REPORT OF GEOTECHNICAL EXPLORATION

PROPOSED SCRUBBER STACK DISPOSAL AREA
KINGSTON FOSSIL PLANT
KINGSTON, TENNESSEE

March 26, 2003

Prepared for:

TENNESSEE VALLEY AUTHORITY

Chattanooga, Tennessee

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC.
1725 Louisville Drive
Knoxville, Tennessee
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MACTEC PROJECT 3043031008/0001

MACTEC

March 26, 2003

Mr. Ron Purkey
Tennessee Valley Authority
1101 Market Street, LP-2G
Chattanooga, TN 37402

Subject: **Report of Geotechnical Exploration**
Proposed Scrubber Stack Disposal Area
Kingston Fossil Plant
Kingston, Tennessee
MACTEC Project 3043031008/0001

Dear Mr. Purkey:

We at MACTEC Engineering and Consulting of Georgia, Inc., (MACTEC) are pleased to submit this Report of Geotechnical Exploration for the proposed Scrubber Stack Disposal Area. Our services, as authorized through TAO No. MAC-0659-7, were provided in general accordance with our proposal number 50399-0-0000/9001, Revision 1, dated February 10, 2003.

This report reviews the information provided to us, discusses the site and subsurface conditions, and presents the results of our laboratory testing of the proposed Scrubber Waste Disposal Area. The Appendices contain a brief description of the Field Exploratory Procedures, a Key Sheet and Test Boring Records, Rock Core Photographs, the Laboratory Test Procedures, and the Laboratory Test Results.

We anticipate further dialog and interaction with TVA and Parsons E&C, Inc., as the design proceeds and will be happy to provide any additional information or interpretation of the data and recommendations presented here in which may be necessary.

We will be pleased to discuss our recommendations with you and would welcome the opportunity to provide the engineering and material testing services needed to successfully complete your project.

Sincerely,

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC.
f/k/a LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Mohamed M. Nofal, P.E.
Senior Geotechnical Engineer

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Senior Principal Engineer

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EXECUTIVE SUMMARY

We were selected by the Tennessee Valley Authority (TVA) to perform a geotechnical exploration for the proposed Scrubber Waste Disposal Area at the Kingston Fossil Plant near Kingston, Tennessee. The objectives of our exploration were to determine general subsurface conditions and provide depth to rock surface/refusal depth to aid in the karst and hydrogeologic study of the proposed site area.

The exploration consisted of drilling six test borings. Two test borings were drilled to refusal and bedrock was cored approximately 30 feet in both borings. In addition, we performed 40 Geoprobe™ borings and refusal depth was recorded across the site. Five auger borings and ten Geoprobe™ borings were drilled in the nearby borrow area. The major findings of our geotechnical exploration follow:

- The project site is a cultivated field with gently rolling hills. The topographic relief across the site is approximately 50 feet. The refusal depth elevations varied from 682 to 746 indicating approximately 60 feet of relief in bedrock surface across the site.
- The test borings mainly encountered topsoil and residual material.
- Top of bedrock was encountered at depths ranging from about 17.2 to 67.9 feet in the proposed Scrubber Waste Disposal Area. Rock core indicated a relatively weathered limestone and shaley bedrock.
- Ground water was encountered in all test borings at the time of drilling. The measured depths for ground water ranged from about 15 to 55 feet. Long-term measurements for the presence or absence of ground water were not obtained.

We recommend experienced geotechnical personnel observe subgrades, foundation excavations, fill placement, and other construction procedures. We recommend that MACTEC be a part of these services based on our familiarity with the project, the subsurface conditions, the intent of the recommendations, and our experience in this area. This summary is only an overview and should not be used as a separate document or in place of reading the entire report, including the appendices.

1.0 INTRODUCTION

This report presents the findings of our subsurface exploration, geotechnical evaluations, and laboratory testing recently performed for the proposed Scrubber Waste Disposal Area at TVA's Kingston Fossil Plant. The Kingston Plant has nine generating units. Scrubber units will be added to all generating units by the year 2008. We understand the proposed scrubbers will use hydrated lime/limestone slurry (i.e., wet scrubbers) to remove sulfur dioxide from the flue gas. As a byproduct of the flue gas desulfurization, oxidized calcium sulfate and gypsum materials are produced. These materials are stable and can be dry stacked for disposal. Our services were authorized by Mr. Ron Purkey of the Tennessee Valley Authority. The subsurface exploration for the proposed site was performed between March 3 and March 17, 2003.

2.0 OBJECTIVES OF EXPLORATION

The objectives of our exploration were to determine general subsurface conditions and to obtain data to aid in evaluating the site from a hydrogeologic aspect for the proposed use as a permanent scrubber waste disposal site. An assessment of site environmental conditions, or an assessment for the presence or absence of pollutants in the soil, bedrock, surface water, or ground water of the site was beyond the proposed objectives of our exploration.

3.0 SCOPE OF EXPLORATION

Our evaluation was based on our proposal number 50399-0-0000/9001, Revision 1, dated February 10, 2003. Our scope of work included:

- Reconnaissance of the immediate site
- Review of existing geotechnical and foundation information
- Subsurface exploration
- Field observations
- Field and laboratory testing including soil test and Geoprobe™ borings
- Geotechnical report summarizing our findings and results of laboratory testing

The drilling and sampling were performed in general accordance with ASTM procedures. The procedures are included in Appendix A. The field exploration was performed between March 3 and March 17, 2001. The equipment used consisted of a Model 55 ATV-mounted CME drill rig equipped with an automatic hammer and a Geoprobe rig mounted on a pickup truck. Standard Penetration Tests (SPTs) were performed at 2-1/2-foot vertical intervals in the upper 10 feet of the test borings and at 5-foot vertical intervals thereafter. In addition to the SPT samples, bedrock was cored in two of the test borings.

Ground-water measurements were obtained after the completion of the augering in each boring. Ground-water levels also were not obtained in the borings after 24 hours or later after the completion of the borings. The ground-water levels are shown on the Test Boring Records in Appendix B.

Upon completion of drilling, the borings were plugged and abandoned by backfilling the full depth with cement-bentonite grout. We transported the samples to our laboratories in Knoxville, Tennessee, where soil and rock core samples were selected for laboratory testing.

The field exploration and laboratory testing for this project consisted of the following:

Field Testing

- 2 Test Borings drilled to refusal – Approximately 30 feet of bedrock was cored in both test borings
- 4 Test Borings advanced to auger refusal
- 31 Geoprobe™ Borings were performed in the site area
- 4 Geoprobe™ Borings were performed in the borrow area (not shown in Figure 2)
- 5 Auger Borings were drilled in the borrow area (not shown in Figure 2)

Laboratory Testing

- 6 Plasticity Index (Atterberg limits) Tests
- 20 Natural Moisture Content of Soil Tests

- 1 Moisture-Density Relationship Test
- 5 Grain Size Distribution Analyses

Subsurface conditions encountered during our exploration are presented on the Test Boring Records in Appendix B. The laboratory testing results are presented in Appendix C.

4.0 PROJECT INFORMATION AND SITE CONDITIONS

Project information was provided to us by Mr. Dan Smith with Parsons, Inc., in the form of a topographic base map and with the proposed waste superimposed. We also visited the site and observed the existing topography and site conditions. We understand that Parsons, Inc., will design the scrubber waste stack, and P.E. LaMoreaux & Associates (PELA) was retained by TVA to perform a karstic evaluation and a hydrogeologic study of the site area. Our services were requested to support PELA's hydrogeologic study which will be part of the overall feasibility study.

5.0 AREA AND SITE GEOLOGY

Kingston, Tennessee, is located in the Appalachian Valley and Ridge Physiographic Province. This province extends as a continuous belt from central Alabama, through Georgia and Tennessee, northward into Pennsylvania. The formations that underlie this province consist primarily of limestone, dolostone, shale, and sandstone, which have been folded and faulted in the geologic past. These formations range in age from Cambrian to Pennsylvanian and have been subject to at least one extensive period of erosion since their structural deformation. The erosion has produced a series of subparallel, alternating ridges and valleys. The valleys are formed over more soluble bedrock (interbedded limestone and limestone), whereas bedrock more resistant to solution weathering forms ridges (sandstone, shale, and cherty dolostone).

In particular, the site is geologically mapped to be underlain by the Knox formation. The Knox formation is mainly composed of light gray to dark gray and olive-gray, siliceous dolomite with a few limestone layers in the upper part. The rock usually weathers to reddish orange residuum containing chert fragments.

6.0 SUBSURFACE CONDITIONS

Subsurface conditions for the project were explored with six test borings drilled in general accordance with the procedures included in Appendix A. The boring locations were proposed by Dr. Barry Beck of PELA. The boring locations were established by TVA using GPS surveying methods. Boring elevations were estimated by superimposing the boring locations on a topographic map of the site and reading the ground elevation between the contour lines. Therefore, the boring locations on the Boring Location Plan (Figure 2) and the boring elevations shown on the Test Boring Records in Appendix B should be considered approximate.

In addition, five auger borings and four Geoprobe™ borings were performed in the proposed borrow area at locations selected by Parsons, Inc. The auger borings were drilled to a predetermined depth of 20 feet. The borings were terminated at the predetermined depth without reaching refusal. The Geoprobe™ borings encountered refusal depths between 14 and 40 feet below the ground surface.

Subsurface conditions encountered at each boring location are shown on the Test Boring Records in Appendix B. The Test Boring Records represent our interpretation of the subsurface conditions, based on the field logs and visual examination of the samples by one of our geotechnical engineers. The lines designating the interfaces between various strata on the Test Boring Records represent the approximate interface locations. The approximate locations of the subsurface sections with respect to the boring locations are shown in Figure 2.

The test borings performed at this site typically encountered a thin layer of topsoil overlying residual soils. Residual soils are those soils that have developed from the in-place weathering of the underlying bedrock. All test borings were drilled to refusal. The depth to top of bedrock ranged from about 17.2 to 67.9 feet in borings B-11 and B-13, respectively. NQ size rock coring was performed in test borings B-22 and B-23.

Thirty-one Geoprobe™ borings were performed in the site area to estimate the depth to the weathered rock surface. The weathered bedrock surface elevation ranges from 682 to 745.7 feet above mean sea level (msl). A summary of the Geoprobe™ borings is provided in Table 1.

Based on our observation of the soil samples obtained from this site, it is our opinion that the test borings did not encounter any hazardous soils.

A summary of the test boring data is presented in the Boring Records presented in Appendix B. Brief descriptions of the materials encountered at the site are presented in the following paragraphs.

6.1 RESIDUUM

Residual materials were encountered in all test borings below the topsoil or cultivated zone. The residual materials encountered consisted of reddish brown to yellowish brown and reddish orange silty clay and chert fragments. The SPT resistance values in the residuum ranged from 0 (weight of hammer) to over 50 bpf, indicating soft to very hard consistency. The majority of the SPT values were in the firm to stiff range.

6.2 BEDROCK

About 30 feet of the bedrock was cored in test borings B-22 and B-23. The bedrock encountered in the test borings was composed primarily of blue-gray shaley and dolomitic limestone. The recovered core was generally fresh to slightly weathered with moderate weathering along joint surfaces. The cored rock was hard to very hard with moderate jointing. The core recovery ratio for the various core runs ranged from about 82 to 100 percent, with an average of about 98 percent. The rock quality designation (RQD) values for the various rock core runs ranged from about 37 to 100 percent with an average of about 90 percent. The core recovery ratios and RQD values for each individual core run are shown on the Test Boring Records in Appendix B.

7.0 GROUND-WATER CONDITIONS

Ground-water was encountered in all test borings at the time of drilling. The approximate ground-water depths ranged from 15 to 55 feet below the ground surface. More accurate ground-water measurements can be provided from the existing piezometers installed at various locations across the site. Ground-water elevations can be obtained from TVA.

Fluctuations in the ground-water level occur because of variation in rainfall, evaporation, construction activity, surface run-off, and other site-specific factors such as fluctuation of water levels in the adjacent Watts Bar Lake.

8.0 COMPACTED FILL RECOMMENDATIONS

We recommend all compacted fill, where required on this project, be constructed by spreading acceptable soil in loose layers not more than 8 inches thick. The soils used within the proposed construction areas should be compacted in lifts to at least 95 percent of the standard Proctor maximum dry density (ASTM D 698). As a general rule, the moisture content of the fill soils should be maintained within –3 to +3 percentage points of the optimum moisture content as determined from the standard Proctor compaction test. This provision may require the contractor to dry soils during periods of wet weather or to wet soils during the hot summer months. The fill soils should have a maximum dry density of no less than 90 pounds per cubic foot (pcf).

The fill surface must be adequately maintained during construction in order to achieve an acceptable compacted fill. We recommend the fill surface be sloped to achieve sufficient drainage and to prevent ponding of water on the fill. If precipitation is expected while fill construction is temporarily halted, the surface should be rolled with rubber-tired or steel-drummed equipment to improve surface run-off. If the surface soils become excessively wet or frozen fill operations should be halted and we should be consulted for guidance.

If sloping of the fill is required, the edge of the compacted fill should extend at least 10 feet horizontally beyond the outside edge of any structural foundations. Fill slopes should be grassed to protect from erosion. Slope stability analyses should be performed during the design of any required major fill slopes.

Before filling operations begin, representative samples of the proposed fill material should be collected and tested to determine the maximum dry density, optimum moisture content, natural moisture content, and the soil plasticity. These tests are needed to determine if the fill material is acceptable and for quality control during compaction.

We recommend the fill placement and compaction be observed and documented by our engineering technician. To verify compaction level obtained, we recommend frequent field density test of fill soils as they are placed. Significant deviations, either from the project specifications or from good practice, will be brought to the attention of the owner's representative along with appropriate recommendations.

9.0 SOIL PLASTICITY CONSIDERATIONS

According to published data for a climate similar to that of East Tennessee, soils with PIs lower than 30 are slightly susceptible to volume changes, and soils with PIs higher than 50 are generally highly susceptible to volume changes. Soils with PIs between these limits have moderate volume change potential. According to the results of our laboratory tests, soils at this site fall in the moderately to highly susceptible range with plasticity indices ranging from 36 to 52.

10.0 BASIS OF RECOMMENDATIONS

The recommendations provided herein are based on the subsurface conditions and on project information provided to us; they apply only to the specific project and site discussed in this report. If the project information section in this report contains incorrect information or if additional information becomes available, you should convey the corrected or additional information to us and retain us to review our recommendations. We will then modify them if the new information has rendered them inappropriate for the proposed project.

Regardless of the thoroughness of a geotechnical exploration, there is always a possibility that conditions between test borings will differ from those at specific test boring locations, and that conditions will not be as anticipated by the designers or contractors. In addition, the construction process may itself alter soil conditions. Therefore, experienced geotechnical personnel should observe and document the construction procedures used and the conditions encountered. Unanticipated conditions and inappropriate procedures will be reported to the design team, along with timely recommendations to solve the problems created. We recommend that the owner retain LAW to provide this service, based upon our familiarity with the subsurface conditions, the project design, and the intent of the recommendations.

Our exploration services include storing the collected samples and making them available for inspection for a period of 30 days. The samples are then discarded unless you request otherwise.

TABLES

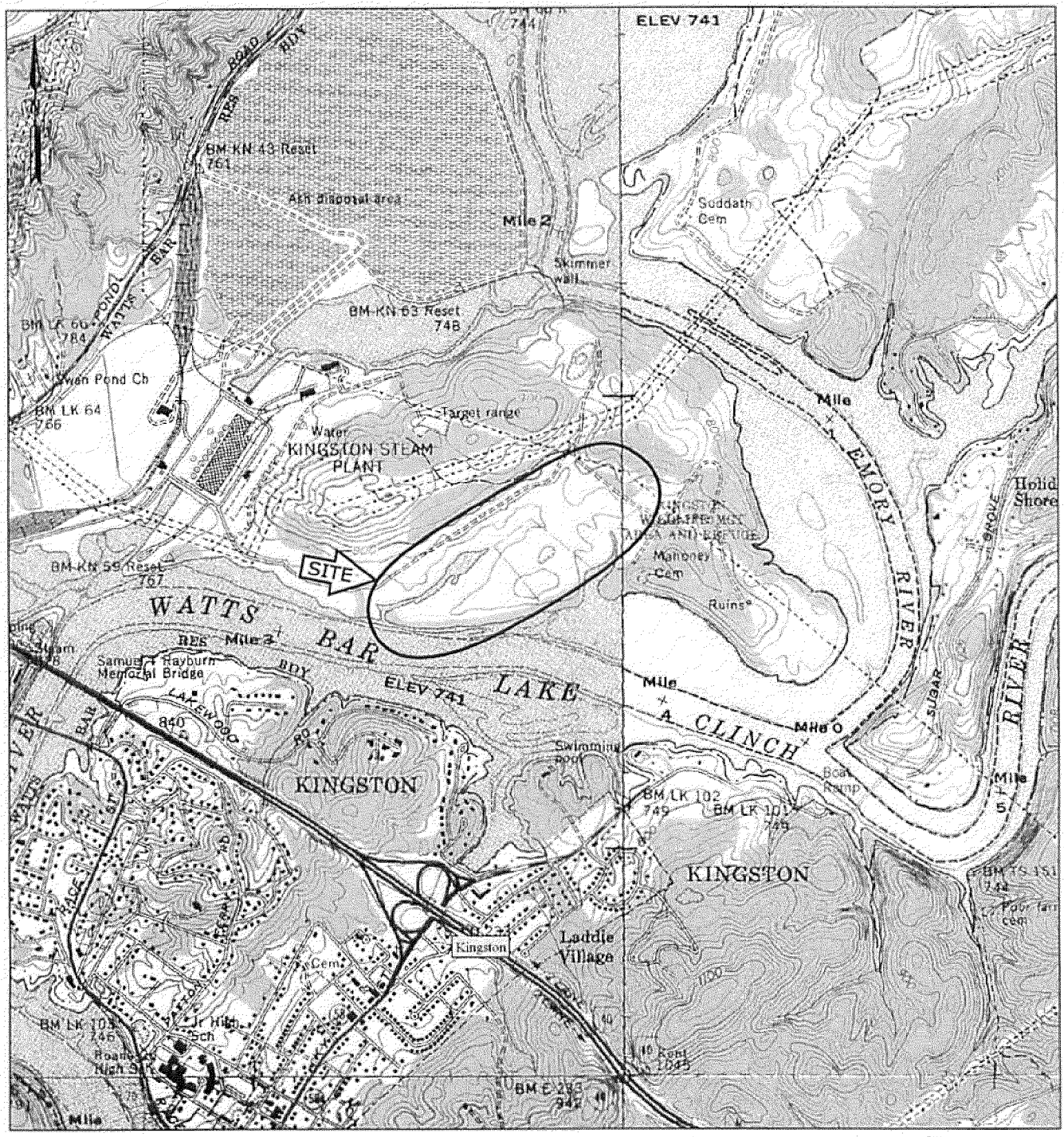
Table 1
Summary of Geoprobe Borings
TVA Kingston Scrubber Stack
MACTEC Project 3043031008/0001

Boring Number	Refusal Depth (Feet)	Longitude	Latitude	Surface Elevation (Feet)	Refusal Elevation (Feet)
GP-1	24.0	-84.51	35.89	749.0	725.0
GP-2	71.0	-84.51	35.89	757.0	686.0
GP-3	41.0	-84.51	35.89	758.5	717.5
GP-4	32.6	-84.51	35.89	755.0	722.4
GP-5	71.0	-84.51	35.89	753.0	682.0
GP-6	40.0	-84.51	35.89	746.5	706.5
GP-7	26.0	-84.51	35.89	750.0	724.0
GP-8	32.0	-84.51	35.89	762.0	730.0
GP-9	36.0	-84.51	35.89	778.0	742.0
GP-10	27.0	-84.51	35.89	764.0	737.0
GP-14	37.4	-84.51	35.89	752.0	714.6
GP-15	49.0	-84.51	35.90	763.0	714.0
GP-16	59.3	-84.50	35.89	767.5	708.2
GP-17	34.3	-84.50	35.89	780.0	745.7
GP-19	55.2	-84.50	35.89	779.0	723.8
GP-20	50.0	-84.50	35.89	792.0	742.0
GP-21	45.1	-84.50	35.89	771.0	725.9
GP-24	34.6	-84.50	35.90	757.0	722.4
GP-25	61.1	-84.50	35.90	768.5	707.4
GP-26	35.2	-84.50	35.90	763.0	727.8
GP-27	55.7	-84.50	35.90	760.0	704.3
GP-28	30.8	-84.50	35.89	752.5	721.7
GP-29	40.5	-84.50	35.89	758.0	717.5
GP-30	37	-84.50	35.90	774.0	737.0
GP-31	31.4	-84.50	35.90	754.0	722.6
GP-32	28.1	-84.50	35.90	760.0	731.9
GP-33	29.8	-84.50	35.90	757.0	727.2
GP-34	15.9	-84.50	35.89	742.0	726.1
GP-35	49	-84.50	35.89	749.0	700.0
GP-36	33.5	-84.50	35.90	760.0	726.5
GP-40	15.3	-84.50	35.90	744.0	728.7

Note: Geoprobe™ borings GP-37, GP-38, and GP-39 were not drilled due to time limitation and their relative proximity to other borings.

Prepared By MMN Date 3/20/03 Checked By [illegible] Date 3/21/03

FIGURES



SOURCE: USGS TOPOGRAPHIC MAPS OF HARRIMAN AND ELVERTON, TN QUADRANGLES

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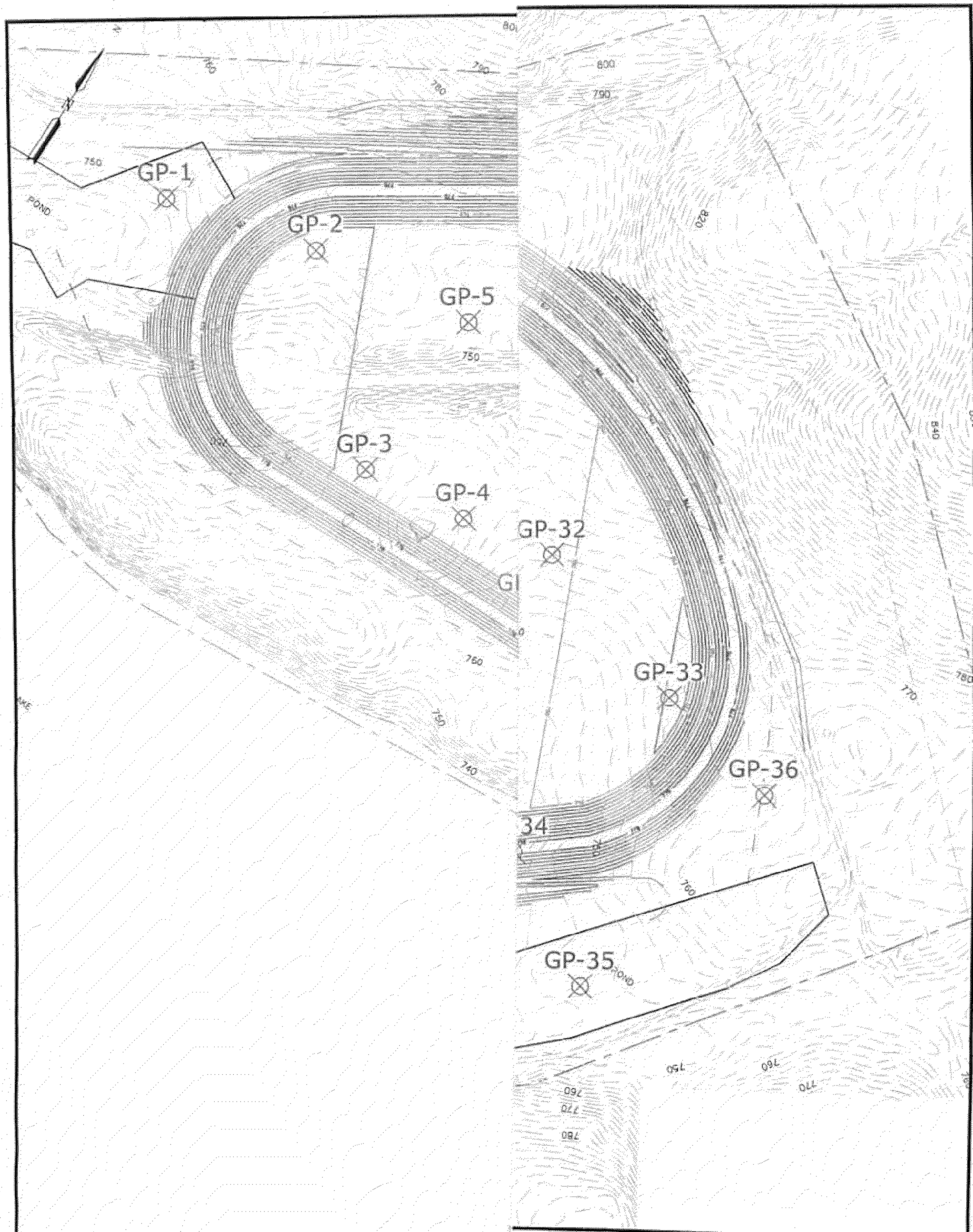
FIGURE 1: SITE LOCATION MAP
PROPOSED SCRUBBER WASTE DISPOSAL AREA
TVA - KINGSTON FOSSIL PLANT
KINGSTON, TENNESSEE

DRAFTING BY:	PREPARED BY: MMN	CHECKED BY:
JOB NUMBER: 3043031008/0001	DATE: MARCH 26, 2003	SCALE: 0 2000'

COORDINATES: N 35°53'39" W 84°31'13"



ORING LOCATION PLAN
CRUBBER WASTE DISPOSAL AREA
TON FOSSIL PLANT
ENNESSEE

N 35°53'39"
W 84°31'13"

PREPARED BY: MMN	CHECKED BY: [signature]
DATE: MARCH 26, 2003	SCALE: 0

DINATES:

APPENDIX A

FIELD EXPLORATORY PROCEDURES

FIELD EXPLORATORY PROCEDURES

Soil Test Boring (Hollow Stem)

All boring and sampling operations were conducted in general accordance with ASTM D 1586. The borings were advanced by mechanically twisting continuous steel hollow-stem auger flights into the ground. At regular intervals, soil samples were obtained with a standard 1.4-inch I.D., 2-inch O.D., split-tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot of penetration was recorded and is designated the "standard penetration resistance (SPT)". Proper evaluation of the penetration resistance provides an index to the soil's strength, density, and ability to support foundations.

Representative portions of the soil samples obtained from the split-tube sampler were sealed in glass jars and transported to our laboratory, where they were examined by our engineer to verify the driller's field classifications. Test Boring Records are attached, graphically showing the soil descriptions and penetration resistances.

Rock Coring

Prior to coring, casing is set in the hole drilled through the overburden soils, if necessary, to keep the hole from caving. Refusal materials are then cored according to ASTM D 2113, using a diamond-studded bit fastened to the end of a hollow, double-tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each core run, the core barrel is brought to the surface, the core recovery is measured, the samples are removed, and the core is placed in boxes for transportation and storage.

The core samples are returned to the laboratory where the refusal material is identified, and the percent core recovery and rock quality designations are determined by a soils engineer or geologist. The percent core recovery is the ratio of the sample length obtained to the depth drilled, expressed as a percent. The rock quality designation (RQD) is obtained by summing up the length of core recovered, including only the pieces of core that are 4 inches or longer, and divided by the total

length drilled. The percent core recovery and RQD are related to the soundness and continuity of the refusal material. Refusal material descriptions, recoveries, and the bit size used are shown on the "Test Boring Records".

The NQ and NX sizes designate bits that obtain rock cores 1-7/8 and 2-1/8 inches in diameter, respectively.

Boring Backfill

The borings were backfilled to the ground surface with cement-bentonite grout. The owner is advised that, even with this backfill technique, there is the possibility of future borehole subsidence depending on actual subsurface conditions, surface drainage, etc. The property owner should monitor the boring locations over time to discover subsidence and make the necessary repairs.

Geoprobe™

The probe holes were advanced with a Geoprobe™ sampling system. The depth of rock or refusal was explored at each hole location by advancing a pointed probe with the hydraulic hammer of the Geoprobe™. Once refusal is encountered, the depth to refusal was recorded on a standard boring log. Alternatively, the probe rod is advanced to a specified depth, to verify that refusal/rock is not present in the specified depth.

APPENDIX B

KEY TO SYMBOLS AND DESCRIPTIONS

SOIL TEST BORING RECORDS

SUBSURFACE FENCE DIAGRAMS

ROCK CORE PHOTOGRAPHS

GROUP SYMBOLS	TYPICAL NAMES	GROUP SYMBOLS	TYPICAL NAMES
	TOPSOIL		**CONCRETE**
	ASPHALT		**DOLOMITE**
	GRAVEL		**LIMESTONE**
	FILL		**SHALE**
	SUBSOIL		**LIMESTONE/SHALE** - Limestone with shale interbeds
	ALLUVIUM		**SANDSTONE**
	COLLUVIUM		**SILTSTONE**
	RESIDUUM - Soft to firm		**AUGER BORING**
	RESIDUUM - Stiff to very hard		**UNDISTURBED SAMPLE ATTEMPT**

	Undisturbed Sample 1.5-2.0 = Recovered (ft) / Pushed (ft)		
	Split Spoon Sample		Auger Cuttings
	Rock Core 60-100 = RQD / Recovery		Dilatometer
	No Sample		Crandall Sampler
	Rotary Drill		Pressure Meter
▽	Water Table at time of drilling	○	No Recovery
		▼	Water Table after 24 hours

Correlation of Penetration Resistance with Relative Density and Consistency

SAND & GRAVEL		SILT & CLAY	
No. of Blows	Relative Density	No. of Blows	Consistency
0 - 4	Very Loose	0 - 2	Very Soft
5 - 10	Loose	3 - 4	Soft
11 - 20	Firm	5 - 8	Firm
21 - 30	Very Firm	9 - 15	Stiff
31 - 50	Dense	16 - 30	Very Stiff
Over 50	Very Dense	31 - 50	Hard
		Over 50	Very Hard

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

No.200 No.40 No.10 No.4 3/4" 3" 12"

U.S. STANDARD SIEVE SIZE

Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1, March, 1953 (Revised April, 1960)

KEY TO SYMBOLS AND DESCRIPTIONS

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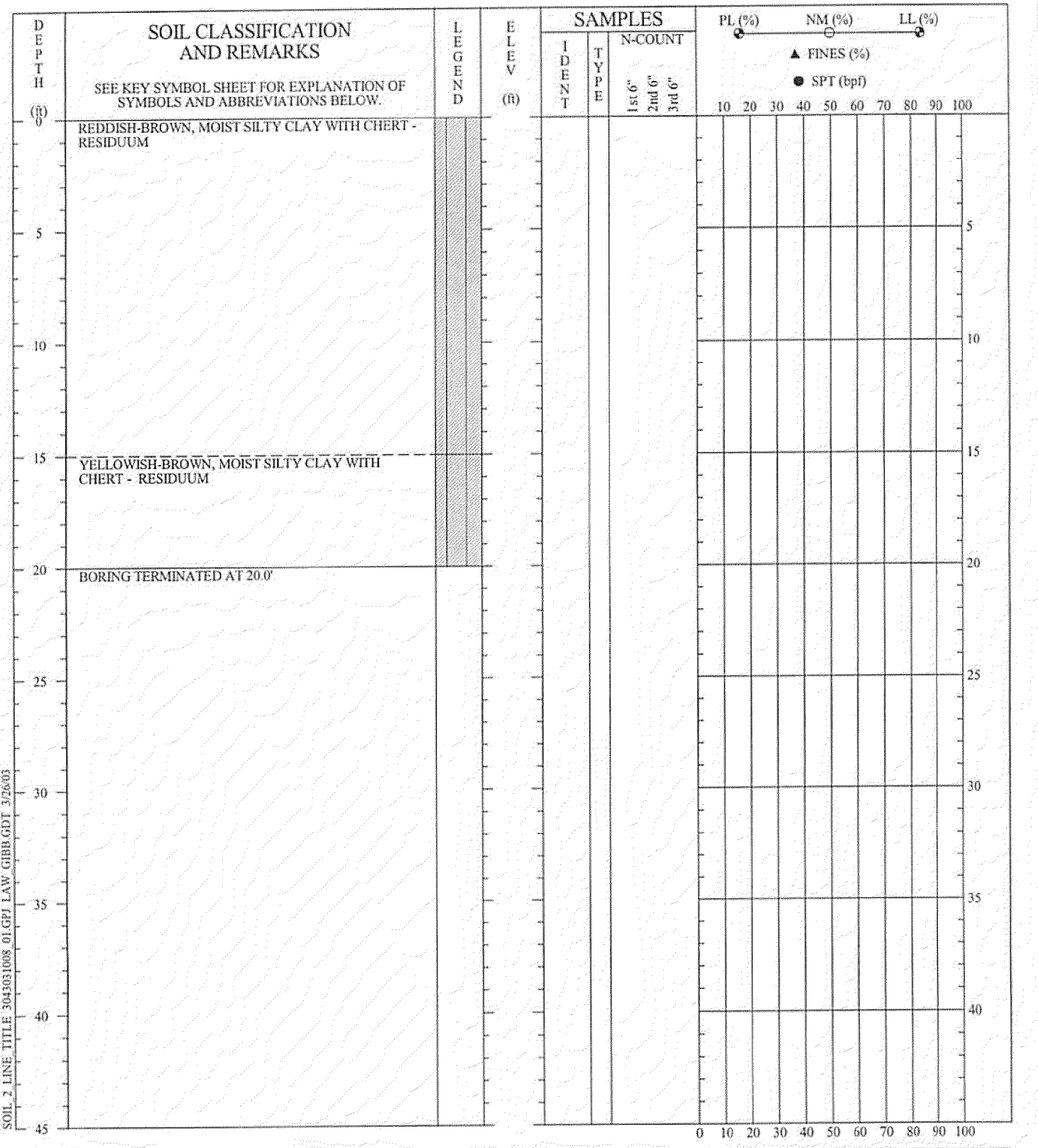

REMARKS: AUGER BORING IN BORROW AREA. GROUND ELEVATION NOT AVAILABLE.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: March 6, 2003 **BORING NO.:** A-1

PROJ. NO.: 3043031008/0001 **PAGE 1 OF 1**

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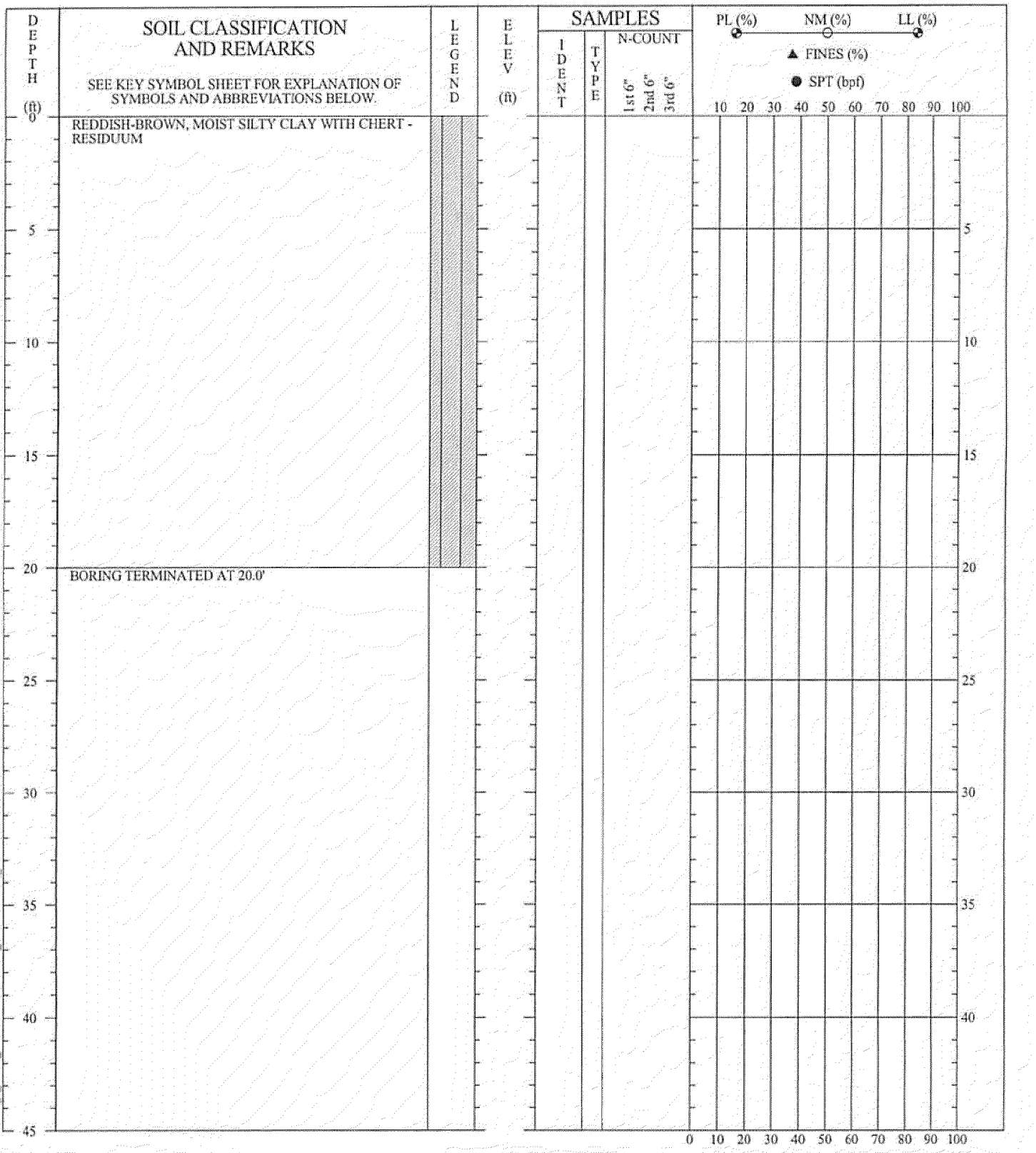

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SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: March 6, 2003 **BORING NO.:** A-2

PROJ. NO.: 3043031008/0001 **PAGE** 1 **OF** 1

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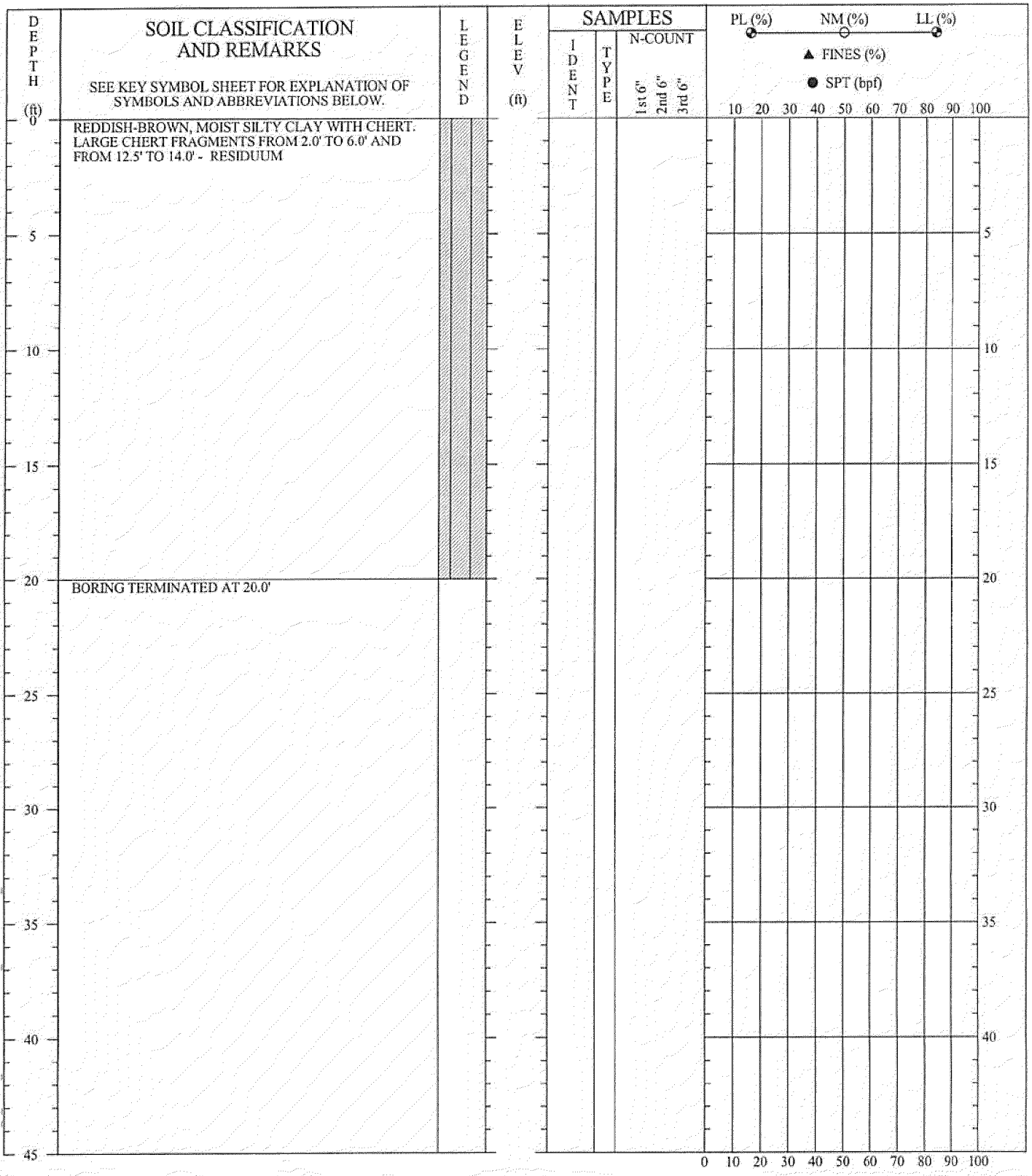

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SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: March 6, 2003 **BORING NO.:** A-3

PROJ. NO.: 3043031008/0001 **PAGE** 1 **OF** 1

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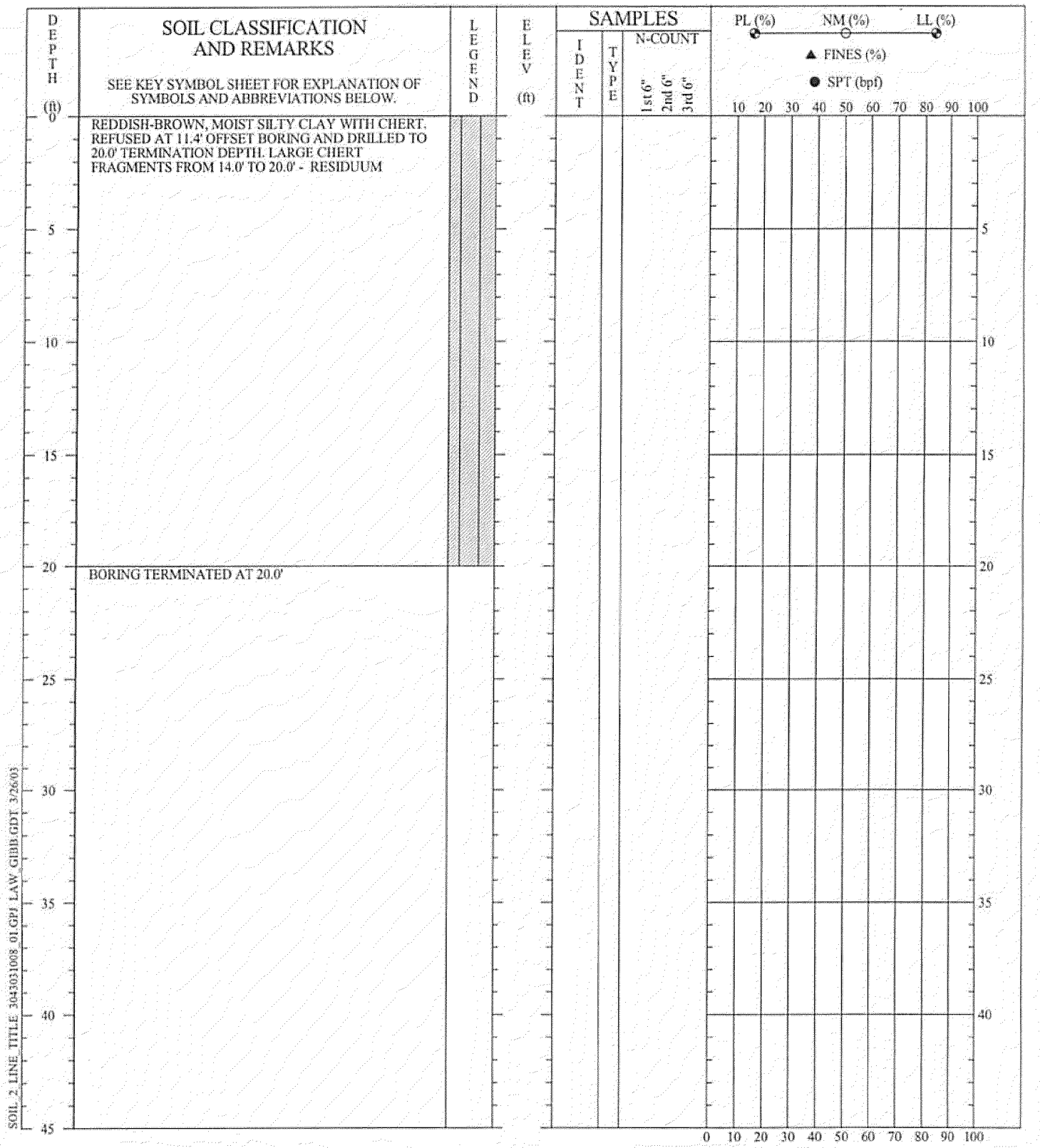


REMARKS: AUGER BORING IN BORROW AREA. GROUND ELEVATION NOT AVAILABLE.

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

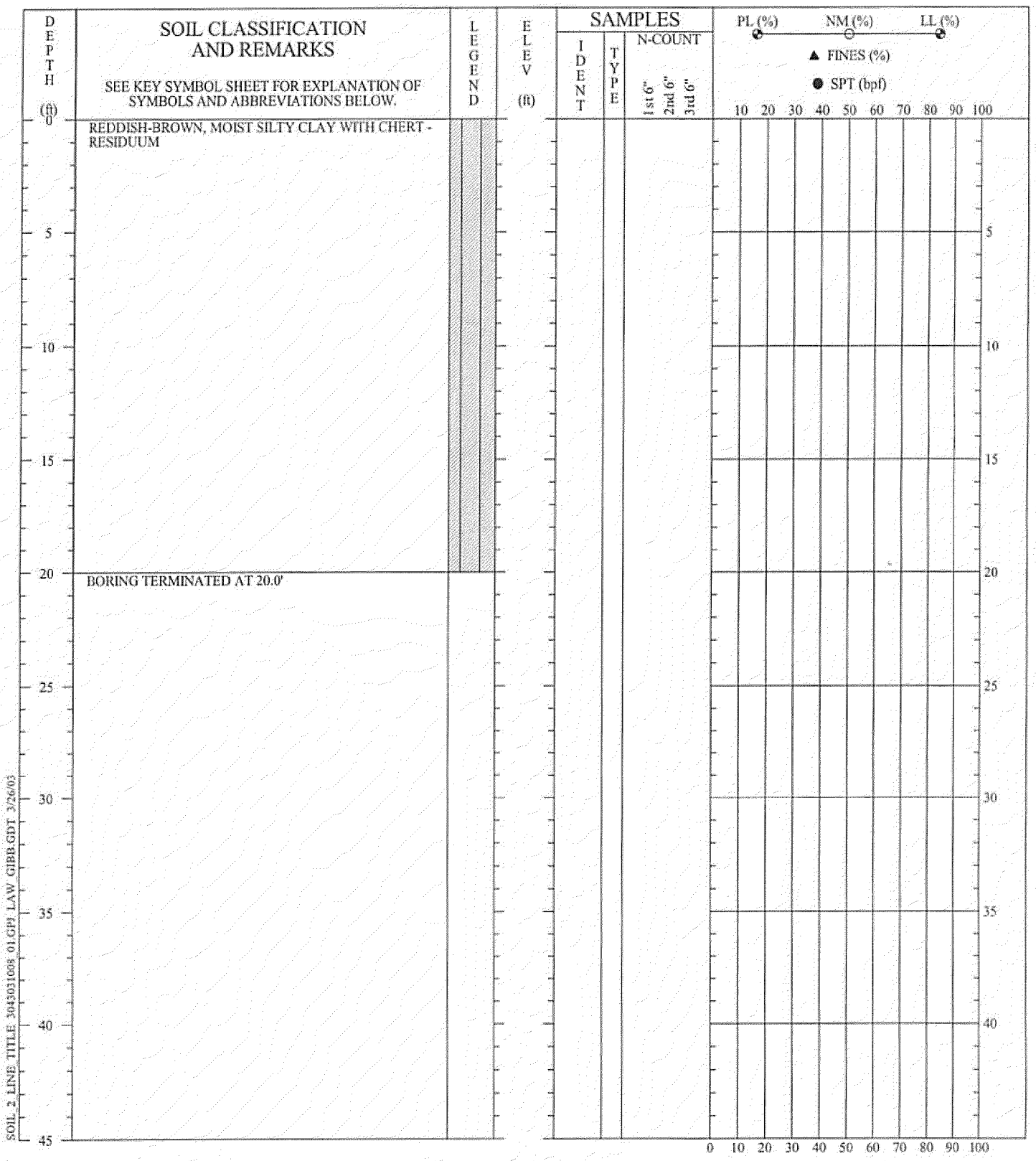
SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: March 6, 2003 **BORING NO.:** A-4

PROJ. NO.: 3043031008/0001 **PAGE** 1 **OF** 1

MACTEC



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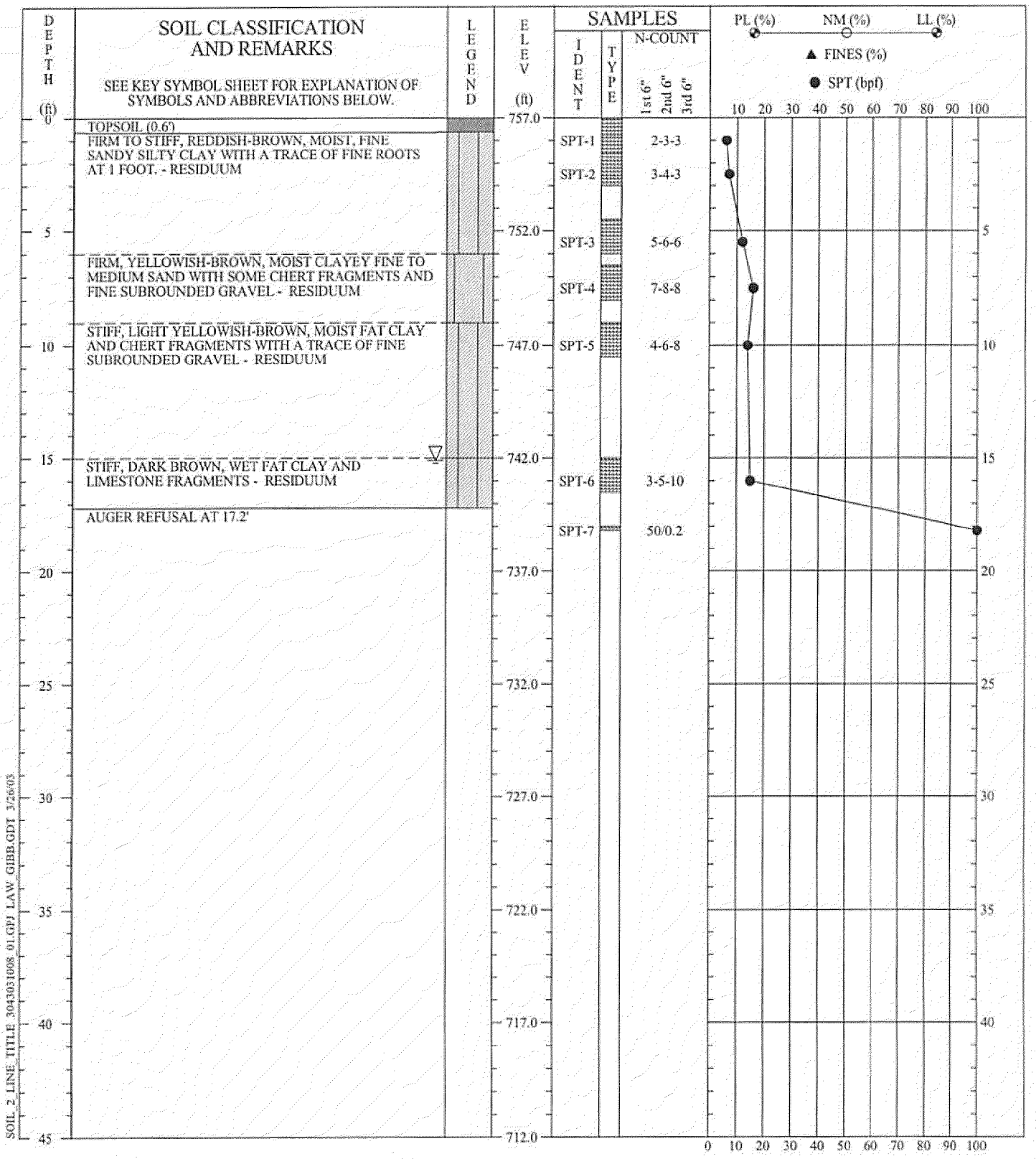
SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: March 11, 2003 **BORING NO.:** A-5

PROJ. NO.: 3043031008/0001 **PAGE** 1 **OF** 1

MACTEC



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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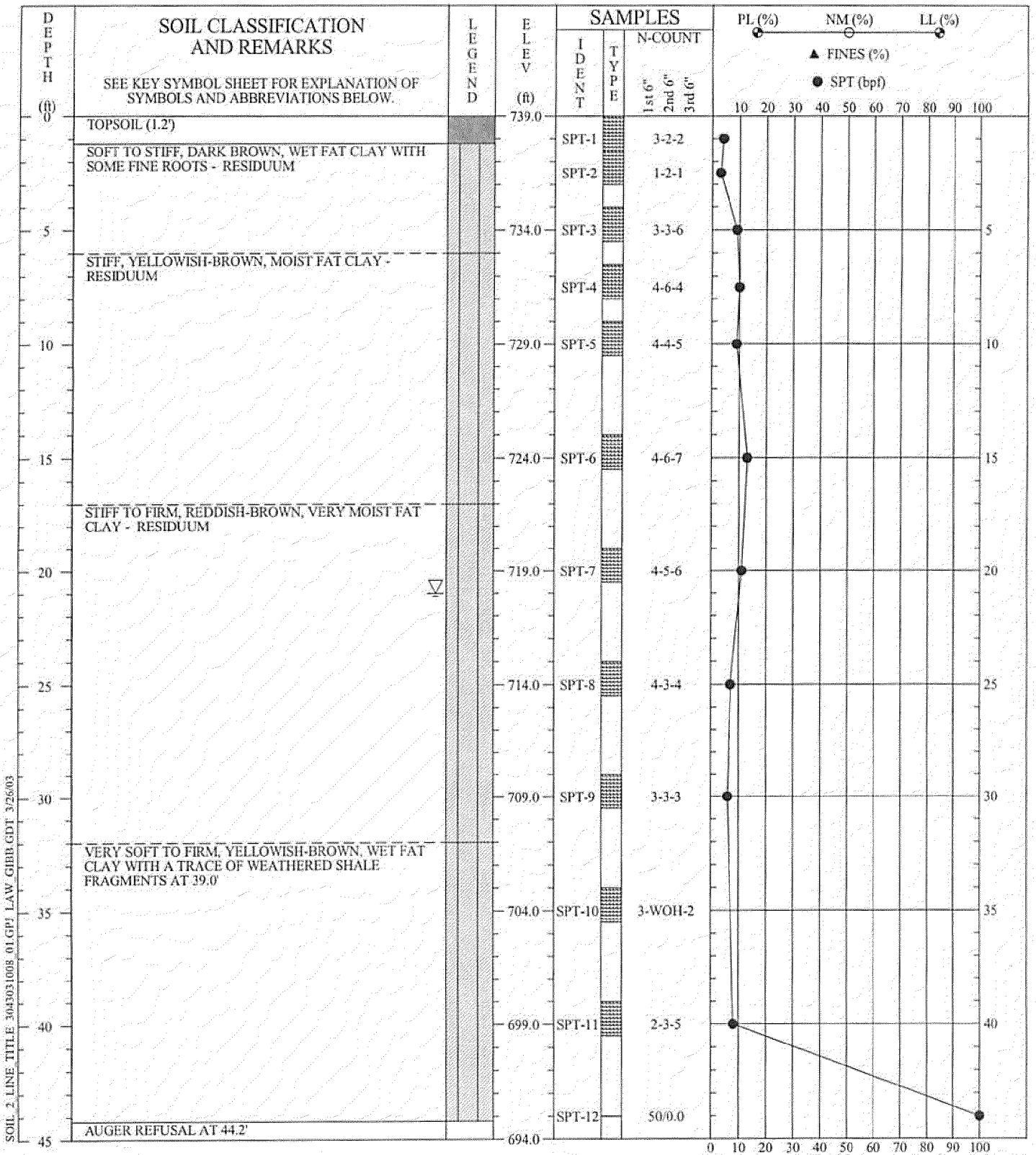
SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: March 10, 2003 **BORING NO.:** B-11

PROJ. NO.: 3043031008/0001 **PAGE 1 OF 1**

MACTEC



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SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: March 6, 2003 **BORING NO.:** B-12

PROJ. NO.: 3043031008/0001 **PAGE** 1 **OF** 1

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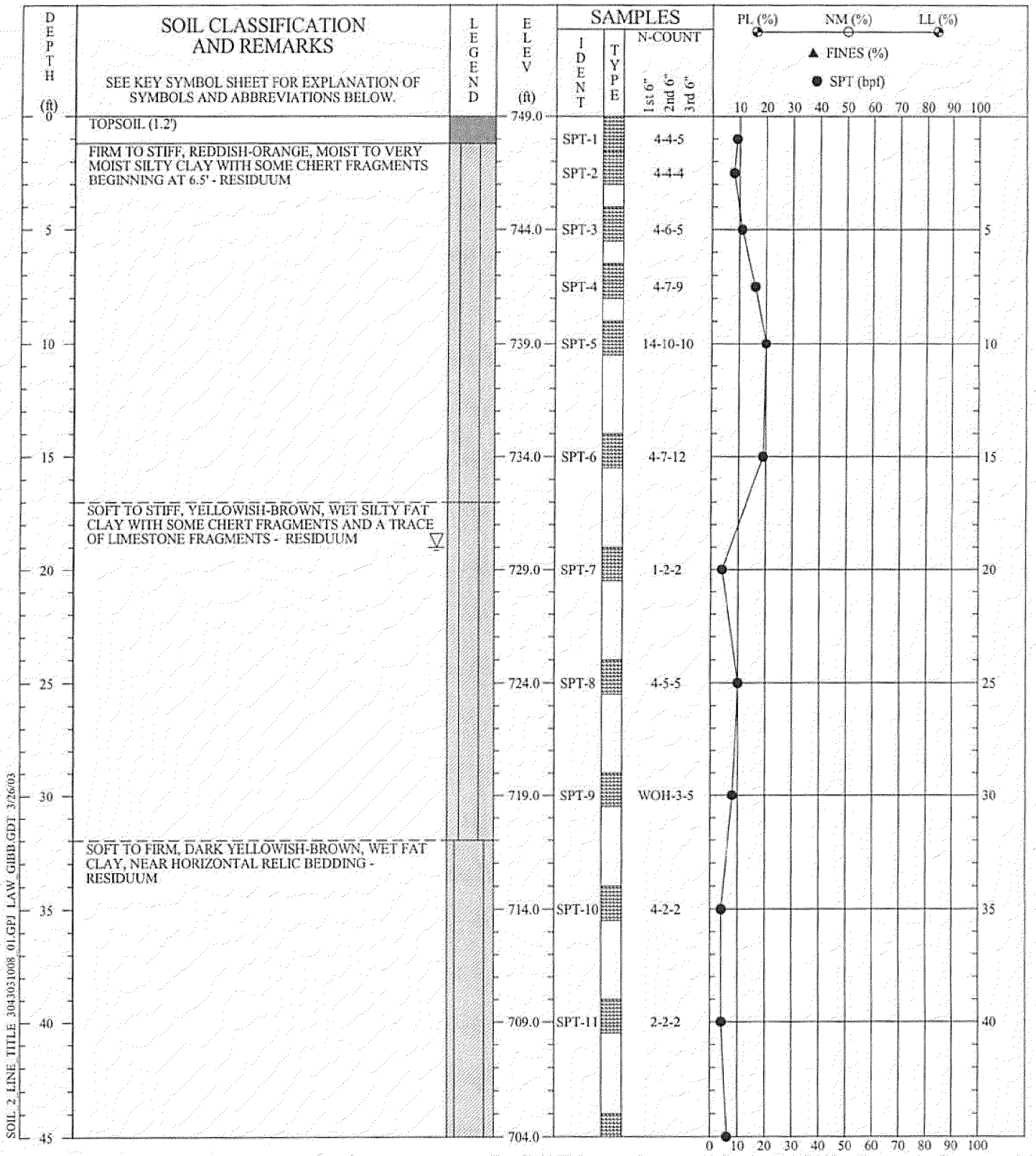

SOIL 2 LINE TITLE 3043031008 01.GPJ LAW GIBB.GDT 3/26/03

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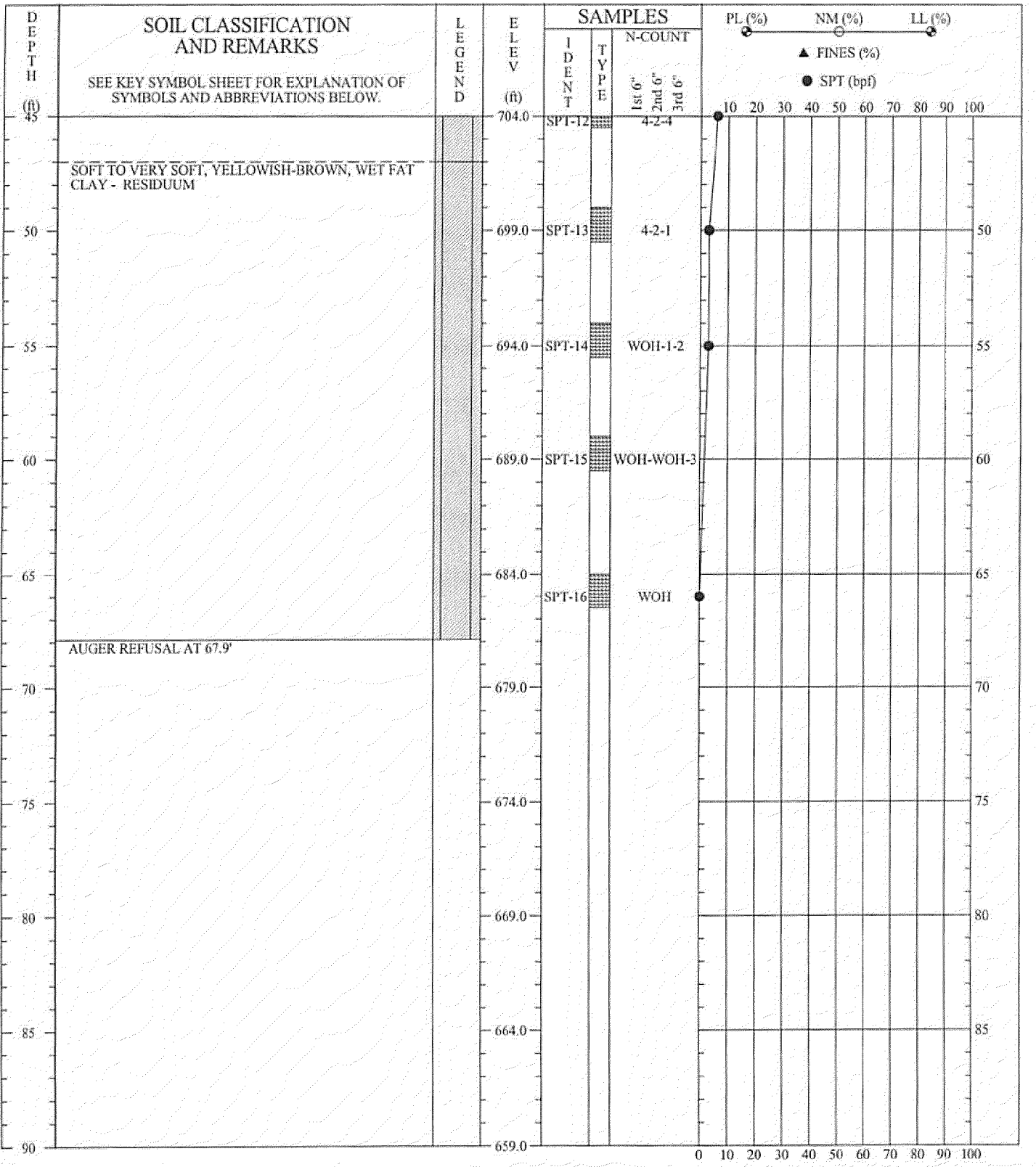
SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: February 5, 2003 **BORING NO.:** B-13

PROJ. NO.: 3043031008/0001 **PAGE** 1 **OF** 2

MACTEC



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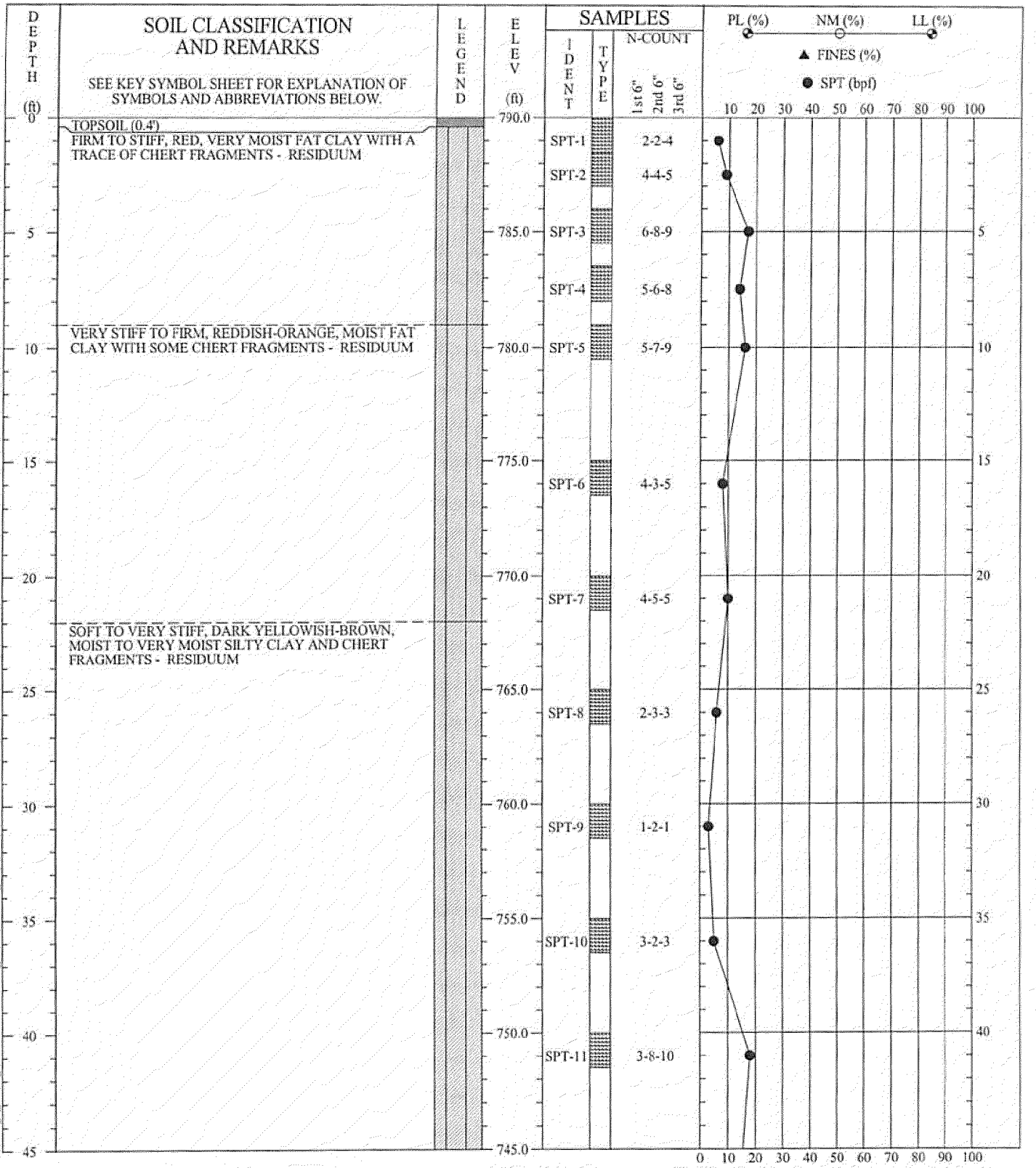
SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: February 5, 2003 **BORING NO.:** B-13

PROJ. NO.: 3043031008/0001 **PAGE 2 OF 2**

MACTEC



SOIL_2_LINE_TITLE 3043031008_01.GPJ LAW_GIBB.GDT 3/26/03

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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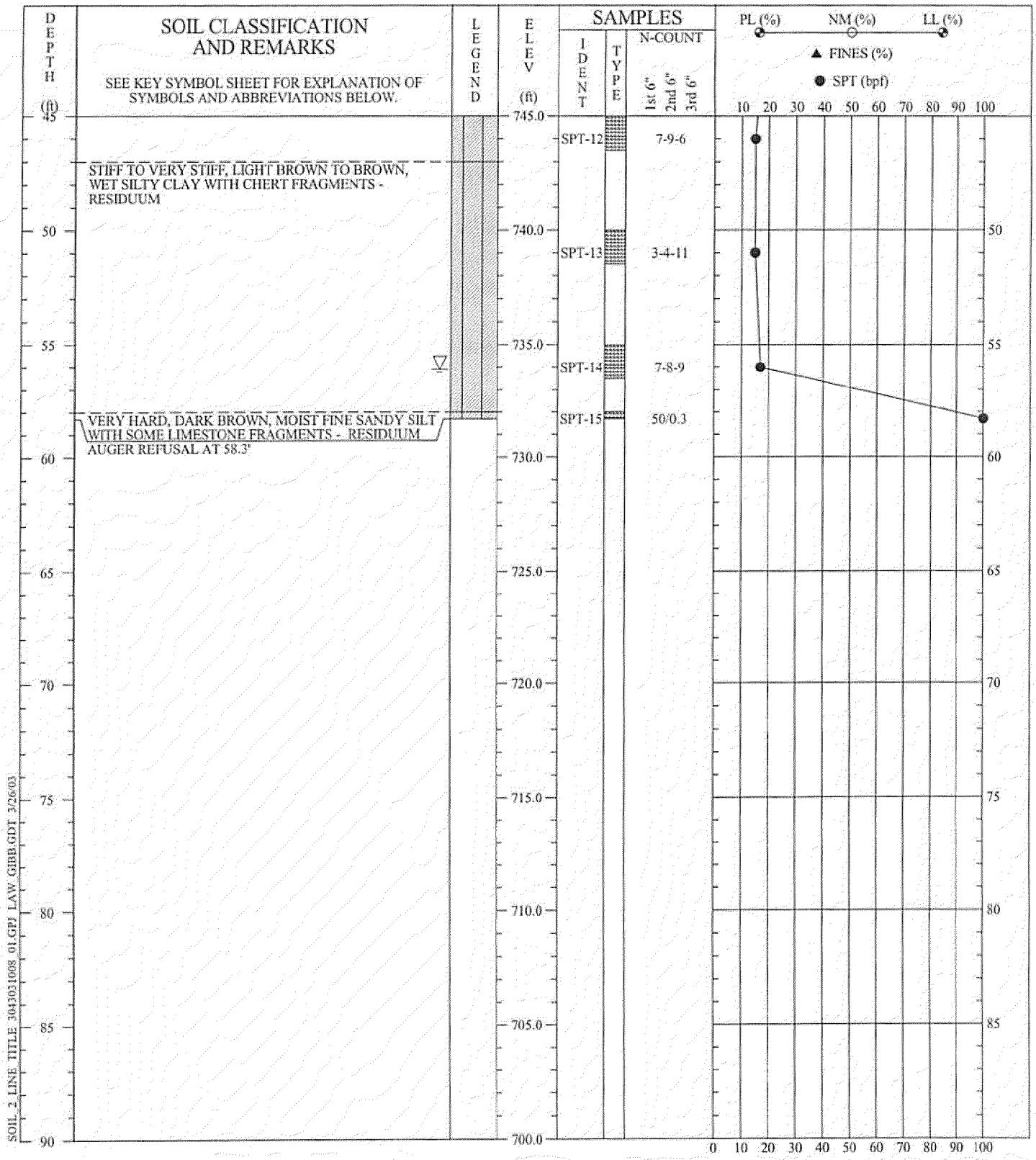
SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: March 10, 2003 **BORING NO.:** B-18

PROJ. NO.: 3043031008/0001 **PAGE** 1 **OF** 2

MACTEC



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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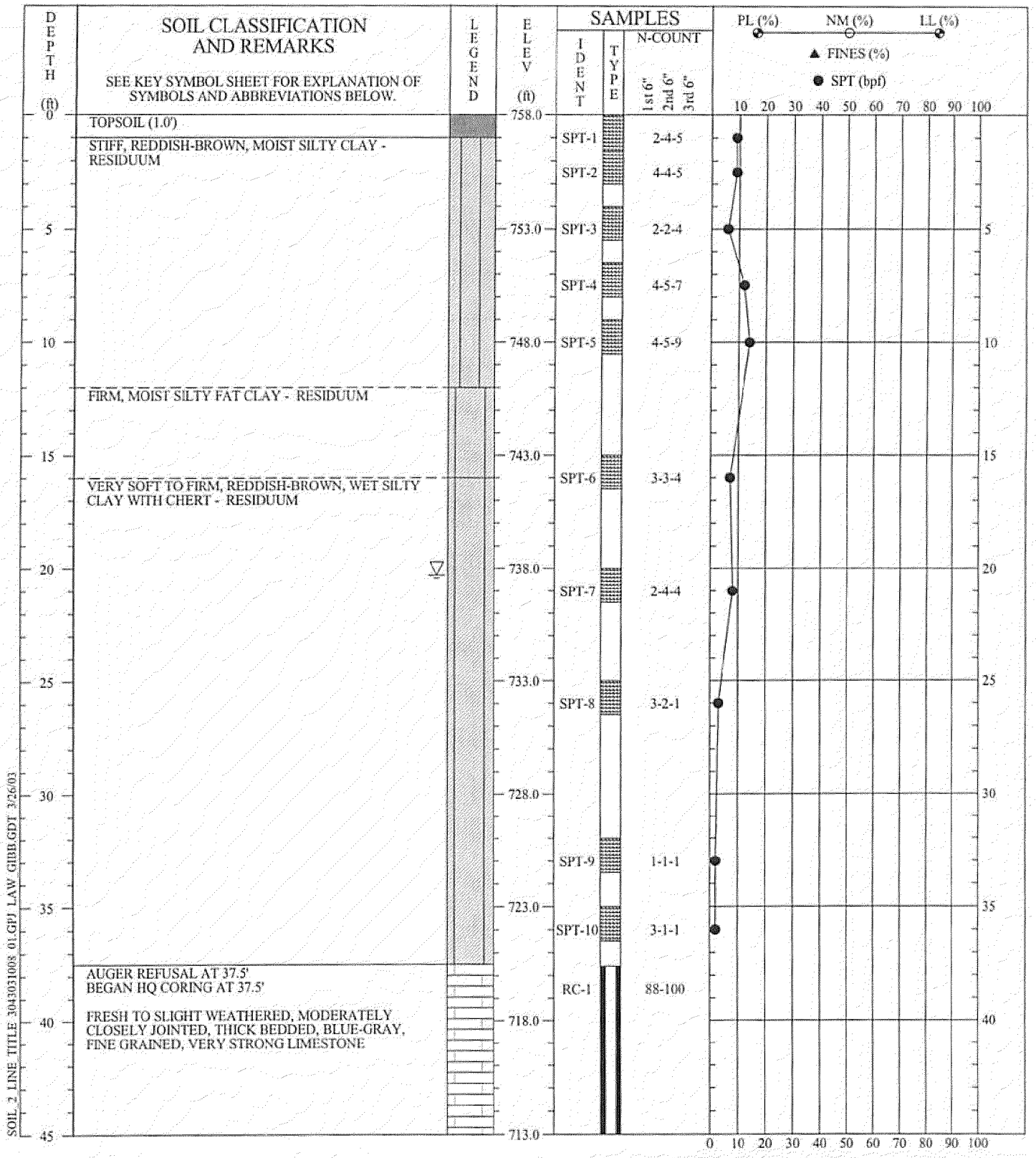
SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: March 10, 2003 **BORING NO.:** B-18

PROJ. NO.: 3043031008/0001 **PAGE 2 OF 2**

MACTEC



SOIL_2 LINE TITLE 3043031008 01.GPJ LAW GIBB.GDT 3/26/03

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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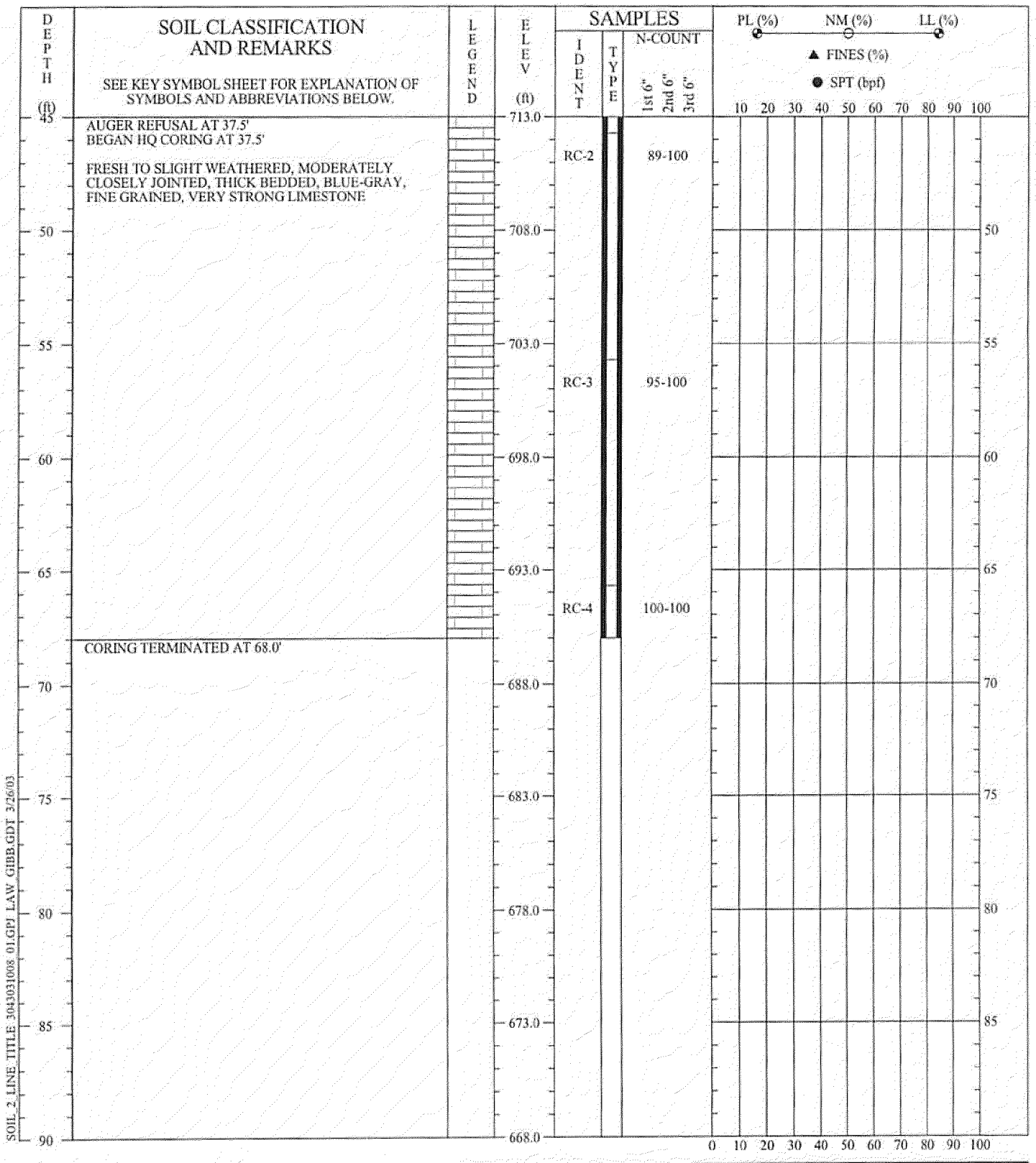
SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: **BORING NO.:** B-22

PROJ. NO.: 3043031008/0001 **PAGE** 1 **OF** 2

MACTEC



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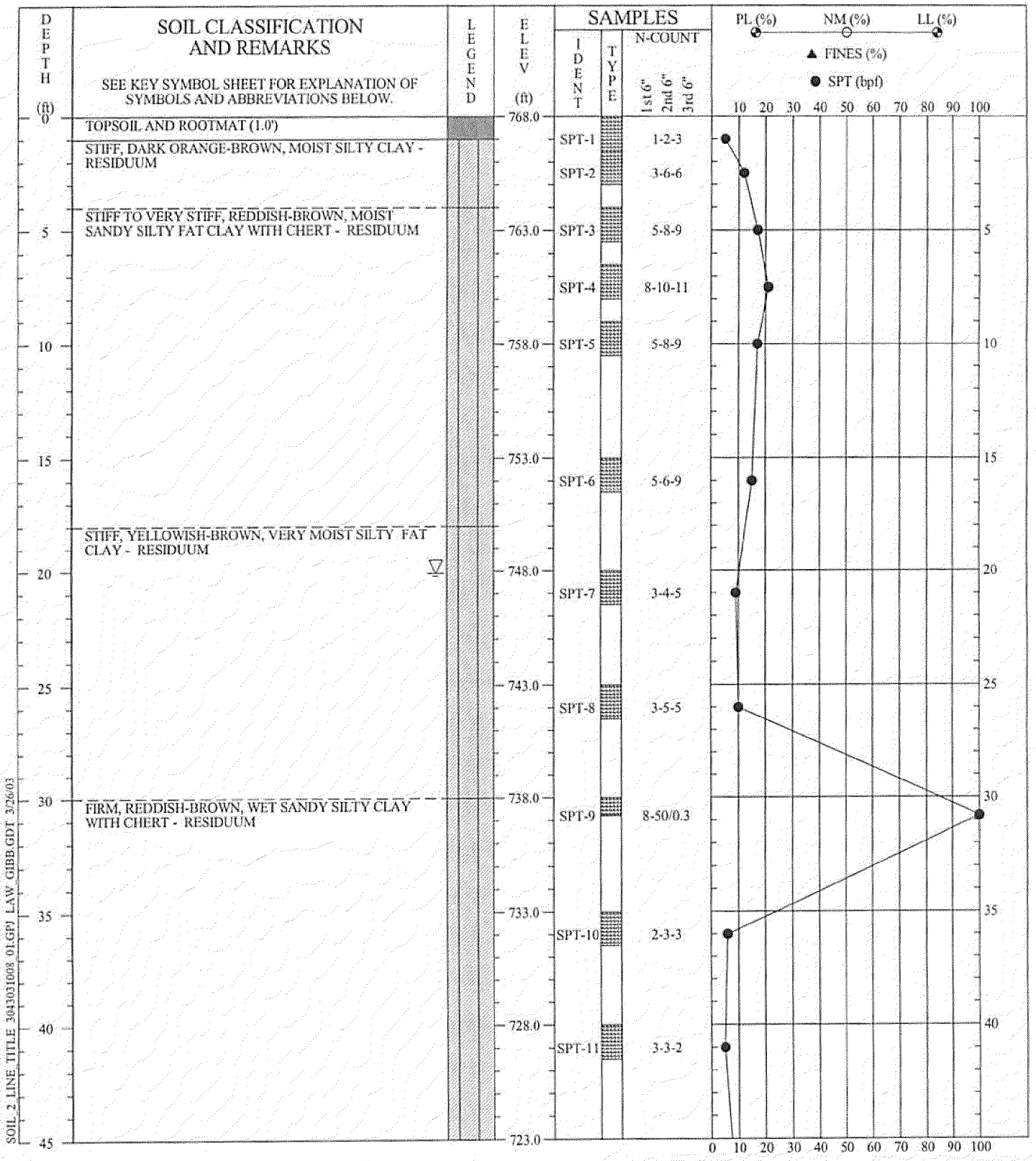
SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: **BORING NO.:** B-22

PROJ. NO.: 3043031008/0001 **PAGE 2 OF 2**

MACTEC



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER.

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SOIL TEST BORING RECORD

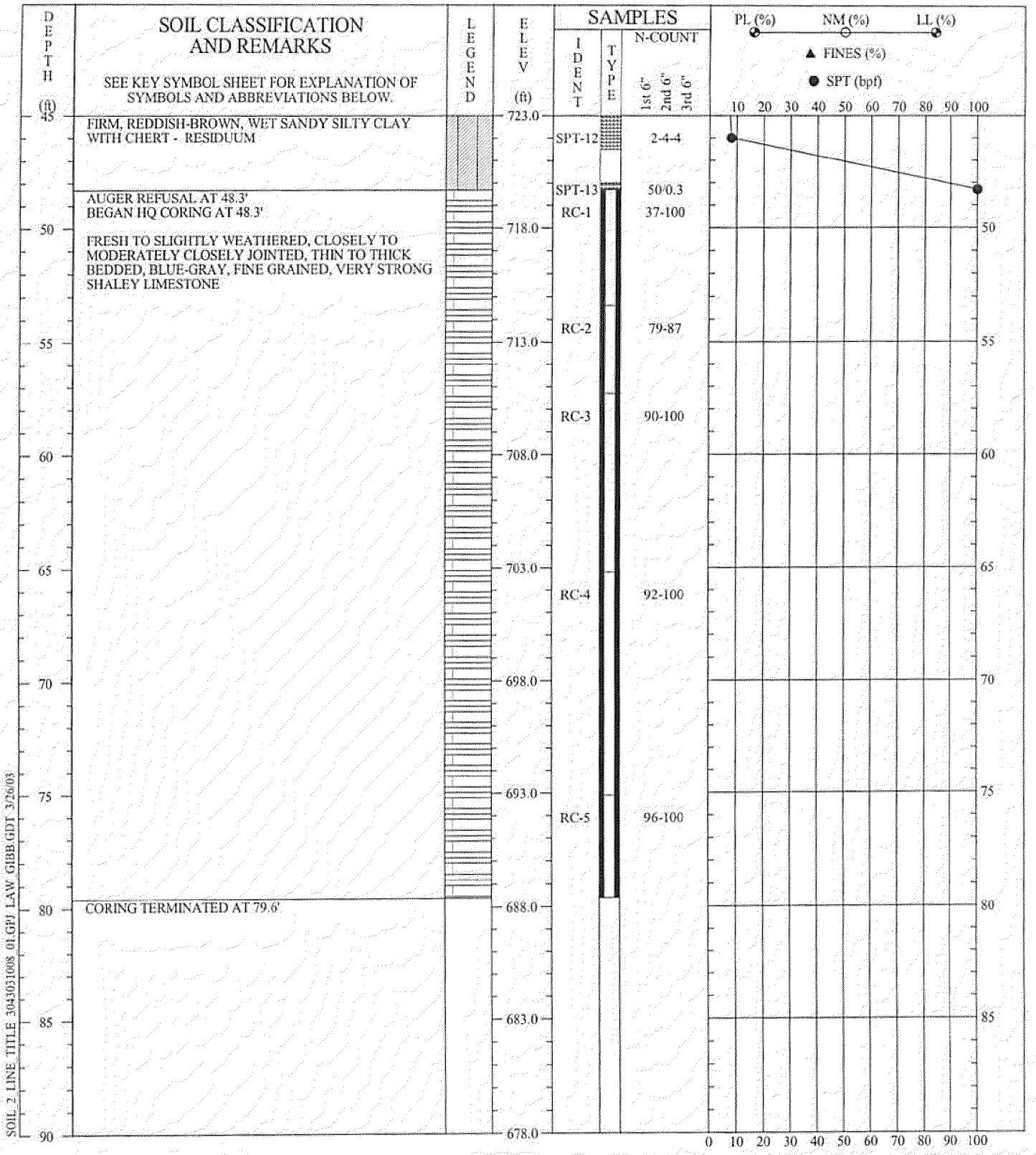
PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED:

BORING NO.: B-23

PROJ. NO.: 3043031008/0001

MACTEC



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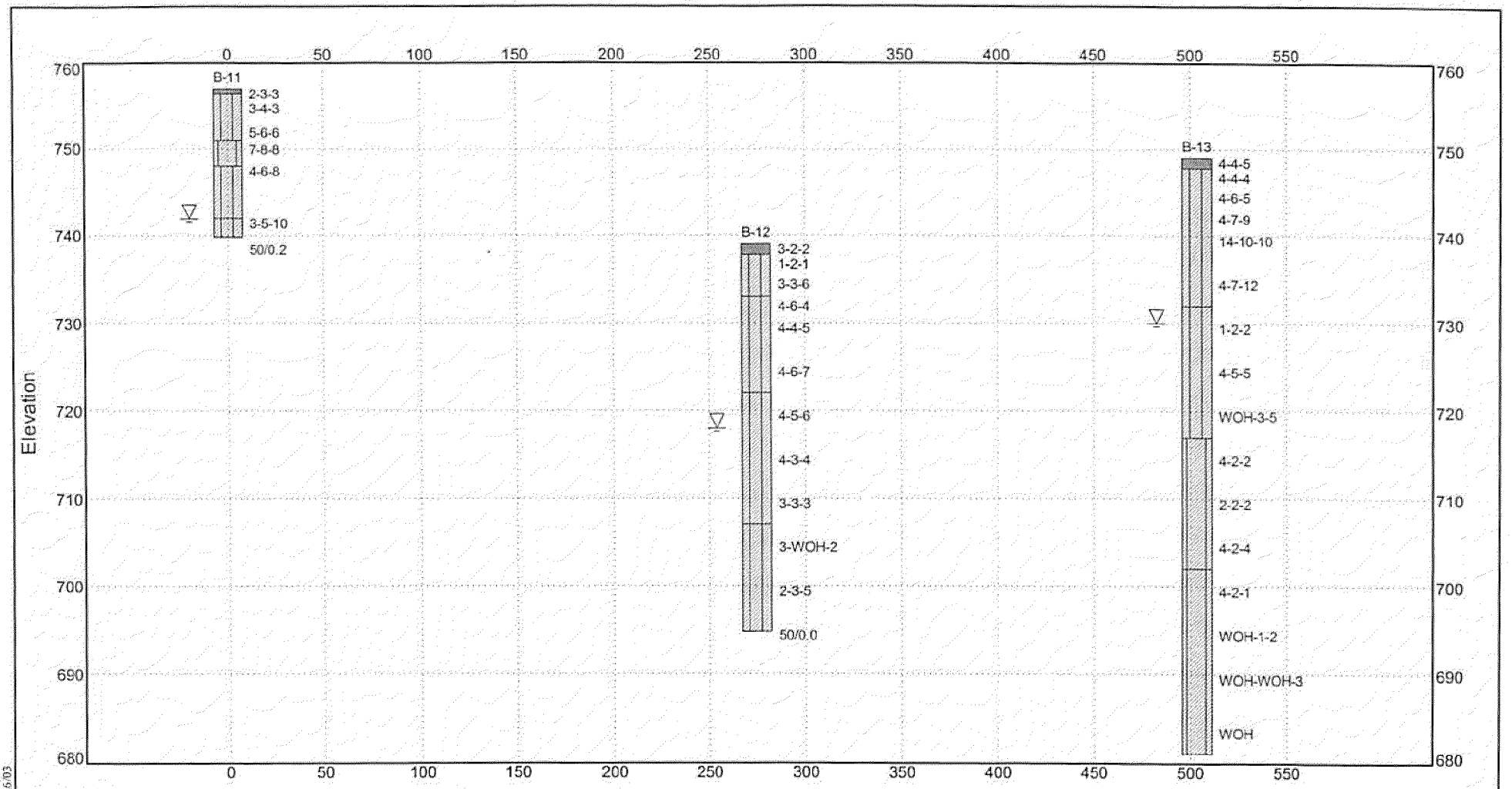
SOIL TEST BORING RECORD

PROJECT: Proposed Scrubber Waste Disposal Area
TVA - Kingston Fossil Plant

DRILLED: **BORING NO.:** B-23

PROJ. NO.: 3043031008/0001 **PAGE 2 OF 2**

MACTEC



SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

Borehole	North	East	Elev.	Depth
B-11	1684	1697	757.0	17.2
B-12	1959	1812	739.0	44.2
B-13	2052	2041	749.0	67.9

DISTANCES:
Beginning 0
Ending 550
VIEWING ANGLES (degrees):
Horizontal 0.0
Vertical 0.0

Position	North	East
Left, Front	1717	1664
Right, Front	2101	2058
Left, Back	1717	1664
Right, Back	2101	2058

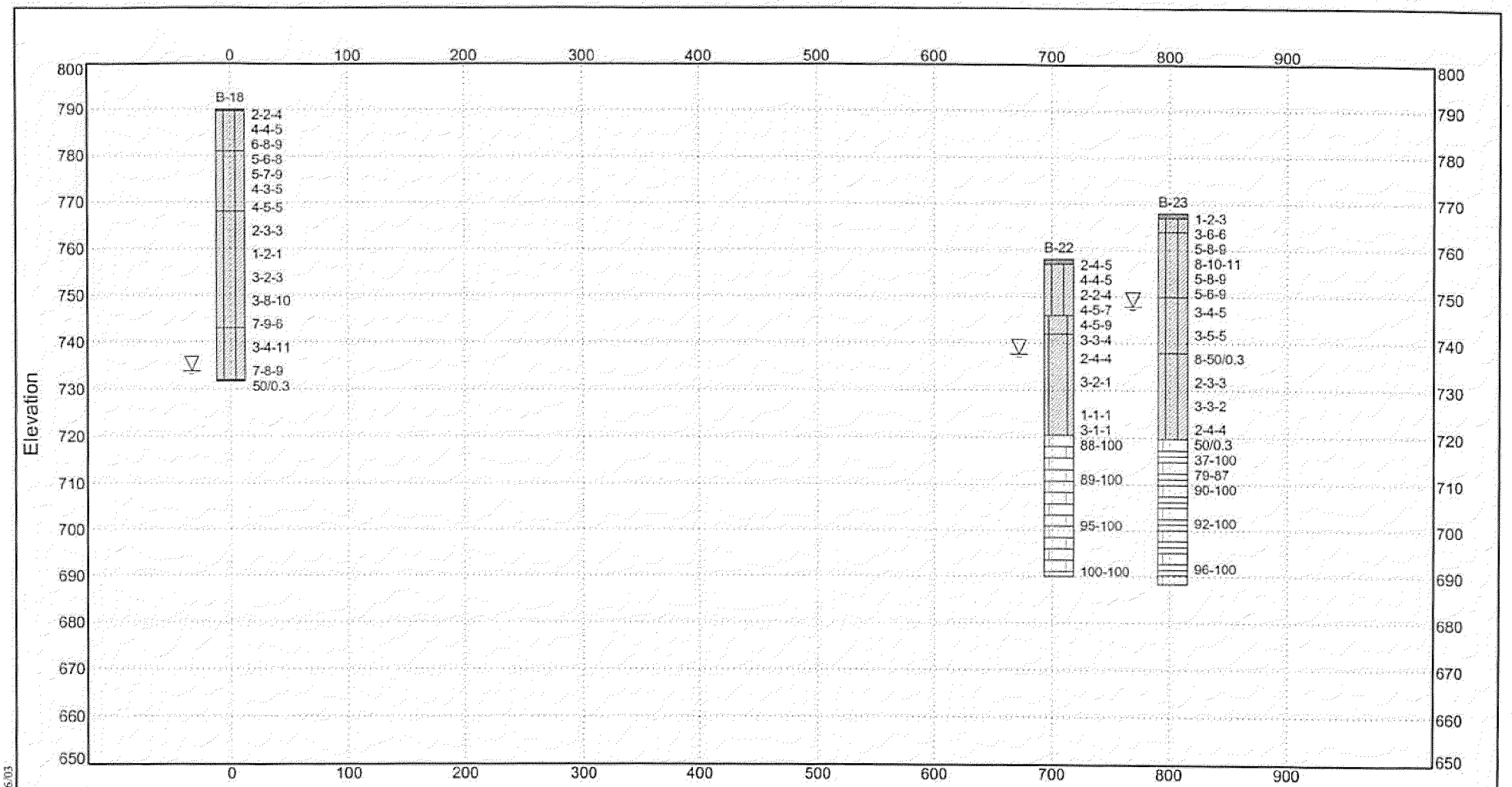
SUBSURFACE FENCE DIAGRAM A - A'

Proposed Scrubber Waste Disposal Area

TVA - Kingston Fossil Plant

PROJECT #	DATE	PLATE
3043031008/0001	Mar 03	1

SECTION2 3043031008_01.GPJ FAGWGN01.GDT 3/26/03



SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

Borehole	North	East	Elev.	Depth
B-18	1020	2194	790.0	58.3
B-22	1491	2722	758.0	100.0
B-23	1635	2712	768.0	100.0

DISTANCES:
Beginning 0
Ending 900
VIEWING ANGLES (degrees):
Horizontal 0.0
Vertical 0.0

Position	North	East
Left, Front	1021	2193
Right, Front	1668	2819
Left, Back	1021	2193
Right, Back	1668	2819

SUBSURFACE FENCE DIAGRAM B - B'

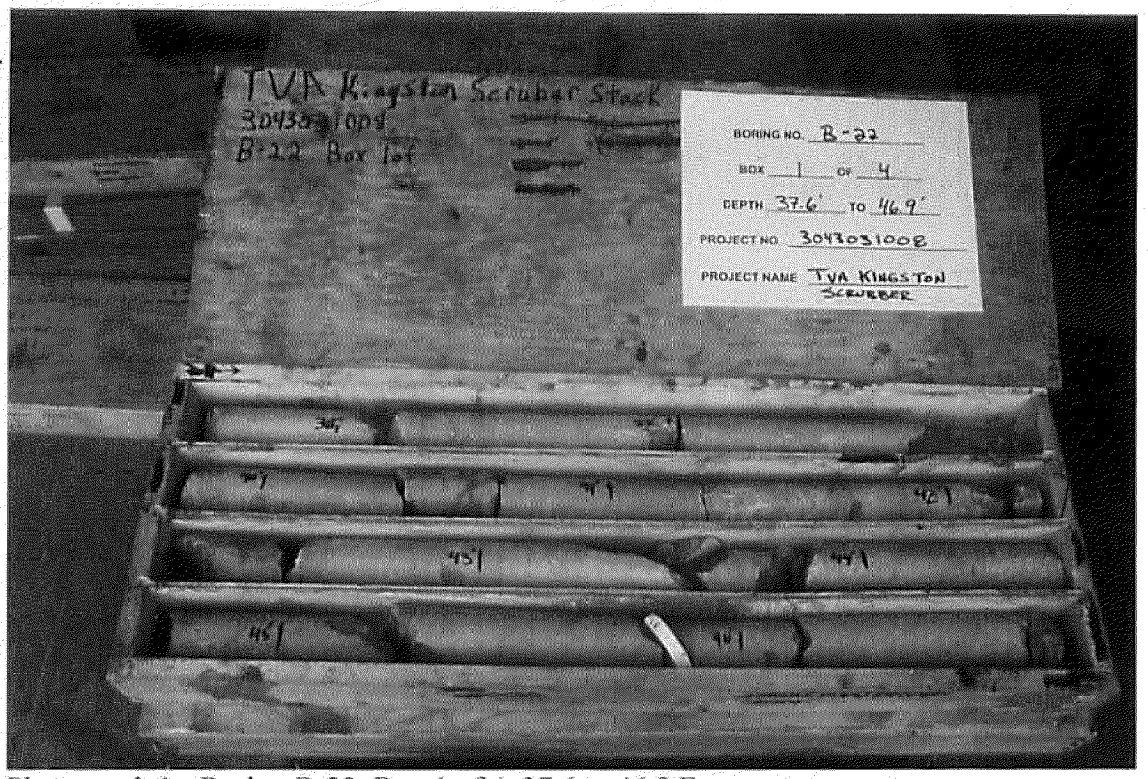
Proposed Scrubber Waste Disposal Area

TVA - Kingston Fossil Plant

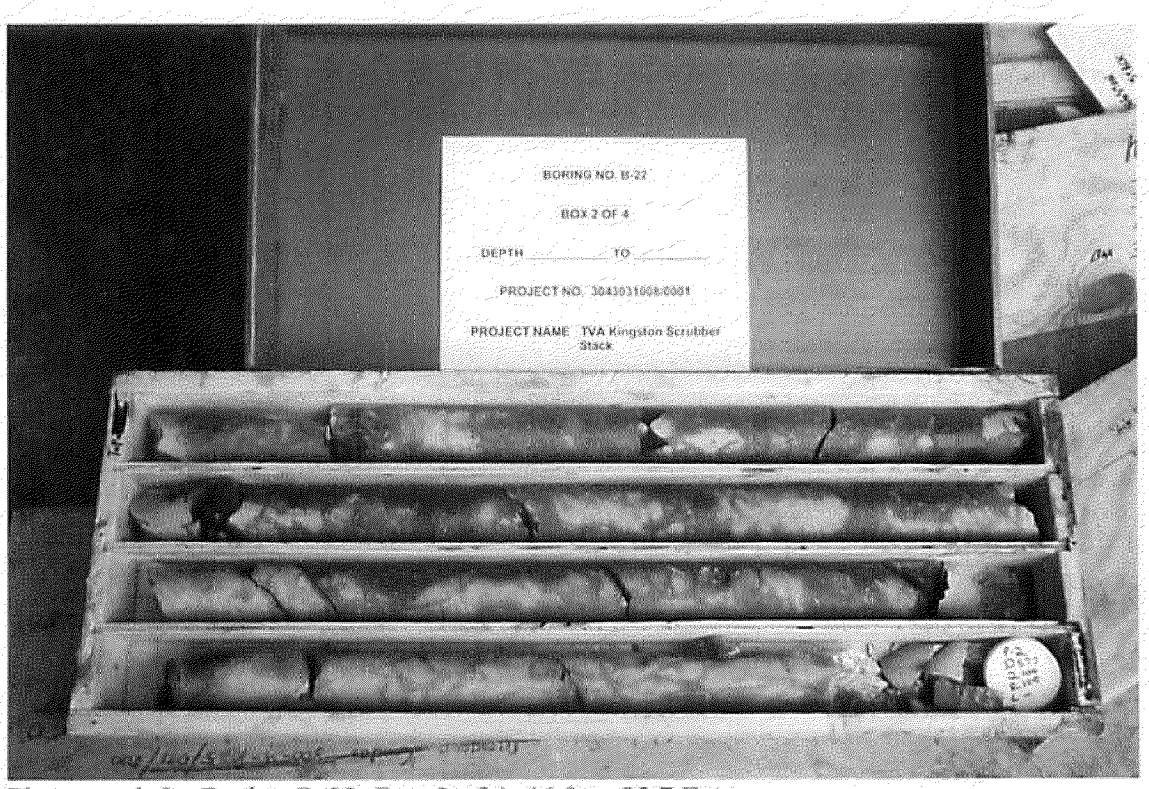
PROJECT #	DATE	PLATE
3043031008/0001	Mar 03	1

SECTION2 3043031008_01.GPJ FAGWGN01.GDT 3/26/03

TVA-00008057



Photograph 1 - Boring B-22, Box 1 of 4, 37.6 to 46.9 Feet.



Photograph 2 - Boring B-22, Box 2 of 4, 46.9 to 55.7 Feet.

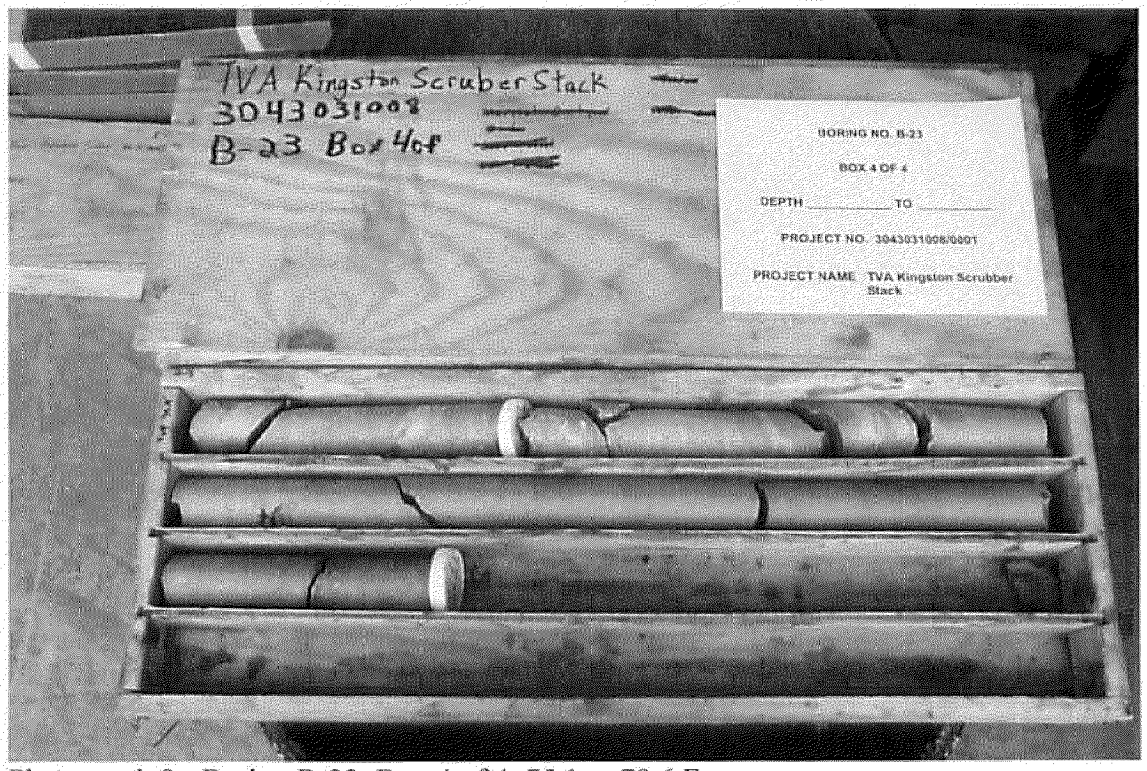
Photograph 3 - Boring B-22, Box 3 of 4, 55.7 to 64.7 Feet.

Photograph 4 - Boring B-22, Box 4 of 4, 64.7 to 68.0 Feet.

Photograph 5 - Boring B-23, Box 1 of 4, 48.3 to 57.3 Feet.

Photograph 6 - Boring B-23, Box 2 of 4, 57.3 to 65.2 Feet.

Photograph 7 - Boring B-23, Box 3 of 4, 65.2 to 75.1 Feet.



Photograph 8 - Boring B-23, Box 4 of 4, 75.1 to 79.6 Feet.

APPENDIX C

LABORATORY TEST PROCEDURES

LABORATORY TEST RESULTS

LABORATORY TEST PROCEDURES

Atterberg Limits (Plasticity Index)

Originally, the Atterberg Limits consisted of seven "limits of consistency" of fine-grained soils. In current engineering usage, the term usually refers only to the liquid limit (LL) and plastic limit (PL). The LL (between the liquid and plastic states) is the water content at which a trapezoidal groove of specified shape, cut in moist soil held in a special cup, is closed after 25 taps on a hard rubber plate. The PL (between plastic and semi-solid states) is the water content at which the soil crumbles when rolled into threads of 1/8 inch in diameter.

The LL has been found to be proportional to the compressibility of the normally consolidated soil. The Plasticity Index (PI) is the calculated difference in water contents between the LL and PL. Together the LL and PI are used to classify silts and clays according to the Unified Soils Classification System (ASTM D 2487). The PI is used to predict the potential for volume changes in confined soils beneath foundations or grade slabs. The LL, PL, and PI are determined in accordance with ASTM D 4318.

Moisture Content

The moisture content in a given mass of soil is the ratio, expressed as a percentage, of the weight of the water to the weight of the solid particles. This test was conducted in accordance with ASTM D-2216.

Grain Size Distribution

Grain Size Tests are performed to aid in determining the soil classification and the grain size distribution. The soil samples are prepared for testing according to ASTM D 421 (dry preparation) or ASTM D 2217 (wet preparation). If only the grain size distribution of soils coarser than a number 200 sieve (0.074-mm opening) is desired, the grain size distribution is determined by washing the sample over a number 200 sieve and, after drying, passing the samples through a standard set of nested sieves. If the grain size distribution of the soils finer than the number 200 sieve is also desired, the grain size distribution of the soils coarser than the number 10 sieve is determined by passing the sample through a set of nested sieves. Materials passing the number 10 sieve are dispersed with a dispersing agent and

suspended in water, and the grain size distribution calculated from the measured settlement rate of the particles. These tests are conducted in accordance with ASTM D 422.

Compaction Tests (Moisture-Density Relationship)

Compaction tests are performed on representative soil samples to determine the maximum dry density and optimum moisture content. The results of the tests are used in conjunction with other tests to determine engineering properties relating to settlement, bearing capacity, shear strength, and permeability. The results may also be used as a standard to determine the percent compaction of any soil embankment.

The two most commonly used compaction tests are the standard Proctor test and the modified Proctor test. They are performed in accordance with ASTM D 698 and D 1557, respectively. Generally, the standard Proctor compaction test is run on samples from building areas and areas where moderate loads are anticipated. The modified Proctor compaction test is generally used for analyses of highways and other areas where large building loads are expected. Both tests have three procedures, depending upon soil particle size:

Test	Procedure	Hammer Weight	Hammer Fall	Mold Diam.	Screen Size (Material Finer Than)	No. Layers	No. of Blows/ Layer
Standard (D 698)	A	5.5 lb.	12"	4"	No. 4 sieve	3	25
	B	5.5 lb.	12"	4"	No. 3/8" sieve	3	25
	C	5.5 lb.	12"	6"	3/4" sieve	3	56
Modified (D 1557)	A	10 lb.	18"	4"	No. 4 sieve	5	25
	B	10 lb.	18"	4"	No. 3/8" sieve	5	25
	C	10 lb.	18"	6"	3/4" sieve	5	56

Test results are presented as a curve depicting dry unit weight versus moisture content. The compaction method used and any deviations from the recommended procedures are noted in the report.

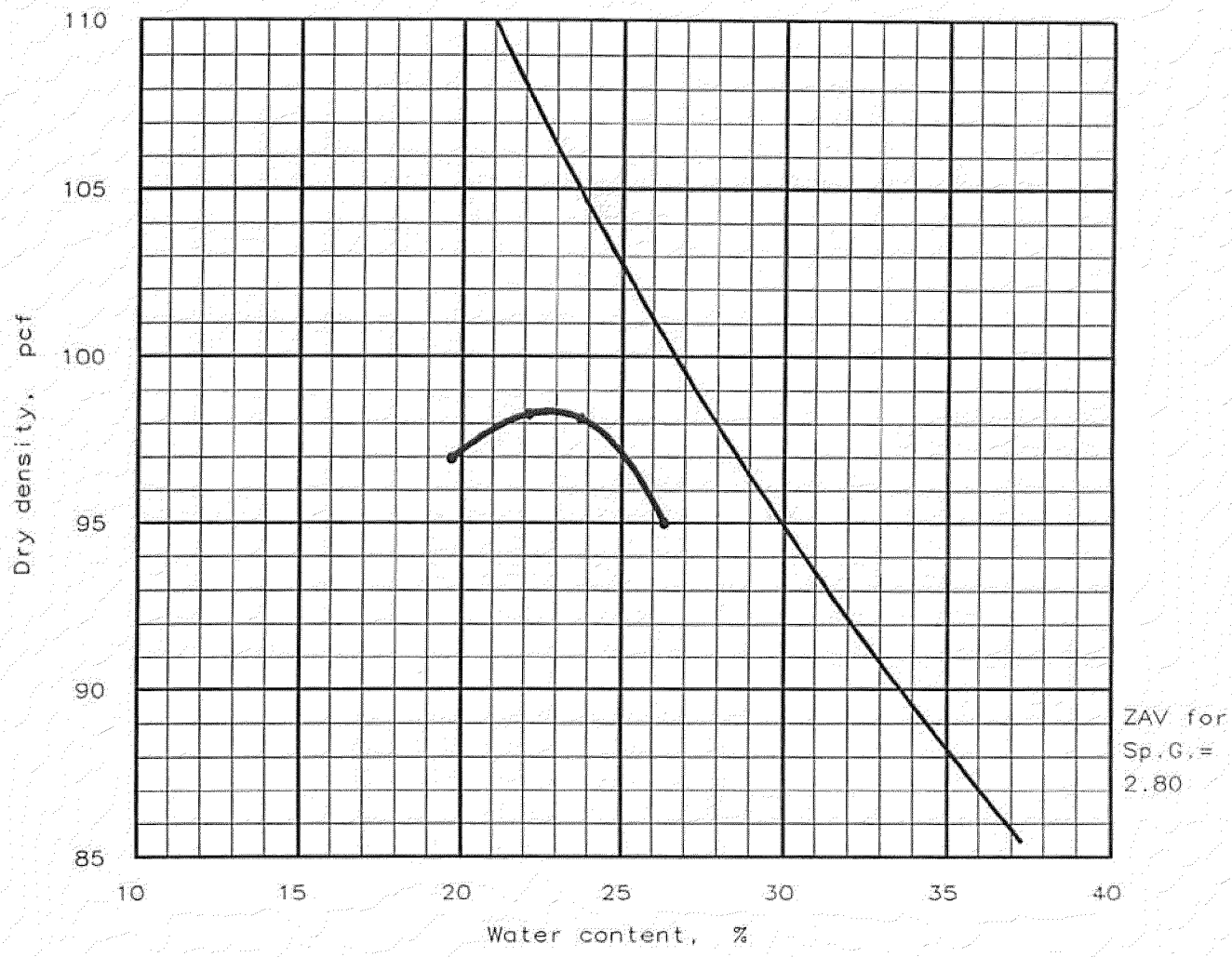
Table C-1
Natural Moisture Content and Atterberg Limits Laboratory Test Results
TVA Kingston Scrubber Stack
MACTEC Project 3043031008/0001

Boring Number	Sample Number	Sample Type	Sample Depth (Feet)	Moisture Content (%)	Atterberg Limits		
					Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)
B-13	3	SPT	4 - 5.5	42	88	36	52
B-13	4	SPT	6.5 - 8	37			
B-13	8	SPT	24 - 25.5	39	64	28	36
B-13	9	SPT	29 - 30.5	40			
B-13	10	SPT	34 - 35.5	69	85	44	41
B-13	11	SPT	39 - 40.5	102			
B-13	14	SPT	54 - 55.5	65	77	31	46
B-13	15	SPT	59 - 60.5	60			
B-18	3	SPT	4 - 5.5	29	NT	NT	NT
B-18	8	SPT	25 - 26.5	33	NT	NT	NT
B-18	11	SPT	40 - 41.5	25	NT	NT	NT
B-18	14	SPT	55 - 56.5	29	NT	NT	NT
B-18	NA	Bulk	DNS	25	66	26	40
B-23	2	SPT	DNS	27	NT	NT	NT
B-23	4	SPT	DNS	30	NT	NT	NT
B-23	6	SPT	DNS	38	NT	NT	NT
B-23	7	SPT	DNS	35	71	26	45
B-23	8	SPT	DNS	NT			
B-23	9	SPT	DNS	25	NT	NT	NT
B-23	10	SPT	DNS	48	71	30	41
B-23	11	SPT	DNS	NT			
B-23	12	SPT	DNS	50	NT	NT	NT

DNS - Data Not Submited
NT - Not Tested
SPT - Standard Penetration Test
Bulk - Bulk Sample

Prepared By MMN Date 3/26/03 Checked By [illegible] Date 3/26/03

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00a Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
DNS	CH	A-7-6(44)	24.5 %	NT	66	40	0 %	95.7 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 98.4 pcf Optimum moisture = 22.8 %	Orange brown silty clay

Project No.: 3043031008.0001
Project: TVA Kingston Fossil Scrubber Stack
Location: Boring B-18 auger cuttings

Date: 3-20-2003

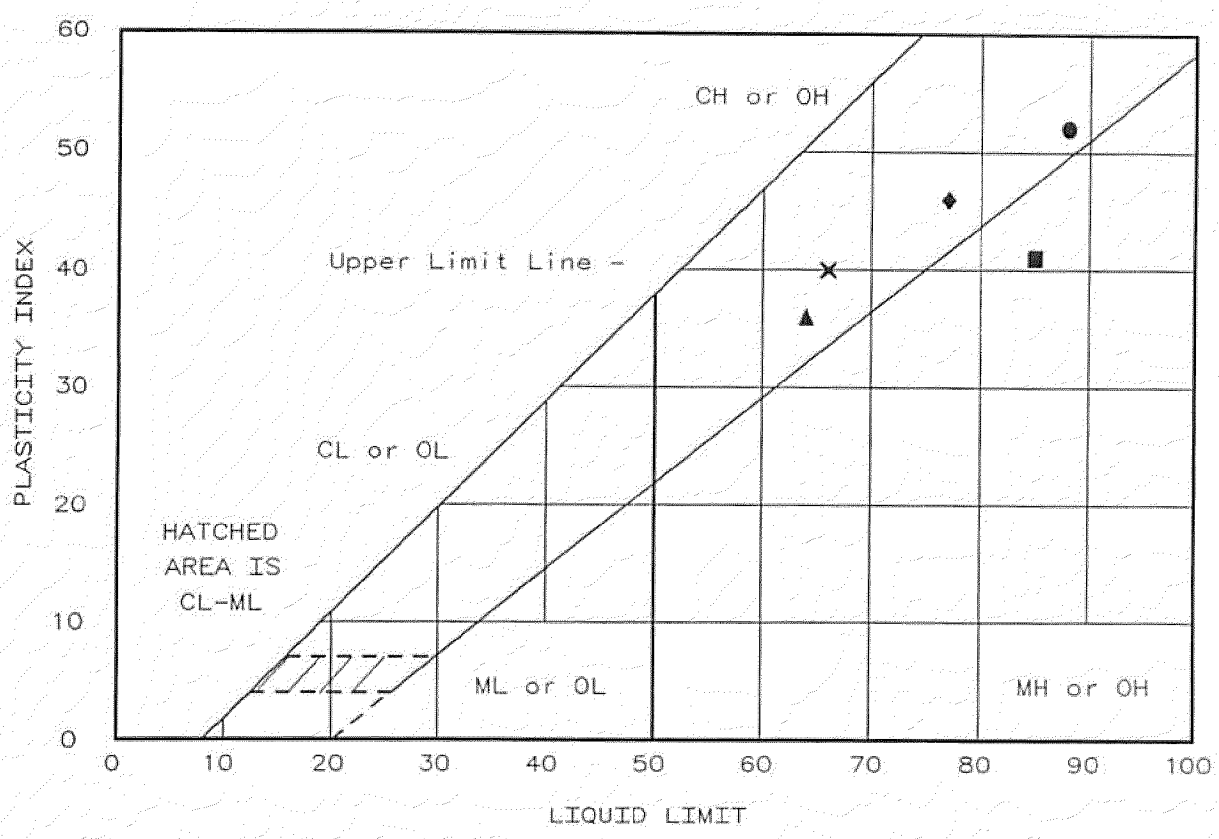
Remarks:
Sample Number 2754
NT- No Test
DNS- Data Not Submitted

MOISTURE-DENSITY RELATIONSHIP TEST

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Fig. No. 2754

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	USCS	AASHTO
●	Boring B-13, 4-5.5' & 6.5 -8'+ Orange brown silty clay	88	36	52	92.2	CH	A-7-5(57)
▲	Boring B-13,24-25.5'& 29-30.5'+ Orange brown clayey sand	64	28	36	48.4	SC	A-7-6(13)
■	Boring B-13, 34-35.5' & 39-40.5'+ Dark brown clayey silt	85	44	41	97.2	MH	A-7-5(52)
♦	Boring B-13, 54-55.5' & 59-60.5'+ Light brown silty clay	77	31	46	95.2	CH	A-7-5(52)
×	Boring B-18 Bulk auger cuttings+ Orange brown silty clay	66	26	40	95.7	CH	A-7-6(44)

Project No.: 3043031008
Project: TVA Kingston Fossil Scrubber Stack

Client: TVA
Location: Kingston, Tennessee

Date: 3-20-2003

Remarks:

Phase 0001

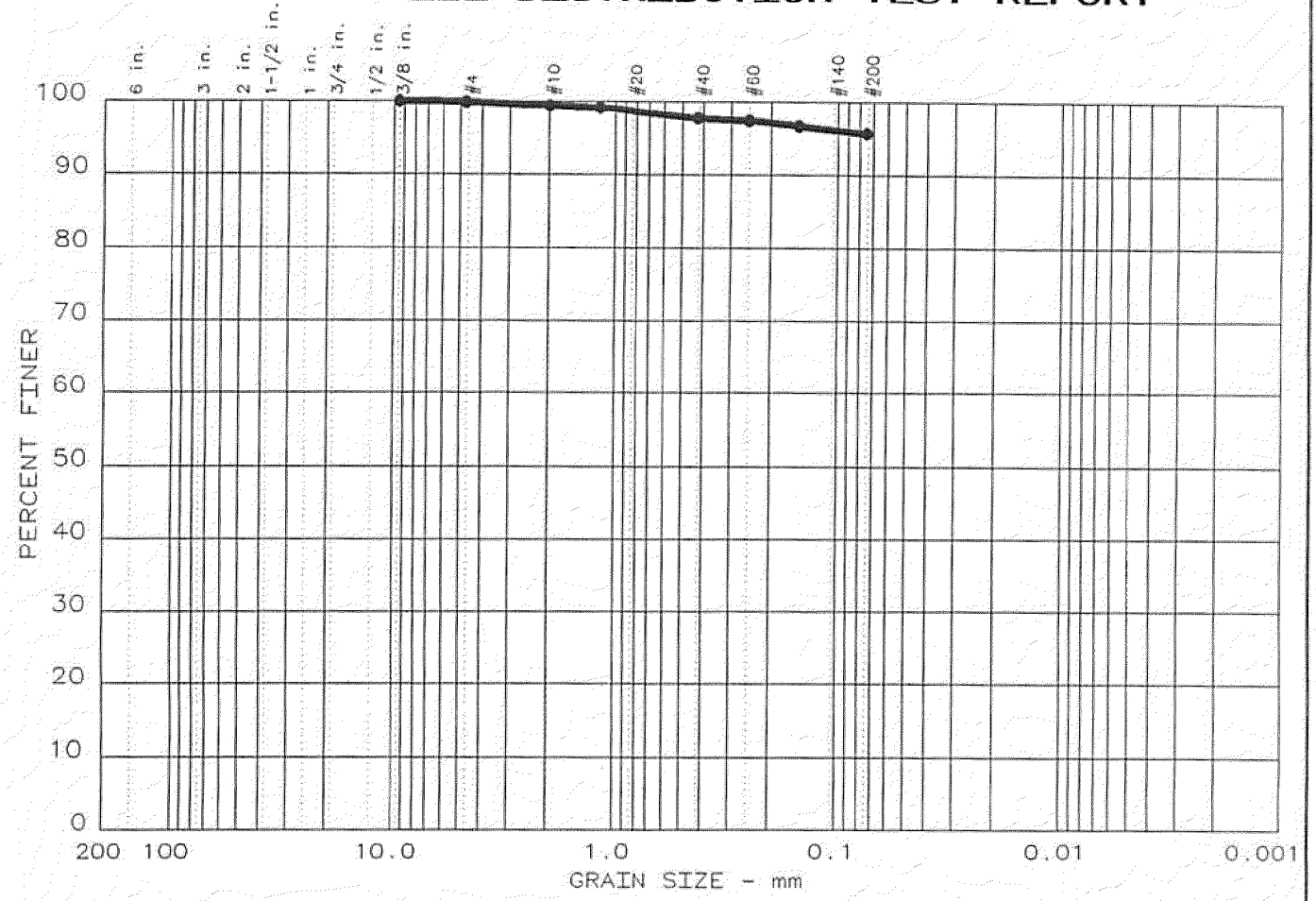
NT- No Test

DNS- Data Not Submitted

LIQUID AND PLASTIC LIMITS TEST REPORT
LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Fig. No. B-13/18

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	11	0.0	0.1	4.2	95.7		CH	66	40

SIEVE inches size	PERCENT FINER ●		
0.375	100.0		
	GRAIN SIZE		
D_{60}			
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ●
4	99.9
10	99.4
16	99.1
40	97.7
60	97.4
100	96.7
200	95.7

Sample information:

● B-18, Bulk auger sample
Orange brown silty clay

Remarks:

Methods: Particle Size:
ASTM D 422-63(1998);
% < No.200:ASTM D1140-00
LL/PI: ASTM D 4318-00

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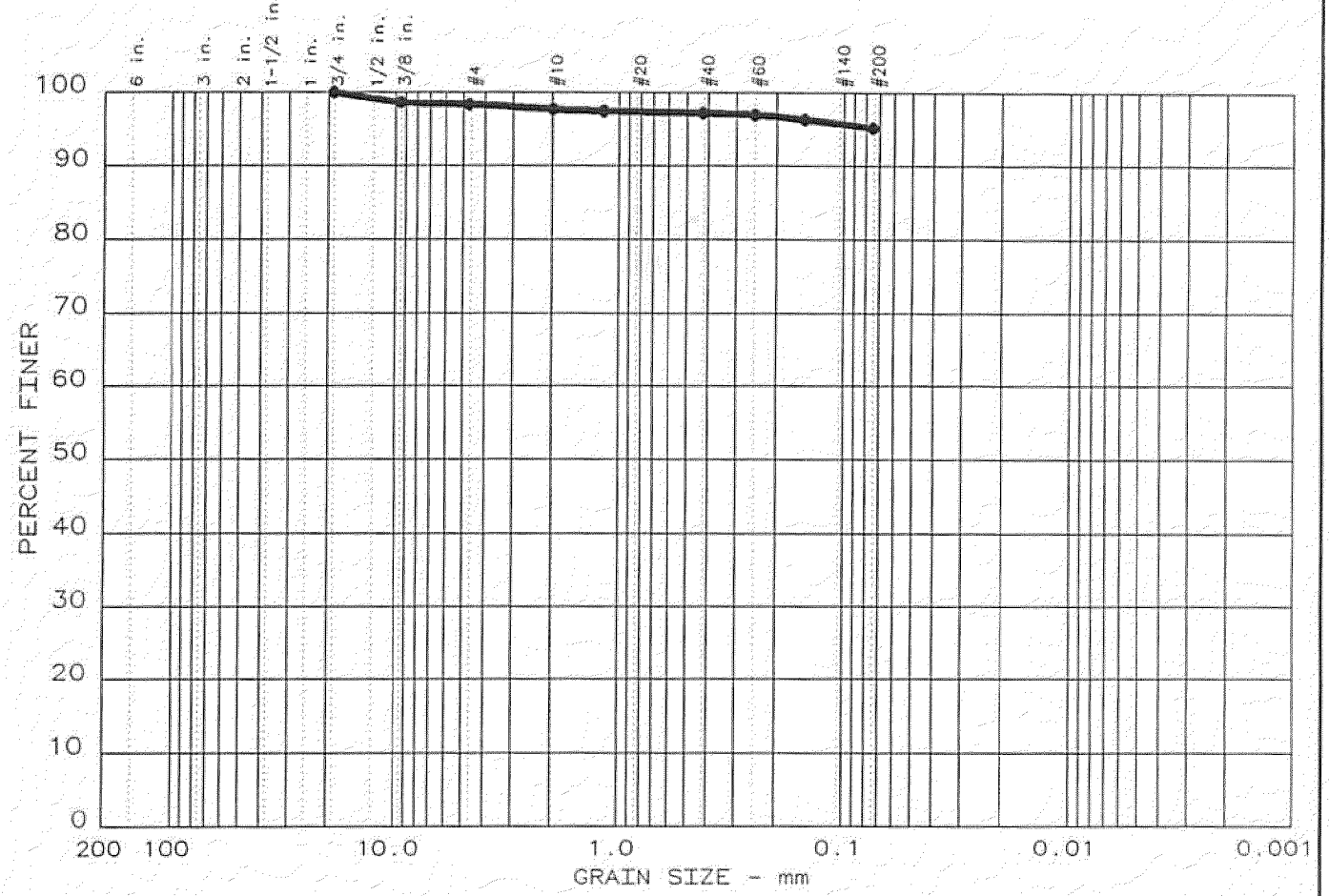
PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	10	0.0	1.7	3.1	95.2		CH	77	46

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	98.6		
GRAIN SIZE			
D_{60}			
D_{30}			
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	98.3		
10	97.7		
16	97.4		
40	97.2		
60	96.9		
100	96.3		
200	95.2		

Sample information:

● B-13, 54-55.5 & 59-60.5'
Light brown silty clay

Remarks:
Methods: Particle Size:
ASTM D 422-63(1998);
% < No.200:ASTM D1140-00
LL/PI: ASTM D 4318-00

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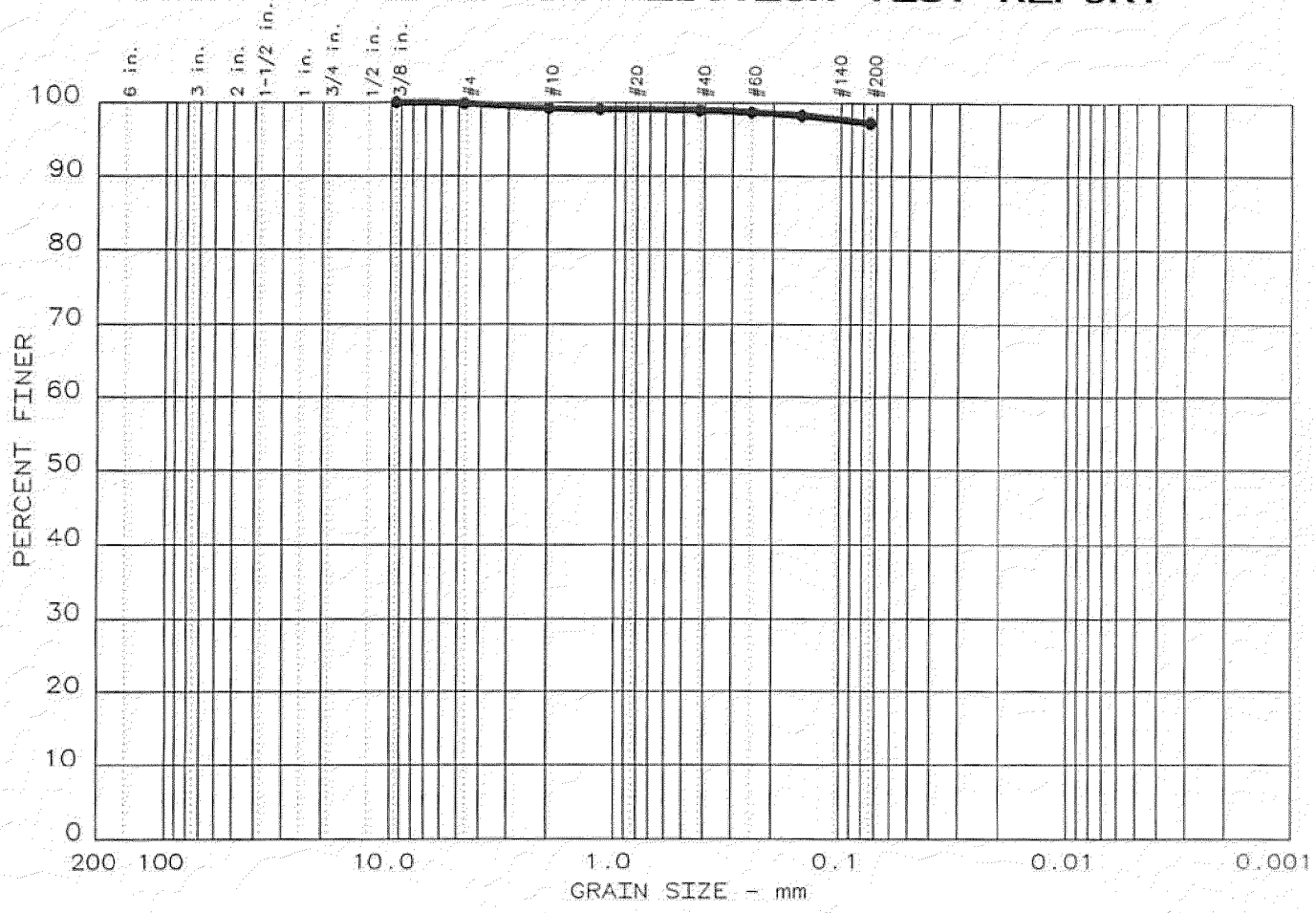
PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	9	0.0	0.2	2.6	97.2		MH	85	41

SIEVE inches size	PERCENT FINER ●		
0.375	100.0		
	GRAIN SIZE		
D_{60} D_{30} D_{10}			
	COEFFICIENTS		
C_c C_u			

SIEVE number size	PERCENT FINER ●		
4	99.8		
10	99.2		
16	99.1		
40	98.9		
60	98.7		
100	98.3		
200	97.2		

Sample information:

● B-13, 34-35.5 & 39-40.5'
Dark brown clayey silt

Remarks:
Methods: Particle Size:
ASTM D 422-63(1998);
% < No.200:ASTM D1140-00
LL/PI: ASTM D 4318-00

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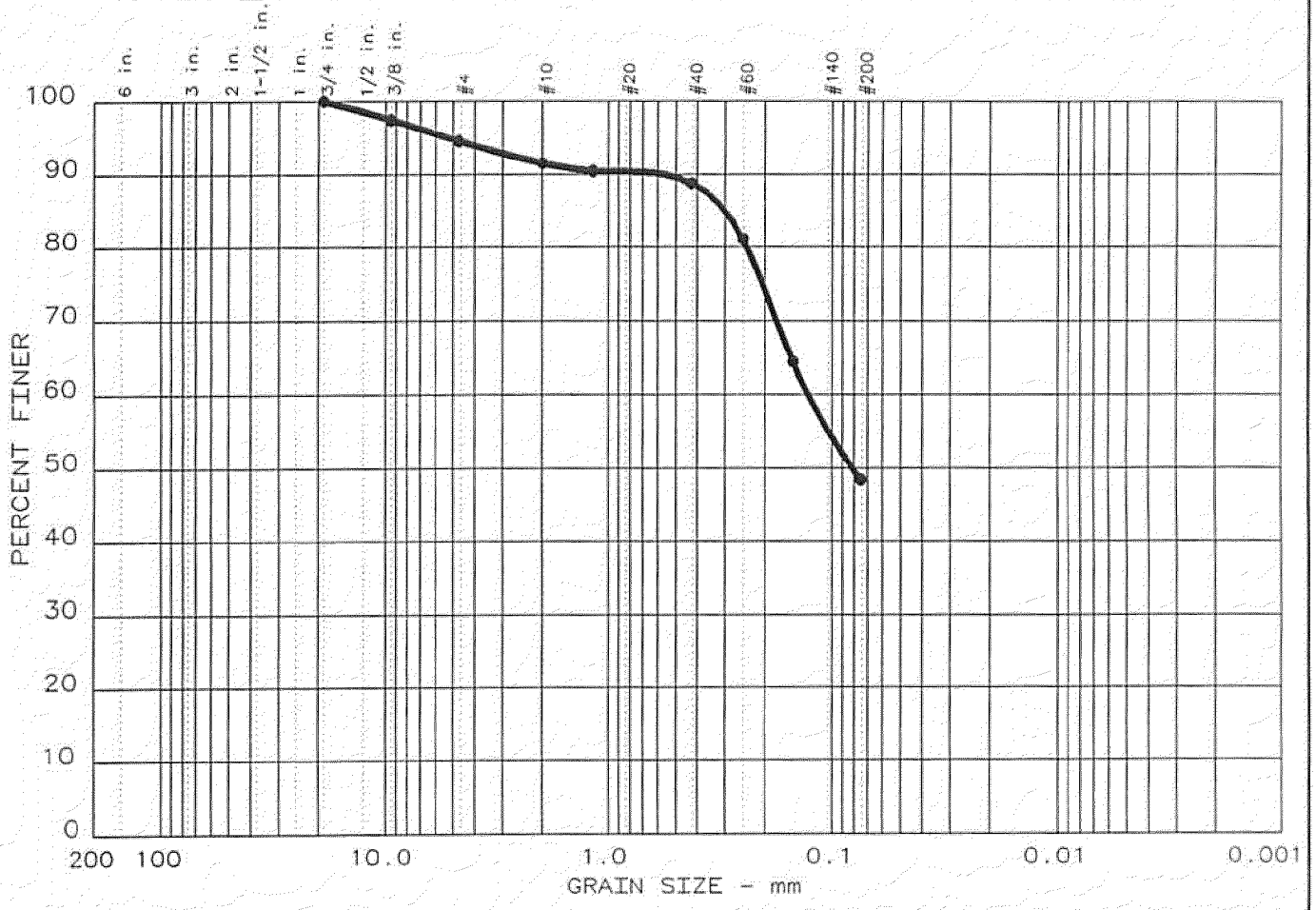
Date: 3-20-2003 Fig. No.: B13

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	8	0.0	5.4	46.2	48.4		SC	64	36

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	97.4		
	GRAIN SIZE		
D_{60}	0.127		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	94.6		
10	91.6		
16	90.5		
40	88.7		
60	81.1		
100	64.5		
200	48.4		

Sample information:
● B-13, 24-25.5 & 29-30.5' Orange brown clayey sand

Remarks:
Methods: Particle Size: ASTM D 422-63(1998);
% < No.200: ASTM D1140-00
LL/PI: ASTM D 4318-00

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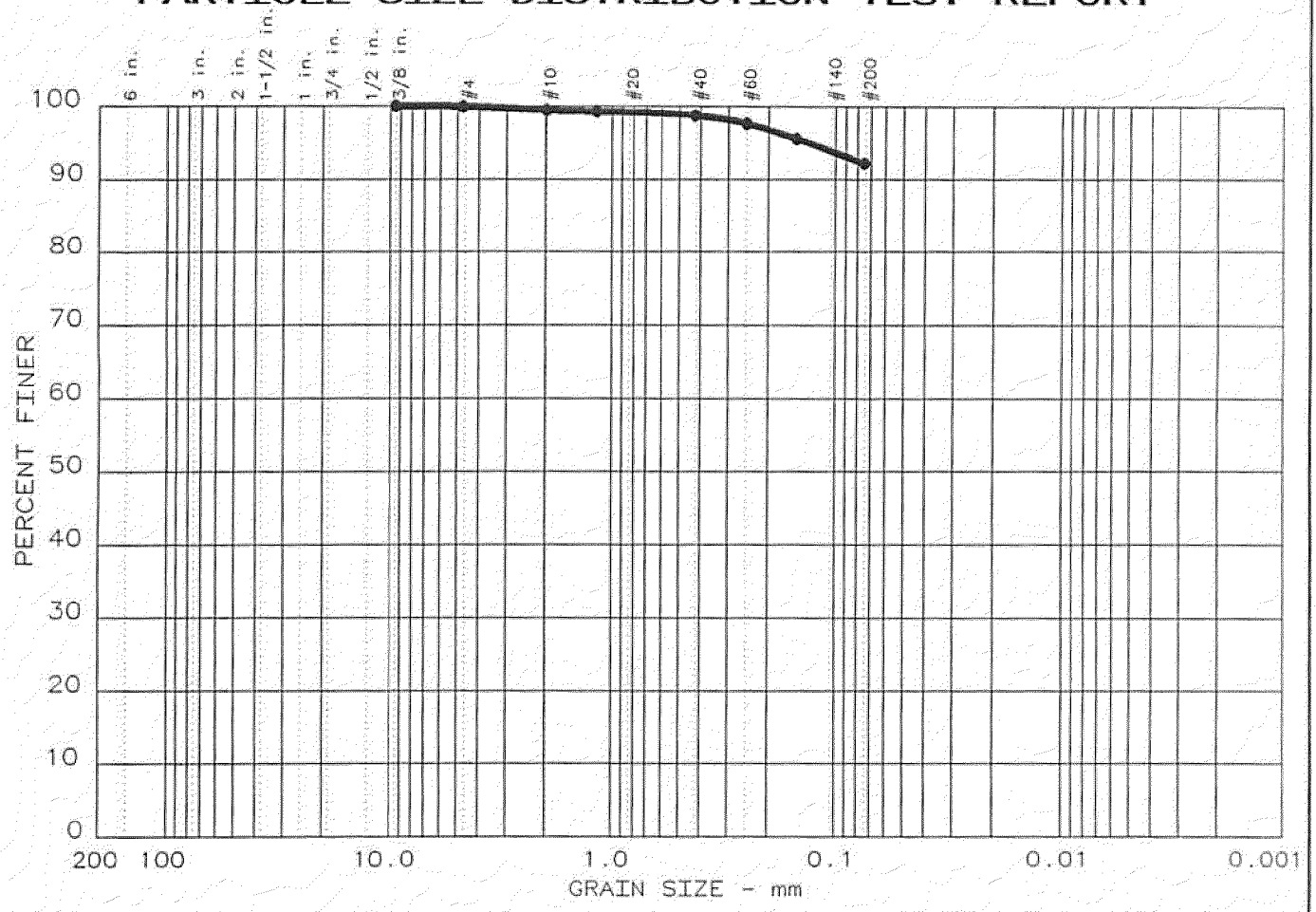
PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	7	0.0	0.1	7.7	92.2		CH	88	52

SIEVE inches size	PERCENT FINER ●		
0.375	100.0		
	GRAIN SIZE		
D_{60}			
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	99.9		
10	99.4		
16	99.3		
40	98.7		
60	97.6		
100	95.6		
200	92.2		

Sample information:

● B-13, 4-5.5' & 6.5-8'
Orange brown silty clay

Remarks:
Methods: Particle Size:
ASTM D 422-63(1998);
% < No.200:ASTM D1140-00
LL/PI: ASTM D 4318-00

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Date: 3-20-2003 Fig. No.: B13