REPORT OF GEOTECHNICAL EXPLORATION

PROPOSED GYPSUM DISPOSAL AREA
KINGSTON FOSSIL PLANT
KINGSTON, TENNESSEE

Prepared For:

TENNESSEE VALLEY AUTHORITY

Chattanooga, Tennessee

Prepared By:

MACTEC ENGINEERING AND CONSULTING, INC.

Knoxville, Tennessee

MACTEC Project 3043051021.01

October 10, 2005

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October 10, 2005

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

Subject: **Report of Geotechnical Exploration**
Proposed Gypsum Disposal Area
TVA Kingston Fossil Plant
Kingston, Tennessee
MACTEC Project 3043051021.01

Dear Mr. Purkey:

We at MACTEC Engineering and Consulting, Inc., (MACTEC) are pleased to submit this Report of Geotechnical Exploration for your project. Our services, as authorized through TAO No. MAC-0717-00075 were provided in general accordance with our proposal number Prop05Knox/132 dated April 25, 2005.

This report reviews the information provided to us, discusses the site and subsurface conditions, and presents the results of our field and laboratory testing for the materials at the proposed gypsum disposal area. The Appendices contain a brief description of the Field Exploratory Procedures, a Key Sheet and Test Boring Records, Monitoring Well Installation Logs, Cone Penetrometer Test Results, the Laboratory Test Procedures, and the Laboratory Test Results. At the time of report finalization the results of the laboratory triaxial strength testing were not completed. MACTEC will issue the results of the triaxial testing in a separate letter report upon completion.

We anticipate further dialog and interaction with the designers as the design proceeds and will be happy to provide any additional information or interpretation of the data presented here in which may be necessary.

We will be pleased to discuss our data 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, INC.

No. 109378
10-10-05

Clinton Todd Justice, P.E.
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EXECUTIVE SUMMARY

MACTEC was selected by the Tennessee Valley Authority (TVA) to perform a geotechnical exploration for the proposed Gypsum Disposal Area at the Kingston Fossil Plant in Kingston, Tennessee. The objectives of our exploration were to determine general subsurface conditions, to obtain data to evaluate the engineering characteristics of the on-site soils, and to install monitoring wells.

The exploration consisted of drilling 26 soil test borings, 7 offset geotechnical borings, installing 13 monitoring wells, and performing cone penetrometer testing (CPT) at 10 locations. Bedrock was cored in 14 of the test borings. The major findings of our geotechnical exploration are as follows:

- The test borings drilled in the proposed Gypsum Disposal Area typically encountered fill, alluvium, and residuum soils. The bedrock encountered in the test borings typically was composed of light brownish gray to medium gray dolomite. A summary of the subsurface conditions are presented in Section 6.0.
- Ground- water measurements were performed in all test borings at the time of drilling. Ground-water measurements were also conducted in the test borings at least 24 hours after completion of drilling. Long-term measurements for the presence or absence of ground water were not obtained during this exploration. Table 3 presents the ground-water data obtained during the exploration.
- Thirteen monitoring wells were installed to total depths ranging from about 35.4 feet (MW-77A) to 104.2 feet (MW-44B). Four monitoring wells were installed in bedrock (i.e. bedrock wells or "B" wells) and nine monitoring wells were installed within the overburden soils and upper 1.5 to 5 feet of bedrock (i.e. overburden / epikarst wells or "A" wells). Each well consisted of a 2-inch diameter, schedule 40 PVC pipe with double-density, 0.010-inch, slotted screen. A summary of the monitoring well installation is given in Section 7.0. The Monitoring Well Installation Logs are presented in Appendix C.
- Cone penetrometer test soundings were performed at 10 selected locations. The results of the cone penetrometer testing are presented in Appendix D.
- Laboratory tests were performed on selected bulk and undisturbed samples. A summary of the tests performed and the test results is presented in Section 9. The test results are presented in Appendix E.

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 and laboratory testing recently performed for the Proposed Gypsum Disposal Area at the TVA Kingston Fossil Plant. Our services were authorized by Mr. Ron Purkey of TVA.

2.0 OBJECTIVES OF EXPLORATION

The objectives of our exploration were to determine general subsurface conditions, to obtain data for use by others to evaluate the engineering characteristics of the on-site soils, and to install monitoring wells. 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

The scope of our exploration was based on our proposal number Prop05Knox/132 dated April 25, 2005, and the geotechnical scope of work outlined in the project's scope of work prepared by Parsons E&C. It includes the following:

- Reconnaissance of the immediate site.
- Drilling 26 soil test borings which ranged in depth from about 12.5 feet (NB-24) to 104.2 feet (NB-44). Bedrock was cored about 2 feet (NB-73W) to 60 feet (NB-44) in 14 of the borings.
- Drilling 7 offset geotechnical borings to obtain additional undisturbed samples
- Installing 13 monitoring wells (4 bedrock wells designated as "B" wells and 9 overburden / epikarst wells designated as "A" wells) to total depths ranging from about 35.4 feet (MW-77A) to 104.2 feet (MW-44B).
- Performing cone penetrometer testing (CPT) at 10 locations
- Conducting laboratory testing on bulk and undisturbed samples from the on-site soils.
- Preparing a geotechnical report summarizing the field and laboratory test results

The drilling and sampling were performed in general accordance with ASTM procedures included in Appendix A. The drilling was performed during the period from April 29 to June 6, 2005. The equipment used consisted of a CME Model 550 ATV (all-terrain-vehicle) mounted drill rig equipped with a manual hammer, a CME Model 55 ATV mounted drill rig equipped with a manual hammer, and a CME Model 75 truck-mounted drill rig equipped with an automatic hammer.

Continuous standard penetration tests (SPTs) were performed in five of the test borings. In the remaining test borings, the SPT sampling was performed at 5-foot vertical intervals. In addition to the SPT samples, bulk and relatively undisturbed samples were obtained from selected test borings for laboratory testing.

Ground-water levels were measured during drilling in each boring. Ground-water measurements were also made in the borings at approximately 24 hours or later after the completion of the borings. Thirteen monitoring wells were installed at selected boring locations. Four bedrock wells designated as "B" wells, and nine overburden/epikarst wells designated as "A" wells were installed. The monitoring well installation program was completed on June 14, 2005.

Upon completion of drilling, the test borings were plugged and abandoned by backfilling the full depth with cement grout.

The CPT soundings were performed on May 16 and 17, 2005. The CPT testing procedures are presented in Appendix D. A track-mounted CPT rig with a 20-ton capacity electronic cone was utilized to perform the testing. During the CPT testing, the cone is continuously pushed into the ground and measurements are taken of the cone tip resistance, sleeve friction, and dynamic pore pressure. Pore pressure dissipation testing was performed only once at some of the CPT locations to estimate the depth to ground-water level. Upon completion of the CPT testing, each hole was plugged and abandoned by backfilling the full depth with grout.

All samples were transported to our laboratories in Knoxville, Tennessee and Charlotte, North Carolina. Parsons (PEC) selected the soil samples for laboratory testing. MACTEC received the laboratory assignment from PEC on July 05, 2005. The testing program for this project consisted of the following:

- 25 Plasticity Index (Atterberg Limits) Tests
- 25 Grain Size Distribution Tests

- 29 Natural Moisture Content Tests
- 10 Standard Proctor Compaction Tests
- 16 Specific Gravity Tests
- 19 Unit Weight and Natural Moisture Content Tests for Undisturbed Samples
- 10 Permeability Tests
- 4 One-Dimensional Consolidation Tests
- 2 Pinhole Tests

Subsurface conditions encountered in the borings are presented on the Test Boring Records in Appendix B. The Monitoring Well Installation Logs are presented in Appendix C. The results of the CPT testing are presented in Appendix D. The laboratory testing results are presented in Appendix E.

4.0 PROJECT INFORMATION AND SITE CONDITIONS

Project information was provided to us by Mr. Daniel Smith with Parsons E&C in the form of a Geotechnical Investigation Scope of Work and a proposed boring/CPT location plan. The site of the proposed gypsum disposal area is located east of the Kingston Fossil Plant site. The ground surface elevations varied by as much as 110 feet (NB-24 to NB-22) in the areas explored. The northern portion of the site is located within a wooded hillside. The remainder of the site is covered with grass and some tree lines.

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 Group. The Knox Group 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.

Dolostone and limestone, such as the strata underlying this site, are of great geologic age and have been subject to solution weathering for many years. Rainwater falling onto the surface and percolating downward through the soil and into cracks and fissures gradually dissolves the rock, producing insoluble impurities such as chert and clay. Since limestone and dolostone vary greatly in their resistance to weathering, the soil/bedrock contact may be extremely irregular. More soluble bedrock develops a thicker soil cover and a more irregular bedrock surface, with pinnacles and slots and less soluble bedrock usually develops a thinner soil cover and a less irregular soil-bedrock surface. Because of the geologic history of the area and the difference in weathering, it is not uncommon to encounter rock at depths varying by as much as 50 feet in borings as close as 10 feet apart in some areas.

These large variations in bedrock depth are greatly enhanced by the presence of fractures, bedding planes, and faults, which provide an increased opportunity for a greater influx of percolating water. The weaknesses may form clay-filled cavities or enlarge into caves and may be connected by a network of passageways. If a cave forms close to the bedrock surface, its roof may collapse and the overlying soils may erode into the cave. Once the weight of the overlying soil exceeds the soil's arching strength, the soil collapses and an open hole or depression may appear at the ground surface. Such a feature is termed a sinkhole.

6.0 SUBSURFACE CONDITIONS

Subsurface conditions at the site of the proposed gypsum disposal area were explored with 26 soil test borings and 10 CPT soundings. Seven offset geotechnical borings were drilled in conjunction with the soil test borings in order to obtain additional undisturbed Shelby tube samples for laboratory testing purposes. The locations for all the borings and CPT soundings were proposed by Parsons E&C. The locations were established in the field by others. After drilling was completed, the boring locations were surveyed by others and we were provided with the surveyed locations and elevations of all borings. Because of access restrictions, some of the borings were offset from the originally proposed location. Offset distances with bearing information were recorded in the field and noted on the field logs.

Subsurface conditions encountered at each boring location are shown on the Soil 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 test borings performed at this site typically encountered fill, alluvial, and residual materials. Fill soils are soils which have been transported to their current location by man. Alluvial soils are soils that have been transported to their present location by running water. Residual soils are soils that have developed from the in-place weathering of the underlying parent bedrock. Bedrock was cored in 14 of the test borings. A summary of the soil test boring depths is presented in Table 1.

Table 1
Soil Test Boring Summary

Boring Number	Ground Elevation msl (Feet)	Auger Refusal Depth (Feet)	Refusal Elevation msl (Feet)	Boring Termination Depth (Feet)	Boring Termination Elevation msl (Feet)
NB-2	762.6	20.2	742.4	20.2	742.4
NB-10	768.1	42.5	725.6	72.9	695.2
NB-18	813.5	23.0	790.5	23.0	790.5
NB-21	757.0	49.9 **	707.1	61.2	695.8
NB-21A*	757.0	NE	NE	41.0	716.0
NB-22	742.1	38.5	703.6	48.5	693.6
NB-22A*	742.1	NE	NE	21.0	721.1
NB-24	852.2	12.5	839.7	12.5	839.7
NB-25	822.7	55.5	767.2	55.5	767.2
NB-35	744.8	20.4	724.4	31.5	713.3
NB-39	787.5	23.2	764.3	23.2	764.3
NB-41	809.2	31.0	778.2	31.0	778.2
NB-44	742.7	44.2	698.5	104.2	638.5
NB-47	762.8	40.0	722.8	69.4	693.4
NB-47A*	762.9	NE	NE	36.5	726.4

Table 1

Soil Test Boring Summary

Boring Number	Ground Elevation msl (Feet)	Auger Refusal Depth (Feet)	Refusal Elevation msl (Feet)	Boring Termination Depth (Feet)	Boring Termination Elevation msl (Feet)
NB-59	758.3	34.0	724.3	34.0	724.3
NB-63	781.0	43.2	737.8	75.1	705.9
NB-63(A)	781.0	52.3	728.7	82.3	698.7
NB-65	768.5	38.4	730.1	38.5	730.0
NB-66	752.7	36.4	716.3	66.4	686.3
NB-73	747.5	40.0	707.5	40.0	707.5
NB-73(A)	747.5	NE	NE	80.5	667.0
NB-73W	749.7	47.5	702.2	49.8	699.9
NB-74	752.1	44.0	708.1	75.8	676.3
NB-74A*	752.3	NE	NE	27.0	725.3
NB-76	769.4	38.0	731.4	38.0	731.4
NB-77	749.3	32.3	717.0	64.5	684.8
NB-77A*	749.3	NE	NE	26.0	723.3
NB-81	762.6	30.5	732.1	61.1	701.5
NB-84	761.2	49.2	712.0	59.2	702.0
NB-85	760.2	32.0	728.2	32.0	728.2
NB-85A*	760.6	NE	NE	23.0	737.6
NB-85B*	761.1	31.0	730.1	31.0	730.1

NE - Not Encountered

* offset geotechnical borings drilled to obtain additional undisturbed Shelby tube samples

** Original location of NB-21 encountered auger refusal at 47.8 ft. Boring was offset and re-drilled due to coring difficulties and encountered auger refusal at 49.9 ft.

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6.1 FILL

Fill soils were encountered underlying a thin veneer of topsoil in test boring NB-63. The fill extended to a depth of about 3.0 feet. The fill soils consisted primarily of brown silty clay with a few chert fragments and black manganese nodules. The SPT resistance value in the fill interval varied from 18 to 22 bpf, indicating very stiff consistency.

6.2 ALLUVIUM

Alluvial soils were encountered in test borings NB-21, NB-22, NB-35, and NB-44. The alluvial soils were encountered at ground surface or underlying topsoil near the ground surface and extended to depths ranging from about 2.5 (NB-22 and NB-44) to 47.8 feet (NB-21). The alluvial soils consisted primarily of red, yellow, brown, and gray clayey silt, silty clay, and sandy silt with sand, gravel, chert fragments, and roots. The SPT resistance values in the alluvium ranged from 2 (NB-22 and NB-44) to 19 (NB-35) blows per foot (bpf), indicating very soft to very stiff consistencies.

6.3 RESIDUUM

Residual materials were encountered in all test borings except NB-21. The residual soils were encountered below the fill, alluvium, or topsoil and extended to refusal. The residuum encountered in the borings consisted of red, orange, yellow, and brown clays and silts with sand and chert fragments. The SPT resistance values in the residuum ranged from 2 (NB-44 and NB-76) to over 50 bpf, indicating very soft to very hard consistencies

6.4 BEDROCK

Bedrock was cored approximately 2 to 60 feet in 14 of the test borings. The bedrock encountered in the test borings typically was composed of light brownish gray to medium gray dolomite. The recovered bedrock was observed to be hard. The core recovery ratio for the various core runs ranged from about 0 (NB-77) to 100 percent (NB-47, NB-63A, NB-77, and NB-81) with an average of about 67 percent. The rock quality designation (RQD) values for the various rock core runs ranged from 0 (NB-22, NB-44, NB-66, NB-73W, NB-77, and NB-84) to 99 percent (NB-47) with an average of about 39 percent. The core recovery ratios and RQD values for each individual core run are shown on the Test Boring Records in Appendix B. Detailed descriptions including structural and mineralogical features for the recovered rock core are also presented on the Test Boring Records in Appendix B.

7.0 MONITORING WELL INSTALLATION

Thirteen monitoring wells were installed at the site as part of our field exploration. Four of the monitoring wells were installed into bedrock, (i.e. bedrock wells) (MW-10B, MW-44B, MW-63B, and MW-81B). The remaining monitoring wells were installed within the overburden soils and upper 1.5 to 5 feet of bedrock, (i.e. overburden/epikarst wells) (MW-10A, MW-21A, MW-44A, MW-47A, MW-63A, MW-66A, MW-74A, MW-77A, and MW-81A). Each monitoring well consisted of a 2-inch I.D., schedule 40 PVC pipe with double-density, 0.010-inch slotted screens. The screened intervals within the overburden/epikarst wells spanned from approximately groundwater depth to top of bedrock. The screened intervals within the bedrock monitoring wells spanned the entire depth in bedrock which ranged from about 30 to 60 feet. A summary of the well installation is presented in Table 2. The Monitoring Well Installation Logs are included in Appendix C.

Table 2
Monitoring Well Summary

Well Number	Ground Surface Elevation (feet msl)	Total Depth (feet)	Screen Depth		Screen Elevation	
			Top (feet)	Bottom (feet)	Top(feet msl)	Bottom (feet msl)
MW-10A	768.2	56.2	20.7	55.1	747.5	713.1
MW-10B	768.2	72.4	45.6	70.2	722.6	698.0
MW-21A	757.7	50.4	18.5	48.1	739.2	709.6
MW-44A	742.4	40.5	3.0	37.5	739.4	704.9
MW-44B	742.7	104.2	49.1	98.6	693.6	644.1
MW-47A	762.9	44.4	22.5	42.1	740.4	720.8
MW-63A	780.2	48.8	17.1	46.5	763.1	733.7
MW-63B	780.9	82.3	52.4	80.9	728.5	700.0
MW-66A	752.9	38.8	12.5	37.0	740.4	715.9
MW-74A	752.0	59.3	12.1	56.5	739.9	695.5
MW-77A	749.9	35.4	11.8	31.4	738.1	718.5
MW-81A	763.4	39.8	21.0	35.4	742.4	728.0
MW-81B	762.9	61.1	33.5	57.9	729.4	705.0

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8.0 CONE PENETROMETER TESTING

Ten CPT soundings (NB-11, NB-26, NB-54, NB-56, NB-57, NB-58, NB-62, NB-71, NB-79, and NB-82) were performed in general accordance with ASTM Standard D5778-95 and the procedures in Appendix D. The CPT sounding locations were proposed by Parsons E&C. The results are presented in Appendix D.

During the CPT testing, the cone is pushed into the ground at a constant rate. Measurement of tip resistance (q_c), sleeve friction (f_s), and dynamic pore pressure (U) are obtained at small intervals (approximately 2-inch intervals). Using published correlations, the collected data is used to estimate several soil parameters such as unit weight, strength parameters, standard penetration test (SPT) value, relative density, and others. Graphs in Appendix D show plots of recorded field data versus depth. The recorded field data and estimated parameters are presented in table format in Appendix D, in addition to the correlations used to develop them.

In addition to the above, pore pressure dissipation tests were performed at some CPT locations to estimate the depth to ground water. The results of the pore pressure tests are also presented in Appendix D.

9.0 LABORATORY TESTING AND DISCUSSION OF TEST RESULTS

This section describes the geotechnical laboratory testing program and summarizes the test results. The laboratory testing procedures and laboratory test results are included in Appendix E. The laboratory tests were performed on undisturbed and bulk soil samples obtained during drilling. The following paragraphs provide a short discussion of the general types of testing conducted and the test results.

9.1 INDEX PROPERTIES, SPECIFIC GRAVITY AND UNIT WEIGHTS

Natural moisture content tests were performed on many of the undisturbed soil samples. Liquid limit, plastic limit, and plasticity index tests (collectively referred to herein as Atterberg limits); specific gravity tests; grain size distributions with hydrometer analyses; and unit weight tests were performed on selected undisturbed and/or bulk samples. These tests were used to confirm our visual-manual classifications. Table E-1 summarizes the index property and moisture-density test results.

Liquid limits for the soil samples tested ranged from 35 to 81; plastic limits ranged from 18 to 42; and plasticity indices ranged from 12 to 47. The tested soils were classified as MH, CH, ML, CL, and SC soils in accordance with the Unified Soil Classification System (USCS).

The natural moisture content of the tested alluvial and residual soils ranged from 17.7 percent (boring NB-41) to 54.2 percent (boring NB-44). The majority of the alluvium and residuum samples tested had a natural moisture content ranging from about 22 to 35 percent.

Specific gravities of the soils tested ranged from 2.62 to 2.78.

The unit weights of the tested soils ranged from 103.6 to 125.1 pcf.

9.2 MOISTURE-DENSITY RELATIONSHIP

Standard Proctor compaction tests were performed on ten bulk soil samples obtained from auger cuttings. The results of the compaction tests performed indicated that the maximum dry densities ranged from 94.7 to 107.6 pcf, and the optimum moisture contents ranged from 17.7 to 26.8 percent.

9.3 HYDRAULIC CONDUCTIVITY

A total of ten constant head permeability tests were performed on undisturbed and remolded bulk samples obtained from the borings. The bulk samples were remolded to approximately 95 % their respective Proctor maximum dry densities and about 2 percent over optimum moisture content. The effective confining pressures applied to the various specimens were varied according to the laboratory assignment. The permeability tests results indicated that the permeabilities ranged from 1.5×10^{-8} cm/sec to 1.6×10^{-4} cm/sec for the soil samples tested. Table E-2 shows the hydraulic conductivity laboratory test results.

9.4 ONE-DIMENSIONAL CONSOLIDATION

Four one-dimensional consolidation tests were performed on undisturbed samples from boring NB-44. The test results indicated that the samples tested had a "laboratory" compression index ranging from 0.26 to 0.61. The recompression indices ranged from 0.0 to 0.02, while the preconsolidation pressures for all samples tested varied from 5.84 to 12.56 ksf. Table E-3 shows the results of the consolidation laboratory testing.

9.5 PINHOLE TESTING

Two pinhole tests were performed on samples obtained from boring NB-44. The results of the pinhole testing are found in Appendix E.

10.0 GROUND-WATER CONDITIONS

Ground-water levels were measured in all test borings at the time of drilling. Further, ground-water measurements were performed approximately 24 hours or later after the completion of drilling in the test borings. The recorded ground-water levels are presented in Table 3. For safety reasons, the borings were backfilled promptly; consequently, long-term measurements for the presence or absence of ground water were not obtained.

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.

Table 3
Ground-Water Data

Boring Number	Ground Elevation (Feet msl)	Depth to Ground Water at Time of Drilling (Feet)	Ground-Water Elevation at Time of Drilling (Feet msl)	Depth to Ground Water 24 Hours After Drilling (Feet)	Ground-Water Elevation 24 Hours After Drilling (Feet msl)
NB-2	762.6	NE	NE	NE	NE
NB-10	768.1	NE	NE	20.7	747.4
NB-18	813.5	NE	NE	NE	NE
NB-21	757.0	34.0	723.0	16.2	740.8
NB-22	742.1	11.5	730.6	2.0	740.1
NB-24	852.2	NE	NE	NE	NE
NB-25	822.7	53.8	768.9	53.8	768.9
NB-35	744.8	14.0	730.8	4.0	740.8
NB-39	787.5	NE	NE	NE	NE

Table 3

Ground-Water Data

Boring Number	**Ground Elevation (Feet msl)**	**Depth to Ground Water at Time of Drilling (Feet)**	**Ground-Water Elevation at Time of Drilling (Feet msl)**	**Depth to Ground Water 24 Hours After Drilling (Feet)**	**Ground-Water Elevation 24 Hours After Drilling (Feet msl)**
NB-41	809.2	NE	NE	NE	NE
NB-44	742.7	9.0	733.7	2.9	739.8
NB-47	762.8	NE	NE	22.0	740.8
NB-59	758.3	20.0	738.3	17.0	741.3
NB-63	781.0	42.5	738.5	16.6	764.4
NB-63A	781.0	NE	NE	NM	NM
NB-65	768.5	23.7*	744.8	24.1	744.4
NB-66	752.7	16.5**	736.2	12.4	740.3
NB-73	747.5	9.8**	737.7	7.5	740.0
NB-73W	749.7	15.0	734.7	9.5	740.2
NB-74	752.1	19.0	733.1	11.5	740.6
NB-76	769.4	28.2*	741.2	27.6	741.8
NB-77	749.3	15.0	734.3	9.0	740.3
NB-81	762.6	21.3**	741.3	20.9	741.7
NB-84	761.2	34.5**	726.7	18.6	742.6
NB-85	760.2	19.0*	741.2	19.9	740.3

NE - Not Encountered

NM - Not Measured

* recorded at the time of boring termination

** recorded at the time of auger refusal

Prepared/Date: CTJ 6/24/05
Checked/Date: CDT 10/7/05

11.0 BASIS OF RESULTS

The results provided herein are based on the encountered subsurface conditions related to the specific project and site discussed in this report.

Regardless of the thoroughness of a field exploration, there is always a possibility that conditions between test locations will differ from those at specific test locations, and that conditions may not be anticipated. In addition, interpretation of the data is critical to the intended design and/or analysis. Therefore, experienced geotechnical engineers should interpret the field data and review any site-specific analysis or design that incorporates the field data. We recommend that TVA retain MACTEC to provide this service, based upon our familiarity with the subsurface conditions, the field and laboratory data, and our geotechnical experience.

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 E-1
Index Property and Moisture-Density Test Results
TVA Kingston Gypsum Disposal Area
MACTEC Project 3043051021/01

					Atterberg Limits						Compaction Tests	
Boring Number	Sample Depth (Feet)	Sample Type	Natural Moisture Content, %	Unit Weight, pcf	Liquid Limit	Plastic Limit	Plasticity Index	Percent Finer Than No. 200 Sieve	USCS Classification	Specific Gravity	Std. Proctor Max. Dry Density, pcf	Opt. Moisture Content, %
NB-2	2 - 10	Bulk	30.9	–	63	35	28	78.2	MH	2.75	100.7	23.1
NB-18	5 - 15	Bulk	33.3	–	62	33	29	86.4	MH	2.76	94.7	26.8
NB-18	6.5 - 18.5	UD	–	–	81	42	39	95.5	MH	2.62	–	–
NB-18	6.5 - 8.5	UD	29.2	115.0	–	–	–	–	–	–	–	–
NB-18	11.5 - 13.5	UD	26.7	114.2	–	–	–	–	–	–	–	–
NB-18	16.5 - 18.5	UD	32.3	110.7	–	–	–	–	–	–	–	–
NB-21A	15 -23	UD	–	–	53	28	25	83.8	CH	2.65	–	–
NB-21A	18 - 20	UD	29.6	116.4	–	–	–	–	–	–	–	–
NB-21A	30 - 32	UD	24.5	121.1	–	–	–	–	–	–	–	–
NB-21A	30 - 38	UD	–	–	36	21	15	84.8	CL	2.66	–	–
NB-21A	33 - 35	UD	29.9	117.9	–	–	–	–	–	–	–	–
NB-21A	33 - 35	UD	26.6**	124.1**	–	–	–	–	–	–	–	–
NB-21A	36 - 38	UD	26.5	113.9	–	–	–	–	–	–	–	–
NB-21A	39 - 41	UD	28.3	–	–	–	–	–	–	–	–	–
NB-22	2 - 10	Bulk	30.7	–	40	22	18	81.1	CL	2.63	107.6	17.7
NB-22A	9 - 11	UD	28.4	112.3	–	–	–	–	–	–	–	–
NB-25	2 - 10	Bulk	33.1	–	72	25	47	85.2	CH	2.74	95.1	26.0
NB-39	5 - 10	Bulk	18.3	–	47	20	27	79.7	CL	2.75	103.8	20.8
NB-41	2 - 10	Bulk	17.7	–	35	18	17	74.9	CL	2.73	106.1	18.8
NB-44	9 - 11	UD	33.4*	122.3*	–	–	–	–	–	–	–	–
NB-44	16.5 - 18.5	UD	36.1*	113.5*	45	22	23	67.4	CL	2.71	–	–
NB-44	16.5 - 18.5	UD	28.2**	121.3**	–	–	–	–	–	–	–	–
NB-44	21.5 - 23.5	UD	36.9*	114.3*	–	–	–	–	–	–	–	–
NB-44	21.5 - 23.5	UD	25.7**	123.4**	54	24	30	71.0	CH	2.73	–	–
NB-44	31 - 33	UD	54.2*	103.6*	74	32	42	74.5	CH	2.74	–	–
NB-47A	9 - 17	UD	–	–	51	30	21	79.2	MH	2.72	–	–
NB-47A	12 - 14	UD	27.6	122.6	–	–	–	–	–	–		

TABLE E-1
Index Property and Moisture-Density Test Results
TVA Kingston Gypsum Disposal Area
MACTEC Project 3043051021/01

					Atterberg Limits						Compaction Tests	
Boring Number	Sample Depth (Feet)	Sample Type	Natural Moisture Content, %	Unit Weight, pcf	Liquid Limit	Plastic Limit	Plasticity Index	Percent Finer Than No. 200 Sieve	USCS Classification	Specific Gravity	Std. Proctor Max. Dry Density, pcf	Opt. Moisture Content, %
NB-47A	18 - 27	UD	–	–	58	34	24	62.8	MH	2.72	–	–
NB-47A	23 - 25	UD	30.5	114.3	–	–	–	–	–	–	–	–
NB-47A	30 - 32	UD	32.8**	117.4**	59	27	32	83.3	CH	2.68	–	–
NB-59	5 - 15	Bulk	25.5	–	40	28	12	77.3	ML	2.75	103.6	20.1
NB-65	2 - 10	Bulk	30.9	–	60	28	32	72.3	CH	2.78	100.2	23.1
NB-76	5 - 15	Bulk	25.3	–	48	28	20	70.0	ML	2.65	100.7	21.7
NB-76	19 - 20.5	UD	23.9**	122.1**	37	24	13	76.3	CL	2.69	–	–
NB-77A	4 - 14	UD	–	–	41	25	16	55.3	CL	2.66	–	–
NB-77A	12 - 14	UD	30.2	113.5	–	–	–	–	–	–	–	–
NB-77A	15 - 26	UD	–	–	53	29	24	57.5	MH	2.64	–	–
NB-77A	21 - 23	UD	21.1	–	–	–	–	–	–	–	–	–
NB-77A	24 - 26	UD	26.5	118.9	–	–	–	–	–	–	–	–
NB-84	2 - 10	Bulk	24.2	–	47	25	22	81.6	CL	2.76	102.2	21.6
NB-84	32.5 - 34.5	UD	27.1**	124.6**	46	30	16	60.8	ML	2.70	–	–
NB-85A	15 - 17	UD	19.5	125.1	–	–	–	–	–	–	–	–
NB-85A/B	13 -19	UD	–	–	59	30	29	45.4	SC	2.66	–	–
NB-85B	17 - 19	UD	23.0	125.1	–	–	–	–	–	–	–	–
NB-85B	19 - 20.65	UD	18.7	117.4	–	–	–	–	–	–	–	–
NB-85B	23 - 29	UD	–	–	50	24	26	68.7	CH	2.64	–	–
NB-85B	25 - 27	UD	30.7	118.9	–	–	–	–	–	–	–	–
NB-85B	29 - 31	UD	23.8	113.0	–	–	–	–	–	–	–	–

UD - Undisturbed Shelby Tube Sample

* - Test results obtained from consolidation testing

** - Test results obtained from Hydraulic conductivity testing

Prepared/Date: CTJ 08/05/05
Checked/Date: SDS 08/05/05

TABLE E-2
Hydraulic Conductivity Laboratory Test Results
TVA Kingston Gypsum Disposal Area
MACTEC Project 3043051021/01

Boring Number	Sample Depth (Feet)	Sample Type	Moisture Content (%)	Dry Density (pcf)	Effective Confining Pressure (psi)	Hydraulic Conductivity (cm/sec)
NB-21A	33 - 35	UD	26.6	98.0	24.0	1.5×10^{-8}
NB-22	2 - 10	BULK	19.2	102.3	10.0	1.3×10^{-6}
NB-44	16.5 - 18.5	UD	28.2	94.6	14.0	4.6×10^{-8}
NB-44	21.5 - 23.5	UD	25.7	98.2	55.6	1.6×10^{-4}
NB-47A	30 - 32	UD	32.8	88.4	24.0	5.5×10^{-8}
NB-59	5 - 15	BULK	22.4	98.2	10.0	1.1×10^{-7}
NB-76	5 - 15	BULK	23.0	94.3	10.0	2.5×10^{-6}
NB-76	19 - 20.5	UD	23.9	98.6	20.0	2.0×10^{-7}
NB-84	2 - 10	BULK	23.8	96.9	10.0	1.4×10^{-7}
NB-84	32.5 - 34.5	UD	27.1	98.0	40.0	5.9×10^{-8}

UD = Undisturbed Shelby Tube Sample

Note: Bulk soil samples were remolded to approximately 95% of their respective Proctor maximum dry densities and 2% over optimum moisture content.

Prepared/Date: CTJ 07/13/05
Checked/Date: SDS 07/19/05

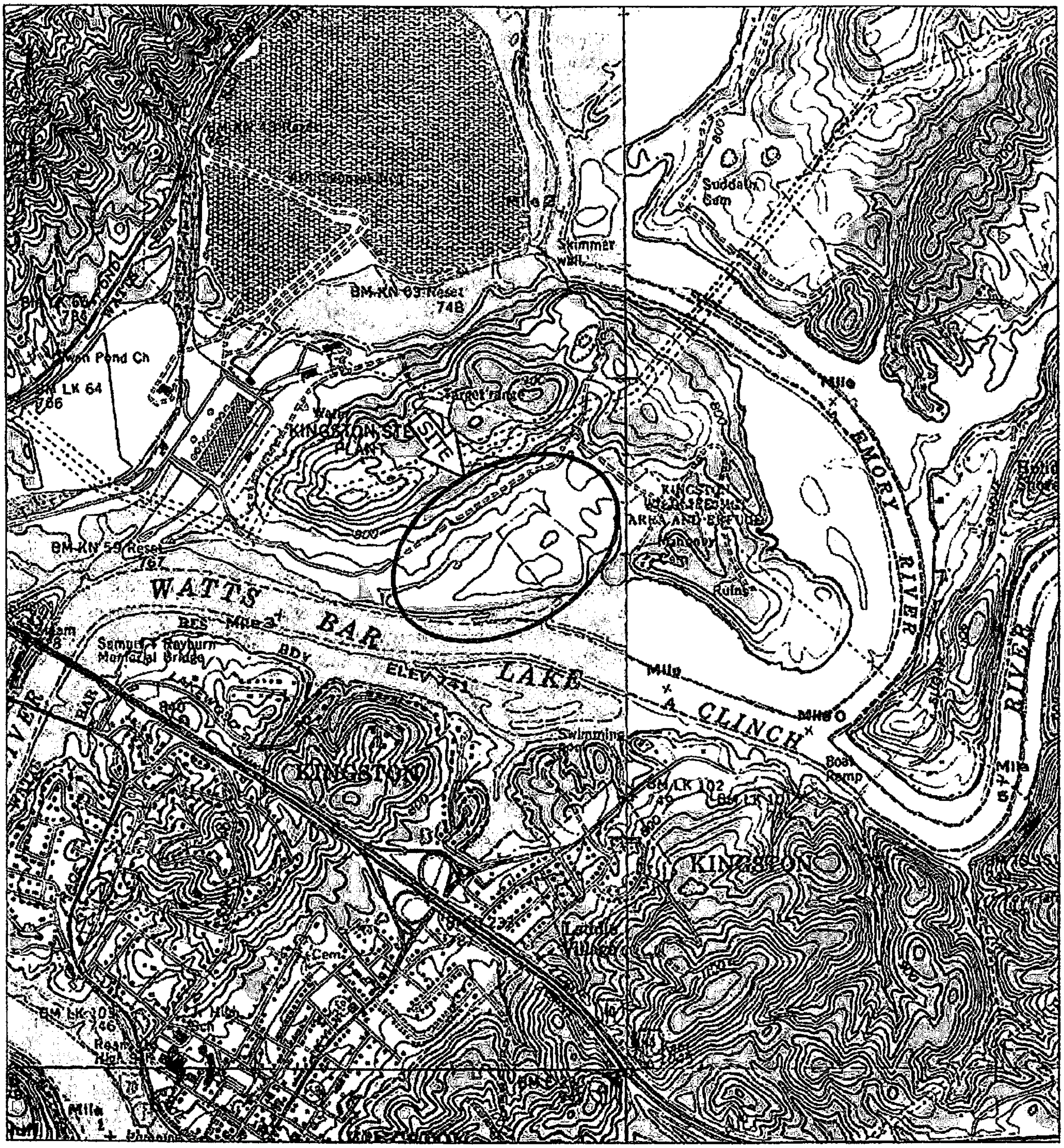
TABLE E-3
Consolidation Laboratory Test Results
TVA Kingston Gypsum Disposal Area
MACTEC Project 3043051021/01

Boring Number	Sample Depth (Feet)	Sample Type	USCS Classification	Initial Moisture Content (%)	Initial Dry Density (pcf)	Initial Void Ratio e_o	"Laboratory" Compression Index C_C	"Laboratory" Recompression Index C_R	"Laboratory" Preconsolidation Pressure P_C (ksf)
NB-44	9 - 11	UD	–	33.4	91.7	0.844	0.26	0.00	11.16
NB-44	16.5 - 18.5	UD	CL	36.1	83.4	1.028	0.32	0.01	12.56
NB-44	21 - 23.5	UD	CH	36.9	83.5	1.041	0.32	0.01	10.79
NB-44	31 - 33	UD	CH	54.2	67.2	1.545	0.61	0.02	5.84

UD = Undisturbed Shelby Tube Sample

Prepared/Date: CTJ 07/13/05
Checked/Date: SDS 07/19/05

FIGURES



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

MACTEC

MACTEC Engineering and Consulting, Inc.
1725 Louisville Drive
Knoxville, Tennessee 37921-5904
865-588-8544 • Fax: 865-588-8026

FIGURE 1: SITE LOCATION MAP
PROPOSED GYPSUM DISPOSAL AREA
KINGSTON, TENNESSEE

DRAFTING BY:	PREPARED BY: CTJ	CHECKED BY: CDT
JOB NUMBER: 3043051021/0001	DATE: MAY 5, 2005	SCALE: 0 2000'

COORDINATES: N 35°53'39" W 84°31'13"

3043051021_0 Thu. 05 May 2005 — 2:33pm REVERENC

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 six 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.

Undisturbed Sampling

The relatively undisturbed samples were obtained by pushing a section of 3-inch O.D., 16-gauge steel tubing into the soil at the desired sampling level. The sampling was performed in general accordance with ASTM D-1587. The tube, together with the encased soils, was carefully removed from the ground, made airtight, and transported to our laboratory.

Boring Backfill

The borings were backfilled to the ground surface with cement 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.

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

APPENDIX B

KEY TO SYMBOLS AND DESCRIPTIONS

SOIL TEST BORING RECORDS

GROUP SYMBOLS	TYPICAL NAMES	GROUP SYMBOLS	TYPICA[illegible]MES
▒	**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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MACTEC Engineering and Consulting of Georgia, Inc.
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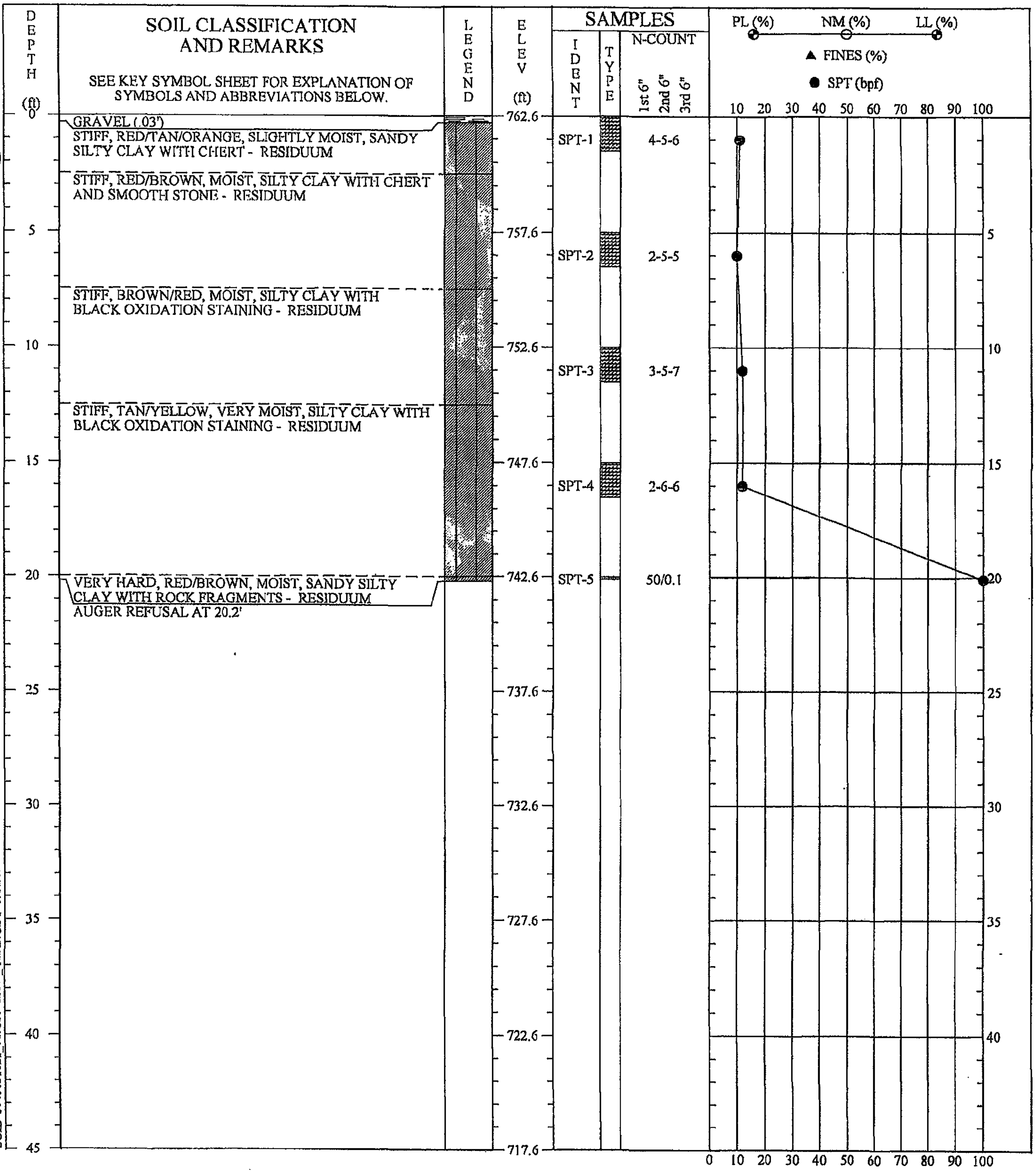


SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

GRAVEL (.03')

STIFF, RED/TAN/ORANGE, SLIGHTLY MOIST, SANDY SILTY CLAY WITH CHERT - RESIDUUM

STIFF, RED/BROWN, MOIST, SILTY CLAY WITH CHERT AND SMOOTH STONE - RESIDUUM

STIFF, BROWN/RED, MOIST, SILTY CLAY WITH BLACK OXIDATION STAINING - RESIDUUM

STIFF, TAN/YELLOW, VERY MOIST, SILTY CLAY WITH BLACK OXIDATION STAINING - RESIDUUM

VERY HARD, RED/BROWN, MOIST, SANDY SILTY CLAY WITH ROCK FRAGMENTS - RESIDUUM

AUGER REFUSAL AT 20.2'

SAMPLES		
IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
SPT-1	▨	4-5-6
SPT-2	▨	2-5-5
SPT-3	▨	3-5-7
SPT-4	▨	2-6-6
SPT-5	▨	50/0.1

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 9/16/05

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NO GROUND WATER ENCOUNTERED AT TIME OF EXPLORATION.

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 24, 2005 **BORING NO.:** NB-2

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

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.

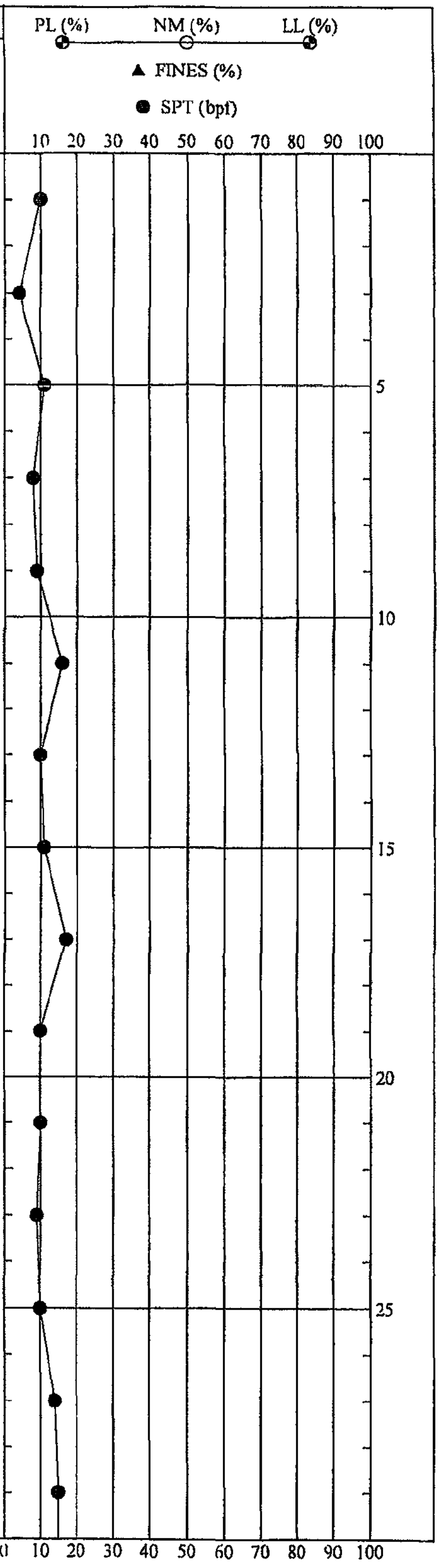
Driller : Bailey
Prepared By: Lawson
Checked By: Justice

MACTEC

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6"
0	STIFF, DARK BROWN, DRY, SLIGHTLY CLAYEY SILT WITH ROOTLETS (TOPSOIL)	768.1		
			SPT-1	3-4-6-4
	SOFT, DARK BROWN, SLIGHTLY MOIST, SLIGHTLY CLAYEY SILT GRADING DOWNWARD TO VERY SILTY CLAY - RESIDUUM		SPT-2	2-2-2-4
5	STIFF, REDDISH BROWN (WITH SOME BLACK SPOTTY MANGANESE MOTTLING), SLIGHTLY MOIST, VERY SILTY CLAY - RESIDUUM	763.1	SPT-3	5-5-6-6
	FIRM, DARK RED (WITH BLACK SPOTTY MANGANESE MOTTLING), SLIGHTLY MOIST, SILTY CLAY - RESIDUUM		SPT-4	4-4-4-7
	STIFF TO VERY STIFF, DARK RED (WITH BLACK SPOTTY MANGANESE MOTTLING), SLIGHTLY MOIST, SILTY CLAY - RESIDUUM		SPT-5	4-4-5-6
10		758.1		
			SPT-6	6-7-9-9
	STIFF, YELLOWISH RED (WITH BLACK SPOTTY MANGANESE MOTTLING), SLIGHTLY MOIST, SILTY CLAY WITH OCCASIONAL 1 TO 3mm, BUFF-COLORED, WEATHERED CHERT FRAGMENTS - RESIDUUM		SPT-7	4-5-5-7
15	STIFF TO VERY STIFF, YELLOWISH RED (WITH BLACK SPOTTY MANGANESE MOTTLING), SLIGHTLY MOIST, SILTY CLAY WITH WEATHERED CHERT FRAGMENTS (BUFF-COLORED), 1 TO 4 mm THROUGHOUT- RESIDUUM	753.1	SPT-8	3-4-7-9
			SPT-9	6-8-9-8
	STIFF, YELLOWISH RED (WITH BLACK SPOTTY MANGANESE MOTTLING), SLIGHTLY MOIST, SILTY CLAY, WITH 1mm TO 1cm BUFF-COLORED, WEATHERED CHERT THROUGHOUT - RESIDUUM		SPT-10	4-5-5-6
20	▼	748.1		
			SPT-11	4-5-5-6
			SPT-12	4-4-5-6
25		743.1	SPT-13	4-4-6-6
	STIFF, YELLOWISH RED, SLIGHTLY MOIST, SLIGHTLY SANDY (IN DISCRETE, IRREGULAR, SUBHORIZONTAL LAYERS A FEW MILLIMETERS THICK), SILTY CLAY - RESIDUUM		SPT-14	5-6-8-10
	STIFF, YELLOWISH RED (WITH SOME SUBHORIZONTAL BLACK MOTTLING), SLIGHTLY MOIST, SILTY CLAY WITH OCCASIONAL 5mm, ANGULAR, BUFF-COLORED WEATHERED CHERT -		SPT-15	7-8-7-9
30		738.1		



SOIL-4BLOWS-STB 3043051021_01.GPJ LAW_GIBB.GDT 8/16/05

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

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 BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL

Driller : Burnett
Prepared By: Mason
Checked By: Haston

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 19, 2005 **BORING NO.:** NB-10

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 3

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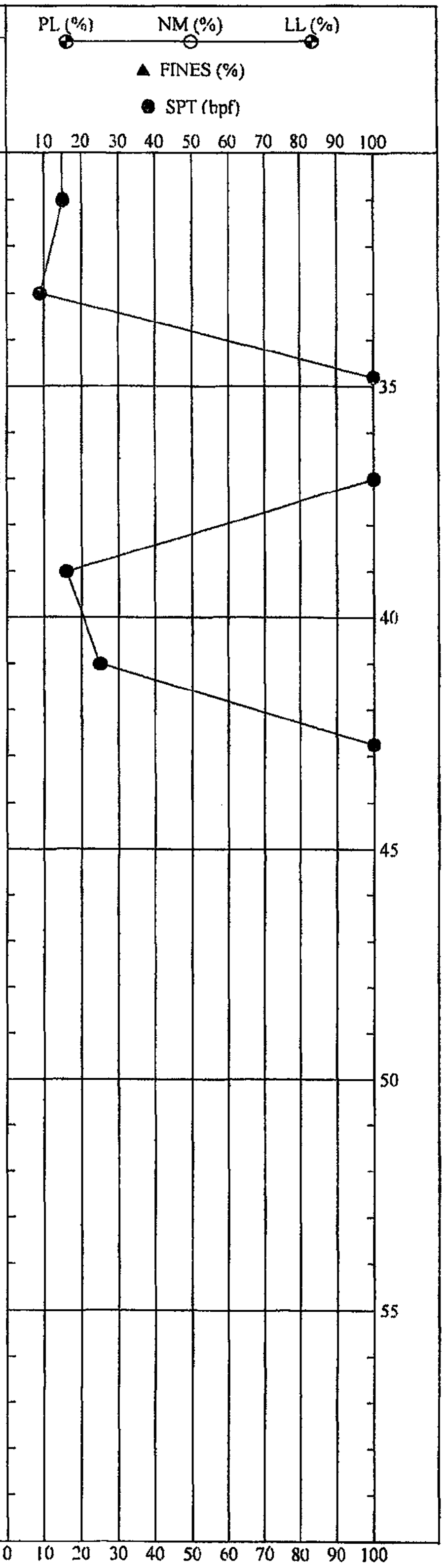
DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)
30	RESIDUUM	738.1
	STIFF MOTTLED (YELLOWISH RED, DARK REDDISH BROWN, AND BROWNISH YELLOW), SLIGHTLY MOIST, SILTY CLAY - RESIDUUM	
	FIRM, YELLOWISH BROWN TO DARK YELLOWISH BROWN, VERY MOIST TO WET, SANDY CLAY. BELIEVED TO BE WEATHERED DOLOMITE - RESIDUUM	
35		733.1
	VERY DENSE, YELLOWISH BROWN TO DARK YELLOWISH BROWN, WET, SILTY SAND WITH WEATHERED FRAGMENTS OF DOLOMITE - SEVERELY WEATHERED DOLOMITE - RESIDUUM	
	VERY STIFF, YELLOWISH RED, SLIGHTLY MOIST, SILTY CLAY, WITH 1 TO 3mm BLACK MANGANESE AND 2 TO 7mm, BUFF-COLORED, WEATHERED CHERT - RESIDUUM	
40	STIFF, YELLOWISH RED TO BROWN, VERY MOIST TO WET, SANDY CLAY - RESIDUUM	728.1
	BROWNISH GRAY, WET, SEVERELY WEATHERED DOLOMITE - RESIDUUM	
	FIRM, YELLOWISH BROWN TO STRONG BROWN, MOIST, SILTY SAND BELIEVED TO BE SEVERELY WEATHERED DOLOMITE - RESIDUUM	
	AUGER REFUSAL AT 42.5' CORING BEGAN AT 42.5'	
	DOLOMITE. LIGHT BROWNISH GRAY TO MEDIUM GRAY, FINE GRAINED. RECOVERED CORE IS INDURATED. BEDDING FEATURES ARE INDISTINGUISHABLE, AND HAVE BEEN OBSCURED BY FRACTURING. OVERALL WEATHERING IS SLIGHT AND RECOVERED CORE IS HARD. THE CORE IS MODERATELY TO EXTREMELY FRACTURED WITH SEVERAL SECTIONS LOCALLY REDUCED (MECHANICALLY) TO RUBBLE. INTACT CORE SUGGESTS CLOSE PROXIMITY TO A FAULT. THE DOLOMITE APPEARS TO HAVE BEEN BRECCIATED AND RECEMENTED WITH LIGHT-COLORED DOLOMITE.	
45		723.1
50		718.1
55		713.1
60		708.1

SAMPLES IDENT	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6")
SPT-16	4-6-9-10
SPT-17	4-4-5-5
SPT-18	10-50/0.3
SPT-19	18-32-50/0.45
SPT-20	6-2-14-8
SPT-21	7-9-16-50/0.3
SPT-22	25-50/0.25
RC-1	43-81
RC-2	43-87



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

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.

Driller : Burnett
Prepared By: Mason
Checked By: Haston

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 19, 2005 **BORING NO.:** NB-10

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 3

MACTEC

SOIL -4BLOWS-STB 3043051021_01.GPJ LAW_GIBB.GDT 8/16/05

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	SAMPLES TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf) 10 20 30 40 50 60 70 80 90 100
60	**DOLOMITE**. LIGHT BROWNISH GRAY TO MEDIUM GRAY FINE GRAINED. RECOVERED CORE IS INDURATED. BEDDING FEATURES ARE INDISTINGUISHABLE AND HAVE BEEN OBSCURED BY FRACTURING. OVERALL WEATHERING IS SLIGHT AND RECOVERED CORE IS HARD. THE CORE IS MODERATELY TO EXTREMELY FRACTURED WITH SEVERAL SECTIONS LOCALLY REDUCED (MECHANICALLY) TO RUBBLE. INTACT CORE SUGGESTS CLOSE PROXIMITY TO A FAULT THE DOLOMITE APPEARS TO HAVE BEEN BRECCIATED AND RECEMENTED WITH LIGHT-COLORED DOLOMITE	▤	708.1	RC-3	■	6-73	
65		▤	703.1		■		65
70		▤	698.1		■		70
	CORING TERMINATED AT 72.89'						
75			693.1				75
80			688.1				80
85			683.1				85
90			678.1				0 10 20 30 40 50 60 70 80 90 100

SOIL-4BLOWS-STB 3043051021_01.GPJ LAW_GIBB.GDT 8/16/05

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

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 BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller: Burnett
Prepared By: Mason
Checked By: Haston

SOIL TEST BORING RECORD

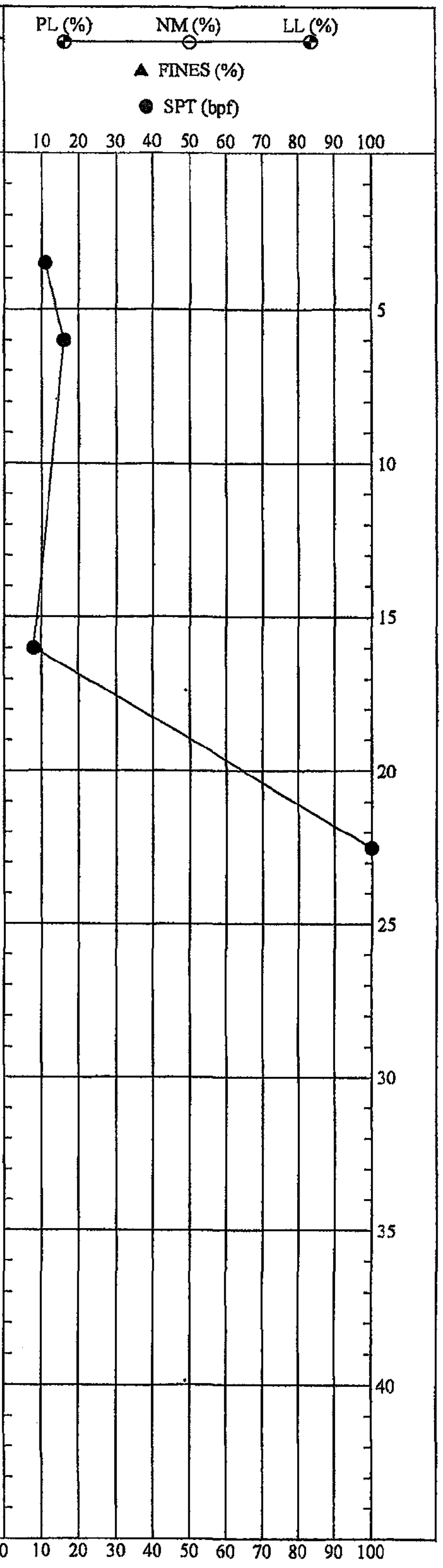
PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 19, 2005 **BORING NO.:** NB-10

PROJ. NO.: 3043051021/0001 **PAGE** 3 **OF** 3

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	SAMPLES TYPE	SAMPLES N-COUNT 1st 6" 2nd 6" 3rd 6"
0	STIFF TO VERY STIFF, BROWN TO RED BROWN, SLIGHTLY MOIST, SILTY CLAY WITH WEATHERED CHERT FRAGMENTS - RESIDUUM		813.5			
				SPT-1		4-4-7
5			808.5			
				SPT-2		4-6-10
				UD-1		1.2-2.0
10			803.5	UD-2		1.9-2.0
	FIRM, RED BROWN, SLIGHTLY MOIST, ELASTIC SILT WITH CHERT - RESIDUUM			UD-3		1.8-2.0
15			798.5			
				SPT-3		4-4-4
				UD-4		1.7-2.0
20			793.5	UD-5		0-0.4
				SPT-4		50/0.0
	AUGER REFUSAL AT 23.0'			UD-6		0-0.5
25			788.5			
30			783.5			
35			778.5			
40			773.5			
45			768.5			



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NO GROUND WATER ENCOUNTERED AT TIME OF EXPLORATION. NB-18 OFFSET APPROXIMATELY 6.5' S82°W OF ORIGINAL STAKED LOCATION.

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.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

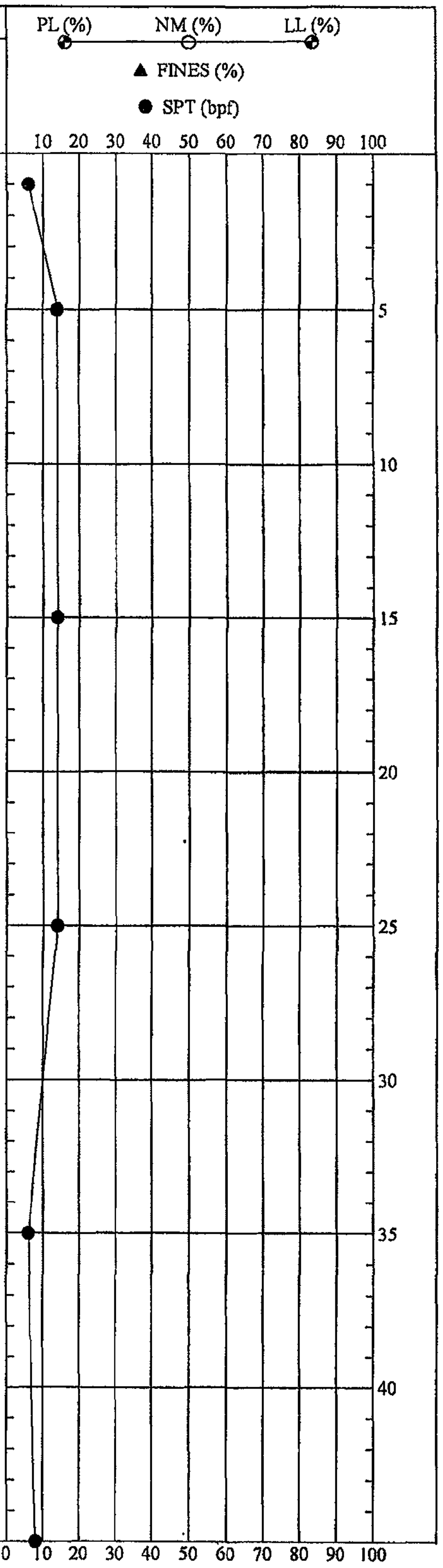
PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 18, 2005 **BORING NO.:** NB-18

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	SAMPLES IDENT	SAMPLES N-COUNT 1st 6" 2nd 6" 3rd 6"
0	FIRM, DARK YELLOWISH BROWN, SANDY SILT, DRY - TOPSOIL	757.0		
	FIRM, YELLOWISH RED, DRY, SLIGHTLY SANDY, SLIGHTLY CLAYEY SILT - ALLUVIUM		SPT-1	6-3-3
	STIFF, YELLOWISH RED, DRY, SLIGHTLY SANDY, SLIGHTLY CLAYEY SILT - ALLUVIUM			
5		752.0	SPT-2	5-6-8
	STIFF, VARIEGATED (ALTERNATING HORIZONTAL BANDS OF BROWNISH YELLOW, YELLOWISH RED, AND VERY DARK BROWN), SLIGHTLY MOIST, SILTY CLAY WITH INTERLAYERED CLAYEY SILTS AND SILTY SAND; ALTERNATING LAYERS ARE TYPICALLY ABOUT 1cm THICK. SOME LIGHT GRAY, WEATHERED CHERT AT BOTTOM OF SAMPLE - ALLUVIUM			
10		747.0		
15		742.0	SPT-3	4-5-9
	▼			
	STIFF, VARIEGATED (YELLOWISH BROWN, LIGHT GRAY, BROWNISH YELLOW), SLIGHTLY MOIST, SLIGHTLY CLAYEY SANDY SILT, INTERLAYERED HORIZONTALLY WITH FINE TO MEDIUM SANDS A FEW MILLIMETERS THICK - ALLUVIUM			
20		737.0		
25		732.0	SPT-4	5-7-7
	FIRM, DARK GRAY, VERY MOIST TO WET, SLIGHTLY SILTY CLAY. HORIZONTALLY INTERLAYERED WITH FINE TO MEDIUM SANDS UP TO 1cm THICK - ALLUVIUM			
30		727.0		
	▽			
35		722.0	SPT-5	3-3-3
40		717.0		
45		712.0		



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

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 BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Burnett
Prepared By: Mason
Checked By: Justice

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 17, 2005 **BORING NO.:** NB-21

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	SAMPLES IDENT	SAMPLES N-COUNT 1st 6" 2nd 6" 3rd 6"
45	FIRM, DARK GRAY, VERY MOIST TO WET, SLIGHTLY SILTY CLAY. HORIZONTALLY INTERLAYERED WITH FINE TO MEDIUM SANDS UP TO 1cm THICK - ALLUVIUM	712.0	SPT-6	4-4-4
	AUGER REFUSAL AT 47.8' BEGAN HQ CORING AT 47.8'			
50	CORE BARREL BREAKS AND REMAINS LODGED IN BORING. RECOVERED 1.0' OF CORE, LIGHT BROWNISH GRAY TO BROWNISH GRAY DOLOMITE RIG OFFSET 5/18/05 TO REDRILL. AUGER REFUSAL AT 49.9' BEGAN CORING AT 49.9'	707.0	RC-1	54-84
55	**DOLOMITE**, MOTTLED APPEARANCE; HUES RANGE FROM PINKISH GRAY TO BROWNISH GRAY. FINE GRAINED. RECOVERED CORE IS INDURATED; WHERE WEATHERING IS MORE DEVELOPED, THE DOLOMITE IS FRIABLE WITH A "SUGARY" TEXTURE, WHICH MAY INDICATE SILICIOUS CONTENT. BEDDING IS THIN, AND AT AN APPARENT DIP OF ABOUT 30°. WEATHERING RANGES FROM SLIGHT TO COMPLETE, WITH THE CORE EXHIBITING INITIAL CAVITY DEVELOPMENT THROUGHOUT, EITHER IN THE FORM OF 1 TO 4mm VUGS WITH THE AFORE MENTIONED SUGARY TEXTURE. OVERALL, THE CORE IS HARD.	702.0		
60		697.0		
65	THE CORE IS SLIGHTLY FRACTURED OVERALL. A FEW BEDDING PLANE FRACTURES HAVE BEEN MECHANICALLY OPENED, BUT THE PREDOMINANT JOINT SET ORIENTED ROUGHLY ORTHOGONAL TO BEDDING ARE FOUND AT AN APPARENT DIP OF 40° TO 50°, AND OFTEN EXHIBIT LIGHT TO HEAVY STAINING. BECAUSE OF CONTINUED BLOCKAGES, THE RECORDED CORE RUN EXCEEDS 10' (SEVERAL PULLS REQUIRED TO REMOVE BLOCK CORE)	692.0		
70	CORING TERMINATED AT 61.2'	687.0		
75		682.0		
80		677.0		
85		672.0		
90		667.0		

PL (%) NM (%) LL (%)

▲ FINES (%)

● SPT (bpf)

10 20 30 40 50 60 70 80 90 100

0 10 20 30 40 50 60 70 80 90 100

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

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 BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Burnett

Prepared By: Mason

Checked By: Justice

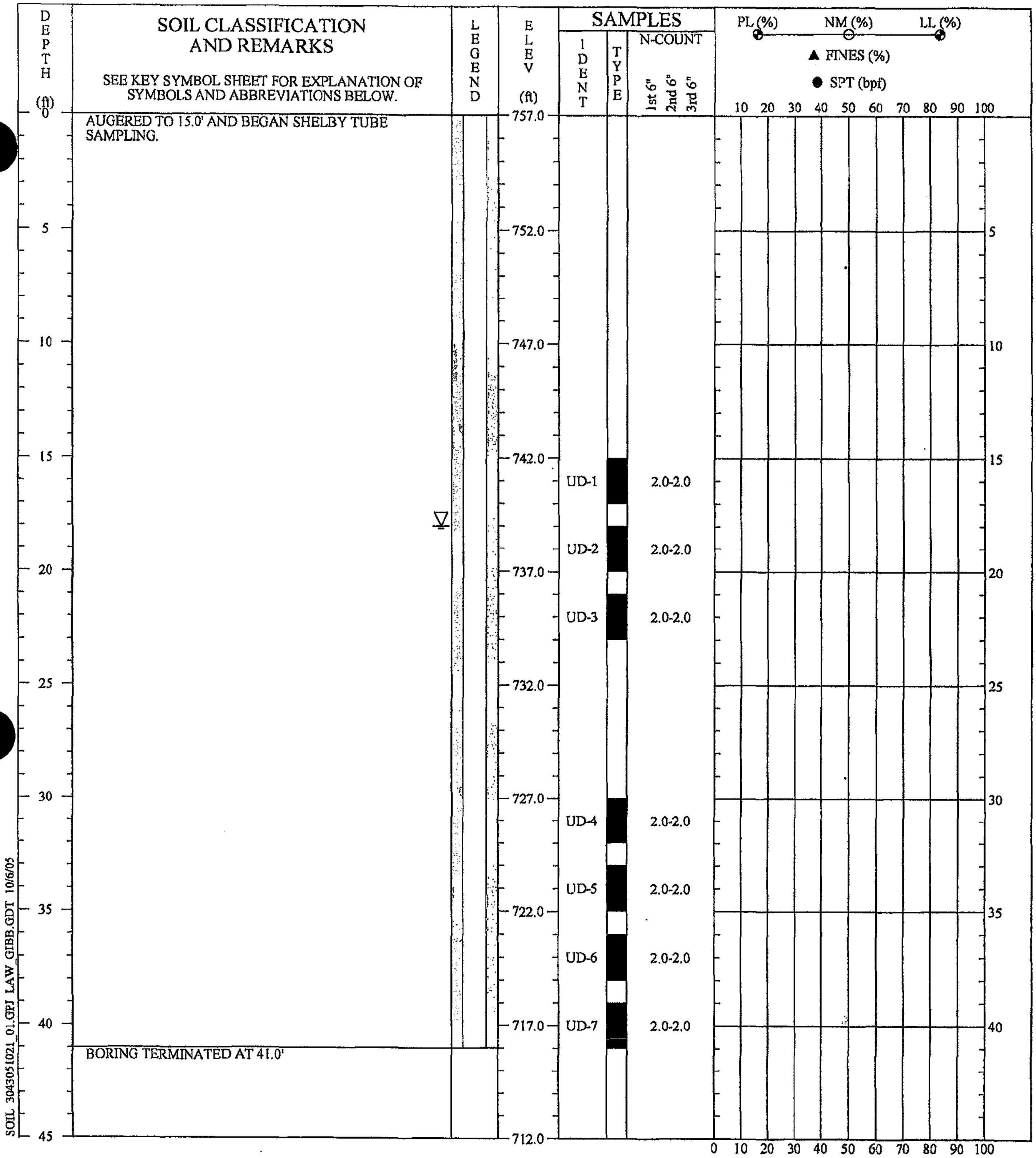
SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 17, 2005 **BORING NO.:** NB-21

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 2

MACTEC



AUGERED TO 15.0' AND BEGAN SHELBY TUBE SAMPLING.

IDENT	N-COUNT
UD-1	2.0-2.0
UD-2	2.0-2.0
UD-3	2.0-2.0
UD-4	2.0-2.0
UD-5	2.0-2.0
UD-6	2.0-2.0
UD-7	2.0-2.0

BORING TERMINATED AT 41.0'

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 10/6/05

REMARKS: NB-21A WAS OFFSET APPROXIMATELY 13.3' NW OF NB-21

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.

Driller : Bailey
Prepared By: Lawson
Checked By: Justice

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

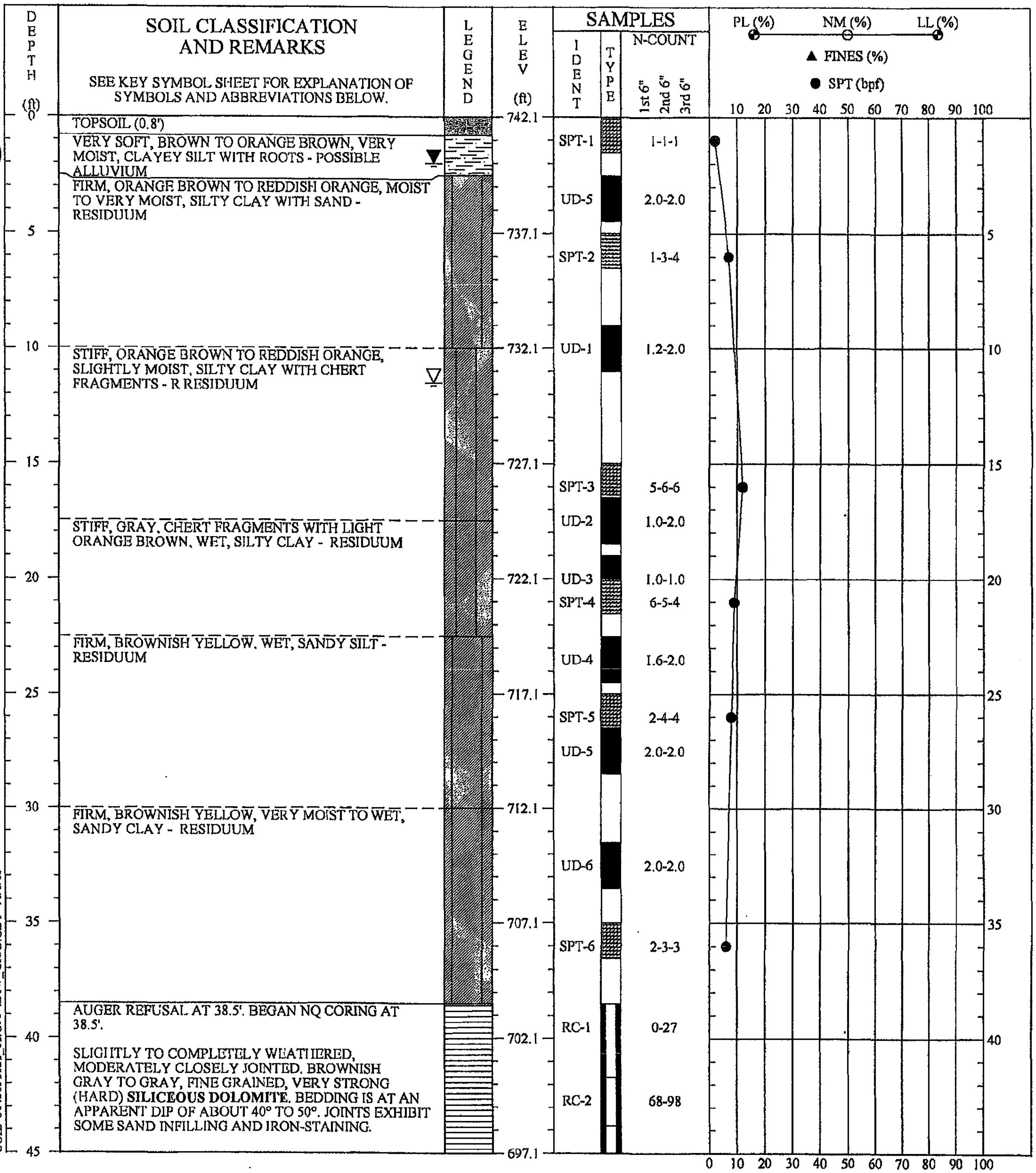
DRILLED: May 25, 2005 **BORING NO.:** NB-21A

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.



TOPSOIL (0.8')

VERY SOFT, BROWN TO ORANGE BROWN, VERY MOIST, CLAYEY SILT WITH ROOTS - POSSIBLE ALLUVIUM

FIRM, ORANGE BROWN TO REDDISH ORANGE, MOIST TO VERY MOIST, SILTY CLAY WITH SAND - RESIDUUM

STIFF, ORANGE BROWN TO REDDISH ORANGE, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS - R RESIDUUM

STIFF, GRAY, CHERT FRAGMENTS WITH LIGHT ORANGE BROWN, WET, SILTY CLAY - RESIDUUM

FIRM, BROWNISH YELLOW, WET, SANDY SILT - RESIDUUM

FIRM, BROWNISH YELLOW, VERY MOIST TO WET, SANDY CLAY - RESIDUUM

AUGER REFUSAL AT 38.5'. BEGAN NQ CORING AT 38.5'.

SLIGHTLY TO COMPLETELY WEATHERED, MODERATELY CLOSELY JOINTED, BROWNISH GRAY TO GRAY, FINE GRAINED, VERY STRONG (HARD) **SILICEOUS DOLOMITE**. BEDDING IS AT AN APPARENT DIP OF ABOUT 40° TO 50°. JOINTS EXHIBIT SOME SAND INFILLING AND IRON-STAINING.

IDENT	N-COUNT
SPT-1	1-1-1
UD-5	2.0-2.0
SPT-2	1-3-4
UD-1	1.2-2.0
SPT-3	5-6-6
UD-2	1.0-2.0
UD-3	1.0-1.0
SPT-4	6-5-4
UD-4	1.6-2.0
SPT-5	2-4-4
UD-5	2.0-2.0
UD-6	2.0-2.0
SPT-6	2-3-3
RC-1	0-27
RC-2	68-98

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-22 OFFSET APPROXIMATELY 50.0' S14°W OF ORIGINAL STAKED LOCATION.

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.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: June 3, 2005 **BORING NO.:** NB-22

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	SAMPLES TYPE	SAMPLES N-COUNT 1st 6" 2nd 6" 3rd 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf) 10 20 30 40 50 60 70 80 90 100
45	SLIGHTLY TO COMPLETELY WEATHERED, MODERATELY CLOSELY JOINTED, BROWNISH GRAY TO GRAY, FINE GRAINED, VERY STRONG (HARD) **SILICEOUS DOLOMITE**. BEDDING IS AT AN APPARENT DIP OF ABOUT 40° TO 50°. JOINTS EXHIBIT SOME SAND INFILLING AND IRON-STAINING. 40.0' TO 41.0' = PARTIALLY SAND-FILLED CAVITY 44.0 TO 47.0' = PARTIALLY SAND-FILLED CAVITY	▤	697.1	RC-3	▮	0-27	
50	CORING TERMINATED AT 48.5'		692.1				50
55			687.1				55
60			682.1				60
65			677.1				65
70			672.1				70
75			667.1				75
80			662.1				80
85			657.1				85
90			652.1				0 10 20 30 40 50 60 70 80 90 100

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 10/6/05

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-22 OFFSET APPROXIMATELY 50.0' S14°W OF ORIGINAL STAKED LOCATION.

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.

Driller : Akins

Prepared By: Justice

Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: June 3, 2005 **BORING NO.:** NB-22

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	AUGERED TO 9.0' AND BEGAN SHELBY TUBE SAMPLING.		742.1			
5			737.1			
10			732.1	UD-1	■	1.2-2.0
15			727.1			
				UD-2	■	1.5-2.0
20			722.1	UD-3	■	1.7-2.0
	BORING TERMINATED AT 21.0'					
25			717.1			
30			712.1			
35			707.1			
40			702.1			
45			697.1			

PL (%) NM (%) LL (%)

▲ FINES (%)

● SPT (bpf)

10 20 30 40 50 60 70 80 90 100

0 10 20 30 40 50 60 70 80 90 100

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 10/6/05

REMARKS: NB-22A OFFSET APPROXIMATELY 3.4' AND S55°W OF NB-22.

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 BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL

Driller : Akins

Prepared By: Justice

Checked By: Lawson

SOIL TEST BORING RECORD

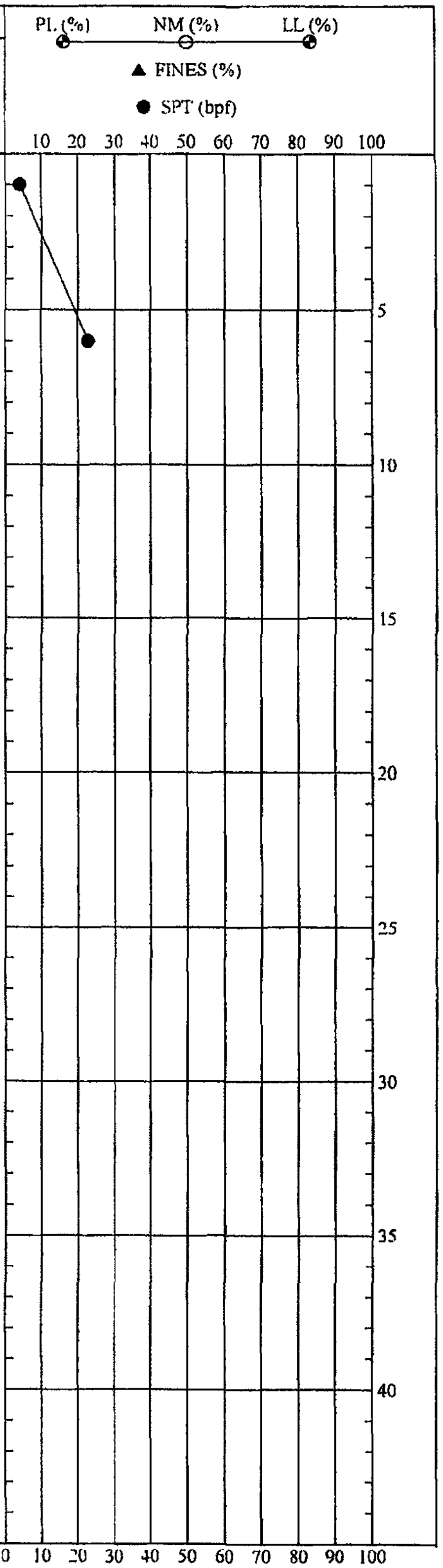
PROJECT: Proposed Gypsum Disposal Area

DRILLED: June 6, 2005 **BORING NO.:** NB-22A

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	TOPSOIL (0.5') SOFT, RED/BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT - RESIDUUM	▨	852.2	SPT-1	▨	1-1-3
5	VERY STIFF, RED/BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT - RESIDUUM	▨	847.2	SPT-2	▨	5-10-13
10		▨	842.2	UD-1	■	0.8-0.8
12.5	AUGER REFUSAL AT 12.5'					
15			837.2			
20			832.2			
25			827.2			
30			822.2			
35			817.2			
40			812.2			
45			807.2			



SOIL 3043051021_01.GPJ LAW_GIRB.GDT 8/16/05

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NO GROUND WATER ENCOUNTERED AT TIME OF EXPLORATION.

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.

Driller : Bailey
Prepared By: Lawson
Checked By: Justice

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 24, 2005 **BORING NO.:** NB-24

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

TOPSOIL (0.2')

SOFT, RED BROWN DRY TO SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS AND BLACK MANGANESE STAINING - RESIDUUM

STIFF, RED BROWN, DRY TO SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS AND BLACK MANGANESE STAINING - RESIDUUM

VERY STIFF, RED BROWN, DRY, SILTY CLAY WITH CHERT FRAGMENTS AND BLACK MANGANESE STAINING - RESIDUUM

VERY STIFF, RED BROWN, DRY, FAT CLAY WITH CHERT FRAGMENTS AND BLACK MANGANESE STAINING - RESIDUUM

VERY STIFF, YELLOWISH BROWN, DRY, FAT CLAY WITH MANGANESE STAINING - RESIDUUM

STIFF, YELLOWISH BROWN, DRY, FAT CLAY WITH MANGANESE STAINING WITH A FEW CHERT FRAGMENTS - RESIDUUM

VERY STIFF, YELLOWISH BROWN, DRY, FAT CLAY WITH MANGANESE STAINING WITH A FEW CHERT FRAGMENTS - RESIDUUM

VERY STIFF, YELLOWISH BROWN, DRY, FAT CLAY WITH MANGANESE STAINING WITH A FEW CHERT FRAGMENTS - RESIDUUM

VERY STIFF, YELLOWISH BROWN, DRY, FAT CLAY WITH MANGANESE STAINING WITH CHERT FRAGMENTS - RESIDUUM

HARD, YELLOWISH BROWN, DRY, FAT CLAY WITH MANGANESE STAINING WITH CHERT FRAGMENTS - RESIDUUM

VERY STIFF, YELLOWISH BROWN, DRY, FAT CLAY WITH BLACK MANGANESE STAINING - RESIDUUM

VERY STIFF, PALE GRAY AND RED BROWN, DRY, FAT CLAY WITH CHERT FRAGMENTS AND BLACK MANGANESE STAINING - RESIDUUM

VERY STIFF, YELLOWISH BROWN, DRY TO SLIGHTLY MOIST, FAT CLAY WITH CHERT FRAGMENTS AND BLACK MANGANESE STAINING - RESIDUUM

VERY STIFF, PALE GRAY AND REDDISH BROWN, DRY TO SLIGHTLY MOIST, FAT CLAY WITH CHERT FRAGMENTS AND BLACK MANGANESE STAINING - RESIDUUM

STIFF, YELLOWISH BROWN AND RED BROWN, SLIGHTLY MOIST, FAT CLAY WITH CHERT FRAGMENTS - RESIDUUM

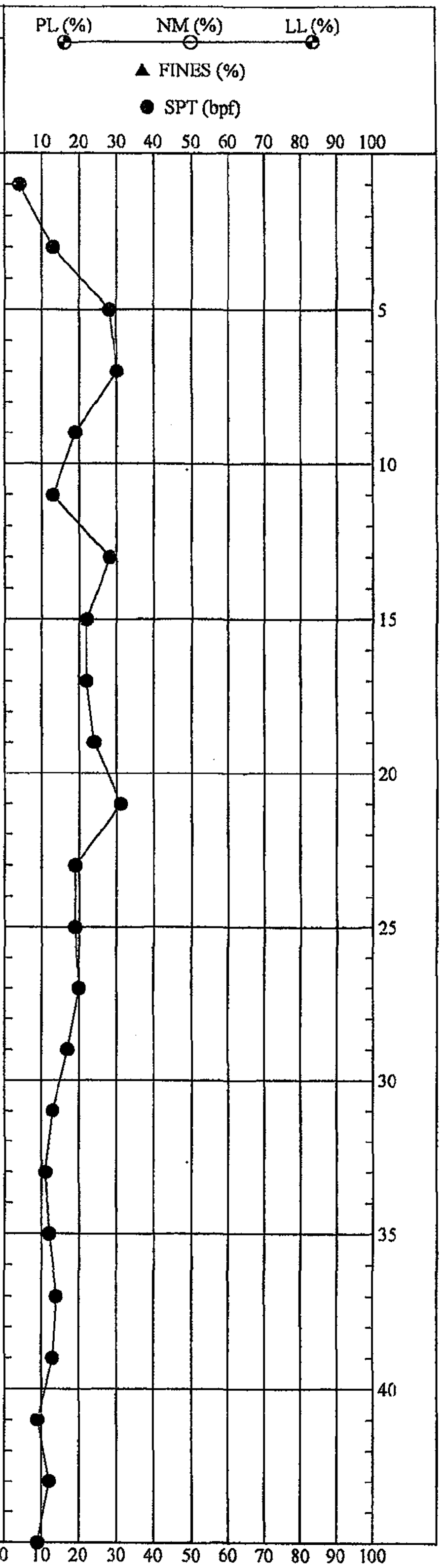
STIFF, YELLOWISH BROWN AND RED BROWN, SLIGHTLY MOIST TO MOIST, FAT CLAY WITH CHERT FRAGMENTS - RESIDUUM

STIFF, YELLOWISH BROWN AND RED BROWN, SLIGHTLY MOIST TO MOIST, FAT CLAY - RESIDUUM

DEPTH (ft)	ELEV (ft)
0	822.7
5	817.7
10	812.7
15	807.7
20	802.7
25	797.7
30	792.7
35	787.7
40	782.7
45	777.7

SAMPLES

IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6"
SPT-1	▤	2-2-2-3
SPT-2	▤	3-5-8-12
SPT-3	▤	7-13-15-17
SPT-4	▤	13-15-15-19
SPT-5	▤	5-8-11-14
SPT-6	▤	3-5-8-13
SPT-7	▤	7-12-16-16
SPT-8	▤	9-9-13-14
SPT-9	▤	7-11-11-13
SPT-10	▤	9-8-16-14
SPT-11	▤	7-11-20-15
SPT-12	▤	6-8-11-13
SPT-13	▤	7-8-11-13
SPT-14	▤	9-9-11-14
SPT-15	▤	7-7-10-14
SPT-16	▤	6-6-7-9
SPT-17	▤	3-5-6-9
SPT-18	▤	5-5-7-7
SPT-19	▤	4-5-9-5
SPT-20	▤	3-5-8-7
SPT-21	▤	3-4-5-5
SPT-22	▤	4-7-5-8



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

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.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

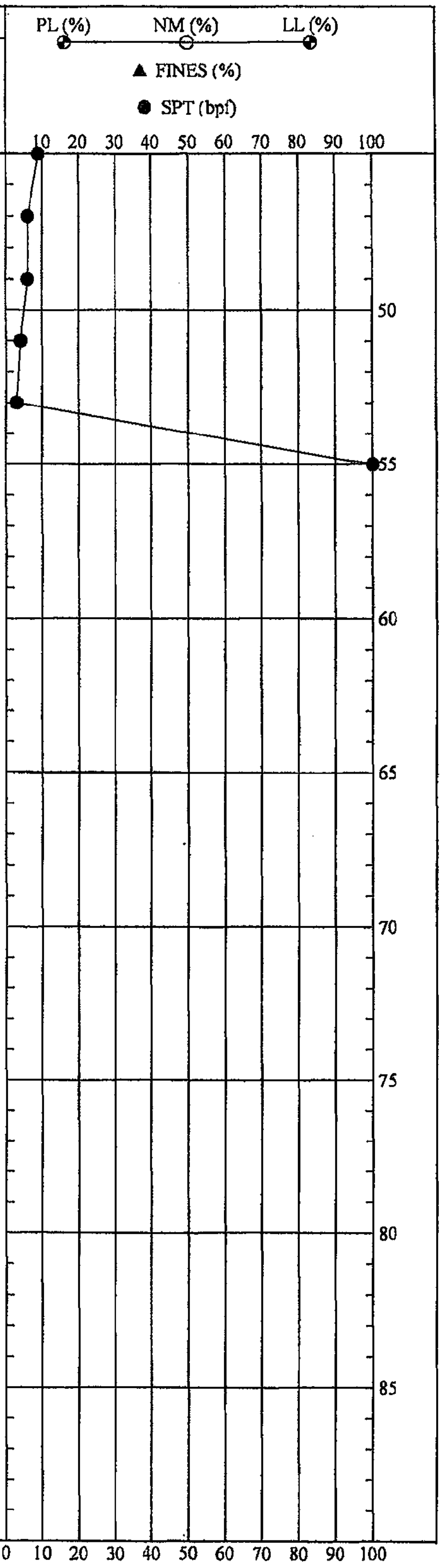
DRILLED: May 19, 2005 **BORING NO.:** NB-25

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 2

MACTEC

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6")
45		▨	777.7	SPT-23	▦	3-4-5-5
	FIRM, YELLOWISH BROWN AND RED BROWN, SLIGHTLY MOIST TO MOIST, FAT CLAY - RESIDUUM	▨		SPT-24	▦	2-3-3-5
	FIRM, REDDISH BROWN, MOIST, FAT CLAY - RESIDUUM	▨		SPT-25	▦	3-3-3-4
50	SOFT, REDDISH BROWN, MOIST TO VERY MOIST, FAT CLAY WITH A FEW CHERT FRAGMENTS - RESIDUUM	▨	772.7	SPT-26	▦	WOH-2-2-2
	▼	▨		SPT-27	▦	2-1-2-2
55	VERY HARD, LIGHT BROWNISH GRAY, SLIGHTLY MOIST, SANDY SILT WITH DOLOMITE FRAGMENTS - RESIDUUM AUGER REFUSAL AT 55.5'	▨	767.7	SPT-28	▦	10-27-50/0.1
60			762.7			
65			757 7			
70			752.7			
75			747.7			
80			742.7			
85			737.7			
90			732.7			



SOIL-4BLOWS-STB 3043051021_01.GPJ LAW_GIBB.GDT 10/4/05

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

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.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

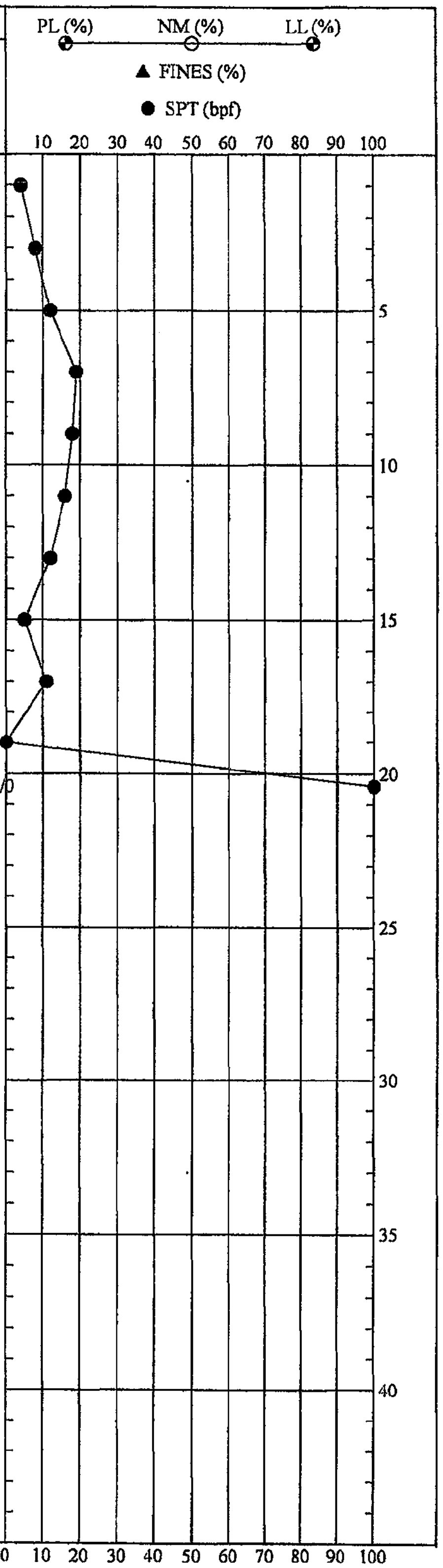
DRILLED: May 19, 2005 **BORING NO.:** NB-25

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)
0	TOPSOIL (0.4)	744.8
	SOFT, BROWN, MOIST, CLAYEY SILT WITH ROOTS - POSSIBLE ALLUVIUM	
	FIRM TO VERY STIFF, ORANGE BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS AND ROUNDED SANDSTONE FRAGMENTS - POSSIBLE ALLUVIUM ▼	
5		739.8
	VERY STIFF, ORANGE BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS - RESIDUUM	
10		734.8
	STIFF, ORANGE BROWN, SLIGHTLY MOIST TO MOIST, SILTY CLAY WITH CHERT FRAGMENTS AND BLACK MANGANESE STAINING - RESIDUUM ▽	
	FIRM, ORANGE BROWN, VERY MOIST TO WET, SILTY CLAY WITH CHERT FRAGMENTS AND BLACK MANGANESE STAINING - RESIDUUM	
15		729.8
	STIFF TO VERY SOFT, BROWN TO ORANGE BROWN, WET, SANDY SILT WITH CHERT FRAGMENTS - RESIDUUM	
20		724.8
	AUGER REFUSAL AT 20.4' BEGAN CORING AT 20.4' SLIGHTLY TO MODERATELY WEATHERED, MODERATELY CLOSELY JOINTED, LIGHT BROWNISH GRAY TO GRAY, FINE GRAINED, VERY STRONG (HARD) SILICEOUS **DOLOMITE**. BEDDING IS NOT EVIDENT. JOINTS EXHIBIT SOME SAND INFILLING AND IRON STAINING. JOINTS DIPPING FROM ABOUT 60° TO NEAR VERTICAL.	
25		719.8
30		714.8
	CORING TERMINATED AT 31.5'	
35		709.8
40		704.8
45		699.8

SAMPLES IDENT	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6")
SPT-1	2-2-2-3
SPT-2	3-3-5-5
SPT-3	5-6-6-8
SPT-4	8-8-11-13
SPT-5	7-10-8-10
SPT-6	3-7-9-11
SPT-7	5-5-7-7
SPT-8	2-3-2-2
SPT-9	50-8-3-3
SPT-10	WOH
SPT-11	WOH-WOH-50/0
RC-1	86-95
RC-2	64-74



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-35 OFFSET APPROXIMATELY 200.0' N45°E OF NB-36 AND ABOUT 20.0' SE FROM EDGE OF POND.

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.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

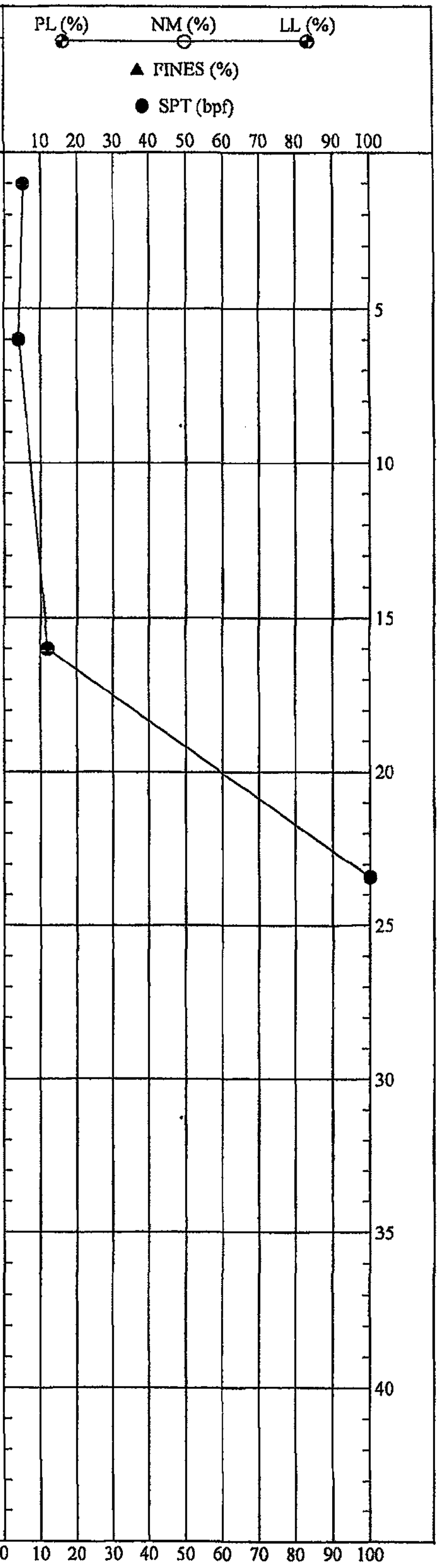
PROJECT: Proposed Gypsum Disposal Area

DRILLED: June 3, 2005 **BORING NO.:** NB-35

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	SAMPLES TYPE	SAMPLES N-COUNT 1st 6" 2nd 6" 3rd 6"
0	FIRM, BROWN, SLIGHTLY MOIST - TOPSOIL	▨	787.5			
				SPT-1	▨	1-2-3
	SOFT, RED BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT - RESIDUUM	▨				
5			782.5			
				SPT-2	▨	1-2-2
10	STIFF, RED BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS - RESIDUUM	▨	777.5	UD-1	■	1.0-1.2
15			772.5			
				SPT-3	▨	3-5-7
20			767.5	UD-2	■	1.65-2.0
	AUGER REFUSAL AT 23.2'			SPT-4	▨	50/0.2
25			762.5			
30			757.5			
35			752.5			
40			747.5			
45			742.5			



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NO GROUND WATER ENCOUNTERED AT TIME OF EXPLORATION

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 BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Bailey
Prepared By: Lawson
Checked By: Justice

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 23, 2005 **BORING NO.:** NB-39

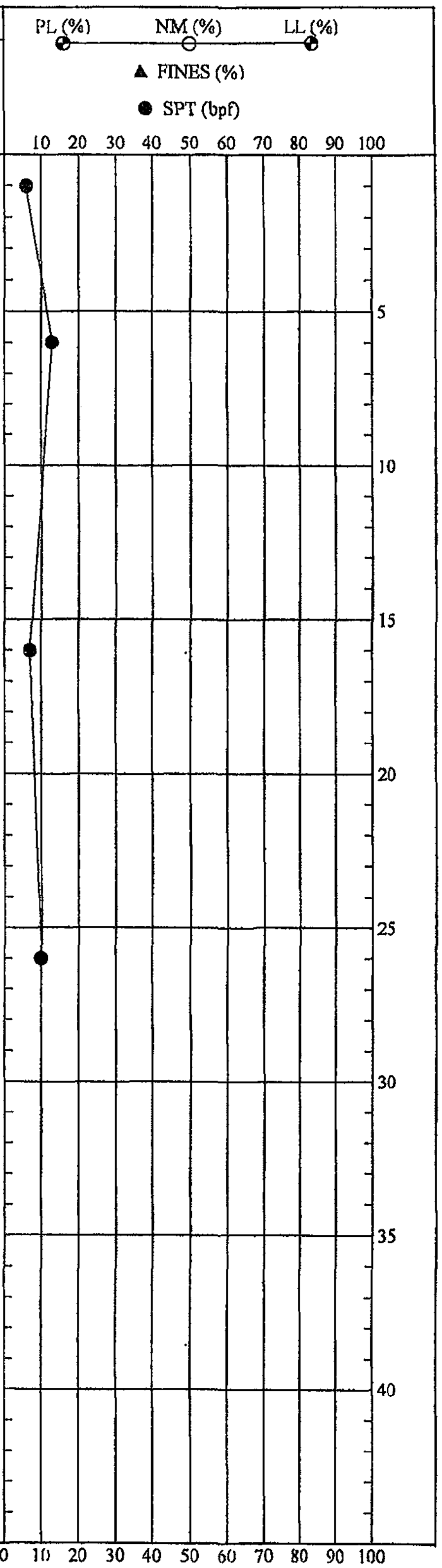
PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	FIRM, BROWN TO RED BROWN, SLIGHTLY MOIST, SILTY CLAY - RESIDUUM	809.2		
			SPT-1	1-2-4
	STIFF, RED BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT/LIMESTONE FRAGMENTS - RESIDUUM			
5		804.2		
			SPT-2	6-6-7
10	FIRM, RED BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS - RESIDUUM	799.2	UD-1	1.1-2.0
15		794.2		
			SPT-3	3-3-4
20	STIFF, RED BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS - RESIDUUM	789.2	UD-2	1.25-1.5
25		784.2		
			SPT-4	4-4-6
			UD-3	1.5-1.5
30		779.2		
	AUGER REFUSAL AT 31.0'			
35		774.2		
40		769.2		
45		764.2		



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NO GROUND WATER ENCOUNTERED AT TIME OF EXPLORATION.

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.

Driller : Bailey
Prepared By: Lawson
Checked By: Justice

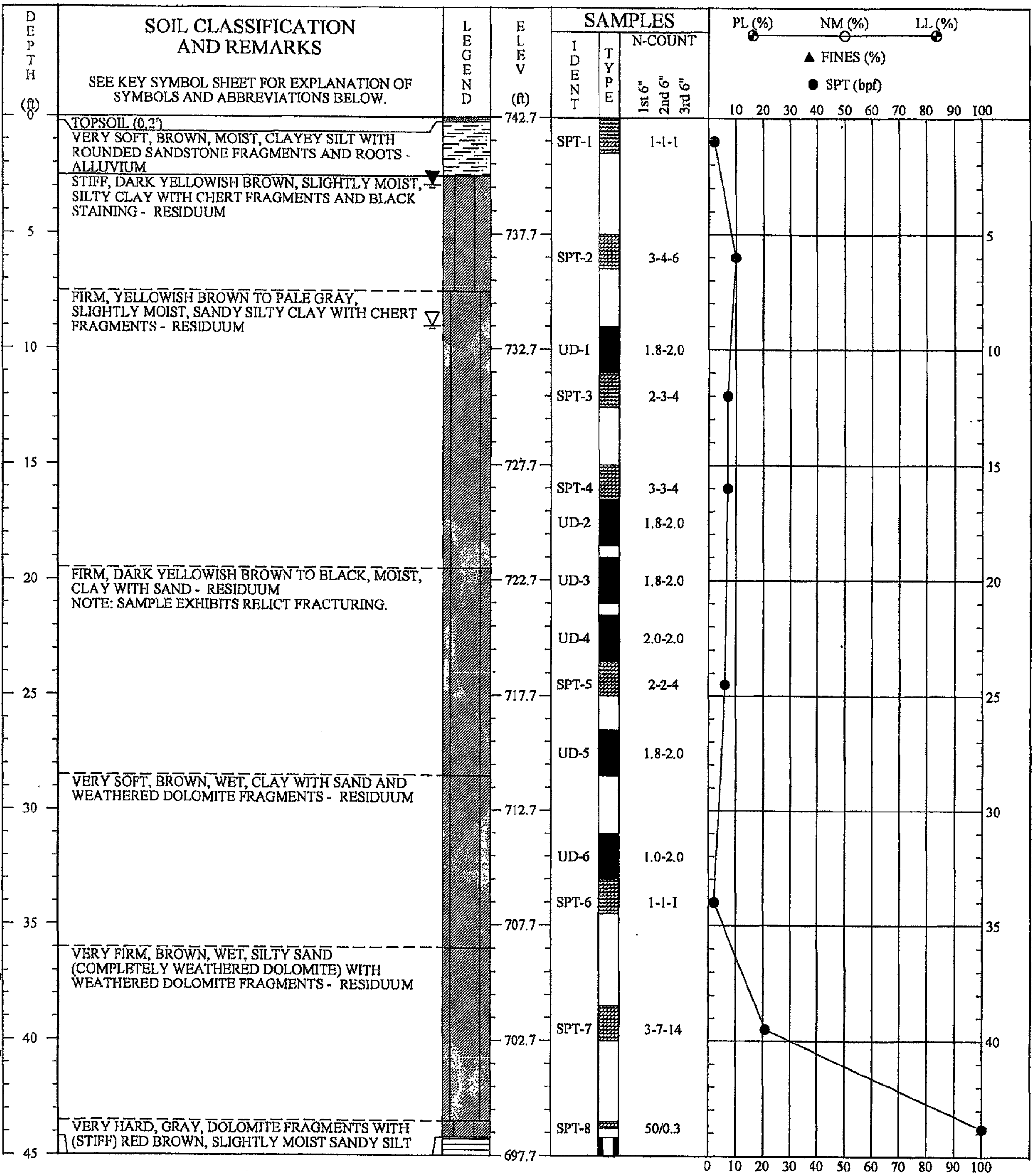
SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 23, 2005 **BORING NO.:** NB-41

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC



SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

TOPSOIL (0.2')

VERY SOFT, BROWN, MOIST, CLAYEY SILT WITH ROUNDED SANDSTONE FRAGMENTS AND ROOTS - ALLUVIUM

STIFF, DARK YELLOWISH BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS AND BLACK STAINING - RESIDUUM

FIRM, YELLOWISH BROWN TO PALE GRAY, SLIGHTLY MOIST, SANDY SILTY CLAY WITH CHERT FRAGMENTS - RESIDUUM

FIRM, DARK YELLOWISH BROWN TO BLACK, MOIST, CLAY WITH SAND - RESIDUUM
NOTE: SAMPLE EXHIBITS RELICT FRACTURING.

VERY SOFT, BROWN, WET, CLAY WITH SAND AND WEATHERED DOLOMITE FRAGMENTS - RESIDUUM

VERY FIRM, BROWN, WET, SILTY SAND (COMPLETELY WEATHERED DOLOMITE) WITH WEATHERED DOLOMITE FRAGMENTS - RESIDUUM

VERY HARD, GRAY, DOLOMITE FRAGMENTS WITH (STIFF) RED BROWN, SLIGHTLY MOIST SANDY SILT

SAMPLES

IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
SPT-1	1-1-1
SPT-2	3-4-6
UD-1	1.8-2.0
SPT-3	2-3-4
SPT-4	3-3-4
UD-2	1.8-2.0
UD-3	1.8-2.0
UD-4	2.0-2.0
SPT-5	2-2-4
UD-5	1.8-2.0
UD-6	1.0-2.0
SPT-6	1-1-1
SPT-7	3-7-14
SPT-8	50/0.3

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-44 OFFSET APPROXIMATELY 9.0' S85°E OF ORIGINAL STAKED LOCATION.

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 31, 2005

BORING NO.: NB-44

PROJ. NO.: 3043051021/0001

PAGE 1 **OF** 3

MACTEC

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.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
45	(LOCATED ON RELICT FRACTURE SURFACE) - RESIDUUM AUGER REFUSAL AT 44.2' BEGAN CORING AT 44.2'		697.7	RC-1		10-87
	SLIGHTLY TO COMPLETELY WEATHERED CLOSELY JOINTED, BROWNISH GRAY TO LIGHT GRAY, FINE GRAINED, VERY STRONG (HARD) **SILICEOUS DOLOMITE**. BEDDING IS AT AN APPARENT DIP OF 45° TO 50°. ORTHOGONAL (TO BEDDING) AND HIGH ANGLE (NEAR VERTICAL) JOINTS OBSERVED THROUGHOUT. BEDDING PLANE FRACTURES AND JOINTS EXHIBIT IRON-STAINING. NUMEROUS CLAY FILLED AND SAND FILLED CAVITIES ARE NOTED. PORTIONS OF RECOVERED ROCK CORE IS HIGHLY FRACTURED.			RC-2		28-51
50			692.7			
55	50.8' TO 51.7' = PARTIALLY CLAY-FILLED CAVITY 51.8' TO 53.3' = PARTIALLY CLAY-FILLED CAVITY 58.0' TO 58.4' = PARTIALLY CLAY-FILLED CAVITY 59.1' TO 60.6' = PARTIALLY CLAY-FILLED CAVITY 61.5' TO 63.0' = PARTIALLY CLAY-FILLED CAVITY 66.0' TO 66.7' = PARTIALLY CLAY-FILLED CAVITY 67.6' TO 68.0' = PARTIALLY CLAY-FILLED CAVITY 68.1' TO 69.6' = PARTIALLY SAND-FILLED CAVITY 73.2' TO 80.0' = PARTIALLY SAND-FILLED CAVITY 86.1' TO 94.1' = PARTIALLY CLAY-FILLED CAVITY		687.7	RC-3		11-43
60			682.7			
65			677.7	RC-4		20-56
70			672.7	RC-5		0-26
75			667.7			
80			662.7	RC-6		0-72
85			657.7	RC-7		5-24
90			652.7			

PL (%) NM (%) LL (%)

▲ FINES (%)

● SPT (bpf)

10 20 30 40 50 60 70 80 90 100

0 10 20 30 40 50 60 70 80 90 100

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 10/6/05

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-44 OFFSET APPROXIMATELY 9.0' S85°E OF ORIGINAL STAKED LOCATION.

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.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 31, 2005 **BORING NO.:** NB-44

PROJ. NO.: 3043051021/0001 **PAGE 2 OF 3**

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	SAMPLES TYPE	SAMPLES N-COUNT 1st 6" 2nd 6" 3rd 6"
90	SLIGHTLY TO COMPLETELY WEATHERED CLOSELY JOINTED, BROWNISH GRAY TO LIGHT GRAY, FINE GRAINED, VERY STRONG (HARD) **SILICEOUS DOLOMITE**. BEDDING IS AT AN APPARENT DIP OF 45° TO 50°. ORTHOGONAL (TO BEDDING) AND HIGH ANGLE (NEAR VERTICAL) JOINTS OBSERVED THROUGHOUT. BEDDING PLANE FRACTURES AND JOINTS EXHIBIT IRON-STAINING. NUMEROUS CLAY FILLED AND SAND FILLED CAVITIES ARE NOTED. PORTIONS OF RECOVERED ROCK CORE IS HIGHLY FRACTURED. 86.1' TO 94.1' = PARTIALLY SAND-FILLED CAVITY		652.7			
95			647.7	RC-8		52-100
100			642.7			
105	CORING TERMINATED AT 104.2'		637.7			
110			632.7			
115			627.7			
120			622.7			
125			617.7			
130			612.7			
135			607.7			

PL (%) NM (%) LL (%)

▲ FINES (%)

● SPT (bpf)

10 20 30 40 50 60 70 80 90 100

95 100 105 110 115 120 125 130

0 10 20 30 40 50 60 70 80 90 100

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 10/6/05

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-44 OFFSET APPROXIMATELY 9.0' S85°E OF ORIGINAL STAKED LOCATION.

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.

Driller : Akins

Prepared By: Justice

Checked By: Lawson

SOIL TEST BORING RECORD

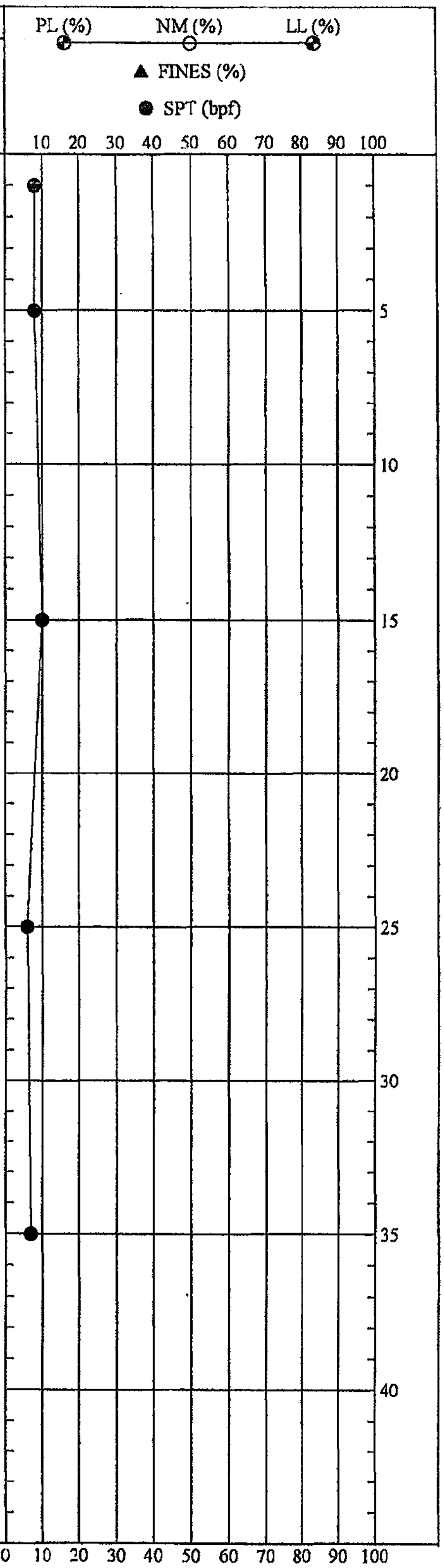
PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 31, 2005 **BORING NO.:** NB-44

PROJ. NO.: 3043051021/0001 **PAGE** 3 **OF** 3

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	FIRM, DARK YELLOWISH BROWN, SLIGHTLY MOIST, SLIGHTLY CLAYEY SILT (TOPSOIL)	762.8		
	FIRM, YELLOWISH RED (WITH OCCASIONAL 1mm BLACK MANGANESE NODULES), SLIGHTLY MOIST, SILTY CLAY - RESIDUUM		SPT-1	3-4-4
5		757.8	SPT-2	4-3-5
	STIFF, STRONG BROWN (WITH MINOR REDDISH YELLOW MOTTLING, AND BLACK, 1mm MANGANESE NODULES), SLIGHTLY MOIST, VERY SILTY CLAY. OCCASIONAL IRREGULAR 5 TO 1cm, VERY FINE SANDY ZONES.			
10		752.8		
15		747.8	SPT-3	4-4-6
	FIRM, STRONG BROWN, SANDY (FINE TO VERY COARSE, WITH OCCASIONAL 2 TO 3cm, ANGULAR, WEATHERED CHERT FRAGMENTS)M MOIST TO VERY MOIST, VERY SILTY CLAY - RESIDUUM ▼			
20		742.8		
25		737.8	SPT-4	3-3-3
	FIRM, STRONG BROWN, VERY MOIST TO WET, CLAY WITH SAND AND 1 TO 4cm, ANGULAR TO SUBANGULAR, WEATHERED CHERT FRAGMENTS - RESIDUUM			
30		732.8		
35		727.8	SPT-5	3-2-5
40	AUGER REFUSAL AT 40.0' BEGAN HQ CORING AT 40.0'	722.8	RC-1	44-55
45		717.8		



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

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.

Driller : Burnett
Prepared By: Mason
Checked By: Justice

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 16, 2005 **BORING NO.:** NB-47

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 2

MACTEC

SOIL 3043051021_01 GPJ LAW GIBB.GDT 10/6/05

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

PL (%) NM (%) LL (%)
▲ FINES (%)
● SPT (bpf)

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
45	**DOLOMITE** LIGHT GRAY TO LIGHT BROWNISH GRAY; DARKER MOTTLING MAY RANGE TO MEDIUM DARK GRAY. FINE GRAINED. CHERTY, USUALLY IN DISCRETE NODULES OR LAYERS UP TO A FEW CENTIMETERS IN THICKNESS. INDURATED. BEDDING IS THIN TO MEDIUM, AND AT AN APPARENT DIP OF ABOUT 30°. WEATHERING OVERALL IS SLIGHT TO MODERATE, WITH IRON STAINING ON FRACTURED SURFACES THROUGHOUT THE CORED SECTION. COMPLETE WEATHERING HAS RESULTED IN A CAVITY FROM APPROXIMATELY 42.4' TO 44.4'. THE DOLOMITE IS HARD. OVERALL, THE CORE IS SLIGHTLY FRACTURED, WITH MODERATELY WEATHERED BEDDING PLANE FRACTURES PREDOMINATING FROM ABOUT 47.1' TO 60.5', THE CORE IS MODERATELY FRACTURED FROM THE MECHANICAL OPENING OF SEVERAL CLOSELY SPACED (ABOUT 1 TO 2cm), SUBVERTICAL FRACTURES, SOME OF WHICH EXHIBIT SLICKEN-SIDED SURFACES. FROM APPROXIMATELY 47.1' TO 48.0', THE DOLOMITE APPEARS TO HAVE ABSORBED ENERGY FROM A FAULT EVENT, WITH CAVITIES RESULTING FROM FRACTURING / FAULTING BEING RECEMENTED WITH DOLOMITE.	717.8	RC-2	68-100
50		712.8		
			RC-3	92-98
55		707.8	RC-4	69-98
60		702.8		
65		697.8	RC-5	99-99
70	CORING TERMINATED AT 69.44'	692.8		
75		687.8		
80		682.8		
85		677.8		
90		672.8		

0 10 20 30 40 50 60 70 80 90 100

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 10/6/05

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

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.

Driller : Burnett
Prepared By: Mason
Checked By: Justice

SOIL TEST BORING RECORD

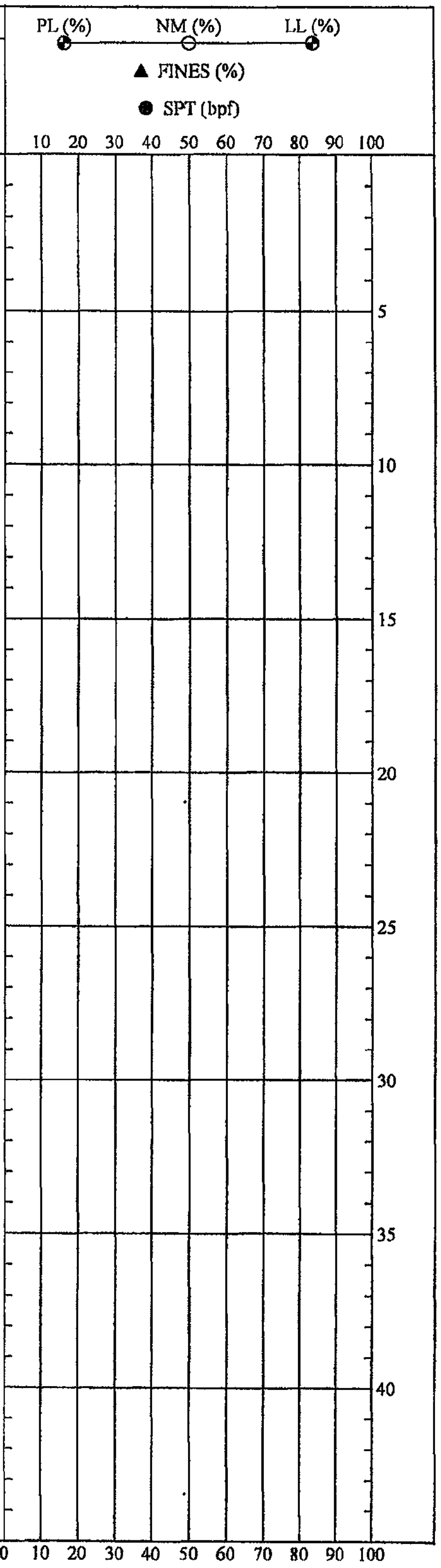
PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 16, 2005 **BORING NO.:** NB-47

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	AUGERED TO 9.0' AND BEGAN SHELBY TUBE SAMPLING.	762.9		
5		757.9		
10		752.9	UD-1	2.0-2.0
			UD-2	2.0-2.0
15		747.9	UD-3	1.3-1.7
	∇		UD-4	1.0-1.0
20		742.9		
			UD-5	1.1-2.0
25		737.9	UD-6	1.05-2.0
30		732.9	UD-7	2.0-2.0
			UD-8	0.0-2.0
35		727.9	UD-9	0.0-0.5
	BORING TERMINATED AT 36.5'			
40		722.9		
45		717.9		



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-47A WAS OFFSET APPROXIMATELY 9.0' N48°E OF NB-47.

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.

Driller : Bailey
Prepared By: Lawson
Checked By: Haston

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

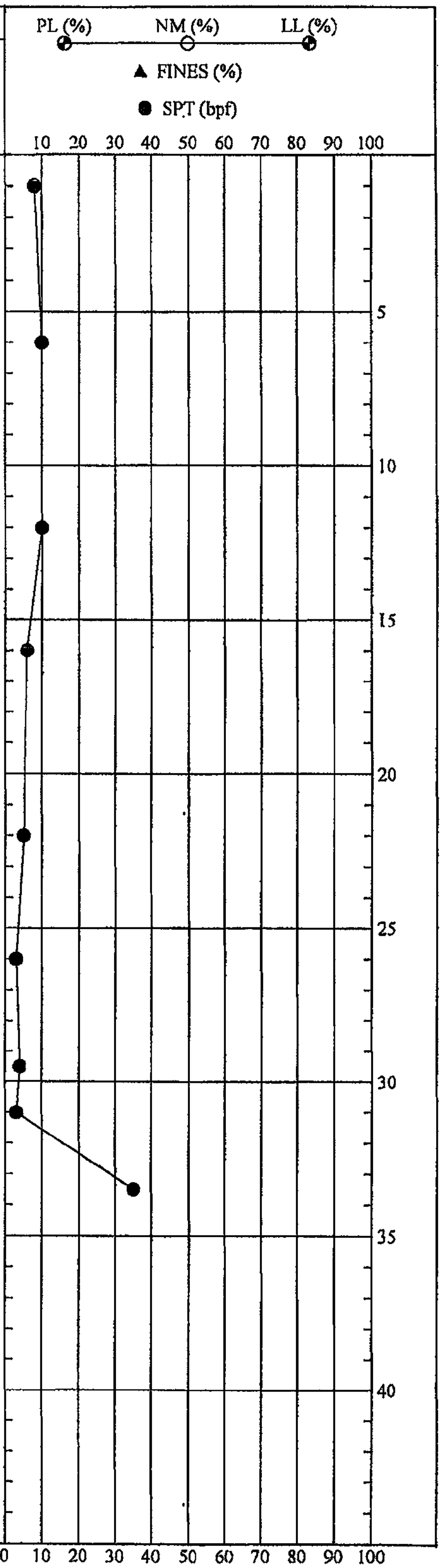
DRILLED: May 26, 2005 **BORING NO.:** NB-47A

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)
0	TOPSOIL (0.6')		758.3
	FIRM, BROWN, SLIGHTLY MOIST, SILTY CLAY WITH MANGANESE NODULES - RESIDUUM		
	STIFF, RED BROWN, SLIGHTLY MOIST, SILTY CLAY WITH MANGANESE NODULES - RESIDUUM		
5			753.3
	STIFF, RED BROWN, SLIGHTLY MOIST, SILTY CLAY - RESIDUUM		
10			748.3
	FIRM, RED BROWN, SLIGHTLY MOIST, SANDY CLAY - RESIDUUM		
15			743.3
		▼	
	FIRM, RED BROWN, MOIST, SANDY CLAY - RESIDUUM		
20		▽	738.3
	SOFT, RED BROWN, VERY MOIST, SANDY CLAY - RESIDUUM		
25			733.3
	SOFT, RED BROWN, VERY MOIST, SANDY CLAY WITH CHERT FRAGMENTS - RESIDUUM		
30			728.3
	DENSE, BROWN AND GRAY, DOLOMITE FRAGMENTS WITH SAND - RESIDUUM		
	AUGER REFUSAL AT 34.0'		
35			723.3
40			718.3
45			713.3

SAMPLES IDENT	N-COUNT (1st 6" 2nd 6" 3rd 6")
SPT-1	3-5-3
SPT-2	4-4-6
UD-1	2.0-2.0
SPT-3	3-4-6
SPT-4	3-3-3
UD-2	1.7-2.0
SPT-5	WOH-3-2
SPT-6	1-2-1
UD-3	2.0-2.0
SPT-7	1-1-3
SPT-8	1-1-2
SPT-9	13-19-16



SOIL 3043051021_01.GPJ LAW_GIBB.GDT 10/6/05

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

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.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

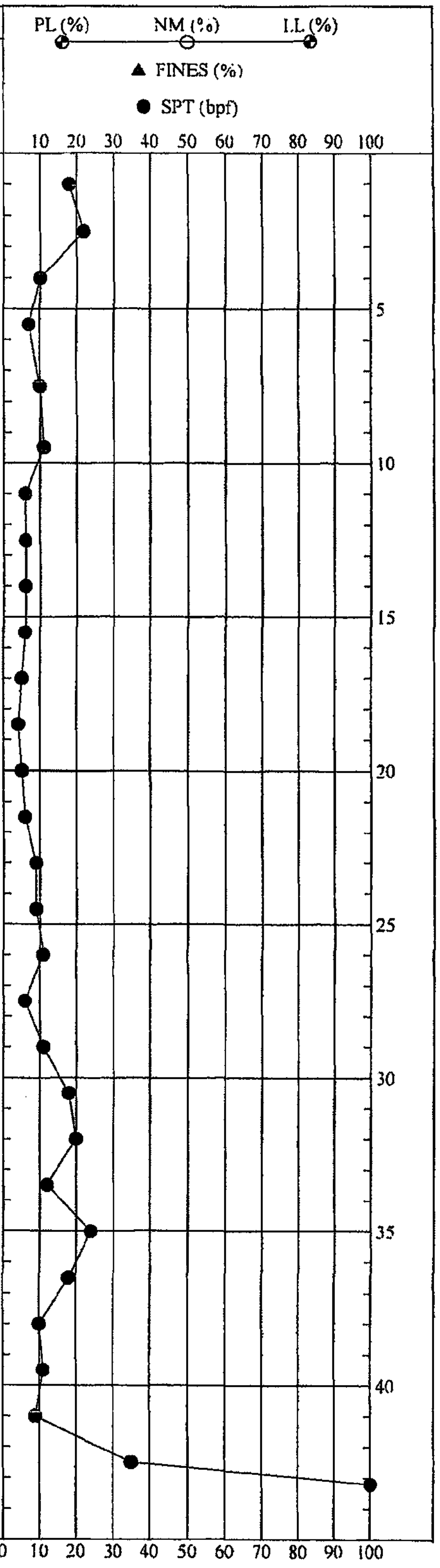
DRILLED: May 12, 2005 **BORING NO.:** NB-59

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)
0	TOPSOIL (0.2')	781.0
	VERY STIFF, BROWN, DRY, SILTY CLAY WITH A FEW CHERT FRAGMENTS AND BLACK MANGANESE NODULES - FILL	
	FIRM TO STIFF, ORANGE, SLIGHTLY MOIST TO MOIST, CLAY (FAT) WITH A FEW CHERT FRAGMENTS - RESIDUUM	
5		776.0
10	SOFT TO FIRM, REDDISH-ORANGE, YELLOWISH-BROWN, AND GRAY, MOIST, CLAY (FAT) WITH A FEW CHERT FRAGMENTS - RESIDUUM	771.0
15		766.0
	SANDY LAYER FROM 18.5' TO 19.0' (SANDY CLAY)	
20		761.0
	FIRM TO STIFF, REDDISH-ORANGE, SLIGHTLY MOIST CLAY (FAT) WITH SOME CHERT FRAGMENTS INCREASING WITH DEPTH FROM 22.0' TO 29.5' - RESIDUUM	
25		756.0
30	VERY STIFF, REDDISH-ORANGE, SLIGHTLY MOIST, CLAY (FAT) WITH MOSTLY CHERT FRAGMENTS (50%) - RESIDUUM	751.0
	STIFF, REDDISH-ORANGE, SLIGHTLY MOIST, CLAY (FAT) WITH A FEW CHERT FRAGMENTS - RESIDUUM	
35	STIFF TO VERY STIFF, REDDISH-ORANGE, MOIST, CLAY *FAT(WITH MOSTLY CHERT FRAGMENTS (50%) - RESIDUUM	746.0
	STIFF, DARK YELLOWISH-BROWN, SLIGHTLY MOIST TO VERY MOIST, CLAY (FAT) WITH A FEW CHERT FRAGMENTS - RESIDUUM	
40		741.0
	VERY HARD, GRAY, WET, DOLOMITE FRAGMENTS - RESIDUUM	
45		736.0

SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
SPT-1	4-6-12
SPT-2	6-11-11
SPT-3	4-5-5
SPT-4	3-3-4
SPT-5	2-4-6
SPT-6	3-5-6
SPT-7	2-3-3
SPT-8	2-3-3
SPT-9	1-3-3
SPT-10	1-3-3
SPT-11	1-2-3
SPT-12	2-2-2
SPT-13	2-2-3
SPT-14	2-3-3
SPT-15	2-5-4
SPT-16	1-4-5
SPT-17	3-5-6
SPT-18	1-2-4
SPT-19	3-4-7
SPT-20	7-9-9
SPT-21	5-12-8
SPT-22	4-6-6
SPT-23	12-16-8
SPT-24	8-12-6
SPT-25	4-4-6
SPT-26	2-5-6
SPT-27	2-4-5
SPT-28	3-25-10
SPT-29	50/0.2



SOIL 3043051021_01.GPJ LAW_GIBB.GDT 8/16/05

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-63 OFFSET APPROXIMATELY 39.0' S45°E OF THE ORIGINAL STAKED LOCATION.

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.

Driller : Warren
Prepared By: Justice
Checked By: Lawson

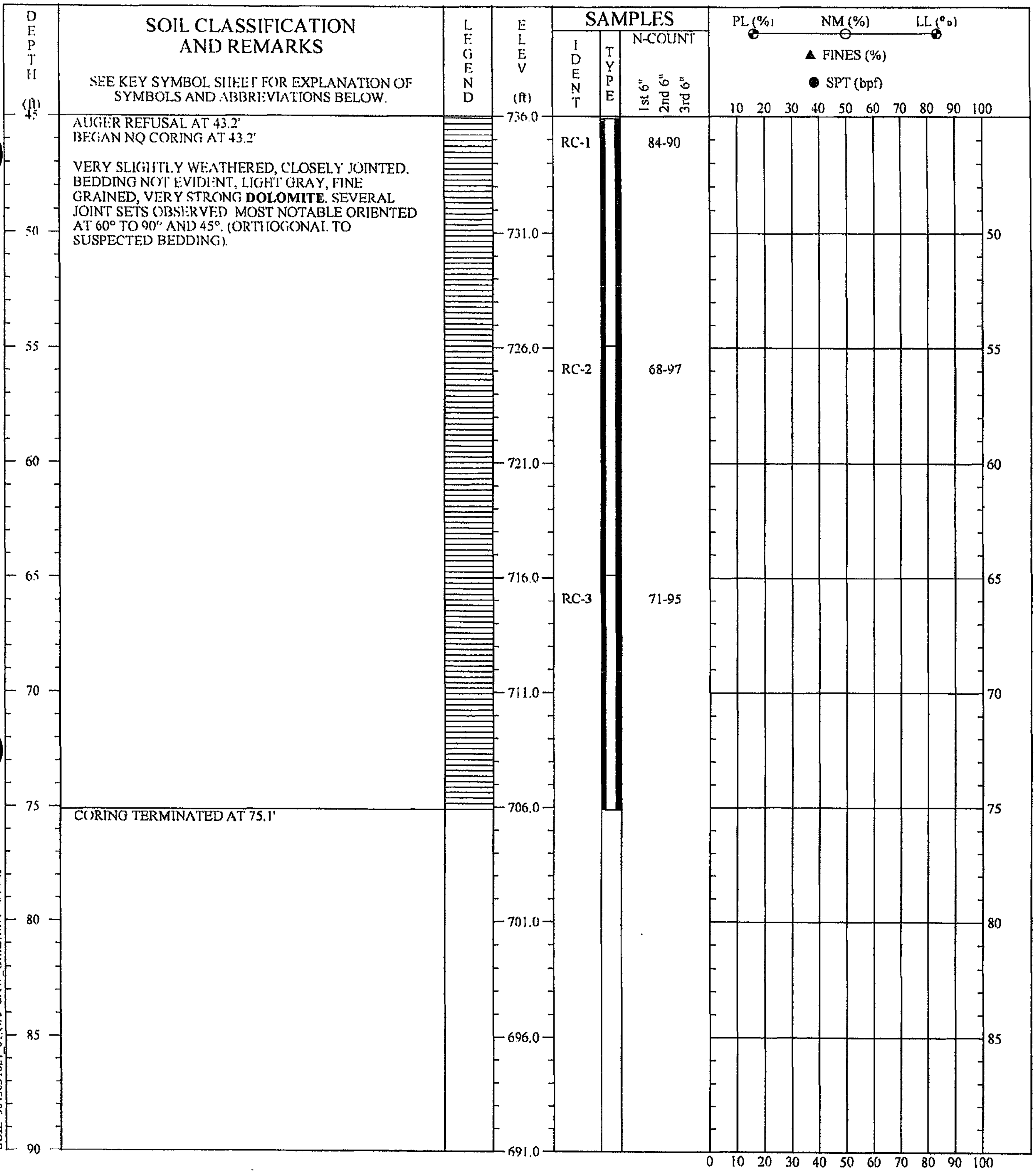
SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: April 29, 2005 **BORING NO.:** NB-63

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 2

MACTEC



AUGER REFUSAL AT 43.2'
BEGAN NQ CORING AT 43.2'

VERY SLIGHTLY WEATHERED, CLOSELY JOINTED. BEDDING NOT EVIDENT, LIGHT GRAY, FINE GRAINED, VERY STRONG **DOLOMITE**. SEVERAL JOINT SETS OBSERVED MOST NOTABLE ORIENTED AT 60° TO 90° AND 45°. (ORTHOGONAL TO SUSPECTED BEDDING).

CORING TERMINATED AT 75.1'

IDENT	N-COUNT
RC-1	84-90
RC-2	68-97
RC-3	71-95

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-63 OFFSET APPROXIMATELY 39.0' S45°E OF THE ORIGINAL STAKED LOCATION.

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.

Driller Warren
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: April 29, 2005 **BORING NO.:** NB-63

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	SAMPLES TYPE	SAMPLES N-COUNT 1st 6" 2nd 6" 3rd 6"
0	RAN HQ CASING TO A DEPTH OF 52.3' AND BEGAN HQ ROCK CORING		781.0			
5			776.0			
10			771.0			
15			766.0			
20			761.0			
25			756.0			
30			751.0			
35			746.0			
40			741.0			
45			736.0			
50	▽		731.0			
	VERY SLIGHTLY WEATHERED, CLOSELY JOINTED, BEDDING APPEARS TO BE FROM 40° TO 50°, LIGHT GRAY, FINE GRAINED, VERY STRONG **DOLOMITE**. SEVERAL JOINT SETS OBSERVED. MOST NOTABLE ORIENTED AT 60° TO 80° AND 45° (ORTHOGONAL TO BEDDING).	▤		RC-1		61-96
55		▤	726.0			
60		▤	721.0	RC-2		30-96
65		▤	716.0	RC-3		40-100
70		▤	711.0	RC-4		59-100
75		▤	706.0			
80		▤	701.0	RC-5		84-97
	HQ CORING TERMINATED AT 82.3'					
85			696.0			
90			691.0			

PL (%) NM (%) LL (%)

▲ FINES (%)

● SPT (bpf)

10 20 30 40 50 60 70 80 90 100

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

Driller : Warren

Prepared By: Justice

Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 6, 2005 **BORING NO.:** NB-63A

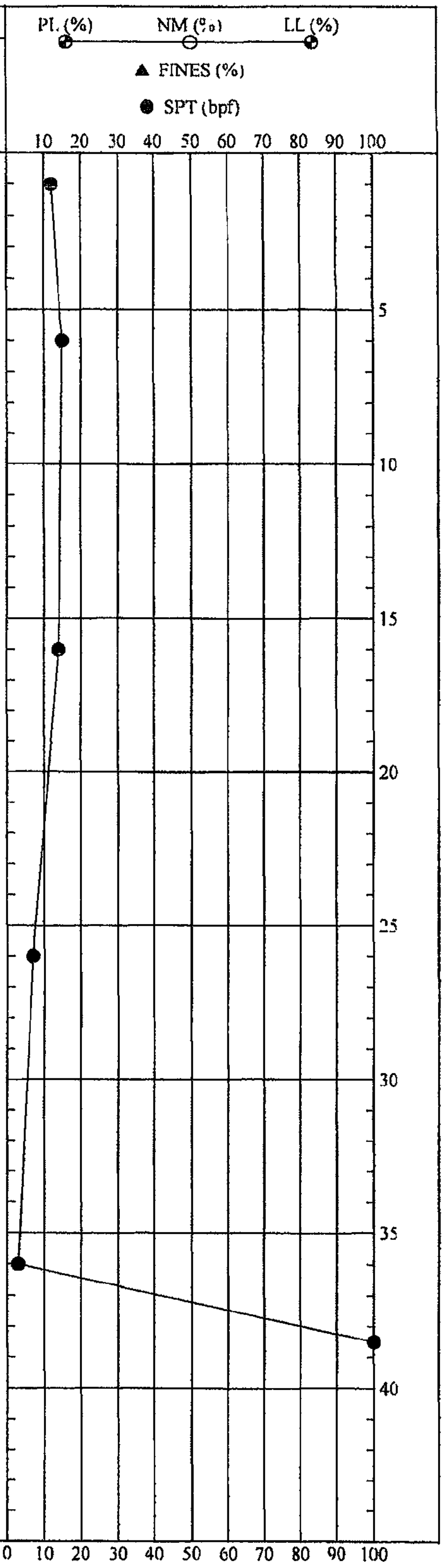
PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	TOPSOIL (0.1')	768.5			
	STIFF, RED BROWN, DRY, SILTY CLAY WITH A FEW CHERT FRAGMENTS AND SOME BLACK MANGANESE NODULES - RESIDUUM		SPT-1	▨	4-4-8
5		763.5	SPT-2	▨	5-6-9
10	STIFF, REDDISH ORANGE, SLIGHTLY MOIST, SANDY SILTY CLAY - RESIDUUM	758.5			
15		753.5	SPT-3	▨	5-6-8
20	FIRM, REDDISH ORANGE TO YELLOWISH BROWN, SLIGHTLY MOIST, SANDY CLAY - RESIDUUM	748.5			
	▼				
25		743.5	SPT-4	▨	2-3-4
30		738.5			
35	SOFT, BROWN, MOIST, SANDY CLAY WITH A FEW CHERT FRAGMENTS - RESIDUUM	733.5			
	SOFT, BROWN, VERY MOIST TO WET, SANDY SILT WITH FEW CHERT FRAGMENTS - RESIDUUM		SPT-5	▨	1-2-1
	VERY LOOSE, BROWN, WET, VERY SILTY SAND (COMPLETELY WEATHERED DOLOMITE) - RESIDUUM		SPT-6		50/0.1
40	AUGER REFUSAL AT 38.4'	728.5			
45		723.5			



SOIL 3043051021_01.GPJ LAW GIBB.GDT 8/16/05

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

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 BEWTEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller: Akins
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

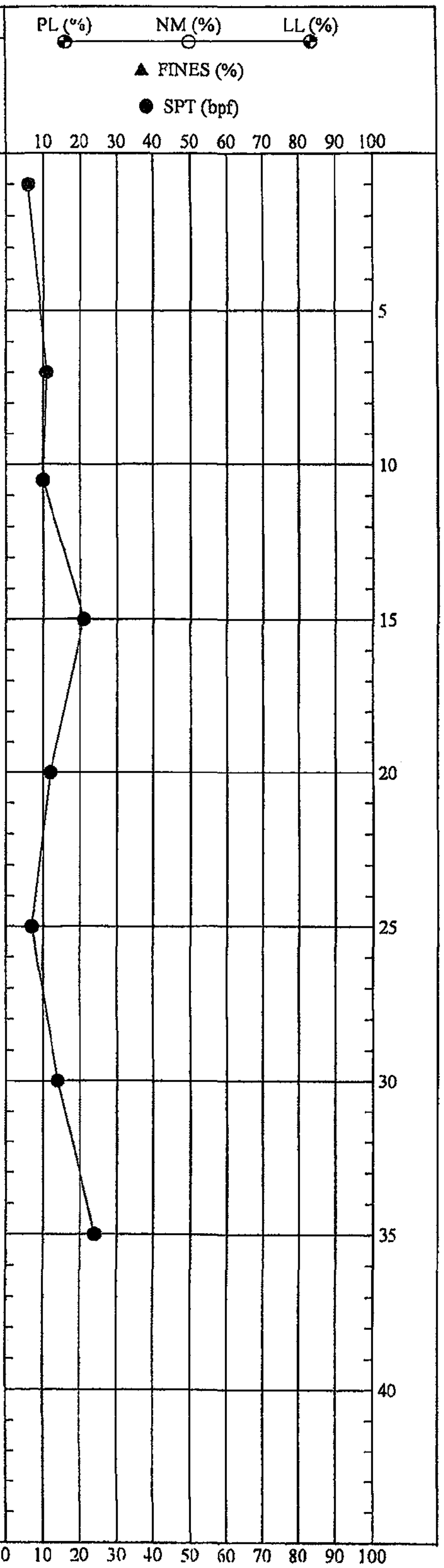
DRILLED: May 12, 2005 **BORING NO.:** NB-65

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)
0	FIRM, BROWN, CLAYEY SILT (TOPSOIL), SLIGHTLY MOIST - RESIDUUM	752.7
	STIFF, YELLOWISH RED, VERY SILTY CLAY, SLIGHTLY MOIST - RESIDUUM	
5		747.7
	STIFF, YELLOWISH RED, VERY SILTY CLAY, WITH OCCASIONAL 1mm, BLACK MANGANESE NODULES THROUGH-OUT, SLIGHTLY MOIST - RESIDUUM	
10		742.7
	▼	
	VERY STIFF, MOTTLED (YELLOWISH RED AND BROWNISH YELLOW), SILTY CLAY, SLIGHTLY MOIST. NOTE:SMALL, SATURATED ZONE SOMEWHERE ABOVE 12.0', OUTSIDE OF SPLIT SPOON IS WET - RESIDUUM	
15		737.7
	▽	
	STIFF, MOTTLED (YELLOWISH RED, BROWNISH YELLOW, AND BLACK FROM MANGANESE STAINING), VERY SLIGHTLY SANDY (FINE, MICACEOUS), SILTY CLAY, SLIGHTLY MOIST - RESIDUUM	
20		732.7
	FIRM, YELLOWISH BROWN, SLIGHTLY SANDY, SILTY CLAY, SLIGHTLY MOIST - RESIDUUM	
25		727.7
	STIFF, MOTTLED (DARK YELLOWISH BROWN, BLACK, AND YELLOW), SILTY CLAY WITH INCREASING SAND CONTENT WITH DEPTH, AS WELL AS 5mm TO 2cm, ROUNDED CHERT AND SEVERELY WEATHERED, ROUNDED SANDSTONE GRAVEL. HAS THE APPEARANCE OF POSSIBLE COLLUVIUM	
30		722.7
	VERY STIFF, BROWN, SLIGHTLY SANDY SILTY CLAY WITH ABUNDANT 1 TO 2.5cm, ANGULAR, SLIGHTLY WEATHERED CHERT FRAGMENTS, MOIST - RESIDUUM	
35		717.7
	AUGER REFUSAL AT APPROXIMATELY 36.4' SET NW CASING TO 38.5' BEGAN NQ CORING AT 36.4'	
40	**DOLOMITE**, LIGHT BROWNISH GRAY TO MEDIUM LIGHT GRAY. FINE GRAINED. MAY BE SLIGHTLY SILICEOUS; BRIGHT LIGHT MAY REFLECT SILICA. RECOVERED CORE IS INDURATED. BEDDING IS LIKELY AT AN APPARENT DIP OF 40° TO 50°, BUT IS LARGELY INDISTINCT. RECOVERED CORE PIECES ARE OVERALL SLIGHTLY TO MODERATELY WEATHERED; LOCALLY WEATHERING HAS	712.7
45		707.7

SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
SPT-1	3-3-3
UD-1	2.0-2.0
SPT-2	4-5-6
UD-2	1.7-2.0
SPT-3	2-5-5
UD-3	2.0-2.0
SPT-4	5-8-13
UD-4	2.0-2.0
SPT-5	4-6-6
UD-5	2.0-2.0
SPT-6	3-3-4
UD-6	1.9-2.0
SPT-7	2-6-8
UD-7	0.4-2.0
SPT-9	6-17-7
RC-1	0-56
RC-2	0-8



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

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Driller : Burnett
Prepared By: Mason
Checked By: Justice

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area
DRILLED: May 2, 2005 **BORING NO.:** NB-66
PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 2

MACTEC

SAMPLES

PL (%) NM (%) LL (%)

▲ FINES (%)

● SPT (bpf)

10 20 30 40 50 60 70 80 90 100

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
45	RESULTED IN CAVITIES (NOTED BELOW). RECOVERED CORE IS HARD. A PERVASIVE JOINT SET IS FORMED AT AN AVERAGE APPARENT DIP OF ABOUT 60°, WITH AN AVERAGE SPACING OF ABOUT 3 5cm. THIS JOINT SET APPEARS TO BE ORTHOGONAL WITH BEDDING. MANY JOINT SURFACES HAVE A THIN WHITE COATING OF DOLOMITE.	707.7	RC-3	0-57
50	OPEN CAVITY FROM 38 8' TO 46.0' OPEN CAVITY FROM 47 84' TO 48.3'	702.7		
			RC-4	20-41
55	**DOLOMITE**. MOTTLED (LIGHT BROWNISH GRAY AND BROWNISH GRAY). FINE GRAINED, WITH AN OFTEN "CRYSTALLINE" APPEARANCE. RECOVERED CORE IS INDURATED. THICKLY BEDDED WITHOUT DISTINCT, NOTICEABLE BEDDING SURFACES; BEDDING IS LIKELY AT 40° TO 50° APPARENT DIP. RECOVERED CORE IS SLIGHTLY WEATHERED, BUT MAY LOCALLY BE COMPLETELY WEATHERED, RESULTING IN CAVITIES (NOTED BELOW). RECOVERED CORE IS HARD THE DOLOMITE IS JOINTED WITH 55° APPARENT DIP JOINTS AT AN AVERAGE SPACING OF ABOUT 6"	697.7		
60		692.7		
	OPEN CAVITY FROM 57.5' TO 61.5'			
	CHERT. GRAYISH ORANGE PINK TO LIGHT BROWNISH GRAY: COLOR ALTERNATES IN 5mm-WIDE BANDS. FINE-GRAINED. SLIGHTLY WEATHERED, VERY HARD		RC-5	47-63
65		687.7		
	DOLOMITE. LIGHT GRAY TO MEDIUM LIGHT GRAY. FINE-GRAINED. INDURATED. BEDDING AT AN APPARENT DIP OF 40° TO 50°, AND MARKED BY THIN (1mm), DISCONTINUOUS DARK LAYERS THAT HAVE A SLIGHTLY STYLITIC APPEARANCE; THINLY BEDDED. SLIGHTLY WEATHERED, HARD.			
70	CORING TERMINATED AT 66.4'	682.7		
75		677.7		
80		672.7		
85		667.7		
90		662.7		

0 10 20 30 40 50 60 70 80 90 100

SOIL_3043051021_01.GPJ LAW_GIBB.GDT 8/16/05

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

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.

Driller : Burnett

Prepared By: Mason

Checked By: Justice

SOIL TEST BORING RECORD

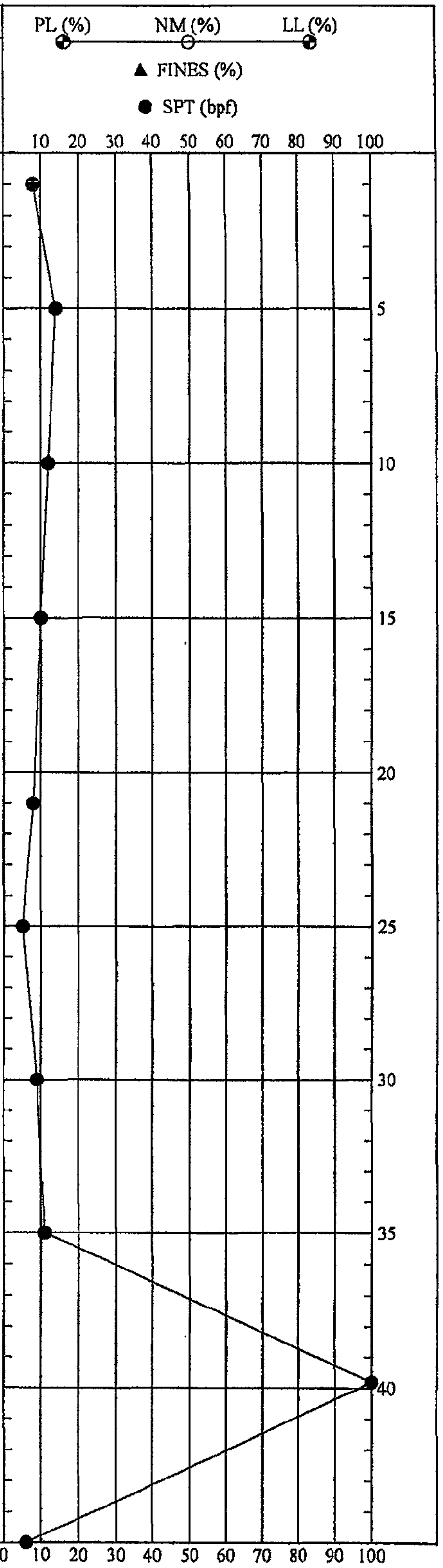
PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 2, 2005 **BORING NO.:** NB-66

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	SAMPLES IDENT	TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	FIRM, DARK YELLOWISH BROWN, SLIGHTLY MOIST, SLIGHTLY CLAYEY SILT - TOPSOIL	747.5			
	FIRM, YELLOWISH BROWN, SLIGHTLY MOIST, SLIGHTLY SANDY, VERY SILTY CLAY - RESIDUUM		SPT-1	▨	2-3-5
5	STIFF, MOTTLED (YELLOWISH BROWN AND BLACK SPOTTY MANGANESE STAINING), SLIGHTLY MOIST, VERY SILTY CLAY - RESIDUUM	742.5	SPT-2	▨	5-6-8
	▼				
10	▽ STIFF, MOTTLED (YELLOWISH BROWN AND BLACK SPOTTY MANGANESE STAINING), SLIGHTLY MOIST, VERY SILTY CLAY WITH OCCASIONAL 1 cm, BUFF-COLORED, WEATHERED CHERT - RESIDUUM	737.5	SPT-3	▨	3-5-7
15	STIFF, MOTTLED (BROWNISH YELLOW AND YELLOWISH BROWN), SLIGHTLY MOIST, VERY SILTY CLAY - RESIDUUM	732.5	SPT-4	▨	4-4-6
			UD-1	■	2.0-2.0
20	FIRM, MOTTLED (BROWNISH YELLOW, YELLOWISH BROWN, AND BLACK MANGANESE STAINING), MOIST, VERY SILTY CLAY - RESIDUUM	727.5	SPT-5	▨	3-4-4
25	FIRM, STRONG BROWN, MOIST, SANDY (VERY FINE SAND) CLAYEY SILT - RESIDUUM	722.5	SPT-6	▨	3-2-3
30	STIFF, STRONG BROWN, SLIGHTLY MOIST, SANDY (VERY FINE SAND) CLAYEY SILT WITH OCCASIONAL 5mm BUFF-COLORED TO LIGHT GRAY-COLORED, ANGULAR WEATHERED CHERT - RESIDUUM	717.5	SPT-7	▨	3-4-5
35	STIFF TO VERY HARD, STRONG BROWN, SLIGHTLY MOIST, SANDY (VERY FINE SAND) CLAYEY SILT WITH OCCASIONAL 3.5mm BUFF TO WHITE WEATHERED CHERT - RESIDUUM	712.5	SPT-8	▨	3-5-6
40	NOTE: NO RECOVERY; THREADED UPPER SECTION OF SPLIT SPOON BROKE OFF INTO SPLIT SPOON HEAD. AUGER REFUSAL AT 40.0'. OFF SET 5.0 FEET N11°E TO NB-73A AND AUGERED TO 44.0' AND BEGAN SPLIT-SPOON SAMPLING.	707.5	SPT-9	▨	38-50/0.3
				▨	
45		702.5			



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-73A WAS OFFSET APPROXIMATELY 5.0' N11°E OF NB-73.

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.

Driller : Burnett
Prepared By: Mason
Checked By: Haston

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

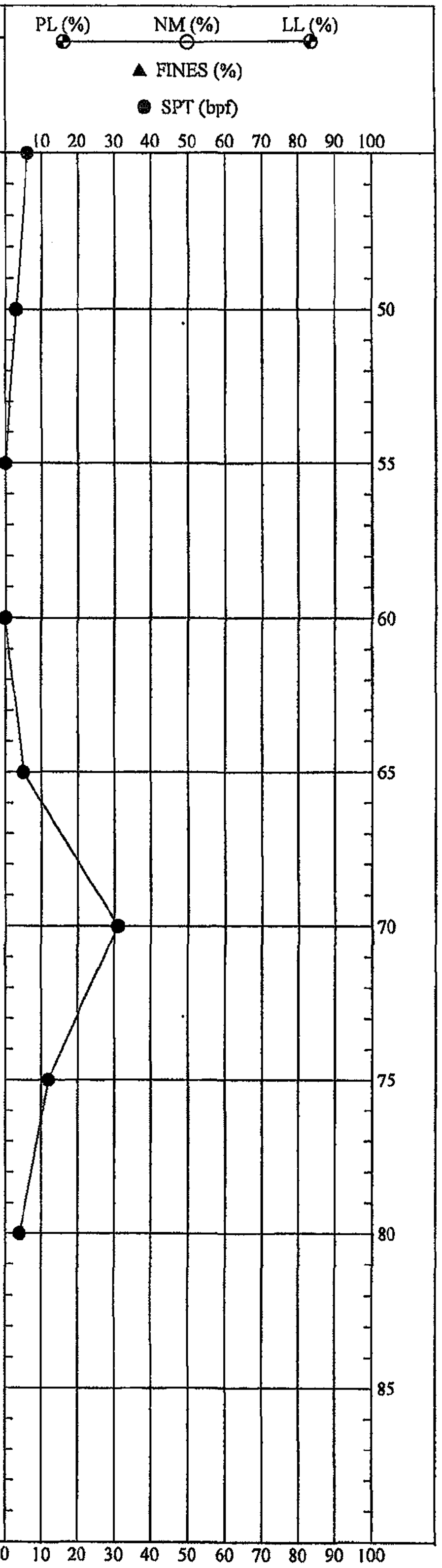
DRILLED: May 4, 2005 **BORING NO.:** NB-73/73A

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 2

MACTEC

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
45	FIRM, MOTTLED (BROWNISH YELLOW, YELLOWISH BROWN, AND BLACK MANGANESE STAINING), MOIST, VERY SILTY CLAY - RESIDUUM	702.5	SPT-10	2-3-3
50	SOFT, YELLOWISH BROWN, MOIST, SLIGHTLY CLAYEY VERY SANDY (FINE SAND) SILT - RESIDUUM	697.5	SPT-11	3-1-2
55		692.5	SPT-12	WOH
60		687.5	SPT-13	WOH
65	FIRM, VERY DARK GRAY TO GREENISH GRAY, SLIGHTLY MOIST, SANDY SILT - RESIDUUM	682.5	SPT-14	3-4-1
70	HARD, PALE YELLOW, VERY MOIST TO WET, SANDY (VERY FINE) SILT, WITH OCCASIONAL FRAGMENTS OF WEATHERED DOLOMITE - RESIDUUM	677.5	SPT-15	12-20-11
75	FIRM, LIGHT YELLOWISH-BROWN, VERY MOIST TO WET, VERY SILTY SAND (FINE TO MEDIUM), WITH OCCASIONAL LITHIC FRAGMENTS - RESIDUUM	672.5	SPT-16	4-7-5
80	VERY LOOSE, BROWNISH YELLOW, MOIST TO WET, FINE TO MEDIUM SILTY SANDY - RESIDUUM BORING TERMINATED AT 80.5' NOTE: AUGERS APPEAR TO BE "LEADING OFF" (OFFSET FROM VERTICAL) DUE TO SUSPECTED SOLUTIONED SLOTS WITHIN HIGHLY WEATHERED BEDROCK INTERVAL	667.5	SPT-17	2-2-2
85		662.5		
90		657.5		



REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-73A WAS OFFSET APPROXIMATELY 5.0' N11°E OF NB-73.

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

Driller : Burnett
Prepared By: Mason
Checked By: Haston

SOIL TEST BORING RECORD

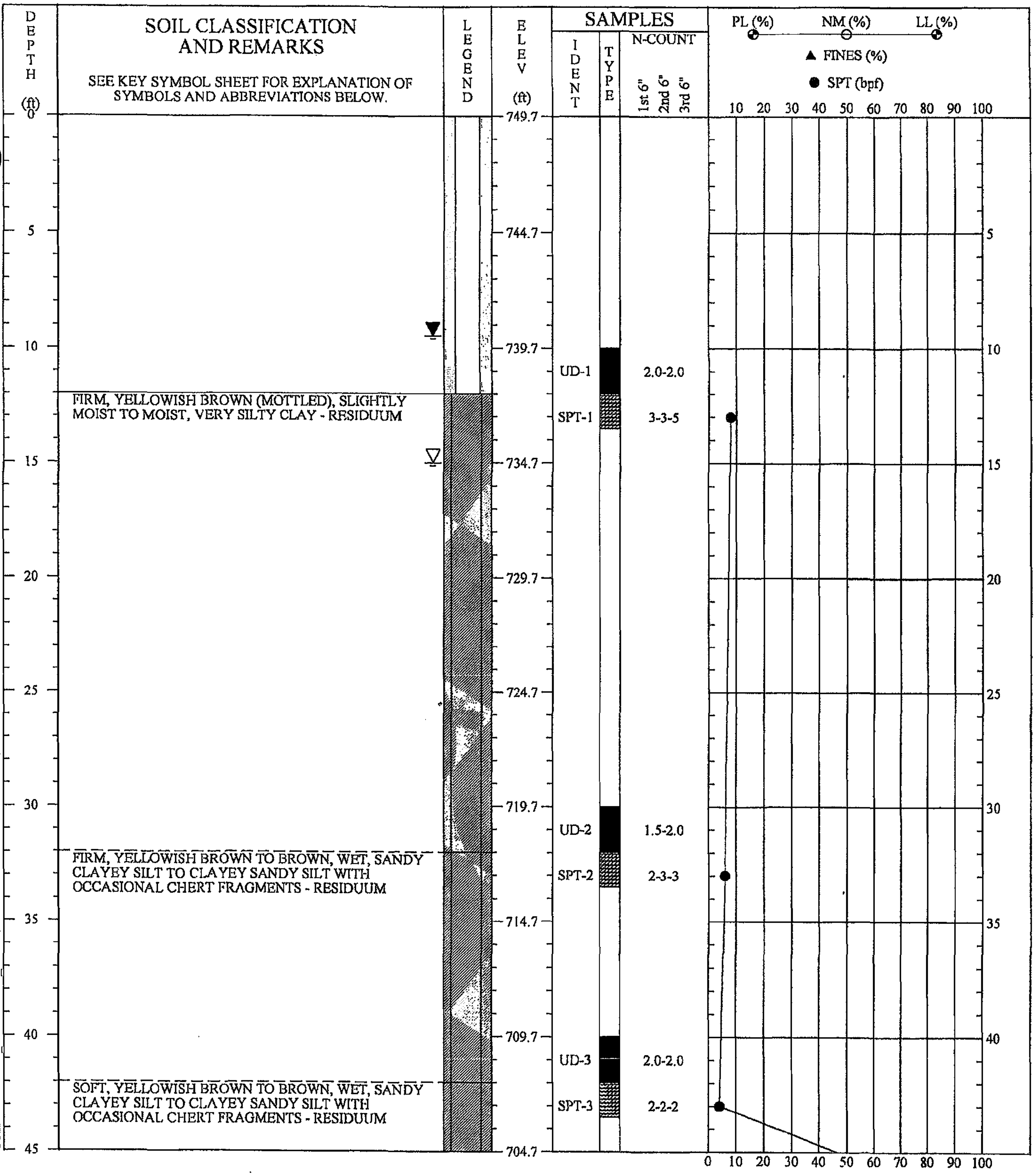
PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 4, 2005 **BORING NO.:** NB-73/73A

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 2

MACTEC

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 10/6/05



SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

FIRM, YELLOWISH BROWN (MOTTLED), SLIGHTLY MOIST TO MOIST, VERY SILTY CLAY - RESIDUUM

FIRM, YELLOWISH BROWN TO BROWN, WET, SANDY CLAYEY SILT TO CLAYEY SANDY SILT WITH OCCASIONAL CHERT FRAGMENTS - RESIDUUM

SOFT, YELLOWISH BROWN TO BROWN, WET, SANDY CLAYEY SILT TO CLAYEY SANDY SILT WITH OCCASIONAL CHERT FRAGMENTS - RESIDUUM

SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
UD-1	2.0-2.0
SPT-1	3-3-5
UD-2	1.5-2.0
SPT-2	2-3-3
UD-3	2.0-2.0
SPT-3	2-2-2

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 9/16/05

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-73W WAS OFFSET APPROXIMATELY 48.9' W OF NB-73.

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.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

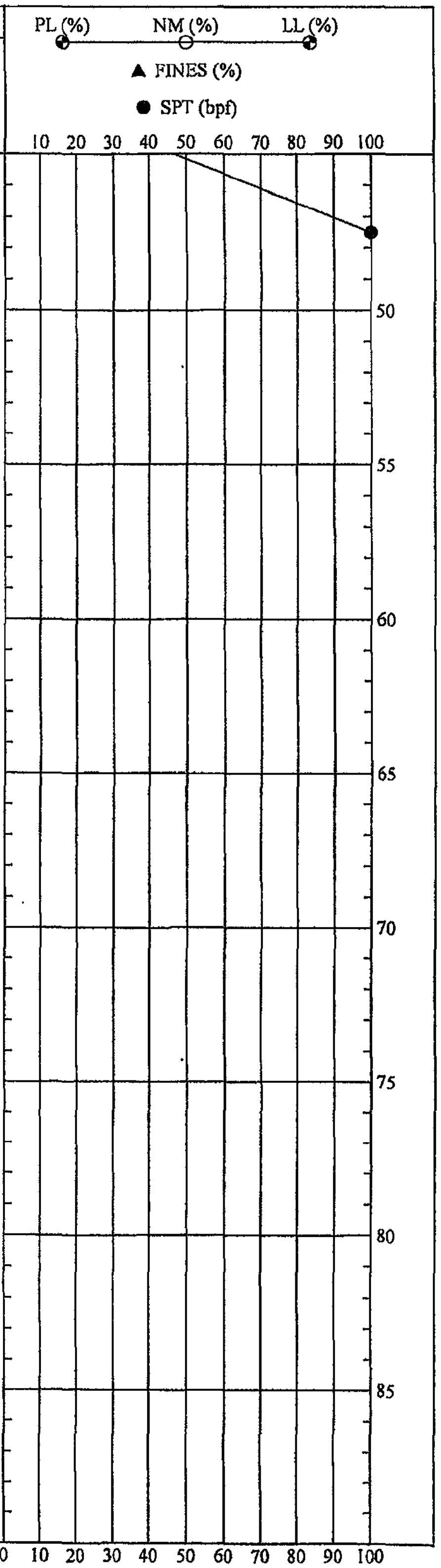
PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 18, 2005 **BORING NO.:** NB-73W

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	SAMPLES TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
45	SOFT, YELLOWISH BROWN TO BROWN, WET, SANDY CLAYEY SILT TO CLAYEY SANDY SILT WITH OCCASIONAL CHERT FRAGMENTS - RESIDUUM	▨	704.7			
	AUGER REFUSAL AT 47.5' BEGAN NQ CORING AT 47.3'	▤		SPT-4 RC-1		50/0.0 0-24
50	SLIGHTLY TO COMPLETELY WEATHERED, BROWNISH GRAY TO LIGHT GRAY, FINE GRAINED, RECOVERED CORE IS HARD SILICEOUS CHERTY **DOLOMITE**. RECOVERED CORE IS HIGHLY FRACTURED. NOTE: ENCOUNTERED TOP OF WEATHERED BEDROCK AT ABOUT 46.0'.		699.7			
55	CORING TERMINATED AT 49.8'		694.7			
60			689.7			
65			684.7			
70			679.7			
75			674.7			
80			669.7			
85			664.7			
90			659.7			



SOIL 3043051021_01.GPJ LAW_GIBB.GDT 9/16/05

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-73W WAS OFFSET APPROXIMATELY 48.9' W OF NB-73.

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.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

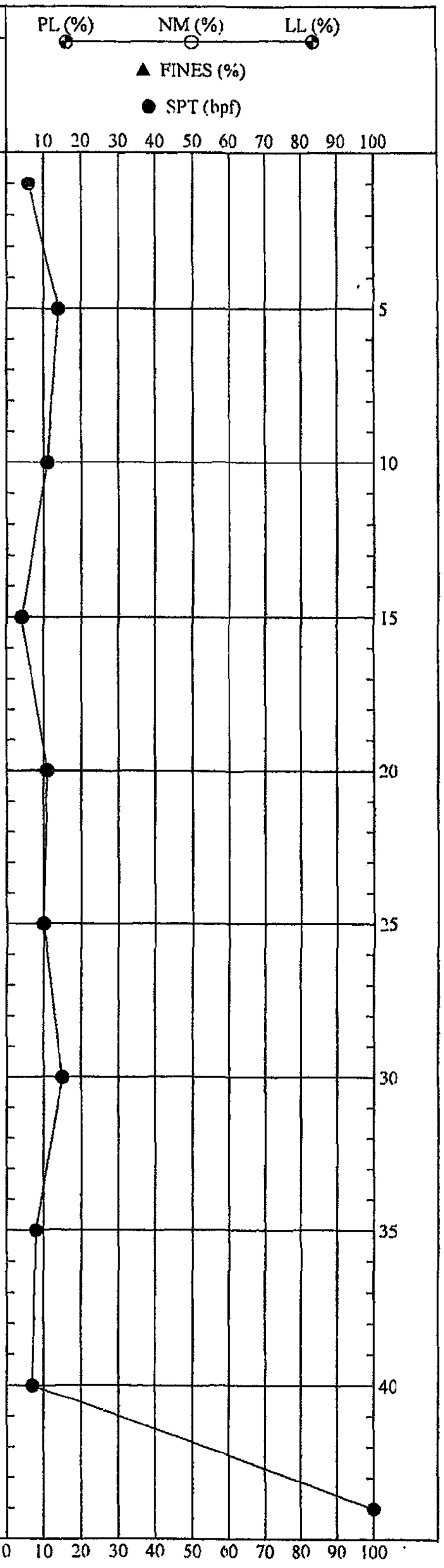
PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 18, 2005 **BORING NO.:** NB-73W

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS — SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)	SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	FIRM, BROWN, SLIGHTLY MOIST, VERY SILTY CLAY - TOPSOIL (0.6') FIRM, YELLOWISH RED, SLIGHTLY MOIST, VERY SILTY CLAY - RESIDUUM	752.1		
			SPT-1	2-3-3
5	STIFF, YELLOWISH RED (WITH OCCASIONAL BROWNISH YELLOW AND SPOTTY MANGANESE MOTTLING), SLIGHTLY MOIST, SILTY CLAY - RESIDUUM	747.1	SPT-2	5-7-7
			UD-1	1.2-2.0
10	FIRM, REDDISH YELLOW, SLIGHTLY MOIST, CLAYEY TO VERY CLAYEY SAND (FINE TO MEDIUM) - RESIDUUM ▼	742.1	SPT-3	4-5-6
			UD-2	1.3-2.0
15	VERY LOOSE, REDDISH YELLOW, SLIGHTLY MOIST TO MOIST, SILTY TO VERY SILTY, FINE TO MEDIUM SAND - RESIDUUM ▽	737.1	SPT-4	1-2-2
			UD-3	1.7-2.0
20	FIRM, YELLOWISH BROWN (WITH SOME BLACK MOTTLING), VERY MOIST, VERY SILTY FINE TO MEDIUM SAND - RESIDUUM FIRM, YELLOWISH BROWN TO VERY DARK GRAYISH BROWN, MOIST, SANDY FINE TO COARSE, SUBROUNDED TO ROUNDED, QUARTZ GRAVEL - RESIDUUM	732.1	SPT-5	7-6-5
			UD-4	1.2-2.0
25	STIFF, MOTTLED (STRONG BROWN TO YELLOW), SLIGHTLY MOIST, SILTY CLAY, WITH 5mm TO 2cm, ANGULAR, WHITE TO LIGHT GRAY CHERT FRAGMENTS FROM 24.3' TO 24.7' - RESIDUUM	727.1	SPT-6	4-4-6
			UD-5	1.4-2.0
30	STIFF, STRONG BROWN (WITH SPOTTY BLACK MOTTLING), SLIGHTLY MOIST, VERY SILTY CLAY WITH 2 TO 6mm, DARK GRAY TO BUFF-COLORED, ANGULAR CHERT FRAGMENTS THROUGHOUT - RESIDUUM	722.1	SPT-7	4-5-10
			UD-6	0.5-2.0
35	FIRM, MOTTLED (STRONG BROWN, YELLOWISH BROWN, BLACK AND PALE YELLOW), SLIGHTLY MOIST, SILTY CLAY WITH OCCASIONAL CONCENTRATIONS OF 1mm TO 3cm, BUFF TO DARK GRAY, ANGULAR CHERT FRAGMENT - RESIDUUM	717.1	SPT-8	2-3-5
40		712.1	SPT-9	2-3-4
	AUGER REFUSAL AT 44.0'. BEGAN NQ CORING AT		SPT-10	50/0.0
45		707.1		



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

Driller : Burnett
Prepared By: Mason
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 5, 2005 **BORING NO.:** NB-74

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 2

MACTEC

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

44.0'

DOLOMITE. LIGHT BROWNISH GRAY TO BROWNISH GRAY. FINE GRAINED: UPPER TWO FEET HAS A CRYSTALLINE APPEARANCE, AND MAY BE SLIGHTLY SILICEOUS. OTHER PORTIONS MAY BE SLIGHTLY CALCIC, WITH A VERY WEAK REACTION OCCASIONALLY TO DILUTE HCL RECOVERED CORE IS INDURATED. DISTINCT, IDENTIFIABLE BEDDING FEATURES ARE NOT READILY NOTICEABLE. WEATHERING RANGES FROM SLIGHT TO COMPLETE, RESULTING IN MULTIPLE CAVITIES (DESCRIBED BELOW), RECOVERED PIECES OF DOLOMITE ARE HARD. THE DOLOMITE IS CONSIDERABLY FRACTURED: INTACT CORE PIECES EXHIBIT A JOINT SET AT AN AVERAGE APPARENT DIP OF 60° WITH A SPACING OF ABOUT 1/2 INCH. MANY OF THESE FRACTURES ARE HEALED WITH WHITE DOLOMITE AND ARE OCCASIONALLY INTERSECTED BY AN ORTHOGONAL SET OF JOINTS WITH AN APPARENT DIP OF 50°.

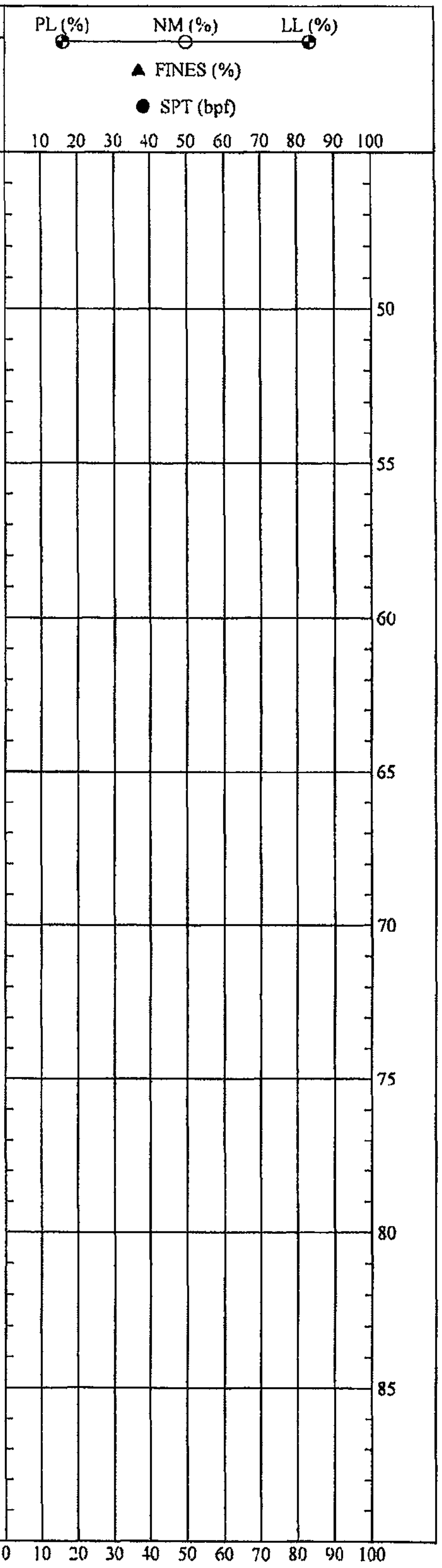
45.4' TO 46.0 ' = CHERTY
47.3' TO 51.1' = CLAY-FILLED CAVITY (CLAY WASHED OUT DURING DRILLING
51.3' TO 54.2' = CAVITY; VERY SOFT FILLING
54.4' TO 54.8' = CAVITY
61.4' TO 65.7' = CAVITY
66.0' TO 68.0' = CAVITY
68.4' TO 68.75' = CHERT LAYER. PINKISH GRAY MATRIX, WITH ABUNDANT 1 TO 7mm, SUBROUNDED QUARTZ CLASTS.
68 75' TO 72.5' = THE ADVANCE OF THE CORE BARREL INDICATES REPEATED INTERVALS OF ALTERNATELY HARD / SOFT MATERIAL IN INCREMENTS TOO SMALL TO MEASURE. ONLY A FEW FRAGMENTS OF DOLOMITE WERE RECOVERED FROM THIS INTERVAL; THE LARGEST INTACT SECTION WAS FROM ABOUT 71.9' TO 72.5'
72.5' TO 75.3' = CAVITY

OVER ALL DRILLING WATER RETURN WAS AT APPROXIMATELY 30%, WHICH MAY INDICATE CLAY FILL IN MOST OF THE CAVITIES

CORING TERMINATED AT 75.8'

DEPTH (ft)	ELEV (ft)
45	707.1
50	702.1
55	697.1
60	692.1
65	687.1
70	682.1
75	677.1
80	672.1
85	667.1
90	662.1

SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
RC-1	20-23
RC-2	20-40
RC-3	3-15



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

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.

Driller : Burnett
Prepared By: Mason
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 5, 2005 **BORING NO.:** NB-74

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)
0	NOTE: OFFSET APPROXIMATELY 8.0 FEET N65°E OF BORING LOCATION NB-74.	752.3
5		747.3
10		742.3
15		737.3
20		732.3
25		727.3
27.0	BORING TERMINATED AT 27.0'	
30		722.3
35		717.3
40		712.3
45		707.3

SAMPLES

IDENT	N-COUNT (1st 6" 2nd 6" 3rd 6")
UD-1	1.9-2.0
UD-2	1.8-2.0
UD-3	1.9-2.0
UD-4	1 7-2.0
UD-5	1.0-2.0
UD-6	1.7-2.0
UD-7	1.2-2.0
UD-8	1.3-2.0

PL (%) NM (%) LL (%)

▲ FINES (%)

● SPT (bpf)

10 20 30 40 50 60 70 80 90 100

0 10 20 30 40 50 60 70 80 90 100

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 10/6/05

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NO GROUND WATER ENCOUNTERED AT TIME OF EXPLORATION. NB-74A WAS OFFSET APPROXIMATELY 8.0' N65°E OF NB-74.

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.

Driller : Burnett
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

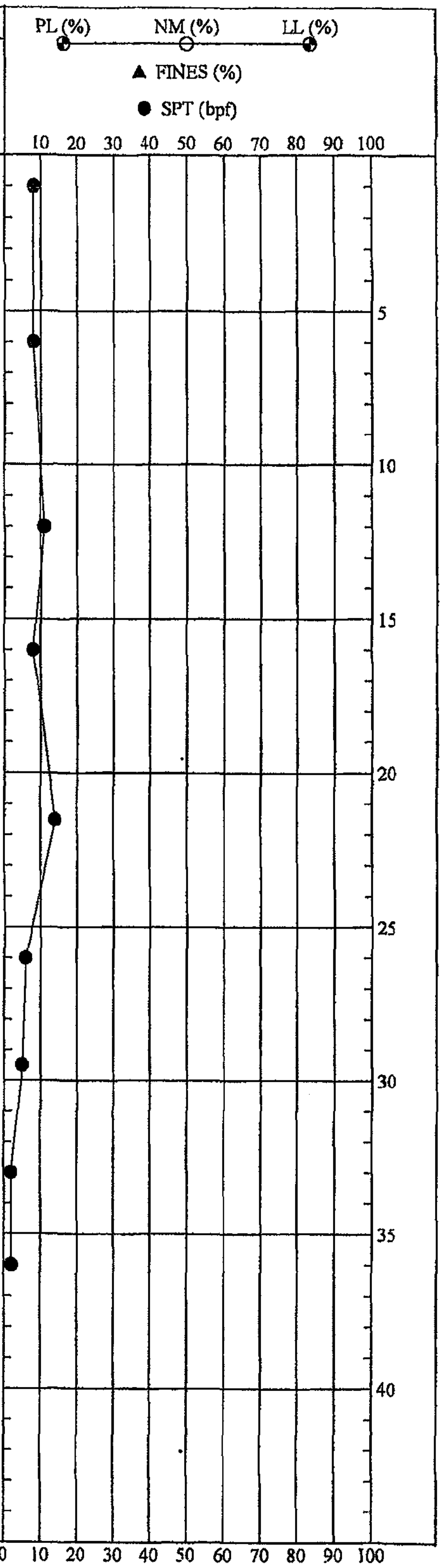
DRILLED: May 11, 2005 **BORING NO.:** NB-74A

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	TOPSOIL (0.5') FIRM, REDDISH BROWN, DRY TO SLIGHTLY MOIST, SILTY CLAY WITH A FEW BLACK MANGANESE NODULES - RESIDUUM	769.4	SPT-1	3-4-4
5	FIRM, REDDISH BROWN, SLIGHTLY MOIST, SANDY SILT WITH A FEW BLACK MANGANESE NODULES AND CHERT FRAGMENTS - RESIDUUM	764.4	SPT-2	3-3-5
10		759.4	UD-1	1.6-2.0
	STIFF, BROWN AND RED BROWN, SLIGHTLY MOIST, SANDY SILT WITH WEATHERED CHERT FRAGMENTS AND BLACK MANGANESE NODULES - RESIDUUM		SPT-3	3-4-7
15	FIRM, BROWN AND RED BROWN, SLIGHTLY MOIST, SILTY CLAY WITH SAND, WEATHERED CHERT FRAGMENTS, AND BLACK MANGANESE NODULES - RESIDUUM	754.4	SPT-4	3-4-4
20		749.4	UD-2	1.5-1.5
	STIFF, YELLOWISH BROWN, SLIGHTLY MOIST, SILTY CLAY WITH CHERT FRAGMENTS AND CHERT SAND - RESIDUUM		SPT-5	3-4-10
25	FIRM, REDDISH BROWN TO REDDISH ORANGE, SLIGHTLY MOIST, SILTY CLAY - RESIDUUM	744.4	SPT-6	2-3-3
			UD-3	1.2-2.0
	FIRM, YELLOWISH BROWN TO BROWN, MOIST, SANDY CLAYEY SILT WITH CHERT FRAGMENTS - RESIDUUM		SPT-7	5-3-2
30		739.4	UD-4	1.5-2.0
			SPT-8	1-1-1
35	VERY SOFT, BROWN TO REDDISH BROWN, WET, SANDY CLAYEY SILT WITH DOLOMITE FRAGMENTS - RESIDUUM	734.4	SPT-9	1-1-1
	AUGER REFUSAL AT 38.0'			
40		729.4		
45		724.4		



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

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 12, 2005 **BORING NO.:** NB-76

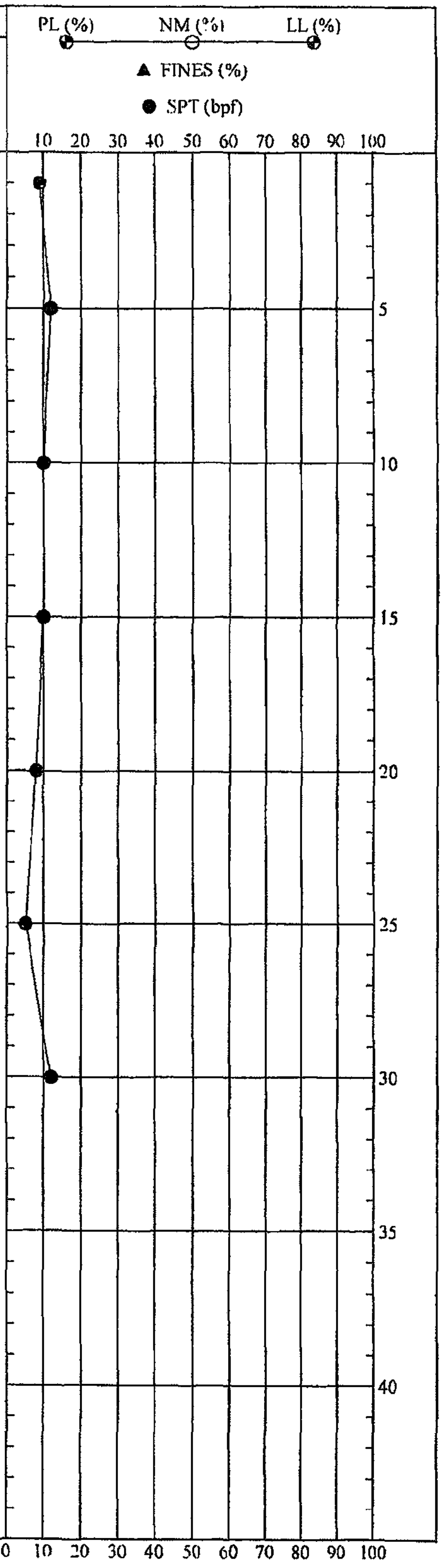
PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

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 BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	SAMPLES TYPE	SAMPLES N-COUNT 1st 6" 2nd 6" 3rd 6"
0	TOPSOIL (0.45')		749.3			
	STIFF, YELLOWISH RED, DRY TO SLIGHTLY MOIST, VERY SILTY CLAY - RESIDUUM			SPT-1		4-4-5
5	STIFF, MOTTLED (YELLOWISH RED AND OLIVE YELLOW), SLIGHTLY MOIST, SLIGHTLY CLAYEY, SANDY TO GRAVELLY, SILT, COARSE ELASTIC MATERIAL RANGES FROM COARSE SAND TO COARSE GRAVEL - RESIDUUM		744.3	SPT-2		2-5-7
10	▼ STIFF, YELLOWISH RED, SLIGHTLY MOIST, SLIGHTLY CLAYEY SANDY SILT - RESIDUUM STIFF, BROWNISH YELLOW, SLIGHTLY MOIST, VERY SILTY CLAY, WITH ABOUT 30% OF SAMPLE COMPRISED OF WHITE VERY SEVERELY WEATHERED CHERT FRAGMENTS - RESIDUUM		739.3	SPT-3		5-5-5
	AUGERS REFUSED SOLIDLY AT 13.0'. RIG PULLED FORWARD APPROXIMATELY 5' IN ORDER TO SAMPLE DEEPER. ▽					
15	STIFF, YELLOWISH BROWN TO VERY DARK GRAY, SLIGHTLY MOIST, VERY SILTY CLAY, WITH 1mm TO 3cm, WHITE TO BUFF, WEATHERED CHERT THROUGHOUT - RESIDUUM		734.3	SPT-4		3-5-5
20	FIRM, YELLOWISH BROWN TO VERY DARK GRAY, SLIGHTLY MOIST, VERY SILTY CLAY, WITH 1mm TO 3cm, WHITE TO BUFF, WEATHERED CHERT THROUGHOUT - RESIDUUM FIRM, STRONG BROWN, MOIST, GRAVELLY, VERY SILTY CLAY, FINE TO MEDIUM ANGULAR, QUARTZ GRAVEL - RESIDUUM		729.3	SPT-5		4-4-4
25	FIRM, STRONG BROWN, MOIST, VERY SILTY CLAY WITH 1mm TO 2cm, ANGULAR QUARTZ GRAVEL THROUGHOUT (ABOUT 7%) - RESIDUUM		724.3	SPT-6		3-2-3
30	STIFF, STRONG BROWN, MOIST, VERY SILTY CLAY WITH 1mm TO 2cm, ANGULAR QUARTZ GRAVEL THROUGHOUT (ABOUT 7%), GRAVEL SIZE AND CONTENT INCREASE WITH DEPTH - RESIDUUM		719.3	SPT-7		2-3-9
	AUGER REFUSAL AT 32.3' BEGAN CORING AT 32.3'			RC-1		86-100
35	**DOLOMITE**. LIGHT BROWNISH GRAY TO BROWNISH GRAY, WITH AN OFTEN MOTTLED APPEARANCE. FINE GRAINED. LOCALLY, DOLOMITE MAY TEND TO BE CHERTY. RECOVERED CORE IS INDURATED. DISTINCT BEDDING FEATURES WERE NOT OBSERVED. WEATHERING RANGES FROM SLIGHT (RECOVERED CORE) TO COMPLETE (VOIDS AS DENOTED BELOW). RECOVERED ROCK IS HARD. THE DOLOMITE IS EXTREMELY FRACTURED THROUGHOUT, AND MOST FRACTURES ARE HEALED WITH WHITE DOLOMITE. THERE APPEARANCE TO BE TWO PREVAILING SETS OF FRACTURES: ONE SET FROM 55° TO 70° APPARENT DIP, WITH AN AVERAGE SPACING OF ONE FOOT AND A SECOND SET THAT DIPS FROM ABOUT 30° TO 40°, AND IS ROUGHLY ORTHOGONAL TO THE FIRST. 44.3' TO 50.83' = CAVITY; 58.5' TO 63.38' = CAVITY		714.3			
40			709.3	RC-2		39-42
45			704.3			



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

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.

Driller : Burnett
Prepared By: Mason
Checked By: Lawson

SOIL TEST BORING RECORD

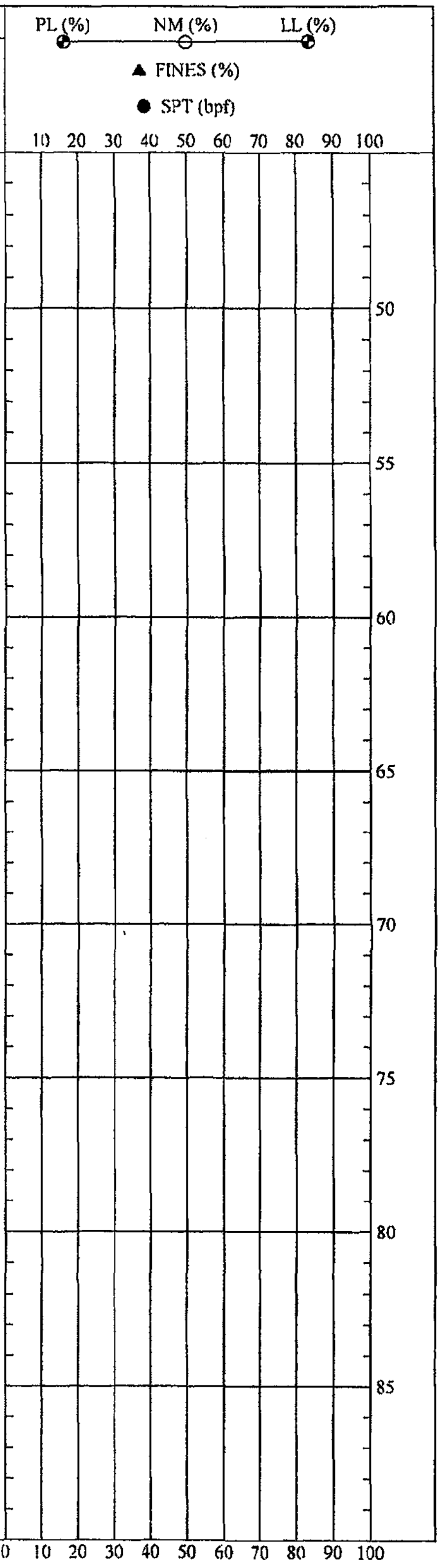
PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 10, 2005 **BORING NO.:** NB-77

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	SAMPLES TYPE	SAMPLES N-COUNT 1st 6" 2nd 6" 3rd 6"
45	**DOLOMITE**. LIGHT BROWNISH GRAY TO BROWNISH GRAY. WITH AN OFTEN MOTTLED APPEARANCE. FINE GRAINED. LOCALLY. DOLOMITE MAY TEND TO BE CHERTY. RECOVERED CORE IS INDURATED. DISTINCT BEDDING FEATURES WERE NOT OBSERVED. WEATHERING RANGES FROM SLIGHT (RECOVERED CORE) TO COMPLETE (VOIDS AS DENOTED BELOW). RECOVERED ROCK IS HARD. THE DOLOMITE IS EXTREMELY FRACTURED THROUGHOUT. AND MOST FRACTURES ARE HEALED WITH WHITE DOLOMITE. THERE APPEARANCE TO BE TWO PREVAILING SETS OF FRACTURES; ONE SET FROM 55° TO 70° APPARENT DIP, WITH AN AVERAGE SPACING OF ONE FOOT AND A SECOND SET THAT DIPS FROM ABOUT 30° TO 40°, AND IS ROUGHLY ORTHOGONAL TO THE FIRST. 44.3' TO 50.83' = CAVITY; 58.5' TO 63.38' = CAVITY	▤	704.3			
50		▤	699.3	RC-3		44-58
55		▤	694.3			
60		▤	689.3	RC-4		0-0
65	CORING TERMINATED AT 64.5'		684.3			
70			679.3			
75			674.3			
80			669.3			
85			664.3			
90			659.3			



SOIL 3043051021 01.GPJ LAW_GIBB.GDT 8/16/05

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

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.

Driller : Burnett
Prepared By: Mason
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 10, 2005 **BORING NO.:** NB-77

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 2

MACTEC

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

PL (%) NM (%) LL (%)

▲ FINES (%)

● SPT (bpf)

10 20 30 40 50 60 70 80 90 100

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	AUGER TO 4.0'. BEGAN SHELBY TUBE SAMPLES AS REQUIRED BY PARSONS (5-25-05)	749.3		
5		744.3	UD-1	2.0-2.0
10		739.3	UD-2	2.0-2.0
			UD-3	1.9-2.0
15	∇	734.3		
			UD-4	1.6-2.0
20		729.3	UD-5	0.8-2.0
			UD-6	0.7-2.0
25		724.3	UD-7	1.7-2.0
	BORING TERMINATED AT 26.0'			
30		719.3		
35		714.3		
40		709.3		
45		704.3		

0 10 20 30 40 50 60 70 80 90 100

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 10/6/05

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NB-77A WAS OFFSET APPROXIMATELY 11.0 N75°E OF NB-77.

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.

Driller : Bailey
Prepared By: Lawson
Checked By: Haston

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 27, 2005 **BORING NO.:** NB-77A

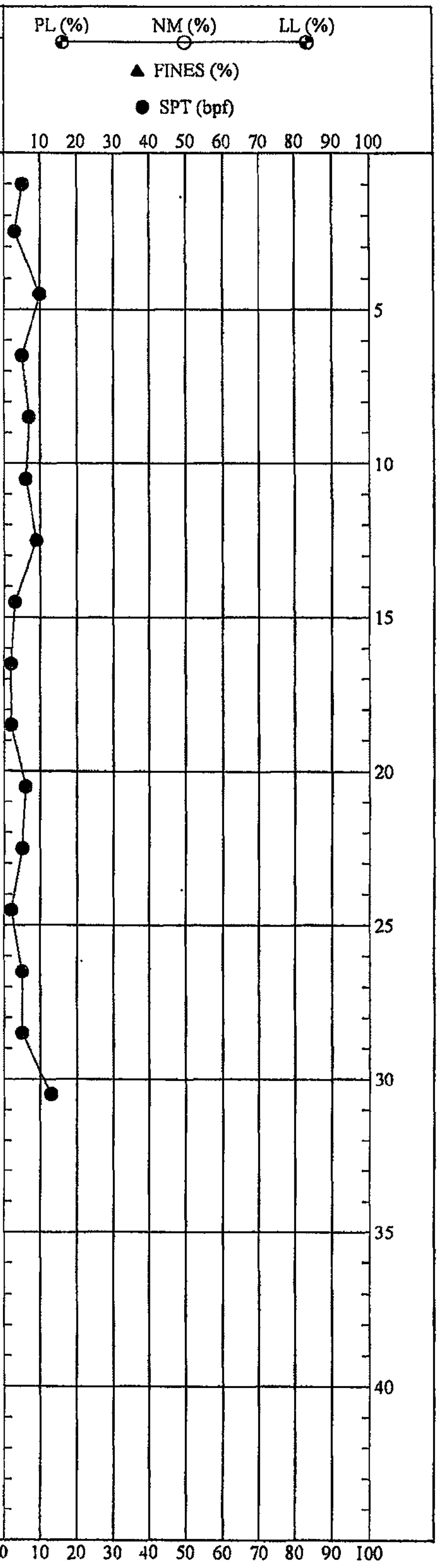
PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)
0	TOPSOIL (0.5')	762.6
	FIRM TO SOFT, DARK BROWN, DRY TO SLIGHTLY MOIST, CLAYEY SILT WITH FINE ROOTS - RESIDUUM	
	STIFF, BROWN TO REDDISH ORANGE, SLIGHTLY MOIST TO MOIST, SILTY CLAY WITH A FEW BLACK MANGANESE NODULES - RESIDUUM	
5	FIRM, REDDISH BROWN TO ORANGE BROWN, SLIGHTLY MOIST, SILTY CLAY WITH A FEW BLACK MANGANESE NODULES - RESIDUUM	757.6
	FIRM, REDDISH BROWN TO ORANGE BROWN, SLIGHTLY MOIST, SILTY CLAY WITH A FEW BLACK MANGANESE NODULES - RESIDUUM	
10		752.6
	STIFF TO SOFT, REDDISH ORANGE, SLIGHTLY MOIST, SILTY CLAY WITH A FEW CHERT FRAGMENTS AND BLACK MANGANESE NODULES - RESIDUUM	
15		747.6
	VERY SOFT, REDDISH ORANGE, SLIGHTLY MOIST TO MOIST, SILTY CLAY WITH A FEW CHERT FRAGMENTS AND BLACK MANGANESE NODULES - RESIDUUM	
20	FIRM, REDDISH ORANGE, SLIGHTLY MOIST, SILTY CLAY - RESIDUUM ▼	742.6
	FIRM TO VERY SOFT, REDDISH ORANGE TO YELLOWISH BROWN, SLIGHTLY MOIST, SILTY CLAY - RESIDUUM	
25		737.6
	FIRM, YELLOWISH BROWN, SLIGHTLY MOIST, SANDY SILTY CLAY WITH A FEW CHERT FRAGMENTS - RESIDUUM	
	FIRM, REDDISH ORANGE TO YELLOWISH BROWN, MOIST TO WET, SILTY CLAY WITH CHERT FRAGMENTS - RESIDUUM	
30		732.6
	AUGER REFUSAL AT 30.5' BEGAN HQ CORING AT 31.1' SLIGHTLY TO COMPLETELY, CLOSELY JOINTED, BROWNISH GRAY TO LIGHT GRAY, FINE GRAINED VERY STRONG (HARD) SILICEOUS **DOLOMITE**. BEDDING IS AT AN APPARENT DIP OF 45° TO 50°. ORTHOGONAL AND HIGH ANGLE JOINTS OBSERVED THROUGHOUT. BEDDING PLANE FRACTURES AND A FEW JOINTS EXHIBIT SOME IRON STAINING. OCCASIONAL CHERTY ZONES OBSERVED. CAVITY (PARTIALLY CLAY-FILLED) FROM 33.5' TO 38.3' CAVITY (PARTIALLY CLAY-FILLED) FROM 39.3' TO 41.0'	
35		727.6
40		722.6
45		717.6

SAMPLES

IDENT	N-COUNT (1st 6" 2nd 6" 3rd 6" 4th 6")
SPT-1	3-2-3
SPT-2	2-1-2-3
SPT-3	2-5-5-6
SPT-4	2-2-3-4
SPT-5	2-3-4-5
SPT-6	2-3-3-5
SPT-7	3-4-5-5
SPT-8	2-1-2-3
SPT-9	1-1-1-2
SPT-10	1-1-1-2
SPT-11	2-2-4-3
SPT-12	1-2-3-4
SPT-13	WOH-1-1-2
SPT-14	WOH-2-3-4
SPT-15	2-2-3-8
SPT-16	6-4-9-25
RC-1	15-22
RC-2	63-90



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

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.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 13, 2005 **BORING NO.:** NB-81

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	SAMPLES TYPE	SAMPLES N-COUNT 1st 6" 2nd 6" 3rd 6" 4th 6"	PL (%) NM (%) LL (%) ▲ FINES (%) ● SPT (bpf) 10 20 30 40 50 60 70 80 90 100
45	SLIGHTLY TO COMPLETELY, CLOSELY JOINTED, BROWNISH GRAY TO LIGHT GRAY, FINE GRAINED VERY STRONG (HARD) SILICEOUS **DOLOMITE**. BEDDING IS AT AN APPARENT DIP OF 45° TO 50°. ORTHOGONAL AND HIGH ANGLE JOINTS OBSERVED THROUGHOUT. BEDDING PLANE FRACTURES AND A FEW JOINTS EXHIBIT SOME IRON STAINING. OCCASIONAL CHERTY ZONES OBSERVED.	▤	717.6				
50	CAVITY (PARTIALLY CLAY-FILLED) FROM 33.5' TO 38.3' CAVITY (PARTIALLY CLAY-FILLED) FROM 39.3' TO 41.0'	▤	712.6	RC-3		89-100	50
55		▤	707.6				55
60		▤	702.6	RC-4		45-64	60
	CORING TERMINATED AT 61.1'						
65			697.6				65
70			692.6				70
75			687.6				75
80			682.6				80
85			677.6				85
90			672.6			0 10 20 30 40 50 60 70 80 90 100	

SOIL-4BLOWS-STB 3043051021_01.GPJ LAW_GIBB.GDT 10/4/05

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

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.

Driller : Akins
Prepared By: Justice
Checked By: Lawson

SOIL TEST BORING RECORD

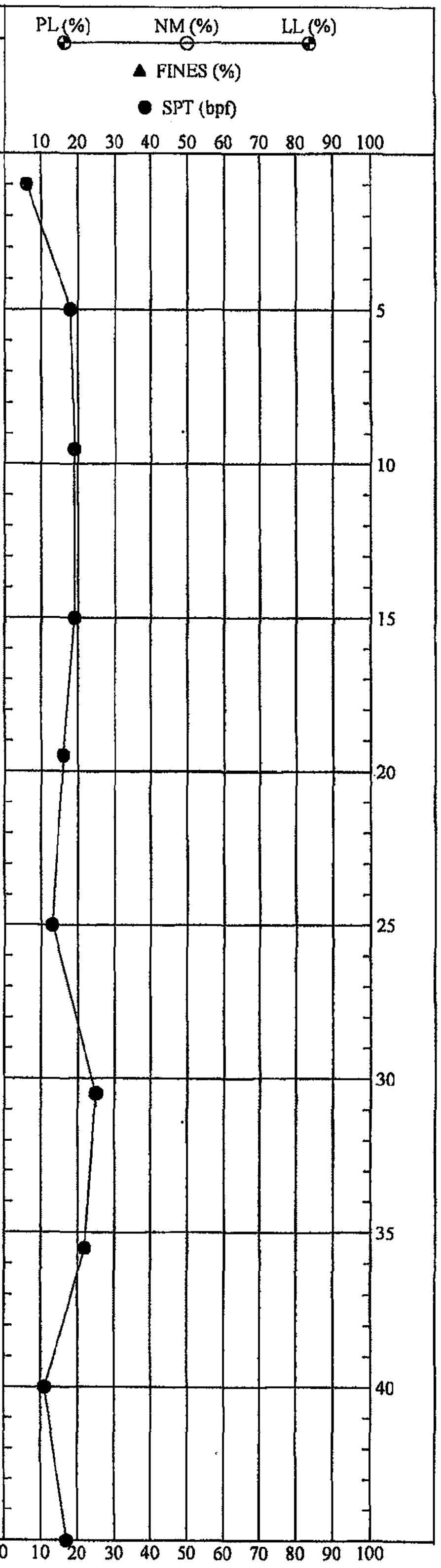
PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 13, 2005 **BORING NO.:** NB-81

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 2

MACTEC

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	LEGEND	ELEV (ft)	SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	TOPSOIL (0.6')		761.2		
	FIRM, YELLOWISH RED, DRY TO SLIGHTLY MOIST, CLAYEY SILT - RESIDUUM			SPT-1	3-2-4
5	VERY STIFF, YELLOWISH RED, DRY TO SLIGHTLY MOIST, VERY SILTY CLAY - RESIDUUM		756.2	SPT-2	4-8-10
10	VERY STIFF, MOTTLED (YELLOWISH RED AND YELLOW), DRY TO SLIGHTLY MOIST, SANDY (VERY FINE, CONFINED TO YELLOW AREAS), VERY SILTY CLAY - RESIDUUM		751.2	SPT-3	5-8-11
				UD-1	2.0-2.0
15	VERY STIFF, YELLOW (WITH SOME BLACK MOTTLING), DRY, VERY SILTY CLAY HAS BEEN "RIBBONED" BY A 4cm PINK SANDSTONE - RESIDUUM		746.2	SPT-4	7-9-10
20	VERY STIFF, BROWNISH YELLOW (WITH MINOR GRAY AND YELLOWISH RED MOTTLING), DRY TO SLIGHTLY MOIST, SILTY CLAY WITH FLAT SUBROUNDED CHERT FRAGMENTS AT 19.0 FEET - RESIDUUM	▼	741.2	SPT-5	5-6-10
				UD-2	1.0-2.0
25	STIFF, LIGHT OLIVE BROWN (WITH SOME BROWN MOTTLING), DRY, SLIGHTLY CLAYEY SILT - RESIDUUM		736.2	SPT-6	3-5-8
				UD-3	1.8-2.0
30	VERY STIFF, BROWN (WITH MINOR YELLOWISH BROWN MOTTLING), DRY, SANDY SILT - RESIDUUM		731.2	SPT-7	4-11-14
				UD-4	1.0-2.0
35	VERY STIFF, DARK YELLOWISH BROWN, (WITH BLACK MOTTLING), SLIGHTLY MOIST, SILTY CLAY WITH OCCASIONAL 1 TO 3cm, ANGULAR, GRAY TO LIGHT GRAY WEATHERED CHERT FRAGMENTS - RESIDUUM	▽	726.2	SPT-8	6-11-11
40	STIFF, LIGHT OLIVE BROWN, SLIGHTLY MOIST TO MOIST, SILTY CLAY WITH OCCASIONAL 1 TO 2cm, LIGHT GRAY, ANGULAR WEATHERED CHERT FRAGMENTS - RESIDUUM		721.2	SPT-9	2-6-5
45			716.2		



SOIL 3043051021_01.GPJ LAW_GIBB.GDT 9/16/05

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

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

Driller : Burnett
Prepared By: Mason
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 13, 2005 **BORING NO.:** NB-84

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 2

MACTEC

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

VERY SOFT, YELLOWISH BROWN, WET, SILTY CLAY, WITH ANGULAR WEATHERED CHERT FRAGMENTS - RESIDUUM

VERY SOFT, YELLOWISH BROWN, WET, SILTY CLAY, WITH ANGULAR WEATHERED CHERT FRAGMENTS AT TOP OF SAMPLE - RESIDUUM

AUGER REFUSAL AT 49.15'

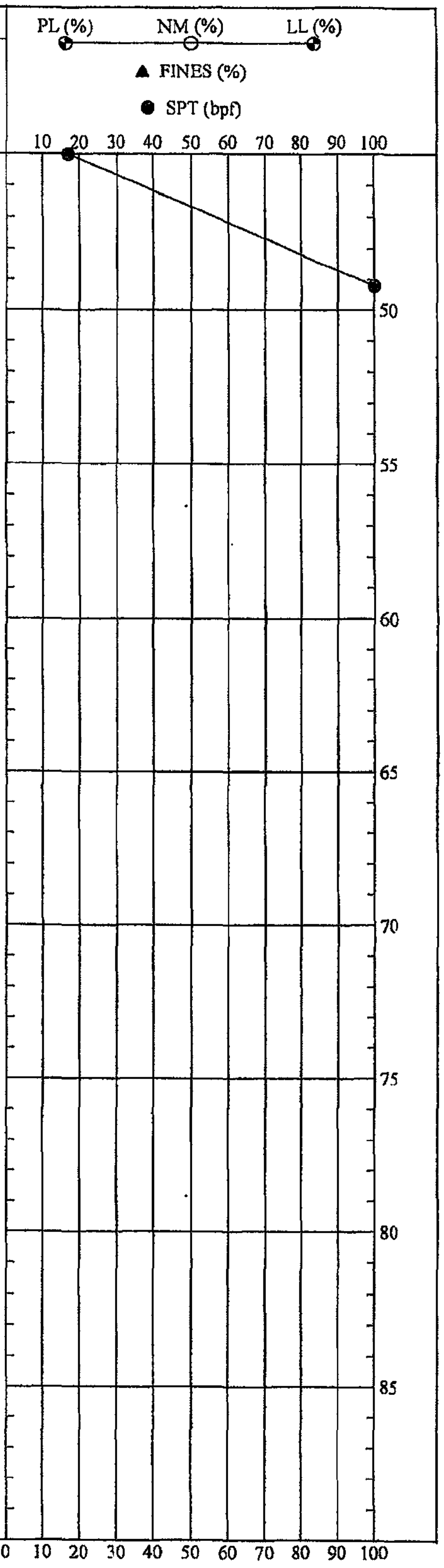
BEGAN HQ CORING AT 49.15'

DOLOMITE. FINE GRAINED. LIGHT BROWNISH GRAY TO MEDIUM DARK GRAY, WHERE MORE SILICEOUS. CHERTY; OCCASIONALLY, CHERT OCCURS AS DISCRETE NODULES A FEW CENTIMETERS IN SIZE, BUT MORE COMMONLY AS BEDS 2 TO 3cm THICK INDURATED. BEDDING IS THIN TO MEDIUM, AND IS AT AN APPARENT DIP OF ABOUT 50°. WEATHERING IS SLIGHT TO MODERATE, AND MAY LOCALLY BE MODERATELY SEVERE. OVERALL, THE DOLOMITE IS HARD. THE DOLOMITE IS CONSIDERABLY FRACTURED THROUGHOUT WITH A SET OF FRACTURES ORIENTED ORTHOGONALLY TO BEDDING. THESE FRACTURES HAVE AN AVERAGE SPACING OF ABOUT 2 INCHES NEAR THE TOP OF ROCK, AND INCREASES TO VERY CLOSE SPACING (0.25 TO 0.5 INCH) WITH DEPTH. JOINT ATTITUDE STEEPENS WITH DEPTH FROM 40° APPARENT DIP TO 70° APPARENT DIP, AND INDICATE AN EPISODE OF FAULTING; JOINTS AT 52.1', 52.3, AND 53.7' HAVE RELATIVELY WELL DEVELOPED SLICKEN SIDES. ADDITIONALLY, BEDDING PLANE FRACTURES IN THE UPPER APPROXIMATE 1.5' MAY BE OPEN AND MODERATELY WEATHERED.

HQ CORING TERMINATED AT 59.2'

DEPTH (ft)	ELEV (ft)
45	716.2
50	711.2
55	706.2
60	701.2
65	696.2
70	691.2
75	686.2
80	681.2
85	676.2
90	671.2

SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
SPT-10	3-16-1
SPT-11	50/0.2
RC-1	75-92
RC-2	0-48



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

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 BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Burnett
Prepared By: Mason
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

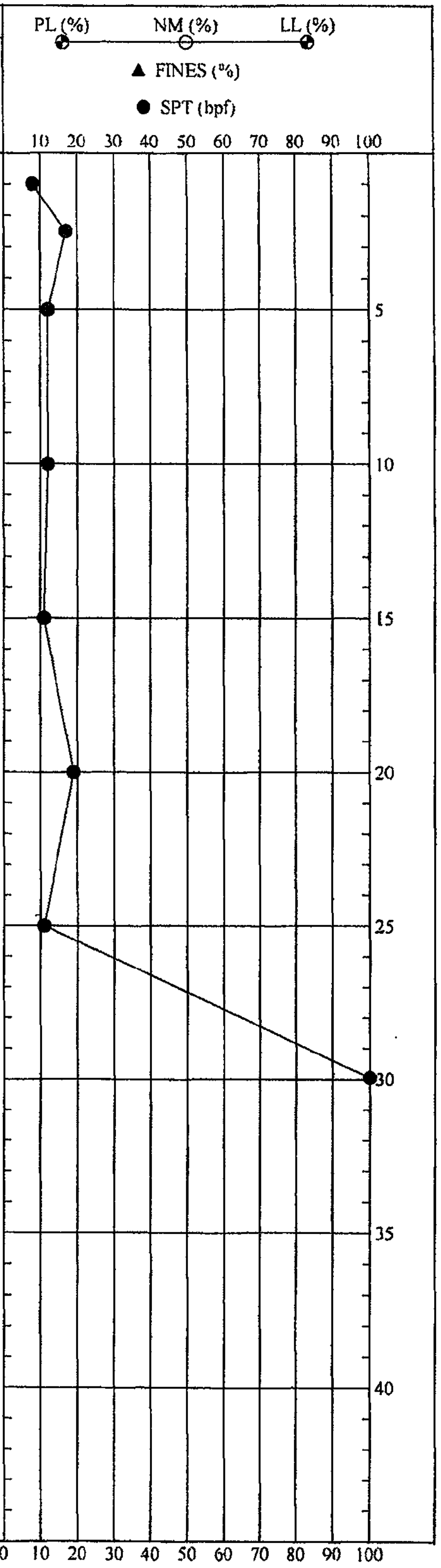
DRILLED: May 13, 2005 **BORING NO.:** NB-84

PROJ. NO.: 3043051021/0001 **PAGE** 2 **OF** 2

MACTEC

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLES IDENT	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	TOPSOIL (0.2')	760.2		
	FIRM, STRONG BROWN, SLIGHTLY MOIST, SILTY CLAY WITH 1mm TO 3cm, BUFF-COLORED, WEATHERED CHERT THROUGHOUT - RESIDUUM		SPT-1	2-4-4
	VERY STIFF, STRONG BROWN, SLIGHTLY MOIST, SILTY CLAY WITH 1mm TO 3cm, BUFF-COLORED, WEATHERED CHERT THROUGHOUT - RESIDUUM		SPT-2	3-10-7
5	STIFF, BROWNISH YELLOW TO YELLOWISH BROWN, SLIGHTLY MOIST, VERY SILTY CLAY, WITH ABUNDANT 1mm TO 2cm, ANGULAR, BUFF-COLORED CHERT - RESIDUUM	755.2	SPT-3	3-5-7
10		750.2	SPT-4	4-5-7
15	STIFF, BROWNISH YELLOW TO YELLOWISH BROWN, SLIGHTLY MOIST WITH MORE MOISTURE WITH DEPTH, VERY SILTY CLAY, WITH ABUNDANT 1mm TO 2cm, ANGULAR, BUFF-COLORED CHERT - RESIDUUM	745.2	SPT-5	5-5-6
20	▽ ▼ VERY STIFF, BROWNISH YELLOW TO YELLOWISH BROWN, SLIGHTLY MOIST, VERY SILTY CLAY, WITH ABUNDANT 1mm TO 2cm, ANGULAR, BUFF-COLORED CHERT - RESIDUUM	740.2	SPT-6	7-7-12
25	STIFF, STRONG BROWN, WITH SUBVERTICAL 5mm TO 1cm WIDE, YELLOWISH BROWN, SANDY (FINE TO MEDIUM) "STRINGERS" OF SILT, OCCASIONAL 1mm TO 2cm, WEATHERED CHERT FRAGMENTS, SLIGHTLY MOIST; SANDY SILTY MAY BE MOIST - RESIDUUM	735.2	SPT-7	4-5-6
30	MEDIUM BROWNISH GRAY, WEATHERED DOLOMITE, WET, OVERLAIN NY 0.3' OF DARK YELLOWISH BROWN, FINE TO MEDIUM, WET, VERY SILTY SAND - RESIDUUM	730.2	SPT-8	44-50/0.45
	AUGER REFUSAL AT 32.0'			
35		725.2		
40		720.2		
45		715.2		



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

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.

Driller : Burnett
Prepared By: Mason
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 10, 2005 **BORING NO.:** NB-85

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

PL (%) NM (%) LL (%)
▲ FINES (%)
● SPT (bpf)

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)	SAMPLES IDENT	SAMPLES TYPE	N-COUNT 1st 6" 2nd 6" 3rd 6"
0	AUGER TO 13.0 AND BEGAN SHELBY TUBE SAMPLING	760.6			
5		755.6			
10		750.6			
			UD-1		1.5-2.0
15		745.6			
			UD-2		1.3-2.0
			UD-3		0.4-2.0
20		740.6	UD-4		0.8-2.0
			UD-5		0.9-2.0
	BORING TERMINATED AT 23.0'				
25		735.6			
30		730.6			
35		725.6			
40		720.6			
45		715.6			

0 10 20 30 40 50 60 70 80 90 100

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 10/6/05

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NO GROUND WATER ENCOUNTERED AT TIME OF EXPLORATION. NB-85A WAS OFFSET APPROXIMATELY 4.3' N25°W OF NB-85.

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 12, 2005 **BORING NO.:** NB-85A

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

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 BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

Driller : Burnett
Prepared By: Mason
Checked By: Lawson

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.	ELEV (ft)
0	AUGERED TO 17.0' AND BEGAN SHELBY TUBE SAMPLING.	761.1
5		756.1
10		751.1
15		746.1
20		741.1
25		736.1
30		731.1
	AUGER REFUSAL AT 31.0'	
35		726.1
40		721.1
45		716.1

SAMPLES IDENT	N-COUNT (1st 6" / 2nd 6" / 3rd 6")
UD-3	1.0-2.0
UD-5	0.9-2.0
UD-6	1.6-2.0
UD-7	2.0-2.0
UD-8	1.6-2.0
UD-9	1.0-2.0

PL (%) NM (%) LL (%)

▲ FINES (%)

● SPT (bpf)

10 20 30 40 50 60 70 80 90 100

0 10 20 30 40 50 60 70 80 90 100

SOIL 3043051021_01.GPJ LAW_GIBB.GDT 10/6/05

REMARKS: STANDARD PENETRATION RESISTANCE TESTING PERFORMED USING AN AUTOMATIC HAMMER. NO GROUND WATER ENCOUNTERED AT TIME OF EXPLORATION. NB-85B WAS OFFSET APPROXIMATELY 7.9' N25°W OF NB-85.

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.

Driller : Burnett
Prepared By: Mason
Checked By: Lawson

SOIL TEST BORING RECORD

PROJECT: Proposed Gypsum Disposal Area

DRILLED: May 12, 2005 **BORING NO.:** NB-85B

PROJ. NO.: 3043051021/0001 **PAGE** 1 **OF** 1

MACTEC

APPENDIX C

MONITORING WELL INSTALLATION LOGS

OVERBURDEN MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA

JOB NUMBER 3043051021

TVA WELL NUMBER MW-10A

INSTALLATION DATE 06/01/2005

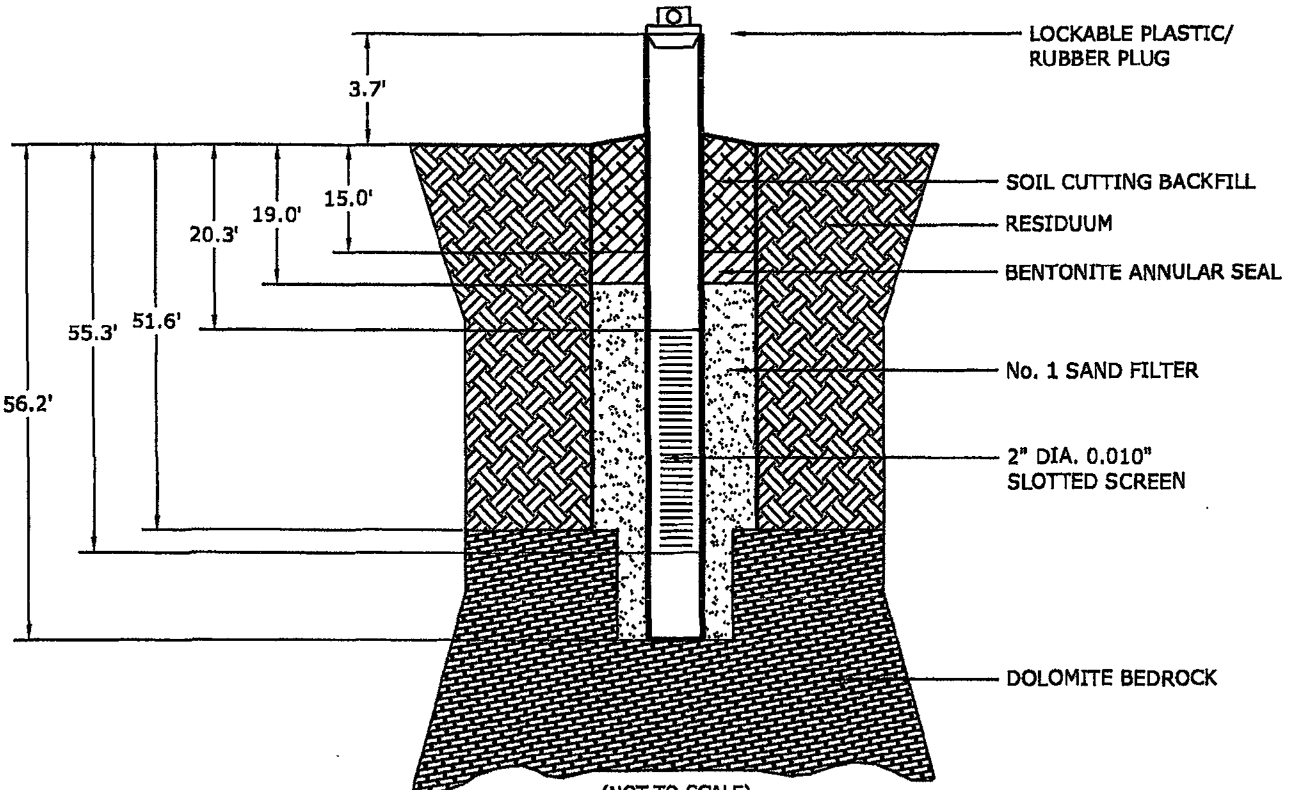
BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)

DRILLED BY M.BURNETT

TOTAL DEPTH 56.2'

RISER/SCREEN
MATERIAL SCHEDULE 40 PVC
DIAMETER 2.0"
SLOT SIZE 0.010"

FIELD REPRESENTATIVE JOHN MASON



(NOT TO SCALE)

MACTEC

BEDROCK MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA

JOB NUMBER 3043051021

TVA WELL NUMBER MW-10B

INSTALLATION DATE 05/31/2005

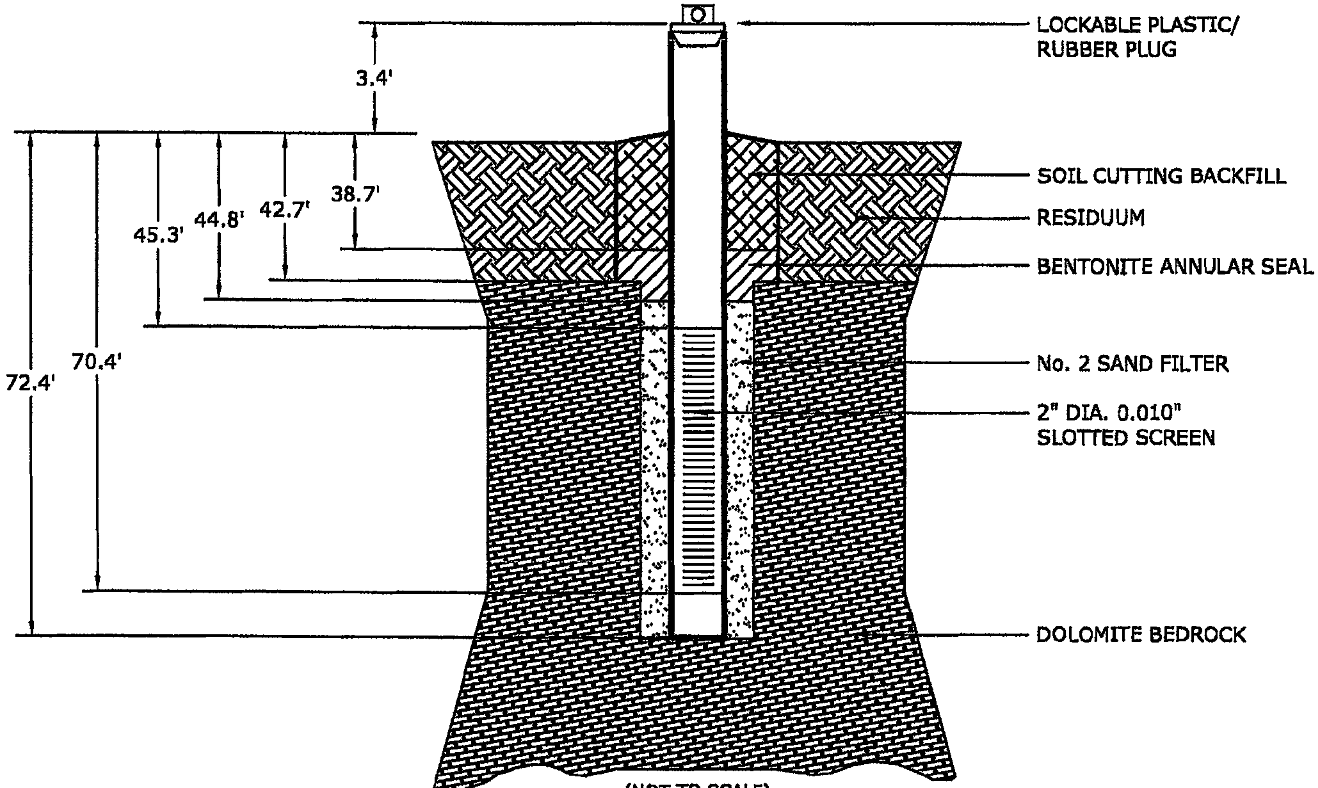
BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)

DRILLED BY M.BURNETT

TOTAL DEPTH 72.4'

RISER/SCREEN
MATERIAL SCHEDULE 40 PVC
DIAMETER 2.0"
SLOT SIZE 0.010"

FIELD REPRESENTATIVE JOHN MASON



(NOT TO SCALE)

MACTEC

OVERBURDEN MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA

JOB NUMBER 3043051021

TVA WELL NUMBER MW-21A

INSTALLATION DATE 06/02/2005

BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)

DRILLED BY M.BURNETT

TOTAL DEPTH 50.4'

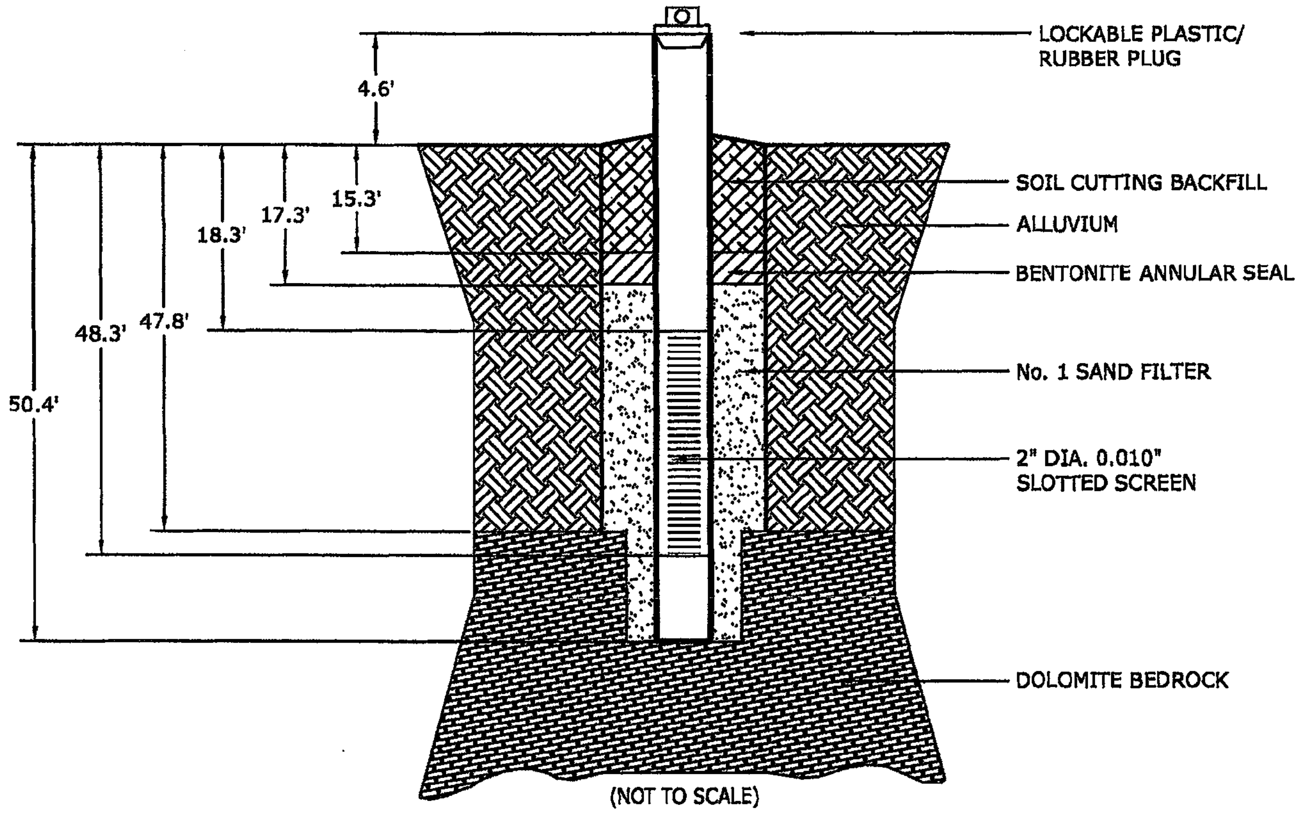
RISER/SCREEN

MATERIAL SCHEDULE 40 PVC

FIELD REPRESENTATIVE JOHN MASON

DIAMETER 2.0"

SLOT SIZE 0.010"



(NOT TO SCALE)

MACTEC

OVERBURDEN MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA

JOB NUMBER 3043051021

TVA WELL NUMBER MW-44A

INSTALLATION DATE 06/07/2005

BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)

DRILLED BY G.AKINS

TOTAL DEPTH 40.5'

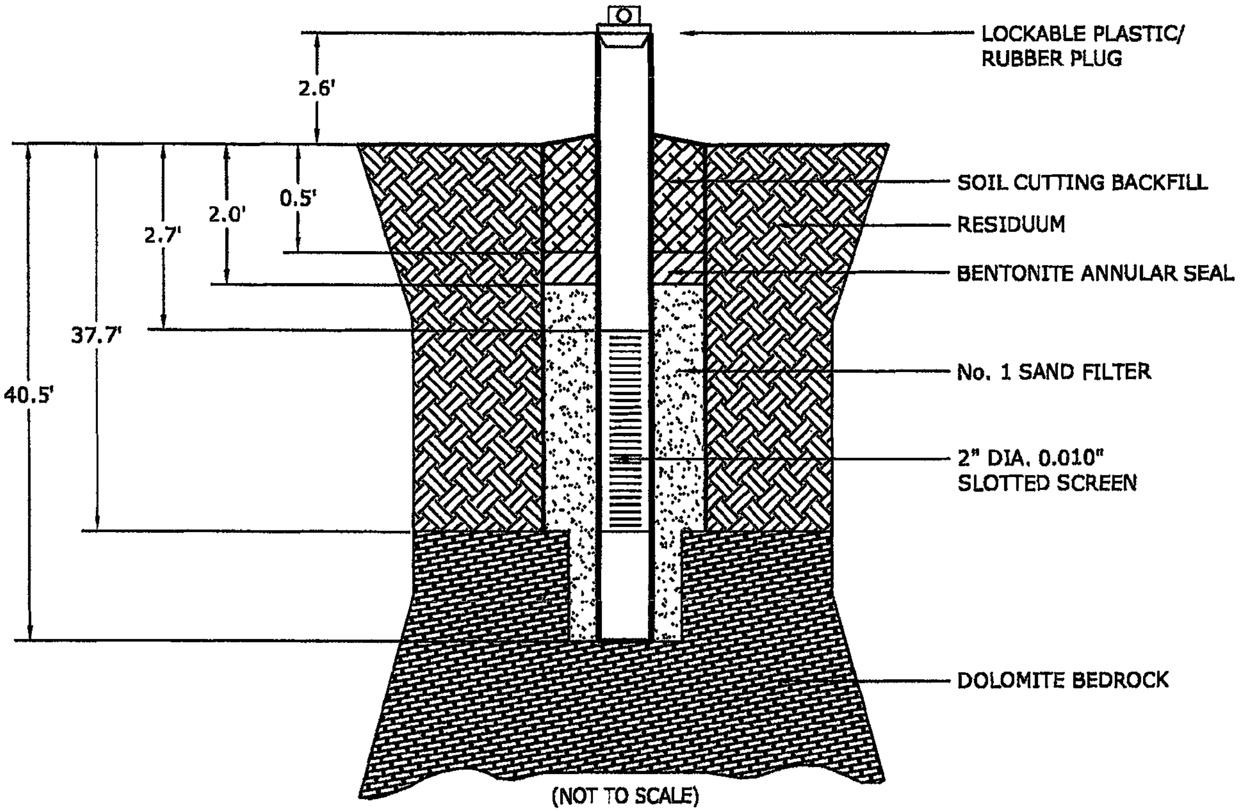
RISER/SCREEN

MATERIAL SCHEDULE 40 PVC

FIELD REPRESENTATIVE TODD JUSTICE

DIAMETER 2.0"

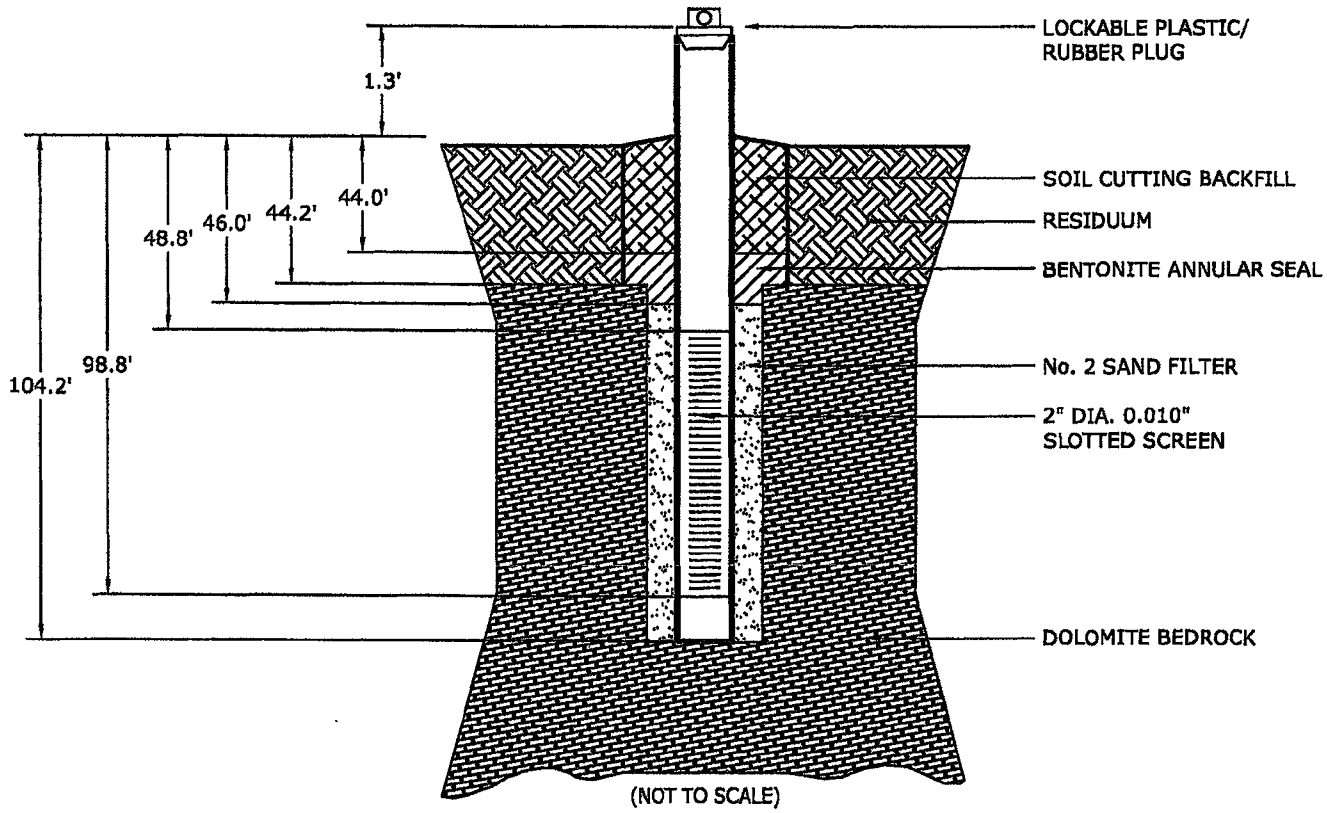
SLOT SIZE 0.010"



MACTEC

BEDROCK MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA
JOB NUMBER 3043051021
TVA WELL NUMBER MW-44B
INSTALLATION DATE 06/02/2005
BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)
DRILLED BY G.AKINS
TOTAL DEPTH 104.2'
RISER/SCREEN
MATERIAL SCHEDULE 40 PVC
FIELD REPRESENTATIVE TODD JUSTICE
DIAMETER 2.0"
SLOT SIZE 0.010"



(NOT TO SCALE)

MACTEC

OVERBURDEN MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA

JOB NUMBER 3043051021

TVA WELL NUMBER MW-47A

INSTALLATION DATE 06/08/2005

BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)

DRILLED BY M.BURNETT

TOTAL DEPTH 44.4'

RISER/SCREEN

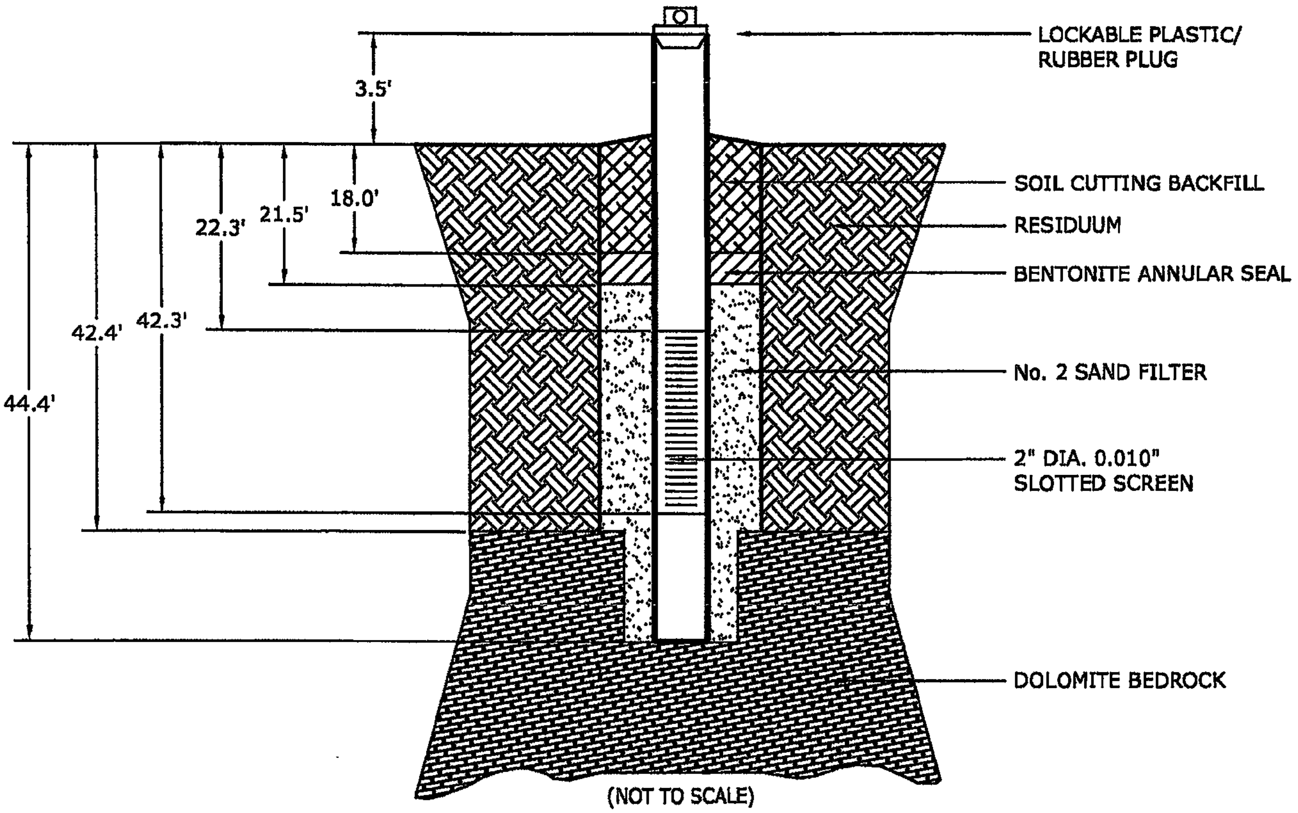
MATERIAL SCHEDULE 40 PVC

FIELD REPRESENTATIVE JOHN MASON

CJ

DIAMETER 2.0"

SLOT SIZE 0.010"



(NOT TO SCALE)

MACTEC

OVERBURDEN MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA

JOB NUMBER 3043051021

TVA WELL NUMBER MW-63A

INSTALLATION DATE 06/06/2005

BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)

DRILLED BY M.BURNETT

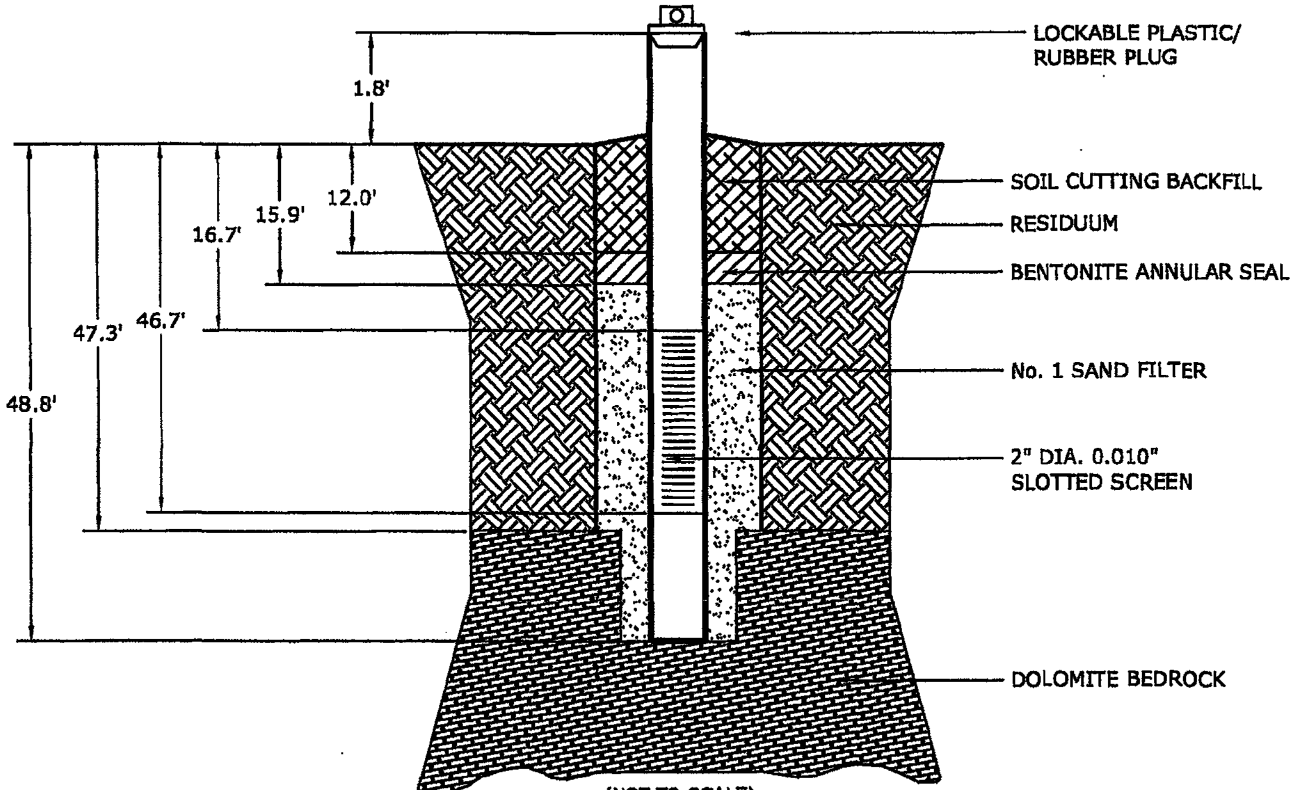
TOTAL DEPTH 48.8'

RISER/SCREEN
MATERIAL SCHEDULE 40 PVC

FIELD REPRESENTATIVE JOHN MASON

DIAMETER 2.0"

SLOT SIZE 0.010"



(NOT TO SCALE)

MACTEC

BEDROCK MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA

JOB NUMBER 3043051021

TVA WELL NUMBER MW-63B

INSTALLATION DATE 05/09/2005

BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)

DRILLED BY J.WARREN

TOTAL DEPTH 82.3'

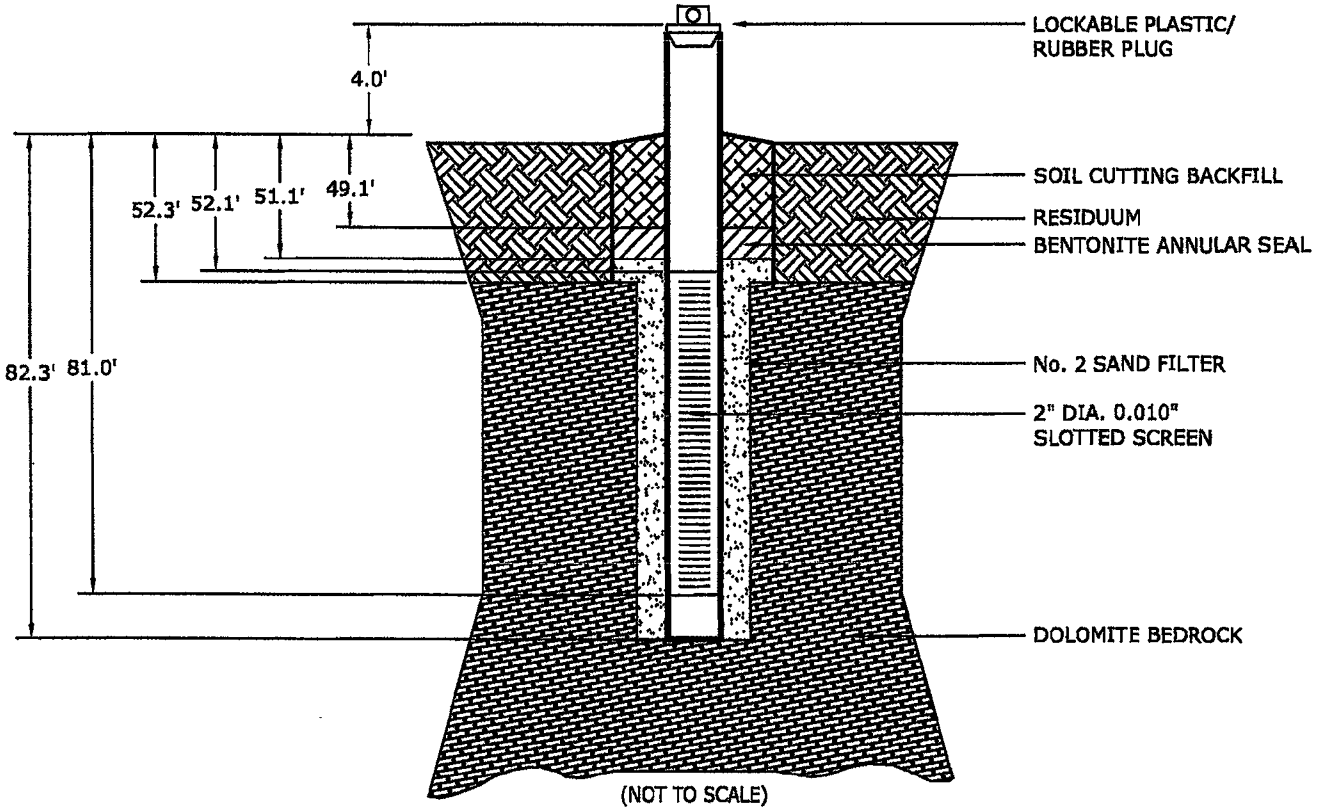
RISER/SCREEN

MATERIAL SCHEDULE 40 PVC

DIAMETER 2.0"

SLOT SIZE 0.010"

FIELD REPRESENTATIVE TODD JUSTICE



(NOT TO SCALE)

MACTEC

OVERBURDEN MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA

JOB NUMBER 3043051021

TVA WELL NUMBER MW-66A

INSTALLATION DATE 05/04/2005

BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)

DRILLED BY M.BURNETT

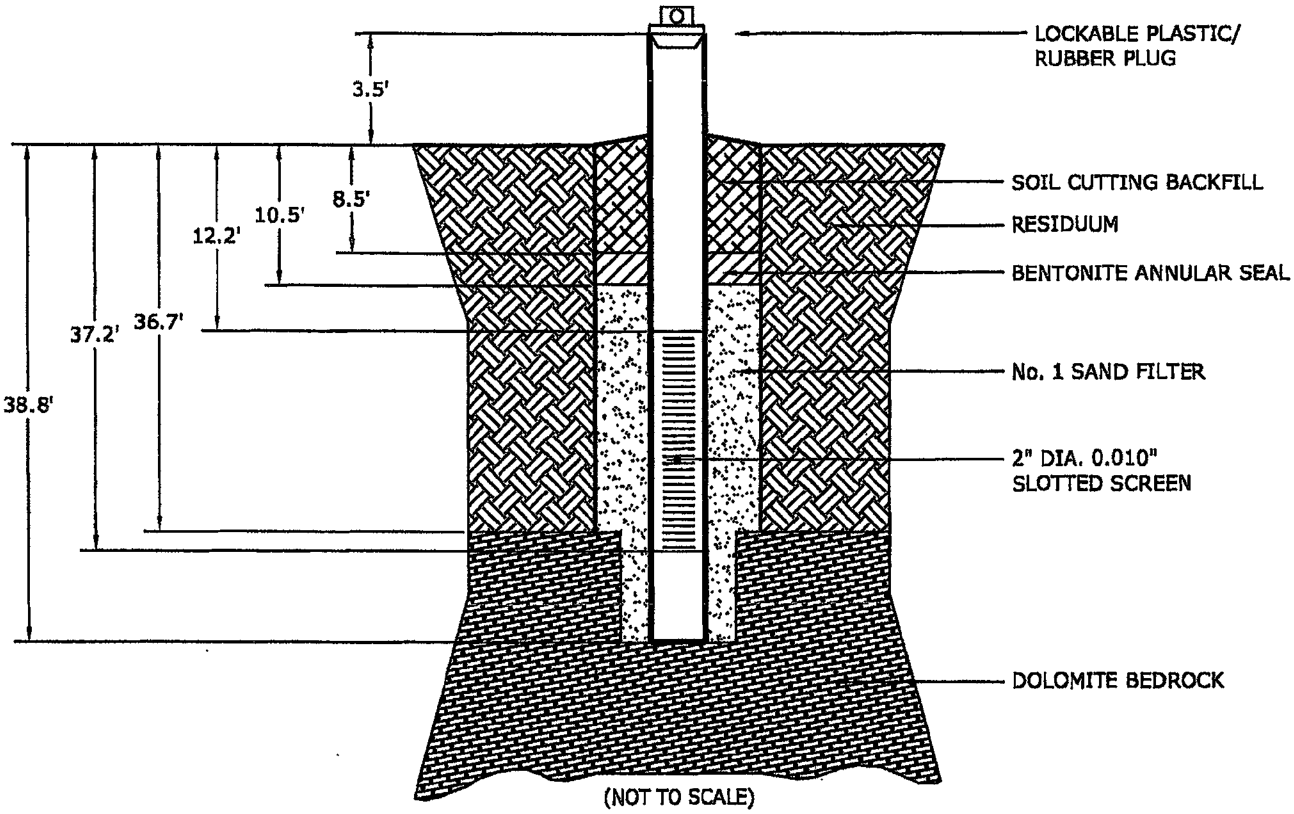
TOTAL DEPTH 38.8'

RISER/SCREEN
MATERIAL SCHEDULE 40 PVC

FIELD REPRESENTATIVE JOHN MASON

DIAMETER 2.0"

SLOT SIZE 0.010"



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MACTEC

OVERBURDEN MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA

JOB NUMBER 3043051021

TVA WELL NUMBER MW-74A

INSTALLATION DATE 05/12/2005

BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)

DRILLED BY M.BURNETT

TOTAL DEPTH 59.3'

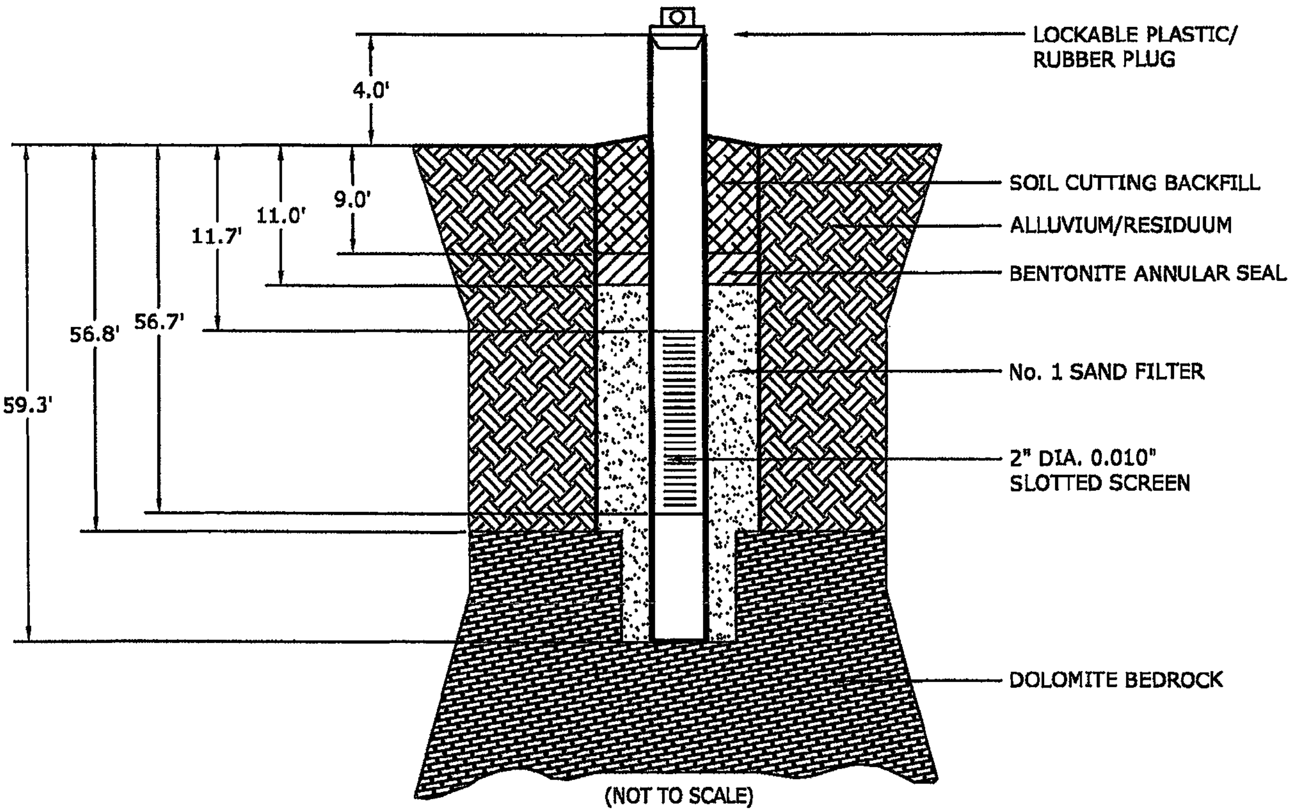
RISER/SCREEN

MATERIAL SCHEDULE 40 PVC

FIELD REPRESENTATIVE JOHN MASON

DIAMETER 2.0"

SLOT SIZE 0.010"



(NOT TO SCALE)

MACTEC

OVERBURDEN MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA

JOB NUMBER 3043051021

TVA WELL NUMBER MW-77A

INSTALLATION DATE 06/14/2005

BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)

DRILLED BY J.WARREN

TOTAL DEPTH 35.4'

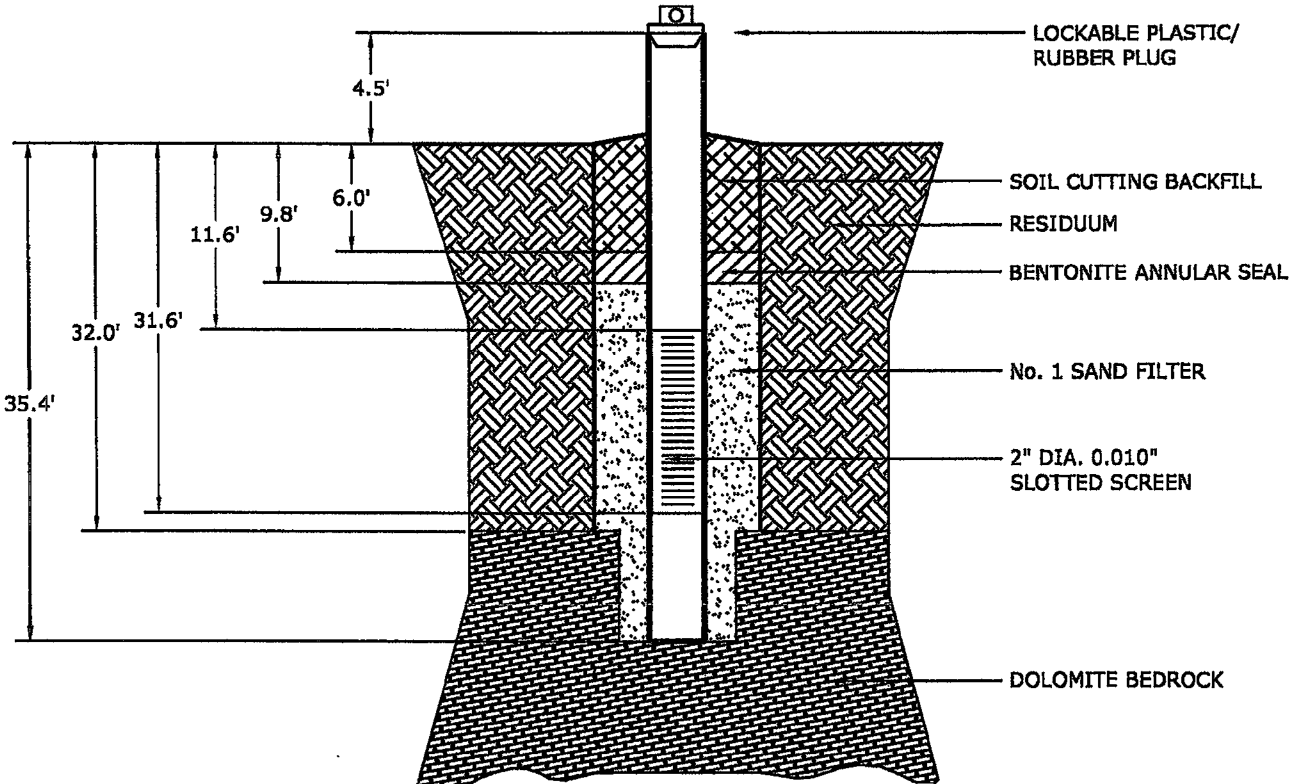
RISER/SCREEN
MATERIAL SCHEDULE 40 PVC

FIELD REPRESENTATIVE TODD JUSTICE

CTJ

DIAMETER 2.0"

SLOT SIZE 0.010"



(NOT TO SCALE)

MACTEC

OVERBURDEN MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA

JOB NUMBER 3043051021

TVA WELL NUMBER MW-81A

INSTALLATION DATE 06/08/2005

BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)

DRILLED BY G.AKINS

TOTAL DEPTH 39.8'

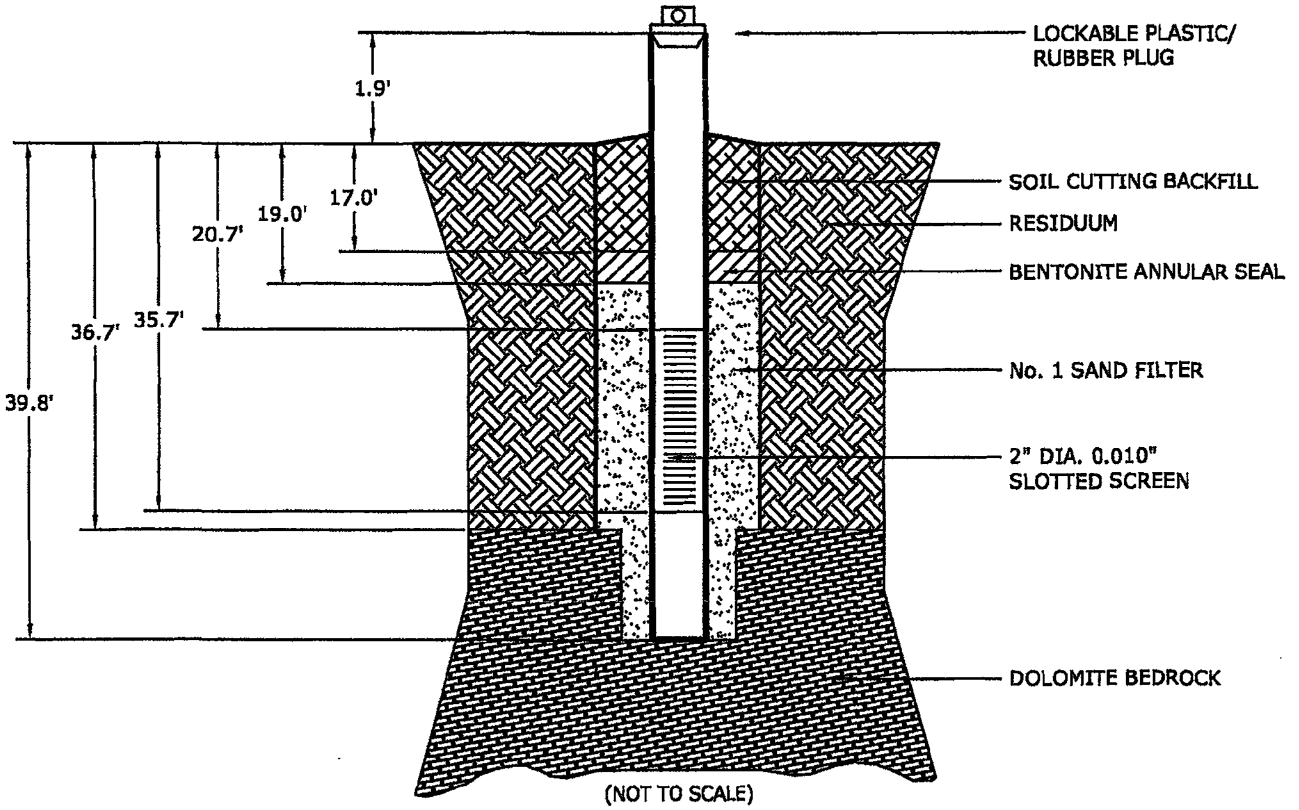
RISER/SCREEN

MATERIAL SCHEDULE 40 PVC

FIELD REPRESENTATIVE TODD JUSTICE

DIAMETER 2.0"

SLOT SIZE 0.010"



MACTEC

BEDROCK MONITORING WELL INSTALLATION RECORD

JOB NAME TVA KINGSTON GYPSUM DISPOSAL AREA

JOB NUMBER 3043051021

TVA WELL NUMBER MW-81B

INSTALLATION DATE 05/17/2005

BOREHOLE DIAMETER 8.25" (SOIL); 3.78" (BEDROCK)

DRILLED BY G.AKINS

TOTAL DEPTH 61.1'

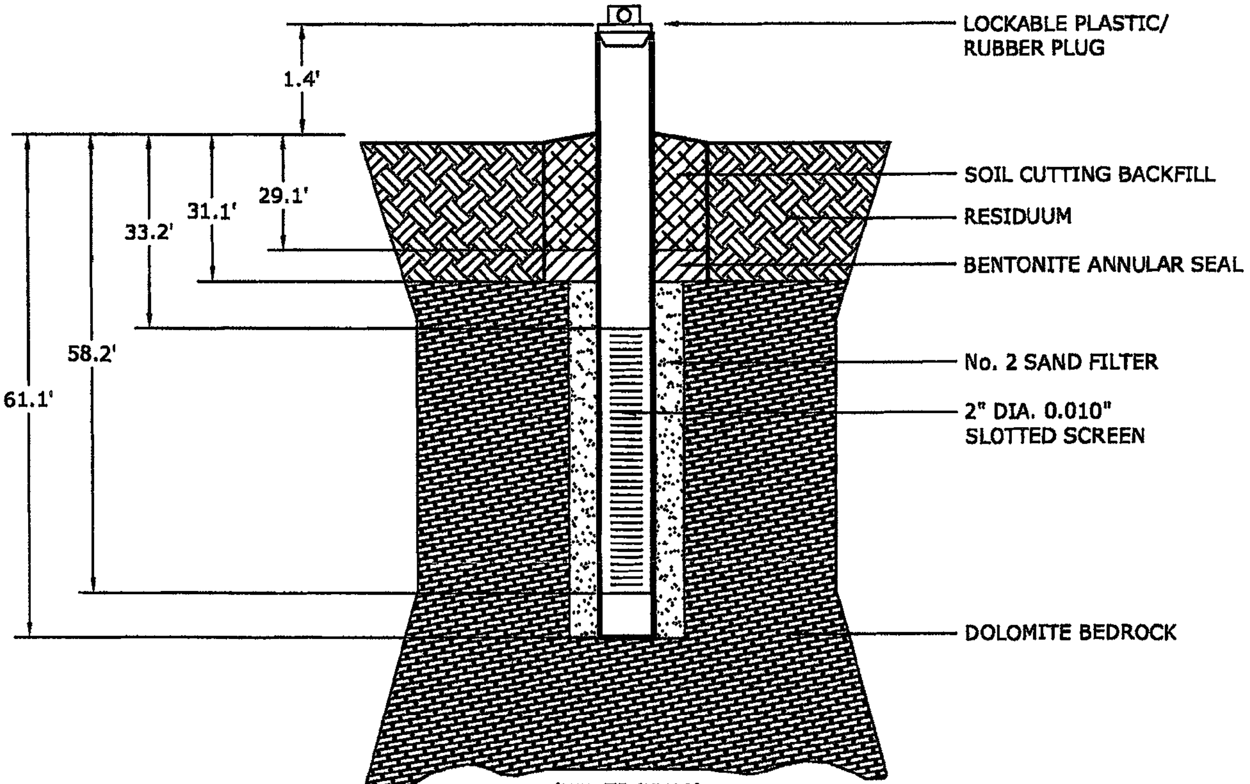
RISER/SCREEN
MATERIAL SCHEDULE 40 PVC

FIELD REPRESENTATIVE TODD JUSTICE

CTJ

DIAMETER 2.0"

SLOT SIZE 0.010"



(NOT TO SCALE)

MACTEC

APPENDIX D

CONE PENETROMETER TEST PROCEDURES AND RESULTS

GREGG

GREGG DRILLING AND TESTING, INC.
GREGG IN SITU, INC.
ENVIRONMENTAL AND GEOTECHNICAL INVESTIGATION SERVICES

May 20, 2005

Mactec
Attn: Hussein Benkhayal
1725 Louisville Drive
Knoxville, TN 37921

Subject: CPT Site Investigation
Kingston TVA
Kingston, TN
GREGG Project Number: 05-062SC

Dear Mr. Benkhayal:

The following report presents the results of GREGG IN SITU's Cone Penetration Test investigation for the above referenced site. The following testing services were performed:

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☒
3	Seismic Cone Penetration Tests	(SCPTU)	☐
4	Resistivity Cone Penetration Tests	(RCPTU)	☐
5	UVIF Cone Penetration Tests	(UVIFCPTU)	☐
6	Groundwater Sampling	(GWS)	☐
7	Soil Sampling	(SS)	☐
8	Vapor Sampling	(VS)	☐
9	Vane Shear Testing	(VST)	☐
10	SPT Energy Calibration	(SPTE)	☐

A list of reference papers providing additional background on the specific tests conducted is provided in the bibliography following the text of the report. If you would like a copy of any of these publications or should you have any questions or comments regarding the contents of this report, please do not hesitate to contact our office at (843) 832-4918.

Sincerely,
GREGG IN SITU, Inc.

Adam Hyer
Operations Manager

106 Butternut Rd • Summerville, South Carolina 29483 • (843) 832-4918 • FAX (843) 832-4919
OTHER OFFICES: LOS ANGELES • SAN FRANCISCO • SALT LAKE CITY • HOUSTON • VANCOUVER • WEST BERLIN (NJ) • AUGUSTA
www.greggdrilling.com

Cone Penetration Testing Procedure (CPT)

Gregg In Situ, Inc. carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*. The soundings were conducted using a 20 ton capacity cone with a tip area of 15 cm^2 and a friction sleeve area of 225 cm^2. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.85.

The cone takes measurements of cone bearing (q_c), sleeve friction (f_s) and dynamic pore water pressure (u_2) at 5-cm intervals during penetration to provide a nearly continuous hydrogeologic log. CPT data reduction and interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored on disk for further analysis and reference. All CPT soundings are performed in accordance with revised (2002) ASTM standards (D 5778-95).

The cone also contains a porous filter element located directly behind the cone tip (u_2), *Figure CPT*. It consists of porous plastic and is 5.0mm thick. The filter element is used to obtain dynamic pore pressure as the cone is advanced as well as Pore Pressure Dissipation Tests (PPDT's) during appropriate pauses in penetration. It should be noted that prior to penetration, the element is fully saturated with silicon oil under vacuum pressure to ensure accurate and fast dissipation.

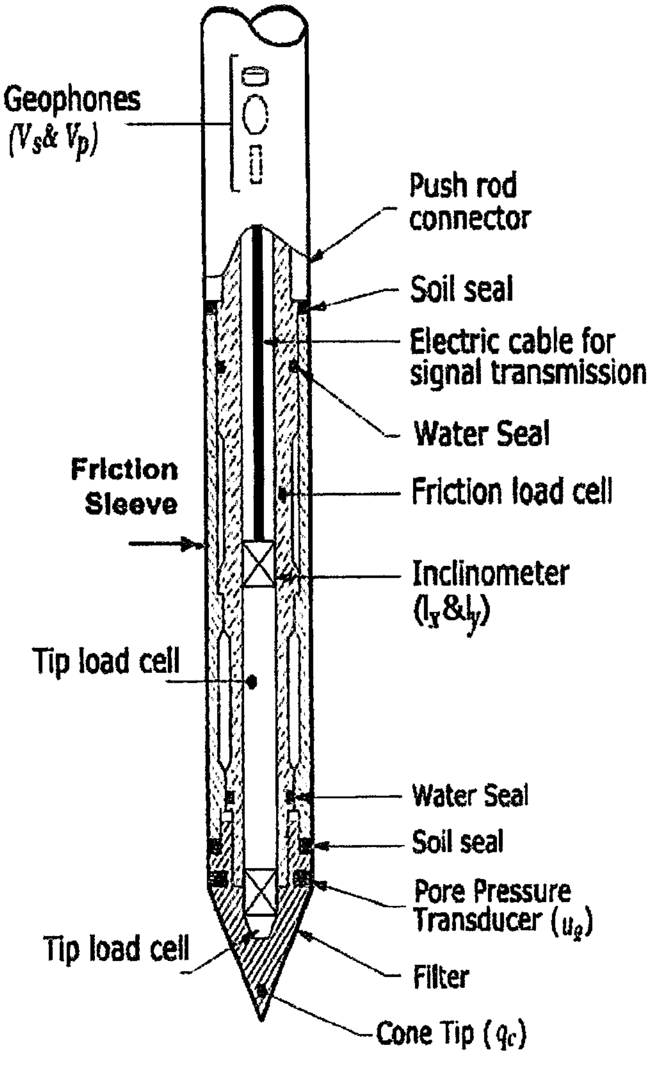


Figure CPT

When the soundings are complete, the test holes are grouted using a Gregg In Situ support rig. The grouting procedure consists of pushing a hollow CPT rod with a "knock out" plug to the termination depth of the test hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

GREGG DRILLING AND TESTING, INC.
GREGG IN SITU, INC.
ENVIRONMENTAL AND GEOTECHNICAL INVESTIGATION SERVICES

Cone Penetration Test Sounding Summary

-Table 1-

CPT Sounding Identification	Client Identification	Date	Termination Depth (Feet)	Depth of Soil Samples (ft)	Depth of Pore Pressure Dissipation Tests (ft)
CPT-01	NB-79	5/16/05	24.4	-	24.4
CPT-02	NB-82	5/16/05	22.3	-	-
CPT-03	NB-71	5/16/05	33.0	-	-
CPT-04	NB-62	5/16/05	58.7	-	56.7
CPT-05	NB-57	5/17/05	41.7	-	-
CPT-06	NB-54	5/17/05	28.8	-	-
CPT-07	NB-58	5/17/05	36.7	-	36.8
CPT-08	NB-56	5/17/05	33.9	-	-
CPT-09	NB-11	5/17/05	30.9	-	30.9
CPT-10	NB-26	5/17/05	35.6	-	35.6

Cone Penetration Test Data & Interpretation

Soil behavior type and stratigraphic interpretation is based on relationships between cone bearing (q_c), sleeve friction (f_s), and pore water pressure (u_2). The friction ratio (R_f) is a calculated parameter defined by $100 f_s / q_c$ and is used to infer soil behavior type. Generally:

Cohesive soils (clays)

- High friction ratio (R_f) due to small cone bearing (q_c)
- Generate large excess pore water pressures (u_2)

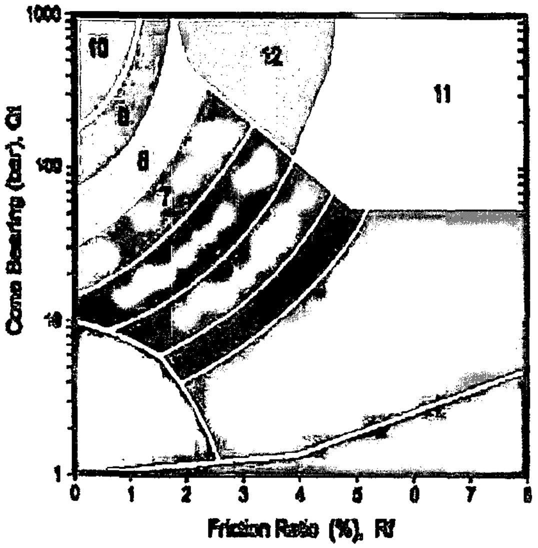
Cohesionless soils (sands)

- Low friction ratio (R_f) due to large cone bearing (q_c)
- Generate very little excess pore water pressures (u_2)

A complete set of baseline readings are taken prior to and at the completion of each sounding to determine temperature shifts and any zero load offsets. Corrections for temperature shifts and zero load offsets can be extremely important, especially when the recorded loads are relatively small. In sandy soils, however, these corrections are generally negligible.

The cone penetration test data collected from your site is presented in graphical form in Appendix CPT. The data includes CPT logs of measured soil parameters, computer calculations of interpreted soil behavior types (SBT), and additional geotechnical parameters. A summary of locations and depths is available in Table 1. Note that all penetration depths referenced in the data are with respect to the existing ground surface.

Soil interpretation for this project was conducted using recent correlations developed by Robertson et al, 1990, *Figure SBT*. Note that it is not always possible to clearly identify a soil type based solely on q_c, f_s, and u_2. In these situations, experience, judgment, and an assessment of the pore pressure dissipation data should be used to infer the soil behavior type.



ZONE	Qt/N	SBT
1	2	Sensitive, fine grained
2	1	Organic materials
3	1	Clay
4	1.5	Silty clay to clay
5	2	Clayey silt to silty clay
6	2.5	Sandy silt to clayey silt
7	3	Silty sand to sandy silt
8	4	Sand to silty sand
9	5	Sand
10	6	Gravely sand to sand
11	1	Very stiff fine grained*
12	2	Sand to clayey sand*

*over consolidated or cemented

Figure SBT

Pore Pressure Dissipation Tests (PPDT)

Pore Pressure Dissipation Tests (PPDT's) conducted at various intervals measured hydrostatic water pressures and determined the approximate depth of the ground water table. A PPDT is conducted when the cone is halted at specific intervals determined by the field representative. The variation of the penetration pore pressure (*u*) with time is measured behind the tip of the cone and recorded by a computer system.

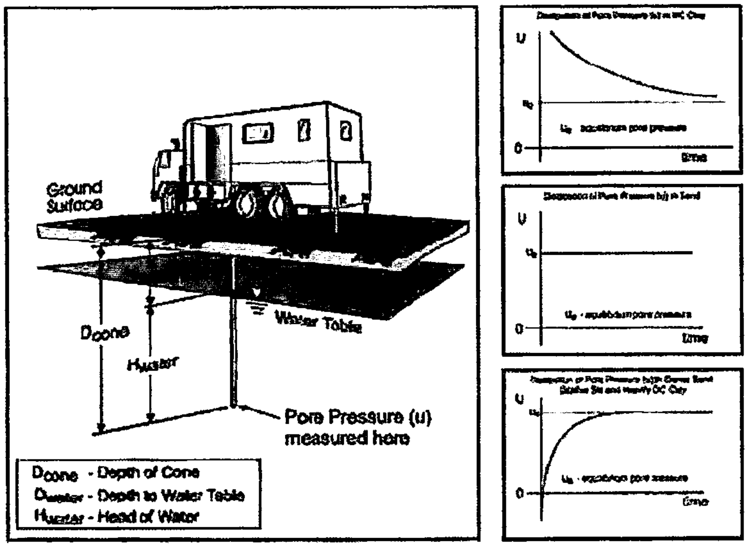
Pore pressure dissipation data can be interpreted to provide estimates of:

- Equilibrium piezometric pressure
- Phreatic Surface
- In situ horizontal coefficient of consolidation (c_h)
- In situ horizontal coefficient of permability (k_h)

In order to correctly interpret the equilibrium piezometric pressure and/or the phreatic surface, the pore pressure must be monitored until such time as there is no variation in pore pressure with time, *Figure PPDT*. This time is commonly referred to as t_{100}, the point at which 100% of the excess pore pressure has dissipated.

A complete reference on pore pressure dissipation tests is presented by Robertson et al. 1991.

A summary of the pore pressure dissipation tests is summarized in Table 1. Pore pressure dissipation data is presented in graphical form in Appendix PPDT.



Water Table Calculation

$$D_{water} = D_{cone} - H_{water}$$

where $H_{water} = U_0$ (depth units)

Useful Conversion Factors: 1psi = 0.704m = 2.31 feet (water)
1tsf = 0.958 bar = 13.9 psi
1m = 3.28 feet

Figure PPDT

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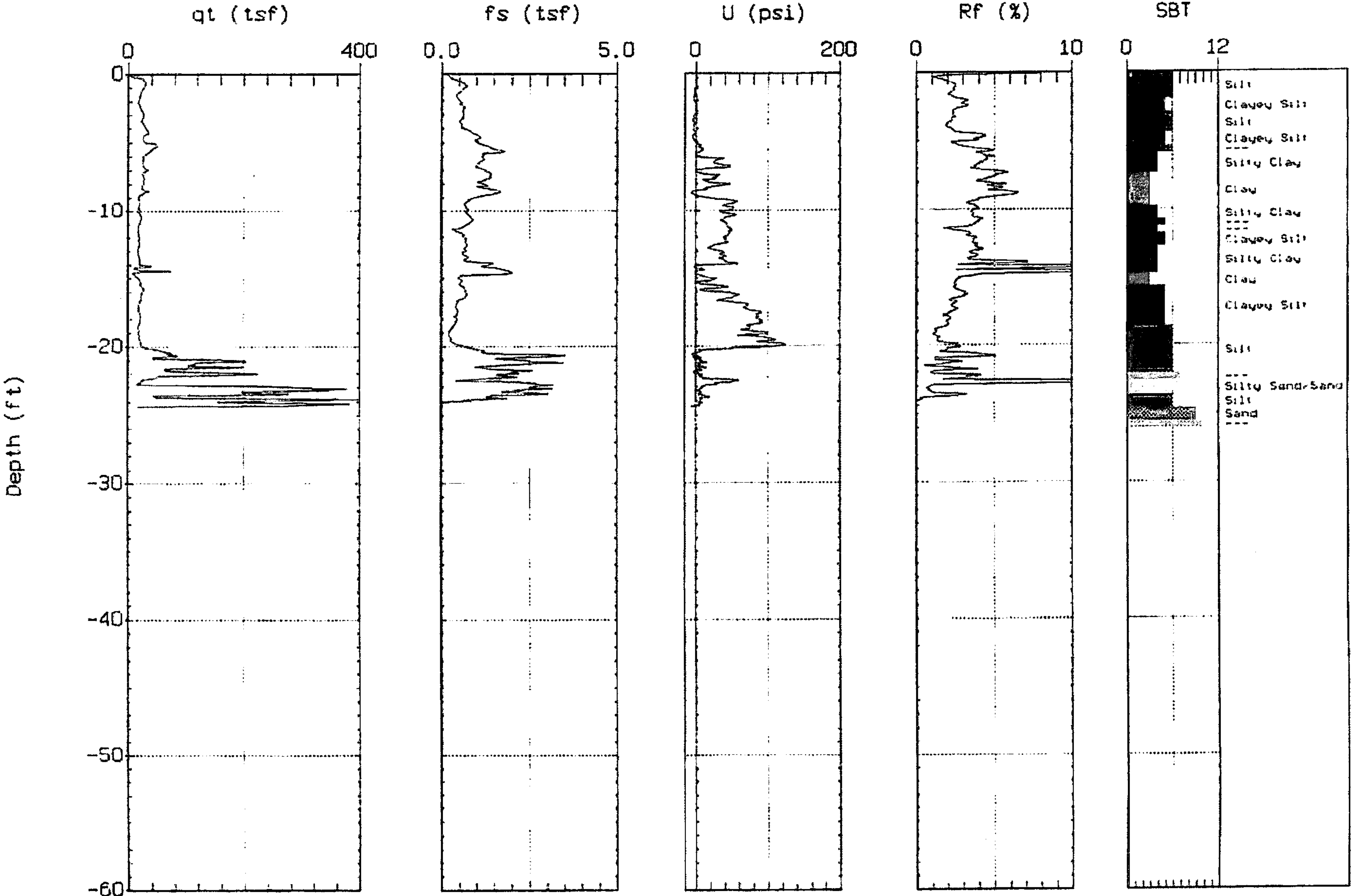
Copies of ASTM Standards are available through www.astm.org

GREGG

MACTEC

Site:KINGSTON TVA
Location:NB-79

Engineer:H.BENKHAYAL
Date:05:16:05 02:28



Max. Depth: 24.41 (ft)
Depth Inc.: 0.066 (ft)

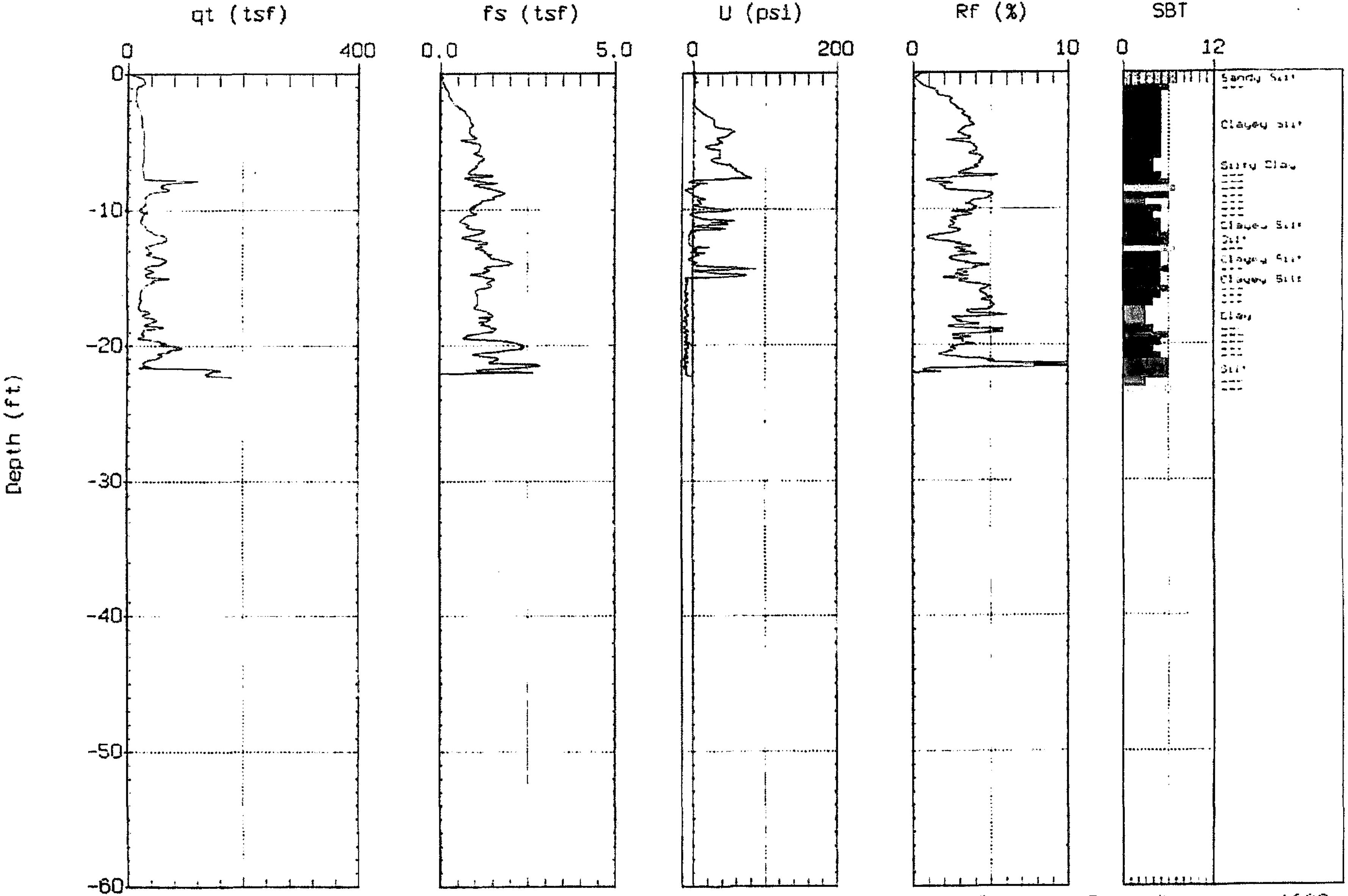
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site:KINGSTON TVA
Location:NB-82

Engineer:H.BENKHHYAL
Date:05:16:05 06:46



Max. Depth: 22.31 (ft)
Depth Inc.: 0.066 (ft)

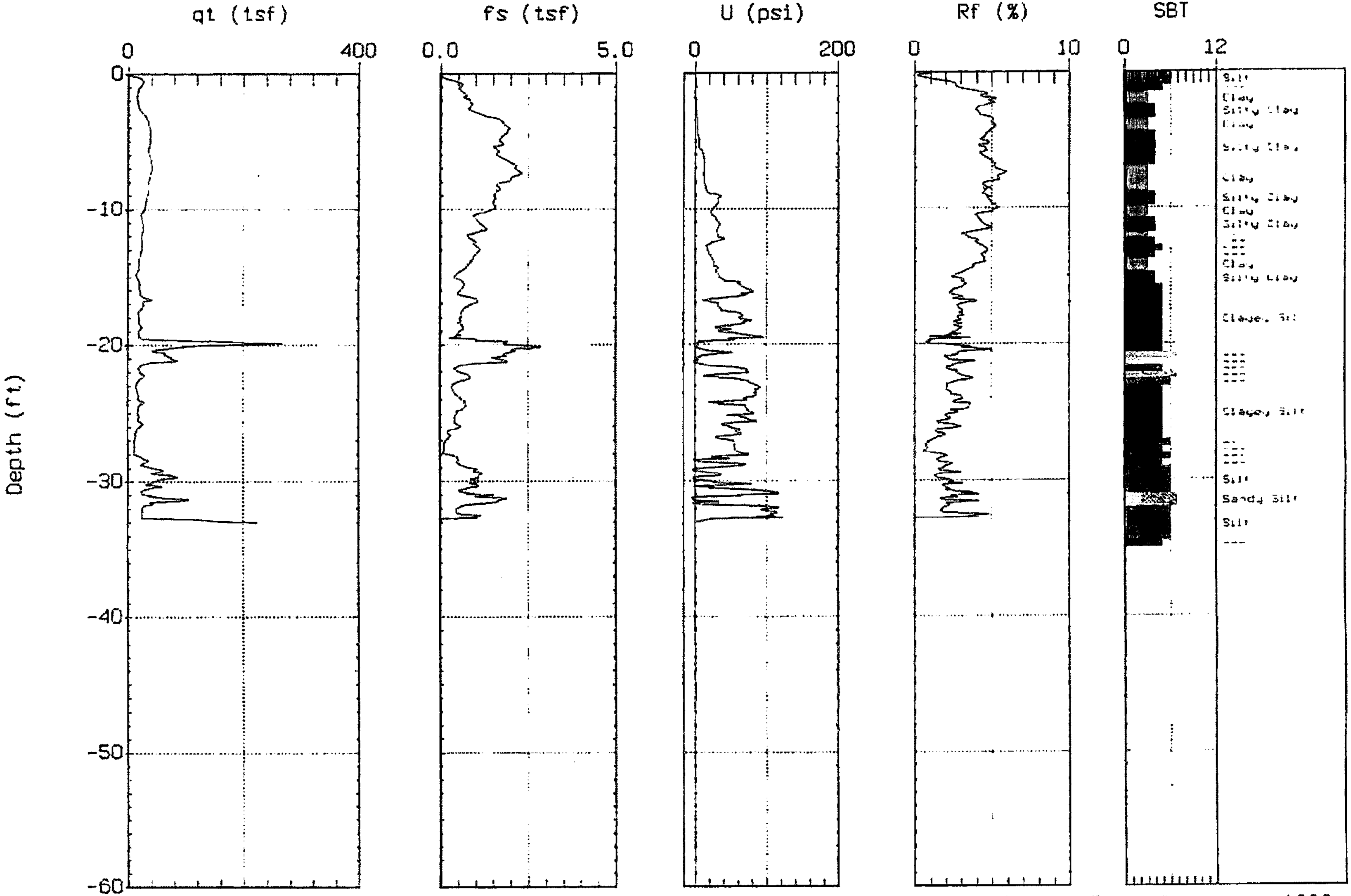
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site: KINGSTON TVA
Location: NB-71

Engineer: H.BENKHAYAL
Date: 05:16:05 02:51



Max. Depth: 33.00 (ft)
Depth Inc.: 0.066 (ft)

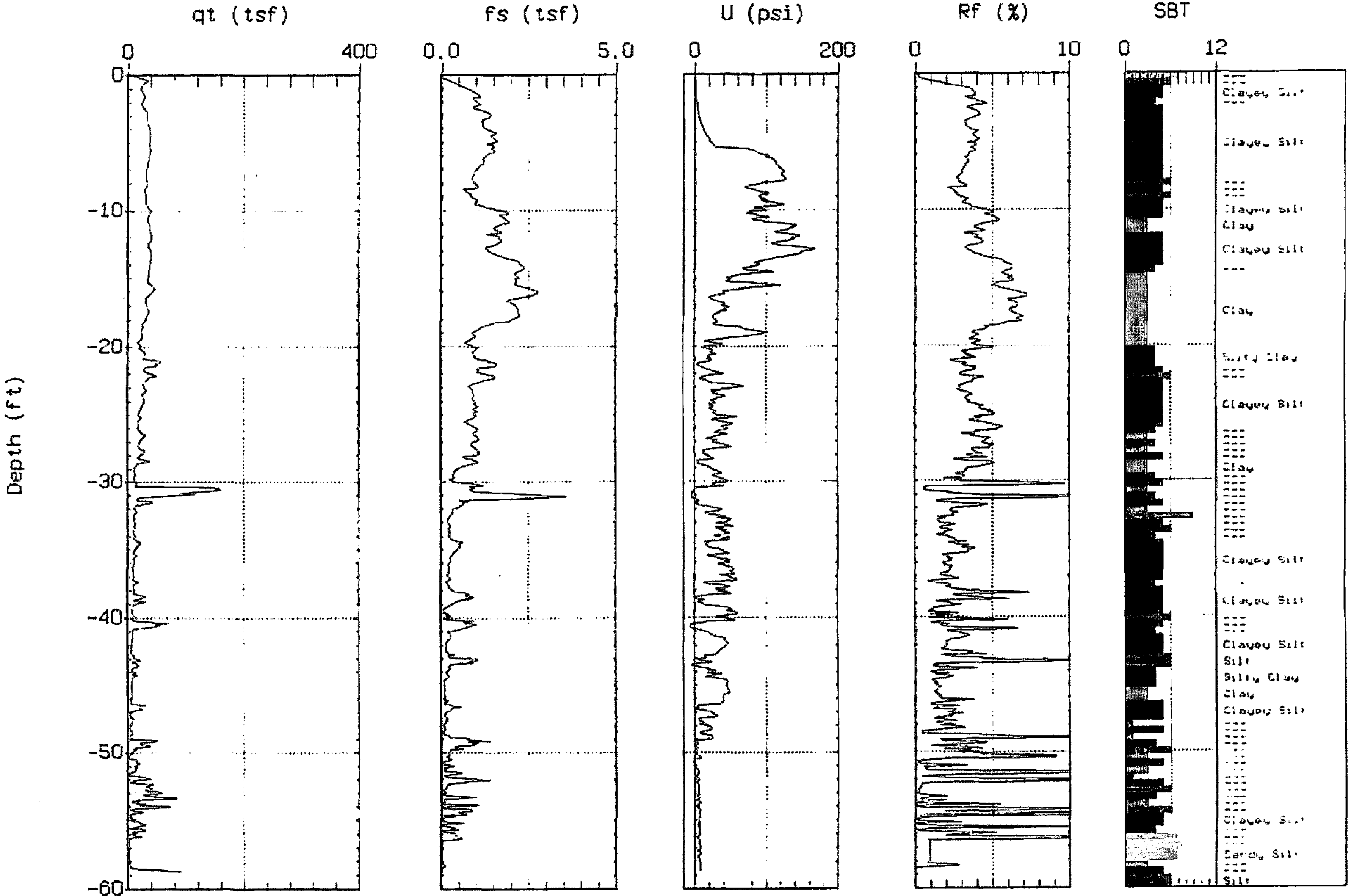
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site: KINGSTON TVA
Location: NB-62

Engineer: H.BENKHAYAL
Date: 05:16:05 08:35



Max. Depth: 58.73 (ft)
Depth Inc.: 0.066 (ft)

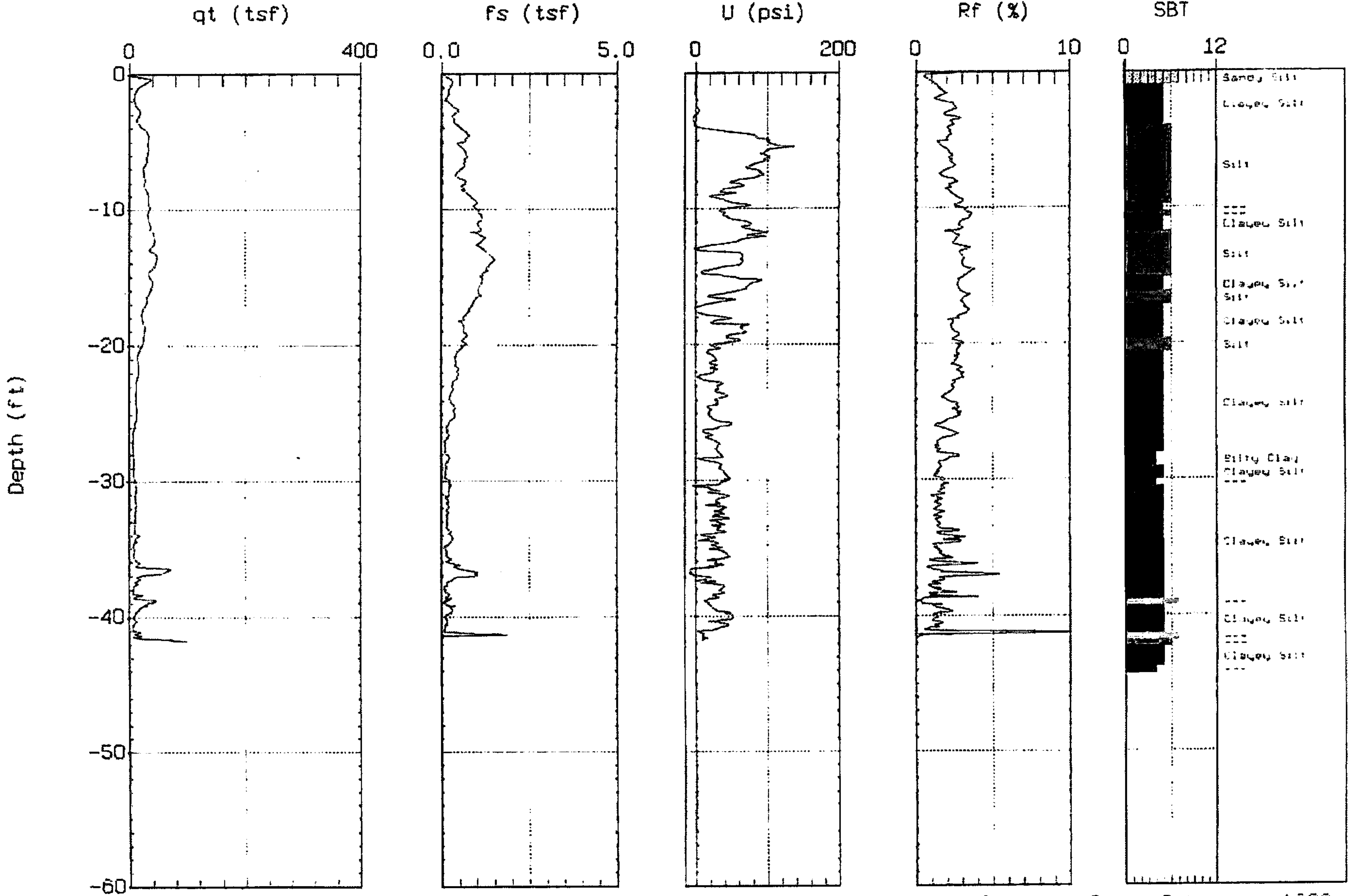
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site: KINGSTON TVA
Location: NB-57

Engineer: H.BENKHAYAL
Date: 05:17:05 01:29



Max. Depth: 41.73 (ft)
Depth Inc.: 0.066 (ft)

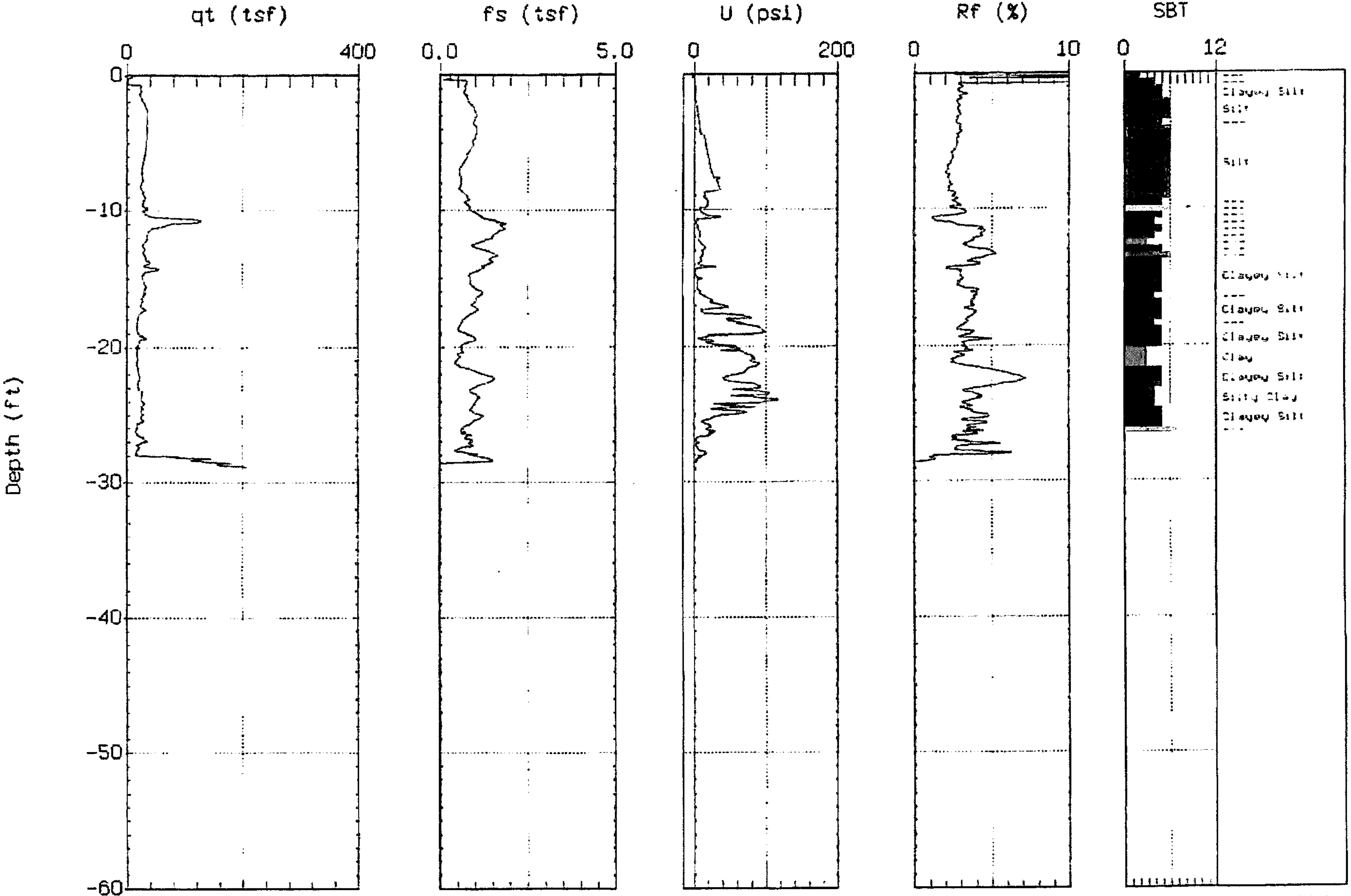
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site:KINGSTON TVA
Location:NB-54

Engineer:H.BENKHAYAL
Date:05:17:05 03:13



Max. Depth: 28.81 (ft)
Depth Inc.: 0.066 (ft)

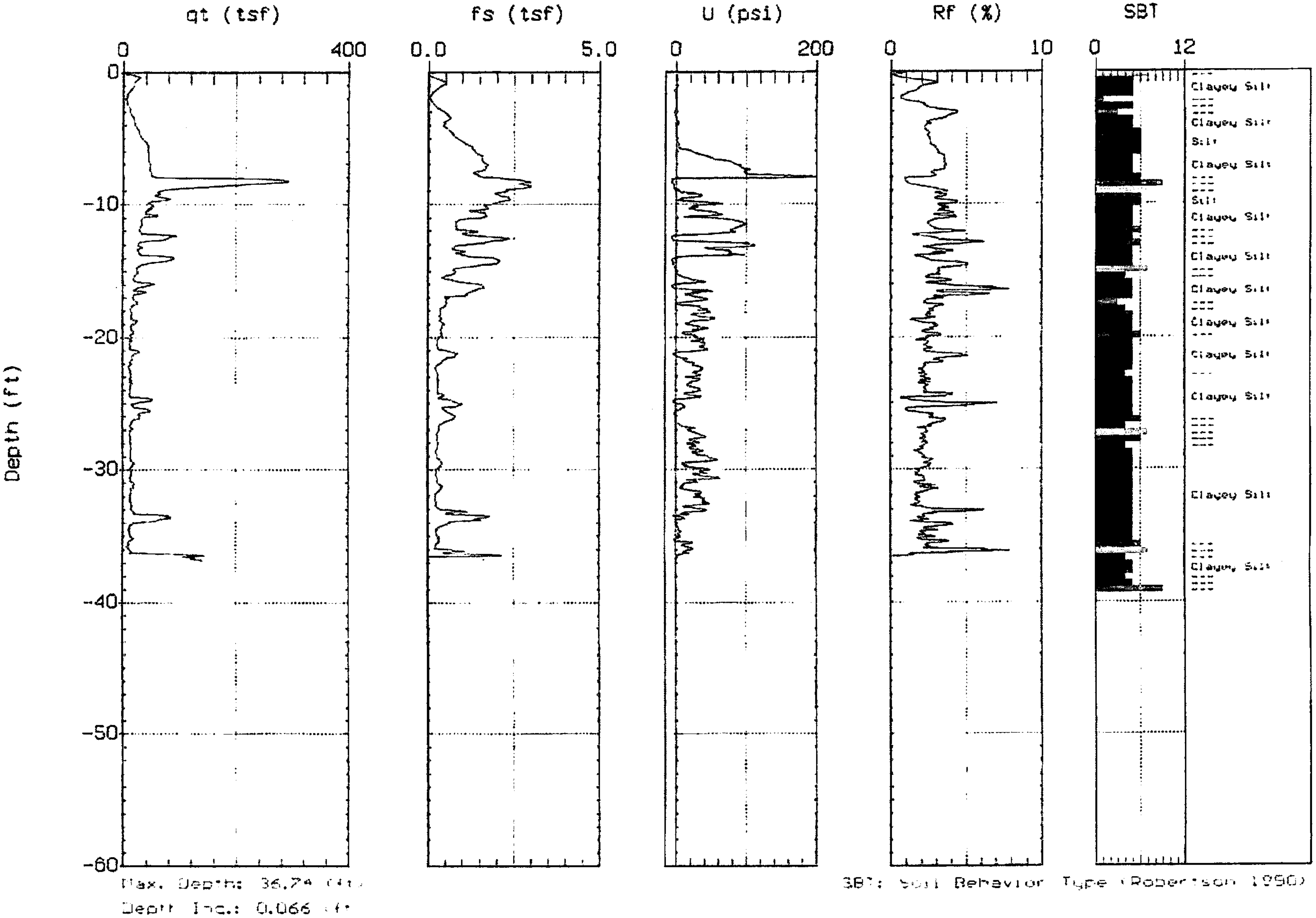
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site:KINGSTON TVA
Location:NB-58

Engineer:H.BENKHAYAL
Date:05:17:05 04:04

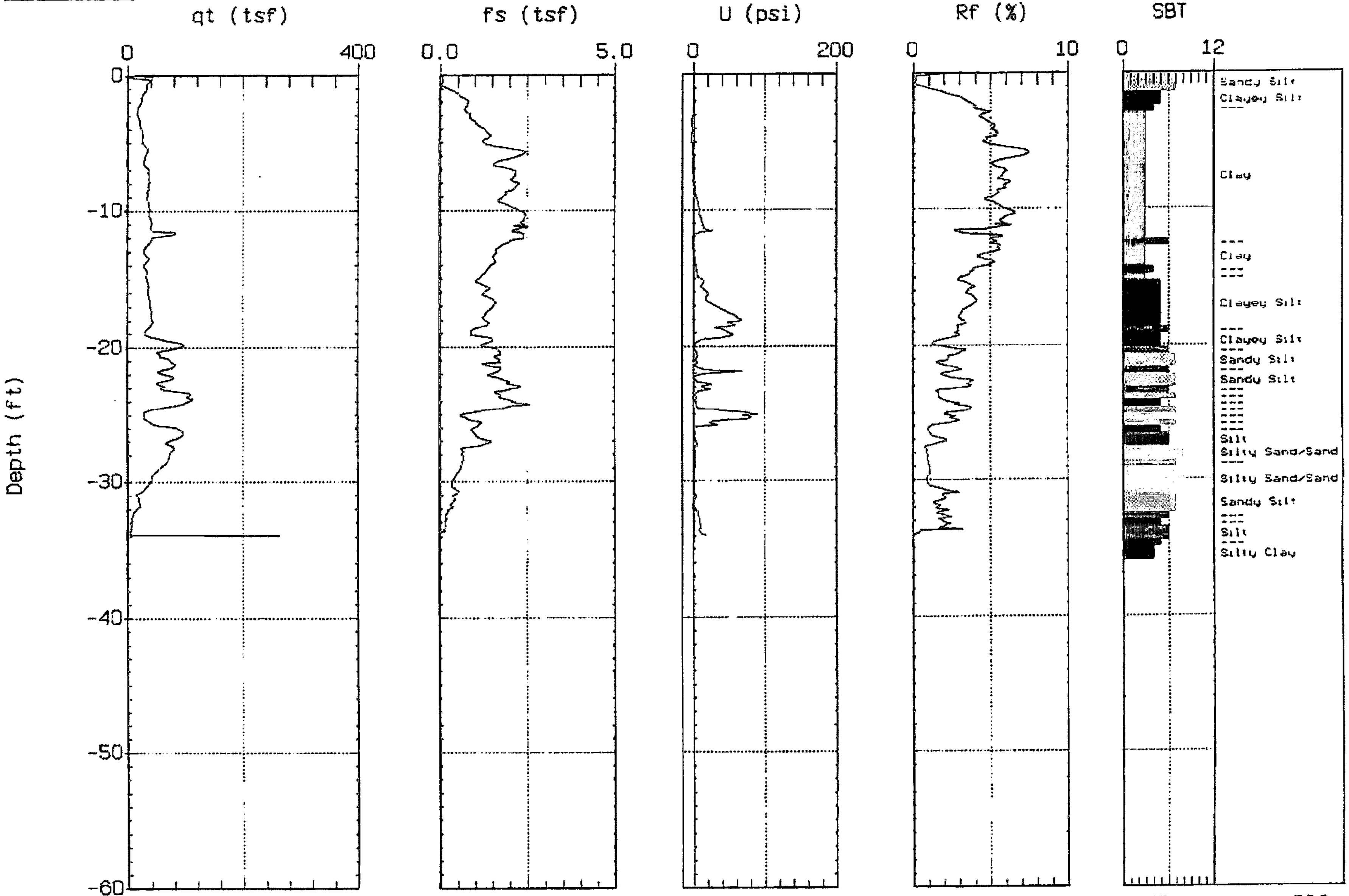


GREGG

MACTEC

Site: KINGSTON TVA
Location: NB-56

Engineer: H.BENKHAYAL
Date: 05:17:05 05:04



Max. Depth: 33.92 (ft)
Depth Inc.: 0.066 (ft)

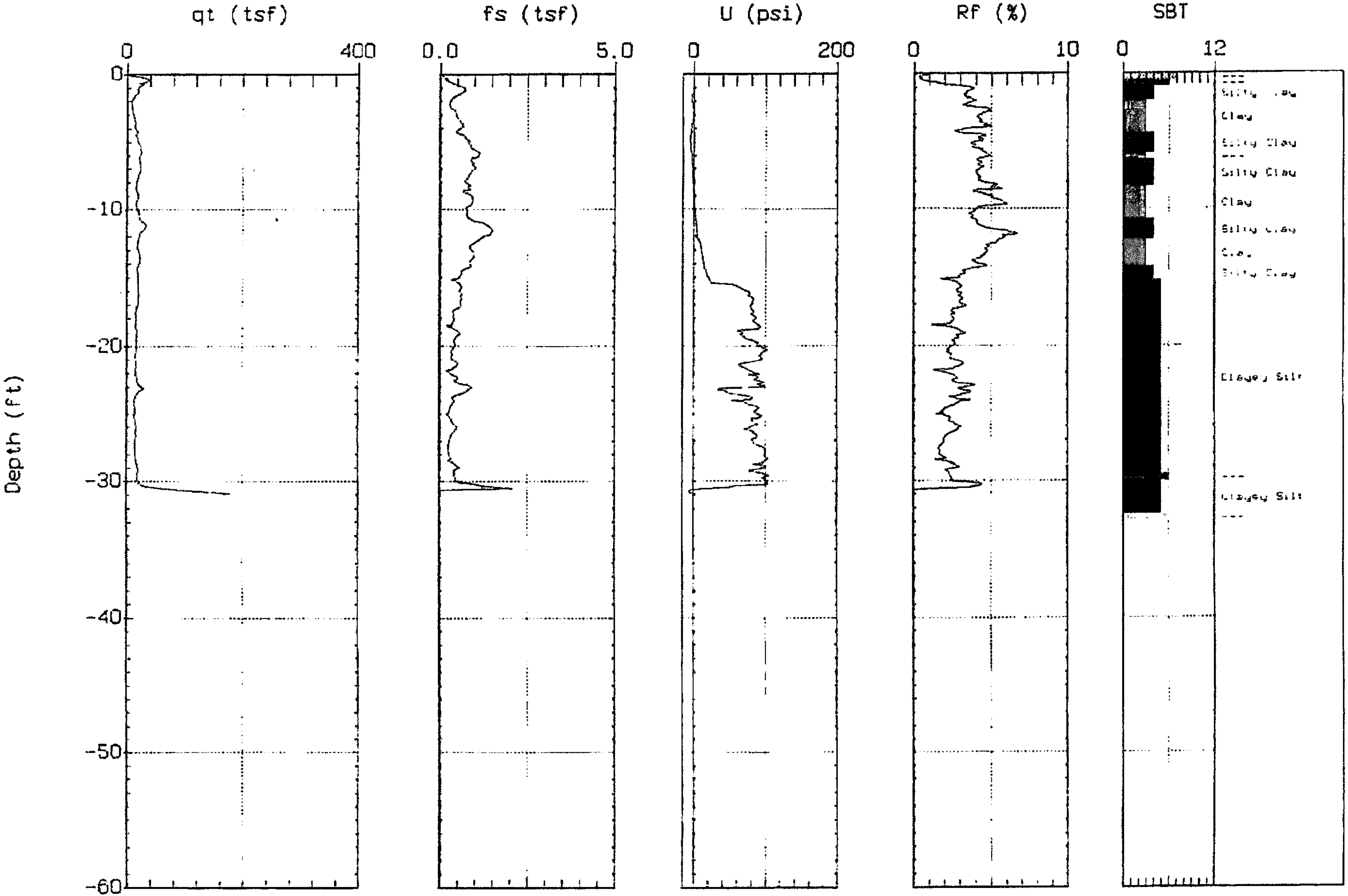
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site: KINGSTON TVA
Location: NB-11

Engineer: H.BENKHAYAL
Date: 05:17:05 06:07



Max. Depth: 30.91 (ft)
Depth Inc.: 0.066 (ft)

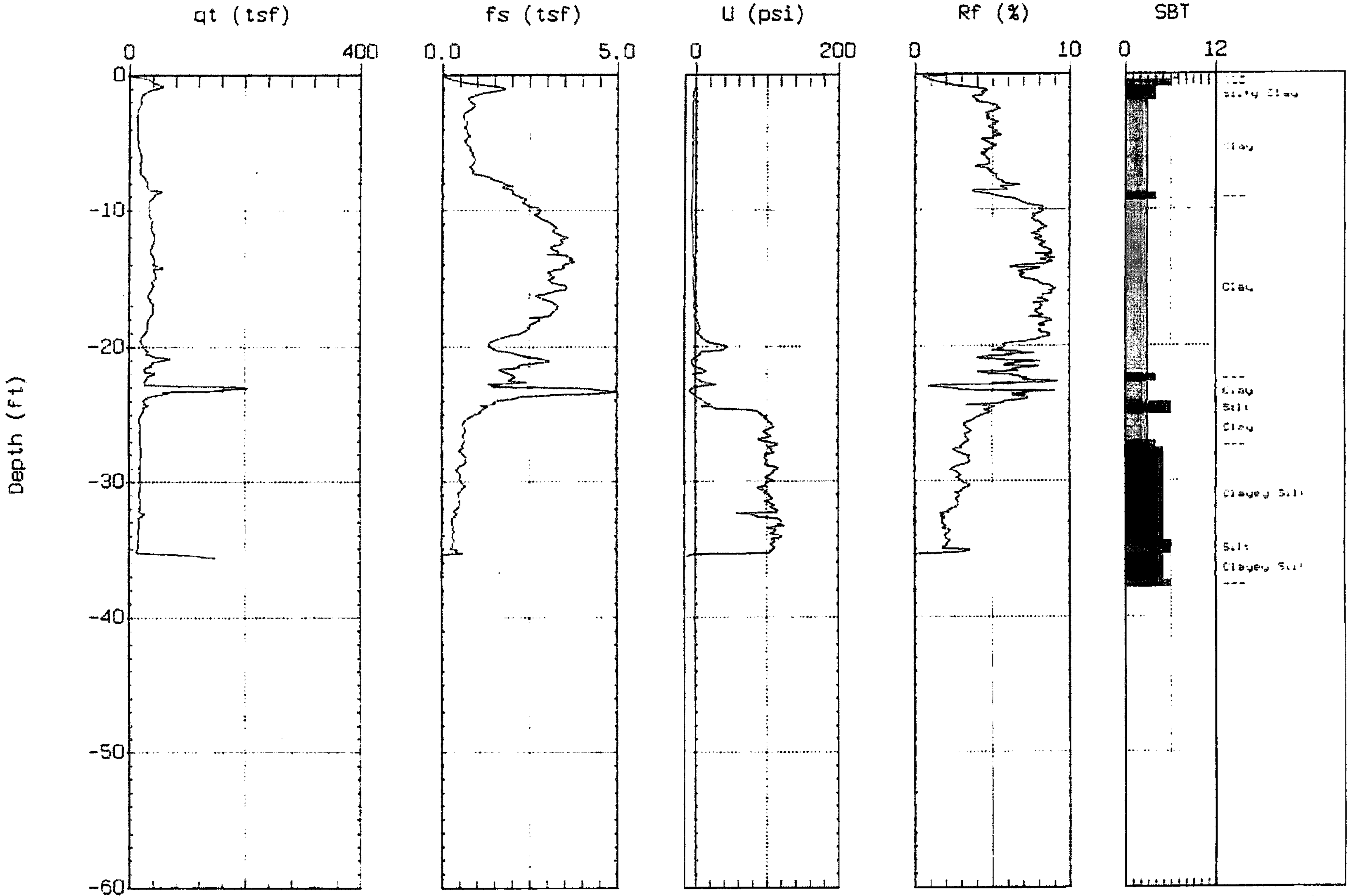
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site: KINGSTON TVA
Location: NE 26

Engineer: H.BENKHAYAL
Date: 05:17:05 07:02



Max. Depth: 35.63 (ft)
Depth Inc.: 0.066 (ft)

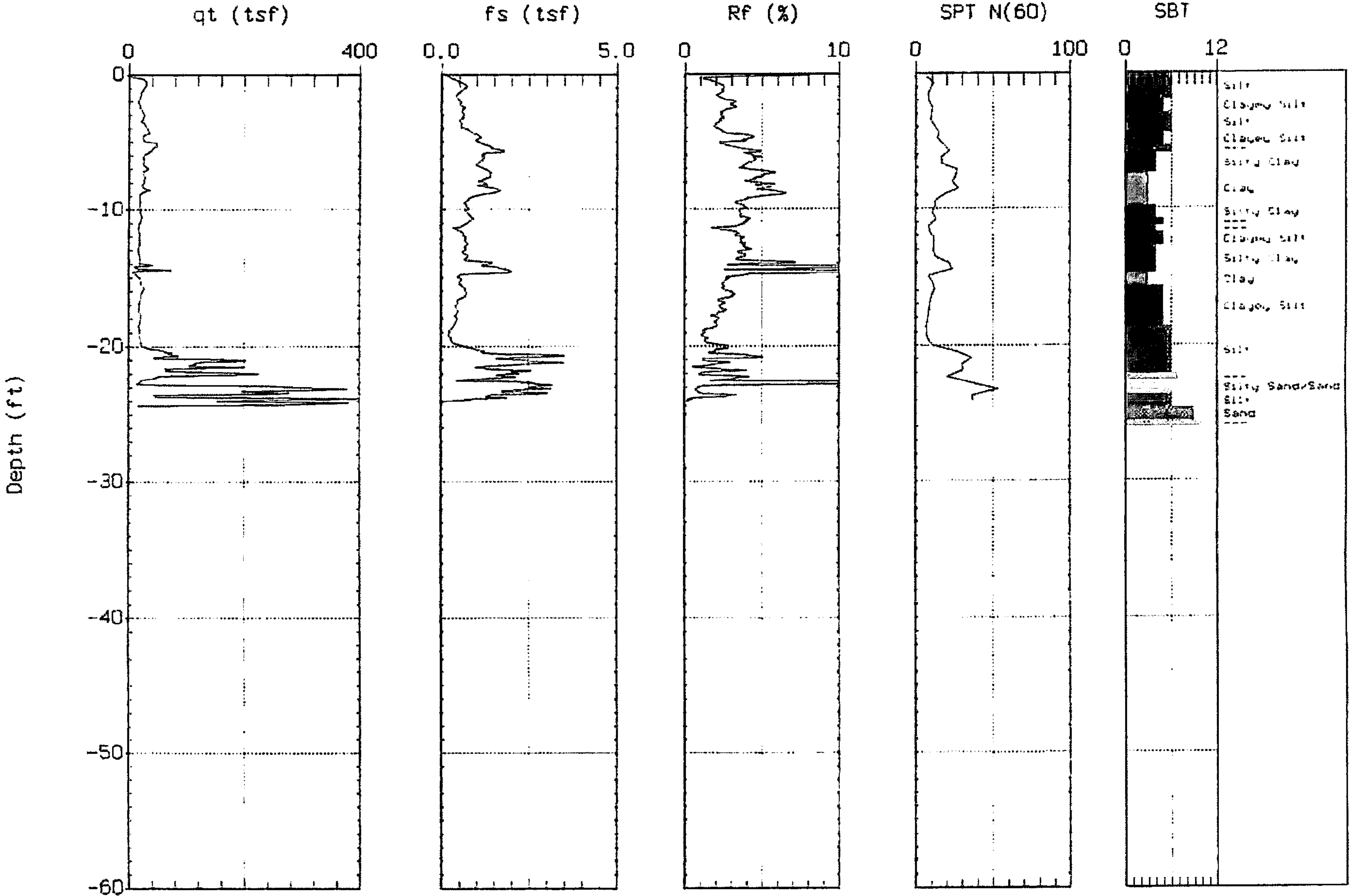
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site: KINGSTON TVA
Location: NE-79

Engineer: H.BENKHAYAI
Date: 05:16:05 02:28



Max. Depth: 24.41 (ft)
Depth Inc.: 0.066 (ft)

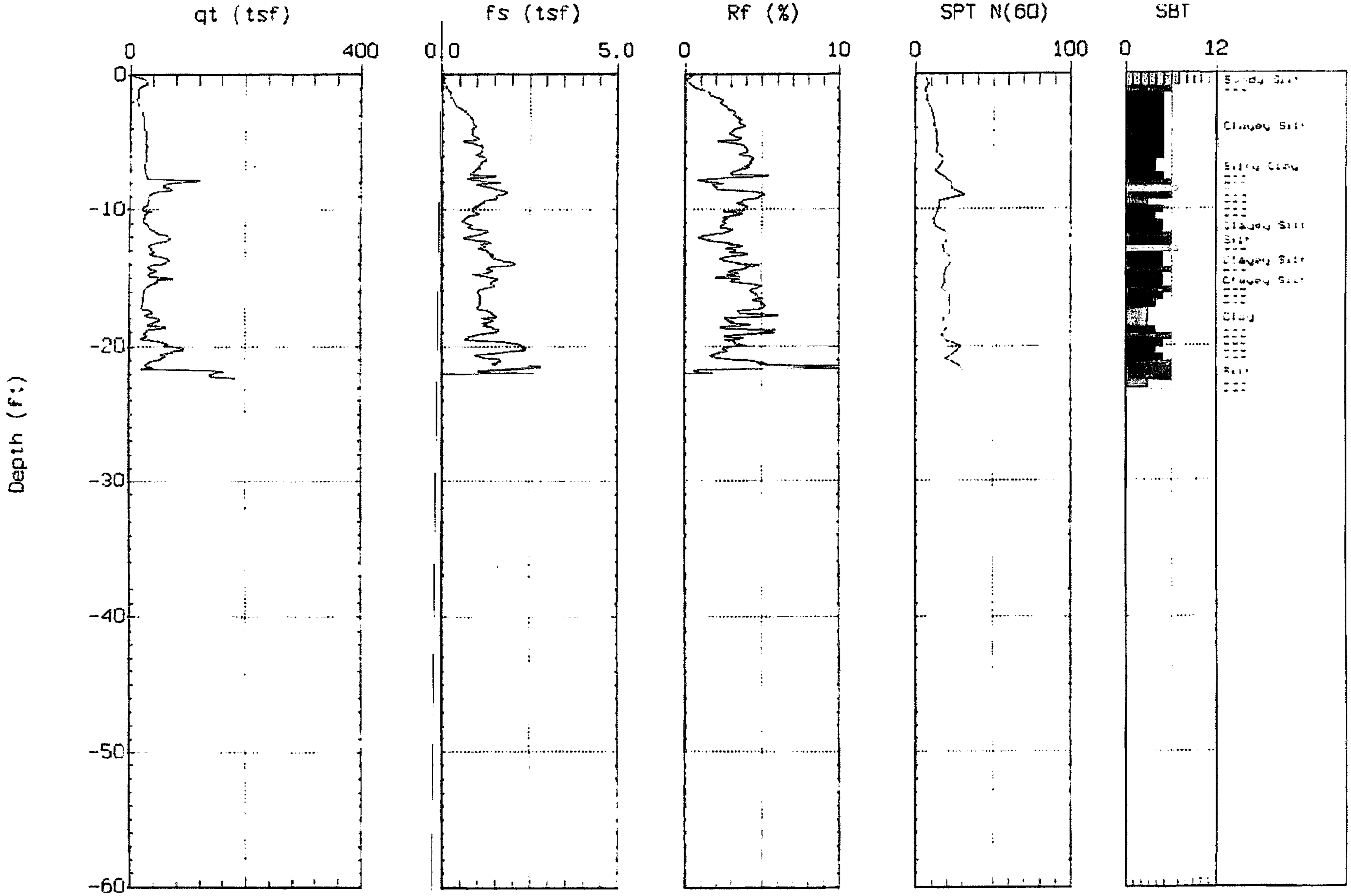
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site:KINGSTON TVA
Location:NB-82

Engineer:H.BENKHAYAL
Date:05:16:06 06:46



Max. Depth: 22.31 (ft)
Depth Inc.: 0.066 (ft)

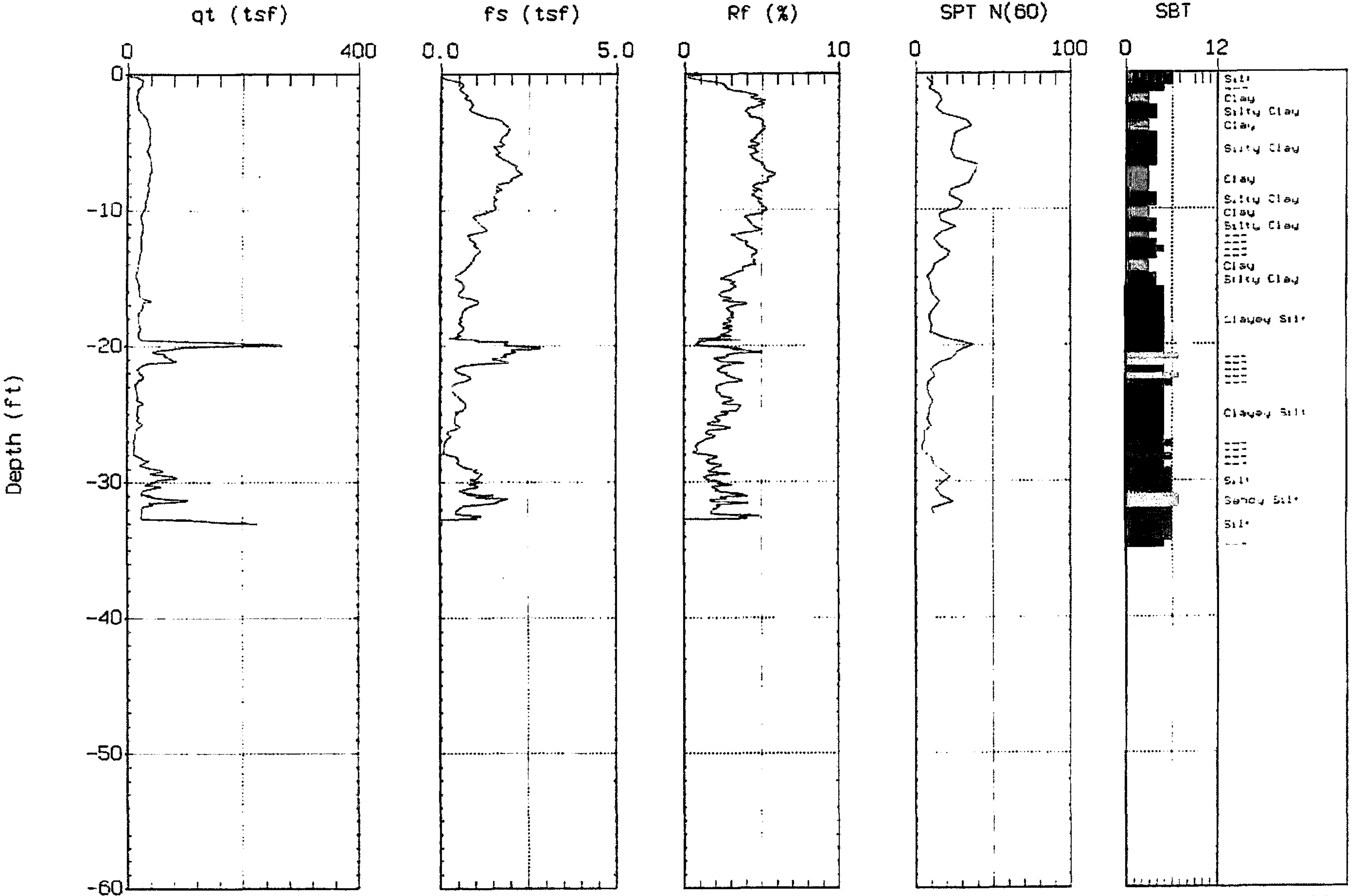
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site: KINGSTON TVA
Location: NB-71

Engineer: H.BENKHAYAL
Date: 05:16:05 07:51



Max. Depth: 33.00 (ft)
Depth Inc.: 0.066 (ft)

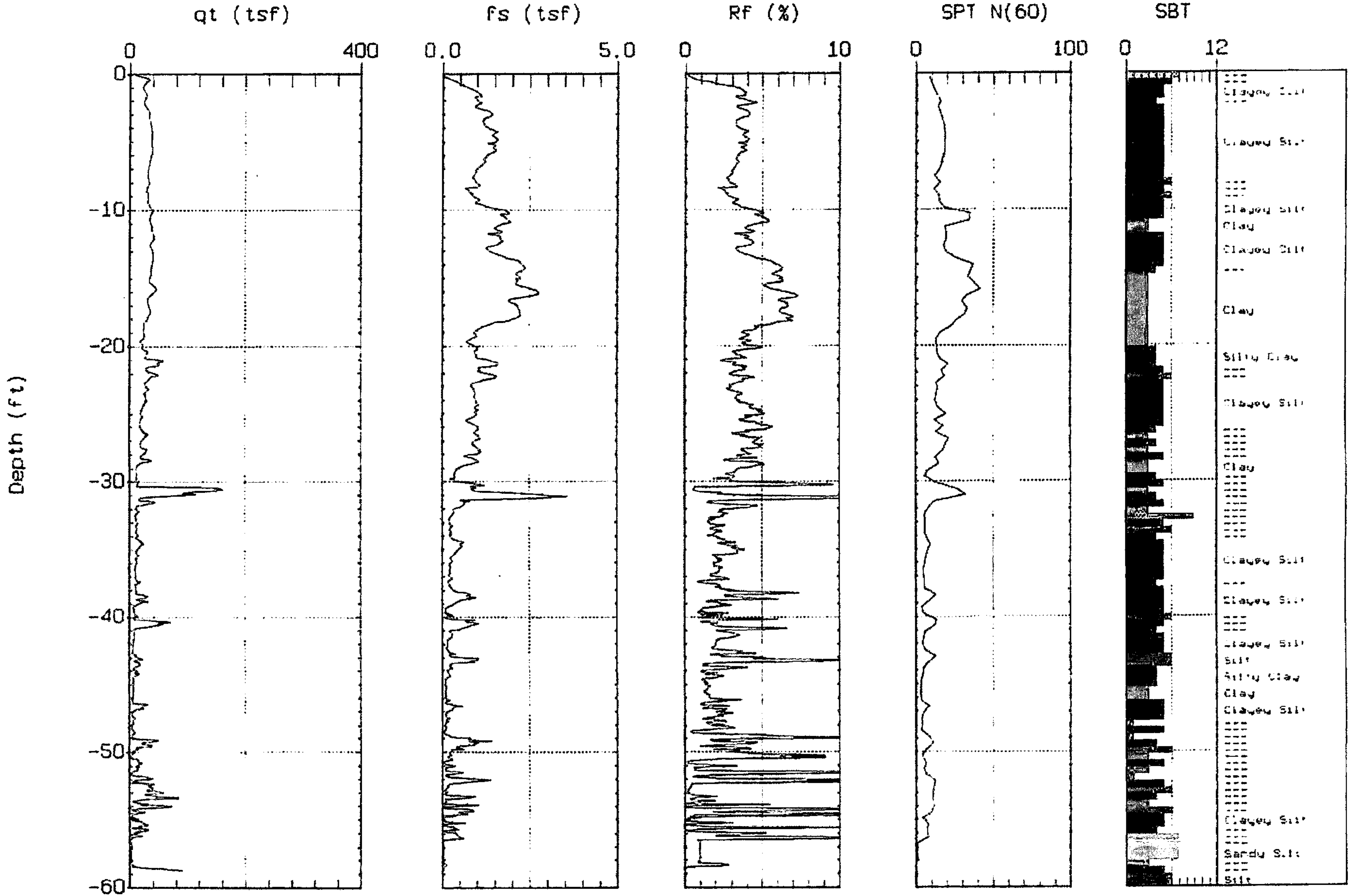
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site: KINGSTON TVA
Location: NB-62

Engineer: H.BENKHAYAL
Date: 05:16:05 08:35



Max. Depth: 58.73 (ft)
Depth Inc.: 0.066 (ft)

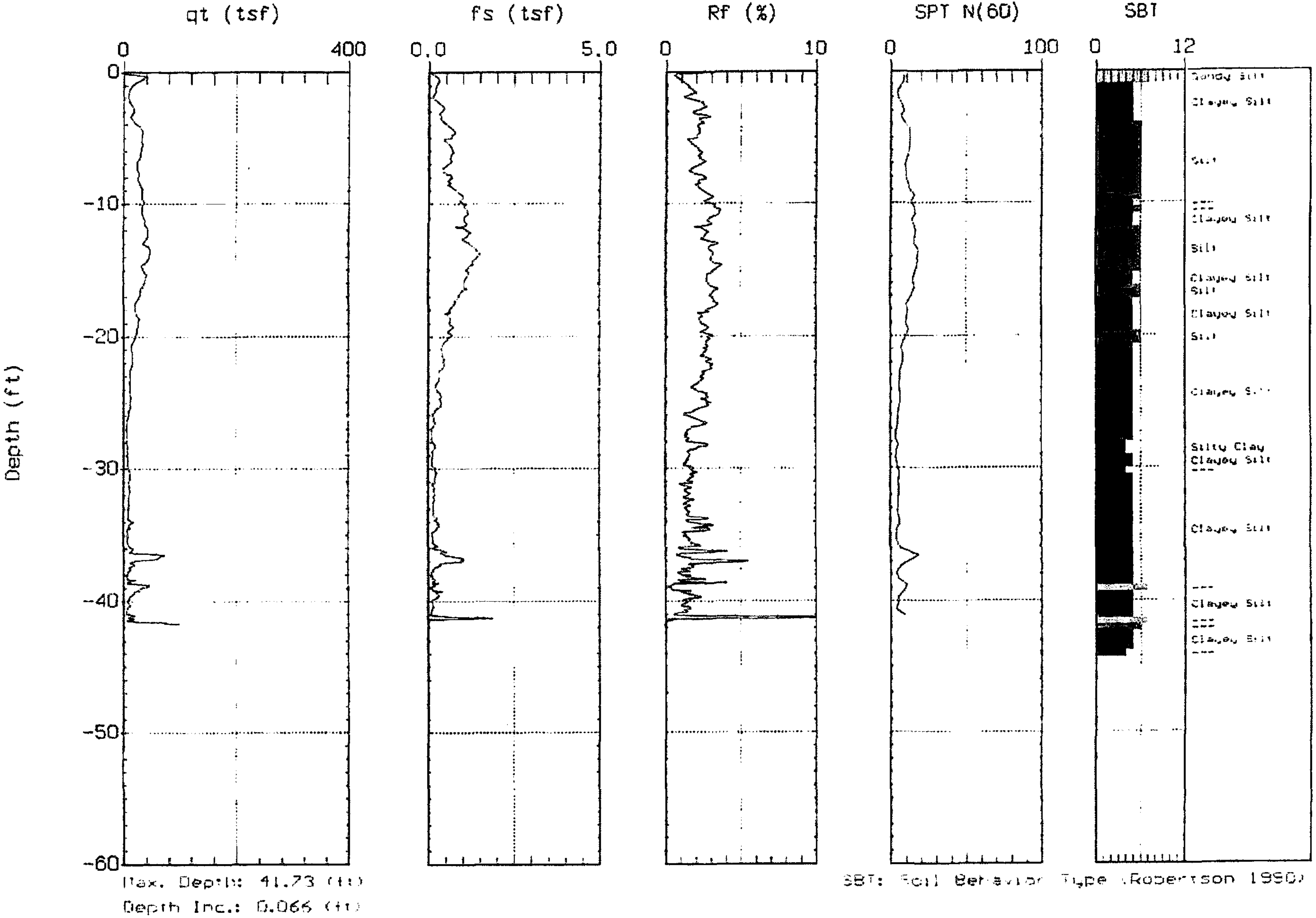
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site: KINGSTON TVA
Location: NB-57

Engineer: H.BENKHAYAL
Date: 05:17:05 01:29



Max. Depth: 41.73 (ft)
Depth Inc.: 0.066 (ft)

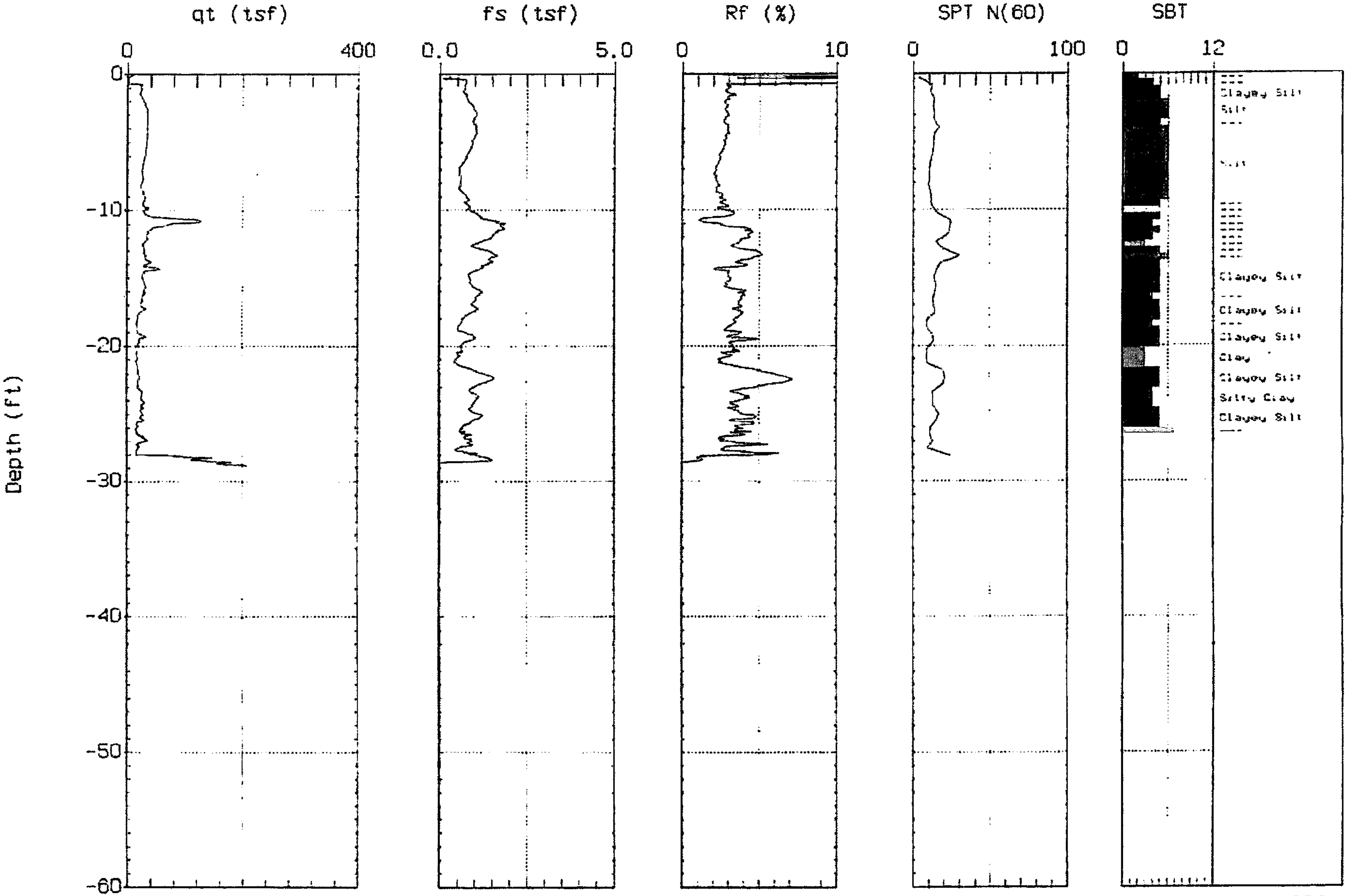
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site: KINGSTON TVA
Location: NB-54

Engineer: H.BENKHAYAL
Date: 05:17:05 03:13



Max. Depth: 28.81 (ft)
Depth Inc.: 0.066 (ft)

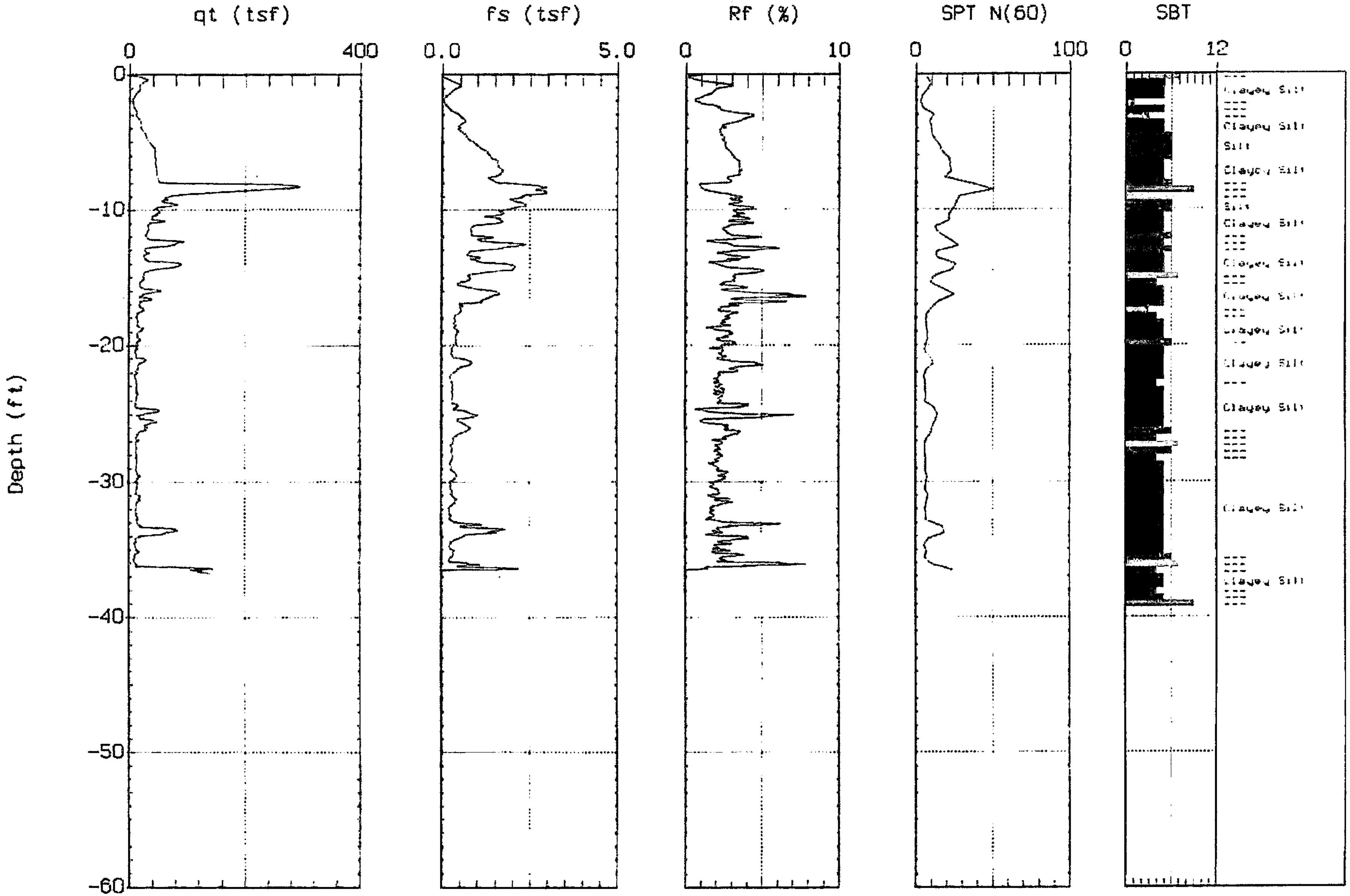
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site:KINGSTON TVA
Location:NB-5A

Engineer:H.BENKHAYAL
Date:05:17:05 04:04



Max. Depth: 36.74 (ft)
Depth Inc.: 0.066 (ft)

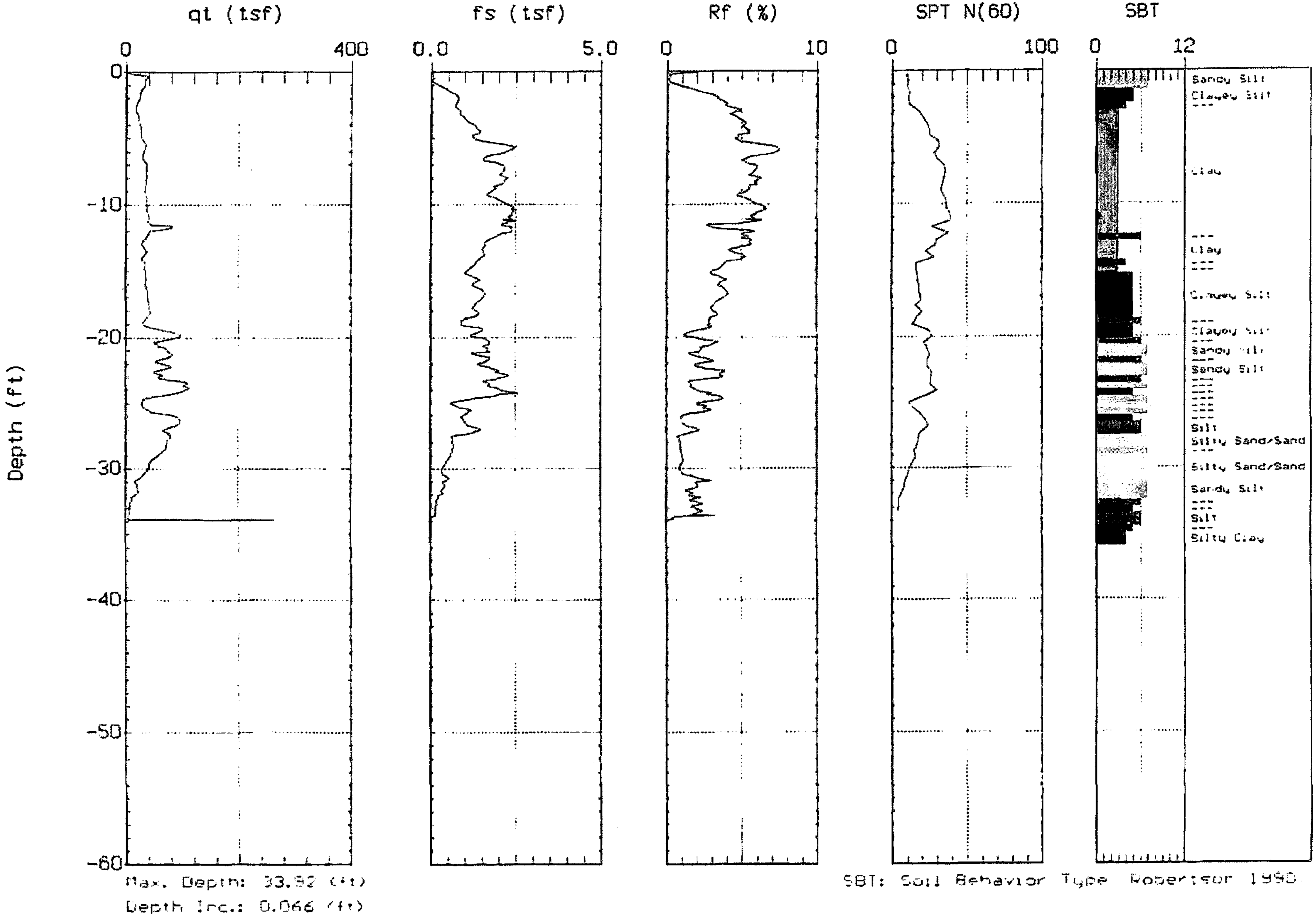
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site: KINGSTON TVA
Location: NE-56

Engineer: H.BENKHAYAL
Date: 05:17:05 05:04



Max. Depth: 33.92 (ft)
Depth Inc.: 0.066 (ft)

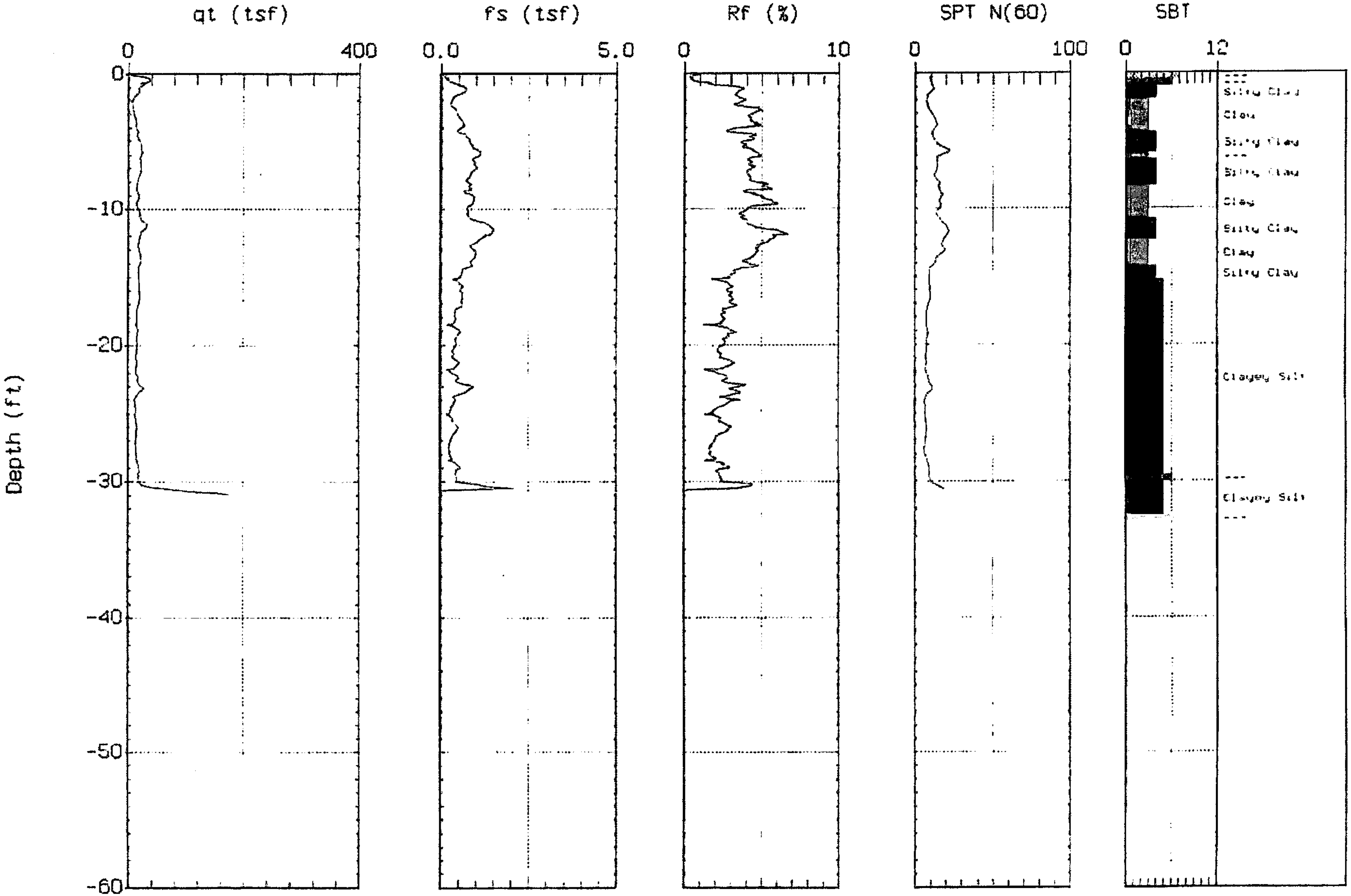
SBT: Soil Behavior Type Robertson 1990

GREGG

MACTEC

Site: KINGSTON TVA
Location: NB-11

Engineer: H.BENKHAYAL
Date: 05:12:05 06:07



Max. Depth: 30.91 (ft)
Depth Inc.: 0.066 (ft)

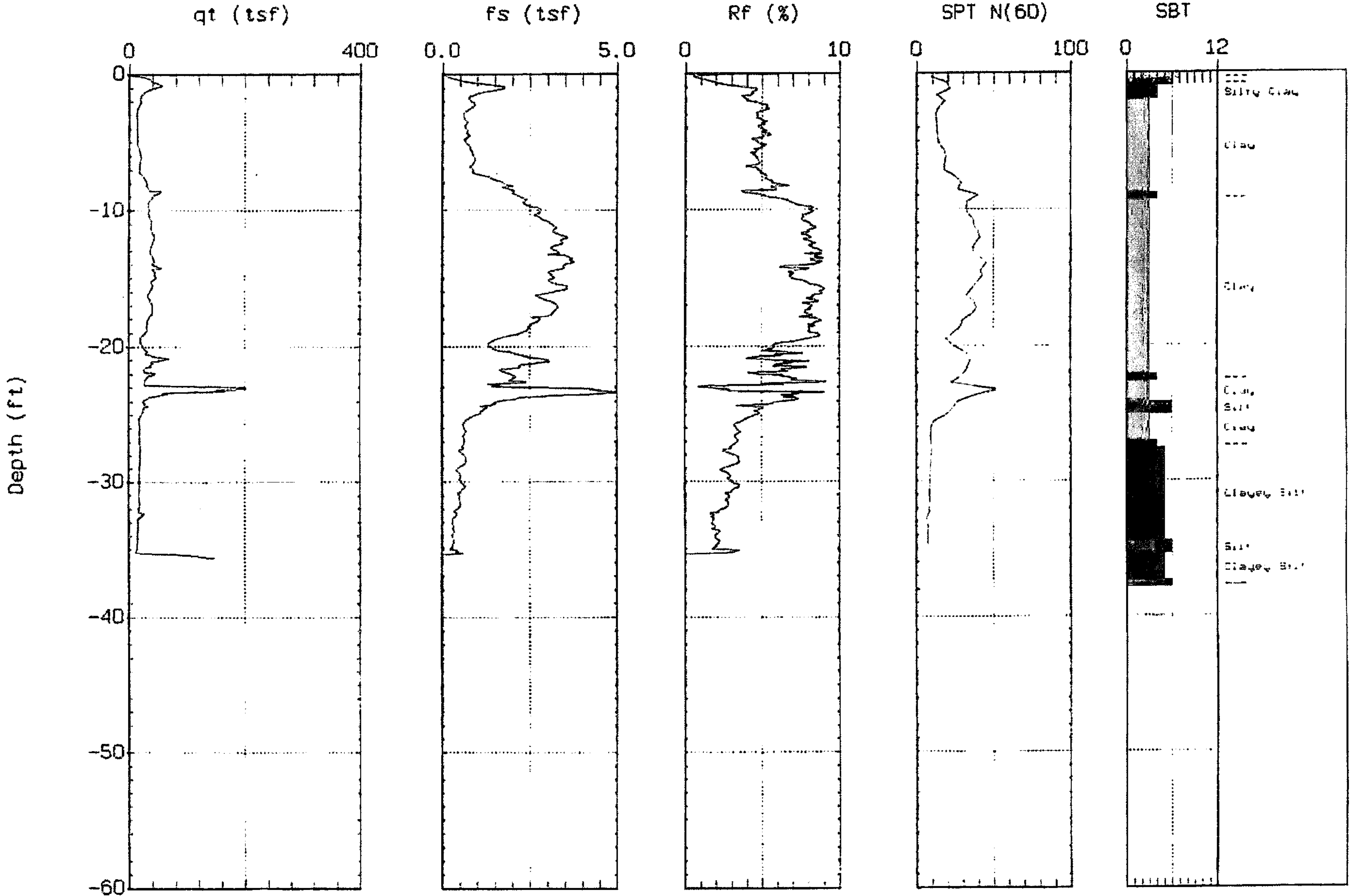
SBT: Soil Behavior Type (Robertson 1990)

GREGG

MACTEC

Site: KINGSTON TVA
Location: NB-26

Engineer: H.BENKHAYAL
Date: 05:17:05 07:52



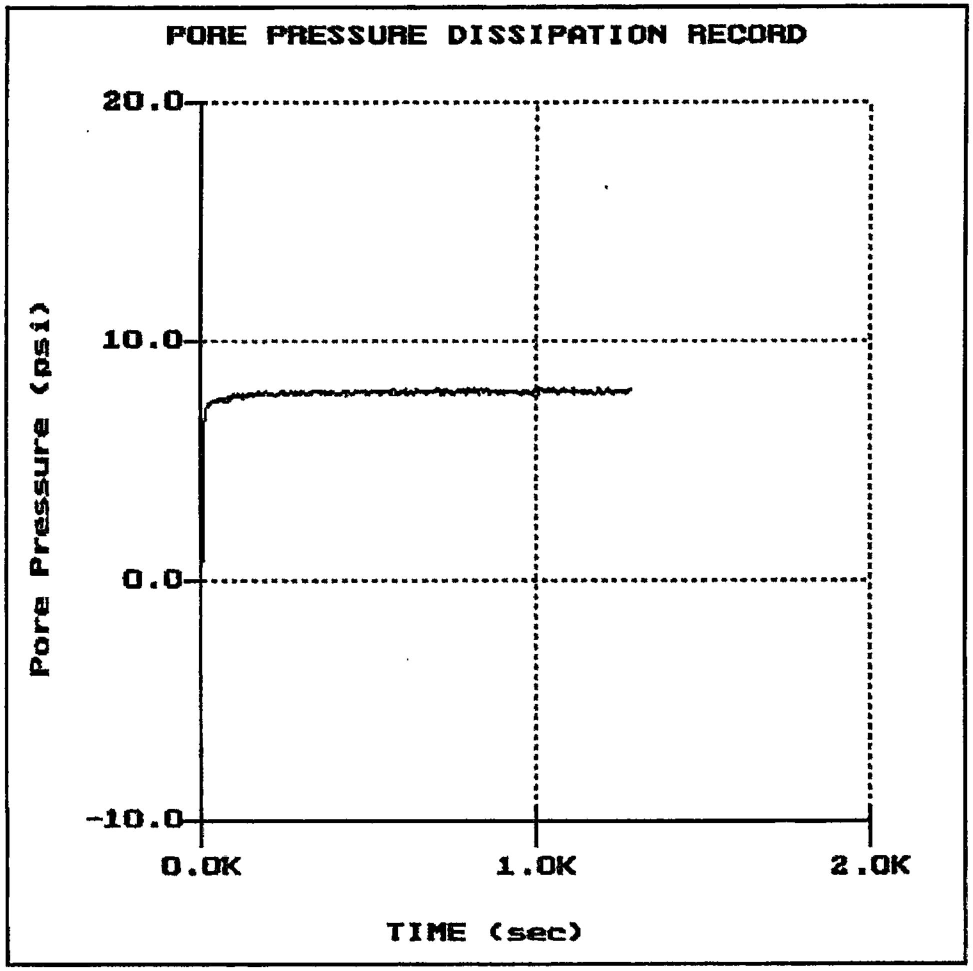
Max. Depth: 35.63 (ft)
Depth Inc.: 0.066 (ft)

SBT: Soil Behavior Type (Robertson 1990)

MACTEC

Site:KINGSTON TVA
Location:NB-79

Engineer:H.BENKHAYAL
Date:05:16:05 02:28



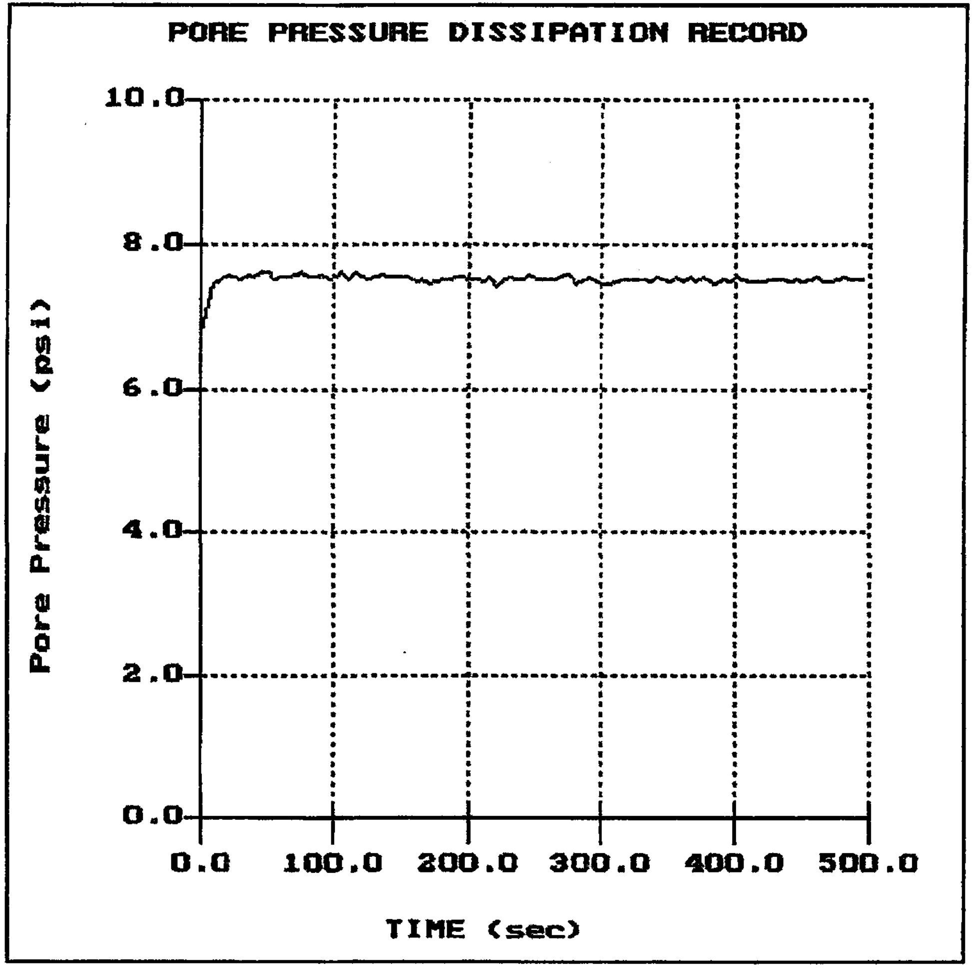
File: 062CP01.PPC
Depth (m): 7.44
(ft): 24.41
Duration : 1285.0s
U-min: -3.21 0.0s
U-max: 8.06 770.0s

MACTEC

Site:KINGSTON TVA
Location:NB-62

Engineer:H.BENKHAYAL
Date:05:16:05 08:35

File: 062CP04.PPC
Depth (m): 17.28
(ft): 56.69
Duration : 495.0s
U-min: 6.73 0.0s
U-max: 7.59 115.0s

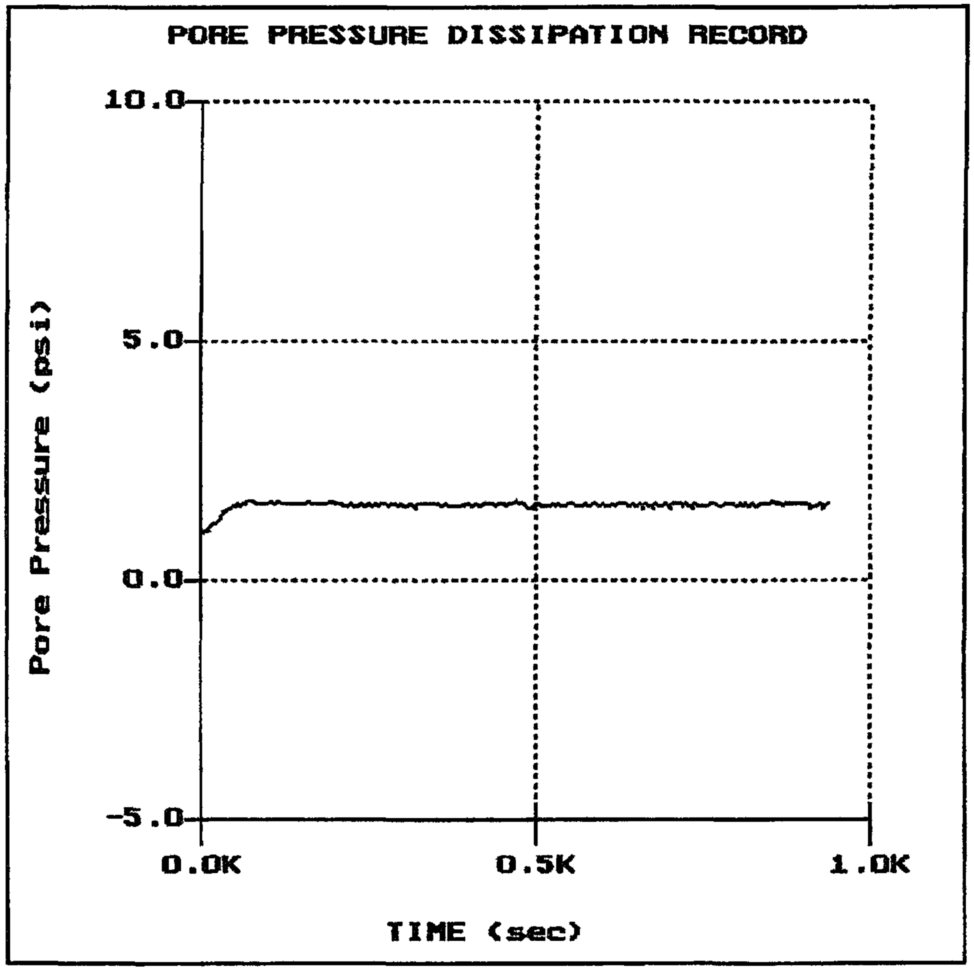

PORE PRESSURE DISSIPATION RECORD

MACTEC

Site:KINGSTON TVA
Location:NB-58

Engineer:H.BENKHAYAL
Date:05:17:05 04:04

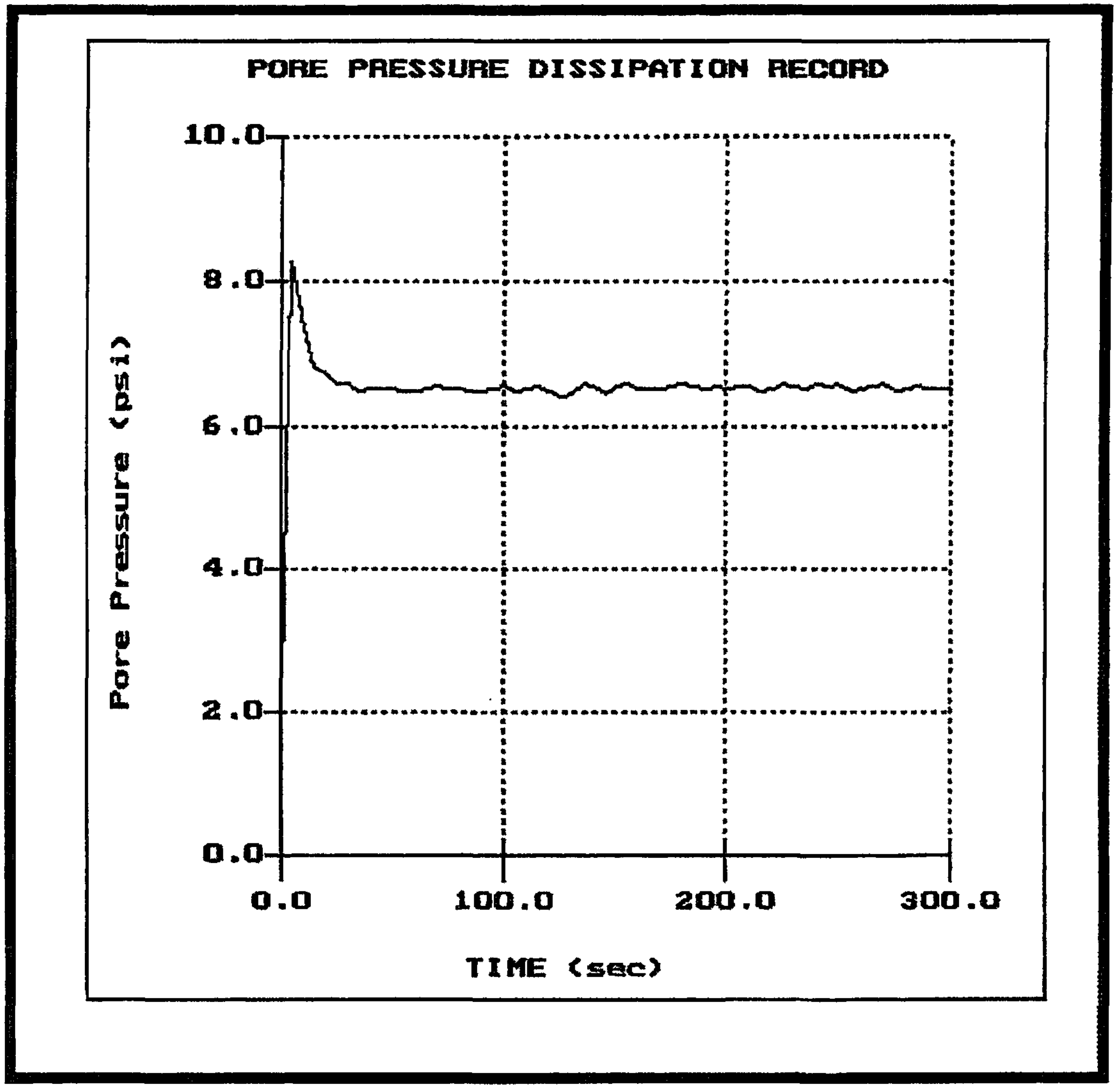
File: 062CP07.PPC
Depth (m): 11.20
(ft): 36.75
Duration : 935.0s
U-min: 0.81 0.0s
U-max: 1.67 855.0s


PORE PRESSURE DISSIPATION RECORD

MACTEC

Site:KINGSTON TVA
Location:NB-11

Engineer:H.BENKHAYAL
Date:05:17:05 06:07

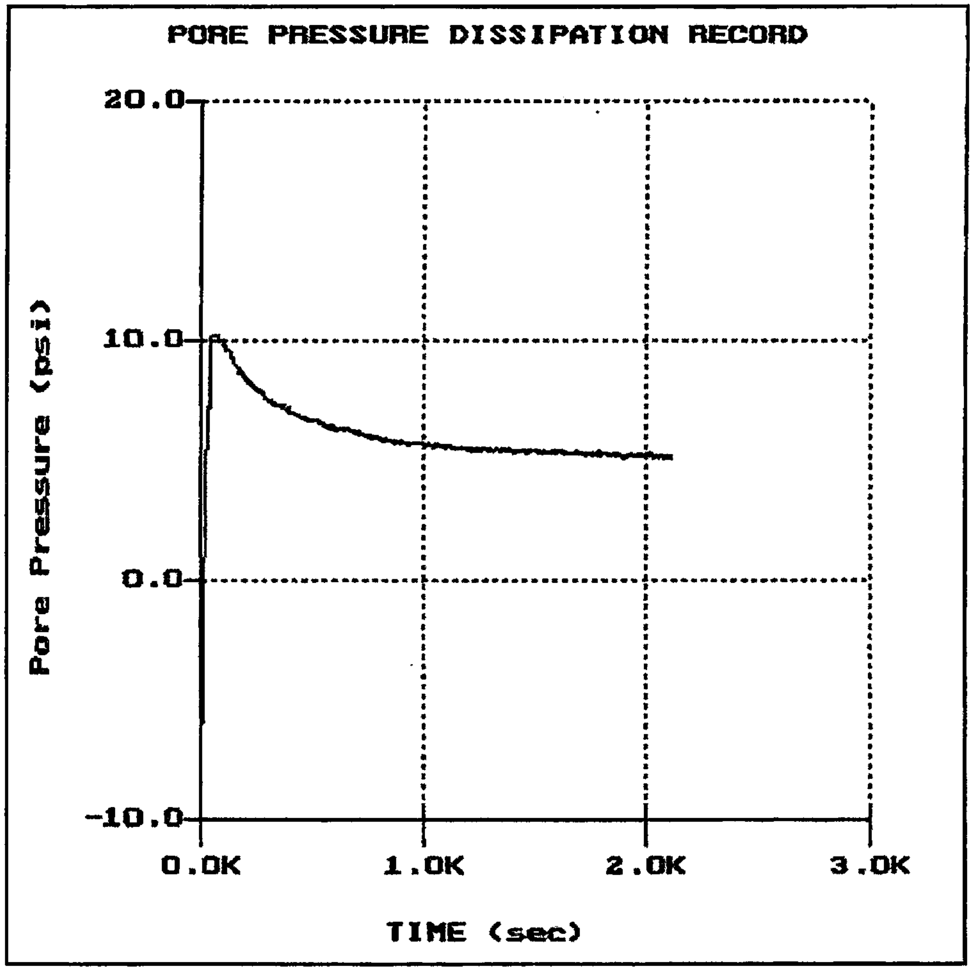


File: 062CP09.PPC
Depth (m): 9.42
(ft): 30.91
Duration : 300.0s
U-min: 2.22 0.0s
U-max: 8.26 5.0s

MACTEC

Site:KINGSTON TVA
Location:NB-26

Engineer:H.BENKHAYAL
Date:05:17:05 07:02



File: 062CP10.PPC
Depth (m): 10.86
(ft): 35.63
Duration : 2105.0s
U-min: -9.03 0.0s
U-max: 10.23 75.0s

APPENDIX E

LABORATORY TEST PROCEDURES

LABORATORY TEST RESULTS

LABORATORY TEST PROCEDURES

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.

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.

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. The percentage of clay, silt, sand, and gravel which are given on the individual particle size analysis sheets presented later in this appendix, were obtained on particle size boundaries in accordance with AASHTO M145-94 (1995).

Specific Gravity

The specific gravity of soil solids is the ratio of the mass of a unit volume of a soil solids to the mass of the same volume of gas-free distilled water at 20C. The test method for determining the specific gravity of soil solids that passes the 4.75-mm (No. 4) sieve using a water pycnometer is described in ASTM D 854, Method B, "Test Methods for Specific Gravity of Soil Solids by Water Pycnometer".

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 (Pounds)	Hammer Fall (Inches)	Mold Diameter (Inches)	Screen Size (Material Finer Than)	Number of Layers	Number of Blows per Layer
Standard (D 698)	A	5.5	12	4	No. 4 sieve	3	25
	B	5.5	12	4	No. 3/8" sieve	3	25
	C	5.5	12	6	3/4" sieve	3	56
Modified (D 1557)	A	10	18	4	No. 4 sieve	5	25
	B	10	18	4	No. 3/8" sieve	5	25
	C	10	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.

Constant Head Permeability Test

The test was performed on undisturbed and remolded samples. The physical dimensions and weight were obtained and the sample was encased in a rubber membrane and placed in a triaxial chamber. The sample was then back-pressure saturated until a B value of 0.95 or greater was reached. After saturation was obtained, the sample was consolidated under various confining stresses depending upon the laboratory assignment requirements. Upon completion of consolidation, a constant head permeability test was performed.

Pinhole Testing

The pinhole test presents a direct, qualitative measurement of the dispersibility or deflocculation and consequent erodibility of clay soils by causing water to flow through a small hole punched in a specimen. The test and criteria for evaluating the test data are based upon results of several hundred tests on samples collected from embankments, channels, and other areas where clay soils have eroded or resisted erosion in nature. The pinhole testing was conducted in accordance to ASTM D 4647.

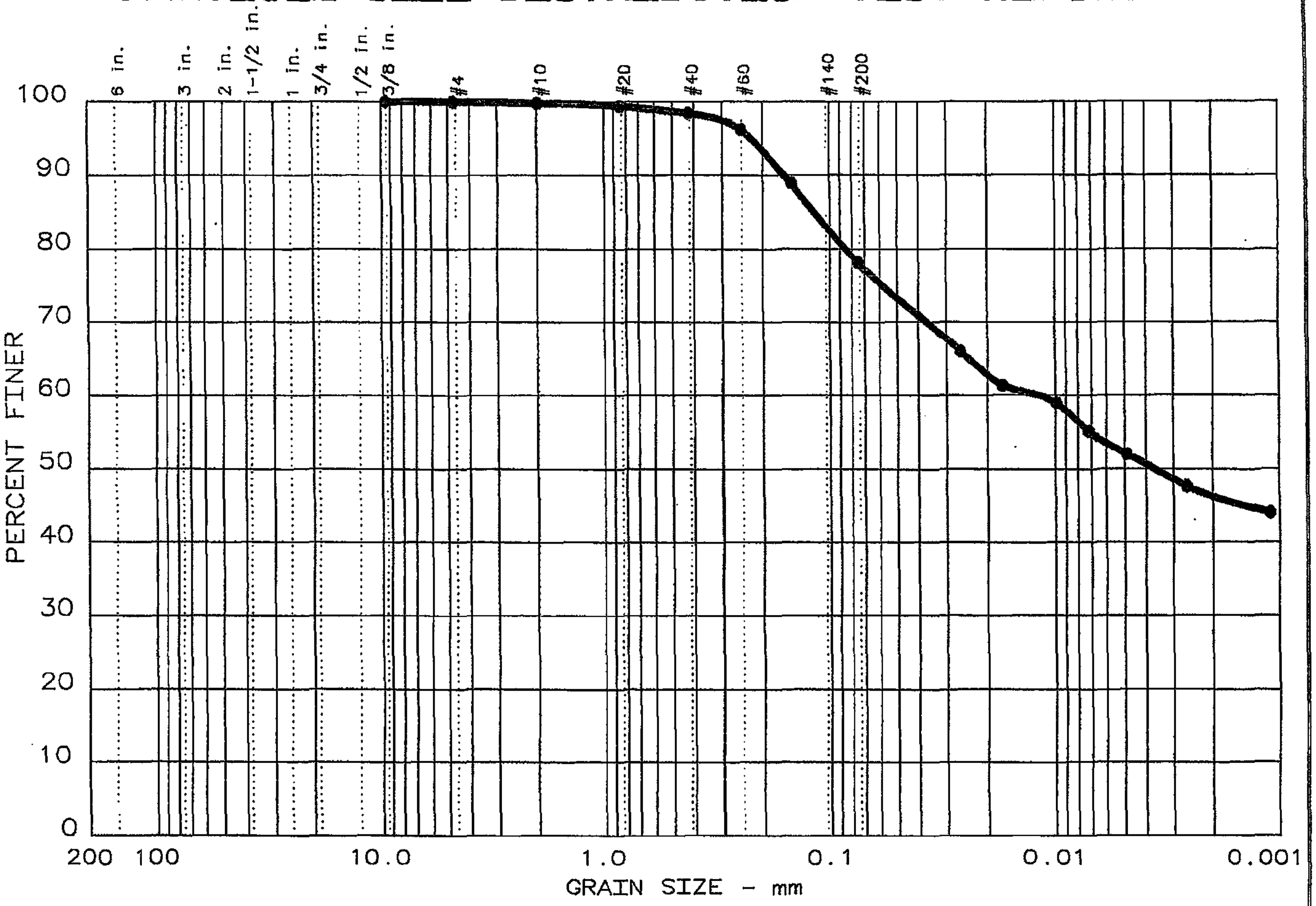
Consolidation Test

Consolidation tests are conducted on representative soil samples to determine the change in height of the sample with increasing load. The results of these tests are used to estimate the amount and rate of settlement of structures constructed on similar soils.

A consolidation test is conducted according to ASTM D-2435 on a single section of an undisturbed sample extruded from a sample tube. The sample is trimmed into a disc 2.0 or 2.5 inches in diameter and 1 inch thick. The disc is confined in a steel ring and sandwiched between porous plates. Depending on the conditions in the field, the test may be conducted with a sample either at its natural moisture content or saturated. It is then subjected to incrementally increasing vertical loads, and the resulting deformations are measured with a micrometer dial gauge. Void ratios are then calculated from these deformation readings. The test results are presented in the form of pressure-versus-void-ratio curves on the accompanying Consolidation Test Sheet.

GRAIN SIZE ANALYSIS TEST RESULTS

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	2	0.0	0.0	21.8	26.0	52.2	MH	63	28

SIEVE inches size	PERCENT FINER ●		
0.375	100.0		
	GRAIN SIZE		
D_{60}	0.0116		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	100.0		
10	99.8		
20	99.4		
40	98.4		
60	96.2		
100	89.0		
200	78.2		

Sample information:

● Boring NB-2, 2-10' Bulk
Light orange brown
elastic silt with sand

Remarks:
Sample Number 3203
Methods: Particle Size:
ASTM D 422-63; Sieve
Analysis: AASHTO T 27-99

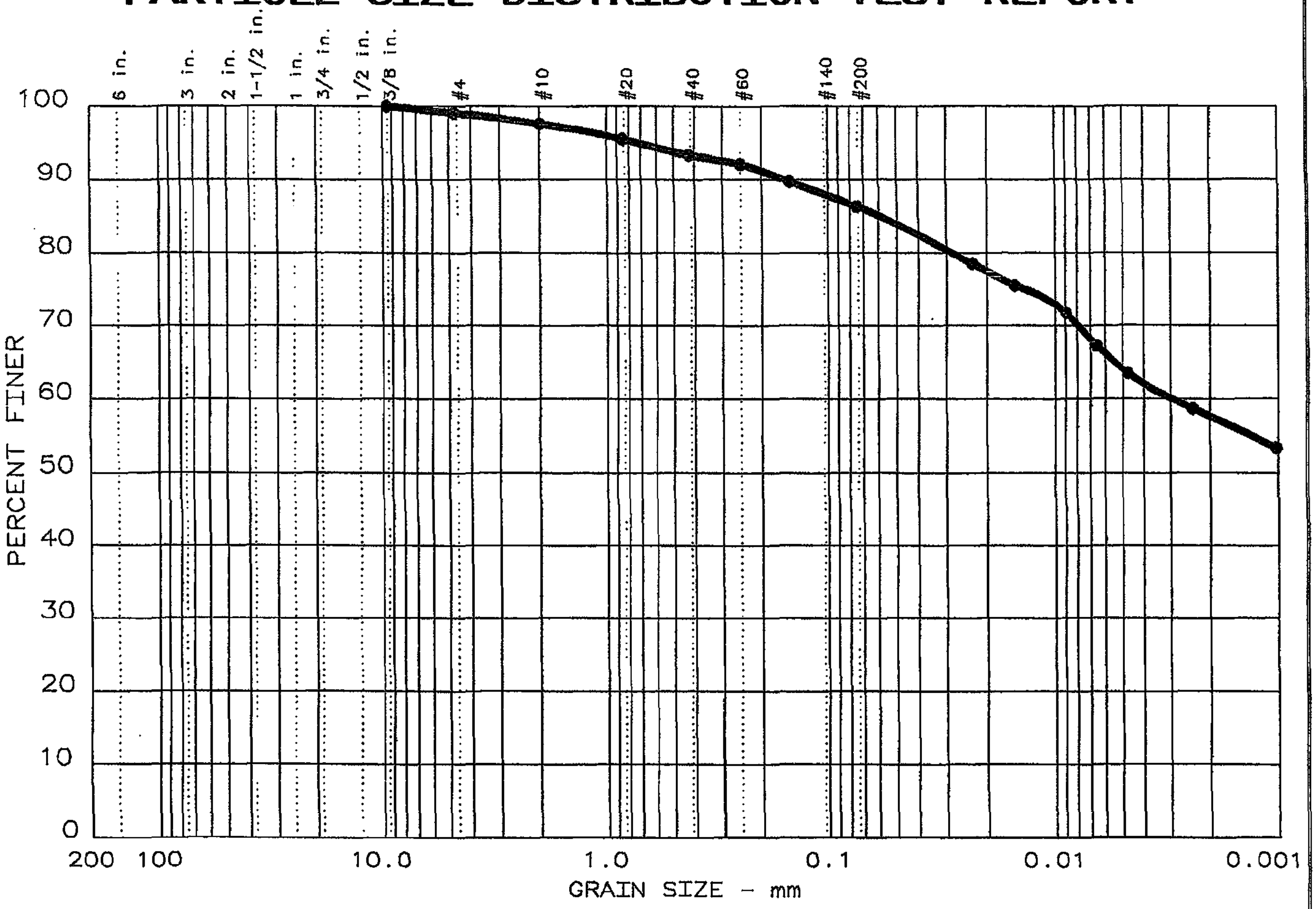
Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: June 23, 2005

```
=============================================================================
                        GRAIN SIZE DISTRIBUTION TEST DATA        Test No.: 2
-----------------------------------------------------------------------------
Date: June 23, 2005
Pr[illegible]ct No.: 3043051021.0001
P[illegible]ct: TVA Kingston - Proposed Gypsum Stack
=============================================================================

-----------------------------------------------------------------------------
                                  Sample Data
-----------------------------------------------------------------------------
Location of Sample: Boring NB-2, 2-10' Bulk
Sample Description 1: Light orange brown
Sample Description 2: elastic silt with sand
USCS Class:  MH    Liquid limit:  63    Plasticity index:  28
-----------------------------------------------------------------------------
                                     Notes
-----------------------------------------------------------------------------
Remarks: Sample Number 3203  Methods: Particle Size:
         ASTM D 422-63; Sieve  Analysis: AASHTO T 27-99
Fig. No.: 203
-----------------------------------------------------------------------------
                            Mechanical Analysis Data
-----------------------------------------------------------------------------
                      Initial     After wash
Dry sample and tare=   686.56       159.81
Tare              =      0.00         0.00
Dry sample weight  =   686.56       159.81
Minus #200 from wash=  76.7 %
Tare for cumulative weight retained= 0
[illegible]ve           Cumul. Wt.   Percent
                  retained     finer
 0.375 inches        0.00      100.0
 # 4                 0.14      100.0
 # 10                1.59       99.8
 # 20                4.37       99.4
 # 40               10.77       98.4
 # 60               26.19       96.2
 # 100              75.76       89.0
 # 200             149.82       78.2
-----------------------------------------------------------------------------
                            Hydrometer Analysis Data
-----------------------------------------------------------------------------
Separation sieve is number 40
Percent -# 40 based on complete sample=  98.4
Weight of hydrometer sample: 63
Hygroscopic moisture correction:
  Moist weight & tare =  55.28
  Dry weight & tare   =  54.50
  Tare                =  22.40
  Hygroscopic moisture=   2.4 %
Calculated biased weight=  62.49
Table of composite correction values:
  Temp, deg C:   20.0   21.0   22.0   22.5   23.0
```

```
  Comp. corr:    - 6.7  - 6.4  - 6.1  - 5.9  - 5.8
Meniscus correction only= 0
Specific gravity of solids= 2.75
Specific gravity correction factor= 0.978
H[illegible]meter type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed    Temp, Actual    Corrected  K       Rm    Eff.   Diameter   Percent
  time, min  deg C reading   reading                  depth  mm         finer
     2.0     23.0  48.0      42.2       0.0128  48.0   8.4   0.0262     66.1
     5.0     23.0  45.0      39.2       0.0128  45.0   8.9   0.0171     61.4
    15.0     23.0  43.5      37.7       0.0128  43.5   9.2   0.0100     59.0
    30.0     23.0  41.0      35.2       0.0128  41.0   9.6   0.0072     55.1
    68.0     23.0  39.0      33.2       0.0128  39.0   9.9   0.0049     52.0
   251.0     22.0  36.5      30.4       0.0129  36.5  10.3   0.0026     47.6
  1445.0     22.5  34.0      28.1       0.0128  34.0  10.7   0.0011     44.0
-------------------------------------------------------------------------------
                              Fractional Components
-------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =  0.0    % GRAVEL =  0.0   % SAND = 21.8
% SILT = 26.0    % CLAY = 52.2

D85=   0.12  D60=   0.012  D50=   0.004
```

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	17	0.0	0.9	12.7	22.3	64.1	MH	62	29

SIEVE inches size	PERCENT FINER ●		
0.375	100.0		

	GRAIN SIZE		
D_{60}	0.0030		
D_{30}			
D_{10}			

	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	99.1		
10	97.6		
20	95.5		
40	93.4		
60	92.1		
100	89.8		
200	86.4		

Sample information:

● Boring NB-18,5-15' Bulk Tan elastic silt with sand

Remarks:
Sample Number 3198
Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T 27-99

Project No.: 3043051021.0001
Project: TVA Kingston – Proposed Gypsum Stack

Date: June 29, 2005

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 17

Date: June 23, 2005
P[illegible]ect No.: 3043051021.0001
[illegible]ect: TVA Kingston - Proposed Gypsum Stack

Sample Data

5 - 9/8/05 CTS

Location of Sample: Boring NB-18,~~1~~-15' Bulk
Sample Description 1: Tan elastic silt with
Sample Description 2: sand
USCS Class: MH Liquid limit: 62 Plasticity index: 29

Notes

Remarks: Sample Number 3198 Methods: Particle Size:
ASTM D 422-63; Sieve Analysis: AASHTO T 27-99
Fig. No.: 198

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	568.96	79.24
Tare =	0.00	0.00
Dry sample weight =	568.96	79.24

Minus #200 from wash= 86.1 %
Tare for cumulative weight retained= 0

[illegible]eve	Cumul. Wt. retained	Percent finer
0.375 inches	0.00	100.0
# 4	5.33	99.1
# 10	13.60	97.6
# 20	25.62	95.5
# 40	37.82	93.4
# 60	44.98	92.1
# 100	58.22	89.8
# 200	77.60	86.4

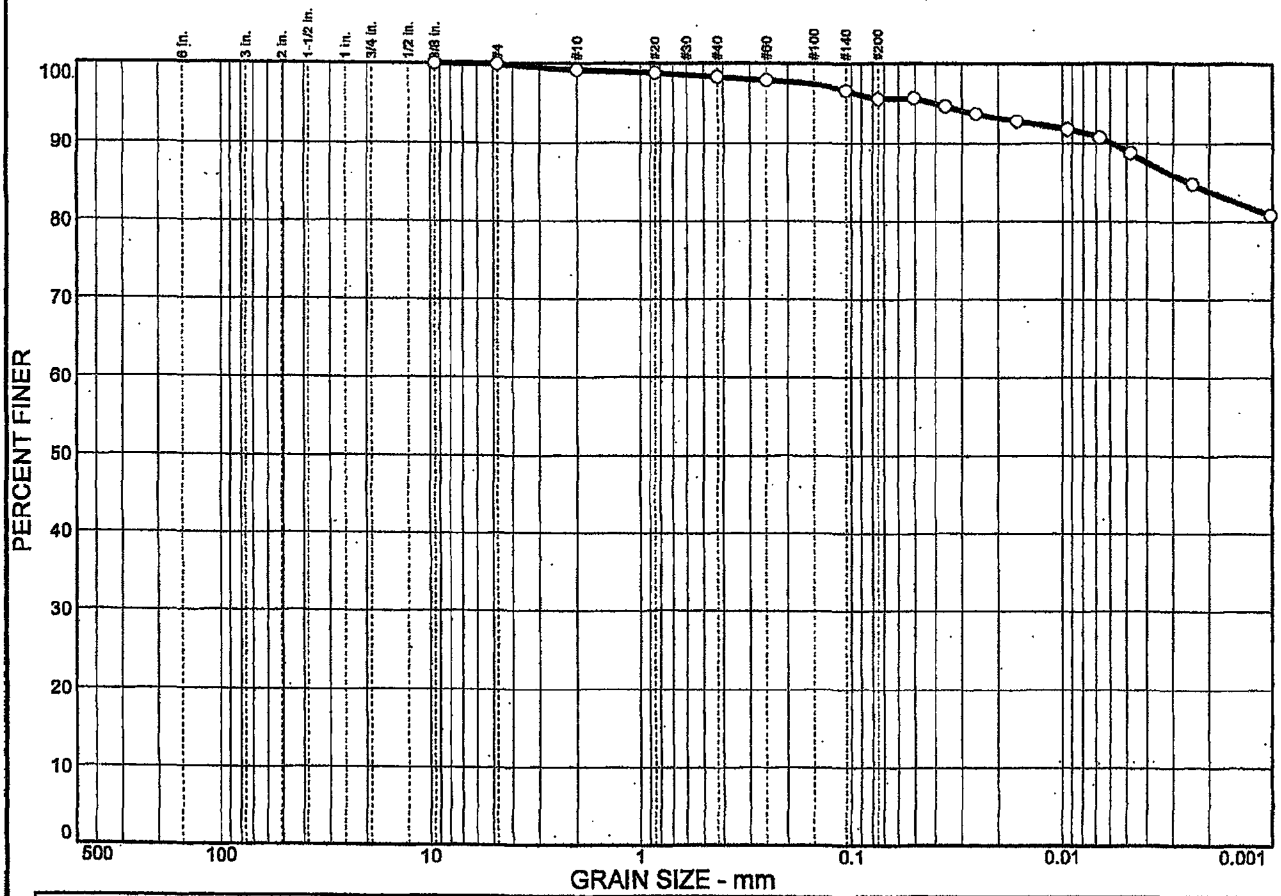
Hydrometer Analysis Data

Separation sieve is number 40
Percent -# 40 based on complete sample= 93.4
Weight of hydrometer sample: 62.28
Hygroscopic moisture correction:
Moist weight & tare = 52.49
Dry weight & tare = 51.78
Tare = 22.04
Hygroscopic moisture= 2.4 %
Calculated biased weight= 65.16
Table of composite correction values:

Temp, deg C:	21.0	22.0	23.0	23.5	24.0

```
  Comp. corr:    - 6.4   - 6.1   - 5.8   - 5.6   - 5.4
Meniscus correction only= 0
Specific gravity of solids= 2.76
Specific gravity correction factor= 0.976
H[illegible]meter type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed     Temp, Actual    Corrected  K        Rm     Eff.   Diameter  Percent
  time, min   deg C reading   reading                    depth  mm        finer
     2.0      23.5  58.0      52.4       0.0127  58.0    6.8   0.0233    78.5
     5.0      23.5  56.0      50.4       0.0127  56.0    7.1   0.0151    75.5
    15.0      23.5  53.5      47.9       0.0127  53.5    7.5   0.0090    71.8
    30.0      23.5  50.5      44.9       0.0127  50.5    8.0   0.0065    67.3
    60.0      23.5  48.0      42.4       0.0127  48.0    8.4   0.0047    63.5
   250.0      23.0  45.0      39.2       0.0127  45.0    8.9   0.0024    58.7
  1441.0      24.0  41.0      35.6       0.0126  41.0    9.6   0.0010    53.3
-------------------------------------------------------------------------------
                              Fractional Components
-------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0     % GRAVEL =   0.9    % SAND = 12.7
% SILT = 22.3     % CLAY = 64.1

D85=   0.06  D60=   0.003
```

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	4.4	6.5	89.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.9		
#10	99.2		
#20	98.8		
#40	98.3		
#60	97.9		
#140	96.6		
#200	95.5		

* (no specification provided)

Soil Description

Brown to red brown elastic silt

Atterberg Limits

PL= 42 LL= 81 PI= 39

Coefficients

D_{85}= 0.0025 D_{60}= D_{50}=

D_{30}= D_{15}= D_{10}=

C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

Sample No.: UD-1, 3 & 4 (CU) **Source of Sample:** **Date:**

Location: NB-18 **Elev./Depth:** 6.5'-18.5'

MACTEC, INC.

Client: TVA

Project: TVA Kingston - Proposed Gypsum Stack

Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
ject: TVA Kingston - Proposed Gypsum Stack
ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-1, 3 & 4 (CU)
Elev. or Depth: 6.5'-18.5' **Sample Length(in./cm.):**
Location: NB-18
Description: Brown to red brown elastic silt
Date: **PL:** 42 **LL:** 81 **PI:** 39
USCS Classification: MH **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

	Initial
Dry sample and tare=	224.16
Tare =	0.00
Dry sample weight =	224.16

Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 50.53 **Tare =** .00 **Sample weight =** 50.53
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
75 inch	0.00	100.0
# 4	0.32	99.9
# 10	1.85	99.2
# 20	0.22	98.8
# 40	0.46	98.3
# 60	0.67	97.9
# 140	1.32	96.6
# 200	1.86	95.5

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 99.2
Weight of hydrometer sample: 53.51
Hygroscopic moisture correction:
Moist weight & tare = 40.29
Dry weight & tare = 38.67
Tare = 11.02
Hygroscopic moisture= 5.9 %
Calculated biased weight= 50.96
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

iscus correction only= 1.0
ific gravity of solids= 2.62
Specific gravity correction factor= 1.007
Hydrometer type: 152H

Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.5	53.5	48.4	0.0132	54.5	7.4	0.0506	95.6
1.00	23.5	53.0	47.9	0.0132	54.0	7.4	0.0360	94.6
2.00	23.5	52.5	47.4	0.0132	53.5	7.5	0.0256	93.6
5.00	23.5	52.0	46.9	0.0132	53.0	7.6	0.0163	92.7
15.00	23.5	51.5	46.4	0.0132	52.5	7.7	0.0094	91.7
30.00	23.5	51.0	45.9	0.0132	52.0	7.8	0.0067	90.7
60.00	23.5	50.0	44.9	0.0132	51.0	7.9	0.0048	88.7
250.00	23.5	48.0	42.9	0.0132	49.0	8.3	0.0024	84.8
1440.00	23.3	46.0	40.9	0.0132	47.0	8.6	0.0010	80.8

Fractional Components

Gravel/Sand based on #4

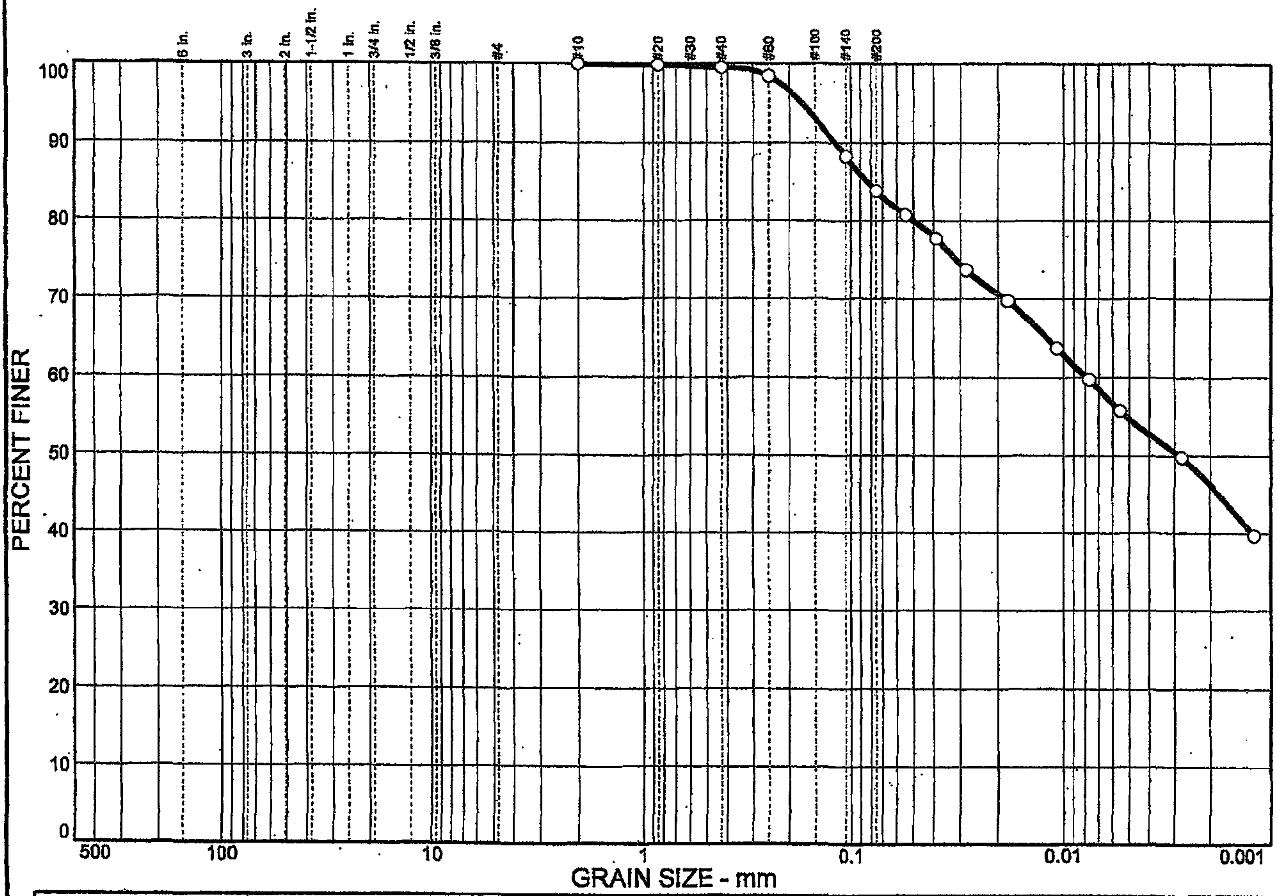
Sand/Fines based on #200

% COBBLES = **% GRAVEL =** 0.1 **% SAND =** 4.4

% SILT = 6.5 **% CLAY =** 89.0

D_{85}= 0.00

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	16.2	29.1	54.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.8		
#40	99.5		
#60	98.4		
#140	88.2		
#200	83.8		

* (no specification provided)

Soil Description

Brown fat clay with sand

Atterberg Limits

PL= 28 LL= 53 PI= 25

Coefficients

D_{85}= 0.0831 D_{60}= 0.0079 D_{50}= 0.0029
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sample No.: UD-1, 2 & 3 (CU) **Source of Sample:** **Date:**
Location: NB-21A **Elev./Depth:** 15'-23'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
ject: TVA Kingston - Proposed Gypsum Stack
ect Number: 3043051021

Sample Data

Source:
Sample No.: UD-1, 2 & 3 (CU)
Elev. or Depth: 15'-23' **Sample Length(in./cm.):**
Location: NB-21A
Description: Brown fat clay with sand
Date: **PL:** 28 **LL:** 53 **PI:** 25
USCS Classification: CH **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

	Initial
Dry sample and tare=	243.64
Tare =	0.00
Dry sample weight =	243.64

Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 50.04 **Tare =** .00 **Sample weight =** 50.04
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
10	0.00	100.0
# 20	0.11	99.8
# 40	0.25	99.5
# 60	0.80	98.4
# 140	5.89	88.2
# 200	8.10	83.8

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 100.0
Weight of hydrometer sample: 51.29
Hygroscopic moisture correction:
Moist weight & tare = 41.04
Dry weight & tare = 40.31
Tare = 11.09
Hygroscopic moisture= 2.5 %
Calculated biased weight= 50.04
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

Meniscus correction only= 1.0
Specific gravity of solids= 2.65
cific gravity correction factor= 1.000
ometer type: 152H
Effective depth L= 16.294964 - 0.164 x Rm

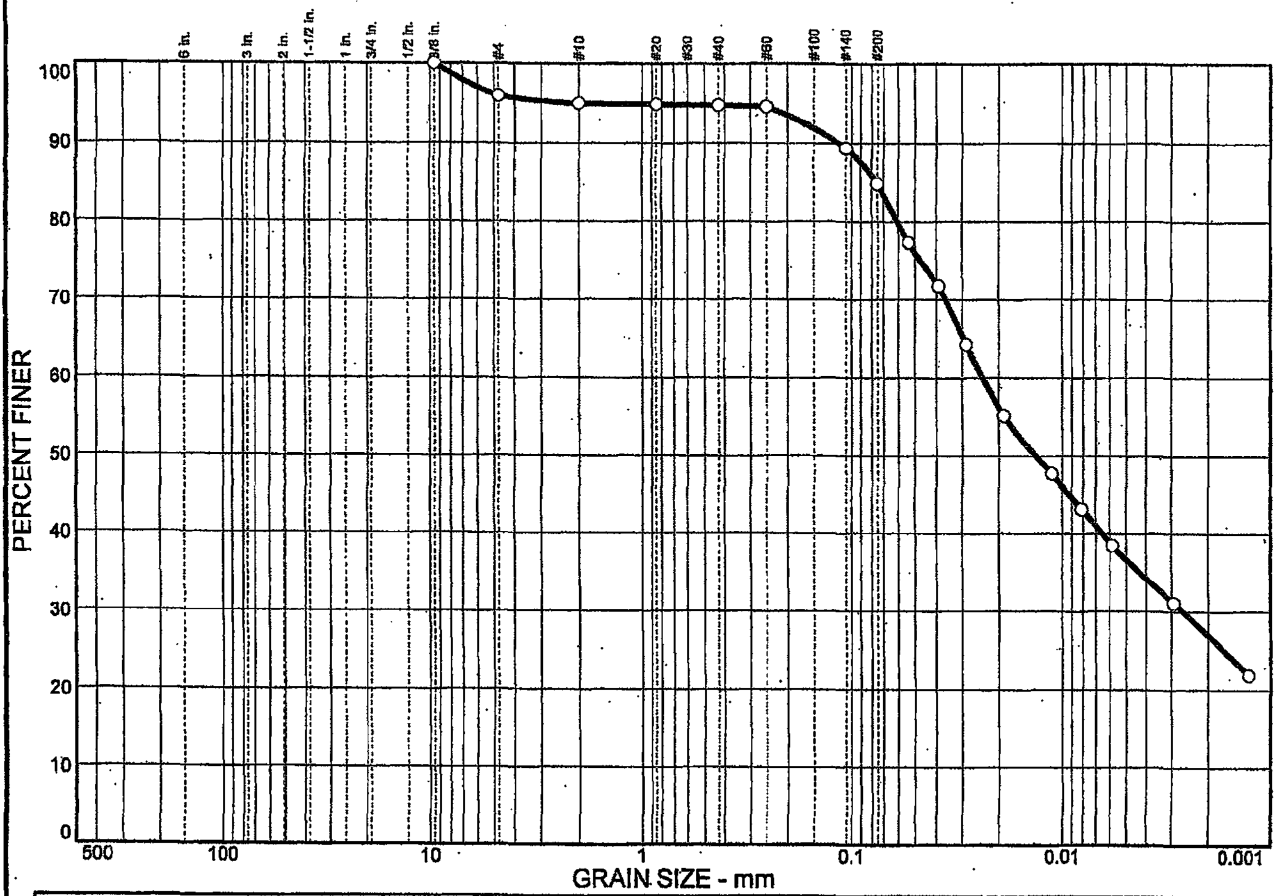
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.5	45.5	40.4	0.0131	46.5	8.7	0.0544	80.7
1.00	23.5	44.0	38.9	0.0131	45.0	8.9	0.0390	77.7
2.00	23.5	42.0	36.9	0.0131	43.0	9.2	0.0281	73.7
5.00	23.5	40.0	34.9	0.0131	41.0	9.6	0.0181	69.7
15.00	23.5	37.0	31.9	0.0131	38.0	10.1	0.0107	63.7
30.00	23.5	35.0	29.9	0.0131	36.0	10.4	0.0077	59.7
60.00	23.5	33.0	27.9	0.0131	34.0	10.7	0.0055	55.7
250.00	23.5	30.0	24.9	0.0131	31.0	11.2	0.0028	49.7
1440.00	23.3	25.0	19.9	0.0131	26.0	12.0	0.0012	39.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 16.2
% SILT = 29.1 **% CLAY =** 54.7

D_{85}= 0.08 D_{60}= 0.01 D_{50}= 0.00

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.1	11.1	48.2	36.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	95.9		
#10	94.9		
#20	94.8		
#40	94.7		
#60	94.5		
#140	89.3		
#200	84.8		

* (no specification provided)

Soil Description

Dark gray lean clay with sand

Atterberg Limits

PL= 21 LL= 36 PI= 15

Coefficients

D_{85}= 0.0758 D_{60}= 0.0240 D_{50}= 0.0134

D_{30}= 0.0026 D_{15}= D_{10}=

C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: UD-4, 5 & 6 (CU) **Source of Sample:** **Date:**

Location: NB-21A **Elev./Depth:** 30'-38'

MACTEC, INC.

Client: TVA

Project: TVA Kingston - Proposed Gypsum Stack

Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
ject: TVA Kingston - Proposed Gypsum Stack
ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-4, 5 & 6 (CU)
Elev. or Depth: 30'-38' **Sample Length(in./cm.):**
Location: NB-21A
Description: Dark gray lean clay with sand
Date: **PL:** 21 **LL:** 36 **PI:** 15
USCS Classification: CL **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

	Initial
Dry sample and tare=	202.53
Tare =	0.00
Dry sample weight =	202.53

Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 51.29 **Tare =** .00 **Sample weight =** 51.29
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
375 inch	0.00	100.0
# 4	8.36	95.9
# 10	10.36	94.9
# 20	0.03	94.8
# 40	0.11	94.7
# 60	0.20	94.5
# 140	3.05	89.3
# 200	5.45	84.8

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 94.9
Weight of hydrometer sample: 52.28
Hygroscopic moisture correction:
Moist weight & tare = 48.58
Dry weight & tare = 47.88
Tare = 11.01
Hygroscopic moisture= 1.9 %
Calculated biased weight= 54.06
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

iscus correction only= 1.0
ific gravity of solids= 2.66
Specific gravity correction factor= 0.998
Hydrometer type: 152H

Effective depth L= 16.294964 - 0.164 x Rm

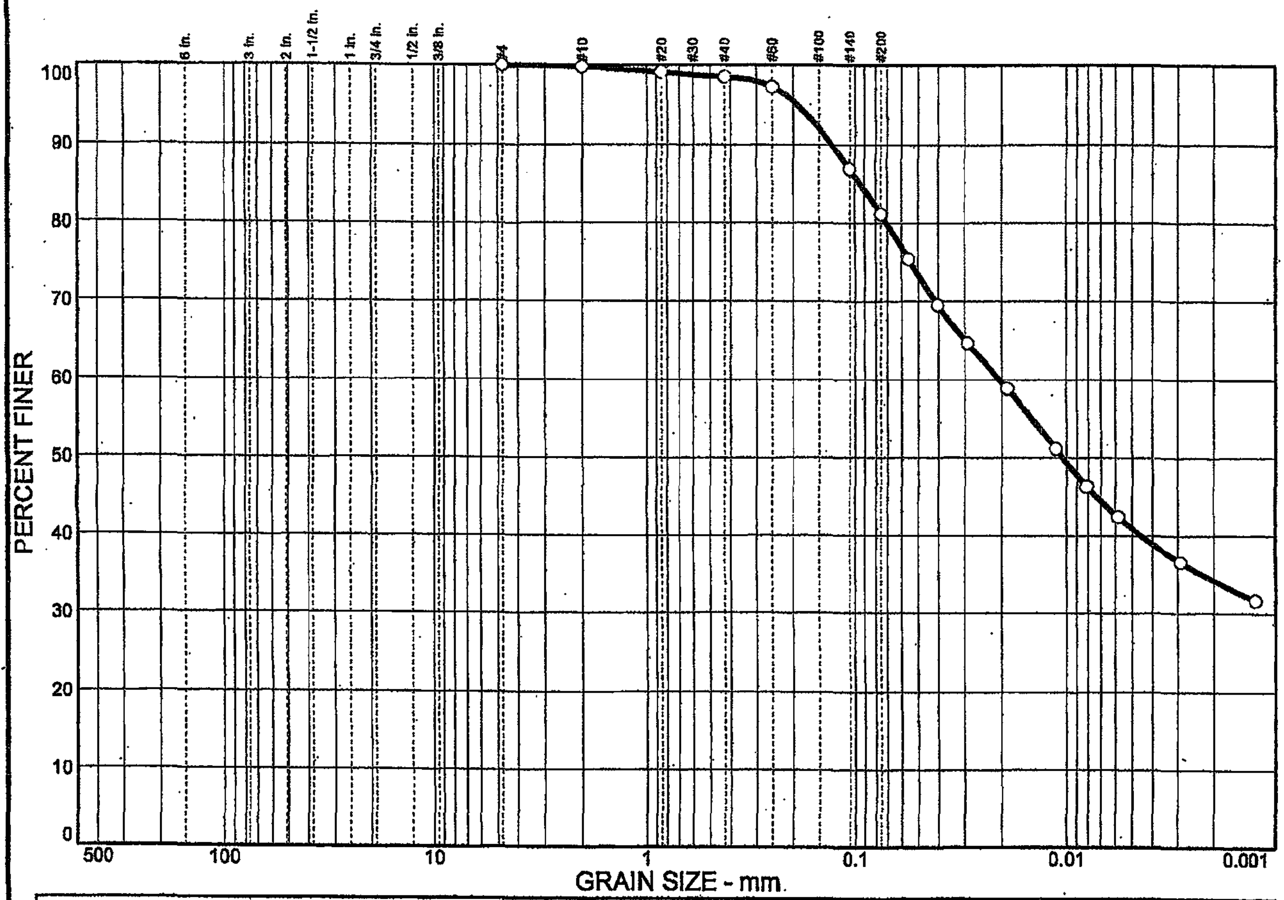
Elapsed time, min	**Temp, deg C**	**Actual reading**	**Corrected reading**	**K**	**Rm**	**Eff. depth**	**Diameter mm**	**Percent finer**
0.50	23.1	47.0	41.9	0.0131	48.0	8.4	0.0538	77.3
1.00	23.1	44.0	38.9	0.0131	45.0	8.9	0.0391	71.7
2.00	23.1	40.0	34.9	0.0131	41.0	9.6	0.0287	64.3
5.00	23.1	35.0	29.9	0.0131	36.0	10.4	0.0189	55.1
15.00	23.1	31.0	25.9	0.0131	32.0	11.0	0.0112	47.7
30.00	23.1	28.5	23.4	0.0131	29.5	11.5	0.0081	43.1
60.00	23.1	26.0	20.9	0.0131	27.0	11.9	0.0058	38.5
250.00	23.1	22.0	16.9	0.0131	23.0	12.5	0.0029	31.1
1440.00	23.1	17.0	11.9	0.0131	18.0	13.3	0.0013	21.9

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 4.1 **% SAND =** 11.1
% SILT = 48.2 **% CLAY =** 36.6

D_{85}= 0.08 D_{60}= 0.02 D_{50}= 0.01
D_{30}= 0.00

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	18.9	40.2	40.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	99.1		
#40	98.5		
#60	97.2		
#140	86.9		
#200	81.1		

* (no specification provided)

Soil Description

Reddish orange lean clay with sand

Atterberg Limits

PL= 22 LL= 40 PI= 18

Coefficients

D_{85}= 0.0942 D_{60}= 0.0205 D_{50}= 0.0105
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: Bulk **Source of Sample:** **Date:**
Location: NB-22 **Elev./Depth:** 2'-10'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
[illegible]ect: TVA Kingston - Proposed Gypsum Stack
[illegible]ject Number: 3043051021

Sample Data

Source:
Sample No.: Bulk
Elev. or Depth: 2'-10'
Sample Length(in./cm.):
Location: NB-22, 2.0'-10.0'
Description: Reddish orange lean clay with sand
Date:
PL: 22
LL: 40
PI: 18
USCS Classification: CL
AASHTO Classification:
Testing Remarks:

Mechanical Analysis Data

	Initial
Dry sample and tare=	247.01
Tare =	0.00
Dry sample weight =	247.01

Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 51.79 **Tare =** .00 **Sample weight =** 51.79
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
[illegible] 4	0.00	100.0
# 10	0.38	99.8
# 20	0.34	99.1
# 40	0.69	98.5
# 60	1.34	97.2
# 140	6.69	86.9
# 200	9.69	81.1

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 99.8
Weight of hydrometer sample: 52.88
Hygroscopic moisture correction:
Moist weight & tare = 44.40
Dry weight & tare = 43.71
Tare = 11.59
Hygroscopic moisture= 2.1 %
Calculated biased weight= 51.87
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

Meniscus correction only= 1.0
[illegible]cific gravity of solids= 2.63
[illegible]cific gravity correction factor= 1.005
Hydrometer type: 152H
Effective depth L= 16.294964 - 0.164 x Rm

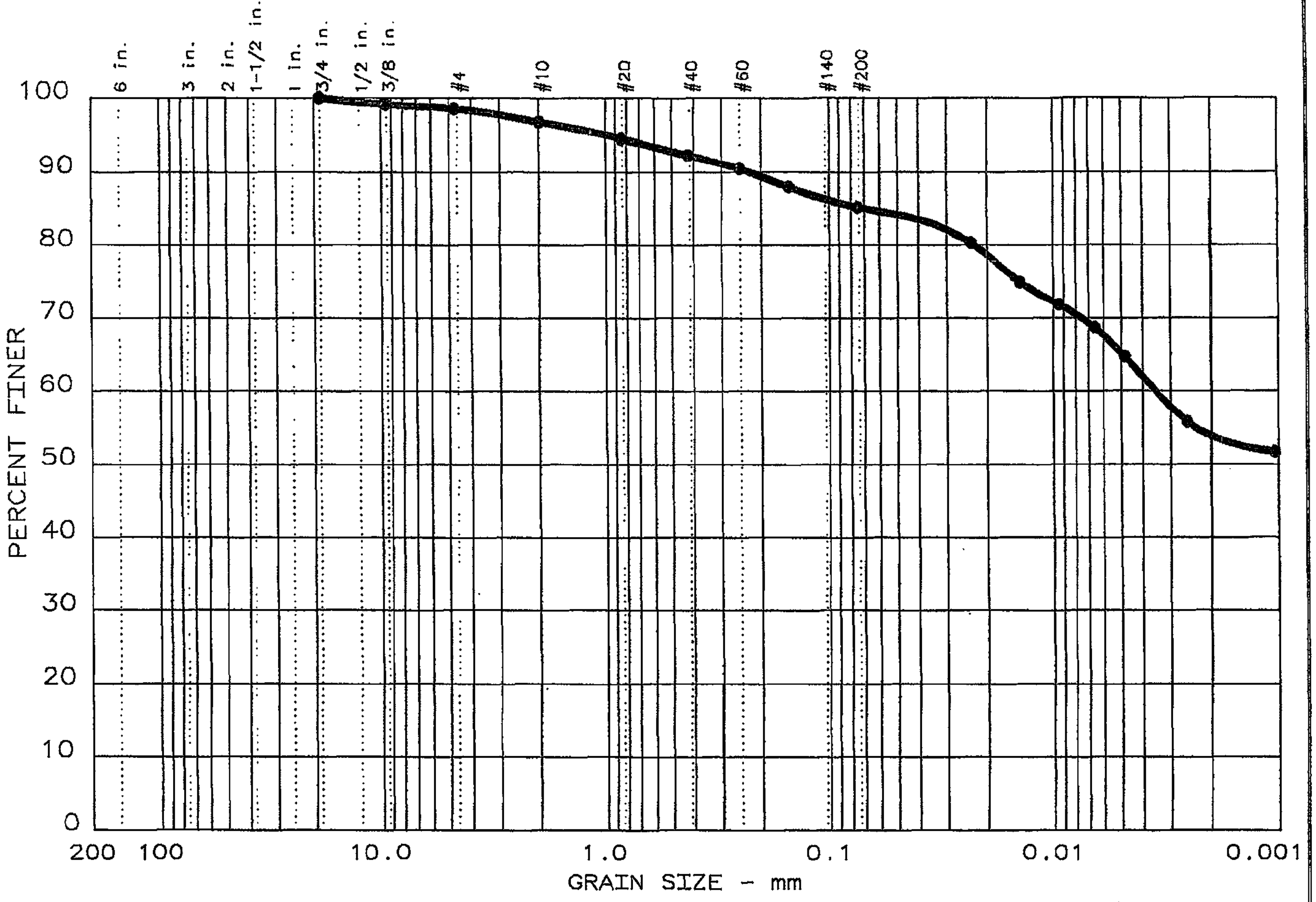
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.5	44.0	38.9	0.0132	45.0	8.9	0.0555	75.4
1.00	23.5	41.0	35.9	0.0132	42.0	9.4	0.0403	69.5
2.00	23.5	38.5	33.4	0.0132	39.5	9.8	0.0291	64.7
5.00	23.5	35.5	30.4	0.0132	36.5	10.3	0.0189	58.9
15.00	23.5	31.5	26.4	0.0132	32.5	11.0	0.0112	51.1
30.00	23.5	29.0	23.9	0.0132	30.0	11.4	0.0081	46.3
60.00	23.5	27.0	21.9	0.0132	28.0	11.7	0.0058	42.4
250.00	23.5	24.0	18.9	0.0132	25.0	12.2	0.0029	36.6
1440.00	23.3	21.5	16.4	0.0132	22.5	12.6	0.0012	31.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 18.9
% SILT = 40.2 **% CLAY =** 40.9

D_{85}= 0.09 D_{60}= 0.02 D_{50}= 0.01

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	18	0.0	1.5	13.3	19.9	65.3	CH	72	47

SIEVE inches size	PERCENT FINER		
	●		
0.75	100.0		
0.375	99.1		
	GRAIN SIZE		
D_{60}	0.0035		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER		
	●		
4	98.5		
10	96.7		
20	94.5		
40	92.2		
60	90.5		
100	88.0		
200	85.2		

Sample information:
● Boring NB-25,2-10' Bulk
Orange brown fat clay
with sand

Remarks:
Sample Number 3199
Methods: Particle Size:
ASTM D 422-63; Sieve
Analysis: AASHTO T 27-99

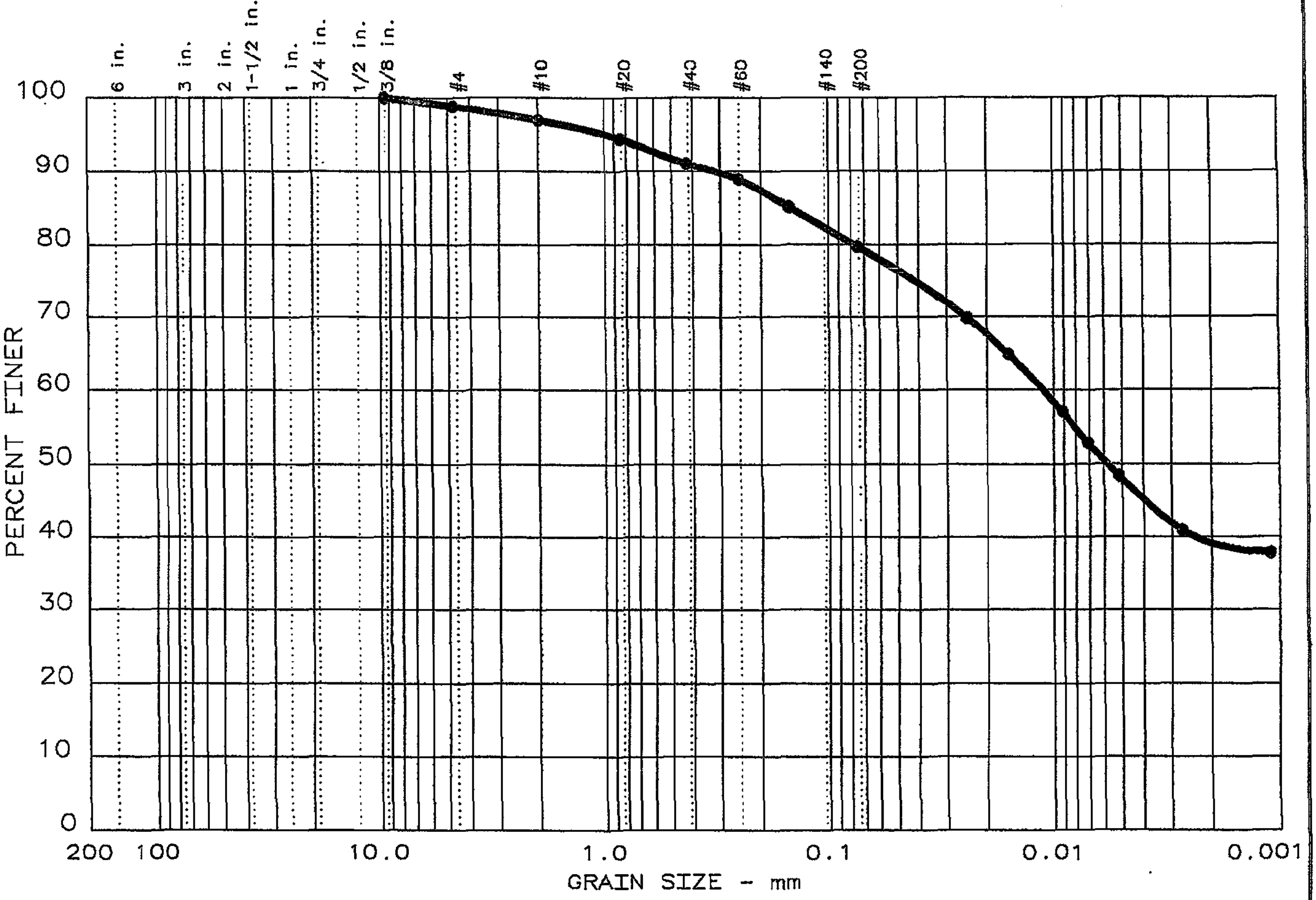
Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: June 23, 2005

```
================================================================================
                        GRAIN SIZE DISTRIBUTION TEST DATA        Test No.: 18
--------------------------------------------------------------------------------
Date: June 23, 2005
P[illegible]ct No.: 3043051021.0001
P[illegible]ect: TVA Kingston - Proposed Gypsum Stack
================================================================================

--------------------------------------------------------------------------------
                                    Sample Data
--------------------------------------------------------------------------------
Location of Sample: Boring NB-25,2-10' Bulk
Sample Description 1: Orange brown fat clay
Sample Description 2: with sand
USCS Class:  CH    Liquid limit:  72    Plasticity index:  47
--------------------------------------------------------------------------------
                                       Notes
--------------------------------------------------------------------------------
Remarks: Sample Number 3199  Methods: Particle Size:
         ASTM D 422-63; Sieve  Analysis: AASHTO T 27-99
Fig. No.: 199
--------------------------------------------------------------------------------
                              Mechanical Analysis Data
--------------------------------------------------------------------------------
                       Initial     After wash
Dry sample and tare=    505.06        77.56
Tare               =      0.00         0.00
Dry sample weight  =    505.06        77.56
Minus #200 from wash=  84.6 %
Ta[illegible] for cumulative weight retained= 0
[illegible]eve            Cumul. Wt.   Percent
                   retained     finer
  0.75  inches        0.00       100.0
  0.375 inches        4.49        99.1
  # 4                 7.37        98.5
  # 10               16.42        96.7
  # 20               27.54        94.5
  # 40               39.15        92.2
  # 60               48.09        90.5
  # 100              60.84        88.0
  # 200              74.88        85.2
--------------------------------------------------------------------------------
                              Hydrometer Analysis Data
--------------------------------------------------------------------------------
Separation sieve is number 40
Percent -# 40 based on complete sample=  92.2
Weight of hydrometer sample: 60.45
Hygroscopic moisture correction:
  Moist weight & tare =  51.93
  Dry weight & tare   =  51.11
  Tare                =  22.22
  Hygroscopic moisture=   2.8 %
Calculated biased weight=  63.72
Table of composite correction values:
```

```
  Temp, deg C:    20.0   21.0   22.0   22.5   23.0
  Comp. corr:    - 6.7  - 6.4  - 6.1  - 5.9  - 5.8
Meniscus correction only= 0
Specific gravity of solids= 2.74
S[illegible]ific gravity correction factor= 0.980
H[illegible]ometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed     Temp, Actual   Corrected  K        Rm      Eff.   Diameter  Percent
  time, min   deg C reading  reading                     depth  mm        finer
     2.0      23.0  58.0     52.2       0.0128   58.0     6.8   0.0236    80.3
     6.0      23.0  54.5     48.7       0.0128   54.5     7.4   0.0142    74.9
    14.0      23.0  52.5     46.7       0.0128   52.5     7.7   0.0095    71.9
    30.0      23.0  50.5     44.7       0.0128   50.5     8.0   0.0066    68.8
    60.0      22.5  48.0     42.1       0.0129   48.0     8.4   0.0048    64.8
   252.0      20.0  43.0     36.3       0.0133   43.0     9.2   0.0025    55.9
  1492.0      22.5  39.5     33.6       0.0129   39.5     9.8   0.0010    51.7
-------------------------------------------------------------------------------
                              Fractional Components
-------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0     % GRAVEL =   1.5    % SAND = 13.3
% SILT = 19.9     % CLAY = 65.3

D85=    0.07  D60=    0.003
```

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	20	0.0	1.2	19.1	31.7	48.0	CL	47	27

SIEVE inches size	PERCENT FINER		
	●		
0.375	100.0		
	GRAIN SIZE		
D_{60} D_{30} D_{10}	0.0111		
	COEFFICIENTS		
C_c C_u			

SIEVE number size	PERCENT FINER		
	●		
4	98.8		
10	96.9		
20	94.4		
40	91.0		
60	88.9		
100	85.2		
200	79.7		

Sample information:

● Boring NB-39,5-10' Bulk Brown lean clay with sand

Remarks:
Sample Number 3201
Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T 27-99

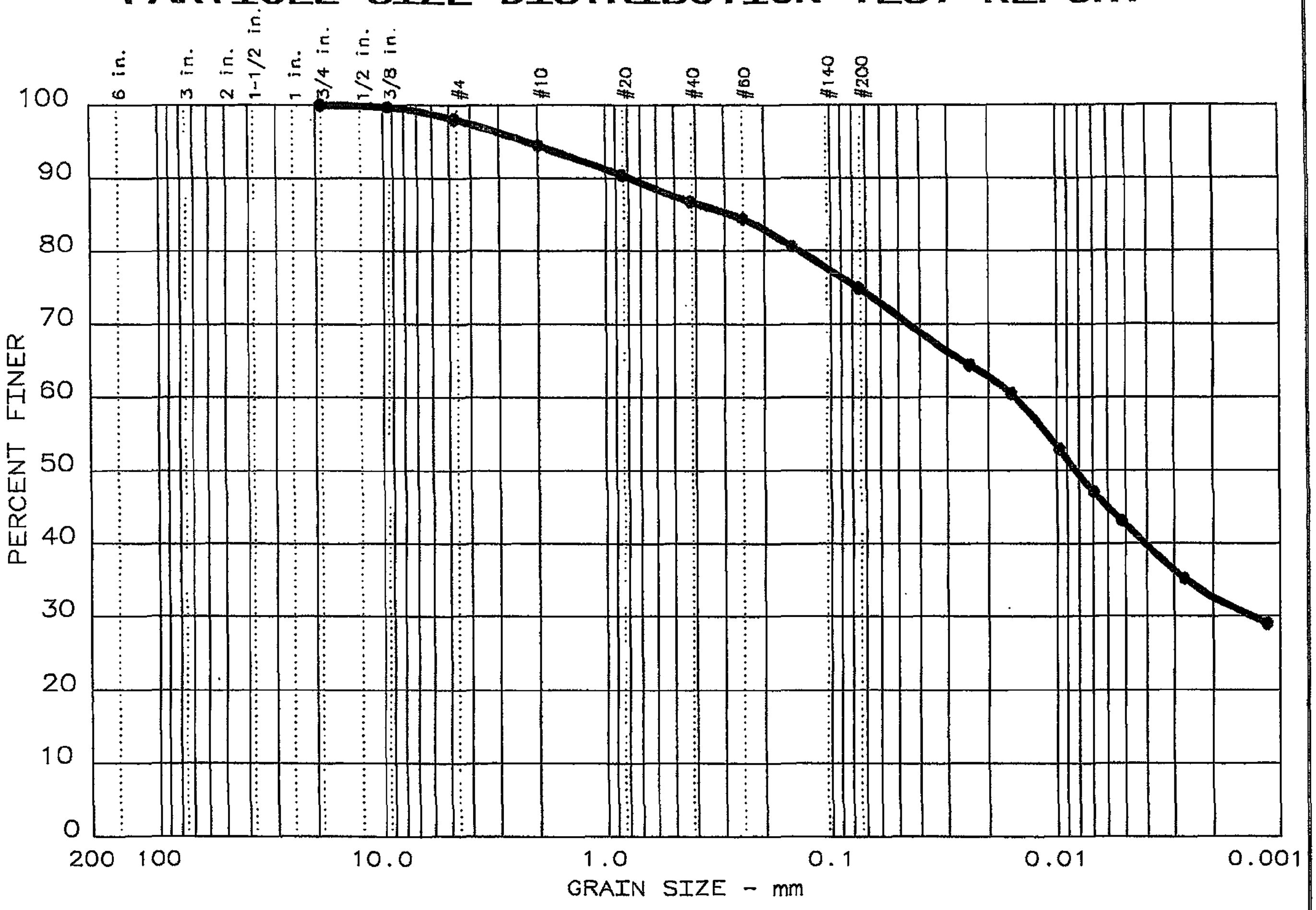
Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: June 23, 2005

```
=================================================================
                  GRAIN SIZE DISTRIBUTION TEST DATA      Test No.: 20
-----------------------------------------------------------------
Date: June 23, 2005
P[illegible]ct No.: 3043051021.0001
P[illegible]ct: TVA Kingston - Proposed Gypsum Stack
=================================================================

-----------------------------------------------------------------
                              Sample Data
-----------------------------------------------------------------
Location of Sample: Boring NB-39,5-10' Bulk
Sample Description 1: Brown lean clay with
Sample Description 2: sand
USCS Class:  CL    Liquid limit:  47    Plasticity index:  27
-----------------------------------------------------------------
                                Notes
-----------------------------------------------------------------
Remarks: Sample Number 3201  Methods: Particle Size:
         ASTM D 422-63; Sieve  Analysis: AASHTO T 27-99
Fig. No.: 201
-----------------------------------------------------------------
                        Mechanical Analysis Data
-----------------------------------------------------------------
                          Initial     After wash
Dry sample and tare=      799.81        164.79
Tare                =       0.00          0.00
Dry sample weight   =     799.81        164.79
Minus #200 from wash=    79.4 %
Tare for cumulative weight retained= 0
[illegible]ve           Cumul. Wt.    Percent
                     retained      finer
  0.375 inches          0.00       100.0
  # 4                   9.59        98.8
  # 10                 24.70        96.9
  # 20                 44.97        94.4
  # 40                 71.71        91.0
  # 60                 88.72        88.9
  # 100               118.72        85.2
  # 200               162.61        79.7
-----------------------------------------------------------------
                        Hydrometer Analysis Data
-----------------------------------------------------------------
Separation sieve is number 40
Percent -# 40 based on complete sample=  91.0
Weight of hydrometer sample: 64.07
Hygroscopic moisture correction:
  Moist weight & tare =  52.78
  Dry weight & tare   =  52.15
  Tare                =  22.40
  Hygroscopic moisture=   2.1 %
Calculated biased weight=  68.92
Table of composite correction values:
  Temp, deg C:    20.0    21.0    22.0    22.5    23.0
```

```
  Comp. corr:    - 6.7   - 6.4   - 6.1   - 5.9   - 5.8
Meniscus correction only= 0
Specific gravity of solids= 2.75
Specific gravity correction factor= 0.978
H[illegible]meter type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed    Temp, Actual    Corrected   K        Rm     Eff.    Diameter   Percent
  time, min  deg C reading   reading                     depth   mm         finer
     2.0     23.0  55.0      49.2        0.0128   55.0    7.3    0.0244     69.8
     5.0     23.0  51.5      45.7        0.0128   51.5    7.8    0.0160     64.9
    17.0     23.0  46.0      40.2        0.0128   46.0    8.8    0.0092     57.1
    30.0     23.0  43.0      37.2        0.0128   43.0    9.2    0.0071     52.8
    60.0     22.5  40.0      34.1        0.0128   40.0    9.7    0.0052     48.4
   250.0     20.0  35.5      28.8        0.0132   35.5   10.5    0.0027     40.9
  1483.0     22.5  32.5      26.6        0.0128   32.5   11.0    0.0011     37.8
------------------------------------------------------------------------------------
                              Fractional Components
------------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0     % GRAVEL =   1.2    % SAND = 19.1
% SILT = 31.7     % CLAY = 48.0

D85=    0.15  D60=    0.011  D50=    0.006
```

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	1	0.0	2.0	23.1	32.4	42.5	CL	35	17

SIEVE inches size	PERCENT FINER		
	●		
0.75	100.0		
0.375	99.7		
	GRAIN SIZE		
D_{60}	0.0151		
D_{30}	0.0013		
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER		
	●		
4	98.0		
10	94.4		
20	90.4		
40	86.7		
60	84.4		
100	80.6		
200	74.9		

Sample information:

- ● Boring NB-41,2-10' Bulk Brown lean clay with sand

Remarks:
Sample Number 3202
Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T 27-99

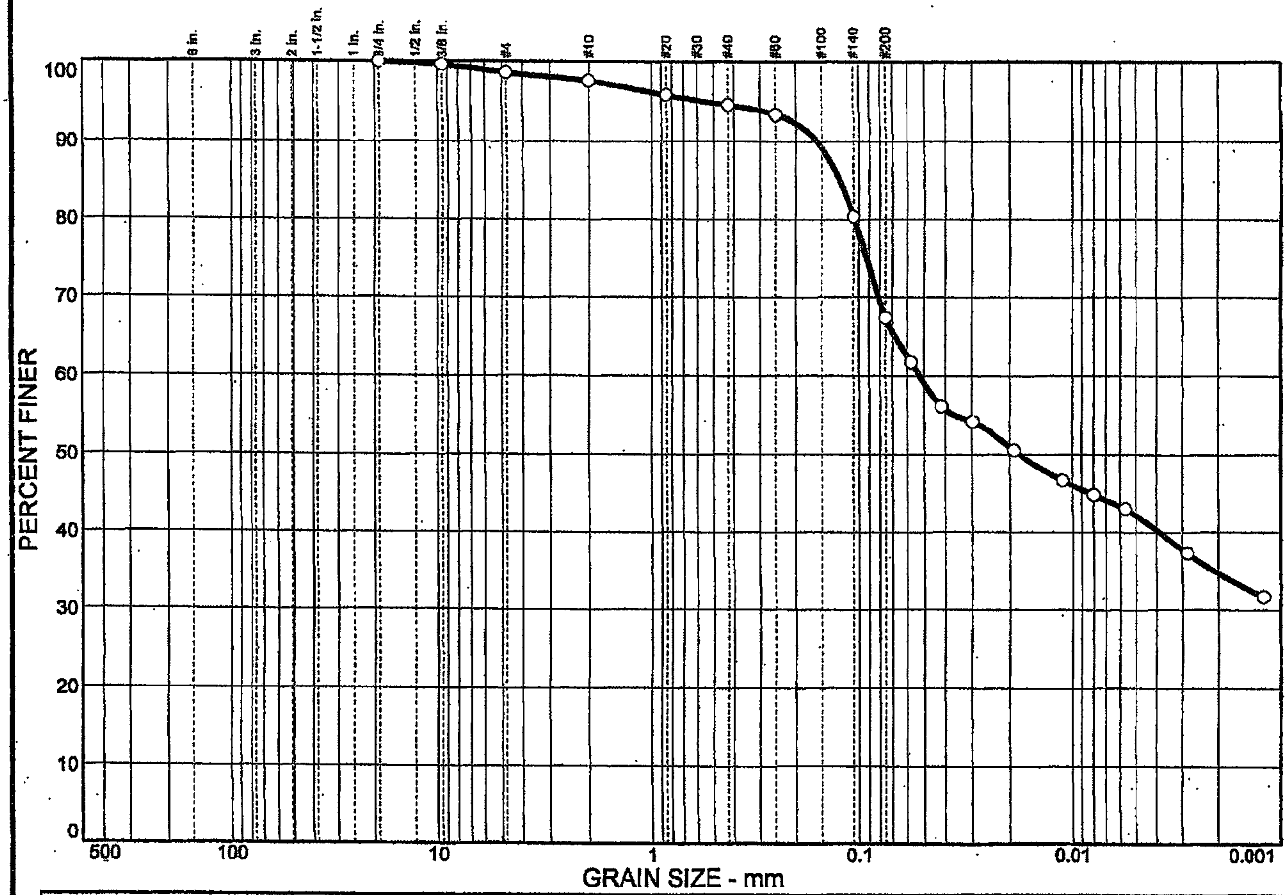
Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: June 23, 2005

```
=======================================================================
                   GRAIN SIZE DISTRIBUTION TEST DATA         Test No.: 1
-----------------------------------------------------------------------
Date: June 23, 2005
[illegible]ect No.: 3043051021.0001
P[illegible]ect: TVA Kingston - Proposed Gypsum Stack
=======================================================================

-----------------------------------------------------------------------
                              Sample Data
-----------------------------------------------------------------------
Location of Sample: Boring NB-41,2-10' Bulk
Sample Description 1: Brown lean clay with
Sample Description 2: sand
USCS Class:  CL   Liquid limit:  35    Plasticity index:  17
-----------------------------------------------------------------------
                                Notes
-----------------------------------------------------------------------
Remarks: Sample Number 3202  Methods: Particle Size:
         ASTM D 422-63; Sieve  Analysis: AASHTO T 27-99
Fig. No.: 202
-----------------------------------------------------------------------
                         Mechanical Analysis Data
-----------------------------------------------------------------------
                     Initial     After wash
Dry sample and tare=   742.20       189.68
Tare               =     0.00         0.00
Dry sample weight  =   742.20       189.68
Minus #200 from wash=  74.4 %
T[illegible] for cumulative weight retained= 0
[illegible]ve              Cumul. Wt.   Percent
                   retained     finer
  0.75  inches       0.00        100.0
  0.375 inches       2.30         99.7
  # 4               14.60         98.0
  # 10              41.29         94.4
  # 20              71.55         90.4
  # 40              98.62         86.7
  # 60             115.68         84.4
  # 100            143.76         80.6
  # 200            186.56         74.9
-----------------------------------------------------------------------
                         Hydrometer Analysis Data
-----------------------------------------------------------------------
Separation sieve is number 40
Percent -# 40 based on complete sample=  86.7
Weight of hydrometer sample: 67.67
Hygroscopic moisture correction:
  Moist weight & tare =  53.32
  Dry weight & tare   =  52.74
  Tare                =  22.19
  Hygroscopic moisture=   1.9 %
Calculated biased weight=  76.59
Table of composite correction values:
```

```
  Temp, deg C:    20.0   21.0   22.0   22.5   23.0
  Comp. corr:    - 6.7  - 6.4  - 6.1  - 5.9  - 5.8
Meniscus correction only= 0
Specific gravity of solids= 2.73
Specific gravity correction factor= 0.983
Hydrometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed     Temp, Actual   Corrected  K         Rm     Eff.   Diameter  Percent
  time, min   deg C reading  reading                     depth  mm        finer
     2.0      23.0  56.0     50.2       0.0128   56.0    7.1   0.0242    64.4
     5.0      23.0  53.0     47.2       0.0128   53.0    7.6   0.0158    60.6
    15.0      23.0  47.0     41.2       0.0128   47.0    8.6   0.0097    52.9
    32.0      23.0  42.5     36.7       0.0128   42.5    9.3   0.0069    47.1
    60.0      22.5  39.5     33.6       0.0129   39.5    9.8   0.0052    43.1
   250.0      22.0  33.5     27.4       0.0130   33.5   10.8   0.0027    35.2
  1471.0      22.5  28.5     22.6       0.0129   28.5   11.6   0.0011    29.0
--------------------------------------------------------------------------------
                               Fractional Components
--------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =  0.0     % GRAVEL =  2.0    % SAND = 23.1
% SILT = 32.4     % CLAY = 42.5

D85=   0.28  D60=   0.015  D50=   0.008
D30=   0.0013
```

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.4	31.2	25.3	42.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	99.6		
#4	98.6		
#10	97.6		
#20	95.8		
#40	94.5		
#60	93.3		
#140	80.4		
#200	67.4		

* (no specification provided)

Soil Description

Yellowish brown sandy silty clay

Atterberg Limits

PL= 22 LL= 45 PI= 23

Coefficients

D_{85}= 0.123 D_{60}= 0.0523 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: UD-2
Location: NB-44
Source of Sample:
Date:
Elev./Depth: 16.5'-18.5'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
ject: TVA Kingston - Proposed Gypsum Stack
ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-2
Elev. or Depth: 16.5'-18.5' **Sample Length(in./cm.):**
Location: NB-44 (16.5'-18.5')
Description: Yellowish brown sandy silty clay
Date: **PL:** 22 **LL:** 45 **PI:** 23
USCS Classification: CL **AASHTO Classification:** -
Testing Remarks:

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	366.18	0.00
Tare =	0.00	0.00
Dry sample weight =	366.18	0.00

Minus #200 from wash= 100.0 %
Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 51.24 **Tare =** .00 **Sample weight =** 51.24
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

ieve	**Cumul. Wt. retained**	**Percent finer**
.75 inch	0.00	100.0
.375 inch	1.30	99.6
# 4	5.07	98.6
# 10	8.66	97.6
# 20	0.94	95.8
# 40	1.65	94.5
# 60	2.28	93.3
# 140	9.01	80.4
# 200	15.83	67.4

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 97.6
Weight of hydrometer sample: 52.32
Hygroscopic moisture correction:
Moist weight & tare = 49.42
Dry weight & tare = 48.65
Tare = 11.66
Hygroscopic moisture= 2.1 %
Calculated biased weight= 52.51
Table of composite correction values:
Temp, deg C: 13.7 24.7 29.1
omp. corr: -6.0 -5.0 -3.5

eniscus correction only= 1.0
Specific gravity of solids= 2.71

MACTEC, INC.

Specific gravity correction factor= 0.987
Hydrometer type: 152H
Effective depth L= 16.294964 - 0.164 x Rm

lapsed time, min	**Temp, deg C**	**Actual reading**	**Corrected reading**	**K**	**Rm**	**Eff. depth**	**Diameter mm**	**Percent finer**
0.50	23.1	38.0	32.9	0.0129	39.0	9.9	0.0574	61.8
1.00	23.1	35.0	29.9	0.0129	36.0	10.4	0.0416	56.1
2.00	23.1	34.0	28.9	0.0129	35.0	10.6	0.0296	54.2
5.00	23.1	32.0	26.9	0.0129	33.0	10.9	0.0190	50.5
15.00	23.1	30.0	24.9	0.0129	31.0	11.2	0.0112	46.7
30.00	23.1	29.0	23.9	0.0129	30.0	11.4	0.0079	44.8
60.00	23.1	28.0	22.9	0.0129	29.0	11.5	0.0057	43.0
250.00	23.1	25.0	19.9	0.0129	26.0	12.0	0.0028	37.3
1440.00	23.2	22.0	16.9	0.0129	23.0	12.5	0.0012	31.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 1.4 **% SAND =** 31.2
% SILT = 25.3 **% CLAY =** 42.1

D_{85}= 0.12 D_{60}= 0.05 D_{50}= 0.02

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	28.7	12.9	58.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.7		
#10	95.0		
#20	94.0		
#40	92.3		
#60	85.6		
#140	72.6		
#200	71.0		

* (no specification provided)

Soil Description

Dark yellowish brown fat clay with sand

Atterberg Limits

PL= 24 LL= 54 PI= 30

Coefficients

D_{85}= 0.241 D_{60}= 0.0072 D_{50}= 0.0022
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO= -

Remarks

Sample No.: UD-4 **Source of Sample:** **Date:**
Location: NB-44 (21.5'-23.5') **Elev./Depth:** 21.5'-23.5'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
ject: TVA Kingston - Proposed Gypsum Stack
ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-4
Elev. or Depth: 21.5'-23.5' **Sample Length(in./cm.):**
Location: NB-44 (21.5'-23.5')
Description: Dark yellowish brown fat clay with sand
Date: **PL:** 24 **LL:** 54 **PI:** 30
USCS Classification: CH **AASHTO Classification:** -
Testing Remarks:

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	465.57	0.00
Tare =	0.00	0.00
Dry sample weight =	465.57	0.00

Minus #200 from wash= 100.0 %
Sample split on number 10 sieve
Split sample data:
Sample and tare = 54.20 **Tare =** .00 **Sample weight =** 54.20
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

ieve	Cumul. Wt. retained	Percent finer
.375 inch	0.00	100.0
# 4	1.61	99.7
# 10	23.08	95.0
# 20	0.57	94.0
# 40	1.55	92.3
# 60	5.35	85.6
# 140	12.79	72.6
# 200	13.68	71.0

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 95.0
Weight of hydrometer sample: 55.70
Hygroscopic moisture correction:
Moist weight & tare = 45.71
Dry weight & tare = 44.82
Tare = 11.59
Hygroscopic moisture= 2.7 %
Calculated biased weight= 57.10
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

iscus correction only= 1.0
Specific gravity of solids= 2.73
Specific gravity correction factor= 0.983

Hydrometer type: 152H
Effective depth L= 16.294964 - 0.164 x Rm

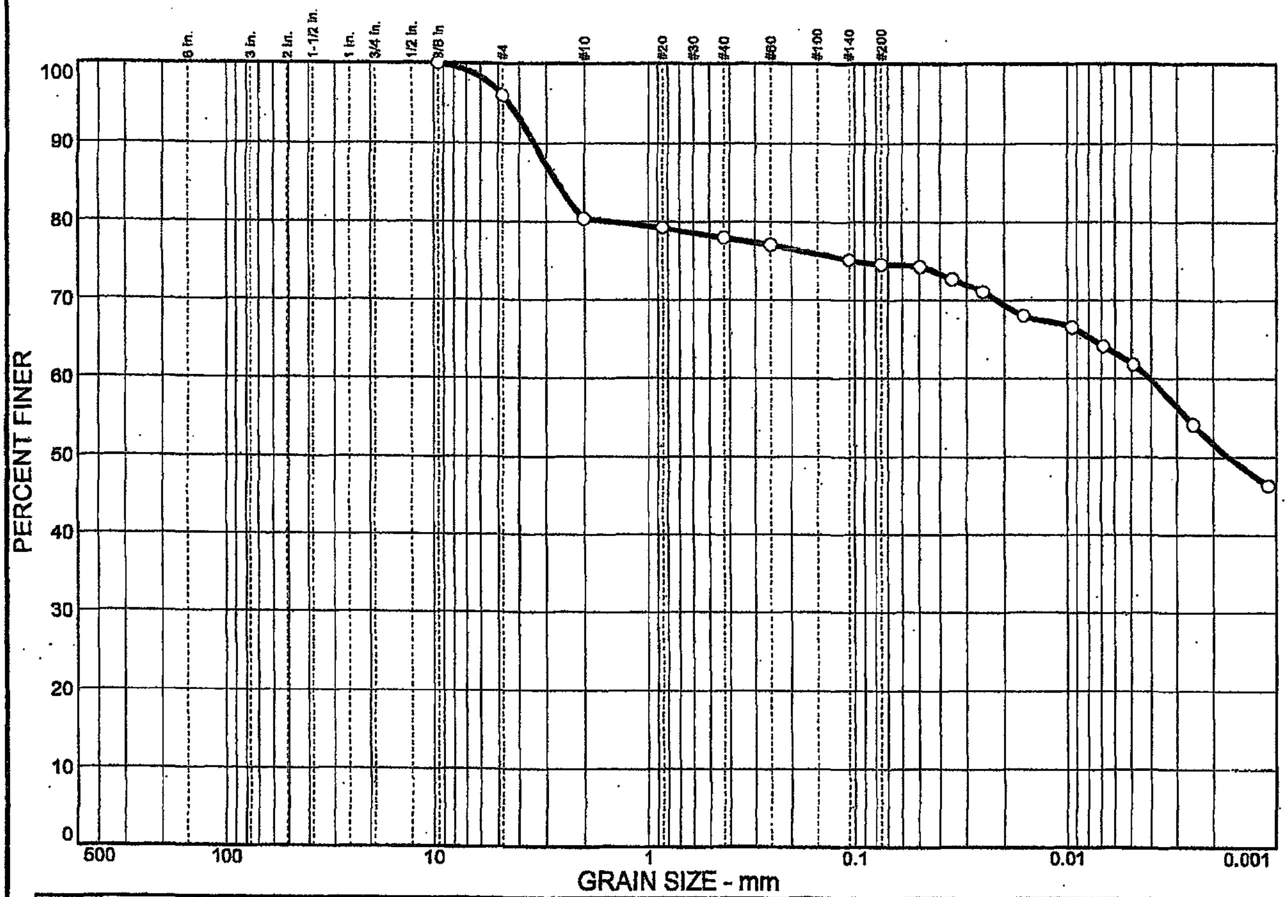
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.1	45.0	39.9	0.0128	46.0	8.8	0.0537	68.6
1.00	23.1	44.0	38.9	0.0128	45.0	8.9	0.0383	66.9
2.00	23.1	43.0	37.9	0.0128	44.0	9.1	0.0273	65.2
5.00	23.1	42.0	36.9	0.0128	43.0	9.2	0.0174	63.4
15.00	23.1	41.0	35.9	0.0128	42.0	9.4	0.0102	61.7
30.00	23.1	40.0	34.9	0.0128	41.0	9.6	0.0072	60.0
60.00	23.1	39.0	33.9	0.0128	40.0	9.7	0.0052	58.3
250.00	23.1	35.0	29.9	0.0128	36.0	10.4	0.0026	51.4
1440.00	23.2	32.0	26.9	0.0128	33.0	10.9	0.0011	46.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 0.3 **% SAND =** 28.7
% SILT = 12.9 **% CLAY =** 58.1

D_{85}= 0.24 D_{60}= 0.01 D_{50}= 0.00

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.1	21.4	12.5	62.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	95.9		
#10	80.4		
#20	79.2		
#40	77.9		
#60	77.0		
#140	75.1		
#200	74.5		

* (no specification provided)

Soil Description

Brown fat clay with sand

Atterberg Limits

PL= 32 LL= 74 PI= 42

Coefficients

D_{85}= 2.67 D_{60}= 0.0041 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sample No.: UD-6
Location: NB-44
Source of Sample:
Date:
Elev./Depth: 31'-33'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
ject: TVA Kingston - Proposed Gypsum Stack
ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-6
Elev. or Depth: 31'-33' **Sample Length(in./cm.):**
Location: NB-44 (31'-33')
Description: Brown fat clay with sand
Date: **PL:** 32 **LL:** 74 **PI:** 42
USCS Classification: CH **AASHTO Classification:** -
Testing Remarks:

Mechanical Analysis Data

Initial
Dry sample and tare= 161.52
Tare = 0.00
Dry sample weight = 161.52
Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 50.80 **Tare =** .00 **Sample weight =** 50.80
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
375 inch	0.00	100.0
# 4	6.60	95.9
# 10	31.62	80.4
# 20	0.77	79.2
# 40	1.56	77.9
# 60	2.13	77.0
# 140	3.32	75.1
# 200	3.71	74.5

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 80.4
Weight of hydrometer sample: 52.58
Hygroscopic moisture correction:
Moist weight & tare = 38.35
Dry weight & tare = 37.43
Tare = 11.07
Hygroscopic moisture= 3.5 %
Calculated biased weight= 63.19
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

iscus correction only= 1.0
cific gravity of solids= 2.74
Specific gravity correction factor= 0.980
Hydrometer type: 152H

MACTEC, INC.

Effective depth L= 16.294964 - 0.164 x Rm

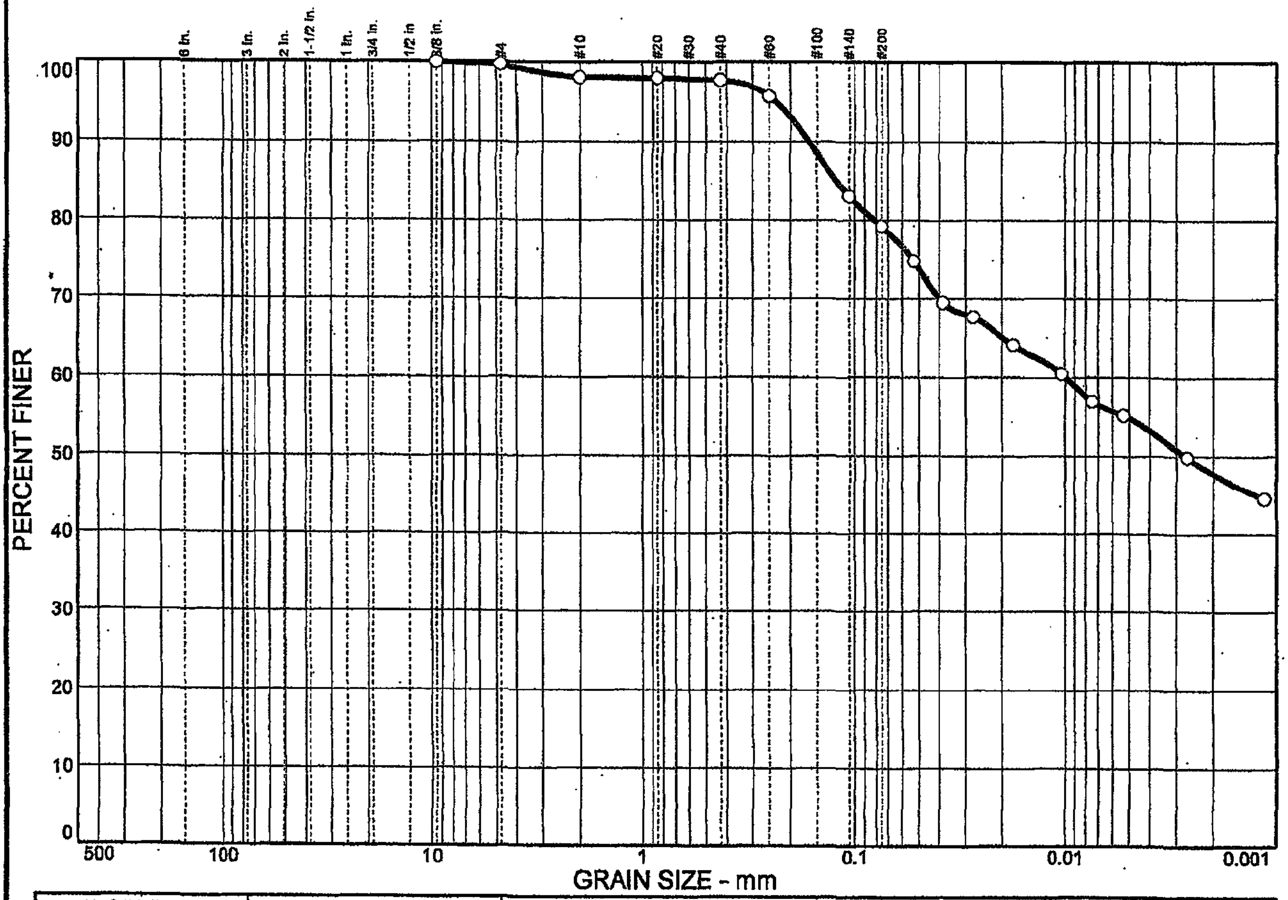
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.2	53.0	47.9	0.0128	54.0	7.4	0.0493	74.2
1.00	23.2	52.0	46.9	0.0128	53.0	7.6	0.0352	72.7
2.00	23.2	51.0	45.9	0.0128	52.0	7.8	0.0252	71.1
5.00	23.2	49.0	43.9	0.0128	50.0	8.1	0.0163	68.0
15.00	23.2	48.0	42.9	0.0128	49.0	8.3	0.0095	66.5
30.00	23.2	46.5	41.4	0.0128	47.5	8.5	0.0068	64.1
60.00	23.2	45.0	39.9	0.0128	46.0	8.8	0.0049	61.8
250.00	23.2	40.0	34.9	0.0128	41.0	9.6	0.0025	54.1
1440.00	23.2	35.0	29.9	0.0128	36.0	10.4	0.0011	46.3

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 4.1 **% SAND =** 21.4
% SILT = 12.5 **% CLAY =** 62.0

D_{85}= 2.67 D_{60}= 0.00 D_{50}= 0.00

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	20.5	24.3	54.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.7		
#10	98.1		
#20	98.0		
#40	97.7		
#60	95.7		
#140	83.1		
#200	79.2		

* (no specification provided)

Soil Description

Brown elastic silt with sand.

Atterberg Limits

PL= 30 LL= 51 PI= 21

Coefficients

D_{85}= 0.121 D_{60}= 0.0099 D_{50}= 0.0027

D_{30}= D_{15}= D_{10}=

C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

Sample No.: UD-1, 2 & 3 (CU) **Source of Sample:** **Date:**

Location: NB-47A **Elev./Depth:** 9'-17'

MACTEC, INC.

Client: TVA

Project: TVA Kingston - Proposed Gypsum Stack

Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
ject: TVA Kingston - Proposed Gypsum Stack
ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-1, 2 & 3 (CU)
Elev. or Depth: 9'-17' **Sample Length(in./cm.):**
Location: NB-47A
Description: Brown elastic silt with sand
Date: **PL:** 30 **LL:** 51 **PI:** 21
USCS Classification: MH **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

	Initial
Dry sample and tare=	335.39
Tare =	0.00
Dry sample weight =	335.39

Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 53.95 **Tare =** .00 **Sample weight =** 53.95
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	**Cumul. Wt. retained**	**Percent finer**
375 inch	0.00	100.0
# 4	1.04	99.7
# 10	6.49	98.1
# 20	0.04	98.0
# 40	0.21	97.7
# 60	1.34	95.7
# 140	8.25	83.1
# 200	10.42	79.2

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 98.1
Weight of hydrometer sample: 55.96
Hygroscopic moisture correction:
Moist weight & tare = 44.87
Dry weight & tare = 43.70
Tare = 10.80
Hygroscopic moisture= 3.6 %
Calculated biased weight= 55.08
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

iscus correction only= 1.0
cific gravity of solids= 2.72
Specific gravity correction factor= 0.985
Hydrometer type: 152H

Effective depth L= 16.294964 - 0.164 x Rm

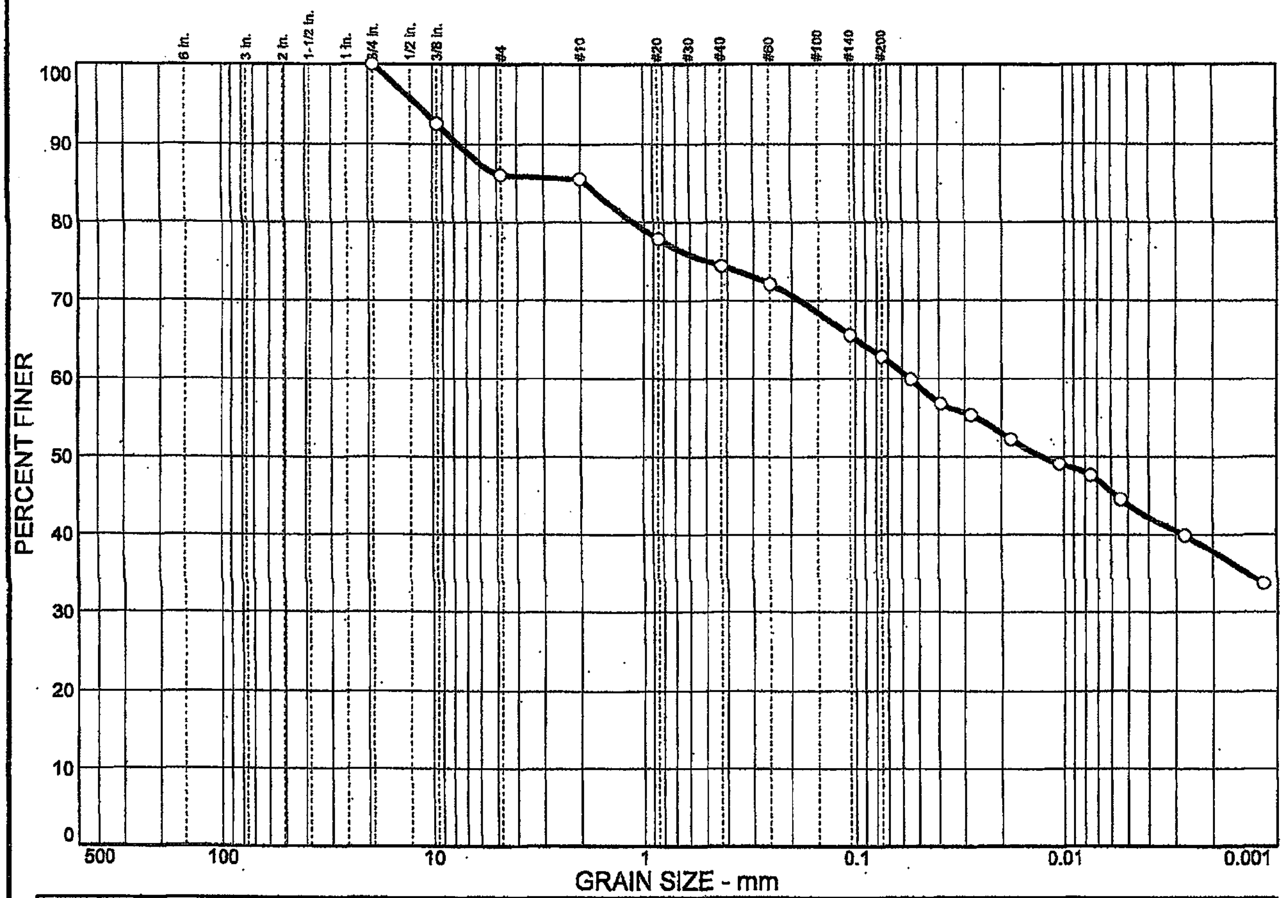
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.1	47.0	41.9	0.0129	48.0	8.4	0.0528	74.8
1.00	23.1	44.0	38.9	0.0129	45.0	8.9	0.0384	69.5
2.00	23.1	43.0	37.9	0.0129	44.0	9.1	0.0274	67.7
5.00	23.1	41.0	35.9	0.0129	42.0	9.4	0.0177	64.1
15.00	23.1	39.0	33.9	0.0129	40.0	9.7	0.0104	60.5
30.00	23.1	37.0	31.9	0.0129	38.0	10.1	0.0075	57.0
60.00	23.1	36.0	30.9	0.0129	37.0	10.2	0.0053	55.2
250.00	23.1	33.0	27.9	0.0129	34.0	10.7	0.0027	49.8
1440.00	23.2	30.0	24.9	0.0129	31.0	11.2	0.0011	44.5

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 0.3 **% SAND =** 20.5
% SILT = 24.3 **% CLAY =** 54.9

D_{85}= 0.12 D_{60}= 0.01 D_{50}= 0.00

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	14.0	23.2	19.0	43.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	92.5		
#4	86.0		
#10	85.5		
#20	77.8		
#40	74.4		
#60	72.1		
#140	65.6		
#200	62.8		

* (no specification provided)

Soil Description

Brown sandy elastic silt

Atterberg Limits

PL= 34 LL= 58 PI= 24

Coefficients

D_{85}= 1.90 D_{60}= 0.0549 D_{50}= 0.0128
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

Sample No.: UD-4, 5 & 6 (UU) **Source of Sample:** **Date:**
Location: NB-47A **Elev./Depth:** 18'-27'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
[illegible]ject: TVA Kingston - Proposed Gypsum Stack
[illegible]ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-4, 5 & 6 (UU)
Elev. or Depth: 18'-27'
Sample Length(in./cm.):
Location: NB-47A
Description:
Date:
PL: 34
LL:
PI:
USCS Classification: MH
AASHTO Classification:
Testing Remarks:

Mechanical Analysis Data

	Initial
Dry sample and tare=	428.50
Tare =	0.00
Dry sample weight =	428.50

Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 54.58 **Tare =** .00 **Sample weight =** 54.58
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	**Cumul. Wt. retained**	**Percent finer**
[illegible]75 inch	0.00	100.0
.375 inch	32.31	92.5
# 4	59.79	86.0
# 10	62.30	85.5
# 20	4.90	77.8
# 40	7.08	74.4
# 60	8.54	72.1
# 140	12.70	65.6
# 200	14.48	62.8

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 85.5
Weight of hydrometer sample: 56.21
Hygroscopic moisture correction:
Moist weight & tare = 51.05
Dry weight & tare = 49.91
Tare = 10.82
Hygroscopic moisture= 2.9 %
Calculated biased weight= 63.88
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

[illegible]scus correction only= 1.0
[illegible]pecific gravity of solids= 2.72
Specific gravity correction factor= 0.985

Hydrometer type: 152H
Effective depth L= 16.294964 - 0.164 x Rm

Elapsed ime, min	**Temp, deg C**	**Actual reading**	**Corrected reading**	**K**	**Rm**	**Eff. depth**	**Diameter mm**	**Percent finer**
0.50	23.1	44.0	38.9	0.0129	45.0	8.9	0.0543	59.9
1.00	23.1	42.0	36.9	0.0129	43.0	9.2	0.0391	56.8
2.00	23.1	41.0	35.9	0.0129	42.0	9.4	0.0279	55.3
5.00	23.1	39.0	33.9	0.0129	40.0	9.7	0.0180	52.2
15.00	23.1	37.0	31.9	0.0129	38.0	10.1	0.0105	49.1
30.00	23.1	36.0	30.9	0.0129	37.0	10.2	0.0075	47.6
60.00	23.1	34.0	28.9	0.0129	35.0	10.6	0.0054	44.5
250.00	23.1	31.0	25.9	0.0129	32.0	11.0	0.0027	39.9
1440.00	23.2	27.0	21.9	0.0129	28.0	11.7	0.0012	33.7

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 14.0 **% SAND =** 23.2
% SILT = 19.0 **% CLAY =** 43.8

D_{85}= 1.90 **D_{60}=** 0.05 **D_{50}=** 0.01

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	5.4	11.3	31.7	51.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	97.5		
#4	94.6		
#10	91.6		
#20	89.3		
#40	88.0		
#60	87.1		
#140	84.6		
#200	83.3		

* (no specification provided)

Soil Description

Brown fat clay with sand

Atterberg Limits

PL= 27 LL= 59 PI= 32

Coefficients

D_{85}= 0.120 D_{60}= 0.0087 D_{50}= 0.0043
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sample No.: UD-7 **Source of Sample:** **Date:**
Location: NB-47A **Elev./Depth:** 30'-32'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
[illegible]ject: TVA Kingston - Proposed Gypsum Stack
[illegible]ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-7
Elev. or Depth: 30'-32' **Sample Length(in./cm.):**
Location: NB-47A
Description: Brown fat clay with sand
Date: **PL:** 27 **LL:** 59 **PI:** 32
USCS Classification: CH **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

	Initial
Dry sample and tare=	149.36
Tare =	0.00
Dry sample weight =	149.36

Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 49.70 **Tare =** .00 **Sample weight =** 49.70
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
[illegible]75 inch	0.00	100.0
.375 inch	3.75	97.5
# 4	8.04	94.6
# 10	12.52	91.6
# 20	1.24	89.3
# 40	1.95	88.0
# 60	2.43	87.1
# 140	3.79	84.6
# 200	4.52	83.3

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 91.6
Weight of hydrometer sample: 51.29
Hygroscopic moisture correction:
Moist weight & tare = 47.90
Dry weight & tare = 46.74
Tare = 10.95
Hygroscopic moisture= 3.2 %
Calculated biased weight= 54.24
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

[illegible]iscus correction only= 1.0
Specific gravity of solids= 2.68
Specific gravity correction factor= 0.993

Hydrometer type: 152H
Effective depth L= 16.294964 - 0.164 x Rm

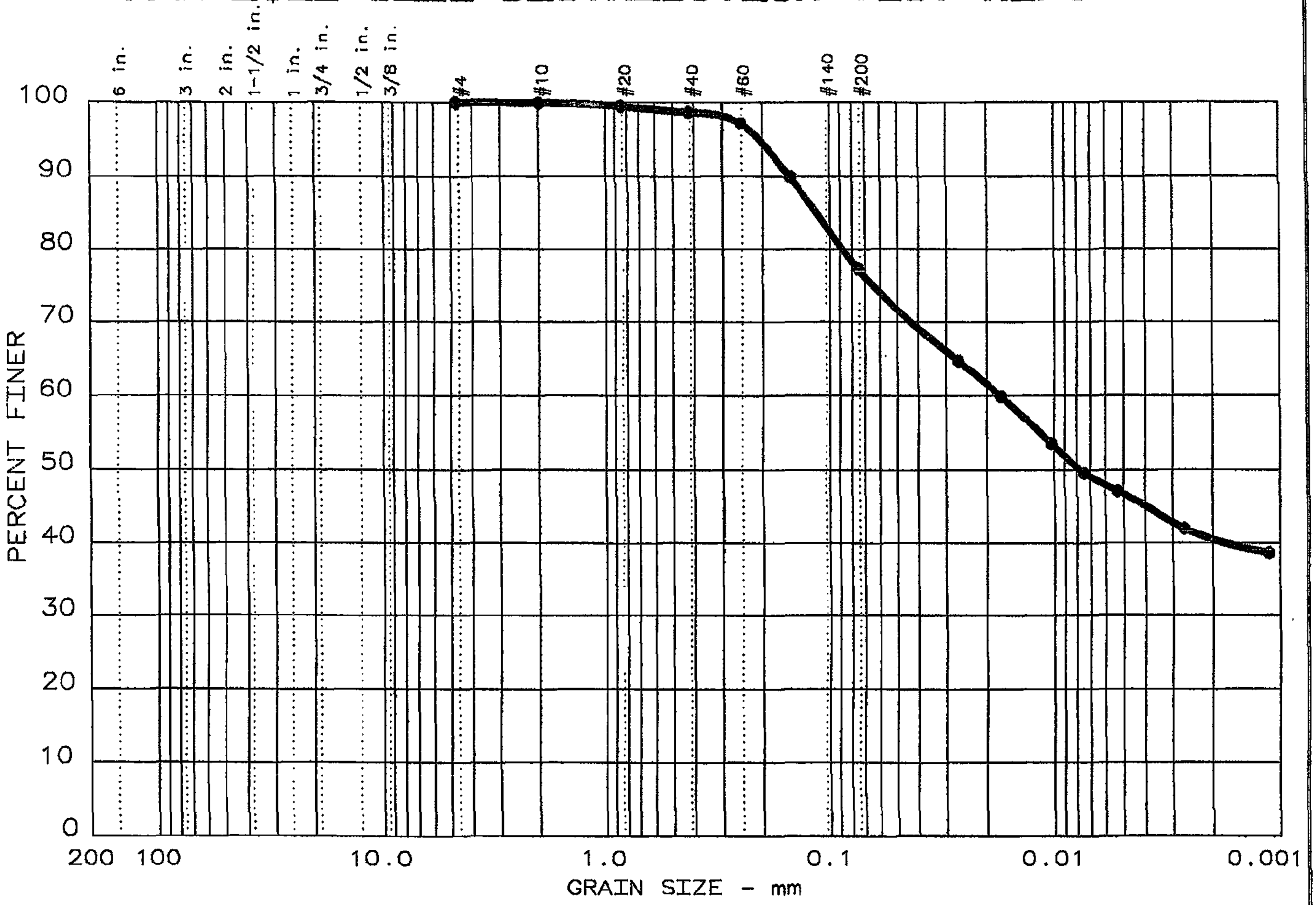
Elapsed time, min	**Temp, deg C**	**Actual reading**	**Corrected reading**	**K**	**Rm**	**Eff. depth**	**Diameter mm**	**Percent finer**
0.50	23.1	49.5	44.4	0.0130	50.5	8.0	0.0521	81.2
1.00	23.1	48.0	42.9	0.0130	49.0	8.3	0.0374	78.5
2.00	23.1	46.0	40.9	0.0130	47.0	8.6	0.0270	74.8
5.00	23.1	43.0	37.9	0.0130	44.0	9.1	0.0175	69.3
15.00	23.1	39.0	33.9	0.0130	40.0	9.7	0.0105	62.0
30.00	23.1	37.0	31.9	0.0130	38.0	10.1	0.0075	58.3
60.00	23.1	34.0	28.9	0.0130	35.0	10.6	0.0055	52.8
250.00	23.1	31.0	25.9	0.0130	32.0	11.0	0.0027	47.3
1440.00	23.1	27.0	21.9	0.0130	28.0	11.7	0.0012	40.0

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 5.4 **% SAND =** 11.3
% SILT = 31.7 **% CLAY =** 51.6

D_{85}= 0.12 D_{60}= 0.01 D_{50}= 0.00

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	15	0.0	0.0	22.7	30.6	46.7	ML	40	12

SIEVE inches size	PERCENT FINER ●		
	GRAIN SIZE		
D_{60}	0.0174		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	100.0		
10	99.9		
20	99.5		
40	98.7		
60	97.2		
100	89.9		
200	77.3		

Sample information:
● Boring NB-59, 5-15'Bulk
Light red brown silt
with sand

Remarks:
Sample Number 3196
Methods: Particle Size:
ASTM D 422-63; Sieve
Analysis: AASHTO T 27-99

Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: June 13, 2005

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 15

Date: June 13, 2005
P[illegible]ect No.: 3043051021.0001
P[illegible]ect: TVA Kingston - Proposed Gypsum Stack

Sample Data

Location of Sample: Boring NB-59, 5-15'Bulk
Sample Description 1: Light red brown silt
Sample Description 2: with sand
USCS Class: ML Liquid limit: 40 Plasticity index: 12

Notes

Remarks: Sample Number 3196 Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T 27-99
Fig. No.: 196

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	602.60	147.20
Tare =	0.00	0.00
Dry sample weight =	602.60	147.20

Minus #200 from wash= 75.6 %
Tare for cumulative weight retained= 0

[illegible]eve	Cumul. Wt. retained	Percent finer
# 4	0.00	100.0
# 10	0.68	99.9
# 20	3.18	99.5
# 40	7.88	98.7
# 60	17.13	97.2
# 100	60.60	89.9
# 200	136.81	77.3

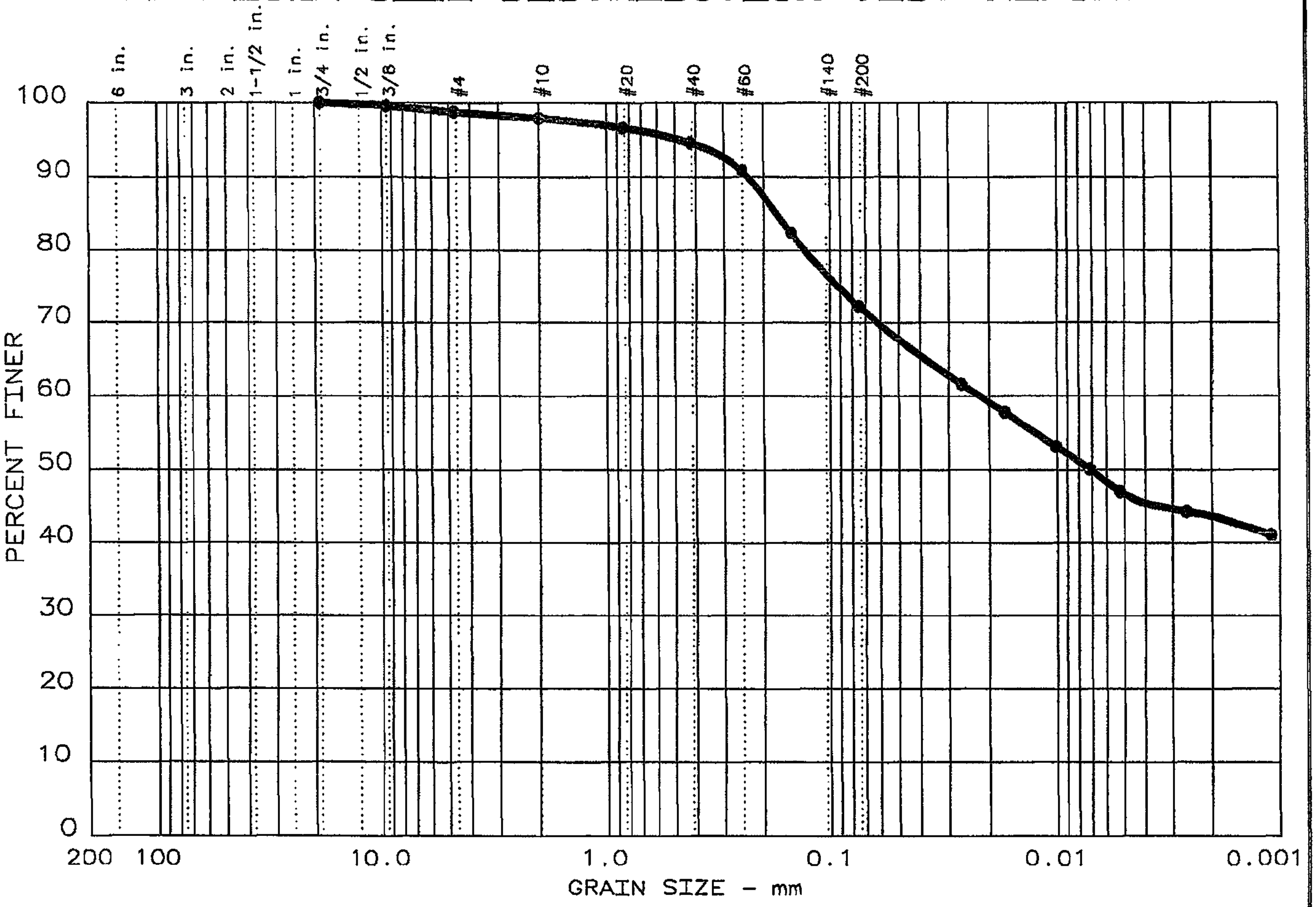
Hydrometer Analysis Data

Separation sieve is number 40
Percent -# 40 based on complete sample= 98.7
Weight of hydrometer sample: 61.46
Hygroscopic moisture correction:
Moist weight & tare = 51.99
Dry weight & tare = 51.42
Tare = 22.18
Hygroscopic moisture= 1.9 %
Calculated biased weight= 61.09
Table of composite correction values:

Temp, deg C:	21.0	22.0	23.0	23.5	24.0
Comp. corr:	- 6.4	- 6.1	- 5.8	- 5.6	- 5.4

```
Meniscus correction only= 0
Specific gravity of solids= 2.75
Specific gravity correction factor= 0.978
Hydrometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

   apsed      Temp,  Actual   Corrected  K          Rm     Eff.    Diameter   Percent
 time, min   deg C  reading  reading                       depth   mm         finer
    2.0      23.5   46.0     40.4       0.0127    46.0     8.8    0.0266     64.7
    5.0      23.5   43.0     37.4       0.0127    43.0     9.2    0.0173     59.9
   15.0      23.5   39.0     33.4       0.0127    39.0     9.9    0.0103     53.5
   30.0      23.5   36.5     30.9       0.0127    36.5    10.3    0.0074     49.5
   60.0      23.5   35.0     29.4       0.0127    35.0    10.6    0.0053     47.1
  250.0      23.0   32.0     26.2       0.0128    32.0    11.0    0.0027     42.0
 1440.0      24.0   29.5     24.1       0.0126    29.5    11.5    0.0011     38.6
----------------------------------------------------------------------------------
                           Fractional Components
----------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =  0.0     % GRAVEL =  0.0    % SAND = 22.7
% SILT = 30.6    % CLAY = 46.7

D85=   0.11  D60=   0.017  D50=   0.008
```

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	16	0.0	1.2	26.5	25.7	46.6	CH	60	32

SIEVE inches size	PERCENT FINER		
	●		
0.75	100.0		
0.375	99.6		
	GRAIN SIZE		
D_{60}	0.0219		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER		
	●		
4	98.8		
10	97.9		
20	96.6		
40	94.6		
60	90.9		
100	82.4		
200	72.3		

Sample information:

● Boring NB-65,2-10' Bulk
Red brown fat clay with
sand

Remarks:
Sample Number 3197
Methods: Particle Size:
ASTM D 422-63; Sieve
Analysis: AASHTO T 27-99

Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: June 29, 2005

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 16

Date: June 13, 2005
P[illegible]ct No.: 3043051021.0001
P[illegible]ect: TVA Kingston - Proposed Gypsum Stack

Sample Data

65 CTJ 7/5/05

Location of Sample: Boring NB-~~8~~5,2-10' Bulk
Sample Description 1: Red brown fat clay with
Sample Description 2: sand
USCS Class: CH Liquid limit: 60 Plasticity index: 32

Notes

Remarks: Sample Number 3197 Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T 27-99
Fig. No.: 197

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	567.15	173.55
Tare =	0.00	0.00
Dry sample weight =	567.15	173.55

Minus #200 from wash= 69.4 %
Tare for cumulative weight retained= 0

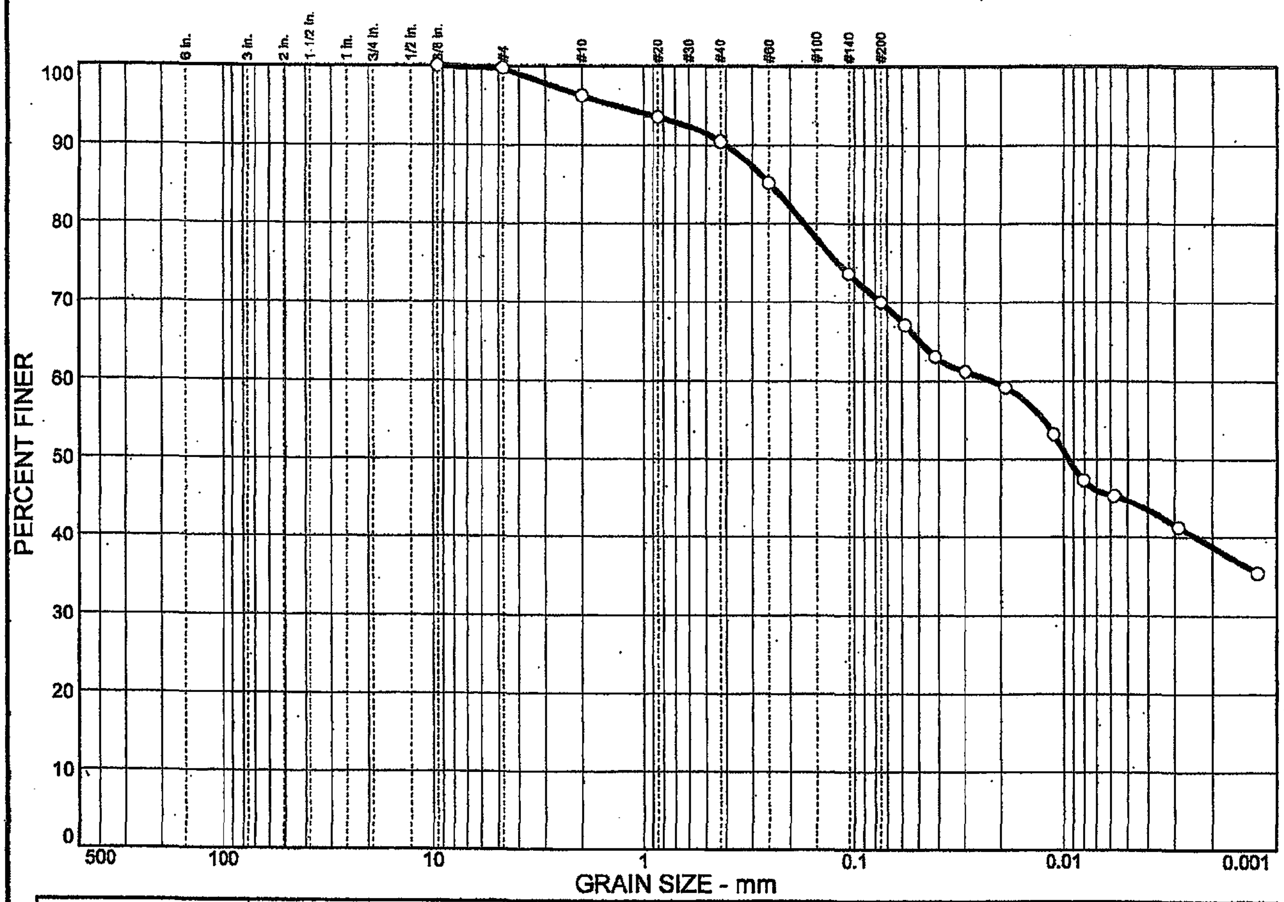
[illegible]eve	Cumul. Wt. retained	Percent finer
0.75 inches	0.00	100.0
0.375 inches	2.41	99.6
# 4	6.80	98.8
# 10	12.01	97.9
# 20	19.22	96.6
# 40	30.72	94.6
# 60	51.46	90.9
# 100	99.63	82.4
# 200	157.24	72.3

Hydrometer Analysis Data

Separation sieve is number 40
Percent -# 40 based on complete sample= 94.6
Weight of hydrometer sample: 60.13
Hygroscopic moisture correction:
  Moist weight & tare = 53.87
  Dry weight & tare = 53.55
  Tare = 21.88
  Hygroscopic moisture= 1.0 %
Calculated biased weight= 62.94
Table of composite correction values:

```
  Temp, deg C:    21.0    22.0    23.0    23.5    24.0
  Comp. corr:    - 6.4   - 6.1   - 5.8   - 5.6   - 5.4
Meniscus correction only= 0
Specific gravity of solids= 2.78
S[illegible]fic gravity correction factor= 0.972
H[illegible]ometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed      Temp, Actual    Corrected  K        Rm     Eff.   Diameter   Percent
  time, min    deg C reading   reading                    depth  mm         finer
     2.0       23.5  45.5      39.9       0.0126   45.5    8.8   0.0265     61.6
     5.0       23.5  43.0      37.4       0.0126   43.0    9.2   0.0171     57.8
    15.0       23.5  40.0      34.4       0.0126   40.0    9.7   0.0101     53.2
    31.0       23.5  38.0      32.4       0.0126   38.0   10.1   0.0072     50.1
    60.0       23.5  36.0      30.4       0.0126   36.0   10.4   0.0052     47.0
   252.0       23.0  34.5      28.7       0.0127   34.5   10.6   0.0026     44.3
  1440.0       24.0  32.0      26.6       0.0125   32.0   11.0   0.0011     41.1
------------------------------------------------------------------------------
                              Fractional Components
------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0     % GRAVEL =   1.2    % SAND = 26.5
% SILT = 25.7     % CLAY = 46.6

D85=   0.17  D60=   0.022  D50=   0.007
```

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	29.7	25.3	44.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.7		
#10	96.2		
#20	93.5		
#40	90.4		
#60	85.2		
#140	73.6		
#200	70.0		

* (no specification provided)

Soil Description

Reddish brown sandy silt

Atterberg Limits

PL= 28 LL= 48 PI= 20

Coefficients

D_{85}= 0.246 D_{60}= 0.0219 D_{50}= 0.0095
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Sample No.: Bulk
Location: NB-76
Source of Sample:
Date:
Elev./Depth: 5'-15'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
[illegible]ject: TVA Kingston - Proposed Gypsum Stack
[illegible]ject Number: 3043051021

Sample Data

Source:
Sample No.: Bulk
Elev. or Depth: 5'-15' **Sample Length(in./cm.):**
Location: NB-76, 5.0'-15.0'
Description: Reddish brown sandy silt
Date: **PL:** 28 **LL:** 47 **PI:** 19
USCS Classification: ML **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

	Initial
Dry sample and tare=	305.41
Tare =	0.00
Dry sample weight =	305.41

Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 48.47 **Tare =** .00 **Sample weight =** 48.47
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
[illegible]375 inch	0.00	100.0
# 4	0.86	99.7
# 10	11.66	96.2
# 20	1.34	93.5
# 40	2.90	90.4
# 60	5.52	85.2
# 140	11.40	73.6
# 200	13.22	70.0

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 96.2
Weight of hydrometer sample: 50.02
Hygroscopic moisture correction:
Moist weight & tare = 51.54
Dry weight & tare = 50.33
Tare = 10.83
Hygroscopic moisture= 3.1 %
Calculated biased weight= 50.45
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

[illegible]iscus correction only= 1.0
[illegible]cific gravity of solids= 2.65
Specific gravity correction factor= 1.000
Hydrometer type: 152H

Effective depth L= 16.294964 - 0.164 x Rm

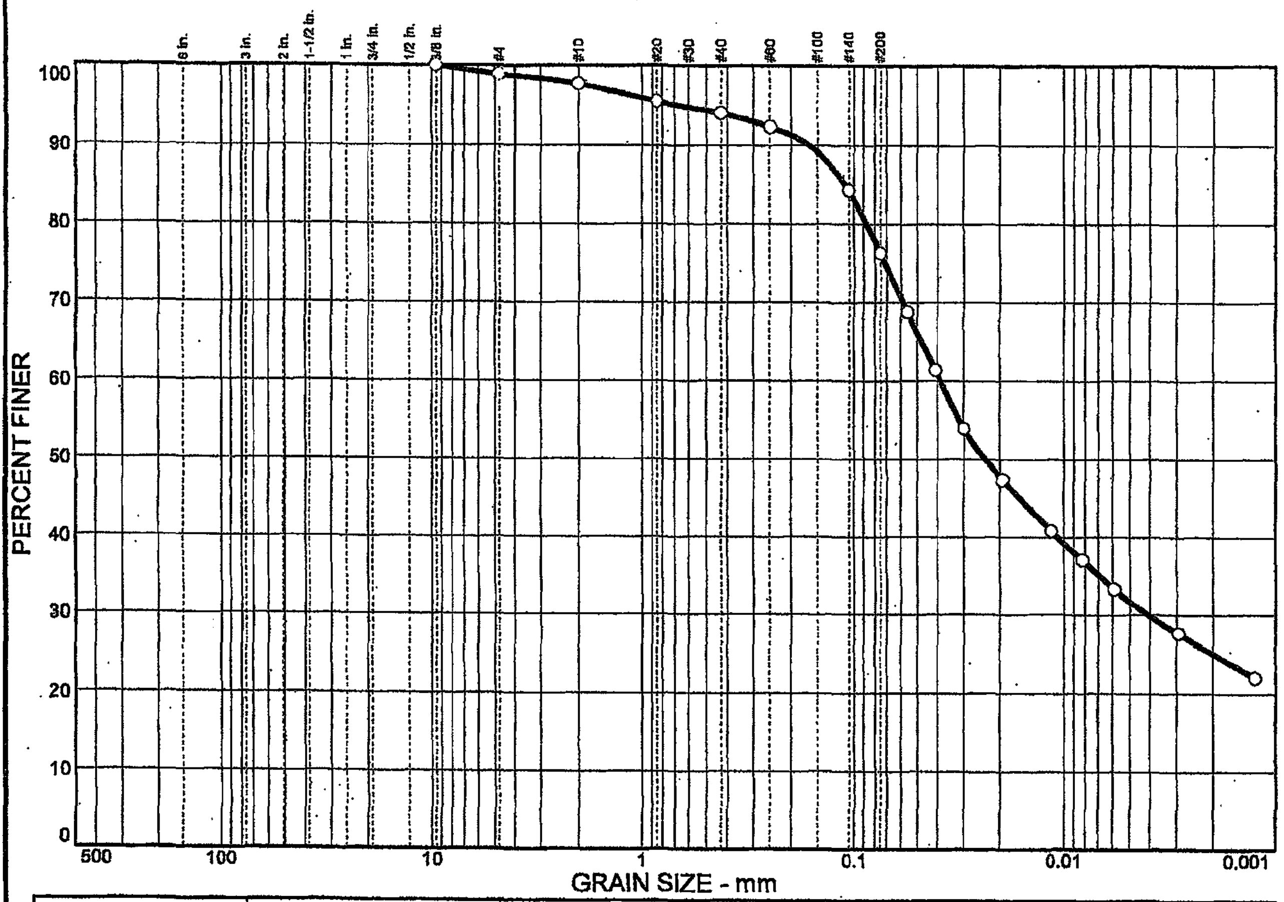
Elapsed time, min	**Temp, deg C**	**Actual reading**	**Corrected reading**	**K**	**Rm**	**Eff. depth**	**Diameter mm**	**Percent finer**
0.50	23.1	39.0	33.9	0.0131	40.0	9.7	0.0580	67.1
1.00	23.1	37.0	31.9	0.0131	38.0	10.1	0.0417	63.1
2.00	23.1	36.0	30.9	0.0131	37.0	10.2	0.0297	61.2
5.00	23.1	35.0	29.9	0.0131	36.0	10.4	0.0189	59.2
15.00	23.1	32.0	26.9	0.0131	33.0	10.9	0.0112	53.2
30.00	23.1	29.0	23.9	0.0131	30.0	11.4	0.0081	47.3
60.00	23.1	28.0	22.9	0.0131	29.0	11.5	0.0058	45.3
250.00	23.1	26.0	20.9	0.0131	27.0	11.9	0.0029	41.3
1440.00	23.1	23.0	17.9	0.0131	24.0	12.4	0.0012	35.4

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 0.3 **% SAND =** 29.7
% SILT = 25.3 **% CLAY =** 44.7

D_{85}= 0.25 D_{60}= 0.02 D_{50}= 0.01

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.1	22.6	44.6	31.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	98.9		
#10	97.7		
#20	95.5		
#40	94.0		
#60	92.3		
#140	84.3		
#200	76.3		

* (no specification provided)

Soil Description

Brown and red brown lean clay with sand

Atterberg Limits

PL= 24 LL= 37 PI= 13

Coefficients

D_{85}= 0.110 D_{60}= 0.0386 D_{50}= 0.0236
D_{30}= 0.0041 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: UD-2
Location: NB-76

Source of Sample:

Date:
Elev./Depth: 19'-20.5'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
ject: TVA Kingston - Proposed Gypsum Stack
ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-2
Elev. or Depth: 19'-20.5' **Sample Length(in./cm.):**
Location: NB-76
Description: Brown and red brown lean clay with sand
Date: **PL:** 24 **LL:** 37 **PI:** 13
USCS Classification: CL **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

Initial
Dry sample and tare= 331.04
Tare = 0.00
Dry sample weight = 331.04
Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 51.85 **Tare** = .00 **Sample weight** = 51.85
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
375 inch	0.00	100.0
# 4	3.73	98.9
# 10	7.70	97.7
# 20	1.16	95.5
# 40	1.98	94.0
# 60	2.84	92.3
# 140	7.12	84.3
# 200	11.36	76.3

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 97.7
Weight of hydrometer sample: 52.78
Hygroscopic moisture correction:
Moist weight & tare = 46.17
Dry weight & tare = 45.54
Tare = 10.83
Hygroscopic moisture= 1.8 %
Calculated biased weight= 53.06
Table of composite correction values:
Temp, deg C: 13.7 24.7 29.1
Comp. corr: -6.0 -5.0 -3.5

iscus correction only= 1.0
ific gravity of solids= 2.69
pecific gravity correction factor= 0.991
Hydrometer type: 152H

MACTEC, INC.

Effective depth L= 16.294964 - 0.164 x Rm

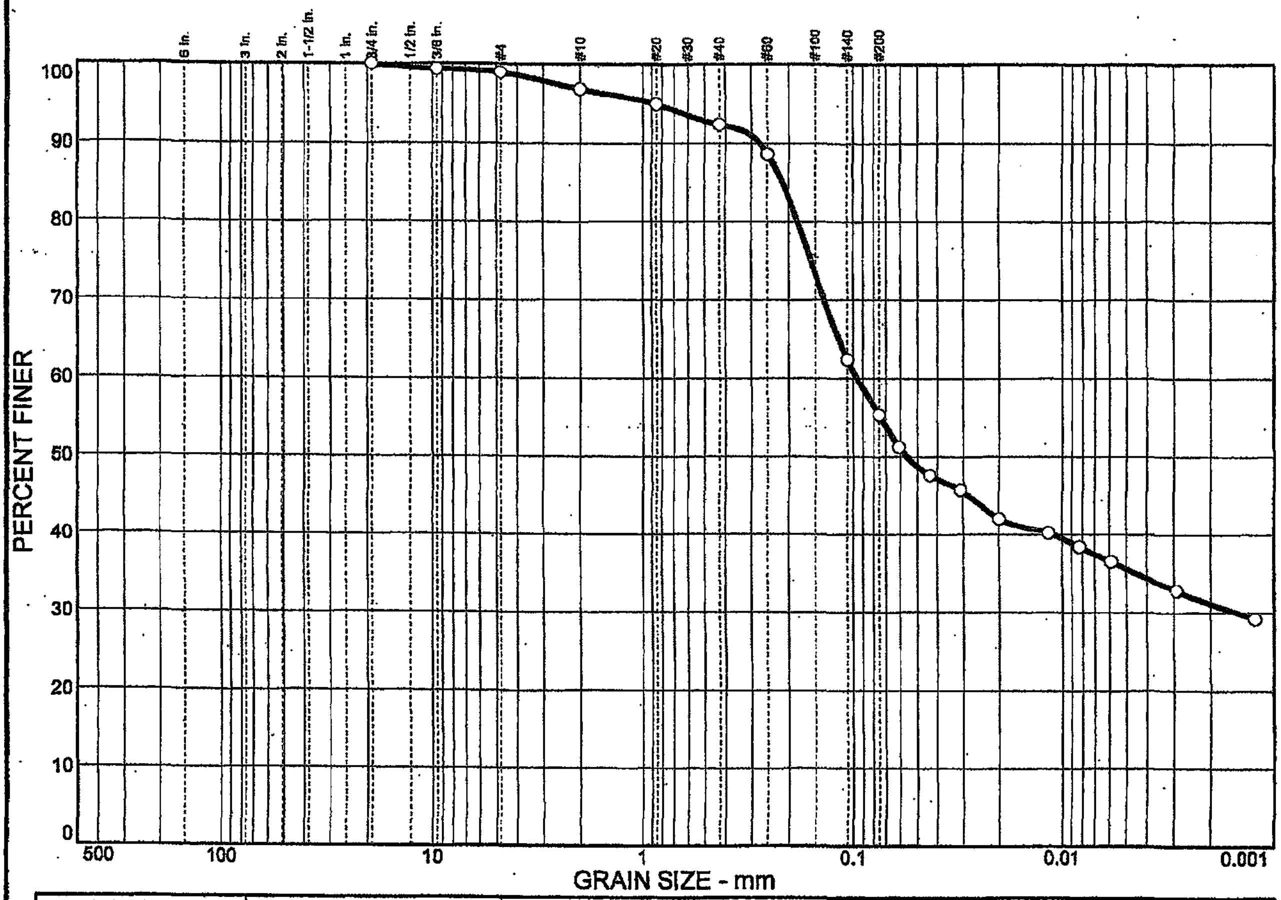
Elapsed time, min	**Temp, deg C**	**Actual reading**	**Corrected reading**	**K**	**Rm**	**Eff. depth**	**Diameter mm**	**Percent finer**
0.50	23.1	42.0	36.9	0.0130	43.0	9.2	0.0558	68.8
1.00	23.1	38.0	32.9	0.0130	39.0	9.9	0.0408	61.4
2.00	23.1	34.0	28.9	0.0130	35.0	10.6	0.0298	53.9
5.00	23.1	30.5	25.4	0.0130	31.5	11.1	0.0194	47.4
15.00	23.1	27.0	21.9	0.0130	28.0	11.7	0.0115	40.8
30.00	23.1	25.0	19.9	0.0130	26.0	12.0	0.0082	37.1
60.00	23.1	23.0	17.9	0.0130	24.0	12.4	0.0059	33.3
250.00	23.1	20.0	14.9	0.0130	21.0	12.9	0.0029	27.7
1440.00	23.1	17.0	11.9	0.0130	18.0	13.3	0.0012	22.1

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 1.1 **% SAND =** 22.6
% SILT = 44.6 **% CLAY =** 31.7

D_{85}= 0.11 D_{60}= 0.04 D_{50}= 0.02
D_{30}= 0.00

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.1	43.6	19.7	35.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	99.3		
#4	98.9		
#10	96.8		
#20	94.9		
#40	92.3		
#60	88.6		
#140	62.4		
#200	55.3		

* (no specification provided)

Soil Description

Brownish yellow sandy lean clay

Atterberg Limits

PL= 25 LL= 41 PI= 16

Coefficients

D_{85}= 0.214 D_{60}= 0.0956 D_{50}= 0.0560
D_{30}= 0.0015 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Sample No.: UD-1, 2 & 3 (UU) **Source of Sample:** **Date:**
Location: NB-77A **Elev./Depth:** 4'-14'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
ject: TVA Kingston - Proposed Gypsum Stack
ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-1, 2 & 3 (UU)
Elev. or Depth: 4'-14' **Sample Length(in./cm.):**
Location: NB-77A
Description:
Date: **PL:** 25 **LL:** **PI:**
USCS Classification: CL **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

	Initial
Dry sample and tare=	408.59
Tare =	0.00
Dry sample weight =	408.59

Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 52.47 **Tare =** .00 **Sample weight =** 52.47
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
75 inch	0.00	100.0
.375 inch	2.87	99.3
# 4	4.32	98.9
# 10	12.97	96.8
# 20	1.04	94.9
# 40	2.45	92.3
# 60	4.42	88.6
# 140	18.63	62.4
# 200	22.50	55.3

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 96.8
Weight of hydrometer sample: 53.60
Hygroscopic moisture correction:
Moist weight & tare = 55.37
Dry weight & tare = 54.48
Tare = 11.31
Hygroscopic moisture= 2.1 %
Calculated biased weight= 54.25
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

iscus correction only= 1.0
Specific gravity of solids= 2.66
Specific gravity correction factor= 0.998

Hydrometer type: 152H
Effective depth L= 16.294964 - 0.164 x Rm

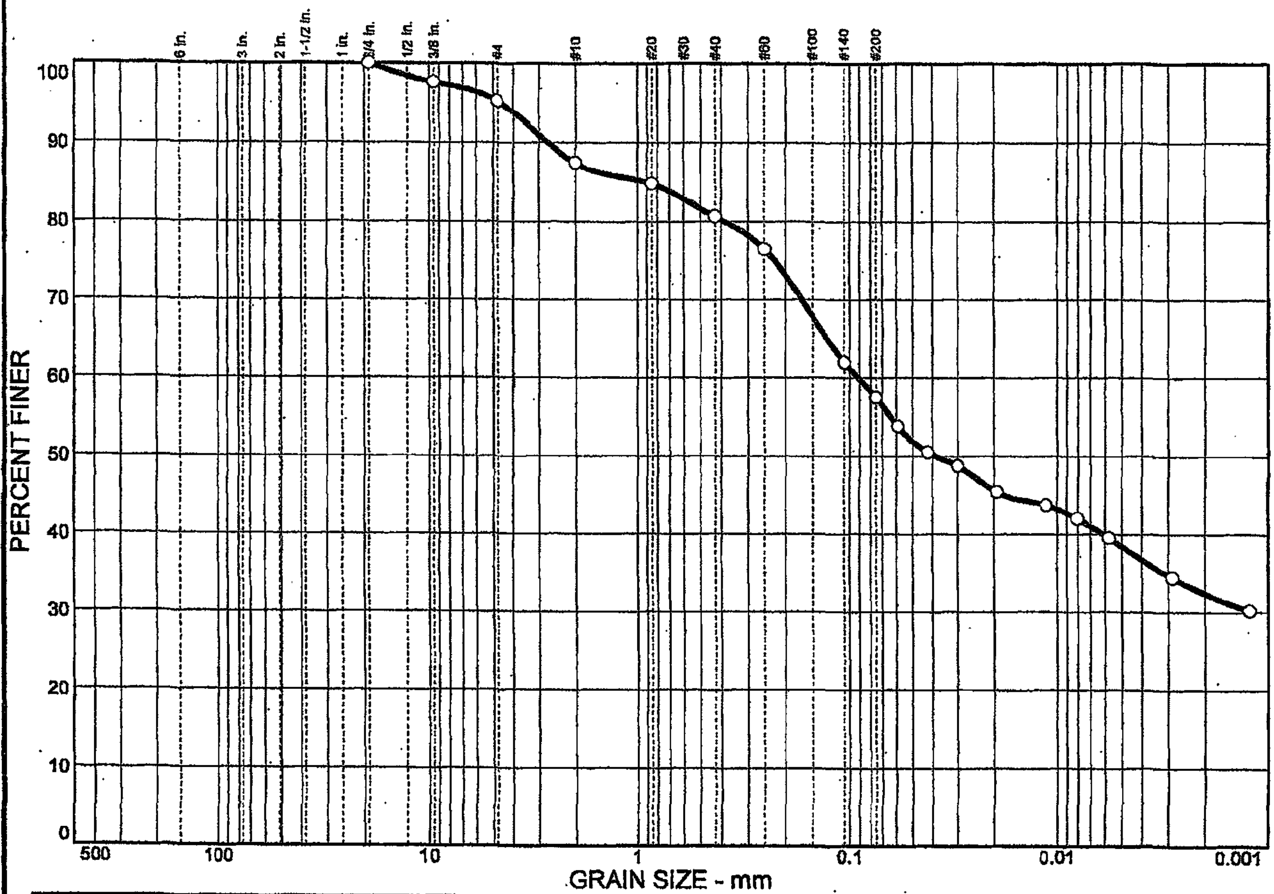
Elapsed me, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.1	33.0	27.9	0.0131	34.0	10.7	0.0606	51.2
1.00	23.1	31.0	25.9	0.0131	32.0	11.0	0.0435	47.6
2.00	23.1	30.0	24.9	0.0131	31.0	11.2	0.0310	45.7
5.00	23.1	28.0	22.9	0.0131	29.0	11.5	0.0199	42.0
15.00	23.1	27.0	21.9	0.0131	28.0	11.7	0.0116	40.2
30.00	23.1	26.0	20.9	0.0131	27.0	11.9	0.0082	38.4
60.00	23.1	25.0	19.9	0.0131	26.0	12.0	0.0059	36.5
250.00	23.1	23.0	17.9	0.0131	24.0	12.4	0.0029	32.8
1440.00	23.2	21.0	15.9	0.0131	22.0	12.7	0.0012	29.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 1.1 **% SAND =** 43.6
% SILT = 19.7 **% CLAY =** 35.6

D_{85}= 0.21 D_{60}= 0.10 D_{50}= 0.06
D_{30}= 0.00

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.8	37.7	19.1	38.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.375 in.	97.6		
#4	95.2		
#10	87.4		
#20	84.8		
#40	80.6		
#60	76.4		
#140	62.0		
#200	57.5		

* (no specification provided)

Soil Description

Brown sandy elastic silt

Atterberg Limits

PL= 29 LL= 53 PI= 24

Coefficients

D_{85}= 0.899 D_{60}= 0.0909 D_{50}= 0.0385
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= MH AASHTO=

Remarks

Sample No.: UD-4, 5 & 7 (CU) **Source of Sample:** **Date:**
Location: NB-77A **Elev./Depth:** 15'-26'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
ject: TVA Kingston - Proposed Gypsum Stack
ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-4, 5 & 7 (CU)
Elev. or Depth: 15'-26' **Sample Length(in./cm.):**
Location: NB-77A
Description: Brown sandy elastic silt
Date: **PL:** 29 **LL:** 53 **PI:** 24
USCS Classification: MH **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

Initial
Dry sample and tare= 305.81
Tare = 0.00
Dry sample weight = 305.81
Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 51.86 **Tare =** .00 **Sample weight =** 51.86
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
75 inch	0.00	100.0
.375 inch	7.23	97.6
# 4	14.80	95.2
# 10	38.54	87.4
# 20	1.57	84.8
# 40	4.04	80.6
# 60	6.52	76.4
# 140	15.07	62.0
# 200	17.72	57.5

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 87.4
Weight of hydrometer sample: 53.57
Hygroscopic moisture correction:
Moist weight & tare = 40.94
Dry weight & tare = 39.99
Tare = 10.89
Hygroscopic moisture= 3.3 %
Calculated biased weight= 59.36
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

iscus correction only= 1.0
Specific gravity of solids= 2.64
Specific gravity correction factor= 1.002

Hydrometer type: 152H
Effective depth L= 16.294964 - 0.164 x Rm

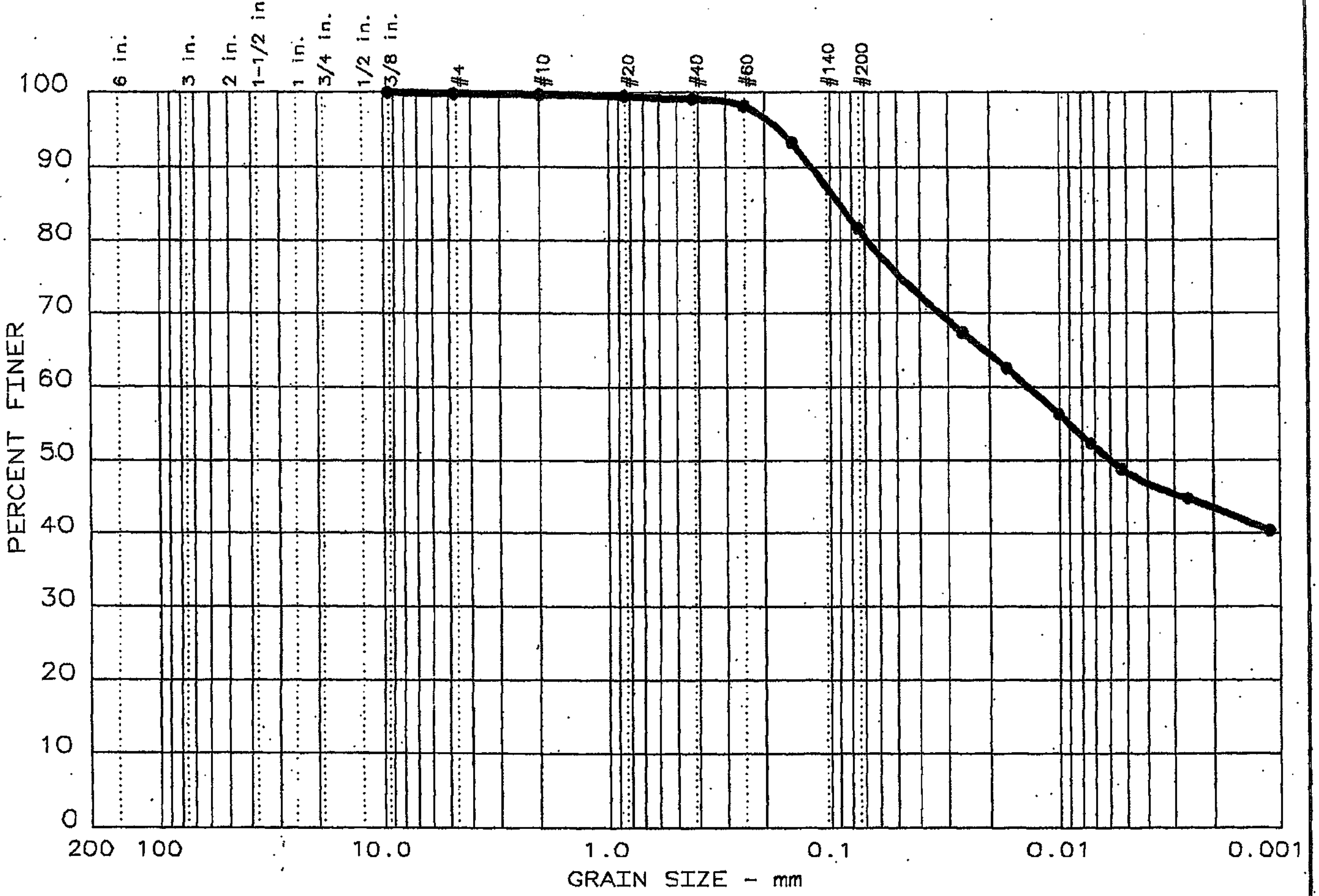
Elapsed time, min	**Temp, deg C**	**Actual reading**	**Corrected reading**	**K**	**Rm**	**Eff. depth**	**Diameter mm**	**Percent finer**
0.50	23.5	37.0	31.9	0.0131	38.0	10.1	0.0588	53.8
1.00	23.5	35.0	29.9	0.0131	36.0	10.4	0.0423	50.5
2.00	23.5	34.0	28.9	0.0131	35.0	10.6	0.0301	48.8
5.00	23.5	32.0	26.9	0.0131	33.0	10.9	0.0193	45.4
15.00	23.5	31.0	25.9	0.0131	32.0	11.0	0.0113	43.7
30.00	23.5	30.0	24.9	0.0131	31.0	11.2	0.0080	42.0
60.00	23.5	28.5	23.4	0.0131	29.5	11.5	0.0057	39.5
250.00	23.5	25.5	20.4	0.0131	26.5	11.9	0.0029	34.4
1440.00	23.3	23.0	17.9	0.0131	24.0	12.4	0.0012	30.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 4.8 **% SAND =** 37.7
% SILT = 19.1 **% CLAY =** 38.4

D_{85}= 0.90 **D_{60}=** 0.09 **D_{50}=** 0.04

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	19	0.0	0.2	18.2	33.3	48.3	CL	47	22

SIEVE inches size	PERCENT FINER ●		
0.375	100.0		
	GRAIN SIZE		
D_{60}	0.0135		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	99.8		
10	99.7		
20	99.5		
40	99.1		
60	98.2		
100	93.2		
200	81.6		

Sample information:

● Boring NB-84,2-10' Bulk Light orange brown fat clay with sand

Remarks:
Sample Number 3200
Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T 27-99

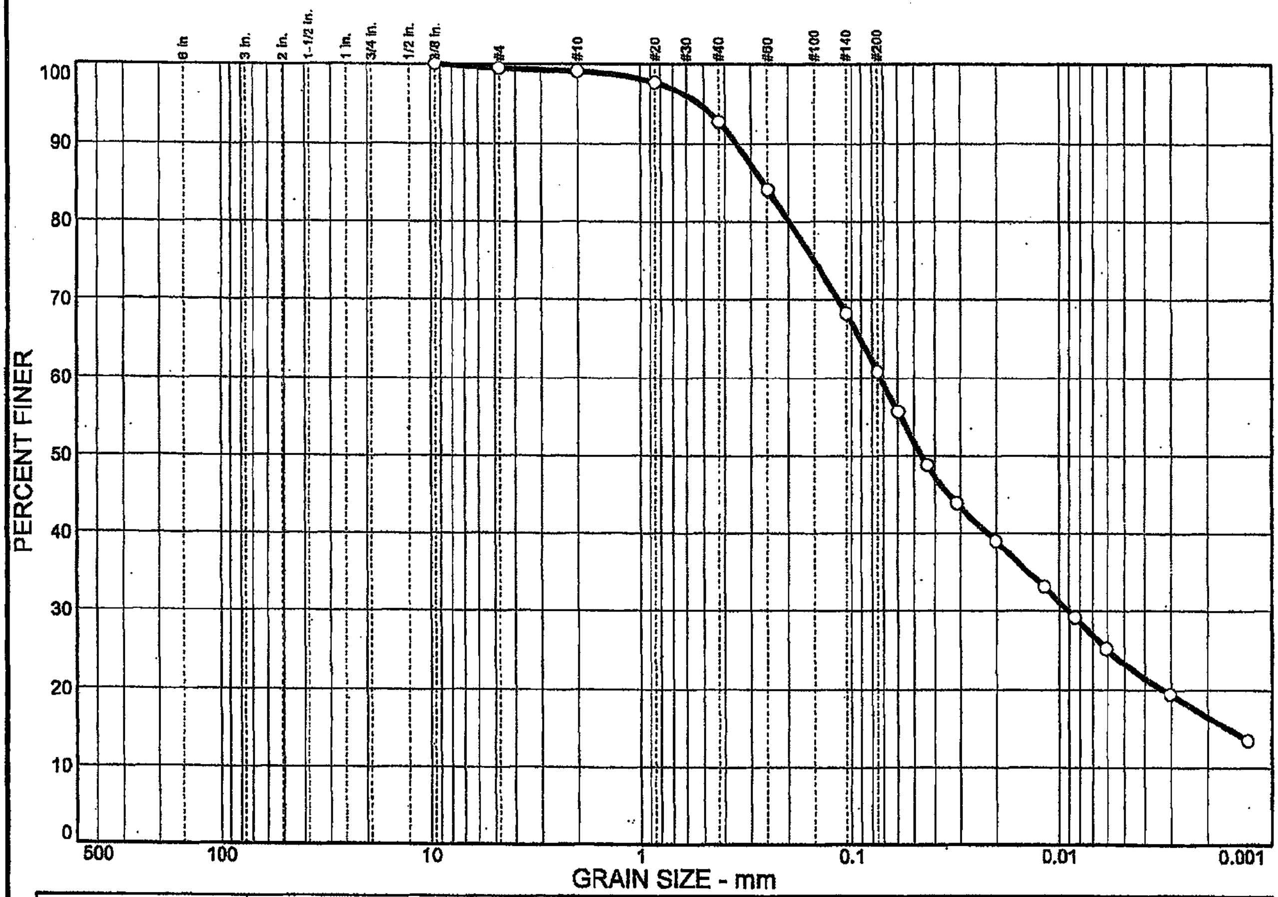
Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: June 23, 2005

```
====================================================================
                  GRAIN SIZE DISTRIBUTION TEST DATA      Test No.: 19
--------------------------------------------------------------------
Date: June 23, 2005
P[illegible]ct No.: 3043051021.0001
P[illegible]ect: TVA Kingston - Proposed Gypsum Stack
====================================================================

--------------------------------------------------------------------
                           Sample Data
--------------------------------------------------------------------
Location of Sample: Boring NB-84,2-10' Bulk
Sample Description 1: Light orange brown fat
Sample Description 2: clay with sand
USCS Class:  CL    Liquid limit:  47    Plasticity index:  22
--------------------------------------------------------------------
                              Notes
--------------------------------------------------------------------
Remarks: Sample Number 3200  Methods: Particle Size:
         ASTM D 422-63; Sieve  Analysis: AASHTO T 27-99
Fig. No.: 200
--------------------------------------------------------------------
                    Mechanical Analysis Data
--------------------------------------------------------------------
                          Initial     After wash
Dry sample and tare=    479.21        106.31
Tare               =      0.00          0.00
Dry sample weight  =    479.21        106.31
Minus #200 from wash=  77.8 %
Tare for cumulative weight retained= 0
[illegible]ve               Cumul. Wt.   Percent
                     retained     finer
  0.375 inches         0.00       100.0
  # 4                  0.93        99.8
  # 10                 1.57        99.7
  # 20                 2.57        99.5
  # 40                 4.44        99.1
  # 60                 8.84        98.2
  # 100               32.41        93.2
  # 200               88.09        81.6
--------------------------------------------------------------------
                    Hydrometer Analysis Data
--------------------------------------------------------------------
Separation sieve is number 40
Percent -# 40 based on complete sample=  99.1
Weight of hydrometer sample: 62.39
Hygroscopic moisture correction:
  Moist weight & tare =  52.68
  Dry weight & tare   =  51.95
  Tare                =  22.35
  Hygroscopic moisture=   2.5 %
Calculated biased weight=  61.46
Table of composite correction values:
  Temp, deg C:   21.0   22.0   23.0   23.5   24.0
```

```
  Comp. corr:    - 6.4   - 6.1   - 5.8   - 5.6   - 5.4
Meniscus correction only= 0
Specific gravity of solids= 2.76
Specific gravity correction factor= 0.976
H[illegible]meter type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed     Temp, Actual    Corrected  K          Rm     Eff.    Diameter   Percent
  time, min   deg C reading   reading                      depth   mm         finer
     2.0      23.5  48.0      42.4       0.0127   48.0     8.4    0.0260     67.4
     5.0      23.5  45.0      39.4       0.0127   45.0     8.9    0.0169     62.6
    15.0      23.5  41.0      35.4       0.0127   41.0     9.6    0.0101     56.2
    30.0      23.5  38.5      32.9       0.0127   38.5    10.0    0.0073     52.3
    60.0      23.0  36.5      30.7       0.0127   36.5    10.3    0.0053     48.8
   250.0      23.0  34.0      28.2       0.0127   34.0    10.7    0.0026     44.8
  1443.0      23.5  31.0      25.4       0.0127   31.0    11.2    0.0011     40.4
-------------------------------------------------------------------------------
                               Fractional Components
-------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0     % GRAVEL =   0.2    % SAND = 18.2
% SILT = 33.3     % CLAY = 48.3

D85=   0.09  D60=   0.013  D50=   0.006
```

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.5	38.7	37.5	23.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.5		
#10	99.1		
#20	97.7		
#40	92.7		
#60	84.1		
#140	68.3		
#200	60.8		

* (no specification provided)

Soil Description

Brown sandy silt

Atterberg Limits

PL= 30 LL= 46 PI= 16

Coefficients

D_{85}= 0.263 D_{60}= 0.0723 D_{50}= 0.0461

D_{30}= 0.0091 D_{15}= 0.0016 D_{10}=

C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Sample No.: UD-4
Location: NB-84
Source of Sample:
Date:
Elev./Depth: 32.5'-34.5'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021
Figure

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
[illegible]ject: TVA Kingston - Proposed Gypsum Stack
[illegible]ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-4
Elev. or Depth: 32.5'-34.5'
Sample Length(in./cm.):
Location: NB-84
Description: Brown sandy silt
Date:
PL: 30
LL: 46
PI: 16
USCS Classification: ML
AASHTO Classification:
Testing Remarks:

Mechanical Analysis Data

	Initial
Dry sample and tare=	190.97
Tare =	0.00
Dry sample weight =	190.97

Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 52.06 **Tare =** .00 **Sample weight =** 52.06
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	**Cumul. Wt. retained**	**Percent finer**
[illegible]375 inch	0.00	100.0
# 4	1.04	99.5
# 10	1.76	99.1
# 20	0.73	97.7
# 40	3.36	92.7
# 60	7.89	84.1
# 140	16.17	68.3
# 200	20.11	60.8

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 99.1
Weight of hydrometer sample: 52.06
Hygroscopic moisture correction:
Moist weight & tare = 45.54
Dry weight & tare = 44.10
Tare = 10.89
Hygroscopic moisture= 4.3 %
Calculated biased weight= 50.35
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

[illegible]iscus correction only= 1.0
[illegible]cific gravity of solids= 2.70
Specific gravity correction factor= 0.989
Hydrometer type: 152H

MACTEC, INC.

Effective depth L= 16.294964 - 0.164 x Rm

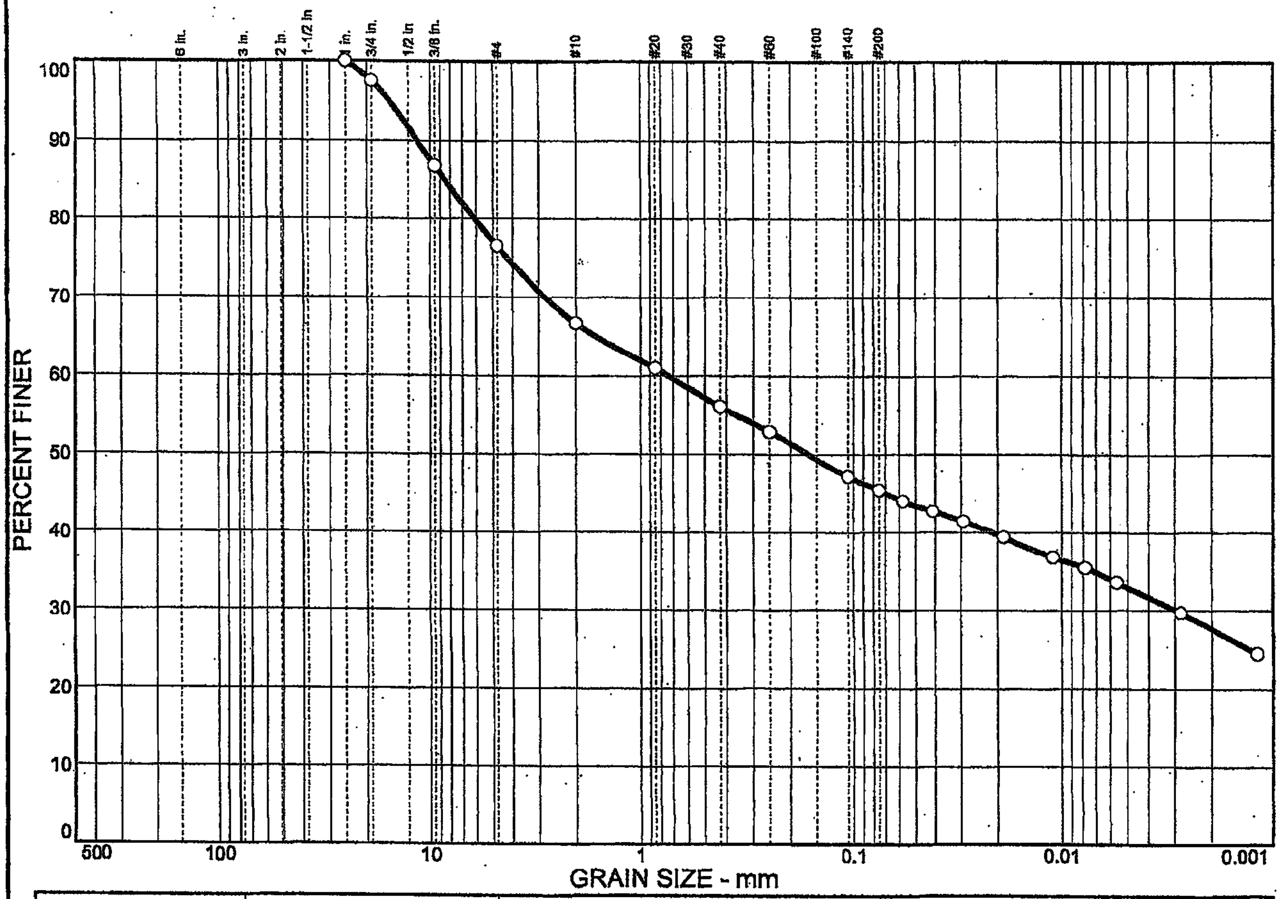
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.1	33.5	28.4	0.0129	34.5	10.6	0.0597	55.7
1.00	23.1	30.0	24.9	0.0129	31.0	11.2	0.0433	48.8
2.00	23.1	27.5	22.4	0.0129	28.5	11.6	0.0312	43.9
5.00	23.1	25.0	19.9	0.0129	26.0	12.0	0.0201	39.0
15.00	23.1	22.0	16.9	0.0129	23.0	12.5	0.0118	33.1
30.00	23.1	20.0	14.9	0.0129	21.0	12.9	0.0085	29.2
60.00	23.1	18.0	12.9	0.0129	19.0	13.2	0.0061	25.2
250.00	23.1	15.0	9.9	0.0129	16.0	13.7	0.0030	19.4
1440.00	23.2	12.0	6.9	0.0129	13.0	14.2	0.0013	13.5

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 0.5 **% SAND =** 38.7
% SILT = 37.5 **% CLAY =** 23.3

D_{85}= 0.26 D_{60}= 0.07 D_{50}= 0.05
D_{30}= 0.01 D_{15}= 0.00

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	23.5	31.1	12.5	32.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	97.5		
.375 in.	86.8		
#4	76.5		
#10	66.7		
#20	61.0		
#40	56.1		
#60	52.9		
#140	47.2		
#200	45.4		

* (no specification provided)

Soil Description

Brownish yellow clayey sand with gravel

Atterberg Limits

PL= 30 LL= 59 PI= 29

Coefficients

D_{85}= 8.53 D_{60}= 0.735 D_{50}= 0.163
D_{30}= 0.0030 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO=

Remarks

Sample No.: UD-1, 2 & 3 (CU) **Source of Sample:** **Date:**
Location: NB-85A and NB-85B **Elev./Depth:** 13'-19'

MACTEC, INC.

Client: TVA
Project: TVA Kingston - Proposed Gypsum Stack
Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
ject: TVA Kingston - Proposed Gypsum Stack
ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-1, 2 & 3 (CU)
Elev. or Depth: 13'-19' **Sample Length(in./cm.):**
Location: NB-85A and NB-85B
Description: Brownish yellow clayey sand with gravel
Date: **PL:** 30 **LL:** 59 **PI:** 29
USCS Classification: SC **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

	Initial
Dry sample and tare=	732.52
Tare =	0.00
Dry sample weight =	732.52

Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 51.33 **Tare** = .00 **Sample weight** = 51.33
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
inch	0.00	100.0
.75 inch	18.41	97.5
.375 inch	96.86	86.8
# 4	172.34	76.5
# 10	244.12	66.7
# 20	4.39	61.0
# 40	8.14	56.1
# 60	10.63	52.9
# 140	15.01	47.2
# 200	16.37	45.4

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 66.7
Weight of hydrometer sample: 52.25
Hygroscopic moisture correction:
Moist weight & tare = 40.44
Dry weight & tare = 39.91
Tare = 11.02
Hygroscopic moisture= 1.8 %
Calculated biased weight= 76.92
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
omp. corr:	-6.0	-5.0	-3.5

Meniscus correction only= 1.0
Specific gravity of solids= 2.66

Specific gravity correction factor= 0.998
Hydrometer type: 152H
Effective depth L= 16.294964 - 0.164 x Rm

lapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.5	39.0	33.9	0.0130	40.0	9.7	0.0575	44.0
1.00	23.5	38.0	32.9	0.0130	39.0	9.9	0.0410	42.7
2.00	23.5	37.0	31.9	0.0130	38.0	10.1	0.0292	41.4
5.00	23.5	35.5	30.4	0.0130	36.5	10.3	0.0187	39.4
15.00	23.5	33.5	28.4	0.0130	34.5	10.6	0.0110	36.8
30.00	23.5	32.5	27.4	0.0130	33.5	10.8	0.0078	35.5
60.00	23.5	31.0	25.9	0.0130	32.0	11.0	0.0056	33.6
250.00	23.5	28.0	22.9	0.0130	29.0	11.5	0.0028	29.7
1440.00	23.3	24.0	18.9	0.0131	25.0	12.2	0.0012	24.5

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 23.5 **% SAND =** 31.1
% SILT = 12.5 **% CLAY =** 32.9

D_{85}= 8.53 D_{60}= 0.74 D_{50}= 0.16
D_{30}= 0.00

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	1.7	29.6	23.0	45.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	98.3		
#10	95.5		
#20	93.6		
#40	91.2		
#60	86.4		
#140	73.1		
#200	68.7		

* (no specification provided)

Soil Description

Brown sandy fat clay

Atterberg Limits

PL= 24 LL= 50 PI= 26

Coefficients

D_{85}= 0.225 D_{60}= 0.0302 D_{50}= 0.0084

D_{30}= D_{15}= D_{10}=

C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

Sample No.: UD-6, 7 & 8 (CU) **Source of Sample:** **Date:**

Location: NB-85B **Elev./Depth:** 23'-29'

MACTEC, INC.

Client: TVA

Project: TVA Kingston - Proposed Gypsum Stack

Project No: 3043051021 **Figure**

GRAIN SIZE DISTRIBUTION TEST DATA

Client: TVA
ject: TVA Kingston - Proposed Gypsum Stack
ject Number: 3043051021

Sample Data

Source:
Sample No.: UD-6, 7 & 8 (CU)
Elev. or Depth: 23'-29' **Sample Length(in./cm.):**
Location: NB-85B
Description: Brown sandy fat clay
Date: **PL:** 24 **LL:** 50 **PI:** 26
USCS Classification: CH **AASHTO Classification:**
Testing Remarks:

Mechanical Analysis Data

Initial
Dry sample and tare= 365.89
Tare = 0.00
Dry sample weight = 365.89
Sample split on number 10 **sieve**
Split sample data:
Sample and tare = 51.01 **Tare** = .00 **Sample weight** = 51.01
Cumulative weight retained tare= .00
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
375 inch	0.00	100.0
# 4	6.28	98.3
# 10	16.56	95.5
# 20	1.04	93.6
# 40	2.32	91.2
# 60	4.85	86.4
# 140	11.99	73.1
# 200	14.29	68.7

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 95.5
Weight of hydrometer sample: 51.93
Hygroscopic moisture correction:
Moist weight & tare = 40.16
Dry weight & tare = 39.64
Tare = 10.94
Hygroscopic moisture= 1.8 %
Calculated biased weight= 53.41
Table of composite correction values:

Temp, deg C:	13.7	24.7	29.1
Comp. corr:	-6.0	-5.0	-3.5

iscus correction only= 1.0
cific gravity of solids= 2.64
pecific gravity correction factor= 1.002
Hydrometer type: 152H

Effective depth L= 16.294964 - 0.164 x Rm

Elapsed time, min	**Temp, deg C**	**Actual reading**	**Corrected reading**	**K**	**Rm**	**Eff. depth**	**Diameter mm**	**Percent finer**
0.50	23.5	40.5	35.4	0.0131	41.5	9.5	0.0571	66.4
1.00	23.5	38.5	33.4	0.0131	39.5	9.8	0.0411	62.6
2.00	23.5	37.0	31.9	0.0131	38.0	10.1	0.0294	59.8
5.00	23.5	35.0	29.9	0.0131	36.0	10.4	0.0189	56.1
15.00	23.5	33.0	27.9	0.0131	34.0	10.7	0.0111	52.3
30.00	23.5	31.5	26.4	0.0131	32.5	11.0	0.0079	49.5
60.00	23.5	30.0	24.9	0.0131	31.0	11.2	0.0057	46.7
250.00	23.5	27.0	21.9	0.0131	28.0	11.7	0.0028	41.1
1440.00	23.3	24.0	18.9	0.0131	25.0	12.2	0.0012	35.4

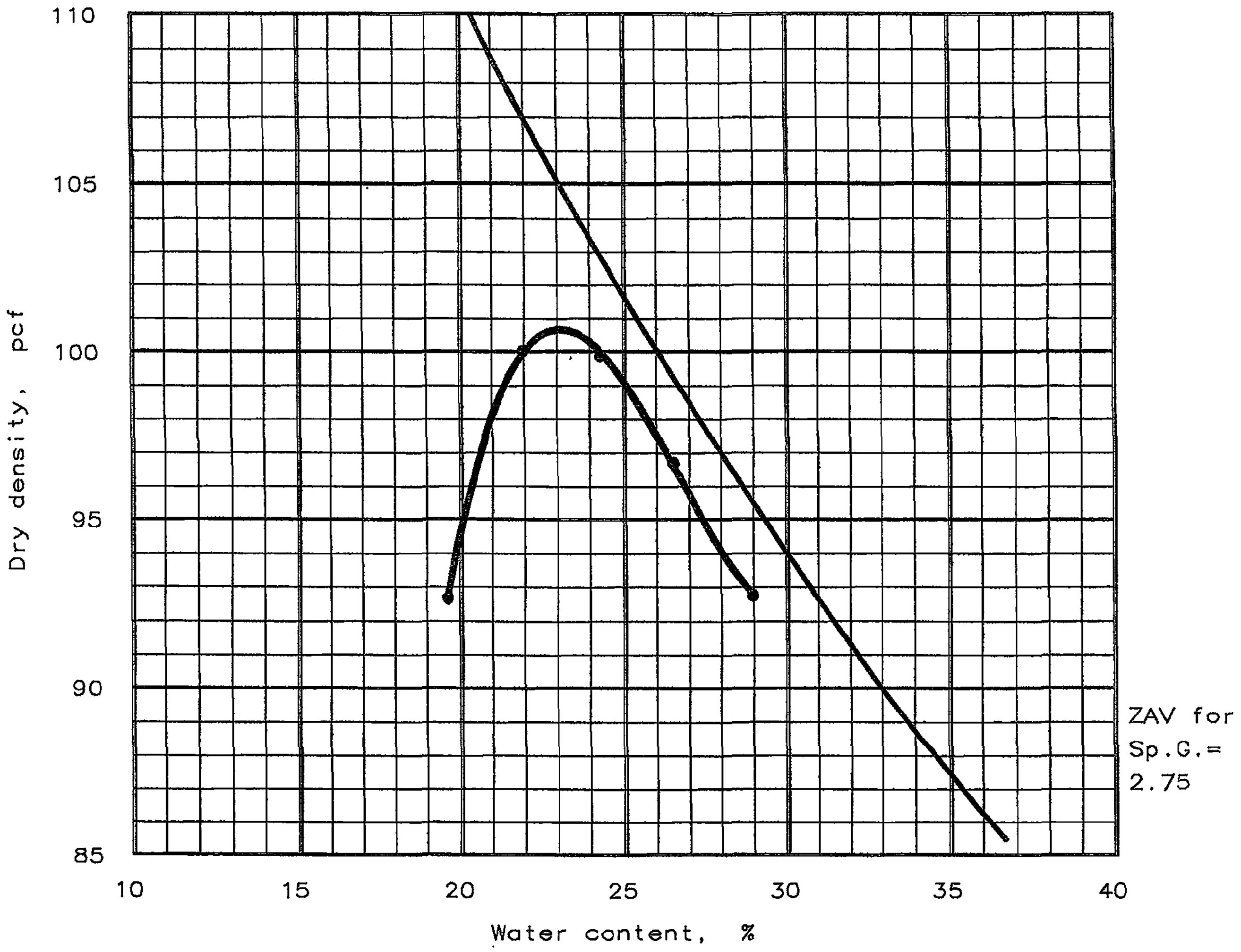
Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** 1.7 **% SAND =** 29.6
% SILT = 23.0 **% CLAY =** 45.7

D_{85}= 0.22 D_{60}= 0.03 D_{50}= 0.01

MOISTURE-DENSITY RELATIONSHIP TEST RESULTS

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
2-10'	MH	A-7-5(25)	30.9 %	2.75	63	28	0 %	78.2 %

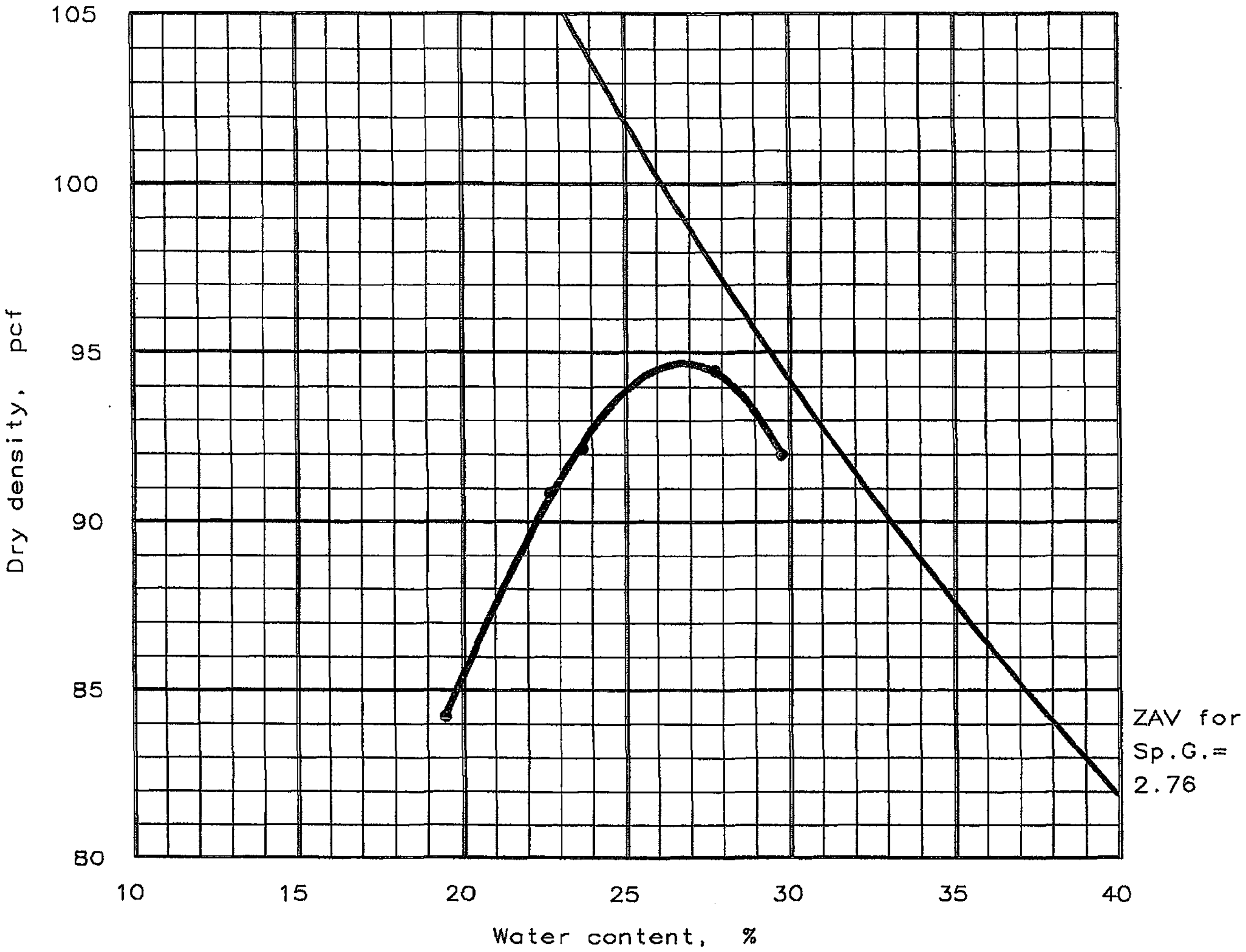
TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 100.7 pcf Optimum moisture = 23.1 %	Light orange brown elastic silt with sand

Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack
Location: Boring NB-2, 2-10' auger cuttings
bulk sample
Date: June 23, 2005

MOISTURE-DENSITY RELATIONSHIP TEST

Remarks:
Sample Number 3203
NT - No Test
DNS - Data Not Submitted

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
5-15'	MH	A-7-5(29)	33.3 %	2.76	62	29	0 %	86.4 %

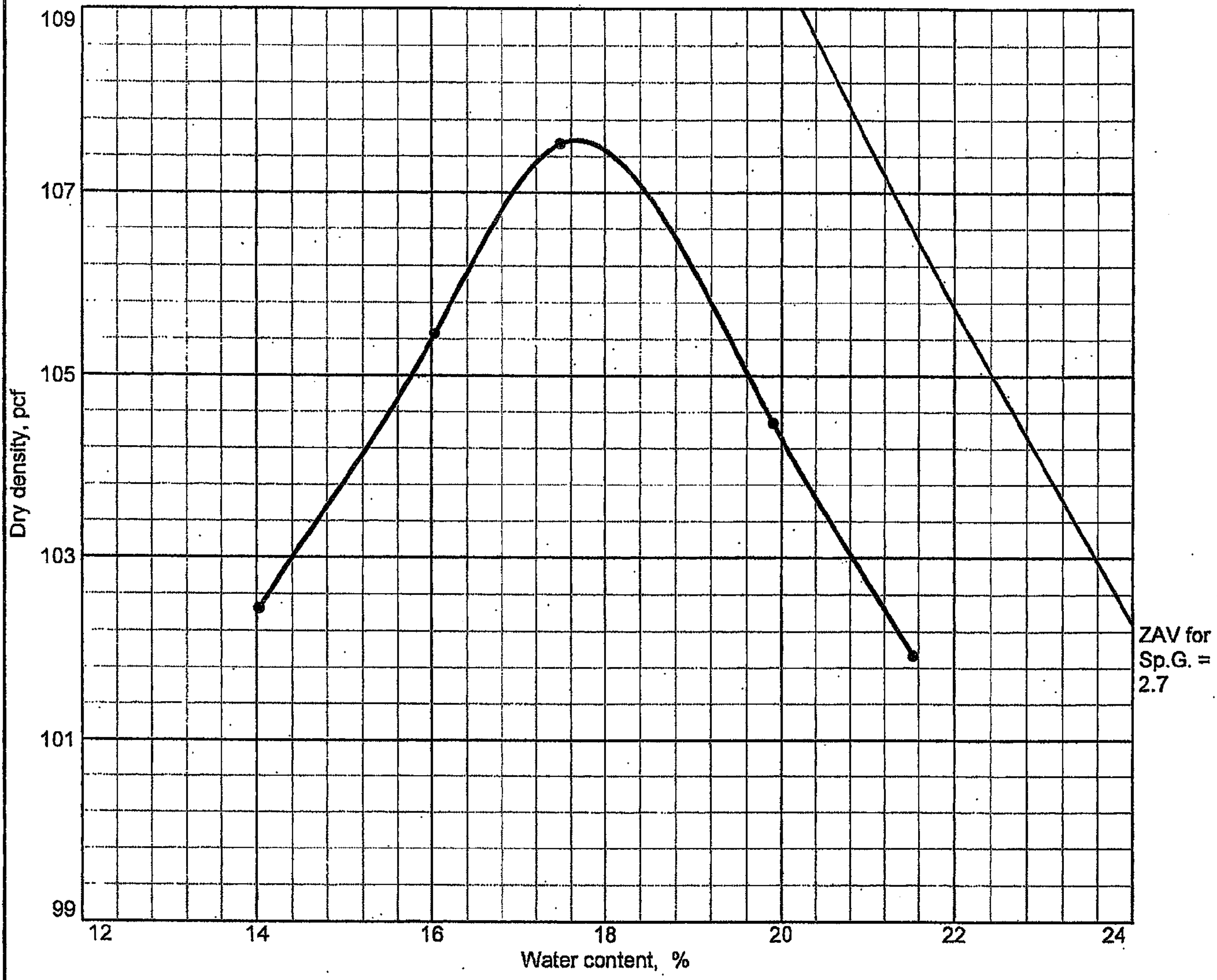
TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 94.7 pcf Optimum moisture = 26.8 %	Tan elastic silt

Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack
Location: Boring NB-18, 5-15' auger cuttings
bulk sample
Date: June 23, 2005

MOISTURE-DENSITY RELATIONSHIP TEST

Remarks:
Sample Number 3198
NT - No Test
DNS - Data Not Submitted

COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
2'-10'	CL	——	30.7	2.63	40	18	0.0	81.1

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 107.6 pcf Optimum moisture = 17.7 %	Reddish orange lean clay with sand

Project No. 3043051021 **Client:** TVA
Project: TVA Kingston - Proposed Gypsum Stack

● **Location:** NB-22, 2.0'-10.0'

Remarks:

COMPACTION TEST REPORT

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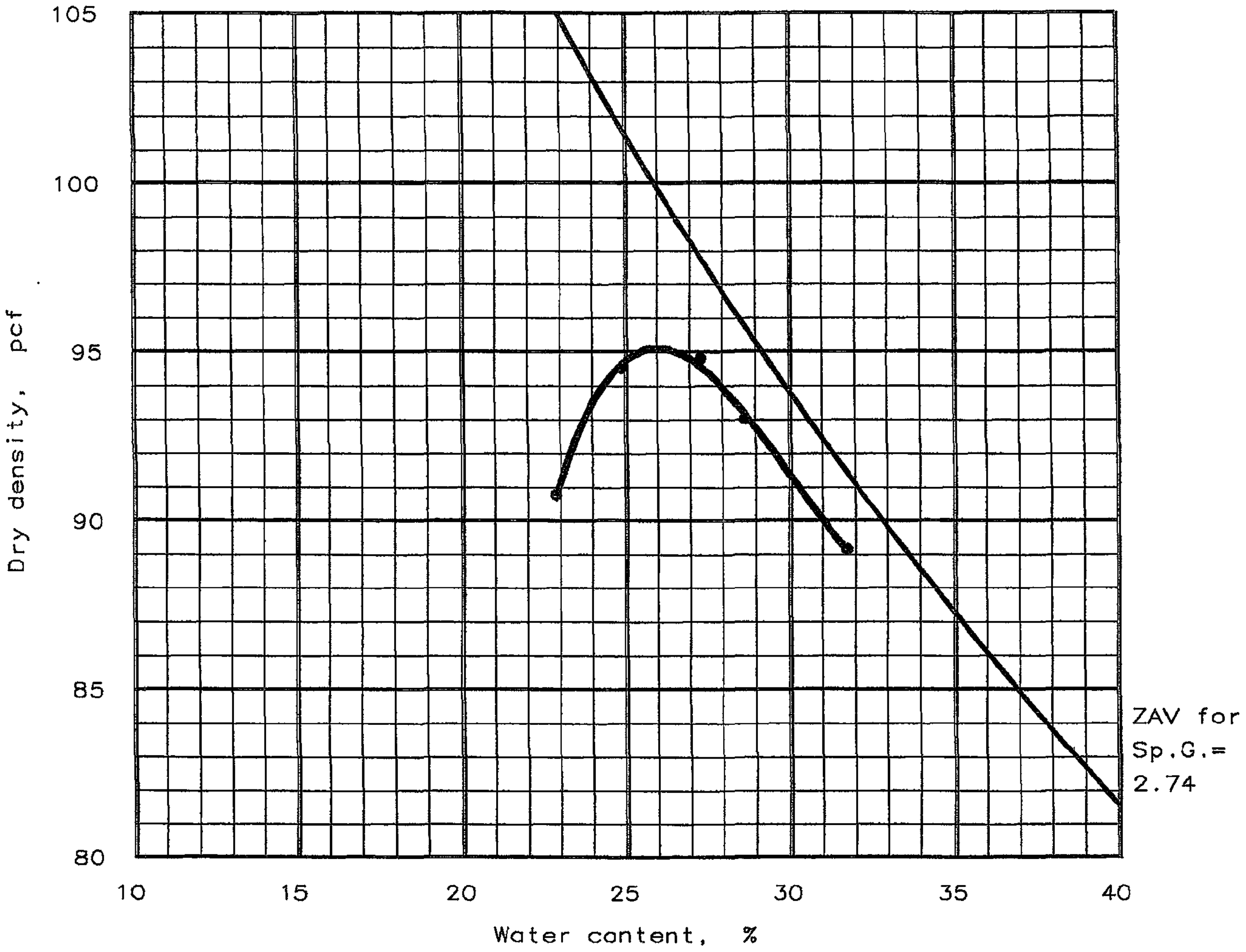
Figure

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
2-10'	CH	A-7-6(44)	33.1 %	2.74	72	47	0.9 %	85.2 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 95.1 pcf Optimum moisture = 26.0 %	Orange brown fat clay

Project No.: 3043051021.0001

Project: TVA Kingston - Proposed Gypsum Stack

Location: Boring NB-25, 2-10' auger cuttings bulk sample

Date: June 23, 2005

MOISTURE-DENSITY RELATIONSHIP TEST

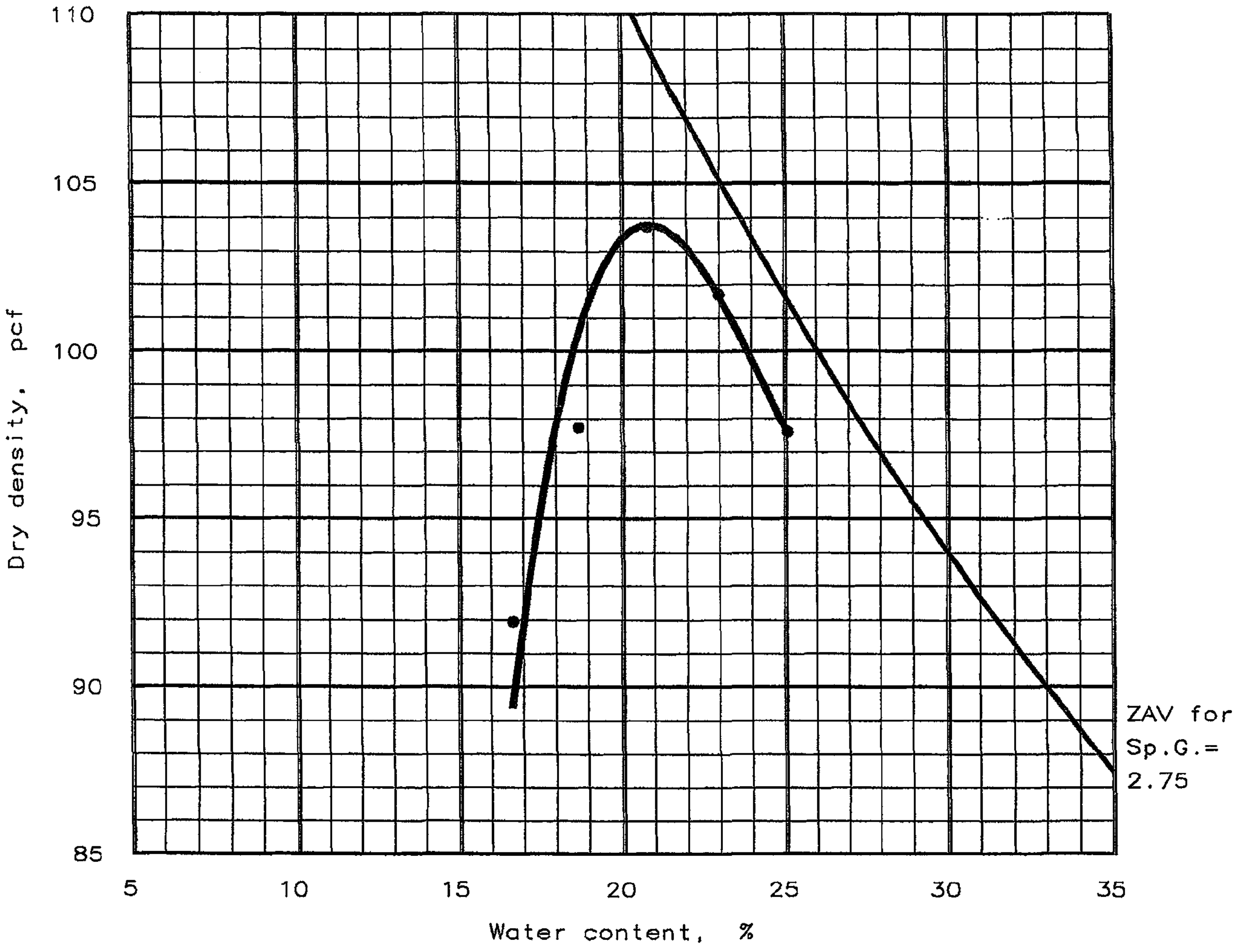
Remarks:

Sample Number 3199

NT - No Test

DNS - Data Not Submitted

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
5-10'	CL	A-7-6(22)	18.3 %	2.75	47	27	0 %	79.7 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 103.8 pcf Optimum moisture = 20.8 %	Brown lean clay with sand

Project No.: 3043051021.0001

Project: TVA Kingston - Proposed Gypsum Stack

Location: Boring NB-39, 5-10' auger cuttings
bulk sample

Date: June 23, 2005

MOISTURE-DENSITY RELATIONSHIP TEST

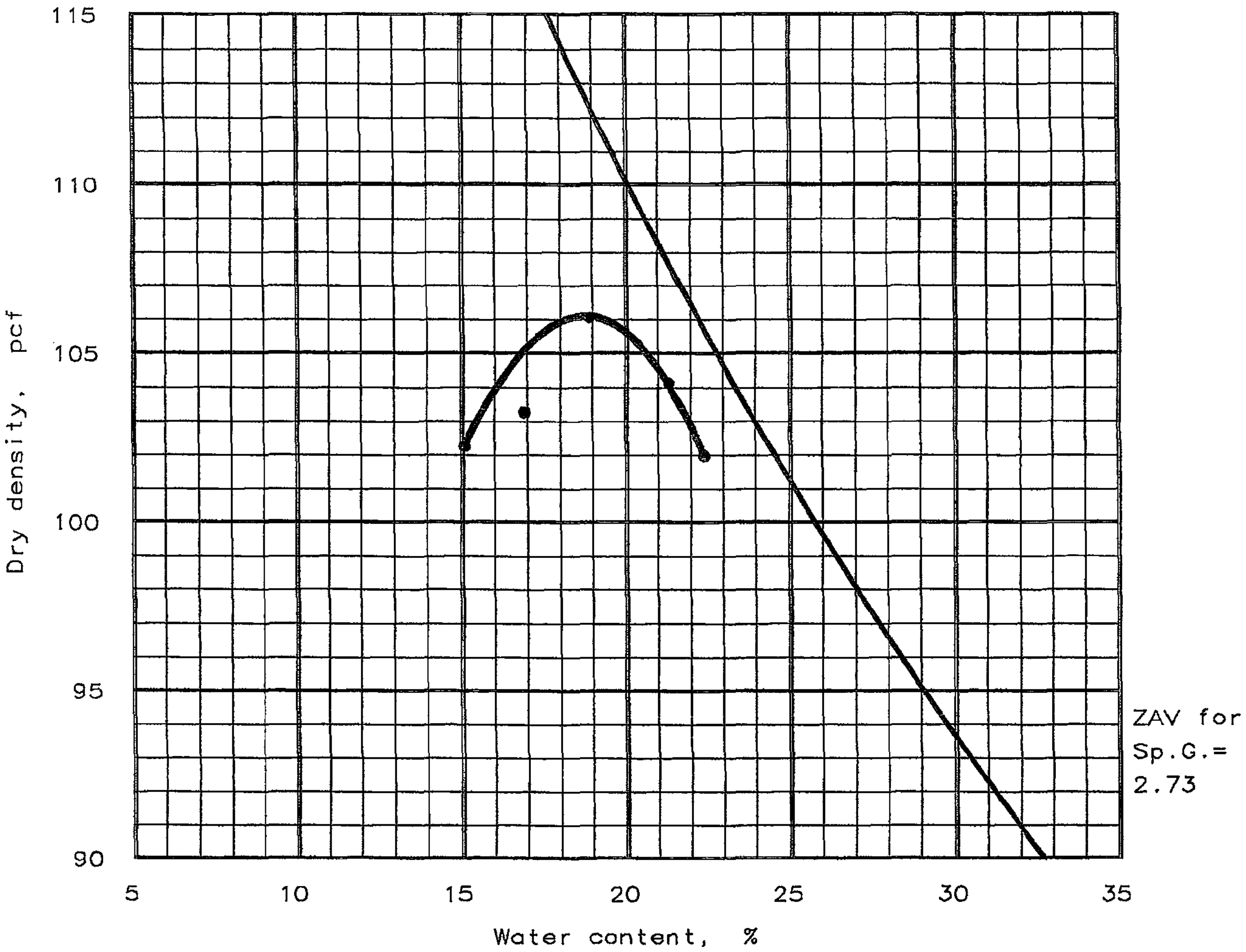
Remarks:

Sample Number 3201

NT - No Test

DNS - Data Not Submitted

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
2-10'	CL	A-6(11)	17.7 %	2.73	35	17	0.3 %	74.9 %

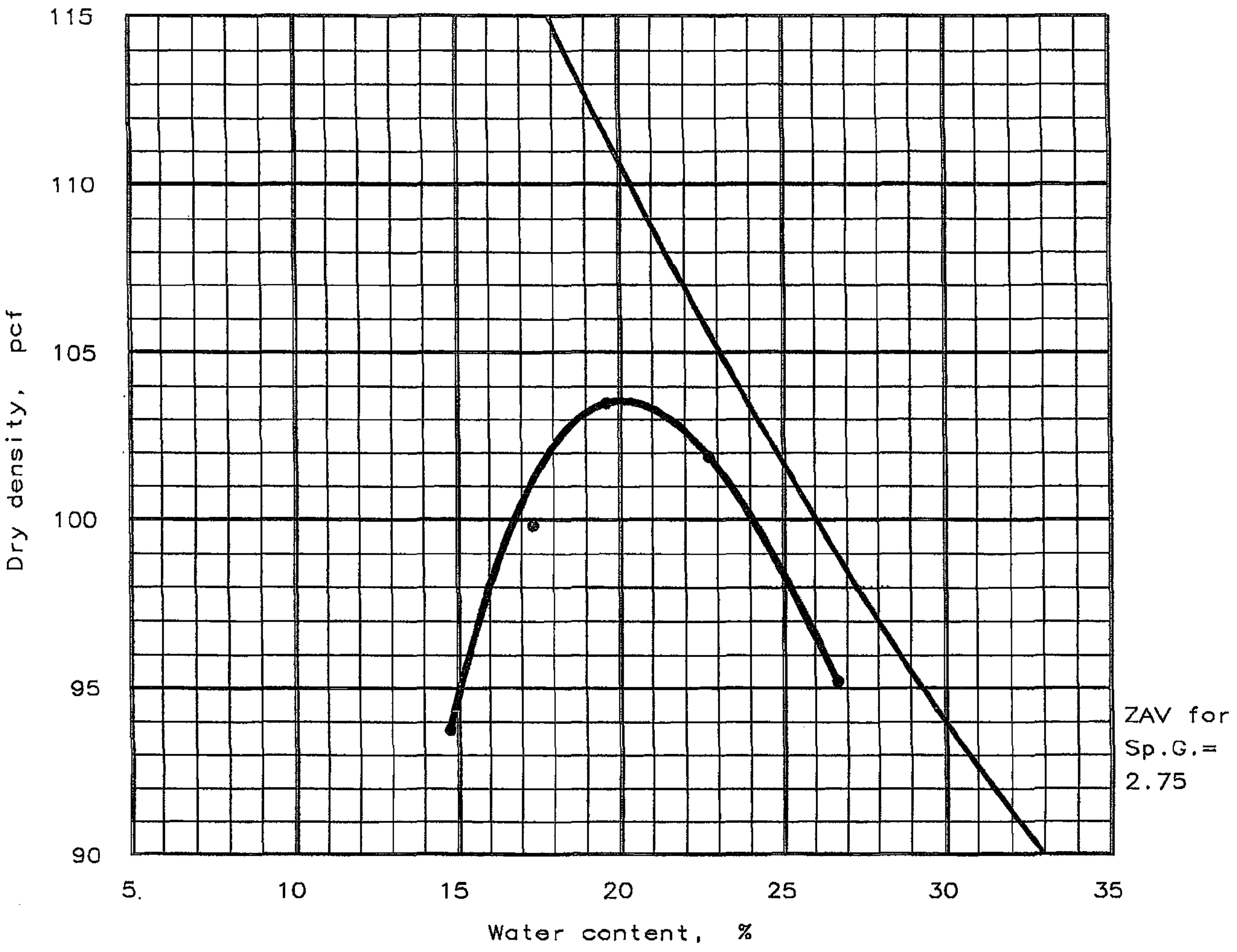
TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 106.1 pcf Optimum moisture = 18.8 %	Brown lean clay with sand

Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack
Location: Boring NB-41, 2-10' auger cuttings bulk sample
Date: June 23, 2005

MOISTURE-DENSITY RELATIONSHIP TEST

Remarks:
Sample Number 3202
NT - No Test
DNS - Data Not Submitted

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
5-15'	ML	A-6(10)	25.5 %	2.75	40	12	0 %	77.3 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 103.6 pcf Optimum moisture = 20.1 %	Light red brown silt with sand

Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack
Location: Boring NB-59, 5-15' auger cuttings
bulk sample
Date: 6-13-2005

MOISTURE-DENSITY RELATIONSHIP TEST

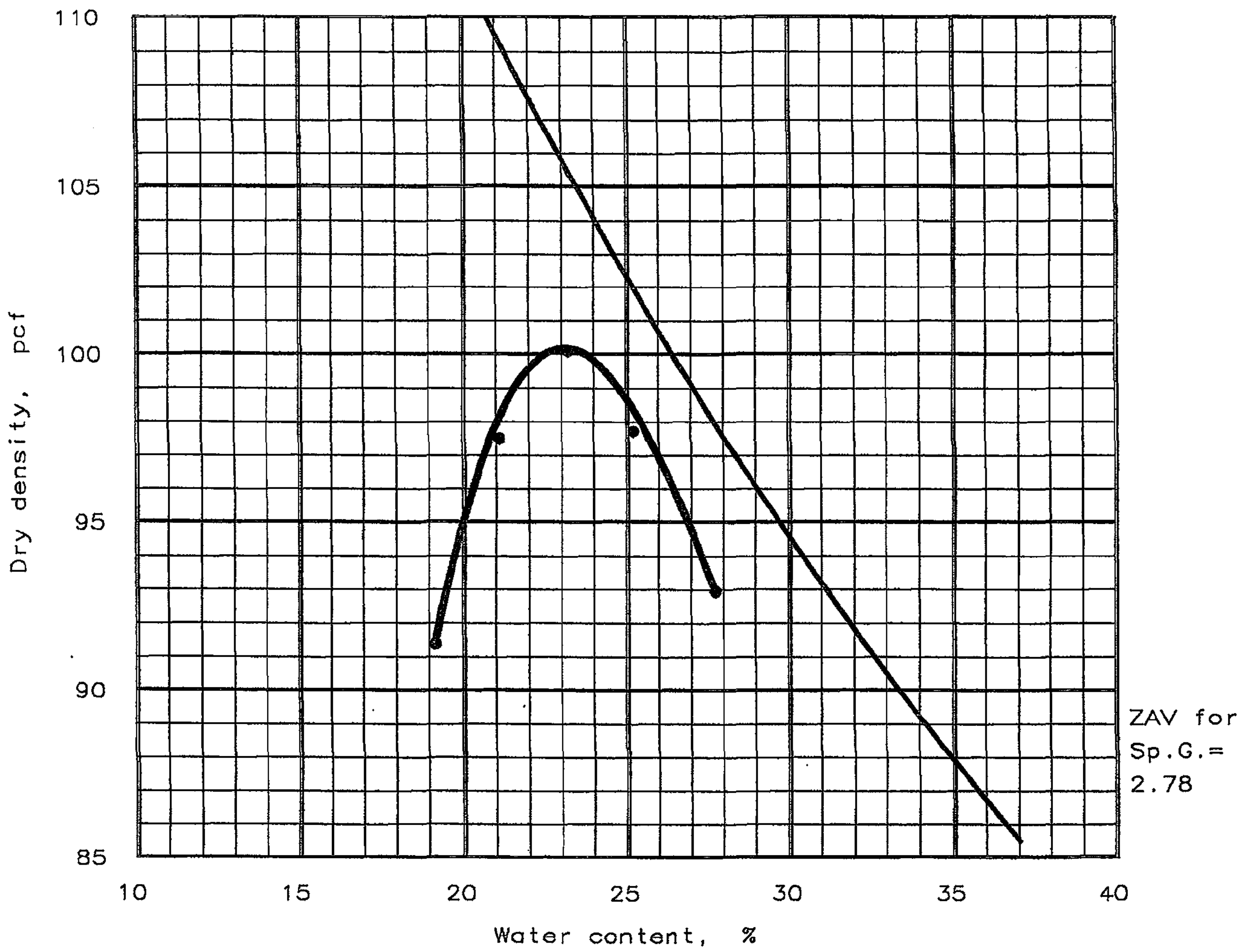
Remarks:

Sample Number 3196

NT - No Test

DNS - Data Not Submitted

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
2-10'	CH	A-7-6(24)	30.9 %	2.78	60	32	0.4 %	72.3 %

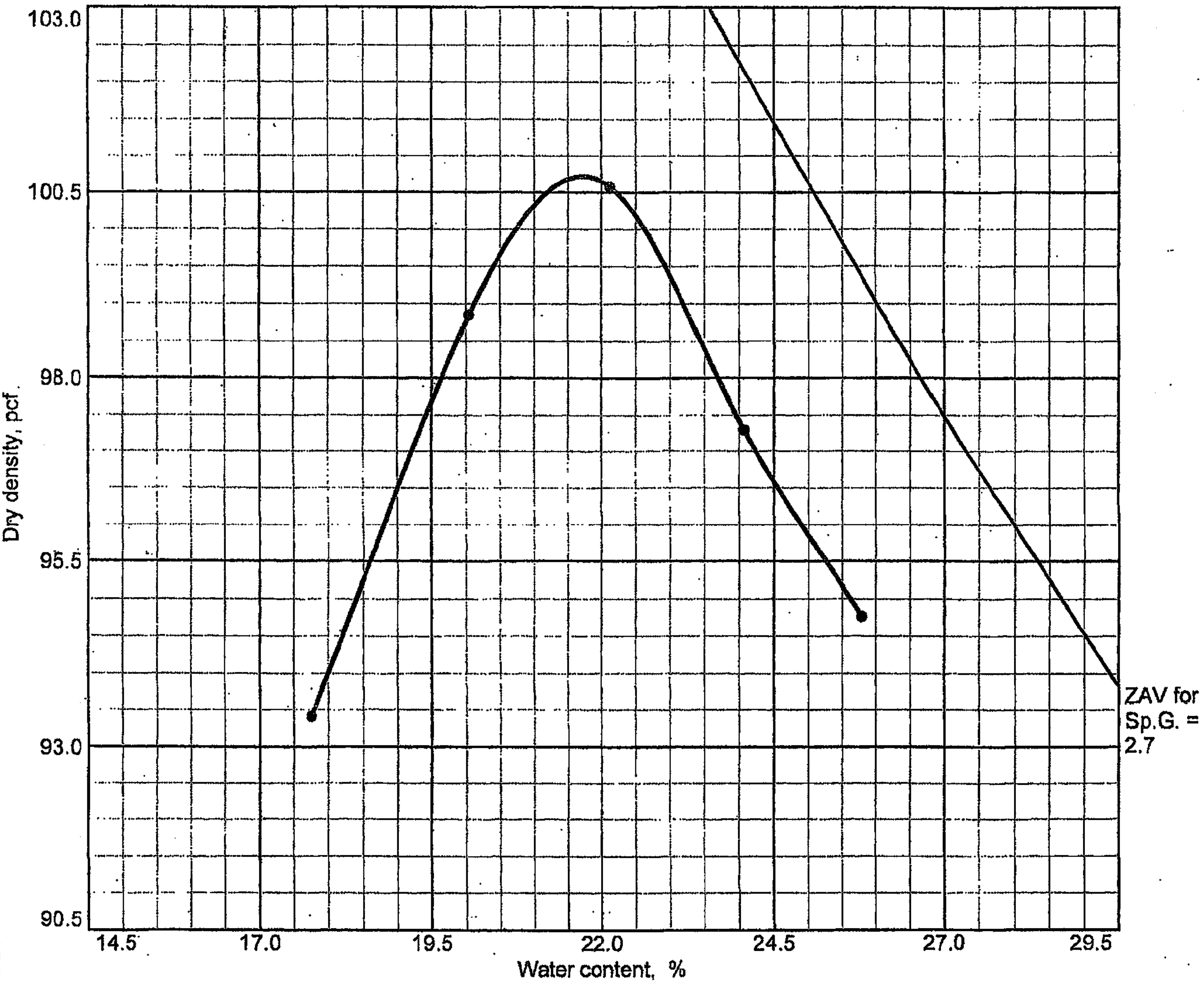
TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 100.2 pcf Optimum moisture = 23.1 %	Red brown fat clay with sand

Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack
Location: Boring NB-65, 2-10' auger cuttings
bulk sample
Date: 6-13-2005

MOISTURE-DENSITY RELATIONSHIP TEST

Remarks:
Sample Number 3197
NT - No Test
DNS - Data Not Submitted

COMPACTION TEST REPORT



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
5'-15'	ML	——	25.3	2.65	40	20	0.3	70.0

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 100.7 pcf Optimum moisture = 21.7 %	Reddish brown sandy silt

Project No. 3043051021 **Client:** TVA
Project: TVA Kingston - Proposed Gypsum Stack

Location: NB-76, 5.0'-15.0'

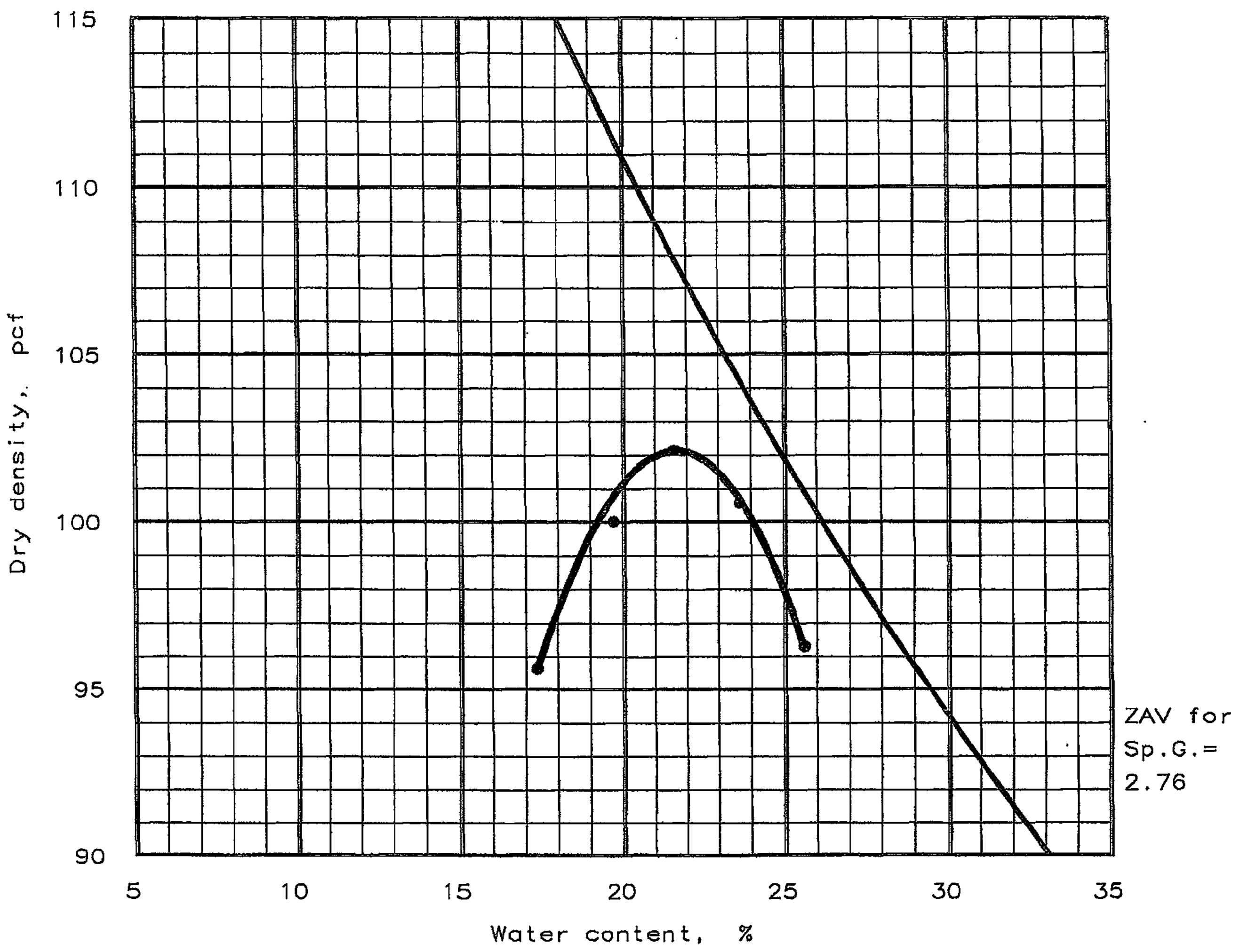
COMPACTION TEST REPORT

MACTEC, INC.

Remarks:

Figure

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
2-10'	CL	A-7-6(19)	24.2 %	2.76	47	22	0 %	81.6 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 102.2 pcf Optimum moisture = 21.6 %	Light orange brown lean clay with sand

Project No.: 3043051021.0001
Project: TVA Kingston - Proposed Gypsum Stack
Location: Boring NB-84, 2-10' auger cuttings
bulk sample
Date: June 23, 2005

MOISTURE-DENSITY RELATIONSHIP TEST

Remarks:
Sample Number 3200
NT - No Test
DNS - Data Not Submitted

PERMEABILITY TEST RESULTS

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA KINGSTON - PROP. GYP. STACK
JOB NO.: 3043-05-1021
BORING NO.: NB-21A
DEPTH: 33'-35'
SAMPLE: UD-5
DESCRIPTION: 24 PSI

TECHNICIAN: JA.
DATE: 8-9-5
CHECKED BY: HC
CELL NO.: Triax A
SYSTEM NO.: 2

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: ~~2.8435~~ (in) (cm)
SOIL LENGTH(L): 1.9750 (in) 5.016 ✓ (cm)
SOIL DIAMETER: 2.8435 (in) 7.222 ✓ (cm)
AREA(A): (in²) 40.97 ✓ (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 408.45 g
FINAL WET WEIGHT (g): 409.45
FINAL DRY WEIGHT (g): 322.67
INITIAL MOISTURE (%): 26.6 ✓
FINAL MOISTURE (%): 27.0 ✓
PAN NAME: NICOLE

$\gamma_{moist} = \gamma_d (1 + m.c.)$

PERM INFORMATION

CELL PRESSURE(psi): 64
FORE PRESSURE(psi): 42
BACK PRESSURE (psi): 40
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F): 73°F
VISCOSITY CORRECTION(R_T): 0.931
PERMEANT LIQUID USED: H_2O
BURET CORRECTION FACTOR(C): 1.0

[illegible]LE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	(L) START	(R)	(L) END	(R)	CC	K
~~8-17~~	~~8-17~~	~~11:50 AM~~	~~5:04 pm~~	~~CONSOL WAITING~~ ~~314~~	~~18840~~	~~22.0~~	~~18.0~~	~~20.3~~	~~17.2~~	~~1.7~~	~~2.5×10^{-8}~~
8-17	8-18	5:04 pm	9:04 AM	960 ✓	57600	20.3	17.2	19.2	18.9	1.1	1.5×10^{-8}
8-18	8-18	9:04 AM	3:39 pm	395 ✓	23700	19.2	18.9	18.8	19.6	0.4	1.4×10^{-8}
8-18	8-18	3:40 pm	6:05 pm	145 ✓	8700	18.8	19.6	18.6	19.8	0.2	1.9×10^{-8}
8-18	8-19	6:05 pm	10:05 AM	960 ✓	57600	18.6	19.8	17.5	21.5	1.1	1.5×10^{-8}
TOTALS					t= 147600 ✓					Q= 2.8 ✓	

COEFFICIENT OF PERMEABILITY, $k = \frac{Q \times L \times R_T \times C}{h \times A \times t}$ $= \boxed{1.5 \times 10^{-8}}$ ✓

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA – KINGSTON
JOB NO.: 3043-05-1021
BORING NO.: NB-22 (BULK)
DEPTH: 2'-10'
SAMPLE: RED BRN F-MSA CLS1
DESCRIPTION:

TECHNICIAN: J. Alex.
DATE: 8-25-5
CHECKED BY: HC
CELL NO.: A
SYSTEM NO.: #2

AMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft): 0.007524212
DRY UNIT WEIGHT (pcf): 102.4
WET UNIT WEIGHT (pcf): 122.1 (@ 19.2%)

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 2.014 (in) 5.116 ✓ (cm)
SOIL DIAMETER: 2.867 (in) 7.282 ✓ (cm)
AREA(A): (in²) 41.65 ✓ (cm)

OISTURE CONTENT

INITIAL WET WEIGHT (g): 416.70
FINAL WET WEIGHT (g): 420.29
FINAL DRY WEIGHT (g): 348.29
INITIAL MOISTURE (%):
FINAL MOISTURE (%):
PAN NAME: BONO

PERM INFORMATION

CELL PRESSURE(psi): 60.0
FORE PRESSURE(psi): 52
BACK PRESSURE (psi): 50
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F): 73°F
VISCOSITY CORRECTION(R_T): 0.931
PERMEANT LIQUID USED: H2O
BURET CORRECTION FACTOR(C): 1.0

BLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END		Q	K
8-25	8-25	4:46pm	5:11pm	25	1500	19.2	11.1	15.9	14.7	3.3	1.8×10^{-6}
8-25	8-25	5:11pm	7:58pm	167 ✓	10920 ✓	15.9	14.7	0.6	30.8	15.3 ✓	1.2×10^{-6}
8-26	8-26	8:17 Am	8:49 Am	32 ✓	1920 ✓	22.0	18.6	19.2	21.5	2.8 ✓	1.2×10^{-6}
8-26	8-26	8:49 Am	12:05 pm	196 ✓	11760 ✓	19.2	21.5	0.0	40.7	19.2 ✓	1.3×10^{-6}
~~8-26~~		~~14:10~~				~~18.3~~	~~9.9~~				
8-29	8-29	9:20Am	10:20Am	60 ✓	3600 ✓	26.7	14.4	20.9	20.2	5.8 ✓	1.3×10^{-6}
TOTALS					t= 27300 ✓					Q= 43.1 ✓	

COEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t} \cdot \frac{5.116(0.931)}{140.68(41.65)} =$ $\boxed{1.3\times10^{-6}}$ ✓

MACTEC
engineering and constructing a better tomorrow

October 4, 2005

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

Subject: **Report of Geotechnical Investigation**
Gypsum Stack Borrow Area
TVA Kingston Fossil Plant
Kingston, Tennessee
MACTEC Project 3043051030.01

Dear Mr. Purkey:

We at MACTEC Engineering and Consulting, Inc., (MACTEC) are pleased to submit this Report of Geotechnical Investigation for your project. Our services, as authorized through TAO No. MAC-0724-00082, were provided in general accordance with our proposal number Prop05Knox/182, dated June 9, 2005.

This report reviews the information provided to us, discusses the site and subsurface conditions, and presents the results of our laboratory testing for the materials at the Gypsum Stack Borrow Area. The Appendices contain a brief description of the Field Exploratory Procedures, Observation Trench Logs, the Laboratory Test Procedures, and the Laboratory Test Results. At the time of report finalization, samples of the composite geonet fabric were not available for laboratory testing purposes as required in this scope of work. MACTEC will provide the results of the geonet fabric testing within a separate letter report upon completion of the laboratory testing.

We anticipate further dialog and interaction with the designers as the design proceeds and will be happy to provide any additional information or interpretation of the data presented here in which may be necessary.

We will be pleased to discuss our data 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, INC.

CLINTON TODD JUSTICE III

C. Todd Justice, P.E.
Project Engineer

10-4-05

Carl D. Tockstein, P.E.
Chief Engineer - Tennessee Operations

CTJ/CDT:sm

MACTEC Engineering and Consulting, Inc.
1725 Louisville Drive • Knoxville, TN 37921-5904 • Phone: 865.588.8544 • Fax: 865.588.8026
www.mactec.com

REPORT OF GEOTECHNICAL INVESTIGATION

GYPSUM STACK BORROW AREA
KINGSTON FOSSIL PLANT
KINGSTON, TENNESSEE

Prepared For:

TENNESSEE VALLEY AUTHORITY

Chattanooga, Tennessee

Prepared By:

MACTEC ENGINEERING AND CONSULTING, INC.

Knoxville, Tennessee

MACTEC Project 3043051030.01

October 4, 2005

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Figure

1 Site Location Map

2 Observation Trench Location Plan

3A Hydraulic Conductivity versus Molding Moisture Content for Soil Type A

3B Hydraulic Conductivity versus Molding Moisture Content for Soil Type B

3C Hydraulic Conductivity versus Molding Moisture Content for Soil Type C

4 Compaction Data Points Showing Acceptable Zone of Hydraulic Conductivity – Soil Type A

5 Compaction Data Points Showing Acceptable Zone of Hydraulic Conductivity – Soil Type B

6 Compaction Data Points Showing Acceptable Zone of Hydraulic Conductivity – Soil Type C

EXECUTIVE SUMMARY

MACTEC was selected by the Tennessee Valley Authority (TVA) to perform a geotechnical investigation for the Gypsum Stack Borrow Area at the Kingston Fossil Plant in Kingston, Tennessee. The objectives of our exploration were to determine general subsurface conditions in the borrow area and to perform geotechnical laboratory testing in order to evaluate the engineering characteristics of the potential borrow soils.

The exploration consisted of excavating 5 observation trenches (OT-1 through OT-5) to maximum depths of 10 feet or refusal, whichever occurred first. The major findings of our geotechnical exploration are as follows:

- The observation trenches excavated in the Gypsum Stack Borrow Area typically encountered residual soils underlying minor amounts of topsoil. The residuum typically consisted of fat clay and lean clays with varying amounts of roots, sand, chert fragments, and manganese nodules. The observation trenches were terminated at depths of about 10 feet.
- Ground water was not encountered in the observation trenches during the time of our investigation. Long-term measurements for the presence or absence of ground water were not obtained during this exploration.
- Laboratory tests were performed on bulk soil samples from the potential borrow area. A summary of the tests performed and the test results is presented in Section 3.0 and Section 7.0, respectively. The test results are presented in Appendix C and are summarized in Tables C-1 through C-4.
- Figures 4, 5, and 6 show graphical plots that can be used to assist the constructors in field control and quality assurance during the placement of the compacted engineered fill. MACTEC recommends that additional hydraulic conductivity testing be performed in order to more accurately develop and verify the initially constructed Acceptable Zone boundaries. Section 8.0 describes the procedures to implement the use of the graphical plots in the field.

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 and laboratory testing recently performed for the Gypsum Stack Borrow Area at the TVA Kingston Fossil Plant. Our services were authorized by Mr. Ron Purkey of TVA.

2.0 OBJECTIVES OF EXPLORATION

The objectives of our exploration were to determine general subsurface conditions in the borrow area and to perform geotechnical laboratory testing in order to evaluate the engineering characteristics of the potential borrow soils. 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

The scope of our exploration was based on our proposal number Prop05Knox/182, dated June 9, 2005 and the geotechnical scope of work outlined in the project's scope of work. It includes the following:

- Excavate 5 observation trenches including logging the soil strata and collecting samples within the Gypsum Stack Borrow Area
- Locate each observation trench using GPS
- Conduct laboratory testing on the potential borrow soils
- Develop moisture-density / hydraulic conductivity relationships for each soil type encountered
- Prepare a geotechnical report summarizing the field and laboratory test results with applicable recommendations

The field work was performed in accordance to the procedures included in Appendix A. The field work was performed on June 28, 2005. TVA provided the backhoe equipment used to excavate the observation trenches. A MACTEC geotechnical engineer was present to identify and log the various soil types encountered. Bulk soil samples of each soil type were obtained from the excavated soils within the observation trenches. Photographs of the observation trenches and soils excavated from the trenches were made upon completion of sampling.

Upon completing the excavation of an observation trench, the trenches were backfilled with the excavated soils.

The samples were transported to our laboratories in Knoxville, Tennessee and Charlotte, North Carolina where the soil samples were tested. The testing program for this project consisted of the following:

- 9 Plasticity Index (Atterberg Limits) Tests
- 9 Grain Size Distribution Tests
- 3 Natural Moisture Content Tests
- 9 Standard Proctor Compaction Tests
- 9 Specific Gravity Tests
- 18 Hydraulic Conductivity Tests

Subsurface conditions encountered in the observation trenches are presented on the Observation Trench Logs 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. Lynn Petty with TVA in the form of a Geotechnical Investigation Scope of Work and a proposed Observation Trench location plan. The investigation was performed in the Gypsum Stack Borrow Area. The Gypsum Stack Borrow Area is located northwest of the proposed Gypsum Disposal Area and is shown in Figure 1- Site Location Map.

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 Group. The Knox Group 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 were explored with 5 observation trenches excavated in general accordance with the procedures presented in Appendix A. The trench locations and depths were selected by TVA. The trench locations were located by GPS by the MACTEC geotechnical engineer. The GPS coordinates are shown on the Observation Trench Logs. The trench locations are shown on Figure 2 - Observation Trench Location Plan.

Subsurface conditions encountered at the boring locations are shown on the Observation Trench Logs. These logs represent our interpretation of the subsurface conditions, based on observations of the materials exposed in the trenches by our geotechnical engineer. The depth intervals designating the interfaces between various strata on the logs represent the approximate interface locations.

The observation trenches excavated at this site encountered topsoil and residual soils. Topsoil is the dark-colored organic soil that forms naturally at the ground surface. Residual soils are soils that have developed from the in-place weathering of the underlying parent bedrock. The observation trenches were terminated at depths of about 10 feet.

A brief summary of subsurface conditions encountered in the trenches is discussed in the following portions of this section. For detailed conditions at each trench location, refer to the Observation Trench Logs in Appendix B.

Topsoil was encountered in observation trenches OT-1 through OT-4 to depths of about 0.5 feet. About 1 foot of topsoil was encountered in OT-5. Lean clay and fat clay residuum was typically encountered underlying the topsoil to termination depths. Large diameter roots (up to 1-inch) were encountered within the residuum to depths varying from about 2 to 4 feet below the existing ground surface. The percentage of chert observed within the encountered soils was visually estimated and noted on the observation trench logs.

7.0 LABORATORY TESTING METHODOLOGY AND DISCUSSION OF TEST RESULTS

A detailed visual examination of the soils obtained from the observation trenches led to the identification of three distinct soil types based on color and chert content. The soil types have been designated as types "A", "B", and "C". Soil type A consists of reddish orange fat clay with varying amounts of chert fragments (observed in OT-1, OT-2 and OT-5). Soil type B consists of reddish brown lean clay / fat clay with varying amounts of sand and chert fragments (observed in OT-3). Soil type C consists of dark reddish brown lean clay with varying amounts of sand and black manganese nodules (observed in OT-4).

Laboratory tests were performed on bulk soil samples obtained from observation trenches OT-1 (soil type A), OT-3 (soil type B), and OT-4 (soil type C). The laboratory testing for each soil type included the following:

- 1 Natural Moisture Content Test
- 3 Plasticity Index (Atterberg Limits) Tests
- 3 Grain Size Distribution Tests
- 3 Specific Gravity Tests
- 3 Standard Proctor Compaction Tests
- 6 to 7 Hydraulic Conductivity Tests

Representative samples of each soil type were obtained from the bulk samples in preparation for laboratory testing. The results of the Proctor compaction tests were used to prepare remolded specimens at relative compactions of 90 and 95 percent maximum dry density, at moisture contents of -2, +1, and +4 percent of optimum. The remolded specimens were subjected to laboratory hydraulic conductivity testing. The data obtained from the laboratory test results was used to develop graphical plots showing relationships between molding moisture content and hydraulic conductivity for soils types A, B, and C at relative compactions of 90 and 95 percent standard Proctor density (Figures 3A, 3B, and 3C). Final graphical plots (Figures 4, 5, and 6), showing the compaction data points, were constructed in order to create an "acceptable zone" which includes data points for specimens with hydraulic conductivity values less than or equal to 1 x 10^{-6} cm/s.

The tests and test results are summarized below in the following paragraphs. Table C-1summarizes the natural moisture content, compaction characteristics, specific gravity, Atterberg Limits, percent fines and Unified Soil Classification results for the soils tested. Tables C-2, C-3, and C-4 summarize the results of the hydraulic conductivity testing performed on the tested soils.

7.1 INDEX PROPERTIES

Natural moisture content, Atterberg limits, and grain size analysis tests were performed on bulk samples obtained from the potential borrow soils at trench locations OT-1, OT-3, and OT-4.

Natural moisture contents of the tested samples ranged from 22.5 percent (OT-4) to 24.6 percent boring (OT-1).

The Atterberg limits test results indicated that liquid limits for the on-site borrow soils tested ranged from 36 to 60, plastic limits ranged from 19 to 29, and plasticity indices ranged from 17 to 33. The tested on-site borrow soils were classified as CL and CH in accordance with the USCS.

The specific gravity of the tested samples ranged from 2.72 to 2.75.

7.2 MOISTURE-DENSITY RELATIONSHIP

Nine Standard Proctor compaction tests were performed on bulk samples obtained from trench locations OT-1, OT-3, and OT-4. The test results indicated that the maximum dry density for the soils tested ranged from 90.7 to 107.3 pcf, and the corresponding optimum moisture contents were 28.3 and 17.6, respectively.

7.3 HYDRAULIC CONDUCTIVITY

Constant head permeability tests were performed on remolded samples from bulk soil samples obtained at locations OT-1, OT-3, and OT-4. The samples were remolded to or near 90 and 95 percent of the standard Proctor maximum dry density and at or near -2, +1, and +4 percent of optimum moisture content for a total of 18 tests. Two additional permeability tests were performed on bulk soil samples from locations OT-1 and OT-4 remolded to or near 95 percent of standard Proctor maximum dry density and at or near +1.7 and +1.8 percent of optimum moisture content.

The permeability test results indicated that the permeability's ranged from 1.2×10^{-5} cm/s to 8.1×10^{-8} cm/s.

8.0 RECOMMENDATIONS

The laboratory testing program just described was used to develop the graphical plots shown in Figures 4, 5, and 6. These graphical plots show compaction data points with respect to an "Acceptable Zone" which includes data points for specimens with hydraulic conductivity values approximately less than or equal to 1×10^{-6} cm/s. The lower limit of the Acceptable Zone is typically parallel to the zero air voids curve. Figures 4, 5, and 6 utilize a specified degree of saturation as the lower boundary of the Acceptable Zone. It is observed that only a limited number of compaction data points were used to construct the Acceptable Zones which utilize a degree of saturation as the lower boundary for each of the soil types. MACTEC recommends that additional hydraulic conductivity testing be performed in order to more accurately develop and verify the initially constructed Acceptable Zone boundaries. Specifically, additional hydraulic conductivity testing should be performed on specimens of each soil type remolded to or near 98 to 100 percent standard Proctor maximum dry density at or near their respective optimum moisture contents and at -1 percent of optimum. An additional 12 hydraulic conductivity tests are recommended.

Once the additional testing has been performed to verify and/or modify the Acceptable Zones, the graphical plots can be used to assist the constructors in field control and quality assurance during the placement of the compacted engineered fill. In order to implement the use of the graphical plots in the field, the soil technicians will have to first classify the soils as types A, B, or C. One-point standard Proctor compaction tests can be occasionally performed in the field to aid in identification of questionable materials. After the materials have been placed and compacted in lifts, the technicians then measure the dry density and moisture content in the field. The field dry density-moisture content point is then plotted on the appropriate graphical plot (Figures 4, 5, or 6). If the field measured dry density value exceeds the minimum required dry density (falls within the acceptable zone) then no further action is needed. If the field measured dry density was less than the minimum required dry density, then additional compaction is performed until the field measured dry density exceeds the minimum required value.

9.0 BASIS OF RESULTS

The results and recommendations provided herein are based on the encountered subsurface conditions and laboratory testing related to the specific project and site discussed in this report.

Regardless of the thoroughness of a field exploration, there is always a possibility that conditions between test locations will differ from those at specific test locations, and that conditions may not be anticipated. In addition, interpretation of the data is critical to the intended design and/or analysis. Therefore, experienced geotechnical engineer should interpret the field data and review any site-specific analysis or design that incorporates the field data. We recommend that TVA retain MACTEC to provide this service, based upon our familiarity with the subsurface conditions, the field and laboratory data, and our geotechnical experience.

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 C-1
Index Property and Moisture-Density Test Results
TVA Kingston Gypsum Stack Borrow Area
MACTEC Project 3043051030/01

				Atterberg Limits						Compaction Tests	
Test Location Number	Sample Depth (Feet)	Soil Type	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Percent Finer Than No. 200 Sieve	USCS Classification	Specific Gravity	Std. Proctor Max. Dry Density, pcf	Opt. Moisture Content, %
OT-1	2.5 - 10	A	24.6	58	29	29	87.8	CH	2.75	90.7	28.3
OT-1	2.5 - 10	A	24.6	59	26	33	87.5	CH	2.75	91.6	28.3
OT-1	2.5 - 10	A	24.6	60	28	32	87.7	CH	2.75	91.4	28.8
OT-3	3 - 10	B	23.3	47	23	24	74.0	CL	2.74	101.0	22.4
OT-3	3 - 10	B	23.3	50	23	27	74.6	CH	2.75	101.3	20.3
OT-3	3 - 10	B	23.3	45	22	23	74.1	CL	2.73	100.6	22.1
OT-4	4 - 10	C	22.5	36	19	17	82.4	CL	2.72	107.3	17.6
OT-4	4 - 10	C	22.5	38	20	18	83.8	CL	2.73	105.9	18.8
OT-4	4 - 10	C	22.5	39	19	20	83.5	CL	2.73	104.9	18.4

Prepared/Date: CTJ 07/29/05
Checked/Date: SDS 08/05/05

Table C-2
Hydraulic Conductivity
Soil Type A
TVA Kingston Gypsum Stack Borrow Area
MACTEC Project 3043051030/01

Trench Location	Bulk Sample Depth (ft)	Target Remolded Proctor Dry Density %	Remolded Moisture (%)	Wet Unit wt (pcf)	Dry Unit wt (pcf)	Hydraulic Conductivity (cm/sec)
OT-1	2.5 - 10	90	26.4	103.1	81.6	6.0×10^{-6}
OT-1	2.5 - 10	90	29.3	105.5	81.6	3.9×10^{-6}
OT-1	2.5 - 10	90	32.5	108.0	81.5	4.3×10^{-7}
OT-1	2.5 - 10	95	26.4	109.0	86.2	1.1×10^{-6}
OT-1	2.5 - 10	95	29.3	111.5	86.2	1.8×10^{-6}
OT-1	2.5 - 10	95	30.0	112.1	86.2	1.4×10^{-7}
OT-1	2.5 - 10	95	32.5	114.0	86.0	2.2×10^{-7}

Note: Maximum dry denisity is 90.7 pcf and optimum moisture content is 28.3 % for soil type A

Table C-3
Hydraulic Conductivity
Soil Type B
TVA Kingston Gypsum Stack Borrow Area
MACTEC Project 3043051030/01

Trench Location	Bulk Sample Depth (ft)	Target Remolded Proctor Dry Density %	Remolded Moisture (%)	Wet Unit wt (pcf)	Dry Unit wt (pcf)	Hydraulic Conductivity (cm/sec)
OT-3	3 - 10	90	19.9	108.7	90.7	**2.1×10^{-6}**
OT-3	3 - 10	90	22.5	111.4	90.9	**2.4×10^{-6}**
OT-3	3 - 10	90	25.6	114.0	90.8	**2.1×10^{-7}**
OT-3	3 - 10	95	19.9	114.7	95.7	**1.2×10^{-5}**
OT-3	3 - 10	95	22.5	117.6	96.0	**2.6×10^{-7}**
OT-3	3 - 10	95	25.6	120.6	96.0	**3.5×10^{-7}**

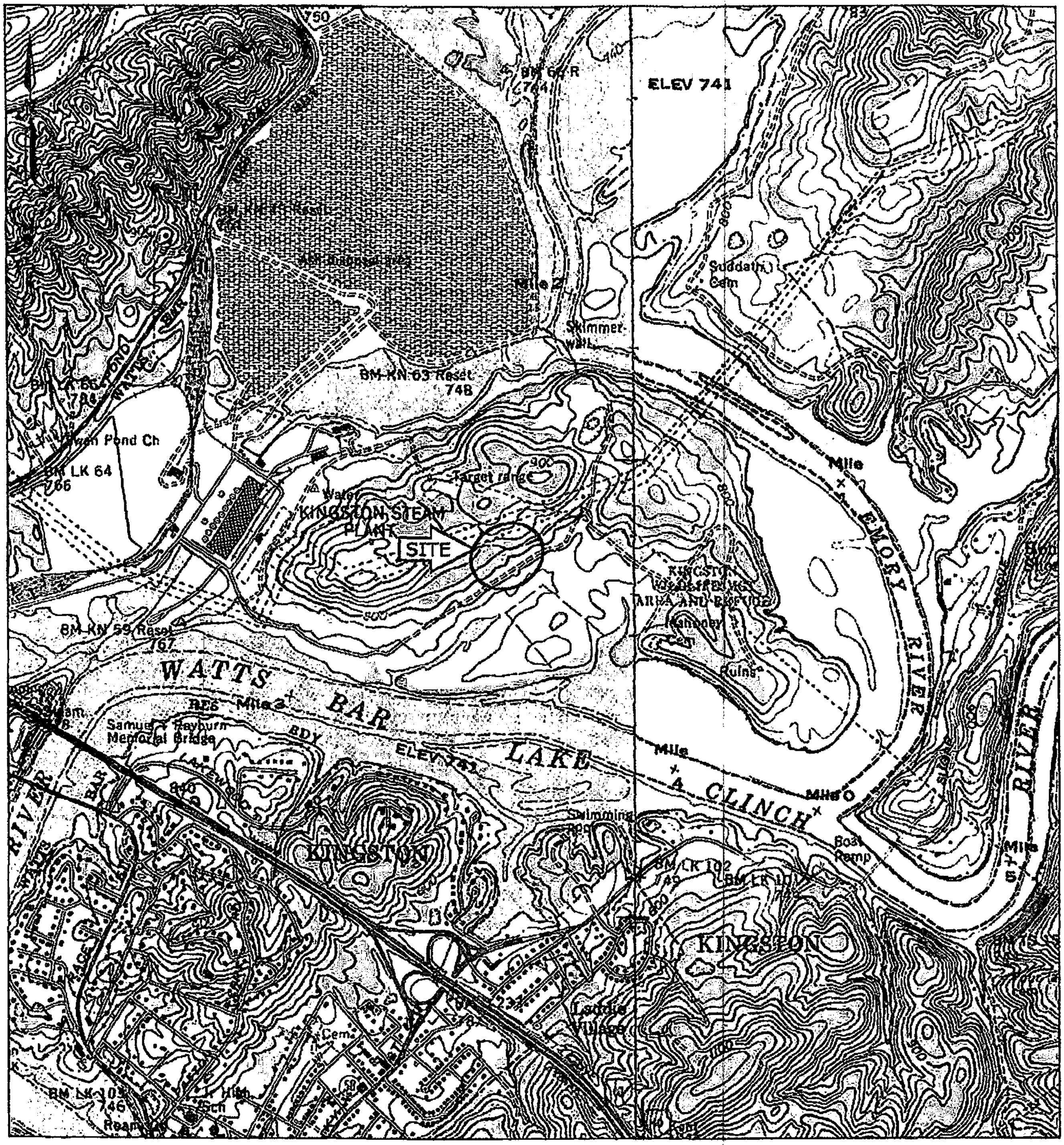
Note: Maximum dry denisity is 100.6 pcf and optimum moisture is 22.1% for soil type B

Table C-4
Hydraulic Conductivity
Soil Type C
TVA Kingston Gypsum Stack Borrow Area
MACTEC Project 3043051030/01

Trench Location	Bulk Sample Depth (ft)	Target Remolded Proctor Dry Density %	Remolded Moisture (%)	Wet Unit wt (pcf)	Dry Unit wt (pcf)	Hydraulic Conductivity (cm/sec)
OT-4	4 - 10	90	17.1	111.2	95.0	**$1.1 X 10^{-5}$**
OT-4	4 - 10	90	19.8	114.2	95.3	**$3.5 X 10^{-6}$**
OT-4	4 - 10	90	22.7	117.1	95.4	**$4.0 X 10^{-7}$**
OT-4	4 - 10	95	17.1	117.5	100.3	**$4.8 X 10^{-6}$**
OT-4	4 - 10	95	19.8	120.5	100.6	**$1.6 X 10^{-6}$**
OT-4	4 - 10	95	20.6	121.3	100.6	**$1.1 X 10^{-6}$**
OT-4	4 - 10	95	22.7	123.6	100.7	**$8.1 X 10^{-8}$**

Note: Maximum dry denisity is 105.9 pcf and optimum mositure is 18.8 % for soil type C

FIGURES



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

MACTEC

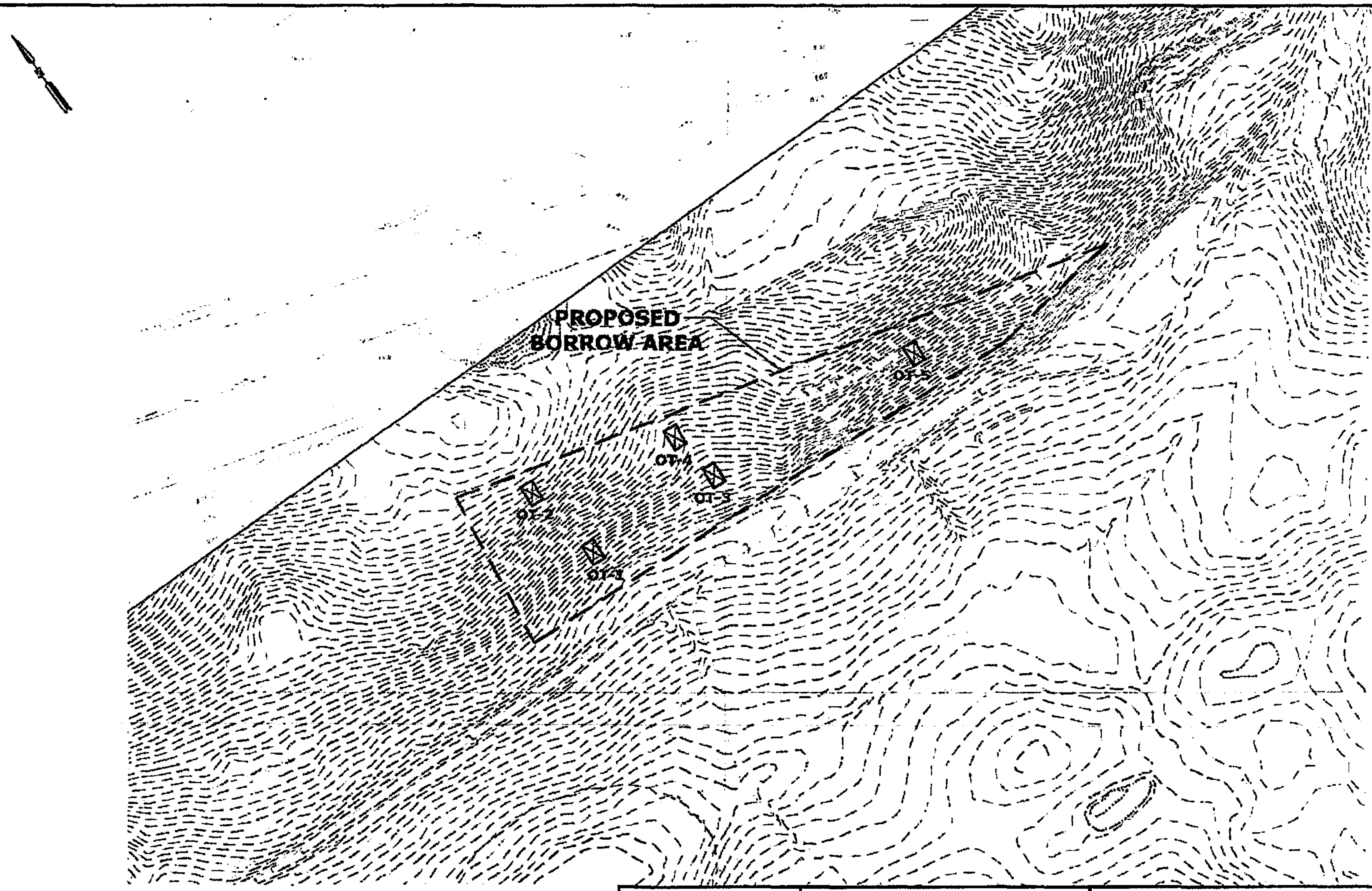
MACTEC Engineering and Consulting, Inc.
1725 Louisville Drive
Knoxville, Tennessee 37921-5904
865-588-8544 • Fax: 865-588-8026

FIGURE 1: SITE LOCATION MAP
TVA KINGSTON
PROPOSED GYPSUM STACK BORROW AREA
KINGSTON, TENNESSEE

DRAFTING BY: RJB	PREPARED BY: CTJ	CHECKED BY: CDT
JOB NUMBER: 3043051030/0001	DATE: JULY 22, 2005	SCALE: 0 2000'

COORDINATES: N 35°53'39" W 84°31'13"

3043051030 Fri, 22 Jul 2005 - 10:30am REVERENC



LEGEND

☒ OT-1 OBSERVATION TRENCH TEST LOCATION AND IDENTIFICATION

MACTEC

FIGURE 2: OBSERVATION TRENCH TEST LOCATION PLAN AND IDENTIFICATION TVA KINGSTON-PROPOSED GYPSUM STACK BORROW AREA - KINGSTON, TENNESSEE

DRAFTING BY: GAH	PREPARED BY: CTJ	CHECKED BY:
JOB NUMBER: 3043051030/0001	DATE: 7/11/05	SCALE: 0 200'

COORDINATES: N XX°XX'XX" W XX°XX'XX"

Soil Type "A" - Reddish Orange Fat Clay with Chert Fragments (CH)
Standard Proctor Maximum Dry Density = 90.7 pcf, Optimum Moisture Content = 28.3%

HYDRAULIC CONDUCTIVITY DATA - SOIL TYPE "A"

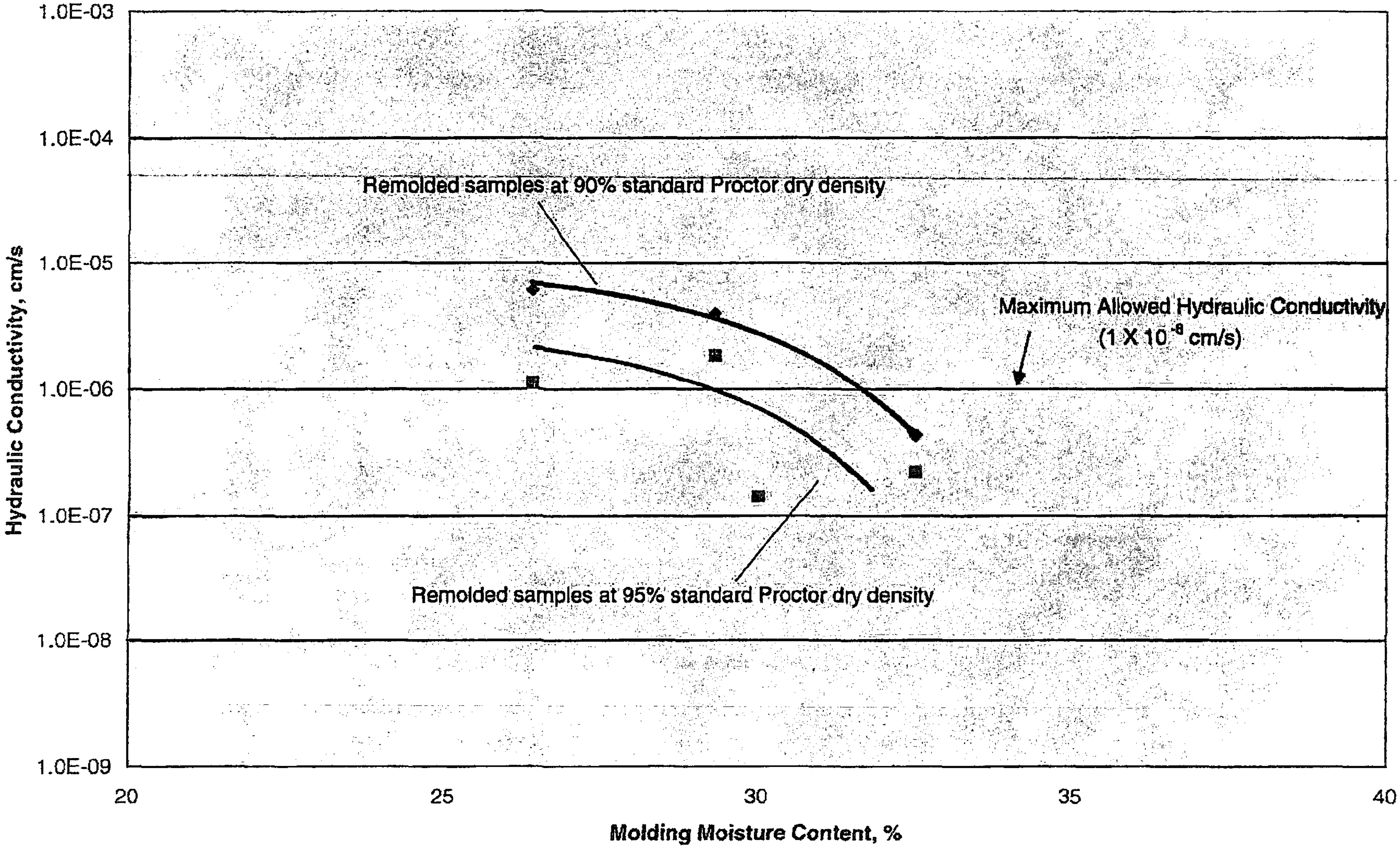


Figure 3A- Hydraulic Conductivity versus Molding Moisture Content for Type "A" Soil

Soil Type "B" - Reddish Brown Lean Clay / Fat Clay with Sand and Chert Fragments (CL/CH)
Standard Proctor Maximum Dry Density = 100.6 pcf, Optimum Moisture Content = 22.1%

HYDRAULIC CONDUCTIVITY DATA - SOIL TYPE "B"

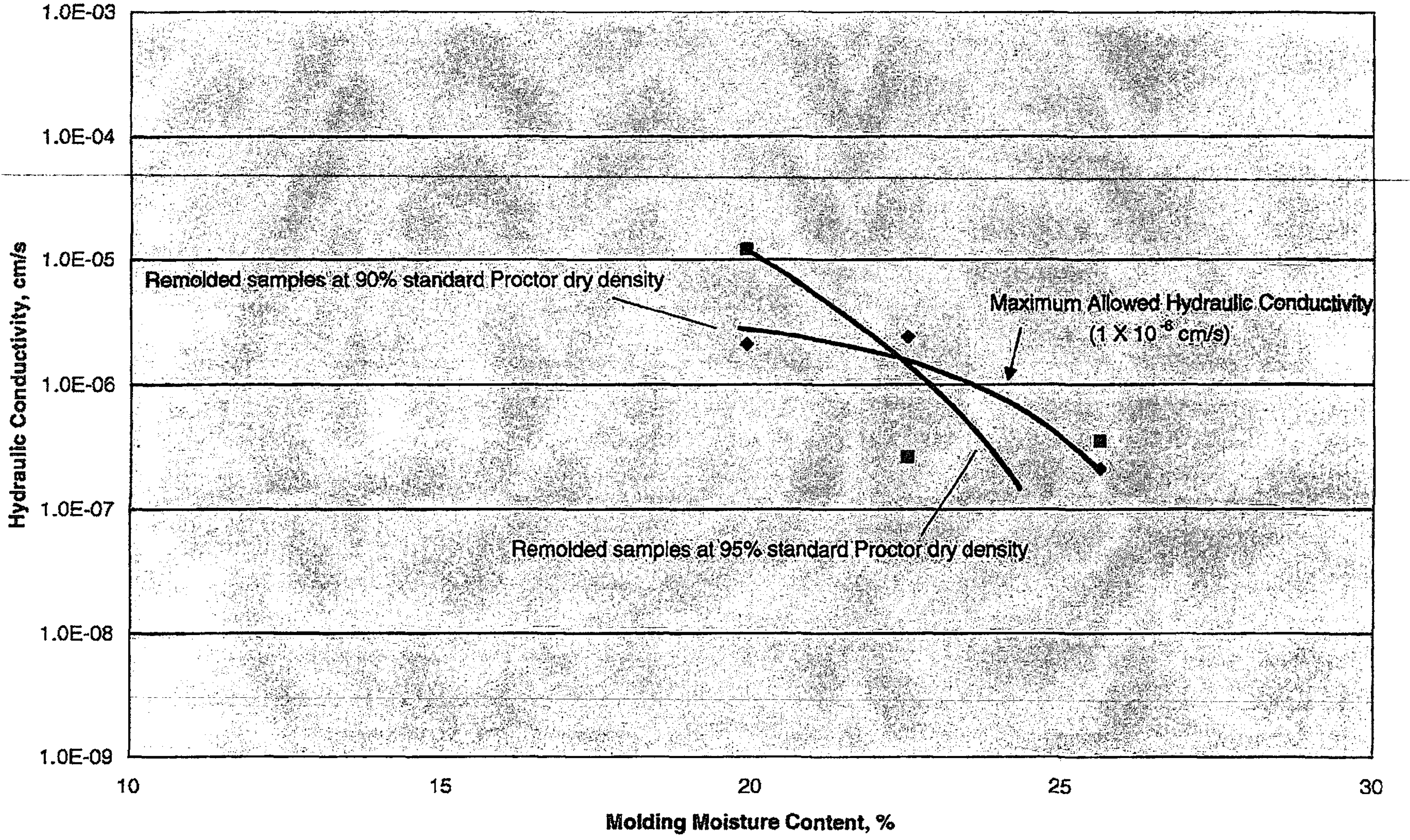


Figure 3B- Hydraulic Conductivity versus Molding Moisture Content for Type "B" Soil

Soil Type "C" - Dark Reddish Brown Lean Clay with Sand and Black Manganese Nodules (CL)
Standard Proctor Maximum Dry Density = 105.9 pcf, Optimum Moisture Content = 18.8%

HYDRAULIC CONDUCTIVITY DATA - SOIL TYPE "C"

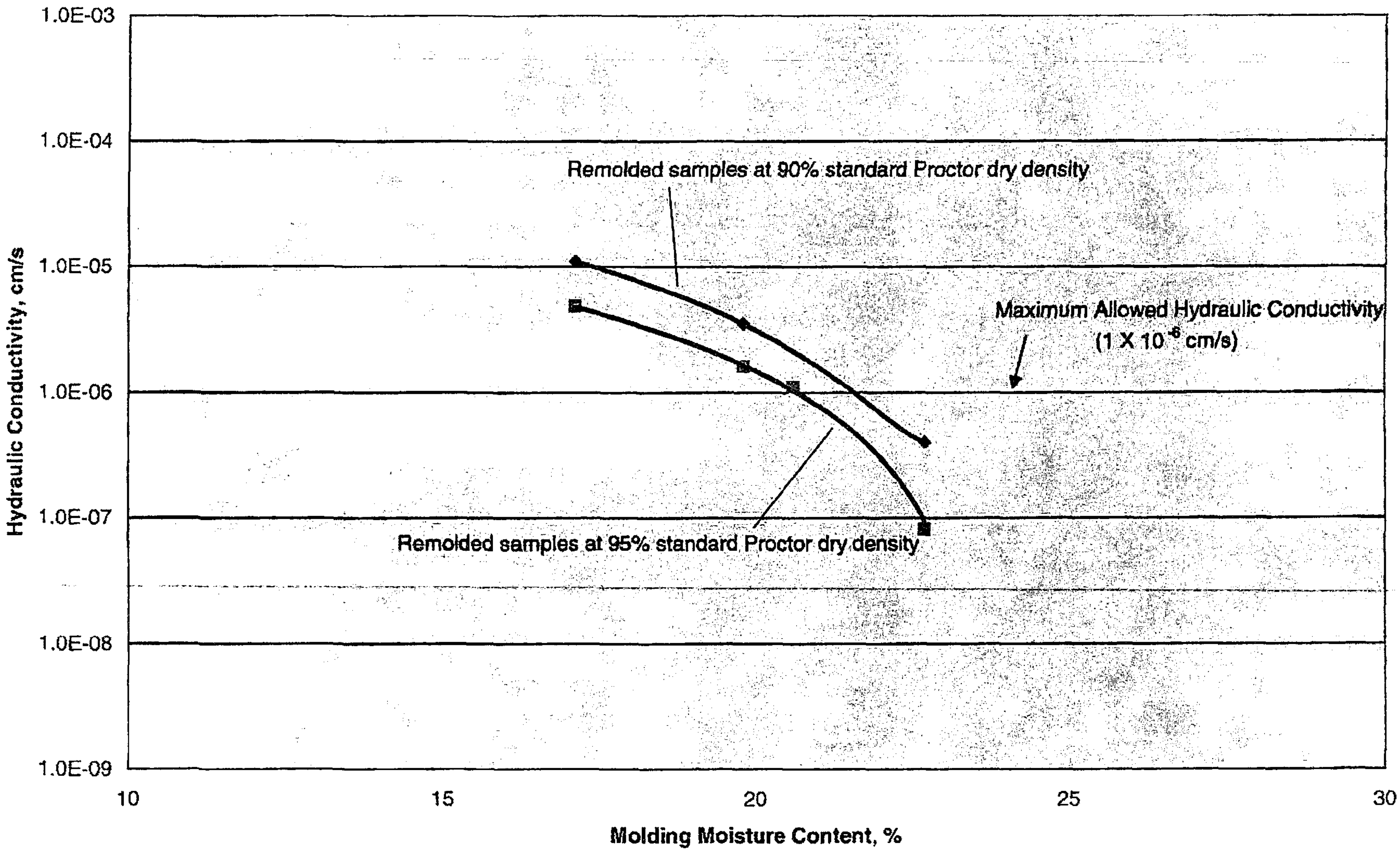


Figure 3C- Hydraulic Conductivity versus Molding Moisture Content for Type "C" Soil

Soil Type "A" - Reddish Orang[illegible]t Clay with Chert Fragments (CH)
Standard Proctor Maximum Dry Density = 90.7 pcf, Optimum Moisture Content = 28.3%

COMPACTION DATA FOR SOIL TYPE "A"

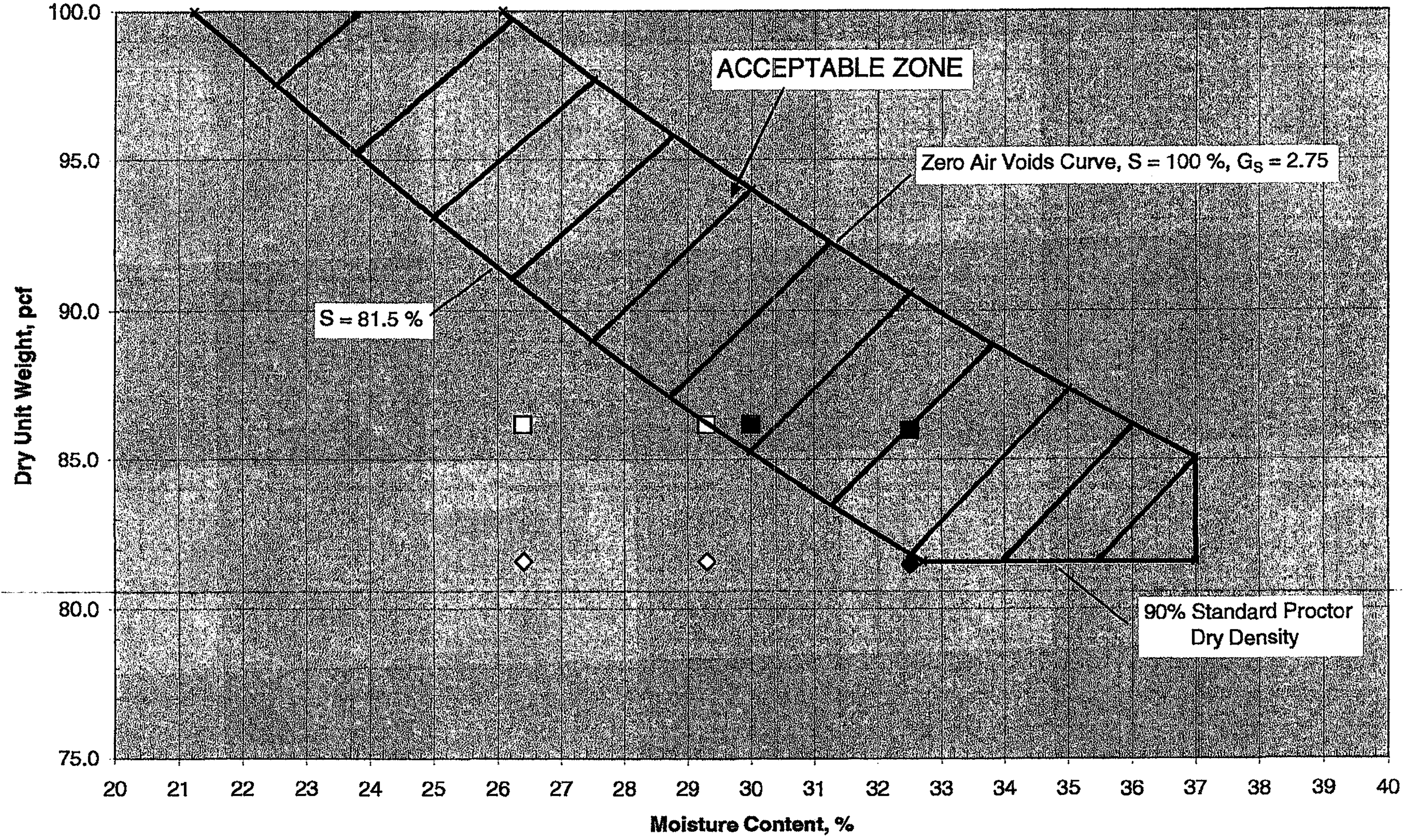


Figure 4- Solid symbols are for compacted specimens with a hydraulic conductivity < 1 x 10^{-6} cm/s and open symbols for specimens with a hydraulic conductivity > 1 x 10^{-6} cm/s. Squares and Diamonds represent 95 and 90% compaction, respectively.

Soil Type "B" - Reddish Brown Lean Clay / [illegible] Clay with Sand and Chert Fragments (CL/CH)
Standard Proctor Maximum Dry Density = 100.6 pcf, Optimum Moisture Content = 22.1%

COMPACTION DATA FOR SOIL TYPE "B"

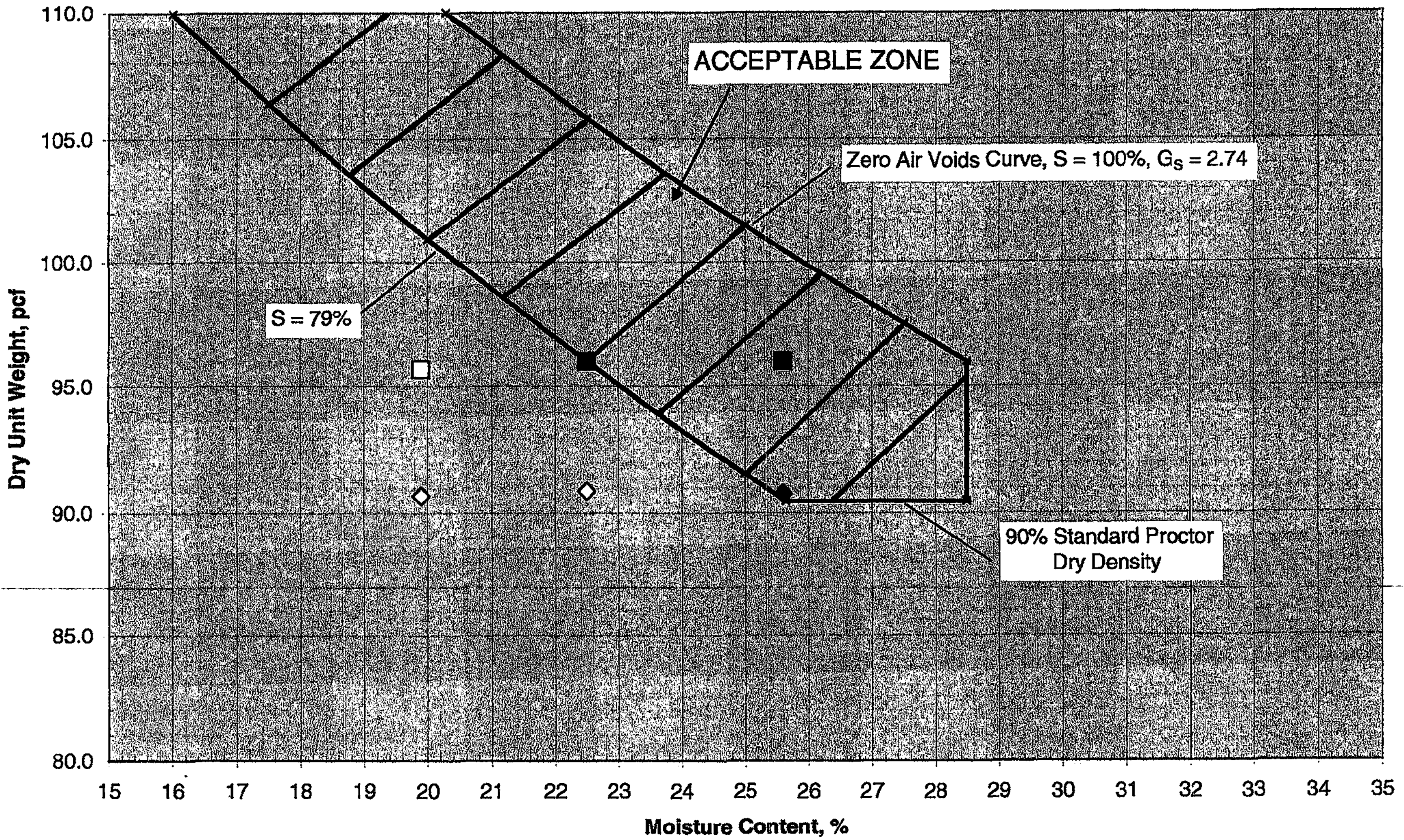


Figure 5- Solid symbols are for compacted specimens with a hydraulic conductivity < 1 x 10^{-6} cm/s and open symbols for specimens with a hydraulic conductivity > 1 x 10^{-6} cm/s. Squares and Diamonds represent 95 and 90% compaction, respectively.

Soil Type "C" - Dark Reddish Brown Lean [illegible] with Sand and Black Manganese Nodules (CL)
Standard Proctor Maximum Dry Density = 105.9 pcf, Optimum Moisture Content = 18.8%

COMPACTION DATA FOR SOIL TYPE "C"

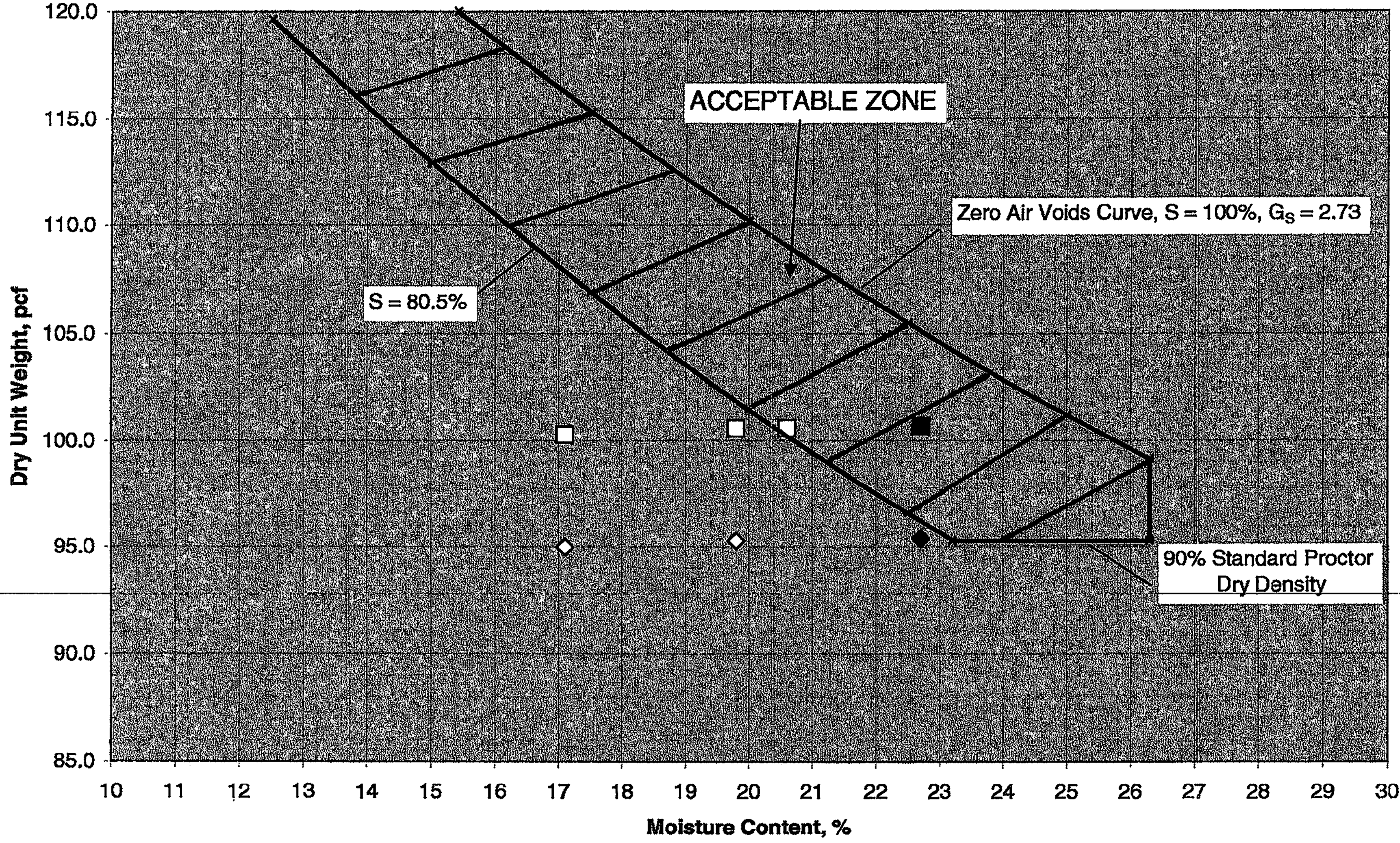


Figure 6- Solid symbols are for compacted specimens with a hydraulic conductivity < 1 x 10^{-6} cm/s and open symbols for specimens with a hydraulic conductivity > 1 x 10^{-6} cm/s. Squares and Diamonds represent 95 and 90% compaction, respectively.

APPENDIX A

FIELD EXPLORATORY PROCEDURES

FIELD EXPLORATORY PROCEDURES

Observation Trenches

The observation trenches were excavated by TVA using a Ford backhoe excavator. One of our geotechnical engineers observed the excavation and documented the materials exposed. The observation trenches were backfilled immediately after excavation for safety purposes. The operator tamped the materials in place with the excavator bucket. You are advised there is the probability of future backfill subsidence depending on actual subsurface conditions, surface drainage, etc.

APPENDIX B

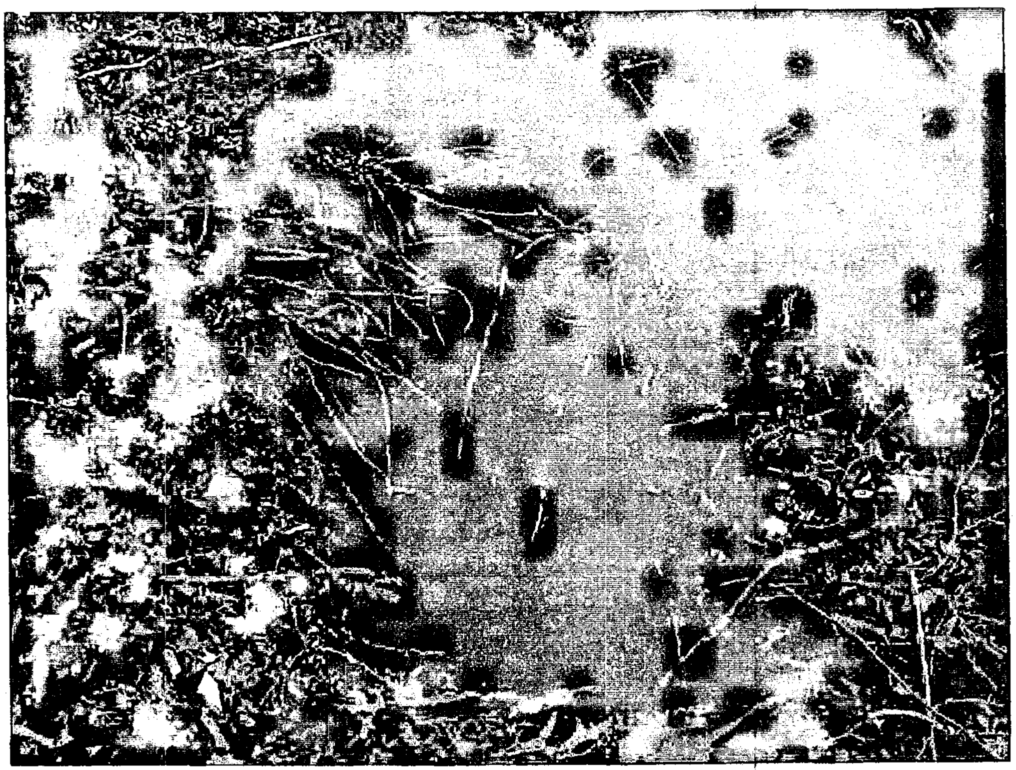
OBSERVATION TRENCH LOGS

OBSERVATION TRENCH LOG

Project Name: TVA Kingston Proposed Gypsum Stack Borrow Area	**Logged By:** Todd Justice
Project Number: 3043051030/01	**Date Logged:** 6/28/05
Observation Trench Number: OT-1	**Degrees/Minutes (GPS):** N35° 53.754' W84° 30.410'

Depth (Feet)		**Stratum Description**	**Chert %**
From	**To**		
0.0	0.5	Topsoil with roots (up to 1-inch diameter)	0
0.5	2.5	Brown, clayey silt / silty clay with sand and roots (up to 1-inch diameter)	0
2.5	10.0	Reddish orange, fat clay with chert fragments	5 to 10

Remarks and Notes: Observation Trench OT-1 was terminated at approximately 10 feet. Bulk sample was obtained from 2.5 to 10.0 feet.



Photograph 1 - Observation Trench OT-1.

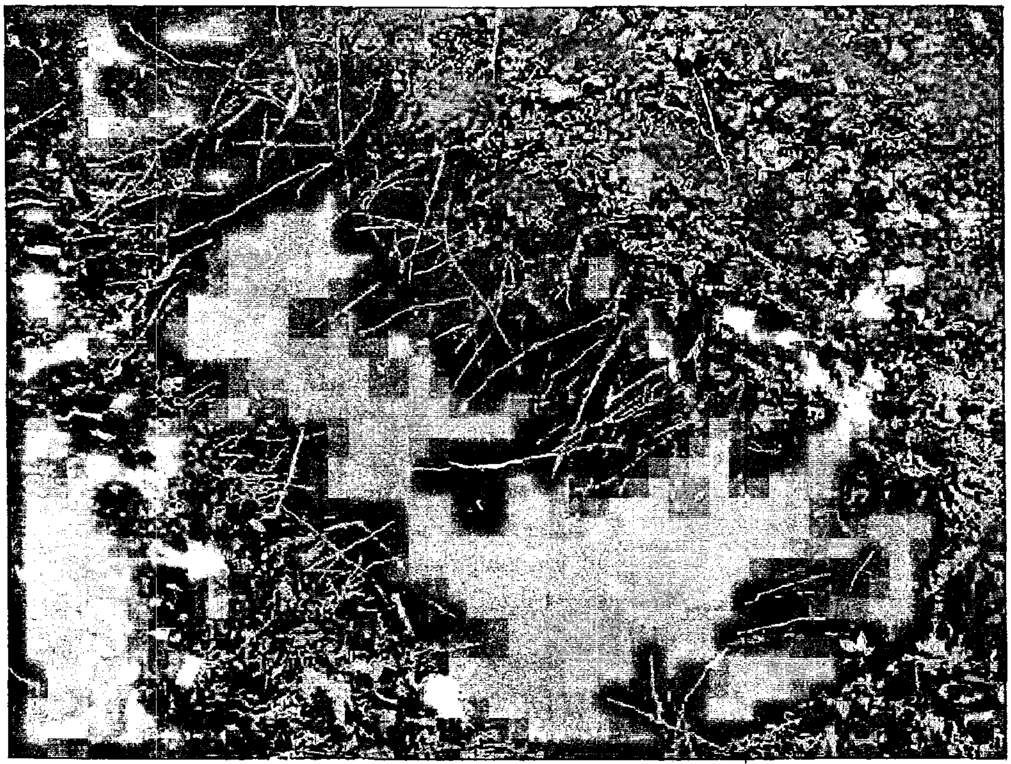
Photograph 2 - Materials excavated from Observation Trench OT-1.

OBSERVATION TRENCH LOG

Project Name: TVA Kingston Proposed Gypsum Stack Borrow Area	**Logged By:** Todd Justice
Project Number: 3043051030/01	**Date Logged:** 6/28/05
Observation Trench Number: OT-2	**Degrees/Minutes (GPS):** N35° 53.775' W84° 30.421'

Depth (Feet)		Stratum Description	Chert %
From	**To**		
0	0.5	Topsoil with roots (up to 1-inch diameter)	0
0.5	2.0	Light brown, clayey silt with sand and roots (up to 1-inch diameter)	0
2.0	10.0	Reddish orange, fat clay with chert fragments	<5

Remarks and Notes: Majority of chert encountered was severely weathered. Observation Trench OT-2 was terminated at approximately 10.0 feet. Bulk sample was obtained from 2.0 to 10.0 feet.



Photograph 3 - Observation Trench OT-2.

Photograph 4 - Materials excavated from Observation Trench OT-2.

OBSERVATION TRENCH LOG

Project Name: TVA Kingston Proposed Gypsum Stack Borrow Area	**Logged By:** Todd Justice
Project Number: 3043051030/01	**Date Logged:** 6/28/05
Observation Trench Number: OT-3	**Degrees/Minutes (GPS):** N35° 53.783' W84° 30.372'

Depth (Feet)		**Stratum Description**	**Chert %**
From	**To**		
0	0.5	Topsoil with roots (up to 1-inch diameter)	0
0.5	3.0	Brown, clayey silt / silty clay with sand and roots (up to 1-inch diameter)	0
3.0	10.0	Reddish brown, lean clay/ fat clay with sand and chert fragments	10 to 15

Remarks and Notes: Observation Trench OT-3 was terminated at approximately 10 feet. Bulk sample was obtained from 3.0 to 10.0 feet.

Photograph 5 - Observation Trench OT-3.

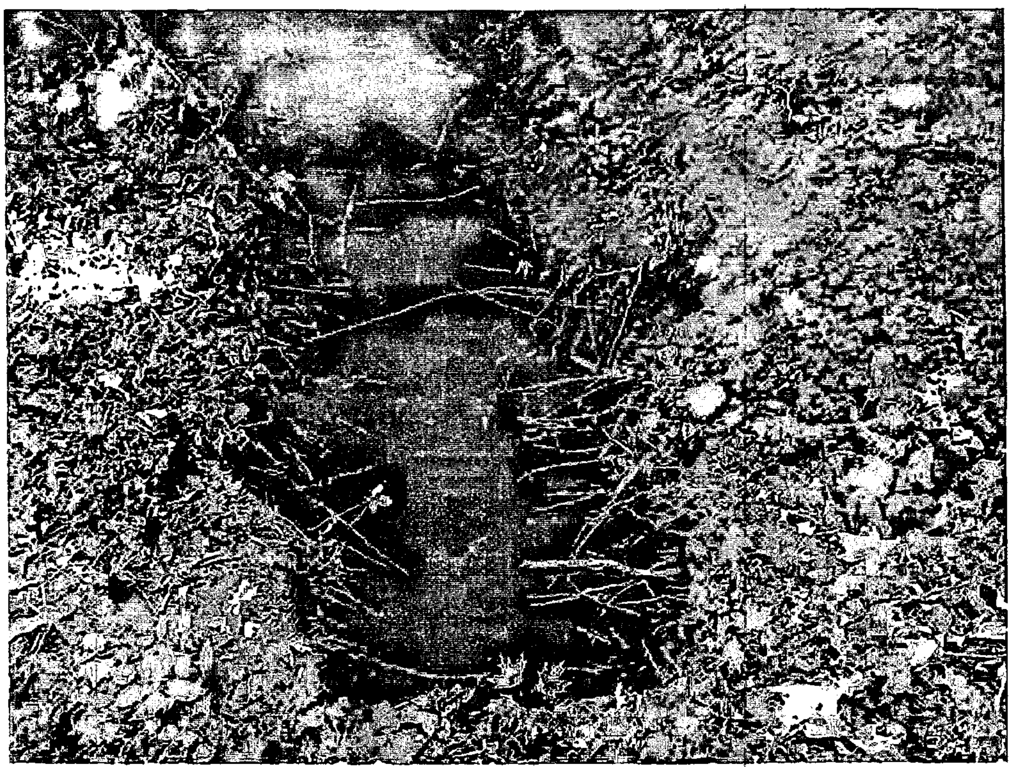
Photograph 6 - Materials excavated from Observation Trench OT-3.

OBSERVATION TRENCH LOG

Project Name: TVA Kingston Proposed Gypsum Stack Borrow Area	**Logged By:** Todd Justice
Project Number: 3043051030/01	**Date Logged:** 6/28/05
Observation Trench Number: OT-4	**Degrees/Minutes (GPS):** N35° 53.792' W84° 30.381'

Depth (Feet)		**Stratum Description**	**Chert %**
From	**To**		
0	0.5	Topsoil with roots (up to 1-inch diameter)	0
0.5	4.0	Brown, clayey silt with sand and roots (up to 1-inch diameter)	0
4.0	10.0	Dark reddish brown, lean clay with sand and black manganese nodules	0

Remarks and Notes: Observation Trench OT-4 was terminated at approximately 10.0 feet. Bulk sample was obtained from 4.0 to 10.0 feet.



Photograph 7 - Observation Trench OT-4.

Photograph 8 - Materials excavated from Observation Trench OT-4.

OBSERVATION TRENCH LOG	
Project Name: TVA Kingston Proposed Gypsum Stack Borrow Area	**Logged By:** Todd Justice
Project Number: 3043051030/01	**Date Logged:** 6/28/05
Observation Trench Number: OT-5	**Degrees/Minutes (GPS):** N35° 53.826' W84° 30.272'

Depth (Feet)		**Stratum Description**	**Chert %**
From	**To**		
0	1.0	Topsoil with roots (up to 1-inch diameter)	0
1.0	2.0	Light brown, clayey silt with roots (up to 1-inch diameter)	0
2.0	10.0	Reddish orange, fat clay with chert fragments	5

Remarks and Notes: Majority of chert encountered was severely weathered. Observation Trench OT-5 was terminated at approximately 10.0 feet. Bulk sample was obtained from 2.0 to 10.0 feet.

Photograph 9 - Observation Trench OT-5.

Photograph 10 - Materials excavated from Observation Trench OT-5.

APPENDIX C

LABORATORY TEST PROCEDURES

LABORATORY TEST RESULTS

LABORATORY TEST PROCEDURES

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.

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.

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. The percentage of clay, silt, sand, and gravel which are given on the individual particle size analysis sheets presented later in this appendix, were obtained on particle size boundaries in accordance with AASHTO M145-94 (1995).

Specific Gravity

The specific gravity of soil solids is the ratio of the mass of a unit volume of a soil solids to the mass of the same volume of gas-free distilled water at 20C. The test method for determining the specific gravity of soil solids that passes the 4.75-mm (No. 4) sieve using a water pycnometer is described in ASTM D 854, Method B, "Test Methods for Specific Gravity of Soil Solids by Water Pycnometer".

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 (Pounds)	Hammer Fall (Inches)	Mold Diameter (Inches)	Screen Size (Material Finer Than)	Number of Layers	Number of Blows per Layer
Standard (D 698)	A	5.5	12	4	No. 4 sieve	3	25
	B	5.5	12	4	No. 3/8" sieve	3	25
	C	5.5	12	6	3/4" sieve	3	56
Modified (D 1557)	A	10	18	4	No. 4 sieve	5	25
	B	10	18	4	No. 3/8" sieve	5	25
	C	10	18	6	3/4" sieve	5	56

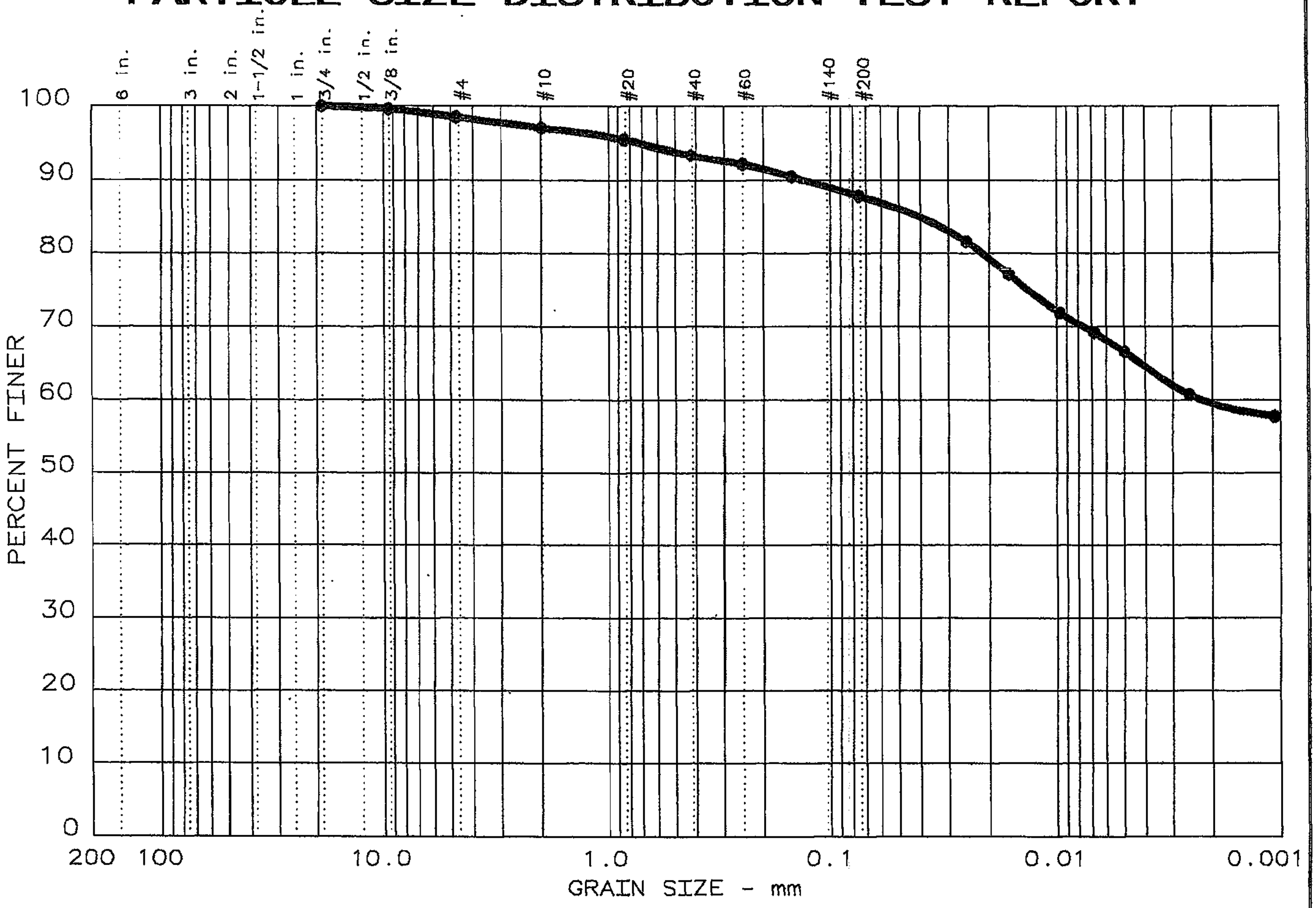
Test results are presented as a curve depicting dry unit weight versus moisture content. The compaction method used and any deviations from the recommended procedures are noted in the report.

Constant Head Permeability Test

The test was performed on undisturbed and remolded samples. The physical dimensions and weight were obtained and the sample was encased in a rubber membrane and placed in a triaxial chamber. The sample was then back-pressure saturated until a B value of 0.95 or greater was reached. After saturation was obtained, the sample was consolidated under 10-psi confining stress. Upon completion of consolidation, a constant head permeability test was performed.

GRAIN SIZE ANALYSIS TEST RESULTS

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	11	0.0	1.5	10.7	21.2	66.6	CH	58	29

SIEVE inches size	PERCENT FINER		
	●		
0.75	100.0		
0.375	99.6		
	GRAIN SIZE		
D_{60}	0.0022		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER		
	●		
4	98.5		
10	97.1		
20	95.4		
40	93.3		
60	92.2		
100	90.5		
200	87.8		

Sample information:
● Borrow area OT-1,2.5-10 Reddish orange fat clay , Sample No. 3221

Remarks:
Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T27-99; Specific Gravity: 2.75

Project No.: 3043051030.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: July 28, 2005 Fig. No.: 221

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 11

Date: July 21, 2005
Project No.: 3043051030.0001
Project: TVA Kingston - Proposed Gypsum Stack

Sample Data

Location of Sample: Borrow area OT-1,2.5-10
Sample Description 1: Reddish Orange : fat
Sample Description 2: clay, Sample No. 3221
USCS Class: CH Liquid limit: 58 Plasticity index: 29

Notes

Remarks: Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T27-99; Specific Gravity: 2.75
Fig. No.: 221

Mechanical Analysis Data

	Initial
Dry sample and tare=	801.29
Tare =	0.00
Dry sample weight =	801.29

Sample split on number 40 sieve
Split sample data:
Sample and tare = 51.73 Tare = 0 Sample weight = 51.73
Cumulative weight retained tare= 0
[illegible] for cumulative weight retained= 0

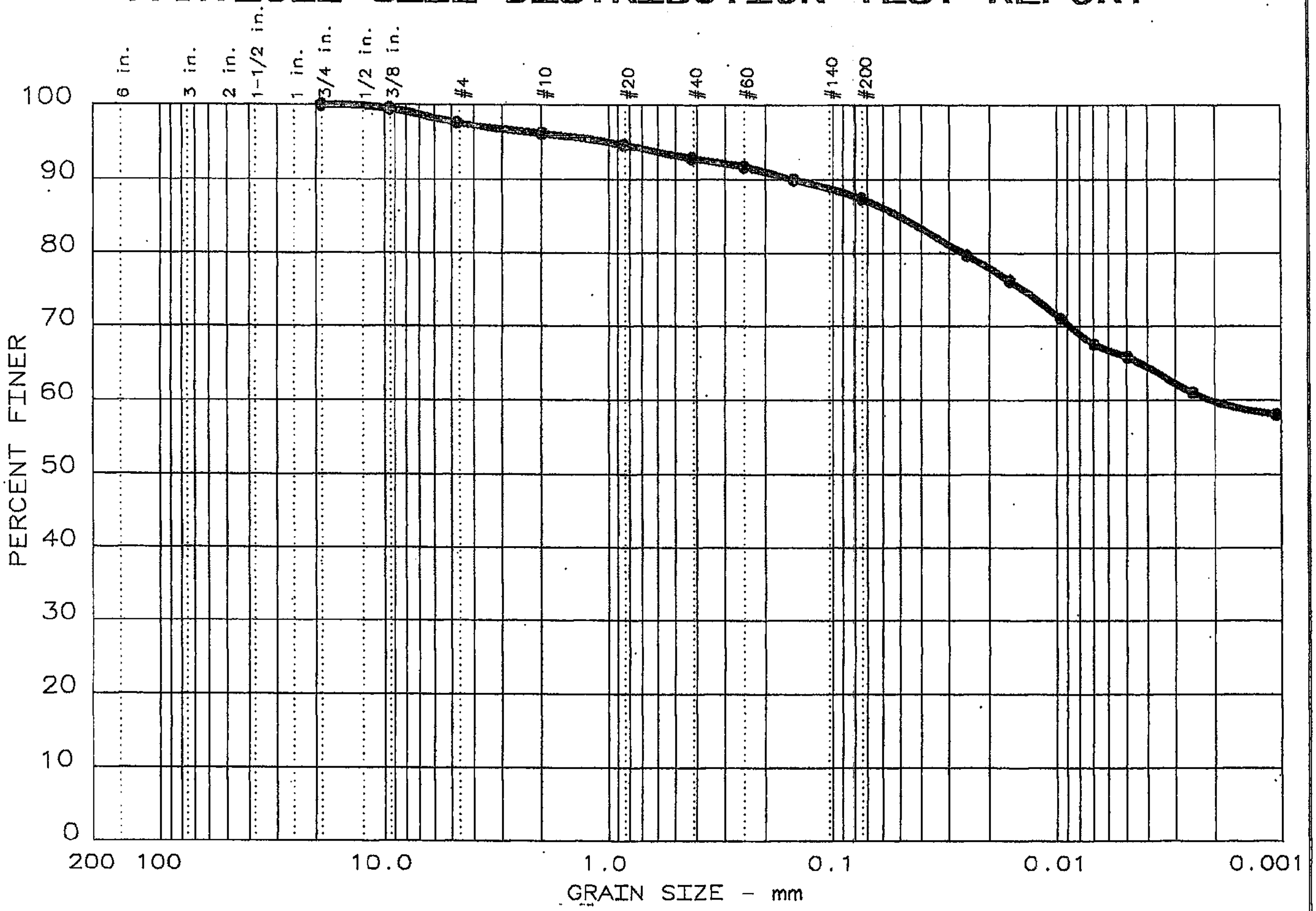
Sieve	Cumul. Wt. retained	Percent finer
0.75 inches	0.00	100.0
0.375 inches	3.44	99.6
# 4	11.78	98.5
# 10	23.63	97.1
# 20	36.62	95.4
# 40	53.40	93.3
# 60	0.64	92.2
# 100	1.58	90.5
# 200	3.08	87.8

Hydrometer Analysis Data

Separation sieve is number 40
Percent -# 40 based on complete sample= 93.3
Weight of hydrometer sample: 54.47
Hygroscopic moisture correction:
Moist weight & tare = 53.50
Dry weight & tare = 51.92
Tare = 22.22

```
  Hygroscopic moisture=   5.3 %
Calculated biased weight=  55.41
Table of composite correction values:
  Temp, deg C:    21.0    22.0    22.5    23.0    23.5
  Comp. corr:    - 6.4   - 6.1   - 5.9   - 5.8   - 5.6
Meniscus correction only= 0
Specific gravity of solids= 2.75
Specific gravity correction factor= 0.978
Hydrometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed     Temp, Actual    Corrected   K          Rm      Eff.    Diameter   Percent
  time, min   deg C reading   reading                        depth   mm         finer
     2.0      23.0  52.0      46.2        0.0128     52.0    7.8     0.0252     81.6
     5.0      23.0  49.5      43.7        0.0128     49.5    8.2     0.0163     77.2
    15.0      23.0  46.5      40.7        0.0128     46.5    8.7     0.0097     71.9
    31.0      23.0  45.0      39.2        0.0128     45.0    8.9     0.0068     69.2
    60.0      23.0  43.5      37.7        0.0128     43.5    9.2     0.0050     66.6
   250.0      22.0  40.5      34.4        0.0129     40.5    9.7     0.0025     60.7
  1441.0      23.0  38.5      32.7        0.0128     38.5   10.0     0.0011     57.7
-------------------------------------------------------------------------------------
                              Fractional Components
-------------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0     % GRAVEL =   1.5    % SAND = 10.7
% SILT = 21.2     % CLAY = 66.6

D85=   0.04  D60=   0.002
```

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	12	0.0	2.3	10.2	21.6	65.9	CH	59	33

SIEVE inches size	PERCENT FINER		
	●		
0.75	100.0		
0.375	99.5		
	GRAIN SIZE		
D_{60}	0.0020		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER		
	●		
4	97.7		
10	96.2		
20	94.6		
40	92.8		
60	91.7		
100	90.0		
200	87.5		

Sample information:

● Borrow area OT-1,2.5-10 Reddish orange fat clay , Sample No. 3222

Remarks:
Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T27-99; Specific Gravity: 2.75

Project No.: 3043051030.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: July 28, 2005 Fig. No.: 222

GRAIN SIZE DISTRIBUTION TEST DATA Test No.: 12

Date: July 20, 2005
Project No.: 3043051030.0001
P[illegible]ect: TVA Kingston - Proposed Gypsum Stack

Sample Data

Location of Sample: Borrow area OT-1,2.5-10
Sample Description 1: Reddish Orange fat
Sample Description 2: clay, Sample No. 3222
USCS Class: CH Liquid limit: 59 Plasticity index: 33

Notes

Remarks: Methods: Particle Size: ASTM D 422-63; Sieve
Analysis: AASHTO T27-99; Specific Gravity: 2.75
Fig. No.: 222

Mechanical Analysis Data

Initial
Dry sample and tare= 849.43
Tare = 0.00
Dry sample weight = 849.43
Sample split on number 40 sieve
Split sample data:
Sample and tare = 52.65 Tare = 0 Sample weight = 52.65
[illegible]mulative weight retained tare= 0
[illegible] for cumulative weight retained= 0

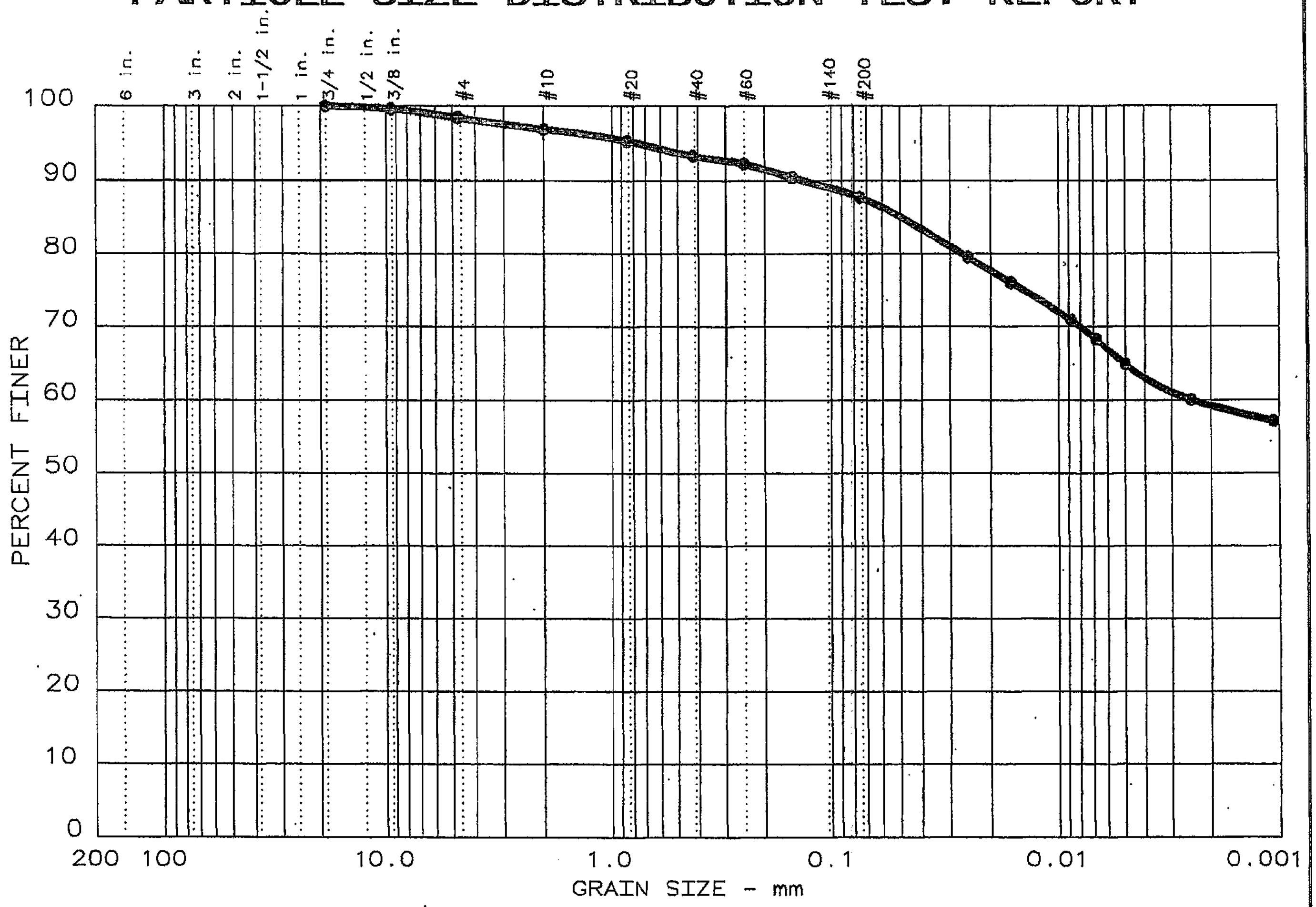
Sieve	Cumul. Wt. retained	Percent finer
0.75 inches	0.00	100.0
0.375 inches	4.13	99.5
# 4	19.88	97.7
# 10	32.60	96.2
# 20	45.53	94.6
# 40	61.10	92.8
# 60	0.62	91.7
# 100	1.58	90.0
# 200	3.02	87.5

Hydrometer Analysis Data

Separation sieve is number 40
Percent -# 40 based on complete sample= 92.8
Weight of hydrometer sample: 56.02
Hygroscopic moisture correction:
Moist weight & tare = 54.00
Dry weight & tare = 52.09
Tare = 22.27

```
  Hygroscopic moisture=   6.4 %
Calculated biased weight=  56.73
Table of composite correction values:
  Temp, deg C:    21.0    22.0    22.5    23.0    23.5
  Comp. corr:   - 6.4   - 6.1   - 5.9   - 5.8   - 5.6
Meniscus correction only= 0
Specific gravity of solids= 2.75
Specific gravity correction factor= 0.978
Hydrometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed     Temp, Actual    Corrected  K         Rm     Eff.    Diameter   Percent
  time, min   deg C reading   reading                     depth   mm         finer
     2.0      23.0  52.0      46.2       0.0128    52.0    7.8    0.0252     79.7
     5.0      23.0  50.0      44.2       0.0128    50.0    8.1    0.0163     76.2
    15.0      23.0  47.0      41.2       0.0128    47.0    8.6    0.0097     71.1
    30.0      23.0  45.0      39.2       0.0128    45.0    8.9    0.0070     67.6
    60.0      23.0  44.0      38.2       0.0128    44.0    9.1    0.0050     65.9
   250.0      22.0  41.5      35.4       0.0129    41.5    9.5    0.0025     61.1
  1440.0      23.0  39.5      33.7       0.0128    39.5    9.8    0.0011     58.1
--------------------------------------------------------------------------------
                               Fractional Components
--------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0     % GRAVEL =   2.3    % SAND = 10.2
% SILT = 21.6     % CLAY = 65.9

D85=    0.05  D60=    0.002
```

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	13	0.0	1.6	10.7	22.8	64.9	CH	60	32

SIEVE inches size	PERCENT FINER		
	●		
0.75	100.0		
0.375	99.6		
	GRAIN SIZE		
D_{60}	0.0024		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER		
	●		
4	98.4		
10	96.9		
20	95.3		
40	93.3		
60	92.2		
100	90.4		
200	87.7		

Sample information:

● Borrow area OT-1,2.5-10 Reddish orange fat clay , Sample No. 3223

Remarks:
Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T27-99; Specific Gravity: 2.75

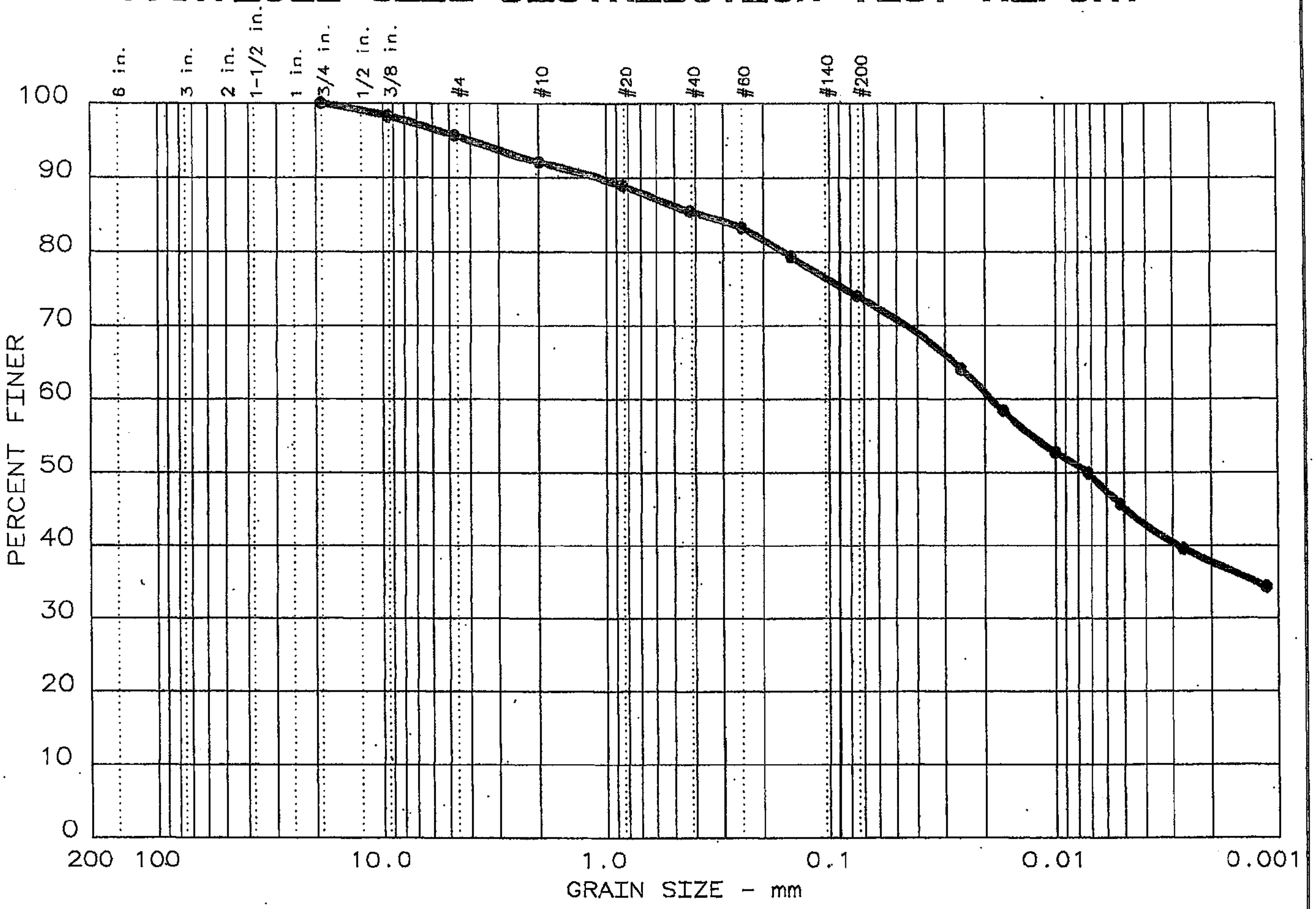
Project No.: 3043051030.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: July 28, 2005 Fig. No.: 223

```
===========================================================================
                     GRAIN SIZE DISTRIBUTION TEST DATA         Test No.: 13
---------------------------------------------------------------------------
Date: July 21, 2005
Project No.: 3043051030.0001
P[illegible]ect: TVA Kingston - Proposed Gypsum Stack
===========================================================================

---------------------------------------------------------------------------
                                Sample Data
---------------------------------------------------------------------------
Location of Sample: Borrow area OT-1,2.5-10
Sample Description 1:        Reddish Orange fat
Sample Description 2: clay, Sample No. 3223
USCS Class:  CH    Liquid limit:  60    Plasticity index:  32
---------------------------------------------------------------------------
                                   Notes
---------------------------------------------------------------------------
Remarks: Methods: Particle Size:  ASTM D 422-63; Sieve
         Analysis: AASHTO T27-99;  Specific Gravity: 2.75
Fig. No.: 223
---------------------------------------------------------------------------
                          Mechanical Analysis Data
---------------------------------------------------------------------------
                       Initial
Dry sample and tare=    821.53
Tare                =     0.00
Dry sample weight   =   821.53
Sample split on number 40 sieve
Split sample data:
  Sample and tare = 53.02  Tare =  0  Sample weight = 53.02
  [illegible]mulative weight retained tare= 0
  [illegible] for cumulative weight retained= 0
  Sieve         Cumul. Wt.   Percent
                retained      finer
  0.75  inches      0.00      100.0
  0.375 inches      3.35       99.6
  # 4              12.86       98.4
  # 10             25.56       96.9
  # 20             38.86       95.3
  # 40             55.24       93.3
  # 60              0.62       92.2
  # 100             1.66       90.4
  # 200             3.17       87.7
---------------------------------------------------------------------------
                          Hydrometer Analysis Data
---------------------------------------------------------------------------
Separation sieve is number 40
Percent -# 40 based on complete sample=  93.3
Weight of hydrometer sample: 54.24
Hygroscopic moisture correction:
  Moist weight & tare =   56.01
  Dry weight & tare   =   55.25
  Tare                =   22.22
```

```
  Hygroscopic moisture=   2.3 %
Calculated biased weight=  56.84
Table of composite correction values:
  Temp, deg C:    21.0    22.0    22.5    23.0    23.5
  Comp. corr:    - 6.4   - 6.1   - 5.9   - 5.8   - 5.6
[illegible]scus correction only= 0
[illegible]ific gravity of solids= 2.75
Specific gravity correction factor= 0.978
Hydrometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed     Temp, Actual    Corrected  K         Rm     Eff.   Diameter   Percent
  time, min   deg C reading   reading                     depth  mm         finer
     2.0      23.0  52.0      46.2       0.0128   52.0    7.8   0.0252     79.5
     5.0      23.0  50.0      44.2       0.0128   50.0    8.1   0.0163     76.1
    18.0      23.0  47.0      41.2       0.0128   47.0    8.6   0.0088     70.9
    31.0      23.0  45.5      39.7       0.0128   45.5    8.8   0.0068     68.3
    60.0      23.0  43.5      37.7       0.0128   43.5    9.2   0.0050     64.9
   266.0      22.0  41.0      34.9       0.0129   41.0    9.6   0.0025     60.1
  1440.0      23.0  39.0      33.2       0.0128   39.0    9.9   0.0011     57.1
-------------------------------------------------------------------------------
                              Fractional Components
-------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =  0.0    % GRAVEL =  1.6    % SAND = 10.7
% SILT = 22.8    % CLAY = 64.9

D85=   0.05  D60=   0.002
```

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	14	0.0	4.3	21.7	28.9	45.1	CL	47	24

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	98.3		
	GRAIN SIZE		
D_{60}	0.0186		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	95.7		
10	92.1		
20	89.0		
40	85.5		
60	83.3		
100	79.4		
200	74.0		

Sample information:

● Borrow area OT-3, 3-10' Reddish brown lean clay with sand, Sample # 3224

Remarks:
Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T27-99; Specific Gravity: 2.74

Project No.: 3043051030.0001
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Fig. No.: 224

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 14

Date: July 21, 2005
Project No.: 3043051030.0001
[illegible]ect: TVA Kingston - Proposed Gypsum Stack

Sample Data

Location of Sample: Borrow area OT-3, 3-10'
Sample Description 1: Reddish brown lean
Sample Description 2: clay w/sand,Sample 3224
USCS Class: CL Liquid limit: 47 Plasticity index: 24

Notes

Remarks: Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T27-99; Specific Gravity: 2.74
Fig. No.: 224

Mechanical Analysis Data

Initial
Dry sample and tare= 980.29
Tare = 0.00
Dry sample weight = 980.29
Sample split on number 40 sieve
Split sample data:
Sample and tare = 59.13 Tare = 0 Sample weight = 59.13
[illegible]mulative weight retained tare= 0
[illegible]e for cumulative weight retained= 0

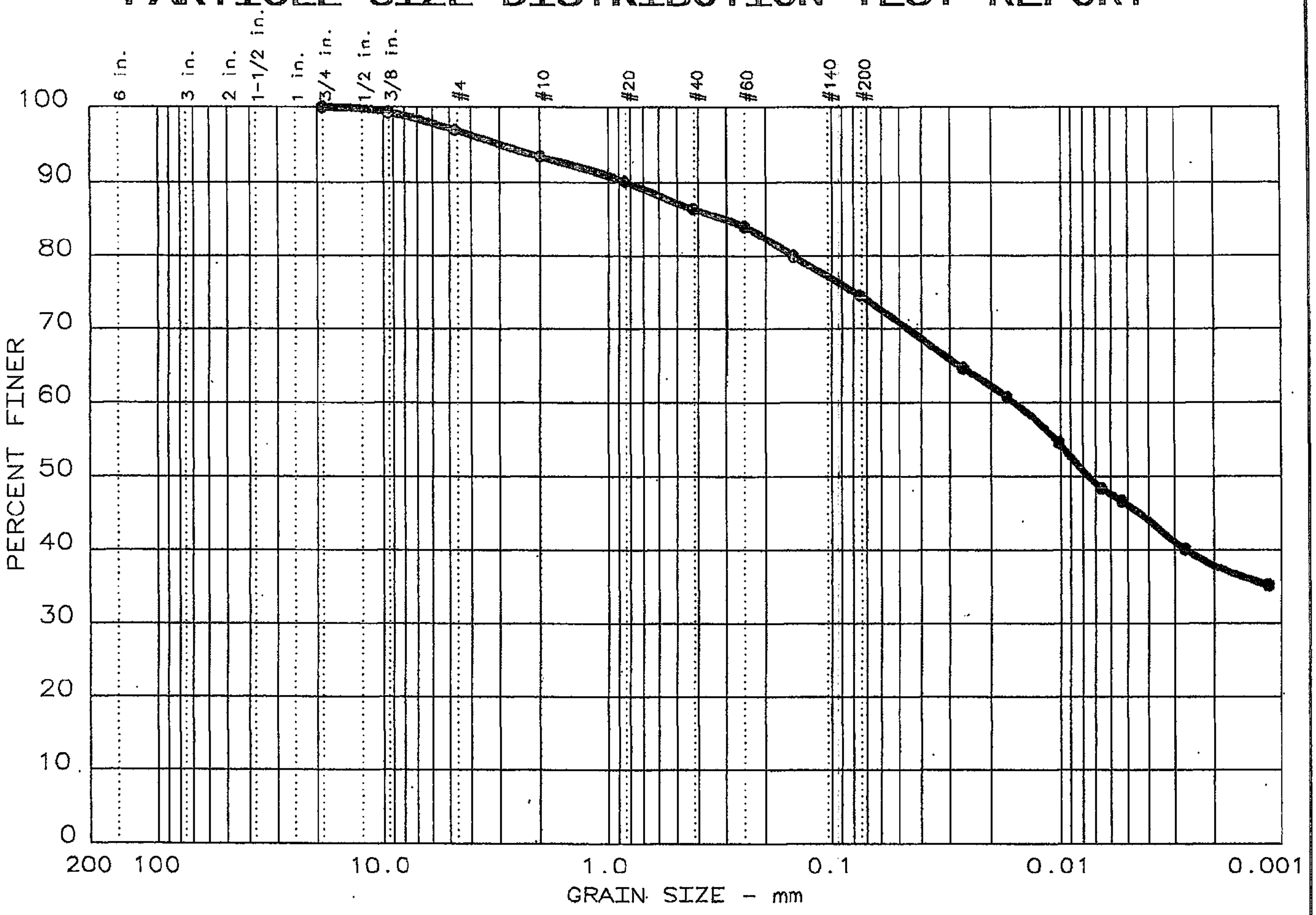
Sieve	Cumul. Wt. retained	Percent finer
0.75 inches	0.00	100.0
0.375 inches	17.15	98.3
# 4	42.37	95.7
# 10	77.60	92.1
# 20	107.68	89.0
# 40	141.66	85.5
# 60	1.55	83.3
# 100	4.26	79.4
# 200	7.96	74.0

Hydrometer Analysis Data

Separation sieve is number 40
Percent -# 40 based on complete sample= 85.5
Weight of hydrometer sample: 59.72
Hygroscopic moisture correction:
Moist weight & tare = 54.87
Dry weight & tare = 54.53
Tare = 22.14

```
  Hygroscopic moisture=   1.0 %
Calculated biased weight=  69.08
Table of composite correction values:
  Temp, deg C:    21.0    22.0    22.5    23.0    23.5
  Comp. corr:    - 6.4   - 6.1   - 5.9   - 5.8   - 5.6
M[illegible]scus correction only= 0
[illegible]ific gravity of solids= 2.74
Specific gravity correction factor= 0.980
Hydrometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed      Temp, Actual    Corrected  K          Rm      Eff.    Diameter  Percent
  time, min    deg C reading   reading                       depth   mm        finer
     2.0       23.0  51.0      45.2       0.0128    51.0     7.9    0.0255    64.2
     5.0       23.0  47.0      41.2       0.0128    47.0     8.6    0.0168    58.5
    15.0       23.0  43.0      37.2       0.0128    43.0     9.2    0.0101    52.8
    30.0       23.0  41.0      35.2       0.0128    41.0     9.6    0.0072    50.0
    60.0       23.0  38.0      32.2       0.0128    38.0    10.1    0.0052    45.7
   250.0       22.0  34.0      27.9       0.0130    34.0    10.7    0.0027    39.6
  1449.0       23.0  30.0      24.2       0.0128    30.0    11.4    0.0011    34.3
------------------------------------------------------------------------------------
                              Fractional Components
------------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0    % GRAVEL =   4.3   % SAND = 21.7
% SILT = 28.9    % CLAY = 45.1

D85=   0.37  D60=   0.019  D50=   0.007
```

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	15	0.0	3.0	22.4	28.5	46.1	CH	50	27

SIEVE inches size	PERCENT FINER		
	●		
0.75	100.0		
0.375	99.3		
	GRAIN SIZE		
D_{60}	0.0157		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER		
	●		
4	97.0		
10	93.4		
20	90.1		
40	86.4		
60	84.0		
100	80.0		
200	74.6		

Sample information:
● Borrow area OT-3, 3-10'
Reddish brown fat clay
with sand, Sample # 3225

Remarks:
Methods: Particle Size:
ASTM D 422-63; Sieve
Analysis: AASHTO T27-99;
Specific Gravity: 2.75

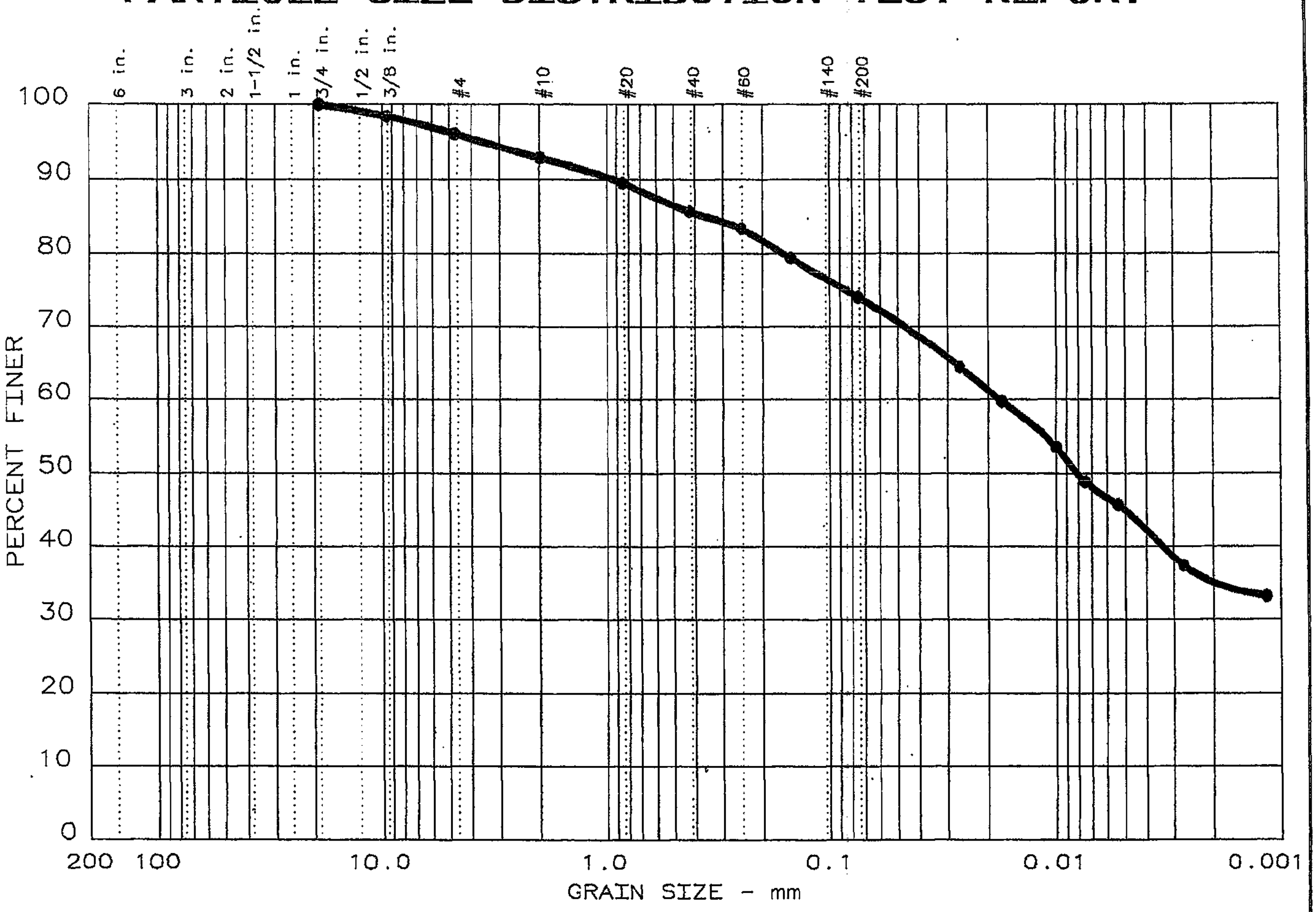
Project No.: 3043051030.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: July 28, 2005 Fig. No.: 225

```
=============================================================================
                        GRAIN SIZE DISTRIBUTION TEST DATA         Test No.: 15
-----------------------------------------------------------------------------
Date: July 21, 2005
Project No.: 3043051030.0001
[illegible]ect: TVA Kingston - Proposed Gypsum Stack
=============================================================================

-----------------------------------------------------------------------------
                                   Sample Data
-----------------------------------------------------------------------------
Location of Sample: Borrow area OT-3, 3-10'
Sample Description 1:       Reddish brown fat
Sample Description 2: clay w/sand,Sample 3225
USCS Class:  CH    Liquid limit:  50    Plasticity index:  27
-----------------------------------------------------------------------------
                                      Notes
-----------------------------------------------------------------------------
Remarks: Methods: Particle Size:  ASTM D 422-63; Sieve
         Analysis: AASHTO T27-99;  Specific Gravity: 2.75
Fig. No.: 225
-----------------------------------------------------------------------------
                             Mechanical Analysis Data
-----------------------------------------------------------------------------
                      Initial
Dry sample and tare=   836.50
Tare               =     0.00
Dry sample weight  =   836.50
Sample split on number 40 sieve
Split sample data:
  [illegible]ample and tare = 54.49  Tare =  0  Sample weight = 54.49
  [illegible]mulative weight retained tare= 0
[illegible]e for cumulative weight retained= 0
  Sieve            Cumul. Wt.   Percent
                   retained     finer
  0.75  inches        0.00      100.0
  0.375 inches        5.70       99.3
  # 4                25.34       97.0
  # 10               55.35       93.4
  # 20               82.95       90.1
  # 40              114.15       86.4
  # 60                1.51       84.0
  # 100               4.01       80.0
  # 200               7.41       74.6
-----------------------------------------------------------------------------
                             Hydrometer Analysis Data
-----------------------------------------------------------------------------
Separation sieve is number 40
Percent -# 40 based on complete sample=  86.4
Weight of hydrometer sample: 56.02
Hygroscopic moisture correction:
  Moist weight & tare =  53.51
  Dry weight & tare   =  52.66
  Tare                =  22.10
```

```
  Hygroscopic moisture=   2.8 %
Calculated biased weight=  63.12
Table of composite correction values:
  Temp, deg C:    21.0    22.0    22.5    23.0    23.5
  Comp. corr:   - 6.4   - 6.1   - 5.9   - 5.8   - 5.6
M[illegible]scus correction only= 0
S[illegible]ific gravity of solids= 2.75
Specific gravity correction factor= 0.978
Hydrometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed      Temp, Actual    Corrected  K        Rm     Eff.   Diameter   Percent
  time, min    deg C reading   reading                    depth  mm         finer
     2.0       23.0  47.5      41.7       0.0128  47.5    8.5   0.0263     64.6
     5.0       23.0  45.0      39.2       0.0128  45.0    8.9   0.0171     60.8
    15.0       23.0  41.0      35.2       0.0128  41.0    9.6   0.0102     54.6
    38.0       23.0  37.0      31.2       0.0128  37.0   10.2   0.0066     48.4
    60.0       22.5  36.0      30.1       0.0128  36.0   10.4   0.0053     46.7
   250.0       22.0  32.0      25.9       0.0129  32.0   11.0   0.0027     40.2
  1442.0       23.0  28.5      22.7       0.0128  28.5   11.6   0.0011     35.2
-------------------------------------------------------------------------------
                               Fractional Components
-------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0    % GRAVEL =   3.0    % SAND = 22.4
% SILT = 28.5    % CLAY = 46.1

D85=   0.30  D60=   0.016  D50=   0.007
```

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	16	0.0	3.9	22.0	29.2	44.9	CL	45	23

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	98.4		
	GRAIN SIZE		
D_{60}	0.0176		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	96.1		
10	92.9		
20	89.5		
40	85.7		
60	83.4		
100	79.4		
200	74.1		

Sample information:

● Borrow area OT-3, 3-10' Reddish brown lean clay with sand, Sample # 3226

Remarks:
Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T27-99; Specific Gravity: 2.73

Project No.: 3043051030.0001
Project: TVA Kingston - Proposed Gypsum Stack
Date: July 21, 2005 Fig. No.: 226

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 16

Date: July 21, 2005
Project No.: 3043051030.0001
[illegible]ect: TVA Kingston - Proposed Gypsum Stack

Sample Data

Location of Sample: Borrow area OT-3, 3-10'
Sample Description 1: Reddish brown lean
Sample Description 2: clay w/sand,Sample 3226
USCS Class: CL Liquid limit: 45 Plasticity index: 23

Notes

Remarks: Methods: Particle Size: ASTM D 422-63; Sieve
Analysis: AASHTO T27-99; Specific Gravity: 2.73
Fig. No.: 226

Mechanical Analysis Data

	Initial
Dry sample and tare=	902.40
Tare =	0.00
Dry sample weight =	902.40

Sample split on number 40 sieve
Split sample data:
[illegible]ample and tare = 53.77 Tare = 0 Sample weight = 53.77
[illegible]mulative weight retained tare= 0
[illegible]e for cumulative weight retained= 0

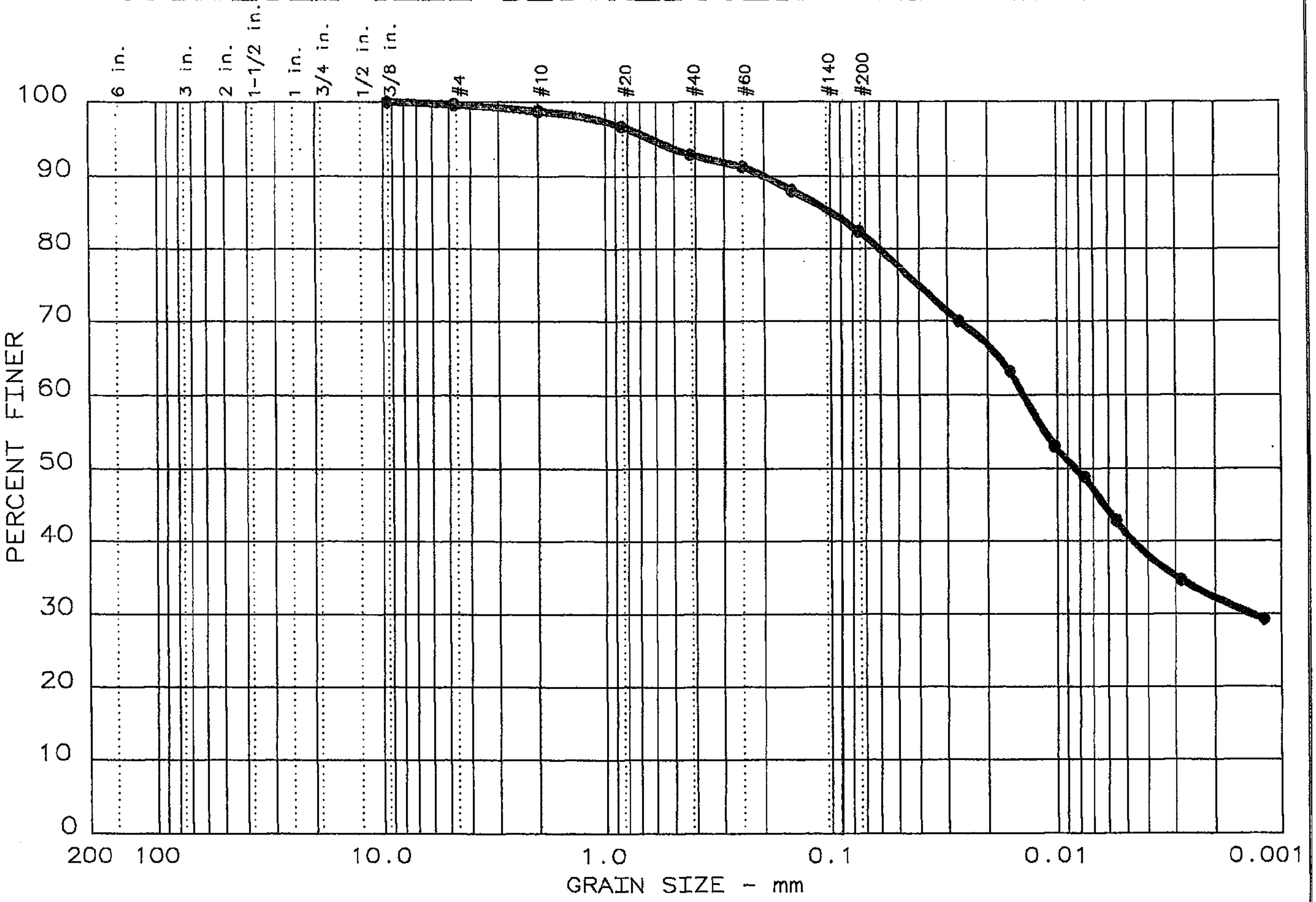
Sieve	Cumul. Wt. retained	Percent finer
0.75 inches	0.00	100.0
0.375 inches	14.25	98.4
# 4	35.33	96.1
# 10	64.17	92.9
# 20	94.51	89.5
# 40	129.34	85.7
# 60	1.45	83.4
# 100	3.95	79.4
# 200	7.29	74.1

Hydrometer Analysis Data

Separation sieve is number 40
Percent -# 40 based on complete sample= 85.7
Weight of hydrometer sample: 56.14
Hygroscopic moisture correction:
Moist weight & tare = 53.13
Dry weight & tare = 51.84
Tare = 22.50

```
  Hygroscopic moisture=   4.4 %
Calculated biased weight=  62.77
Table of composite correction values:
  Temp, deg C:    21.0    22.0    22.5    23.0    24.0
  Comp. corr:    - 6.4   - 6.1   - 5.9   - 5.8   - 5.4
[illegible]scus correction only= 0
[illegible]cific gravity of solids= 2.73
Specific gravity correction factor= 0.983
Hydrometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed     Temp, Actual     Corrected  K        Rm      Eff.    Diameter   Percent
  time, min   deg C reading    reading                     depth   mm         finer
     2.0      23.0  47.0       41.2       0.0128   47.0     8.6    0.0266     64.5
     5.0      23.0  44.0       38.2       0.0128   44.0     9.1    0.0173     59.8
    16.0      23.0  40.0       34.2       0.0128   40.0     9.7    0.0100     53.5
    30.0      23.0  37.0       31.2       0.0128   37.0    10.2    0.0075     48.8
    60.0      23.0  35.0       29.2       0.0128   35.0    10.6    0.0054     45.7
   260.0      22.0  30.0       23.9       0.0130   30.0    11.4    0.0027     37.4
  1441.0      23.0  27.0       21.2       0.0128   27.0    11.9    0.0012     33.2
-----------------------------------------------------------------------------
                              Fractional Components
-----------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0     % GRAVEL =   3.9    % SAND = 22.0
% SILT = 29.2     % CLAY = 44.9

D85=   0.36   D60=    0.018   D50=    0.008
```

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	17	0.0	0.4	17.2	41.4	41.0	CL	36	17

SIEVE inches size	PERCENT FINER ●		
0.375	100.0		
	GRAIN SIZE		
D_{60}	0.0138		
D_{30}	0.0014		
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	99.6		
10	98.8		
20	96.7		
40	92.9		
60	91.2		
100	88.0		
200	82.4		

Sample information:
● Borrow area OT-4, 4-10'
Dark red brown lean
clay w/sand, Sample 3227

Remarks:
Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T27-99; Specific Gravity: 2.72

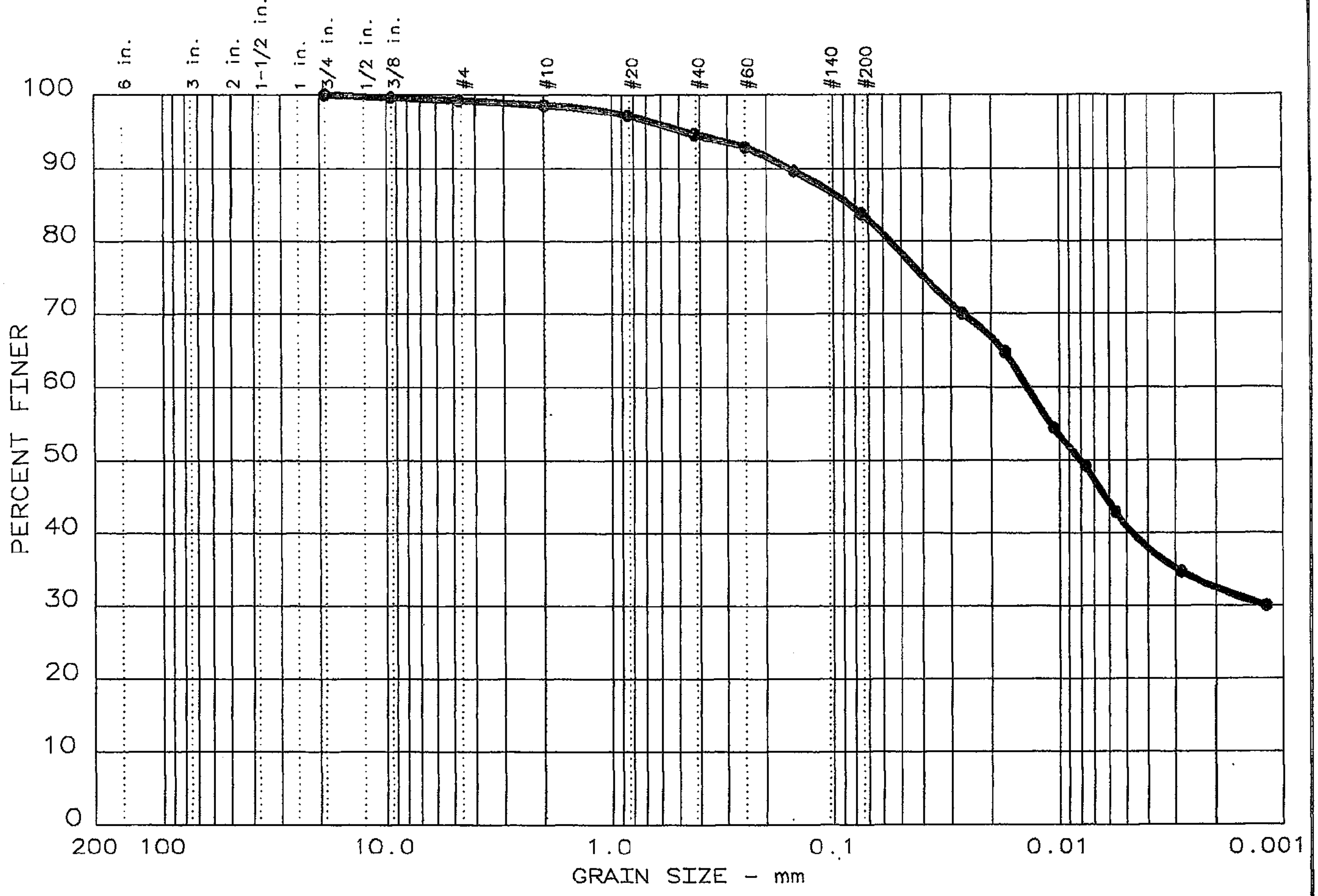
Project No.: 3043051030.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: July 21, 2005 Fig. No.: 227

```
==============================================================================
                      GRAIN SIZE DISTRIBUTION TEST DATA          Test No.: 17
------------------------------------------------------------------------------
Date: July 21, 2005
[illegible]ect No.: 3043051030.0001
[illegible]ect: TVA Kingston - Proposed Gypsum Stack
==============================================================================

------------------------------------------------------------------------------
                                 Sample Data
------------------------------------------------------------------------------
Location of Sample: Borrow area OT-4, 4-10'
Sample Description 1: Dark red brown lean
Sample Description 2: clay with sand, # 3227
USCS Class:  CL    Liquid limit:  36    Plasticity index:  17
------------------------------------------------------------------------------
                                    Notes
------------------------------------------------------------------------------
Remarks: Methods: Particle Size:  ASTM D 422-63; Sieve
         Analysis: AASHTO T27-99;  Specific Gravity: 2.72
Fig. No.: 227
------------------------------------------------------------------------------
                           Mechanical Analysis Data
------------------------------------------------------------------------------
                       Initial
Dry sample and tare=   766.97
Tare               =     0.00
Dry sample weight  =   766.97
Sample split on number 40 sieve
Split sample data:
[illegible]mple and tare = 53.78  Tare =  0  Sample weight = 53.78
[illegible]mulative weight retained tare= 0
Tare for cumulative weight retained= 0
  Sieve           Cumul. Wt.   Percent
                  retained     finer
  0.375 inches       0.00      100.0
  # 4                2.93       99.6
  # 10               9.58       98.8
  # 20              25.58       96.7
  # 40              54.33       92.9
  # 60               0.99       91.2
  # 100              2.84       88.0
  # 200              6.09       82.4
------------------------------------------------------------------------------
                           Hydrometer Analysis Data
------------------------------------------------------------------------------
Separation sieve is number 40
Percent -# 40 based on complete sample=  92.9
Weight of hydrometer sample: 54.91
Hygroscopic moisture correction:
  Moist weight & tare =  53.25
  Dry weight & tare   =  52.62
  Tare                =  21.93
  Hygroscopic moisture=   2.1 %
```

```
Calculated biased weight=  57.91
Table of composite correction values:
  Temp, deg C:    21.0    22.0    22.5    23.0    24.0
  Comp. corr:    - 6.4   - 6.1   - 5.9   - 5.8   - 5.4
M[illegible]iscus correction only= 0
[illegible]ific gravity of solids= 2.72
Specific gravity correction factor= 0.985
Hydrometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed     Temp, Actual   Corrected  K         Rm      Eff.    Diameter   Percent
  time, min   deg C reading  reading                      depth   mm         finer
     2.0      23.0  47.0     41.2       0.0129   47.0     8.6    0.0267     70.1
     6.0      23.0  43.0     37.2       0.0129   43.0     9.2    0.0160     63.3
    16.0      23.0  37.0     31.2       0.0129   37.0    10.2    0.0103     53.1
    30.0      23.0  34.5     28.7       0.0129   34.5    10.6    0.0077     48.8
    60.0      23.0  31.0     25.2       0.0129   31.0    11.2    0.0056     42.8
   250.0      22.0  26.5     20.4       0.0130   26.5    11.9    0.0029     34.7
  1440.0      23.0  23.0     17.2       0.0129   23.0    12.5    0.0012     29.2
---------------------------------------------------------------------------------
                              Fractional Components
---------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0     % GRAVEL =   0.4    % SAND = 17.2
% SILT = 41.4     % CLAY = 41.0

D85=    0.10  D60=    0.014  D50=    0.008
D30=    0.0014
```

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	18	0.0	0.8	15.4	42.9	40.9	CL	38	18

SIEVE inches size	PERCENT FINER ●		
0.75	100.0		
0.375	99.6		

	GRAIN SIZE		
D_{60}	0.0138		
D_{30}			
D_{10}			

	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ●		
4	99.2		
10	98.6		
20	97.2		
40	94.6		
60	92.9		
100	89.7		
200	83.8		

Sample information:

● Borrow area OT-4, 4-10'
Dark red brown lean
clay w/sand, Sample 3228

Remarks:
Methods: Particle Size:
ASTM D 422-63; Sieve
Analysis: AASHTO T27-99;
Specific Gravity: 2.73

Project No.: 3043051030.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: July 21, 2005 Fig. No.: 228

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 18

Date: July 21, 2005
P[illegible]ect No.: 3043051030.0001
[illegible]ect: TVA Kingston - Proposed Gypsum Stack

Sample Data

Location of Sample: Borrow area OT-4, 4-10'
Sample Description 1: Dark red brown lean
Sample Description 2: clay with sand, # 3228
USCS Class: CL Liquid limit: 38 Plasticity index: 18

Notes

Remarks: Methods: Particle Size: ASTM D 422-63; Sieve
Analysis: AASHTO T27-99; Specific Gravity: 2.73
Fig. No.: 228

Mechanical Analysis Data

	Initial
Dry sample and tare=	736.29
Tare =	0.00
Dry sample weight =	736.29

Sample split on number 40 sieve
Split sample data:
[illegible]mple and tare = 53.35 Tare = 0 Sample weight = 53.35
[illegible]mulative weight retained tare= 0
Tare for cumulative weight retained= 0

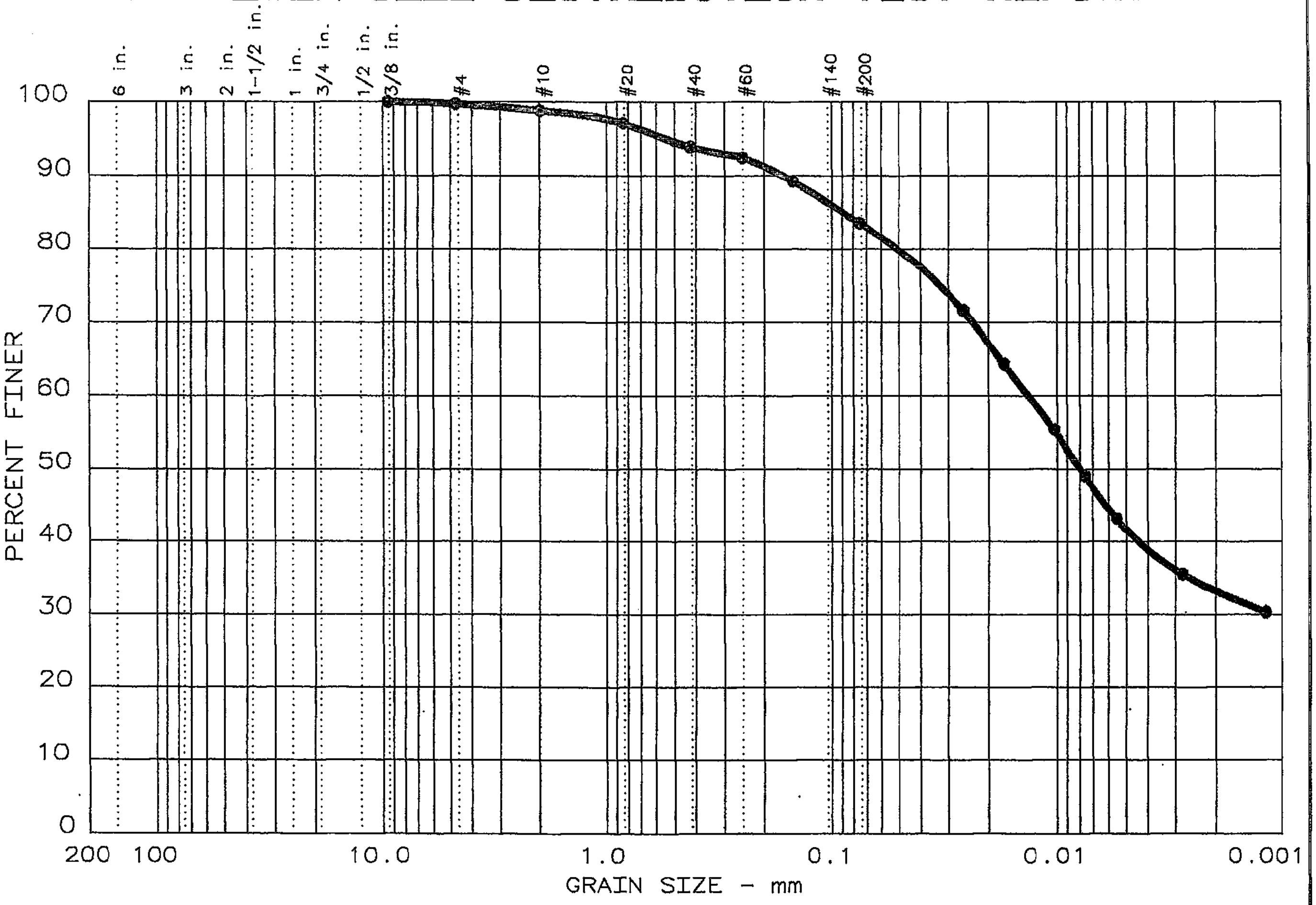
Sieve	Cumul. Wt. retained	Percent finer
0.75 inches	0.00	100.0
0.375 inches	3.01	99.6
# 4	5.77	99.2
# 10	10.49	98.6
# 20	20.88	97.2
# 40	39.58	94.6
# 60	0.97	92.9
# 100	2.79	89.7
# 200	6.11	83.8

Hydrometer Analysis Data

Separation sieve is number 40
Percent -# 40 based on complete sample= 94.6
Weight of hydrometer sample: 53.99
Hygroscopic moisture correction:
Moist weight & tare = 53.35
Dry weight & tare = 52.97
Tare = 22.26

```
  Hygroscopic moisture=   1.2 %
Calculated biased weight=  56.36
Table of composite correction values:
  Temp, deg C:    21.0    22.0    22.5    23.0    24.0
[illegible]mp. corr:    - 6.4   - 6.1   - 5.9   - 5.8   - 5.4
[illegible]scus correction only= 0
Specific gravity of solids= 2.73
Specific gravity correction factor= 0.983
Hydrometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed     Temp, Actual    Corrected  K         Rm     Eff.    Diameter   Percent
  time, min   deg C reading   reading                     depth   mm         finer
     2.0      23.0  46.0      40.2       0.0128    46.0    8.8    0.0269     70.1
     5.0      23.0  43.0      37.2       0.0128    43.0    9.2    0.0175     64.9
    15.0      23.0  37.0      31.2       0.0128    37.0   10.2    0.0106     54.4
    30.0      23.0  34.0      28.2       0.0128    34.0   10.7    0.0077     49.2
    60.0      22.5  30.5      24.6       0.0129    30.5   11.3    0.0056     42.9
   250.0      22.0  26.0      19.9       0.0130    26.0   12.0    0.0029     34.7
  1444.0      23.0  23.0      17.2       0.0128    23.0   12.5    0.0012     30.0
------------------------------------------------------------------------------------
                              Fractional Components
------------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0     % GRAVEL =   0.8    % SAND = 15.4
% SILT = 42.9     % CLAY = 40.9

D85=   0.08  D60=   0.014  D50=   0.008
```

PARTICLE SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY	USCS	LL	PI
●	19	0.0	0.3	16.2	41.9	41.6	CL	39	20

SIEVE inches size	PERCENT FINER		
	●		
0.375	100.0		
	GRAIN SIZE		
D_{60}	0.0132		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER		
	●		
4	99.7		
10	98.8		
20	97.1		
40	93.9		
60	92.4		
100	89.3		
200	83.5		

Sample information:
● Borrow area OT-4, 4-10'
Dark red brown lean
clay w/sand, Sample 3229

Remarks:
Methods: Particle Size:
ASTM D 422-63; Sieve
Analysis: AASHTO T27-99;
Specific Gravity: 2.73

Project No.: 3043051030.0001
Project: TVA Kingston - Proposed Gypsum Stack

Date: July 21, 2005 Fig. No.: 229

GRAIN SIZE DISTRIBUTION TEST DATA

Test No.: 19

Date: July 21, 2005
P[illegible]ect No.: 3043051030.0001
[illegible]ect: TVA Kingston - Proposed Gypsum Stack

Sample Data

Location of Sample: Borrow area OT-4, 4-10'
Sample Description 1: Dark red brown lean
Sample Description 2: clay with sand, # 3229
USCS Class: CL   Liquid limit: 39   Plasticity index: 20

Notes

Remarks: Methods: Particle Size: ASTM D 422-63; Sieve Analysis: AASHTO T27-99; Specific Gravity: 2.73
Fig. No.: 229

Mechanical Analysis Data

	Initial
Dry sample and tare=	662.70
Tare =	0.00
Dry sample weight =	662.70

Sample split on number 40 sieve
Split sample data:
[illegible]mple and tare = 56.92   Tare = 0   Sample weight = 56.92
[illegible]mulative weight retained tare= 0
Tare for cumulative weight retained= 0

Sieve	Cumul. Wt. retained	Percent finer
0.375 inches	0.00	100.0
# 4	1.90	99.7
# 10	7.78	98.8
# 20	19.16	97.1
# 40	40.45	93.9
# 60	0.89	92.4
# 100	2.81	89.3
# 200	6.30	83.5

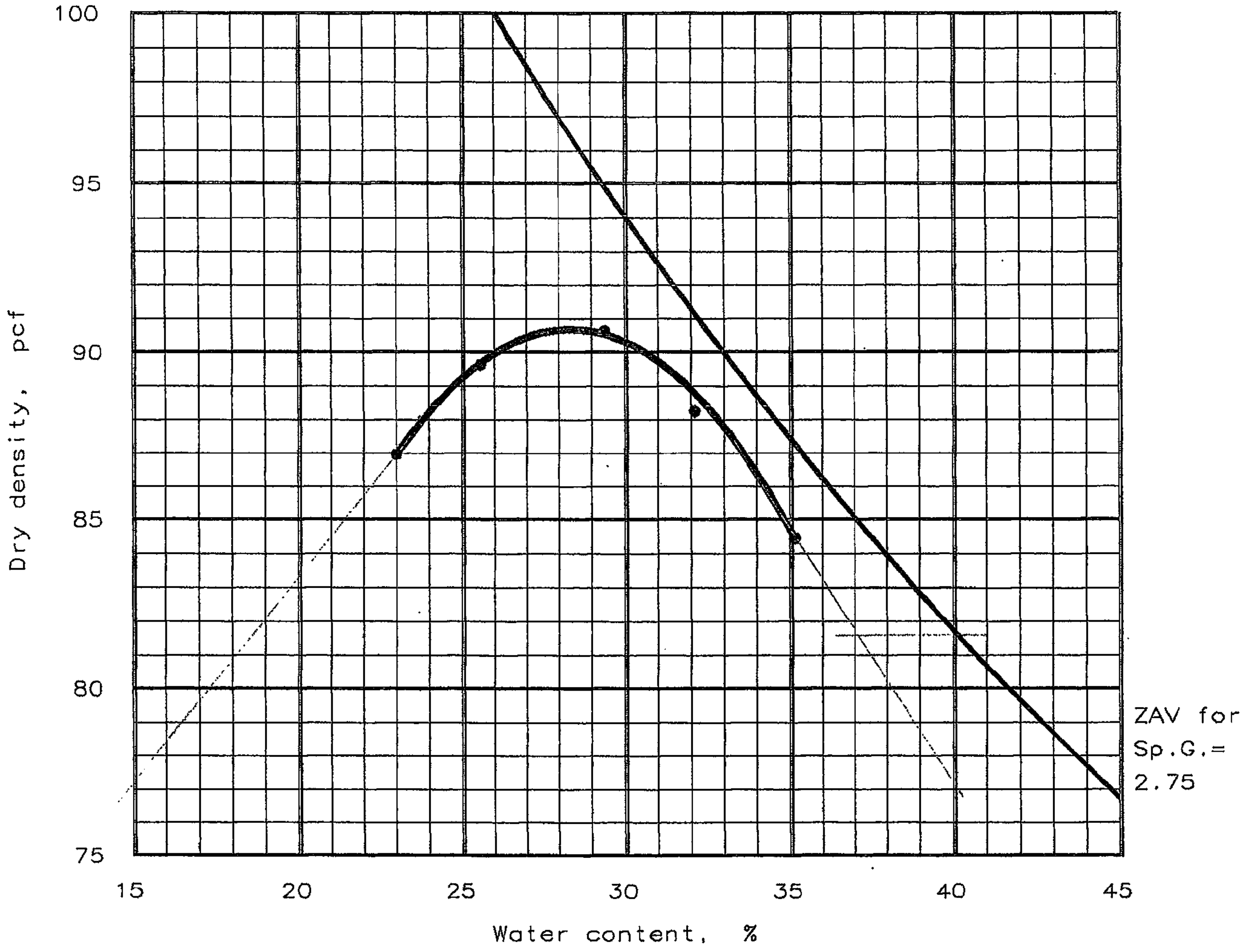
Hydrometer Analysis Data

Separation sieve is number 40
Percent -# 40 based on complete sample= 93.9
Weight of hydrometer sample: 58.34
Hygroscopic moisture correction:
  Moist weight & tare = 53.55
  Dry weight & tare = 52.77
  Tare = 21.97
  Hygroscopic moisture= 2.5 %

```
Calculated biased weight=  60.60
Table of composite correction values:
  Temp, deg C:    21.0    22.0    22.5    23.0    24.0
  Comp. corr:    - 6.4   - 6.1   - 5.9   - 5.8   - 5.4
M[illegible]scus correction only= 0
[illegible]ific gravity of solids= 2.73
Specific gravity correction factor= 0.983
Hydrometer type: 152H   Effective depth L= 16.294964 - 0.164 x Rm

  Elapsed     Temp, Actual    Corrected   K        Rm     Eff.   Diameter   Percent
  time, min   deg C reading   reading                     depth  mm         finer
     2.0      23.0  50.0      44.2        0.0128   50.0    8.1   0.0258     71.7
     5.0      23.0  45.5      39.7        0.0128   45.5    8.8   0.0171     64.4
    15.0      23.0  40.0      34.2        0.0128   40.0    9.7   0.0103     55.5
    30.0      23.0  36.0      30.2        0.0128   36.0   10.4   0.0076     49.0
    60.0      22.5  32.5      26.6        0.0129   32.5   11.0   0.0055     43.1
   250.0      22.0  28.0      21.9        0.0130   28.0   11.7   0.0028     35.5
  1440.0      23.0  24.5      18.7        0.0128   24.5   12.3   0.0012     30.3
-------------------------------------------------------------------------------
                              Fractional Components
-------------------------------------------------------------------------------
Gravel/Sand based on #4 sieve
Sand/Fines based on #200 sieve
% + 3 in. =   0.0     % GRAVEL =   0.3    % SAND = 16.2
% SILT = 41.9     % CLAY = 41.6

D85=   0.09  D60=   0.013  D50=   0.008
```

MOISTURE-DENSITY RELATIONSHIP TEST RESULTS

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
2.5-10	CH	A-7-6(16)	24.6 %	2.75	58	29	0.4 %	87.8 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 90.7 pcf Optimum moisture = 28.3 %	Reddish orange fat clay

Project No.: 3043051030.0001

Project: TVA Kingston - Proposed Gypsum Stack

Location: Borrow Area Observation Trench OT-1

Date: 7-28-2005

MOISTURE-DENSITY RELATIONSHIP TEST

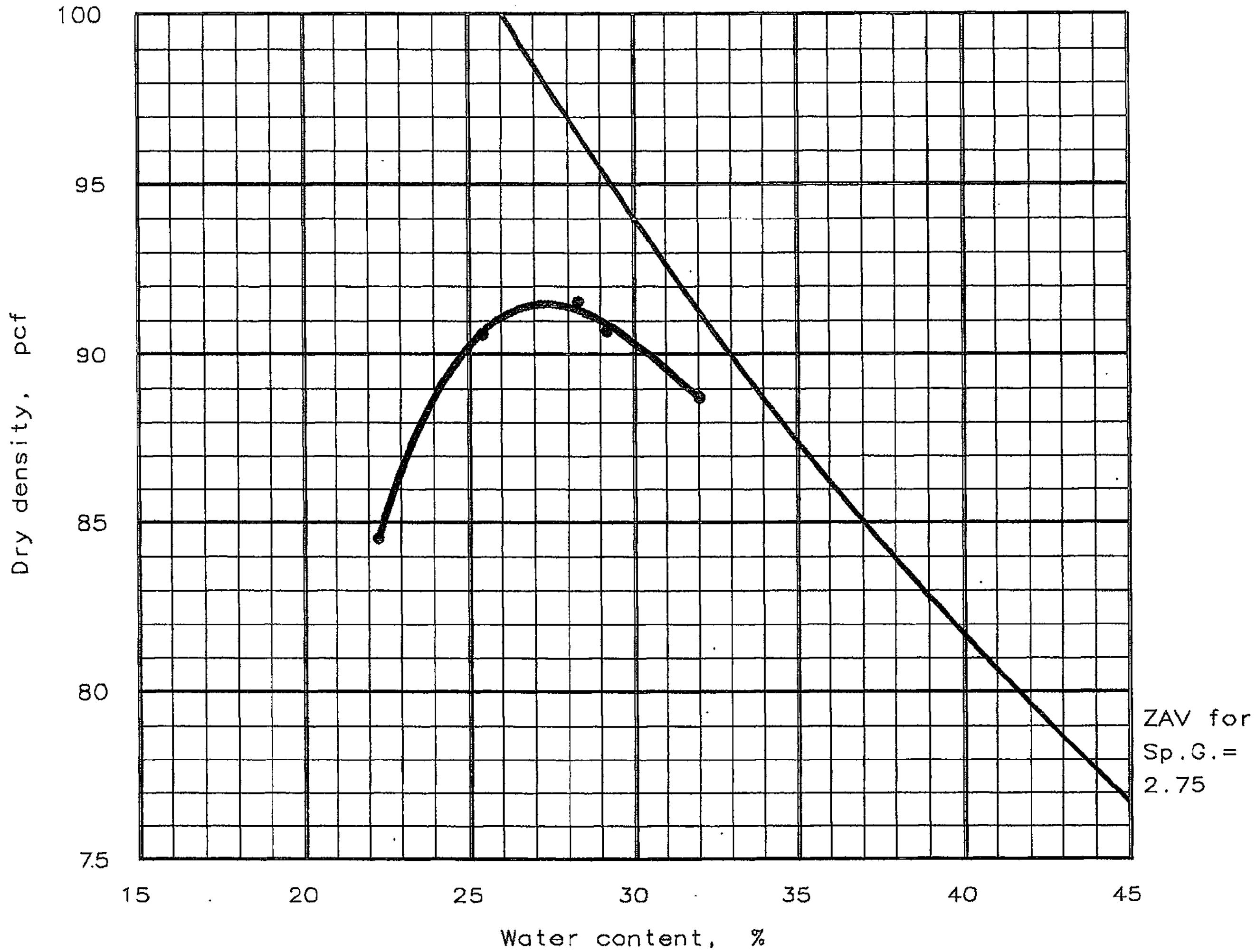
Remarks:

Sample Number 3221

TIP - Test In Progress

NT - No Test

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
2.5-10	CH	A-7-6(32)	24.6 %	2.75	59	33	0.5 %	87.5 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 91.6 pcf Optimum moisture = 28.3 %	Reddish orange fat clay

Project No.: 3043051030.0001

Project: TVA Kingston - Proposed Gypsum Stack

Location: Borrow Area Observation Trench OT-1

Date: 7-28-2005

MOISTURE-DENSITY RELATIONSHIP TEST

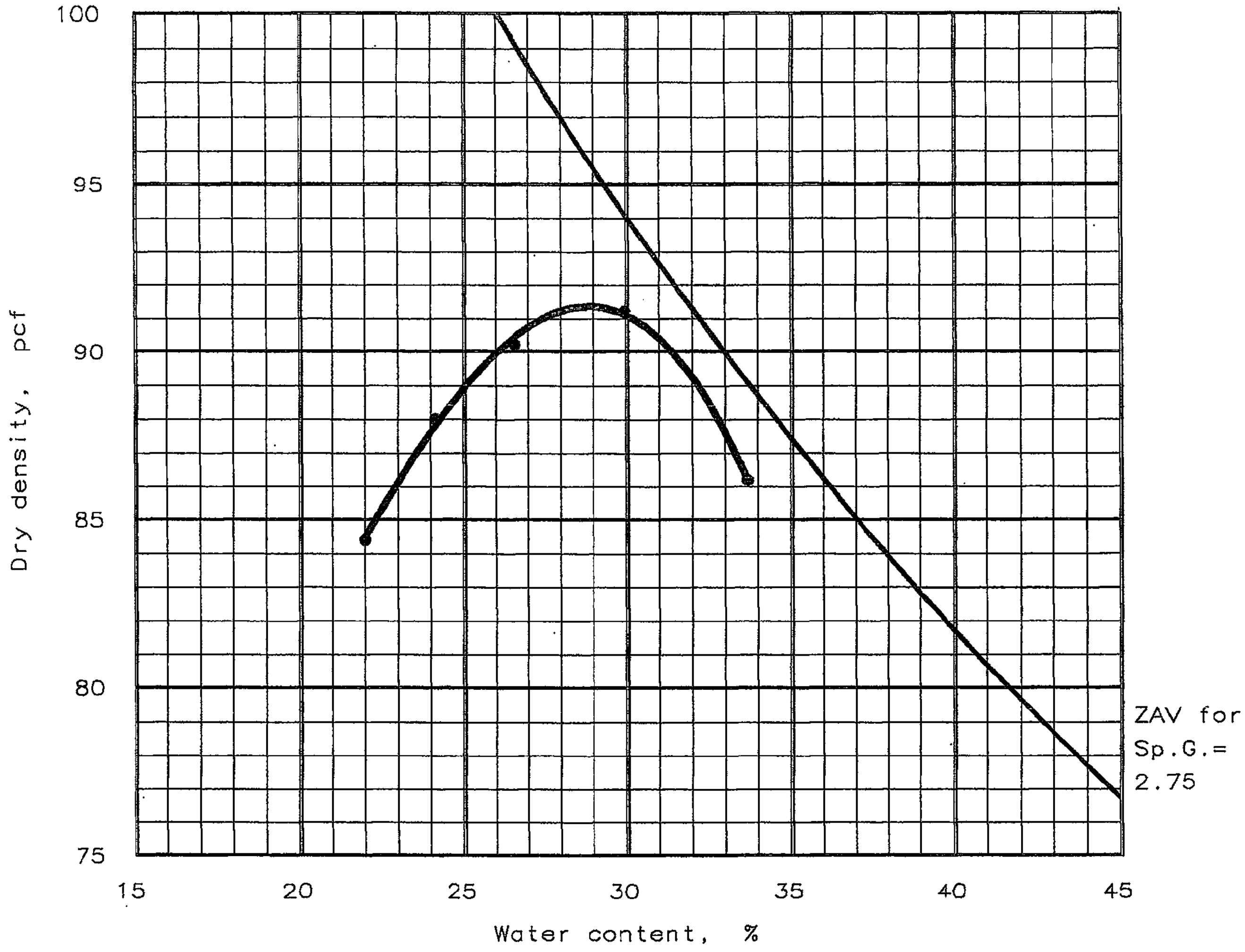
Remarks:

Sample Number 3222

TIP - Test In Progress

NT - No Test

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
2.5-10	CH	A-7-6(32)	24.6 %	2.75	60	32	0.4 %	87.7 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 91.4 pcf Optimum moisture = 28.8 %	Reddish orange fat clay

Project No.: 3043051030.0001

Project: TVA Kingston - Proposed Gypsum Stack

Location: Borrow Area Observation Trench OT-1

Date: 7-28-2005

MOISTURE-DENSITY RELATIONSHIP TEST

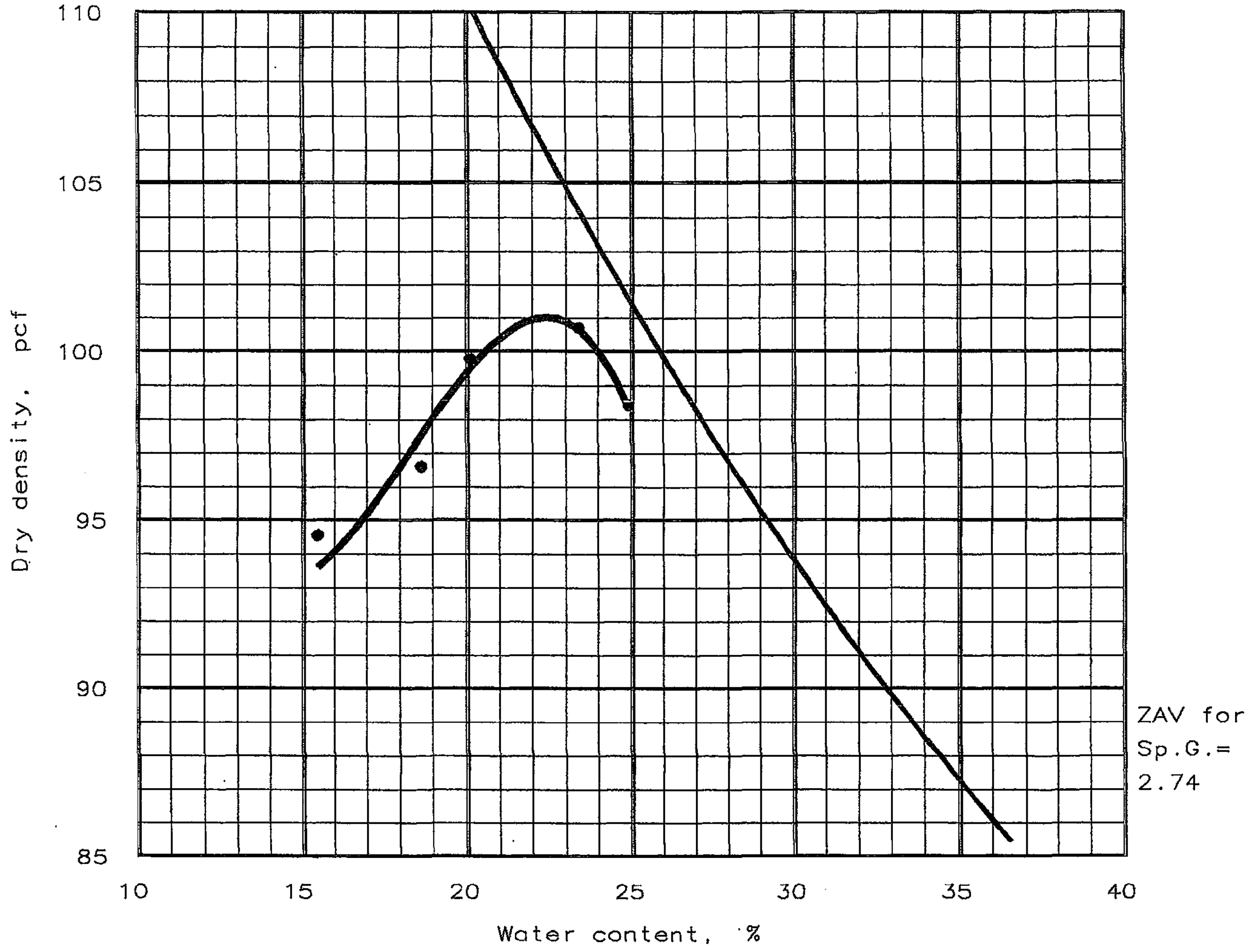
Remarks:

Sample Number 3223

TIP - Test In Progress

NT - No Test

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
3-10'	CL	A-7-6(17)	23.3 %	2.74	47	24	1.7 %	74.0 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 101.0 pcf Optimum moisture = 22.4 %	Reddish brown lean clay with sand

Project No.: 3043051030.0001

Project: TVA Kingston - Proposed Gypsum Stack

Location: Borrow Area Observation Trench OT-3

Date: 7-28-2005

MOISTURE-DENSITY RELATIONSHIP TEST

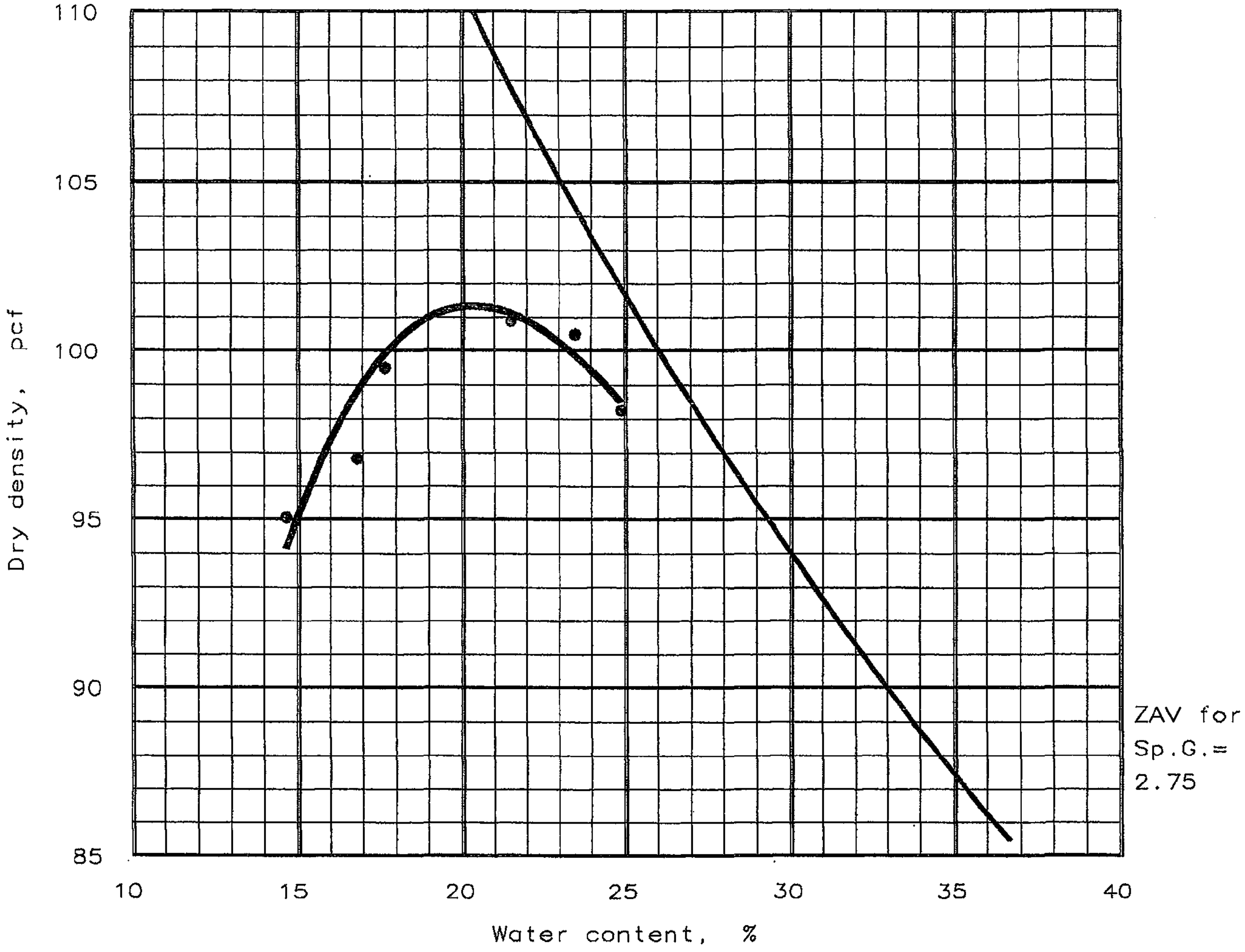
Remarks:

Sample Number 3224

TIP - Test In Progress

NT - No Test

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
3-10'	CH	A-7-6(20)	23.3 %	2.75	50	27	0.7 %	74.6 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 101.3 pcf Optimum moisture = 20.3 %	Reddish brown fat cloy with sand

Project No.: 3043051030.0001

Project: TVA Kingston - Proposed Gypsum Stack

Location: Borrow Area Observation Trench OT-3

Date: 7-28-2005

MOISTURE-DENSITY RELATIONSHIP TEST

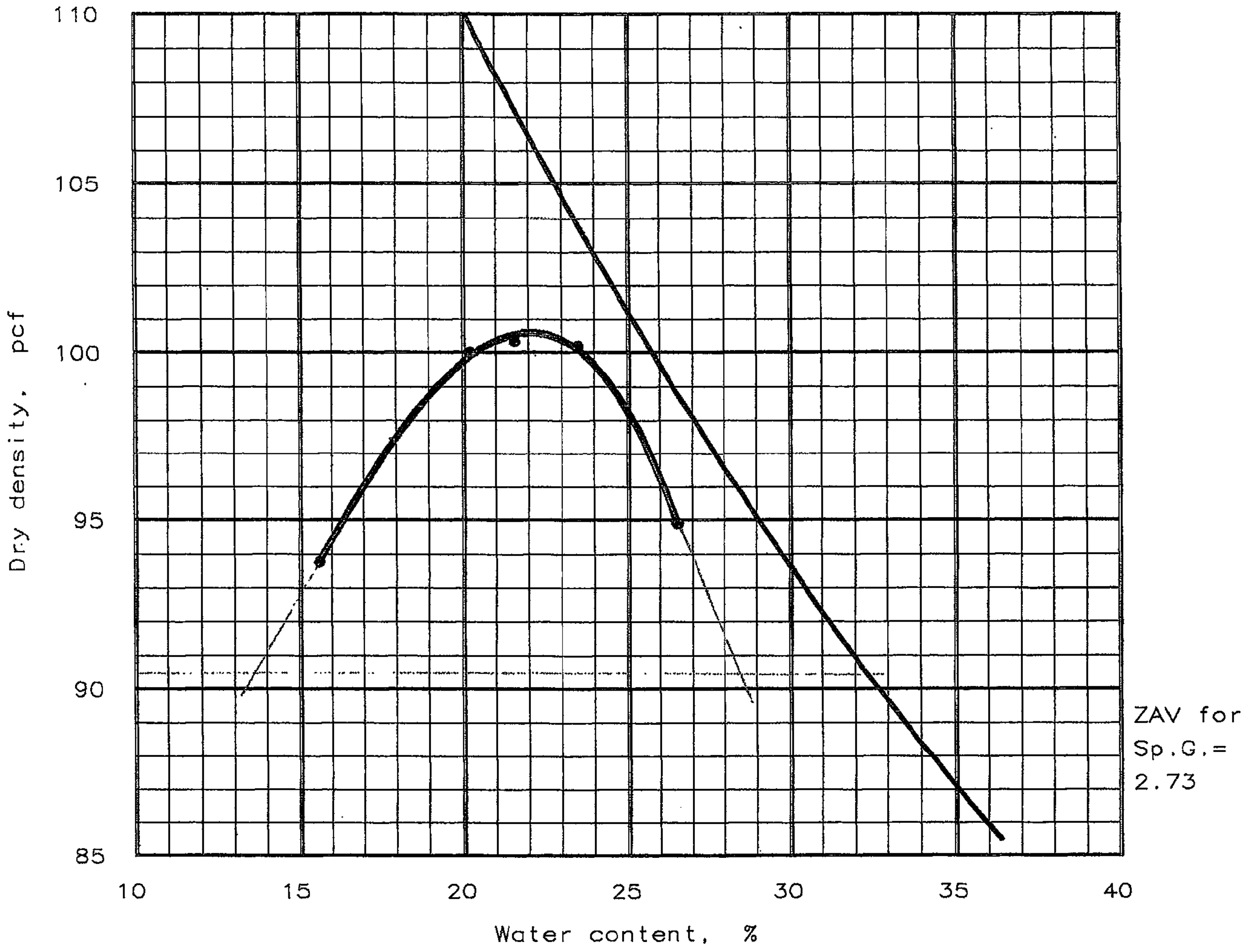
Remarks:

Sample Number 3225

TIP - Test In Progress

NT - No Test

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
3-10'	CL	A-7-6(16)	23.3 %	2.73	45	23	1.6 %	74.1 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 100.6 pcf Optimum moisture = 22.1 %	Reddish brown lean clay with sand

Project No.: 3043051030.0001

Project: TVA Kingston - Proposed Gypsum Stack

Location: Borrow Area Observation Trench OT-3

Date: 7-21-2005

MOISTURE-DENSITY RELATIONSHIP TEST

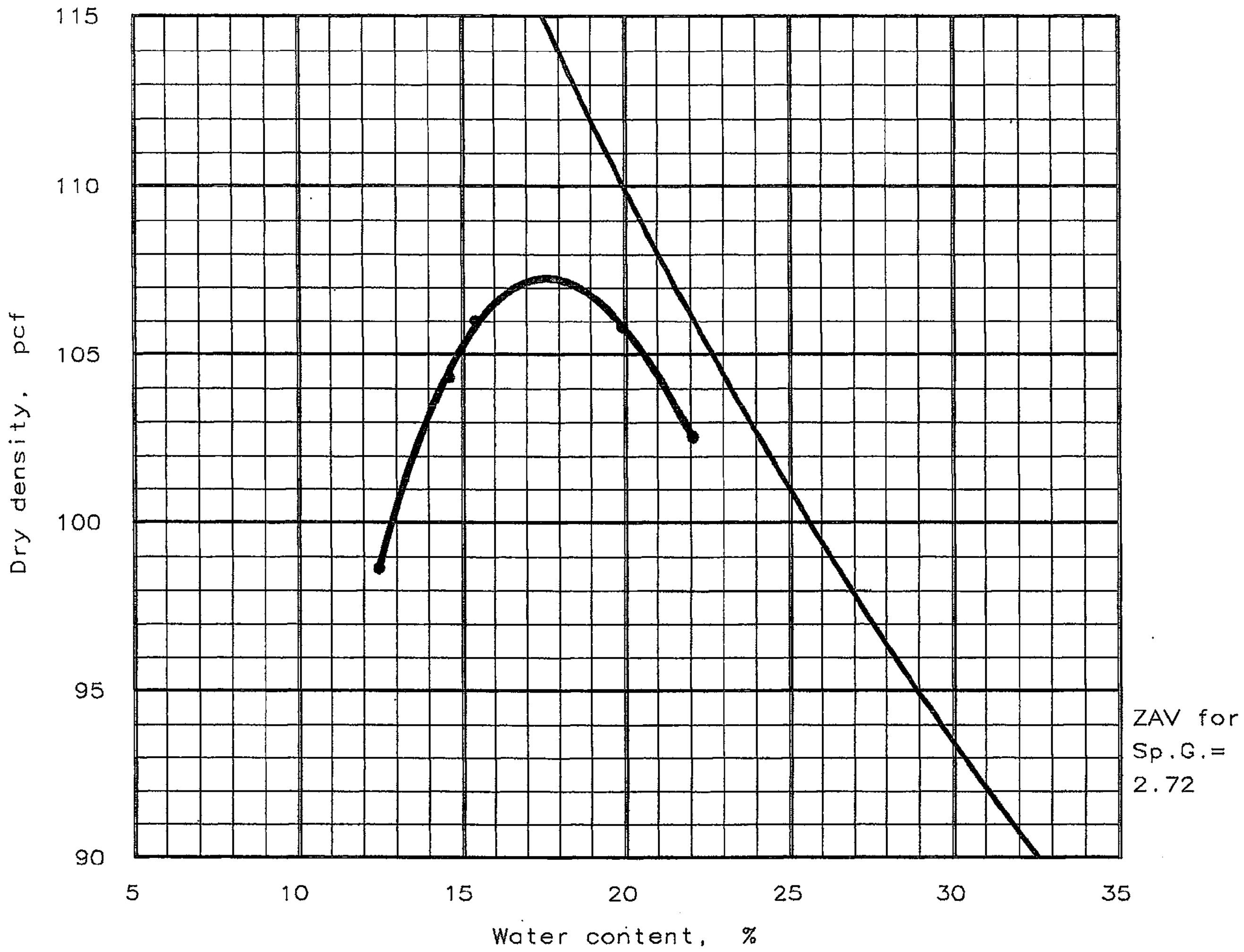
Remarks:

Sample Number 3226

TIP - Test In Progress

NT - No Test

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
4-10'	CL	A-6(13)	22.5 %	2.72	36	17	0.0 %	82.4 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 107.3 pcf Optimum moisture = 17.6 %	Dark red brown lean clay with sand

Project No.: 3043051030.0001

Project: TVA Kingston - Proposed Gypsum Stack

Location: Borrow Area Observation Trench OT-4

Date: 7-21-2005

MOISTURE-DENSITY RELATIONSHIP TEST

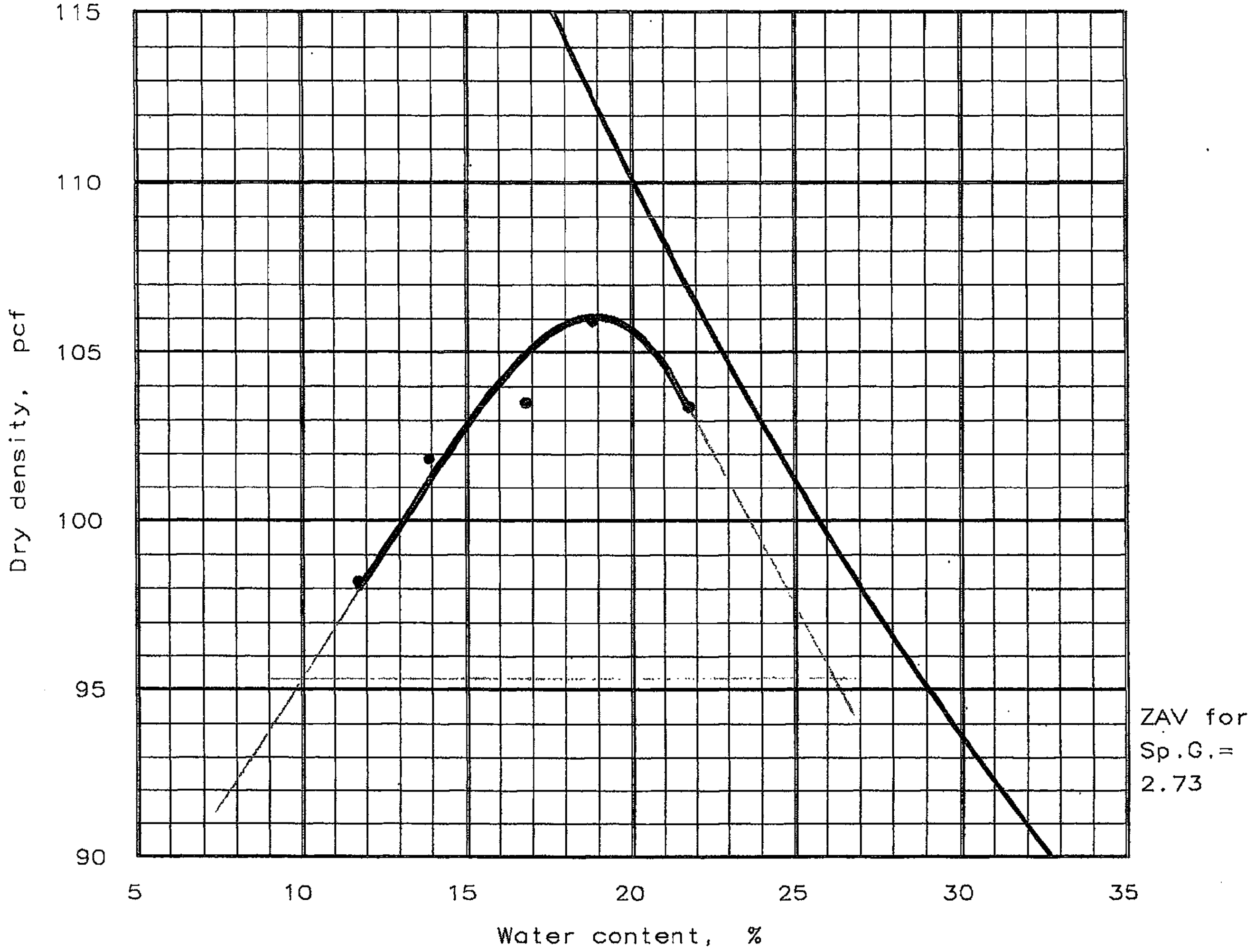
Remarks:

Sample Number 3227

TIP - Test In Progress

NT - No Test

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
4-10'	CL	A-6(15)	22.5 %	2.73	38	18	0.4 %	83.8 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 105.9 pcf Optimum moisture = 18.8 %	Dark red brown lean clay with sand

Project No.: 3043051030.0001

Project: TVA Kingston - Proposed Gypsum Stack

Location: Borrow Area Observation Trench OT-4

Date: 7-21-2005

MOISTURE-DENSITY RELATIONSHIP TEST

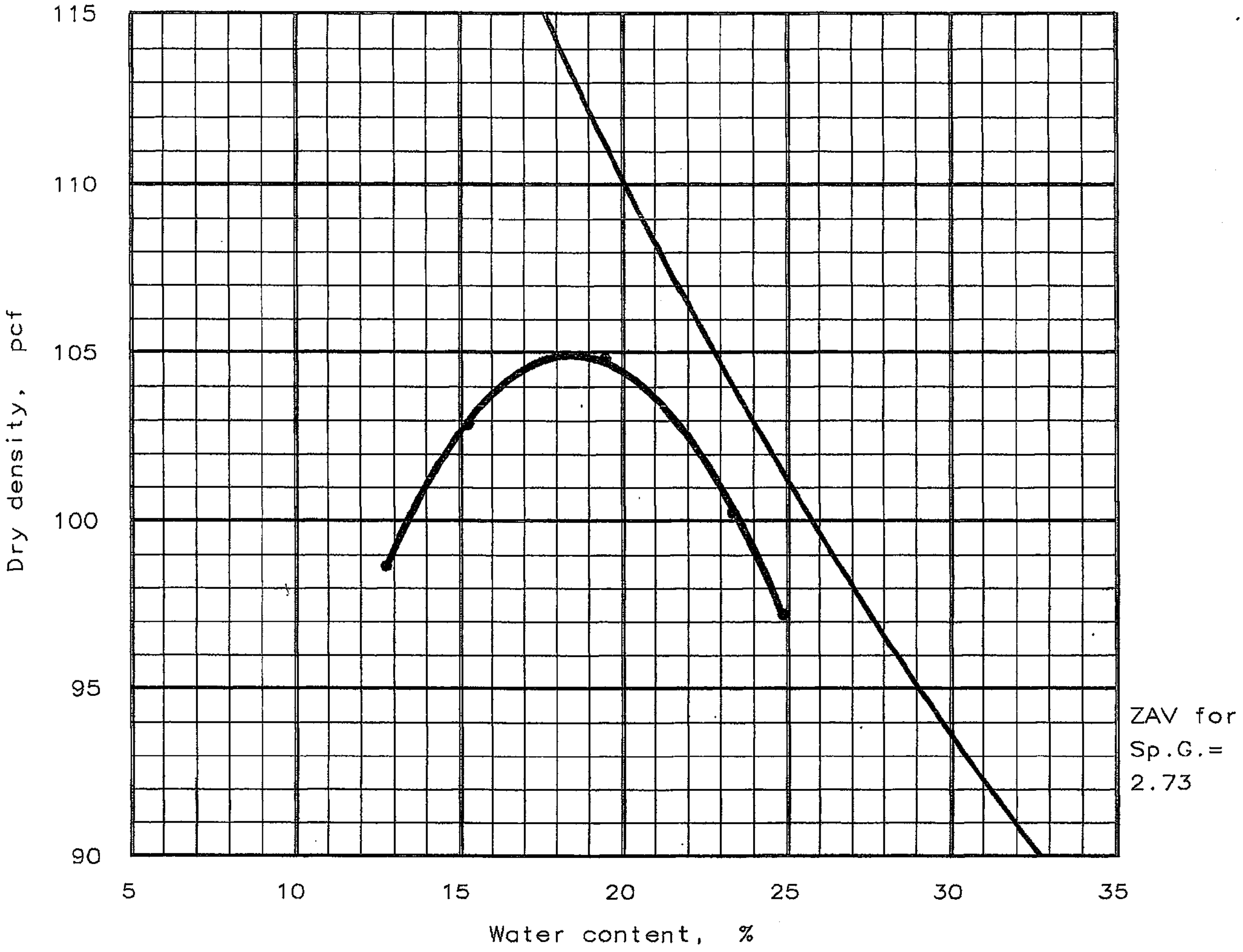
Remarks:

Sample Number 3228

TIP - Test In Progress

NT - No Test

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-00ae1 Procedure B, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in	% < No.200
	USCS	AASHTO						
4-10'	CL	A-6(16)	22.5 %	2.73	39	20	0.0 %	83.5 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 104.9 pcf Optimum moisture = 18.4 %	Dark red brown lean clay with sand

Project No.: 3043051030.0001

Project: TVA Kingston - Proposed Gypsum Stack

Location: Borrow Area Observation Trench OT-4

Date: 7-21-2005

MOISTURE-DENSITY RELATIONSHIP TEST

Remarks:

Sample Number 3229

TIP - Test In Progress

NT - No Test

HYDRAULIC CONDUCTIVITY TEST RESULTS

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-1
DEPTH: 2.5-10'
SAMPLE: Bulk
DESCRIPTION: RMS-90 @ 26.3 $\boxed{89.9\%}$ (ACTUAL COMPACTION)

TECHNICIAN: J.C
DATE: 8/30/05
CHECKED BY: M
CELL NO.: #3
SYSTEM NO.: 14

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu-ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 2.1435 (in) 5.444 (cm)
SOIL DIAMETER: 2.8910 (in) 7.343 (cm)
AREA(A): (in²) 42.35 (cm²)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 351.45
FINAL WET WEIGHT (g): 373.64
FINAL DRY WEIGHT (g): 276.68
INITIAL MOISTURE (%): → 26.4 %
FINAL MOISTURE (%):
PAN NAME: UN

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F):
VISCOSITY CORRECTION(R_T):
PERMEANT LIQUID USED:
BURET CORRECTION FACTOR(C):

BLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END		cc	k
8-31	8-31	8:19 am	8:24 AM	5	300	14.4	5.9	11.8	8.3	2.6	7.3×10^{-6}
8-31	8-31	8:24 AM	8:28 AM	4	240	11.8	8.3	10.0	10.0	1.8	6.4×10^{-6}
8-31	8-31	8:28 AM	8:32 AM	4	240	10.0	10.0	8.5	11.5	1.5	5.3×10^{-6}
8-31	8-31	8:32 AM	8:39 AM	7	420	8.5	11.5	6.0	14.1	2.5	5.1×10^{-6}
~~8-31~~	8-31	~~8:39~~									
~~8-31~~	~~8-31~~										
								$= \boxed{6.0 \times 10^{-6}}$ ✓			
TOTALS					t= 1200 ✓					Q= 8.4 ✓	

COEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t}$

$\frac{Q}{t} = \frac{(5.444)(0.9[illegible])}{(140.68)(42.35)} = \frac{Q}{t} = 8.507\times10^{-4}$

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack
JOB NO.: 3043-05-1030 Borrow Area
BORING NO.: OT-1
DEPTH: 2.5 - 10'
SAMPLE: Bulk
DESCRIPTION: BMS - 95 @ 26.3 95.0% (Actual Compaction)

TECHNICIAN: J.C
DATE: 8/30/05
CHECKED BY: JQ
CELL NO.: #5
SYSTEM NO.: 15

AMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 1.953 (in) 4.961 (cm)
SOIL DIAMETER: 2.8750 (in) 7.303 (cm)
AREA(A): (in²) 41.88 (cm)

OISTURE CONTENT

INITIAL WET WEIGHT (g): 371.92
FINAL WET WEIGHT (g): 391.94
FINAL DRY WEIGHT (g): 293.16
INITIAL MOISTURE (%): → 26.4%
FINAL MOISTURE (%):
PAN NAME: II

PERM INFORMATION

CELL PRESSURE(psi): 57
FORE PRESSURE(psi): 52
BACK PRESSURE (psi): 50
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F): 73°F
VISCOSITY CORRECTION(R_T): 0.931
PERMEANT LIQUID USED: H_2O
BURET CORRECTION FACTOR(C): 1.0

BLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END		cc	K
8-31	8-31	8:18 am	8:47 am	29	1740	15.4	4.6	12.7	7.1	2.7	1.2×10^{-6}
8-31	8-31	8:47 am	9:13 am	26	1560	12.7	7.1	10.4	9.3	2.3	1.2×10^{-6}
8-31	8-31	9:13 am	10:08 am	55	3300	10.4	9.3	5.8	13.8	4.6	1.1×10^{-6}
8-31	8-31	10:08 am	10:16 am	8	480	5.8	13.8	5.1	14.4	0.7	1.1×10^{-6}
TOTALS					t = 7080 ✓					Q = 10.3 ✓	

OEFFICIENT OF PERMEABILITY, $k = \frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t} \cdot \frac{4.961(0.931)}{140.68(41.88)} = \boxed{1.1 \times 10^{-6}}$

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-1
DEPTH: 2.5'-10'
SAMPLE: Bulk
DESCRIPTION: RMS-90 @ 29.3 90.0% (Actual Compaction)

TECHNICIAN: JC
DATE: 8/30/05
CHECKED BY: JO.
CELL NO.: #1
SYSTEM NO.:

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 2.0990 (in) 5.331 (cm)
SOIL DIAMETER: 2.8865 (in) 7.332 (cm)
AREA(A): (in²) 42.22 (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 358.68
FINAL WET WEIGHT (g): 374.57
FINAL DRY WEIGHT (g): 278.08
INITIAL MOISTURE (%): → 29.3 %
FINAL MOISTURE (%):
PAN NAME: Bot

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F):
VISCOSITY CORRECTION(R_T):
PERMEANT LIQUID USED:
BURET CORRECTION FACTOR(C):

ABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END		cc	k
8-31	8-31	8:21 AM	8:33 AM	12	720	15.6	4.7	11.8	8.3	3.8	4.4×10^{-6}
8-31	8-31	8:33 AM	8:40 AM	7	420	11.8	8.3	9.8	10.4	2.1	4.2×10^{-6}
8-31	8-31	8:40 AM	8:46 AM	6	360	9.8	10.4	8.1	12.0	1.7	3.9×10^{-6}
8-31	8-31	8:46 AM	9:10	24	1440	8.1	12.0	2.0	18.1	6.1	3.5×10^{-6}
TOTALS					t=2940					Q= 13.7	

COEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t} \cdot 8.356\times10^{-4} = \boxed{3.9\times10^{-6}}$

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-1
DEPTH: 2.5 -10'
SAMPLE: Bulk
DESCRIPTION: RMS-95@29.3 95.1% (ACTUAL COMPACTION)

TECHNICIAN: J.C
DATE: 8/30/05

CHECKED BY: J.C
CELL NO.: #2
SYSTEM NO.: 13/14

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 2.0690 (in) 5.2553 (cm)
SOIL DIAMETER: 2.8765 (in) 7.3063 (cm)
AREA(A): (in²) 41.93 (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 379.82
FINAL WET WEIGHT (g): 395.03
FINAL DRY WEIGHT (g): 294.71
INITIAL MOISTURE (%): 29.3 %
FINAL MOISTURE (%):
PAN NAME: FF

PERM INFORMATION

CELL PRESSURE(psi): 57
FORE PRESSURE(psi): 52
BACK PRESSURE (psi): 50
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F): 73°F
VISCOSITY CORRECTION(R_T): 0.931
PERMEANT LIQUID USED: H_2O
BURET CORRECTION FACTOR(C): 1.0

TABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END		Cc	K
8-31	8-31	8:20 AM	8:34 AM	14	840	15.0	5.2	12.8	7.5	2.2	2.2×10^{-6}
8-31	8-31	8:34 am	9:11 am	37	2220	12.8	7.5	7.5	12.9	5.3	2.0×10^{-6}
8-31	8-31	9:11 am	10:05 AM	54	3240	7.5	12.9	0.8	19.7	6.7	1.7×10^{-6}
8-31	8-31	10:07 am	10:21 AM	14	840	12.4	7.8	11.0	9.0	1.4	1.4×10^{-6}
TOTALS					t= 7140					Q= 15.6	

COEFFICIENT OF PERMEABILITY, $k = \frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t} \cdot \frac{(5.255)(0.931)}{(140.68)(41.93)} = \boxed{1.8 \times 10^{-6}}$

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-1
DEPTH: 2.5 -10'
SAMPLE: Bulk
DESCRIPTION: RMS-90 @ 32.3 89.9% (ACTUAL COMPACTION)

TECHNICIAN: J.C
DATE: 8/30/05
CHECKED BY: JO.
CELL NO.: A
SYSTEM NO.: 2

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 1.9945 (in) 5.066 (cm)
SOIL DIAMETER: 2.8910 (in) 7.343 (cm)
AREA(A): (in²) 42.35 (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 374.52
FINAL WET WEIGHT (g): 369.98
FINAL DRY WEIGHT (g): 274.18
INITIAL MOISTURE (%): 32.5 %
FINAL MOISTURE (%):
PAN NAME: RR

PERM INFORMATION

CELL PRESSURE(psi): 57
FORE PRESSURE(psi): 52
BACK PRESSURE (psi): 59
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F): 73°F
VISCOSITY CORRECTION(R_T): 0.931
PERMEANT LIQUID USED: H2O
BURET CORRECTION FACTOR(C): 1.0

ABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END		cc	k
8-31	8-31	8:23am	9:13am	50	3000	25.4	15.5	23.4	17.7	2.0	5.3×10^{-7}
8-31	8-31	9:13am	10:09am	56	3360	23.4	17.7	21.4	19.8	2.0	4.7×10^{-7}
8-31	8-31	10:09am	10:21am	12	720	21.4	19.8	21.0	20.2	0.4	4.4×10^{-7}
8-31	8-31	10:21am	11:25am	64	3840	21.0	20.2	18.9	23.4	21	4.3×10^{-7}
8-31	8-31	11:25am	1:15pm	110	6600	18.9	22.4	15.6	25.8	3.3	4.0×10^{-7}
TOTALS					t= 14520					Q= 7.8	

COEFFICIENT OF PERMEABILITY, $k = \frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{(5.066)(0.931)}{(140.68)(42.35)}$ = $\boxed{4.3 \times 10^{-7}}$

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-1
DEPTH: 2.5 - 10'
SAMPLE: Bulk
DESCRIPTION: RMS - 95 @ 32.3 (94.9%) (ACTUAL COMPACTION)

TECHNICIAN: J.C.
DATE: 8/30/05
CHECKED BY: S.O.
CELL NO.: #13
SYSTEM NO.:

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 2.0435 (in) 5.190 (cm)
SOIL DIAMETER: 2.8890 (in) 7.338 (cm)
AREA(A): (in²) 42.29 (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 399.92
FINAL WET WEIGHT (g): 391.39
FINAL DRY WEIGHT (g): 292.95
INITIAL MOISTURE (%): → 32.5%
FINAL MOISTURE (%):
PAN NAME: 55

PERM INFORMATION

CELL PRESSURE(psi): 57
FORE PRESSURE(psi): 52
BACK PRESSURE (psi): 50
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F): 73°F
VISCOSITY CORRECTION(R_T): 0.931
PERMEANT LIQUID USED: H2O
BURET CORRECTION FACTOR(C): 1.0

TABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END		cc	K
8-31	8-31	8:22 am	9:28 am	66	3960	26.5	15.1	25.3	16.2	1.2	2.5×10⁻⁷
8-31	8-31	9:28 am	11:38 am	130	7800	25.3	16.2	23.3	18.5	2.0	2.1×10⁻⁷
8-31	8-31	11:38 am	1:15 pm	97	5820	23.3	18.5	21.8	20.1	1.5	2.1×10⁻⁷
8-31	8-31	1:15 pm	1:50	35	2100	21.8	20.1	21.2	20.7	0.6	2.3×10⁻⁷
TOTALS					t = 19680					Q = 5.3	

COEFFICIENT OF PERMEABILITY, $k = \frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t} \frac{5.190\ (0.831)}{(140.68)(42.29)} =$ $\boxed{2.2 \times 10^{-7}}$

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA KINGSTON - B.A.
JOB NO.: 3043-05-1030
BORING NO.: QT-1
DEPTH: 2.5-10'
SAMPLE: Bulk
DESCRIPTION: RMS ≅ 95%. @ 30.0% CT

TECHNICIAN: JALEX. / J.C.
DATE: 9-13-5

CHECKED BY: JA
CELL NO.: #5
SYSTEM NO.: #15

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 1.990 (in) 5.055 ✓ (cm)
SOIL DIAMETER: 2.881 (in) 7.318 ✓ (cm)
AREA(A): (in^2) 42.06 ✓ (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 381.76
FINAL WET WEIGHT (g): 389.79
FINAL DRY WEIGHT (g): 294.32
INITIAL MOISTURE (%): 29.7
FINAL MOISTURE (%): 32.4
PAN NAME: 55

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F): 73°
VISCOSITY CORRECTION(R_T): .931
PERMEANT LIQUID USED: H_2O
BURET CORRECTION FACTOR(C): 1.0

ABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END		Q	K
9-15	9-15	9:14	11:14	120	7200	13.1	6.8	11.8	8.2	1.3	1.4×10^{-7}
9-15	9-15	11:14	11:49	35	2100	11.8	8.2	11.4	8.6	.4	1.5×10^{-7}
9-15	9-15	11:49	1:00	71	4260	11.4	8.6	10.7	9.3	.7	1.3×10^{-7}
9-15	9-15	1:00	2:07	67	4020	10.7	9.3	10.0	10.0	.7	1.4×10^{-7}
TOTALS					t=17580 ✓					Q=3.1 ✓	

COEFFICIENT OF PERMEABILITY, $k = \frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t} \cdot \frac{5.055(.931)(1.0)}{(140.68)(42.06)} = 1.4 \times 10^{-7}$ ✓

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-3
DEPTH: 3'-10'
SAMPLE: Bulk
DESCRIPTION: RMS-90@ 20.1 90.1% (Actual Compaction)

TECHNICIAN: J.C.
DATE: 8/31/05
CHECKED BY: JA
CELL NO.: 13
SYSTEM NO.: 4

AMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 1.9730 (in) 5.011 (cm)
SOIL DIAMETER: 2.8820 (in) 7.320 (cm)
AREA(A): (in²) 42.09 (cm)

OISTURE CONTENT

INITIAL WET WEIGHT (g): 357.15
FINAL WET WEIGHT (g): 393.66
FINAL DRY WEIGHT (g): 308.70
INITIAL MOISTURE (%): 19.9%
FINAL MOISTURE (%):
PAN NAME: 4011

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F):
VISCOSITY CORRECTION(R_T):
PERMEANT LIQUID USED:
BURET CORRECTION FACTOR(C):

ABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END		Δ	
9-1		10:02	10:13	11	660	28.8	49.2	33.2	44.8	4.4	5.3x10^{-6}
		10:13	10:58	45	2700	33.2	44.8	46.6	31.1	13.7	4.0x10^{-6}
		10:58	11:11	13	780	46.6	31.1	49.3	28.4	2.7	2.7x10^{-6}
		11:11	11:45	34	2040	49.3	28.4	55.0	22.6	5.7	2.2x10^{-6}
		11:45	12:03	18	1080	55.0	22.6	57.4	20.2	2.4	1.8x10^{-6}
		12:03	12:21	18	1080	57.4	20.2	59.8	17.8	2.4	1.8x10^{-6}
TOTALS					t= 4980					Q=	13.2

OEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t} \cdot \frac{(5.011)(.931)(1.0)}{(140.68)(42.09)}$ $\boxed{2.1 \times 10^{-6}}$

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack
JOB NO.: 3043-05-1030 Borrow Area
BORING NO.: OT-3
DEPTH: 3' - 10'
SAMPLE: Bulk
DESCRIPTION: RMS-95@20.1 95.2% (Actual Compaction)

TECHNICIAN: J.C
DATE: 8/31/05
CHECKED BY: A
CELL NO.: 1-0
SYSTEM NO.: 5

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 1.9945 (in) 5.066 (cm)
SOIL DIAMETER: 2.8840 (in) 7.325 (cm)
AREA(A): (in²) 42.15 (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 378.18
FINAL WET WEIGHT (g): 415.6
FINAL DRY WEIGHT (g): 326.86
INITIAL MOISTURE (%): 19.9%
FINAL MOISTURE (%):
PAN NAME: BOT

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F):
VISCOSITY CORRECTION(R_T):
PERMEANT LIQUID USED:
BURET CORRECTION FACTOR(C):

TABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END			
~~9-1~~		~~10:05~~				~~29.2~~	~~49.3~~		~~1.1~~		
		~~12:26~~	~~12:29~~	~~3~~	~~180~~	~~27.4~~	~~38.1~~	~~30.4~~	~~38.3~~		
		12:29	12:30	1	60	30.4	38.3	31.3	37.4	.9	1.2x10^{-5}
		12:30	12:31	1	60	31.3	37.4	32.3	36.3	1.0	1.3x10^{-5}
		12:31	12:32	1	60	32.3	36.3	33.2	35.5	.9	1.2x10^{-5}
		12:32	12:33	1	60	33.2	35.5	34.0	34.7	.8	1.1x10^{-5}
TOTALS					t=240					Q=	3.6

COEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t} \cdot \frac{(5.066)(.931)(1.0)}{(140.68)(42.15)}$ $\boxed{1.2 \times 10^{-5}}$

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-3
DEPTH: 3'-10'
SAMPLE: Bulk
DESCRIPTION: RMS-90@23.1 90.4% (ACTUAL COMPACTION)

TECHNICIAN: JC
DATE: 8/31/05
CHECKED BY:
CELL NO.: A
SYSTEM NO.: 3

AMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 1.9555 (in) 4.962 (cm)
SOIL DIAMETER: 2.8810 (in) 7.318 (cm)
AREA(A): (in²) 42.06 (cm)

IOISTURE CONTENT

INITIAL WET WEIGHT (g): 379.92
FINAL WET WEIGHT (g): 393.66
FINAL DRY WEIGHT (g): 309.66
INITIAL MOISTURE (%): → 22.5%
FINAL MOISTURE (%):
PAN NAME: NN

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F):
VISCOSITY CORRECTION(R_T):
PERMEANT LIQUID USED:
BURET CORRECTION FACTOR(C):

ABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END			
9-1		9:12	9:49	37	2220	25.0	15.2	17.8	22.4	7.2	2.6×10^{-6}
		9:49	10:03	14	840	17.8	22.4	15.5	24.7	2.3	2.1×10^{-6}
		10:03	10:10	7	420	15.5	24.7	14.3	26.0	1.2	2.2×10^{-6}
		10:10	10:20	10	600	14.3	26.0	12.6	27.8	1.7	2.2×10^{-6}
					4080					12.4	
TOTALS					t= ~~4060~~					Q=	

COEFFICIENT OF PERMEABILITY, $k = \frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{12.4}{4060} \cdot \frac{(4.962)(.931)(1.0)}{(140.68)(42.06)} = \boxed{2.4 \times 10^{-6}}$

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-3
DEPTH: 3' - 10'
SAMPLE: Bulk
DESCRIPTION: RMS-95@ 23.1 95.4% (ACTUAL COMPACTION)

TECHNICIAN: J.C
DATE: 9/1/05
CHECKED BY: JA
CELL NO.: 2-N
SYSTEM NO.: 6

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 2.0085 (in) 5.102 (cm)
SOIL DIAMETER: 2.8805 (in) 7.316 (cm)
AREA(A): (in²) 42.04 (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 401.57
FINAL WET WEIGHT (g): 412.71
FINAL DRY WEIGHT (g): 326.50
INITIAL MOISTURE (%): 22.5%
FINAL MOISTURE (%):
PAN NAME: RR

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD, h (psi) x 70.34: 140.68
TEMPERATURE (°F):
VISCOSITY CORRECTION(R_T):
PERMEANT LIQUID USED:
BURET CORRECTION FACTOR(C):

ABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END			
9-1		10:14									
		11:02	12:04	62	3720	24.8	35.3	26.1	34.1	1.2	2.6x10⁻⁷
		12:04	12:34	30	1800	26.1	34.1	26.6	33.6	.5	2.2x10⁻⁷
		12:34	1:09	35	2100	26.6	33.6	27.2	33.0	.7	2.7x10⁻⁷
		1:09	1:34	25	1500	27.2	33.0	27.7	32.5	.5	2.7x10⁻⁷
TOTALS					t=9120 ✓					Q=2.9 ✓	

COEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t} \cdot \frac{(5.102)(.931)(1.0)}{(140.68)(42.04)} = \boxed{2.6 \times 10^{-7}}$ ✓

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-3
DEPTH: 3'-10'
SAMPLE: Bulk
DESCRIPTION: KMS-90@ 26.1 90.3% (Actual Compaction)

TECHNICIAN: J.C
DATE: 8/31/05
CHECKED BY: JQ
CELL NO.: 3
SYSTEM NO.: 18

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) 2.54 (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 1.9865 → (in) 5.046 (cm)
SOIL DIAMETER: 2.8835 → (in) 7.324 (cm)
AREA(A): (in) 42.13 (cm)

$\frac{D^2\pi}{4}$

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 388.29
FINAL WET WEIGHT (g): 393.55
FINAL DRY WEIGHT (g): 308.39
INITIAL MOISTURE (%): → 25.6%
FINAL MOISTURE (%):
PAN NAME: SS

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F): 73°F
VISCOSITY CORRECTION(R_T):
PERMEANT LIQUID USED:
BURET CORRECTION FACTOR(C):

TABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END			
9/1		9:05	9:48	43	2580	24.8	15.5	24.2	16.3	.6	1.8x10^-7
		9:48	10:06	18	1080	24.2	16.2	23.9	16.5	.3	2.2x10^-7
		10:06	10:54	48	2880	23.9	16.5	23.[illegible]	17.4	.8	2.2x10^-7
		10:54	11:40	46	2760	23.[illegible]	17.4	22.8	18.1	.7	2.0x10^-7
		11:40	12:37	57	3420	22.8	18.1	21.9	19.0	.9	2.1x10^-7
TOTALS					t=10140					Q= 2.7	

$$\frac{(2.7)(5.046)(0.931)}{(140.68)(42.13)(10140)}$$

COEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t}$ $= \boxed{2.11 \times 10^{-7}}$

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-3
DEPTH: 3'-10'
SAMPLE: Bulk
DESCRIPTION: RMS-95@26.1 95.4% (Actual compaction)

TECHNICIAN: J.C
DATE: 8/31/05
CHECKED BY: JA
CELL NO.: B
SYSTEM NO.: 2

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 2.0805 (in) 5.284 (cm)
SOIL DIAMETER: 2.8805 (in) 7.316 (cm)
AREA(A): (in^2) 42.04 (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 411.37
FINAL WET WEIGHT (g): 412.73
FINAL DRY WEIGHT (g): 326.41
INITIAL MOISTURE (%): 25.6%
FINAL MOISTURE (%):
PAN NAME: WALLACE

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F): 73°F
VISCOSITY CORRECTION(R_T): 0.931
PERMEANT LIQUID USED: H_2O
BURET CORRECTION FACTOR(C): 1.0

ABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END			
9-1		9:09	9:48	39	2340	25.2	15.0	24.1	16.1	1.1	3.9×10^{-7}
		9:48	10:04	16	960	24.1	16.1	23.6	16.6	.5	4.3×10^{-7}
		10:04	10:19	15	900	23.6	16.6	23.2	16.9	.3	2.8×10^{-7}
		10:19	10:51	32	1920	23.2	16.9	22.4	17.7	.8	3.5×10^{-7}
		10:51	11:08	17	1020	22.4	17.7	21.9	18.2	.5	4.1×10^{-7}
		11:39	12:09	30	1800	21.8	18.4	21.0	19.2	.8	3.7×10^{-7}
		12:09	12:36	27	1620	21.0	19.2	20.4	19.8	.6	3.1×10^{-7}
		12:36	1:12	36	2160	20.4	19.8	19.5	20.7	.9	3.5×10^{-7}
		$\frac{Q}{t}$	$\frac{5.284(0.931)}{140.68(42.04)}$								
TOTALS					t=6600					Q=	2.8

COEFFICIENT OF PERMEABILITY, $k = \frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t} \cdot \frac{5.284(.931)(1.0)}{(140.68)(42.5…)}$ = $\boxed{3.5\times10^{-7}}$

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-4
DEPTH: 4'-10'
SAMPLE: Bulk
DESCRIPTION: RMS-90@16.8 (89.8%) (Actual % compaction)

TECHNICIAN: J.C
DATE: 8/31/05
CHECKED BY:
CELL NO.: #3
SYSTEM NO.: 13/14

AMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 2.0615 (in) 5.236 (cm)
SOIL DIAMETER: 2.8875 (in) 7.333 (cm)
AREA(A): (in²) 42.23 (cm)

IOISTURE CONTENT

INITIAL WET WEIGHT (g): 379.35
FINAL WET WEIGHT (g): 412.34
FINAL DRY WEIGHT (g): 323.33
INITIAL MOISTURE (%): 17.1%
FINAL MOISTURE (%):
PAN NAME: B-9

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F):
VISCOSITY CORRECTION(R_T):
PERMEANT LIQUID USED:
BURET CORRECTION FACTOR(C):

ABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END			
9-1		9:24	9:37			14.3	5.5	4.0	16.0		
		9:40	9:52			18.7	2.2	10.0	10.9		
		9:52	10:01			10.0	10.9	3.6	17.4		
		~~10:49~~				~~10.4~~	~~9.7~~				
		12:15	12:17	2	120	15.5	5.0	13.8	6.7	1.7	1.2×10^{-5}
		12:17	12:19	2	120	13.8	6.7	12.3	7.9	1.5	1.0×10^{-5}
		12:19	12:21	2	120	12.3	7.9	11.0	9.4	1.5	1.0×10^{-5}
		12:21	12:23	2	120	11	9.4	9.5	10.8	1.5	1.0×10^{-5}
TOTALS					t=480 ✓					Q= 6.2	

COEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t}$

$$\frac{Q}{t} \cdot \frac{(5.236)(.931)(1.0)}{(140.68)(42.23)} = \boxed{1.1\times10^{-5}}$$

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-4
DEPTH: 4'-10'
SAMPLE: Bulk
DESCRIPTION: RMS-95@ 16.8 94.8% (ACTUAL % Compaction)

TECHNICIAN: J.C
DATE: 8/31/05
CHECKED BY:
CELL NO.: #1
SYSTEM NO.: 13

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 2.115 (in) 5.378 (cm)
SOIL DIAMETER: 2.883 (in) 7.323 (cm)
AREA(A): (in²) 42.12 (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 400.50
FINAL WET WEIGHT (g): 432.17
FINAL DRY WEIGHT (g): 341.26
INITIAL MOISTURE (%): → 17.1%
FINAL MOISTURE (%):
PAN NAME: CMS

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F):
VISCOSITY CORRECTION(R_T):
PERMEANT LIQUID USED:
BURET CORRECTION FACTOR(C):

BLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END			
9-1		9:18	9:36	18	1080	12.7	6.1	4.6	14.2	8.1	6.3×10^{-6}
9-1		9:39	9:51	12	720	17.2	2.3	11.9	7.4	5.1	6.0×10^{-6}
		9:51	10:02	11	660	11.9	7.4	8.0	11.4	3.9	5.0×10^{-6}
		10:02	10:09	7	420	8.0	11.4	5.6	13.8	2.4	4.8×10^{-6}
		10:09	10:17	8	480	5.6	13.8	3.0	16.4	2.6	4.6×10^{-6}
		10:55	11:07	12	720	11.1	9.6	7.1	13.0	4.0	4.7×10^{-6}
										12.9 ✓	
TOTALS					t=2280 ✓					Q= ✓	

COEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t} \cdot 8.45 \times 10^{-4} = \boxed{4.8 \times 10^{-6}}$

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA - KINGSTON - PROP GYP. STA.
TECHNICIAN: J.C.
JOB NO.: 3043-05-1030 Borrow Area.
DATE: 8/31/05
BORING NO.: OT-4
DEPTH: 4'-10'
CHECKED BY: JA
SAMPLE: BULK
CELL NO.: #2
DESCRIPTION: RMS - .900 19.8 90.0% (ACTUAL COMPACTION)
SYSTEM NO.: #14

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 2.0755 (in) 5.272 (cm)
SOIL DIAMETER: 2.8735 (in) ~~7.304~~ 7.2 (cm)
AREA(A): (in²) ~~41.99~~ 41.84 (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 384.65
FINAL WET WEIGHT (g): 406.14
FINAL DRY WEIGHT (g): 320.86
INITIAL MOISTURE (%): → 19.8%
FINAL MOISTURE (%):
PAN NAME: WALLACE

PERM INFORMATION

CELL PRESSURE(psi): 57
FORE PRESSURE(psi): 52
BACK PRESSURE (psi): 59
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F): 73°F
VISCOSITY CORRECTION(R_T): 0.931
PERMEANT LIQUID USED: H_2O
BURET CORRECTION FACTOR(C): 1.0

BLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END		cc	Ki
9-5	9-5	4:08 pm	4:14 pm	6	360	10.9	9.4	9.1	11.1	1.8	4.2×10^{-6}
9-5	9-5	4:15 pm	4:21 pm	6	360	10.9	7.3	9.3	10.8	1.6	3.7×10^{-6}
9-5	9-5	4:22 pm	4:35 pm	13	780	11.2	9.1	8.7	11.6	2.5	2.7×10^{-6}
9-5	9-5	4:36 pm	4:42	6	360	11.2	9.0	9.3	10.9	1.9	4.4×10^{-6}
TOTALS					t= 1860					Q= 7.8	

COEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t} = \frac{Q}{t} \cdot \frac{5.272(0.931)}{140.68(41.84)} = \boxed{3.5 \times 10^{-6}}$ ✓

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-4
DEPTH: 4' - 10'
SAMPLE: Bulk
DESCRIPTION: RMS-95@ 19.8 95.0% (Actual compaction)

TECHNICIAN: J. C
DATE: 8/31/05
CHECKED BY: M
CELL NO.: 5
SYSTEM NO.: 15

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 1.9900 (in) 5.055 (cm)
SOIL DIAMETER: 2.8665 (in) 7.281 (cm)
AREA(A): (in^2) 41.64 (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 404.15
FINAL WET WEIGHT (g): 419.31
FINAL DRY WEIGHT (g): 336.51
INITIAL MOISTURE (%): 19.8%
FINAL MOISTURE (%):
PAN NAME: B-3

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F):
VISCOSITY CORRECTION(R_T):
PERMEANT LIQUID USED:
BURET CORRECTION FACTOR(C):

ABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END			
9-1		9:30	9:54	24	1440	15.2	5.1	12.2	8.0	3.0	1.7×10^{-6}
		9:54	10:00	6	360	12.2	8.0	11.6	8.7	.7	1.6×10^{-6}
		10:00	10:07	7	420	11.6	8.7	10.8	9.5	.8	1.5×10^{-6}
		10:07	10:15	8	480	10.8	9.5	9.8	10.5	1.0	1.7×10^{-6}
		10:51	11:04	13	780	16.6	3.8	15.0	5.5	1.6	1.6×10^{-6}
										4.1	
TOTALS					t=2040					Q=	

COEFFICIENT OF PERMEABILITY, $k = \frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{4.1}{2040} \cdot \frac{(5.055)(.991)(1.0)}{(140.68)(41.64)} = \boxed{1.6 \times 10^{-6}}$

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack Borrow Area
JOB NO.: 3043-05-1030
BORING NO.: OT-4
DEPTH: 4' - 10'
SAMPLE: Bulk
DESCRIPTION: RMS-90 @ 22.8 90.0% (ACTUAL COMPACTION)

TECHNICIAN: J.C
DATE: 8/31/05
CHECKED BY: JA
CELL NO.: 4
SYSTEM NO.: 9

SAMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 1.9840 (in) 5.039 (cm)
SOIL DIAMETER: 2.8905 (in) 7.342 (cm)
AREA(A): (in²) 42.34 (cm)

MOISTURE CONTENT

INITIAL WET WEIGHT (g): 399.44
FINAL WET WEIGHT (g): 405.29
FINAL DRY WEIGHT (g): 324.43
INITIAL MOISTURE (~~%~~): → 22.7%
FINAL MOISTURE (%):
PAN NAME: FF

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F):
VISCOSITY CORRECTION(R_T):
PERMEANT LIQUID USED:
BURET CORRECTION FACTOR(C):

TABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END			
9-1		10:01	10:57	56	3360	19.3	39.4	21.1	37.5	1.8	4.2x10^{-7}
		10:57	11:44	47	2820	21.1	37.5	22.7	36.1	1.5	4.2x10^{-7}
		11:44	12:28	44	2640	22.7	36.1	24.0	34.5	1.3	3.9x10^{-7}
		12:28	1:03	35	2100	24.0	34.5	25.0	33.3	[illegible]	3.8x10^{-7}
TOTALS					t=10920 ✓					Q=	5.6 ✓

COEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t}$

$\frac{Q}{t} \cdot \frac{5.039(.931)(1.0)}{(140.68)(42.34)} = \boxed{4.0 \times 10^{-7}}$ ✓

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA Kingston - Proposed Gypsum Stack
JOB NO.: 3043-05-1030 Borrow Area
BORING NO.: OT-4
DEPTH: 4'-10'
SAMPLE: Bulk
DESCRIPTION: RMS-95@ 22.8 95.0% (Actual Compaction)

TECHNICIAN: J.C
DATE: 8/31/05
CHECKED BY: JL
CELL NO.: #1
SYSTEM NO.: 8

AMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu.ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 2.0760 (in) 5.273 (cm)
SOIL DIAMETER: 2.8835 (in) 7.324 (cm)
AREA(A): (in²) 42.13 (cm)

OISTURE CONTENT

INITIAL WET WEIGHT (g): 421.08
FINAL WET WEIGHT (g): 427.70
FINAL DRY WEIGHT (g): 342.09
INITIAL MOISTURE (%): → 22.7%
FINAL MOISTURE (%):
PAN NAME: II

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F):
VISCOSITY CORRECTION(R_T):
PERMEANT LIQUID USED:
BURET CORRECTION FACTOR(C):

BLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	Ⓛ START	Ⓡ	Ⓛ END	Ⓡ	α	k
8/		9:52	10:56	64	3840	27.6	38.6	28.0	38.2	.4	8.6×10^{-8}
		10:56	11:43	47	2820	28.0	38.2	28.3	37.9	.3	8.8×10^{-8}
		11:43	1:02	79	4740	28.3	37.9	28.7	37.4	.4	7.0×10^{-8}
		1:02	1:33	31	1860	28.7	37.4	28.9	37.2	.2	8.9×10^{-8}
TOTALS					t=13260 ✓					Q= 1.3 ✓	

COEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t} \cdot \frac{(5.273)(.931)(1.0)}{(140.68)(42.13)} = \boxed{8.1 \times 10^{-8}}$ ✓

MACTEC

CONSTANT HEAD PERMEABILITY TEST

(ASTM D5084)

JOB NAME: TVA KINGSTON - B.A.
JOB NO.: 3043-05-1030
BORING NO.: QT-4
DEPTH: 4'-10'
SAMPLE: Bulk
DESCRIPTION: RMS ≅ 95% @ 20.6% CJ

TECHNICIAN: J. Alex / J C.
DATE: 9-12-5

CHECKED BY: JA
CELL NO.: #2
SYSTEM NO.: #14

AMPLE INFORMATION

WEIGHT TUBE & SOIL (g):
WEIGHT TUBE (g):
WEIGHT SOIL (g):
VOLUME SOIL (cu ft):
DRY UNIT WEIGHT (pcf):
WET UNIT WEIGHT (pcf):

TUBE LENGTH: (in) (cm)
TUBE DIAMETER: (in) (cm)
SOIL LENGTH(L): 2.006 (in) 5.095 ✓ (cm)
SOIL DIAMETER: 2.888 (in) 7.336 ✓ (cm)
AREA(A): (in²) 42.26 ✓ (cm)

OISTURE CONTENT

INITIAL WET WEIGHT (g): 416.04
FINAL WET WEIGHT (g): 429.77
FINAL DRY WEIGHT (g): 345.82
INITIAL MOISTURE (%): 20.3
FINAL MOISTURE (%): 24.3
PAN NAME: FF

PERM INFORMATION

CELL PRESSURE(psi):
FORE PRESSURE(psi):
BACK PRESSURE (psi):
HEAD,h (psi) x 70.34: 140.68
TEMPERATURE (°F): 73°F
VISCOSITY CORRECTION(R_T): .931
PERMEANT LIQUID USED: H2O distilled
BURET CORRECTION FACTOR(C): 1.0

ABLE OF HYDRAULIC CONDUCTIVITY

DATE		TIME		ELASPED TIME (+)		READING				FLOW (CC)	
START	END	START	END	MINUTES	SECONDS	START		END		Q	K
9-15	9-15	9:13	11:14	121	7260 ✓	13.0	7.3	2.6	18.2	10.4	1.1x10^{-6}
9-15	9-15	11:14	11:45	31	1860 ✓	2.6	18.2	.2	20.6	2.4	1.0x10^{-6}
9-15	9-15	11:48	12:59	71	4260 ✓	13.8	2.9	7.3	9.4	6.5	1.2x10^{-6}
9-15	9-15	12:59	2:06	67	4020 ✓	7.3	9.4	2.0	14.9	5.3	1.1x10^{-6}
TOTALS					t=17400 ✓					Q=24.6 ✓	

COEFFICIENT OF PERMEABILITY, $k=\frac{Q \times L \times R_T \times C}{h \times A \times t}$ $\frac{Q}{t}(.00079787) = \boxed{1.1\times10^{-6}}$ ✓