana and is heavily developed for industrial, public supply and domestic purposes. Large wells may yield as much as 2,000 gallons per minute from sands in the lower part of the aquifer.

The Cockfield formation consists of layers and beds of sand, silt and clay containing minor amounts of lignite and bentonite in certain zones. The formation is extremely variable in the character of its sediments, both laterally and vertically. The sands are composed predominately of fine to medium sized sub-angular to rounded quartz grains. Thicknesses of the sand beds vary from about 50 ft to as much as 200 ft. The clays are generally silty and range from gray to dark chocolate brown in color. These sediments were deposited in deltaic to fluvial environments. In northern Louisiana, the regional dip of the Cockfield formation is 15 ft to 50 ft per mile to the east-southeast and southeast into the Mississippi Alluvial Valley. Infiltration of precipitation in the upland areas and movement of water from other aquifers account for most of the recharge to the Cockfield aquifer. Also, a minor amount of water reaches the aquifer as a result of inflow from local streams due to high water conditions. The quality of groundwater is generally good with water from the aquifer being soft to moderately hard and having low iron content. The hydraulic conductivity ranges from 25 to 100 feet per day with typical well yields ranging from 100 to 1800 gallons per minute. Regional movement is down dip to the south and toward the Mississippi River Valley.

The Pleistocene Braided Stream Terraces and Holocene floodplain deposits provide a minor source of groundwater in the area. The water yielding materials are primarily the fine sands and occasional gravels found beneath the fine-grained topstratum of silts and clays. The water in this shallow aquifer is generally high in iron.

4.4 Descriptions of Site Soil and Groundwater Conditions

4.4.1 General. The soils encountered at the borings were generally found to consist of fine-grained topstratum deposits underlain by a coarse-grained substratum of sands with occasional traces of gravels. A general description of the stratification and physical properties of the soil types encountered in the borings is included in the following paragraphs. Stick log profiles of the borings are shown on Figures 3, 4, 5, 6 and 7 to aid in visualizing subsurface soil conditions. Tabulated adjacent to the stick logs are water contents, Atterberg limits and blow counts from the standard penetration tests. The graphical logs shown on Figures A-1 through A-42 should be referred to for specific soil conditions encountered at each boring location.

4.4.2 Topstratum The ground surface is directly underlain by the braided stream (topstratum) deposits to depths ranging from about 3 ft to 13 ft which include clays (CH), sandy clays (CL), silty clays (CL), clayey silts (ML), sandy silts (ML) and silts (ML). The ground surface at Borings 1 and 16 was found to be underlain by sandy clays (CL). Sandy clays were also found at the location of Boring 34 within the depth interval of about 8.5 ft to 13 ft. The sandy clays (CL) are generally classified as stiff and very stiff with respect to consistency. The sandy clays (CL) are considered to have moderate to moderate-high strength and low to moderate compressibility. The sandy clays (CL) are considered to have low shrink/swell potential.

The ground surface at Borings 2, 4 through 9, 14, 15, 18 through 23, 28 through 30, and 32 through 40 was found to be underlain by silty clays (CL). Silty clays (CL) were also found at the locations of Borings 11, 27 and 34 within the depth intervals of about 3 ft to 8.5 ft, 3 ft to 8 ft, and 6 ft to 8.5 ft, respectively. The silty clays (CL) are generally classified as medium stiff, stiff, very stiff and hard with respect to consistency. However, silty clays (CL) classified as soft were encountered at the location of Boring 4 to a depth below the ground surface of about 3 ft. The stiff, very stiff and hard silty clays (CL) are considered to have moderate to high strength and low to low-moderate compressibility. The soft and medium stiff silty clays (CL) are considered to have low to low-moderate strength and moderate to high compressibility. The silty clays (CL) are considered to have low shrink/swell potential.

The ground surface at Borings 3, 5, 10, 11, 12, 13, 17, 24 through 27 and 31 was found to be underlain by clays (CH) to depths ranging from about 3 ft to 13 ft. Clays (CH) were also found at the location of Boring 34 within the depth interval of about 4 ft to 6 ft. The clays (CH) are generally classified as medium stiff, stiff, very stiff and hard with respect to consistency. The stiff, very stiff and hard clays (CH) are considered to have moderate to high strength and low to low-moderate compressibility. The medium stiff clays (CH) are considered to have low-moderate strength and settlement potential. The clays (CH) are considered to have moderate to moderate-high shrink/swell potential.

Silts (ML), sandy silts (ML) and clayey silts (ML) were encountered within the topstratum soils at the locations of Borings 1, 6, 13, 15, 17, 20, 23, 29, and 39. The silts are generally classified as medium dense and dense. However, silts classified as loose were encountered at the locations of Borings 1 and 29 within depth intervals of 3 ft to 8 ft and 13 ft to 18.5 ft, respectively. The medium dense and dense silts are considered to have moderate to high strength and low to low-moderate compressibility. The loose silts are considered to have low-moderate strength and moderate compressibility. The silts are considered to have very low to no shrink swell potential.

4.4.3 Substratum The topstratum soils at all boring locations were found to be underlain by substratum sands to the completion depth of the borings, with the exception of Boring 23 which extends into the underlying Claiborne Group. The substratum sands consist of silty sands (SM), slightly silty sands (SP-SM), sands (SP) and clayey sands (SC). Also, sandy silts (ML) were encountered at the location of Boring 29 within the depth interval between about 13 ft and 18 ft. The majority of the sands are classified as medium dense, dense and very dense with respect to relative density. However, sands classified as very loose or loose were encountered within a few depth intervals. The medium dense, dense and very dense sands are considered to have moderate to very high strength and very low to low compressibility. The very loose and loose sands are considered to have low-moderate strength and moderate compressibility. The sands are considered to have no shrink/swell potential.

4.4.4 Claiborne Group The substratum sands at the location of Boring 23 were found to be underlain by Claiborne Group (Cockfield Formation) soils. These soils were encountered below a depth of about 105 ft to the boring completion depth of 125 ft. The Claiborne Group soils encountered in Boring 23 consisted of hard clays (CH) underlain by very dense sands (SP).

4.4.5 Site Groundwater Conditions. As discussed previously, temporary piezometers were set in Borings 1, 5, 18, 36 and 40 after completion of drilling and sampling to monitor groundwater conditions during our field investigations. The temporary piezometers indicated that the water table was generally about 18 ft to 20 ft below the ground surface during the period of November 2, 2007 through November 17, 2007. The groundwater levels within the area of the site are influenced by rainfall, and the rise and fall of streams in the area. The groundwater levels within the site will generally be at their highest levels near the end of the rainy season of the year, typically the spring, and will generally be at the lowest levels near the end of the driest season of the year, typically the fall. Therefore, the water levels observed during our investigation were likely fairly close to the annual low groundwater level.

5.0 DISCUSSION

5.1 General

The approximate 1,400-acre site is being studied for potential development of a large industrial facility. We have considered that the facility would include a large pad area for buildings and pavements. The buildings would likely vary from lightly to heavily loaded structures and would possibly include pits and possibly vaults. Relatively heavy and dynamically loaded machinery may also be utilized. Plans would likely be to obtain borrow fill materials from the site if an adequate quality of soil could be located. A detention basin is likely and could potentially be located within borrow area(s). Railroad spur track(s) will likely be constructed near the facility. An elevated water storage tank and water and wastewater treatment plants will also likely be situated adjacent to the facility. An electrical substation may also be located within the site to serve the powerhouse of the facility.

The proposed site is generally relatively flat. Available USGS topographic information indicates that existing grade within the site generally varies between about El. 85 ft and El. 80 ft. Drainage is generally to the south with West Fork Creek running through the northern and eastern portions of the site.

5.2 General Soil and Groundwater Conditions

The soils encountered in this preliminary investigation were found to consist of fine-grained, braided stream (topstratum) deposits underlain by a coarse-grained substratum of sands with occasional traces of gravels. The topstratum deposits were encountered directly beneath the ground surface to depths ranging from about 3 ft to 13 ft and include silty clays (CL), clays (CH), sandy clays (CL) and silts (ML). The topstratum soils are in turn underlain by coarse-grained substratum sands with some gravels. The substratum includes clayey sands (SC), silty sands (SM), slightly silty sands (SP-SM) and sands (SP) with a general decrease in fines content and increase in grain size with depth. Traces of gravel were encountered in six of the borings below depths ranging from about 17 ft to 47 ft. The substratum sands were found to the underlain at the location of one boring below a depth of about 105 ft by soils of the Cockfield formation. The Cockfield formation soils were found to include clays (CH) and sands (SP).

The topstratum clay (CL and CH) soils were generally found to have consistencies ranging from stiff to hard and the silts (ML) were generally found to have a medium dense relative density. Soft consistency silty clays (CL) were encountered directly beneath the ground surface at the location of one boring and medium stiff silty clays (CL) and clays (CH) were encountered directly beneath the ground surface at the locations of nine borings. As discussed subsequently in this report, the strengths of the surficial soils are generally influenced by rainfall, local drainage conditions and season of the year. The majority of the substratum sands (SM, SP-SM and SP) were found to have medium dense to dense relatively densities. However, a few sand zones were found to have very loose, loose or very dense relative densities.

The clays (CL and CH) having stiff to hard consistencies are considered to have moderate to high strength and low to low-moderate settlement potential, and the soft and medium stiff clays (CL and CH) are considered to have low strength and moderate settlement potential. The medium dense and dense silts (ML) generally have moderate to high strength and low to low-moderate compressibility, and the loose silts (ML) generally have low-moderate to moderate strength and settlement potential. The sands (SM, SP-SM and SP) generally have moderate to very high strength and very low to low settlement potential. The clays (CH) have moderate to moderate-high shrink/swell potential. The clays (CL) and silts (ML) have low shrink/swell potential, and the sands (SM, SP-SM and SP) have no shrink/swell potential.

The groundwater levels were at depths below the ground surface ranging from about 18 ft to 20 ft during the time of our field investigation. The groundwater levels are typically highest in the spring of the year and lowest in the late fall. Accordingly, the groundwater level was probably near its annual low level at the time of our field investigation.

5.3 Geotechnical-Related Design Considerations

5.3.1 General. The following paragraphs describe general geotechnical-related design considerations based on the subsurface soil and groundwater conditions encountered in this preliminary investigation.

5.3.2 Surficial Soils Based on the soil conditions encountered, the strength and compressibility of the surficial sandy clays (CL), silty clays (CL), clays (CH), sandy silts (ML), clayey silts (ML) and silts (ML) will have a significant influence on the required site preparation and earthwork for a new facility. The soils encountered directly beneath the ground surface at the locations of 30 of the 40 borings made for this investigation were generally found to be moderately strong and stable at the time of our investigation, and moderately weak and unstable at the locations of the remaining borings. The weak soils were typically encountered to a depth of about 3 ft. It should be recognized that the strength of these surficial soils is strongly influenced by the season of the year. During a relatively dry season of the year, these surficial soils will generally be moderately strong, but are likely to be relatively weak during wet seasons of the year. The necessity of undercutting and backfilling relatively weak surficial soils during site preparation and earthwork will be dependant upon the subgrade stability exhibited during earthwork construction which will, in turn, be dependent on the drying conditions preceding and during construction. In their condition at the time of our investigation, some undercutting and backfilling would be required to remove relatively weak soft or medium stiff silty clay (CL) and clay (CH) soils.

5.3.3 Expansive Clays (CH) Expansive clays (CH) with moderate to moderate-high shrink/swell potential were encountered directly beneath the ground surface at the locations of 13 of the 40 borings made for this investigation to depths ranging from about 3 ft to 13 ft. The clays

(CH) are considered to have moderate to moderate-high shrink/swell potential. The expansive clays (CH) are subject to volumetric changes with fluctuations in natural water content resulting from seasonal rainfall variations and other factors. There is a general trend for expansive clay (CH) soils under buildings and pavements to swell due to an increase in water content caused by capillarity and vapor-phase movement of water within the clays, with resulting vertical and lateral movements. Therefore, special design considerations will be required to minimize the potential differential volumetric changes in the expansive clays (CH) resulting from these causes.

Nonexpansive cover materials overlying expansive soils act as a buffer against seasonal moisture content changes caused by weather variations and transpiration by plants and trees. Thus, the potential magnitude of moisture content changes and associated shrink/swell movements within expansive soils is proportionate to the thickness of overlying nonexpansive cover materials. Seasonal moisture content changes and shrink/swell movements within expansive soils decrease as the thickness of cover materials increases. Even with a suitable buffer of nonexpansive cover materials, expansive soils can also experience considerable swelling if directly supplied by water due to poor drainage, sprinkler systems, broken underground water and sewer pipes, or any other source. Therefore, controlling sources of water to the expansive clays should be considered during design, construction and maintenance throughout the life of the new facility.

5.3.4 Groundwater Groundwater observations made at the temporary piezometer locations indicated groundwater levels varying from about 18 ft to 20 ft. Based on the time that our investigation was performed, the groundwater was likely near the seasonal low. Excavations for below grade structures extending to depths of about 8 ft to 10 ft or less should not encounter significant seepage. For preliminary design prior to conducting a more detailed site investigation, it is prudent to assume that some free water could be encountered in deeper excavations. Residual seepage into vaults or pits can likely be controlled using properly located collection sumps and discharge pumps. Any pits or vaults deeper than 10 ft to 15 ft will likely require temporary dewatering to allow construction in the dry and the structures will likely need to be designed to resist hydrostatic uplift pressures.

5.3.5 Building Foundations. Our preliminary recommendations are that any lightly loaded buildings can be supported by shallow foundation systems. Heavier loads will likely need to be supported by a deep foundation system. The following paragraphs provide our preliminary recommendations for foundations and site preparation and earthwork, and also provide guideline considerations for pavement design.

6.0 PRELIMINARY DESIGN RECOMMENDATIONS

6.1 Minimum Buffer Requirements

6.1.1 Buildings As previously noted, expansive clays (CH) were encountered directly beneath the ground surface at the locations of 13 of the 40 borings made for this investigation. The magnitude of shrink/swell movements within the expansive clays (CH) will be related to the thickness of the nonexpansive clayey (CL) soils between the foundation slab and the clays (CH). The greater the thickness of this separating layer of nonexpansive soils, the smaller the resulting shrink/swell movements within the clays (CH). For any buildings supported by a shallow foundation system, we expect that the foundation slab and the ground surface adjacent to the building be separated from the expansive clays (CH) by approximately 3 ft to 5 ft of strong, low permeability nonexpansive clayey soils. The actual buffer requirement will depend on the type of structure and the actual subsurface conditions in the area of proposed construction. The buffer should be measured below the bottom of the floor slab or below finished outside grade, whichever results in the lower elevation. The buffer can be provided naturally, by the addition of fill, undercutting and backfilling with select fill, or a combination of these approaches. The buffer should generally extend a minimum of 5 ft beyond the perimeter of the buildings.

Following any undercutting required to provide the buffer, backfilling should be performed using select nonexpansive clay (CL) fill materials. The material types used as fill should consist of the same soil types discussed in subsection **6.7 Site Preparation and Earthwork**.

6.1.2 Pavements Depending on the actual subsurface conditions and the types of pavements and loads anticipated, a buffer may be required between pavements and the expansive clays (CH) or lime treatment may be sufficient to provide an adequate subgrade for the pavements. We are of the opinion that a 1-ft to 3-ft thick buffer of low permeability nonexpansive soil will need to be provided between pavements and the expansive clays (CH). The actual buffer thickness will need to be determined based on specific conditions within the pavement area. The minimum buffer required should be measured below the bottom of the pavement. The recommended buffer can be provided naturally, by the addition of fill, undercutting and backfilling with select fill, or a combination of these approaches. In fact, the filling required to provide the finished subgrade level may frequently provide the required buffer. The buffer should extend a minimum of 3 ft beyond the pavement edges. Lime treatment may consist of mixing on the order of 4 to 6 percent hydrated lime by dry weight of soil into the upper 12 in. of the soil subgrade.

6.2 Building Foundations

6.2.1 Shallow Foundations. In conjunction with recommendations contained in this report for site preparation and earthwork, we are of the opinion that lightly-loaded buildings can likely be supported on a shallow foundation system. The shallow foundation system could consist of spread and strip footings. Isolated spread footings may be used to support column loads. Strip footings may be utilized to support exterior and interior load bearing and partition walls. The footings should be founded directly upon compacted select fill material or relatively strong non-expansive natural soils. Footings around the perimeter of the buildings should probably bear at a depth of not less than 2 ft below the lowest adjacent finished outside grades. Interior footings should be brought to bear at a depth of about 2 ft below the top of the floor slab. As a general guide, allowable column loads ranging from about 100 to 150 kips and allowable wall loads ranging from about 1 to 3 kips/ft of wall may be considered for preliminary shallow foundation design with total settlement estimates of around 1 in. to 1.5 in., depending upon the actual loads and subsurface conditions. These general loads and settlements would correspond to net allowable soil bearing pressures of around 2,500 lbs per sq ft to 3,000 lbs per sq ft for spread footings and 2,000 lbs per sq ft 2,500 lbs per sq ft for strip footings. The shallow foundation system should only be used with a suitable buffer of strong nonexpansive clayey soils in areas where expansive clays (CH) are encountered.

6.2.2 Deep Foundations. Column loads greater than about 100 to 150 kips may require deep foundations. An extensive geotechnical evaluation would be required at this site in the future to determine the exact need for deep foundation versus shallow foundation support due to vertical movement constraints for particular structures. This study would also better define requirements to address expansive clays in greater detail. The deep foundation systems would need to be designed on a building-to-building basis and variations such as element diameter, design depth, number required, etc. would be dependent on the specific stratigraphy and properties of the underlying soils at each location and the corresponding finished floor elevations.

If deep foundation systems are required, they could likely consist of auger-cast piles or driven piles. Drilled shafts are not considered a viable deep foundation alternative because of the relatively shallow groundwater and sandy soils encountered within the borings made for this investigation. Auger-cast piles are typically constructed with diameters ranging from 14 in. to 24 in. Driven piles could consist of steel H-piles, pipe piles or pre-cast concrete piles. Based on the preliminary boring information, pile penetrations on the order of 40 to 60 ft will be required for the deep foundation system to completely penetrate through the topstratum fine-grained soils into the substratum sands and provide capacities on the order of 40 tons to 90 tons. The actual penetrations required will depend on many factors including the configuration of the pile groups, number of piles in the groups, pile size, the depth of installation, and the pile spacing. We generally recommend a minimum center to center spacing of not less than 3 pile diameters.

6.3 Elevated Water Storage Tanks

Elevated water storage tanks will likely require support from deep foundations. As previously discussed, deep foundations at this site would likely include auger-cast piles or driven piles. The stability of the water tanks against overturning should be checked for the condition when the tank is empty and subjected to the maximum wind loading.

6.4 Substations

Lightly-loaded substation structures would likely be supported on a shallow foundation system. Heavily-loaded structures, such as A-frame or H-type laced box column structures may require support from deep foundations. These types of structures are generally designed to accommodate large overturning loads. As previously discussed, deep foundations at this site would likely include auger-cast piles or driven piles.

6.5 Detention Basins

We expect detention basins will typically remain dry except during periods of heavy rainfall. Subgrade conditions for the basins will likely consist of the natural fine-grained clays or silts. As such, a synthetic or compacted clay soil liner would not be necessary to retain water in the basins. However, if the upper topstratum soils are penetrated and the underlying substratum sands are exposed, a liner would likely be required to retain water. Vegetation growth should be promoted on the exterior pond slopes to provide a measure of erosion protection. In areas where expansive soils were encountered, cut and fill slopes composed of such soils would require notably flattened surfaces on the order of 1V:4H to maintain stability, or may require plating with 2 ft to 3 ft of low expansive soil for steepened slopes. In areas without expansive soils, cut and fill slopes no steeper than 1V:3H will likely be appropriate.

6.6 Onsite Borrow Materials

As discussed previously in this report, the site soils consist of a fine-grained topstratum underlain by a coarse-grained substratum. The fine-grained topstratum ranges in thickness from about 3 ft to 13 ft and includes silty clays (CL), clays (CH), sandy clays (CL) and silts (ML). The underlying substratum consists predominantly of silty sands (SM), slightly silty sands (SP-SM) and sands (SP). Of the soil types available, we are of the opinion that the preferred soils for use as select fill materials consist of the relatively nonexpansive silty and sandy clays (CL) having a liquid limit less than 45 and a plasticity index within the range of 10 to 24. Based on the borings approximately two-thirds of the topstratum soils are clays (CL), one-quarter are clays (CH) and the remainder are silts (ML). The silts (ML) and also the underlying sands (SM, SP-SM and SC) can potentially be used as borrow materials under certain conditions. The clay (CH) soils at the site are not suitable for use as select fill materials and should only be placed in areas such as landscaping areas. The onsite borrow materials can be obtained from required excavations such as detention ponds or from designated borrow areas.

6.7 Site Preparation and Earthwork

No specifics with regard to earthwork or grading plans have been established at this time. As an initial step of site preparation, all trees and shrubs including their root systems should be removed within the building and pavement areas. Stripping should then be performed to remove organic-laden surficial soils, vegetation, debris, brush and roots. After stripping, any wet or weak soils will need to be excavated to expose suitably stable soils. Zones of moderately weak silty clays (CL) or clays (CH) that may need to be excavated were encountered at the ground surface at several boring locations at the time of our investigation. The actual condition of the surficial soils will need to be determined during earthwork construction and should be further evaluated during the final investigation for the facility. Undercutting will need to be performed as required to remove expansive clays (CH) to the depth necessary to create the recommended buffer thickness.

The majority of the surficial soils encountered at the ground surface at the boring locations were found to have moderate strength at the time of our field investigation. However, during wet seasons of the year, we expect that these soils would become weak and wet to some depth and could potentially require undercutting, drying by processing, or treatment of the in situ soils with admixtures, or a combination of these approaches, to achieve stable conditions that would support fill placement.

Special consideration should be given to the surficial soils at this site during earthwork planning and operations since the soils are very sensitive to disturbance and moisture content fluctuations. The construction techniques and types of equipment utilized and site drainage provided will have a great effect on the performance of these soils throughout the project.

The select fill materials that we typically recommend to replace unsuitable soils, to raise site grades, below building foundations, and as backfill against shallow foundations consist of the silty and sandy clays (CL) recommended in paragraph **6.6. Onsite Borrow Materials.** Select fill materials placed beneath buildings and pavements are generally compacted to not less than 95 percent of standard Proctor maximum dry density (ASTM D 698). A higher degree of compaction may be required in situations where there are special design requirements (e.g., high floor loads or high volumes of truck traffic) to satisfy foundation or pavement design.

6.8 Drives and Parking Areas

We are of the opinion that either flexible asphalt concrete or rigid Portland cement concrete pavement could be utilized. A detailed pavement design should be performed for anticipated traffic volumes and loads during project design.

The strength and compressibility of the subgrade soils may need to be improved by lime treatment. If lime treatment of the subgrade soils is conducted, the improved subgrade soils would permit a reduction in the pavement thickness. We normally recommend that at least the top 8 in. of the subgrade soils be treated with lime. The lime would also improve the constructability during wet seasons of the year.

Pavements underlain by expansive materials can be expected to experience some differential vertical movements caused by swelling or heave of the expansive soils. Also expansive soils have low subgrade support strength. Pavement structures should be separated from the expansive soils by approximately 1ft to 3 ft of strong, nonexpansive soils. In some areas, lime treatment to a depth of about 12 in. may be used as an alternative to undercutting and replacement of expansive soils.

Flexible asphalt concrete pavement will better accommodate differential movement than rigid Portland cement concrete. We are the opinion that rigid Portland cement concrete will provide better support in front of garbage dumpsters, loading docks and in areas subject to significant heavy truck traffic and parking. If the subgrade soils are prepared and select fill materials are placed in accordance with the recommendations given in this report, it is our opinion that a CBR on the order of 5 would be appropriate for preliminary design of flexible asphalt pavement design, and a modulus of subgrade reaction on the order of 150 lbs per cu in. would be appropriate for preliminary design of rigid Portland cement concrete pavement. The actual pavement sections required for this project will be highly dependent on the expected truck traffic and whether lime treatment is performed.

7.0 REPORT LIMITATIONS

The preliminary guideline recommendations in this report are based on conditions as they existed at the time of our field investigation and further on the assumption that the widely spaced exploratory borings are representative of subsurface conditions throughout the site. It should be noted that actual subsurface conditions between and beyond the borings might differ from those encountered at the boring locations.

We emphasize that this investigation is preliminary and the contents of this report should only be used for planning and estimating purposes. The guideline recommendations included in herein should be considered as tentative until additional borings, laboratory tests and analyses are performed for the actual planned facility.

This preliminary report has been prepared for the exclusive use of Denmon Engineering for specific application to the geotechnical aspects of design and construction for the proposed Richland Parish Megasite in Richland Parish, Louisiana. The only warranty made by us in connection with the services provided is we have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of our profession practicing in the same or similar locality. No other warranty, express or implied, is made or intended.

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2. Saucier, Roger, T., "Quaternary Geology of the Lower Mississippi Valley", Arkansas Archeological Survey Research Series, No. 6, 1974.

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5. U.S. Army Corps of Engineers, "Hurricane Quadrangle, LA", Distribution of Alluvial Deposits, Geological Investigation of the Boeuf-Tensas Basin, Lower Mississippi Valley, February 1967.

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7. U.S. Geological Survey, "Bee Bayou, La.", Topographic Quadrangle, Scale, 1:24,000, 1987.

8. U.S. Geological Survey, "Whitney Island South, La.", Topographic Quadrangle, Scale, 1:24,000, 1993.

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FIGURES

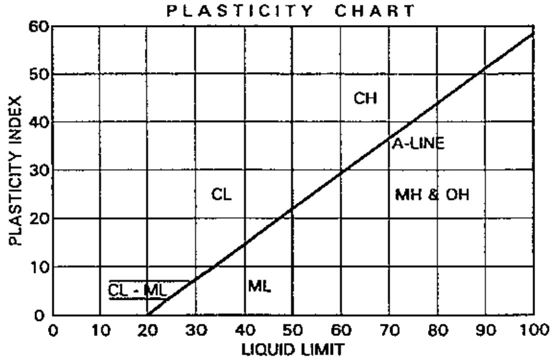
UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOL & LETTER	DESCRIPTION
COARSE-GRAINED SOILS More than half of material larger than No. 200 sieve size	GRAVELS More than half of coarse fraction larger than No. 4 sieve size	Clean Gravels (Little or no fines)	GW	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURE
			GP	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURE
		Gravels with fines (Appreciable amount of fines)	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE
			GC	CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE
	SANDS More than half of coarse fraction smaller than No. 4 sieve size	Clean Sands (Little or no fines)	SW	WELL GRADED SAND, GRAVELLY SAND
			SP	POORLY GRADED SAND, GRAVELLY SAND
		Sands with fines (Appreciable amount of fines)	SM	SILTY SAND, SAND-SILT MIXTURE
			SC	CLAYEY SAND, SAND-CLAY MIXTURE
FINE-GRAINED SOILS More than half of material smaller than No. 200 sieve	SILTS AND CLAYS	Liquid limit less than 50	ML	SILT WITH LITTLE OR NO PLASTICITY
			ML	CLAYEY SILT, SILT WITH SLIGHT TO MEDIUM PLASTICITY
			CL	SILTY CLAY, LOW TO MEDIUM PLASTICITY
			CL	SANDY CLAY, LOW TO MEDIUM PLASTICITY (30% TO 50% SAND)
	SILTS AND CLAYS	Liquid limit greater than 50	MH	SILT, FINE SANDY OR SILTY SOIL WITH HIGH PLASTICITY
			CH	CLAY, HIGH PLASTICITY
			OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOIL

TERMS CHARACTERIZING SOIL STRUCTURE

- Slickensided - Clays with polished and striated planes created as a result of volume changes related to shrinking, swelling and/or changes in overburden pressure.
- Fissured - Clays with a blocky or jointed structure generally created by seasonal shrinking and swelling.
- Laminated - Composed of thin alternating layers of varying color and texture.
- Calcareous - Containing appreciable quantities of calcium carbonate.
- Parting - Paper thin (less than 1/8 inch).
- Seam - 1/8 inch to 3 inch thickness.
- Layer - Greater than 3 inches in thickness.

PLASTICITY CHART

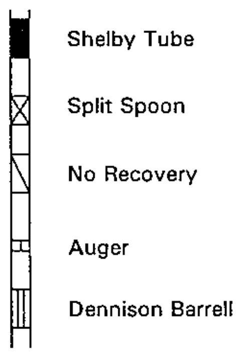


FOR CLASSIFICATION OF FINE GRAINED SOILS

DENSITY AND CONSISTENCY

COARSE-GRAINED SOILS		FINE-GRAINED SOILS		
DENSITY	PENETRATION RESISTANCE, N Blows per Foot	CONSISTENCY	COHESION Kips/Sq.Ft	PENETRATION RESISTANCE, N Blows per Foot
Very loose	0 - 4	Very Soft	<0.25	0 - 1
Loose	5 - 10	Soft	0.25 - 0.50	2 - 4
Medium Dense	11 - 30	Medium Stiff	0.50 - 1.00	5 - 8
Dense	31 - 50	Stiff	1.00 - 2.00	9 - 15
Very Dense	>50	Very Stiff	2.00 - 4.00	16 - 30
		Hard	>4.00	>30

SAMPLE TYPES
(Shown in Sample Column)



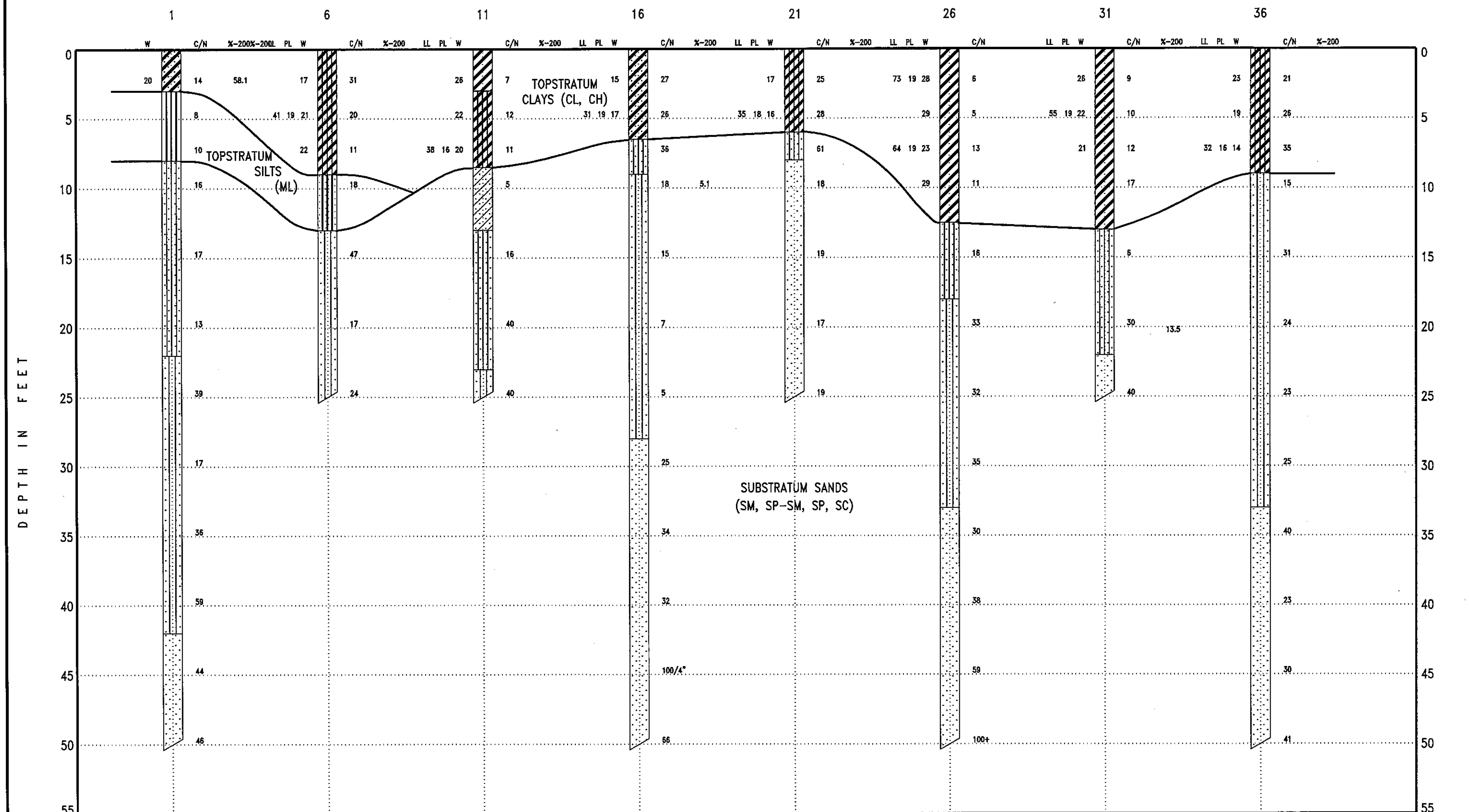
PARTICLE SIZE IDENTIFICATION

- Cobbles - Greater than 3 inches
- Gravel - Coarse - 3/4 inch to 3 inches
  Fine - 4.76 mm to 3/4 inch
- Sand - Coarse - 2 mm to 4.76mm
  Medium - 0.42 mm to 2 mm
  Fine - 0.074 mm to 0.42 mm
- Silt & Clay - Less than 0.074 mm

RELATIVE COMPOSITION

Slightly	5 - 15%
With	16 - 29%
Sandy (or gravelly)	30 - 50%

CLASSIFICATION, SYMBOLS AND TERMS USED ON GRAPHICAL BORING LOGS



LEGEND:
LL = Liquid Limit
PL = Plastic Limit
W = Water Content
DD = Dry Density (pcf)
C/N = Cohesion (ksf)/Penetration Resistance, N (blows per ft) in the same column
% -200 = % Passing No. 200 Sieve

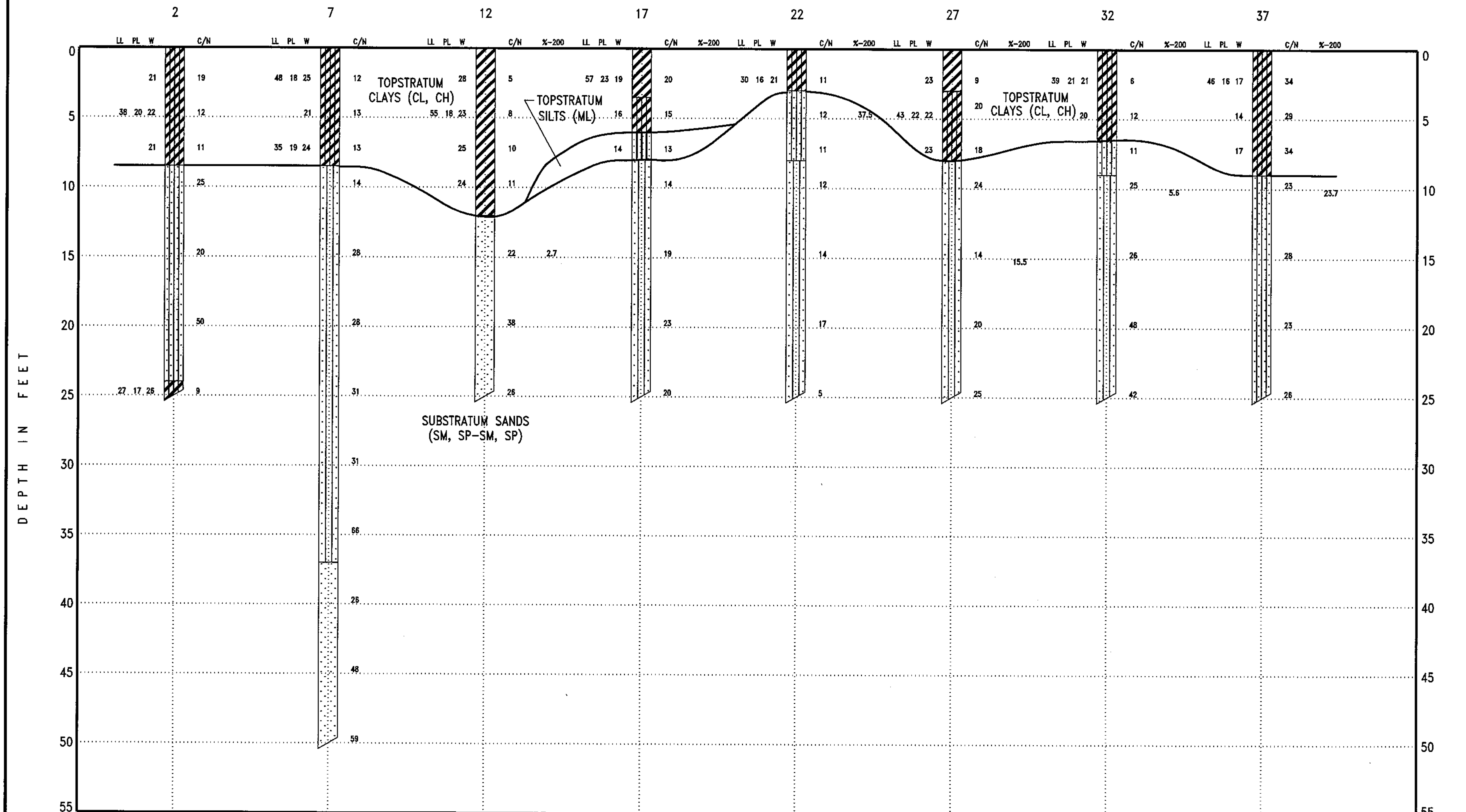
NOTE: See Figure 3 for boring log legend.

SUBSURFACE PROFILE A-A'

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

Job No.	070556	Date	1/22/08	Figure	4

BURNS COOLEY DENNIS, INC.

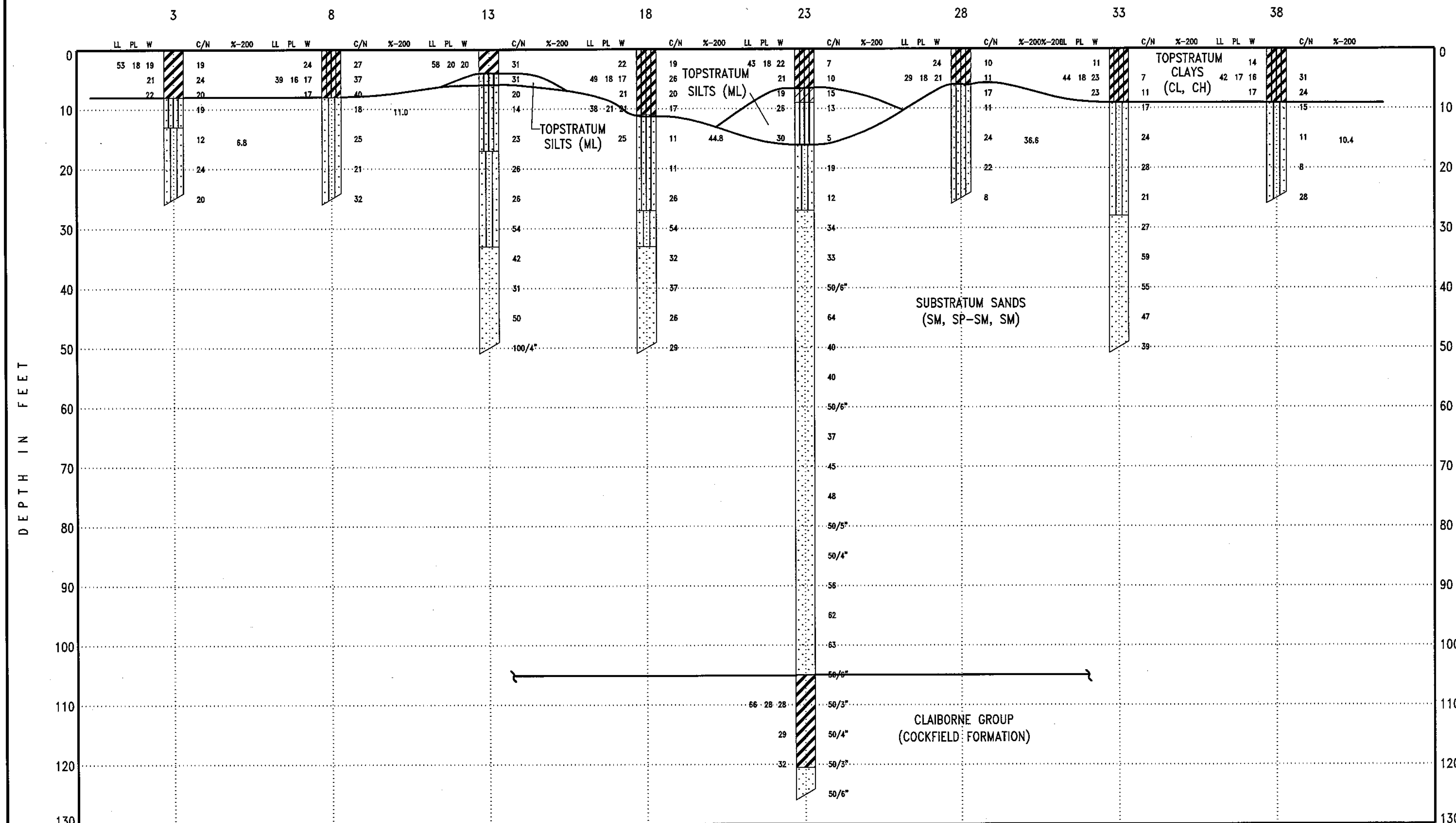


LEGEND:
LL = Liquid Limit
PL = Plastic Limit
W = Water Content
DD = Dry Density (pcf)
C/N = Cohesion (ksf)/Penetration Resistance, N (blows per ft) in the same column
% -200 = % Passing No. 200 Sieve

NOTE: See Figure 3 for boring log legend.

SUBSURFACE PROFILE B-B'					
RICHLAND PARISH MEGASITE RICHLAND PARISH, LOUISIANA					
Job No.	070556	Date	1/22/08	Figure	5

BURNS COOLEY DENNIS, INC.

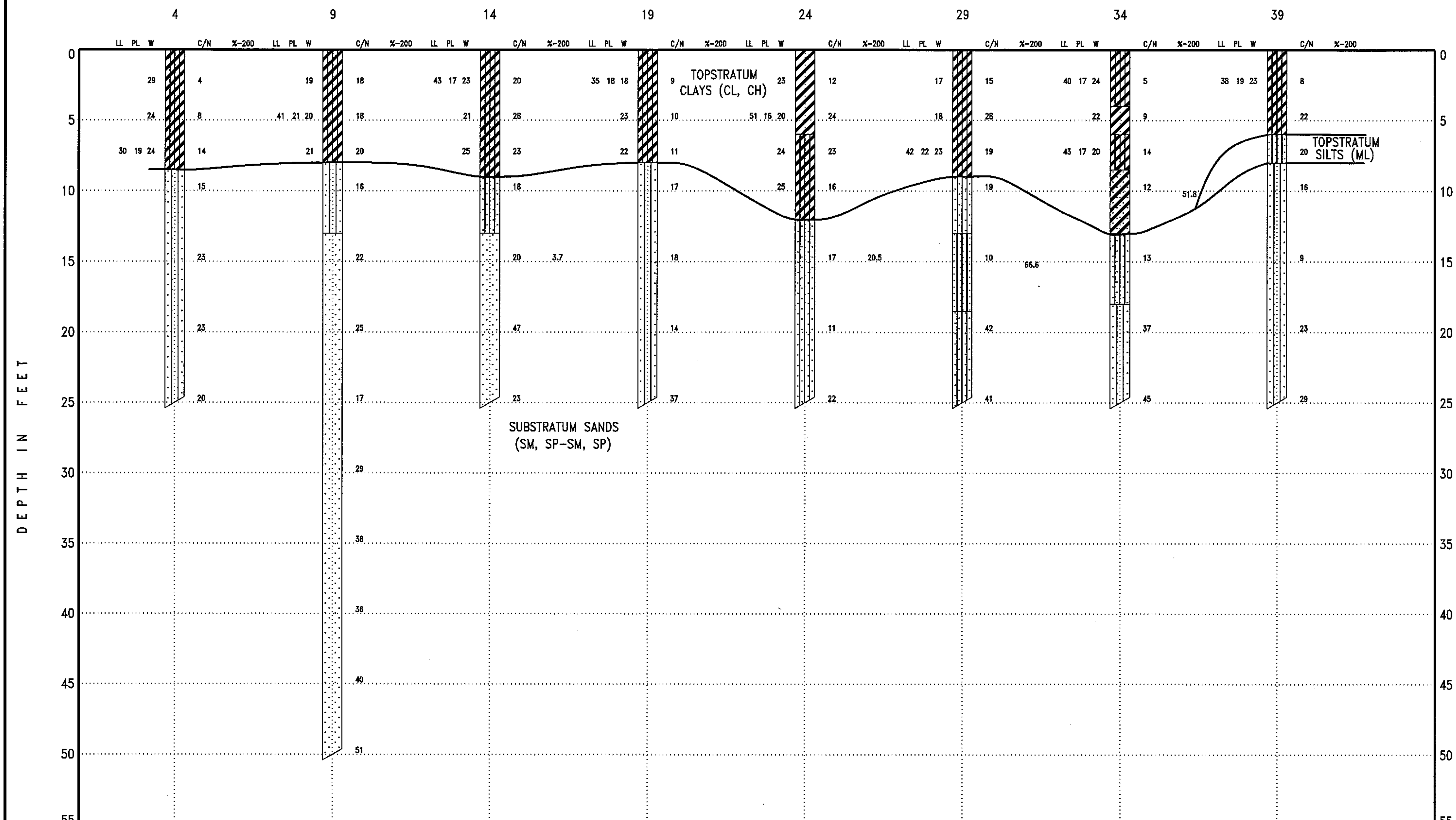


LEGEND:
- LL = Liquid Limit
- PL = Plastic Limit
- W = Water Content
- DD = Dry Density (pcf)
- C/N = Cohesion (ksf)/Penetration Resistance, N (blows per ft) in the same column
- % -200 = % Passing No. 200 Sieve

NOTE: See Figure 3 for boring log legend.

SUBSURFACE PROFILE C–C'					
RICHLAND PARISH MEGASITE RICHLAND PARISH, LOUISIANA					
Job No.	070556	Date	1/22/08	Figure	6

BURNS COOLEY DENNIS, INC.

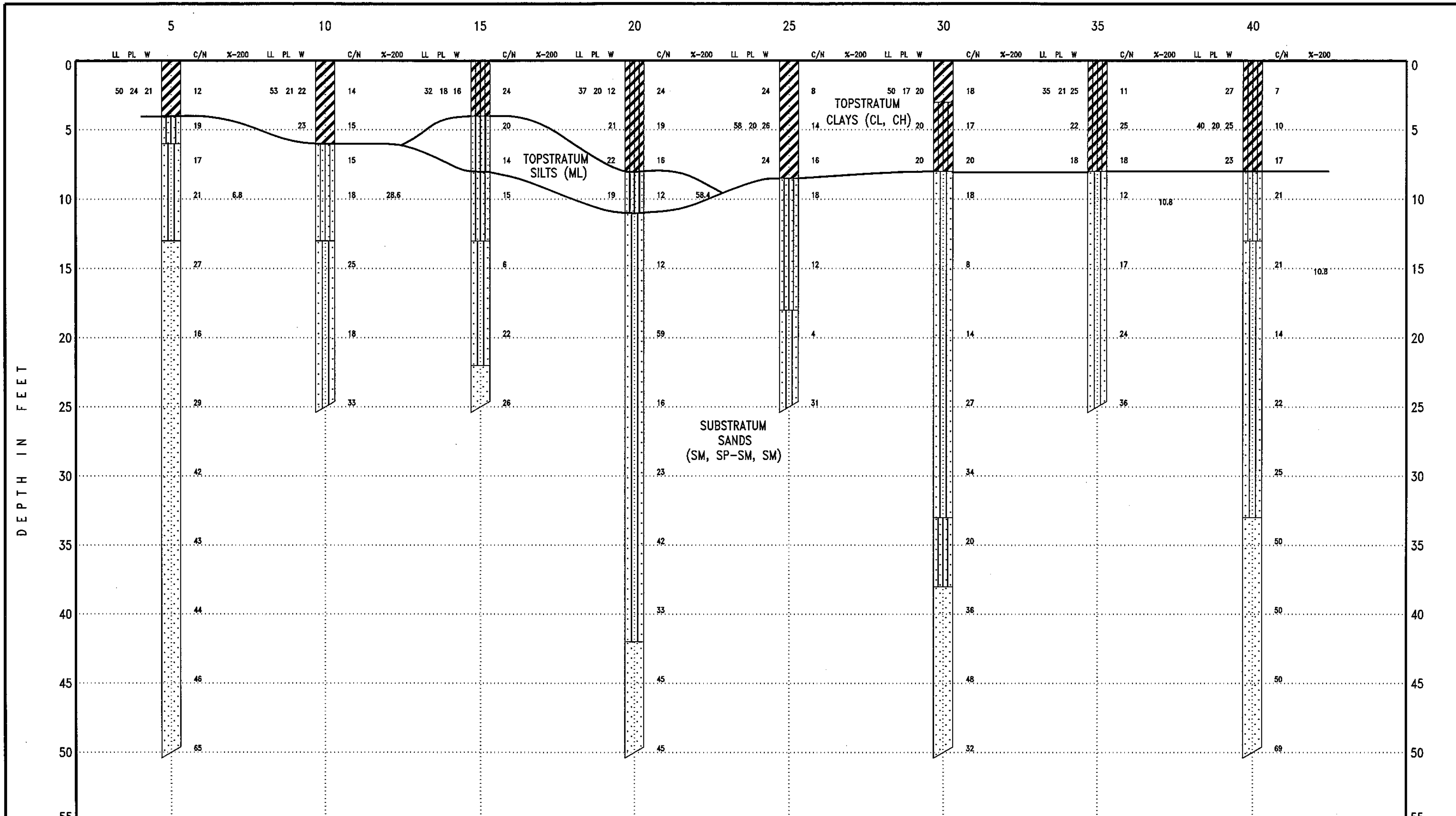


LEGEND:
LL = Liquid Limit
PL = Plastic Limit
W = Water Content
DD = Dry Density (pcf)
C/N = Cohesion (ksf)/Penetration Resistance, N (blows per ft) in the same column
% -200 = % Passing No. 200 Sieve

NOTE: See Figure 3 for boring log legend.

SUBSURFACE PROFILE D-D'					
RICHLAND PARISH MEGASITE RICHLAND PARISH, LOUISIANA					
Job No.	070556	Date	1/22/08	Figure	7

BURNS COOLEY DENNIS, INC.



LEGEND:
LL = Liquid Limit
PL = Plastic Limit
W = Water Content
DD = Dry Density (pcf)
C/N = Cohesion (ksf)/Penetration Resistance, N (blows per ft) in the same column
% -200 = % Passing No. 200 Sieve

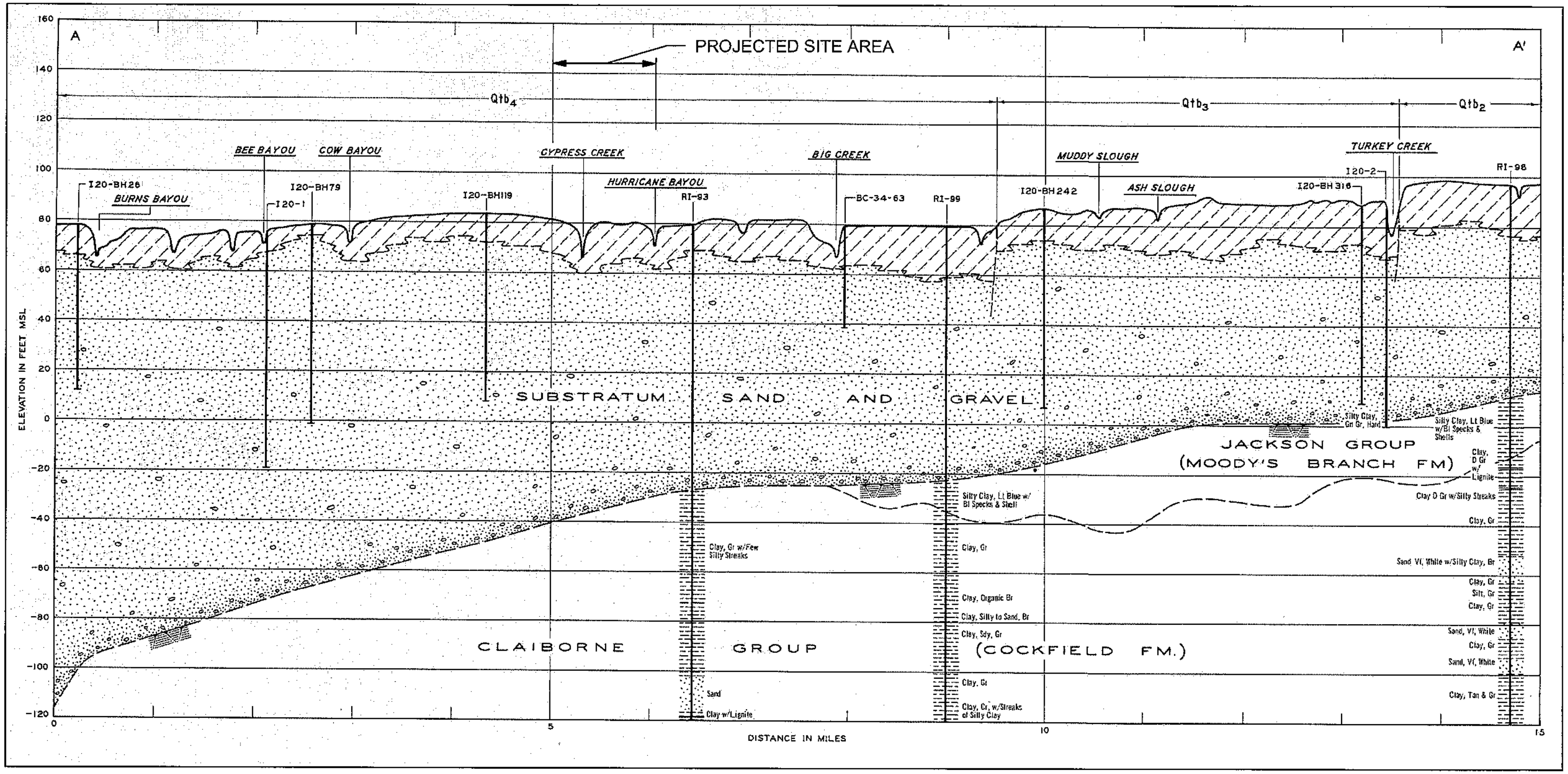
NOTE: See Figure 3 for boring log legend.

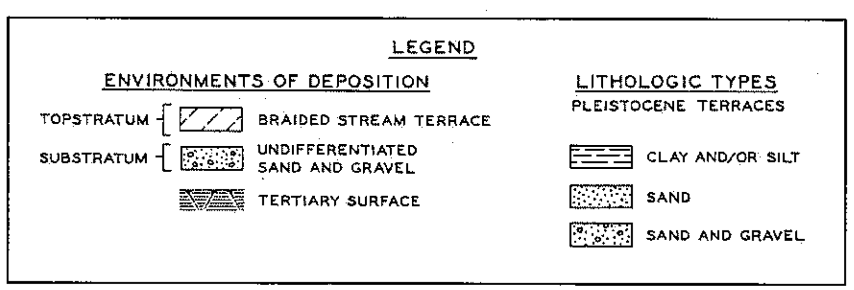
SUBSURFACE PROFILE E-E"

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

Job No.	070556	Date	1/22/08	Figure	8

BURNS COOLEY DENNIS, INC.





SOURCE: REFERENCE 4

Geologic Profile

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

BURNS COOLEY DENNIS, INC.
551 SUNNYBROOK ROAD
RIDGELAND, MISSISSIPPI 39157

JOB NO. 070556	SCALE: 1"=50'	FIGURE 12

SYSTEM	SERIES	GROUP	FORMATION	AQUIFER	LITHOLOGY
QUARTER-NARY	HOLOCENE		ALLUVIUM/ COLLUVIUM	QUATERNARY	CLAYS, SILTS, SANDS
	PLEISTOCENE		BRAIDED STREAM TERRACES		SANDS, GRAVELS
TERTIARY	EOCENE	CLAIBORNE	COCKFIELD	COCKFIELD	MASSIVE CROSS-BEDDED SAND, LIGNITE SHALE
			COOK MOUNTAIN		FOSSILIFEROUS, GLAUCONTIC SHALE
			SPARTA	SPARTA	LIGNITIC SAND
			CANE RIVER		FOSSILIFEROUS SAND
		WILCOX		WILCOX	LIGNITIC SANDS
	PALEOCENE	MIDWAY			BLACK SHALE, SAND, CALCAREOUS SEDIMENTS
UPPER CRETACEOUS	GULF	NAVARRO			SHALE, SAND, CHALK
		TAYLOR			CHALK, SAND
		AUSTIN			SHALE, SAND, CHALK
		EAGLEFORD			SHALE, SAND
		WOODBINE	TUSCALOOSA		SHALE, SAND, TUFFACEOUS MATERIALS
LOWER CRETACEOUS	COMANCHE	TRINITY	PALUXY		RED, GRAY SHALE, WHITE SAND, GRAY LIMESTONE
			MOORINGSPORT		SHALE, LIMESTONE LOCALLY OOLITIC, ANHYDRITE
			FERRY LAKE		MASSIVE ANHYDRITE
			RODESSA		SHALE, LIMESTONE LOCALLY OOLITIC, ANHYDRITE
			JAMES		LIMESTONE, SAND
			PINE ISLAND		SHALE, SAND
	COAHUILA	NUEVO LEON-DURANGO	SLIGO		SHALE, LIMESTONE, SAND
			HOSSTON		RED SHALE, GLAUCONITIC SANDSTONE, LIMESTONE
JURASSIC		COTTON VALLEY			SANDSTONE, SHALE

SUBSURFACE

Geologic Units and Major Aquifers

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

BURNS COOLEY DENNIS, INC.
551 SUNNYBROOK ROAD
RIDGELAND, MISSISSIPPI 39157

SOURCE: REFERENCE 9

JOB NO. 070556 | SCALE: N.T.S. | FIGURE 9

Map Unit Legend

Richland Parish, Louisiana (LA083)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Da	Deerford silt loam	19.6	1.3%
De	Dexter silt loam, 1 to 3 percent slopes	36.0	2.4%
Fe	Foley silt loam	23.0	1.5%
Fr	Forestdale silty clay loam	392.9	26.1%
Ge	Gigger silt loam, 1 to 3 percent slopes	108.7	7.2%
Gk	Gilbert silt loam	84.4	5.6%
Gm	Gilbert-Egypt silt loams, gently undulating	823.6	54.6%
Ne	Necessity silt loam, 1 to 3 percent slopes	17.6	1.2%
Ng	Necessity-Gilbert silt loams, gently undulating	2.2	0.1%
Totals for Area of Interest (AOI)		1,508.0	100.0%

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features

Municipalities
- Cities
- Urban Areas

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 15N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Richland Parish, Louisiana
Survey Area Data: Version 4, Apr 13, 2007

Date(s) aerial images were photographed: 1998

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

SOURCE: REFERENCE 6

Soil Map Legend

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

BURNS COOLEY DENNIS, INC.
551 SUNNYBROOK ROAD
RIDGELAND, MISSISSIPPI 39157

JOB NO. 070556	SCALE: N.T.S.	FIGURE 15

APPENDIX A

LOG OF BORING NO. 1
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	WATER CONTENT %	% PASSING NO. 200 SIEVE
0–3	Stiff tan and red sandy clay (CL)	14		~20 (plotted)	58.1
3–8	Loose tan silt (ML) with clay partings	8			
		10			90.9
8–22	Medium dense tan silty fine sand (SM)	16			
		17			
		13			
22–42	Dense tan fine sand (SP-SM), slightly silty	39			
	- medium dense 28' - 32'	17			
		36			
	- very dense below 37'	59			
42–50	Dense tan fine to medium sand (SP)	44			
		46			

Chart legend: O - UC, Δ - UU, Cohesion, kips/sq ft (1, 2, 3, 4); PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT (20, 40, 60, 80).

BORING DEPTH: 50 ft

DATE: 11/07/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Temporary piezometer installed to 50'. See groundwater data in report.

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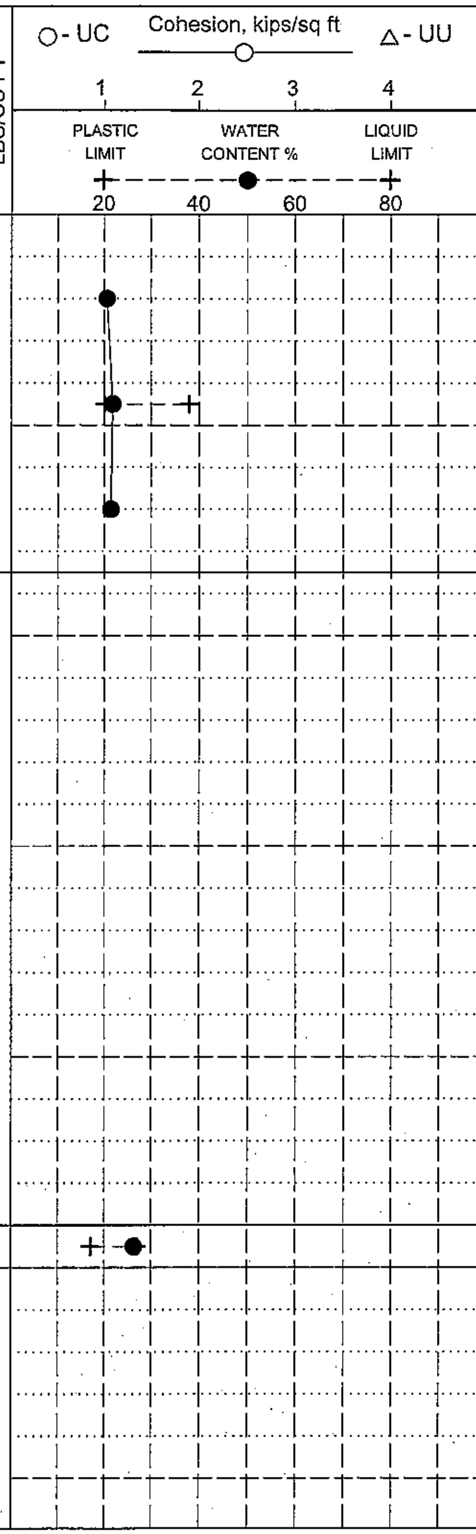
FIGURE A-1

LOG OF BORING NO. 2
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0	Very stiff tan and light gray silty clay (CL) with ferrrous nodules			
	- stiff below 3'	19		
5		12		
	- slightly sandy below 6'	11		
	Medium dense tan silty sand (SM)	25		
10				
15		20		
	- dense below 18'			
20		50		
	Stiff gray silty clay (CL)	9		
25				
30				



BORING DEPTH: 25 ft

DATE: 11/12/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

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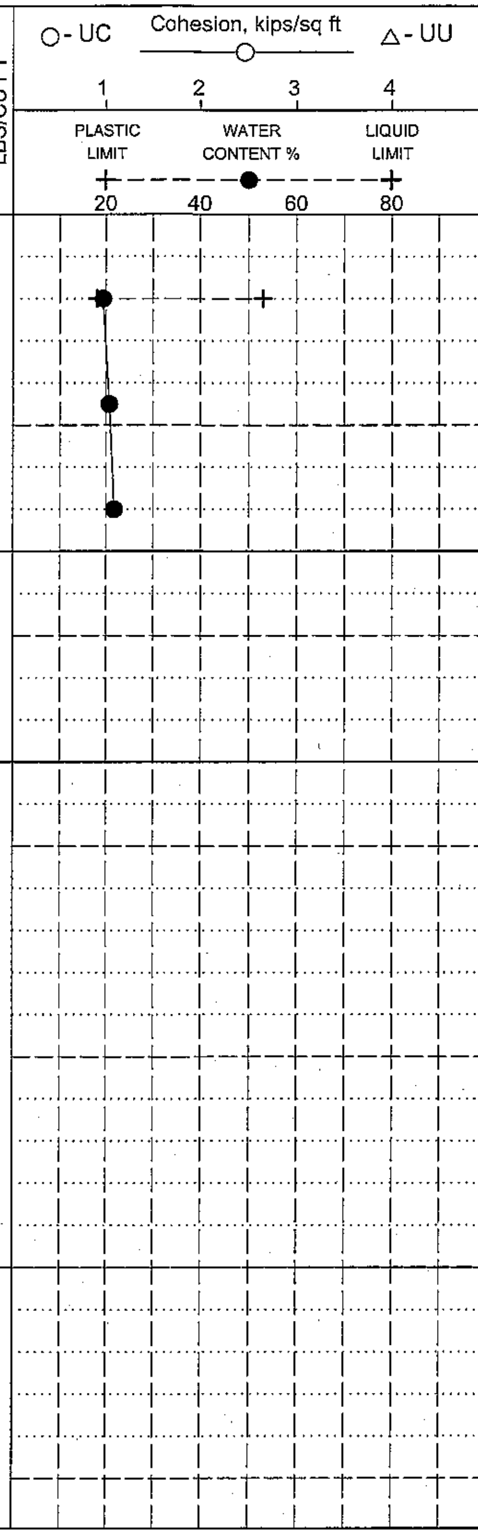
FIGURE A-2

LOG OF BORING NO. 3
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

DEPTH, ft	DESCRIPTION OF MATERIAL (SURFACE EL: ft)	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–8	Very stiff light gray clay (CH), slightly silty - tan and light gray with ferrous nodules below 3'	19, 24, 20		
8–13	Medium dense tan silty fine sand (SM)	19		
13–25	Medium dense tan fine sand (SP-SM), slightly silty	12, 24, 20		6.8



BORING DEPTH: 25 ft

DATE: 11/09/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

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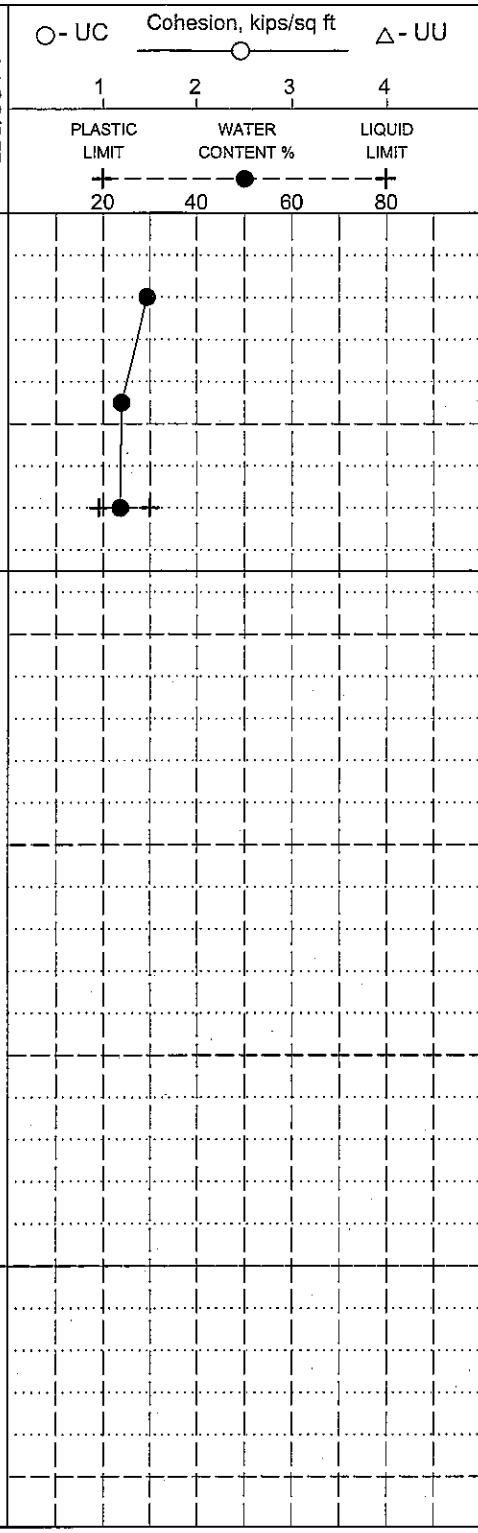
FIGURE A-3

LOG OF BORING NO. 4
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0	Soft tan and light gray silty clay (CL)			
2		4		
4.5	- medium stiff 3' - 6'	8		
5.5	- stiff below 6'			
7		14		
8.5	Medium dense tan fine sand (SP-SM), slightly silty	15		
14.5		23		8.9
19.5		23		
24.5		20		



BORING DEPTH: 25 ft

DATE: 11/09/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

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FIGURE A-4

LOG OF BORING NO. 5
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–4	Stiff tan and red clay (CH) with silt seams	12		
4–6.5	Medium dense tan silty fine sand (SM), slightly clayey	19		
6.5–13	Medium dense tan fine sand (SP-SM), slightly silty	17		
		21		6.8
13–50	Medium dense tan fine sand (SP)	27		
		16		
		29		
	- dense 27' - 47'	42		
		43		
		44		
		46		
	- very dense with trace of coarse sand below 47'	65		

Cohesion, kips/sq ft: ○ - UC, △ - UU (scale 1, 2, 3, 4)

PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT (scale 20, 40, 60, 80)

BORING DEPTH: 50 ft

DATE: 11/07/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Temporary piezometer installed to 50'. See groundwater data in report.

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FIGURE A-5

LOG OF BORING NO. 6

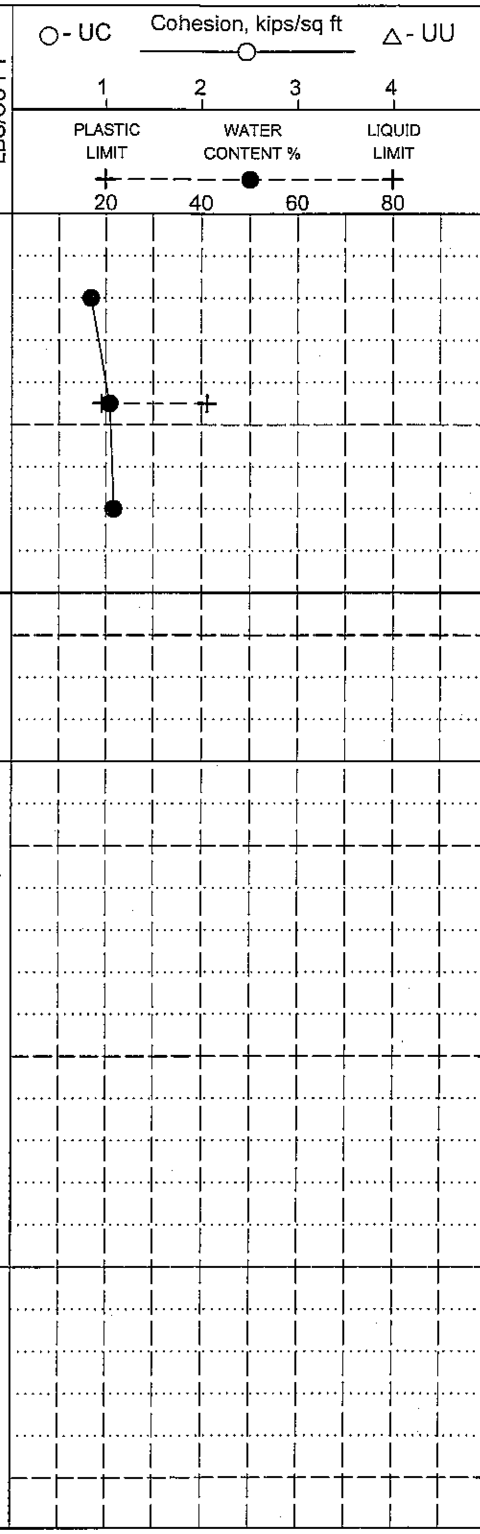
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–9	Hard tan and light gray silty clay (CL) with silt seams	31		
	- with ferrous nodules below 3'			
	- very stiff 3' - 6'	20		
	- stiff and slightly sandy below 6'	11		
9–13	Medium dense tan sandy silt (ML)	18		56.6
13–25	Dense tan fine sand (SP-SM), slightly silty	47		
	- medium dense below 18'	17		
		24		



BORING DEPTH: 25 ft

DATE: 11/13/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

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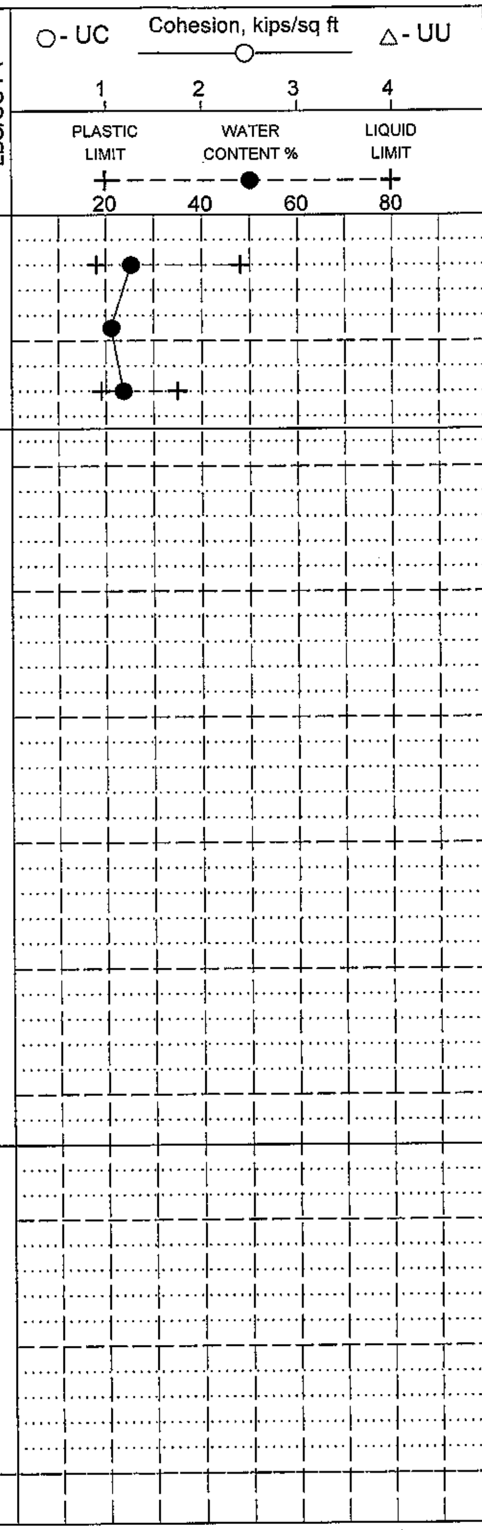
LOG OF BORING NO. 7
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

DEPTH, ft	DESCRIPTION OF MATERIAL (SURFACE EL: ft)	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–8	Stiff tan and light gray silty clay (CL)	12		
	- with ferrous nodules 3' - 5'	13		
	- light gray and red below 5'	13		
8–37	Medium dense tan fine sand (SP-SM), slightly silty	14		
		28		
		28		
	- dense 23' - 33'	31		
		31		
	- very dense below 33'	66		
37–50	Medium dense tan fine sand (SP)	26		
	- with medium sand and trace of gravel below 43'	48		
	- dense 43' - 47'			
	- very dense below 47'	59		



BORING DEPTH: 50 ft

DATE: 11/12/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

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GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

FIGURE A-7

LOG OF BORING NO. 8

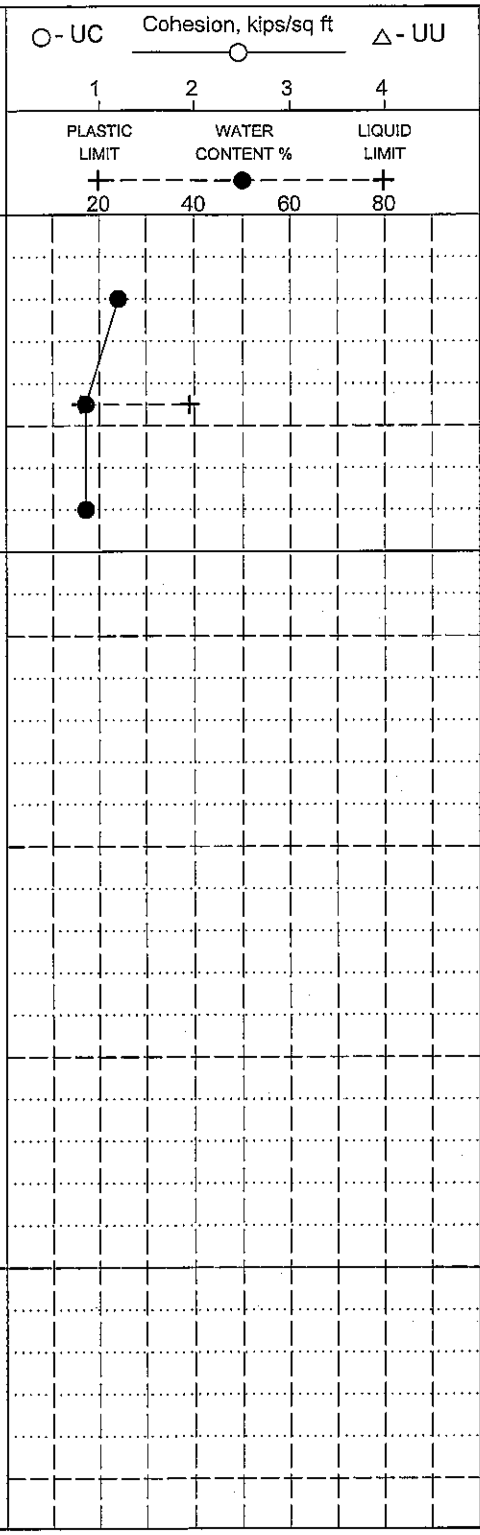
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–8	Very stiff tan and light gray silty clay (CL)	27		
	- hard and slightly sandy below 3'	37		
		40		
8–25	Medium dense tan fine sand (SP-SM), slightly silty	18		11.0
		25		
		21		
	- dense with alternating layers of silt below 23'	32		



BORING DEPTH: 25 ft

DATE: 11/09/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

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FIGURE A-8

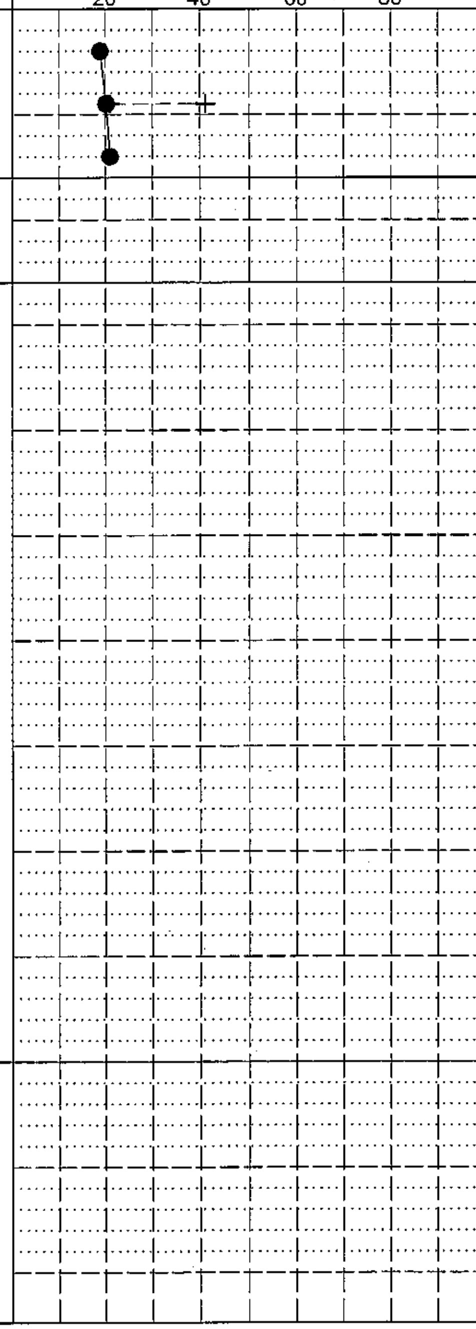
LOG OF BORING NO. 9
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

SURFACE EL: ft

Description of Material	Blows per ft	Dry Density lbs/cu ft	% Passing No. 200 Sieve
Very stiff tan and light gray silty clay (CL) with trace of ferrous nodules	18		
	18		
- slightly sandy below 7.5'	20		
Medium dense tan fine sand (SP-SM), slightly silty	16		
Medium dense tan fine sand (SP)	22		3.4
	25		
	17		
	29		
	38		
- dense 33' - 47'	36		
	40		
- very dense with trace of gravel below 47'	51		



Cohesion, kips/sq ft: ○ - UC, △ - UU (scale 1, 2, 3, 4). Plastic Limit +, Water Content % ●, Liquid Limit + (scale 20, 40, 60, 80).

Depth, ft: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60

BORING DEPTH: 50 ft

DATE: 11/08/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

BURNS COOLEY DENNIS, INC.
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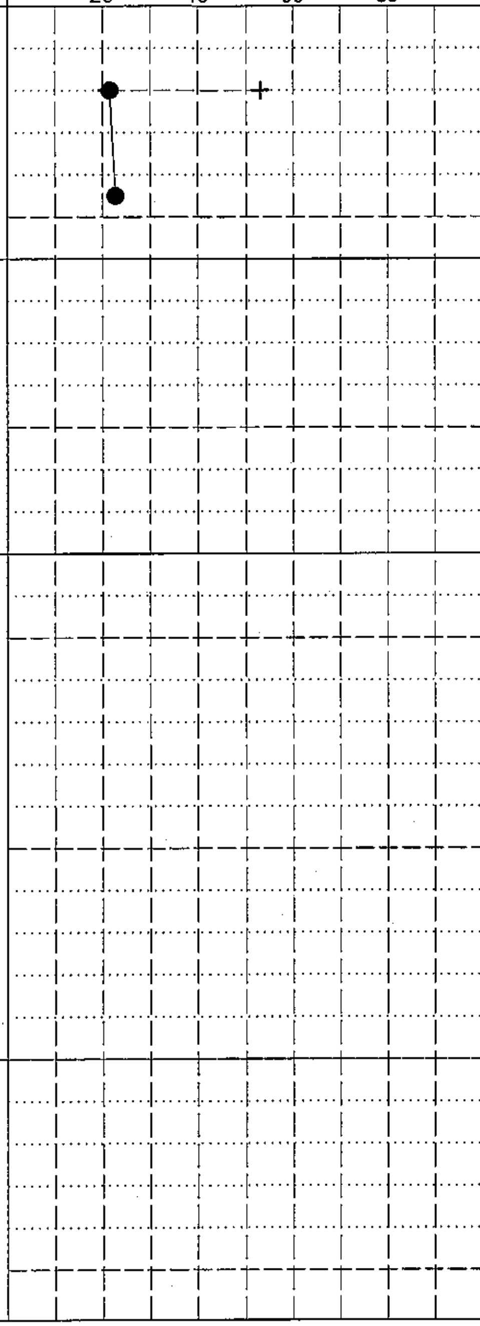
FIGURE A-9

LOG OF BORING NO. 10
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

DEPTH, ft	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL (SURFACE EL: ft)	BLOWS PER FT	DRY DENSITY LBS/CU FT	○ - UC Cohesion, kips/sq ft △ - UU (1, 2, 3, 4); PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT (20, 40, 60, 80)	% PASSING NO. 200 SIEVE
0–6			Stiff tan and light gray clay (CH), slightly silty, with silt pockets	14 15			
6–13			Medium dense tan and red silty fine sand (SM)	15 18			28.6
13–25			Medium dense tan fine sand (SP-SM), slightly silty - dense below 23'	25 18 33			



Depth scale: 5, 10, 15, 20, 25, 30

BORING DEPTH: 25 ft

DATE: 11/08/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

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FIGURE A-10

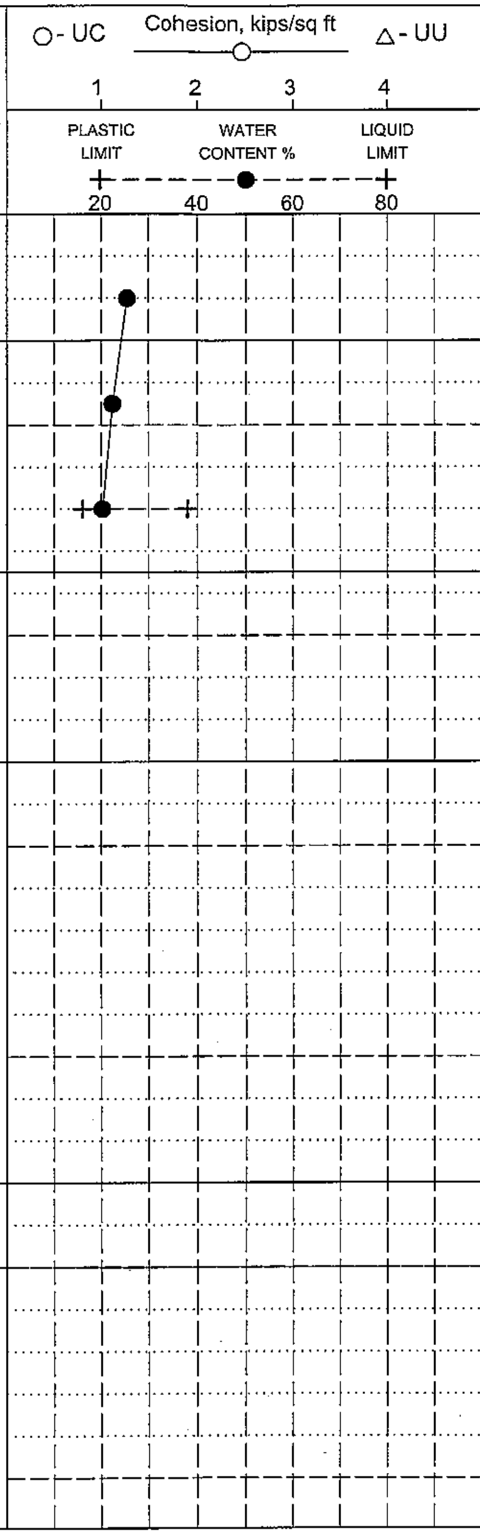
LOG OF BORING NO. 11
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
Medium stiff tan and light gray clay (CH), slightly silty	7		
Stiff tan and light gray silty clay (CL) with ferrous nodules	12 11		
Loose light gray clayey fine sand (SC)	5		46.3
Medium dense gray silty fine sand (SM) - dense below 18'	16 40		
Dense tan fine sand (SP-SM), slightly silty	40		

DEPTH, ft: 5, 10, 15, 20, 25, 30



BORING DEPTH: 25 ft

DATE: 11/13/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

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FIGURE A-11

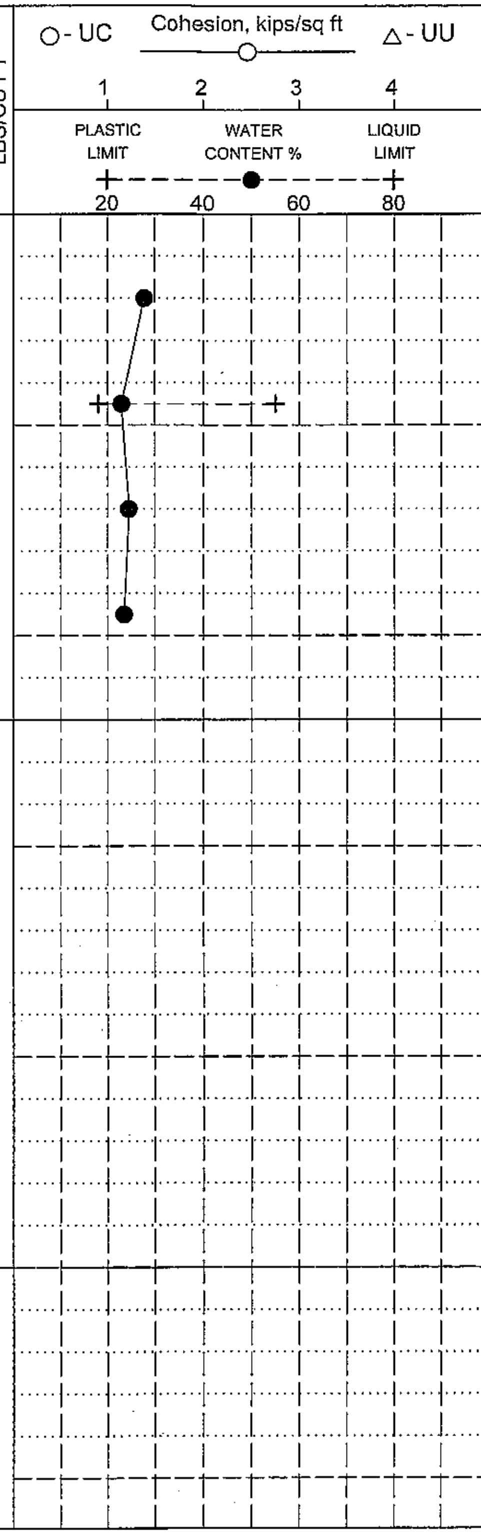
LOG OF BORING NO. 12

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–12	Medium stiff tan and light gray clay (CH), slightly silty			
	- with ferrous nodules below 2.5'	5		
		8		
	- stiff below 6'	10		
	- slightly sandy below 9'	11		
12–25	Medium dense tan fine sand (SP)			
		22		2.7
	- dense 18' - 22'	38		
		26		



BORING DEPTH: 25 ft

DATE: 11/05/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:14:53 AM

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FIGURE A-12

LOG OF BORING NO. 13
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

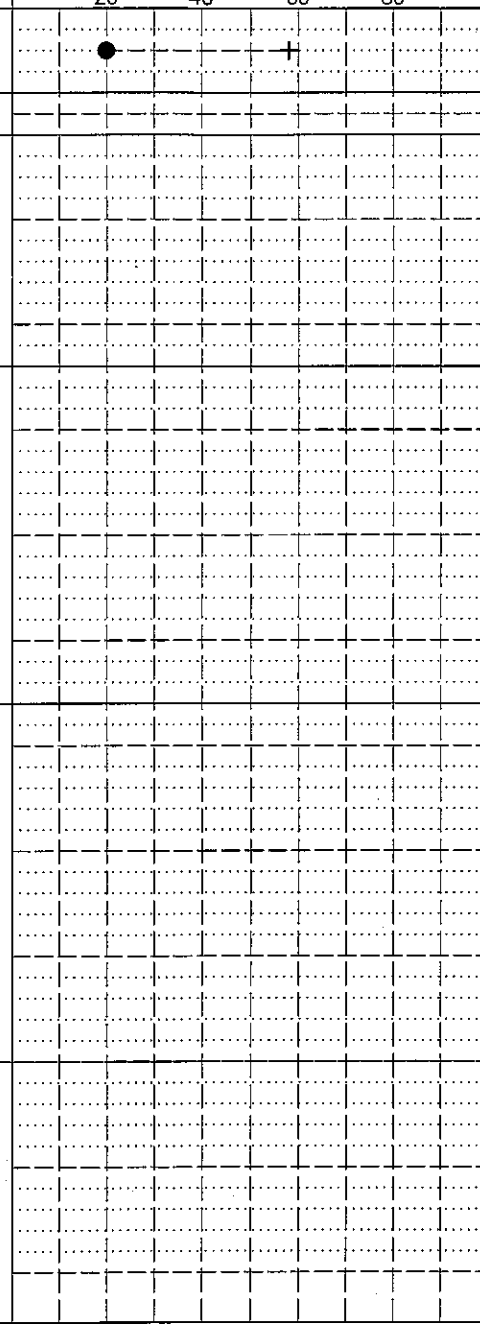
TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–4	Hard tan and light gray clay (CH), slightly silty - trace of ferrous nodules below 2'	31		
4–6	Dense tan sandy silt (ML), slightly clayey	31		72.4
6–17	Medium dense tan silty sand (SM) - with clay seams below 7'	20 14 23		
17–33	Medium dense tan fine sand (SP-SM), slightly silty - very dense, tan and light gray below 29'	26 26 54		
33–50	Dense tan fine to medium sand (SP) - very dense below 47'	42 31 50 100/4"		

Cohesion, kips/sq ft: ○ - UC, △ - UU (scale 1, 2, 3, 4)

PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT (scale 20, 40, 60, 80)



BORING DEPTH: 50 ft	COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.	GROUNDWATER DATA: Not determined.
DATE: 11/05/2007		

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FIGURE A-13

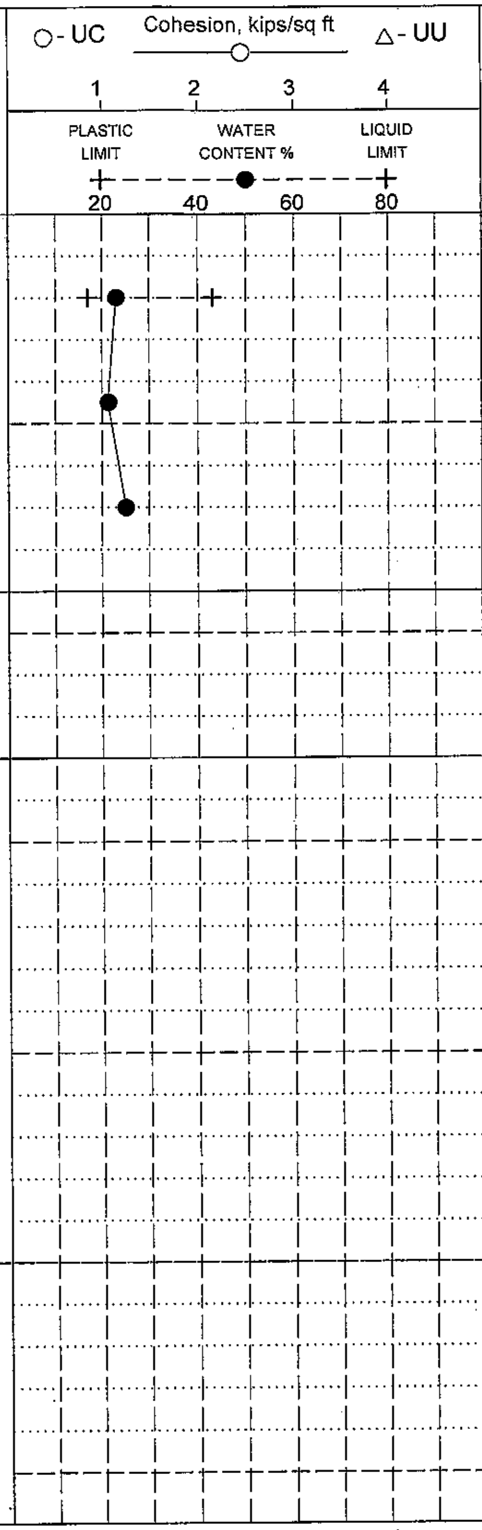
LOG OF BORING NO. 14
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–9	Very stiff tan and light gray silty clay (CL) - slightly sandy to 3' - with ferrous nodules below 3'	20 28 23		
9–13	Medium dense tan silty fine sand (SM)	18		
13–25	Medium dense tan fine sand (SP) - dense 18' - 22'	20 47 23		3.7



BORING DEPTH: 25 ft

DATE: 11/06/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

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FIGURE A-14

LOG OF BORING NO. 15

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

DEPTH, ft	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE EL: ft	BLOWS PER FT	DRY DENSITY LBS/CU FT	○ - UC Cohesion, kips/sq ft △ - UU (1 2 3 4) PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT (20 40 60 80)	% PASSING NO. 200 SIEVE
0–4			Very stiff tan silty clay (CL) with trace of ferrous nodules	24			
4–8			Medium dense tan sandy silt (ML)	20 14			52.7
8–13			Medium dense tan silty fine sand (SM)	15			
13–22			Loose tan fine sand (SP-SM), slightly silty - medium dense below 18'	6 22			
22–25			Medium dense tan fine to medium sand (SP) with fine gravel	26			

BORING DEPTH: 25 ft

DATE: 11/08/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

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FIGURE A-15

LOG OF BORING NO. 16
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–6.5	Very stiff tan and light gray sandy clay (CL)	27		
		26		
6.5–9	Dense tan and red silty fine sand (SM), slightly clayey	36		
9–28	Medium dense tan fine sand (SP-SM), slightly silty	18		5.1
		15		
	- loose below 18'	7		
		5		
28–50	Medium dense tan fine sand (SP)	25		
	- trace of fine gravel 32.5' - 34' - dense below 33'	34		
		32		
	- very dense below 43' - with medium sand below 43'	100/4"		
		66		

Chart legend: O - UC; Cohesion, kips/sq ft (1, 2, 3, 4); △ - UU; PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT (20, 40, 60, 80)

BORING DEPTH: 50 ft

DATE: 11/07/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:14:57 AM

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FIGURE A-16

LOG OF BORING NO. 17

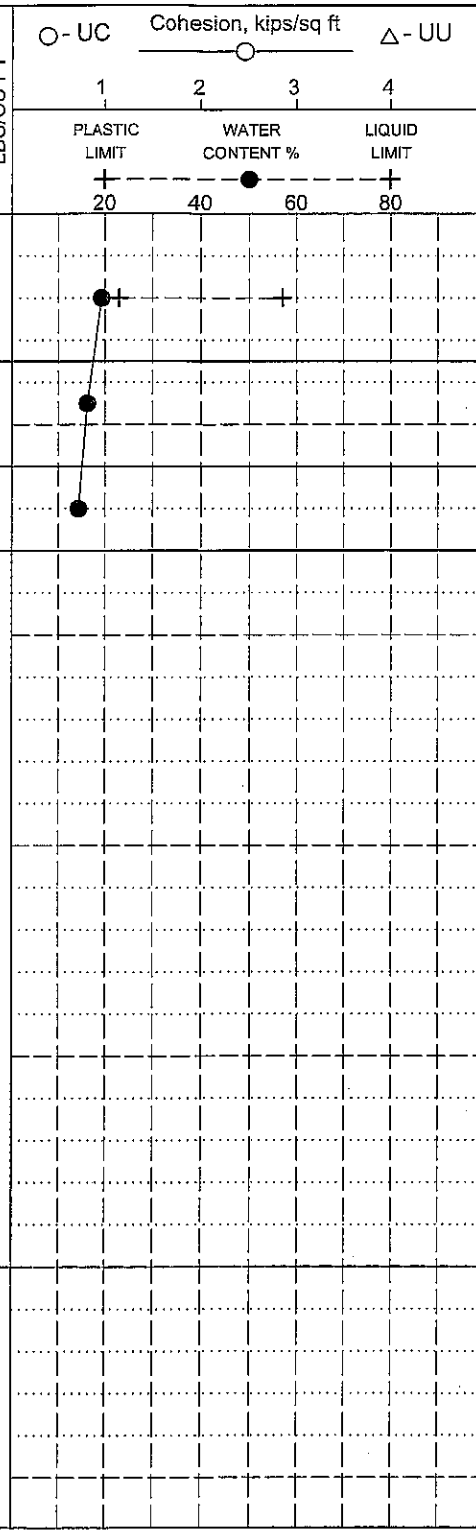
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0 – 3.5	Very stiff tan and light gray clay (CH), slightly silty	20		
3.5 – 6	Stiff tan and light gray silty clay (CL)	15		
6 – 8	Medium dense tan sandy silt (ML)	13		
8 – 25	Medium dense tan fine sand (SP-SM), slightly silty	14		
		19		5.4
		23		
		20		



BORING DEPTH: 25 ft

DATE: 11/01/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

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GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

FIGURE A-17

LOG OF BORING NO. 18

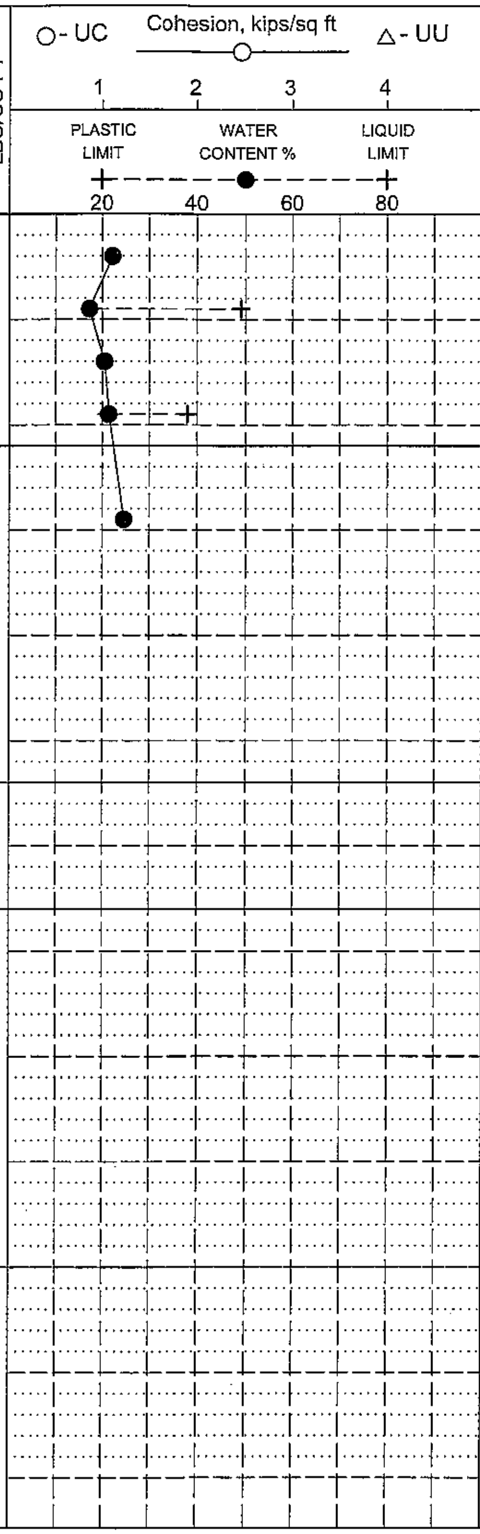
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

SURFACE EL: ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
Stiff tan silty clay (CL)			
- very stiff and gray below 1'	19		
	26		
- tan with ferrous nodules below 6'	20		
	17		
Medium dense tan and light gray silty fine sand (SM)	11		44.8
- gray below 17'	11		
	26		
Very dense gray fine sand (SP-SM), slightly silty	54		
Dense light gray fine sand (SP)	32		
	37		
- medium dense below 43'	26		
	29		



BORING DEPTH: 50 ft

DATE: 11/01/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Temporary piezometer installed to 50'. See groundwater data in report.

070556 LC 1/21/2008 10:14:59 AM

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FIGURE A-18

LOG OF BORING NO. 19
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

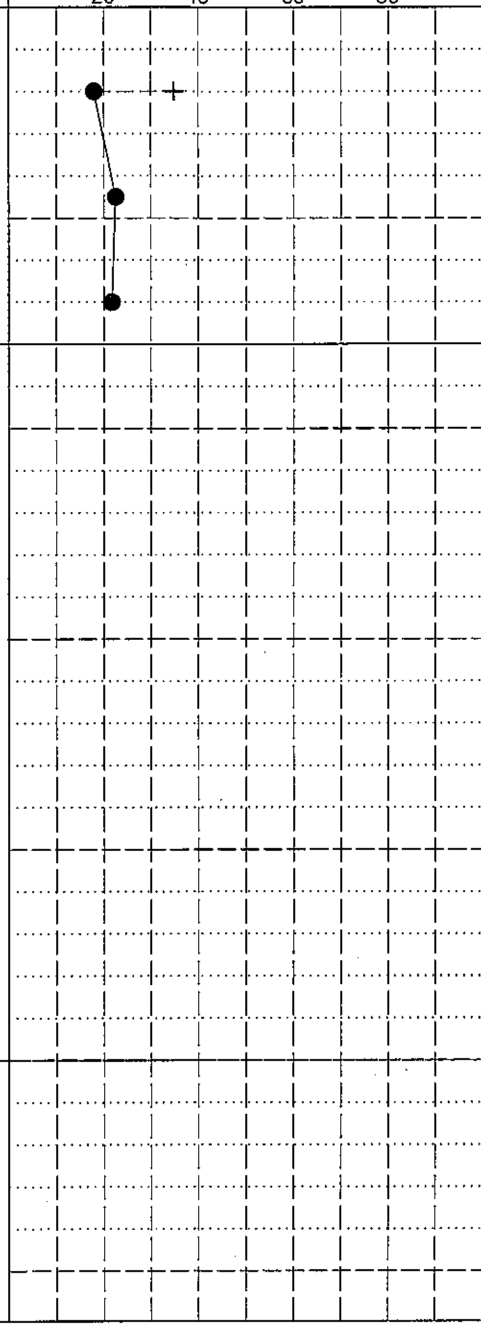
TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0	Stiff tan and light gray silty clay (CL)			
2		9		
4.5		10		
6	- slightly sandy below 6'			
7		11		
8	Medium dense tan fine sand (SP-SM), slightly silty			
9.5		17		14.8
14.5		18		
19.5		14		
23	- dense below 23'			
24.5		37		

Cohesion, kips/sq ft: ○ - UC, △ - UU (1, 2, 3, 4)

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT (20, 40, 60, 80)



BORING DEPTH: 25 ft

DATE: 11/05/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:00 AM

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FIGURE A-19

LOG OF BORING NO. 20

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

SURFACE EL: ft

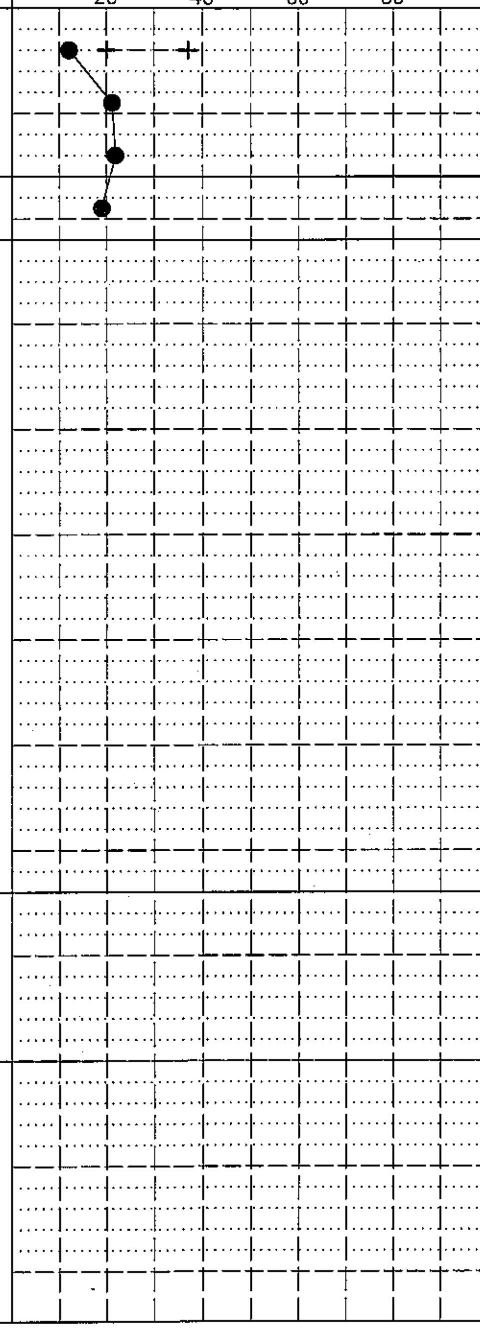
DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–8	Very stiff tan and light gray silty clay (CL) - with ferrous nodules below 3'	24 19 16		
8–11	Medium dense tan sandy silt (ML)	12		58.4
11–42	Medium dense tan fine sand (SP-SM), slightly silty - very dense 18' - 22' - dense below 33' - tan below 37'	12 59 16 23 42 33		
42–50	Medium dense tan fine sand (SP)	45 45		

O - UC Cohesion, kips/sq ft △ - UU

1 2 3 4

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT

20 40 60 80



BORING DEPTH: 50 ft

DATE: 11/01/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:01 AM

BURNS COOLEY DENNIS, INC.
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FIGURE A-20

LOG OF BORING NO. 21
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–6	Very stiff tan and light gray silty clay (CL) - with ferrous nodules below 2.5'	25, 28		
6–8	Very dense tan and red silty fine sand (SM)	61		
8–25	Medium dense tan fine sand (SP)	18, 19, 17, 19		2.7

Chart headings: O - UC; Cohesion, kips/sq ft (1, 2, 3, 4); Δ - UU; PLASTIC LIMIT; WATER CONTENT %; LIQUID LIMIT (20, 40, 60, 80)

BORING DEPTH: 25 ft

DATE: 11/07/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:02 AM

BURNS COOLEY DENNIS, INC.
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FIGURE A-21

LOG OF BORING NO. 22

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

Cohesion, kips/sq ft: ○ - UC, △ - UU (scale 1, 2, 3, 4)

PLASTIC LIMIT + — WATER CONTENT % ● — LIQUID LIMIT + (scale 20, 40, 60, 80)

DEPTH, ft	DESCRIPTION OF MATERIAL (SURFACE EL: ft)	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–3	Stiff tan and red silty clay (CL)	11		
3–8	Medium dense tan silty sand (SM) - with trace of clay partings	12		37.5
		11		
8–25	Medium dense tan fine sand (SP-SM), slightly silty	12		
		14		
		17		
	- loose below 23'	5		

BORING DEPTH: 25 ft

DATE: 11/06/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

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FIGURE A-22

LOG OF BORING NO. 23
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–6.5	Medium stiff gray silty clay (CL) with ferrous nodules - stiff, tan and light gray below 3'	7 10		
6.5–9	Medium dense tan and light gray clayey silt (ML) with ferrous nodules	15		
9–16	Medium dense tan silt (ML), slightly clayey - loose below 12.5'	13 5		91.5
16–27	Medium dense gray fine sand (SP-SM), slightly silty - with clay seams to 23'	19 12		
27–50	Dense gray fine sand (SP) - very dense 37' - 47'	34 33 50/6" 64 40		

○ - UC Cohesion, kips/sq ft △ - UU

1 2 3 4

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT

20 40 60 80

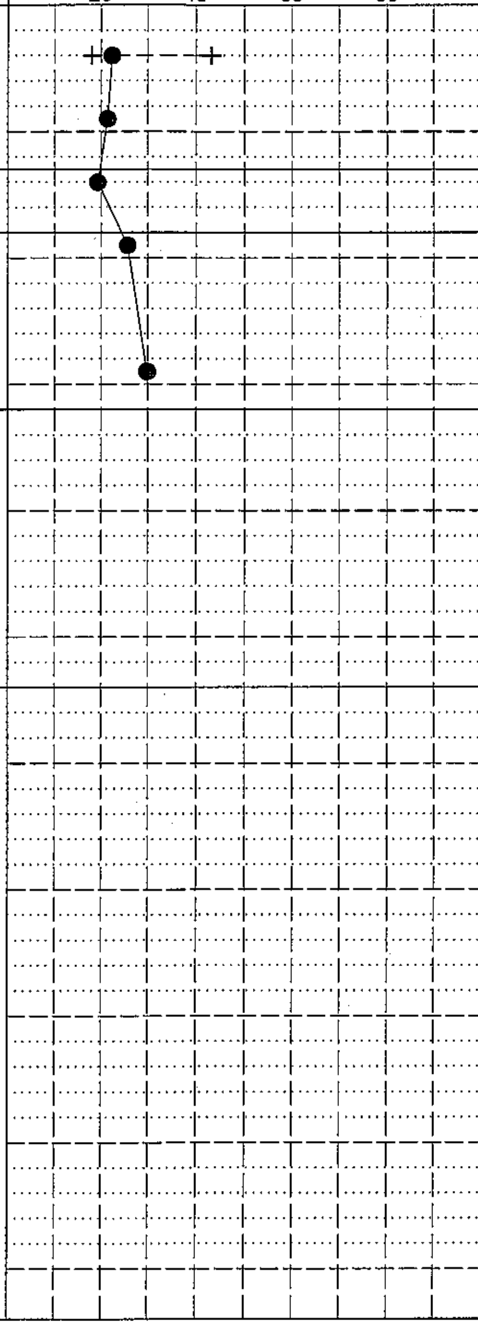

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FIGURE A-23

LOG OF BORING NO. 23 (Continued)

DEPTH, ft	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	○ - UC Cohesion, kips/sq ft △ - UU (1, 2, 3, 4); PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT (20, 40, 60, 80)	% PASSING NO. 200 SIEVE
			- dense 47' - 58'				
55		X		40			
60		X	- very dense 58' - 62'	50/6"			
65		X		37			
70		X	- dense 63' - 77'	45			
75		X		48			
			- very dense below 77'				
80		X		50/5"			
85		X		50/4"			
90		X		56			
95		X		62			
100		X		63			

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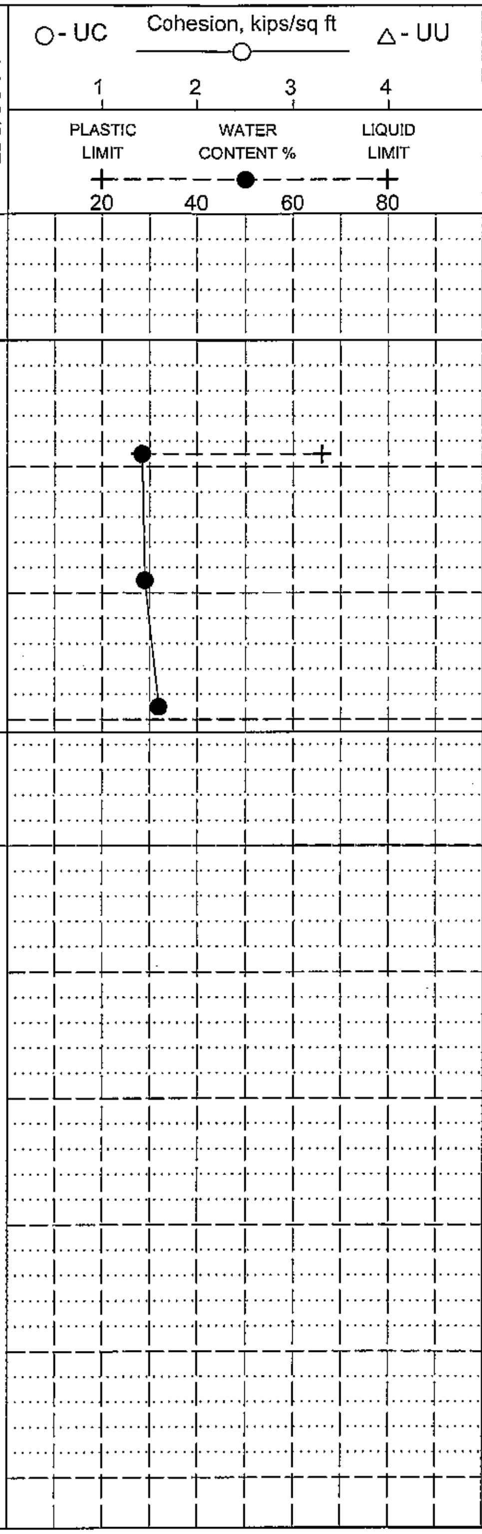
LOG OF BORING NO. 23 (Continued)

DEPTH, ft	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
105		X		50/6"		
105–120			Hard gray clay (CH) with sand seams			
		X		50/3"		
		X		50/4"		
		X		50/3"		
120–125			Very dense light gray fine sand (SP)			
		X		50/6"		



BORING DEPTH: 125 ft

DATE: 10/31/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:04 AM

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

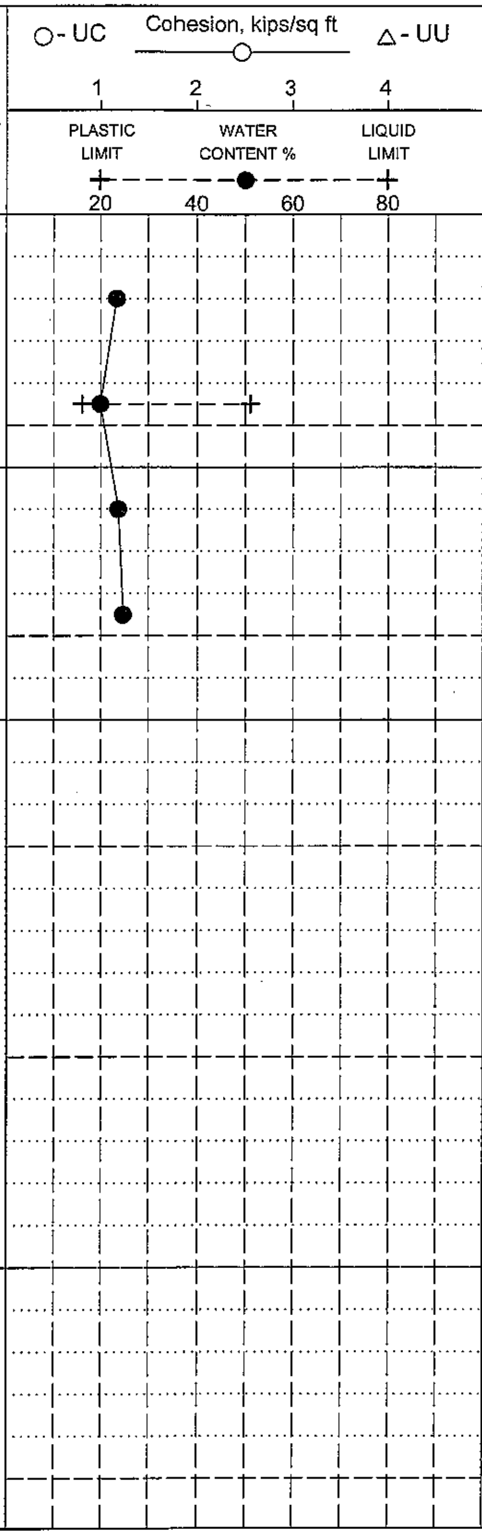
FIGURE A-25

LOG OF BORING NO. 24
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash | LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–6	Stiff tan and light gray clay (CH), slightly silty	12		
	- very stiff below 3'	24		
6–12	Very stiff tan and light gray silty clay (CL) with ferrous nodules	23		
		16		
12–25	Medium dense tan silty fine sand (SM)	17		20.5
		11		
		22		



BORING DEPTH: 25 ft

DATE: 11/06/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:05 AM

BURNS COOLEY DENNIS, INC.
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FIGURE A-26

LOG OF BORING NO. 25

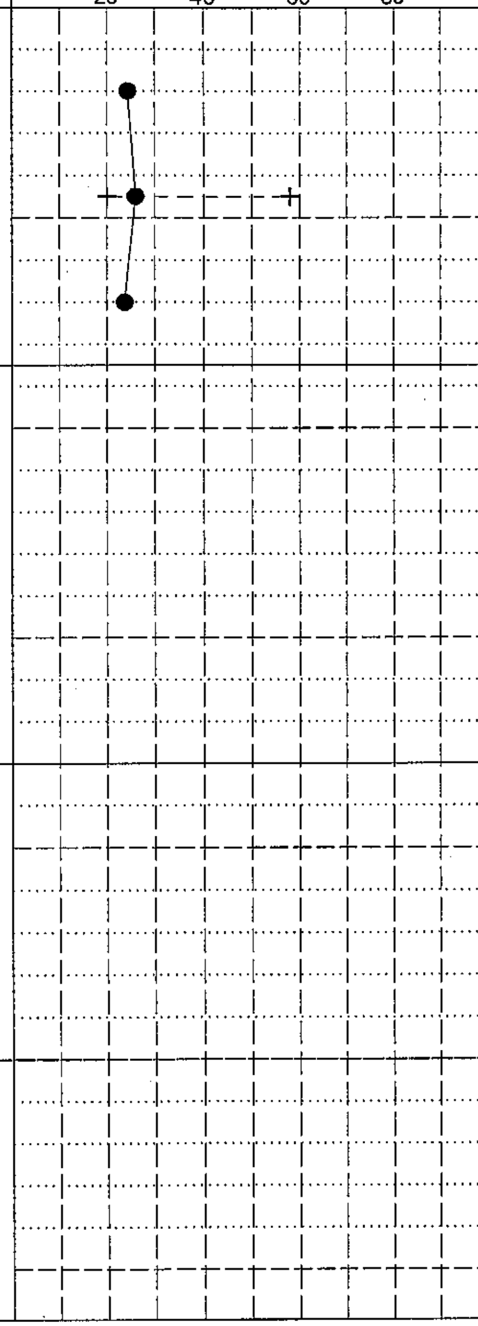
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash | LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0 – 8.5	CH		Medium stiff tan and light gray clay (CH), slightly silty with ferrous nodules	8		
			- stiff 3' - 6'	14		
			- very stiff below 6'	16		
8.5 – 18	SM		Medium dense tan and red silty fine sand (SM)	18		14.6
			- tan below 14' - trace of clay seams 14.5' - 16'	12		
18 – 25	SP-SM		Very loose tan fine sand (SP-SM), slightly silty	4		
			- gray below 23' - dense below 24'	31		

Cohesion, kips/sq ft (○ - UC, △ - UU): 1, 2, 3, 4
Plastic limit, water content %, liquid limit: 20, 40, 60, 80



BORING DEPTH: 25 ft

DATE: 11/06/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:44:59 AM

BURNS COOLEY DENNIS, INC.
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FIGURE A-27

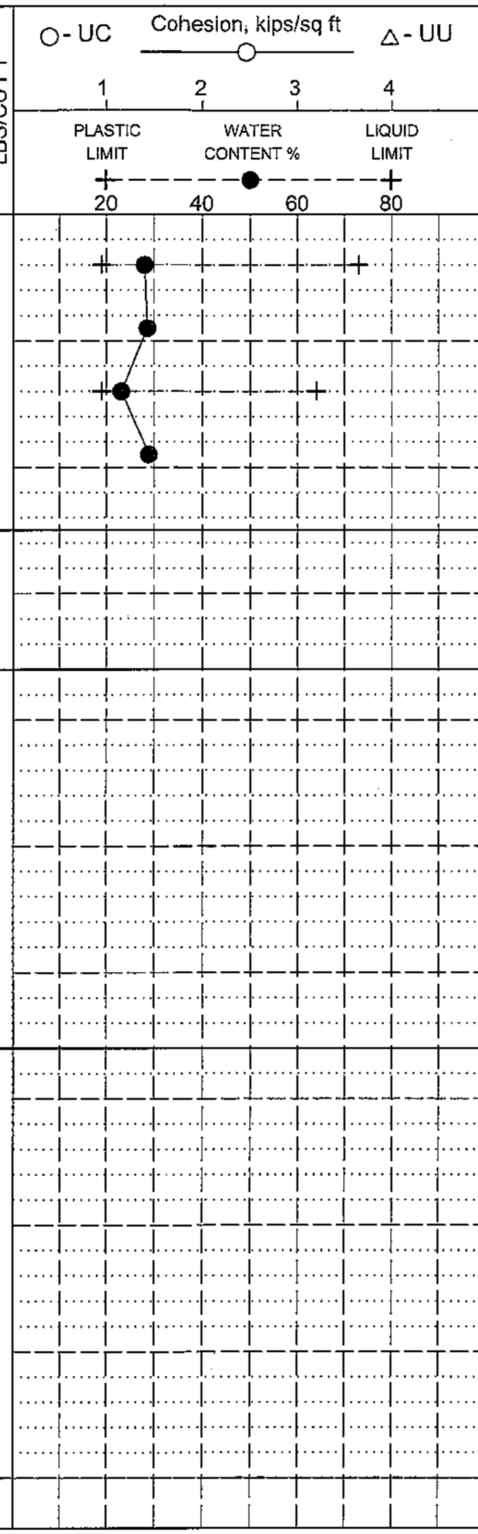
LOG OF BORING NO. 26

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0	Medium stiff light gray and tan clay (CH)	6		
		5		
5	- stiff, slightly silty below 6'	13		
10		11		
	Medium dense tan silty fine sand (SM)	16		
15	- tan and light gray below 15'			
	Dense tan fine sand (SP-SM), slightly silty	33		
20	- tan and gray below 23'	32		
25				
30		35		
	- tan with medium sand below 33'			
	Dense tan fine to medium sand (SP)	30		
35				
40		38		
	- with trace of gravel 38' - 42'			
	- very dense below 43'	59		
45				
50		100+		



BORING DEPTH: 50 ft

DATE: 11/16/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:07 AM

BURNS COOLEY DENNIS, INC.
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FIGURE A-28

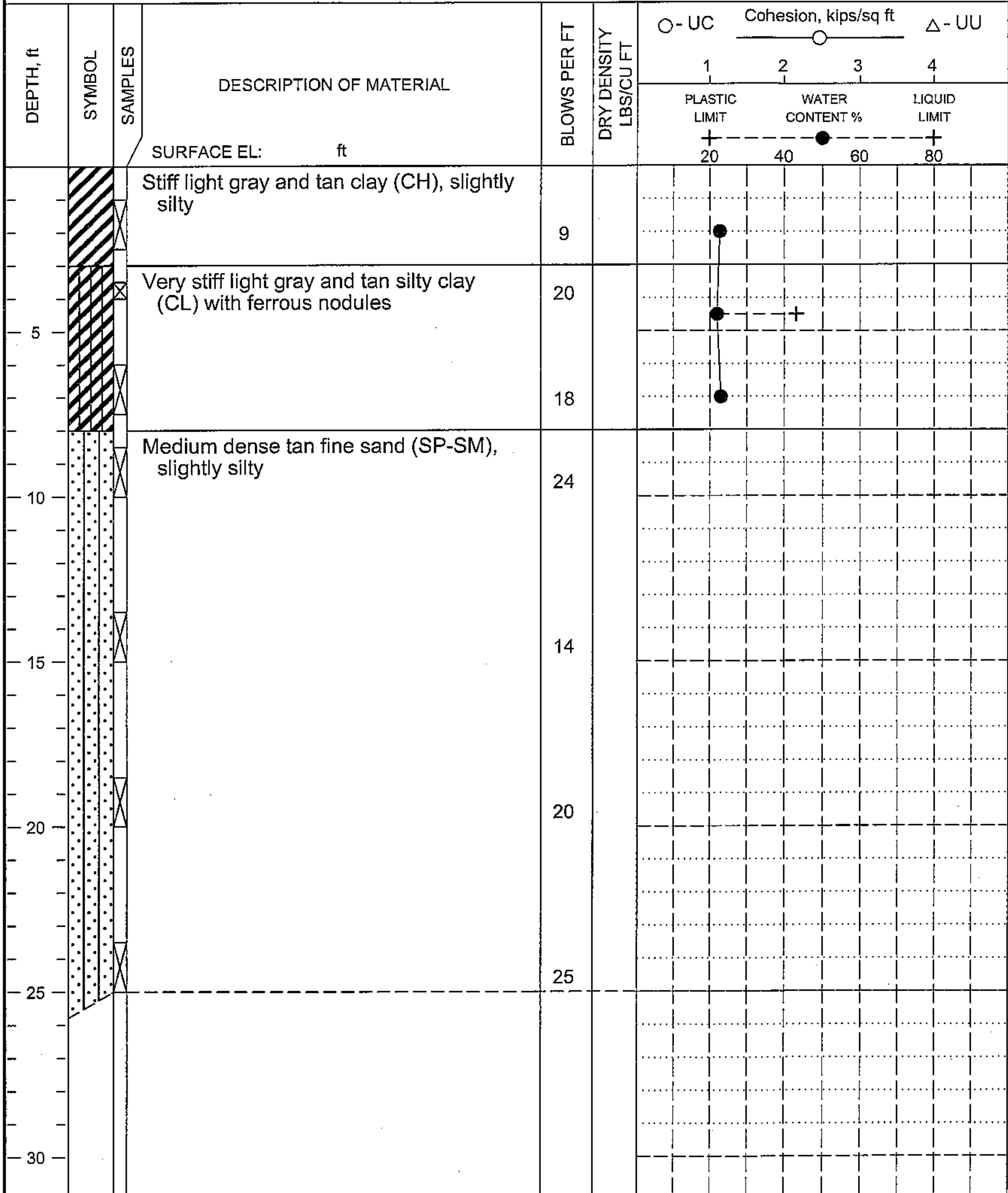
LOG OF BORING NO. 27
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

SURFACE EL: ft

DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
Stiff light gray and tan clay (CH), slightly silty	9		
Very stiff light gray and tan silty clay (CL) with ferrous nodules	20		
	18		
Medium dense tan fine sand (SP-SM), slightly silty	24		
	14		15.5
	20		
	25		



BORING DEPTH: 25 ft

DATE: 11/16/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:08 AM

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

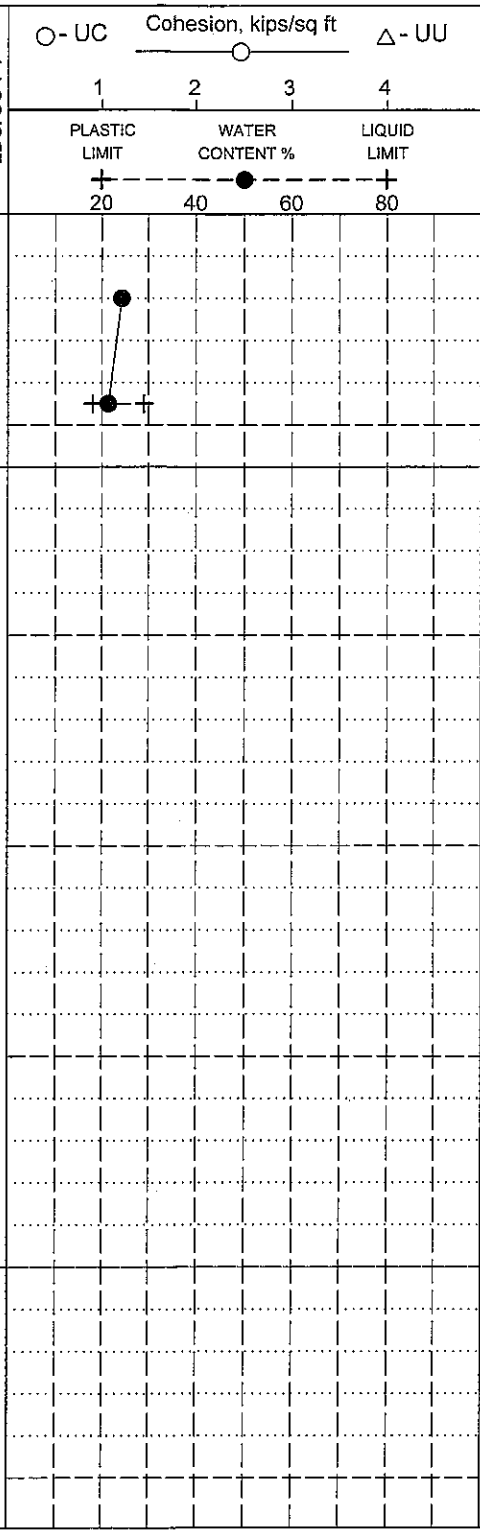
FIGURE A-29

LOG OF BORING NO. 28
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash   LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–6	Stiff tan and light gray silty clay (CL) with ferrous nodules	10		
	- slightly sandy below 4.5'	11		
6–25	Medium dense tan and light gray silty fine sand (SM) with silt pockets	17		24.1
		11		
	- light gray below 14'	24		36.6
		22		
	- loose below 23'	8		



BORING DEPTH: 25 ft

DATE: 11/16/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

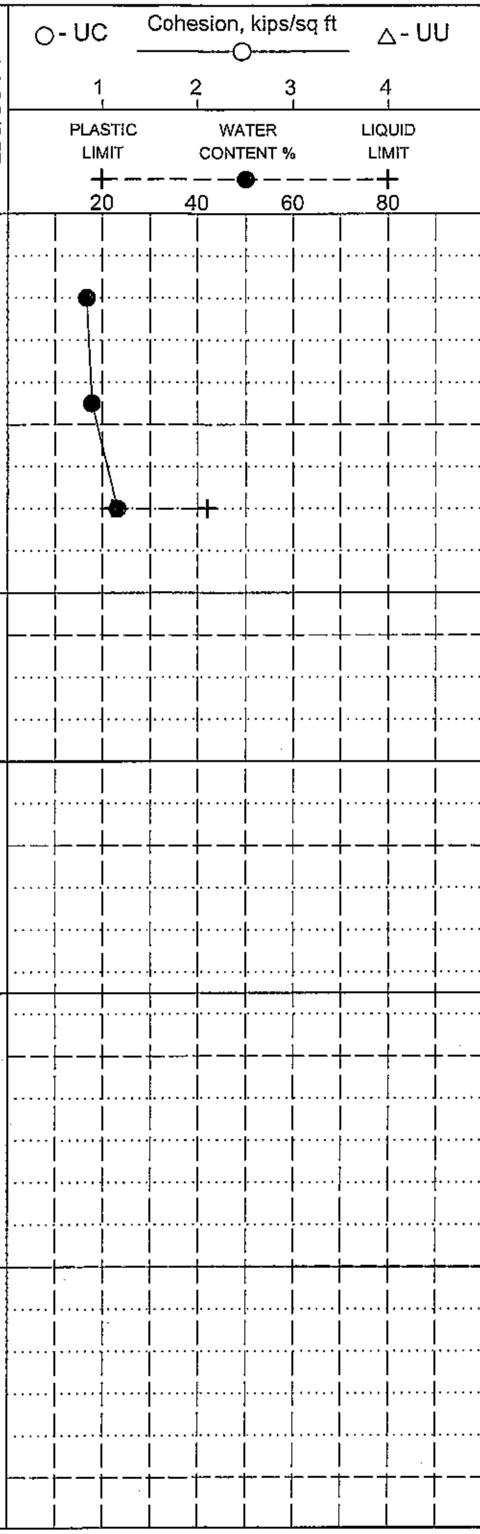
070556 LC 1/21/2008 10:15:09 AM

LOG OF BORING NO. 29

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

DEPTH, ft	DESCRIPTION OF MATERIAL (SURFACE EL: ft)	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–9	Stiff tan and light gray silty clay (CL) with silt pockets and calcareous nodules	15		
	- very stiff with ferrous nodules below 4'	28		
		19		
9–13	Medium dense tan silty fine sand (SM), slightly clayey	19		
13–18.5	Loose gray sandy silt (ML)	10		66.6
18.5–25	Dense tan and gray silty fine sand (SM)	42		
		41		



BORING DEPTH: 25 ft

DATE: 11/15/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:10 AM

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

FIGURE A-31

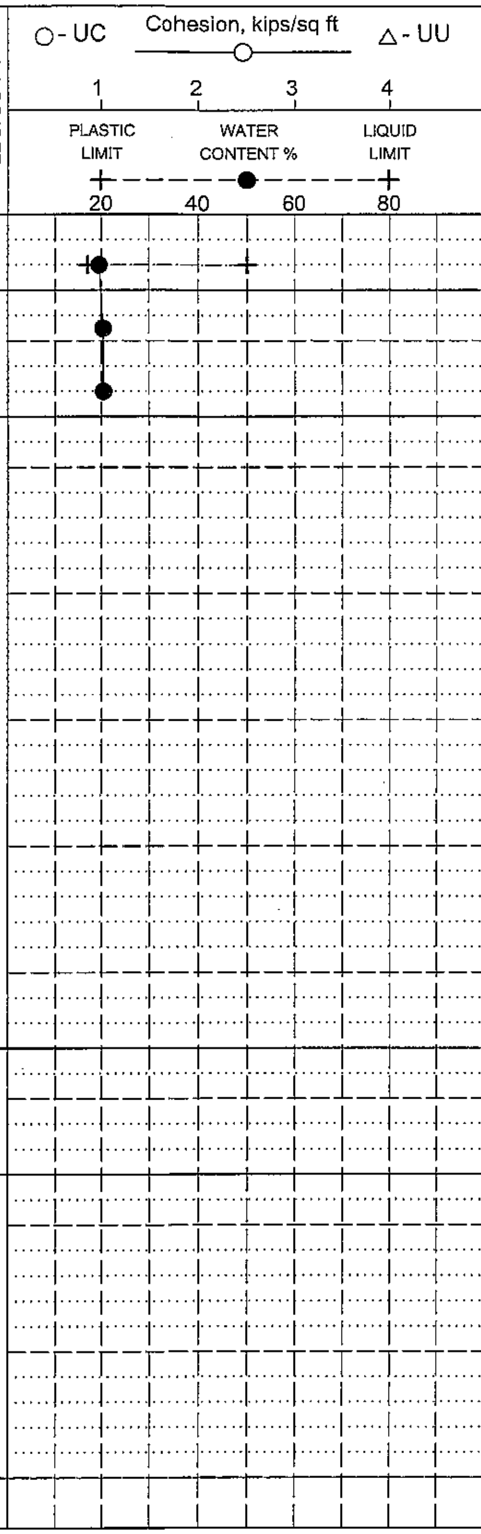
LOG OF BORING NO. 30

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–3	Very stiff light gray and tan clay (CH)	18		
3–8	Very stiff tan and light gray silty clay (CL) with silt pockets and ferrous nodules	17		
	- slightly sandy below 7'	20		
8–33	Medium dense tan fine sand (SP-SM), slightly silty	18		
	- loose 13' - 17'	8		
		14		
		27		
	- dense below 28'	34		
33–38	Medium dense gray silty fine sand (SM)	20		39.8
38–50	Dense tan fine to medium sand (SP), with trace of gravel	36		
		48		
		32		



BORING DEPTH: 50 ft

DATE: 11/15/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:11 AM

BURNS COOLEY DENNIS, INC.
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FIGURE A-32

LOG OF BORING NO. 31

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

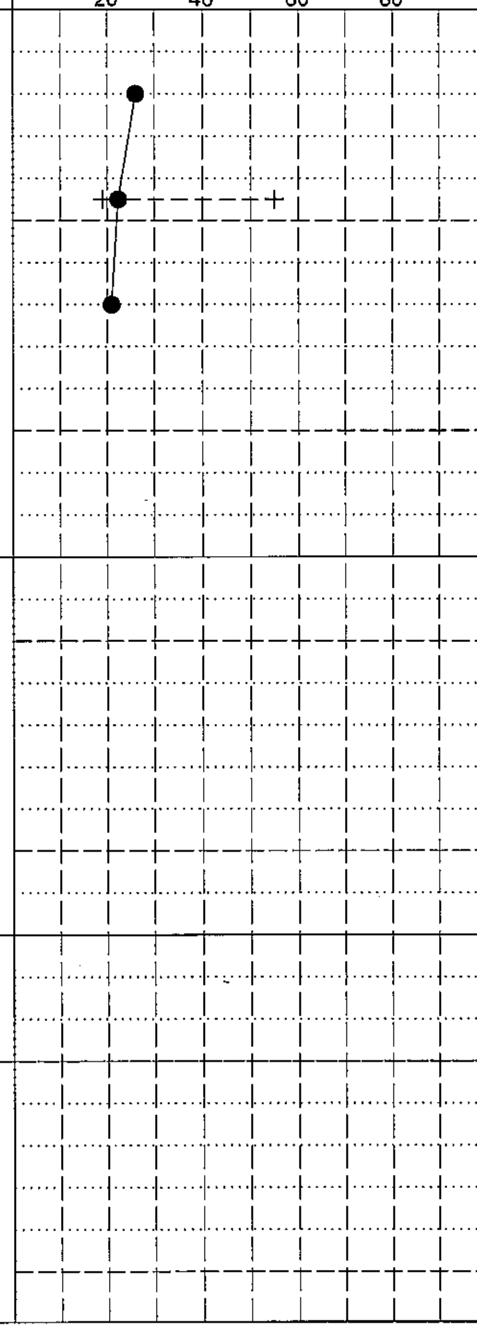
LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0 – 13	Stiff tan and light gray clay (CH), slightly silty	9		
		10		
		12		
	- with trace of concretions below 8'	17		
13 – 22	Loose tan silty fine sand (SM)			
	- with gray clay layer 14' - 14.5'	6		
	- dense below 18'	30		13.5
22 – 25	Dense light gray fine sand (SP-SM), slightly silty	40		

Cohesion, kips/sq ft: ○ - UC, △ - UU (scale 1, 2, 3, 4)

PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT (scale 20, 40, 60, 80)



BORING DEPTH: 25 ft

DATE: 11/16/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 4:59:54 PM

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FIGURE A-33

LOG OF BORING NO. 32

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	Cohesion, kips/sq ft (O- UC, △- UU) / PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT	% PASSING NO. 200 SIEVE
0–6.5	CL		Medium stiff tan and light gray silty clay (CL) with silt seams and pockets	6			
			- stiff with ferrous nodules below 4'	12			
6.5–9	SM		Medium dense tan silty fine sand (SM)	11			
9–25	SP-SM		Medium dense tan fine sand (SP-SM), slightly silty	25			5.6
				26			
			- dense and with trace of gravel below 17.5'	48			
				42			

BORING DEPTH: 25 ft

DATE: 11/17/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:13 AM

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FIGURE A-34

LOG OF BORING NO. 33

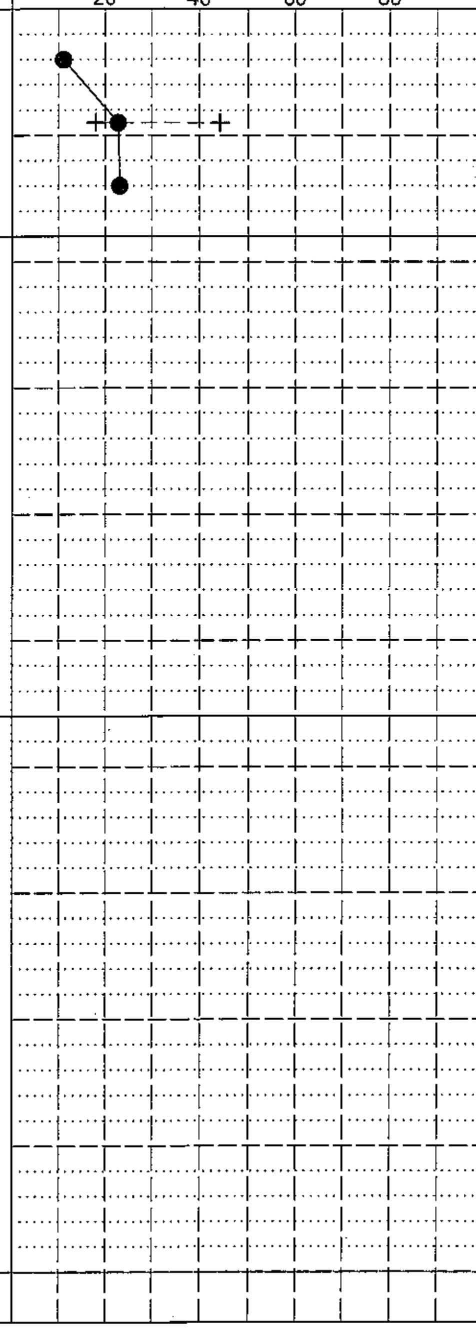
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

Legend: ○ - UC; Cohesion, kips/sq ft (1, 2, 3, 4); △ - UU; PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT (20, 40, 60, 80)

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–9	Medium stiff tan and light gray silty clay (CL) - with ferrous nodules below 3'	7 11		
9–28	Medium dense tan fine sand (SP-SM), slightly silty	17		
		24		11.0
	- gray below 19'	28		
		21		
28–50	Gray fine to medium sand (SP)	27		
	- tan below 33'	59		
	- very dense 33' - 43'	55		
	- dense below 43'	47		
		39		



BORING DEPTH: 50 ft

DATE: 11/15/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:13 AM

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

FIGURE A-35

LOG OF BORING NO. 34

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–4	Medium stiff tan and light gray silty clay (CL) with silt seams and pockets	5		
4–6	Stiff tan and light gray clay (CH), slightly silty with ferrous nodules	9		
6–8.5	Stiff tan and light gray silty clay (CL) with ferrous nodules	14		
8.5–13	Stiff tan and light gray sandy clay (CL) with ferrous nodules	12		51.8
13–18	Medium dense tan silty fine sand (SM)	13		
18–25	Dense tan fine sand (SP-SM), slightly silty	37		
		45		

Chart legend: ○ - UC; Cohesion, kips/sq ft (1, 2, 3, 4); △ - UU; PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT (20, 40, 60, 80)

BORING DEPTH: 25 ft

DATE: 11/15/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:14 AM

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FIGURE A-36

LOG OF BORING NO. 35

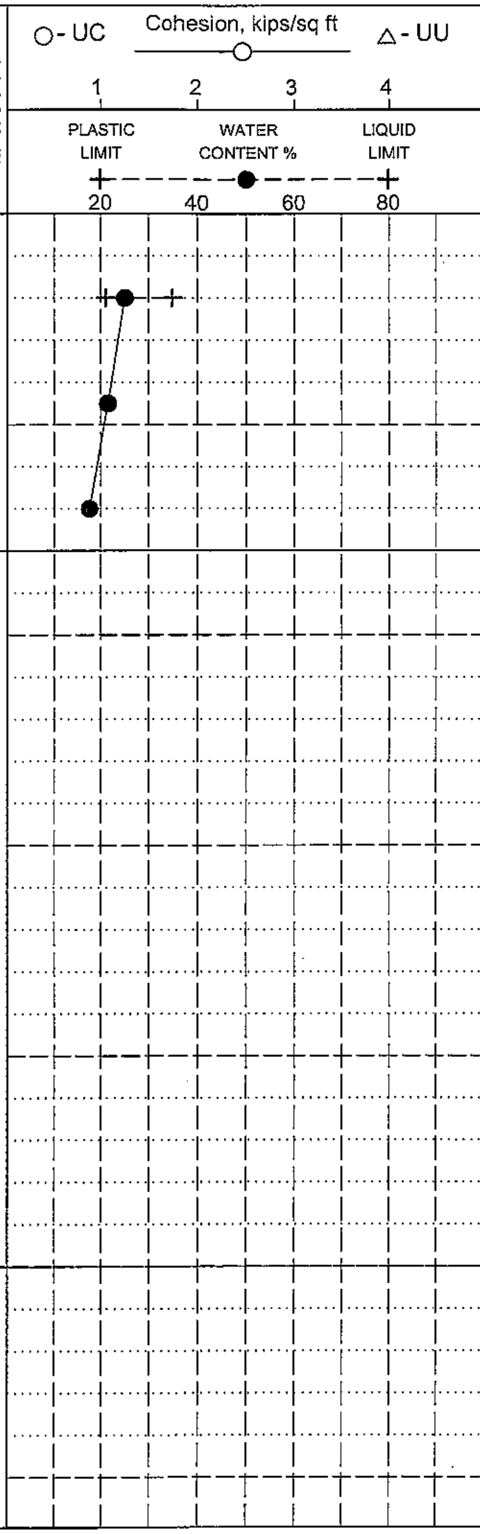
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash

LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0 – 8	Stiff tan and light gray silty clay (CL) with silt pockets - very stiff below 3'	11 25 18		
8 – 25	Medium dense tan fine sand (SP-SM), slightly silty - with clay layers 9' - 9.5' - dense below 23'	12 17 24 36		10.8



BORING DEPTH: 25 ft

DATE: 11/15/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:15 AM

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

FIGURE A-37

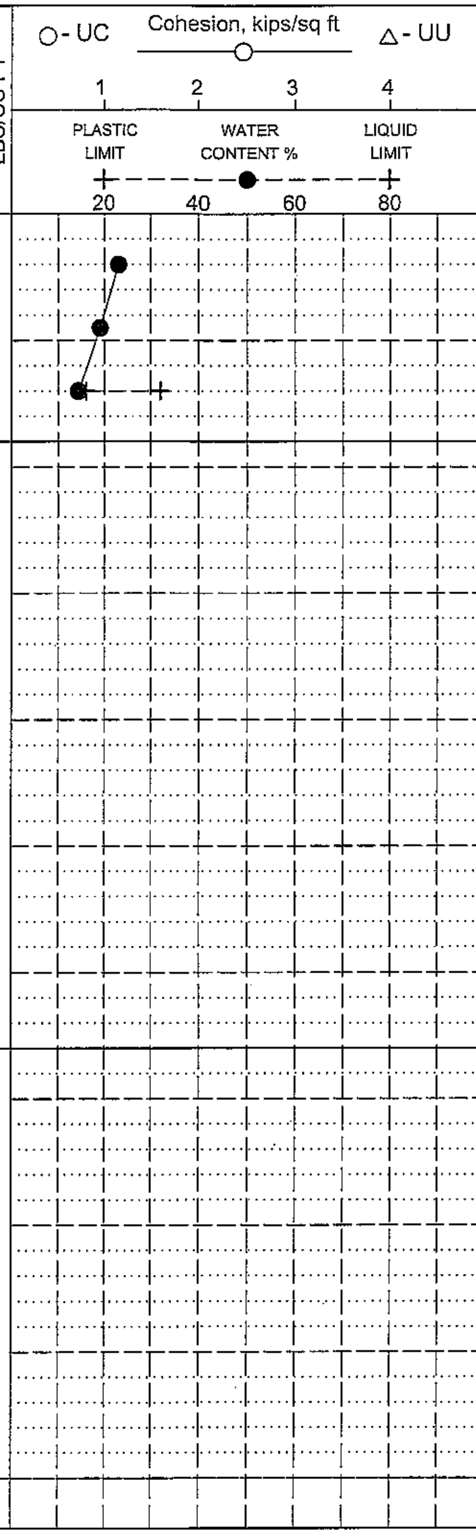
LOG OF BORING NO. 36

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash — LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–9	Very stiff tan and light gray silty clay (CL) with silt seams and pockets	21, 26		
	- hard below 6'	35		
9–33	Medium dense tan fine sand (SP-SM), slightly silty	15		
	- dense 13' - 17'	31, 24, 23, 25		
33–50	Dense tan fine sand (SP)	40		2.9
	- with trace of gravel below 43'	23		
	- medium dense 38' - 48'	30		
	- dense below 48'	41		



BORING DEPTH: 50 ft

DATE: 11/13/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Temporary piezometer installed to 50'. See groundwater data in report.

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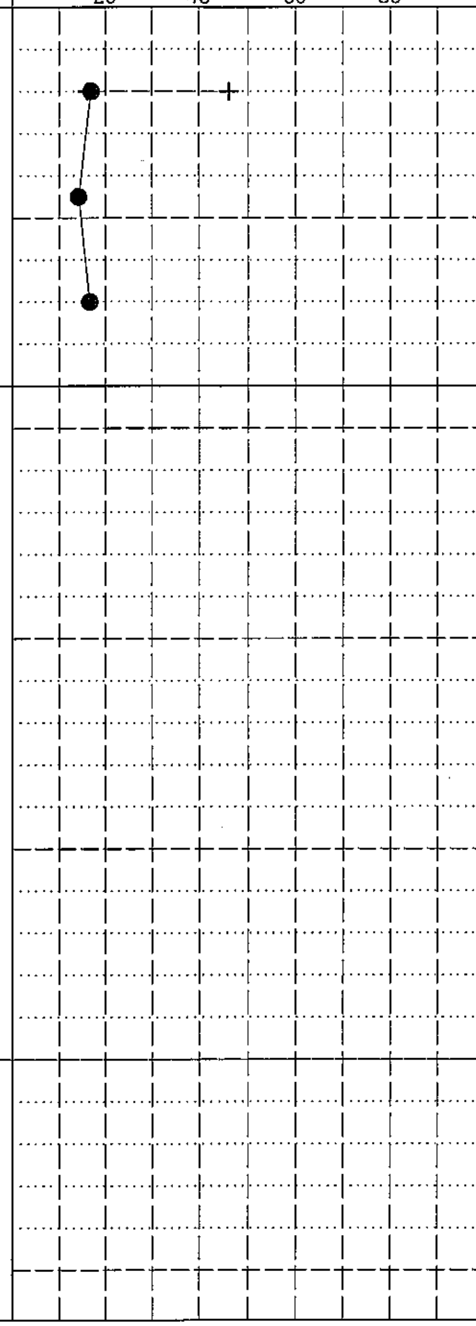
FIGURE A-38

LOG OF BORING NO. 37
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash   LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	O - UC Cohesion, kips/sq ft △ - UU (1, 2, 3, 4) / PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT (20, 40, 60, 80)	% PASSING NO. 200 SIEVE
0–9	CL		Hard tan and light gray silty clay (CL) with silt seams and pockets	34			
5			- very stiff 3' - 6'	29			
			- with ferrous nodules below 6'	34			
			- slightly sandy below 7.5'				
9–25	SM		Medium dense tan silty fine sand (SM)	23			23.7
15				28			
20				23			
25				26			
30							



BORING DEPTH: 25 ft

DATE: 11/13/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:17 AM

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

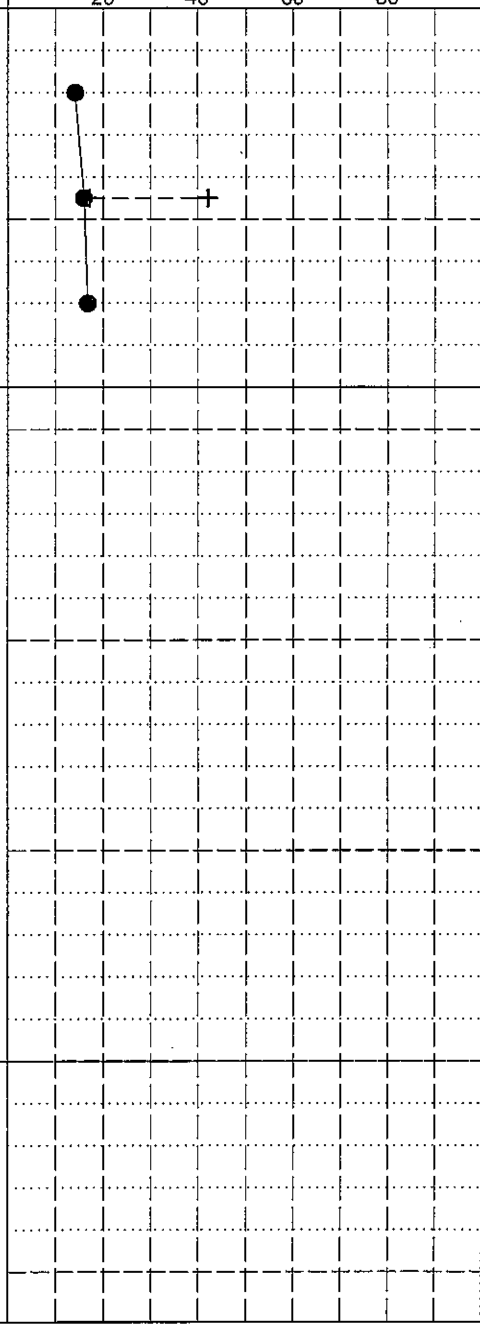
FIGURE A-39

LOG OF BORING NO. 38

RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash   LOCATION: See Figure 1

DEPTH, ft	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL (SURFACE EL: ft)	BLOWS PER FT	DRY DENSITY LBS/CU FT	○ - UC Cohesion, kips/sq ft △ - UU (1, 2, 3, 4); PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT (20, 40, 60, 80)	% PASSING NO. 200 SIEVE
			Very stiff tan and light gray silty clay (CL)				
			- with ferrous nodules below 3'				
5			- hard 3' - 6'	31			
				24			
10			Medium dense tan fine sand (SP-SM), slightly silty	15			
15				11			10.4
20				8			
25				28			
30							



BORING DEPTH: 25 ft

DATE: 11/14/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:18 AM

BURNS COOLEY DENNIS, INC.
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FIGURE A-40

LOG OF BORING NO. 39
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	Cohesion, kips/sq ft (O - UC, △ - UU); Plastic Limit / Water Content % / Liquid Limit	% PASSING NO. 200 SIEVE
0–6	Medium stiff tan silty clay (CL) with silt seams	8		PL ≈ 20, WC ≈ 22, LL ≈ 38	
	- very stiff with fine sand below 3'	22			
6–8	Medium dense tan sandy silt (ML), slightly clayey	20			64.7
8–25	Medium dense tan fine sand (SP-SM), slightly silty	16			
		9			
		23			
	- tan, red and with medium sand below 23'	29			

BORING DEPTH: 25 ft

DATE: 11/14/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Not determined.

070556 LC 1/21/2008 10:15:19 AM

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FIGURE A-41

LOG OF BORING NO. 40
RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

TYPE: Rotary wash LOCATION: See Figure 1

SURFACE EL: ft

Cohesion, kips/sq ft: ○ - UC, △ - UU (1, 2, 3, 4)
PLASTIC LIMIT, WATER CONTENT %, LIQUID LIMIT (20, 40, 60, 80)

DEPTH, ft	DESCRIPTION OF MATERIAL	BLOWS PER FT	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0–8	Medium stiff tan and light gray silty clay (CL) with ferrous nodules - stiff below 3'	7 10 17		
8–13	Medium dense tan silty fine sand (SM)	21		
13–33	Medium dense tan fine sand (SP-SM), slightly silty	21 14 22 25		10.8
33–50	Dense tan fine to medium sand (SP) with trace of gravel - very dense below 47'	50 50 50 69		

BORING DEPTH: 50 ft

DATE: 11/14/2007

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.

GROUNDWATER DATA: Temporary piezometer installed to 50'. See groundwater data in report.

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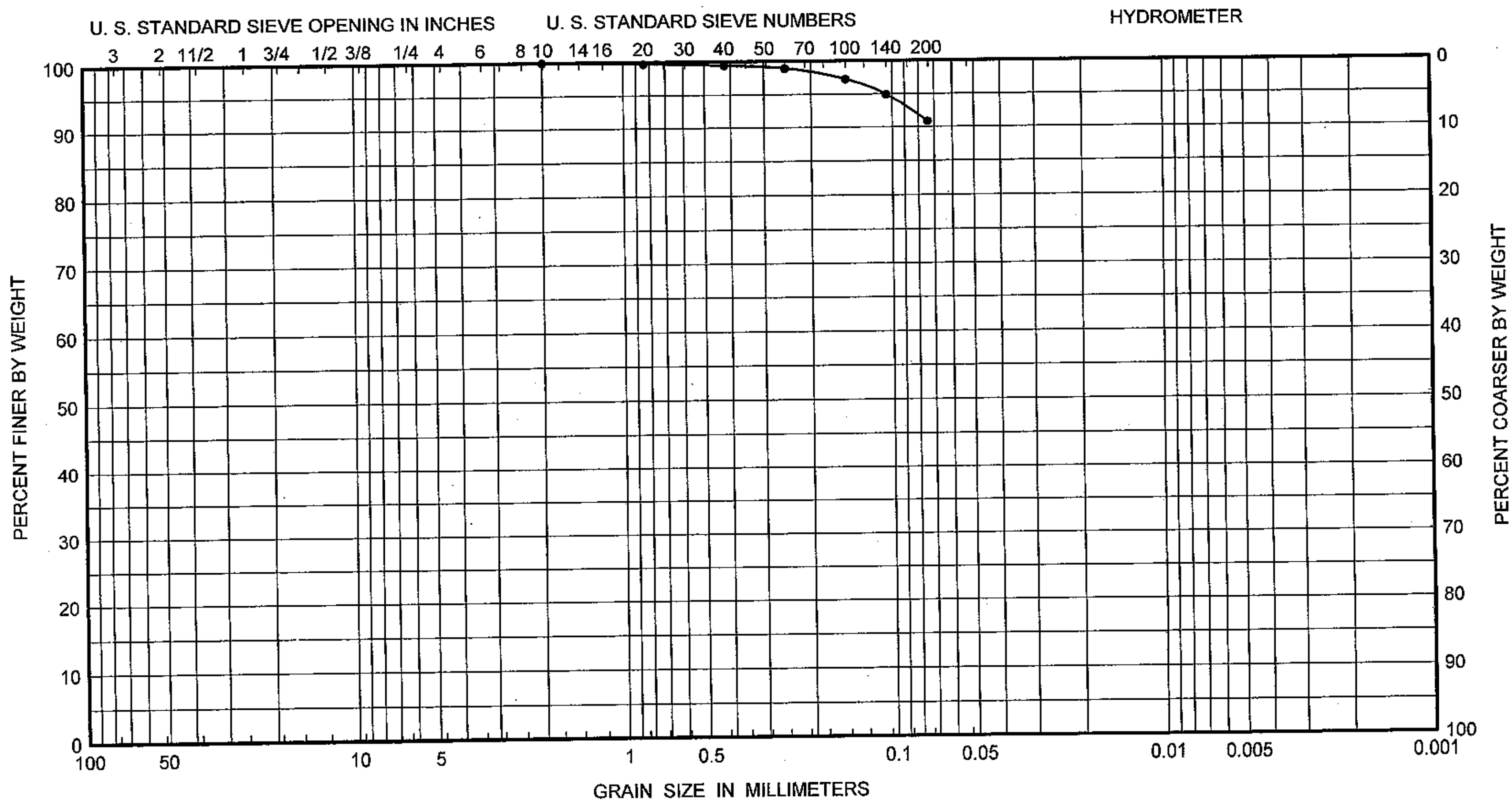
APPENDIX B

GRAIN SIZE CURVES



GRAVEL	SAND			SILT or CLAY
	Coarse	Medium	Fine	

Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
1	3	7	Tan silt (ML), slightly clayey				

Project	RICHLAND PARISH MEGASITE
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FIGURE B-1

BURNS COOLEY DENNIS, INC.
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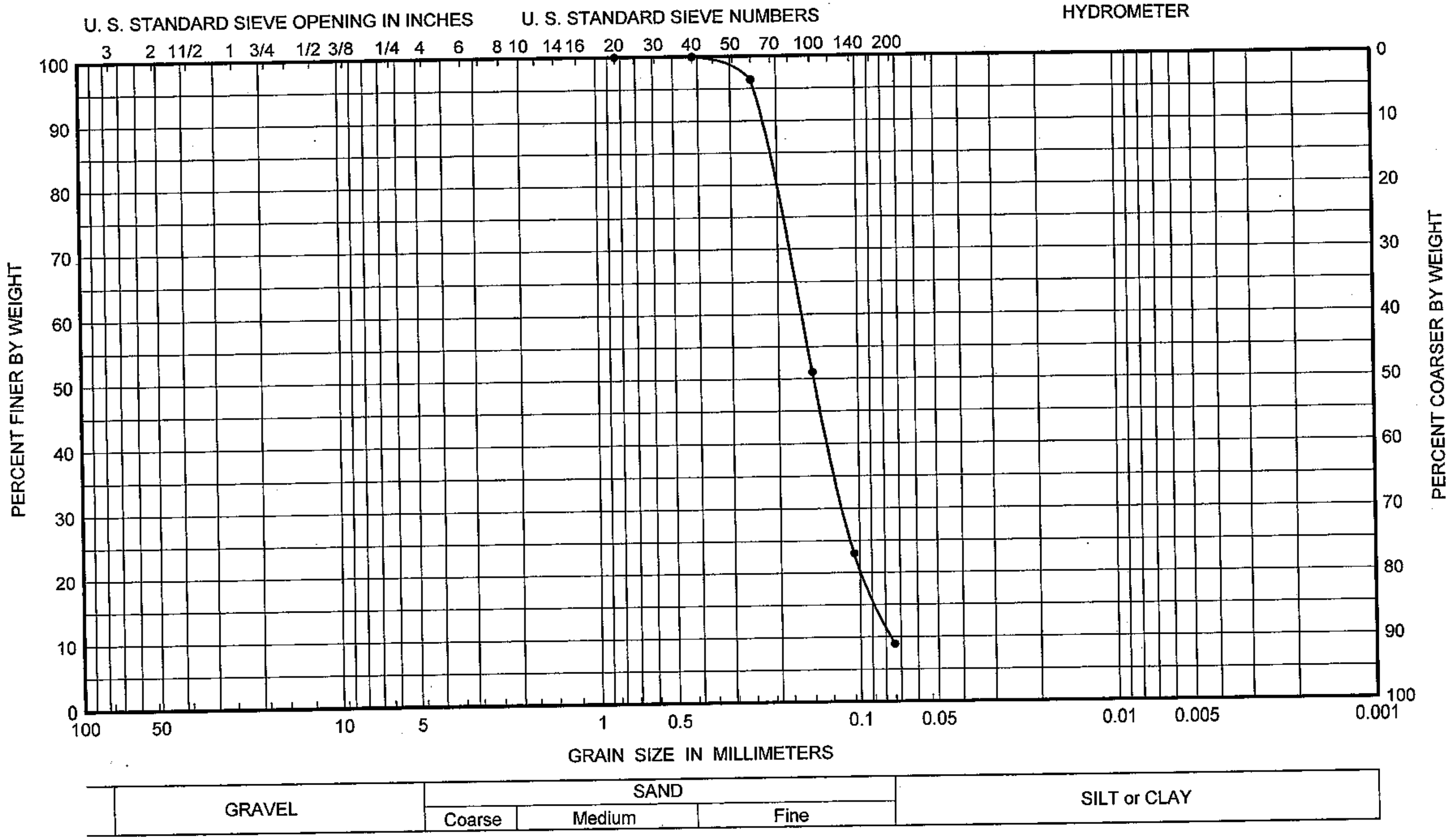
GRAIN SIZE CURVES



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
4	5	15	Tan fine sand (SP-SM), slightly silty				

Project RICHLAND PARISH MEGASITE
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FIGURE B-2

BURNS COOLEY DENNIS, INC.
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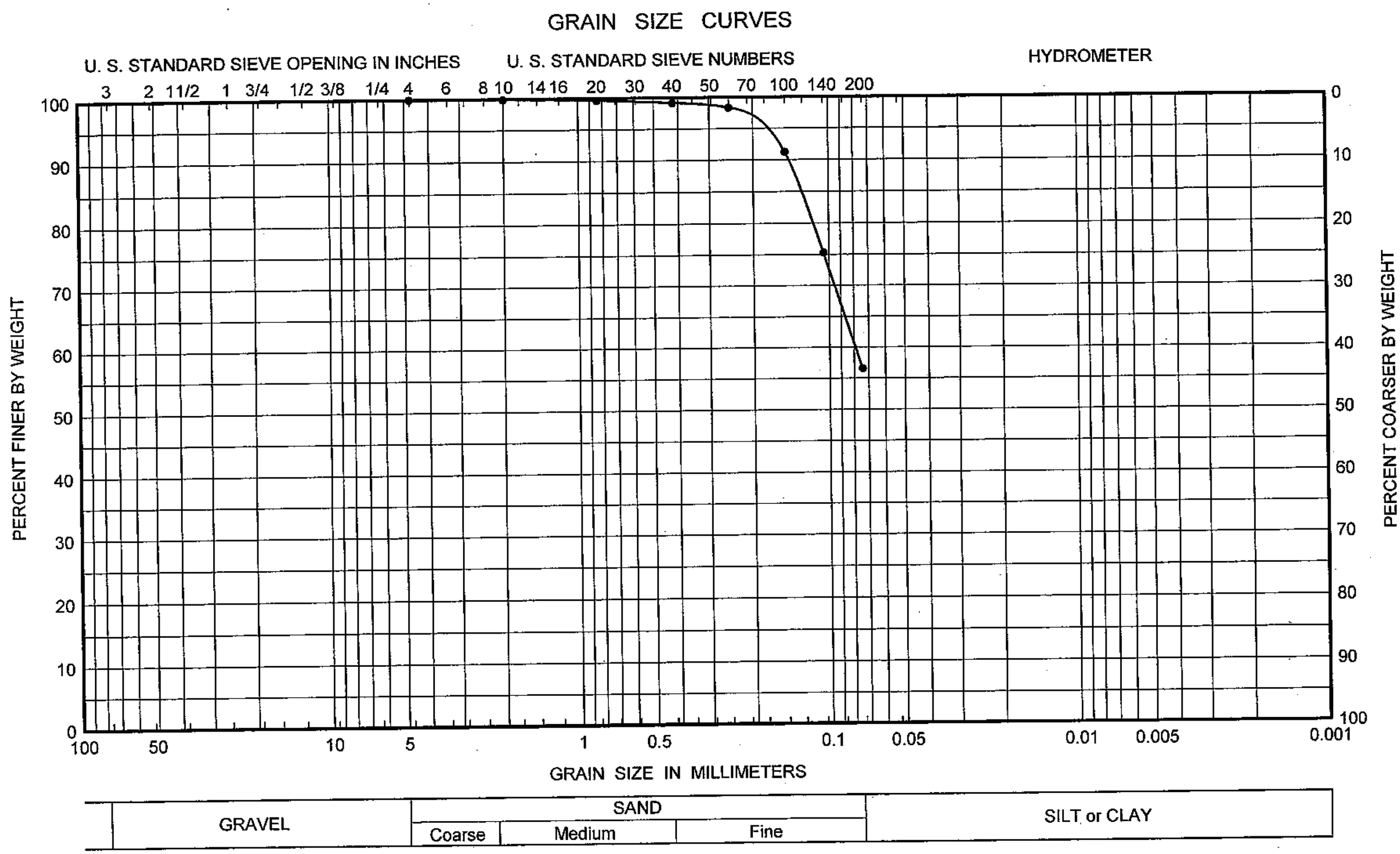

Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
6	4	10	Tan sandy silt (ML)				

Project RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

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FIGURE B-3

BURNS COOLEY DENNIS, INC.
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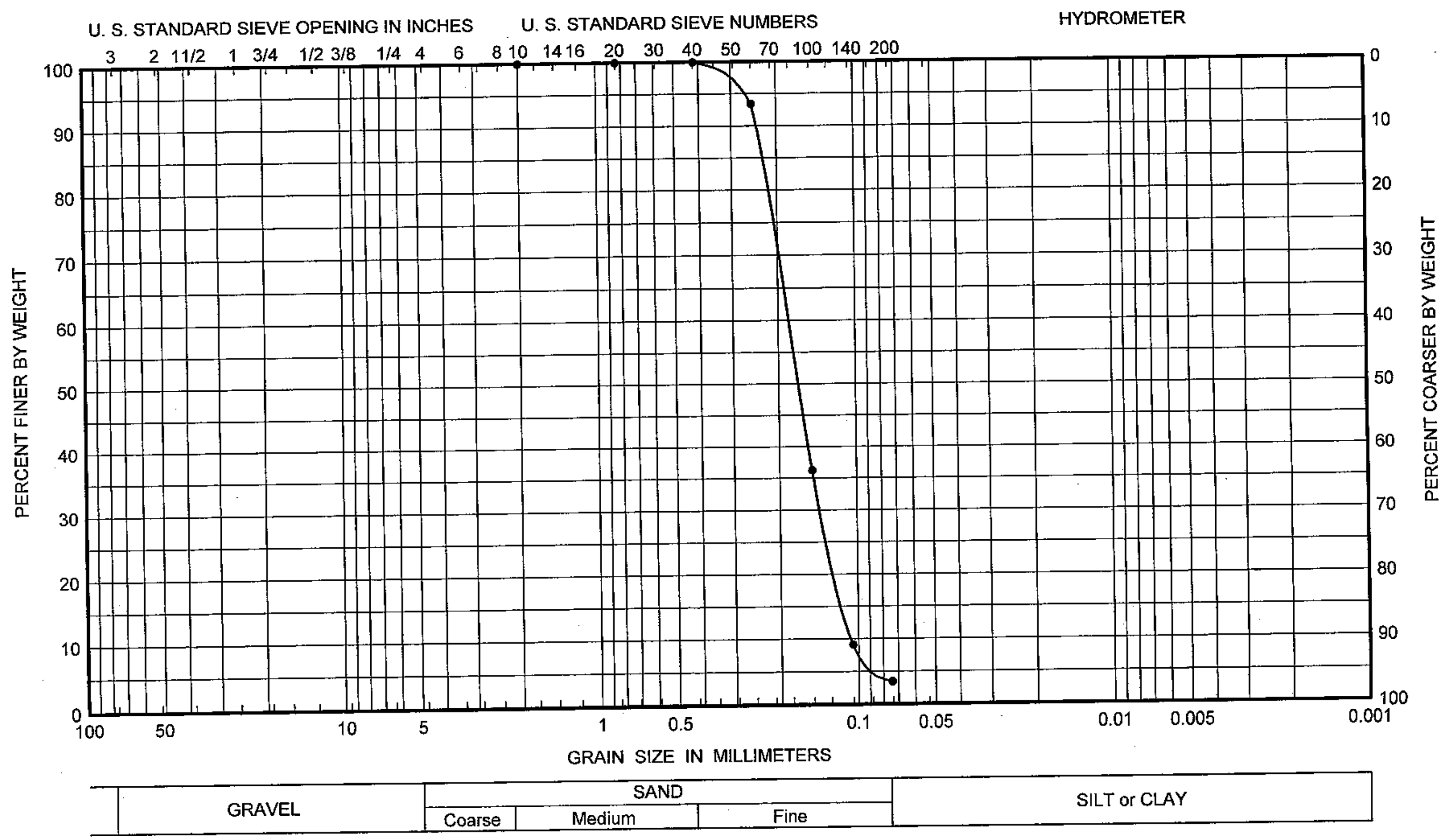
GRAIN SIZE CURVES

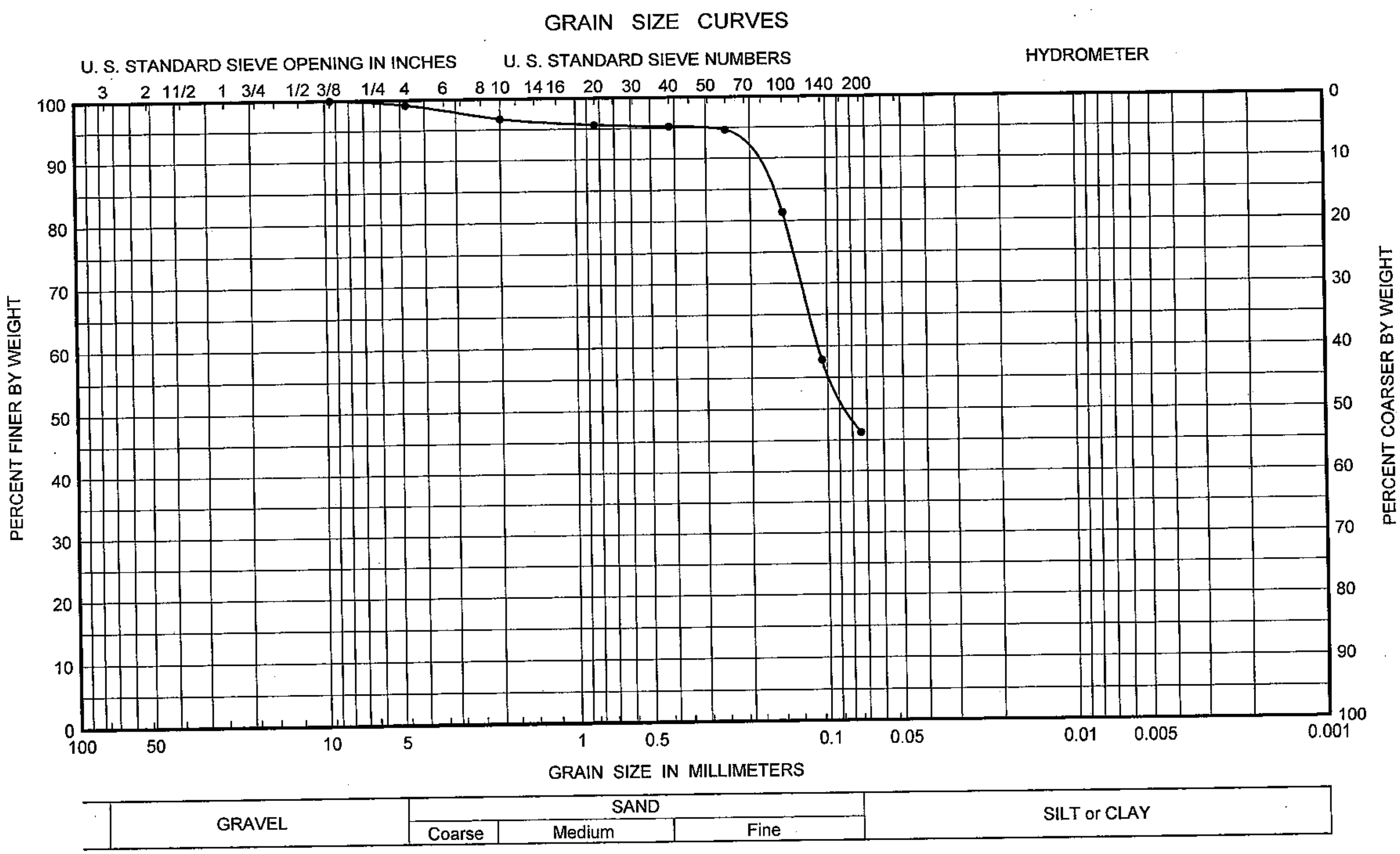


Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
9	5	14.5	Tan fine sand (SP)				

Project	RICHLAND PARISH MEGASITE
	RICHLAND PARISH, LOUISIANA
Date 11/08/07	Job No. 070556

FIGURE B-4

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
11	4	10	Light gray clayey fine sand (SC)				

Project RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

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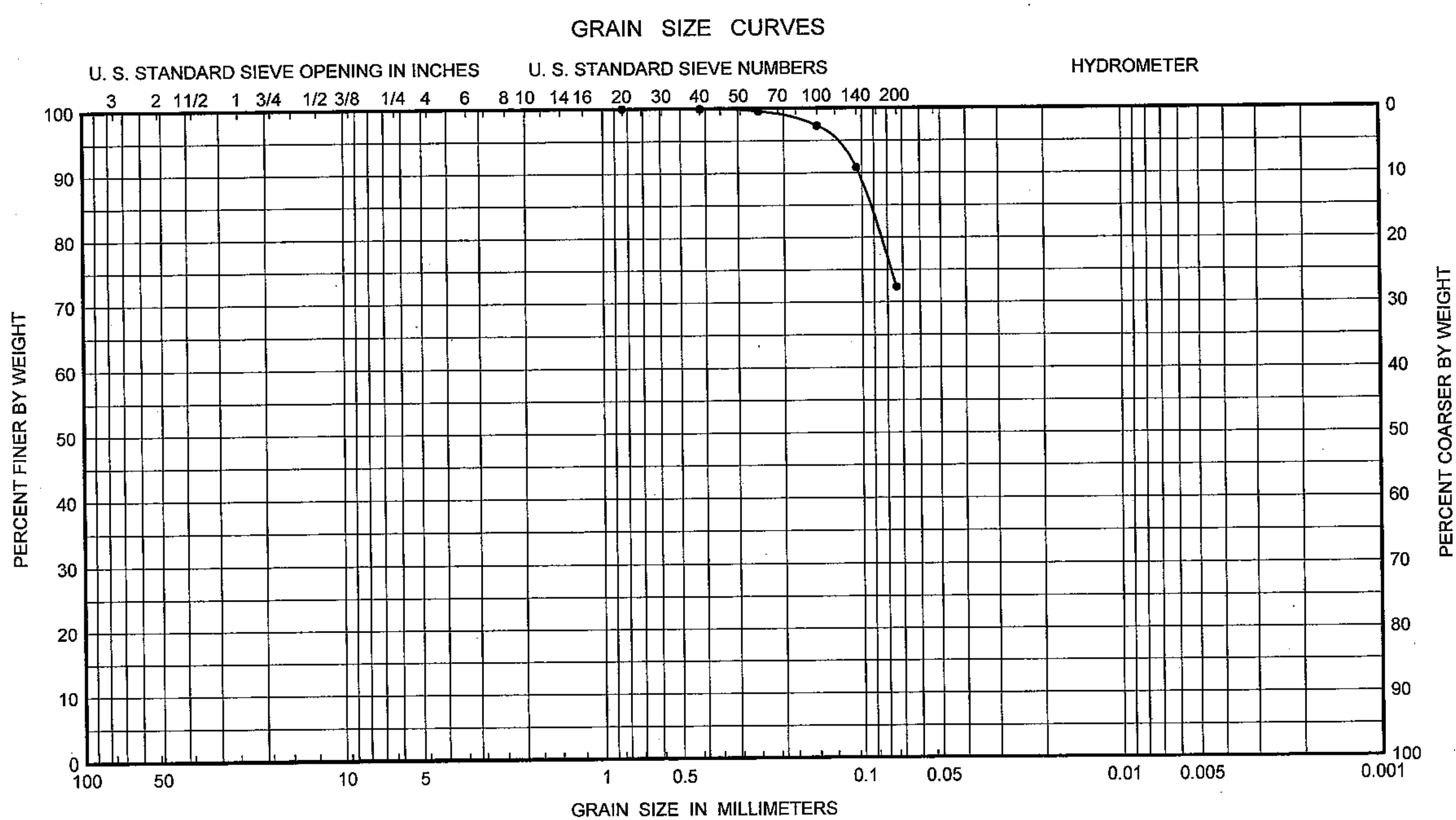
FIGURE B-5



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
13	2	4.5	Tan sandy silt (ML), slightly clayey				

Project	RICHLAND PARISH MEGASITE
	RICHLAND PARISH, LOUISIANA
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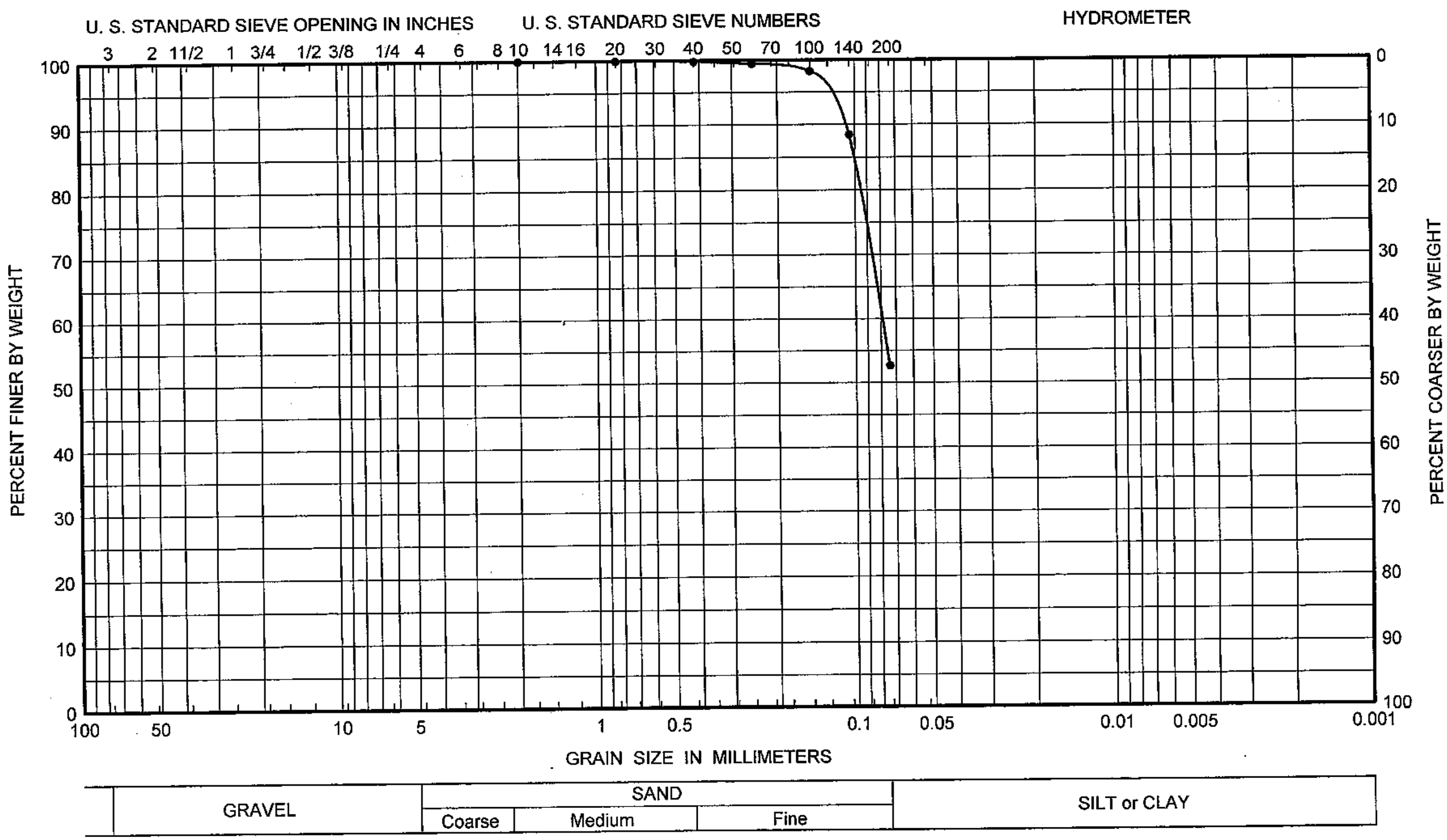
FIGURE B-6

GRAIN SIZE CURVES



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
15	3	7	Tan sandy silt (ML)				

Project: RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

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FIGURE B-7

BURNS COOLEY DENNIS, INC.
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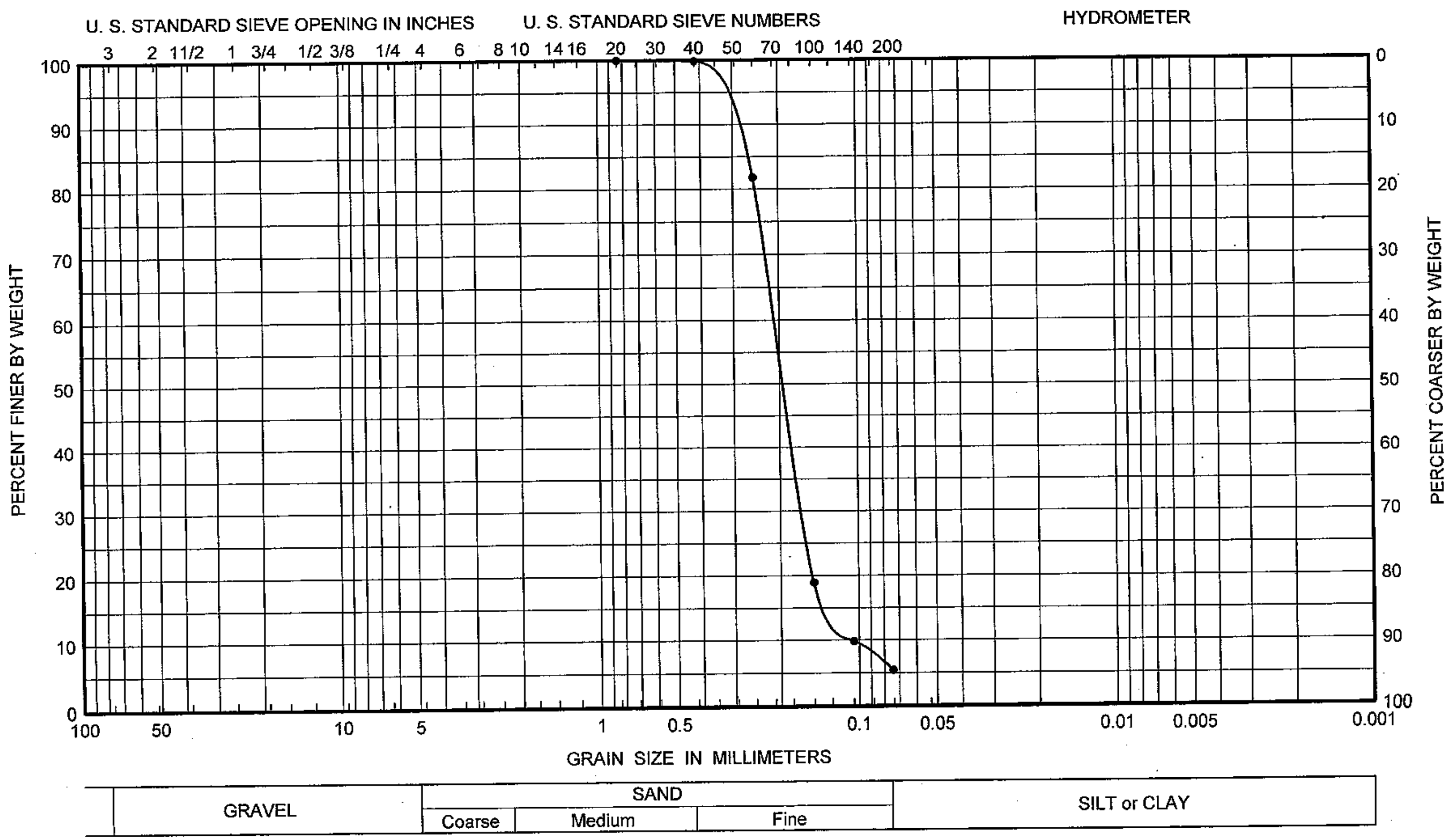
GRAIN SIZE CURVES



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
17	5	14.5	Tan fine sand (SP-SM), slightly silty				

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RICHLAND PARISH, LOUISIANA

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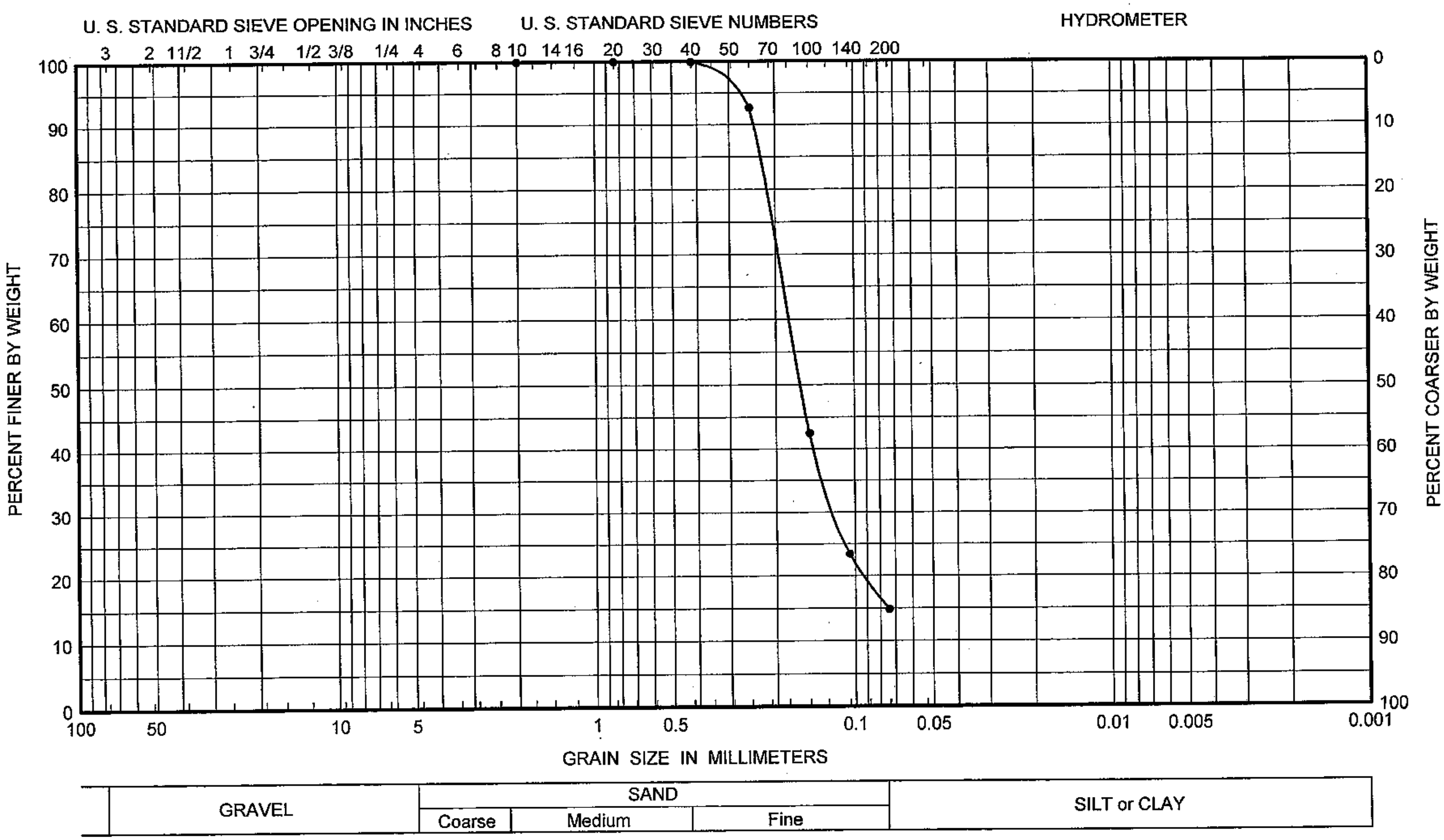
FIGURE B-8

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

GRAIN SIZE CURVES



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
19	4	9.5	Tan fine sand (SP-SM), slightly silty				

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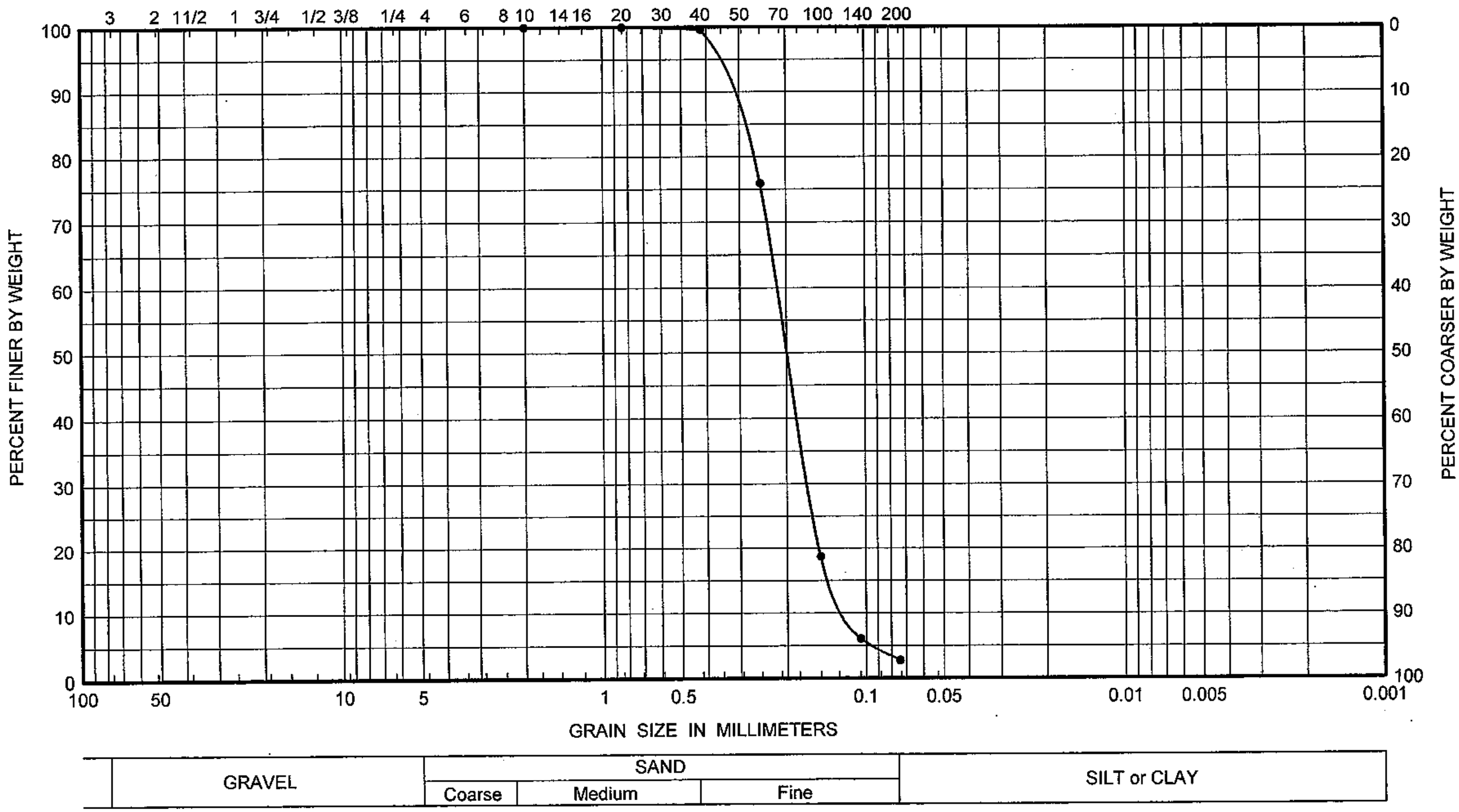
BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

FIGURE B-9

GRAIN SIZE CURVES



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
21	4	9.5	Tan fine sand (SP-SM), slightly silty				

Project RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

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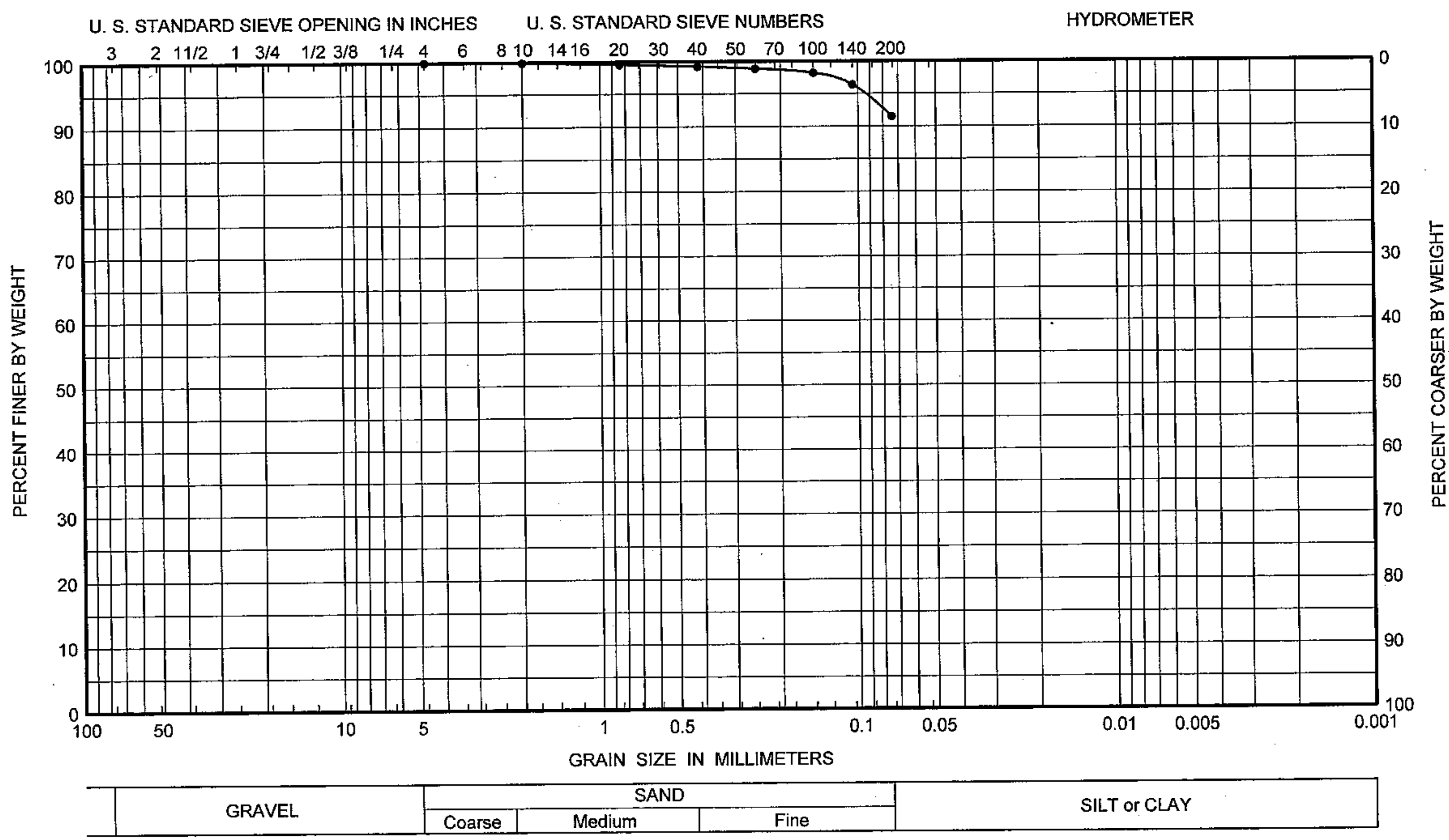
FIGURE B-10

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

GRAIN SIZE CURVES



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
23	4	9.5	Tan and light gray clayey silt (ML)	25.7			

Project RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

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FIGURE B-11

BURNS COOLEY DENNIS, INC.
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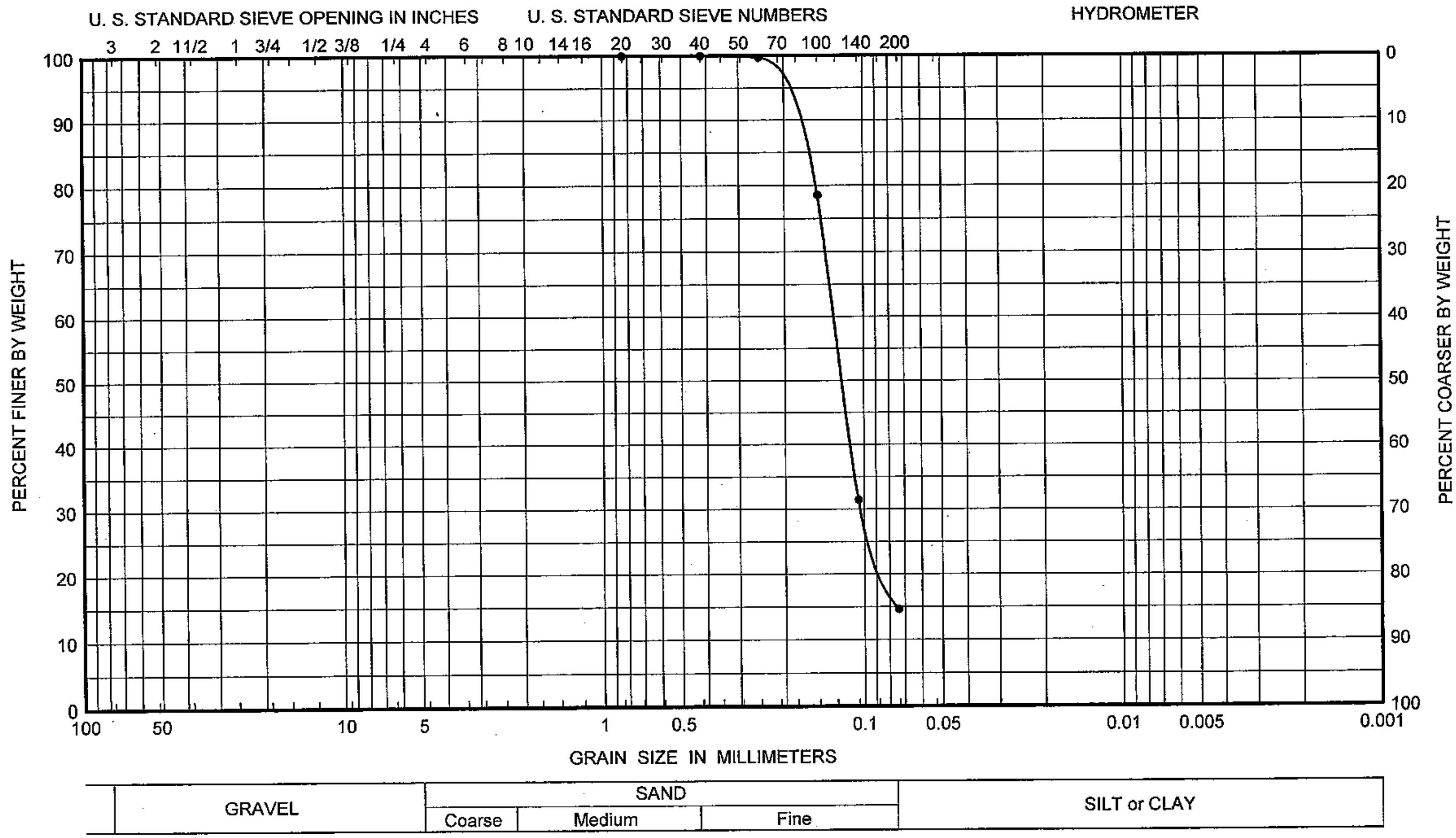
GRAIN SIZE CURVES



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
25	4	9.5	Tan and red silty fine sand (SM)				

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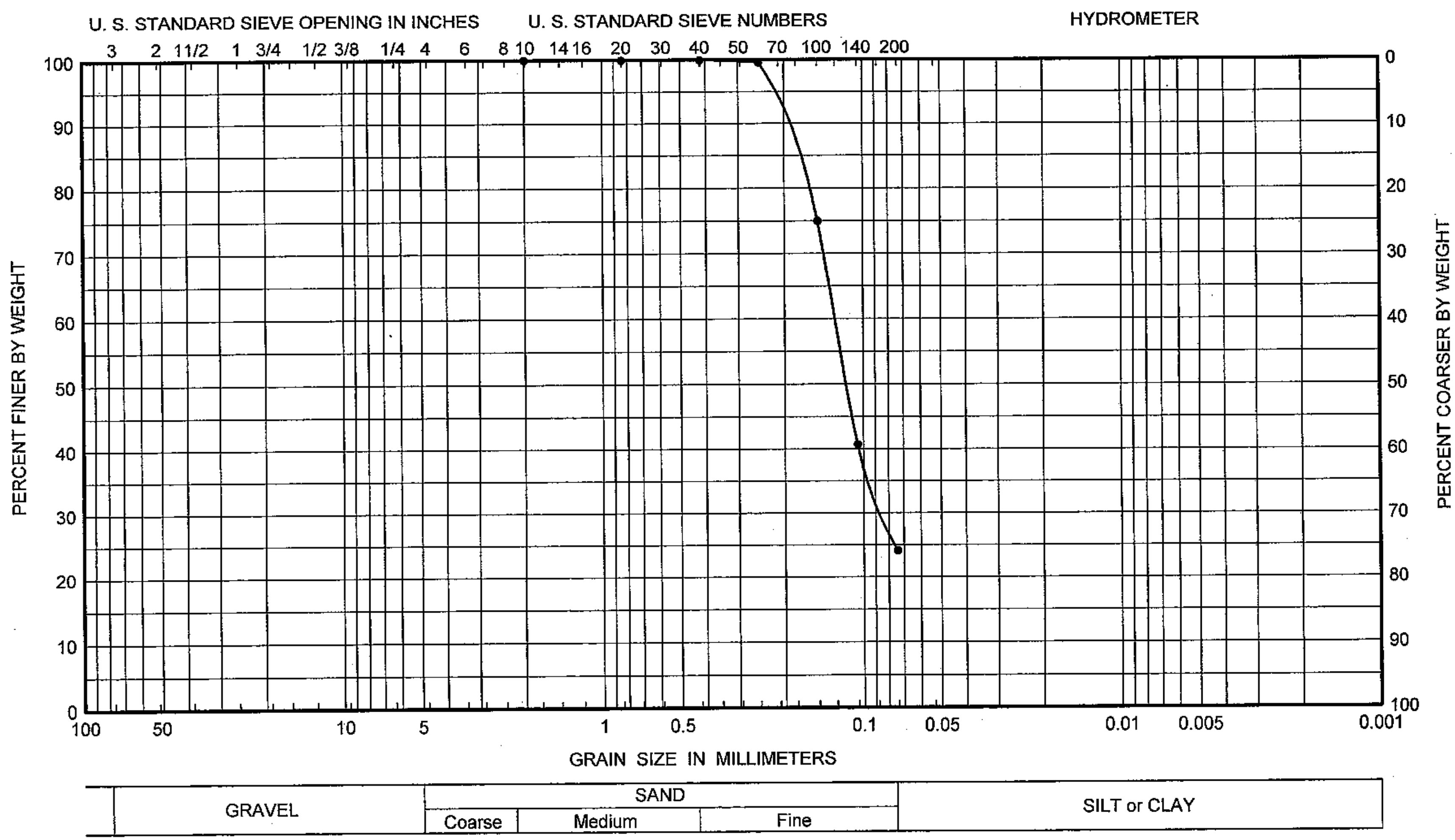
FIGURE B-12

BURNS COOLEY DENNIS, INC.
GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

GRAIN SIZE CURVES



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
28	3	7.5	Tan and light gray silty fine sand (SM) with silt pockets				

Project	RICHLAND PARISH MEGASITE RICHLAND PARISH, LOUISIANA
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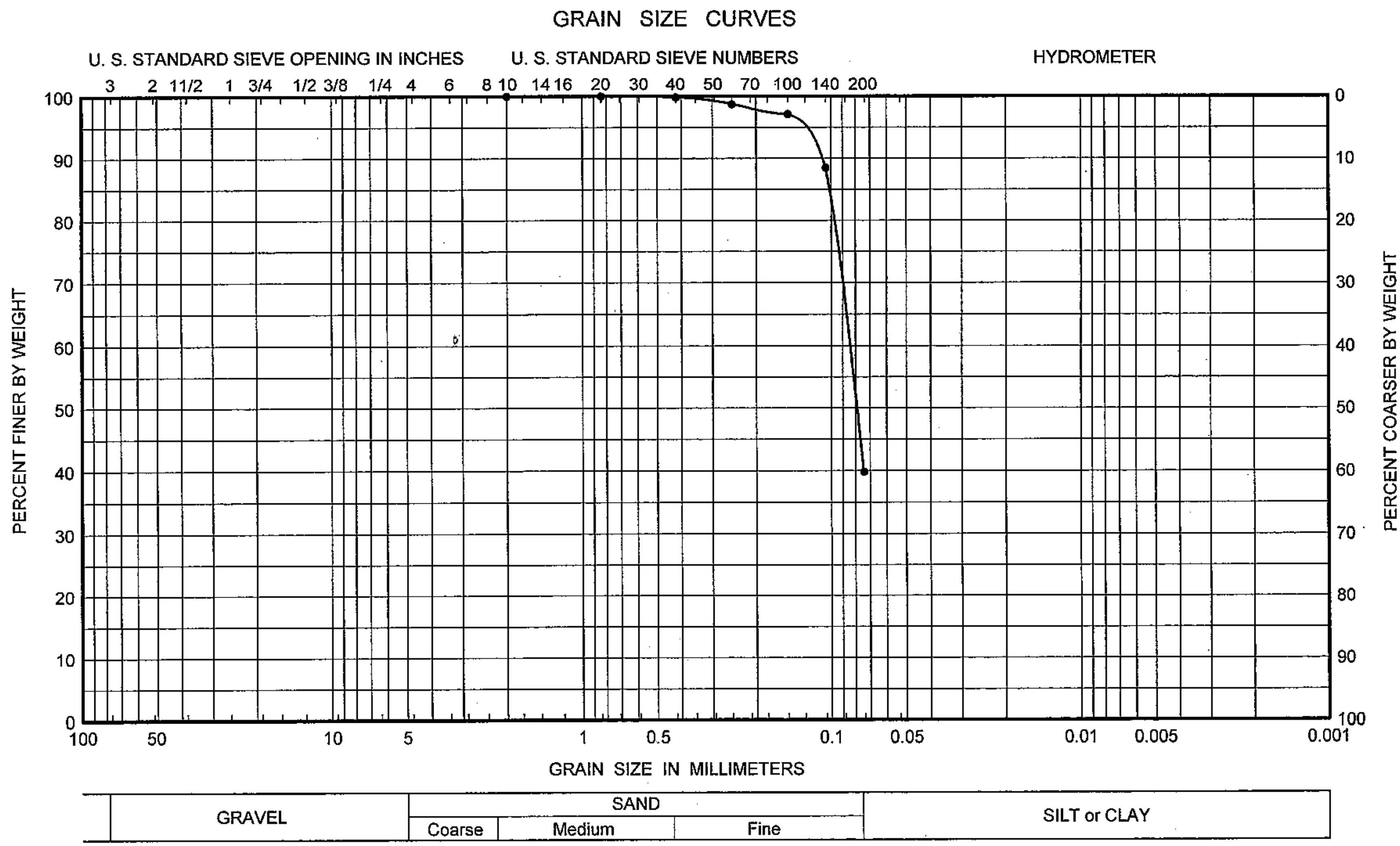
FIGURE B-13



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
30	9	35	Gray silty fine sand (SM)				

Project: RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

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BURNS COOLEY DENNIS, INC.
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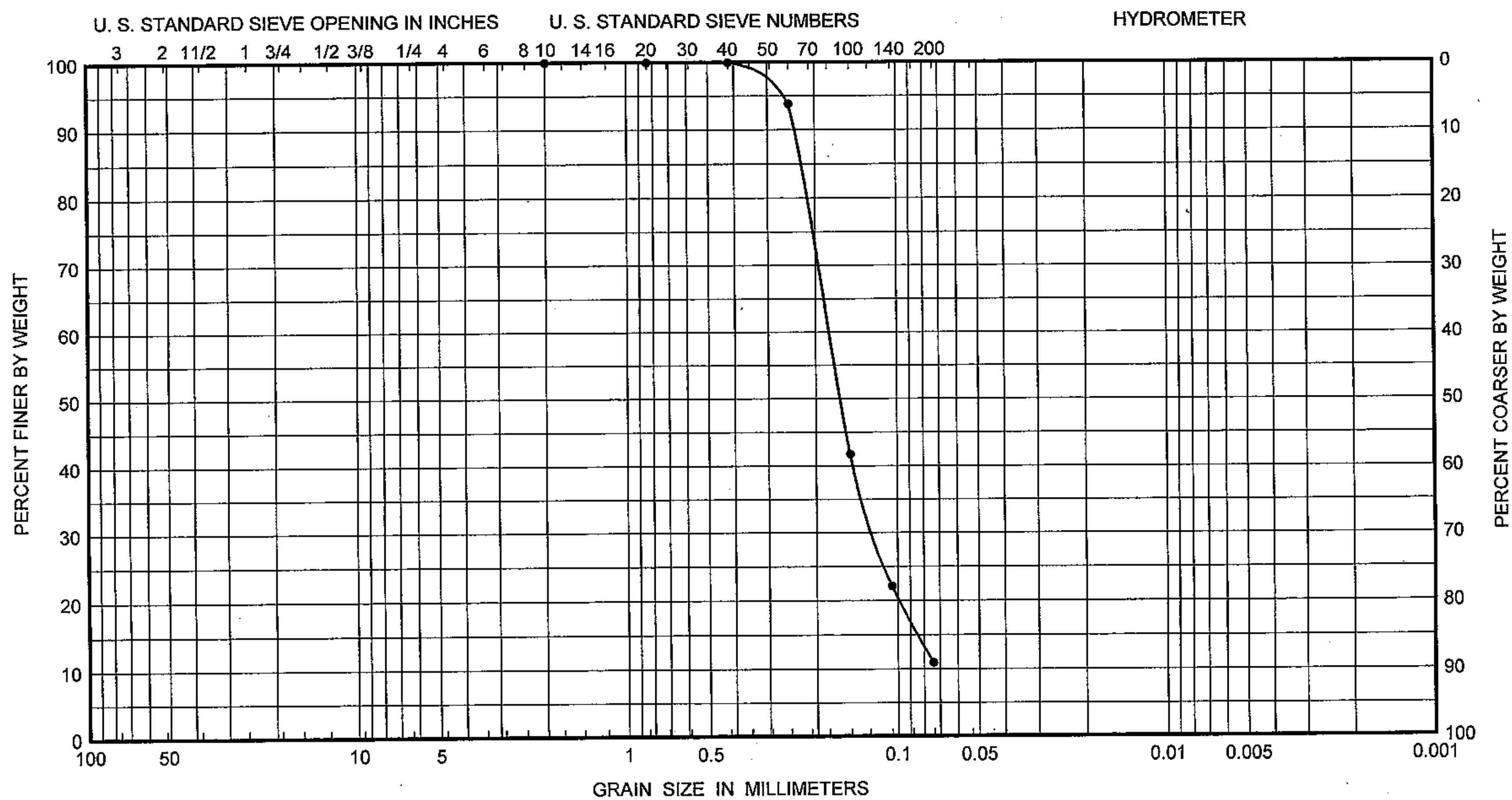
FIGURE B-14

GRAIN SIZE CURVES



GRAVEL	SAND			SILT or CLAY
	Coarse	Medium	Fine	

Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
33	5	15	Tan fine sand (SP-SM), slightly silty				

Project RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

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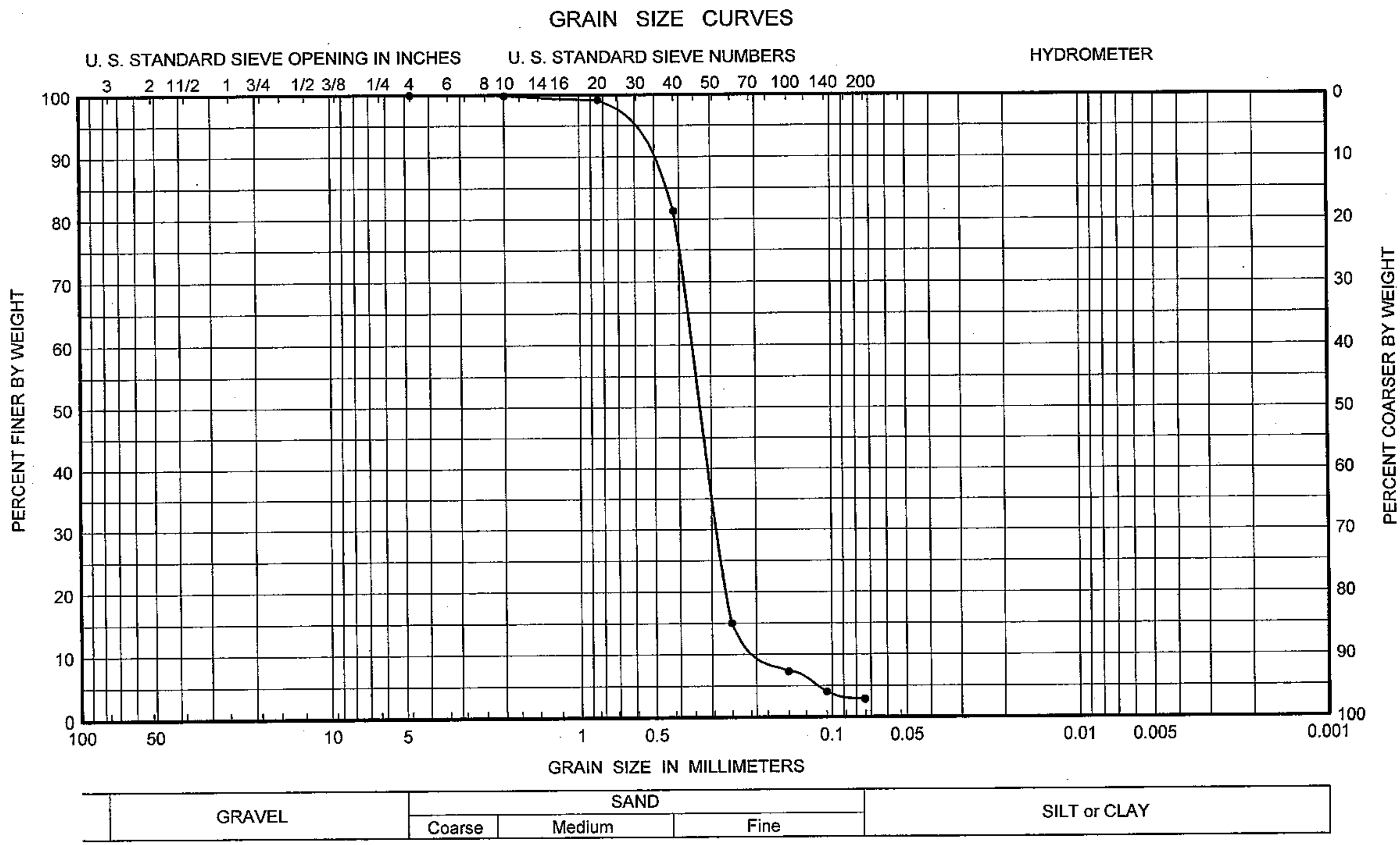
FIGURE B-15



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
36	9	35	Tan fine sand (SP)				

Project: RICHLAND PARISH MEGASITE
RICHLAND PARISH, LOUISIANA

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FIGURE B-16

BURNS COOLEY DENNIS, INC.
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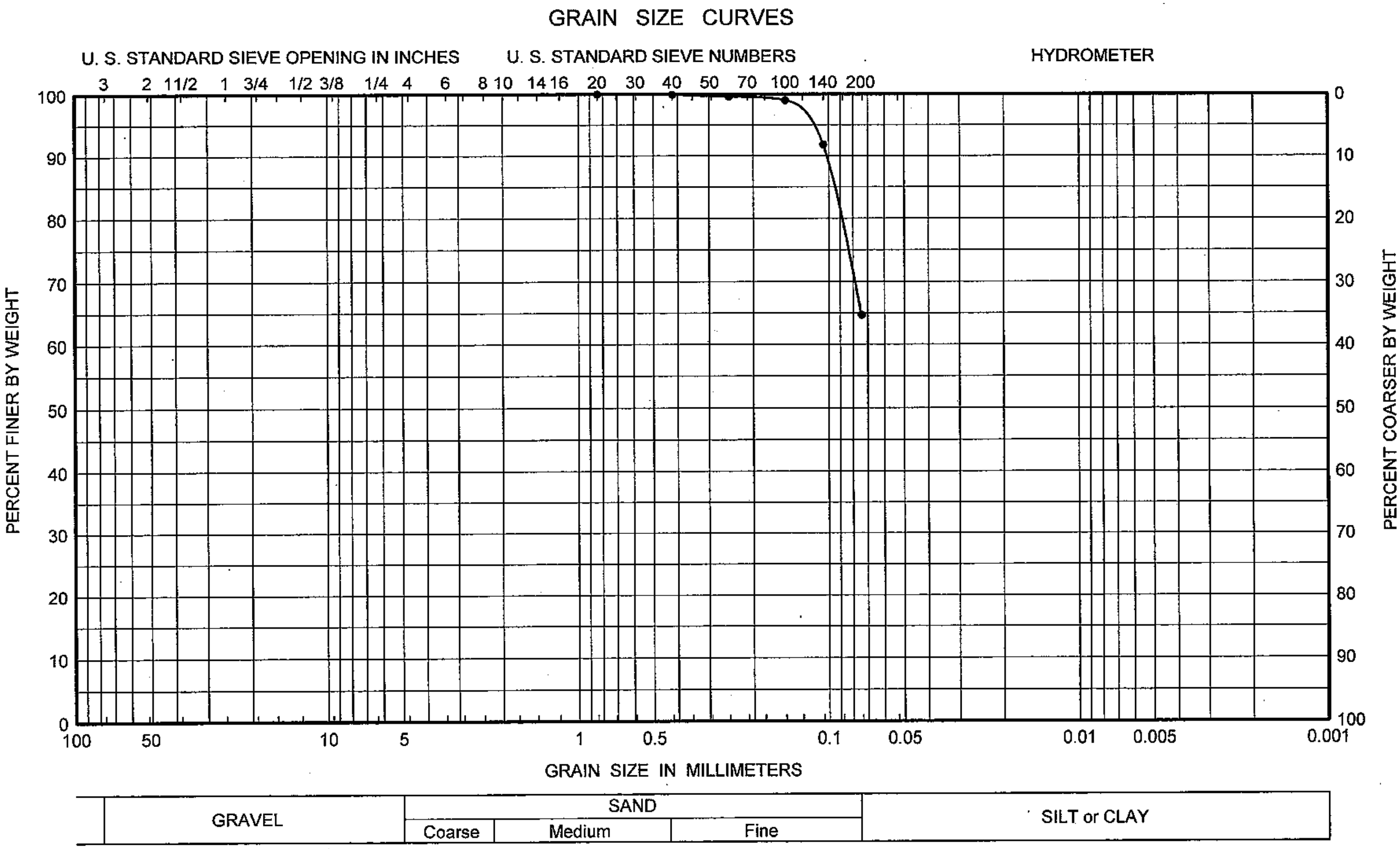
GRAIN SIZE CURVES



Boring No.	Sample No.	Depth, Ft.	Classification	Nat W%	LL	PL	PI
39	3	7.5	Tan sandy silt (ML), slightly clayey				

Project	RICHLAND PARISH MEGASITE
	RICHLAND PARISH, LOUISIANA
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FIGURE B-17