Preliminary Report for:

Subsurface Exploration and MSE Wall and Embankment Evaluations for Proposed US 23 / SR 823 Interchange

Prepared for:

TranSystems Corporation

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DLZ Ohio, Inc.

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DLZ Job No. 0121-3070.03

October 4, 2006

Prepared by:

DLZ

inter-office communication

to: District 9 - Jim Brushart, District Deputy Director date: April 23, 2007
Attn: Tom Barnitz , District Production Administrator

from: Tim Keller, P.E., Administrator, Office of Structural Engineering by: Peter Narsavage, P.E.

subject: SCI-823-10.13, Portsmouth Bypass Phase 2; PID 79977;
Review of MSE Wall and Embankment Evaluation Report

We have reviewed the *Preliminary Report for Subsurface Exploration and MSE Wall and Embankment Evaluations for Proposed US 23 / SR 823 Interchange*, dated October 4, 2007, by DLZ. We received this report after a meeting on February 22, 2007, and we have reviewed it in conjunction with the submittal of the retaining wall type study for the structures over Fairground Road. This report primarily addresses the MSE walls for Ramps B and C, identified as Walls No. 4 and 5 in the *Retaining Wall Type Study* by CH2M Hill, dated March 2007. We offer the following comments.

1. In general, we concur with the analyses and calculations for the MSE walls.

2. The boring identification labels on the Boring Location Plan are obscured by other linework. Either move the labels or mask the lines underneath the labels.

3. From the report, we understand that undrained bearing capacity and differential settlement of the ramp MSE walls are of concern. The other stability checks, such as global stability, sliding, and drained bearing capacity result in acceptable safety factors. We believe that MSE walls could be built in two stages, without any surcharging or ground improvement. Wick drains could be considered to decrease the amount of time required for consolidation of the foundation soil. Where the height of the MSE wall was high enough to cause concern about differential settlement, slip joints can be provided at regular intervals. The top row of facing panels would not be fabricated until after settlement was substantially complete.

Nothing in these comments is to be construed as authorizing extra work for which additional compensation may be claimed. If you believe that these comments require work outside the limits of the Scope of Services for this project, please contact this office before proceeding.

If you should have any questions regarding these comments, please contact our office.

TJK:JS: pan

c: John K. Wetzel, ODOT District 9
Lawrence A. Wills, ODOT District 9
Tim Keller, P.E., Office of Structural Engineering
Jawdat Siddiqi, P.E., Office of Structural Engineering
file

Letter of Transmittal

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To: Peter Narsavage	**From:** Jon Cox
ODOT Central Office	TranSystems Corporation
Office of Structural Engineering	**Subject:** Revised Subsurface Report US23/SR823
Date: 23 February 2007	**Project Name:** Portsmouth Bypass
No. of Pages:	**Project No:**

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Comments:

Peter,

Per our meeting on Thursday, February 22, 2007, enclosed is a copy of the October 4, 2006 revised geotechnical report that you did not have a copy.

Jon

Deliver Via:

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CC: Michael Weeks, TranSystems, Columbus

Shawn Thompson, CH2MHill

Signature: Jon Cox

Print: Jon R. Cox

REPORT

OF

PRELIMINARY SUBSURFACE EXPLORATION AND

MSE WALL AND EMBANKMENT EVALUATIONS

FOR

PROPOSED US 23 / SR 823 INTERCHANGE

Prepared for:
TranSystems Corporation
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TABLE OF CONTENTS

REPORT
OF
PRELIMINARY SUBSURFACE EXPLORATION AND MSE WALL AND EMBANKMENT EVALUATIONS
FOR
PROPOSED US 23 / SR 823 INTERCHANGE

1.0 INTRODUCTION

This report presents the findings of the preliminary subsurface exploration and mechanically stabilized earth (MSE) retaining wall and embankment evaluations conducted for the proposed US 23 and SR 823 (Portsmouth Bypass) interchange. The project is located in Scioto County, north of Lucasville, Ohio, within the area of the Scioto County Fairgrounds.

The purpose of this exploration was to 1) determine the subsurface conditions to the depths penetrated by the borings, 2) evaluate the engineering characteristics of the subsurface materials, and 3) provide preliminary information to assist in designing the proposed MSE walls and earthen embankments for the ramps at the interchange.

The findings and recommendations presented in this report should be considered preliminary. After the bridge and ramp designs are refined, it will be necessary to drill additional borings in the area of the proposed ramps in accordance with ODOT's specifications for subsurface investigations in order to finalize the MSE wall and embankment evaluations.

The geotechnical engineer has planned and supervised the performance of the geotechnical engineering services, has considered the findings, and has prepared this report in accordance with generally accepted geotechnical engineering practices. No other warranties, either expressed or implied, are made as to the professional advice included in this report.

2.0 GENERAL PROJECT INFORMATION

The proposed interchange reportedly will include four ramps: Ramp A will direct southbound US 23 traffic onto SR 823, Ramp B will direct northbound US 23 traffic onto SR 823, Ramp C will direct SR 823 traffic onto US 23 north, and Ramp D will direct SR 823 traffic onto US 23 south. It is understood that at the time this report was prepared it was uncertain exactly where earthwork or MSE walls will be constructed for the four ramps at the proposed US 23 and SR 823 interchange. However, based on the information provided by TranSystems, it is understood that approximately 2,100 feet of MSE walls will be used on Ramps B and C and there will be no MSE walls on Ramps A or D. Furthermore, it is understood that on Ramp B, an MSE wall will be used on the west side of the ramp from station 2596+50 to 2605+50 and on the east side of the ramp from station 2604+00 to 2605+50. It is also understood that on Ramp C, a MSE wall will

be used on the east side of the ramp from station 3898+50 to 3901+00 and on the west side of the ramp from station 3898+50 to 3906+50. The embankments and MSE walls used in this interchange reportedly will require a grade separation of up to 36 feet. The area where the four ramps merge into proposed SR 823 will likely be located in a cut up to 80 feet deep.

The preliminary analysis and recommendations presented in this report have been made on the basis of the foregoing information. If the proposed location or the overall concept of the proposed interchange is changed or differs from that assumed above, DLZ Ohio, Inc. (DLZ) should be informed of the changes so that the recommendations and conclusions presented in this report may be revised as necessary.

3.0 FIELD EXPLORATION

The locations of the borings were established and staked by representatives of DLZ Ohio, Inc. The surveyed locations and ground surface elevations of the borings were determined by representatives from Lockwood, Lanier, Mathias & Noland, Inc. (2LMN). All borings were advanced using either a truck-mounted or ATV-mounted rotary-type drill rig. The locations of the borings are presented in both tabular and graphical format in Appendix A. Also, information concerning the drilling procedures is presented in Appendix B.

Between July 13 and November 2, 2005, fifty-three borings, identified as borings B-1101 through B-1152, and B-1108A were drilled and sampled for the proposed interchange ramps and embankments. The depths of these fifty-two borings ranged from 10 feet to 49 feet below the existing ground surface. Also, boring logs are presented in Appendix B.

In addition, between March 14, 2005 and March 22, 2005, sixteen borings were drilled for the various structures in the proposed interchange and identified as borings TR-46 through TR-61. These borings were drilled and sampled to the top of rock, where 10 feet of rock was cored in each boring. The depths of these borings ranged from 25 feet to 45 feet below the existing ground surface. These sixteen borings have also been included in this report, and are presented in Appendix B.

4.0 FINDINGS

4.1 Geology of the Site

Generalized geological references report that the site lies on the east side of the flood plain of the Tayes Stage, Portsmouth River, currently the east side of the Scioto River valley. This area is unglaciated but the Scioto River valley is filled with Illinoian and Wisconsin outwash to depths of up to 90 feet. The bedrock is generally Berea sandstone underlain with Bedford and Ohio shales.

4.2 Subsurface Conditions

The following sections present the generalized subsurface conditions encountered by the borings. For more detailed information, please refer to the Boring Logs in Appendix B. The results of laboratory testing can be found in Appendix D. All of the soil and rock samples collected were visually identified in the laboratory. Index tests (grain size and plasticity tests) were performed on selected soil samples. Consolidation testing and direct shear testing were performed on selected samples. Results of the grain-size and plasticity testing are presented on the boring logs in Appendix B as well as in Appendix D.

4.2.1 Soil Conditions

Forty-four of the sixty-nine borings first encountered topsoil during drilling. The thickness of topsoil encountered in these borings ranged from 1 to 7 inches with an average thickness of approximately 3.5 inches. In addition, seventeen of the remaining borings first encountered asphalt concrete pavement and aggregate base during drilling. The thickness of asphalt concrete pavement encountered ranged from 3 to 8 inches with an average thickness of approximately 5.5 inches while the thickness of the aggregate base encountered ranged from 4 to 8 inches with an average thickness of approximately 6 inches.

Underlying any topsoil or paving layers, twenty-six of the sixty-nine borings encountered fill and/or possible fill material to depths of up to 33 feet. The fill and/or possible fill material generally consisted of cohesive soils (sandy silt (A-4a), silt and clay (A-6a), or silty clay (A-6b)), some of which were confirmed by laboratory testing to be slightly organic to organic. Five samples from four borings were tested to determine the organic content. Samples from borings B-1102, B-1103, B-1129, and B-1150 were tested. The results indicate organic contents ranging from 3.74 to 6.12 percent.

Underlying any fill or possible fill, most of the sixty-nine borings generally encountered cohesive soils consisting of very stiff to hard, damp to moist, silt and clay (A-6a), silty clay (A-6b), sandy silt (A-4a), clay (A-7-6), or silt (A-4b) to depths of between 10 and 20 feet. Some of these naturally occurring, cohesive soils were also confirmed by laboratory testing to be slightly organic to organic. Granular material was then typically encountered beneath these cohesive soils to the top of bedrock.

It should be noted that seven of the sixty-nine borings first encountered very loose to dense, damp to moist, gravel with sand (A-1-b) or gravel with sand and silt (A-2-4) before encountering any cohesive soils. The soil conditions varied across the entire interchange, therefore, the

individual boring logs should be reviewed for the soil conditions at a particular location.

Finally, it should be noted that several of the borings encountered a water-bearing granular layer overlying bedrock. Most of these borings encountered this granular layer after first extending through a fine-grained, cohesive layer. This cohesive layer acts to confine the water in the granular layer, placing the pore water in this granular layer under pressure. When sampling through the fine-grained cohesive layer into the granular layer, excess pore water pressures in the granular layer were released through and around the augers and split-spoon sampler. These circumstances developed a "quick" condition, meaning that the upward movement of the water acts to suspend the sand/soil particles near the upper portions of this granular layer, resulting in very low shear strength. This condition is evident on the boring logs with the weight-of-hammer (WOH) SPT N-values for the upper one or two samples in this granular layer. Several drilling techniques were employed to overcome this condition with little success.

4.2.2 Bedrock Conditions

Fifty-six of the sixty-nine borings encountered bedrock during drilling. The bedrock generally consisted of medium hard to hard sandstone. However shale, siltstone, and claystone layers were also encountered. The top of bedrock was first encountered at depths of between 13 and 38 feet below the existing ground surface, with the average depth to top of bedrock being 24 feet below the existing ground surface. It should be noted that some of the bedrock encountered at higher elevations was highly weathered to decomposed and exhibited a soil-like structure.

4.2.3 Groundwater Conditions

Groundwater seepage was encountered in most of the borings during drilling. Seepage was first encountered at depths from 9 to 35 feet below the existing ground surface.

At the completion of drilling, the depth to water, as measured inside the augers, ranged from 2 to 48 feet below the ground surface. However, it should be noted that some of these water levels also included water used during drilling (rock coring) operations and, therefore, may not be representative of actual groundwater conditions.

5.0 ANALYSIS AND RECOMMENDATIONS

5.1 Shear Strength Selection

Strength values used in the analyses were based upon laboratory test data, hand penetrometer values, soil classifications, typical values, and conservative judgment. Boring B-1108A was drilled essentially in the same location as boring B-1108. This boring was drilled to obtain undisturbed samples for laboratory strength and consolidation testing. Based upon the results of unconfined compression test and hand penetrometer test, the selected shear strength values are presented in the table below.

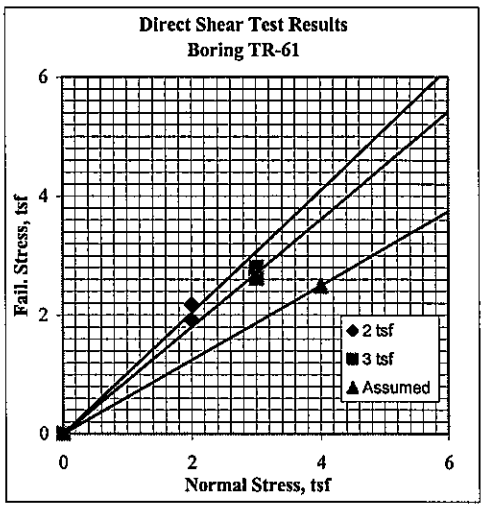
Strength Parameters Used in MSE Wall / Embankment Stability Analyses
Proposed SR 823 and US 23 Interchange

Zone	Soil Type	Unit Weight (pcf)	Strength Parameters			
			Undrained		Drained	
			c	ϕ	c'	ϕ'
Reinforced Fill MSE	Compacted Granular Fill	120	0	34	0	34
Retained Soil Embankment / MSE	Compacted Embankment Fill	120	0	30	0	30
Embankment	Compacted Embankment Fill	120	2000	0	300	28
Foundation Soil (Ramp B) (Boring B-1108)	Very Stiff Clay*	125	2500	0	0	29
	Soft Clay+	125	1000	0	0	29
Foundation Soil (Ramp C) (Boring B-1120/1121)	Very Stiff Clay*	125	2500	0	0	29
	Soft Clay+	125	1000	0	0	29
Foundation Soil (Ramp B) (Boring B-1108)	Hard Sandy Silt	125	2500	0	0	30
	Stiff Silt and Clay	125	1000	0	0	29
Foundation Soil	Loose Sand and Gravel	115	0	32	0	32

* *Strength Value used for Sliding and Overturning. Soil present at MSE/Soil interface.*
\+ *Strength Value used for Bearing Capacity Calculations. Softer soil controls analysis.*

It should be noted that testing was also performed to determine the strength of the granular layers that exhibited low SPT N-values. Granular material from boring TR-61 was remolded in a very loose condition and a direct shear test was performed. The sample was saturated in the mold with free water. Furthermore, the sample was stirred prior to commencing the test to ensure a loose condition. The results of the tests indicated friction angles between 42.1 and 45.7 degrees. However, to be conservative, a value of 32 degrees was selected for the purposes

of analyses. The results of this test are presented here in graphic form, as well as in Appendix D.



5.2 Mechanically Stabilized Earth (MSE) Retaining Walls – General Information

An MSE retaining wall essentially consists of good quality backfill material with layers of metal or plastic reinforcing that are attached to concrete facing panels. The MSE wall and associated backfill should be constructed in accordance with the specifications of the manufacturer of the MSE wall.

Global stability analyses and bearing capacity analyses were performed for the MSE walls at this interchange location in accordance with ODOT and AASHTO guidelines. The MSE walls were also analyzed for sliding, overturning, and settlement.

At the time this report was prepared, it was not known what foundation type would be used at this site to support the bridge abutments. However, the conditions at the site seem best suited for the use of deep foundations. Therefore, the use of deep foundations is assumed for the purposes of analyses. If the foundation type selected for the proposed bridges should be different than that assumed in this report, DLZ should be informed so that the analyses may be revised as necessary. The minimum required factor of safety for the global stability analyses was taken to be 1.3.

Calculations for bearing capacity, sliding, and overturning as well as the results of the global stability analyses are attached. Other external and internal stability analyses are required for the design of an MSE wall, but are considered outside the scope of this report. The parameters required to perform the stability analyses are presented below. In accordance with ODOT Bridge Design Manual (BDM) guidelines, a unit weight of 120 pcf and a friction angle of 34 degrees were selected for the backfill material in the reinforced zone. However, the fill material used to construct the roadway embankments is assumed to have a unit weight of 120 pcf and a friction angle of 30 degrees. If the embankment fill material or backfill material for the reinforcing zone has properties significantly different from these values, DLZ should be informed so that the analyses may be revised as necessary.

5.3 MSE Wall Recommendations

Due to dissimilarities in the soil profiles, the most critical profile was analyzed with the maximum MSE wall / embankment height for each ramp. For Ramp B, boring B-1108 was generally found to have the most critical soil profile. Similarly, for Ramp C, borings B-1120 and B-1121 were generally found to have the most critical soil profiles. A composite profile (B-1120 and B-1121) was used in the analyses of Ramp C.

It should be noted that the bearing capacity was controlled by the soft/stiff clay layer. This layer was found below a 10-foot thick, very stiff clay layer. To be conservative, the strength values from the soft/stiff layer were used for the calculation of bearing capacity.

We would also note that based on current information, the analyses indicate that MSE walls can be safely constructed using staged construction and ground modification techniques at this interchange. However, due to the relatively poor subsurface conditions, the risk of detrimental differential settlement is greater when constructing the MSE walls using staged construction. In addition, the final borings may indicate poorer conditions than those encountered in the preliminary borings. To significantly reduce the risk of detrimental differential settlement, pile supported walls would most likely be necessary for the higher walls.

5.3.1 Ramp B

Ramp B is anticipated to be constructed with MSE walls to contain the embankment fill. It is assumed that the width of the ramp is approximately 30 feet. Based upon the stability and the AASHTO guidelines, the minimum required embedment depth for the proposed MSE wall is 3.0 feet below the finished grade. The length of the reinforcing straps is limited by the width of the ramp for the higher walls. At the maximum wall height, a reinforcing strap length of approximately 0.75H is the maximum length able to be accommodated by the ramp dimensions. As the height of the ramp lessens, as the width remains constant (30 feet), it is recommended that a minimum reinforcing length of 0.9H be used as allowed by the ramp dimensions.

In the area of Ramp B, several analyses were performed to determine the most critical soil profile. Based upon the results of these analyses, the soil profile encountered in boring B-1108 was generally found to be the most critical. It is assumed that the maximum height of the MSE wall/embankment for Ramp B is 36 feet.

The results of global stability analyses yielded acceptable factors of safety for global stability (>1.3). Drawings illustrating the results of the global

stability analyses are presented in Appendix C. The wall was also analyzed for bearing capacity and stability (sliding and overturning). The calculations for stability yielded factors of safety above the minimum recommended values. The drained bearing capacity calculation also yielded an acceptable factor of safety. However, the factor of safety for the undrained bearing capacity was calculated to be significantly below the required minimum value of 2.5. Consequently, additional analyses were undertaken to evaluate possible remedies to this low factor of safety for undrained bearing capacity. A five-foot undercut and replacement with compacted, granular fill was considered. However, this analysis did not provide an appreciable increase in the undrained bearing capacity.

UTEXAS3 was utilized to evaluate the multi-layered bearing capacity of the MSE wall. UTEXAS3 is a computer program that can be used to evaluate several types of global stability failure modes. If the problem is modeled so the failure surface passes through or below the toe of the MSE wall volume, this analysis can be considered a global stability failure mode that is essentially a bearing capacity failure. Using this type of failure model for the MSE walls, the factor of safety for undrained bearing capacity of the full height wall was calculated to be 1.5, which is less than the required minimum value of 2.5. Therefore, additional analyses were performed to determine the maximum allowable staged construction height to achieve a minimum factor of safety for undrained bearing capacity. This analysis resulted in a maximum allowable staged height of 22 feet, with a factor of safety of 2.5. In addition, it was determined that a waiting period of approximately 217 days will be required before placing additional 14 feet of fill to complete the full height of the MSE walls. The waiting period will allow excess pore water pressures to dissipate enough to accommodate the additional loading of the embankment fill, while maintaining a minimum factor of safety of 2.5. Due to the long consolidation period, it is anticipated that the use of wick drains or other methods will be explored to accelerate the consolidation of foundation soils. These alternatives will be evaluated for this site in the final report.

Due to the inherent variations of the subsurface conditions, the actual required waiting period may be shorter or longer than anticipated. It is recommended that piezometers be installed in the clay layer to monitor the excess pore water pressures that will develop during construction and ensure that a critical pore water pressure is not exceeded. Analyses have been performed to determine the critical pore water pressures. Based upon the results of the analyses, if the water level in the piezometer rises 14 feet above the existing ground surface, construction of the MSE wall/embankment should halt immediately. Construction may continue after pore pressures in the clay layer have dissipated. The results of the critical pore pressure stability analyses are presented in Appendix C.

Assuming continuous embankment loading and a height of 36 feet, the total maximum settlement of the MSE wall volumes at the boring B-1108 location was estimated to be approximately 11 inches at the MSE wall face, and 16 inches at the centerline of Ramp B. Assuming an "end of fill" condition (i.e., end wall at structure location), the total maximum settlement of the MSE wall volume at the boring B-1108 location was estimated to be approximately 11 inches at the centerline of Ramp B. Settlement was also evaluated at the boring B-1106 location assuming continuous embankment loading using an embankment height of 12 feet. These calculations indicated that approximately 6 inches of settlement would occur at the MSE wall face, and approximately 10 inches at the centerline of Ramp B. Settlement was calculated using the computer program EMBANK, using the "end of fill" option to model the non-continuous embankments and strip loads to model the double-faced MSE walls used to construct Ramp B. The maximum differential settlement along Ramp B was estimated to be 2.1 percent, at the abutment wall location. MSE retaining walls are able to withstand relatively large amounts of differential settlement, typically up to 100 millimeters per 10 meters of wall length (1/100). Settlement calculations are presented in Appendix C.

Due to the large amount of differential settlement at the abutment wall, alternatives will need to be developed to remedy this situation. Some possibilities include; 1) pre-loading the site (abutment location only) to allow a significant portion of the consolidation to occur prior to constructing the wall, 2) the use of wire-faced MSE walls (although ODOT has been recently hesitant to use these walls), or 3) selecting an alternate wall type (pile-supported wall) at the abutment location. It is anticipated that the final wall type selection will be reached through discussions with TranSystems and ODOT. Recommendations for the selected wall system will be included in the final report.

Time-rate of consolidation calculations have indicated that approximately 353 days will be required to achieve 90 percent consolidation of foundational soils without using wick drains or other methods. Due to the long consolidation period, it is anticipated that the use of wick drains or other methods will be used to accelerate the consolidation of foundation soils. Wick drain analyses will be performed for this site in the final report. Time-rate of consolidation calculations are presented in Appendix C.

5.3.2 Ramp C

Ramp C is anticipated to be constructed with MSE walls to contain the embankment fill. It is assumed that the width of the ramp is approximately 30 feet. Based upon the stability and the AASHTO guidelines, the minimum required embedment depth for the proposed MSE wall is 3.0 feet below the finished grade. The length of the reinforcing straps is limited by the width of the ramp for the higher walls. At the maximum wall height, a reinforcing strap length of approximately 0.75H is the maximum length able to be accommodated by the ramp dimensions. As the height of the ramp lessens, while the width of the ramp remains constant (30 feet), it is recommended that a minimum reinforcing length of 0.9H be used as allowed by the ramp dimensions.

In the area of Ramp C, several analyses were performed to determine the most critical soil profile. Based upon the results of these analyses, the soil profile encountered in boring B-1120 and B-1121 was generally found to be the most critical. It is assumed that the maximum height of the MSE wall/embankment for Ramp C is 35 feet.

The results of global stability analyses yielded acceptable factors of safety for global stability (>1.3). Drawings illustrating the results of the global stability analyses are presented in Appendix C. The wall was also analyzed for bearing capacity and stability (sliding and overturning). The calculations for stability yielded factors of safety above the minimum recommended values. The drained bearing capacity calculation also yielded an acceptable factor of safety. However, the factor of safety for the undrained bearing capacity was calculated to be significantly below the required minimum value of 2.5. Consequently, additional analyses were undertaken to evaluate possible remedies to this low factor of safety for undrained bearing capacity. A five-foot undercut and replacement with compacted granular fill was considered. This analysis did not provide an appreciable increase in the undrained bearing capacity.

UTEXAS3 was utilized to evaluate the multi-layered bearing capacity of the MSE wall. UTEXAS3 is a computer program that can be used to evaluate several types of global stability failure modes. If the problem is modeled so the failure surface passes through or below the toe of the MSE wall volume, this analysis can be considered a global stability failure mode that is essentially a bearing capacity failure. Using this type of failure model for the MSE walls, the factor of safety for undrained bearing capacity of the full height wall was calculated to be 1.5 which is less than the required minimum value of 2.5. Therefore, additional analyses were performed to determine the maximum allowable staged construction height to achieve a minimum factor of safety for undrained bearing

capacity. This analysis resulted in a maximum allowable staged height of 20 feet, with a factor of safety of 2.5. In addition, it was determined that a waiting period of approximately 77 days will be required before placing additional 15 feet of fill to complete the full height of the MSE walls. The waiting period will allow excess pore water pressures to dissipate enough to accommodate the additional loading of the embankment fill, while maintaining a minimum factor of safety of 2.5.

Due to the inherent variations of the subsurface conditions, the actual required waiting period may be shorter or longer than anticipated. It is recommended that piezometers be installed in the clay layer to monitor the excess pore water pressures that will develop during construction and ensure that a critical pore water pressure is not exceeded. Analyses have been performed to determine the critical pore water pressures. Based upon the results of the analyses, if the water level in the piezometer rises 13 feet above the existing ground surface, construction of the MSE wall/embankment should halt immediately. Construction may continue after pore pressures in the clay layer have dissipated. The results of the critical pore pressure stability analyses are presented in Appendix C.

Assuming continuous embankment loading and a height of 35 feet, the total maximum settlement of the MSE wall volumes at the boring B-1120/1121 location was estimated to be approximately 11 inches at the MSW wall face, and 16 inches at the centerline of Ramp C. Assuming an "end of fill" condition (i.e., end wall at structure location), the total maximum settlement of the MSE wall volume at the boring B-1120/1121 location was estimated to be approximately 10 inches at the centerline of Ramp C. Settlement was also evaluated at the boring B-1124 location assuming continuous embankment loading using an embankment height of 13 feet. These calculations indicated that approximately 6 inches of settlement would occur at the MSE wall face, and approximately 10 inches at the centerline of Ramp C. Settlement was calculated using the computer program EMBANK, using the "end of fill" option to model the non-continuous embankments and strip loads to model the double-faced MSE walls used to construct Ramp C. Differential settlement at this location was estimated to be approximately 2.2 percent. MSE retaining walls are able to withstand relatively large amounts of differential settlement, typically up to 100 millimeters per 10 meters of wall length (1/100). Settlement calculations are presented in Appendix C.

Due to the large amount of differential settlement at the abutment wall, alternatives will need to be developed to remedy this situation. Some possibilities include; 1) pre-loading the site (abutment location only) to allow a significant portion of the consolidation to occur prior to constructing the wall, 2) the use of wire-faced MSE walls (although

ODOT has been recently hesitant to use these walls), or 3) selecting an alternate wall type (pile-supported wall) at the abutment location. It is anticipated that the final wall type selection will be reached through discussions with TranSystems and ODOT. Recommendations for the selected wall system will be included in the final report.

Time-rate of consolidation calculations have indicated that approximately 139 days will be required to achieve 90 percent consolidation of foundational soils without using wick drains or other methods. Due to the long consolidation period, it is anticipated that the use of wick drains or other methods will be explored to accelerate the consolidation of foundation soils. These alternatives will be evaluated for this site in the final report. Time-rate of consolidation calculations are presented in Appendix C.

Tables summarizing the MSE retaining wall parameters and results of analyses can be found on the following pages.

MSE Retaining Wall Parameters and Analyses Results
Proposed SR 823 Ramp B (US 23 Interchange)
Analysis Based on Boring B-1108

Retained Soil (New Embankment) Unit Weight = 120 pcf Coefficient of Active Earth Pressure (K_a) = 0.33* (Based on $\phi' = 30°$)
Sliding along base of MSE wall Sliding Coefficient (m)(0.67) = tan 29°(0.67) = 0.37 Use (m)(0.67) = 0.35 as a maximum value as per AASHTO, BDM,303.4.1.1
Allowable Bearing Capacity – Undrained Condition q_{all} = 2,640 psf**
Allowable Bearing Capacity – Drained Condition q_{all} = 7,097 psf
Global Stability Factor of Safety – Undrained Condition = 1.5 Factor of Safety – Drained Condition = 1.7 Factor of Safety – Seismic Condition = 1.6
Estimated Settlement of MSE volume Maximum Total Settlement = 11 inches Differential Settlement = **2.1%**
Maximum Full Height of MSE Wall = 36 feet Minimum Embedment Depth = 3.0 feet Minimum Length of Reinforcement for External Stability = $0.9H^{+}$ Maximum Staged Construction Height = 22 feet Maximum Pore Pressure = 14^{++} feet above ground surface

* *Coefficient of lateral earth pressure varies depending on MSE wall reinforcing strap separation/overlap.*

** *Calculated based on maximum allowable staged height of 22 feet, as per UTEXAS analysis.*

$^{+}$ *The use of shorter reinforcing straps is necessary for higher walls due to limiting ramp width.*

$^{++}$*Maximum pore pressure as measured in piezometer installed in clay layer. See results of analyses for more information.*

MSE Retaining Wall Parameters and Analyses Results
Proposed SR 823 Ramp C (US 23 Interchange)
Analysis Based on Borings B-1121 & B-1120

Retained Soil (New Embankment) Unit Weight = 120 pcf Coefficient of Active Earth Pressure (K_a) = 0.33* (Based on $\phi' = 30°$)
Sliding along base of MSE wall Sliding Coefficient (m)(0.67) = tan 29°(0.67) = 0.37 Use (m)(0.67) = 0.35 as a maximum value as per AASHTO, BDM,303.4.1.1
Allowable Bearing Capacity – Undrained Condition q_{all} = 2,400 psf**
Allowable Bearing Capacity – Drained Condition q_{all} = 6,397 psf
Global Stability Factor of Safety – Undrained Condition = 1.5 Factor of Safety – Drained Condition = 1.7 Factor of Safety – Seismic Condition = 1.6
Estimated Settlement of MSE volume Maximum Total Settlement = 11 inches Maximum Differential Settlement = **2.2%**
Maximum Full Height of MSE Wall = 35 feet Minimum Embedment Depth = 3.0 feet Minimum Length of Reinforcement for External Stability = $0.9H^{+}$ Maximum Staged Construction Height = 20 feet Maximum Pore Pressure = 13^{++} feet above ground surface

* *Coefficient of lateral earth pressure varies depending on MSE wall reinforcing strap separation/overlap.*

** *Calculated based on maximum allowable staged height of 20 feet, as per UTEXAS analysis.*

$^{+}$ *The use of shorter reinforcing straps is necessary for higher walls due to limiting ramp width.*

$^{++}$ *Maximum pore pressure as measured in piezometer installed in clay layer. See results of analyses for more information.*

5.4 Embankment Recommendations

Subgrades and embankments should be constructed in accordance with Ohio Department of Transportation Construction and Material Specification (ODOT-CMS) Item 203, "Roadway Excavation and Embankment."

Topsoil was encountered in the majority of the borings to depths of between 1 and 7 inches. The average topsoil thickness, as measured at the boring locations, was 3.5 inches. All topsoil should be removed prior to placing fill, MSE walls, or pavement materials.

Fill and/or possible fill was encountered in several of the borings. The presence of these materials does not necessarily indicate poor subgrade conditions. However, because of the apparent uncontrolled nature of some of the fill, it should be anticipated that conditions at some locations along the proposed roadway alignments may vary considerably from those encountered by the borings, especially outside of the existing roadways.

The soils identified as possible fill did not necessarily contain deleterious material or other obvious evidence that they were fill. It is often difficult to distinguish between clean fill and natural material based solely on the appearance of the samples. The materials classified as possible fill were identified as such based on other additional information, including the topography of the site and depth below existing grade.

In addition, several of the borings encountered material classified as silt (A-4b). Where silt is encountered at proposed subgrade levels, it should be overexcavated and replaced to a depth of at least 3 feet below the surface of the proposed subgrade in accordance with the applicable sections of the ODOT-CMS Item 203. Silt is generally considered suitable for use in roadway embankments only when placed at least 3 feet below the surface of the subgrade.

Based on the findings of the borings, areas of soft, organic, or otherwise unsuitable material will likely be encountered during construction. Unsuitable subgrade areas may be revealed during subgrade compaction and testing. However, they can best be identified by proof rolling. Areas which are unstable or exhibit excessive deflection or rutting during proof rolling should be overexcavated and replaced with suitable material in accordance with the ODOT-CMS Item 203.13. Overexcavation should extend to suitable material or to the depth necessary to achieve reasonable stability. This can generally be achieved with overexcavation and replacement of 2 feet or less.

Global stability analyses were performed by DLZ for the earthen embankments for this project. For the purposes of analyses, it was assumed that deep foundations would be used to support the structures. The assumed maximum height of embankments in the area of Ramps A and D is approximately 34 feet. As per ODOT Office of Geotechnical Engineering, the following material properties were used to carry out the stability analyses; 1) a cohesion value of 2000 pound per square foot (psf) and a friction angle of zero was used for the undrained analysis and 2) a cohesion value of 300 psf and a friction angle of 28 was used for the drained and seismic analyses. Based on the soils encountered in the borings and the stability analyses that were performed, the US 23 and SR 823 interchange site appears to be suitable for earthen embankments, provided they are constructed with side slopes of no steeper than 2H:1V. A drawing illustrating the results of the stability analyses is included in Appendix C.

Settlement analyses were performed for Ramp A and D embankments. Preliminary calculations indicate the maximum total settlement of the embankment will be approximately 23 inches. Time-rate of consolidation calculations have indicated that approximately 229 days will be required to achieve 90 percent consolidation of foundational soils without using wick drains or other methods. Due to the long consolidation period, it is anticipated that the use of wick drains or other methods will be used to accelerate the consolidation of foundation soils. Wick drains will be evaluated for this site in the final report. Time-rate of consolidation calculations are presented in Appendix C.

5.5 Excavation and Groundwater Considerations

Based on the findings of the borings, excavations of 9 feet or less should not encounter significant groundwater seepage. However, excavations deeper than 9 feet may encounter significant groundwater seepage. However, the Contractor should be prepared to deal with anticipated or unexpected seepage and with any surface water, which may accumulate, in excavation. Special efforts, such as sumping and pumping or surface drainage may be needed in order to maintain dry excavations. In addition, groundwater conditions can vary seasonally and with the passage of time.

The bottom of the excavations should be kept essentially dry. Excavations extending below the water table into sand, silt, or gravel deposits can result in a "quick condition" when the confining effect of the overburden is removed. To prevent this occurrence, areas of proposed excavation may need to be dewatered and the water level maintained a minimum of 3 feet below the bottom of the proposed excavation during construction.

All excavations should be constructed in accordance with the current OSHA regulations governing excavation and trench safety standards (29 CFR Part 1926).

Heavy equipment working close to excavations and stockpiles of construction materials close to the excavations act as a surcharge weight and may result in instability of the excavation sidewalls. In addition, vibrations from heavy equipment or trains could result in instability of the excavation sidewalls as well.

A "competent person" having knowledge relative to slope stability should constantly observe side slopes of excavations for signs of yielding and potential failure or "cave'ins".

6.0 CLOSING REMARKS

We encourage you to discuss with us any questions or concerns you have about the findings and conclusions presented in this report. Please do not hesitate to call if we can be of any further assistance.

Sincerely,

DLZ Ohio, Inc.

Steven J. Riedy
Geotechnical Engineer

Arthur (Pete) Nix, P.E.
Geotechnical Division Manager

Copies: Mike Weeks, TranSystems Corporation – 4
File – 2

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APPENDIX A

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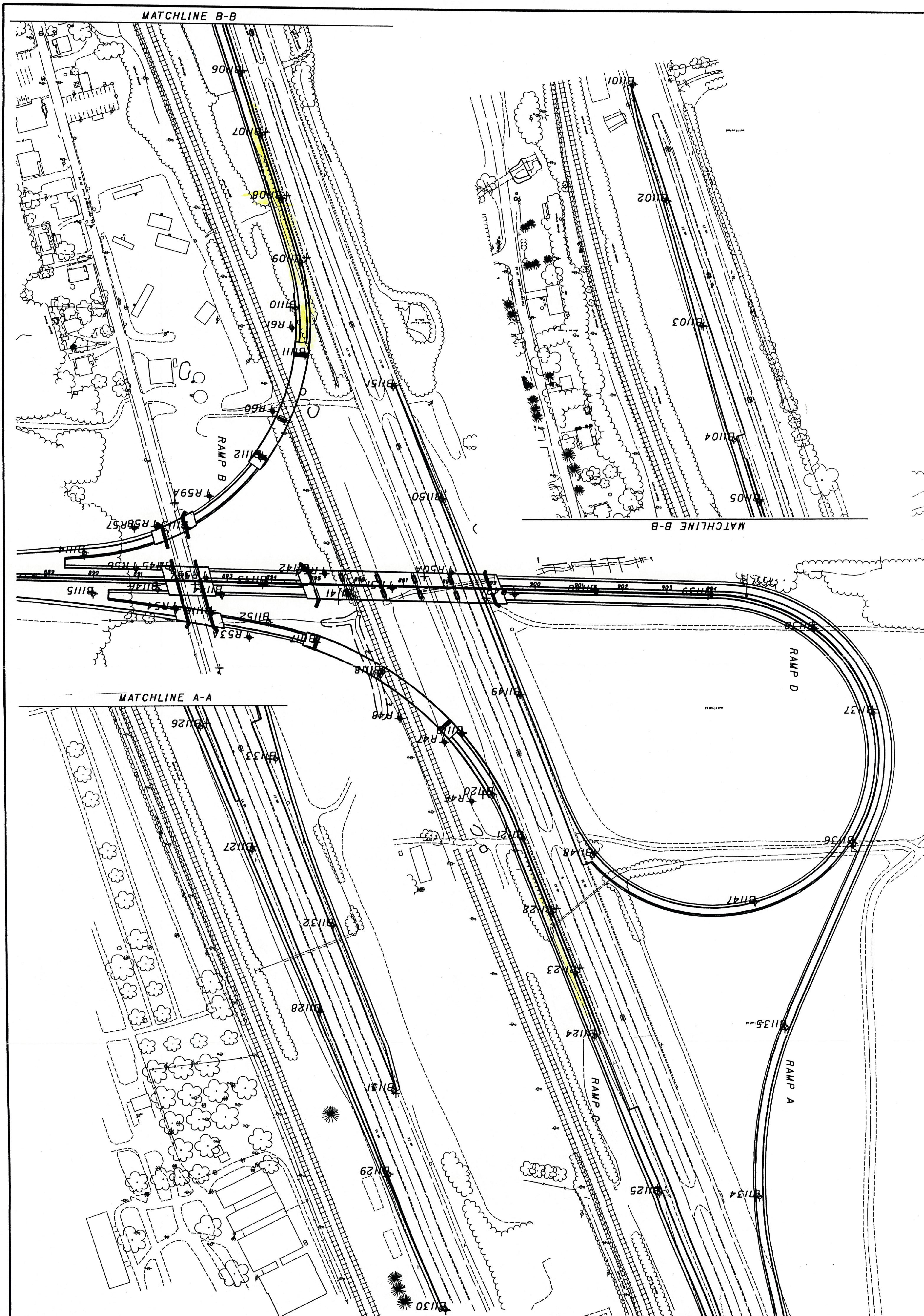
APPENDIX A

Boring Location Plan
Table of Boring Locations



SCI-832-0.00	BORING LOCATION PLAN PROPOSED US 23 / SR 823 INTERCHANGE	CALCULATED CHECKED	0 50 100 200 HORIZONTAL SCALE IN FEET	N

Table of Boring Locations

Boring	As Drilled			Ramp	Type	Boring Depth (ft.)
	Northing	Easting	Elevation			
B-1101	323061.247	1827070.641	541.57	B	RDWY	10
B-1102	323332.814	1826993.771	540.78	B	RDWY	10
B-1103	323618.601	1826908.781	539.51	B	EMB	10
B-1104	324017.412	1826783.581	538.82	B	EMB	41.5
B-1105	324017.469	1826783.266	538.96	B	MSE	37
B-1106	324159.837	1826733.921	540.22	B	MSE	37.5
B-1107	324299.806	1826682.352	540.52	B	MSE	35
B-1108	324444.358	1826634.809	540.69	B	MSE	33.5
B-1108A	324444.358	1826634.809	540.69	B	MSE	33.5
B-1109	324583.865	1826589.040	540.64	B	MSE	30
B-1110	324695.088	1826626.272	542.30	B	MSE	30
B-1111	324800.005	1826593.701	543.79	B	STR	35
B-1112	325034.315	1826688.991	560.88	B	STR	43
B-1113	325197.009	1826860.751	566.84	B	STR	49
B-1114	325260.432	1827090.824	584.14	B	STR	31.5
B-1115	325343.406	1827073.558	582.38	C	STR	29
B-1116	325386.086	1826805.402	565.84	C	STR	48
B-1117	325458.045	1826571.466	562.56	C	STR	48
B-1118	325533.090	1826443.997	546.17	C	STR	35
B-1119	325668.639	1826236.989	542.03	C	MSE	30
B-1120	325809.232	1826192.665	542.67	C	MSE	33.5
B-1121	325893.136	1826112.414	539.03	C	MSE	30
B-1122	326069.463	1826027.053	540.66	C	MSE	32.5
B-1123	326207.660	1825973.884	540.85	C	MSE	32.5
B-1124	326357.984	1825942.319	533.47	C	MSE	25
B-1125	326716.410	1825803.510	538.90	C	EMB	30
B-1126	327052.646	1825651.739	540.71	C	EMB	32.5
B-1127	327331.386	1825549.607	539.99	C	RDWY	10
B-1128	327710.700	1825399.765	540.56	C	RDWY	10
B-1129	328086.377	1825253.394	540.86	C	RDWY	10
B-1130	328394.202	1825118.313	541.42	C	RDWY	10
B-1131	327899.004	1825229.125	540.95	A	RDWY	10
B-1132	327513.460	1825367.896	540.65	A	RDWY	10
B-1133	327134.200	1825508.691	540.15	A	EMB	35
B-1134	326741.512	1825584.253	534.00	A	EMB	30

* Northing, Easting and Elevation for Boring are "As Per Plan"

Borings ending in "A", are redrilled holes due to original holes being staked wrong

STR = Structure Boring MSE = MSE Wall Boring

RDWY = Roadway Boring EMB = Embankment Boring

Overpass = Mainline Overpass Over US 23

Table of Boring Locations

Boring	As Drilled			Ramp	Type	Boring Depth (ft.)
	Northing	Easting	Elevation			
B-1135	326352.347	1825512.811	533.14	A	EMB	35
B-1136	325931.815	1825360.454	524.92	A/D	EMB	32.5
B-1137	325620.882	1825310.332	524.99	A/D	EMB	31
B-1138	325422.958	1825443.598	525.33	A/D	EMB	30
B-1139	325353.958	1825678.123	529.66	A/D	EMB	35
B-1140	325340.967	1825934.726	535.83	A/D	EMB	40
B-1141	325362.944	1826517.749	556.24	Overpass	STR	43
B-1142	325293.723	1826586.346	560.39	Overpass	STR	48.5
B-1143	325327.769	1826689.992	563.20	Overpass	STR	37
B-1144	325347.233	1826785.628	565.17	Overpass	STR	26
B-1145	325285.001	1826918.911	567.30	Overpass	STR	24.5
B-1146	325329.610	1826929.736	567.69	Overpass	STR	24.5
B-1147	326057.226	1825578.667	529.70	D	EMB	33
B-1148	325941.799	1825938.520	530.24	D	EMB	25
B-1149	325581.623	1826105.077	540.44	D	RDWY	10
B-1150	325132.329	1826281.059	540.75	D	RDWY	10
B-1151	324869.302	1826393.170	541.12	D	RDWY	10
B-1152*	325413.066	1826677.035	563.00	C	STR	37
TR-46	325824.223	1826216.977	543.10	C	STR	37
TR-47	325689.987	1826278.864	543.06	C	STR	36.5
TR-48	325635.827	1826379.383	546.33	C	STR	35
TR-49A	325351.073	1826116.599	538.10	Overpass	STR	35
TR-50A	325302.044	1826260.104	539.25	Overpass	STR	37.5
TR-51	325336.603	1826395.590	544.46	Overpass	STR	37.5
TR-52	325303.442	1826548.490	558.01	Overpass	STR	45
TR-53A	325447.818	1826720.590	565.34	C	STR	32.5
TR-54	325382.450	1826885.040	566.91	C	STR	25
TR-55A	325312.752	1826817.666	565.44	Overpass	STR	30
TR-56	325291.521	1826974.037	569.95	Overpass	STR	25
TR-57	325198.417	1826977.925	569.52	B	STR	25
TR-58	325195.371	1826928.980	567.12	B	STR	25
TR-59A	325126.513	1826809.594	563.91	B	STR	35
TR-60	324934.012	1826665.121	552.28	B	STR	40
TR-61	324742.822	1826622.009	543.40	B	STR	35

* Northing, Easting and Elevation for Boring are "As Per Plan"

Borings ending in "A", are redrilled holes due to original holes being staked wrong

STR = Structure Boring MSE = MSE Wall Boring

RDWY = Roadway Boring EMB = Embankment Boring

Overpass = Mainline Overpass Over US 23

APPENDIX B

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APPENDIX B

General Information – Drilling Procedures and Logs of Borings
Legend – Boring Log Terminology
Boring Logs – sixty-nine (69) Boring Logs

GENERAL INFORMATION
DRILLING PROCEDURES AND LOGS OF BORINGS

Drilling and sampling were conducted in accordance with procedures generally recognized and accepted as standardized methods of investigation of subsurface conditions concerning geotechnical engineering considerations. Borings were drilled with either a truck-mounted or ATV-mounted drill rig.

Drive split-barrel sampling was performed in 1.5 foot increments at intervals not exceeding 5 feet. In the event the sampler encountered resistance to penetration of 6 inches or less after 50 blows of the drop hammer, the sampling increment was discontinued. Standard penetration data were recorded and one or more representative samples were preserved from each sampling increment.

In borings where rock was cored, NXM or NQ size diamond coring tools were used.

In the laboratory all samples were visually classified by a geotechnical engineer. Moisture contents of representative fine-grained soil samples were determined. A limited number of samples, considered representative of foundation materials present, were selected for performance of grain-size analyses and plasticity characteristics tests. The results of these tests are shown on the boring logs.

The boring logs included in the Appendix have been prepared on the basis of the field record of drilling and sampling, and the results of the laboratory examination and testing of samples. Stratification lines on the boring logs indicating changes in soil stratigraphy represent depths of changes approximated by the driller, by sampling effort and recovery, and by laboratory test results. Actual depths to changes may differ somewhat from the estimated depths, or transitions may occur gradually and not be sharply defined. The boring logs presented in this report therefore contain both factual and interpretative information and are not an exact copy of the field log.

Although it is considered that the borings have disclosed information generally representative of site conditions, it should be expected that between borings conditions may occur which are not precisely represented by any one of the borings. Soil deposition processes and natural geologic forces are such that soil and rock types and conditions may change in short vertical intervals and horizontal distances.

Soil/rock samples will be stored at our laboratory for a period of six months. After this period of time, they will be discarded, unless notified to the contrary by the client.

LEGEND – BORING LOG TERMINOLOGY

Explanation of each column, progressing from left to right

1. Depth (in feet) – refers to distance below the ground surface.

2. Elevation (in feet) – is referenced to mean sea level, unless otherwise noted.

3. Standard Penetration (N) – the number of blows required to drive a 2-inch O.D., 1-3/8 inch I.D., split-barrel sampler, using a 140-pound hammer with a 30-inch free fall. The blows are recorded in 6-inch drive increments. Standard penetration resistance is determined from the total number of blows required for one foot of penetration by summing the second and third 6-inch increments of an 18-inch drive.

   50/n – indicates number of blows (50) to drive a split-barrel sampler a certain number of inches (n) other than the normal 6-inch increment.

4. The length of the sampler drive is indicated graphically by horizontal lines across the "Standard Penetration" and "Recovery" columns.

5. Sample recovery from each drive is indicated numerically in the column headed "Recovery".

6. The drive sample location is designated by the heavy vertical bar in the "Sample No., Drive" column.

7. The length of hydraulically pressed "Undisturbed" samples is indicated graphically by horizontal lines across the "Press" column.

8. Sample numbers are designated consecutively, increasing in depth.

9. Soil Description

   a. The following terms are used to describe the relative compactness and consistency of soils:

   Granular Soils – Compactness

Term	Blows/Foot Standard Penetration
Very Loose	0 – 4
Loose	4 – 10
Medium Dense	10 – 30
Dense	30 – 50
Very Dense	over 50

   Cohesive Soils – Consistency

Term	Unconfined Compression tons/sq.ft.	Blows/Foot Standard Penetration	Hand Manipulation
Very Soft	less than 0.25	below 2	Easily penetrated by fist
Soft	0.25 – 0.50	2 – 4	Easily penetrated by thumb
Medium Stiff	0.50 – 1.0	4 – 8	Penetrated by thumb with moderate pressure
Stiff	1.0 – 2.0	8 – 15	Readily indented by thumb but not penetrated
Very Stiff	2.0 – 4.0	15 – 30	Readily indented by thumb nail
Hard	over 4.0	over 30	Indented with difficulty by thumb nail

   b. Color – If a soil is a uniform color throughout, the term is single, modified by such adjective as light and dark. If the predominant color is shaded by a secondary color, the secondary color precedes the primary color. If two major and distinct colors are swirled throughout the soil, the colors are modified by the term "mottled".

   c. Texture is based on the Ohio Department of Transportation Classification System. Soil particle size definitions are as follows:

Description		Size	Description		Size
Boulders		Larger than 8"	Sand	– Coarse	2.0 mm to 0.42 mm
Cobbles		8" to 3"		– Fine	0.42 mm to 0.074 mm
Gravel	– Coarse	3" to ¾"	Silt		0.074 mm to 0.005 mm
	– Fine	¾" to 2.0 mm	Clay		smaller than 0.005 mm

d. The main soil component is listed first. The minor components are listed in order of decreasing percentage of particle size.

e. Modifiers to main soil descriptions are indicated as a percentage by weight of particle sizes.

trace	0 to 10%
little	10 to 20%
some	20 to 35%
"and"	35 to 50%

f. Moisture content of **cohesionless soils** (sands and gravels) is described as follows:

Term	Relative Moisture or Appearance
Dry	No moisture present
Damp	Internal moisture, but none to little surface moisture
Moist	Free water on surface
Wet	Voids filled with free water

g. The moisture content of **cohesive soils** (silts and clays) is expressed relative to plastic properties.

Term	Relative Moisture or Appearance
Dry	Powdery
Damp	Moisture content slightly below plastic limit
Moist	Moisture content above plastic limit but below liquid limit
Wet	Moisture content above liquid limit

10. Rock Hardness and Rock Quality Designation

a. The following terms are used to describe the relative hardness of the **bedrock.**

Term	Description
Very Soft	Permits denting by moderate pressure of the fingers. Resembles hard soil but has rock structure. (Crushes under pressure of fingers and/or thumb)
Soft	Resists denting by fingers, but can be abraded and pierced to shallow depth by a pencil point. (Crushes under pressure of pressed hammer)
Medium Hard	Resists pencil point, but can be scratched with a knife blade. (Breaks easily under single hammer blow, but with crumbly edges.)
Hard	Can be deformed or broken by light to moderate hammer blows. (Breaks under one or two strong hammer blow, but with resistant sharp edges.)
Very Hard	Can be broken only by heavy and in some rocks repeated hammer blows.

b. Rock Quality Designation, RQD – This value is expressed in percent and is an indirect measure of rock soundness. It is obtained by summing the total length of all core pieces which are at least four inches long, and then dividing this sum by the total length of the core run.

11. Gradation – when tests are performed, the percentage of each particle size is listed in the appropriate column (defined in Item 9c).

12. When a test is performed to determine the natural moisture content, liquid limit moisture content, or plastic limit moisture content, the moisture content is indicated graphically.

13. The standard penetration (N) value in blows per foot is indicated graphically.

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

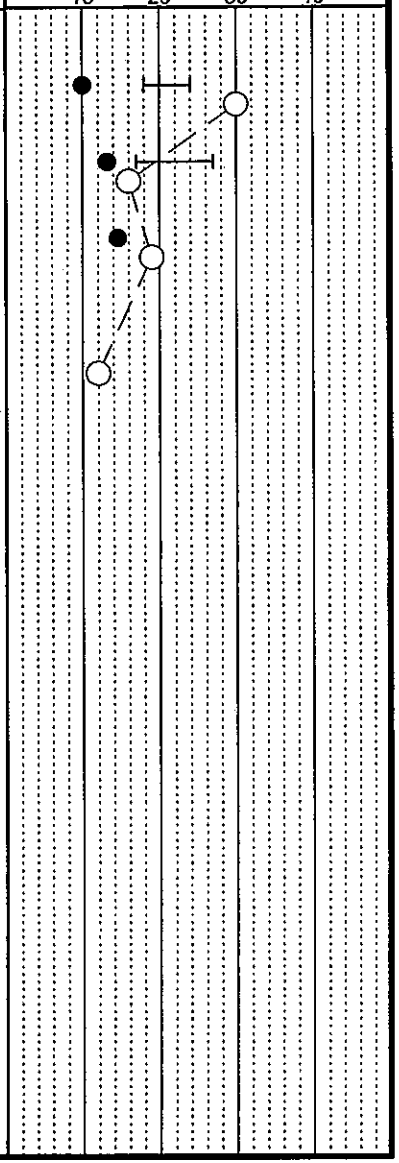
LOG OF: Boring B-1101 | Location: Ramp B N:323061.247 E:1827070.641 | Date Drilled: 07/27/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	541.6						Asphalt - 5" Aggregate Base - 7"						
1.0	540.6	24 20 10 7	13	1			Medium dense to dense brown GRAVEL WITH SAND AND SILT (A-2-4), trace clay; damp to moist.	52	12	--	6	30	
		7 8 8 23	10	2				31	35	--	13	12	9
5		28 12 7 7	16	3									
7.5	534.1												
		5 6 6 5	16	4		1.75	Stiff brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; moist.						
10.0	531.6						Bottom of Boring - 10.0'						
15													
20													
25													
30													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1102 | Location: Ramp B N:323332.814, E:1826993.771 | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.8												
0.8	540.0						Asphalt - 5" Aggregate Base - 4"						
		7 10 7 10	21	1		4.5+	Hard brown and gray SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; slightly organic; damp.	2	2	–	10	49	37
3.0	537.8	3 3 4 4	24	2		2.5	Very stiff gray SILT (A-4b), some clay, trace fine to coarse sand; slightly organic; moist.	0	0	–	3	65	32
5.0	535.8	3 3 3 5	20	3		2.0	Stiff to very stiff brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; damp to moist.	0	1	–	2	64	34
		2 2 3	16	4		1.0							
		3 4 3	18	5		3.5							
10.0	530.8						Bottom of Boring - 10.0'						

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

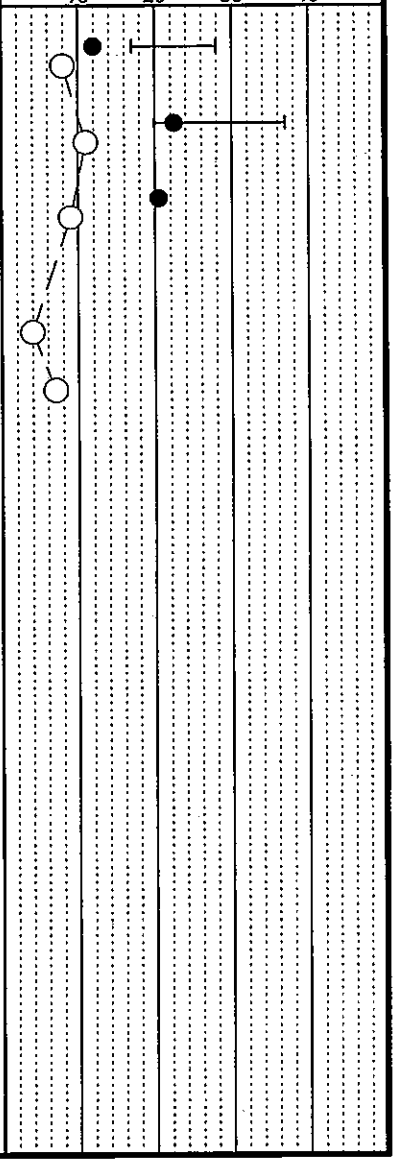
LOG OF: Boring B-1103 | Location: Ramp B N:323618.601, E:1826908.781 | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	539.5												
0.4	539.1	2 3 5 5	24	1		4.5+	Topsoil - 5" Hard brown SILT AND CLAY (A-6a), some fine to coarse sand, little gravel; slightly organic; damp.	18	17	–	15	31	19
2.0	537.5	6 7 4 5	22	2		3.0	Very stiff to hard gray SILTY CLAY (A-6b), trace fine to coarse sand; moist. @ 2.0', 4.0', slightly organic. @ 4.0'-6.0', damp.	0	2	–	4	50	44
5		4 5 4 4	20	3		4.5+							
		2 2 2	18	4		1.5	@ 7.0', stiff.						
		4 4 3	18	5		1.0							
10.0	529.5						Bottom of Boring - 10.0'						
15													
20													
25													
30													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

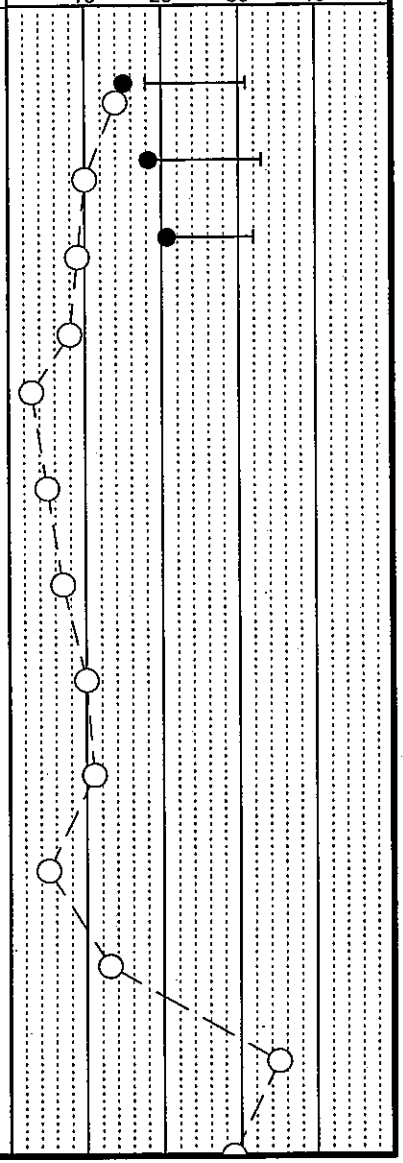
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1104 | Location: Ramp B N:324017.412 E:1826783.581 | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 21.0' - 35.0'
Water level at completion: 2' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	538.8												
0.8	538.0						Asphalt - 6" Aggregate Base - 4"						
		7 6 8 7	24	1		4.5+	Very stiff to hard brown SILT AND CLAY (A-6a), little to some fine to coarse sand, trace gravel; damp.	4	4	--	8	51	33
		3 5 5 7	24	2		4.0		0	2	--	17	45	36
5		4 5 4 6	22	3		3.5		0	2	--	4	62	32
		3 5 3	18	4		1.0	@ 7.0', stiff, grayish brown, moist.						
		1 2 1	15	5		1.5							
10													
10.5	528.3												
		1 1 4	17	6		3.5	Very stiff brown SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
		3 3 4	18	7		2.0							
15													
15.5	523.3												
		2 4 6	18	8		4.5+	Hard brown CLAY (A-7-6), trace fine to coarse sand, trace gravel; damp.						
		2 5 6	16	9		4.25							
20													
20.5	518.3												
		1 2 3	18	10			Loose to medium dense brown GRAVEL WITH SAND (A-1-b), little clay, trace silt; wet.						
		3 4 9	17	11									
25													
		10 18 17	15	12									
		5 12 17	16	13									
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1104 | Location: Ramp B N:324017.412 E:1826783.581 | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 21.0' - 35.0'
Water level at completion: 2' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	508.8						Loose to medium dense brown GRAVEL WITH SAND (A-1-b), little clay, trace silt; wet.							
31.5	507.3	4 50/4	10	14			Medium hard gray SANDSTONE; slightly to moderately weathered, argillaceous, micaceous.							
		50/4	3	15										
35														
36.5	502.3	50/2	2	16										
		Core 60"	Rec 57"	RQD 57%	R-1		Very hard gray SANDSTONE; very fine to fine grained, highly weathered, argillaceous, micaceous, massively bedded, slightly fractured. @ 38.2', high angle fracture. @ 36.5' to 37.3', decomposed. @ 37.3' to 38.2', broken, highly weathered to decomposed.							
40														
41.5	497.3						Bottom of Boring - 41.5'							
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1105 | Location: Ramp B N:324017.469, E:1826783.266 | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 22.0' - 30.0'
Water level at completion: 6' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	539.0												
0.4	538.6						Topsoil - 5"						
		8 8 5	18	1		4.5+	Hard brown SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; damp.	3	3	--	8	56	30
3.0	536.0												
		2 5 7	13	2		4.0	Very stiff brown and gray SILT AND CLAY (A-6a), trace gravel, trace fine to coarse sand; damp.	1	3	--	12	46	38
5													
		2 2 3	18	3		1.5	@ 6.0', stiff; moist.	0	2	--	6	61	31
		1 1 1	13	4		1.75							
10													
		1 1 1	15	5		1.0							
		1 1 3	16	6		1.25							
15													
15.5	523.5						Very stiff to hard brown and gray CLAY (A-7-6), trace gravel, trace fine to coarse sand; damp.						
		4 5 7	18	7		4.25							
		2 3 5	17	8		3.5							
20													
20.5	518.5						Loose to medium dense brown GRAVEL WITH SAND (A-1-b), little clay; wet.						
		2 3 4	18	9									
		WOH	4	10									
25													
		5 6 15	18	11									
		6 21 28	16	12									
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1105 | Location: Ramp B N:324017.469, E:1826783.266 | Date Drilled: 07/14/05

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION
	509.0						WATER OBSERVATIONS: Water seepage at: 22.0' - 30.0' Water level at completion: 6' (Including drill water)
30.0	509.0						
		50/4	4	13			Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, massively bedded, moderately fractured, iron-staining on high angle fractures. @ 34.2' to 34.5', decomposed; filled fractures. @ 32.3' to 32.6', high angle fracture.
		Core 60"	Rec 60"	RQD 70%	R-1		
35							
37.0	502.0						Bottom of Boring - 37.0'
40							
45							
50							
55							
60							

GRADATION: % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt | % Clay

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1106 | Location: Ramp B N:324159.837, E:1826733.921 | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 22.5' - 31.0'
Water level at completion: 8.5' (including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.2												
0.3	539.9						Topsoil - 4"						
		6 7 6	14	1		4.5+	Hard brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; damp to moist.	0	0	--	2	61	37
		4 6 5	18	2		4.5+		1	2	--	6	60	31
5.5	534.7						Very stiff gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
		2 5 4	16	3		3.75		0	1	--	4	59	36
		4 4 5	17	4		3.5							
		2 2 2	13	5		2.0	@ 11.0', stiff, little gravel.						
		1 2 3	16	6		1.0							
15.5	524.7						Very stiff to hard brown CLAY (A-7-6), trace fine to coarse sand; damp.						
		3 4 5	18	7		4.5+		0	1	--	2	34	63
		4 6 6	18	8		3.5							
		2 3 5	17	9		2.5							
23.0	517.2						Loose brown GRAVEL WITH SAND (A-1-b), trace clay; wet.						
		1 1 1	13	10				13	57	--	23	7	Non-Plastic
		4 3 3	16	11			@ 26.0'-27.5', little clay.						
30		2 2 8	18	12									

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1106 | Location: Ramp B N:324159.837, E:1826733.921 | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 22.5' - 31.0'
Water level at completion: 8.5' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % - ● / PL ⊢—⊣ LL / Blows per foot - ○ (10 20 30 40)
	510.2													
30.0	510.2	50/4	4	13			Severely weathered gray SANDSTONE argillaceous, micaceous.							
32.5	507.7	Core 60"	Rec 58"	RQD 65%	R-1		Hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, moderately fractured. @ 32.5' to 33.2', broken. @ 33.6',34.5',34.7',35.6',35.9', shale laminations with fractures.							
37.5	502.7						Bottom of Boring - 37.5'							

40 45 50 55 60

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1107 | Location: Ramp B N:324299.806, E:1826682.352 | Date Drilled: 07/20/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.5						Asphalt - 4" Aggregate Base - 8"						
1.0	539.5	5 7 6	10	1		3.5	Medium dense dark brown GRAVEL WITH SAND AND SILT (A-2-4), little clay; damp.	27	24	--	20	18	11
3.0	537.5	4 5 6	11	2		4.5+	Hard brown SILT (A-4b), trace fine to coarse sand, trace gravel; damp to moist.	3	1	--	5	57	34
5.5	535.0	4 5 4	14	3		3.0	Very stiff gray SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; damp to moist.	8	5	--	12	42	33
		3 4 4	12	4		2.5							
10.5	530.0	2 2 3	14	5		1.5	Stiff to very stiff brown and gray CLAY (A-7-6), trace fine to coarse sand; moist.						
		1 3 4	14	6		3.0							
		1 3 3	16	7		2.5							
		3 4 5	13	8		2.5							
		2 2 3	17	9		1.25		0	2	--	5	38	55
23.0	517.5	WOH 1 1	15	10			Loose brown COARSE AND FINE SAND (A-3a), little gravel, trace clay; wet.	9	70	--	14	7	
		2 4 5	10	11									
28.0	512.5	10 11 19	18	12			Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4), trace clay; moist.						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

Non-Plastic

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1107 | Location: Ramp B N:324299.806, E:1826682.352 | Date Drilled: 07/20/05

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION
30.0	510.5	Core 60"	Rec 50"	RQD 20%	R-1		Hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, massively bedded, slightly fractured. @ 30.0' to 30.7', loss of recovery. @ 30.7' to 31.6', calcareous, sulfur odor. @ 30.7' to 31.6', 32.7' to 32.9', 33.8' to 33.9', high angle fracture.
35.0	505.5						Bottom of Boring - 35.0'

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: None

GRADATION: % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt | % Clay

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

40 45 50 55 60

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1108 | Location: Ramp B N:324444.358, E:1826634.809 | Date Drilled: 07/21/05

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.7						WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None						
0							Asphalt - 4" Aggregate Base - 8"						
1.0	539.7	3 5 4	12	1		1.5	FILL: Stiff dark brown SANDY SILT (A-4a), little clay, little gravel; damp to moist.	10	18	--	28	31	13
3.0	537.7	3 4 6	10	2		3.0	FILL: Very stiff dark brown SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; damp to moist.	6	4	--	8	43	39
5.5	535.2	2 3 5	16	3		--	FILL: Stiff to very stiff gray SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; slightly organic; moist.	10	4	--	8	51	27
8.0	532.7	3 5 7	13	4		4.5+	Hard brown and gray SILTY CLAY (A-6b), trace to little fine to coarse sand, trace gravel; moist.	7	6	--	10	44	33
10							@ 11.0', stiff.						
		2 2 2	14	5		1.0		3	0	--	1	59	37
		2 2 3	16	6		1.5							
15													
		1 3 3	15	7		1.75							
18.0	522.7						Stiff brown CLAY (A-7-6), trace gravel, trace fine to coarse sand; moist.						
		2 2 4	15	8		1.0							
20													
		1 2 3	18	9		1.5		2	0	--	1	25	72
23.0	517.7						Very loose to loose gray COARSE AND FINE SAND (A-3a), little gravel, trace clay; wet.						
		WOH 1 1	15	10									
25													
26.5	514.2	6 50/4	9	11			Soft to medium hard black SHALE; fine grained, slightly to moderately weathered, carbonaceous, thinly laminated.						
28.9	511.8						Hard gray SANDSTONE interbedded with SILTSTONE; very						
30													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

59

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1108 | Location: Ramp B N:324444.358, E:1826634.809 | Date Drilled: 07/21/05

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL — LL Blows per foot - ○ 10 20 30 40
30	510.7	Core 60"	Rec 53"	RQD 78%	R-1		fine to fine grained, moderately weathered, argillaceous, micaceous, medium bedded, slightly fractured. @ 28.9', 31.3', high angle fractures. @ 28.9' to 29.1',31.4' to 31.5',31.5' to 31.6',31.6' to 31.7',32.2' to 33.2', high angle fractures.							
33.5	507.2						Bottom of Boring - 33.5'							
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1108A | Location: US 23 | Date Drilled: 07/25/06

WATER OBSERVATIONS: Water seepage at: N/A
Water level at completion: N/A

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0							Asphalt - 11"						
							Aggregate Base - 6"						
10					ST-1	3.75		0	1	--	3	58	38
15					ST-2			2	4	--	9	48	37
					ST-3			1	4	--	4	52	39
20.0							Bottom of Boring - 20.0'						
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

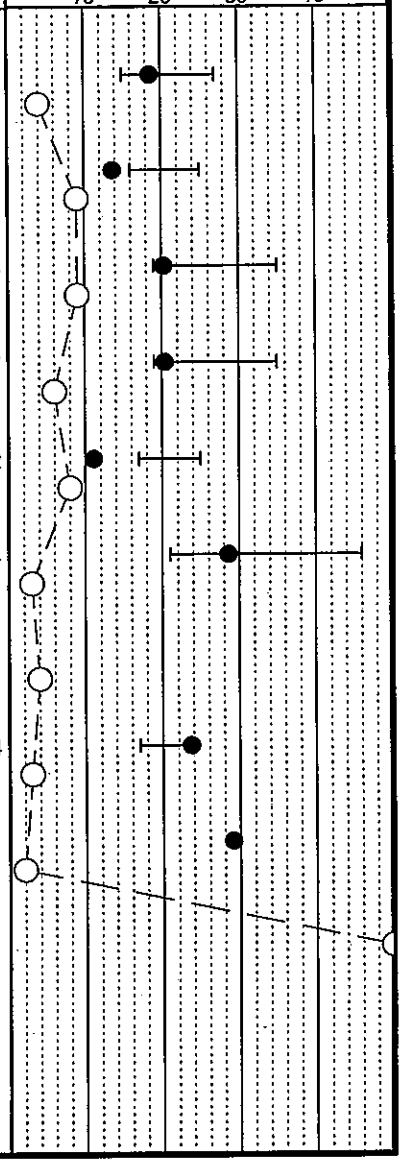
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1109 | Location: Ramp B N:324583.865, E:1826589.04 | Date Drilled: 07/22/05

WATER OBSERVATIONS: Water seepage at: 19.0' - 22.0'
Water level at completion: 8.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.6						Asphalt - 4" Aggregate Base - 8"						
1.0	539.6	3 2 2	12	1		1.5	FILL: Stiff dark brown SILT AND CLAY (A-6a), some fine to coarse sand, trace gravel; moist.	7	10	–	11	48	24
3.0	537.6	2 4 5	14	2		2.0	FILL: Stiff dark brown SANDY SILT (A-4a), some gravel, little clay; contains wood fragments; damp.	22	15	–	12	32	19
5.5	535.1	3 4 5	15	3		3.5	POSSIBLE FILL: Very stiff to hard grayish brown SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; slightly organic; moist.	1	3	–	7	51	38
10		2 3 3	13	4		4.25		1	4	–	11	47	37
10.5	530.1	1 4 4	10	5			Medium stiff brown SANDY SILT (A-4a), some gravel, little clay; moist.	33	17	–	14	24	12
13.0	527.6	1 1 2	15	6		1.5	Stiff gray CLAY (A-7-6), trace fine to coarse sand, trace gravel; moist to wet.	1	3	–	7	35	54
15		1 1 3	12	7		2.0							
18.0	522.6	1 1 2	18	8			Very loose brown SANDY SILT (A-4a), little clay, trace gravel; wet.	3	12	–	32	39	14
20		WOH 1 1	16	9				0	1	–	52	47	
23.5	517.1	10 50/5	9	10			Soft to medium hard black SHALE; very fine grained, moderately weathered to decomposed, carbonaceous, thinly laminated, highly fractured.						
25		Core 60"	Rec 60"	RQD 77%	R-1		@ 28.3' to 30.0', gray calcareous sandstone.						
							@ 28.0' to 28.1', high angle fractures.						
28.3	512.3						@ 28.3' to 28.6', high angle fracture.						
30.0	510.6						Medium hard to hard gray SANDSTONE; very fine to fine						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1109 | Location: Ramp B N:324583.865, E:1826589.04 | Date Drilled: 07/22/05

WATER OBSERVATIONS: Water seepage at: 19.0' - 22.0'
Water level at completion: 8.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢⊣ LL Blows per foot - ○ 10 20 30 40
30	510.6						grained, moderately to highly weathered, micaceous, argillaceous, massively bedded, slightly fractured. Bottom of Boring - 30.0'							
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD * COLUMBUS, OHIO 43229 * (614)888-0040

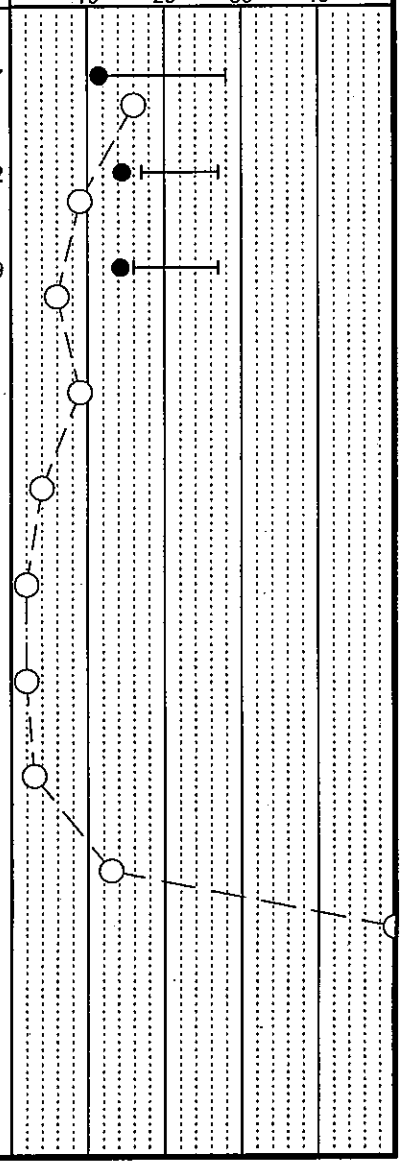
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1110 | Location: Ramp B N:324695.088, E:1826626.272 | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 12.0' - 25.0'
Water level at completion: 5.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	542.3												
0.5	541.8						Topsoil - 6"						
		6 8 8	18	1		4.5+	Hard brown SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; damp.	1	4	--	11	57	27
3.0	539.3												
		6 5 4	18	2		3.5	Very stiff brown SILT (A-4b), some clay, little fine to coarse sand; damp.	0	7	--	11	60	22
5													
5.5	536.8												
		2 3 3	15	3		4.0	Very stiff brown SILT AND CLAY (A-6a), "and" fine to coarse sand, trace gravel; moist.	3	15	--	25	28	29
		1 4 5	16	4		2.5							
10													
		2 2 2	18	5		2.0							
13.0	529.3												
		1 1 1	6	6			Very loose brown COARSE AND FINE SAND (A-3a), little clay, little gravel; wet.						
15													
		1 1 1	10	7									
18.0	524.3												
		2 1 2	16	8			Loose to medium dense brown GRAVEL WITH SAND (A-1-b), little clay, little silt; wet.						
20													
		9 6 7	9	9									
23.0	519.3												
		50/5	7	10			Soft to medium hard black SHALE; fine grained, slightly to moderately weathered, carbonaceous, thinly laminated, moderately fractured.						
25													
25.6	516.7						@ 25.0' to 25.6', decomposed.						
		Core 60"	Rec 52"	RQD 32%	R-1		Medium hard black SHALE; very fine grained, unweathered, carbonaceous, thinly laminated, slightly fractured. @ 27.8' to 28.0', 29.3' to 29.5', high angle fractures.						
30.0	512.3						Bottom of Boring - 30.0'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1110 | Location: Ramp B N:324695.088, E:1826626.272 | Date Drilled: 07/14/05

WATER OBSERVATIONS: Water seepage at: 12.0' - 25.0'
Water level at completion: 5.0' (including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	512.3													
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

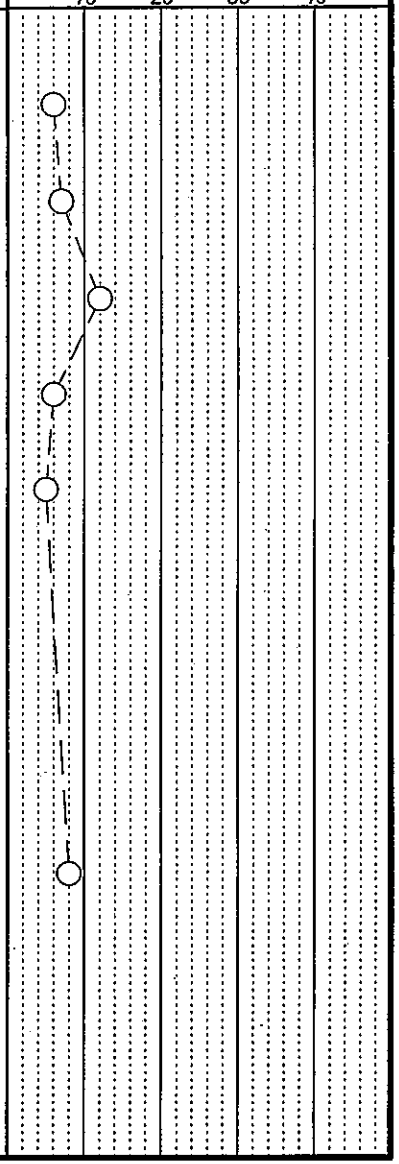
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1111 | Location: Ramp B N:324800.005, E:1826593.701 | Date Drilled: 11/2/05

WATER OBSERVATIONS: Water seepage at: 10.0'-22.5'
Water level at completion: 8.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	543.8												
0.3	543.5						Topsoil - 3"						
		3 3 3	13	1		2.5	FILL: Very stiff to hard brown SANDY SILT (A-4a), little clay, trace gravel; damp.						
		4 3 4	10	2		4.5+							
5													
5.5	538.3						Hard brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; moist.						
		4 5 7	15	3		4.25							
		2 3 3	12	4		2.0	@ 8.5', some gravel, some fine to coarse sand.						
10													
10.5	533.3						Loose brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); wet.						
		2 2 3	12	5									
13.0	530.8						Very loose brown COARSE AND FINE SAND (A-3a), little clay, little gravel; wet.						
		WOH WOH 1	16	6									
15													
		WOH WOH WOH	18	7									
		WOH WOH WOH	11	8									
20													
20.5	523.3						Loose brown GRAVEL WITH SAND AND SILT (A-2-4), little clay; wet.						
		WOH 2 6	12	9									
23.0	520.8						Medium hard to hard black SHALE; very fine grained, slightly to moderately weathered, argillaceous, carbonaceous, thinly laminated, moderately fractured, contains turbidity.						
		50/4	2	10			@ 25.0' to 25.4', broken zone.						
25							@ 26.4', 26.5', 27.2', low angle fracture.						
		Core 120"	Rec 120"	RQD 57%	R1								
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1111 | Location: Ramp B N:324800.005, E:1826593.701 | Date Drilled: 11/2/05

WATER OBSERVATIONS: Water seepage at: 10.0'-22.5'
Water level at completion: 8.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL — LL Blows per foot - ○ 10 20 30 40
30.0	513.8						Hard gray SANDSTONE; very fine to fine grained, moderately weathered, argillaceous, micaceous, medium bedded to thickly bedded, moderately to highly fractured. @ 31.5', 31.6', 31.7', 32.1', low angle fracture. @ 32.7',32.9',33.6',33.8' to 34.0',34.1' to 34.2', fracture with decomposed zones.							
35.0	508.8						Bottom of Boring - 35.0'							

40 45 50 55 60

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD * COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1112 | Location: Ramp B N:325034.315, E:1826688.991 | Date Drilled: 10-12-05

WATER OBSERVATIONS: Water seepage at: 26.0'-30.0'
Water level at completion: 6.6' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	560.9												
0.3	560.6						Topsoil - 3"						
		3 3 4	9	1		4.0	FILL: Very stiff brown SILT AND CLAY (A-6a), little gravel, trace fine to coarse sand; moist.						
3.0	557.9												
		5 5 6	18	2			FILL: Medium dense brown and dark gray SANDY SILT (A-4a), trace clay, trace gravel; damp.						
5													
5.5	555.4						POSSIBLE FILL: Medium dense brown COARSE AND FINE SAND (A-3a), trace to little gravel; dry.						
		5 7 7	15	3									
		13 14 14	10	4									
10													
		4 10 11	11	5									
		8 8 6	9	6									
15													
		3 3 4	17	7			@ 16.0', little silt, little clay; damp to moist.						
		5 8 8	6	8									
20													
		5 6 6	13	9									
23.0	537.9						POSSIBLE FILL: Medium dense to dense brown GRAVEL WITH SAND (A-1-b), little silt, trace clay; wet.						
		9 11 15	1	10									
25													
		3 5 6	14	11				26	39	--	19	13	3
		6 25 15	11	12									
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1112 | Location: Ramp B N:325034.315, E:1826688.991 | Date Drilled: 10-12-05

WATER OBSERVATIONS: Water seepage at: 26.0'-30.0'
Water level at completion: 6.6' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	530.9						POSSIBLE FILL: Medium dense to dense brown GRAVEL WITH SAND (A-1-b), little silt, trace clay; wet.							
33.0	527.9						Medium hard black SHALE; very fine grained, moderately to highly weathered, carbonaceous, thinly bedded, moderately fractured. @ 33.9' to 34.0', broken zone.							
35		Core 120"	Rec 120"	RQD 83%	R1									
40														
43.0	517.9						Bottom of Boring - 43.0'							
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

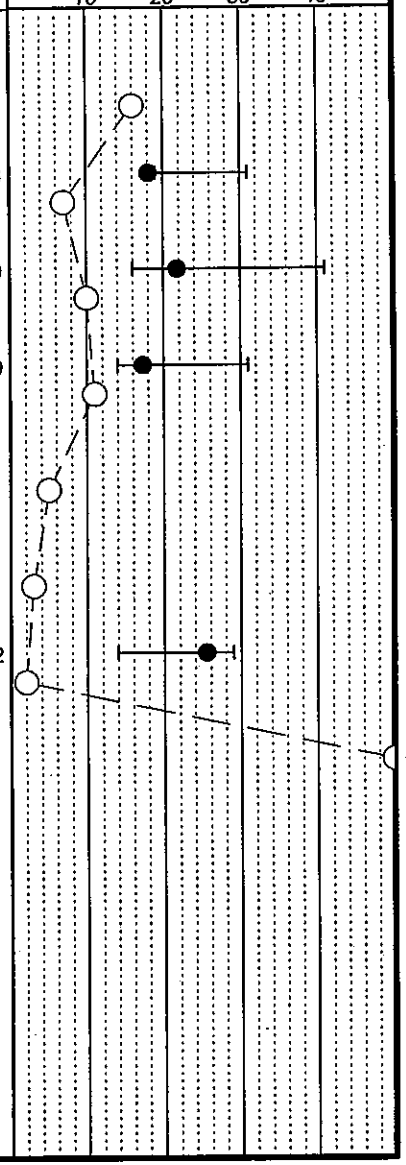
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1113 | Location: Ramp B N:325197.009, E:1826860.751 | Date Drilled: 9/28/05

WATER OBSERVATIONS: Water seepage at: 15'
Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	566.8												
0.4	566.4	8 8 8	13	1		3.5	Topsoil - 5" Very stiff dark brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; contains roots; damp.						
5		4 3 4	15	2		4.0		1	3	--	11	52	33
5.5	561.3	3 4 6	16	3		4.0	Very stiff brown and gray SILTY CLAY (A-6b), little fine to coarse sand, trace to little gravel; moist.	0	1	--	12	47	40
10		5 4 7	18	4		1.5	@ 8.5', "and" fine to coarse sand.	15	15	--	28	23	19
		2 3 2	17	5		1.5							
15		2 1 2	16	6		1.0							
15.5	551.3	2 1 1	18	7			Very loose brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); wet.	18	37	--	25	8	12
18.0	548.8	34 50/5	11	8			Soft to medium hard gray SHALE; very fine grained, highly weathered to decomposed, micaceous.						
20		50/5	5	9									
		50/4	4	10									
25		50/4	4	11									
		50/4	4	12									
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1113 | Location: Ramp B N:325197.009, E:1826860.751 | Date Drilled: 9/28/05

WATER OBSERVATIONS: Water seepage at: 15'
Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	536.8	Core 48"	Rec 33"	RQD 0%	R1		Soft to medium hard gray SHALE; very fine grained, highly weathered to decomposed, micaceous.							
		50/5	5	13										
35														
37.0	529.8						Medium hard black SHALE; very fine grained, slightly to moderately weathered, carbonaceous, thinly laminated, slightly fractured.							
		50/4	4	14										
40														
		50/2	2	15										
45		Core 60"	Rec 56"	RQD 58%	R2		@ 45.1',47.2',48.9', decomposed fractures.							
49.0	517.8						Bottom of Boring - 49.0'							
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1114 | Location: Ramp B N:325260.432, E:1827090.824 | Date Drilled: 10/17/05

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: 4.1' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % / PL — LL / Blows per foot
0	581.1						Topsoil - 3"							
1.0	580.1	7 14 16	18	1		4.5+	Hard brown SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; contains sandstone fragments; damp.	0	1	–	4	44	51	
5		14 26 35	14	2		4.5+		3	4	–	9	46	38	61
		10 15 21	18	3		4.5+								
10		10 22 33	18	4		4.5+								55
		11 17 26	18	5		4.5+								
14.7	566.4	17 21 40	18	6A 6B		4.5+	Very soft brownish gray SHALE; very fine grained, decomposed.							61
		21 35 50/5	17	7										85
20		50/5	5	8										
21.5	559.6	50/3	3	9			@ 21.0', gray.							
25		Core 120"	Rec 113"	RQD 70%	R1		Soft to medium hard gray SANDSTONE; very fine grained, moderately to highly weathered, argillaceous, micaceous, medium bedded, moderately fractured. @ 21.6' to 22.2', loss of recovery from washed out clay. @ Bands of interbedded sandstone at 22.7'-22.9', 24.1'-24.3', 25.5'-25.7', 26.3'-26.4', 27.9'-28.1', and 31.1'-31.2'.							
30														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1114 | Location: Ramp B N:325260.432, E:1827090.824 | Date Drilled: 10/17/05

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: 4.1' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢——⊣ LL Blows per foot - ○ 10 20 30 40
30	551.1													
31.5	549.6						Bottom of Boring - 31.5'							

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

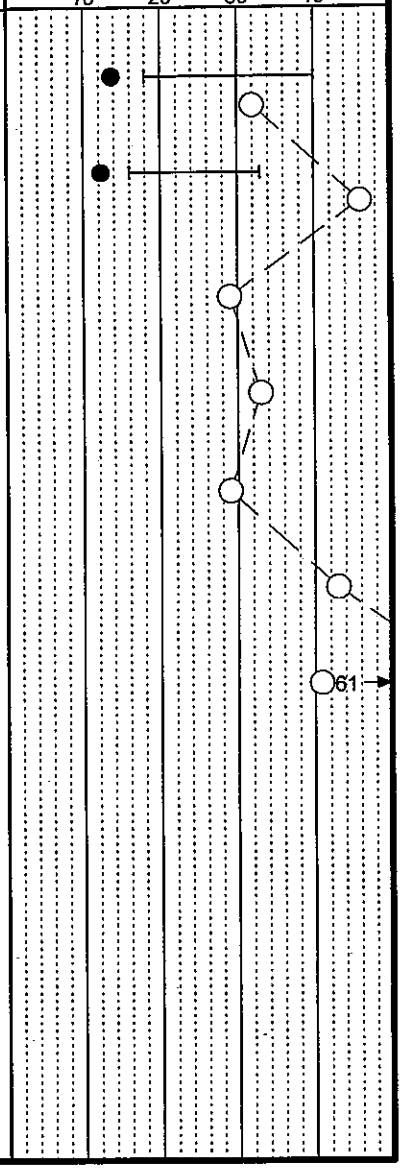
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1115 | Location: Ramp C N:325343.406, E:1827073.558 | Date Drilled: 10/14/05

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: 8.1' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	582.4						Topsoil - 3"						
1.0	581.4	11 15 17	18	1		4.5+	Hard brown SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; contains sandstone fragments; damp to moist.	4	3	--	8	43	42
		11 20 26	18	2		4.5+		1	4	--	12	47	36
5		6 11 18	18	3		4.5+							
		10 14 19	18	4		4.5+							
10		7 10 19	18	5		4.5+							
		9 19 24	18	6		4.5+							
15.0	567.4						Very soft gray SHALE; very fine grained, decomposed.						
		18 26 35	18	7									
19.0	563.4	50/5	5	8			Very soft to soft gray SANDSTONE; very fine grained, highly weathered, micaceous, laminated to thinly bedded, moderately fractured to broken, contains ferric band of very fine sandstone; contains moderate to abundant argillaceoud laminations. @ 20.5' to 20.7', decomposed zone; core loss.						
20													
		Core 120"	Rec 118"	RQD 71%	R1								
25													
29.0	553.4						Bottom of Boring - 29.0'						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

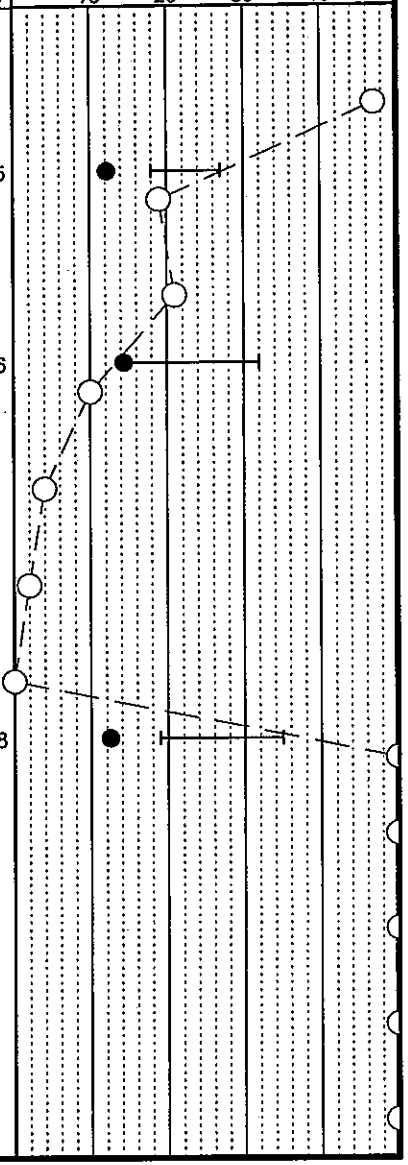
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1116 | Location: Ramp C N:325386.086, E:1826805.402 | Date Drilled: 9/27/05

WATER OBSERVATIONS: Water seepage at: 16.0'
Water level at completion: 48.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	565.8												
0.3	565.5	18 21 26	9	1			Topsoil - 4" Dense grayish brown SANDY SILT (A-4a), trace clay; possible boulder; dry.						
3.0	562.8	8 9 10	8	2			Medium dense brown SANDY SILT (A-4a), some clay; damp.	0	2	--	7	66	25
5		6 8 13	13	3									
8.0	557.8	4 4 6	13	4			Medium dense reddish brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); damp to moist.	11	37	--	24	12	16
10		3 2 2	13	5			@ 11.0', moist to wet.						
15		2 1 1	13	6			@ 14.0', wet.						
		1 WOH WOH	0	7									
18.0	547.8	12 50/3	9	8			Soft to medium hard gray and black SHALE; very fine grained, highly weathered, thinly bedded to medium bedded.	1	5	--	3	53	38
20		50/4	4	9									
		50/4	4	10									
25		50/4	4	11									
		50/4	4	12									
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1116 | Location: Ramp C N:325386.086, E:1826805.402 | Date Drilled: 9/27/05

WATER OBSERVATIONS: Water seepage at: 16.0'
Water level at completion: 48.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
	535.8													
30.0	535.8						Medium hard to hard gray and black SHALE; very fine grained, highly weathered, thinly bedded to medium bedded.							
		50/5	5	13										
35														
38.0	527.8						Medium hard black SHALE; very fine grained, slightly to moderately weathered, laminated, slightly fractured.							
40		Core 120"	Rec 104"	RQD 21%	R1									
45														
48.0	517.8						Bottom of Boring - 48.0'							
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1117 | Location: Ramp C N:325458.045, E:1826571.466 | Date Drilled: 9/19/05 to 9/20/05

WATER OBSERVATIONS: Water seepage at: 26.0'
Water level at completion: 35.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	562.6	3 6 6	6	1			POSSIBLE FILL: Medium dense brown and gray SANDY SILT (A-4a), little coarse gravel, trace clay; damp. @ 0.0'-2.5', contains roots.						
		3 4 5	6	2									
5													
5.5	557.1	4 2 3	3	3			POSSIBLE FILL: Medium stiff gray SILTY CLAY (A-6b), little gravel; contains organic material and sandstone fragments; moist.						
		2 2 2	2	4									
10													
		2 2 4	4	5									
		2 4 9	5	6									
15													
15.5	547.1	5 6 5	12	7		3.0	Very stiff brown SILT (A-4b), little clay; contains coarse sand seams; wet.	0	2	--	13	70	15
18.0	544.6	5 6 7	12	8		--	Medium stiff brown GRAVEL WITH SAND AND SILT (A-2-4), trace clay; moist.	53	13	--	9	15	10
20		3 2 2	8	9		1.5	@ 21.0', wet.						
		2 2 2	12	10		--							
25													
25.5	537.1	1 WOH WOH	12	11			Very loose brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); wet.	32	33	--	9	17	9
30		6 8 9	6	12				53	12	--	9	15	11

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1117 | Location: Ramp C N:325458.045, E:1826571.466 | Date Drilled: 9/19/05 to 9/20/05

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	WATER OBSERVATIONS: Water seepage at: 26.0' Water level at completion: 35.0' (includes drilling water) — DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30.0	532.6													
		4 5 7	6	13		0.5	Medium stiff gray SILT (A-4b), little fine to coarse sand, trace to little clay; wet.							
33.0	529.6													
		50/4	4	14			Soft black SHALE; very fine grained, moderately weathered, carbonaceous, laminated, moderately fractured.							
35														
		50/3		15										
		50/3		16										
40														
		Core 60"	Rec 60"	RQD 28%	R1		@ 43.0' to 44.0', broken. @ 44.9' to 45.0', decomposed.							
48.0	514.6						Bottom of Boring - 48.0'							
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1118 | Location: Ramp C N:325533.09, E:1826443.997 | Date Drilled: 10/18/05

WATER OBSERVATIONS: Water seepage at: 11.8'-20.5'
Water level at completion: 15.6' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	546.2	1 2 2	18	1		0.75	Medium stiff to stiff brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; moist.						
		1 2 3	18	2		1.5		1	2	–	5	62	30
5													
5.5	540.7	5 6 9	18	3		2.5	Very stiff brown CLAY (A-7-6), trace fine to coarse sand; moist.	0	0	–	2	31	67
		6 7 8	18	4		2.0							
10													
11.8	534.4	4 5 9	18	5A 5B		0.25	Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4), little clay; wet.	41	16	–	9	24	10
		4 5 4	3	6									
15													
15.5	530.7	4 7 11	13	7			Medium dense brown GRAVEL WITH SAND (A-1-b), little silt, trace clay; wet.	55	12	–	10	18	5
		7 14 18	13	8									
20													
21.5	524.7	17 41 28	10	9			Medium hard black SHALE; very fine grained, moderately weathered, carbonaceous, laminated, slightly to moderately fractured.						
		50/3	3	10									
25													
		Core 120"	Rec 120"	RQD 78%	R1		@ 28.9' to 29.1', broken zone.						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

53
69

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1118 | Location: Ramp C N:325533.09, E:1826443.997 | Date Drilled: 10/18/05

WATER OBSERVATIONS: Water seepage at: 11.8'-20.5'
Water level at completion: 15.6' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢——⊣ LL Blows per foot - ○ 10 20 30 40
30	516.2													
30.6	515.6						Hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, micaceous, thickly bedded, slightly fractured. @ 30.8', 33.6', 33.7', 34.8' low angle clay filled fractures. @ 30.8' to 33.8', calcareous.							
35.0	511.2						Bottom of Boring - 35.0'							
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1119 | Location: Ramp C N:325668.639, E:1826236.989 | Date Drilled: 7/18/05

WATER OBSERVATIONS: Water seepage at: 10.0'-25.0'
Water level at completion: 5.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % / PL — LL / Blows per foot
0	542.0													
0.3	541.7						Topsoil - 4"							
		6 6 5	7	1		3.0	Very stiff brown SANDY SILT (A-4a), little clay, trace gravel; possible organic; damp.							
3.0	539.0													
		4 5 7	12	2		4.5+	Very stiff to hard brown CLAY (A-7-6), trace fine to coarse sand, trace gravel; damp.							
5														
		4 4 5	12	3		2.0	@ 6.0', some fine to coarse sand; moist.	9	11	--	32	22	26	
8.0	534.0													
		3 3 3	10	4			Loose to medium dense brown GRAVEL WITH SAND AND SILT (A-2-4), trace clay; wet.	46	18	--	9	18	9	
10														
		1 1 1	8	5										
13.0	529.0													
		1 1 2	14	6			Very loose to loose brown GRAVEL WITH SAND (A-1-b), little clay; wet.							
15														
		2 4 3	12	7				12	47	--	22	19		Non-Plastic
18.0	524.0													
		5 8 9	13	8			Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4), little clay; contains sandstone fragments; wet.	36	22	--	11	18	13	Non-Plastic
20														
20.5	521.5													
		4 5 17	12	9			Medium dense to dense brown COARSE AND FINE SAND (A-3a), little clay; contains sandstone fragments; moist.	14	6	--	48	20	12	Non-Plastic
		7 17 19	14	10										
25.0	517.0													
		Core 60"	Rec 59"	RQD 30%	R-1		Very hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thinly bedded to medium bedded, highly fractured, iron-staining @ 28.7'-28.9', high angle fractures.							
30.0	512.0						Bottom of Boring - 30.0'							

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1119 | Location: Ramp C N:325668.639, E:1826236.989 | Date Drilled: 7/18/05

WATER OBSERVATIONS: Water seepage at: 10.0'-25.0'
Water level at completion: 5.0' (including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	512.0													
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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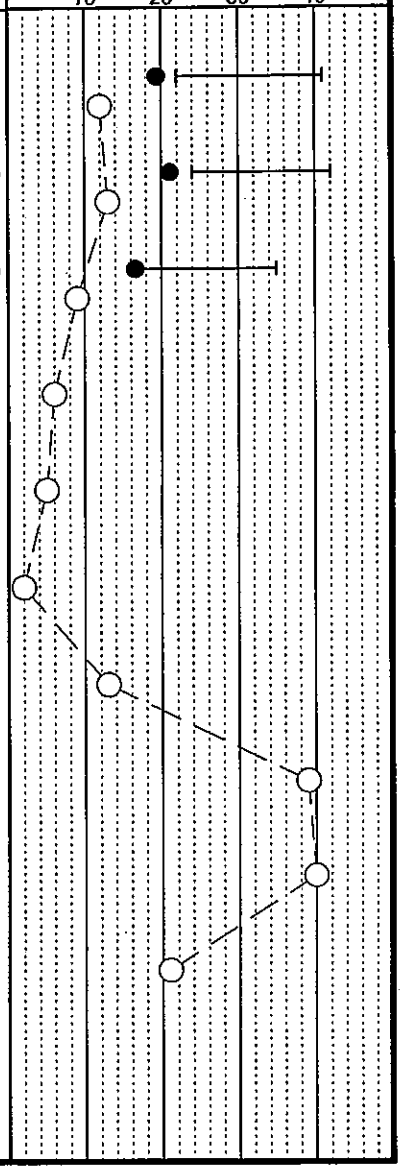
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1120 | Location: Ramp C N:325809.232, E:1826192.665 | Date Drilled: 7/18/05

WATER OBSERVATIONS: Water seepage at: 11.0'-19.0'
Water level at completion: 5.0' (including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	542.7												
0.4	542.3						Topsoil - 5"						
		3 5 7	9	1		4.5+	Very stiff to hard brown CLAY (A-7-6), trace fine to coarse sand; damp.	0	1	–	2	44	53
		3 6 7	15	2		3.25		0	0	–	2	49	49
5													
5.5	537.2						Very stiff brown SILTY CLAY (A-6b), "and" fine to coarse sand, little gravel; moist to wet.						
		2 5 4	12	3		2.5		16	30	–	20	14	20
		1 2 4	8	4		0.75	@ 8.5', Medium stiff.						
10													
10.5	532.2						Loose brown GRAVEL WITH SAND (A-1-b), some clay; wet.						
		3 3 2	6	5									
		1 1 1	8	6									
15													
		8 7 6	7	7									
		7 29 10	6	8									
20													
		14 22 18	6	9									
23.0	519.7						Medium dense brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); contains sandstone fragments; moist.						
		10 12 9	14	10									
25													
26.0	516.7	50/5	6	11			Hard gray SANDSTONE; very fine to fine grained, moderately weathered, micaceous, argillaceous, laminated to medium bedded, moderately to highly fractured.						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1120 | Location: Ramp C N:325809.232, E:1826192.665 | Date Drilled: 7/18/05

WATER OBSERVATIONS: Water seepage at: 11.0'-19.0'
Water level at completion: 5.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
30.0	512.7	Core 60"	Rec 54"	RQD 17%	R-1		Hard gray SANDSTONE; very fine to fine grained, moderately weathered, micaceous, argillaceous, laminated to medium bedded, moderately to highly fractured. @ 32.8' to 33.1', broken.						
33.5	509.2						Bottom of Boring - 33.5'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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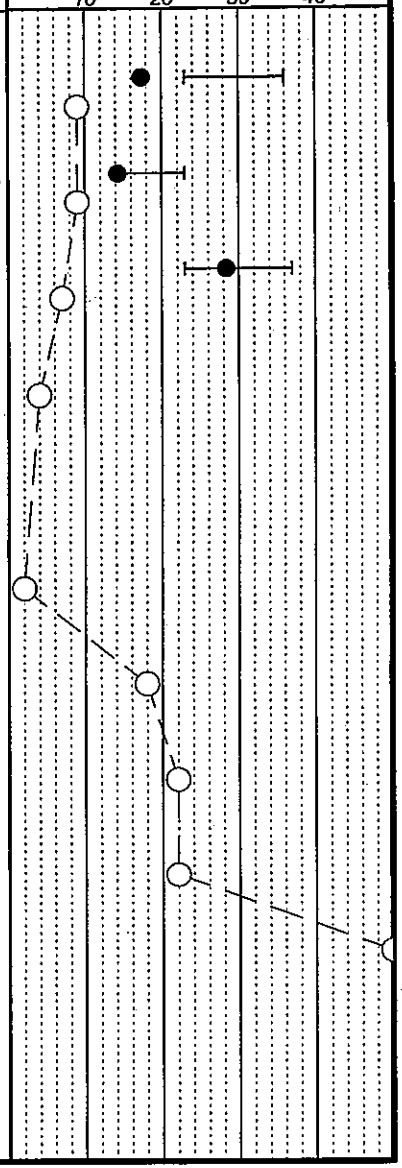
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1121 | Location: Ramp C N:325893.136, E:1826112.414 | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 16.0'-21.0'
Water level at completion: 9.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	539.0												
0.3	538.7						Topsoil - 4"						
		3 4 5	13	1		4.5+	FILL: Hard dark brown SILTY CLAY (A-6b), little fine to coarse sand, little gravel; damp.	16	9	--	7	38	30
3.5	535.5	3 4 5	8	2		--	FILL: Medium stiff brown SANDY SILT (A-4a), some clay, trace gravel; wet.	7	16	--	24	31	22
5.5	533.5	3 4 3	13	3		1.0	Medium stiff gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist. @ 6.0'-7.5', organic staining.	2	4	--	6	57	31
10		2 2 2	16	4		1.25							
		WOH	17	5		1.0	@ 11.0', some sand.						
13.0	526.0												
15		2 1 1	10	6			Loose to medium dense brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); moist to wet.						
		4 9 9	9	7									
18.0	521.0												
20		9 9 13	12	8			Medium dense brown COARSE AND FINE SAND (A-3a), some clay, trace gravel; wet.						
21.5	517.5	12 11 11	13	9			Soft to medium hard gray SANDSTONE; fine grained, highly weathered, micaceous, argillaceous.						
24.0	515.0	33 50/4	8	10			Very hard gray SANDSTONE; very fine to fine grained, slightly weathered, micaceous, argillaceous, medium bedded, moderately fractured. @ 25.3'-25.4', 26.3'-26.4', 29.1'-29.5', filled fracture. @ 29.7'-30.0', calcareous sandstone.						
25		Core 60"	Rec 57"	RQD 65%	R-1								
30.0	509.0						Bottom of Boring - 30.0'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1121 | Location: Ramp C N:325893.136, E:1826112.414 | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 16.0'-21.0'
Water level at completion: 9.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	509.0													
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1122 | Location: Ramp C N:326069.463, E:1826027.053 | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 16.0'-22.0'
Water level at completion: 10.5' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.7						Asphalt - 8" Aggregate Base - 4"						
1.0	539.7	5 5 6	9	1		2.0	FILL: Stiff brown SANDY SILT (A-4a), little clay, little gravel; damp to moist.	16	19	--	22	28	15
3.0	537.7	5 5 9	14	2		4.5+	Hard brown and gray SILTY CLAY (A-6b), trace fine to coarse sand; moist.	0	1	--	4	56	39
5													
6.0	534.7	5 5 7	12	3		4.0	Hard brown SILT AND CLAY (A-6a), little fine to coarse sand, little gravel; contains sand seams; moist.	13	11	--	8	44	24
8.0	532.7	10 5 4	9	4			Medium dense brown COARSE AND FINE SAND (A-3a), little gravel, trace clay; damp to moist.						
10													
10.5	530.2	3 5 4	2	5		3.0	Very stiff brown SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
		2 2 3	12	6		1.0	@ 13.0', Medium stiff; wet.						
15		1 1 1	8	7		--							
		WOH 3 3	6	8		0.5							
20													
20.5	520.2	13 16 15	12	9			Dense brown and gray GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); contains sandstone fragments; moist.						
		18 24 18	10	10									
25													
26.5	514.2	22 50/3	4	11			Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, thinly bedded to massive, slightly fractured, iron-staining.						
		Core 60"	Rec 54"	RQD 65%	R-1								
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1122 | Location: Ramp C N:326069.463, E:1826027.053 | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 16.0'-22.0'
Water level at completion: 10.5' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
	510.7													
30.0	510.7						@ 28.2' to 28.3', broken. @ 28.5' to 28.9', broken and decomposed.							
32.5	508.2						Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, thinly bedded to massive, slightly fractured, iron-staining. @ 30.4' to 30.7', broken with decomposed zones. Bottom of Boring - 32.5'							
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD * COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1123 | Location: Ramp C N:326207.66, E:1825973.884 | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 19.0'-20.0'
Water level at completion: 12.5' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.9						Asphalt - 6" Aggregate Base - 6"						
1.0	539.9	4 5 6	9	1		2.5	FILL: Very stiff gray SANDY SILT (A-4a), some gravel, little clay; damp.	25	12	--	13	34	16
3.0	537.9	2 5 4	10	2		4.5+	FILL: Hard brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; damp.	7	6	--	4	45	38
5		5 6 5	15	3		3.0	@ 6.0', gray, organic staining and odor, contains sand seams.	4	8	--	8	47	33
		3 4 3	9	4		3.5							
10		3 3 4	13	5		2.5							
13.0	527.9												
		2 4 4	9	6		2.0	Stiff brown and gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist to wet.						
15		1 2 2	14	7		1.0							
		2 2 2	10	8		1.0							
20													
20.5	520.4												
		5 14 14	6	9		4.5+	Hard brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); damp.						
		10 25 18	13	10		4.5+							
25													
27.0	513.9	8 46 50/3	8	11		4.5+							
		Core 60"	Rec 50"	RQD 42%	R-1		Hard gray SANDSTONE; fine grained, moderately to highly weathered, micaceous, argillaceous, medium bedded, highly fractured to broken, iron-staining.						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

96 →

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1123 | Location: Ramp C N:326207.66, E:1825973.884 | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 19.0'-20.0'
Water level at completion: 12.5' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
30.0	510.9						Hard gray SANDSTONE; fine grained, moderately to highly weathered, micaceous, argillaceous, medium bedded, highly fractured to broken, iron-staining.						
32.5	508.4						Bottom of Boring - 32.5'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

35 40 45 50 55 60

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

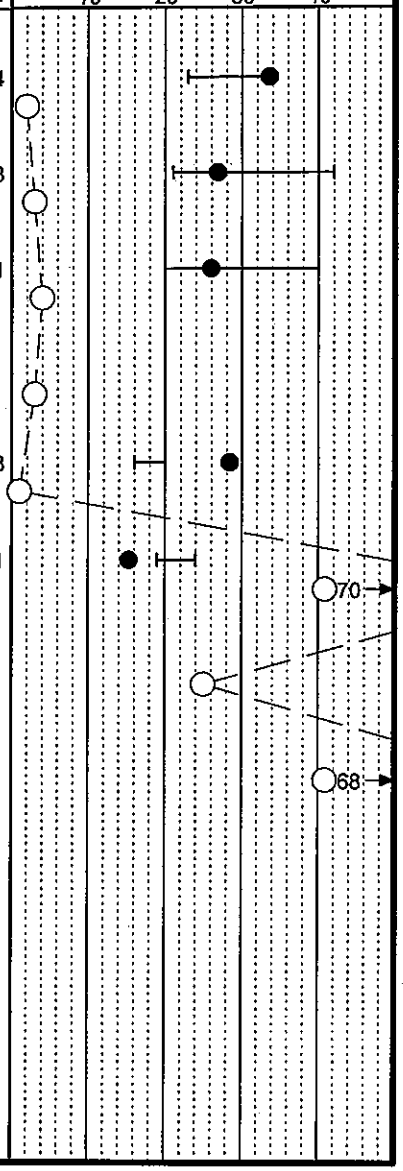
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1124 | Location: Ramp C N:326357.984, E:1825942.319 | Date Drilled: 7/19/05

WATER OBSERVATIONS: Water seepage at: 11.0'-16.0'
Water level at completion: 14.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	533.5												
0.3	533.2						Topsoil - 4"						
		WOH 1 1	16	1		1.0	FILL: Stiff gray SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; contains roots; organic odor; moist to wet.	1	5	--	11	59	24
3.0	530.5						FILL: Stiff gray CLAY (A-7-6), trace fine to coarse sand; moist.						
		1 1 2	12	2		1.75		0	1	--	8	48	43
5													
5.5	528.0						Stiff brown SILTY CLAY (A-6b), trace fine to coarse sand; moist to wet.						
		2 2 2	12	3		1.5		0	0	--	7	52	41
		2 1 2	12	4		0.25	@ 8.5', very soft, some sand seems.						
10													
10.5	523.0						Very soft brown SANDY SILT (A-4a), little clay, trace gravel; wet.						
		WOH WOH 1	8	5		0.0		1	1	--	36	44	18
		8 40 30	8	6			@ 13.5', some gravel; moist.	27	14	--	18	30	11
15													
		8 10 15	8	7									
							@ 18.0', gray; wet.						
		46 18 50/4	8	8									
19.5	514.0												
20		Core 60"	Rec 48"	RQD 70%	R-1		Hard gray SANDSTONE; very fine to fine grained, moderately weathered, micaceous, medium bedded, slightly fractured, iron-staining. @ 22.1' to 22.5', 23.1' to 23.2', high angle fractures.						
25.0	508.5						Bottom of Boring - 25.0'						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

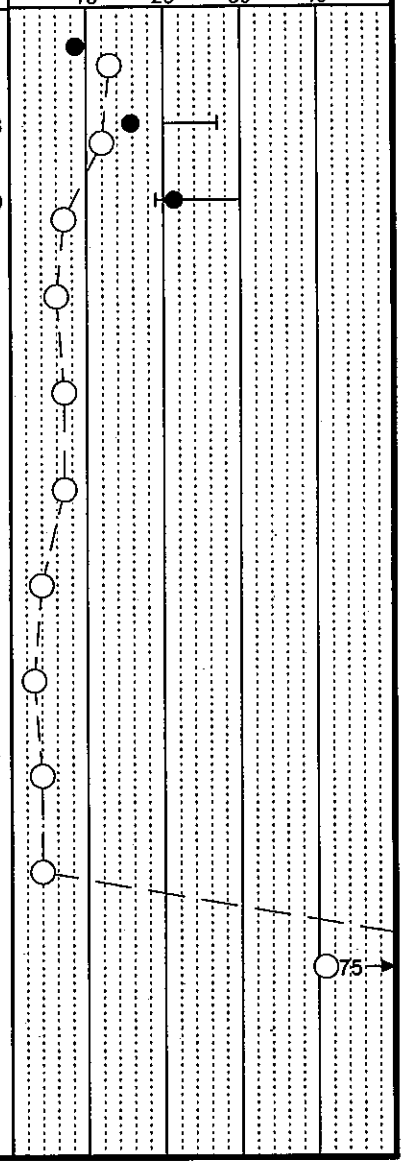
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1125 | Location: Ramp C N:326716.41, E:1825803.51 | Date Drilled: 7/19/05 to 07/20/05

WATER OBSERVATIONS: Water seepage at: 14.0'-19.0'
Water level at completion: 11.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	538.9												
0.3	538.6	2 5 8 6	18	1		4.5+	Topsoil - 4" FILL: Hard brown SANDY SILT (A-4a), trace gravel, little clay; damp.						
		5 7 5 5	17	2		4.5+		8	14	--	11	49	18
4.0	534.9	4 3 4 4	19	3		2.0	Stiff brown SILT AND CLAY (A-6a), trace gravel, little fine to coarse sand; moist.	1	8	--	9	53	29
5		2 3 3	16	4		1.5							
8.0	530.9												
		2 3 4	18	5		2.5	Very stiff brown SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
10		3 3 4	16	6		2.25							
		2 2 2	16	7		--	@ 13.5', "and" sand; wet.						
15													
15.5	523.4	1 1 2	12	8			Very loose brown GRAVEL WITH SAND (A-1-b), some silt, little clay; wet.						
		WOH 2 2	10	9									
20		WOH 2 2	3	10									
23.0	515.9												
		8 25 50	18	11			Very dense brown SANDY SILT (A-4a), trace gravel, trace clay; moist.						
25.0	513.9	Core 60"	Rec 52"	RQD 48%	R-1		Hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, medium bedded, moderately fractured, iron-staining. @ 25.2' to 25.7', 26.2' to 26.6', 27.5' to 27.8', broken. @ 26.6' to 26.7', 28.5' to 28.6', high angle fractures.						
30.0	508.9						Bottom of Boring - 30.0'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1125 | Location: Ramp C N:326716.41, E:1825803.51 | Date Drilled: 7/19/05 to 07/20/05

WATER OBSERVATIONS: Water seepage at: 14.0'-19.0'
Water level at completion: 11.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	508.9													
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1126 | Location: Ramp C N:327052.646, E:1825651.739 | Date Drilled: 7/20/05

WATER OBSERVATIONS: Water seepage at: 11.0'-14.0' and 21.0'-25.0'
Water level at completion: 7.5' (including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.7						Asphalt - 3" Aggregate Base - 8"						
0.9	539.8	5 6 7 7	16	1		4.5+	Hard brown SILTY CLAY (A-6b), trace fine to coarse sand; damp.	0	1	--	2	62	35
3.0	537.7	1 6 5 5	17	2		4.5+	Very stiff to hard brown SILT AND CLAY (A-6a), some fine to coarse sand, trace gravel; damp to moist.	8	13	--	10	37	32
5		7 8 9 5	14	3		3.0	@ 5.0'-7.0', contains sand seems. @ 5.0', gray and brown.						
		3 4 5	15	4		2.5							
		2 2 3	13	5		3.5	@ 8.5', little fine to coarse sand.	0	1	--	11	42	46
10													
10.5	530.2	2 2 2	15	6		0.25	Very soft brown SILT (A-4b), some clay, little fine to coarse sand; wet.	0	1	--	15	58	26
		1 1 2	13	7		0.5							
15													
15.5	525.2	WOH 2 2	18	8		0.75	Medium stiff brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; moist to wet.	1	2	--	4	64	29
		1 2 2	16	9		1.0							
20													
20.5	520.2	WOH WOH 2	17	10		0.0	Very soft brown SANDY SILT (A-4a), little clay; wet.	0	12	--	48	29	11
23.0	517.7	8 14 21	18	11			Dense brown and gray GRAVEL WITH SAND (A-1-b), trace clay; wet.	5	69	--	20	6	
25													
26.5	514.2	10 50/5	11	12			Hard to very hard gray SANDSTONE; very fine to fine grained, highly weathered to decomposed, micaceous, argillaceous, thinly bedded to medium bedded, highly fractured to broken, iron-staining.						
30		Core 60"	Rec 53"	RQD 33%	R-1								

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

Non-Plastic

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1126 | Location: Ramp C N:327052.646, E:1825651.739 | Date Drilled: 7/20/05

WATER OBSERVATIONS: Water seepage at: 11.0'-14.0' and 21.0'-25.0'
Water level at completion: 7.5' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
	510.7													
30.0	510.7						@ 28.6' to 30.5', decomposed zones. Hard to very hard gray SANDSTONE; very fine to fine grained, highly weathered to decomposed, micaceous, argillaceous, thinly bedded to medium bedded, highly fractured to broken, iron-staining.							
32.5	508.2						Bottom of Boring - 32.5'							
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

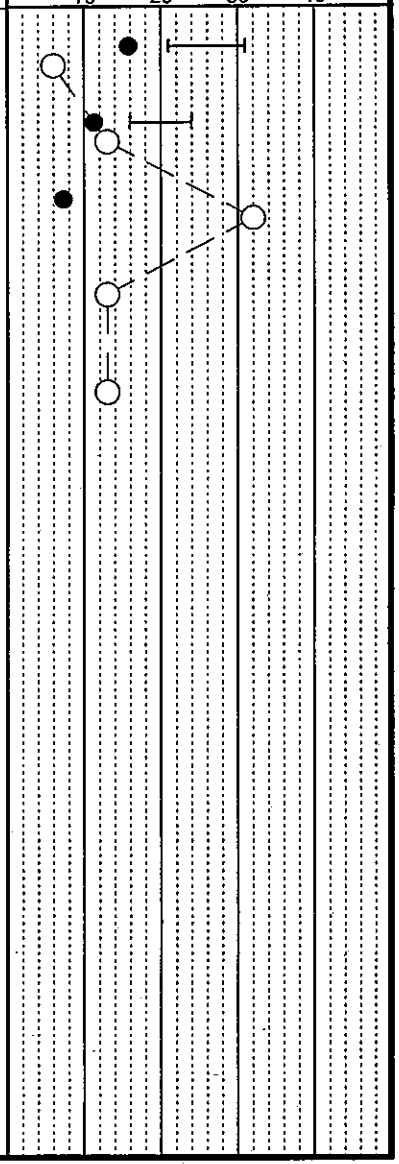
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1127 | Location: Ramp C N:327331.386, E:1825549.607 | Date Drilled: 7/13/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.0												
0.3	539.7	2 3 3 7	20	1		3.75	Topsoil - 4" Very stiff to hard brown SANDY SILT (A-4a), some clay, trace gravel; damp.	8	9	–	9	45	29
		6 5 8 7	22	2		4.5+		6	19	–	20	33	22
5		5 16 16 16	21	3		4.5+							
6.0	534.0	2 5 8	17	4		4.5+	Hard dark brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; damp.						
8.0	532.0												
		5 6 7	18	5		3.0	Very stiff brown SILTY CLAY (A-6b), trace fine to coarse sand; moist.						
10.0	530.0						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 (10/2/2006 4:18 PM)

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1128 | Location: Ramp C N:327710.7, E:1825399.765 | Date Drilled: 7/13/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.6						Asphalt - 8" Aggregate Base - 4"						
1.0	539.6	8 11 7 6	19	1		4.5+	Hard brown SILT AND CLAY (A-6a), trace gravel, trace fine to coarse sand; damp.	8	2	–	2	55	33
3.0	537.6	3 9 17 10	22	2			Medium dense brown GRAVEL WITH SAND (A-1-b), little silt, trace clay; damp.	41	23	–	14	17	5
5.0	535.6	8 5 13 10	20	3		4.5+	Hard brown SILT AND CLAY (A-6a), trace gravel, trace fine to coarse sand; damp.	2	5	–	10	48	35
7.0	533.6	2 4 4	16	4		4.5+	Hard gray SILTY CLAY (A-6b), trace fine to coarse sand; damp.						
		4 4 4	18	5		4.25	@ 8.5', brown.						
10.0	530.6						Bottom of Boring - 10.0'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1129 | Location: Ramp C N:328086.377, E:1825253.394 | Date Drilled: 7/13/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.9												
0.8	540.1	6 6 20 21	22	1		4.5+	Asphalt - 6" Aggregate Base - 4" Hard black SILT (A-4b), some clay, trace gravel, trace fine to coarse sand; organic; damp.	6	2	--	5	55	32
3.0	537.9	7 10 12 11	21	2			Medium dense brown COARSE AND FINE SAND (A-3a), little gravel, little silt, trace clay; damp.	17	32	--	26	17	8
5		15 15 14 14	20	3									
		16 18 15	18	4									
		13 21 17	18	5			@ 8.5', contains sandstone fragments.						
10.0	530.9						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1130 | Location: Ramp C N:328394.202, E:1825118.313 | Date Drilled: 7/27/05

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	541.4												
0.8	540.6	20 30 15	14	1			Asphalt - 4" Aggregate Base - 6" Dense brown GRAVEL WITH SAND (A-1-b), little clay; damp.	53	19	--	10	18	
3.0	538.4	5 5 5 5	16	2		2.5	Very stiff brown SANDY SILT (A-4a), some gravel, little clay; damp.	21	18	--	22	22	17
5		6 3 2 1	15	3		3.25							
7.5	533.9	10 7 5 3	16	4			Medium dense brown GRAVEL WITH SAND (A-1-b); damp.						
10.0	531.4						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

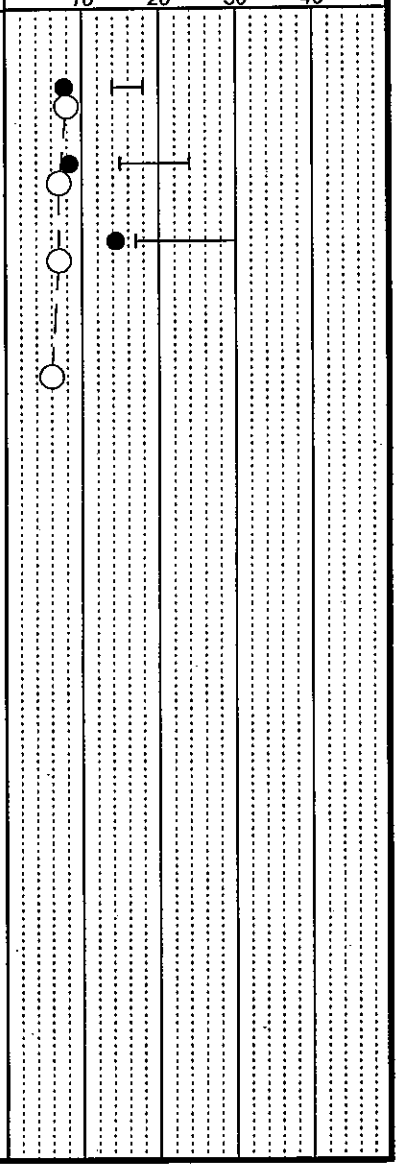
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1131 | Location: Ramp A N:327899.004, E:1825229.125 | Date Drilled: 7/27/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	541.0												
0.8	540.2						Asphalt - 5" Aggregate Base - 5"						
		3 4 4 5	6	1			Loose gray GRAVEL WITH SAND AND SILT (A-2-4), little clay; damp.	16	25	--	29	18	12
		3 4 3 5	16	2				34	19	--	12	20	15
5.0	536.0	2 4 3 3	15	3		4.5+	Very stiff to hard brown and gray SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; damp.	0	2	--	11	57	30
		3 3 3 4	16	4		3.5							
10.0	531.0						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

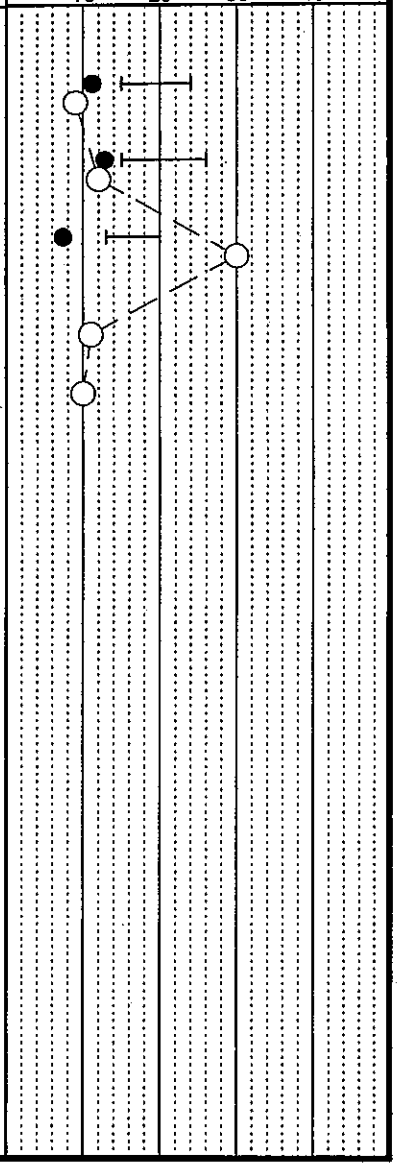
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1132 | Location: Ramp A N:327513.46, E:1825367.896 | Date Drilled: 7/13/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.7												
0.8	539.9						Asphalt - 6" Aggregate Base - 4"						
		3 4 5 5	20	1		3.5	Very stiff brown SANDY SILT (A-4a), some clay, little gravel; damp.	16	19	--	18	27	20
3.0	537.7	4 6 6 6	22	2		3.5	Very stiff brown SILT AND CLAY (A-6a), "and" fine to coarse sand, little gravel; damp.	15	24	--	18	23	20
5.0	535.7	7 16 14 8	21	3		4.0	Very stiff brown SANDY SILT (A-4a), some clay, little gravel; damp.	19	31	--	20	19	11
7.0	533.7	3 4 7	11	4		3.5	Very stiff brown and gray SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; moist.						
		5 5 5	17	5		3.0							
10.0	530.7						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1133 | Location: Ramp A N:327134.2, E:1825508.691 | Date Drilled: 7/20/05

WATER OBSERVATIONS: Water seepage at: 11.0'-16.0' and 27.0'-28.0'
Water level at completion: 7.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.2												
0.4	539.8	2 6 7 10	16	1		2.75	Topsoil - 5" Very stiff brown SANDY SILT (A-4a), some clay, little gravel; moist.	12	22	--	20	32	13
2.0	538.2	6 7 7 9	14	2		4.5+	Hard brown SILT AND CLAY (A-6a), some fine to coarse sand, little gravel; damp.	27	20	--	11	23	19
5		5 6 12 16	16	3		4.0		13	31	--	18	27	11
		4 5 5	15	4		3.5	@ 6.0'-7.5', very stiff, gray, organic staining.						
		3 5 4	14	5		4.0							
10													
10.5	529.7	1 1 1	13	6			Very loose brown SANDY SILT (A-4a), some clay, little gravel; wet.						
		WOH 1 1	17	7			@ 13.5'-15.0', "and" gravel.						
15		WOH WOH WOH	17	8									
18.0	522.2												
		WOH WOH WOH	17	9		0.25	Very soft gray SILTY CLAY (A-6b), trace fine to coarse sand; wet.						
20		WOH WOH WOH	18	10		0.5							
		WOH WOH WOH	18	11		0.25							
25													
25.5	514.7	1 4 9	15	12			Loose gray COARSE AND FINE SAND (A-3a), little gravel; wet.						
28.0	512.2												
29.5	510.7	7 11 50/4	16	13			Medium dense brown and gray GRAVEL WITH SAND AND SILT (A-2-4), little clay; contains sandstone fragments; wet.						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1133 | Location: Ramp A N:327134.2, E:1825508.691 | Date Drilled: 7/20/05

WATER OBSERVATIONS: Water seepage at: 11.0'-16.0' and 27.0'-28.0'
Water level at completion: 7.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	510.2	Core 60"	Rec 52"	RQD 33%	R-1		Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, thinly bedded to medium bedded, moderately to highly fractured. @ 30.4' to 30.7', 32.5' to 32.9', broken and decomposed. @ 33.0' to 33.2', 34.7' to 35.0', high angle fractures.							
35.0	505.2						Bottom of Boring - 35.0'							
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

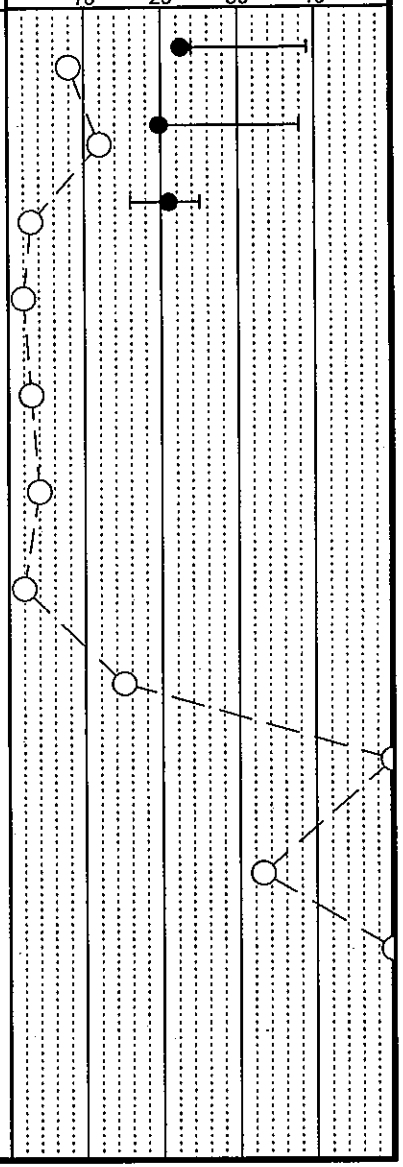
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1134 | Location: Ramp A N:326741.512, E:1825584.253 | Date Drilled: 7/27/05

WATER OBSERVATIONS: Water seepage at: 14.0'-19.0'
Water level at completion: 11.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	534.0												
0.3	533.7	3 4 4 4	15	1		4.5+	Topsoil - 4" Hard dark brown SANDY SILT (A-4a), little clay; damp.	0	2	–	10	59	30
2.0	532.0	8 6 6 7	16	2		4.5+	Hard brown SILT AND CLAY (A-6a), trace fine to coarse sand; damp.	0	0	–	2	55	43
4.0	530.0	3 2 1 2	18	3		1.5	Stiff brown SANDY SILT (A-4a), some clay, trace gravel; moist.	0	1	–	32	47	20
5		2 1 1	18	4		0.25	@ 6.0', soft; wet.						
		WOH 2 1	18	5		0.5							
10		WOH 2 2	17	6		1.0							
13.0	521.0	WOH 1 1	16	7			Loose brown COARSE AND FINE SAND (A-3a), trace clay, trace gravel; wet.						
15		2 6 9	15	8									
19.0	515.0	28 50/4	10	9			Dense brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); contains sandstone fragments; moist to wet.						
20		10 12 21	12	10									
24.0	510.0	18 50/5	8	11			Medium hard gray SANDSTONE; fine grained, highly weathered to decomposed, micaceous, argillaceous, thinly bedded to medium bedded, highly fractured to broken .						
25		Core 60"	Rec 60"	RQD 35%	R-1		@ 25.4' to 26.3', 28.1' to 28.4', 28.9' to 29.2', decomposed zones . @ 29.8', high angle fractures.						
30.0	504.0						Bottom of Boring - 30.0'						

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1134 | Location: Ramp A N:326741.512, E:1825584.253 | Date Drilled: 7/27/05

WATER OBSERVATIONS: Water seepage at: 14.0'-19.0'
Water level at completion: 11.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press./Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢——⊣ LL Blows per foot - ○ 10 20 30 40
30	504.0													
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2005 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1135 | Location: Ramp A N:326352.347, E:1825512.811 | Date Drilled: 7/28/05

WATER OBSERVATIONS: Water seepage at: 11.0'-16.0' and 29.0'
Water level at completion: 6.0' (including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	533.1												
0.4	532.7						Topsoil - 5"						
		4 5 4	12	1		4.5+	Hard brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; damp.						
		3 2 2	4	2		4.5+							
5													
6.5	526.6	1 2 3	8	3			Loose to medium dense brown COARSE AND FINE SAND (A-3a), little gravel, trace clay; moist.						
		3 6 5	10	4									
10													
10.5	522.6						Loose to medium dense brown GRAVEL WITH SAND (A-1-b), little clay, little silt; moist to wet.						
		3 5 3	8	5									
		4 6 8	11	6									
15													
		6 10 6	12	7									
18.0	515.1												
		3 3 3	11	8		1.5	Stiff brown and gray SILTY CLAY (A-6b), trace fine to coarse sand; wet.						
20													
		1 4 5	15	9		2.0							
		2 2 2	16	10		1.25	@ 23.5'-25.0', gray.						
25													
		WOH WOH 3	4	11		0.5							
28.5	504.6	50/6	6	12									
29.0	504.1						Dense gray GRAVEL WITH SAND (A-1-b), trace clay; wet.						
30													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1135 | Location: Ramp A N:326352.347, E:1825512.811 | Date Drilled: 7/28/05

WATER OBSERVATIONS: Water seepage at: 11.0'-16.0' and 29.0'
Water level at completion: 6.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % - ● / PL — LL / Blows per foot - ○
30	503.1	Core 60"	Rec 30"	RQD 58%	R-1		Hard gray SANDSTONE; very fine to fine grained, moderately weathered, micaceous, argillaceous, massively bedded, slightly fractured. @ 30.0' to 30.4', broken and highly weathered. @ 31.2' to 31.5' and 32.5' to 32.8', decomposed.							
35.0	498.1						Bottom of Boring - 35.0'							
40														
45														
50														
55														
60														

STANDARD PENETRATION (N): 10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1136 | Location: Ramps A & D N:325931.815, E:1825360.454 | Date Drilled: 7/26/05

WATER OBSERVATIONS: Water seepage at: 15.0'-21.0'
Water level at completion: 11.5' (including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	524.9												
0.3	524.6						Topsoil - 4"						
		3 5 5	8	1		4.5+	Hard dark brown SANDY SILT (A-4a), little clay; slightly organic; damp. @ 3.0', brown.						
		7 2 3	5	2		3.0							
5													
5.5	519.4						Stiff brown SILT AND CLAY (A-6a), trace fine to coarse sand; moist.						
		2 2 2	16	3		1.0							
		2 2 2	15	4		0.75							
10													
10.5	514.4						Soft gray SILT (A-4b); moist to wet.						
		1 1 2	14	5		0.5							
13.0	511.9						Loose brown COARSE AND FINE SAND (A-3a), trace clay, trace gravel; wet.						
		WOH 2 2	16	6									
15													
15.5	509.4						Medium stiff to stiff brown and gray SILTY CLAY (A-6b), little fine to coarse sand; wet.						
		2 10 50/4	14	7		2.5							
		WOH 1 2	10	8		1.0							
20													
20.5	504.4						Loose to medium dense gray COARSE AND FINE SAND (A-3a), some silt, little clay; wet.						
		1 1 1	18	9									
		5 7 12	15	10									
25													
26.0	498.9	50/2	2	11			Hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, thinly bedded to medium bedded, highly fractured. @ 28.7' to 30.3', 31.5' to 32.5', decomposed zone. @ 28.7' to 30.3', 31.5' to 32.5', decomposed.						
		Core 60"	Rec 60"	RQD 48%	R-1								
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40
60 →

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1136 | Location: Ramps A & D N:325931.815, E:1825360.454 | Date Drilled: 7/26/05

WATER OBSERVATIONS: Water seepage at: 15.0'-21.0'
Water level at completion: 11.5' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30.0	494.9						Hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, thinly bedded to medium bedded, highly fractured.							
32.5	492.4						Bottom of Boring - 32.5'							

35 40 45 50 55 60

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

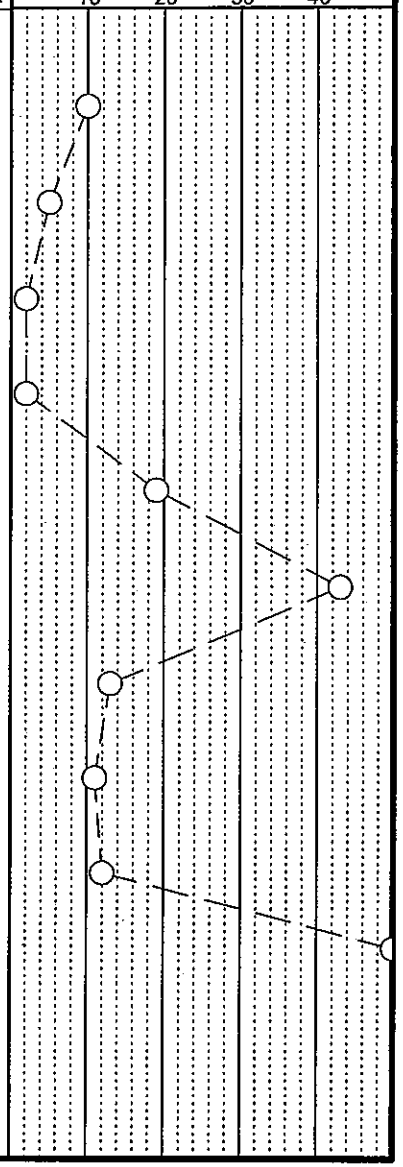
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1137 | Location: Ramps A & D N:325620.882, E:1825310.332 | Date Drilled: 7/26/05

WATER OBSERVATIONS: Water seepage at: 9.0'-25.0'
Water level at completion: 6.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	525.0												
0.3	524.7						Topsoil - 4"						
		7 5 5	7	1		4.5+	FILL: Hard brown SANDY SILT (A-4a), some clay, trace gravel; contains organic material; damp.						
		4 3 2	4	2		--							
5													
5.5	519.5						Very loose brown COARSE AND FINE SAND (A-3a), little clay, trace gravel; moist to wet.						
		3 1 1	10	3									
		WOH 1 1	11	4									
10													
10.5	514.5						Medium dense brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); moist.						
		5 11 8	12	5									
		6 18 25	11	6									
15													
15.5	509.5						Medium dense brown and gray COARSE AND FINE SAND (A-3a), little gravel, trace clay; wet.						
		3 4 9	10	7									
		2 4 7	13	8									
20													
		2 4 8	12	9			@ 21.0', gray.						
24.0	501.0	28 50/5	11	10									
25							Medium hard to hard gray SANDSTONE; fine grained, moderately to highly weathered, micaceous, argillaceous, medium bedded, moderately fractured to broken. @ 27.9' to 28.3', 29.6' to 30.0', decomposed. @ 26.4'-26.6', 27.1' to 27.7', high angle fractures.						
		Core 60"	Rec 51"	RQD 48%	R-1								
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1137 | Location: Ramps A & D N:325620.882, E:1825310.332 | Date Drilled: 7/26/05

WATER OBSERVATIONS: Water seepage at: 9.0'-25.0'
Water level at completion: 6.0' (including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
	495.0													
30.0	495.0						Medium hard to hard gray SANDSTONE; fine grained, moderately to highly weathered, micaceous, argillaceous, medium bedded, moderately fractured to broken.							
31.0	494.0						Bottom of Boring - 31.0'							

35 40 45 50 55 60

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

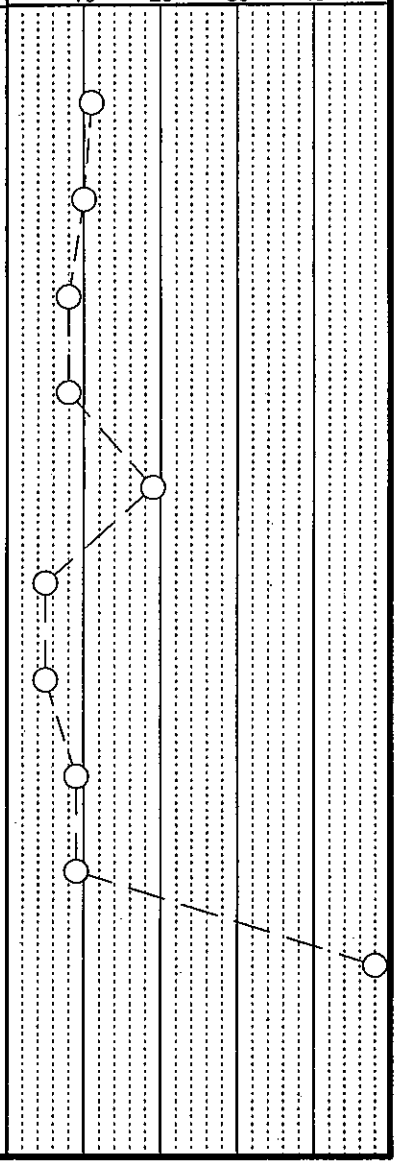
LOG OF: Boring B-1138 | Location: Ramps A & D N:325422.958, E:1825443.598 | Date Drilled: 7/26/05

WATER OBSERVATIONS: Water seepage at: 11.0'-24.0'
Water level at completion: 6.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	525.3												
0.3	525.0						Topsoil - 4"						
		6 4 7	9	1		4.5+	FILL: Hard dark brown SANDY SILT (A-4a), trace clay, trace gravel; damp.						
		6 5 5	8	2		4.5+							
5.0	520.3						Stiff to very stiff brown SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; moist.						
		3 3 5	9	3		0.75							
		2 4 4	10	4		1.5							
10													
10.5	514.8						Medium dense brown GRAVEL WITH SAND (A-1-b), trace clay; moist.						
		5 9 10	12	5									
13.0	512.3						Loose to medium dense brown and gray COARSE AND FINE SAND (A-3a), little gravel, trace clay; wet.						
		4 2 3	13	6									
15													
		4 2 3	14	7									
		1 4 5	10	8									
20													
		10 5 4	11	9			@ 21.0', gray.						
		10 20 28	18	10									
25.0	500.3						@ 25.0' to 26.2', core loss.						
		Core 60"	Rec 48"	RQD 48%	R-1		Hard gray SANDSTONE; very fine to fine grained, slightly weathered, micaceous, argillaceous, thinly bedded to medium bedded, highly fractured.						
							@ 26.2' to 27.5', broken with decomposed zone.						
30.0	495.3						Bottom of Boring - 30.0'						

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1138 | Location: Ramps A & D N:325422.958, E:1825443.598 | Date Drilled: 7/26/05

WATER OBSERVATIONS: Water seepage at: 11.0'-24.0'
Water level at completion: 6.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	495.3						@ 29.4' to 29.5', decomposed. @ 28.6' and 29.7', filled fracture (decomposed).							
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1139 | Location: Ramps A & D N:325353.958, E:1825678.123 | Date Drilled: 7/25/05

WATER OBSERVATIONS: Water seepage at: 11.0'-26.0'
Water level at completion: 9.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % / PL — LL / Blows per foot
0	529.7													
0.3	529.4						Topsoil - 4"							
		5 5 4	7	1		4.5+	FILL: Hard brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; damp.							
3.0	526.7													
		5 8 22	8	2		2.5	FILL: Very stiff gray SILTY CLAY (A-6b), trace gravel; contains organic material and odor; moist.							
5														
		7 3 3	3	3			@ 6.0', wood fragments.							
		2 4 5	6	4		1.5								
10														
10.5	519.2						Loose to medium dense brown GRAVEL WITH SAND (A-1-b), trace clay; wet.							
		4 2 2	12	5										
		1 1 2	10	6				3	53	–	31	8	5	Non-Plastic
15														
		2 4 4	13	7										
		4 5 4	12	8										
20														
20.5	509.2						Medium dense brown FINE SAND (A-3), trace clay, trace gravel; wet.							
		6 16 14	18	9				1	21	–	69	7	2	Non-Plastic
23.0	506.7						Loose to medium dense brown GRAVEL WITH SAND (A-1-b), trace clay; wet.							
		2 6 9	17	10										
25							@ 26.0', gray.							
		4 12 12	14	11										
28.5	501.2	50/3	3	12			Hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, thinly bedded to							
30														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1139 | Location: Ramps A & D N:325353.958, E:1825678.123 | Date Drilled: 7/25/05

WATER OBSERVATIONS: Water seepage at: 11.0'-26.0'
Water level at completion: 9.0' (including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	499.7	Core 60"	Rec 56"	RQD 68%	R-1		medium bedded, slightly fractured. @ 30.8' to 31.3',33.1' to 33.4', broken argillaceous zones.							
35.0	494.7						Bottom of Boring - 35.0'							
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1140 | Location: Ramps A & D N:325340.967, E:1825934.726 | Date Drilled: 7/25/05

WATER OBSERVATIONS: Water seepage at: 16.0'-21.0'
Water level at completion: 19.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N)
0	535.8													Natural Moisture Content, % - ● PL ⊢—⊣ LL; Blows per foot - ○ (10 20 30 40)
0.4	535.4	3 6 9	2	1		–	Topsoil - 5" FILL: Medium dense brown SANDY SILT (A-4a); dry to damp.							
3.0	532.8	3 2 2	6	2		2.5	FILL: Very stiff brown and gray SILT AND CLAY (A-6a), trace to little fine to coarse sand, trace to little gravel; moist.							
5		1 2 3	7	3		2.5		15	10	–	8	39	28	
		2 2 4	8	4		2.0		1	3	–	6	55	35	
10														
10.5	525.3	2 2 3	16	5			Medium stiff brown SANDY SILT (A-4a), little clay; moist.	0	2	–	47	32	19	
		1 2 3	15	6										
15														
15.5	520.3	7 11 10	12	7			Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4), little clay; moist.							
		8 9 12	14	8										
20														
20.5	515.3	WOH 2 5	11	9			Loose to medium dense brown and gray GRAVEL WITH SAND (A-1-b), trace clay; moist to wet.	3	50	–	40	7		Non-Plastic
		3 4 4	10	10										
25		7 8 7	12	11										
		3 8 14	13	12										
30														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1140 | Location: Ramps A & D N:325340.967, E:1825934.726 | Date Drilled: 7/25/05

WATER OBSERVATIONS: Water seepage at: 16.0'-21.0'
Water level at completion: 19.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % - ● / PL — LL / Blows per foot - ○
30	505.8						Loose to medium dense gray GRAVEL WITH SAND (A-1-b), trace clay; moist to wet.							
		2 6 6	13	13										
34.0	501.8	22 50/4	6	14			Hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, micaceous, argillaceous, thinly bedded to medium bedded, highly fractured.							
35		Core 60"	Rec 51"	RQD 43%	R-1		@ 35.0' to 35.8', lost recovery.							
							@ 37.9' to 38.2', broken with decomposed layers.							
							@ 38.8', broken with decomposed layer.							
40.0	495.8						Bottom of Boring - 40.0'							
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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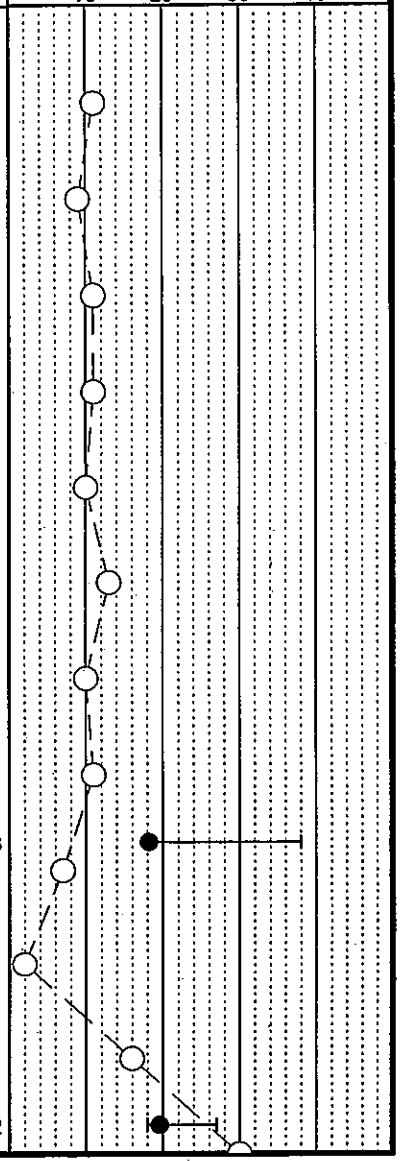
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1141 | Location: Mainline Overpass N:325362.944, E:1826517.749 | Date Drilled: 10/12/05

WATER OBSERVATIONS: Water seepage at: 21.0'-30.0'
Water level at completion: 7.7' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	556.2												
0.2	556.0						Topsoil - 2"						
		5 5 6	18	1			FILL: Medium dense gray SANDY SILT (A-4a), trace clay, trace gravel; contains shale fragments; damp to moist.						
		4 4 5	18	2									
5		2 6 5	6	3									
		4 8 3	8	4									
10		15 7 3	5	5			@ 11.0', contains wood fragments.						
		4 5 8	3	6									
15													
15.5	540.7						FILL: Soft to medium stiff brown and gray GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); moist to wet.						
		3 5 5	0	7			@ 16.0'-20.0', contains wood fragments.						
		5 5 6	3	8									
20		3 4 3	14	9			@ 21.0', brown.	57	15	--	7	8	13
		2 1 1	18	10									
25		1 1 15	5	11									
28.0	528.2												
		10 15 15	8	12		1.5	Stiff brown SANDY SILT (A-4a), some clay, little gravel; wet.	11	8	--	27	32	22
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 (10/2/2006 4:18 PM)

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1141 | Location: Mainline Overpass N:325362.944, E:1826517.749 | Date Drilled: 10/12/05

WATER OBSERVATIONS: Water seepage at: 21.0'-30.0'
Water level at completion: 7.7' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢——⊣ LL Blows per foot - ○ 10 20 30 40
30	526.2						Stiff brown SANDY SILT (A-4a), some clay, little gravel; wet.							
33.0	523.2	Core 120"	Rec 120"	RQD 78%	R1		Medium hard to hard black SHALE; very fine grained, moderately to highly weathered, carbonaceous, thinly laminated to laminated, highly fractured. @ 33.3', 33.4', 33.5', 33.9', 34.7' to 34.8', 35.1', 35.3', 35. 4', 36.0', 37.2', 37.4' to 37.6', 38.0', 38.3', 38.8', 39.2', 39.3', 39.9', 40.1', 40.8', 41.1', low angle fractures.							
42.6	513.6													
43.0	513.2						Hard gray SANDSTONE; fine grained, slightly weathered, micaceous, medium bedded, unfractured.							
							Bottom of Boring - 43.0'							
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1142 | Location: Mainline Overpass N:325293.723, E:1826586.346 | Date Drilled: 9/21/05 to 9/22/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	560.4												
0.3	560.1						Topsoil - 4"						
		5 7 7	5	1		4.0	FILL: Very stiff to hard gray SILTY CLAY (A-6b), trace gravel; damp.						
		3 5 5	6	2		4.25							
5		2 1 5	5	3		2.5	@ 6.0', moist.						
8.0	552.4												
		11 5 6	6	4		1.0	FILL: Stiff brown SILT AND CLAY (A-6a), little gravel, trace fine to coarse sand; moist.						
10		5 5 4	4	5		1.0	@ 11.0', brown and gray.						
13.0	547.4												
		5 5 8	18	6		2.0	FILL: Medium stiff black SANDY SILT (A-4a), trace gravel; contains brick fragments and organic material; moist.						
15													
15.5	544.9												
		5 7 6	18	7		3.5	Very stiff brown SANDY SILT (A-4a), some clay, trace gravel; damp.	0	3	--	6	62	29
		5 4 4	18	8		3.0							
20													
20.5	539.9												
		4 5 5	8	9		2.0	Medium stiff brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); contains red sandstone fragments; moist.	30	26	--	16	11	17
23.0	537.4												
		5 4 4	2	10		0.5	Soft brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; wet.						
25													
25.5	534.9												
		5 5 5	1	11			Medium dense brown COARSE AND FINE SAND (A-3a), "and" clay, little silt, little gravel; wet.						
29.0	531.4	18 50 10	12	12A 12B			Very dense brown GRAVEL WITH SAND AND SILT (A-2-4),	31	28	--	12	21	8
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1142 | Location: Mainline Overpass N:325293.723, E:1826586.346 | Date Drilled: 9/21/05 to 9/22/05

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
	530.4												
30.0	530.4						trace clay; moist.						
		5 4 5	18	13			Loose gray SANDY SILT (A-4a), little clay, trace gravel; wet.	0	1	–	37	47	15
		3 2 24	18	14A 14B				1	1	–	42	44	12
34.5	525.9						Medium hard black SHALE; very fine grained, moderately to highly weathered, carbonaceous, medium bedded, moderately fractured.						
35		50/4	4	15									
		50/2	2	16									
40													
							@ 43.6' to 44.0', high angle fracture.						
45.1	515.3	Core 60"	Rec 60"	RQD 75%	R1		@ 48.0', moderate siltstone and sandstone laminae. @ 48.0' to 48.5', multiple fractures.						
							Very hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, medium bedded, slightly fractured to unfractured.						
48.5	511.9						Bottom of Boring - 48.5'						
50													
55													
60													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40 60

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1143 | Location: Mainline Overpass N:325327.769, E:1826689.992 | Date Drilled: 10/13/05

WATER OBSERVATIONS: Water seepage at: 23.5'-26.3'
Water level at completion: 3.5' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % / Blows per foot
0	563.2													
0.2	563.0						Topsoil - 2"							
		7 10 11	18	1		--	FILL: Very stiff to hard brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; damp.							
		4 5 3	14	2		4.5+								
5		5 6 6	18	3		3.0								
		4 5 9	9	4		3.0								
10														
10.5	552.7						POSSIBLE FILL: Medium dense brown GRAVEL WITH SAND (A-1-b), trace to little silt, trace to little clay; dry to damp.	21	44	--	19	16		Non-Plastic
		5 5 6	8	5										
		4 5 5	9	6										
15		3 4 7	10	7										
		4 6 8	14	8										
20		3 4 5	18	9										
		3 2 3	3	10			@ 23.5', wet.							
25														
26.5	536.7	25 50/4	8	11A 11B			Soft greenish gray SHALE; very fine grained, decomposed, micaceous, thinly laminated, highly fractured.							
							@ 28.8' to 29.3', loss of recovery from washed out clay.							
30														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1143 | Location: Mainline Overpass N:325327.769, E:1826689.992 | Date Drilled: 10/13/05

WATER OBSERVATIONS: Water seepage at: 23.5'-26.3'
Water level at completion: 3.5' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	533.2													
30.5	532.7	Core 120"	Rec 120"	RQD 81%	R1		@ High angle fractures from 29.3' to 29.4' and 29.6' to 29.7'. @ Low angle fractures at 30.5', 31.2', 31.7', 33.6', 34.7', 35.3', 36.7'. Medium hard black SHALE; very fine grained, moderately weathered, carbonaceous, thinly laminated, moderately fractured.							
35														
37.0	526.2						Bottom of Boring - 37.0'							
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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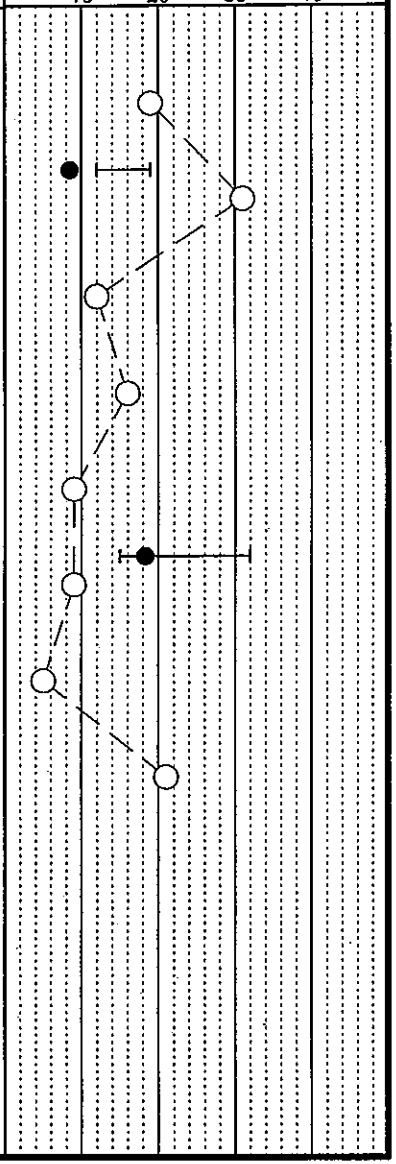
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1144 | Location: Mainline Overpass N:325347.233, E:1826785.628 | Date Drilled: 9/22/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	565.2												
0.3	564.9						Topsoil - 3"						
		5 8 11	6	1			FILL: Medium dense gray and brown SANDY SILT (A-4a), little clay, little gravel; contains organic material; dry to damp.						
3.0	562.2												
		12 14 17	12	2			Medium dense to dense reddish brown SANDY SILT (A-4a), little clay, trace gravel; damp to moist.	4	14	–	32	30	20
5		9 11 1	13	3									
		6 7 9	14	4									
10		5 4 5	12	5									
13.0	552.2												
		3 4 5	8	6			Medium dense brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6), little clay, little gravel; moist to wet.	13	31	–	30	9	17
15		2 3 2	14	7									
20		1 1 20	8	8									
21.0	544.2												
		Core 60"	Rec 45"	RQD 14%	R1		Soft to medium hard gray SHALE interbedded with SANDSTONE; very fine grained, highly weathered to decomposed, thinly laminated to thinly bedded, moderately fractured. @ 21.0' to 21.1', chert layer.						
25													
26.0	539.2						Bottom of Boring - 26.0'						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1145 | Location: Mainline Overpass N:325285.001, E:1826918.911 | Date Drilled: 10/13/05

WATER OBSERVATIONS: Water seepage at: 10.5'-13.0'
Water level at completion: 3.4' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
	567.3												
0.2	567.1						Topsoil - 2"						
		5 7 8	18	1		4.5+	Very stiff to hard brown SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; moist.						
		9 13 16	18	2		4.0		0	1	–	2	58	39
5		3 5 9	18	3		2.0							
		4 7 9	18	4		2.5	@ 8.5', some fine to coarse sand.						
10													
10.5	556.8						Medium dense dark brown GRAVEL WITH SAND (A-1-b); moist to wet.						
		4 3 7	18	5				4	47	–	33	16	
14.0	553.3	8 50/4	10	6			Soft gray SHALE; very fine grained, highly weathered, micaceous, medium bedded, highly fractured.						
15							@ 14.9' to 15.2',loss of recovery.						
							@ 14.5', 14.7', 15.6', 16.1', 16.5', 17.1', 17.2', 18.0', low angle fractures.						
19.0	548.3	Core 120"	Rec 116"	RQD 87%	R1		@ 21.2', 21.3', 21.7', 22.2', low angle fractures.						
20							Medium hard gray SANDSTONE; very fine grained, moderately weathered, argillaceous, micaceous, laminated to thinly bedded, moderately fractured, contains abundant argillaceous laminations.						
24.5	542.8						Bottom of Boring - 24.5'						
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1146 | Location: Mainline Overpass N:325329.61, E:1826929.736 | Date Drilled: 10/13/05

WATER OBSERVATIONS: Water seepage at: 10.5'-13.0'
Water level at completion: 3.4' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	567.7												
0.2	567.5						Topsoil - 2"						
		6 7 9	18	1		4.5+	Very stiff to hard brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; damp to moist.	0	3	--	5	50	42
		7 12 17	18	2		4.5+							
5		2 6 8	18	3		3.0							
		5 8 8	18	4		1.75	@ 8.5', stiff, contains sand seam						
10													
10.5	557.2	2 4 6	14	5			Medium dense dark brown GRAVEL WITH SAND (A-1-b); moist.	30	29	--	25	16	
13.0	554.7	35 50/2	8	6			Soft brownish gray SHALE; very fine grained, highly weathered to decomposed, micaceous, medium bedded, highly fractured. @ 14. 8' to 14.9', high angle fracture. Many broken areas from low angle fractures.						
15													
19.0	548.7	Core 120"	Rec 120"	RQD 77%	R1		@ 21.3' and 22.4', low angle fractures. Medium hard gray SANDSTONE; very fine grained, moderately to highly weathered, micaceous, laminated to thinly bedded, moderately fractured, contains abundant argillaceous laminations.						
20													
24.5	543.2						Bottom of Boring - 24.5'						
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1147 | Location: Ramp D N:326057.226, E:1825578.667 | Date Drilled: 7/27/05

WATER OBSERVATIONS: Water seepage at: 9.0'-16.0' and 25.0'-26.0'
Water level at completion: 7.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	529.7												
0.4	529.3						Topsoil - 5"						
		7 6 7	13	1		4.5+	FILL: Hard brown SANDY SILT (A-4a), little clay, trace gravel; damp.						
		4 2 2	9	2		4.5+							
5													
5.5	524.2						Loose to medium dense brown GRAVEL WITH SAND AND SILT (A-2-4), some clay; moist to wet.						
		2 2 3	10	3									
		3 4 4	12	4									
10													
		4 8 7	13	5									
13.0	516.7						Loose brown COARSE AND FINE SAND (A-3a), little clay, little gravel; wet.						
		3 3 2	13	6									
15													
15.5	514.2						Stiff to very stiff brown SILTY CLAY (A-6b), little gravel, trace fine to coarse sand; moist.						
		3 5 6	15	7		1.5							
		3 5 5	12	8		2.5							
20													
20.5	509.2						Very stiff gray SILT (A-4b), little fine to coarse sand, trace clay; moist.						
		1 2 4	11	9		2.5							
23.0	506.7						Loose gray COARSE AND FINE SAND (A-3a), little gravel, trace clay; wet.						
		1 2 5	13	10									
25													
25.5	504.2						Dense gray GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); contains sandstone fragments; moist.						
26.5	503.2	25 50/2	10	11			Hard gray SANDSTONE; fine grained, moderately to highly weathered, argillaceous, micaceous, massively bedded, highly fractured.						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1147 | Location: Ramp D N:326057.226, E:1825578.667 | Date Drilled: 7/27/05

WATER OBSERVATIONS: Water seepage at: 9.0'-16.0' and 25.0'-26.0'
Water level at completion: 7.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	499.7	Core 60"	Rec 52"	RQD 43%	R-1		@ 28.0' to 28.6', loss recovery. @ 29.6' to 29.9', 31.5' to 31.9', broken and decomposed.							
33.0	496.7						Bottom of Boring - 33.0'							
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1148 | Location: Ramp D N:325941.799, E:1825938.52 | Date Drilled: 7/20/05

WATER OBSERVATIONS: Water seepage at: 11.0'-14.0'
Water level at completion: 9.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	530.2												
0.3	529.9						Topsoil - 4"						
		2 3 5	12	1		3.0	FILL: Very stiff grayish brown SANDY SILT (A-4a), little clay, trace gravel; slightly organic; damp.						
3.0	527.2												
		2 3 4	8	2		2.5	Very stiff brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; contains one large rock; damp to moist.						
5													
5.5	524.7												
		2 4 4	11	3		2.5	Stiff to very stiff brown SILTY CLAY (A-6b), trace fine to coarse sand; moist to wet.						
		3 2 2	14	4		1.25							
10													
10.5	519.7												
		WOH 1 1	11	5		0.5	Very soft brown SANDY SILT (A-4a), little clay; contains sand seams; wet.						
13.0	517.2												
		WOH WOH 1	13	6			Very loose to medium dense brown GRAVEL WITH SAND (A-1-b), trace clay; wet.						
15													
		3 10 11	17	7									
		5 15 50/4	10	8									
19.5	510.7												
20		Core 60"	Rec 60"	RQD 60%	R-1		Medium hard to hard gray SANDSTONE; very fine to fine grained, moderately to highly weathered, argillaceous, micaceous, thinly bedded to medium bedded, highly fractured. @ 22.0' to 24.0', broken with decomposed zones.						
25.0	505.2						Bottom of Boring - 25.0'						
30													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40
65 →

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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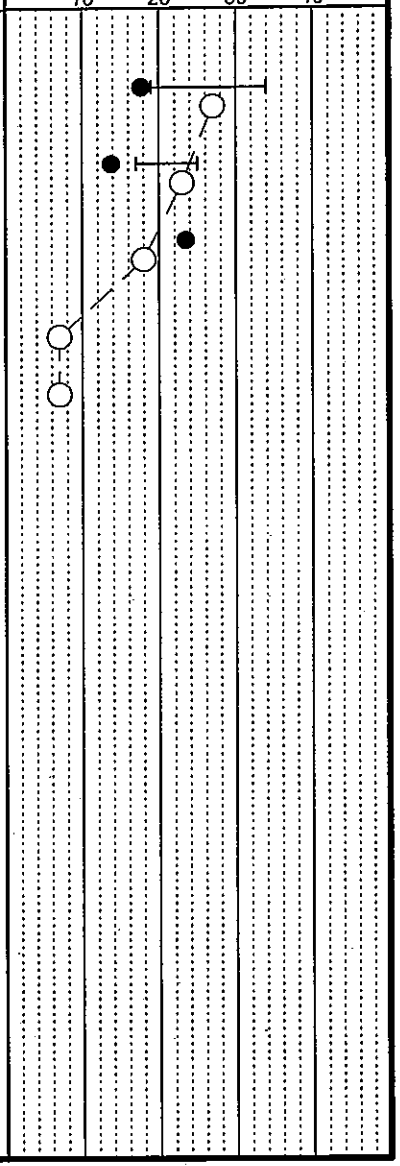
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1149 | Location: Ramp D N:325581.623, E:1826105.077 | Date Drilled: 7/13/05

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.4						Asphalt - 7" Aggregate Base - 4"						
0.9	539.5	10 17 10 13	21	1		4.5+	Hard brown SILT AND CLAY (A-6a), trace gravel, trace fine to coarse sand; damp.	1	4	--	5	50	40
3.0	537.4	6 10 13 12	20	2		2.5	Very stiff brown SANDY SILT (A-4a), some clay, little gravel; damp.	20	12	--	11	34	23
5		17 10 8 10	23	3		2.25							
7.0	533.4	3 3 4	15	4		4.0	Very stiff brown SILT AND CLAY (A-6a), trace fine to coarse sand; moist.						
		3 4 3	17	5		2.5							
10.0	530.4						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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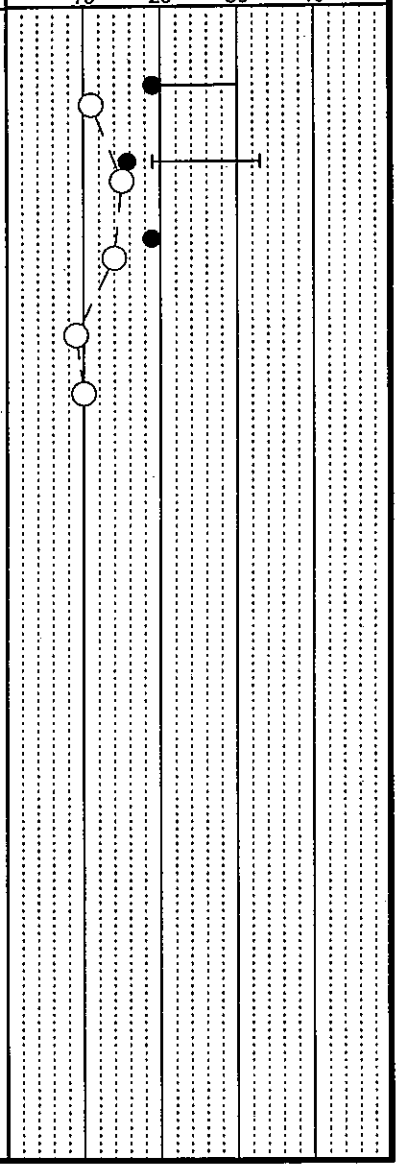
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1150 | Location: Ramp D N:325132.329, E:1826281.059 | Date Drilled: 7/13/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	540.8												
0.9	539.9	6 5 6 6	22	1		4.0	Asphalt - 6" Aggregate Base - 5" Very stiff dark gray SANDY SILT (A-4a), some clay, trace gravel; organic; damp.	7	6	–	8	48	31
3.0	537.8	3 6 9 9	22	2		4.5+	Very stiff to hard brown and gray SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; damp. @ 3.0'-5.0', slightly organic.	0	2	–	5	57	36
5		8 7 7 8	24	3		2.5							
		3 4 5	18	4		4.0							
		4 5 5	17	5		3.5							
10.0	530.8						Bottom of Boring - 10.0'						
15													
20													
25													
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40



FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1151 | Location: Ramp D N:324869.302, E:1826393.17 | Date Drilled: 7/27/05

WATER OBSERVATIONS: Water seepage at: None; Water level at completion: None

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	541.1						Asphalt - 4" Aggregate Base - 8"						
1.0	540.1	18 11 4 5	13	1			Medium dense gray GRAVEL WITH SAND AND SILT (A-2-4), little clay; damp.	18	23	--	32	16	11
3.0	538.1	3 5 8 5	15	2		3.0	Very stiff to hard brown and gray SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; damp.	4	5	--	7	42	42
5		7 6 6 7	12	3		4.5+							
		5 9 8 8	16	4									
10.0	531.1						Bottom of Boring - 10.0'						
15													
20													
25													
30													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

FILE: 0121-3070-03 (10/2/2006 4:18 PM)

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1152 | Location: Ramp C N:325413.0663, E:1826677.035 | Date Drilled: 10/18/2005 to 10/19/2005

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % / PL / LL / Blows per foot
0	563.0						WATER OBSERVATIONS: Water seepage at: 15.5'-20.5'; Water level at completion: 13.9' (includes drilling water)							
0.3	562.7						Topsoil - 3"							
		8 12 18	18	1		4.5+	FILL: Very stiff to hard brownish gray SILTY CLAY (A-6b), trace fine to coarse sand, trace gravel; damp.							
		6 7 9	18	2		4.0								
5														
5.5	557.5						POSSIBLE FILL: Medium dense brown GRAVEL WITH SAND (A-1-b), trace clay; dry to damp.							
		6 8 8	10	3										
		8 9 8	18	4				32	43	–	19	6		Non-Plastic
10														
		7 12 12	11	5										
		8 7 8	14	6										
15														
15.5	547.5						Medium dense brown GRAVEL WITH SAND AND SILT (A-2-4), trace clay; moist.							
		5 4 5	16	7										
		6 8 11	18	8										
20														
21.0	542.0	27 50/3	9	9			Very soft to medium hard gray SHALE interbedded with SANDSTONE; very fine to fine grained, highly weathered to decomposed, micaceous, thinly laminated to medium bedded, highly fractured to broken.							
25		Core 120"	Rec 120"	RQD 50%	R1									
30							@ 29.3' to 32.9', light gray.							

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1152 | Location: Ramp C N:325413.0663, E:1826677.035 | Date Drilled: 10/18/2005 to 10/19/2005

WATER OBSERVATIONS: Water seepage at: 15.5'-20.5'
Water level at completion: 13.9' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30.0	533.0						Very soft to medium hard gray SHALE; very fine grained, highly weathered to decomposed, micaceous, medium bedded, broken. @ 30.5' to 32.9', calcareous. @ 32.0' to 32.7', lost recovery.							
32.9	530.1	Core 60"	Rec 52"	RQD 82%	R2		Medium hard black SHALE; very fine grained, highly weathered, carbonaceous, laminated, moderately fractured. @ 35.6', low angle fracture.							
37.0	526.0						Bottom of Boring - 37.0'							

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-46 | Location: Ramp C N:325824.223, E:1826216.977 | Date Drilled: 03/17/05

WATER OBSERVATIONS: Water seepage at: 13.5'-19.0'
Water level at completion: 6.0' (prior to coring)
5.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % - ● / PL ⊢—⊣ LL / Blows per foot - ○
0.0	543.1													
0.1	543.0	2 1 1	2	1			Topsoil - 1" FILL: Very loose brown and black GRAVEL WITH SAND (A-1-b), some silty clay; contains roots; damp. @ 1.0'-2.5', organic odor.							
5		2 2 2	4	2				44	19	–	13	16	8	
5.5	537.6	3 3 3	18	3		2.0	Stiff brown SILT AND CLAY (A-6a), little fine to coarse gravel, trace fine to coarse sand; damp to moist.							
8.5	534.6	2 6 6	12	4			Medium dense brown and gray GRAVEL WITH SAND (A-1-b), little silty clay; moist.							
10		2 11 7	11	5				56	15	–	9	16	4	Non-Plastic
13.5	529.6	3 4 3	8	6			Loose brown GRAVEL WITH SAND (A-1-b), some silt, trace clay; wet.							
15		5 4 4	12	7			@ 18.0', heaving sand.	33	31	–	13	20	3	Non-Plastic
19.0	524.1	16 15 20	14	8			Dense light brown GRAVEL WITH SAND AND SILT (A-2-4), trace clay; moist to wet.							
20		14 19 20	8	9										
25		5 5 12	14	10			@ 23.0', gray.	30	11	–	24	25	10	
25.5	517.6	50/3	3	11			Severely weathered gray SANDSTONE argillaceous, micaceous.							
27.0	516.1						Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thickly to massively bedded, slightly fractured.							
30														

STANDARD PENETRATION (N) scale: 10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-46 | Location: Ramp C N:325824.223, E:1826216.977 | Date Drilled: 03/17/05

WATER OBSERVATIONS: Water seepage at: 13.5'-19.0'
Water level at completion: 6.0' (prior to coring)
5.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	513.1	Core 120"	Rec 118"	RQD 83%	R1		@ 29.4', very thin clay seam. @ 29.8', 30.8', thin clay seam. Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, laminated to medium bedded, slightly fractured. @ 31.4', very thin clay seam. @ 31.6'-32.0', broken zone with clay and rock fragments. @ 33.4'-33.7', clay seam. @ 33.7'-34.2', cross bedded. @ 35.9', very thin clay seam.							
37.0	506.1						Bottom of Boring - 37.0'							
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-47 | Location: Ramp C N:325689.987, E:1826278.864 | Date Drilled: 03/17/05

WATER OBSERVATIONS: Water seepage at: 13.0'-18.0'
Water level at completion: 18.0' (prior to coring)
9.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	543.1												
0.1	543.0						Topsoil - 1"						
		1 2 4	10	1		1.5	Stiff to very stiff brown and gray CLAY (A-7-6), trace fine sand; moist. @ 1.0'-2.5', slightly organic. @ 3.0', very stiff.						
		2 4 5	13	2		2.5							
5		4 6 10	15	3		4.5	@ 6.0', hard.	0	0	--	2	48	50
8.0	535.1						Medium stiff brown SANDY SILT (A-4a), trace gravel, trace clay; moist to wet.						
		1 3 2	10	4		0.5							
10		2 2 2	7	5		--							
13.0	530.1						Very loose brown COARSE AND FINE SAND (A-3a), trace clay; wet.						
		WOH WOH WOH	18	6				0	2	--	83	15	Non-Plastic
15		WOH WOH 1	18	7									
18.0	525.1						Stiff brown GRAVEL WITH SAND AND SILT (A-2-4), little clay; moist.						
		11 14 12	10	8		1.5		30	11	--	24	22	13
20													
21.0	522.1	42 34 17	12	9			Very stiff to hard dark gray SANDY SILT (A-4a), little clay, little gravel; moist.	15	9	--	35	26	15
23.0	520.1						Severely weathered black SHALE carbonaceous.						
		4 10 21	11	10				29	23	--	31	12	5
25													
26.5	516.6	50/4	4	11			Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, massively bedded, slightly fractured. @ 26.7'-28.4',30.0'-30.2', vertical healed fracture.						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic
51
Non-Plastic

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-47 | Location: Ramp C N:325689.987, E:1826278.864 | Date Drilled: 03/17/05

WATER OBSERVATIONS: Water seepage at: 13.0'-18.0'
Water level at completion: 18.0' (prior to coring)
9.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	513.1	Core 120"	Rec 120"	RQD 74%	R1		Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, massively bedded, slightly fractured. @ 30.2'-32.4', 34.7'-35.4', high angle bedding. @ 31.8'-32.4, broken zone with thin clay seam. @ 33.1'-33.6', low angle healed fracture. @ 33.1'-33.6', high angle healed fracture. @ 33.7', highly weathered fracture. @ 33.7'-34.0', very argillaceous.							
35														
36.5	506.6						Bottom of Boring - 36.5'							
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-48 | Location: Ramp C N:325635.827, E:1826379.383 | Date Drilled: 3/21/05

WATER OBSERVATIONS: Water seepage at: 13.0'-18.0'
Water level at completion: 8.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % / PL / LL / Blows per foot
0	546.3	2 2 3	14	1			FILL: Loose black GRAVEL WITH SAND (A-1-b); contains mostly coal fragments and cinders; damp.							
3.0	543.3	WOH WOH WOH	1	2			FILL: Very loose gray and black SILT AND CLAY (A-6a), little fine to coarse sand; contains roots, coal and cinder fragments; damp.							
5.5	540.8	WOH 2 3	16	3		2.5	Very stiff brown SILT (A-4b), some clay, trace fine sand; moist.							
8.0	538.3	2 5 7	17	4		3.5	Very stiff brown and gray CLAY (A-7-6), trace fine sand; damp to moist.	0	0	–	2	43	55	
		2 5 6	15	5		3.5								
13.0	533.3	1 2 2	5	6			Very loose brown GRAVEL WITH SAND (A-1-b), little silt, trace clay; moist to wet.							
		1 1 1	8	7				37	27	–	17	19		Non-Plastic
		6 6 7	10	8			@ 18.5', medium dense; moist.	52	14	–	15	12	7	Non-Plastic
		2 7 30	15	9			@ 21.0', trace gravel and trace clay.							
23.5	522.8	20 15 50	12	10			Severely weathered black SHALE.							
25.0	521.3						Soft to medium hard black SHALE; very fine grained, carbonaceous, slightly weathered, very thinly bedded, highly fractured. @ 25.3'-25.6', 26.0'-26.4', broken @ 27.15'-27.2', sandstone seam.							65
30		Core 120"	Rec 120"	RQD 97%	R1									

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-48 | Location: Ramp C N:325635.827, E:1826379.383 | Date Drilled: 3/21/05

WATER OBSERVATIONS: Water seepage at: 13.0'-18.0'
Water level at completion: 8.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30.0	516.3						Hard gray SANDSTONE; very fine to fine grained, argillaceous, micaceous, slightly weathered, massively bedded, slightly fractured. @ 32.9', fracture							
35.0	511.3						Bottom of Boring - 35.0'							
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-49A | Location: Mainline Overpass N:325351.073, E:1826116.599 | Date Drilled: 3/21/05

WATER OBSERVATIONS: Water seepage at: 18.0'-28.0'
Water level at completion: 14.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	538.1												
		4 5 7	17	1		4.5+	Hard brown SANDY SILT (A-4a), some clay, some gravel; contains sandstone fragments; damp.						
		3 4 4	16	2		4.0							
5		3 5 5	16	3		1.5	@ 6.0', stiff; moist.						
		2 2 3	17	4		1.0							
10		3 4 5	18	5		1.5	@ 11.0', little gravel.	23	16	–	9	30	22
13.0	525.1												
		WOH 2 2	18	6		<0.25	Soft brown SILT AND CLAY (A-6a), trace fine to coarse sand; wet.	0	5	–	16	54	25
15		1 2 3	18	7		<0.25		0	0	–	1	67	32
18.0	520.1												
		WOH WOH WOH	3	8			Very loose brown GRAVEL (A-1-a), some to "and" fine to coarse sand, little clay; wet.						
20		5 9 18	12	9			@ 21.0', medium dense.	62	16	–	8	14	
		2 2 6	18	10									
25		6 5 8	13	11									
		10 43 50/4	16	12									
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-49A | Location: Mainline Overpass N:325351.073, E:1826116.599 | Date Drilled: 3/21/05

WATER OBSERVATIONS: Water seepage at: 18.0'-28.0'
Water level at completion: 14.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢——⊣ LL Blows per foot - ○ 10 20 30 40
30.0	508.1													
	508.1						Medium hard gray SANDSTONE							
		50/2	1	13										93
35.0	503.1						Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, massive, highly fractured, to broken..							
40		Core 120"	Rec 84"	RQD 13%	R1									
45.0	493.1						Bottom of Boring - 45.0'							
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-50A | Location: Mainline Overpass N:325302.044, E:1826260.104 | Date Drilled: 3/22/05

WATER OBSERVATIONS: Water seepage at: 18.0'-25.0'
Water level at completion: 18.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0.1	539.3 / 539.2						Topsoil -1"						
		3 2 3	10	1			FILL: Loose dark brown SANDY SILT (A-4a), trace gravel; contains roots; damp.						
3.0	536.3												
		2 1 2	8	2		1.0	Stiff brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; moist.						
5		2 3 3	13	3		2.0							
		1 2 3	16	4		1.5		1	4	--	6	56	33
10													
10.5	528.8												
		1 2 3	18	5		1.25	Stiff brown SILTY CLAY (A-6b), some gravel, some fine to coarse sand; moist.	32	20	--	12	18	18
		WOH 2 3	18	6		1.5							
15													
		1 1 2	18	7		1.25							
18.0	521.3												
		WOH 1 3	16	8			Very loose brown GRAVEL WITH SAND (A-1-b), little to some clay; wet.	16	40	--	23	21	Non-Plastic
20													
		2 5 11	16	9			@ 21.0', medium dense.	42	24	--	20	14	Non-Plastic
		2 7 50	18	10									57
24.5	514.8						Severely weathered brownish gray SANDSTONE.						
25		25 37 50/4	10	11									87
27.5	511.8						Hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, medium bedded, moderately fractured.						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-50A | Location: Mainline Overpass N:325302.044, E:1826260.104 | Date Drilled: 3/22/05

WATER OBSERVATIONS: Water seepage at: 18.0'-25.0'
Water level at completion: 18.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	509.3	Core 120"	Rec 117"	RQD 68%	R1		@ 28.1',-28.7', 29.0'-29.1', filled fractures. Hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, medium bedded, moderately fractured. @ 33.3', 34.3'-34.4', 36.2', 37. 2', clay-filled fractures.							
37.5	501.8						Bottom of Boring - 37.5'							
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-51 | Location: Mainline Overpass N:325336.603, E:1826395.590 | Date Drilled: 03/17/05

WATER OBSERVATIONS: Water seepage at: 13.0'-18.0'
Water level at completion: 21.0' (prior to coring)
13.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % - ● / PL — LL / Blows per foot - ○
0	544.5													10 20 30 40
0.1	544.4						Topsoil - 2"							
		1 2 1	7	1		2.0	Stiff dark brown SILT AND CLAY (A-6a), little fine to coarse sand, trace fine to coarse gravel; damp to moist.							
5		1 2 3	13	2		1.0								
5.5	539.0						Very stiff brown SILTY CLAY (A-6b), trace fine to coarse sand, trace fine to coarse gravel; damp.							
		2 3 6	8	3		3.5								
8.0	536.5						Very loose to loose brown GRAVEL WITH SAND (A-1-b), little clay, trace silt; damp.							
10		3 3 4	10	4		2.0								
		1 1 1	7	5		1.5	@ 11.0', moist.	43	28	--	11	7	11	Non-Plastic
13.0	531.5						Very loose brown COARSE AND FINE SAND (A-3a), trace fine to coarse gravel, trace clay; wet.	12	28	--	45	15		Non-Plastic
15		WOH WOH WOH	18	6										
		WOH WOH WOH	18	7										
18.0	526.5						Medium dense reddish brown GRAVEL WITH SAND AND SILT (A-2-4), trace clay; contains sandstone fragments; damp to moist.							
20		16 7 8	18	8										
		7 14 11	14	9				19	19	--	30	24	8	Non-Plastic
23.0	521.5						Stiff gray CLAY (A-7-6), trace fine sand; moist.							
		1 3 5	11	10		1.5		0	0	--	1	43	56	
25														
25.5	519.0						Severely weathered black SHALE carbonaceous.							
		20 50/3	8	11										
27.5	517.0						Medium hard black SHALE; moderately weathered, pyritic, laminated, broken.							
28.6	515.9						@ 28.1'-28.2', gray.							
30														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-51 | Location: Mainline Overpass N:325336.603, E:1826395.590 | Date Drilled: 03/17/05

WATER OBSERVATIONS: Water seepage at: 13.0'-18.0'
Water level at completion: 21.0' (prior to coring)
13.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
30	514.5	Core 120"	Rec 116"	RQD 71%	R1		Hard gray SANDSTONE Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thickly bedded, moderately fractured. @ 28.7'-28.8', pyritic. @ 31.8', very thin clay seam. @ 33.1'-33.3', clay and gravel infilled fracture. @ 33.5', fracture. @ 34.5', very thin clay infilled fracture. @ 35.5'-36.2', broken zone with clay infilling. @ 36.6'-36.8', highly weathered.						
37.5	507.0						Bottom of Boring - 37.5'						
40													
45													
50													
55													
60													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

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Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-52 | Location: Mainline Overpass N:325303.442, E:1826548.490 | Date Drilled: 03/15/05

WATER OBSERVATIONS: Water seepage at: 23.0'-30.0'
Water level at completion: 27.0' (prior to coring)
6.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	558.0												
0.1	557.9						Topsoil - 1"						
		2 2 3	4	1		4.5+	Hard gray SILTY CLAY (A-6b), trace to little fine to coarse sand; contains shale fragments; damp.						
		3 5 7	10	2		4.5+							
5		10 7 4	9	3		4.5+							
		1 2 3	8	4		4.5+							
10													
10.5	547.5	2 2 3	7	5			Loose gray GRAVEL WITH SAND AND SILT (A-2-4), trace clay; damp.	66	4	–	2	18	10
13.0	545.0	2 3 3	16	6		3.75	Very stiff gray SILT AND CLAY (A-6a), trace fine to coarse sand, trace fine to coarse gravel; moist.						
15		3 5 6	16	7		4.0	@ 16.0', brown.						
		2 2 2	18	8		1.0	@ 18.5', stiff, moist to wet.						
20													
20.5	537.5	2 4 4	12	9			Loose brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); damp.	35	20	–	17	14	14
23.0	535.0	WOH WOH 1	18	10		<0.25	Very soft brown CLAY (A-7-6), trace fine sand; wet.						
25													
25.5	532.5	WOH WOH WOH	18	11			Very loose brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); wet.						
		13 15 5	17	12			@ 28.0', medium dense.						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-52 | Location: Mainline Overpass N:325303.442, E:1826548.490 | Date Drilled: 03/15/05

WATER OBSERVATIONS: Water seepage at: 23.0'-30.0'
Water level at completion: 27.0' (prior to coring)
6.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % / PL — LL / Blows per foot
30	528.0						Very loose brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); wet.							
32.0	526.0						Severely weathered black SHALE.							
		22 50/5	10	13										
35.0	523.0						Medium hard black SHALE; moderately weathered, carbonaceous, laminated, broken to moderately fractured.							
40		Core 120"	Rec 120"	RQD 35%	R1									
40.4	517.6						Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, micaceous, thickly bedded, slightly fractured.							
45.0	513.0						Bottom of Boring - 45.0'							
50														
55														
60														

STANDARD PENETRATION (N) — Natural Moisture Content, % - ● — PL ⊢——⊣ LL — Blows per foot - ○ (10, 20, 30, 40)

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-53A | Location: Ramp C N:325447.818, E:1826720.590 | Date Drilled: 3-15-05

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	WATER OBSERVATIONS / DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	565.3												
0.6	564.7	5 5 5	4	1		–	Topsoil - 7" Stiff gray SILTY CLAY (A-6b), trace gravel; contains shale fragments; damp.						
3.0	562.3	3 4 4	11	2		4.5+	Hard brown SANDY SILT (A-4a), some gravel, little clay; damp.	28	16	–	15	24	17
5.5	559.8	5 3 3	12	3			Loose brown COARSE AND FINE SAND (A-3a), some gravel; dry to damp.	21	20	–	36	23	
		3 3 5	13	4									
10		4 4 5	12	5									
		4 7 9	10	6			@ 13.5'-15.0', medium dense.						
15		5 3 2	8	7									
18.0	547.3	1 2 1	8	8			Very loose dark brown GRAVEL WITH SAND (A-1-b), trace clay; wet.						
20.5	544.8	50/4	4	9			Severely weathered gray SHALE.						
22.5	542.8	Core 120"	Rec 120"	RQD 78%	R-1		Medium hard gray SHALE; moderately weathered, thinly laminated, arenaceous, slightly fractured, contains sandstone ferric bands fissile often desiccate. @ 22.5'-28.0', highly fractured. @ 28.8'-28.9' high angle fracture. @ 23.5', 27.8', 31.3', clay seams. @ 29.2' to 30.0', very fine sandstone.						
25													
30													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic
Non-Plastic

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: Dry (Prior to coring)
11.0' (Including drill water)

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-53A | Location: Ramp C N:325447.818, E:1826720.590 | Date Drilled: 3-15-05

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: Dry (Prior to coring)
11.0' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	535.3						Medium hard gray SHALE; moderately weathered, thinly laminated, arenaceous, slightly fractured, contains sandstone ferric bands fissile often desiccate.							
32.5	532.8						Bottom of Boring - 32.5'							
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-54 | Location: Ramp C N:325382.450, E:1826885.040 | Date Drilled: 3-16-05

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: None (prior to coring)
11.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	566.9												
0.2	566.7						Topsoil - 3"						
		2 2 2	14	1		1.0	Stiff to very stiff brown SILTY CLAY (A-6b), trace fine sand; damp. @ 0.0'-2.5', contains roots.						
		2 5 6	17	2		3.5		0	0	–	4	61	35
5													
5.5	561.4						Very stiff brown SILT (A-4b), some clay, little fine sand; damp.						
		3 5 6	18	3		2.25		0	0	–	12	67	21
8.0	558.9						Loose dark brown COARSE AND FINE SAND (A-3a), trace to little clay, trace gravel; damp.						
		1 3 2	11	4		2.0							
10													
		1 2 3	13	5				7	38	–	37	18	
13.6	553.3						Severely weathered gray SHALE.						
		7 35 50/4	14	6									
15.0	551.9						Medium hard gray SHALE; very fine grained, arenaceous, decomposed to highly weathered, laminated, moderately fractured. @ 15.0'-17.3', broken with high angles fractures and thin clay seams. @ 18.9'-19.0', 20.6'-20.9', high angle fractures.						
20		Core 120"	Rec 120"	RQD 83%	R-1								
22.6	544.3						Hard gray SANDSTONE; very fine to fine grained, slightly weathered, argillaceous, medium bedded, slightly fractured.						
23.5	543.4						Hard gray SHALE; highly weathered, arenaceous, very thinly bedded, slightly fractured.						
25.0	541.9						Bottom of Boring - 25.0'						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢—⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

85

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-55A | Location: Mainline Overpass N:325312.752, E:1826817.666 | Date Drilled: 3-15-05

WATER OBSERVATIONS: Water seepage at: 13.0'-18.0'
Water level at completion: 18.0' (prior to coring)
18.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % / PL — LL / Blows per foot
0	565.4	3 5 5	10	1		4.5+	Hard gray SILTY CLAY (A-6b); damp.							
3.0	562.4	6 7 7	9	2		4.5+	Hard brown SILT AND CLAY (A-6a), "and" fine to coarse sand, some gravel; damp.							
5		11 11 9	12	3		4.5+		22	15	--	23	21	19	
8.0	557.4	4 5 4	14	4			Loose brown GRAVEL WITH SAND AND SILT (A-2-4), little clay; damp.	4	25	--	39	16	16	Non-Plastic
10		5 4 3	12	5										
13.0	552.4	2 2 2	15	6			Loose brown COARSE AND FINE SAND (A-3a), trace gravel; wet.	9	38	--	40	13		Non-Plastic
15		1 2 2	7	7										
18.0	547.4	35 50/5	11	8			Severely weathered gray SHALE.							
20.0	545.4						Medium hard gray SHALE interbedded with SANDSTONE; fine grained, highly weathered, very thinly bedded, highly fractured. @ 20.0'-22.0', 26.7'-27.5', 28.3'-28.5', 29.3'-29.6', highly fractured with clay seams. @ 21.0'-21.3', 21.7'-21.9', 26.5'-26.7', 26.9'-22.0', hard brown ferric sandstone; slightly weathered laminated.							
25		Core 120"	Rec 120"	RQD 64%	R-1									
30.0	535.4						Bottom of Boring - 30.0'							

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-55A | Location: Mainline Overpass N:325312.752, E:1826817.666 | Date Drilled: 3-15-05

WATER OBSERVATIONS: Water seepage at: 13.0'-18.0'
Water level at completion: 18.0' (prior to coring)
18.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL — LL Blows per foot - ○ 10 20 30 40
30	535.4													
35														
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-56 | Location: Mainline Overpass N:325291.521, E:1826974.037 | Date Drilled: 3-16-05

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: None (prior to coring)
7.5' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	570.0												
0.2	569.8						Topsoil -3"						
		2 2 3	15	1		2.5	Very stiff to hard brown SILTY CLAY (A-6b), trace fine sand; damp.						
		4 6 9	17	2		4.5+							
5		4 6 9	16	3		4.25		0	0	–	2	57	41
8.0	562.0												
		2 2 3	18	4			Loose brown and gray SILT (A-4b), some fine to coarse sand, trace clay; damp to moist.	0	1	–	19	55	25
10		2 6 4	9	5									
14.1	555.9	8 23 50/4	15	6			Severely weathered grayish brown SILTSTONE.						
15.0	555.0						Medium hard grayish brown SANDSTONE interbedded with SHALE; very fine to fine grained, slightly weathered, argillaceous, laminated to thinly bedded, highly fractured.						
20		Core 120"	Rec 120"	RQD 68%	R-1		@ 16.4' to 17.2', high angle fracture and clay seam. @ 17.2', gray. @ 19.2' to 19.7', clay seam. @ 20.4' to 20.8', highly broken, clay seam.						
25.0	545.0						Bottom of Boring - 25.0'						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

73

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-57 | Location: Ramp B N:325198.417, E:1826977.925 | Date Drilled: 3-16-04

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: Dry (Prior to coring)
3.5' (Including drill water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	569.5												
0.3	569.2						Topsoil -4"						
		2 3 4	14	1		4.0	Very stiff to hard brown SILTY CLAY (A-6b), trace fine sand; damp.						
		3 5 7	12	2		4.5							
5		4 5 6	17	3		3.5		0	0	--	1	64	35
8.0	561.5						Stiff brown SILT (A-4b), some clay, little fine to coarse sand; moist.	0	0	--	10	67	23
		1 2 2	18	4		1.0							
10													
10.5	559.0						Medium dense brown SILT AND CLAY (A-6a), "and" fine to coarse sand, some gravel; damp.	23	15	--	19	26	17
		2 5 5	14	5									
14.0	555.5	12 27 50/3	13	6			Soft to medium hard gray SHALE; highly weathered to decomposed, argillaceous, laminated to thinly bedded, moderately to highly fractured.	0	2	--	3	64	31
15							@ 15.8' to 16.3', 19.1' to 19.5', clay seams.						
20		Core 120"	Rec 120"	RQD 90%	R-1								
20.9	548.6						Hard gray SANDSTONE interbedded with SHALE; slightly weathered, laminated.						
22.9	546.6						@ 22.7 to 22.9', high angle fracture						
							Hard gray SHALE; moderately weathered, argillaceous, laminated, slightly fractured.						
25.0	544.5						Bottom of Boring - 25.0'						
30													

GRADATION

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

77 →

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-58 | Location: Ramp B N:325195.371, E:1826928.980 | Date Drilled: 3-16-05

WATER OBSERVATIONS: Water seepage at: None
Water level at completion: None (prior to coring)
4.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % / PL — LL / Blows per foot
0	567.1													
0.3	566.8	1 2 2	16	1		–	Topsoil -4" Soft brown SILTY CLAY (A-6b), trace fine sand; damp to moist. @ 0.0'-2.5', contains roots.							
5		3 6 8	15	2		4.25	@ 3.5', very stiff to hard.							
		5 6 7	18	3		3.5		0	0	–	6	65	29	
8.0	559.1													
		2 4 3	16	4			Loose dark brown COARSE AND FINE SAND (A-3a), trace to little clay, trace gravel; damp.	7	34	–	40	19		Non-Plastic
10		4 4 3	15	5										
14.0	553.1	2 20 50/5	16	6			Severely weathered brownish gray SHALE.							70
15.0	552.1						Soft to medium hard gray SHALE; highly weathered to decomposed, argillaceous, thinly bedded, slightly fractured. @ 15.0' to 16.7', broken with clay seams and high angle fractures @ 17.5' to 17.8', 19.5' to 20.1', clay seams with high angle fractures @ 20.9' to 21.0', clay seam. @ 24.2' and 24.4', very thin clay seam.							
20		Core 120"	Rec 120"	RQD 82%	R-1									
25.0	542.1						Bottom of Boring - 25.0'							
30														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-59A | Location: Ramp B N:325126.513, E:1826809.594 | Date Drilled: 3-14-05

WATER OBSERVATIONS: Water seepage at: 19'-21.5'
Water level at completion: None (prior to coring)
17.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	563.9												
		3 3 3	14	1			Loose dark gray SANDY SILT (A-4a), some clay, trace gravel; damp to moist.						
		2 2 2	12	2			@ 3.5', brown.	7	13	–	26	32	22
5													
5.5	558.4						Very loose to loose brown COARSE AND FINE SAND (A-3a), little clay, little gravel; moist.						
		2 2 3	15	3				15	36	–	37	12	
		2 2 1	13	4									
10													
10.5	553.4						Loose brown GRAVEL WITH SAND, SILT, AND CLAY (A-2-6); damp to moist.						
		2 2 2	16	5				14	25	–	31	9	21
		1 2 3	15	6									
15													
		2 3 3	12	7									
		0 1 1	14	8			@ 19.0' to 21.5', very loose; wet.						
20													
21.5	542.4	1 36 50	12	9			Severely weathered gray SHALE.						
		32 50/3	9	10									
25.0	538.9						Medium hard to hard gray SANDSTONE interbedded with SHALE; very fine to fine grained, highly weathered to decomposed, laminated to thinly bedded, slightly fractured. @ 25.4' to 25.7', 28.5', 29.6', clay seams @ 25.9', 26.5 to 26.7', 27.8', high angle fractures @ 28.6' to 29.6', moderately weathered SHALE.						
		Core 120"	Rec 119"	RQD 65%	R-1								
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

Non-Plastic

86

FILE: 0121-3070-03 (10/2/2006 4:18 PM)

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-59A | Location: Ramp B N:325126.513, E:1826809.594 | Date Drilled: 3-14-05

WATER OBSERVATIONS: Water seepage at: 19'-21.5'
Water level at completion: None (prior to coring)
17.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION
	533.9						
30.0	533.9						Medium hard to hard gray SANDSTONE interbedded with SHALE; very fine to fine grained, highly weathered to decomposed, laminated to thinly bedded, slightly fractured. @ 31.4' to 31.7', clay seams with high angle fractures
33.0	530.9						Hard black SHALE; moderately weathered, carbonaceous, laminated, slightly fractured. @ 33.8' to 34.0', high angle fractures and broken.
35.0	528.9						Bottom of Boring - 35.0'
40							
45							
50							
55							
60							

GRADATION: % Aggregate | % C. Sand | % M. Sand | % F. Sand | % Silt | % Clay

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ⊢——⊣ LL
Blows per foot - ○
10 20 30 40

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-60 | Location: Ramp B N:324934.012, E:1826665.121 | Date Drilled: 3-14-05

WATER OBSERVATIONS: Water seepage at: 18.0'-28.0'
Water level at completion: 26.0' (prior to coring)
19.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % / Atterberg
0.1	552.3						Topsoil -1"							
0.1	552.2	4 8 7	12	1			FILL: Medium dense brown SANDY SILT (A-4a), little gravel, little clay; damp.							
3.0	549.3	4 4 4	12	2			Loose brown COARSE AND FINE SAND (A-3a), some gravel, trace clay; damp.	33	43	--	11	13		Non-Plastic
5		3 2 2	9	3										
10		3 2 3	13	4										
10.5	541.8	3 3 3	14	5			Loose brown GRAVEL WITH SAND (A-1-b), little silt, trace clay; damp.	50	20	--	9	17	4	Non-Plastic
15		3 3 4	1	6			@ 13.5', moist.							
		2 3 3	14	7										
18.0	534.3	1 1 2	17	8			Very loose to loose brown COARSE AND FINE SAND (A-3a), little clay, trace gravel; wet.	10	53	--	20	17		Non-Plastic
20		4 3 3	16	9										
23.0	529.3	7 4 4	18	10			Stiff brown SANDY SILT (A-4a), some gravel, little clay; wet.	31	27	--	12	18	12	
25														
25.5	526.8	3 6 4	18	11			Loose reddish brown COARSE AND FINE SAND (A-3a), some clay, trace gravel; wet.	7	14	--	58	21		Non-Plastic
28.0	524.3	50/4	4	12			Severely weathered black SHALE.							
30														

STANDARD PENETRATION (N) / Natural Moisture Content, % - ● / PL ⊢—⊣ LL / Blows per foot - ○ (10 20 30 40)

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-60 | Location: Ramp B N:324934.012, E:1826665.121 | Date Drilled: 3-14-05

WATER OBSERVATIONS: Water seepage at: 18.0'-28.0'
Water level at completion: 26.0' (prior to coring)
19.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press / Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL — LL Blows per foot - ○ 10 20 30 40
	522.3													
30.0	522.3						Soft to medium hard black SHALE; moderately weathered to decomposed, carbonaceous, laminated, slightly fractured.							
							@ 30.0' to 32.3', clay seam.							
							@ 32.3' hard.							
							@ 33.2', 38.0' to 38.2', clay seams.							
35		Core 120"	Rec 119"	RQD 79%	R-1									
							@ 39.4' to 39.8', high angle fracture.							
							@ 39.9', Hard gray SANDSTONE.							
40.0	512.3						Bottom of Boring - 40.0'							
45														
50														
55														
60														

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-61 | Location: Ramp B N:324742.822, E:1826622.009 | Date Drilled: 3-16-05

WATER OBSERVATIONS: Water seepage at: 13.5'-23.0'
Water level at completion: 14.0' (prior to coring)
9.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetrometer (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) / Natural Moisture Content, % / Atterberg Limits / Blows per foot
0	543.4													
		2 2 2	2	1			FILL: Loose black SANDY SILT (A-4a), little clay, little gravel; organic; dry to damp.							
		3 4 3	1	2				14	20	--	26	28	12	
5														
5.5	537.9													
		2 3 3	16	3		2.5	Very stiff light brown CLAY (A-7-6), some fine to coarse sand, trace gravel; damp.							
		1 3 5	12	4		2.25	@ 8.5', brown.	8	12	--	12	29	39	
10														
10.5	532.9													
		1 2 2	13	5			Very loose brown GRAVEL WITH SAND (A-1-b), little silty clay; moist to wet.	9	46	--	32	13	Non-Plastic	
13.0	530.4													
		WOH WOH WOH	16	6			Very loose brown COARSE AND FINE SAND (A-3a), little silty clay, trace gravel; wet.	1	22	--	62	15	Non-Plastic	
15														
		WOH WOH 1	18	7										
17.0	526.4						Very loose to loose brown GRAVEL WITH SAND (A-1-b), little silty clay; moist to wet.							
		1 3 2	18	8										
20														
		1 1 3	18	9										
23.0	520.4													
		50/3	3	10			Medium hard black SHALE; moderately weathered.							
25.0	518.4						Hard black SHALE; fine grained, moderately weathered, carbonaceous, thinly bedded, moderately fractured. @ 25.0' to 25.2', 27.5' to 27.6', 28.1' to 28.2', 29.3' to 30.0', high angle fractures							
		Core 120"	Rec 114"	RQD 92%	R-1									
30														

STANDARD PENETRATION (N) / Natural Moisture Content, % - ● / PL ⊢—⊣ LL / Blows per foot - ○ (10 20 30 40)

FILE: 0121-3070-03 [10/2/2006 4:18 PM]

DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-61 | Location: Ramp B N:324742.822, E:1826622.009 | Date Drilled: 3-16-05

WATER OBSERVATIONS: Water seepage at: 13.5'-23.0'
Water level at completion: 14.0' (prior to coring)
9.0' (includes drilling water)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press /Core	Hand Penetro-meter (tsf)	DESCRIPTION	GRADATION % Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ⊢—⊣ LL Blows per foot - ○ 10 20 30 40
30	513.4													
30.5	512.9						Hard gray SANDSTONE; very fine to fine grained, slightly weathered, thinly to medium bedded, slightly fractured. @ 31.2' to 31.6', high angle fracture. 33.7' to 33.9', clay seam.							
35.0	508.4						Bottom of Boring - 35.0'							
40														
45														
50														
55														
60														

FILE: 0121-3070-03 (10/2/2006 4:18 PM)

APPENDIX C

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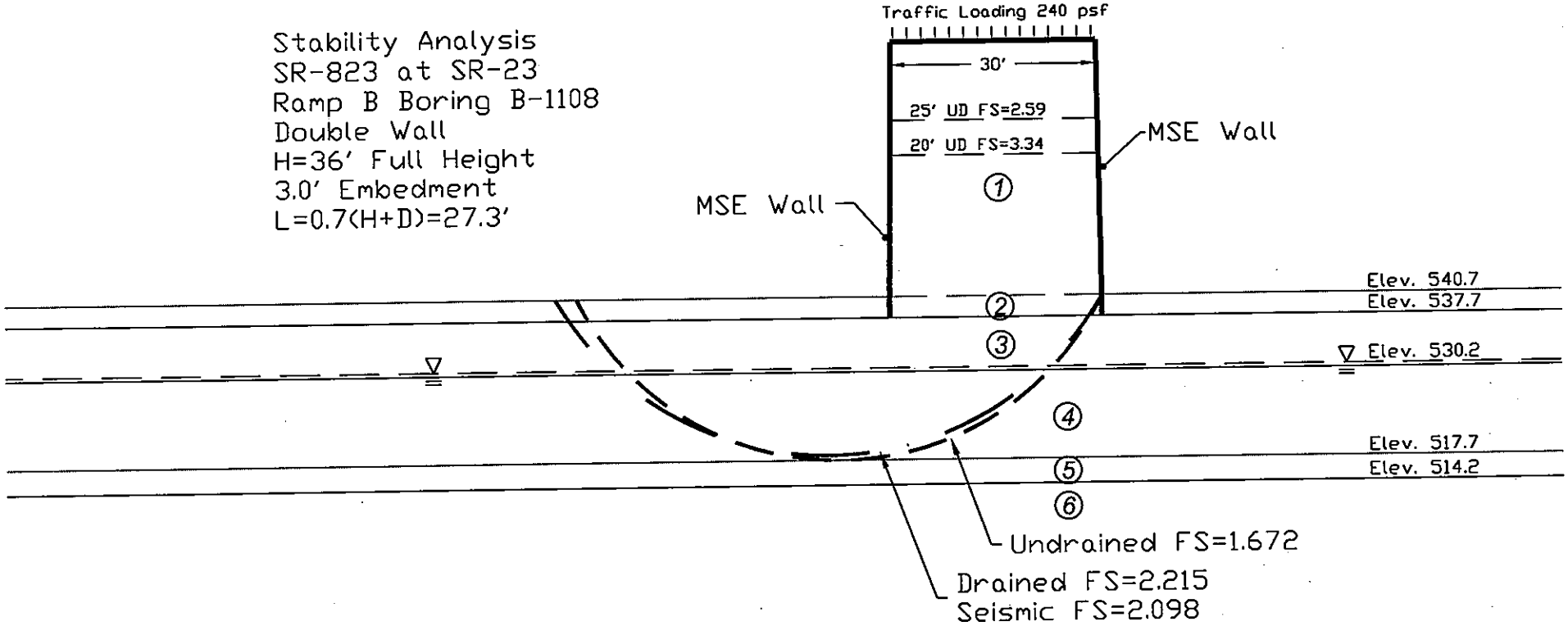
APPENDIX C

Calculations

RAMP B

Material	Consistency	Soil Type	Undrained C (psf)	Undrained Φ (deg)	Drained C' (psf)	Drained Φ' (deg)	γ (pcf)
Material 1	Compacted	MSE Fill	0	34	0	34	120
Material 2	Compacted	Gran. Fill	0	32	0	32	120
Material 3	Very Stiff	Silty Clay	2500	0	0	29	125
Material 4	M. Stiff	Clay	1000	0	0	29	125
Material 5	Loose	C & F Sand	0	32	0	32	115
Material 6		Bedrock	10000	45	10000	45	145

Stability Analysis
SR-823 at SR-23
Ramp B Boring B-1108
Double Wall
H=36' Full Height
3.0' Embedment
L=0.7(H+D)=27.3'



US-23 Ramp B
Boring B-1108
DOUBLE MSE WALL

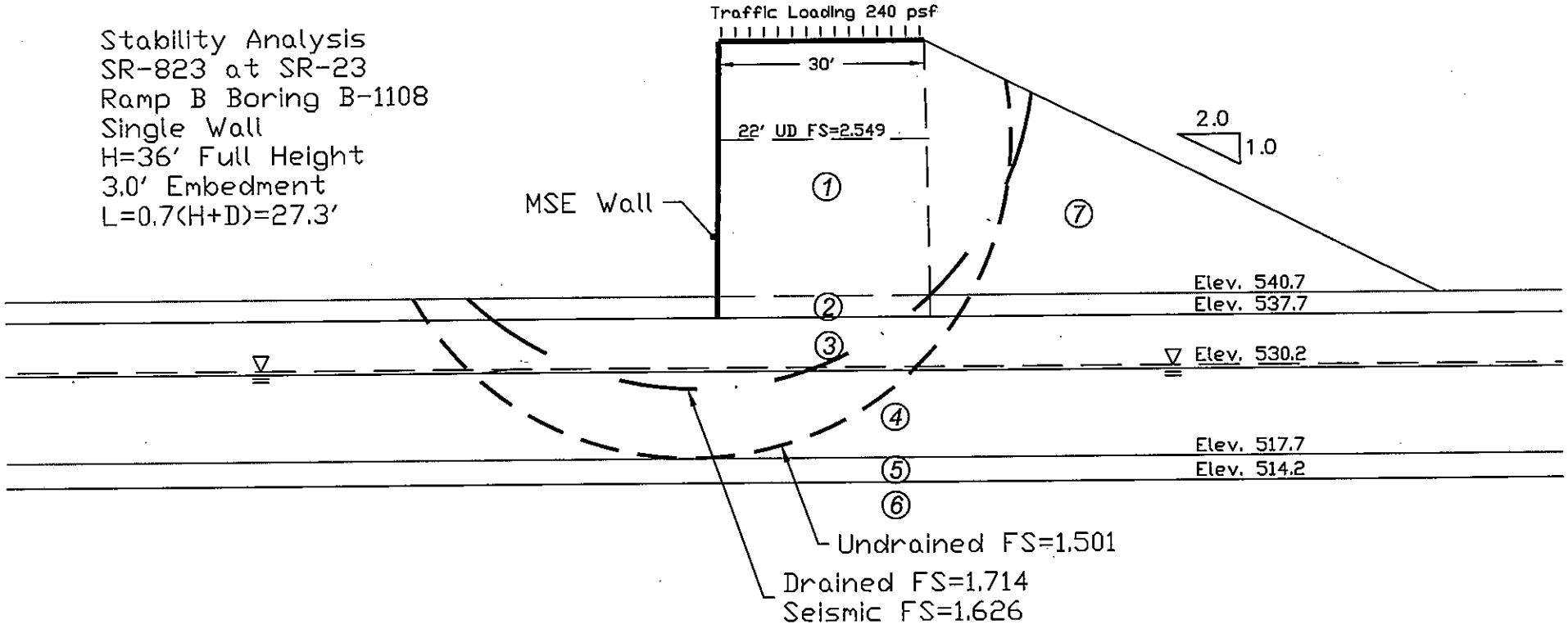
MSE STABILITY ANALYSIS

SCI-823-0.00 V'd: TAA

PROJECT NO. 0121-3070.03 | CALC: SJR | DATE 9/29/06

			Undrained		Drained		
Material	Consistency	Soil Type	C (psf)	Φ (deg)	C' (psf)	Φ' (deg)	γ (pcf)
Material 1	Compacted	MSE Fill	0	34	0	34	120
Material 2	Compacted	Gran. Fill	0	32	0	32	120
Material 3	Very Stiff	Silty Clay	2500	0	0	29	125
Material 4	M. Stiff	Clay	1000	0	0	29	125
Material 5	Loose	C & F Sand	0	32	0	32	115
Material 6		Bedrock	10000	45	10000	45	145
Material 7	Compacted	Embank Fill	0	30	0	30	120

Stability Analysis
SR-823 at SR-23
Ramp B Boring B-1108
Single Wall
H=36' Full Height
3.0' Embedment
L=0.7(H+D)=27.3'



US-23 Ramp B
Boring B-1108
SINGLE MSE WALL

MSE STABILITY ANALYSIS

SCI-823-0.00 V'd: TAH

PROJECT NO. 0121-3070.03	CALC: SJR	DATE 10/03/06

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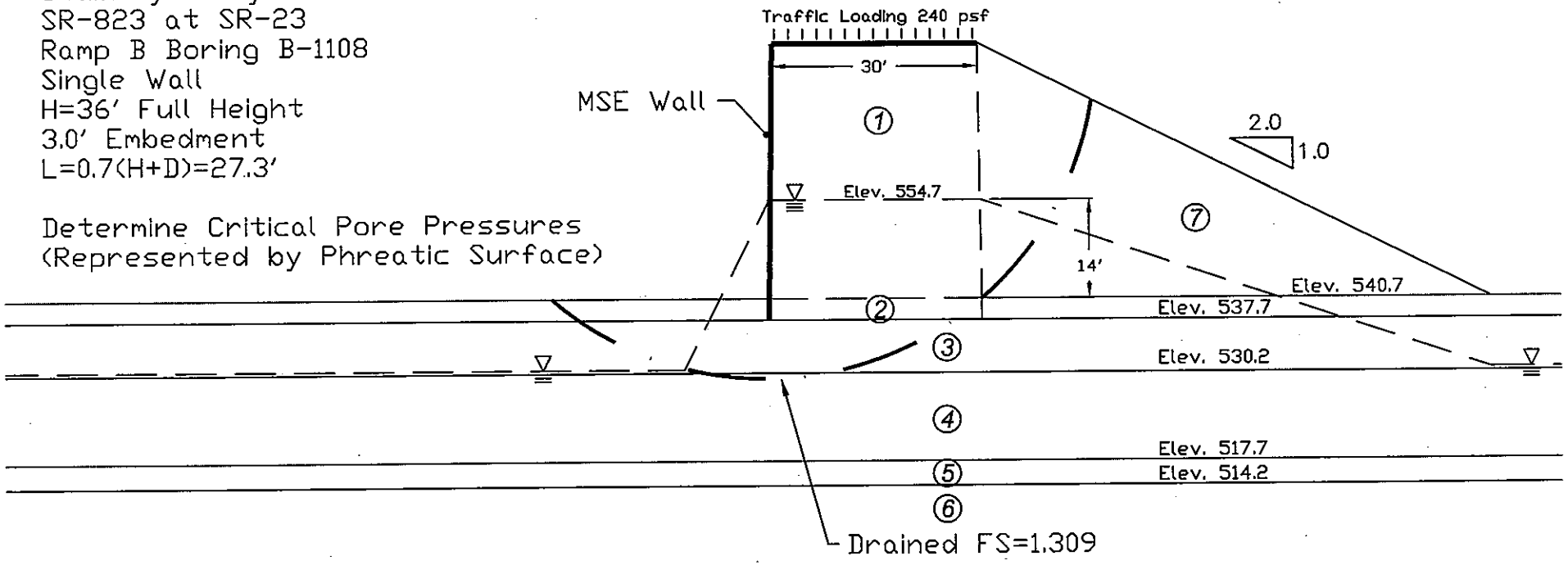
			Undrained		Drained		
Material	Consistency	Soil Type	C (psf)	ϕ (deg)	C' (psf)	ϕ' (deg)	γ (pcf)
Material 1	Compacted	MSE Fill	0	34	0	34	120
Material 2	Compacted	Gran. Fill	0	32	0	32	120
Material 3	Very Stiff	Silty Clay	2500	0	0	29	125
Material 4	M. Stiff	Clay	1000	0	0	29	125
Material 5	Loose	C & F Sand	0	32	0	32	115
Material 6		Bedrock	10000	45	10000	45	145
Material 7	Compacted	Embank Fill	0	30	0	30	120

Stability Analysis - Drained Case
SR-823 at SR-23
Ramp B Boring B-1108
Single Wall
H=36' Full Height
3.0' Embedment
L=0.7(H+D)=27.3'

Determine Critical Pore Pressures
(Represented by Phreatic Surface)



US-23 Ramp B Boring B-1108
Determine Critical Pore Pressure
SINGLE MSE WALL

MSE STABILITY ANALYSIS

SCI-823-0.00 Vd: TAH

PROJECT NO. 0121-3070.03	CALC: SJR	DATE 10/03/06

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DLZ

SUBJECT	Client	TranSystems Corp.	JOB NUMBER 0121-3070.03
	Project	SCI-823 Portsmouth Bypass	SHEET NO. 4 OF 21
	Item	MSE Wall Stability Ramp B Boring B-1108	COMP. BY SJR DATE 09/28/06
		0.3H or Greater overlap of Reinforcing Straps	CHECKED BY TRW DATE 10-3-06

STABILITY OF MSE WALL

Assumptions:

1 Estimated height of embankment; H=36'
2 Ka=0.0 Due to overlay of straps; double wall
3 Ground water; Dw=0.0'
4 Traffic loading is neglected in resisting forces
5

Wall Properties				Foundational Soil Properties			
H+D	=	39	feet	c	=	2500	psf Cohesion
γ_{mse}	=	120	pcf	ϕ'	=	29	deg Friction angle
L	=	29.25	feet	ω_T	=	240	psf Traffic loading
L factor	=	0.75		Length factor-range (0.7 - 1.0)			
ϕ	=	30	deg	Friction Angle of Embankment Fill			

RESISTANCE AGAINST SLIDING ALONG BASE

Thrust: $P_o = K_o\left[\frac{1}{2}\gamma H^2 + \omega_T H\right]$

where; $K_o = 1 - \sin(\phi')$ Ko = **0.00**

P_O = 0 lbs per foot of wall

Resistance: $P_r = W(0.67)(\mu)$ (Drained)

where; $\mu = \tan(\phi)$ 0.67μ = 0.37

0.67μ Max. = 0.35 {AASHTO, Bridge Design Manual, 303.4.1.1}

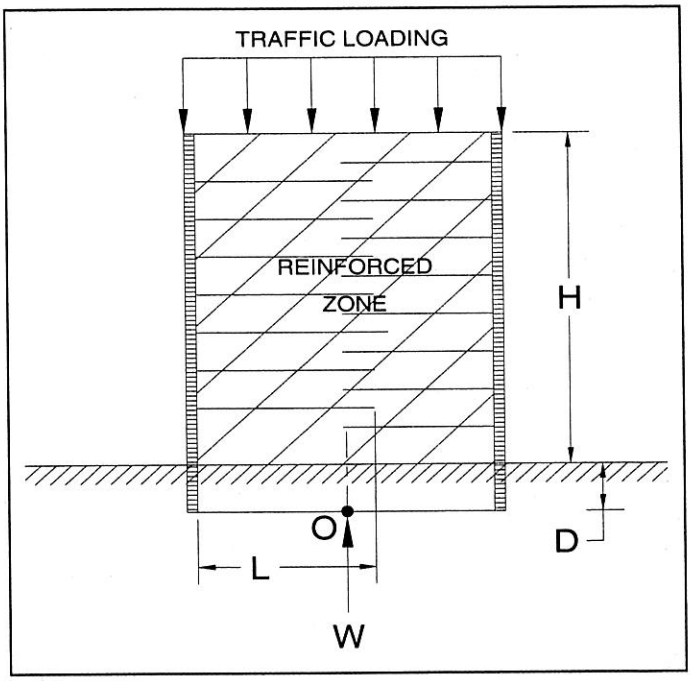
P_r = 47,912 lbs per foot of wall

USE THIS VALUE

$P_r = L(c)$ (Undrained)

P_r = 73,125 lbs per foot of wall

Use Drained Value



	Calculated		Required	
$FS = \frac{F_R}{F_O}$	FS =	**>1.5**	FS =	1.50

Resistance Against Sliding is **OK**

RESISTANCE AGAINST OVERTURNING

* Summation of Moments about point "O" (base of wall).
* Traffic loading is neglected in resisting forces

$\Sigma M_{resisting}$ = 2,002,016 lb-ft $\quad \Sigma M_{resisting} = \gamma HL\left(\frac{L}{2}\right)$

$\Sigma M_{overturning}$ = 0 lb-ft $\quad \Sigma M_{overturning} = K_a\left[\frac{1}{2}\gamma H^2\left(\frac{H}{3}\right) + \omega_T H\left(\frac{H}{2}\right)\right]$

	Calculated		Required	
$FS = \frac{\Sigma M_{resisting}}{\Sigma M_{overturning}}$	FS =	**>1.5**	FS =	2.00

Resistance Against Overturning is **OK**

DLZ

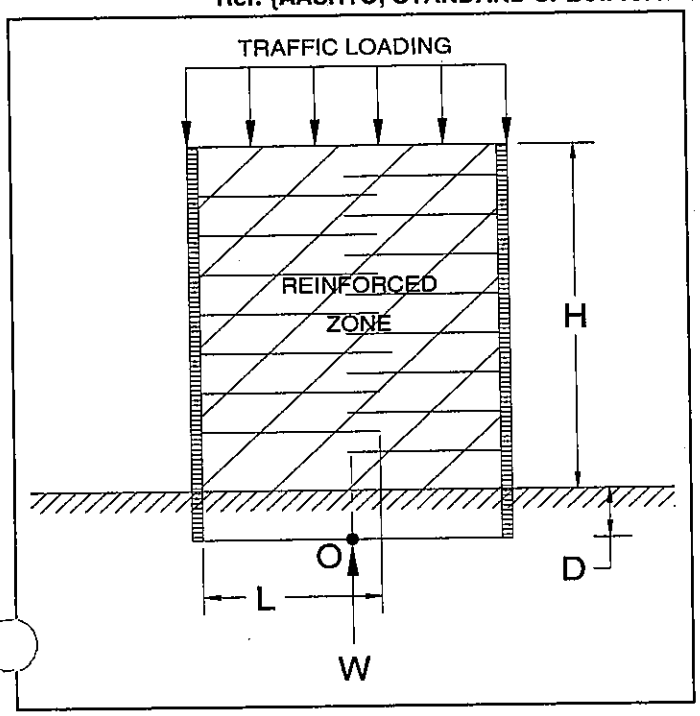
SUBJECT

Client TranSystems Corp.
Project SCI-823 Portsmouth Bypass
Item MSE Wall Bearing Capacity
0.3H or Greater Overlap of Reinforcing Straps
US-23 Ramp B Boring B-1108 36' Wall

JOB NUMBER 0121-3070.03
SHEET NO. 5 OF 21
COMP. BY SJR DATE 9/28/06
CHECKED BY DATE 10-3-06

BEARING CAPACITY OF A MSE WALL

Ref: {AASHTO; STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 17th Edition, 2002}



Soil Properties

γ_{REIN}	= 120	pcf	Unit weight	Reinforced Fill
ϕ'_{REIN}	= 34	deg.	Friction ang.	Reinforced Sill
γ_{FDN}	= 125	pcf	Unit weight	Foundation soil
c	= 1000	psf	Cohesion	Foundation soil
ϕ	= 0	deg.	Friction ang.	Foundation soil
c'	= 0	psf	Cohesion	Foundation soil
ϕ'	= 29	deg.	Friction ang.	Foundation soil

Loads and Parameters

ω_t	= 240	psf	Traffic loading	
L=B	= 29.25	ft	Length of MSE reinforcement	
L factor	= 0.75		Length factor-range (0.7 - 1.0)	
D	= 3	ft	Embedment depth	
Dw	= 0	ft	Groundwater depth	
H+D	= 39	ft		
H	= 36	ft	Height of wall	
Ko	= **0.00**			
⌜ Pa	= 0	ft	Moment arm	
⌜ Wt	= 19.5	ft	Moment arm	
B'	= 29.25	ft		
γ'	= 62.6	pcf		
W_t	7,020	lb/ft of wall	Weight from traffic	
W_{mse}	= 136,890	lb/ft of wall	Weight from MSE wall	

Effective Bearing Pressure

$$\sigma_v = \frac{W_t + W_{MSE}}{L - 2e}$$

σ_V = 4,920 psf

Ultimate undrained bearing capacity, q_{ult}

$$q_{ULT} = cN_c + \sigma'_D N_q + \frac{1}{2}\gamma' B N_\gamma$$

q_{ULT} = 5,328 psf

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 2,131 psf

Factor of Safety = **1.08** **No Good**

Ultimate drained bearing capacity, q_{ult}

$$q_{ULT} = c'N_c + \sigma'_D N_q + \frac{1}{2}\gamma' B N_\gamma$$

q_{ULT} = 20,794 psf

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 8,318 psf

Factor of Safety = **4.23** **OK**

Bearing Capacity Factors for Equations (AASHTO)

Undrained		Drained	
N_c	5.14	N_c	27.86
N_q	1.00	N_q	16.44
N_γ	0.00	N_γ	19.34

Eccentricity of Resultant Force

e = 0.00 ft

Kern

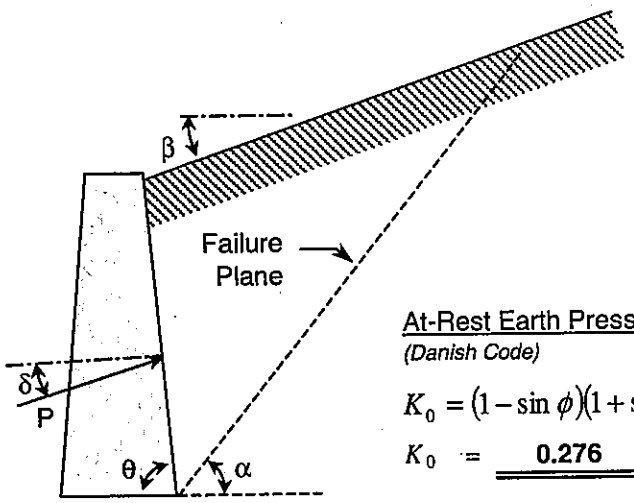
e < L/6 = 4.88 ft

CLIENT	TranSystems Corp.	JOB NUMBER	0121-3070.03
PROJECT	SCI-823 Portsmouth Bypass	SHEET NO.	6 OF 21
SUBJECT	Lateral Earth Pressure Coefficients	COMP. BY	SJR DATE 10/3/2006
	MSE Walls with negative backslopes	CHECKED BY	TWK DATE 10-3-06

EARTH PRESSURE COEFFICIENTS

Ref: EM 1110-2-2502 (1989) Retaining and Floodwalls

with corrections based on Bowles, J.E. (1988) Foundation Analysis and Design, 4th ed.



Parameters

ϕ	=	30	deg.	internal friction angle of soil
δ	=	0	deg.	angle of wall friction
θ	=	90	deg.	angle of wall face from horizontal
β	=	-26.6	deg.	angle of backfill slope from horizontal

At-Rest Earth Pressure

(Danish Code)

$$K_0 = (1-\sin\phi)(1+\sin\beta)$$

K_0 = **0.276**

Passive Earth Pressure

(Coulomb's Theory, wall friction must be less than $\phi/3$)

$$K_p = \frac{\sin^2(\theta-\phi)}{\sin^2\theta\cdot\sin(\theta+\delta)\left[1-\sqrt{\frac{\sin(\phi+\delta)\sin(\phi+\beta)}{\sin(\theta+\delta)\sin(\theta+\beta)}}\right]^2}$$

K_p = **1.121**

Active Earth Pressure

(Coulomb's Theory)

$$K_a = \frac{\sin^2(\theta+\phi)}{\sin^2\theta\cdot\sin(\theta-\delta)\left[1+\sqrt{\frac{\sin(\phi+\delta)\sin(\phi-\beta)}{\sin(\theta-\delta)\sin(\theta+\beta)}}\right]^2}$$

K_a = **0.265**

Angle between active failure plane and horizontal, α

$$\tan\alpha = \tan\phi + \sqrt{1+\tan^2\phi - \frac{\tan\beta}{\sin\phi\cos\phi}}$$

$\tan\alpha$ = 2.1553

α = **65.1** °

Recommended values for angle of wall friction, δ

- from U.S. Army Corps of Engineers, EM 1110-2-2502 (1989), page 3-37
  Active side, $\delta \le \phi/2$ Resisting side, $\delta \ne 0$ to $\phi/3$
- from NAVFAC 7.2 (1986) Foundations & Earth Structures, page 7.2-63

Mass concrete on the following foundation materials:	
Clean sound rock	35
Clean gravel, gravel-sand mixtures, coarse sand	29 - 31
Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	24 - 29
Clean fine sand, silty or clayey fine to medium sand	19 - 24
Fine sandy silt, nonplastic silt	17 - 19
Very stiff and hard residual or preconsolidated clay	22 - 26
Medium stiff and stiff clay and silty clay	17 - 19
(Masonry on foundation materials has same friction factors)	
Steel sheet piles against the following soils:	
Clean gravel, gravel-sand mixtures, well-graded rock fill with spalls	22
Clean sand, silty sand-gravel mixture, single size hard rock fill	17
Silty sand, gravel or sand mixed with silt or clay	14
Fine sandy silt, nonplastic silt	11
Formed concrete or concrete sheet piling against the following soils:	
Clean gravel, gravel-sand mixture, well-graded rock fill with spalls	22 - 26
Clean sand, silty sand-gravel mixture, single size hard rock fill	17 - 22
Silty sand, gravel or sand mixed with silt or clay	17
Fine sandy silt, nonplastic silt	14

DLZ

SUBJECT

Client	TranSystems ODOT D-9	JOB NUMBER	0121-3070.03
Project	SCI 823-0.00 Portsmouth Bypass	SHEET NO.	7 OF 21
Item	Single Wall with Embankment	COMP. BY	SJR DATE 10/03/06
	US-23 Ramp B Boring B-1108 36' Single MSE W:	CHECKED BY	TAA DATE 10-4-06

STABILITY OF MSE WALL

Assumptions:

1 Estimated height of embankment; H=36'
2 It is assumed that the bridge is supported on piles
3 Ground water; Dw=0.0'
4 Traffic loading is neglacted in resisting forces
5 Ka Calculated as per Coulomb for negative backslope

Wall Properties

H+D	= 39	feet	
γ_{mse}	= 120	pcf	
L	= 29.25	feet	
L factor	= 0.75		Length factor-range (0.7 - 1.0)
ϕ	= 30	deg	Friction Angle of Embankment Fill

Foundational Soil Properties

c	= 2500	psf	Cohesion
ϕ'	= 29	deg	Friction angle
ω_T	= 240	psf	Traffic loading

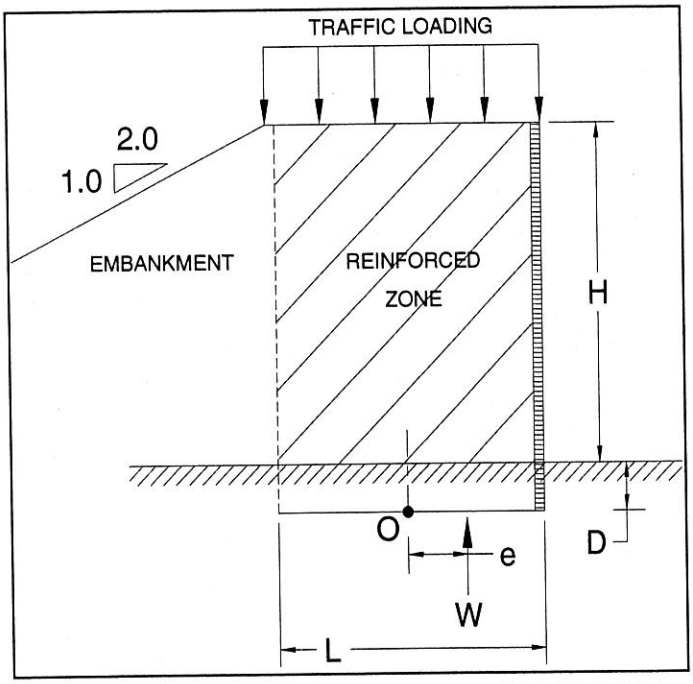
RESISTANCE AGAINST SLIDING ALONG BASE

Thrust: $P_a = K_a\left[\frac{1}{2}\gamma H^2 + \omega_T H\right]$

K_a = 0.265 ✓

2480.4 *From Coulomb

P_a = 26,664 lbs per foot of wall ✓



Resistance: $P_r = W(0.67)(\mu)$ (Drained)

where; $\mu = \tan(\phi)$ 0.67μ = 0.37

0.67μ Max. = 0.35 {AASHTO, Bridge Design Manual, 303.4.1.1}

P_r = 47,912 lbs per foot of wall

USE THIS VALUE

$P_r = L(c)$ (Undrained)

P_r = 73,125 lbs per foot of wall

Use Drained Value

	Calculated	Required	
$FS = \frac{P_r}{P_a}$	FS = **1.80** ✓	FS = 1.50	Resistance Against Sliding is **OK**

RESISTANCE AGAINST OVERTURNING

* Summation of Moments about point "O" (base of wall).
* Traffic loading is neglected in resisting forces

$\Sigma M_{resisting}$ = 2,002,016 lb-ft $\quad \Sigma M_{resisting} = \gamma HL\left(\frac{L}{2}\right)$

$\Sigma M_{overturning}$ = 362,759 lb-ft $\quad \Sigma M_{overturning} = K_a\left[\frac{1}{2}\gamma H^2\left(\frac{H}{3}\right) + \omega_T H\left(\frac{H}{2}\right)\right]$

	Calculated	Required	
$FS = \frac{\Sigma M_{resisting}}{\Sigma M_{overturning}}$	FS = **5.52** ✓	FS = 2.00	Resistance Against Overturning is **OK**

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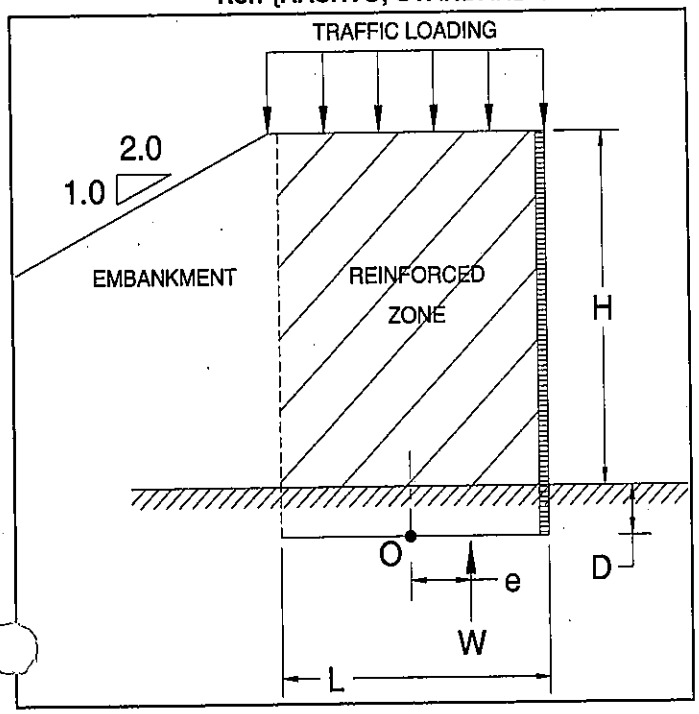
SUBJECT

Client TranSystems Corp.
Project SCI-823 Portsmouth Bypass
Item MSE Wall Bearing Capacity
Single Wall with Embankment
US-23 Ramp B Boring B-1108 36' Single MSE Wall

JOB NUMBER 0121-3070.03
SHEET NO. 8 OF 21
COMP. BY SJR DATE 10/3/06
CHECKED BY TRW DATE 10-4-06

BEARING CAPACITY OF A MSE WALL

Ref: {AASHTO; STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 17th Edition, 2002}



Soil Properties

γ_{EMB}	=	120	pcf	Unit weight — Embankment fill
ϕ'_{EMB}	=	30	deg.	Friction ang. — Embankment fill
γ_{FDN}	=	125	pcf	Unit weight — Foundation soil
c	=	1000	psf	Cohesion — Foundation soil
ϕ	=	0	deg.	Friction ang. — Foundation soil
c'	=	0	psf	Cohesion — Foundation soil
ϕ'	=	29	deg.	Friction ang. — Foundation soil

Loads and Parameters

ω_t	=	240	psf	Traffic loading
L=B	=	29.25	ft	Length of MSE reinforcement
L factor	=	0.75		Length factor-range (0.7 - 1.0)
D	=	3	ft	Embedment depth
Dw	=	0	ft	Groundwater depth
H+D	=	39	ft	
H	=	36	ft	Height of wall
Ka	=	0.265		*From Coulomb
Γ Pa	=	13	ft	Moment arm
Γ Wt	=	19.5	ft	Moment arm
B'	=	24.21	ft	
γ'	=	62.6	pcf	
W_t		7,020	lb/ft of wall	Weight from traffic
W_{mse}	=	136,890	lb/ft of wall	Weight from MSE wall

Effective Bearing Pressure

$$\sigma_v = \frac{W_t + W_{MSE}}{L - 2e}$$

σ_v = 5,944 psf

Ultimate undrained bearing capacity, q_{ult}

$$q_{ULT} = cN_c + \sigma'_D N_q + \frac{1}{2}\gamma' B N_\gamma$$

q_{ULT} = 5,328 psf

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 2,131 psf

Factor of Safety = **0.90** **No Good**

Ultimate drained bearing capacity, q_{ult}

$$q_{ULT} = c'N_c + \sigma'_D N_q + \frac{1}{2}\gamma' B N_\gamma$$

q_{ULT} = 17,743 psf

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 7,097 psf

Factor of Safety = **2.99** **OK**

Bearing Capacity Factors for Equations (AASHTO)

Undrained		Drained	
N_c	5.14	N_c	27.86
N_q	1.00	N_q	16.44
N_γ	0.00	N_γ	19.34

Eccentricity of Resultant Force

e = 2.52 ft

Kern

e < L/6 = 4.88 ft

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CLIENT TranSystems Corp / ODOT D-9 PROJECT NO. 0121-3070.03
PROJECT SCI-823 Portsmouth Bypass SHEET NO. 9 OF 21
SUBJECT Staged Construction COMP. BY SJR DATE 9-29-06
Excess Pore Water Pressures CHECKED BY TAM DATE 10-3-06

* As per UTEXAS analysis, the maximum staged embankment height is 22'

Based upon this height, the excess pore water pressure is equal to the applied load at t=0 for a saturated clay.

At $t=0$ $u_e = 22'(120\ pcf) = 2640\ psf$ * This is the theoretical maximum pore water pressure.

Additional applied load $36' - 22' = 14'$; $\Delta u_e = 14(120\ pcf) = 1680\ psf$

* Determine the amount of time to dissipate 1680 psf of excess pore pressure.

$$\frac{u_e}{\Delta\bar{\sigma}_z} = \frac{2640-1680}{2640} = 0.36$$

From graph (attached) $T_v \simeq 0.52$ when $\frac{u_e}{\Delta\bar{\sigma}_z} = 0.36$ $\frac{Z_{dr}}{H_{dr}} = 1.0$ (Center of Clay Layer)

$$T_v = \frac{C_v \cdot t}{H_{dr}^2}$$

where from B-1108 (Double Drainage) $C_v \simeq 0.24\ ft^2/day$, $H_{dr} = 20'/2 = 10'$

$$t = \frac{T_v \cdot H_{dr}^2}{C_v}$$

$$t = \frac{(0.52)(10)^2}{0.24\ ft^2/day} = \boxed{217\ days}$$

* At 217 days, the additional 14' of Embankment / MSE wall may be constructed while maintaining FS = 2.5.

Time (days)	u_e (psf)	
$t=0$	2640	- End of Construction of 22' Stage
$t=217$	960	- Excess Pore Water Pressures have dissipated.
$t=218$	2640	- Added 14' to Completion height of 36'.

* It is recommended that settlements and pore pressures be monitored during construction.

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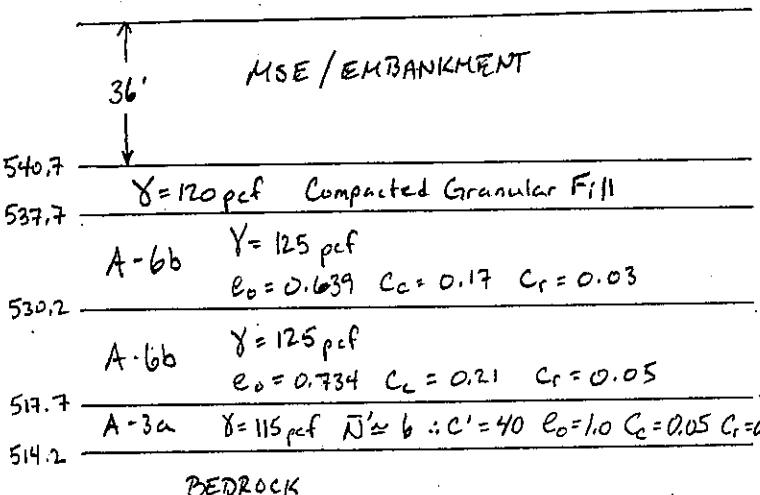
CLIENT TranSystems / ODOT D-9
PROJECT SCI - 823
SUBJECT Consolidation Parameters
US 23 Interchange Ramp B B-1108

PROJECT NO. 0121-3070.03
SHEET NO. 10 OF 21
COMP. BY JAN DATE 9-19-06
CHECKED BY TAM DATE 10-3-06



Assume groundwater table at 530.7 ft.

(1) $\gamma = 120$ pcf Compacted Granular Fill > Assumed Incompressible

(2) A-6b $\gamma = 125$ pcf $e_o = 0.639$ $C_c = 0.17$ $C_r = 0.03$ > Assumed Soil Properties from B-1108A ST-1

(3) A-6b $\gamma = 125$ pcf $e_o = 0.734$ $C_c = 0.21$ $C_r = 0.05$ > Assumed Soil Properties from B-1108A ST-3

(4) A-3a $\gamma = 115$ pcf $\bar{N} \simeq 6 \therefore C' = 40$ $e_o = 1.0$ $C_c = 0.05$ $C_r = 0.0$ > Calculated/Estimated using FHWA NHI-00-045

(see sheet for example calc's)

US-23 Ramp B B-1108 Cont

ÚÄÄÄÄÄ ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration ÄÄÄÄÄ¿
STRIP SYMMETRICAL VERTICAL EMBANKMENT LOADING

Project Name : SCI-823 Portsmouth Client : TranSystems Corp.
File Name : US-23 Ramp B B-1108 Project Manager : Nix
Date : 9/28/10 Computed by : SJR
v'd: TAA

Settlement for X-Direction

Embankment slope a	= 1.00 (ft)	Height of fill H	= 36.00 (ft)
Embankment top width	= 29.00 (ft)	Unit weight of fill	= 120.00 (pcf)
Embankment bottom width	= 31.00 (ft)	p load/unit area	= 4320.00 (psf)
Ground Surface Elev.	= 540.70 (ft)	Foundation Elev.	= 540.70 (ft)
Water table Elev.	= 530.70 (ft)	Unit weight of Wat.	= 62.40 (pcf)

N§.	LAYER TYPE	THICK. (ft)	COEFFICIENT COMP.	RECOMP.	SWELL.	UNIT WEIGHT (pcf)	SPECIFIC GRAVITY	VOID RATIO
1	INCOMP.	3.0	-----	-----	-----	120.00	----	----
2	COMP.	7.5	0.170	0.030	0.000	125.00	2.65	0.63
3	COMP.	12.5	0.210	0.050	0.000	125.00	2.65	0.73
4	COMP.	3.5	0.050	0.000	0.000	115.00	2.65	1.00

N§.	SUBLAYER THICK. (ft)	ELEV. (ft)	SOIL STRESSES INITIAL (psf)	MAX.PAST PRESS. (psf)
1	INCOMP.			
2	7.50	533.95	828.75	828.75
3	12.50	523.95	1657.55	1657.55
4	3.50	515.95	2140.85	2140.85

Layer	X = Stress (psf)	0.00 Sett. (in.)	X = Stress (psf)	2.00 Sett. (in.)	X = Stress (psf)	4.00 Sett. (in.)	X = Stress (psf)	6.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	1948.37	4.93	2738.55	5.95	3363.11	6.61	3754.20	6.97
3	1967.56	6.19	2274.83	6.83	2564.15	7.39	2819.42	7.86
4	1839.82	0.28	2023.60	0.30	2196.53	0.32	2352.18	0.34
		11.40	7.48	13.09		14.32		15.17

Settlement at wall face

Layer	X = Stress (psf)	8.00 Sett. (in.)	X = Stress (psf)	10.00 Sett. (in.)	X = Stress (psf)	12.00 Sett. (in.)	X = Stress (psf)	14.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	3972.72	7.16	4090.31	7.26	4151.80	7.31	4180.16	7.33
3	3029.95	8.22	3190.73	8.49	3300.84	8.66	3361.31	8.76
4	2484.97	0.35	2590.44	0.36	2665.34	0.37	2707.59	0.37
		15.73		16.11		16.34		16.47

with P_c = 1.5 ksf

US-23 Ramp B B-1108 Cont

Layer	X = Stress (psf)	16.00 Sett. (in.)
1	INCOMP.	
2	4185.39	7.34
3	3373.34	8.78
4	2716.09	0.37
		16.49

12.39

Settlement at ℄ of Ramp

Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu

US-23 Ramp B B-1108 End

ÚÄÄÄÄÄ ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration ÄÄÄÄÄ¿
INCREMENT OF STRESSES BENEATH THE END OF FILL CONDITION

Project Name : SCI-823 Portsmouth Client : TranSystems Corp.
File Name : US-23 Ramp B B-1108 Project Manager : Nix
Date : 9/28/10 Computed by : SJR
V'd : TAH

Settlement for X-Direction

Embank. slope, x direc. =	1.00 (ft)	Height of fill H =	36.00 (ft)
y direc. =	1.00 (ft)	Unit weight of fill =	120.00 (pcf)
Embankment top width =	30.00 (ft)	p load/unit area =	4320.00 (psf)
Embankment bottom width =	32.00 (ft)	Foundation Elev. =	540.70 (ft)
Ground Surface Elev. =	540.70 (ft)		
Water table Elev. =	530.70 (ft)	Unit weight of Wat. =	62.40 (pcf)

	N§.	LAYER TYPE	THICK. (ft)	COEFFICIENT COMP.	RECOMP.	SWELL.	UNIT WEIGHT (pcf)	SPECIFIC GRAVITY	VOID RATIO
540.7	1	INCOMP.	3.0	-----	-----	-----	120.00	----	----
537.7	2	COMP.	7.5	0.170	0.030	0.000	125.00	2.65	0.63
530.2	3	COMP.	12.5	0.210	0.050	0.000	125.00	2.65	0.73
517.7	4	COMP.	3.5	0.050	0.000	0.000	115.00	2.65	1.00
514.2									

N§.	SUBLAYER THICK. (ft)	ELEV. (ft)	SOIL STRESSES INITIAL (psf)	MAX.PAST PRESS. (psf)		
					540.7	3000
1	INCOMP.					
2	7.50	533.95	828.75	828.75	530.2	3080
3	12.50	523.95	1657.55	1657.55	530.1	1830
4	3.50	515.95	2140.85	2140.85	514.2	2220

Layer	X = Stress (psf)	0.00 Sett. (in.)	X = Stress (psf)	2.00 Sett. (in.)	X = Stress (psf)	4.00 Sett. (in.)	X = Stress (psf)	6.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	888.28	2.97	1239.84	3.73	1518.65	4.24	1695.22	4.54
3	950.24	3.58	1097.71	4.02	1236.85	4.41	1360.12	4.74
4	903.48	0.16	993.80	0.17	1079.11	0.19	1156.36	0.20
		6.71		7.92		8.84		9.47

Layer	X = Stress (psf)	8.00 Sett. (in.)	X = Stress (psf)	10.00 Sett. (in.)	X = Stress (psf)	12.00 Sett. (in.)	X = Stress (psf)	14.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	1795.36	4.70	1850.17	4.78	1879.57	4.83	1894.03	4.85
3	1462.55	5.00	1541.84	5.20	1597.67	5.34	1630.66	5.42
4	1222.90	0.21	1276.60	0.21	1315.94	0.22	1339.92	0.22
		9.91		10.20		10.38		10.49

US-23 Ramp B B-1108 End

Layer	X = Stress (psf)	16.00 Sett. (in.)
1	INCOMP.	
2	1898.38	4.86
3	1641.56	5.44
4	1347.97	0.22
		10.52

Maximum Settlement at End of MSE Wall.

ÀÄÄÄÄÄ Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu ÄÄÄÄÄÙ

$$\frac{10.52 - 6.71}{16 \times 12} = 2\%$$

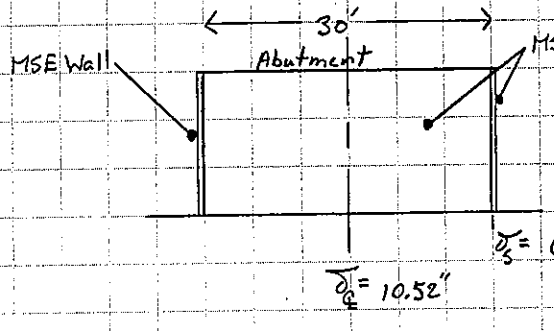
DLZ
ENGINEERS • ARCHITECTS • SCIENTISTS
PLANNERS • SURVEYORS

CLIENT Tran Systems Corp. / ODOT D-9
PROJECT SCI-823 Portsmouth Bypass
SUBJECT Ramp B Differential Settlement

PROJECT NO. 0121-3076.03
SHEET NO. 15 OF 21
COMP. BY SJR DATE 10-2-06
CHECKED BY TAH DATE 10-3-06

* Differential Settlement Based upon boring B-1108

1.) Assume End of fill Condition using Embank.



$$\text{Differential Settlement} = \frac{(10.52" - 6.71")\left(\frac{1\,ft}{12\,in}\right)}{(30\,ft/2)} = 0.021 \text{ OR } 2.1\%$$

Differential Settlement = 2.1% > 1.0 %

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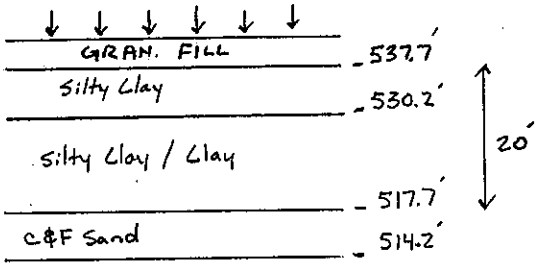
ENGINEERS • ARCHITECTS • SCIENTISTS
PLANNERS • SURVEYORS

CLIENT TranSystems Corp / ODOT D-9 PROJECT NO. 0121-3070.03
PROJECT SCI-823 Portsmouth Bypass SHEET NO. 16 OF 21
SUBJECT Time-Rate of Consolidation COMP. BY SJR DATE 9-29-06
US-23 Ramp B & SR-823 Boring B-1108 CHECKED BY TMM DATE 10-3-06

* Based on soil profile at boring B-1108 (Most Critical)
Consolidation Testing performed on sample ST-1 & ST-3 from B-1108A.
↳ B-1108A was drilled essentially at the same location of B-1108 for the purposes of lab testing.

*B-1108 Profile



From ST-1 $C_v \simeq 0.0004$ in²/sec
$C_v \simeq 0.24$ ft²/day

* Assume Double Drainage $H_v = 10'$

Time Rate of Consolidation: $t_{90} = \frac{T \cdot H_v^2}{C_v}$

for $U = 90$ (90% Consolidation) $\longrightarrow T = 0.848$

$$t_{90} = \frac{(0.848)\left(\frac{20'}{2}\right)^2}{0.24 \text{ ft}^2/\text{day}} = \frac{353 \text{ days} \simeq 1 \text{ year}}{\text{(Without Wick Drains)}}$$

DLZ

SUBJECT	Client	TranSystems ODOT D-9	JOB NUMBER 0121-3070.03
	Project	SCI 823-0.00 Portsmouth Bypass	SHEET NO. 17 OF 21
	Item	Single Wall with Embankment	COMP. BY SJR DATE 10/03/06
		US-23 Ramp B Boring B-1106 12' Single Wall	CHECKED BY TRM DATE 10-4-06

STABILITY OF MSE WALL

Assumptions:

1 Estimated height of embankment; H=12'
2 It is assumed that the bridge is supported on piles
3 Ground water; Dw=0.0'
4 Traffic loading is neglacted in resisting forces
5 Full Ka

Wall Properties				Foundational Soil Properties				
H+D	=	15	feet	c	=	2500	psf	Cohesion
γ_{mse}	=	120	pcf	ϕ'	=	29	deg	Friction angle
L	=	13.5	feet	ω_T	=	240	psf	Traffic loading
L factor	=	0.90		Length factor-range (0.7 - 1.0)				
ϕ	=	30	deg	Friction Angle of Embankment Fill				

RESISTANCE AGAINST SLIDING ALONG BASE

Thrust: $P_a = K_a\left[\frac{1}{2}\gamma H^2 + \omega_T H\right]$

K_a = 0.330 *From Coulomb

P_a = 5,643 lbs per foot of wall ✓

Resistance: $P_r = W(0.67)(\mu)$ (Drained)

where; $\mu = \tan(\phi)$ 0.67μ = 0.37

0.67μ Max. = 0.35 {AASHTO, Bridge Design Manual, 303.4.1.1}

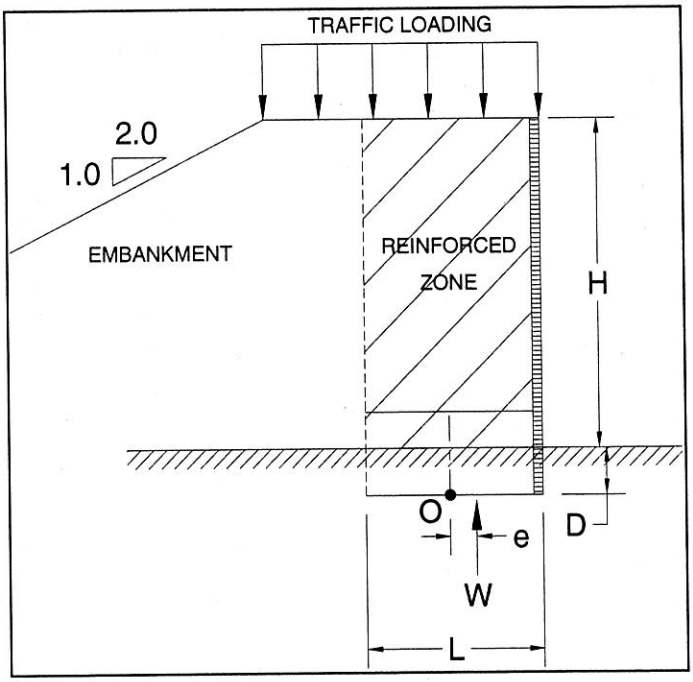
P_r = 8,505 lbs per foot of wall ✓

USE THIS VALUE

$P_r = L(c)$ (Undrained)

P_r = 33,750 lbs per foot of wall

Use Drained Value



	Calculated	Required	
$FS = \frac{P_r}{P_a}$	FS = **1.51**	FS = 1.50	Resistance Against Sliding is **OK** ✓

RESISTANCE AGAINST OVERTURNING

* Summation of Moments about point "O" (base of wall).
* Traffic loading is neglected in resisting forces

$\Sigma M_{resisting}$ = 164,025 lb-ft $\quad \Sigma M_{resisting} = \gamma HL\left(\frac{L}{2}\right)$

$\Sigma M_{overturning}$ = 31,185 lb-ft $\quad \Sigma M_{overturning} = K_a\left[\frac{1}{2}\gamma H^2\left(\frac{H}{3}\right) + \omega_T H\left(\frac{H}{2}\right)\right]$

	Calculated	Required	
$FS = \frac{\Sigma M_{resisting}}{\Sigma M_{overturning}}$	FS = **5.26**	FS = 2.00	Resistance Against Overturning is **OK** ✓

DLZ

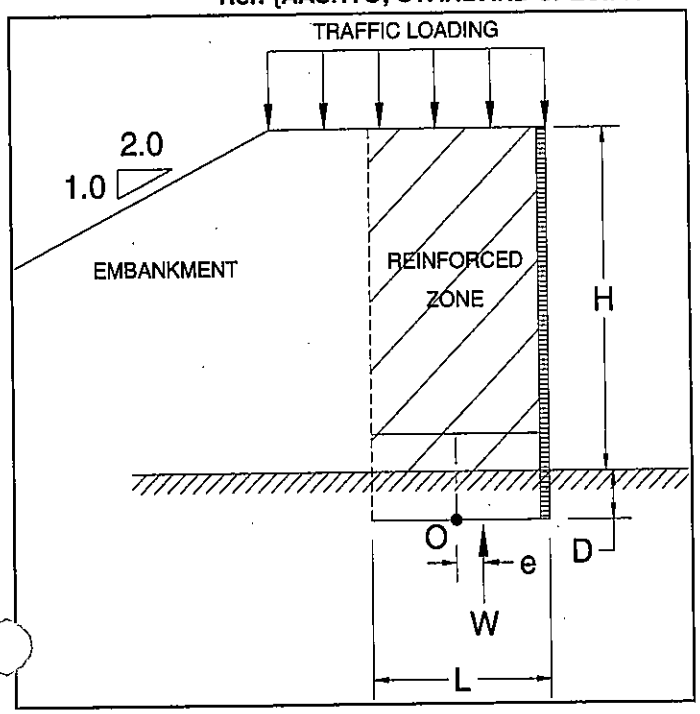
SUBJECT

Client TranSystems Corp.
Project SCI-823 Portsmouth Bypass
Item MSE Wall Bearing Capacity
Single Wall with Embankment
US-23 Ramp B Boring B-1106 12' Single MSE Wall

JOB NUMBER 0121-3070.03
SHEET NO. 18 OF 21
COMP. BY SJR DATE 10/3/06
CHECKED BY TAK DATE 10-4-06

BEARING CAPACITY OF A MSE WALL

Ref: {AASHTO; STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 17th Edition, 2002}



Soil Properties

γ_{EMB}	=	120	pcf	Unit weight Embankment fill
ϕ'_{EMB}	=	30	deg.	Friction ang. Embankment fill
γ_{FDN}	=	125	pcf	Unit weight Foundation soil
c	=	1000	psf	Cohesion Foundation soil
ϕ	=	0	deg.	Friction ang. Foundation soil
c'	=	0	psf	Cohesion Foundation soil
ϕ'	=	29	deg.	Friction ang. Foundation soil

Loads and Parameters

ω_t	=	240	psf	Traffic loading
L=B	=	13.5	ft ✓	Length of MSE reinforcement
L factor	=	0.9	✓	Length factor-range (0.7 - 1.0)
D	=	3	ft ✓	Embedment depth
Dw	=	0	ft	Groundwater depth
H+D	=	15	ft	
H	=	12	ft	Height of wall
Ka	=	0.330		
⌜ Pa	=	5	ft	Moment arm
⌜ Wt	=	7.5	ft	Moment arm
B'	=	11.24	ft	
γ'	=	62.6	pcf	
W_t		3,240	lb/ft of wall ✓	Weight from traffic
W_{mse}	=	24,300	lb/ft of wall ✓	Weight from MSE wall

Effective Bearing Pressure

$$\sigma_v = \frac{W_t + W_{MSE}}{L - 2e}$$

σ_v = 2,450 psf ✓

Ultimate undrained bearing capacity, q_{ult}

$$q_{ULT} = cN_c + \sigma'_D N_q + \frac{1}{2}\gamma' B N_\gamma$$

q_{ULT} = 5,328 psf ✓

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 2,131 psf

Factor of Safety = **2.17** **No Good** ✓

Ultimate drained bearing capacity, q_{ult}

$$q_{ULT} = c'N_c + \sigma'_D N_q + \frac{1}{2}\gamma' B N_\gamma$$

q_{ULT} = 9,891 psf

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 3,956 psf

Factor of Safety = **4.04** **OK** ✓

Bearing Capacity Factors for Equations (AASHTO)

Undrained		Drained	
N_c	5.14	N_c	27.86
N_q	1.00	N_q	16.44
N_γ	0.00	N_γ	19.34

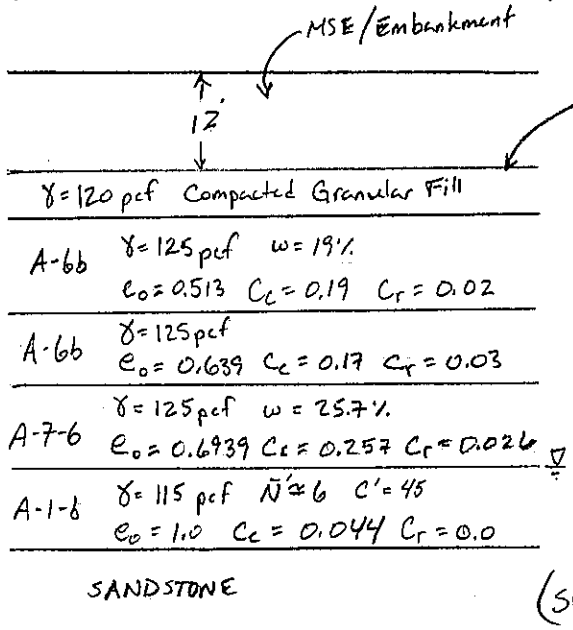
Eccentricity of Resultant Force

e = 1.13 ft ✓

Kern

e < L/6 = 2.25 ft

There were two borings along ramp B (B-1106 and B-1108) and two borings along ramp C (B-1124 and B-1126), that we considered "Most critical". These borings were chosen due to the large amount of compresible material, an analyzed with a maximum wall height of 12'.



(See below for sample calc's)

* The computer programed used, EMBANK, requires inputs for C_c, C_r and e_o.

Cohesive Materials - Example Calc's

$$e_o = \frac{(w)(G_s)}{100} = \frac{(19.0)(2.7)}{100}$$

$$e_o = 0.513$$

$$C_c = \frac{w}{100} = \frac{19}{100}$$

$$C_c = 0.19$$

$$C_r = \frac{w}{1000} = \frac{19}{1000}$$

$$C_r = 0.019$$

Non-Cohesive Material - Example Calc's

Assume $e_o = 1.0$ & $C_r = 0.0$

$$\frac{1}{C'} = \frac{C_c}{1+e_o}$$

$$\frac{1}{45} = \frac{C_c}{1+1.0}$$

$$C_c = \frac{2}{45}$$

$$C_c = 0.044$$

US 23 Ramp B B-1106

ÚÄÄÄÄÄ ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration ÄÄÄÄÄ¿
STRIP SYMMETRICAL VERTICAL EMBANKMENT LOADING

Project Name : SCI-823 Portsmouth Client : TranSystems Corp
File Name : 23 Ramp B B-1106 Project Manager : Nix
Date : 9/28/10 Computed by : SJR
√d : TAB

Settlement for X-Direction

Embankment slope a	= 1.00 (ft)	Height of fill H	= 12.00 (ft)
Embankment top width	= 29.00 (ft)	Unit weight of fill	= 120.00 (pcf)
Embankment bottom width	= 31.00 (ft)	p load/unit area	= 1440.00 (psf)
Ground Surface Elev.	= 540.20 (ft)	Foundation Elev.	= 540.20 (ft)
Water table Elev.	= 530.20 (ft)	Unit weight of Wat.	= 62.40 (pcf)

N§.	LAYER TYPE	THICK. (ft)	COEFFICIENT COMP.	RECOMP.	SWELL.	UNIT WEIGHT (pcf)	SPECIFIC GRAVITY	VOID RATIO
1	INCOMP.	3.0	-----	-----	-----	120.00	----	----
2	COMP.	7.5	0.190	0.020	0.000	125.00	2.65	0.51
3	COMP.	5.0	0.170	0.030	0.000	125.00	2.65	0.63
4	COMP.	7.5	0.257	0.026	0.000	125.00	2.65	0.69
5	COMP.	7.0	0.044	0.000	0.000	115.00	2.65	1.00

N§.	SUBLAYER THICK. (ft)	ELEV. (ft)	SOIL STRESSES INITIAL (psf)	MAX.PAST PRESS. (psf)
1	INCOMP.			
2	7.50	533.45	828.75	828.75
3	5.00	527.20	1422.80	1422.80
4	7.50	520.95	1814.05	1814.05
5	7.00	513.70	2232.90	2232.90

Layer	X = Stress (psf)	0.00 Sett. (in.)	X = Stress (psf)	2.00 Sett. (in.)	X = Stress (psf)	4.00 Sett. (in.)	X = Stress (psf)	6.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	649.46	2.85	912.85	3.65	1121.04	4.21	1251.40	4.53
3	665.45	1.04	801.65	1.21	927.60	1.36	1033.86	1.48
4	645.02	1.81	731.41	2.01	813.01	2.20	885.94	2.36
5	601.74	0.19	656.98	0.21	708.82	0.22	755.45	0.23
		5.89		7.09		7.99		8.61

Settlement at Face of Wall

Layer	X = Stress (psf)	8.00 Sett. (in.)	X = Stress (psf)	10.00 Sett. (in.)	X = Stress (psf)	12.00 Sett. (in.)	X = Stress (psf)	14.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	1324.24	4.70	1363.44	4.78	1383.93	4.83	1393.39	4.85
3	1116.42	1.57	1175.66	1.64	1214.11	1.68	1234.45	1.70
4	947.23	2.50	995.03	2.60	1028.38	2.67	1046.95	2.71
5	795.26	0.24	826.92	0.25	849.46	0.26	862.18	0.26

US 23 Ramp B B-1106

9.01	9.27	9.43	9.52

Layer	X = Stress (psf)	16.00 Sett. (in.)
1	INCOMP.	
2	1395.13	4.85
3	1238.42	1.70
4	1050.67	2.72
5	864.75	0.26
		9.53

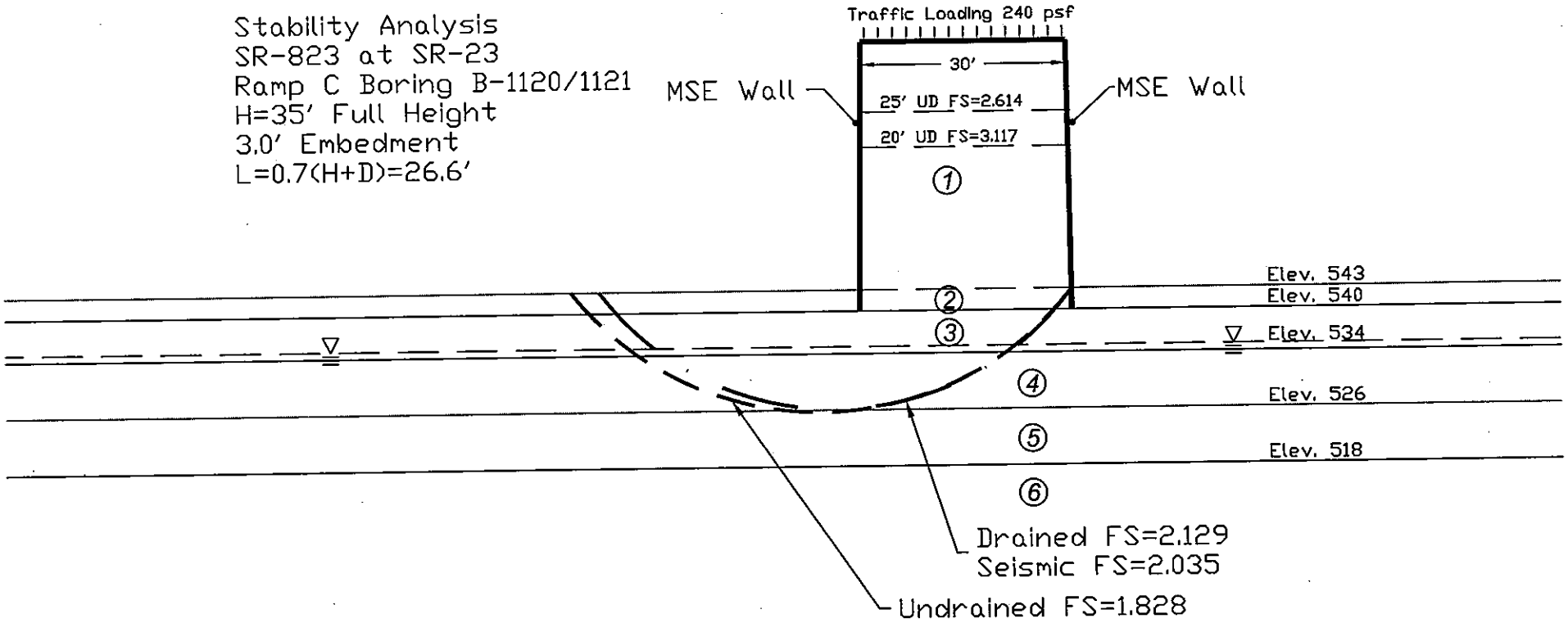
Settlement at ℄ of Ramp.

ÀÄÄÄÄÄ Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu ÄÄÄÄÄÙ

RAMP C

Material	Consistency	Soil Type	Undrained C (psf)	Undrained φ (deg)	Drained C' (psf)	Drained φ' (deg)	γ (pcf)
Material 1	Compacted	MSE Fill	0	34	0	34	120
Material 2	Compacted	Gran. Fill	0	32	0	32	120
Material 3	Very Stiff	Silty Clay	2500	0	0	29	125
Material 4	M. Stiff	Silty Clay	1000	0	0	29	125
Material 5	Loose	C & F Sand	0	32	0	32	115
Material 6		Bedrock	10000	45	10000	45	145

Stability Analysis
SR-823 at SR-23
Ramp C Boring B-1120/1121
H=35' Full Height
3.0' Embedment
L=0.7(H+D)=26.6'



Sheet 1 of 20

US-23 Ramp C
Borings B-1120/1121

MSE STABILITY ANALYSIS

SCI-823-0.00 Vd. TR8

PROJECT NO. 0121-3070.03	CALC: SJR	DATE 9/28/06

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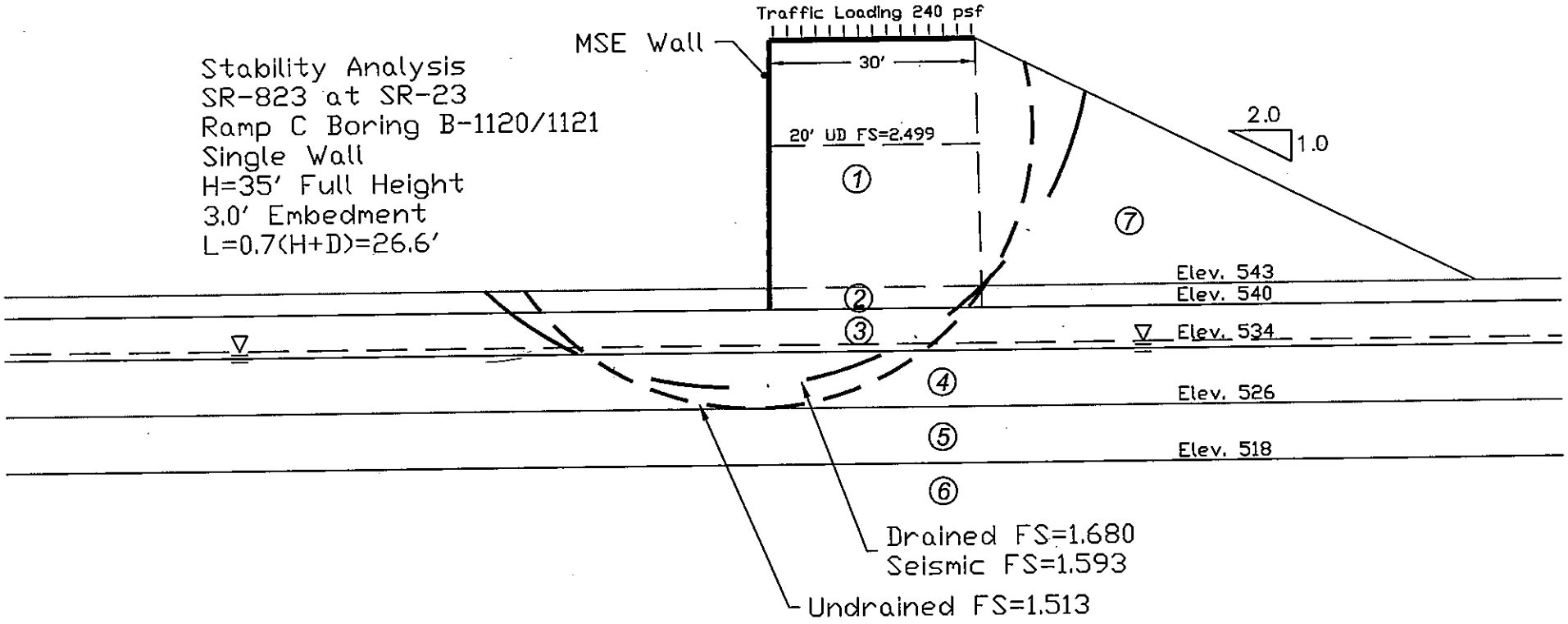
Material	Consistency	Soil Type	Undrained C (psf)	Undrained ϕ (deg)	Drained C' (psf)	Drained ϕ' (deg)	γ (pcf)
Material 1	Compacted	MSE Fill	0	34	0	34	120
Material 2	Compacted	Gran. Fill	0	32	0	32	120
Material 3	Very Stiff	Silty Clay	2500	0	0	29	125
Material 4	M. Stiff	Silty Clay	1000	0	0	29	125
Material 5	Loose	C & F Sand	0	32	0	32	115
Material 6		Bedrock	10000	45	10000	45	145
Material 7	Compacted	Embank Fill	0	30	0	30	120

Stability Analysis
SR-823 at SR-23
Ramp C Boring B-1120/1121
Single Wall
H=35' Full Height
3.0' Embedment
L=0.7(H+D)=26.6'



Sheet 2 of 20

US-23 Ramp C
Borings B-1120/1121
SINGLE MSE WALL

MSE STABILITY ANALYSIS

SCI-823-0.00 J.d. TMA

PROJECT NO. 0121-3070.03 | CALC: SJR | DATE 10/03/06

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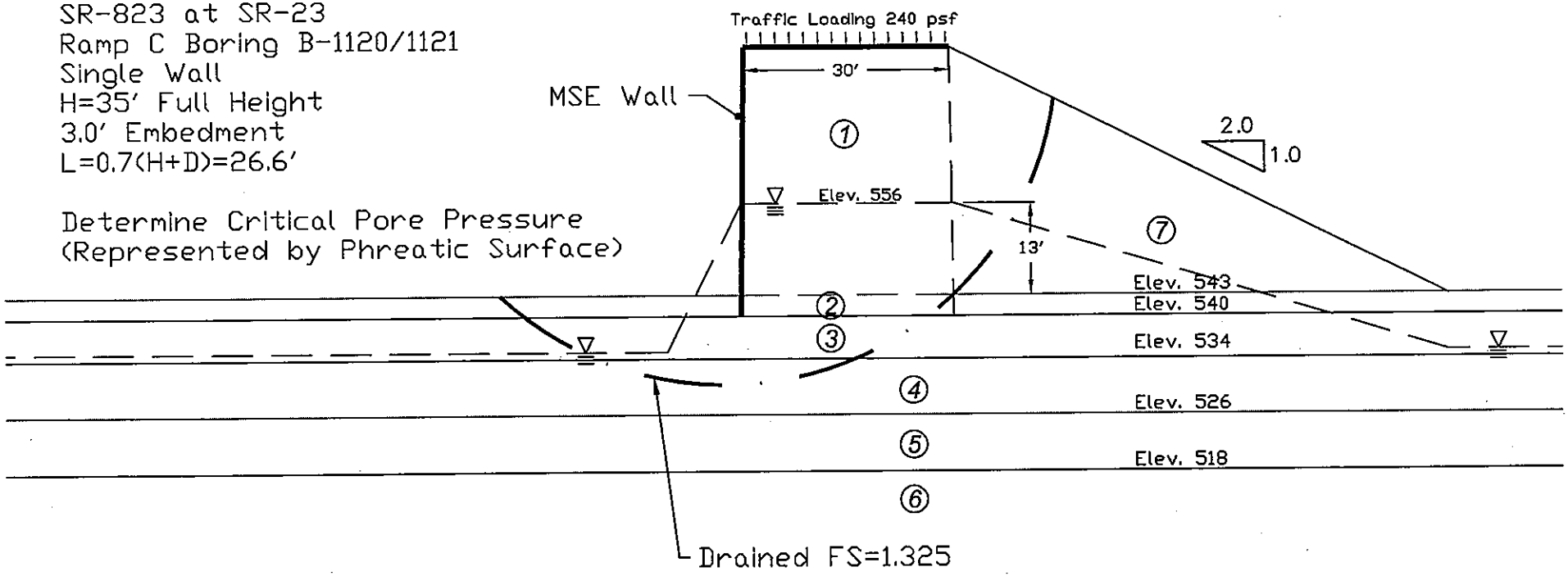
			Undrained		Drained		
Material	Consistency	Soil Type	C (psf)	ϕ (deg)	C' (psf)	ϕ' (deg)	γ (pcf)
Material 1	Compacted	MSE Fill	0	34	0	34	120
Material 2	Compacted	Gran. Fill	0	32	0	32	120
Material 3	Very Stiff	Silty Clay	2500	0	0	29	125
Material 4	M. Stiff	Silty Clay	1000	0	0	29	125
Material 5	Loose	C & F Sand	0	32	0	32	115
Material 6		Bedrock	10000	45	10000	45	145
Material 7	Compacted	Embank Fill	0	30	0	30	120

Stability Analysis
SR-823 at SR-23
Ramp C Boring B-1120/1121
Single Wall
H=35' Full Height
3.0' Embedment
L=0.7(H+D)=26.6'

Determine Critical Pore Pressure
(Represented by Phreatic Surface)



US-23 Ramp C Boring B-1120/1121
Determine Critical Pore Pressure
SINGLE MSE WALL

MSE STABILITY ANALYSIS

SCI-823-0.00 Vd: TKK

PROJECT NO. 0121-3070.03	CALC: SJR	DATE 10/03/06

DLZ

SUBJECT

Client	TranSystems Corp.
Project	SCI-823 Portsmouth Bypass
Item	MSE Wall Stability Ramp C
	0.3H or Greater overlap of Reinforcing Straps
	Boring B-1120/1121

JOB NUMBER	0121-3070.03		
SHEET NO.	4	OF	20
COMP. BY	SJR	DATE	09/29/06
CHECKED BY	TRA	DATE	10-4-06

STABILITY OF MSE WALL

Assumptions:

1 Estimated height of embankment; H=35'
2 Ka=0.0 Due to overlay of straps; double wall
3 Ground water; Dw=0.0'
4 Traffic loading is neglected in resisting forces
5

Wall Properties			
H+D	= 38	feet	
γ_{mse}	= 120	pcf	
L	= 26.6	feet	
L factor	= 0.70		Length factor-range (0.7 - 1.0)
ϕ	= 30	deg	Friction Angle of Embankment Fill

Foundational Soil Properties			
c	= 2500	psf	Cohesion
ϕ'	= 29	deg	Friction angle
ω_T	= 240	psf	Traffic loading

RESISTANCE AGAINST SLIDING ALONG BASE

Thrust: $P_o = K_o\left[\frac{1}{2}\gamma H^2 + \omega_T H\right]$

where; $K_o = 1 - \sin(\phi')$ Ko = **0.00**

P_O = 0 lbs per foot of wall

Resistance: $P_r = W(0.67)(\mu)$ (Drained)

where; $\mu = \tan(\phi)$ 0.67μ = 0.37

0.67μ Max. = 0.35 {AASHTO, Bridge Design Manual, 303.4.1.1}

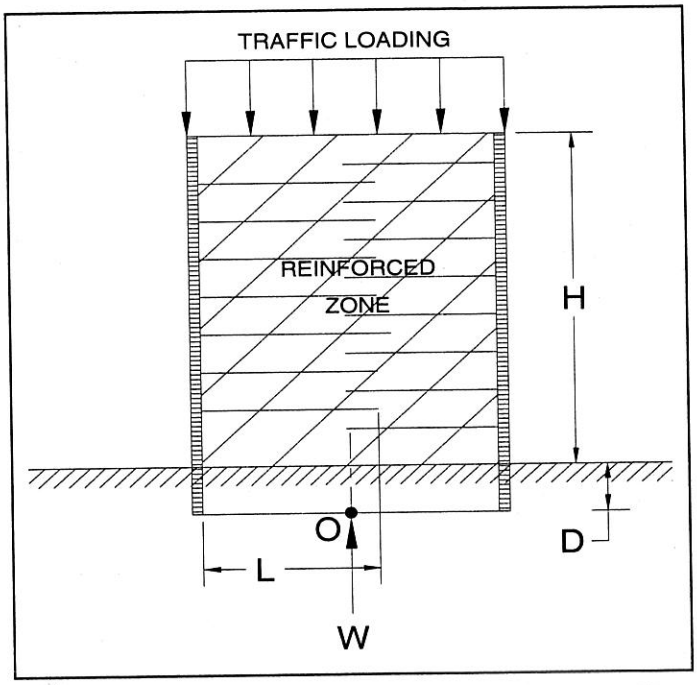
P_r = 42,454 lbs per foot of wall

USE THIS VALUE

$P_r = L(c)$ (Undrained)

P_r = 66,500 lbs per foot of wall

Use Drained Value



	Calculated		Required	
$FS = \frac{F_R}{F_O}$	FS =	**>1.5**	FS =	1.50

Resistance Against Sliding is **OK**

RESISTANCE AGAINST OVERTURNING

* Summation of Moments about point "O" (base of wall).
* Traffic loading is neglected in resisting forces

$\Sigma M_{resisting}$ = 1,613,237 lb-ft

$\Sigma M_{overturning}$ = 0 lb-ft

$\Sigma M_{resisting} = \gamma HL\left(\frac{L}{2}\right)$

$\Sigma M_{overturning} = K_a\left[\frac{1}{2}\gamma H^2\left(\frac{H}{3}\right) + \omega_T H\left(\frac{H}{2}\right)\right]$

	Calculated		Required	
$FS = \frac{\Sigma M_{resisting}}{\Sigma M_{overturning}}$	FS =	**>1.5**	FS =	2.00

Resistance Against Overturning is **OK**

DLZ

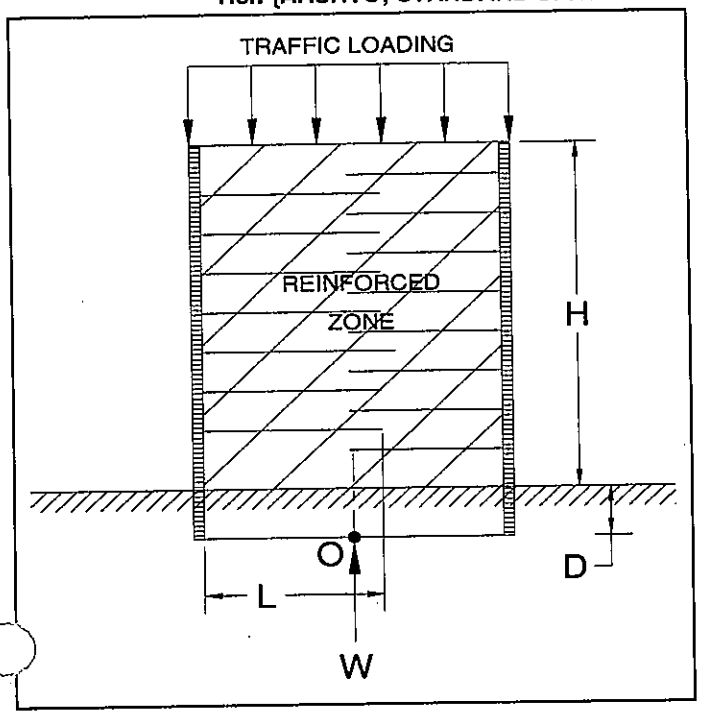
SUBJECT

Client TranSystems Corp.
Project SCI-823 Portsmouth Bypass
Item MSE Wall Bearing Capacity
0.3H or Greater Overlap of Reinforcing Straps
US-23 Ramp C Boring B-1120/1121 35' Wall

JOB NUMBER 0121-3070.03
SHEET NO. 5 OF 20
COMP. BY SJR DATE 9/29/06
CHECKED BY TRW DATE 10.4.06

BEARING CAPACITY OF A MSE WALL

Ref: {AASHTO; STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 17th Edition, 2002}



Soil Properties

γ_{REIN}	=	120	pcf	Unit weight Embankment fill
ϕ'_{REIN}	=	34	deg.	Friction ang. Embankment fill
γ_{FDN}	=	125	pcf	Unit weight Foundation soil
c	=	1000	psf	Cohesion Foundation soil
ϕ	=	0	deg.	Friction ang. Foundation soil
c'	=	0	psf	Cohesion Foundation soil
ϕ'	=	29	deg.	Friction ang. Foundation soil

Loads and Parameters

ω_t	=	240	psf	Traffic loading
L=B	=	26.6	ft	Length of MSE reinforcement
L factor	=	0.7		Length factor-range (0.7 - 1.0)
D	=	3	ft	Embedment depth
Dw	=	0	ft	Groundwater depth
H+D	=	38	ft	
H	=	35	ft	Height of wall
Ko	=	**0.00**		
⌜ Pa	=	0	ft	Moment arm
⌜ Wt	=	19	ft	Moment arm
B'	=	26.60	ft	
γ'	=	62.6	pcf	
W_t		6,384	lb/ft of wall	Weight from traffic
W_{mse}	=	121,296	lb/ft of wall	Weight from MSE wall

Effective Bearing Pressure

$$\sigma_v = \frac{W_t + W_{MSE}}{L - 2e}$$

σ_v = 4,800 psf

Ultimate undrained bearing capacity, q_{ult}

$$q_{ULT} = cN_c + \sigma'_D N_q + \frac{1}{2}\gamma' B N_\gamma$$

q_{ULT} = 5,328 psf

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 2,131 psf

Factor of Safety = **1.11** **No Good**

Ultimate drained bearing capacity, q_{ult}

$$q_{ULT} = c'N_c + \sigma'_D N_q + \frac{1}{2}\gamma' B N_\gamma$$

q_{ULT} = 19,190 psf

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 7,676 psf

Factor of Safety = **4.00** **OK**

Bearing Capacity Factors for Equations (AASHTO)

Undrained		Drained	
N_c	5.14	N_c	27.86
N_q	1.00	N_q	16.44
N_γ	0.00	N_γ	19.34

Eccentricity of Resultant Force

e = 0.00 ft

Kern

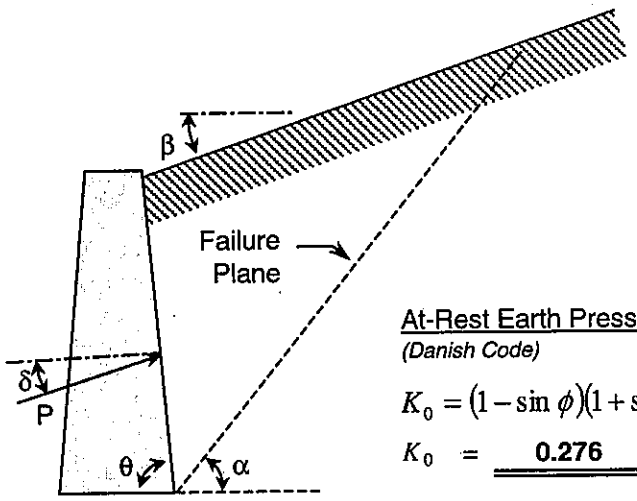
e < L/6 = 4.43 ft

CLIENT	TranSystems Corp.	JOB NUMBER	0121-3070.03
PROJECT	SCI-823 Portsmouth Bypass	SHEET NO.	6 OF 20
SUBJECT	Lateral Earth Pressure Coefficients	COMP. BY	SJR DATE 10/3/2006
	MSE Walls with negative backslopes	CHECKED BY	TRA DATE 10-4-06

EARTH PRESSURE COEFFICIENTS

Ref: EM 1110-2-2502 (1989) Retaining and Floodwalls

with corrections based on Bowles, J.E. (1988) Foundation Analysis and Design, 4th ed.



Parameters

ϕ	=	30	deg.	internal friction angle of soil
δ	=	0	deg.	angle of wall friction
θ	=	90	deg.	angle of wall face from horizontal
β	=	-26.6	deg.	angle of backfill slope from horizontal

At-Rest Earth Pressure

(Danish Code)

$$K_0 = (1-\sin\phi)(1+\sin\beta)$$

K_0 = **0.276**

Passive Earth Pressure

(Coulomb's Theory, wall friction must be less than $\phi/3$)

$$K_p = \frac{\sin^2(\theta-\phi)}{\sin^2\theta\cdot\sin(\theta+\delta)\left[1-\sqrt{\frac{\sin(\phi+\delta)\sin(\phi+\beta)}{\sin(\theta+\delta)\sin(\theta+\beta)}}\right]^2}$$

K_p = **1.121**

Active Earth Pressure

(Coulomb's Theory)

$$K_a = \frac{\sin^2(\theta+\phi)}{\sin^2\theta\cdot\sin(\theta-\delta)\left[1+\sqrt{\frac{\sin(\phi+\delta)\sin(\phi-\beta)}{\sin(\theta-\delta)\sin(\theta+\beta)}}\right]^2}$$

K_a = **0.265**

Angle between active failure plane and horizontal, α

$$\tan\alpha = \tan\phi + \sqrt{1+\tan^2\phi - \frac{\tan\beta}{\sin\phi\cos\phi}}$$

$\tan\alpha$ = 2.1553

α = **65.1** °

Recommended values for angle of wall friction, δ

- from U.S. Army Corps of Engineers, EM 1110-2-2502 (1989), page 3-37
  Active side, $\delta \le \phi/2$ Resisting side, δ = 0 to $\phi/3$
- from NAVFAC 7.2 (1986) Foundations & Earth Structures, page 7.2-63

Mass concrete on the following foundation materials:	
Clean sound rock	35
Clean gravel, gravel-sand mixtures, coarse sand	29 - 31
Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	24 - 29
Clean fine sand, silty or clayey fine to medium sand	19 - 24
Fine sandy silt, nonplastic silt	17 - 19
Very stiff and hard residual or preconsolidated clay	22 - 26
Medium stiff and stiff clay and silty clay	17 - 19
(Masonry on foundation materials has same friction factors)	
Steel sheet piles against the following soils:	
Clean gravel, gravel-sand mixtures, well-graded rock fill with spalls	22
Clean sand, silty sand-gravel mixture, single size hard rock fill	17
Silty sand, gravel or sand mixed with silt or clay	14
Fine sandy silt, nonplastic silt	11
Formed concrete or concrete sheet piling against the following soils:	
Clean gravel, gravel-sand mixture, well-graded rock fill with spalls	22 - 26
Clean sand, silty sand-gravel mixture, single size hard rock fill	17 - 22
Silty sand, gravel or sand mixed with silt or clay	17
Fine sandy silt, nonplastic silt	14

DLZ

SUBJECT

Client	TranSystems ODOT D-9
Project	SCI 823-0.00 Portsmouth Bypass
Item	Single Wall with Embankment
	US-23 Ramp C Boring B-1120/1121 35' Wall

JOB NUMBER	0121-3070.03		
SHEET NO.	7	OF	20
COMP. BY	SJR	DATE	10/03/06
CHECKED BY	TRM	DATE	10-4-06

STABILITY OF MSE WALL

Assumptions:

1 Estimated height of embankment; H=35'
2 It is assumed that the bridge is supported on piles
3 Ground water; Dw=0.0'
4 Traffic loading is neglacted in resisting forces
5 Ka Calculated as per coulomb with negative backslope

Wall Properties				Foundational Soil Properties			
H+D	=	38	feet	c	=	2500	psf Cohesion
γ_{mse}	=	120	pcf	ϕ'	=	29	deg Friction angle
L	=	26.6	feet	ω_T	=	240	psf Traffic loading
L factor	=	0.70		Length factor-range (0.7 - 1.0)			
ϕ	=	30	deg	Friction Angle of Embankment Fill			

RESISTANCE AGAINST SLIDING ALONG BASE

Thrust: $P_a = K_a\left[\frac{1}{2}\gamma H^2 + \omega_T H\right]$

K_a = 0.265 *From Coulomb

P_a = 25,376 lbs per foot of wall ✓

Resistance: $P_r = W(0.67)(\mu)$ (Drained)

where; $\mu = \tan(\phi)$ 0.67μ = 0.37

0.67μ Max. = 0.35 {AASHTO, Bridge Design Manual, 303.4.1.1}

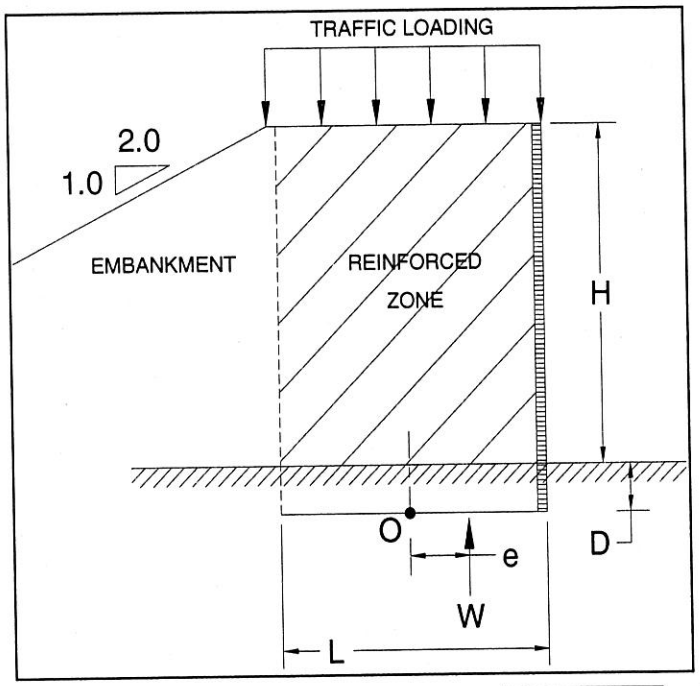
P_r = 42,454 lbs per foot of wall ✓

USE THIS VALUE

$P_r = L(c)$ (Undrained)

P_r = 66,500 lbs per foot of wall

Use Drained Value



	Calculated		Required	
$FS = \frac{P_r}{P_a}$	FS = **1.67** ✓		FS = 1.50	

Resistance Against Sliding is **OK** ✓

RESISTANCE AGAINST OVERTURNING

* Summation of Moments about point "O" (base of wall).
* Traffic loading is neglected in resisting forces

$\Sigma M_{resisting}$ = 1,613,237 lb-ft $\quad \Sigma M_{resisting} = \gamma H L\left(\frac{L}{2}\right)$

$\Sigma M_{overturning}$ = 336,741 lb-ft $\quad \Sigma M_{overturning} = K_a\left[\frac{1}{2}\gamma H^2\left(\frac{H}{3}\right) + \omega_T H\left(\frac{H}{2}\right)\right]$

	Calculated		Required	
$FS = \frac{\Sigma M_{resisting}}{\Sigma M_{overturning}}$	FS = **4.79** ✓		FS = 2.00	

Resistance Against Overturning is **OK** ✓

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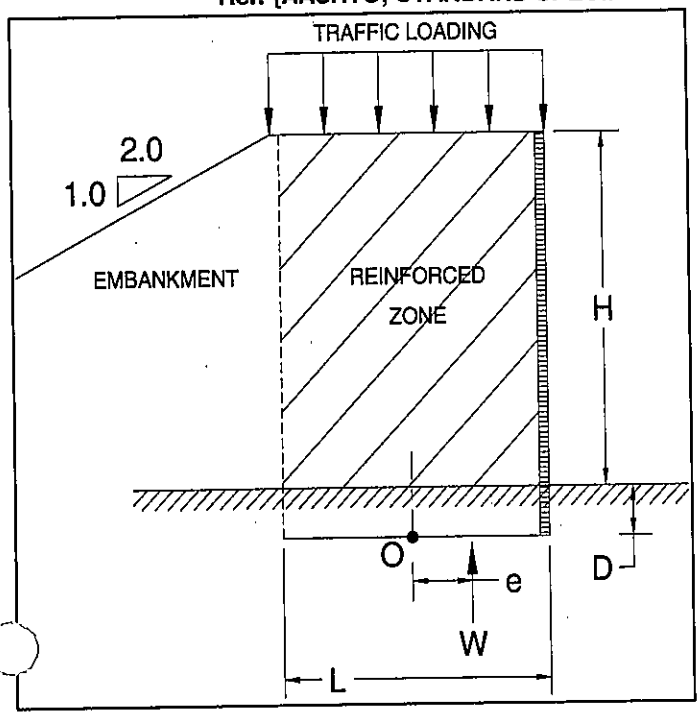
SUBJECT

Client TranSystems Corp.
Project SCI-823 Portsmouth Bypass
Item MSE Wall Bearing Capacity
Single Wall with Embankment
US-23 Ramp C Boring B-1120/1121 35' Single MSE Wall

JOB NUMBER 0121-3070.03
SHEET NO. 8 OF 20
COMP. BY SJR DATE 10/3/06
CHECKED BY TKM DATE 10-4-06

BEARING CAPACITY OF A MSE WALL

Ref: {AASHTO; STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 17th Edition, 2002}



Soil Properties

γ_{EMB}	=	120	pcf	Unit weight Embankment fill
ϕ'_{EMB}	=	30	deg.	Friction ang. Embankment fill
γ_{FDN}	=	125	pcf	Unit weight Foundation soil
c	=	1000	psf	Cohesion Foundation soil
ϕ	=	0	deg.	Friction ang. Foundation soil
c'	=	0	psf	Cohesion Foundation soil
ϕ'	=	29	deg.	Friction ang. Foundation soil

Loads and Parameters

ω_t	=	240	psf	Traffic loading
L=B	=	26.6	ft ✓	Length of MSE reinforcement
L factor	=	0.7	✓	Length factor-range (0.7 - 1.0)
D	=	3	ft	Embedment depth
Dw	=	0	ft	Groundwater depth
H+D	=	38	ft ✓	
H	=	35	ft	Height of wall
Ka	=	0.265	✓	*From Coulomb
Pa	=	12.667	ft ✓	Moment arm
Wt	=	19	ft ✓	Moment arm
B'	=	21.32	ft ✓	
γ'	=	62.6	pcf	
W_t		6,384	lb/ft of wall ✓	Weight from traffic
W_{mse}	=	121,296	lb/ft of wall ✓	Weight from MSE wall

Effective Bearing Pressure

$$\sigma_v = \frac{W_t + W_{MSE}}{L - 2e}$$

σ_v = 5,989 psf ✓

Ultimate undrained bearing capacity, q_{ult}

$$q_{ULT} = cN_c + \sigma'_D N_q + \frac{1}{2}\gamma' B N_\gamma$$

q_{ULT} = 5,328 psf ✓

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 2,131 psf

Factor of Safety = **0.89** **No Good** ✓

Ultimate drained bearing capacity, q_{ult}

$$q_{ULT} = c'N_c + \sigma'_D N_q + \frac{1}{2}\gamma' B N_\gamma$$

q_{ULT} = 15,993 psf ✓

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 6,397 psf

Factor of Safety = **2.67** **OK** ✓

Bearing Capacity Factors for Equations (AASHTO)

Undrained		Drained	
N_c	5.14	N_c	27.86
N_q	1.00	N_q	16.44
N_γ	0.00	N_γ	19.34

Eccentricity of Resultant Force

e = 2.64 ft ✓

Kern

e < L/6 = 4.43 ft

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PLANNERS • SURVEYORS

CLIENT TranSystems Corp. / ODOT D-9
PROJECT SCI-823 Portsmouth Bypass
SUBJECT Time - Rate of Consolidation
US-23 Ramp C & SR-823

PROJECT NO. 0121-3070.03
SHEET NO. 9 OF 20
COMP. BY SJR DATE 9-29-06
CHECKED BY TDM DATE 10-4-06

* Based on composite soil profile from B-1120 & B-1121

Atterburg Limits B-1120 LL Range 23 - 37
PI Range 9 - 14

B-1121 LL Range 35 - 42
PI Range 18-19

From boring B-1108A Sample ST-3 (Consolidation Testing)
LL = 38 PI = 19 $C_v \simeq 0.0004$ in²/sec = 0.24 ft²/day

From boring B-1108A Sample ST-1 (Consolidation Testing)
LL = 36 PI = 15 $C_v \simeq 0.0004$ in²/sec = 0.24 ft²/day

Estimates of C_v based on LL [FHWA HI-97-021] from NAVFAC, DM-7.1, 1982

$\overline{LL} \simeq 34 \longrightarrow$ from chart $C_v \simeq 0.4 \longrightarrow$ Use $C_v = 0.3$ ft²/day

Profile Based on B-1120 & B-1121

543 GRAN. FILL
540
V. Stiff Silty Clay
534
Stiff Silty Clay
526
C&F Sand
518

14'

$C_v = 0.30$ ft²/day
* Assume Double Drainage $H_v = 14'/2 = 7'$

Time - Rate of Consolidation: $t_{90} = \frac{T \cdot H_v^2}{C_v}$

for U = 90 (90% Consolidation) $\longrightarrow$ T = 0.848

$t_{90} = \frac{(0.848)(\frac{14'}{2})^2}{0.30} =$ 139 days (Without Wick Drains)

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CLIENT Trans Systems Corp / ODOT D-9 PROJECT NO. 0121-3070.03
PROJECT 561-823 Portsmouth Bypass SHEET NO. 10 OF 20
SUBJECT Staged Construction - Ramp C COMP. BY SJR DATE 9-29-06
Excess Pore Water Pressures CHECKED BY TRM DATE 10-4-06

* As per UTEXAS analysis, the maximum staged embankment height is 20'.

Based upon this height, the excess pore water pressure is equal to the applied load at t=0 for a saturated clay.

At $t=0$ $u_e = 20\,(120\,pcf) = 2{,}400\,psf$ * This is the theoretical maximum pore water pressure.

Additional applied load $35' - 20 = 15'$; $\Delta u_e = 15'(120\,pcf) = 1800\,psf$

Determine the amount of time to dissipate 1800 psf of excess pore pressure.

$$\frac{u_e}{\Delta\bar{\sigma}_z} = \frac{3000 - 1800}{3000} = 0.40$$

From graph (attached) $T_v \simeq 0.47$ when $\frac{u_e}{\Delta\bar{\sigma}_z} = 0.40$ $\frac{z_{dr}}{H_{dr}} = 1.0$ (Center of Clay Layer)

$$T_v = \frac{c_v \cdot t}{H_{dr}^2}$$

* Double Drainage ; $c_v = 0.30\,ft^2/day$ $H_{dr} = 7'$

$$t = \frac{T_v \cdot H_{dr}^2}{c_v}$$

$$t = \frac{(0.47)(7)^2}{0.30} = \boxed{77 \text{ days}}$$

*At 77 days, the additional 15' of Embankment / MSE wall may be constructed while maintaining FS = 2.5

time (days)	u_e (psf)	
$t=0$	3000	- End of Construction of 20' Stage.
$t=77$	1200	- Excess Pore Water Pressures have dissipated.
$t=78$	3000	- Added 15' to Completion height of 35'.

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CLIENT Tran Systems Corp. / ODOT D-9 PROJECT NO. 0121-3070.03
PROJECT SCI-823 Portsmouth Bypass SHEET NO. 11 OF 20
SUBJECT Consolidation Parameters COMP. BY SJR DATE 9-29-06
US-23 Interchange - Ramp C CHECKED BY TAM DATE 10-4-06

* Settlement Parameters Estimated from moistures as per FHWA NHI-00-045.

B-1120 / 1121 H=35'

543.0 ~ ① Compacted Gran. Fill (Incompressible)
540.0 —
534.0 ② γ=125 pcf $\bar{\omega}$=20% C_c=0.20 C_r=0.02 e_o=0.53
526.0 ③ γ=125 pcf $\bar{\omega}$=25% C_c=0.25 C_r=0.025 e_o=0.66
518.0 ④ γ=115 pcf $\bar{N}\simeq 15$ @18' σ_o=2250 psf N'/N=0.91 $\bar{N}'=(0.91)(15)=14$
BED ROCK

from FHWA NHI-00-045 → C'=70

Groundwater Table at 533.0'

* The Program EMBANK requires inputs in the form of C_c or C_r.

∴ For C & F Sand layer, find equivalent parameters.

$\bar{N}\simeq 14 \rightarrow C'\simeq 70$

$$\frac{1}{C'} = \frac{C_c}{1+e_o}$$ Say e_o=1.0

$$\frac{1}{70} = \frac{C_c}{1+1.0}$$

$$C_c = \frac{2}{70} = 0.0286$$

B-1124 H=13'

533.5
530.5 ① COMPACTED GRAN. FILL Assumed Incompressible
525.5 ② γ=125 pcf $\bar{\omega}$=30% C_c=0.30 C_r=0.03 e_o=0.81
523.0 ③ γ=125 pcf $\bar{\omega}$=25% C_c=0.25 C_r=0.025 e_o=0.68
520.5 ④ γ=120 pcf $\bar{\omega}$=29% C_c=0.29 C_r=0.029 e_o=0.78
514.0 ⑤ γ=120 pcf $\bar{\omega}$=15% C_c=0.15 C_r=0.15 e_o=0.41
BEDROCK

Groundwater Table at 523.5'

US-23 Ramp C B-1120-1121 Cont

ÚÄÄÄÄÄ ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration ÄÄÄÄÄ¿
STRIP SYMMETRICAL VERTICAL EMBANKMENT LOADING

Project Name : SCI-823 Portsmouth Client : TranSystems Corp
File Name : US-23 Ramp C Project Manager : Nix
: Borings B-1121/1120
Date : 9/29/10 Computed by : SJR
V'd :TAH

Settlement for X-Direction

Embankment slope a	= 1.00 (ft)	Height of fill H	= 35.00 (ft)
Embankment top width	= 29.00 (ft)	Unit weight of fill	= 120.00 (pcf)
Embankment bottom width	= 31.00 (ft)	p load/unit area	= 4200.00 (psf)
Ground Surface Elev.	= 543.00 (ft)	Foundation Elev.	= 543.00 (ft)
Water table Elev.	= 533.00 (ft)	Unit weight of Wat.	= 62.40 (pcf)

N§.	LAYER TYPE	THICK. (ft)	COEFFICIENT COMP.	RECOMP.	SWELL.	UNIT WEIGHT (pcf)	SPECIFIC GRAVITY	VOID RATIO
1	INCOMP.	3.0	-----	-----	-----	120.00	----	----
2	COMP.	6.0	0.200	0.020	0.000	125.00	2.65	0.53
3	COMP.	8.0	0.250	0.025	0.000	125.00	2.65	0.66
4	COMP.	8.0	0.028	0.000	0.000	115.00	2.65	1.00

N§.	SUBLAYER THICK. (ft)	ELEV. (ft)	SOIL STRESSES INITIAL (psf)	MAX.PAST PRESS. (psf)
1	INCOMP.			
2	6.00	537.00	735.00	735.00
3	8.00	530.00	1422.80	1422.80
4	8.00	522.00	1883.60	1883.60

Layer	X = Stress (psf)	0.00 Sett. (in.)	X = Stress (psf)	2.00 Sett. (in.)	X = Stress (psf)	4.00 Sett. (in.)	X = Stress (psf)	6.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	1872.73	5.18	2731.61	6.34	3375.10	7.04	3743.80	7.39
3	1940.91	5.40	2338.15	6.10	2705.49	6.69	3015.43	7.14
4	1854.66	0.40	2079.69	0.43	2292.23	0.46	2483.03	0.49
		10.98		12.88		14.19		15.02

Settlement at Wall face

Layer	X = Stress (psf)	8.00 Sett. (in.)	X = Stress (psf)	10.00 Sett. (in.)	X = Stress (psf)	12.00 Sett. (in.)	X = Stress (psf)	14.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	3933.59	7.56	4029.77	7.64	4078.15	7.68	4099.96	7.70
3	3256.22	7.47	3429.02	7.70	3541.16	7.85	3600.47	7.92
4	2644.63	0.51	2771.76	0.53	2861.22	0.54	2911.33	0.55
		15.54		15.87		16.07		16.17

US-23 Ramp C B-1120-1121 Cont

Layer	X = Stress (psf)	16.00 Sett. (in.)
1	INCOMP.	
2	4103.95	7.70
3	3612.07	7.94
4	2921.39	0.55
		16.18

Settlement at Ramp C.

ÀÄÄÄÄÄ Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu ÄÄÄÄÄÙ

US-23 Ramp C B-1120-1121 End

ÚÄÄÄÄÄ ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration ÄÄÄÄÄ¿
³ INCREMENT OF STRESSES BENEATH THE END OF FILL CONDITION ³

Project Name	: SCI-823 Portsmouth	Client	: TranSystems Corp
File Name	: US-23 Ramp C	Project Manager	: Nix
	: Borings B-1120/1121		
Date	: 9/29/10	Computed by	: SJR

V'd : TAA

Settlement for X-Direction

Embank. slope, x direc. =	1.00 (ft)	Height of fill H =	35.00 (ft)
y direc. =	1.00 (ft)	Unit weight of fill =	120.00 (pcf)
Embankment top width =	30.00 (ft)	p load/unit area =	4200.00 (psf)
Embankment bottom width =	32.00 (ft)	Foundation Elev. =	543.00 (ft)
Ground Surface Elev. =	543.00 (ft)		
Water table Elev. =	533.00 (ft)	Unit weight of Wat. =	62.40 (pcf)

N§.	LAYER TYPE	THICK. (ft)	COEFFICIENT COMP.	RECOMP.	SWELL.	UNIT WEIGHT (pcf)	SPECIFIC GRAVITY	VOID RATIO
1	INCOMP.	3.0	-----	-----	-----	120.00	----	----
2	COMP.	6.0	0.200	0.020	0.000	125.00	2.65	0.53
3	COMP.	8.0	0.250	0.025	0.000	125.00	2.65	0.66
4	COMP.	8.0	0.028	0.000	0.000	115.00	2.65	1.00

N§.	SUBLAYER THICK. (ft)	ELEV. (ft)	SOIL STRESSES INITIAL (psf)	MAX.PAST PRESS. (psf)
1	INCOMP.			
2	6.00	537.00	735.00	735.00
3	8.00	530.00	1422.80	1422.80
4	8.00	522.00	1883.60	1883.60

Layer	X = Stress (psf)	0.00 Sett. (in.)	X = Stress (psf)	2.00 Sett. (in.)	X = Stress (psf)	4.00 Sett. (in.)	X = Stress (psf)	6.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	844.33	3.13	1220.62	4.00	1503.86	4.55	1668.60	4.84
3	925.80	3.15	1113.36	3.63	1287.06	4.05	1434.17	4.38
4	904.63	0.23	1014.12	0.25	1117.85	0.27	1211.44	0.29
		6.50		7.88		8.87		9.51

Layer	X = Stress (psf)	8.00 Sett. (in.)	X = Stress (psf)	10.00 Sett. (in.)	X = Stress (psf)	12.00 Sett. (in.)	X = Stress (psf)	14.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	1754.97	4.99	1799.59	5.06	1822.62	5.10	1833.69	5.11
3	1549.26	4.63	1632.88	4.80	1688.56	4.91	1720.14	4.98
4	1291.40	0.30	1355.26	0.32	1401.55	0.32	1429.53	0.33
		9.92		10.18		10.33		10.42

US-23 Ramp C B-1120-1121 End

	X =	16.00
Layer	Stress (psf)	Sett. (in.)
1	INCOMP.	
2	1836.98	5.12
3	1730.35	5.00
4	1438.88	0.33
		10.45

Max. Settlement at End of MSE wall

ÀÄÄÄÄÄ Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu ÄÄÄÄÄÙ

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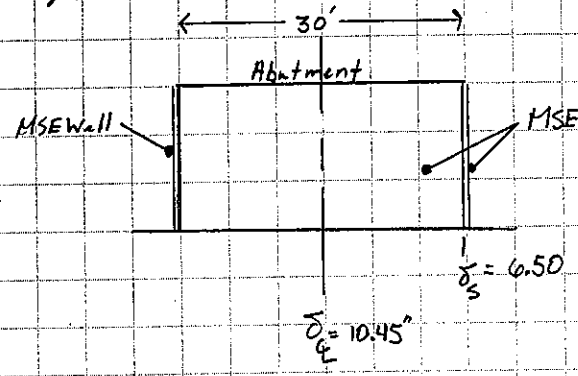
CLIENT TranSystems Corp / ODOT D-9
PROJECT SCI-823 Portsmouth Bypass
SUBJECT Ramp C Differential Settlement

PROJECT NO. 0121-3070.03
SHEET NO. 16 OF 20
COMP. BY SJR DATE 10-2-06
CHECKED BY TAN DATE 10-4-06

* Differential Settlement Based upon borings B-1120 & B-1121.

1.) Assume End of fill condition using Embank



$$\text{Differential Settlement} = \frac{(10.45" - 6.50")\left(\frac{1\text{ ft}}{12\text{ in.}}\right)}{(30\text{ ft}/2)} = 0.022$$

Differential Settlement = 2.2% > 1.0% ✓

DLZ

SUBJECT

Client	TranSystems ODOT D-9
Project	SCI 823-0.00 Portsmouth Bypass
Item	Single Wall with Embankment
	US-23 Ramp C Boring B-1124 13' Single Wall

JOB NUMBER	0121-3070.03		
SHEET NO.	17	OF	20
COMP. BY	SJR	DATE	10/03/06
CHECKED BY	TRN	DATE	10-4-06

STABILITY OF MSE WALL

Assumptions:

1 Estimated height of embankment; H=13'
2 It is assumed that the bridge is supported on piles
3 Ground water; Dw=0.0'
4 Traffic loading is neglacted in resisting forces
5 Full Ka

Wall Properties			
H+D	= 16	feet	
γ_{mse}	= 120	pcf	
L	= 14.4	feet	
L factor	= 0.90		Length factor-range (0.7 - 1.0)
ϕ	= 30	deg	Friction Angle of Embankment Fill

Foundational Soil Properties			
c	= 2500	psf	Cohesion
ϕ'	= 29	deg	Friction angle
ω_T	= 240	psf	Traffic loading

RESISTANCE AGAINST SLIDING ALONG BASE

Thrust: $P_a = K_a\left[\frac{1}{2}\gamma H^2 + \omega_T H\right]$

K_a = 0.330 *From Coulomb

P_a = 6,336 lbs per foot of wall ✓

Resistance: $P_r = W(0.67)(\mu)$ (Drained)

where; $\mu = \tan(\phi)$ 0.67μ = 0.37

0.67μ Max. = 0.35 {AASHTO, Bridge Design Manual, 303.4.1.1}

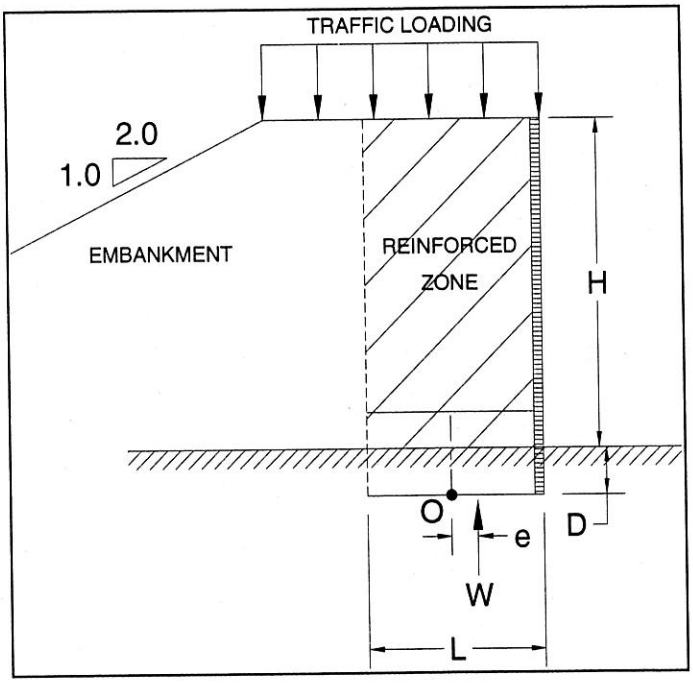
P_r = 9,677 lbs per foot of wall ✓

USE THIS VALUE

$P_r = L(c)$ (Undrained)

P_r = 36,000 lbs per foot of wall

Use Drained Value



	Calculated		Required	
$FS = \frac{P_r}{P_a}$	FS = **1.53** ✓		FS = 1.50	Resistance Against Sliding is **OK** ✓

RESISTANCE AGAINST OVERTURNING

* Summation of Moments about point "O" (base of wall).
* Traffic loading is neglected in resisting forces

$\Sigma M_{resisting}$ = 199,066 lb-ft $\quad \Sigma M_{resisting} = \gamma HL\left(\frac{L}{2}\right)$

$\Sigma M_{overturning}$ = 37,171 lb-ft $\quad \Sigma M_{overturning} = K_a\left[\frac{1}{2}\gamma H^2\left(\frac{H}{3}\right) + \omega_T H\left(\frac{H}{2}\right)\right]$

	Calculated		Required	
$FS = \frac{\Sigma M_{resisting}}{\Sigma M_{overturning}}$	FS = **5.36** ✓		FS = 2.00	Resistance Against Overturning is **OK** ✓

DLZ

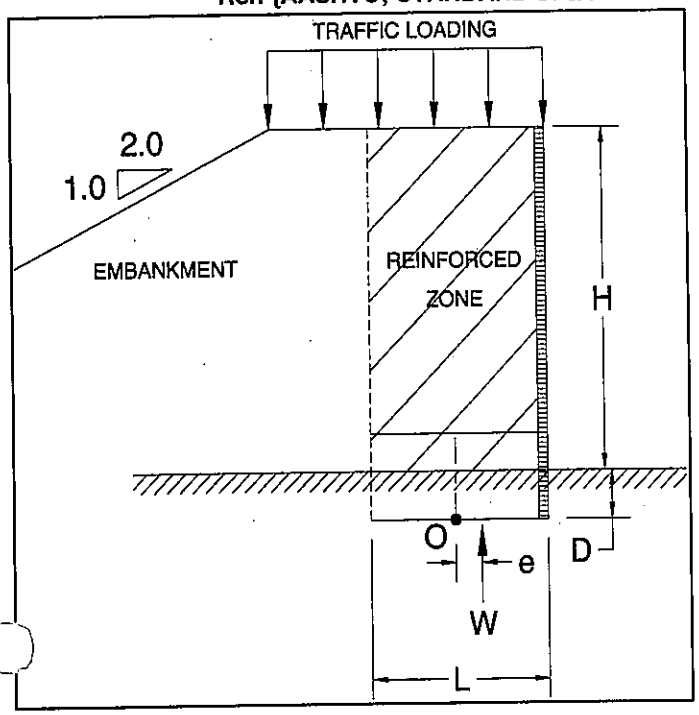
SUBJECT

Client TranSystems Corp.
Project SCI-823 Portsmouth Bypass
Item MSE Wall Bearing Capacity
Single Wall with Embankment
US-23 Ramp C Boring B-1124 13' Single MSE Wall

JOB NUMBER 0121-3070.03
SHEET NO. 18 OF 20
COMP. BY SJR DATE 10/3/06
CHECKED BY TJM DATE 10-4-06

BEARING CAPACITY OF A MSE WALL

Ref: {AASHTO; STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 17th Edition, 2002}



Soil Properties

γ_{EMB}	= 120	pcf	Unit weight	Embankment fill
ϕ'_{EMB}	= 30	deg.	Friction ang.	Embankment fill
γ_{FDN}	= 125	pcf	Unit weight	Foundation soil
c	= 1000	psf	Cohesion	Foundation soil
ϕ	= 0	deg.	Friction ang.	Foundation soil
c'	= 0	psf	Cohesion	Foundation soil
ϕ'	= 29	deg.	Friction ang.	Foundation soil

Loads and Parameters

ω_t	= 240	psf	Traffic loading	
L=B	= 14.4	ft	Length of MSE reinforcement	
L factor	= 0.9		Length factor-range (0.7 - 1.0)	
D	= 3	ft	Embedment depth	
Dw	= 0	ft	Groundwater depth	
H+D	= 16	ft		
H	= 13	ft	Height of wall	
Ka	= 0.330			
Pa	= 5.3333	ft	Moment arm	
Wt	= 8	ft	Moment arm	
B'	= 12.00	ft		
γ'	= 62.6	pcf		
W_t	3,456	lb/ft of wall	Weight from traffic	
W_{mse}	= 27,648	lb/ft of wall	Weight from MSE wall	

Effective Bearing Pressure

$$\sigma_v = \frac{W_t + W_{MSE}}{L - 2e}$$

σ_v = 2,592 psf

Ultimate undrained bearing capacity, q_{ult}

$$q_{ULT} = cN_c + \sigma'_D N_q + \frac{1}{2}\gamma' B N_\gamma$$

q_{ULT} = 5,328 psf

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 2,131 psf

Factor of Safety = **2.06** **No Good**

Ultimate drained bearing capacity, q_{ult}

$$q_{ULT} = c'N_c + \sigma'_D N_q + \frac{1}{2}\gamma' B N_\gamma$$

q_{ULT} = 10,352 psf

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 4,141 psf

Factor of Safety = **3.99** **OK**

Bearing Capacity Factors for Equations (AASHTO)

Undrained		Drained	
N_c	5.14	N_c	27.86
N_q	1.00	N_q	16.44
N_γ	0.00	N_γ	19.34

Eccentricity of Resultant Force

e = 1.20 ft

Kern

e < L/6 = 2.40 ft

US-23 Ramp C B-1124

ÚÄÄÄÄÄ ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration ÄÄÄÄÄ¿
STRIP SYMMETRICAL VERTICAL EMBANKMENT LOADING

Project Name	: SCI-823 Portsmouth	Client	: TranSystems Corp
File Name	: US-23 Ramp C B-1124	Project Manager	: Nix
Date	: 9/29/10	Computed by	: SJR

V'd: THR

Settlement for X-Direction

Embankment slope a	= 1.00 (ft)	Height of fill H	= 13.00 (ft)
Embankment top width	= 29.00 (ft)	Unit weight of fill	= 120.00 (pcf)
Embankment bottom width	= 31.00 (ft)	p load/unit area	= 1560.00 (psf)
Ground Surface Elev.	= 533.50 (ft)	Foundation Elev.	= 533.50 (ft)
Water table Elev.	= 523.50 (ft)	Unit weight of Wat.	= 62.40 (pcf)

N§.	LAYER TYPE	THICK. (ft)	COEFFICIENT COMP.	RECOMP.	SWELL.	UNIT WEIGHT (pcf)	SPECIFIC GRAVITY	VOID RATIO
1	INCOMP.	3.0	-----	-----	-----	120.00	----	----
2	COMP.	5.0	0.300	0.030	0.000	125.00	2.65	0.81
3	COMP.	2.5	0.250	0.025	0.000	125.00	2.65	0.68
4	COMP.	2.5	0.290	0.029	0.000	120.00	2.65	0.78
5	COMP.	6.5	0.150	0.015	0.000	120.00	2.65	0.41

N§.	SUBLAYER THICK. (ft)	ELEV. (ft)	SOIL STRESSES INITIAL (psf)	MAX.PAST PRESS. (psf)
1	INCOMP.			
2	5.00	528.00	672.50	672.50
3	2.50	524.25	1141.25	1141.25
4	2.50	521.75	1338.30	1338.30
5	6.50	517.25	1597.50	1597.50

Layer	X = Stress (psf)	0.00 Sett. (in.)	X = Stress (psf)	2.00 Sett. (in.)	X = Stress (psf)	4.00 Sett. (in.)	X = Stress (psf)	6.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	688.82	3.05	1034.79	4.02	1282.26	4.61	1414.06	4.89
3	718.21	0.95	927.96	1.15	1111.22	1.32	1248.86	1.43
4	721.81	0.92	886.07	1.08	1036.09	1.22	1159.28	1.32
5	712.45	1.33	827.43	1.50	935.56	1.66	1030.59	1.79
		6.24		7.76		8.80		9.44

Settlement at Wall Face

Layer	X = Stress (psf)	8.00 Sett. (in.)	X = Stress (psf)	10.00 Sett. (in.)	X = Stress (psf)	12.00 Sett. (in.)	X = Stress (psf)	14.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	1477.77	5.02	1508.68	5.08	1523.82	5.11	1530.54	5.12
3	1341.81	1.51	1400.24	1.55	1434.36	1.58	1451.19	1.59
4	1251.78	1.40	1315.94	1.45	1356.43	1.49	1377.44	1.50
5	1108.56	1.90	1167.75	1.98	1208.09	2.03	1230.16	2.06

US-23 Ramp C B-1124

	9.83	10.06	10.20	10.28

X = 16.00

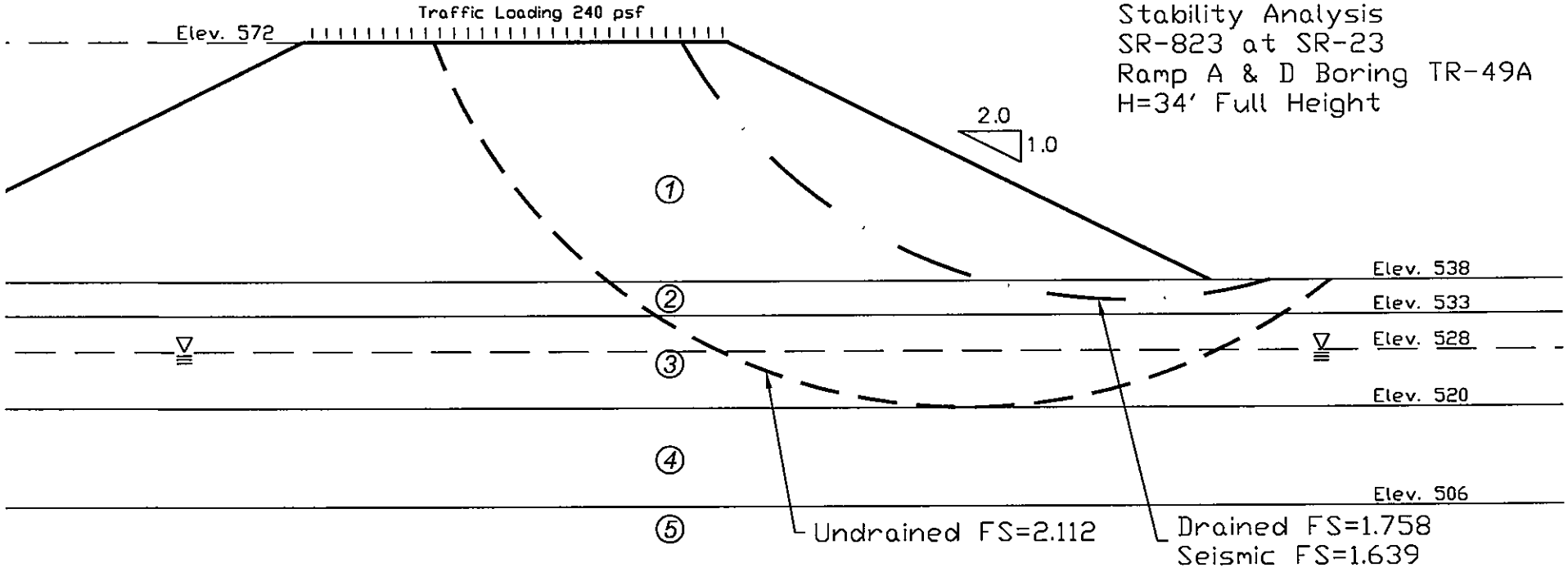
Layer	Stress (psf)	Sett. (in.)
1	INCOMP.	
2	1531.76	5.13
3	1454.39	1.59
4	1381.51	1.51
5	1234.54	2.06
		10.29

Settlement at ℄ of Ramp

ÀÄÄÄÄÄ Hit arrow keys to display next screen. <F8> Print. <F10> Main Menu ÄÄÄÄÄÙ

RAMP A & D

Material	Consistency	Soil Type	Undrained C (psf)	Undrained φ (deg)	Drained C' (psf)	Drained φ' (deg)	γ (pcf)
Material 1	Compacted	Embank Fill	2000	0	300	28	120
Material 2	Hard	Sandy Silt	2500	0	0	30	125
Material 3	Stiff	Silt and Clay	1000	0	0	29	125
Material 4	Loose	Gravel & Sand	0	32	0	32	115
Material 5		Bedrock	10000	45	10000	45	145



Stability Analysis
SR-823 at SR-23
Ramp A & D Boring TR-49A
H=34' Full Height

Sheet 1 of 4

US-23 Ramp A & D
Based on Boring TR-49A

EMBANKMENT STABILITY ANALYSIS

SCI-823-0.00

V.d: TAH

PROJECT NO. 0121-3070.03	CALC: SJR	DATE 10/2/06

M:\proj\0121\3070.03\Interchanges\US 23\embankment stability.dwg, 10/4/2006 11:43:12 AM, \\Dbztree\Q_geotechhplj5100tn

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CLIENT TranSystems Corp / ODOT D-9
PROJECT SCI-823 Portsmouth Bypass
SUBJECT Consolidation Parameters
US-23 & SR-823 Interchange Ramp A&D

PROJECT NO. 0121.3070.03
SHEET NO. 2 OF 4
COMP. BY SJK DATE 10-02-06
CHECKED BY TMM DATE 10-4-06

* Soil Profile based upon borings TR-49A and B-1140.
* Maximum Embankment height equal to approximately 34 feet.
* Ground water table at 528.1'
* Parameters Estimated From FHWA-NHI-00-045

Depth	Elev.	
0.0	538.1	Embankment Loading ↓ ↓ ↓ ↓ ↓ ↓ ↓
		Hard Sandy Silt $\gamma = 125$
		$\bar{\omega} = 20\%$ LL = 21
50	533.1	Stiff Silt & Clay $\gamma = 125$
		$\bar{\omega} = 22\%$ LL = 33
18.0	520.1	Loose Sand & Gravel $\gamma = 115$
		$\bar{N} \simeq 16$ $N' \simeq 13$ $C' \simeq 60$
32.0	506.1	BEDROCK

$C_c = 0.20$ $C_r = 0.02$ $e_o = 0.53$
$C_v \simeq 0.4\ ft^2/day$ {Estimated as per FHWA, based on LL}
$C_c = 0.22$ $C_r = 0.02$ $e_o = 0.58$
$C_v \simeq 0.3\ ft^2/day$ {Estimated as per FHWA, based on LL}
$C' = 60$

* From Consolidation Testing in B-1108A, soils are assumed to be normally consolidate.

Time-Rate of Consolidation

* Assume Double Drainage
$H_v = 18.0/2 = 9'$

$$t_{90} = \frac{T \cdot H_v^2}{C_v}$$ for $U = 90$ (90% Consolidation) $\rightarrow T = 0.848$

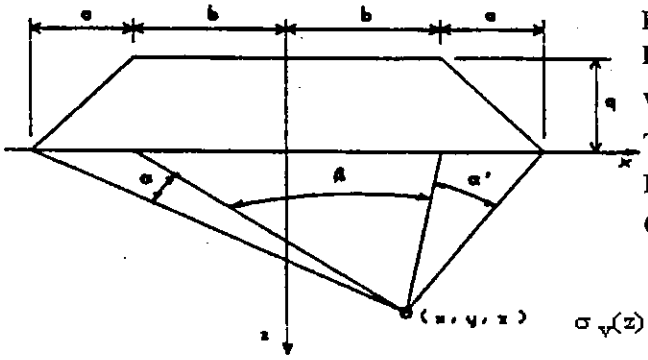
$$t_{90} = \frac{(0.848)(18/2)^2}{(0.30\ ft^2/day)} = 229 \text{ days} \quad \text{(Without Wick Drains)}$$

DLZ

SUBJECT	Client TranSystems Corp. / ODOT D-9	JOB NUMBER	0121-3070.03
	Project SCI-823 Portsmouth Bypass	SHEET NO.	3 OF 4
	Item Embankment Consolidation	COMP. BY	SJR DATE 10/02/06
	US-23 and SR-823 Interchange Ramp A&D	CHECKED BY	TJM DATE 10-4-06

SETTLEMENT ANALYSIS - EMBANKMENT

Embankment Informaiton:



Groundwater Table:	D=	10.0	ft			
Embankment Height:	H =	34	ft			
Fill Unit Weight:	γ_{emb} =	120	pcf	q =	4,080	psf ✓
Width of Slope:	a =	68 ✓				
Top half-width of Emb:	b =	30 ✓				
Distance from CL:	x =	0				
Output Range:	z =	0	to	32	ft	

**See Data output Attached*

$$\sigma_v(z) := \left\{\frac{q}{\pi}\right\}\left(a\cdot(\alpha(z)+\beta(z)+\alpha'(z)) + b\cdot(\alpha(z)+\alpha'(z)) + x\cdot(\alpha(z)-\alpha'(z))\right)$$

$$\beta(z) := \operatorname{atan}\left[\frac{(b-x)}{z}\right] + \operatorname{atan}\left[\frac{(b+x)}{z}\right] \qquad \alpha'(z) := \operatorname{atan}\left[\frac{(a+b-x)}{z}\right] - \operatorname{atan}\left[\frac{(b-x)}{z}\right] \qquad \alpha(z) := \operatorname{atan}\left[\frac{(a+b+x)}{z}\right] - \operatorname{atan}\left[\frac{(b+x)}{z}\right]$$

Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

Soil Properites: *Settlement is calculated at mid-point of layer*

No.	Bot. of Laye	Soil Type	γ_{soil} (pcf)	σ'_c (psf)	σ'_o (psf)	$\Delta\sigma z$ (psf)	σ'_f (psf)	Cohesionless Soils C'	Cohesive Soils C_r	Cohesive Soils C_c	Cohesive Soils e_o
1	5.0 ft	Sandy Silt	125	313	313	4,080 ✓	4,392 ✓	0.0	0.02	0.20	0.530
2	18.0 ft	Silt and Clay	125	1,344	1,344	4,063 ✓	5,407 ✓	0.0	0.02	0.22	0.580
3	32.0 ft	Sand & Grvl	115	2,119	2,119	3,942 ✓	6,061 ✓	60.0	0.00	0.00	0.000
4	0.0		0	0							
5	0.0		0	0							
6	0.0		0	0							
7	0.0		0	0							
8	0.0		0	0							
9	0.0		0	0							
10	0.0		0	0							

No.	Settlement:	
1	0.750	ft
2	1.094	ft
3	0.106	ft
4		
5		
6		
7		
8		
9		
10		

Total Settlement

1.951 ft ✓

23.4 in ✓

Reference: Geotechnical Engineering Principles and Practices; Coduto, 1999

Overconsolidated Soils - Case I ($\sigma'_0<\sigma'_c$) Eqn:11.24

$$(\delta_c)_{ult} = \sum \frac{C_r}{1+e_0} H \log\left(\frac{\sigma'_f}{\sigma'_0}\right)$$

Overconsolidated Soils - Case II ($\sigma'_0<\sigma'_c<\sigma_f$) Eqn:11.25

$$(\delta_c)_{ult} = \sum\left[\frac{C_r}{1+e_0} H \log\left(\frac{\sigma'_c}{\sigma'_0}\right) + \frac{C_c}{1+e_0} H \log\left(\frac{\sigma'_f}{\sigma'_c}\right)\right]$$

Normally Consolidated Soils ($\sigma'_0=\sigma'_c$) Eqn: 11.23

$$(\delta_c)_{ult} = \sum \frac{C_c}{1+e_0} H \log\left(\frac{\sigma'_f}{\sigma'_0}\right)$$

Reference: FHWA NHI-00-045

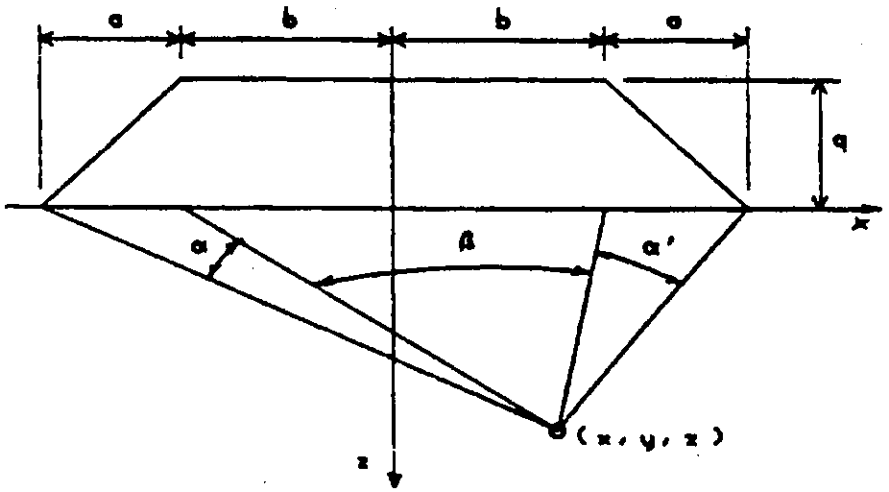
Cohesionless Soils ($\sigma'_0=\sigma'_c$)

$$(\delta_c)_{ult} = \sum \frac{1}{C'} H \log\left(\frac{\sigma'_f}{\sigma'_0}\right)$$

DLZ SUBJECT

Client	TranSystems Corp. / ODOT D-9	JOB NUMBER	
Project	SCI-823 Portsmouth Bypass	SHEET NO.	4 OF 4
Item	Embankment Consolidation	COMP. BY	SJR DATE 10-4-06
	US-23 and SR-823 Interchange Ramp A&D	CHECKED BY	TAM DATE 10-4-06

INCREASE IN VERTICAL STRESS DUE TO EMBANKMENT LOADING



q = 4080 ✓ load

a = 68 ✓ width of slope

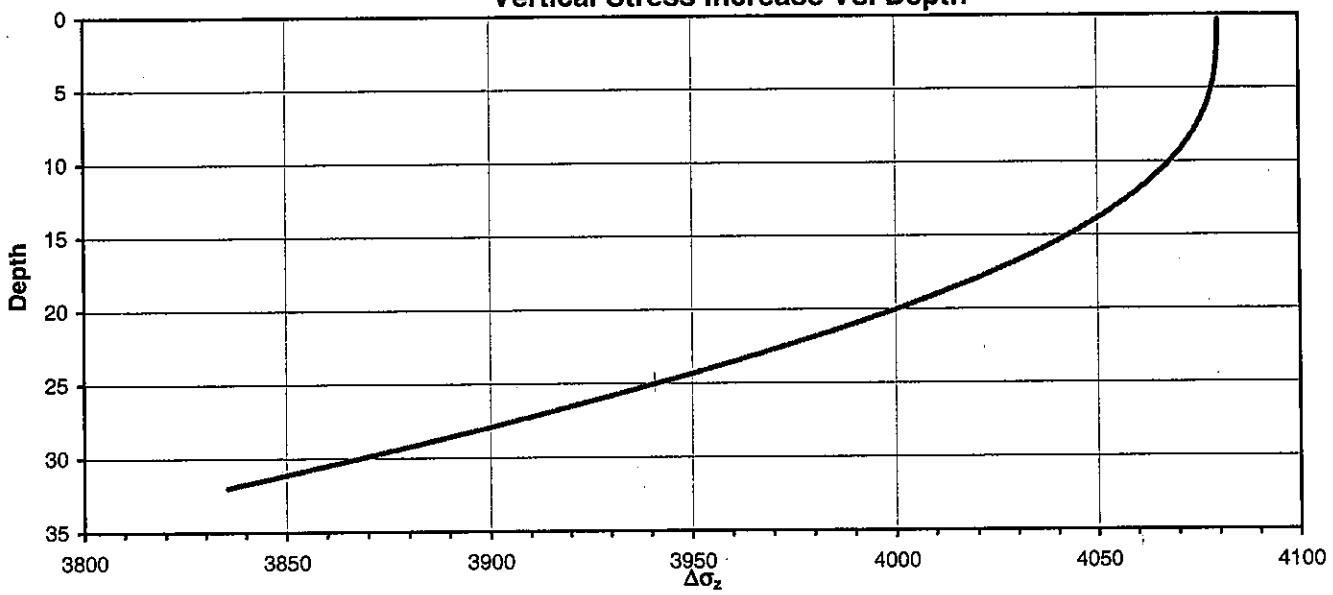
b = 30 ✓ top half-width of embankment

x = 0 distance from CL

z = 0 to 32 depth range

$$\sigma_v(z) := \left(\frac{q}{\pi}\right)\left(a\cdot(\alpha(z)+\beta(z)+\alpha'(z))+b\cdot(\alpha(z)+\alpha'(z))+x\cdot(\alpha(z)-\alpha'(z))\right)$$

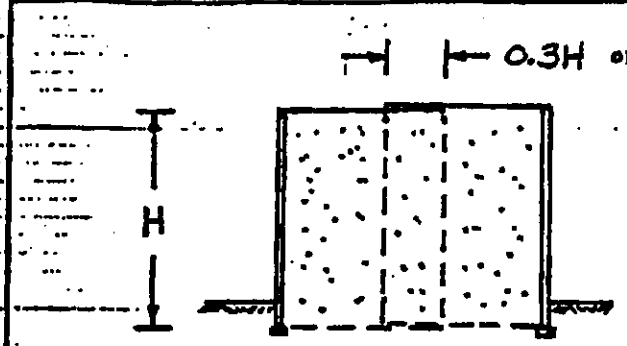
$$\beta(z) := \operatorname{atan}\left[\frac{(b-x)}{z}\right]+\operatorname{atan}\left[\frac{(b+x)}{z}\right] \quad ; \quad \alpha'(z) := \operatorname{atan}\left[\frac{(a+b-x)}{z}\right]-\operatorname{atan}\left[\frac{(b-x)}{z}\right] \quad \alpha(z) := \operatorname{atan}\left[\frac{(a+b+x)}{z}\right]-\operatorname{atan}\left[\frac{(b+x)}{z}\right]$$



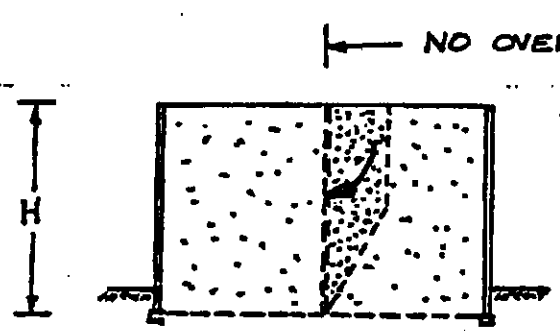
Reference: US Army Corps of Engineers EM 1110-1-1904 "Settlement Analysis", Table C-1

BACK TO BACK WALLS – REDUCED E.P. AS f OF DISTANCE APART

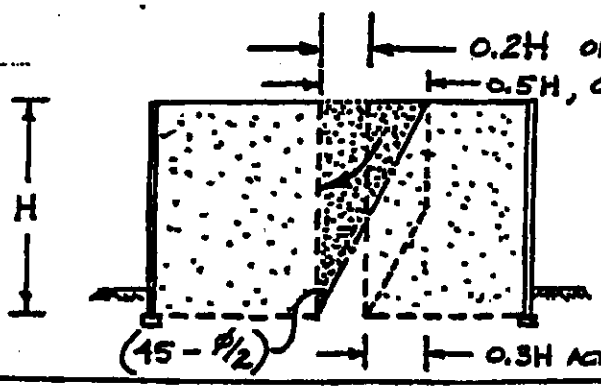
AS SUGGESTED BY ROD SMITH – REINFORCED EARTH – U.K.
MODIFIED BY P. ANDERSON BASED ON SMALL SCALE MODEL



ZERO E.P. DUE TO REINFORCEMENT PROVIDED IN BOTH DIRECTIONS, IMMOBILIZING THE POSSIBILITY OF AN ACTIVE ZONE DEVELOPING.



REDUCED E.P. – ASSUME 60% OF FULL E.P. BASED ON LINEAR INTERPOLATION BETWEEN TWO LIMITING EARTH PRESSURES (SEE PLOT AT BOTTOM OF PAGE)



FULL ACTIVE E.P.
FULL COULOMB WEDGE IS POSSIBLE TO DEVELOP

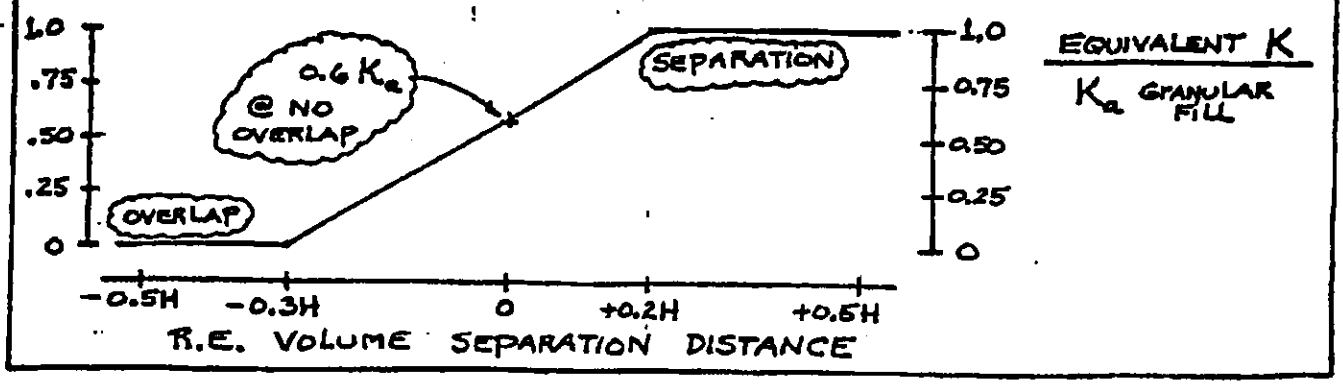


FIGURE 1

Form FHWA-391 (Rev. 11-67)

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
MINUTE - MEMO

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SUBJECT
Double Faced Mechanically Stabilized Embankments (cont.)

TO	MESSAGE/COMMENT	FROM/DATE
	Based on model studies performed by the Reinforced Earth Company B/H ratios should never be less than .6 (this may differ for other systems but I am not aware of any other research work). This criteria applies to all three cases.	

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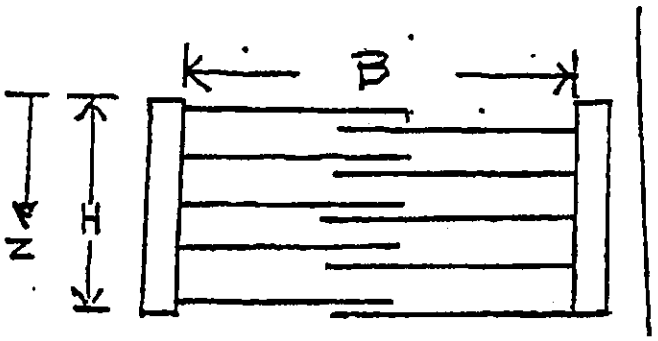
SUBJECT
Double Faced Mechanically Stabilized Embankment (cont.)

TO	MESSAGE/COMMENT	FROM/DATE

In this case, the base to height ratio is such that an independent analysis of each wall indicates the reinforcements from the two walls would overlap and hence interact. To save materials, some wall suppliers have used a single reinforcement layer which is connected to both wall faces. Potential construction and performance problems associated with this detail include difficulty in maintaining the wall alignment during erection and wall distortions which may occur when differential settlement between the walls takes place. Problems in design include how to analyze seismic forces and earth pressure at the wall face. Since the wall will be backfilled in a confined state, at-rest earth pressures (possibly higher) should be used for the entire wall height. For external stability analysis earth pressure at the back of the reinforced volume is equal to zero.

Case III



This situation is similar to case II, the reinforcements overlap but individual reinforcements are provided for each wall. Each wall is designed independently using conventional design theory except:

1. Earth pressure at the back of the reinforced volume is equal to zero. only IF overlap is 0.3H or better
2. Earth pressure at the wall face is computed based on $K\gamma Z$(overburden). ie, no eccentricity

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MINUTE - MEMO

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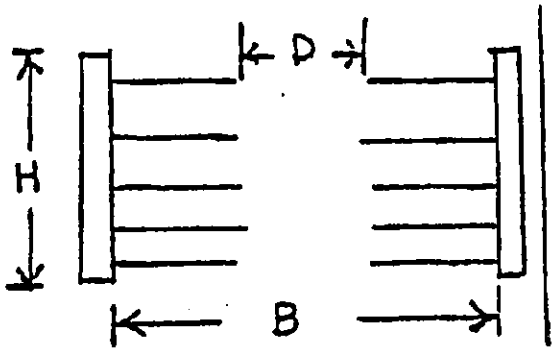
SUBJECT

Double Faced Mechanically Stabilized Embankments (MSE)

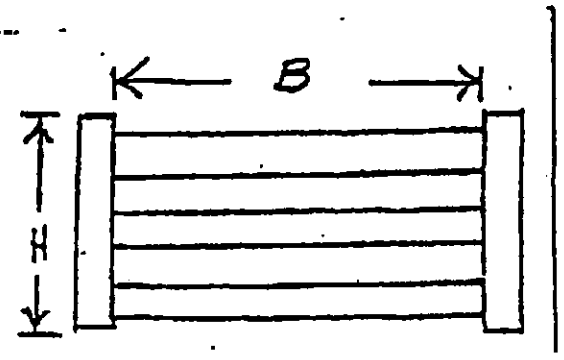
TO	MESSAGE/COMMENT	FROM/DATE
Regional Geotechnical Engineers	John Walkinshaw recently asked how double faced walls should be designed. There are two possible geometric wall situations H:B ratio large and small, and three possible reinforcement configurations, case I, II, and III.	Jerry DiMaggio HHO-33 2/20/85

Case I



The distance B is large enough so each wall is designed independently. The externally applied earth pressure can vary from full active earth pressure to zero depending on the distance D. To avoid differential settlement problems it is best to use the same backfill type within the entire embankment area between the two wall faces. When external earth pressure diagrams overlap, you can conservatively assume full active pressure.

Case II



2-27-85

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The Reinforced Earth Company
Rosslyn Center, 1700 North Moore Street, Arlington, Virginia 22209
(703) 527-3434

LOCATION: USA PROJECT NO: SHEET 1 OF 2

SUBJECT: BACK TO BACK WALLS DES: PLA CHKD: DATE: 8-25-88

BACK TO BACK WALLS - SEE FIGURE 1 (NEXT SHEET)

When reinforcing strips of back to back walls overlap by 0.3H or more, the structures may be considered as one structure with no independent action. When reinforcing strips of back to back walls just touch, the structures may behave independently with reduced pressure at the back of the mass, maybe 60% of full earth pressure is a good approximation. When the two structures become separated by 0.2H or more, no reduction in earth pressure should be considered.

When the two wall faces become very close to one another, say 0.4H apart, tieing across the structure may be necessary. When doing so, an at rest state of stress should be considered with some additional conservatism added to offset any inconsistencies produced by difficult construction.

Back to back structures have been used for highway ramps, railway embankments, containment dikes, military blast barricades, acute corner bridge abutments, side walls to dump bin structures and a railway train deflector.

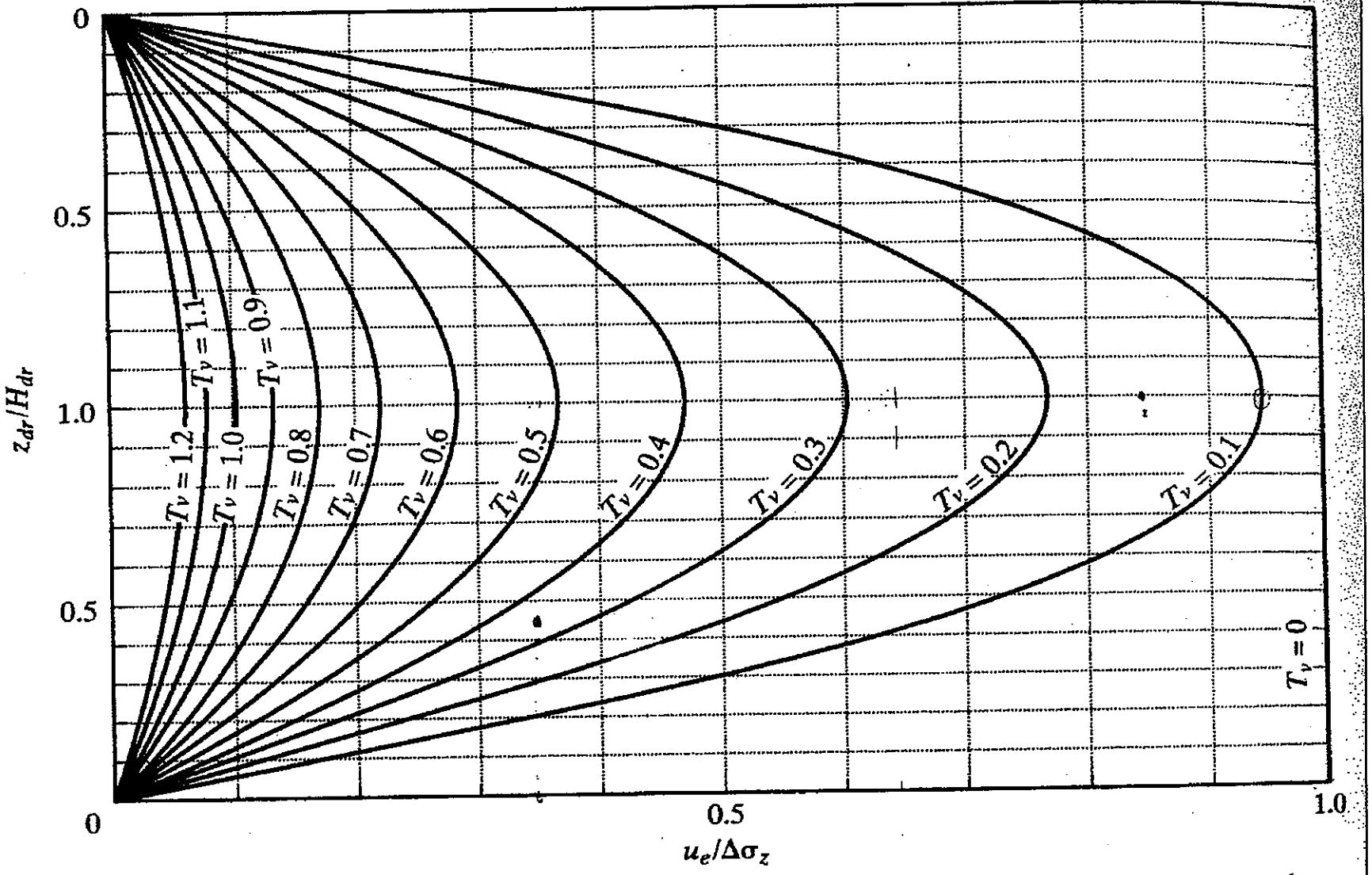


Figure 12.4 $u_e/\Delta\sigma_z$ for various values of T_v with double drainage. For the single drainage case, use only the upper half of this diagram.

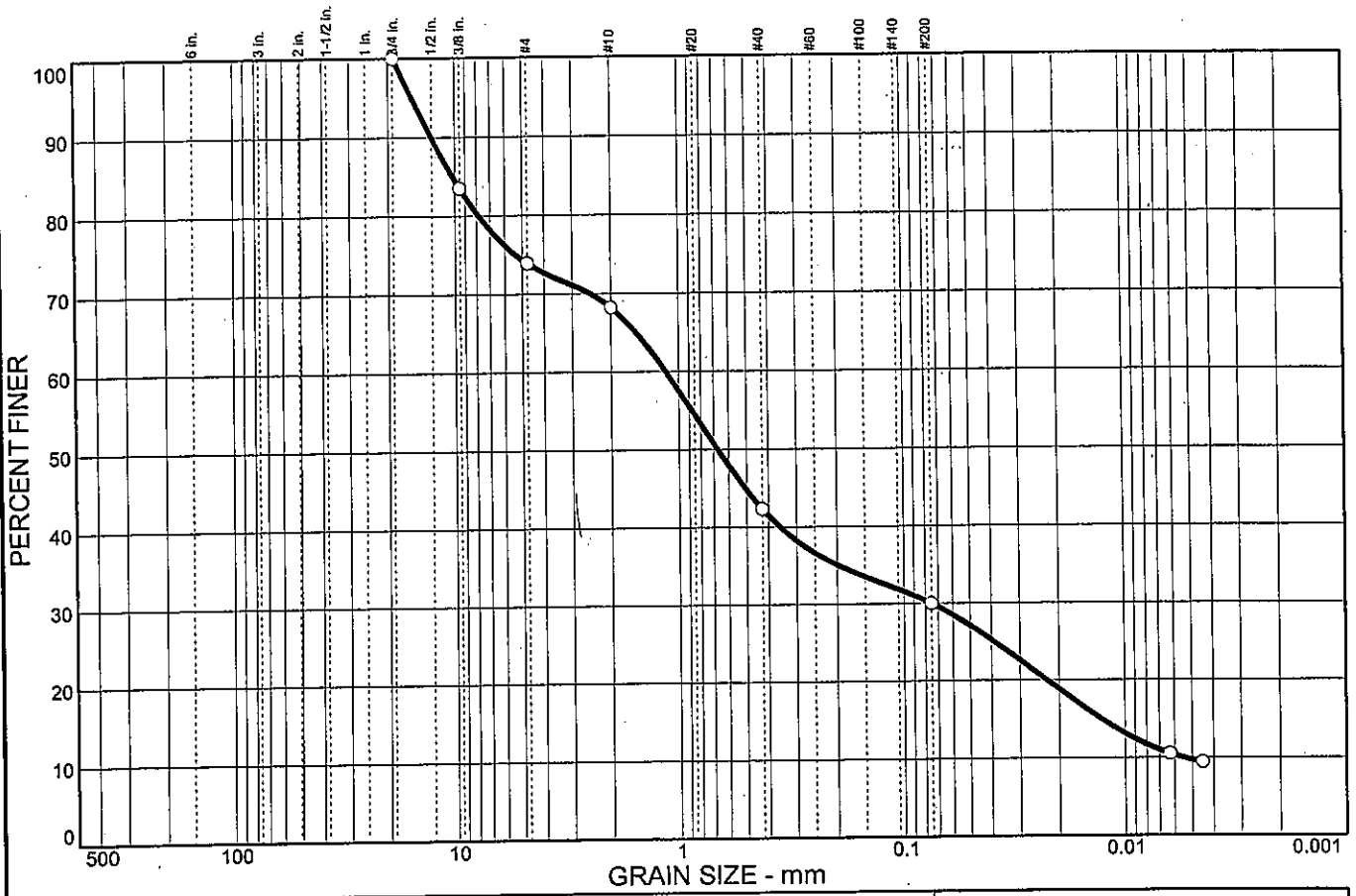
APPENDIX D

DLZ

APPENDIX D

Laboratory Test Results

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	26.1	5.7	25.9	12.3	20.3	9.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	83.5		
#4	73.9		
#10	68.2		
#40	42.3		
#200	30.0		

* (no specification provided)

Soil Description

Silty, clayey sand with gravel

Atterberg Limits

PL= 18 LL= 24 PI= 6

Coefficients

D_{85}= 10.3 D_{60}= 1.14 D_{50}= 0.672
D_{30}= 0.0750 D_{15}= 0.0128 D_{10}= 0.0055
C_u= 208.85 C_c= 0.90

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

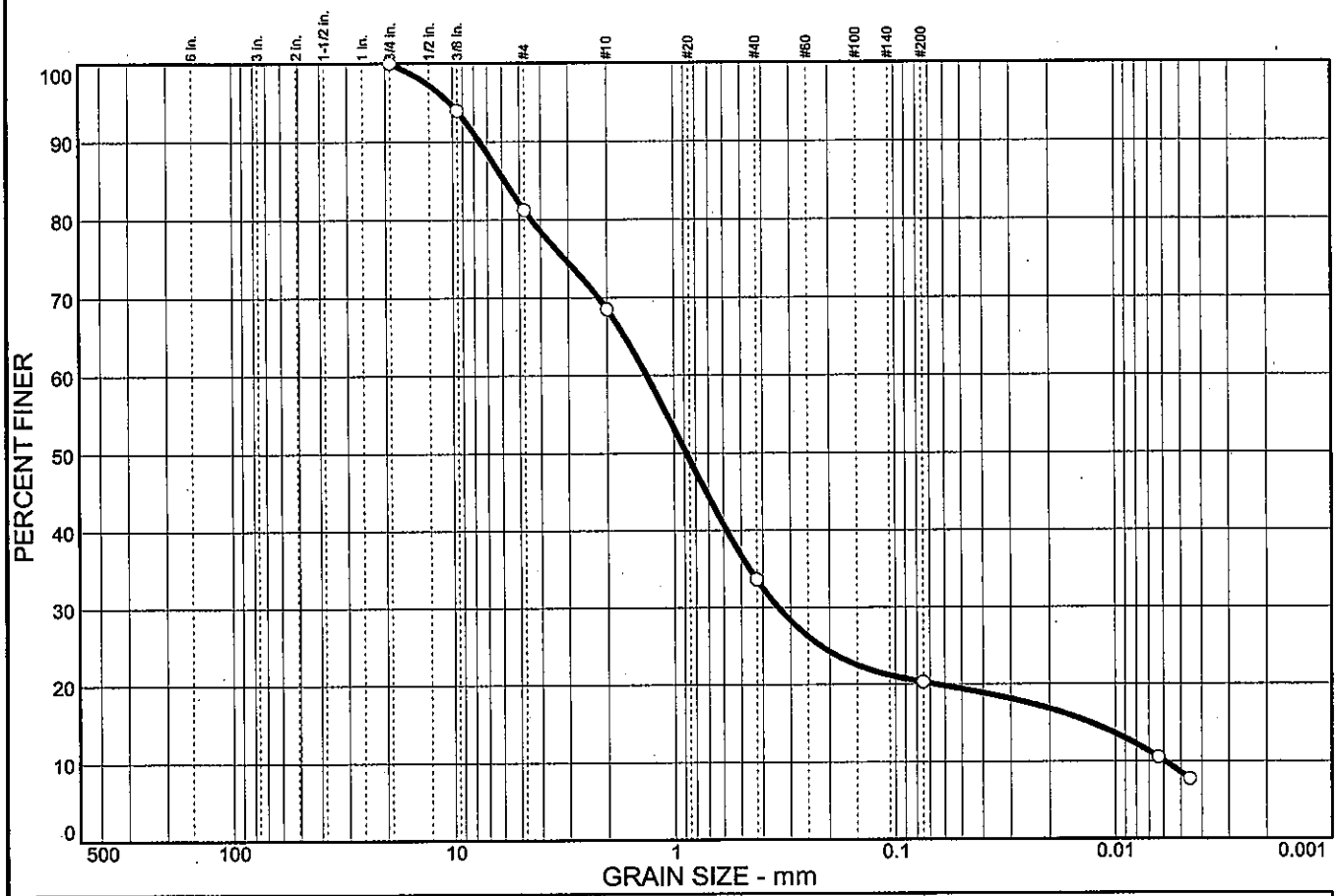
Moisture Content= 10.0%
F.M.=0.43

Sample No.: 1 **Source of Sample:** B-1101 **Date:** 8/15/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	18.8	12.7	34.9	13.3	11.7	8.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	93.9		
#4	81.2		
#10	68.5		
#40	33.6		
#200	20.3		

* (no specification provided)

Soil Description

Clayey sand with gravel

Atterberg Limits

PL= 17 LL= 27 PI= 10

Coefficients

D_{85}= 5.84 D_{60}= 1.33 D_{50}= 0.880
D_{30}= 0.340 D_{15}= 0.0129 D_{10}= 0.0059
C_u= 223.30 C_c= 14.71

Classification

USCS= SC AASHTO= A-2-4(0)

Remarks

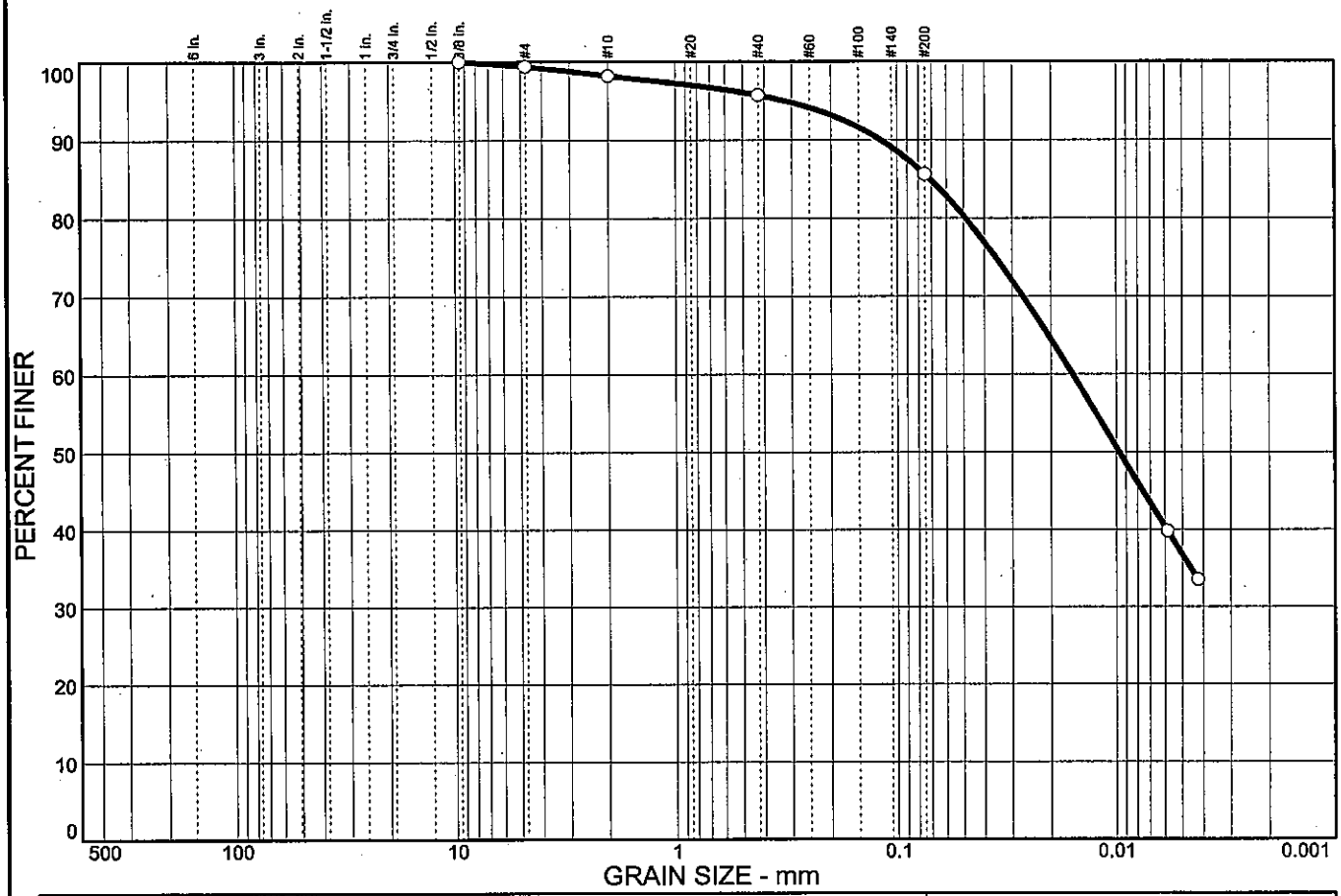
Moisture Content= 13.2%

Sample No.: 2 **Source of Sample:** B-1101 **Date:** 8/15/05
Location: **Elev./Depth:** 3.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.6	1.2	2.5	10.1	48.9	36.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.4		
#10	98.2		
#40	95.7		
#200	85.6		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 17 LL= 35 PI= 18

Coefficients

D_{85}= 0.0712 D_{60}= 0.0159 D_{50}= 0.0097
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(15)

Remarks

Moisture Content= 16.9%

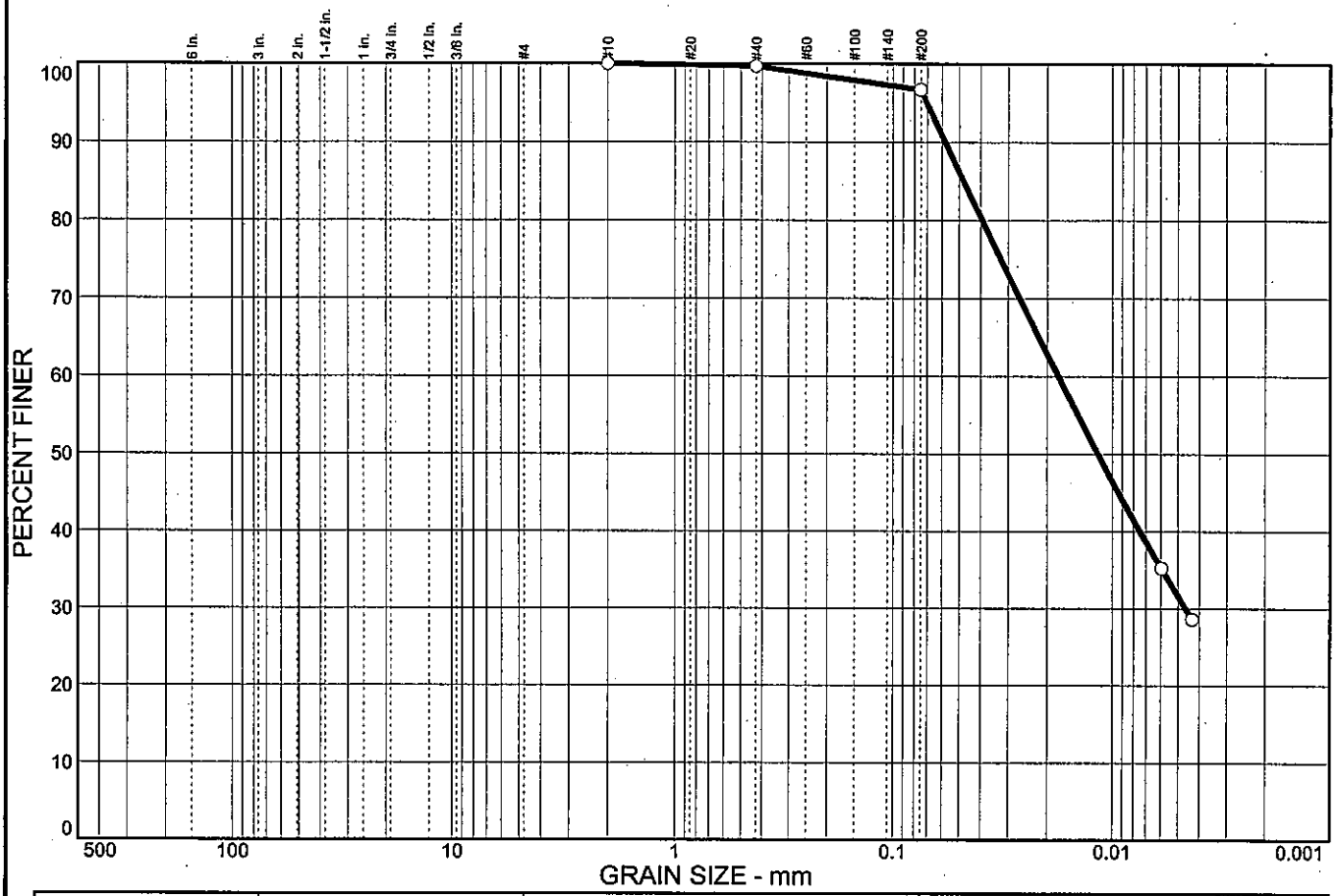
Sample No.: 1 **Source of Sample:** B-1102 **Date:** 8/15/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.3	3.0	65.1	31.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.7		
#200	96.7		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 17 LL= 27 PI= 10

Coefficients

D_{85}= 0.0478 D_{60}= 0.0178 D_{50}= 0.0117
D_{30}= 0.0046 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(8)

Remarks

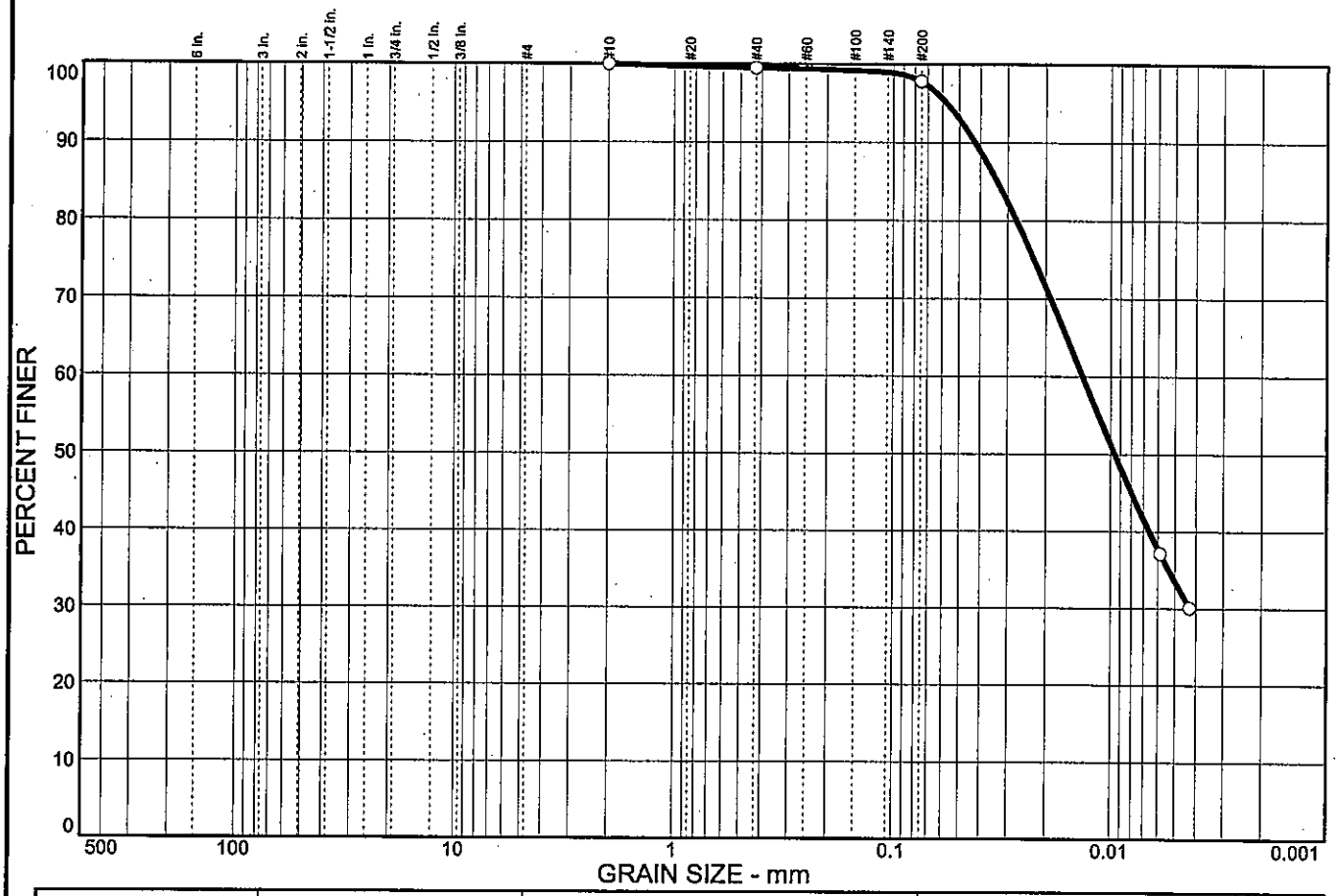
Moisture Content= 23.0%
LOI (Organic Content)= 3.82%

Sample No.: 2 **Source of Sample:** B-1102 **Date:** 8/15/05
Location: **Elev./Depth:** 3.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.5	1.7	64.3	33.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.5		
#200	97.8		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20 LL= 32 PI= 12

Coefficients

D_{85}= 0.0335 D_{60}= 0.0135 D_{50}= 0.0095
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(12)

Remarks

Moisture Content= 23.7%

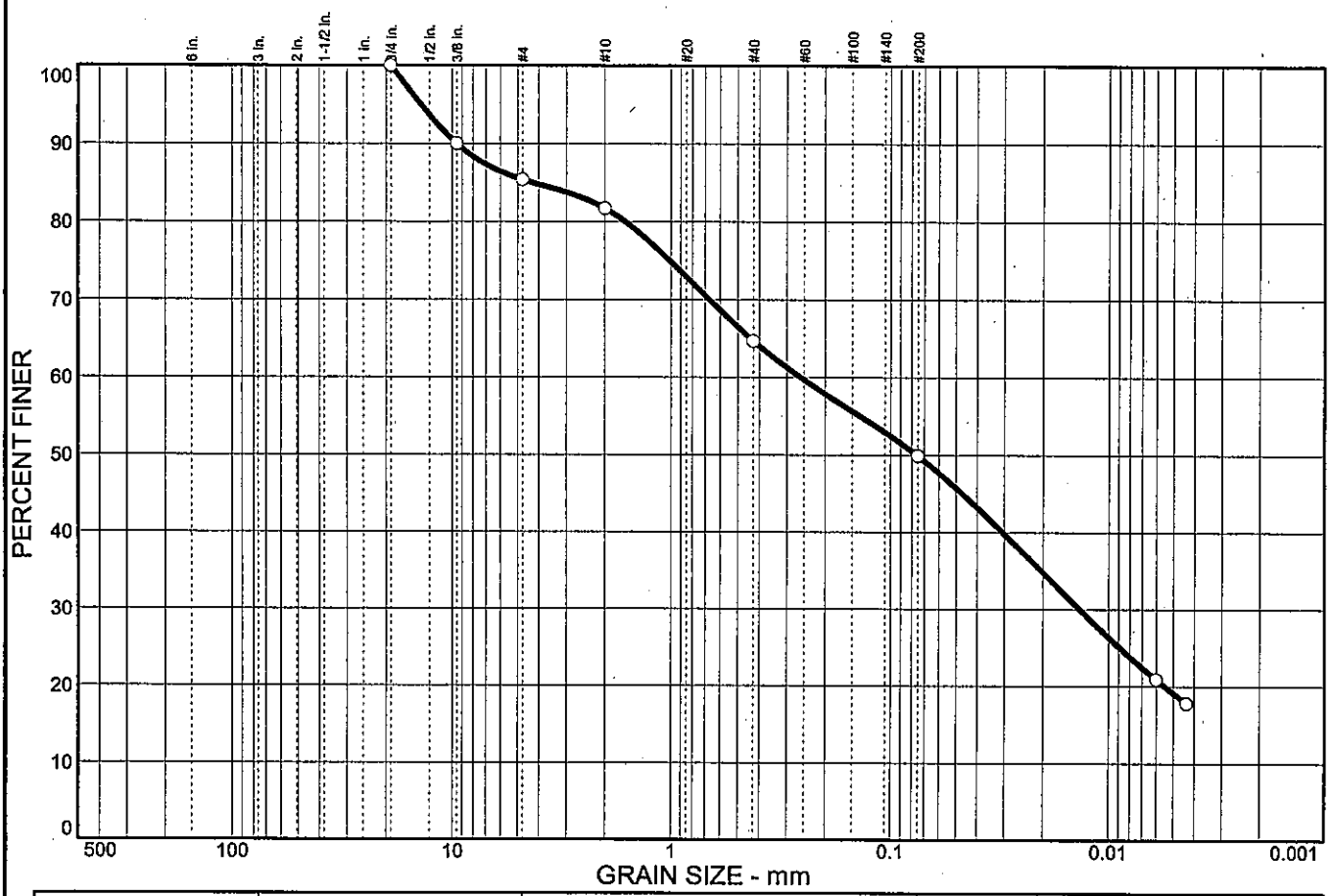
Sample No.: 3 **Source of Sample:** B-1102 **Date:** 7/28/06
Location: **Elev./Depth:** 5.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	14.6	3.7	17.0	14.8	30.8	19.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	90.0		
#4	85.4		
#10	81.7		
#40	64.7		
#200	49.9		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 17 LL= 28 PI= 11

Coefficients

D_{85}= 4.26 D_{60}= 0.258 D_{50}= 0.0758
D_{30}= 0.0136 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(2)

Remarks

Moisture Content= 12.0%

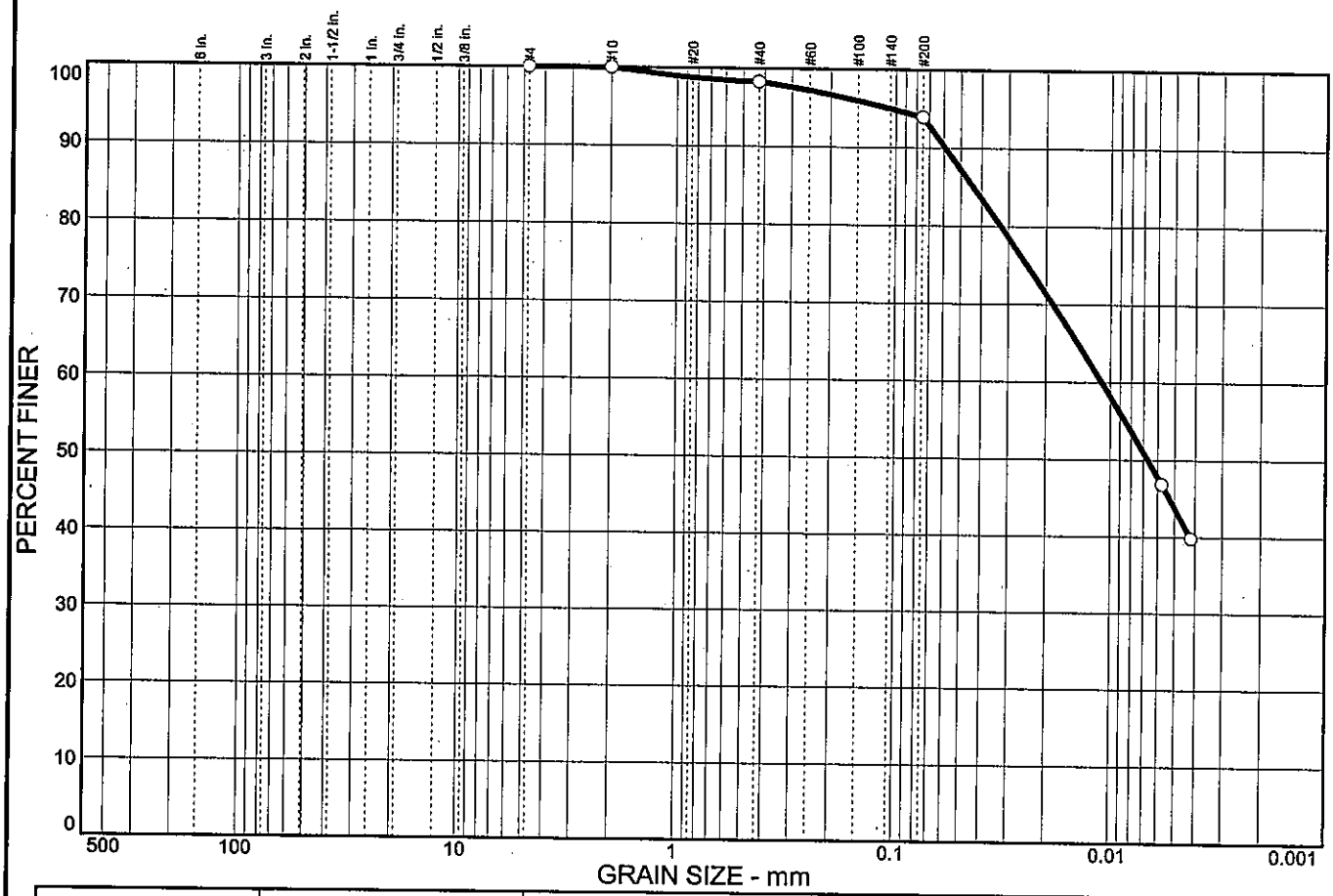
Sample No.: 1 **Source of Sample:** B-1103 **Date:** 8/15/05
Location: **Elev./Depth:** 0.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	1.7	4.4	50.1	43.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#40	98.3		
#200	93.9		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20 LL= 37 PI= 17

Coefficients

D_{85}= 0.0437 D_{60}= 0.0109 D_{50}= 0.0067
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(16)

Remarks

Moisture Content= 22.5%
LOI (Organic Content)= 4.92%

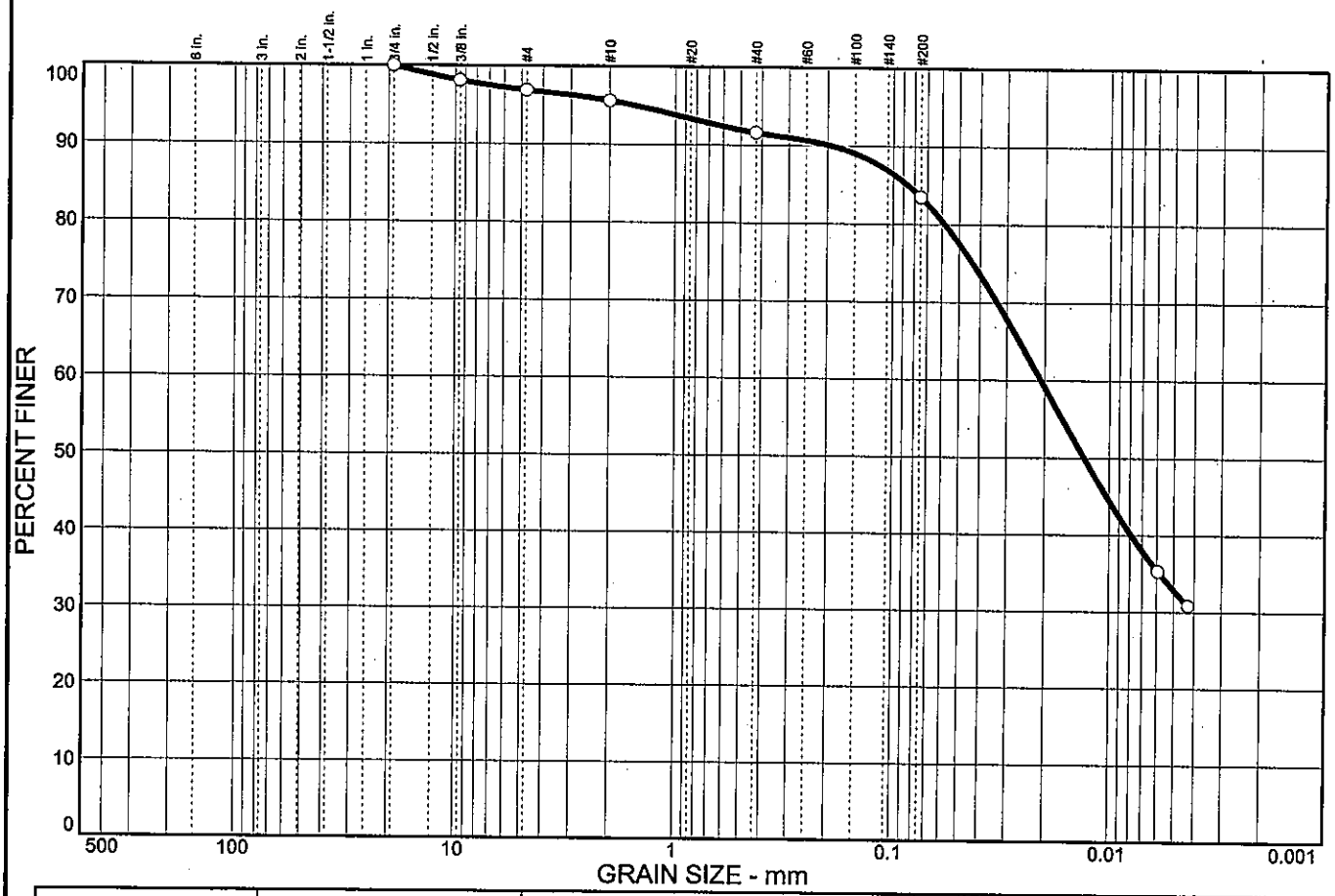
Sample No.: 2 **Source of Sample:** B-1103 **Date:** 8/15/05
Location: **Elev./Depth:** 2.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.1	1.3	4.0	8.1	50.6	32.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.1		
#4	96.9		
#10	95.6		
#40	91.6		
#200	83.5		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 18 LL= 31 PI= 13

Coefficients

D_{85}= 0.0858 D_{60}= 0.0208 D_{50}= 0.0131
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(10)

Remarks

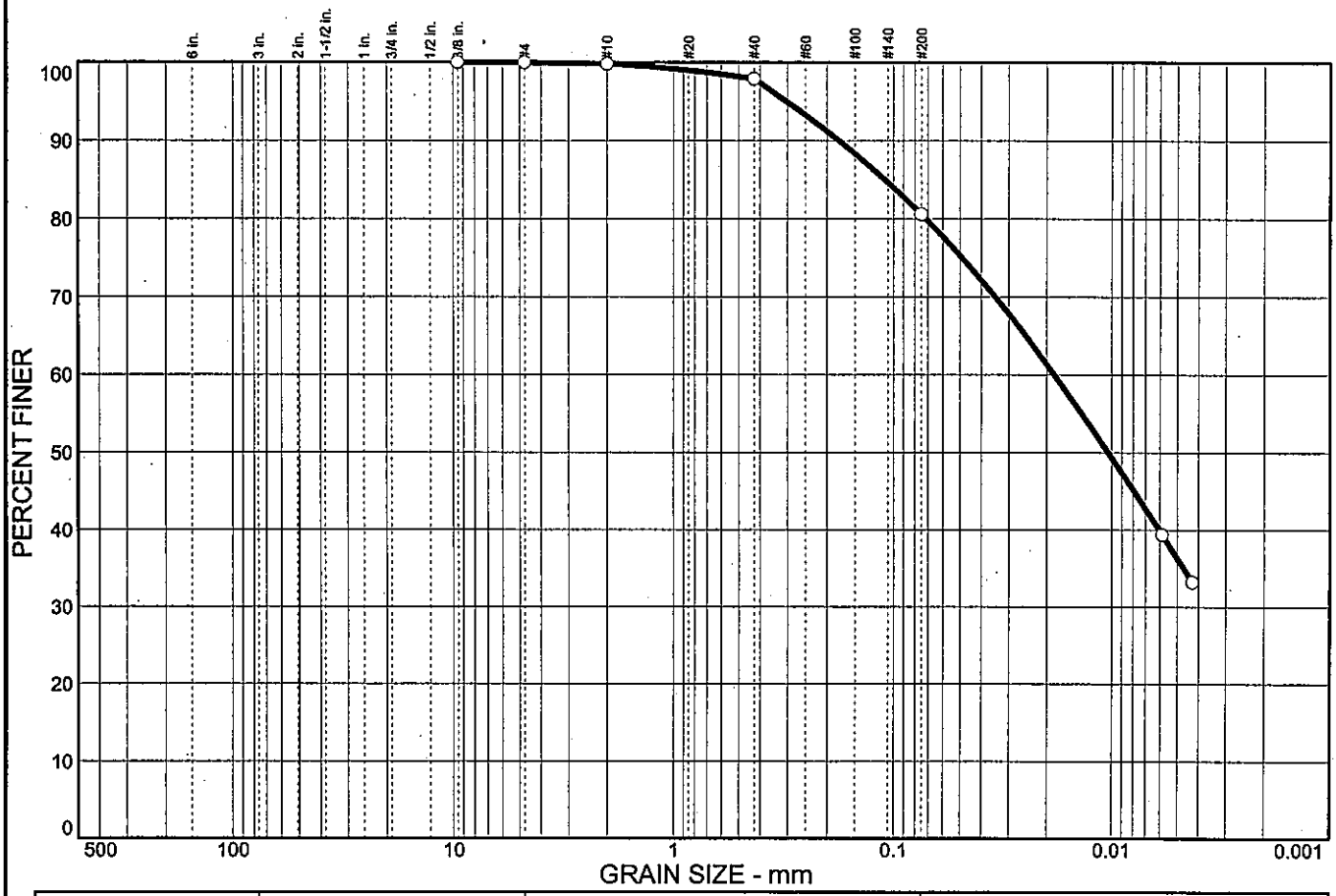
Moisture Content= 15.1%

Sample No.: 1 **Source of Sample:** B-1104 **Date:** 10/26/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.2	1.9	17.3	44.3	36.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.8		
#40	97.9		
#200	80.6		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 18 LL= 33 PI= 15

Coefficients

D_{85}= 0.109 D_{60}= 0.0184 D_{50}= 0.0104
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(11)

Remarks

Moisture Content= 18.3%

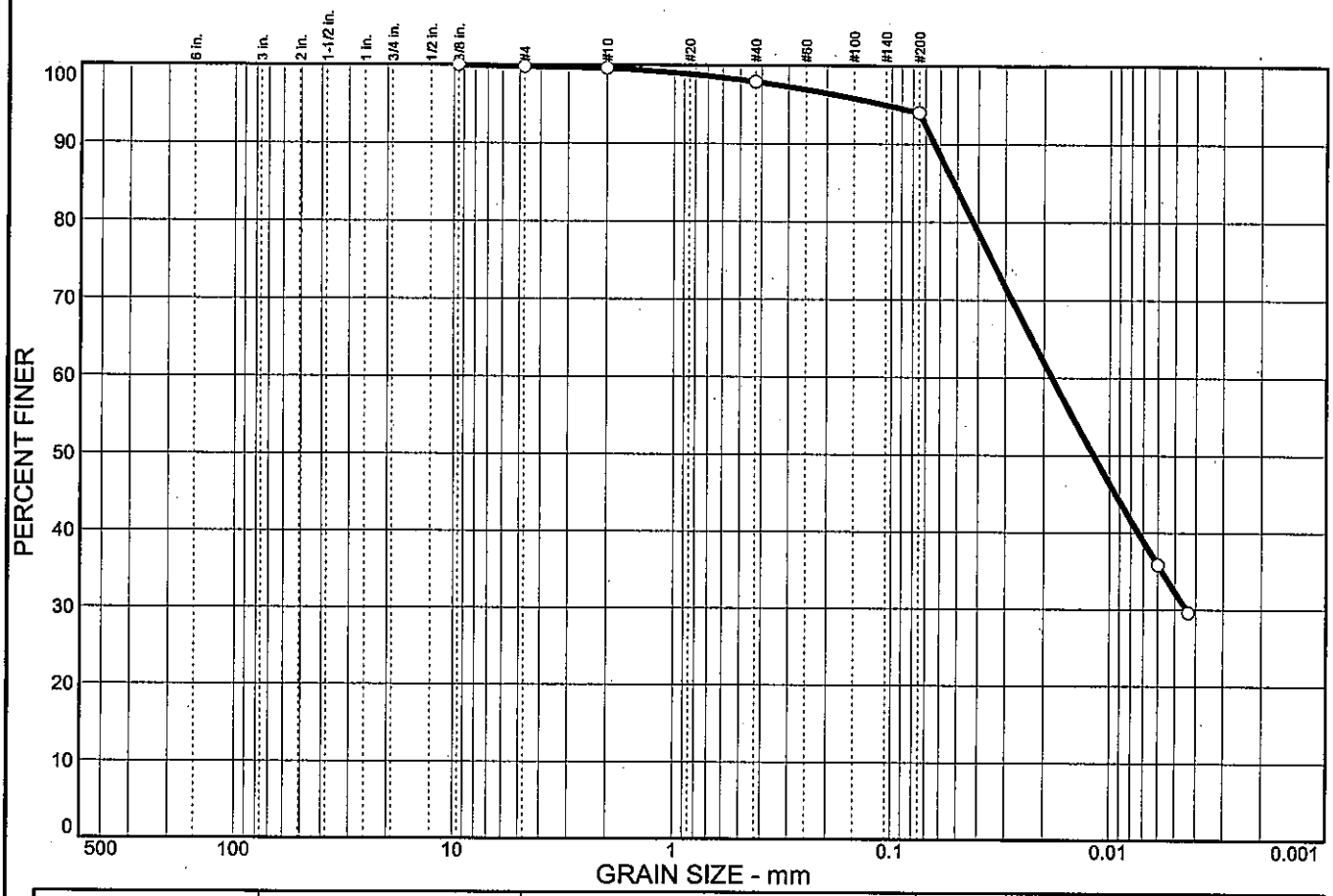
Sample No.: 2 **Source of Sample:** B-1104 **Date:** 10/26/05
Location: **Elev./Depth:** 3.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.2	0.2	1.7	3.9	61.7	32.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.8		
#10	99.6		
#40	97.9		
#200	94.0		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20 LL= 32 PI= 12

Coefficients

D_{85}= 0.0519 D_{60}= 0.0183 D_{50}= 0.0118
D_{30}= 0.0044 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(11)

Remarks

Moisture Content= 20.7%

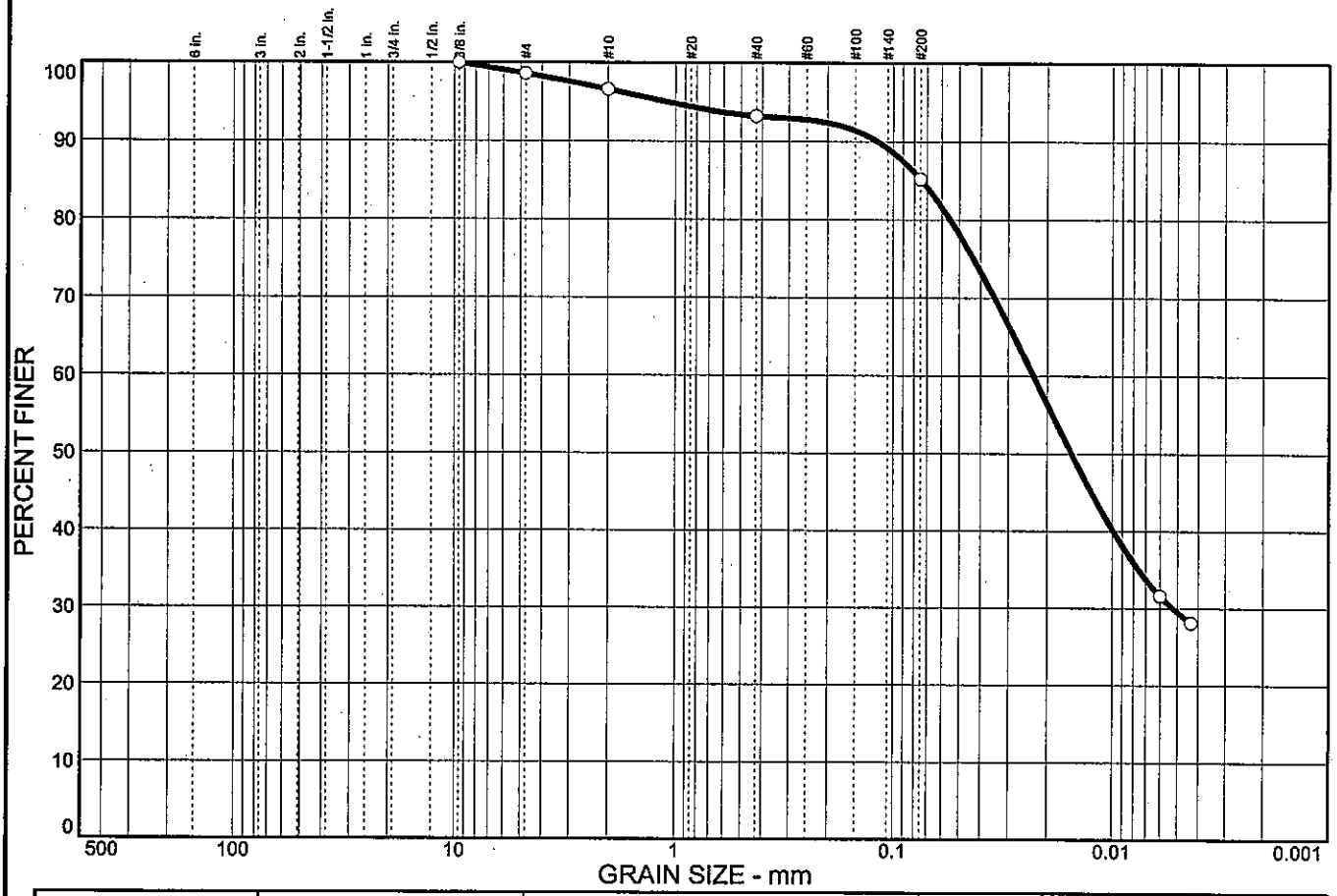
Sample No.: 3 **Source of Sample:** B-1104 **Date:** 10/26/05
Location: **Elev./Depth:** 5.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.4	2.0	3.4	8.0	55.7	29.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.6		
#10	96.6		
#40	93.2		
#200	85.2		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 22 LL= 38 PI= 16

Coefficients

D_{85}= 0.0740 D_{60}= 0.0231 D_{50}= 0.0154
D_{30}= 0.0052 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(14)

Remarks

Moisture Content= 15.6%

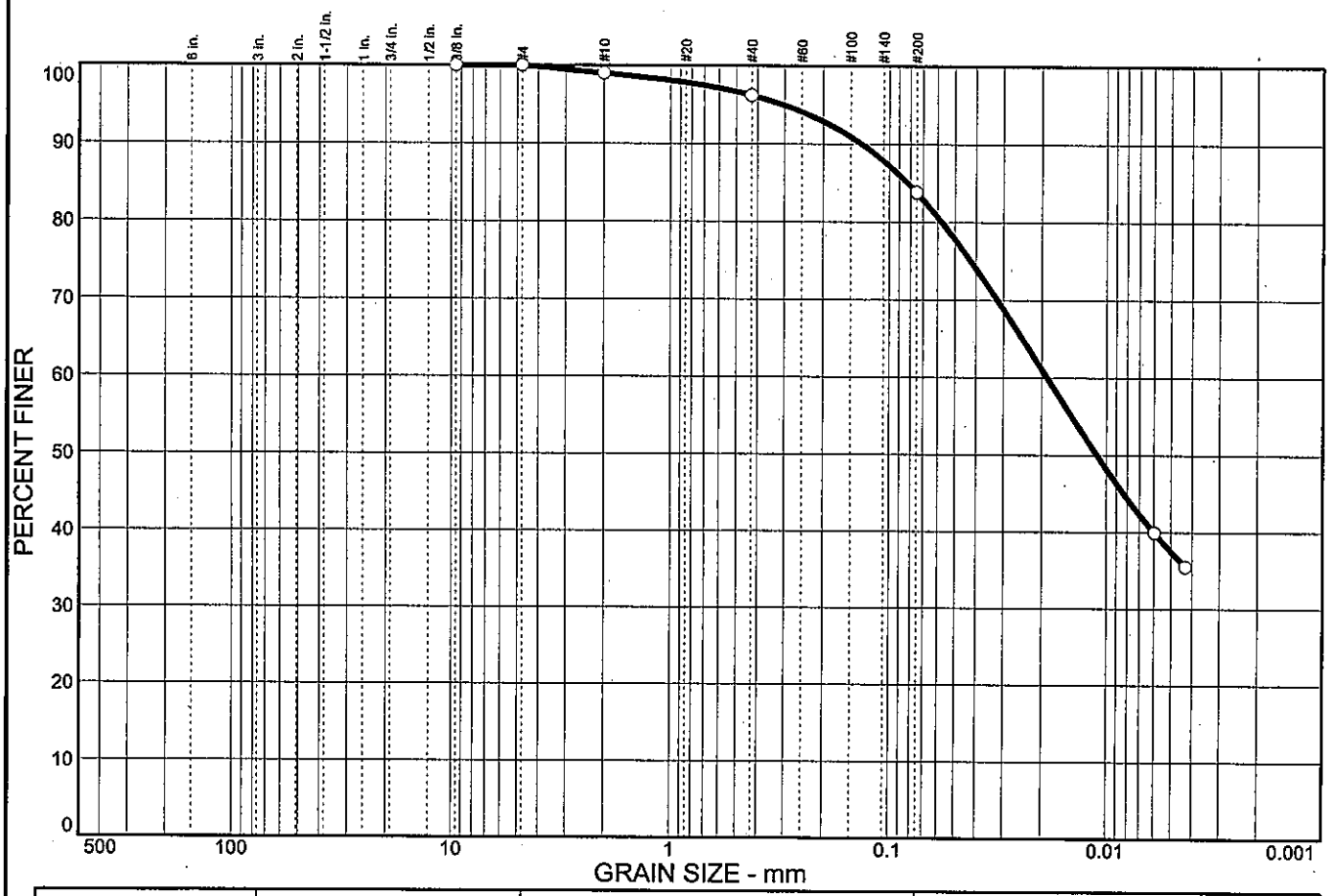
Sample No.: 1 **Source of Sample:** B-1105 **Date:** 10/26/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	1.0	2.8	12.4	46.3	37.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.0		
#40	96.2		
#200	83.8		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 19 LL= 34 PI= 15

Coefficients

D_{85}= 0.0824 D_{60}= 0.0189 D_{50}= 0.0111
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(12)

Remarks

Moisture Content= 19.0%

Sample No.: 2 **Source of Sample:** B-1105 **Date:** 10/26/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT

% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.4	1.8	6.3	60.6	30.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.6		
#40	97.8		
#200	91.5		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 30 PI= 11

Coefficients

D_{85}= 0.0583 D_{60}= 0.0218 D_{50}= 0.0142
D_{30}= 0.0047 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

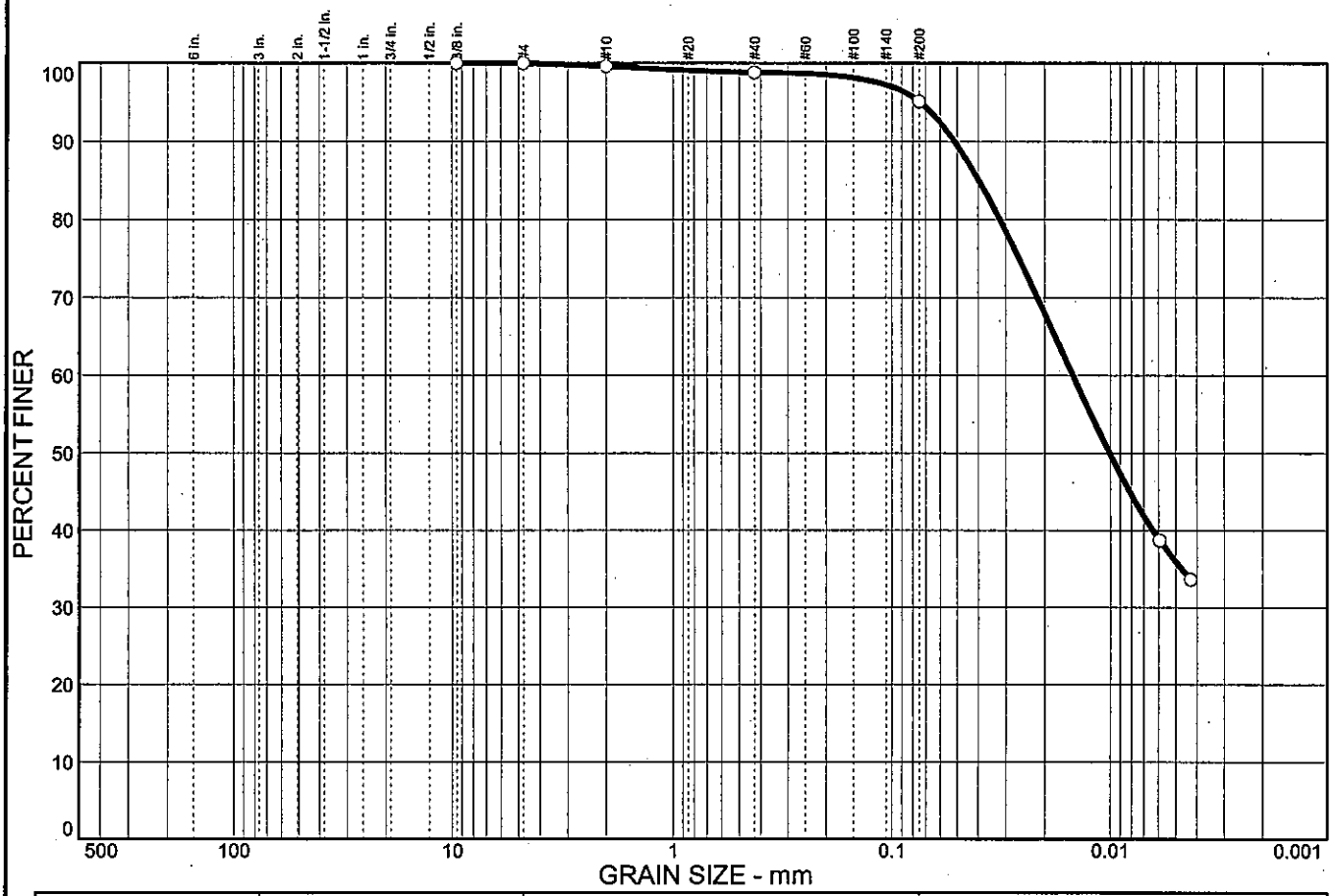
Moisture Content= 23.2%

Sample No.: 3 **Source of Sample:** B-1105 **Date:** 10/26/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.4	0.8	3.7	59.2	35.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.6		
#40	98.8		
#200	95.1		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 18 LL= 34 PI= 16

Coefficients

D_{85}= 0.0398 D_{60}= 0.0148 D_{50}= 0.0101
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(15)

Remarks

Moisture Content= 21.4%

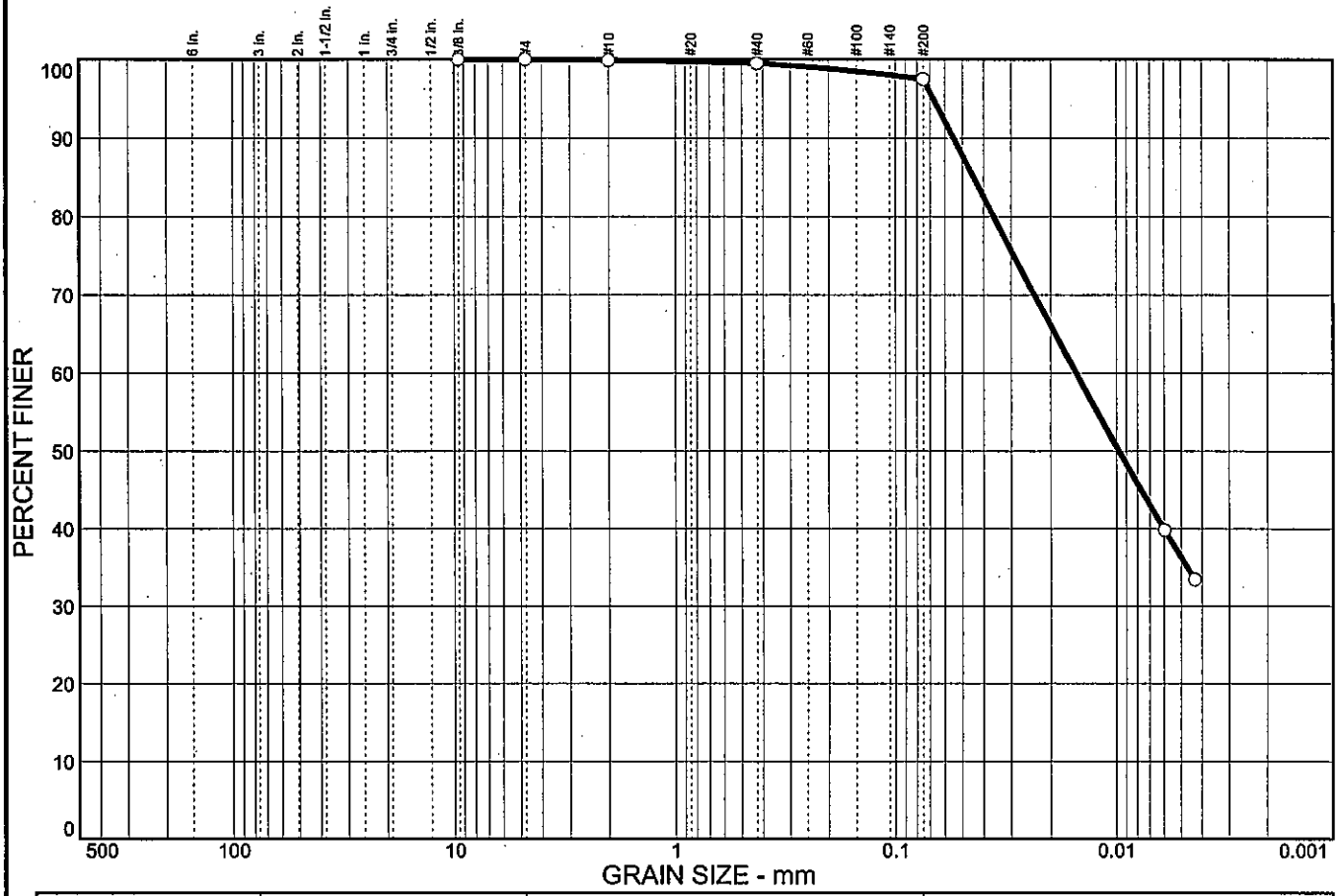
Sample No.: 3 **Source of Sample:** B-1106 **Date:** 10/26/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	0.4	2.0	61.2	36.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.9		
#40	99.5		
#200	97.5		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 17 LL= 32 PI= 15

Coefficients

D_{85}= 0.0444 D_{60}= 0.0153 D_{50}= 0.0097
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(14)

Remarks

Moisture Content= 16.9%

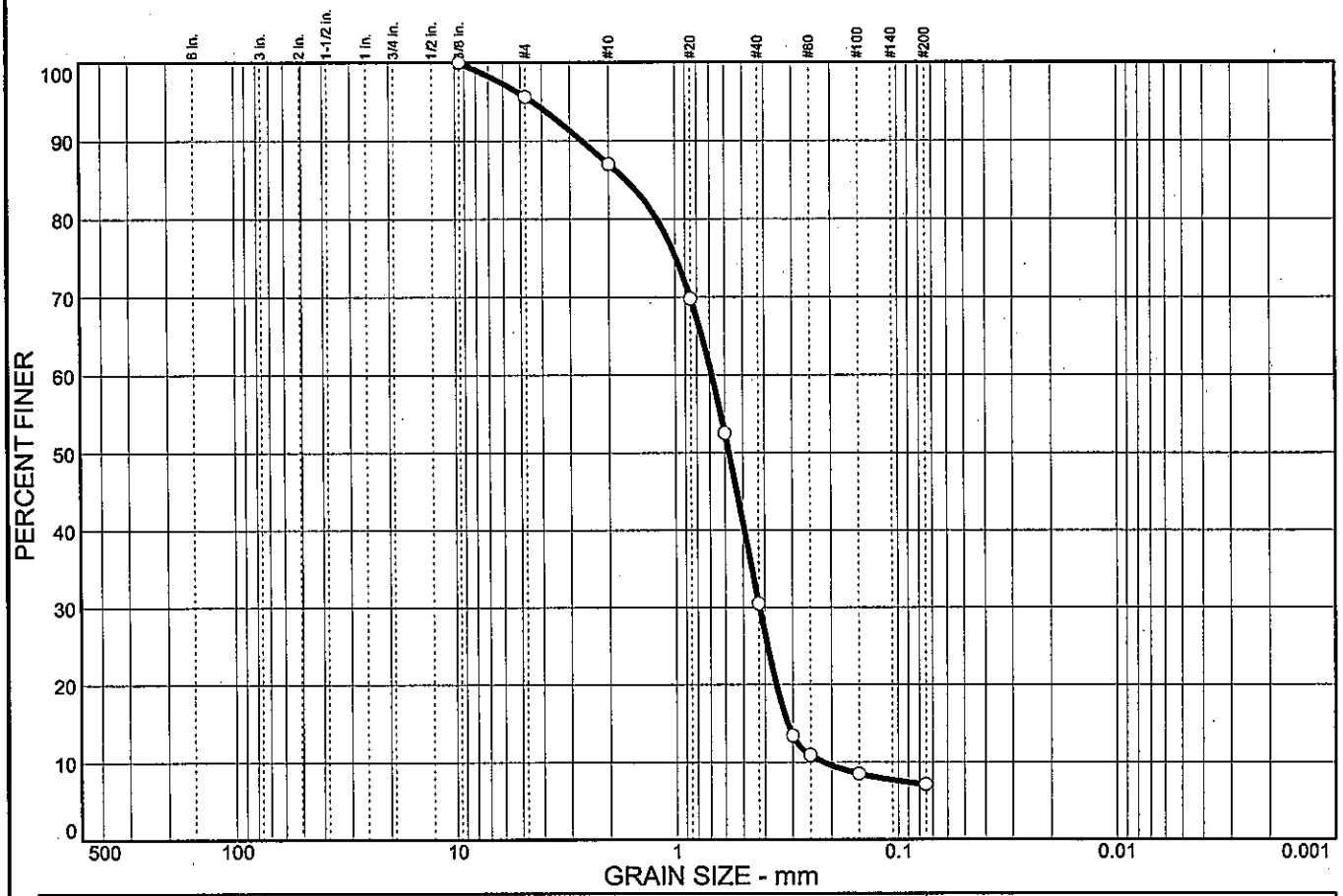
Sample No.: 1 **Source of Sample:** B-1106 **Date:** 10/26/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.4	8.6	56.5	23.4	7.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	95.6		
#10	87.0		
#20	69.8		
#30	52.5		
#40	30.5		
#50	13.4		
#60	10.9		
#100	8.5		
#200	7.1		

* (no specification provided)

Soil Description

Poorly graded sand with silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 1.67 D_{60}= 0.686 D_{50}= 0.576
D_{30}= 0.422 D_{15}= 0.316 D_{10}= 0.217
C_u= 3.16 C_c= 1.19

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Moisture Content= 22.7%

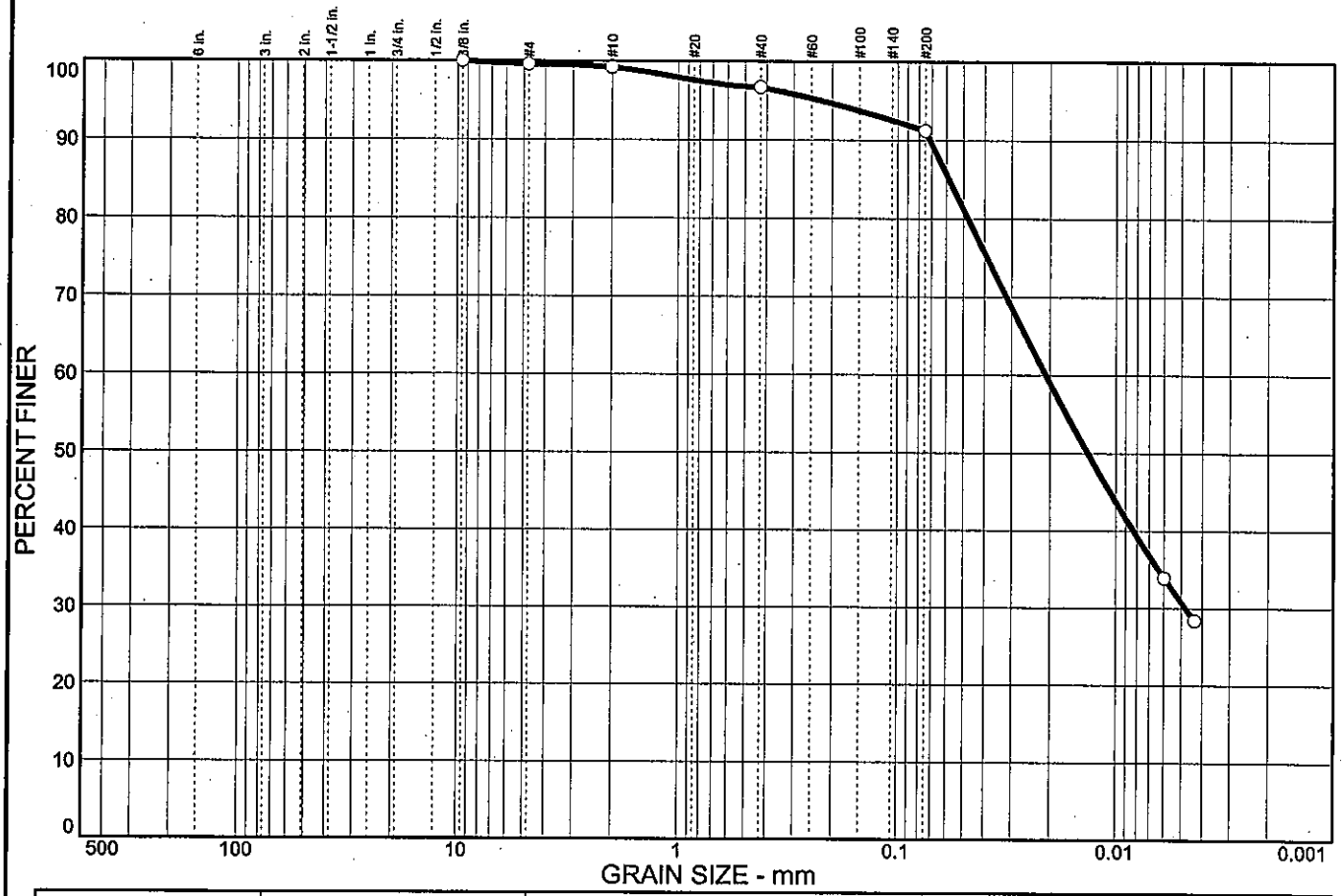
Sample No.: 10 **Source of Sample:** B-1106 **Date:** 9/12/06
Location: **Elev./Depth:** 23.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.4	0.4	2.5	5.5	60.4	30.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.6		
#10	99.2		
#40	96.7		
#200	91.2		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 31 PI= 12

Coefficients

D_{85}= 0.0583 D_{60}= 0.0208 D_{50}= 0.0134
D_{30}= 0.0048 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(10)

Remarks

Moisture Content= 18.0%

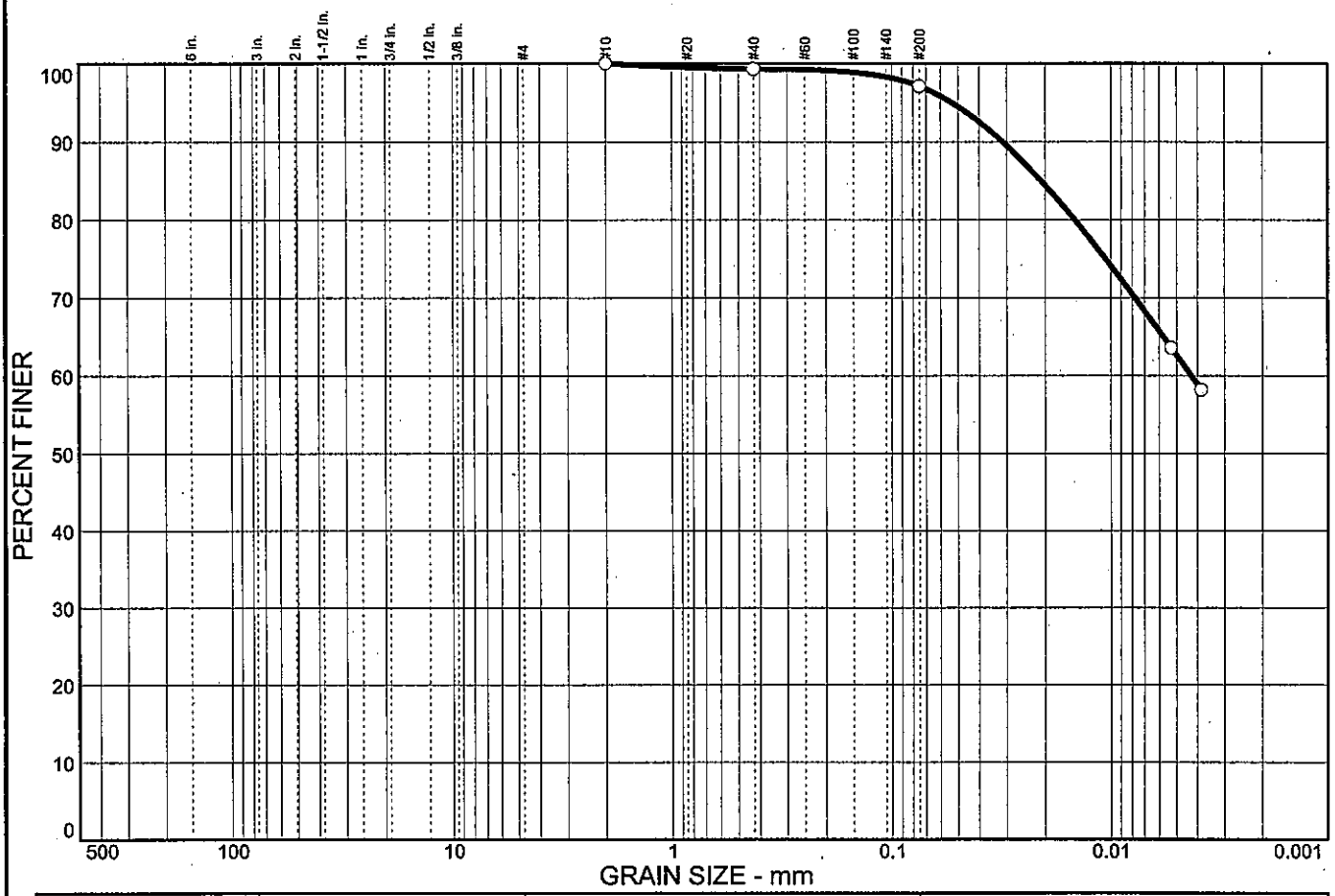
Sample No.: 2 **Source of Sample:** B-1106 **Date:** 10/26/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.7	2.2	34.4	62.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.3		
#200	97.1		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 25 LL= 47 PI= 22

Coefficients

D_{85}= 0.0208 D_{60}= 0.0043 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(24)

Remarks

Moisture Content= 25.7%

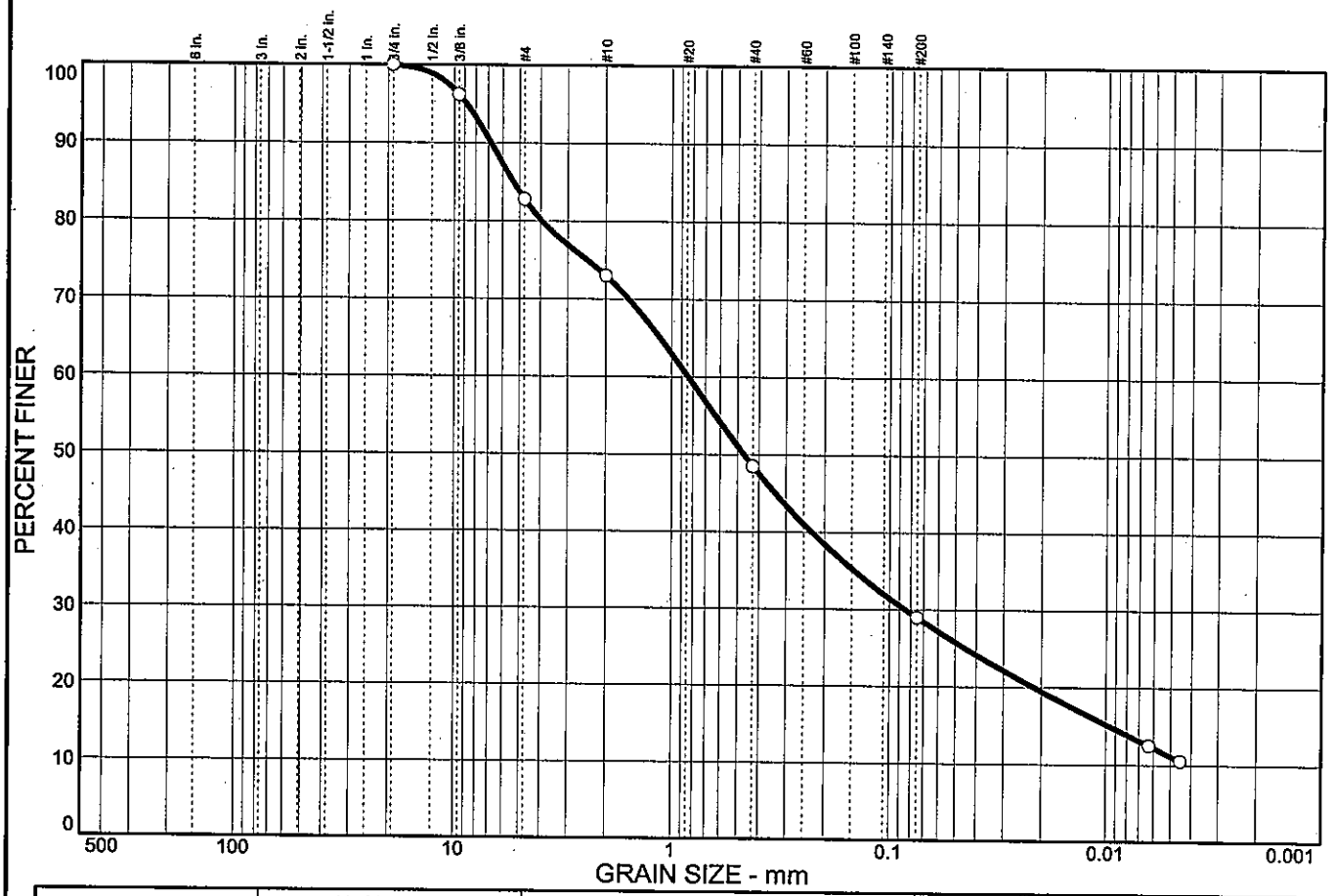
Sample No.: 7 **Source of Sample:** B-1106 **Date:** 9/12/06
Location: **Elev./Depth:** 16.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	17.2	9.8	24.5	19.5	17.9	11.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.2		
#4	82.8		
#10	73.0		
#40	48.5		
#200	29.0		

* (no specification provided)

Soil Description

Clayey sand with gravel

Atterberg Limits

PL= 14 LL= 23 PI= 9

Coefficients

D_{85}= 5.35 D_{60}= 0.838 D_{50}= 0.467
D_{30}= 0.0846 D_{15}= 0.0096 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-2-4(0)

Remarks

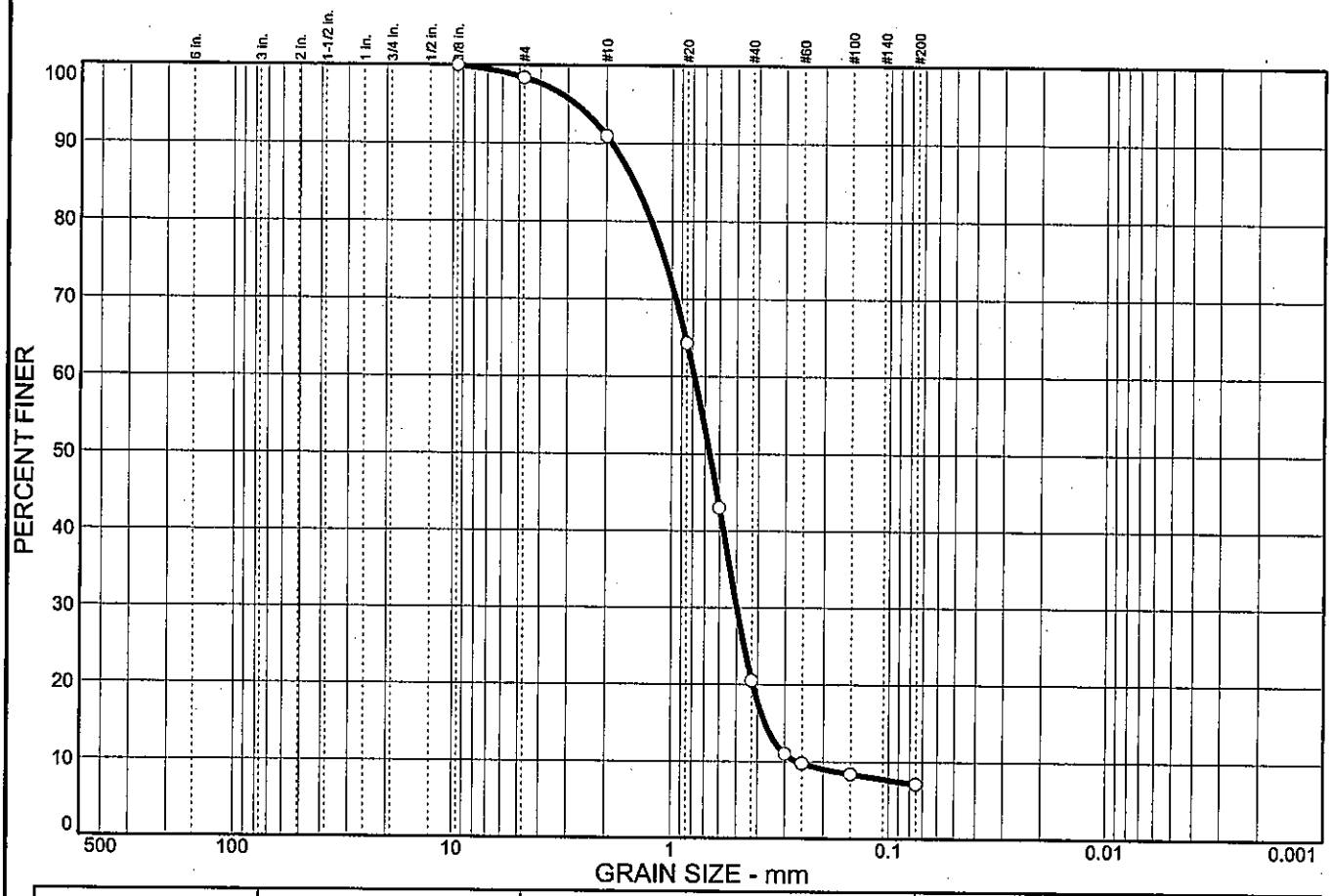
Moisture Content= 11.5%

Sample No.: 1 **Source of Sample:** B-1107 **Date:** 9/23/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.6	7.5	70.4	13.4	7.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.4		
#10	90.9		
#20	64.3		
#30	43.0		
#40	20.5		
#50	11.0		
#60	9.8		
#100	8.4		
#200	7.1		

* (no specification provided)

Soil Description

Poorly graded sand with silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 1.49 D_{60}= 0.785 D_{50}= 0.666
D_{30}= 0.498 D_{15}= 0.369 D_{10}= 0.262
C_u= 3.00 C_c= 1.21

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Moisture Content= 25.9%

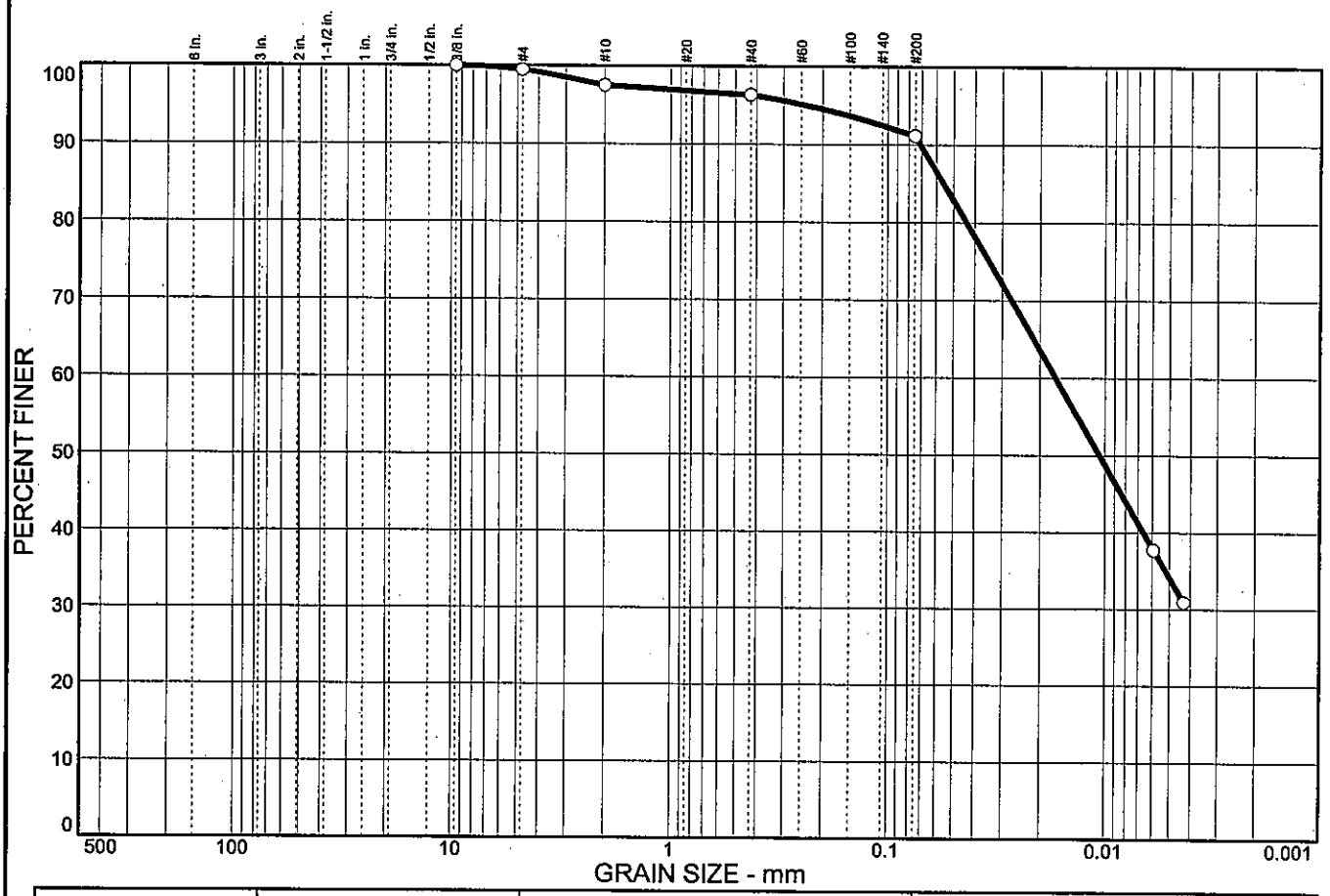
Sample No.: 10 **Source of Sample:** B-1107 **Date:** 9/23/05
Location: **Elev./Depth:** 23.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.5	2.0	1.2	5.2	57.0	34.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.5		
#10	97.5		
#40	96.3		
#200	91.1		

* (no specification provided)

Soil Description

Silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.0556 D_{60}= 0.0169 D_{50}= 0.0106
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Moisture Content= 19.1%

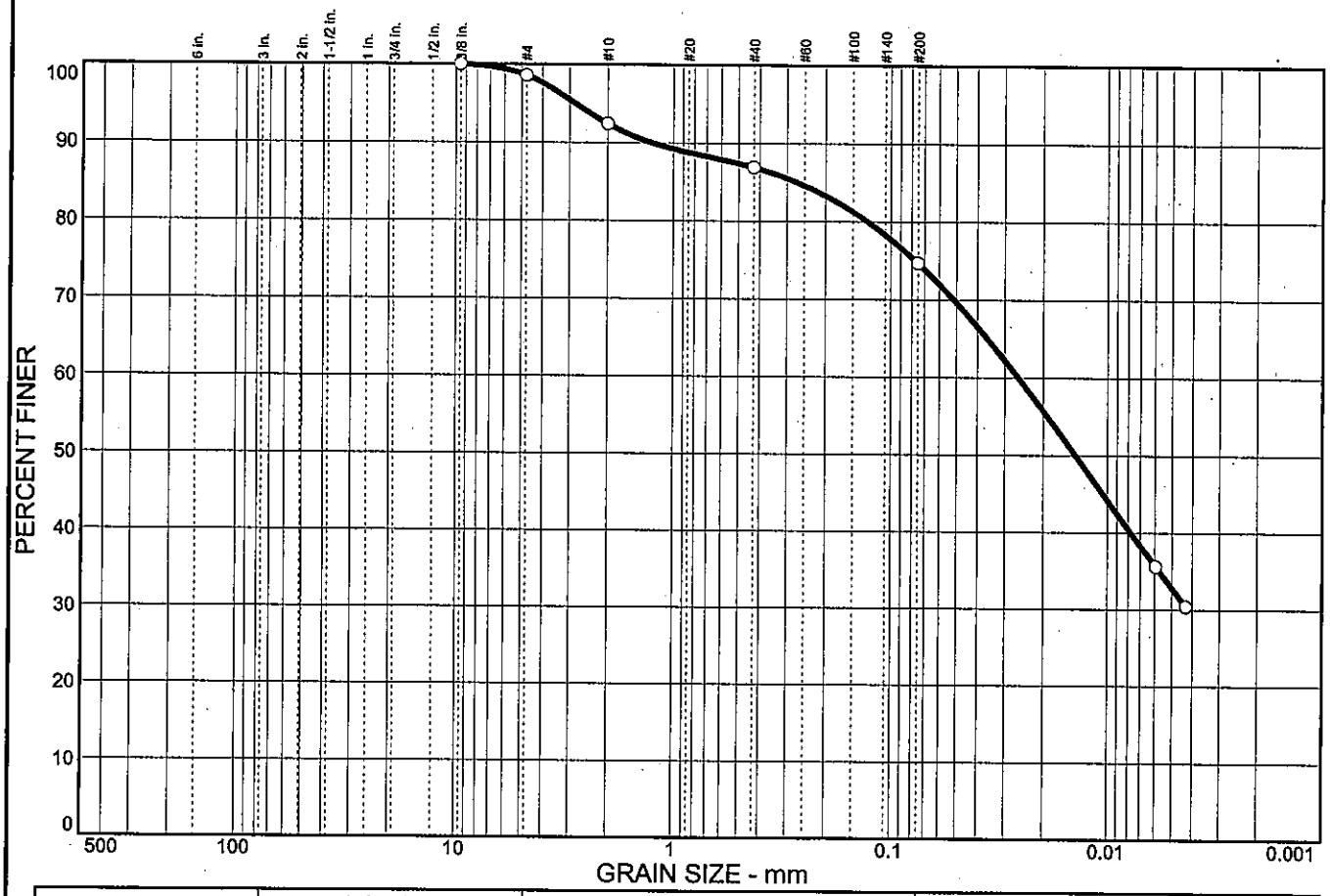
Sample No.: 2 **Source of Sample:** B-1107 **Date:** 9/23/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.4	6.2	5.5	12.2	41.9	32.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.6		
#10	92.4		
#40	86.9		
#200	74.7		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 18 LL= 35 PI= 17

Coefficients

D_{85}= 0.270 D_{60}= 0.0260 D_{50}= 0.0141
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(11)

Remarks

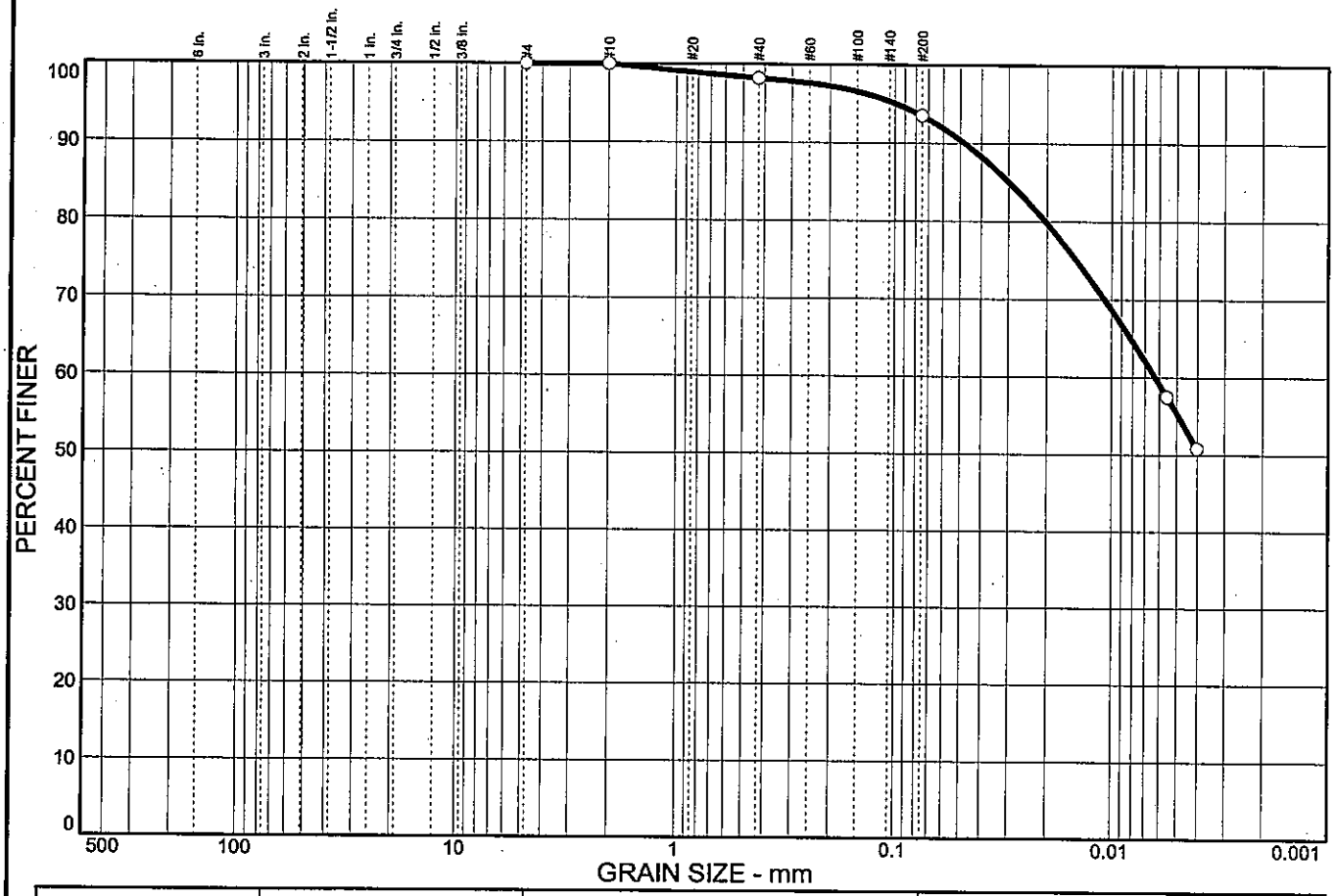
Moisture Content= 21.2%

Sample No.: 3 **Source of Sample:** B-1107 **Date:** 10/26/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	1.8	4.7	38.1	55.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#40	98.2		
#200	93.5		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20 LL= 46 PI= 26

Coefficients

D_{85}= 0.0298 D_{60}= 0.0063 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(26)

Remarks

Moisture Content= 29.5%

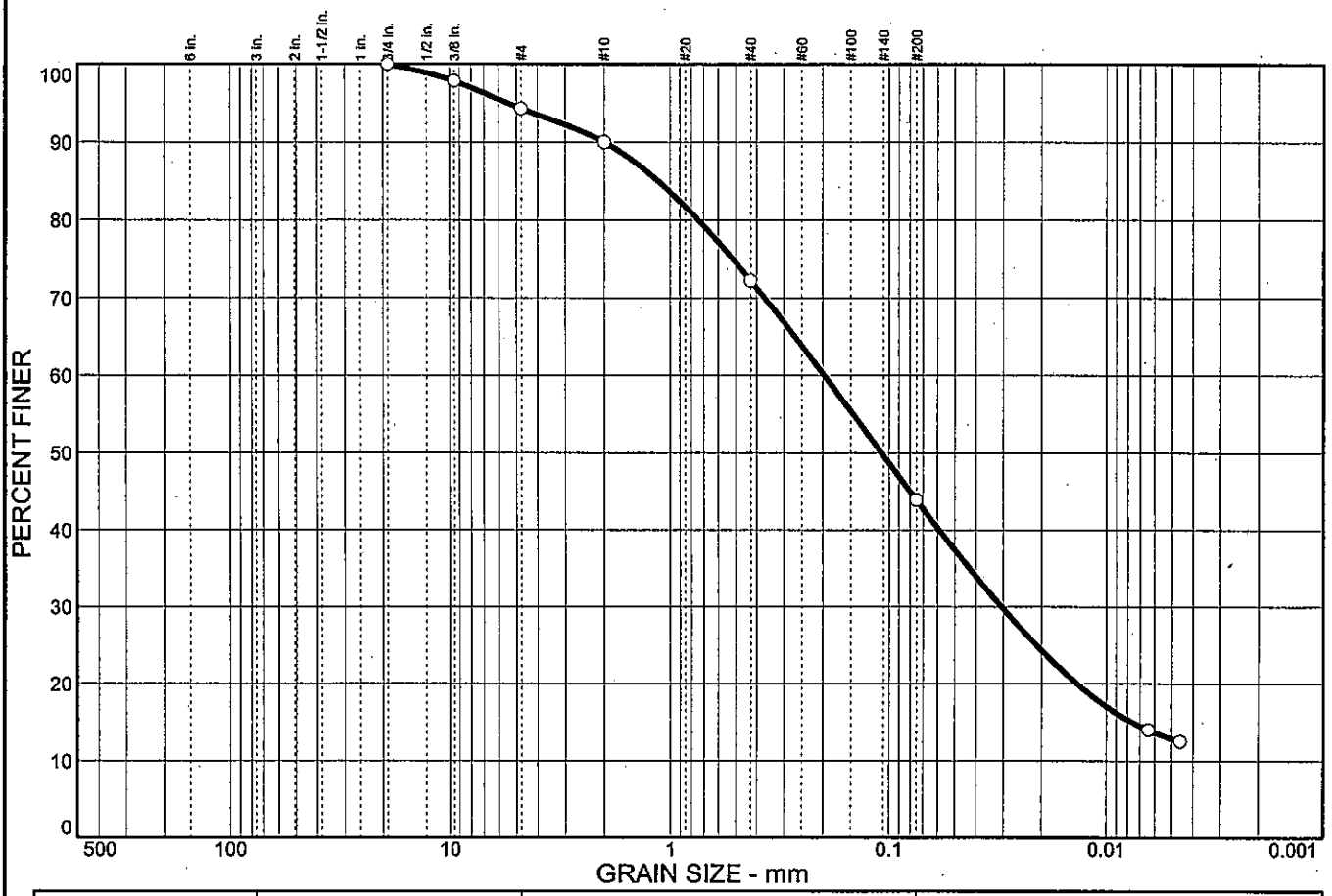
Sample No.: 9 **Source of Sample:** B-1107 **Date:** 9/23/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	5.7	4.3	17.8	28.3	31.0	12.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.8		
#4	94.3		
#10	90.0		
#40	72.2		
#200	43.9		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 14 LL= 18 PI= 4

Coefficients

D_{85}= 1.13 D_{60}= 0.197 D_{50}= 0.108
D_{30}= 0.0305 D_{15}= 0.0076 D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

Moisture Content= 14.0%

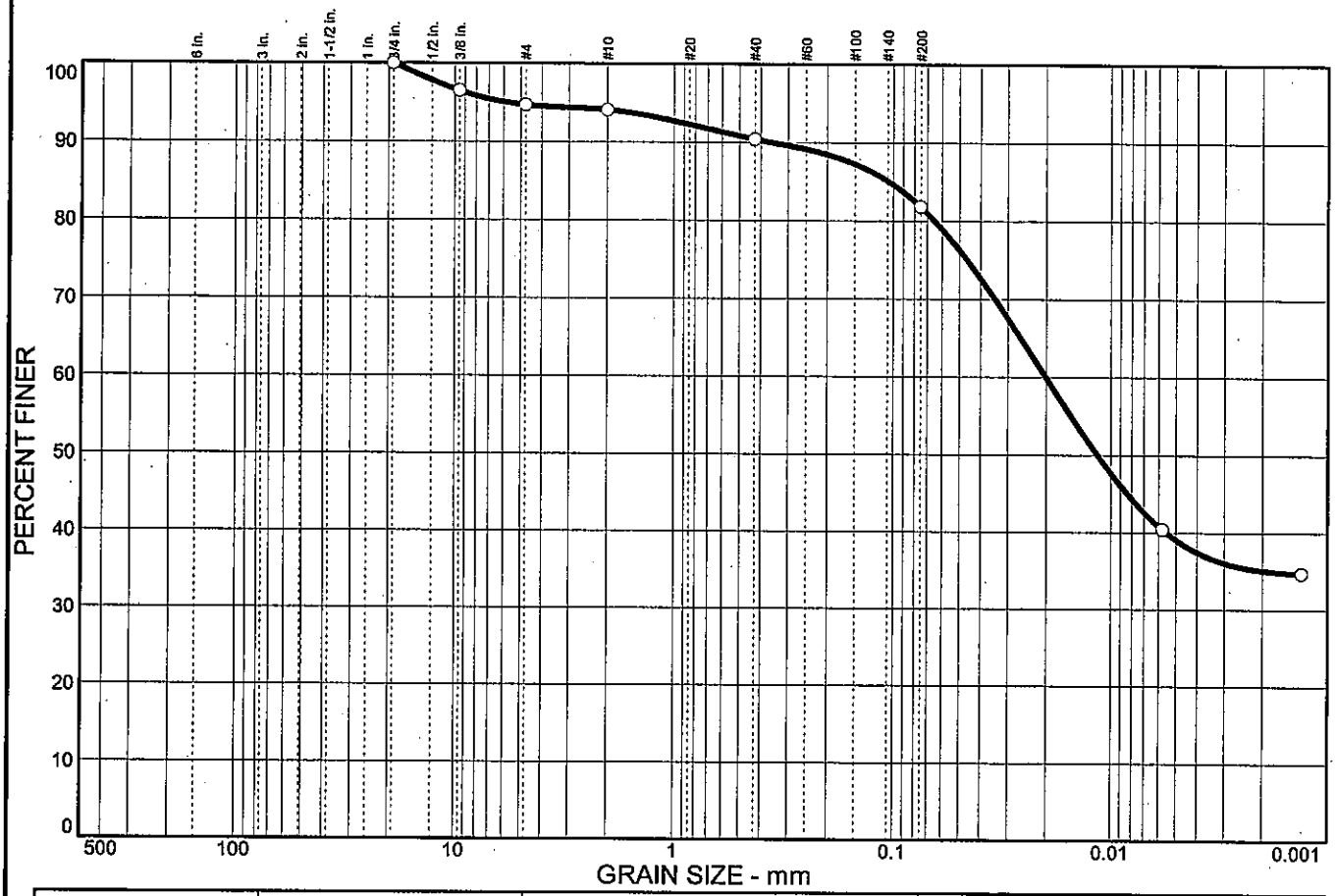
Sample No.: 1 **Source of Sample:** B-1108 **Date:** 10/26/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	5.3	0.6	3.7	8.6	42.7	39.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.5		
#4	94.7		
#10	94.1		
#40	90.4		
#200	81.8		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 19 LL= 36 PI= 17

Coefficients

D_{85}= 0.105 D_{60}= 0.0200 D_{50}= 0.0115
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

Remarks

Moisture Content= 19.5%

Sample No.: 2 **Source of Sample:** B-1108 **Date:** 10/26/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT

% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	7.5	2.9	3.5	7.6	51.1	27.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	95.5		
#4	92.5		
#10	89.6		
#40	86.1		
#200	78.5		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 19 LL= 33 PI= 14

Coefficients

D_{85}= 0.188 D_{60}= 0.0277 D_{50}= 0.0178
D_{30}= 0.0062 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(10)

Remarks

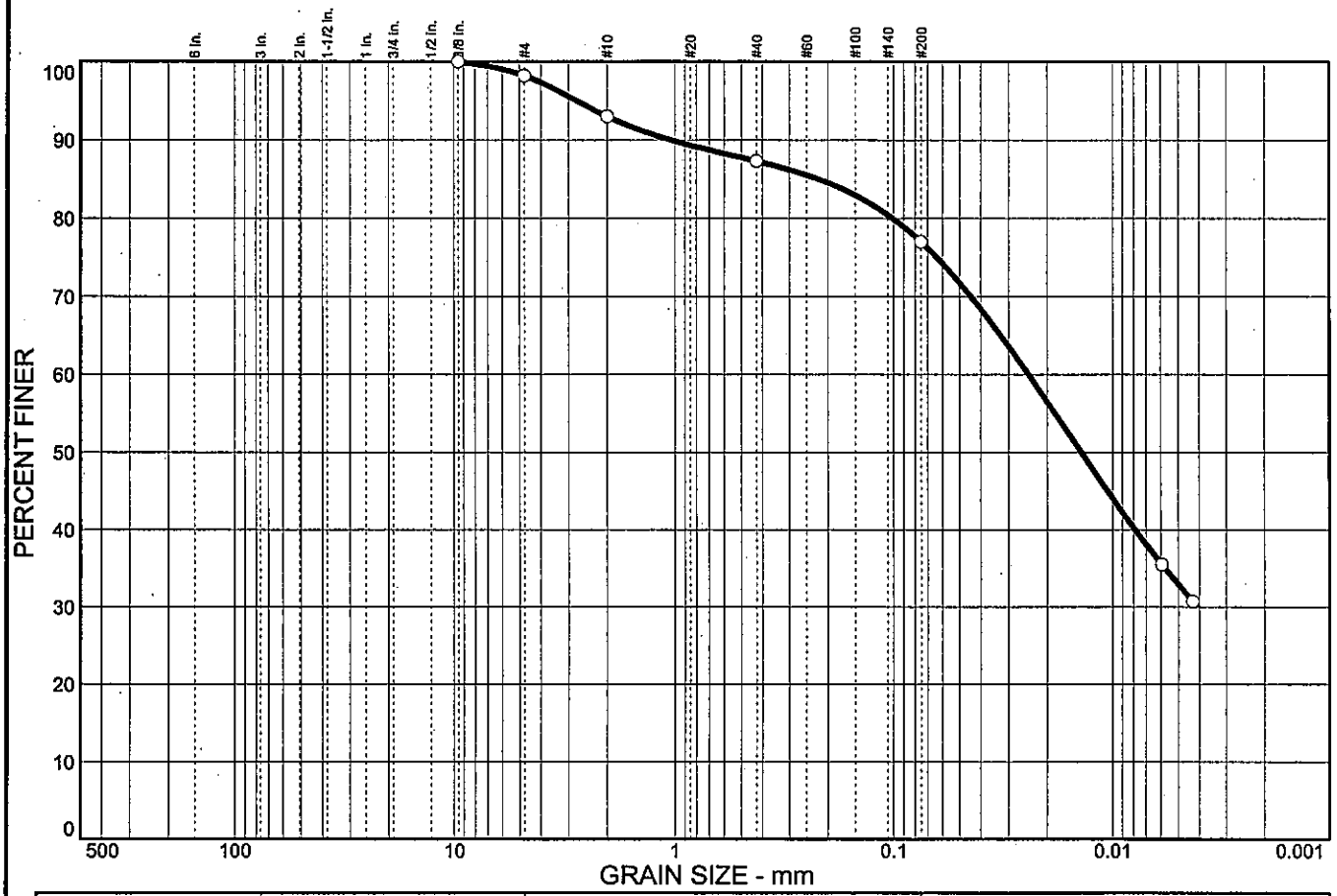
Moisture Content= 20.6%

Sample No.: 3 **Source of Sample:** B-1108 **Date:** 10/26/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.8	5.2	5.7	10.3	44.0	33.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.2		
#10	93.0		
#40	87.3		
#200	77.0		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 17 LL= 33 PI= 16

Coefficients

D_{85}= 0.221 D_{60}= 0.0243 D_{50}= 0.0139
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(11)

Remarks

Moisture Content= 17.9%

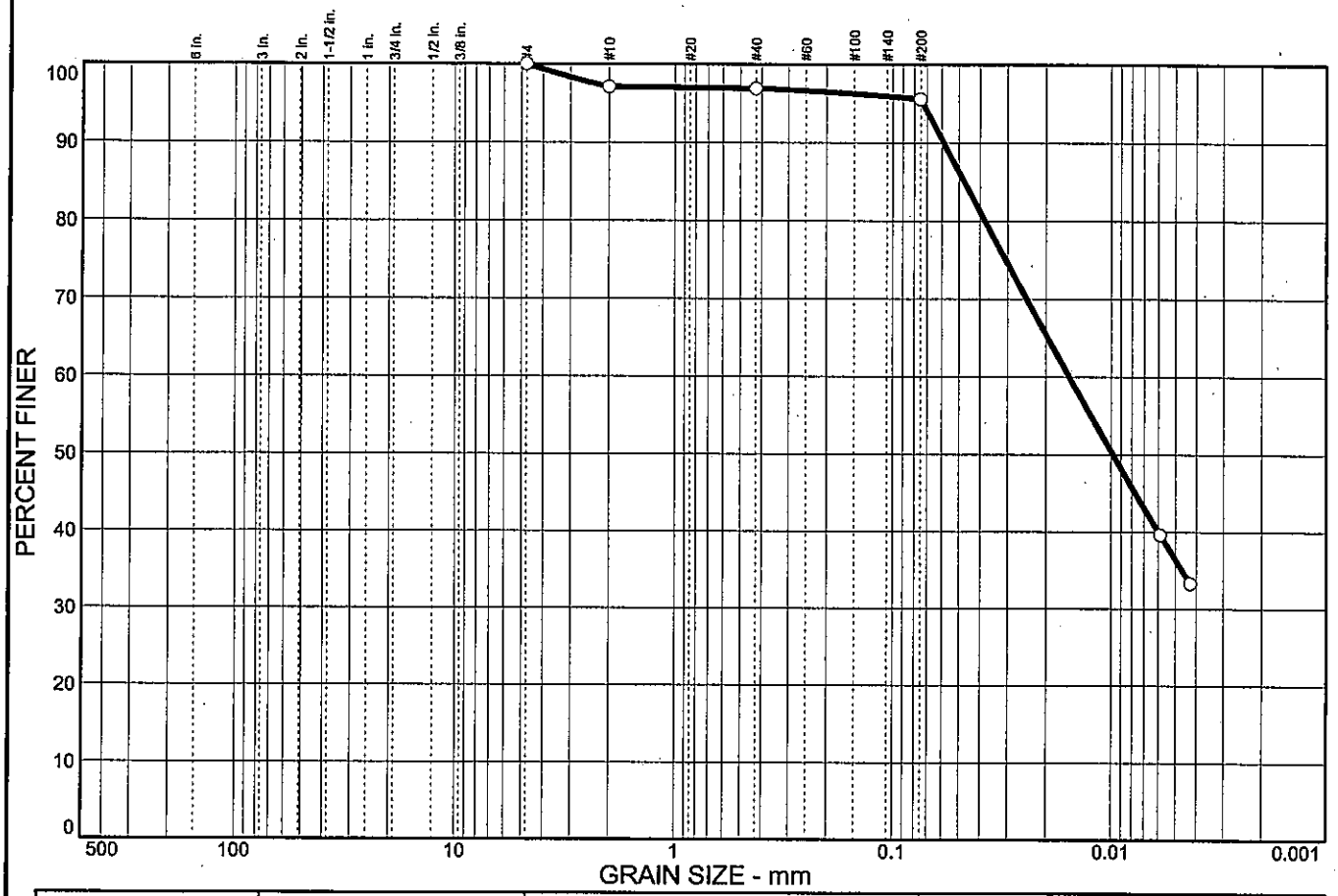
Sample No.: 4 **Source of Sample:** B-1108 **Date:** 9/23/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	2.9	0.2	1.3	59.2	36.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	97.1		
#40	96.9		
#200	95.6		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20 LL= 37 PI= 17

Coefficients

D_{85}= 0.0472 D_{60}= 0.0156 D_{50}= 0.0098
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(17)

Remarks

Moisture Content= 32.1%

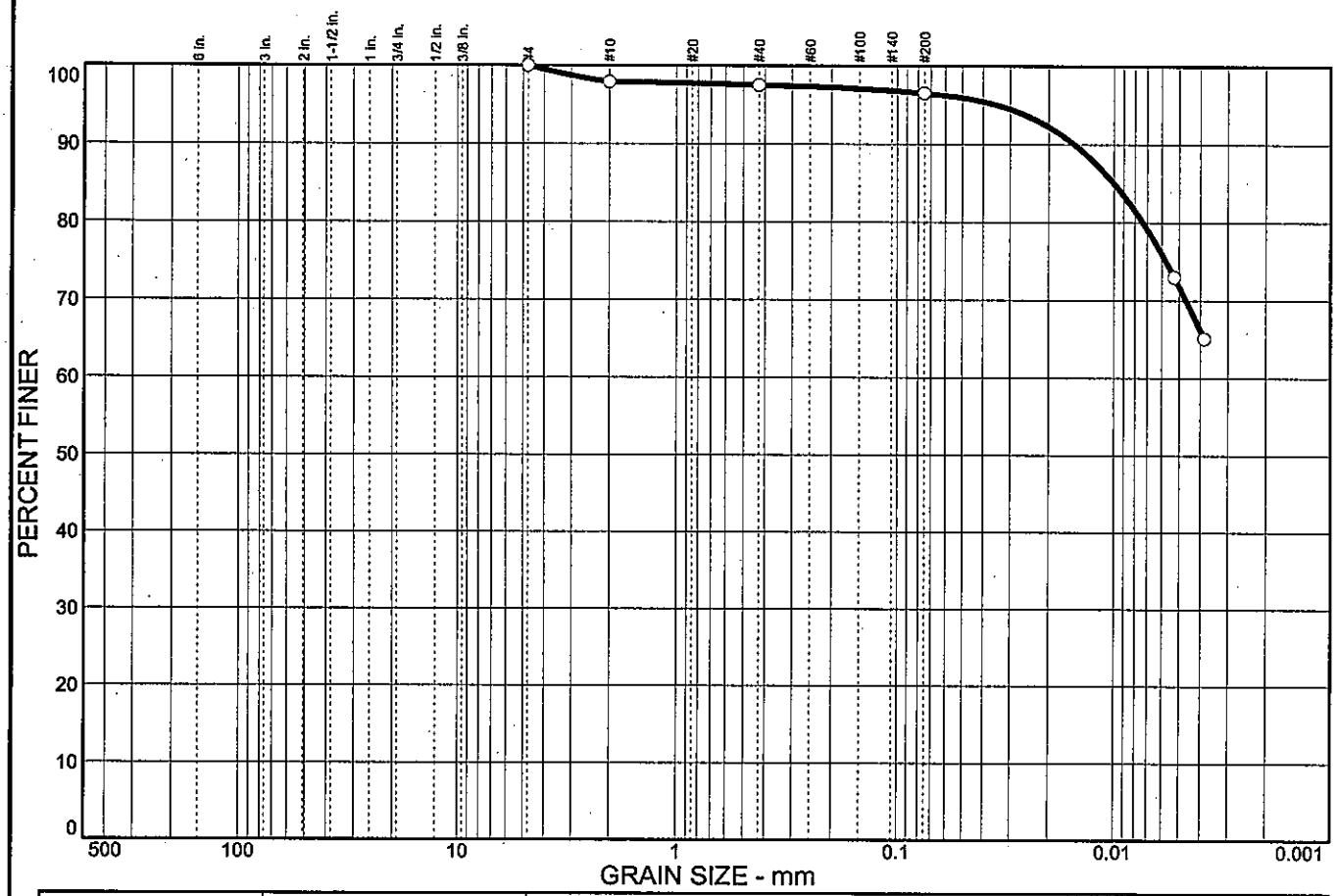
Sample No.: 5 **Source of Sample:** B-1108 **Date:** 9/23/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	2.1	0.4	1.0	24.7	71.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	97.9		
#40	97.5		
#200	96.5		

* (no specification provided)

Soil Description

Fat clay

Atterberg Limits

PL= 23 LL= 59 PI= 36

Coefficients

D_{85}= 0.0100 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(39)

Remarks

Moisture Content= 38.1%

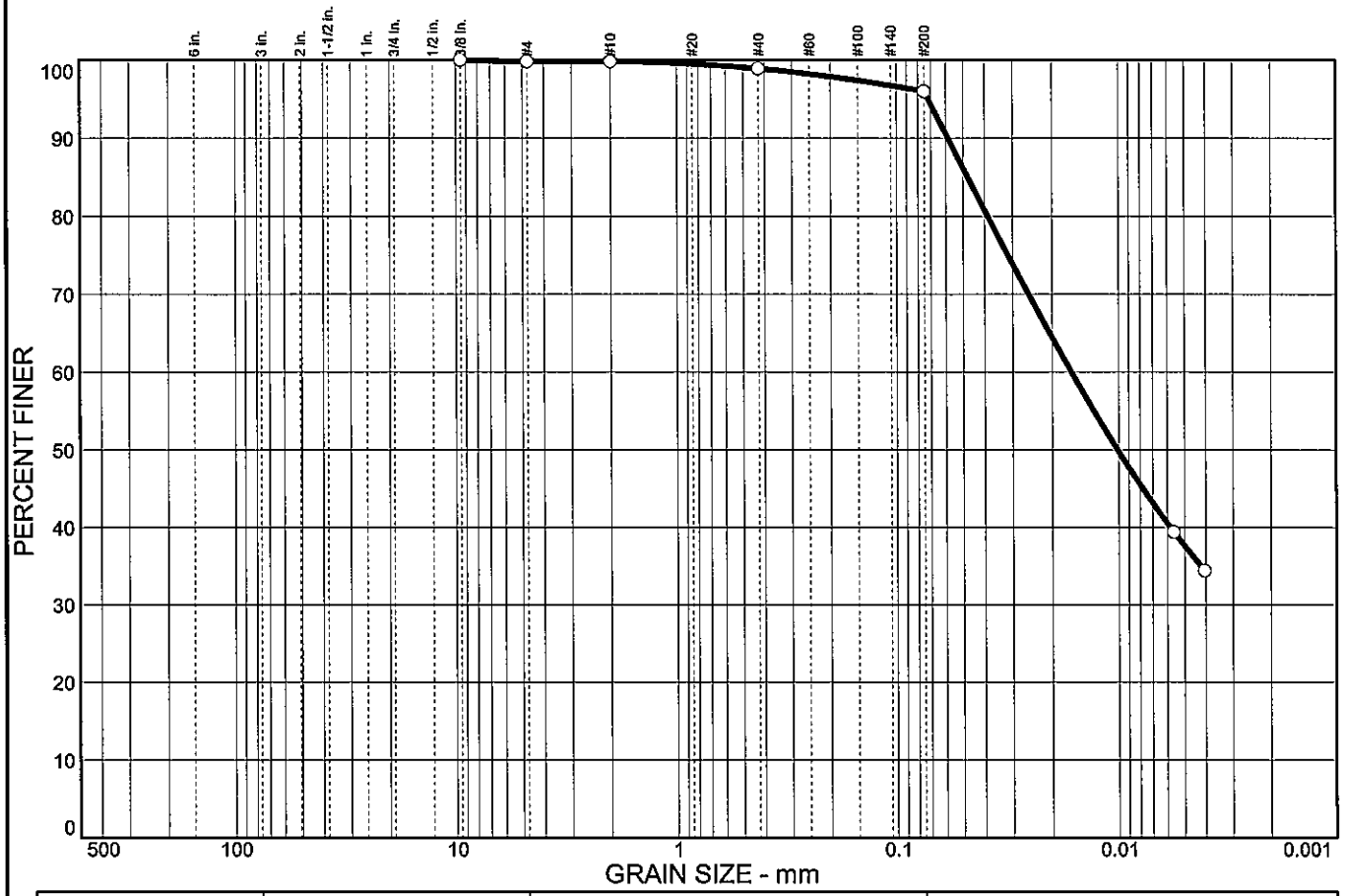
Sample No.: 9 **Source of Sample:** B-1108 **Date:** 9/23/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.2	0.0	0.9	2.9	58.4	37.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.8		
#10	99.8		
#40	98.9		
#200	96.0		

* (no specification provided)

Soil Description

Lean clay,
Specific Gravity= 2.65

Atterberg Limits

PL= 21 LL= 36 PI= 15

Coefficients

D_{85}= 0.0477 D_{60}= 0.0164 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(15)

Remarks

Moisture Content = 14.5%

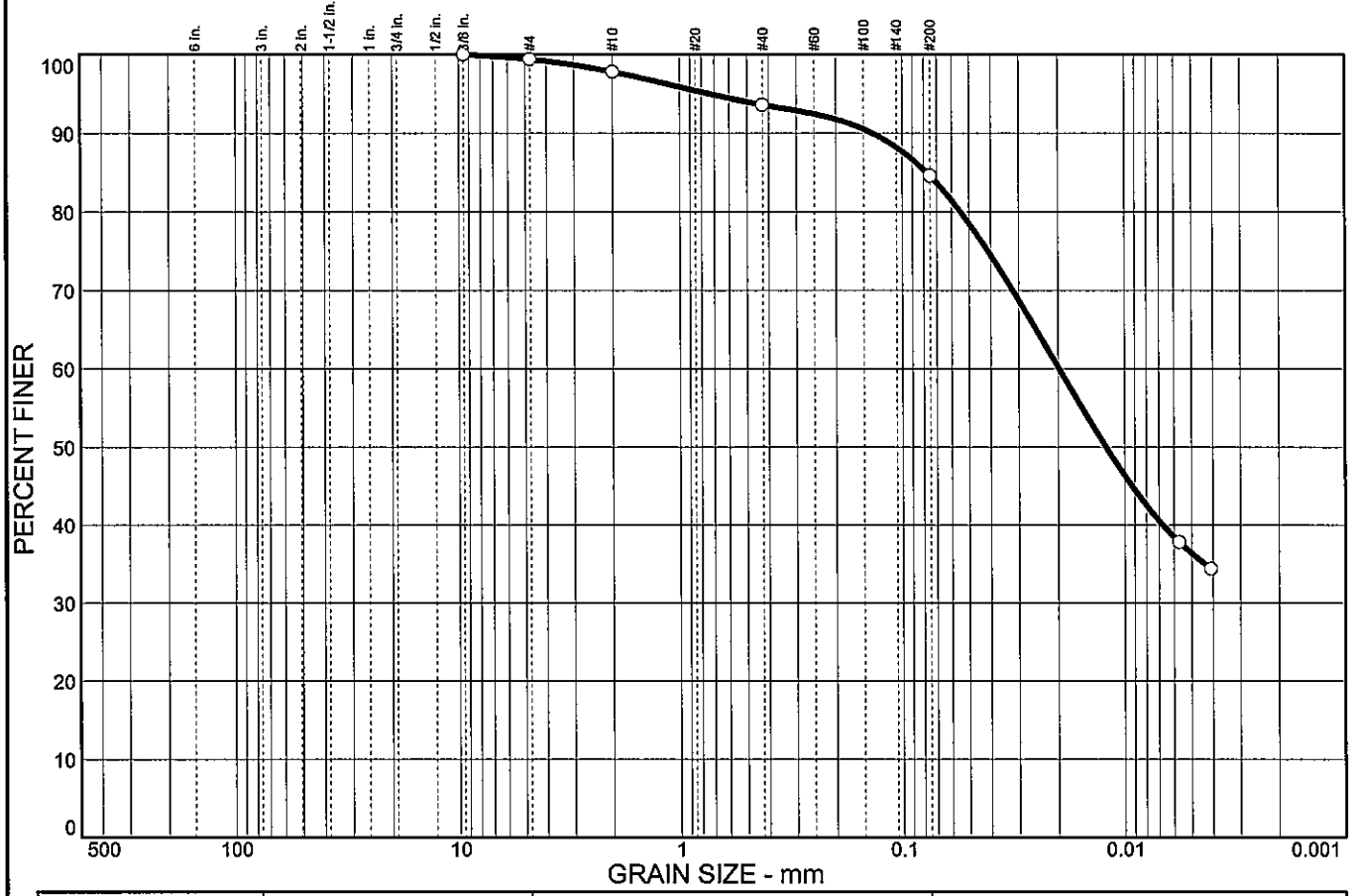
Sample No.: ST-1 **Source of Sample:** B-1108A **Date:** 08/16/06
Location: **Elev./Depth:** 10.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.6	1.6	4.2	9.0	48.2	36.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.4		
#10	97.8		
#40	93.6		
#200	84.6		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 19 LL= 38 PI= 19

Coefficients

D_{85}= 0.0775 D_{60}= 0.0198 D_{50}= 0.0121
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(16)

Remarks

Moisture Content = 19.8%

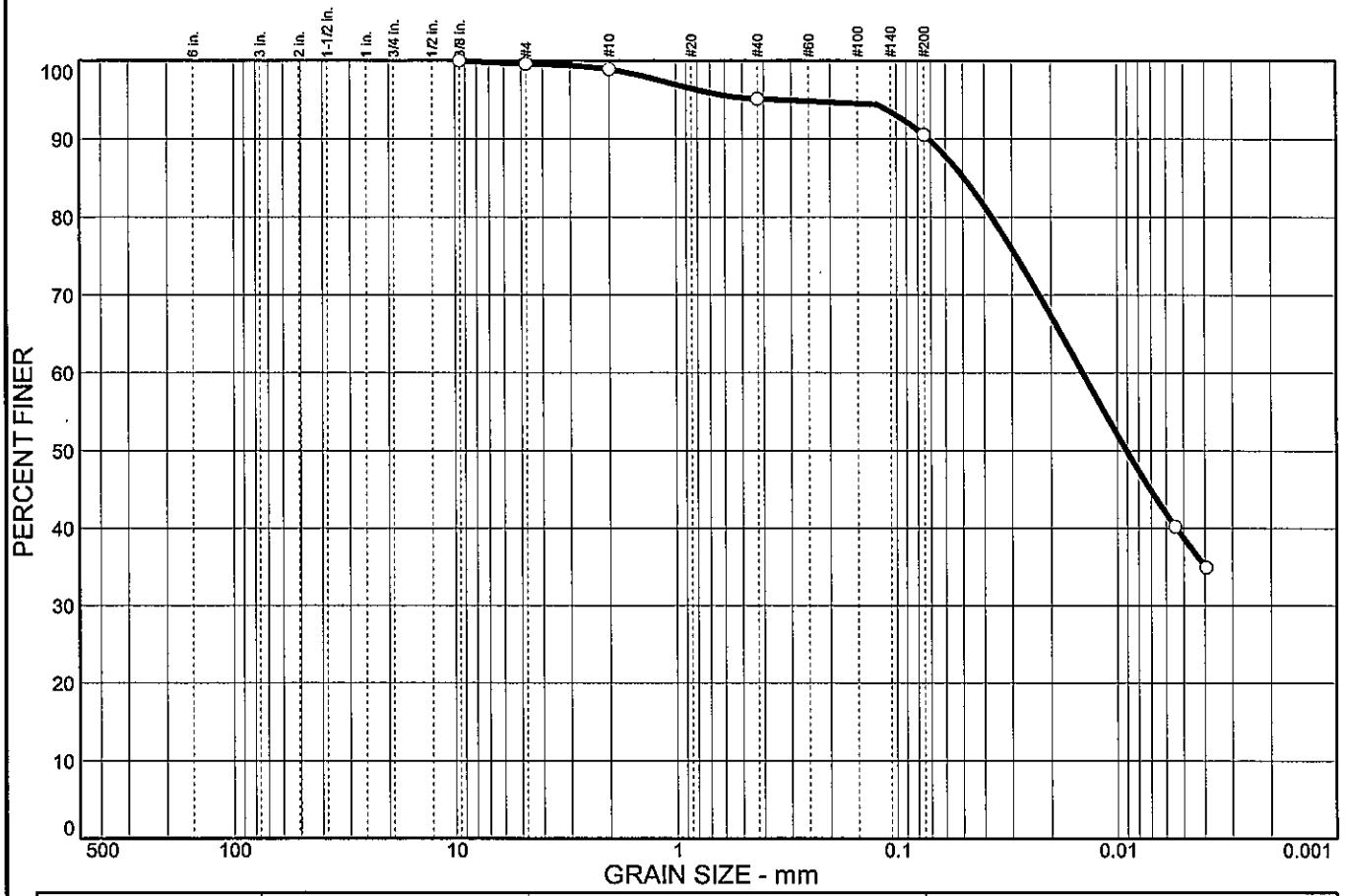
Sample No.: ST-2 **Source of Sample:** B-1108A **Date:** 08/16/06
Location: **Elev./Depth:** 14.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.4	0.7	3.8	4.6	51.8	38.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.6		
#10	98.9		
#40	95.1		
#200	90.5		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 38 PI= 19

Coefficients

D_{85}= 0.0495 D_{60}= 0.0144 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(17)

Remarks

Moisture Content = 24.0%

Sample No.: ST-3 **Source of Sample:** B-1108A **Date:** 08/16/06
Location: **Elev./Depth:** 18.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT

% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.9	3.1	10.1	10.5	48.2	24.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	96.1		
#10	93.0		
#40	82.9		
#200	72.4		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 15 LL= 27 PI= 12

Coefficients

D_{85}= 0.602 D_{60}= 0.0364 D_{50}= 0.0227
D_{30}= 0.0082 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(6)

Remarks

Moisture Content= 18.6%

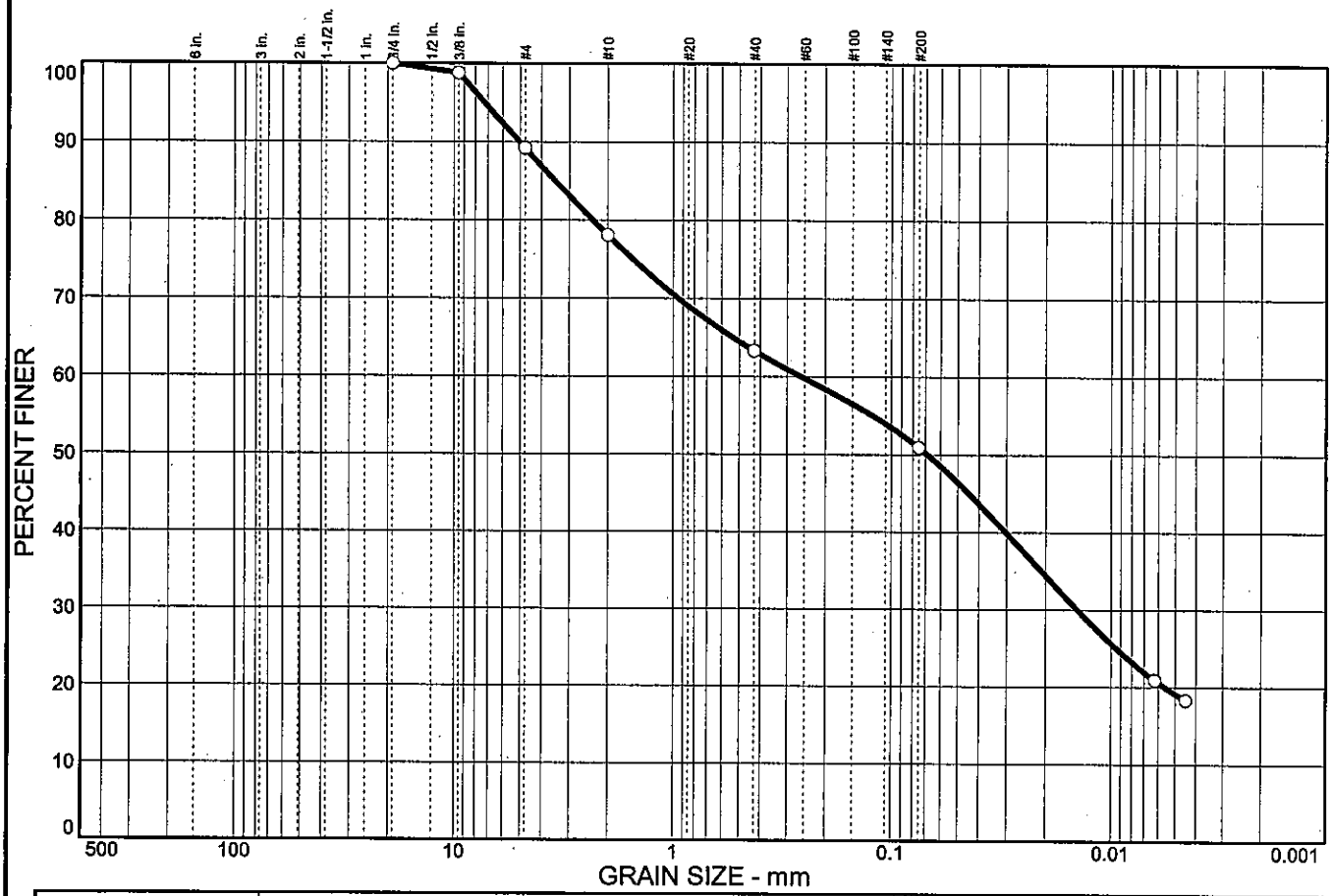
Sample No.: 1 **Source of Sample:** B-1109 **Date:** 10/26/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	10.8	11.1	14.8	12.4	31.7	19.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.8		
#4	89.2		
#10	78.1		
#40	63.3		
#200	50.9		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 16 LL= 25 PI= 9

Coefficients

D_{85}= 3.47 D_{60}= 0.258 D_{50}= 0.0686
D_{30}= 0.0143 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(2)

Remarks

Moisture Content= 13.7%

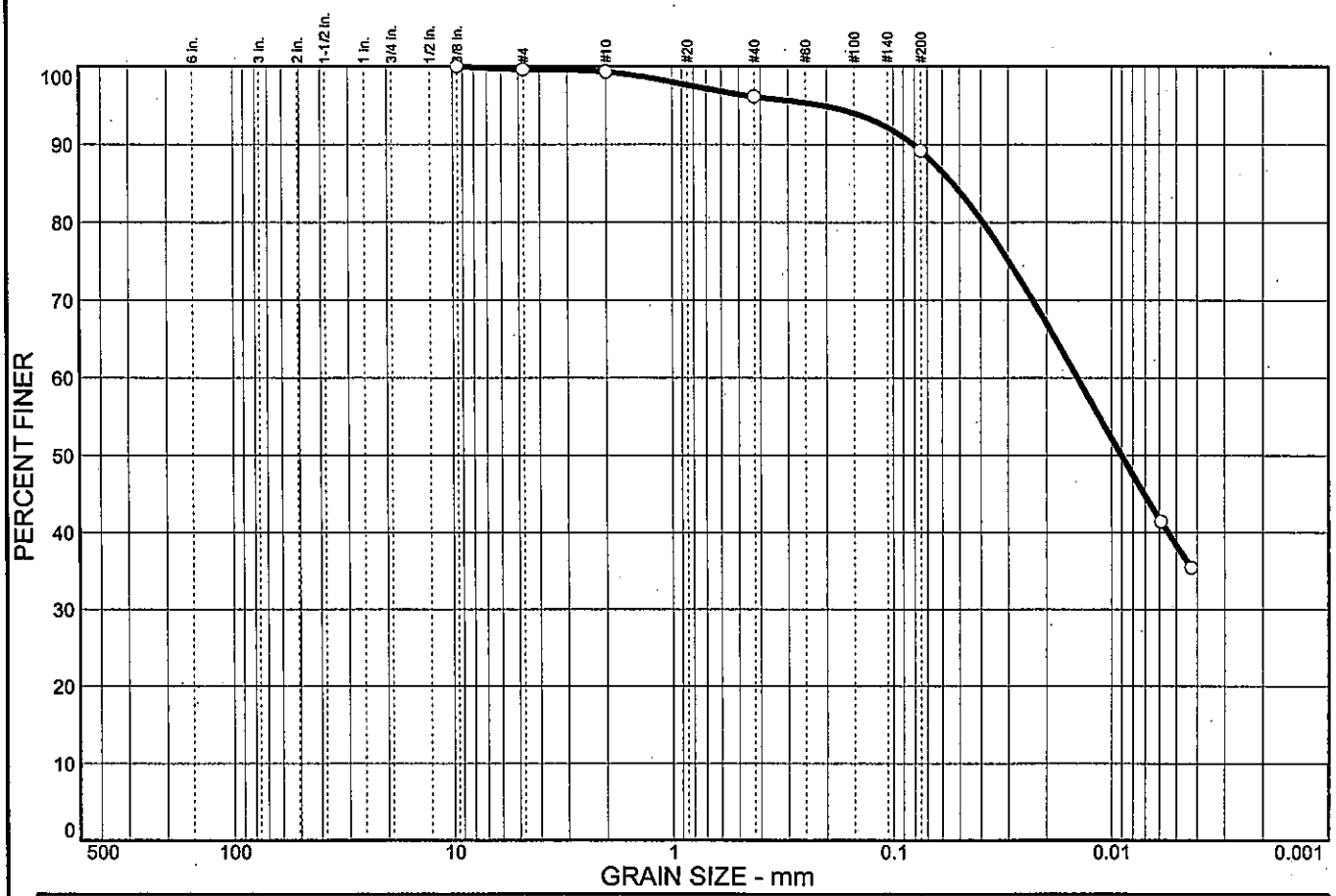
Sample No.: 2 **Source of Sample:** B-1109 **Date:** 10/26/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.4	0.3	3.2	6.9	50.9	38.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.6		
#10	99.3		
#40	96.1		
#200	89.2		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 35 PI= 16

Coefficients

D_{85}= 0.0537 D_{60}= 0.0144 D_{50}= 0.0090
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(14)

Remarks

Moisture Content= 20.3%

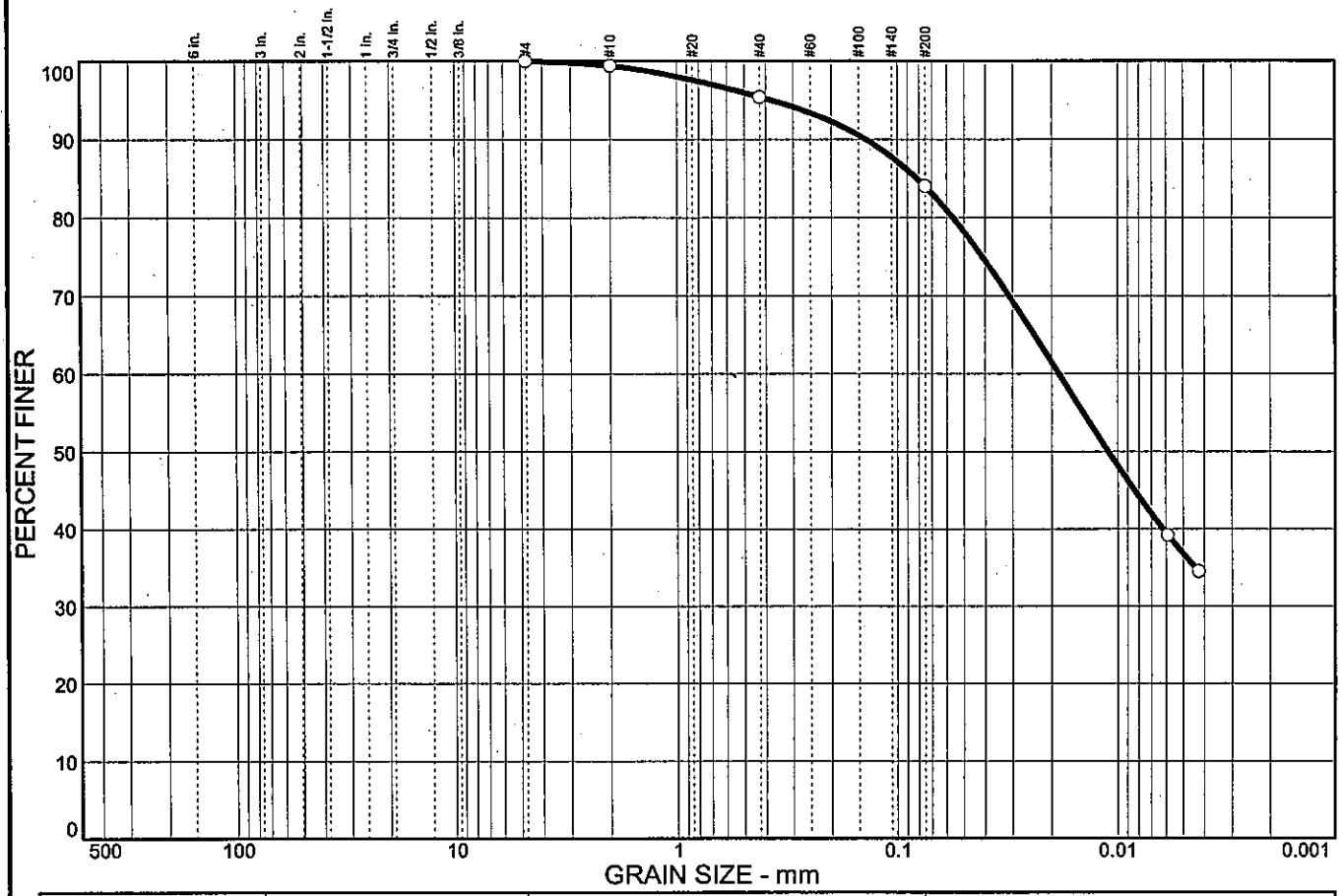
Sample No.: 3 **Source of Sample:** B-1109 **Date:** 10/26/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.6	4.0	11.4	47.2	36.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#40	95.4		
#200	84.0		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 19 LL= 35 PI= 16

Coefficients

D_{85}= 0.0815 D_{60}= 0.0185 D_{50}= 0.0110
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

Remarks

Moisture Content= 20.4%

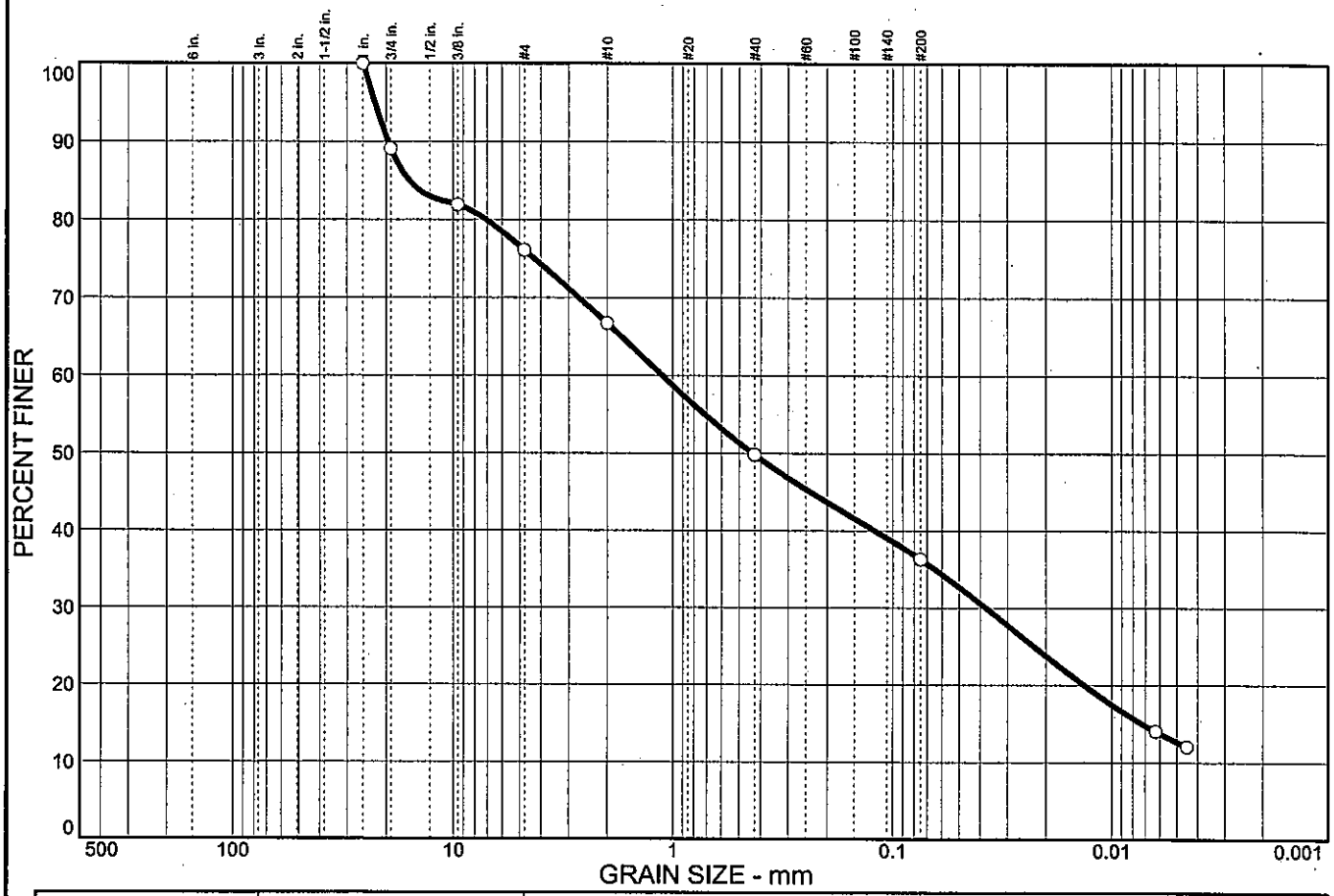
Sample No.: 4 **Source of Sample:** B-1109 **Date:** 9/29/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	10.9	13.0	9.4	16.9	13.5	23.7	12.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	89.1		
0.375 in.	81.9		
#4	76.1		
#10	66.7		
#40	49.8		
#200	36.3		

* (no specification provided)

Soil Description

Clayey sand with gravel

Atterberg Limits

PL= 17 LL= 25 PI= 8

Coefficients

D_{85}= 15.7 D_{60}= 1.11 D_{50}= 0.434
D_{30}= 0.0377 D_{15}= 0.0073 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-4(0)

Remarks

Moisture Content= 11.1%

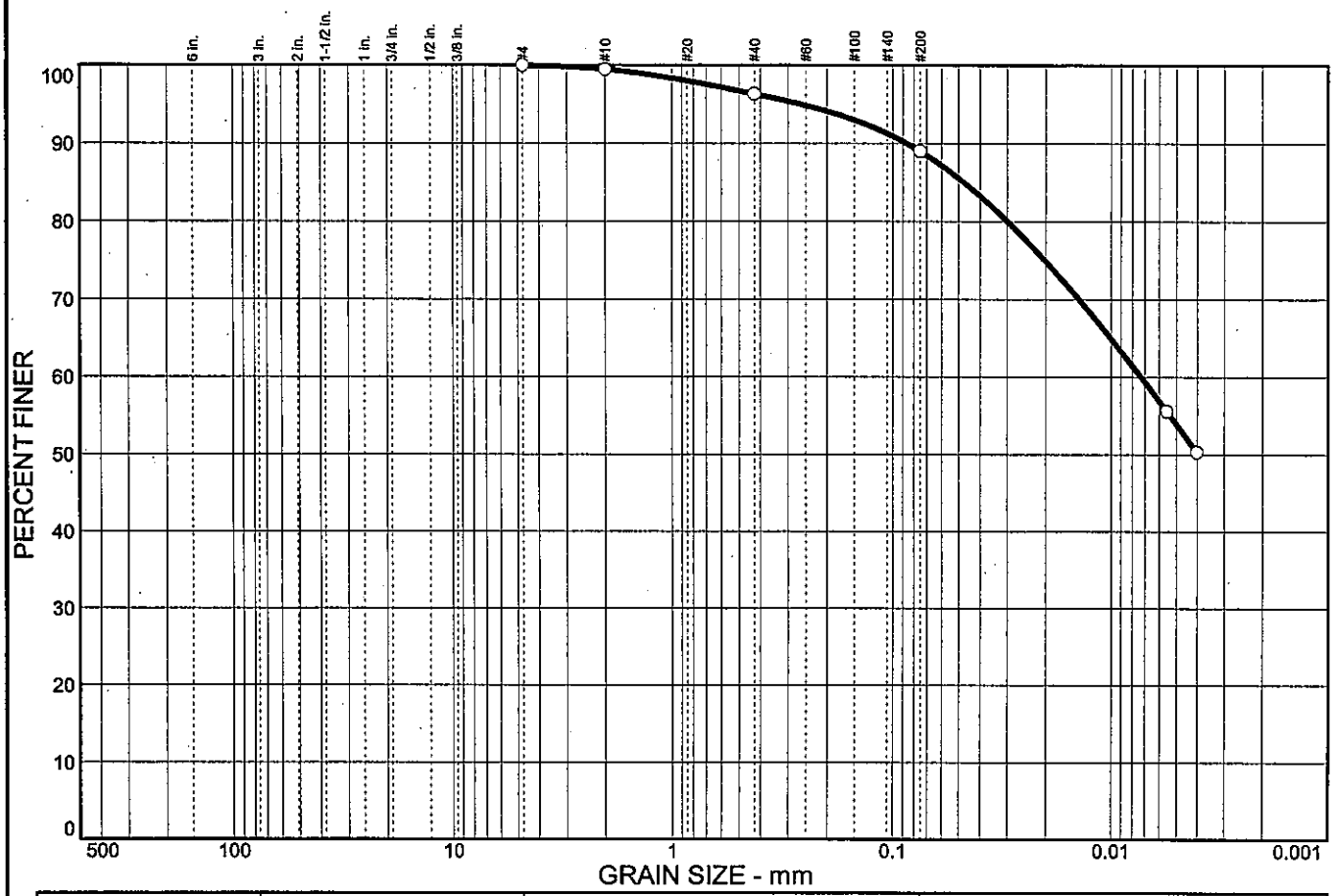
Sample No.: 5 **Source of Sample:** B-1109 **Date:** 9/29/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.5	3.2	7.3	35.1	53.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#40	96.3		
#200	89.0		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 21 LL= 46 PI= 25

Coefficients

D_{85}= 0.0473 D_{60}= 0.0073 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(24)

Remarks

Moisture Content= 28.6%

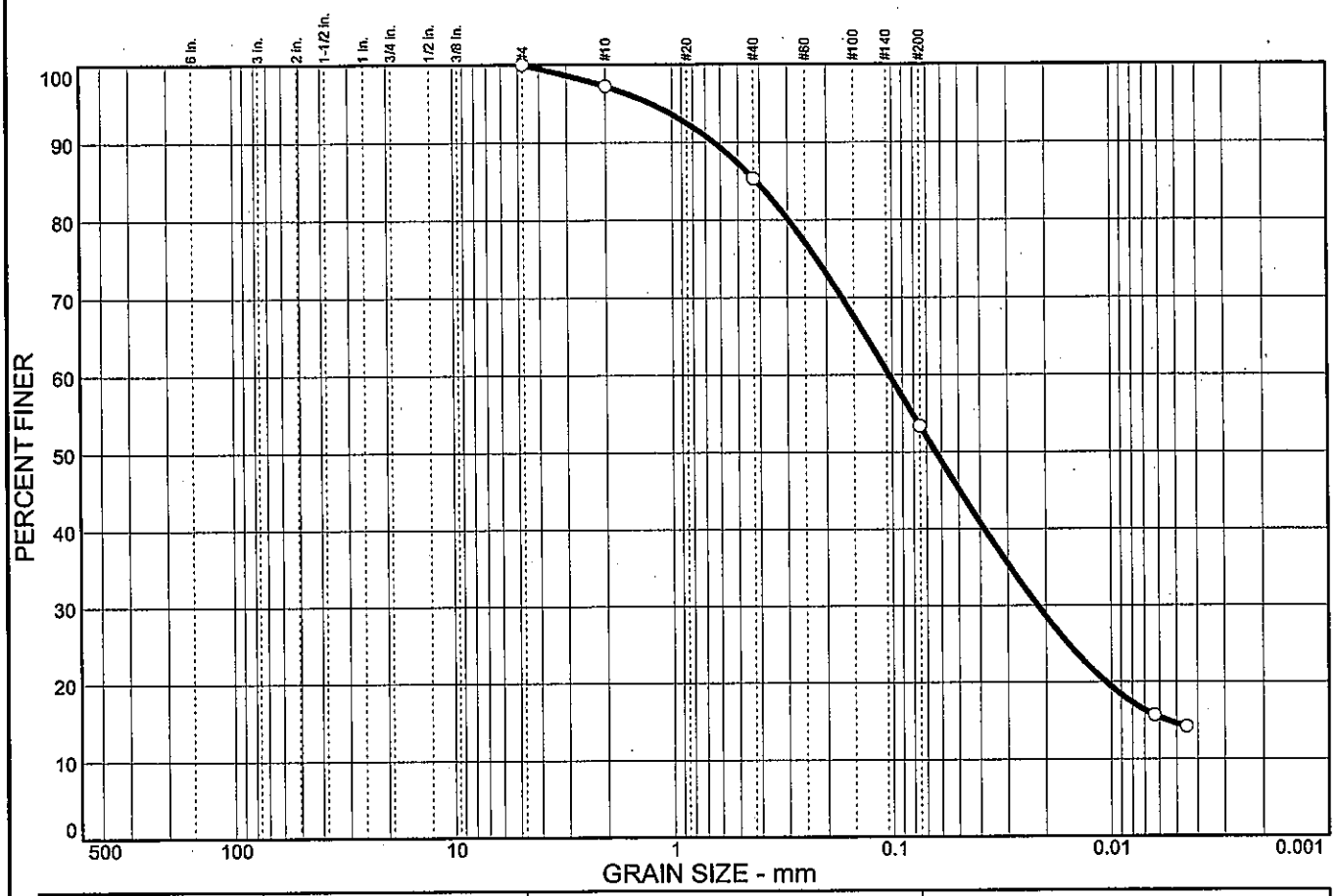
Sample No.: 6 **Source of Sample:** B-1109 **Date:** 9/29/05
Location: **Elev./Depth:** 13.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	2.8	11.9	31.9	38.8	14.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	97.2		
#40	85.3		
#200	53.4		

* (no specification provided)

Soil Description

Sandy silty clay

Atterberg Limits

PL= 17 LL= 23 PI= 6

Coefficients

D_{85}= 0.416 D_{60}= 0.103 D_{50}= 0.0635
D_{30}= 0.0218 D_{15}= 0.0055 D_{10}=
C_u= C_c=

Classification

USCS= CL-ML AASHTO= A-4(1)

Remarks

Moisture Content= 23.7%

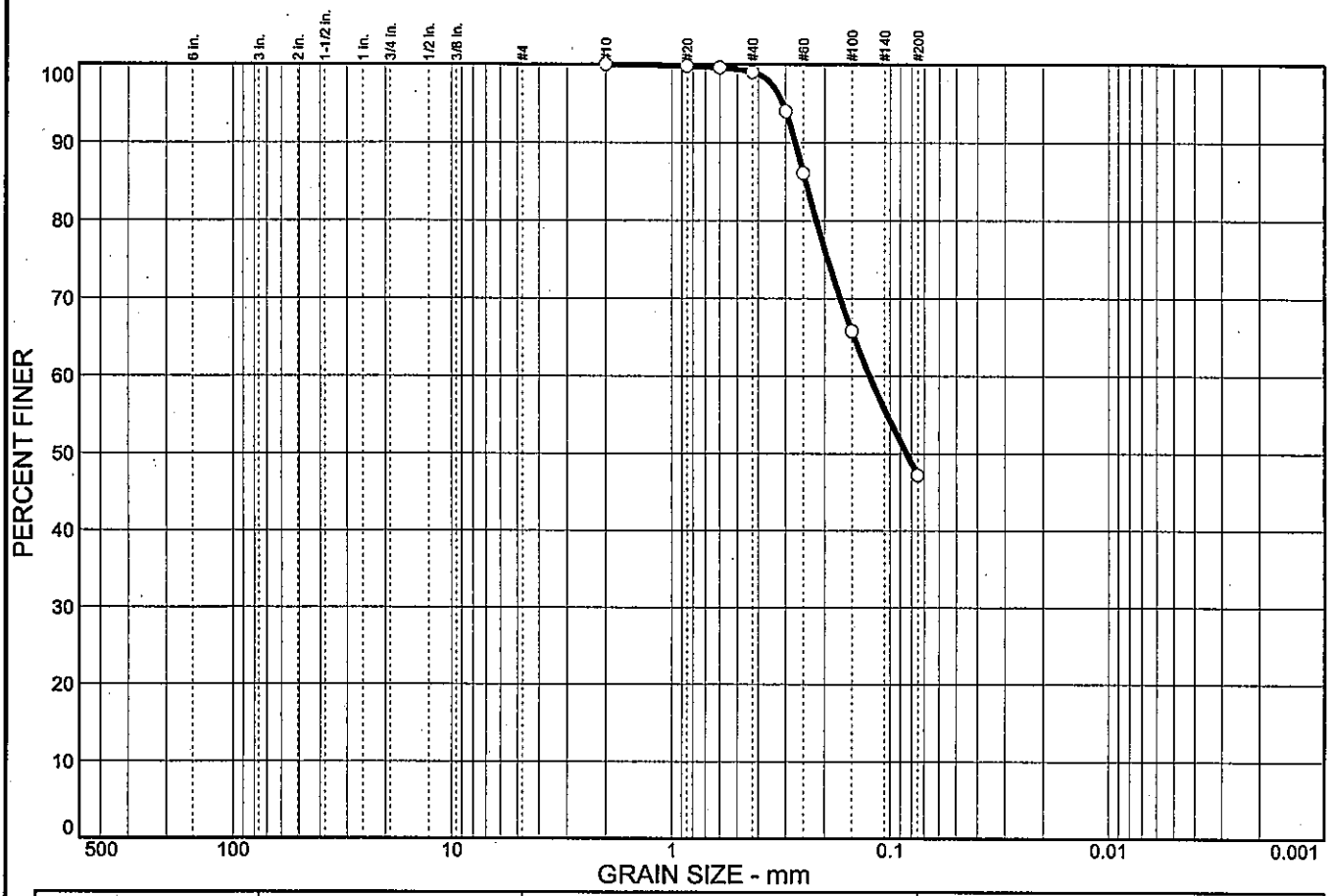
Sample No.: 8 **Source of Sample:** B-1109 **Date:** 9/29/05
Location: **Elev./Depth:** 18.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	1.0	51.8	47.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.8		
#30	99.6		
#40	99.0		
#50	94.0		
#60	86.1		
#100	65.8		
#200	47.2		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.244 D_{60}= 0.124 D_{50}= 0.0843
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Moisture Content= 29.1%

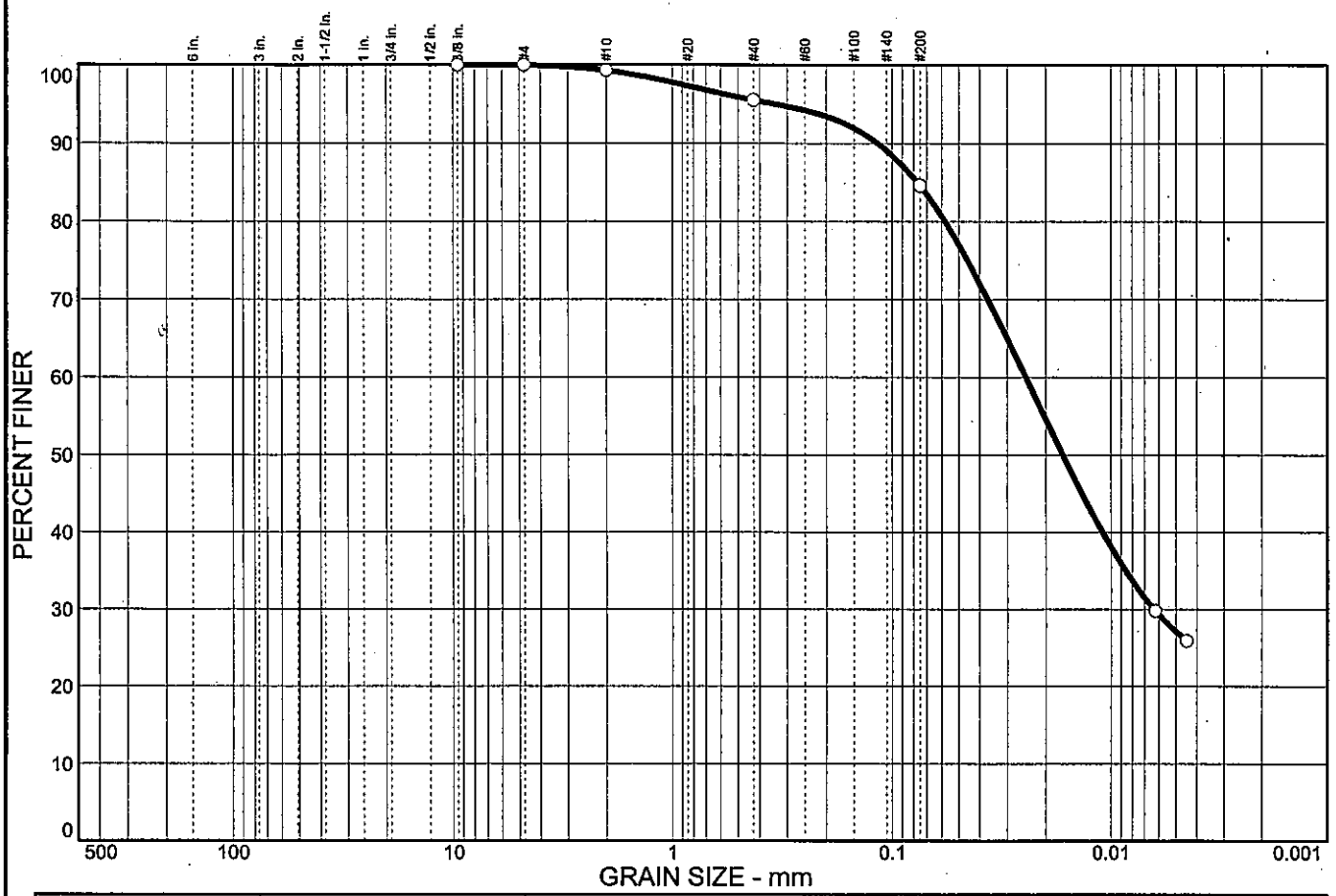
Sample No.: 9 **Source of Sample:** B-1109 **Date:** 9/29/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.7	3.8	10.9	57.5	27.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.3		
#40	95.5		
#200	84.6		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 12 LL= 28 PI= 16

Coefficients

D_{85}= 0.0770 D_{60}= 0.0247 D_{50}= 0.0167
D_{30}= 0.0063 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(11)

Remarks

Moisture Content= 11.5%

Sample No.: 1 **Source of Sample:** B-1110 **Date:** 11/1/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT

% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.4	7.0	10.8	59.8	22.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.6		
#40	92.6		
#200	81.8		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 17 LL= 27 PI= 10

Coefficients

D_{85}= 0.0942 D_{60}= 0.0286 D_{50}= 0.0198
D_{30}= 0.0086 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(6)

Remarks

Moisture Content= 14.5%

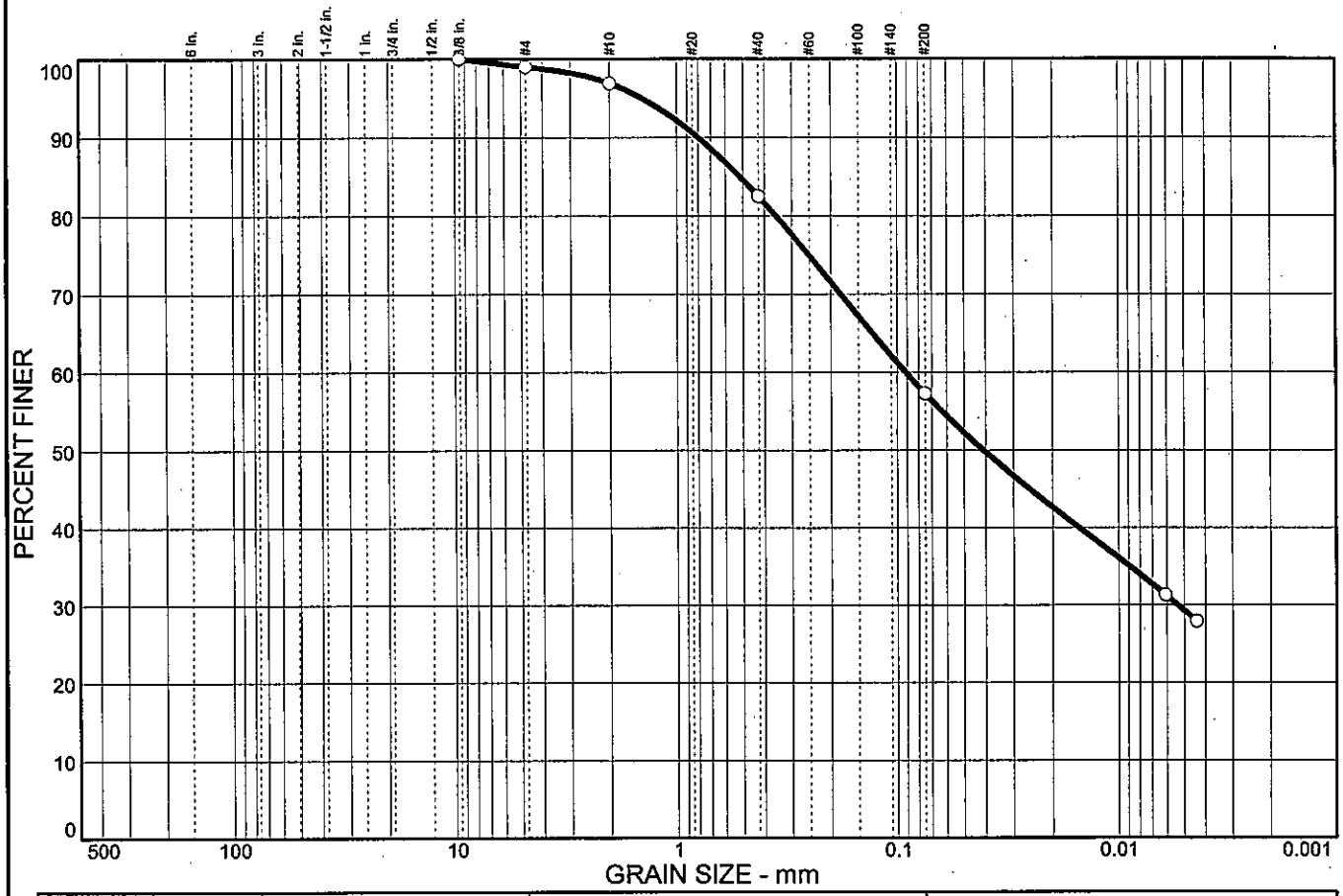
Sample No.: 2 **Source of Sample:** B-1110 **Date:** 11/1/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.0	2.1	14.4	25.2	28.0	29.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.0		
#10	96.9		
#40	82.5		
#200	57.3		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 16 LL= 27 PI= 11

Coefficients

D_{85}= 0.516 D_{60}= 0.0914 D_{50}= 0.0410
D_{30}= 0.0054 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(3)

Remarks

Moisture Content= 14.3%

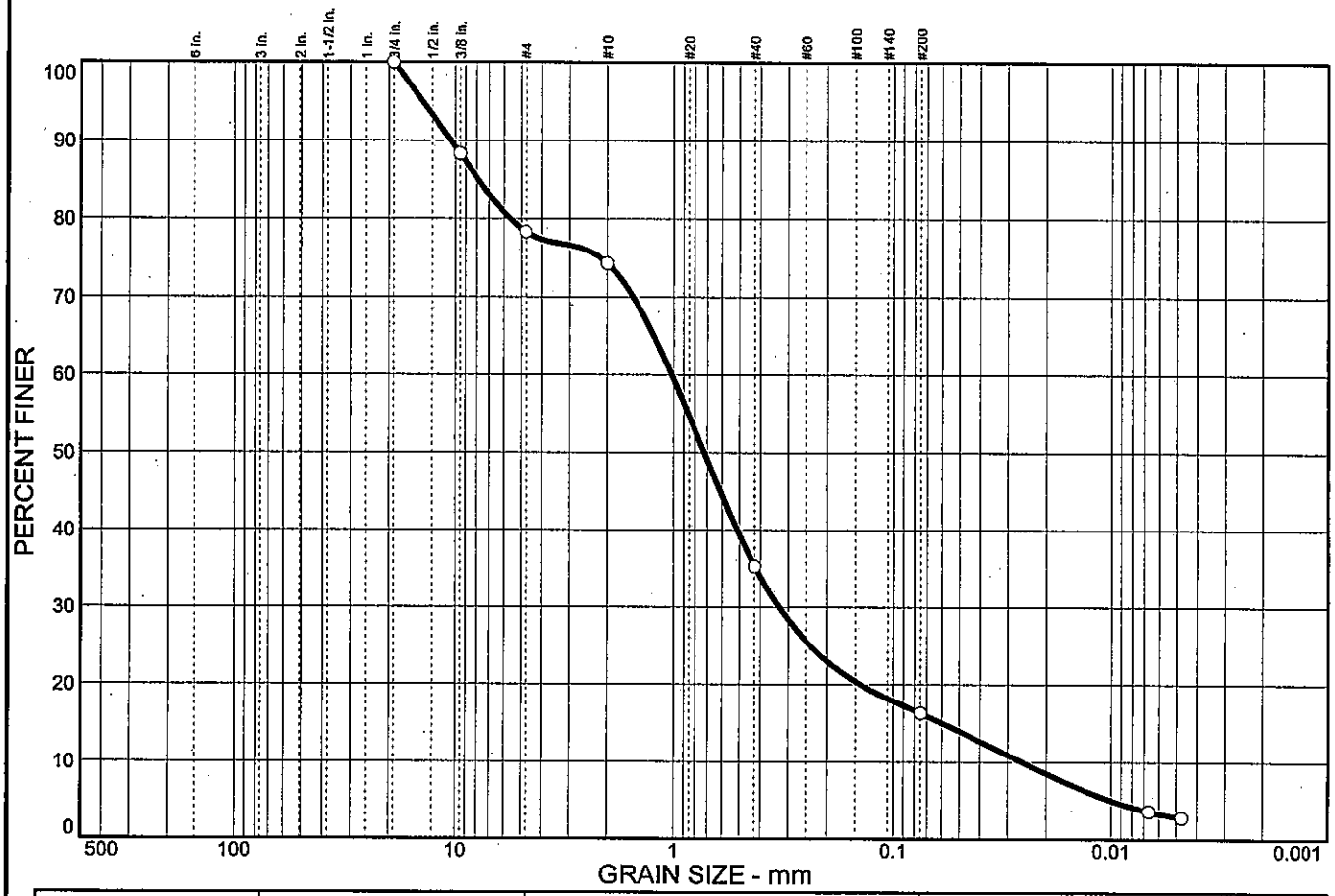
Sample No.: 3 **Source of Sample:** B-1110 **Date:** 11/1/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	21.7	4.0	39.0	19.0	13.4	2.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	88.3		
#4	78.3		
#10	74.3		
#40	35.3		
#200	16.3		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 7.87 D_{60}= 1.02 D_{50}= 0.725
D_{30}= 0.329 D_{15}= 0.0595 D_{10}= 0.0258
C_u= 39.41 C_c= 4.11

Classification

USCS= SM AASHTO= A-1-b

Remarks

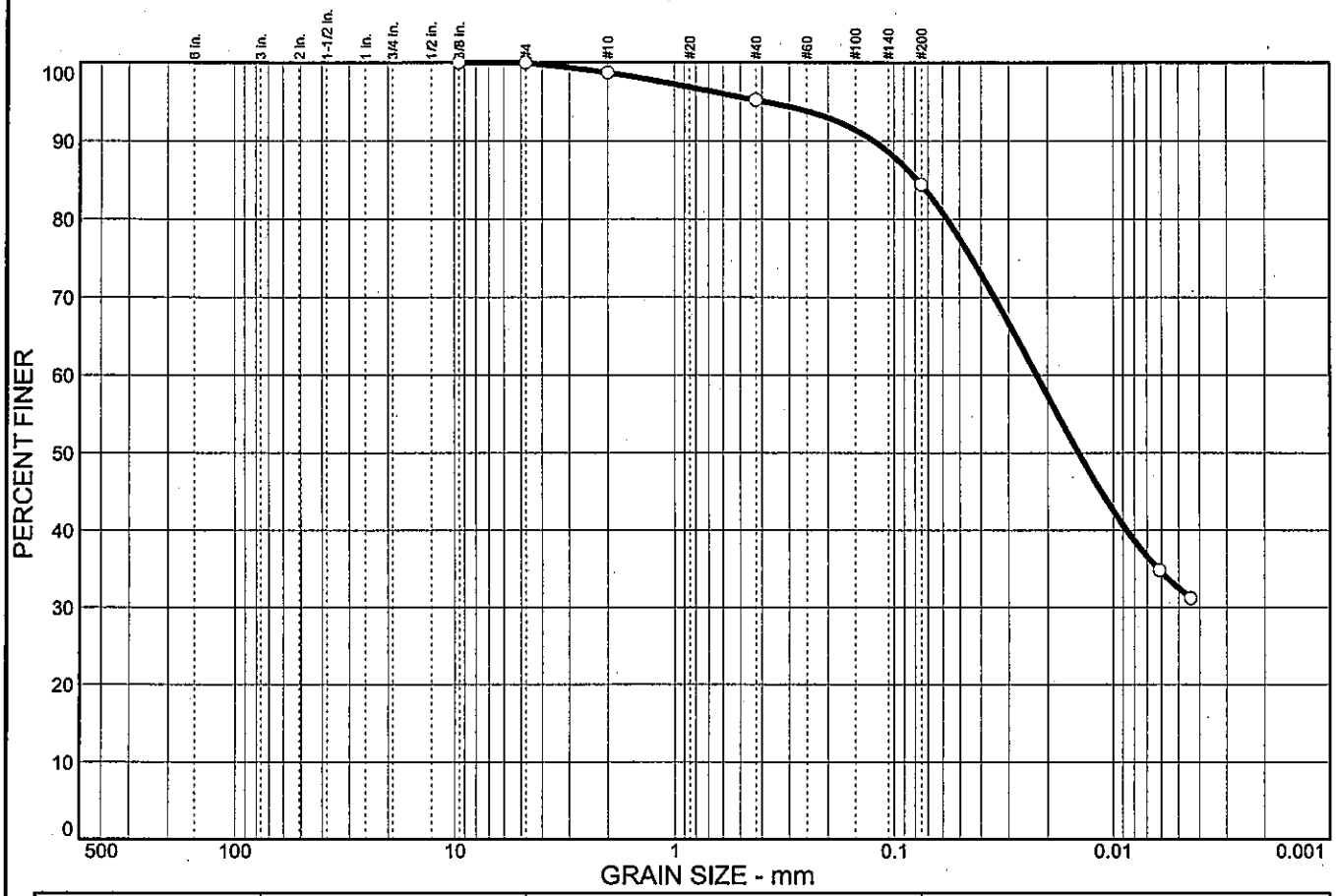
Moisture Content= 15.3%

Sample No.: 11 **Source of Sample:** B-1112 **Date:** 10/27/05
Location: **Elev./Depth:** 26.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	1.3	3.5	10.8	51.9	32.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	98.7		
#40	95.2		
#200	84.4		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 19 LL= 31 PI= 12

Coefficients

D_{85}= 0.0783 D_{60}= 0.0224 D_{50}= 0.0144
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

Moisture Content= 18.1%

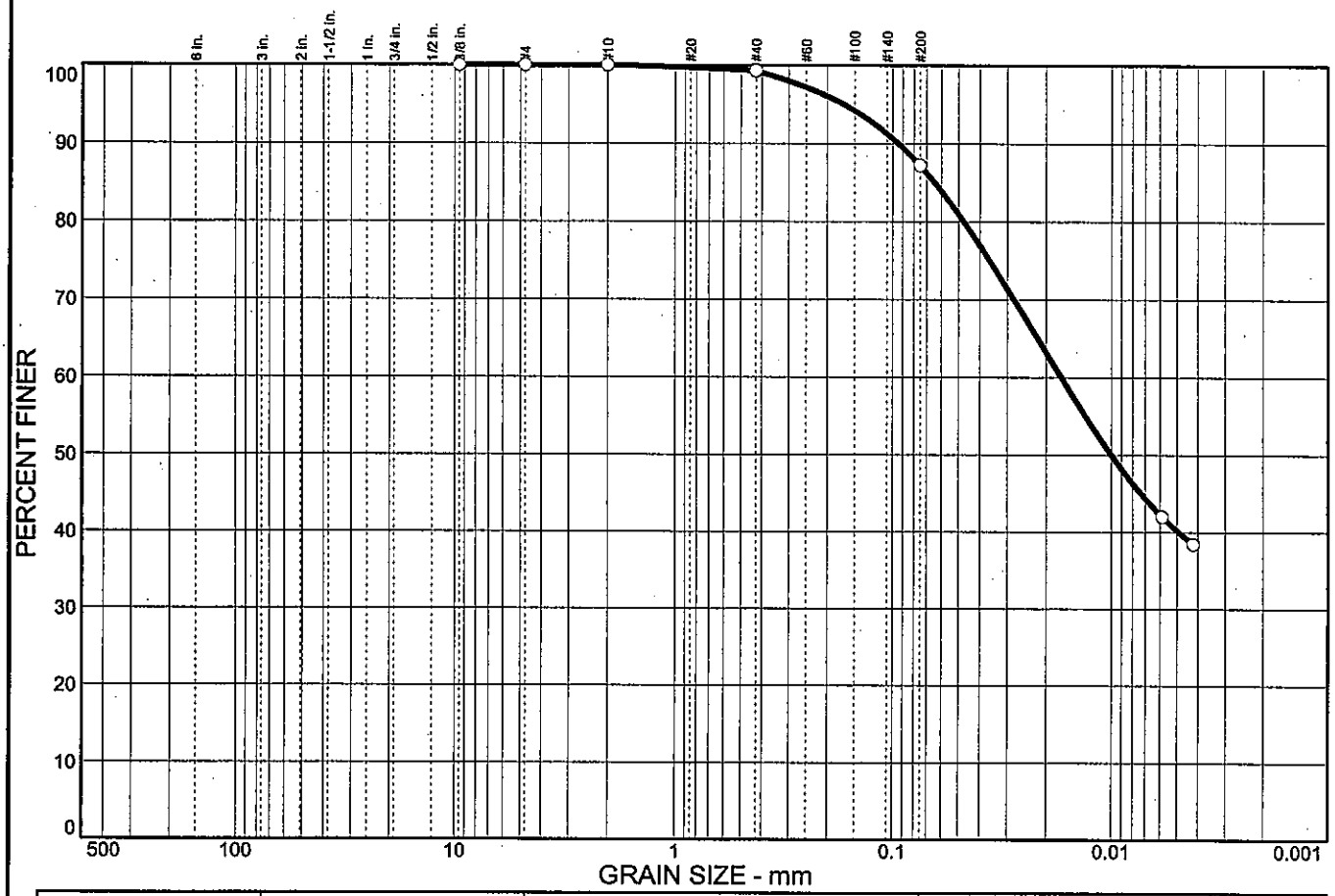
Sample No.: 2 **Source of Sample:** B-1113 **Date:** 10/27/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.7	12.1	47.0	40.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	100.0		
#40	99.3		
#200	87.2		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 16 LL= 41 PI= 25

Coefficients

D_{85}= 0.0643 D_{60}= 0.0170 D_{50}= 0.0100
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(21)

Remarks

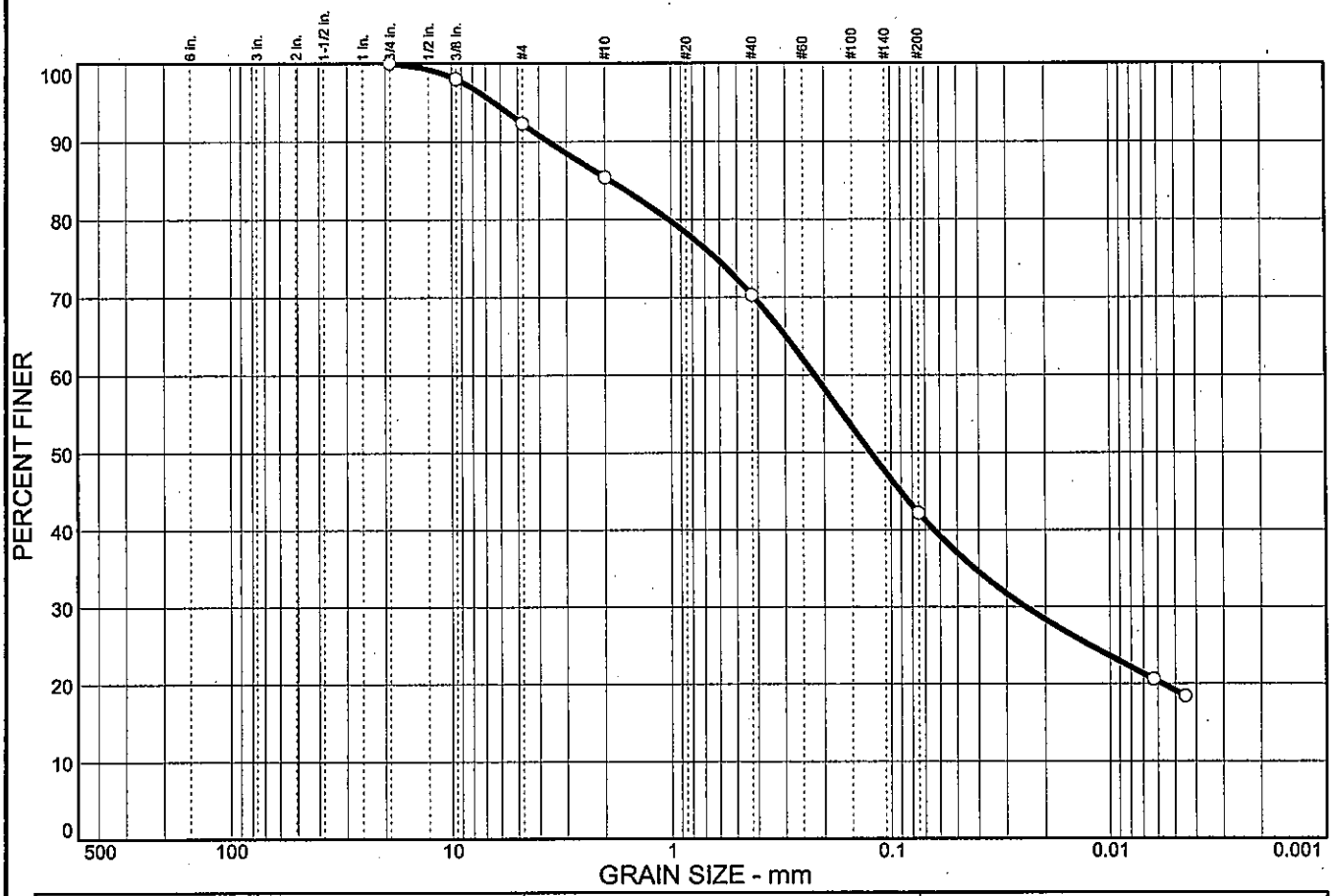
Moisture Content= 21.8%

Sample No.: 3 **Source of Sample:** B-1113 **Date:** 10/27/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	7.7	6.9	15.1	28.1	23.1	19.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.0		
#4	92.3		
#10	85.4		
#40	70.3		
#200	42.2		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 14 LL= 31 PI= 17

Coefficients

D_{85}= 1.90 D_{60}= 0.221 D_{50}= 0.123
D_{30}= 0.0246 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(3)

Remarks

Moisture Content= 17.3%

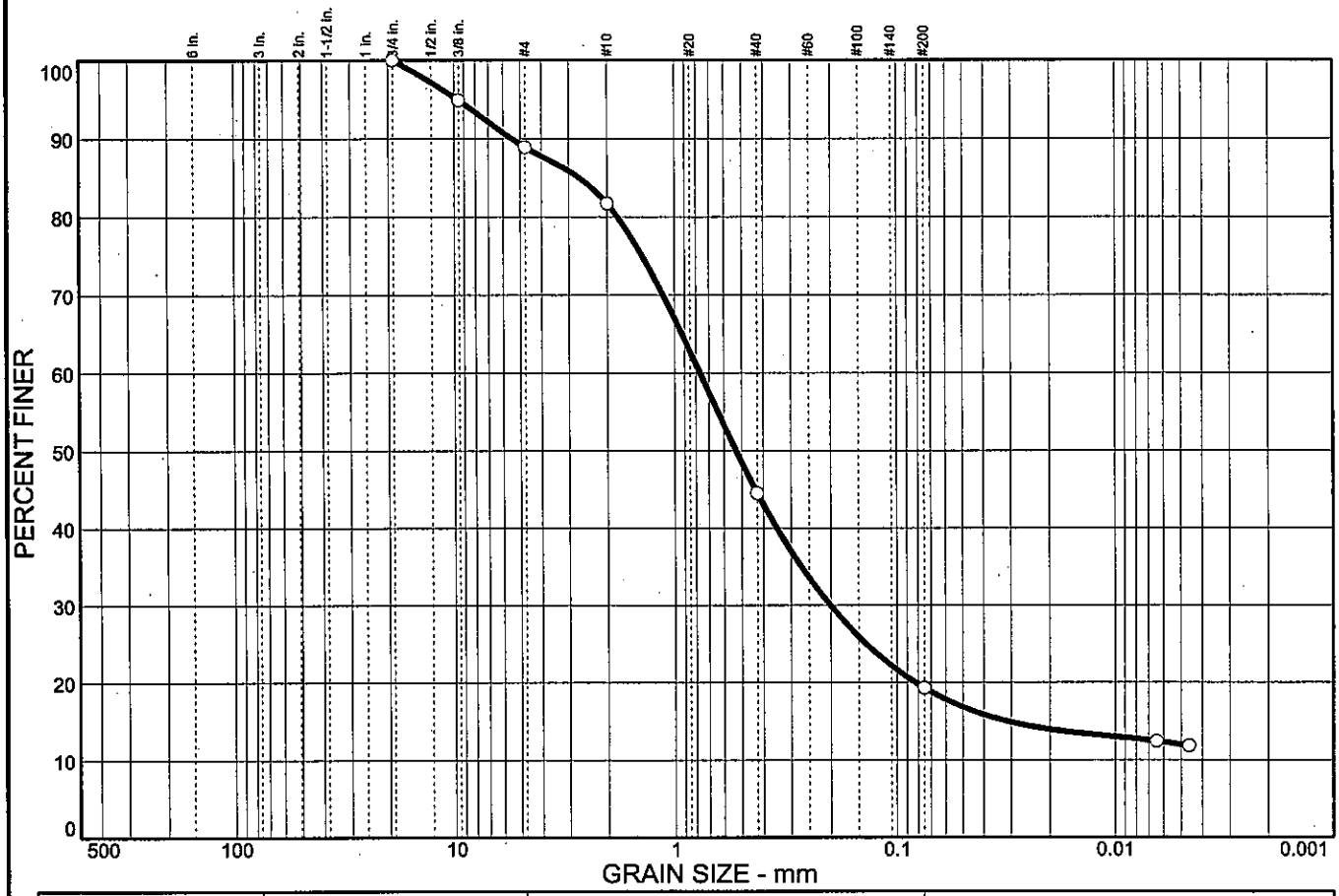
Sample No.: 4 **Source of Sample:** B-1113 **Date:** 10/27/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	11.1	7.2	37.2	25.2	7.3	12.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.9		
#4	88.9		
#10	81.7		
#40	44.5		
#200	19.3		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 14 LL= 29 PI= 15

Coefficients

D_{85}= 2.69 D_{60}= 0.767 D_{50}= 0.529
D_{30}= 0.201 D_{15}= 0.0313 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(0)

Remarks

Moisture Content= 25.5%

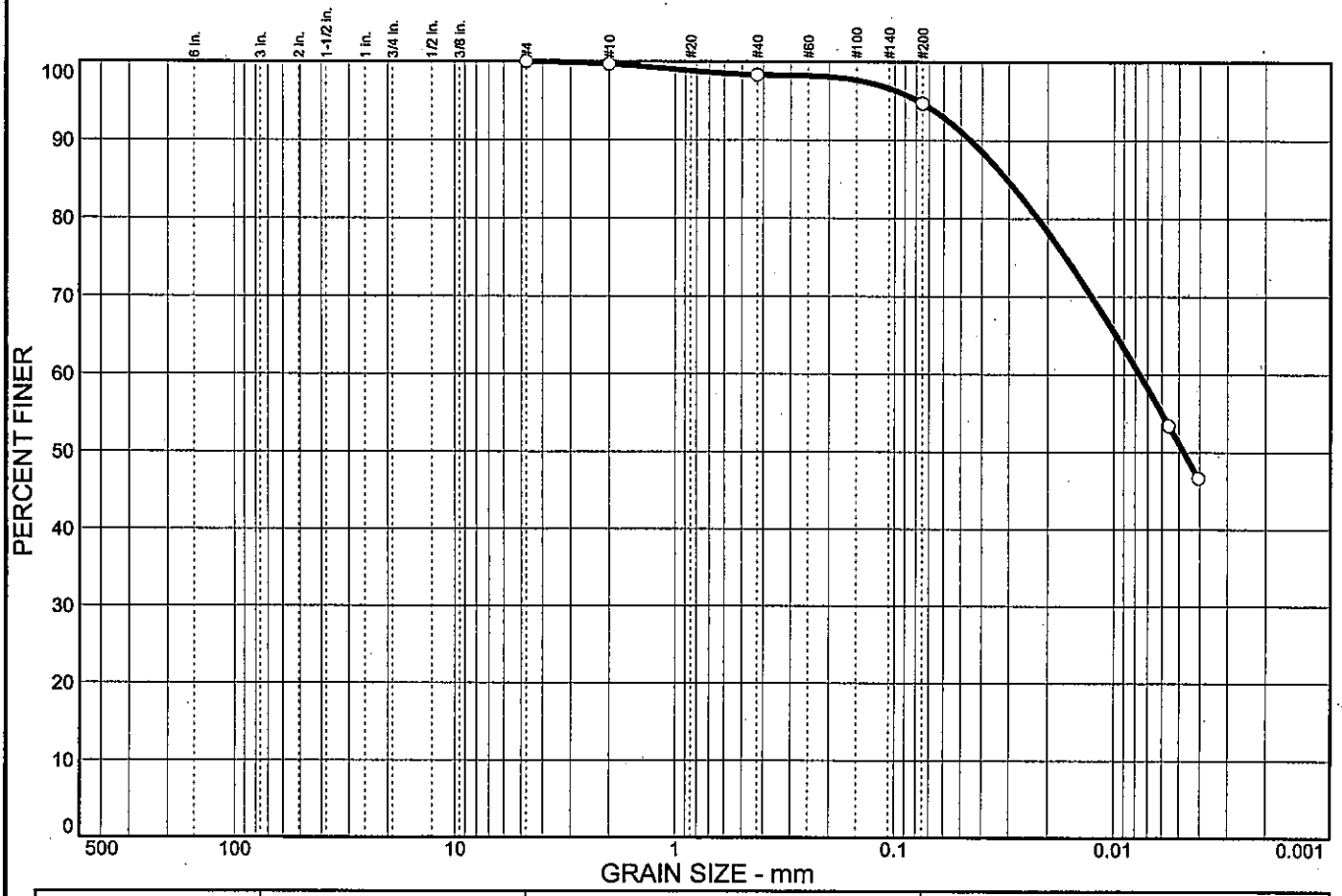
Sample No.: 7 **Source of Sample:** B-1113 **Date:** 10/27/05
Location: **Elev./Depth:** 16.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.3	1.4	3.6	43.6	51.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#40	98.3		
#200	94.7		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 18 LL= 36 PI= 18

Coefficients

D_{85}= 0.0306 D_{60}= 0.0076 D_{50}= 0.0047
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(17)

Remarks

Moisture Content= 16.2%

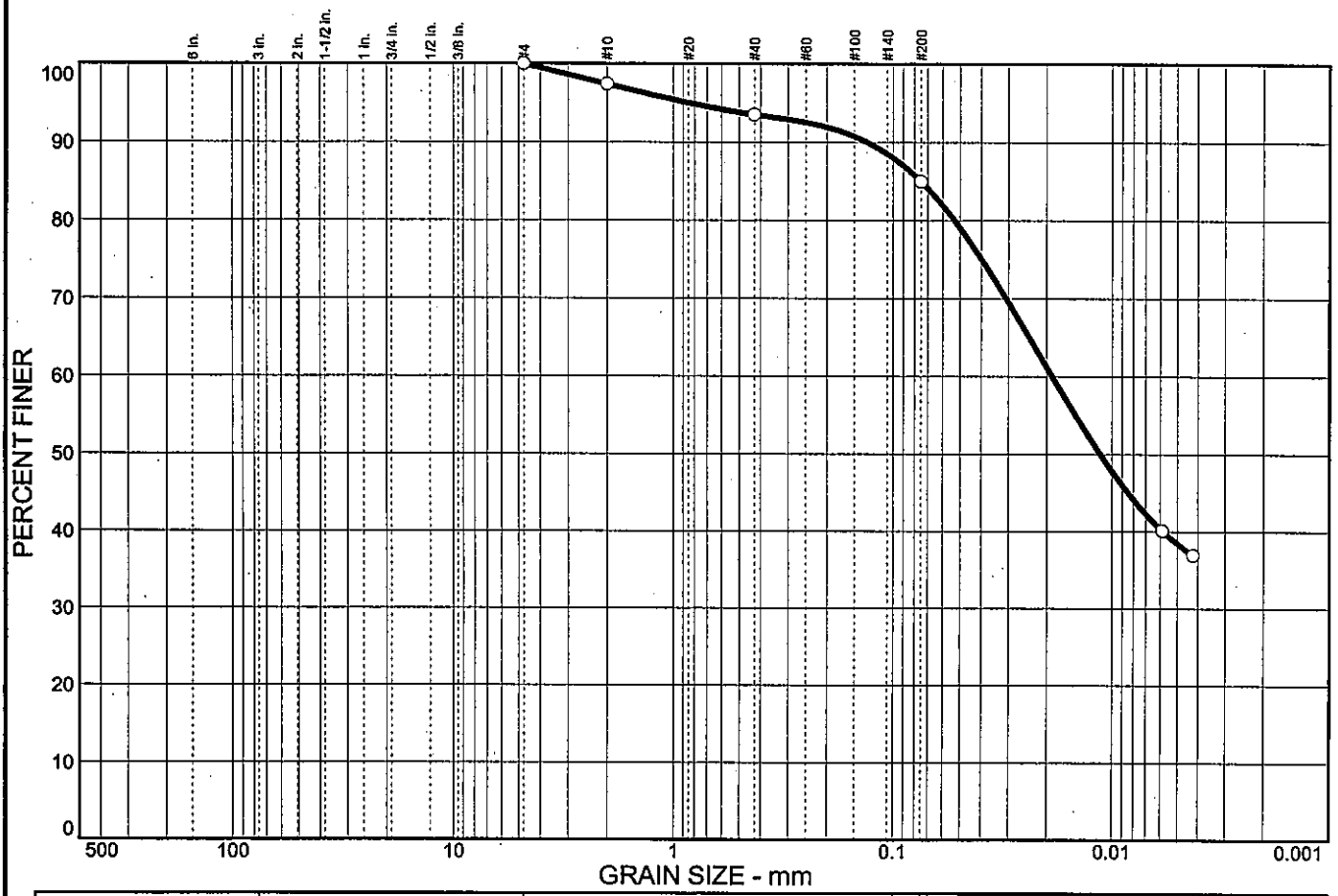
Sample No.: 1 **Source of Sample:** B-1114 **Date:** 10/27/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	2.6	3.9	8.5	46.6	38.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	97.4		
#40	93.5		
#200	85.0		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 16 LL= 36 PI= 20

Coefficients

D_{85}= 0.0750 D_{60}= 0.0188 D_{50}= 0.0113
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(16)

Remarks

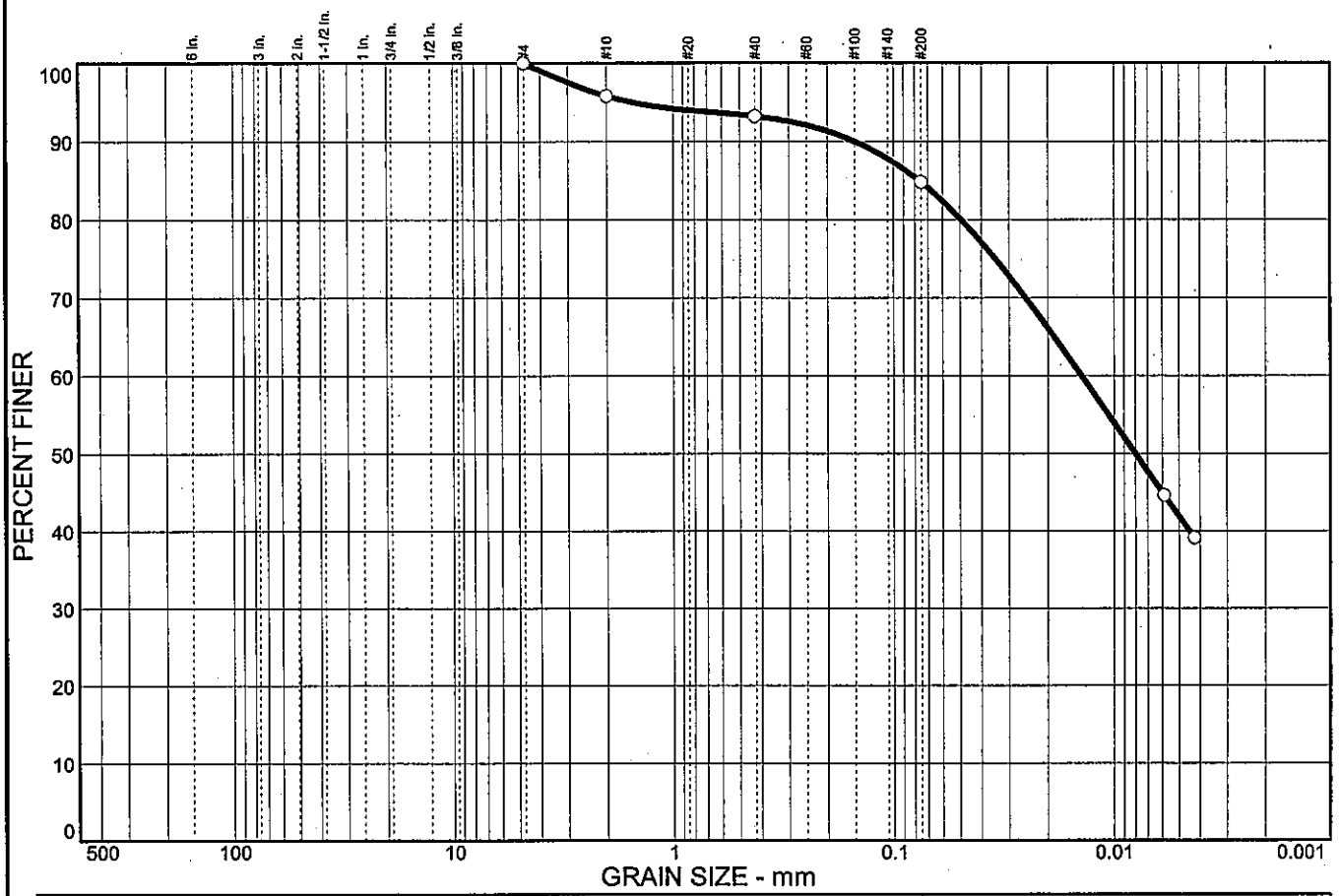
Moisture Content= 14.0%

Sample No.: 2 **Source of Sample:** B-1114 **Date:** 10/27/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	4.2	2.6	8.4	42.9	41.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	95.8		
#40	93.2		
#200	84.8		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 18 LL= 40 PI= 22

Coefficients

D_{85}= 0.0765 D_{60}= 0.0140 D_{50}= 0.0080
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(18)

Remarks

Moisture Content= 13.7%

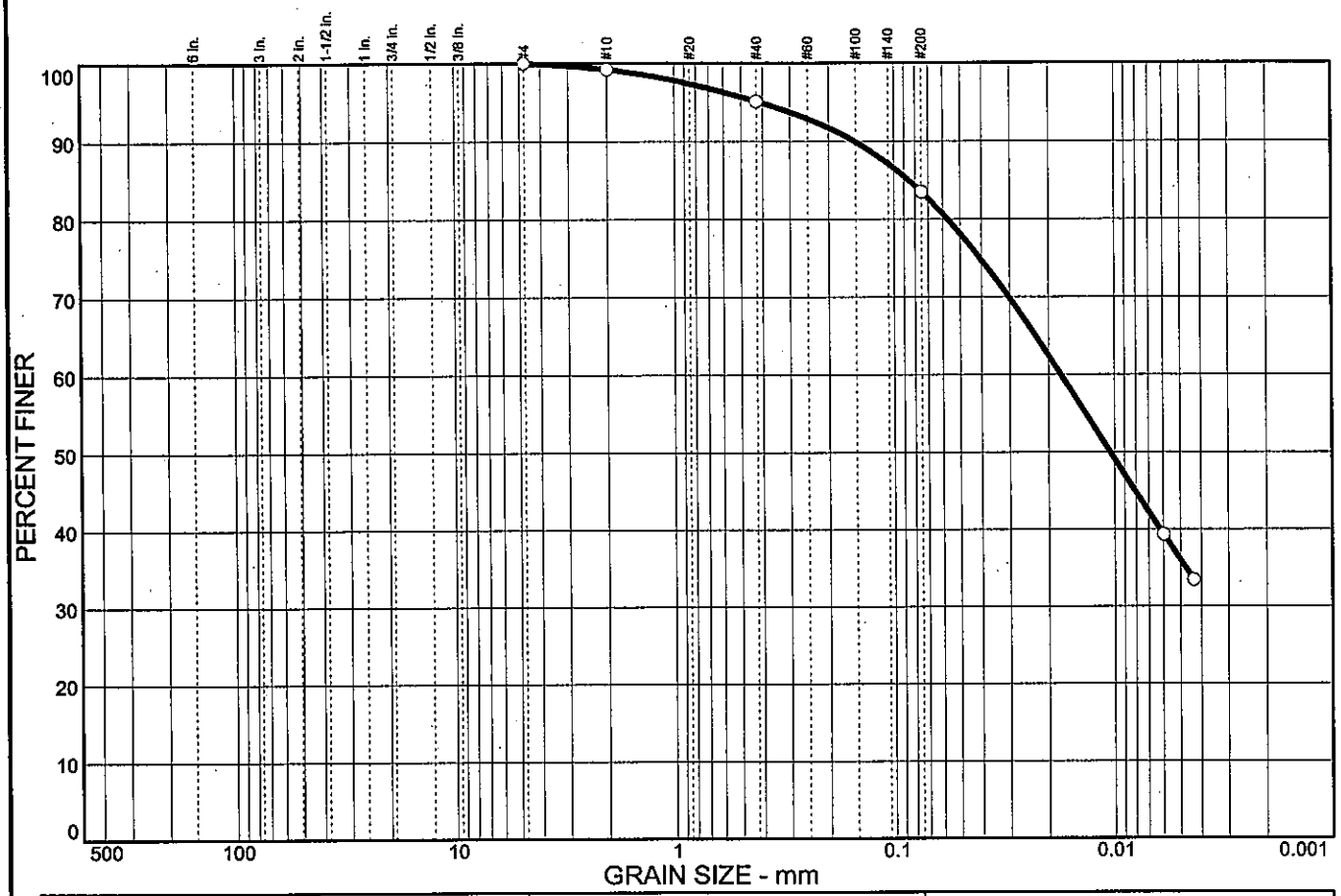
Sample No.: 1 **Source of Sample:** B-1115 **Date:** 10/27/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.8	4.1	11.6	47.5	36.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.2		
#40	95.1		
#200	83.5		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 16 LL= 33 PI= 17

Coefficients

D_{85}= 0.0857 D_{60}= 0.0175 D_{50}= 0.0105
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

Remarks

Moisture Content= 12.3%

Sample No.: 2 **Source of Sample:** B-1115 **Date:** 10/27/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT

% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	1.7	7.0	65.8	25.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	100.0		
#40	98.3		
#200	91.3		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 18 LL= 27 PI= 9

Coefficients

D_{85}= 0.0614 D_{60}= 0.0273 D_{50}= 0.0191
D_{30}= 0.0074 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(7)

Remarks

Moisture Content= 12.2%

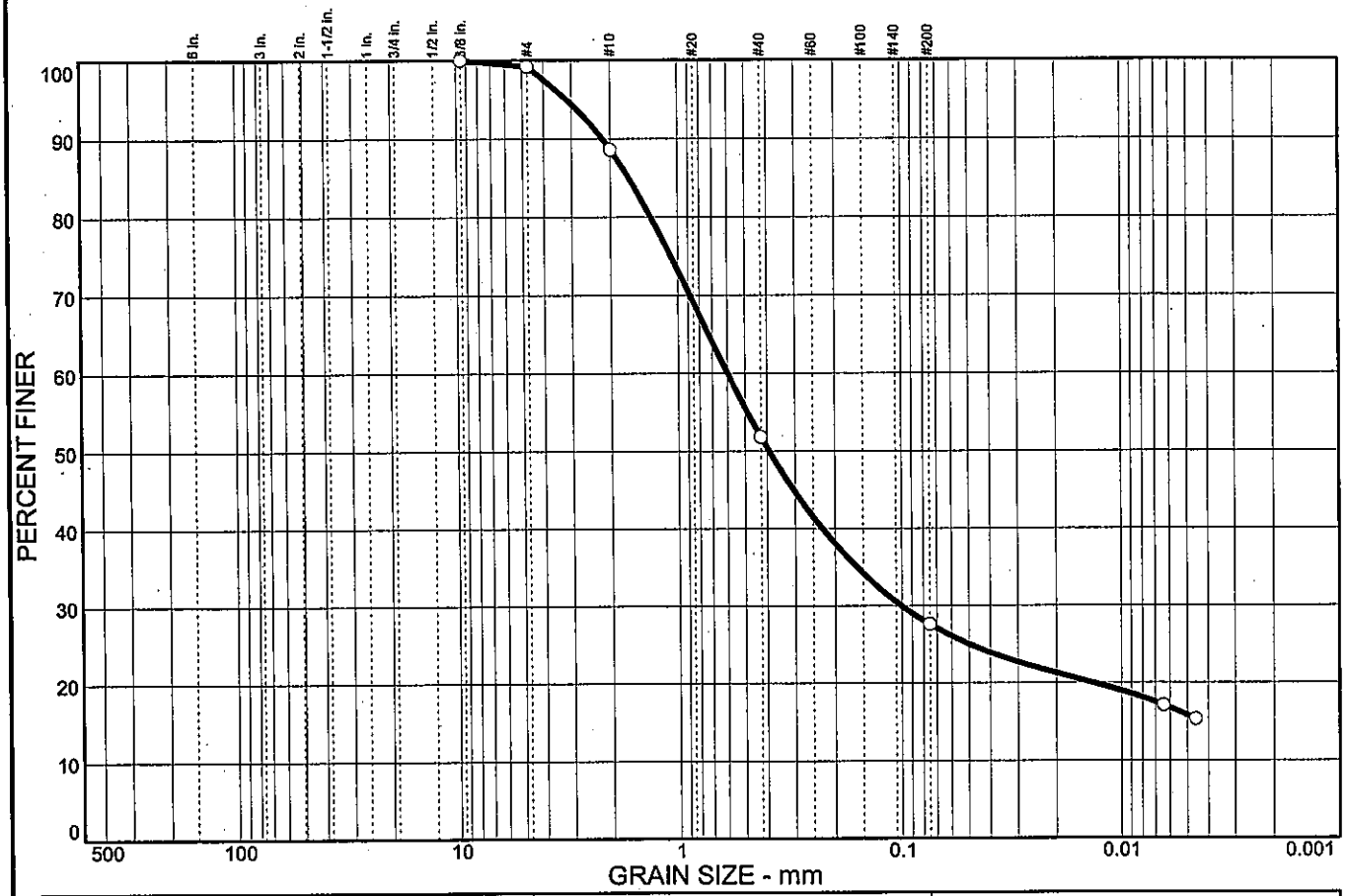
Sample No.: 2 **Source of Sample:** B-1116 **Date:** 10/27/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.8	10.6	36.8	24.2	11.8	15.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.2		
#10	88.6		
#40	51.8		
#200	27.6		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 15 LL= 32 PI= 17

Coefficients

D_{85}= 1.66 D_{60}= 0.598 D_{50}= 0.391
D_{30}= 0.100 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(1)

Remarks

Moisture Content= 14.4%

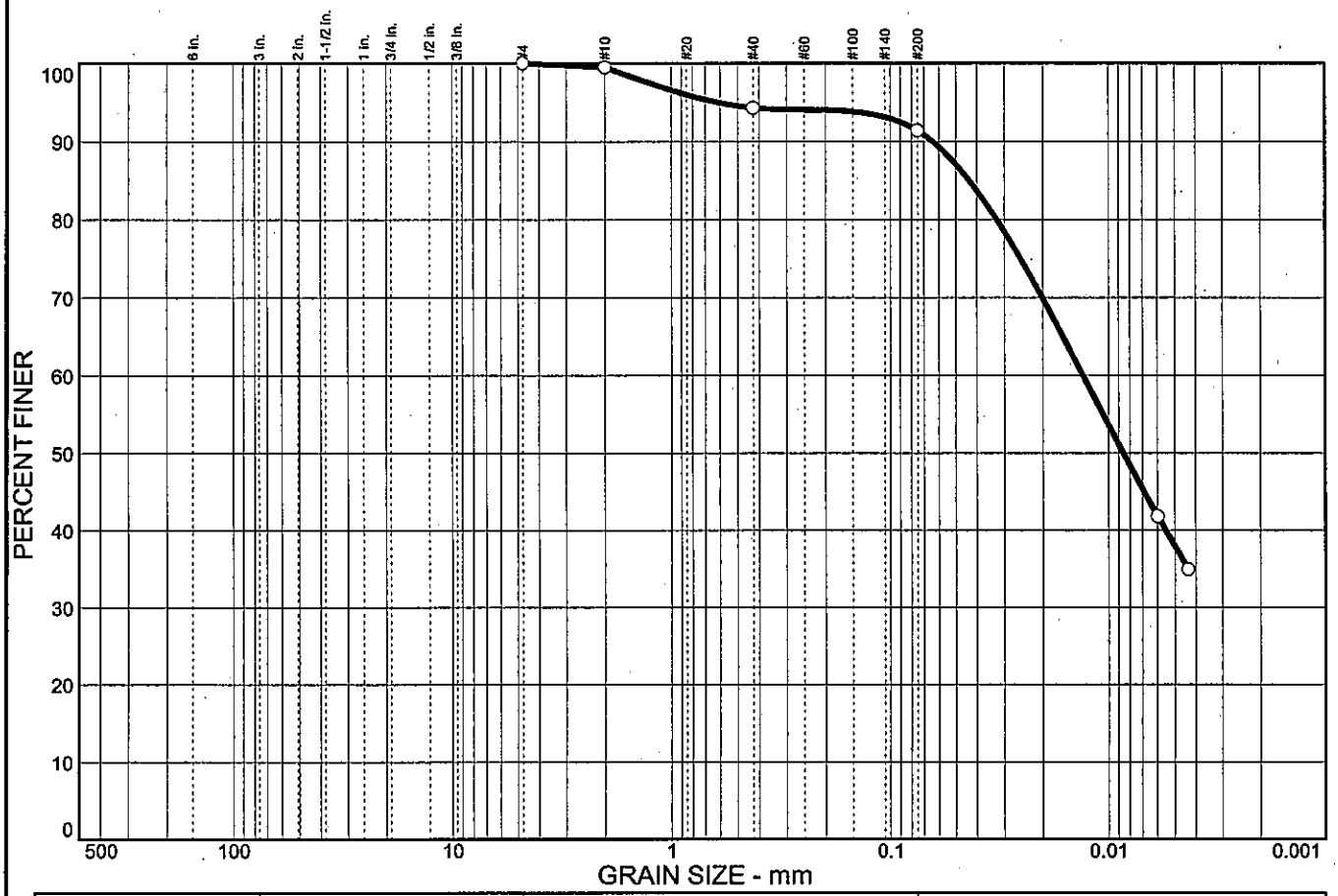
Sample No.: 4 **Source of Sample:** B-1116 **Date:** 10/27/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.5	5.2	2.9	53.4	38.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#40	94.3		
#200	91.4		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 35 PI= 16

Coefficients

D_{85}= 0.0435 D_{60}= 0.0130 D_{50}= 0.0086
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(14)

Remarks

Moisture Content= 12.5%

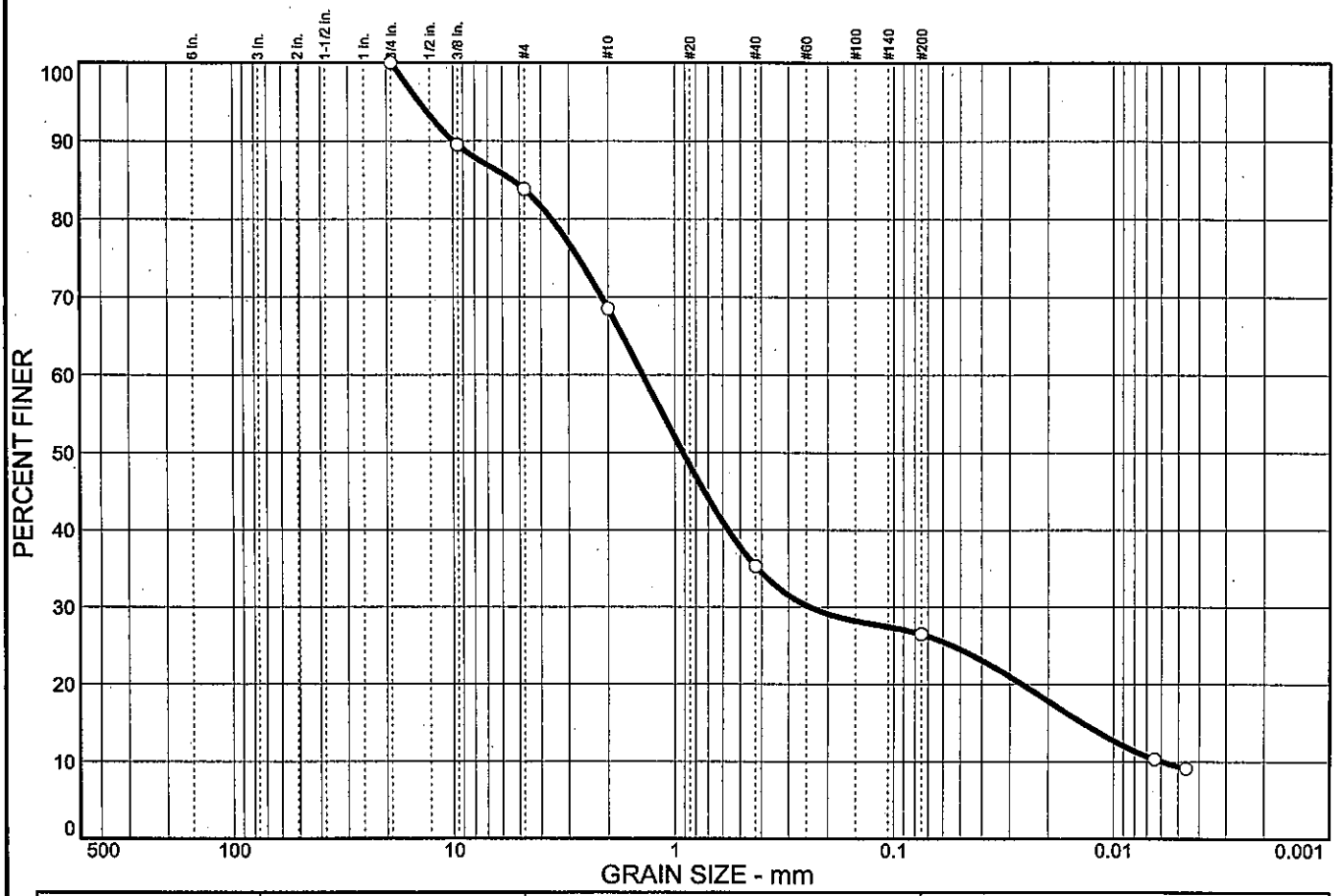
Sample No.: 8 **Source of Sample:** B-1116 **Date:** 10/27/05
Location: **Elev./Depth:** 18.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	16.2	15.3	33.2	8.8	17.1	9.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	89.5		
#4	83.8		
#10	68.5		
#40	35.3		
#200	26.5		

* (no specification provided)

Soil Description

Clayey sand with gravel

Atterberg Limits

PL= 16 LL= 28 PI= 12

Coefficients

D_{85}= 5.39 D_{60}= 1.39 D_{50}= 0.915
D_{30}= 0.240 D_{15}= 0.0139 D_{10}= 0.0060
C_u= 233.44 C_c= 6.93

Classification

USCS= SC AASHTO= A-2-6(0)

Remarks

Moisture Content= 23.2%

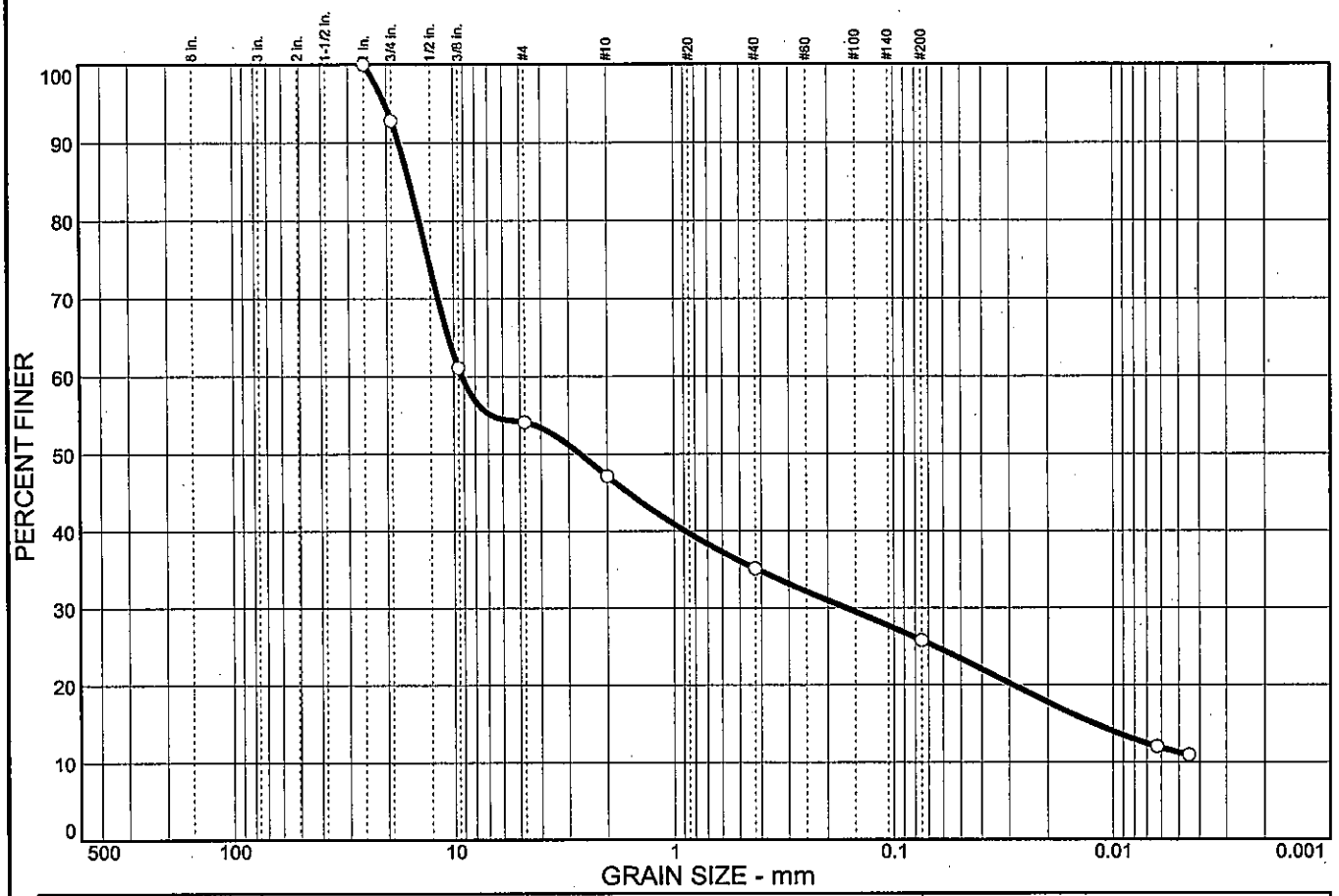
Sample No.: 11 **Source of Sample:** B-1117 **Date:** 10/27/05
Location: **Elev./Depth:** 26.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	7.2	38.7	7.0	12.0	9.3	14.6	11.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	92.8		
0.375 in.	61.1		
#4	54.1		
#10	47.1		
#40	35.1		
#200	25.8		

* (no specification provided)

Soil Description

Clayey gravel with sand

Atterberg Limits

PL= 13 LL= 31 PI= 18

Coefficients

D_{85}= 15.8 D_{60}= 9.19 D_{50}= 2.66
D_{30}= 0.165 D_{15}= 0.0122 D_{10}=
C_u= C_c=

Classification

USCS= GC AASHTO= A-2-6(1)

Remarks

Moisture Content= 15.6%

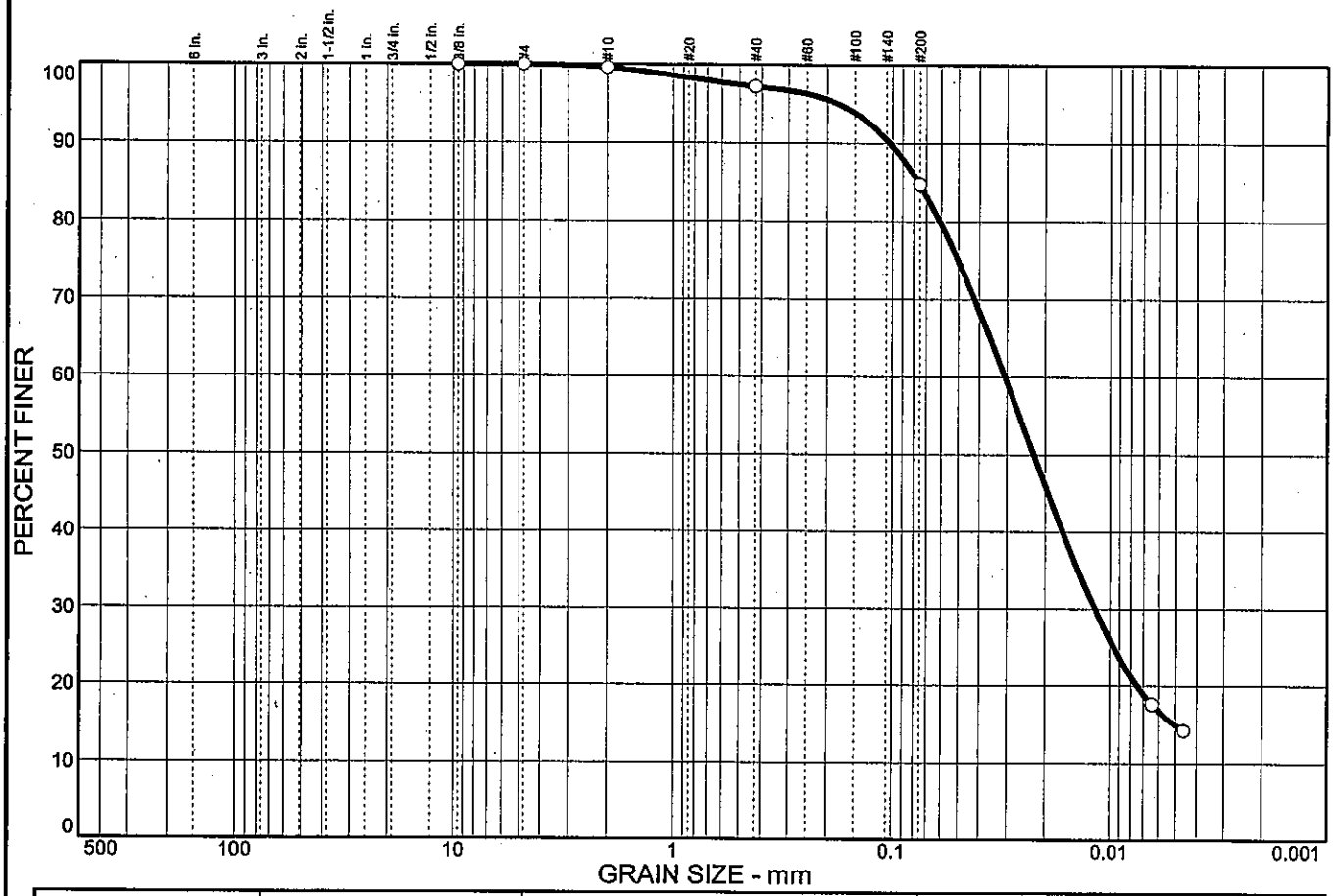
Sample No.: 12 **Source of Sample:** B-1117 **Date:** 10/27/05
Location: **Elev./Depth:** 28.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.4	2.4	12.5	69.7	15.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.6		
#40	97.2		
#200	84.7		

* (no specification provided)

Soil Description

Silty clay with sand

Atterberg Limits

PL= 18 LL= 24 PI= 6

Coefficients

D_{85}= 0.0761 D_{60}= 0.0307 D_{50}= 0.0226
D_{30}= 0.0117 D_{15}= 0.0050 D_{10}=
C_u= C_c=

Classification

USCS= CL-ML AASHTO= A-4(3)

Remarks

Moisture Content= 22.2%

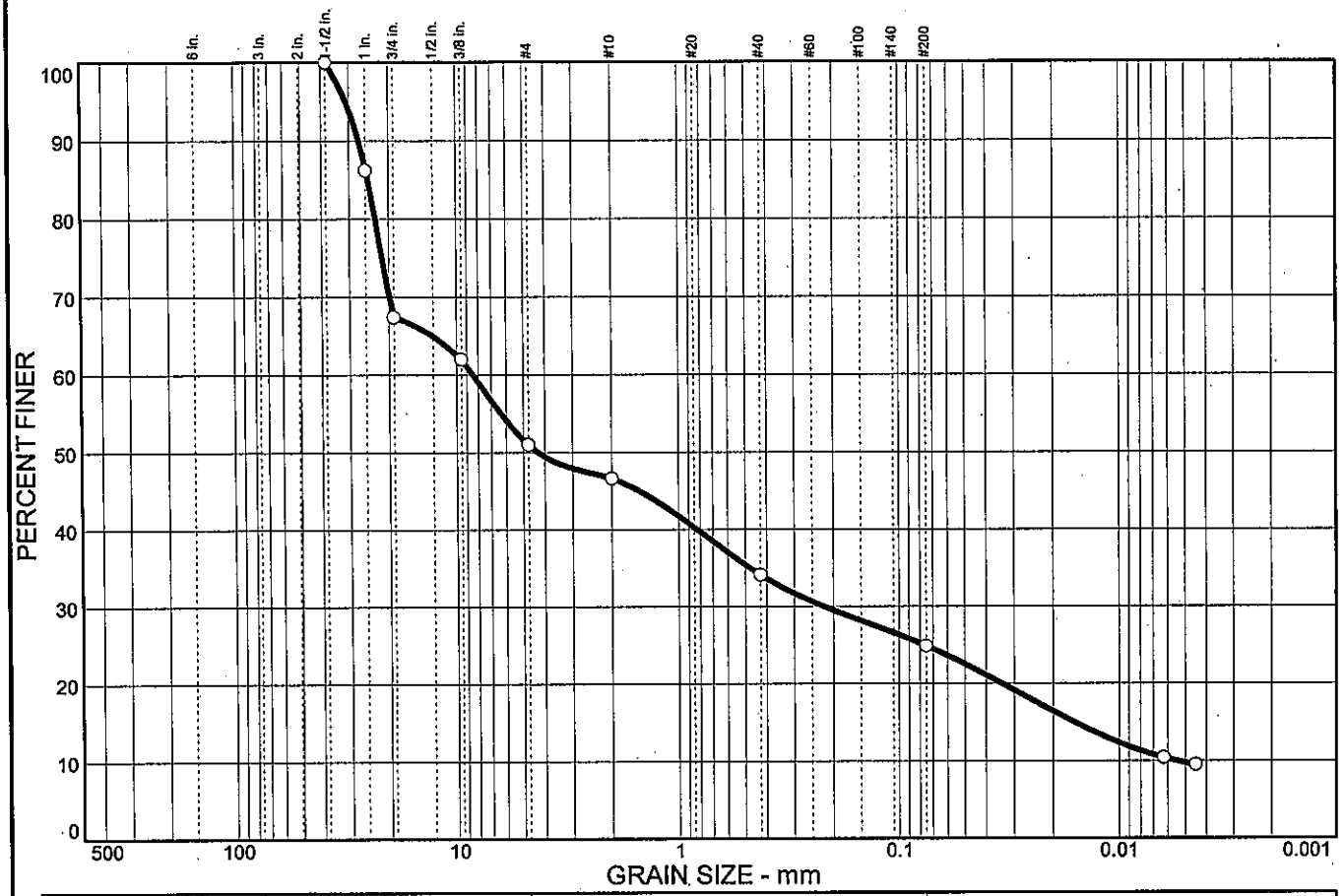
Sample No.: 7 **Source of Sample:** B-1117 **Date:** 10/27/05
Location: **Elev./Depth:** 16.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	32.6	16.4	4.4	12.5	9.2	15.1	9.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	86.2		
0.75 in.	67.4		
0.375 in.	62.0		
#4	51.0		
#10	46.6		
#40	34.1		
#200	24.9		

* (no specification provided)

Soil Description

Clayey gravel with sand

Atterberg Limits

PL= 19 LL= 28 PI= 9

Coefficients

D_{85}= 24.9 D_{60}= 8.45 D_{50}= 4.29
D_{30}= 0.220 D_{15}= 0.0159 D_{10}= 0.0055
C_u= 1545.52 C_c= 1.05

Classification

USCS= GC AASHTO= A-2-4(0)

Remarks

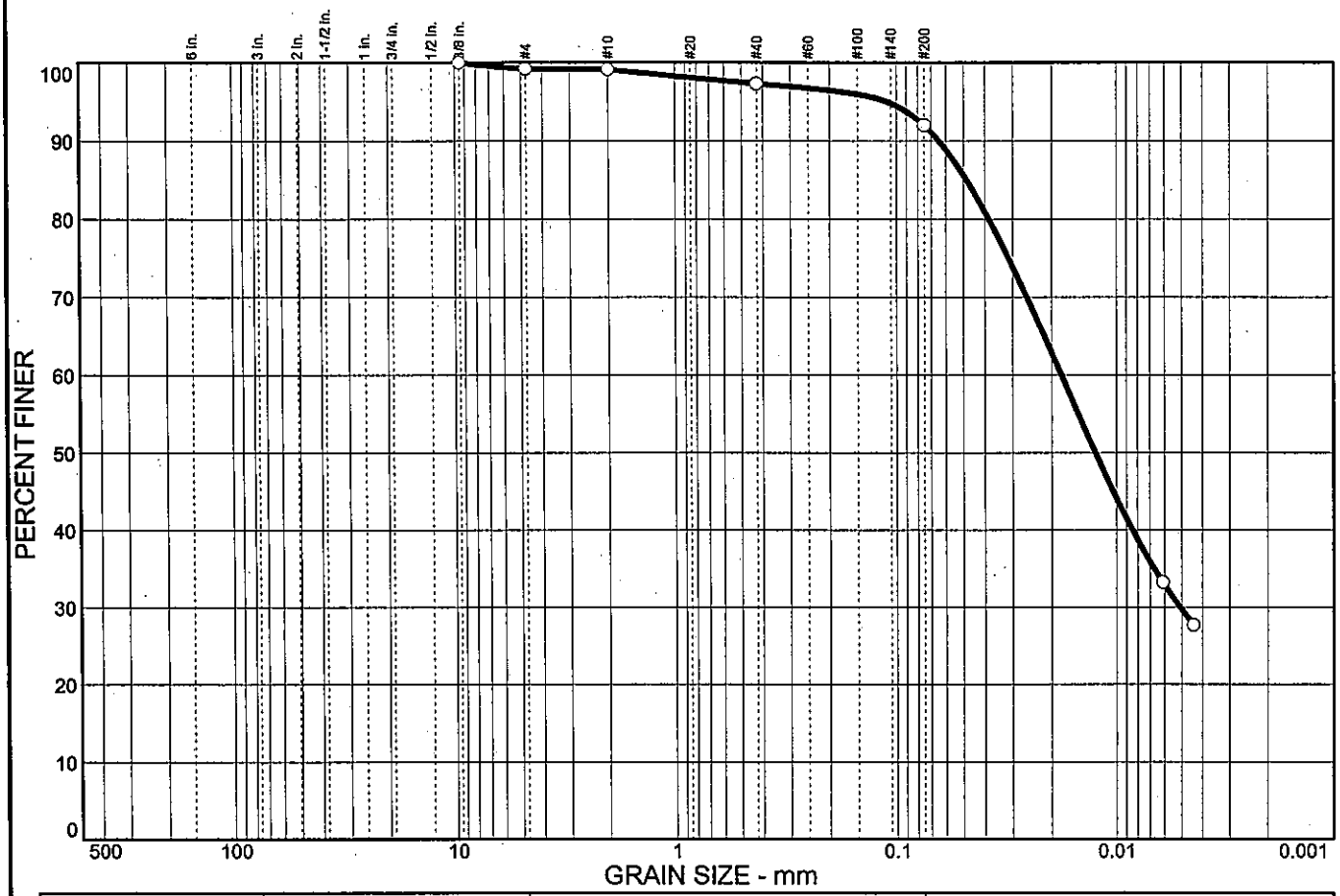
Moisture Content= 10.9%

Sample No.: 8 **Source of Sample:** B-1117 **Date:** 10/27/05
Location: **Elev./Depth:** 18.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.8	0.1	1.8	5.3	62.3	29.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.2		
#10	99.1		
#40	97.3		
#200	92.0		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20 LL= 33 PI= 13

Coefficients

D_{85}= 0.0484 D_{60}= 0.0180 D_{50}= 0.0125
D_{30}= 0.0051 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(12)

Remarks

Moisture Content= 24.5%

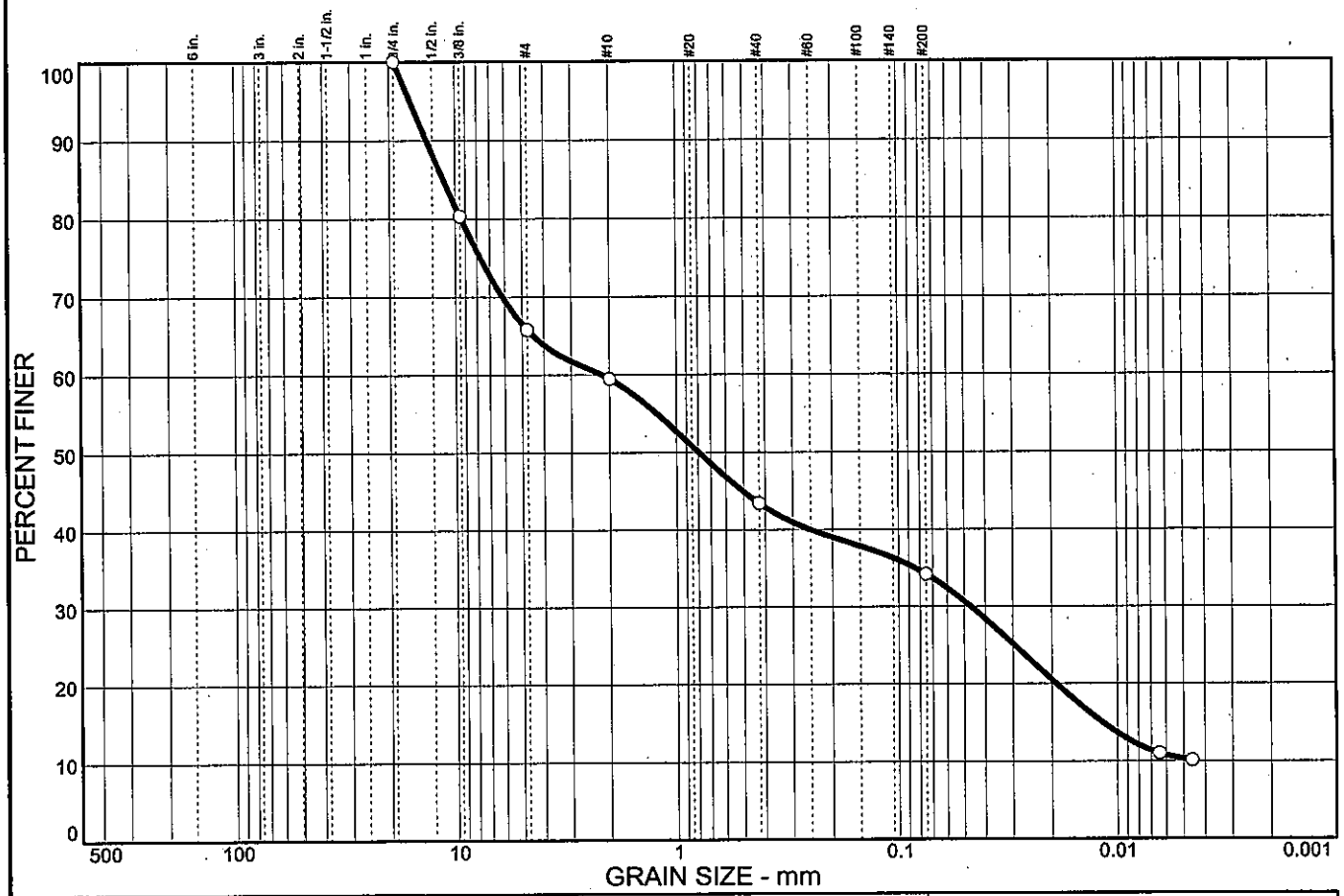
Sample No.: 2 **Source of Sample:** B-1118 **Date:** 10/27/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	34.2	6.3	16.1	9.2	23.9	10.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	80.3		
#4	65.8		
#10	59.5		
#40	43.4		
#200	34.2		

* (no specification provided)

Soil Description

Clayey gravel with sand

Atterberg Limits

PL= 16 LL= 26 PI= 10

Coefficients

D_{85}= 11.3 D_{60}= 2.16 D_{50}= 0.793
D_{30}= 0.0467 D_{15}= 0.0117 D_{10}=
C_u= C_c=

Classification

USCS= GC AASHTO= A-2-4(0)

Remarks

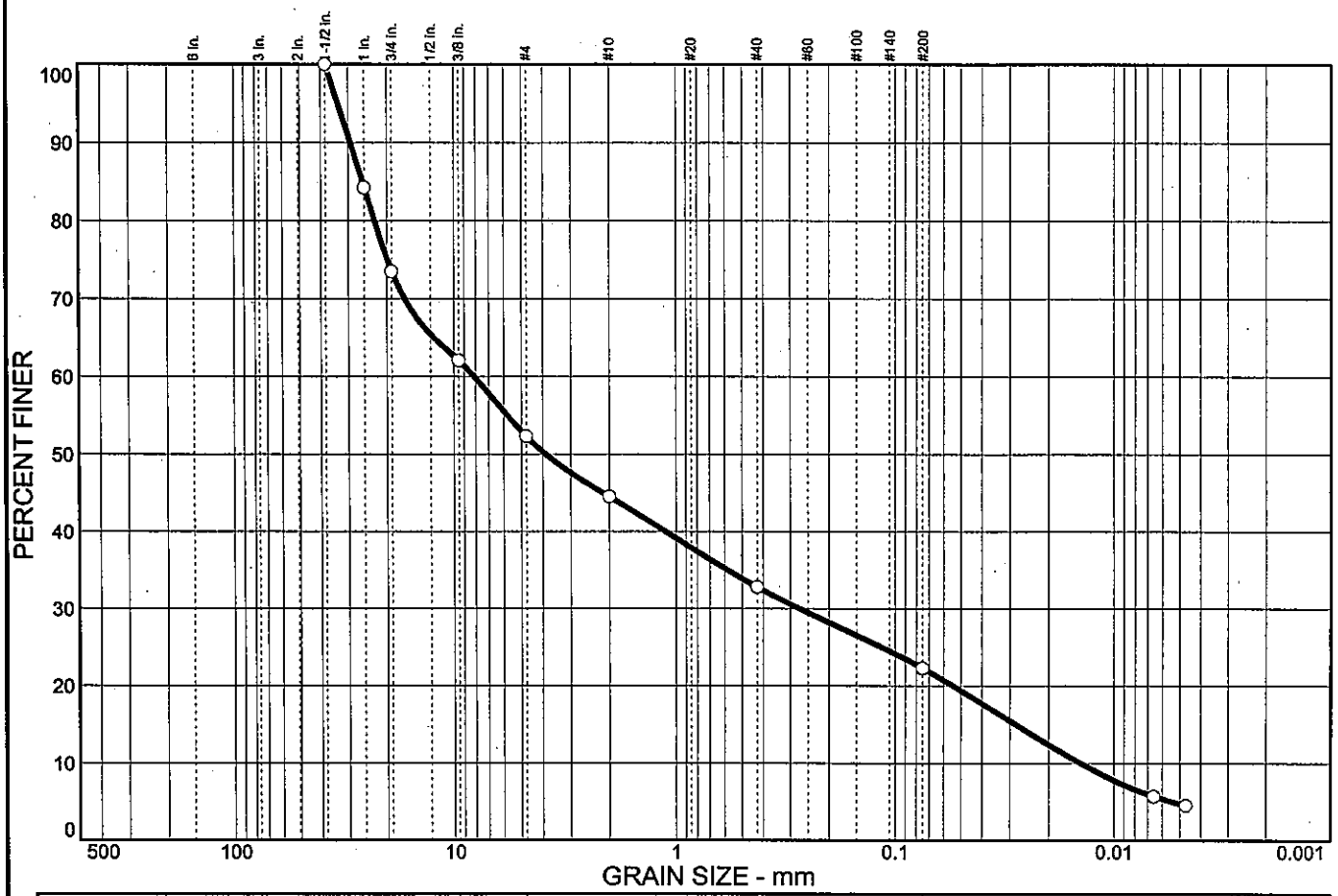
Moisture Content= 17.4%

Sample No.: 5B **Source of Sample:** B-1118 **Date:** 10/27/05
Location: **Elev./Depth:** 11.8

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	26.5	21.2	7.8	11.7	10.5	17.6	4.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	84.2		
0.75 in.	73.5		
0.375 in.	62.1		
#4	52.3		
#10	44.5		
#40	32.8		
#200	22.3		

* (no specification provided)

Soil Description

Silty clayey gravel with sand

Atterberg Limits

PL= 16 LL= 20 PI= 4

Coefficients

D_{85}= 25.9 D_{60}= 8.11 D_{50}= 3.89
D_{30}= 0.272 D_{15}= 0.0282 D_{10}= 0.0143
C_u= 569.29 C_c= 0.64

Classification

USCS= GC-GM AASHTO= A-1-b

Remarks

Moisture Content= 14.9%

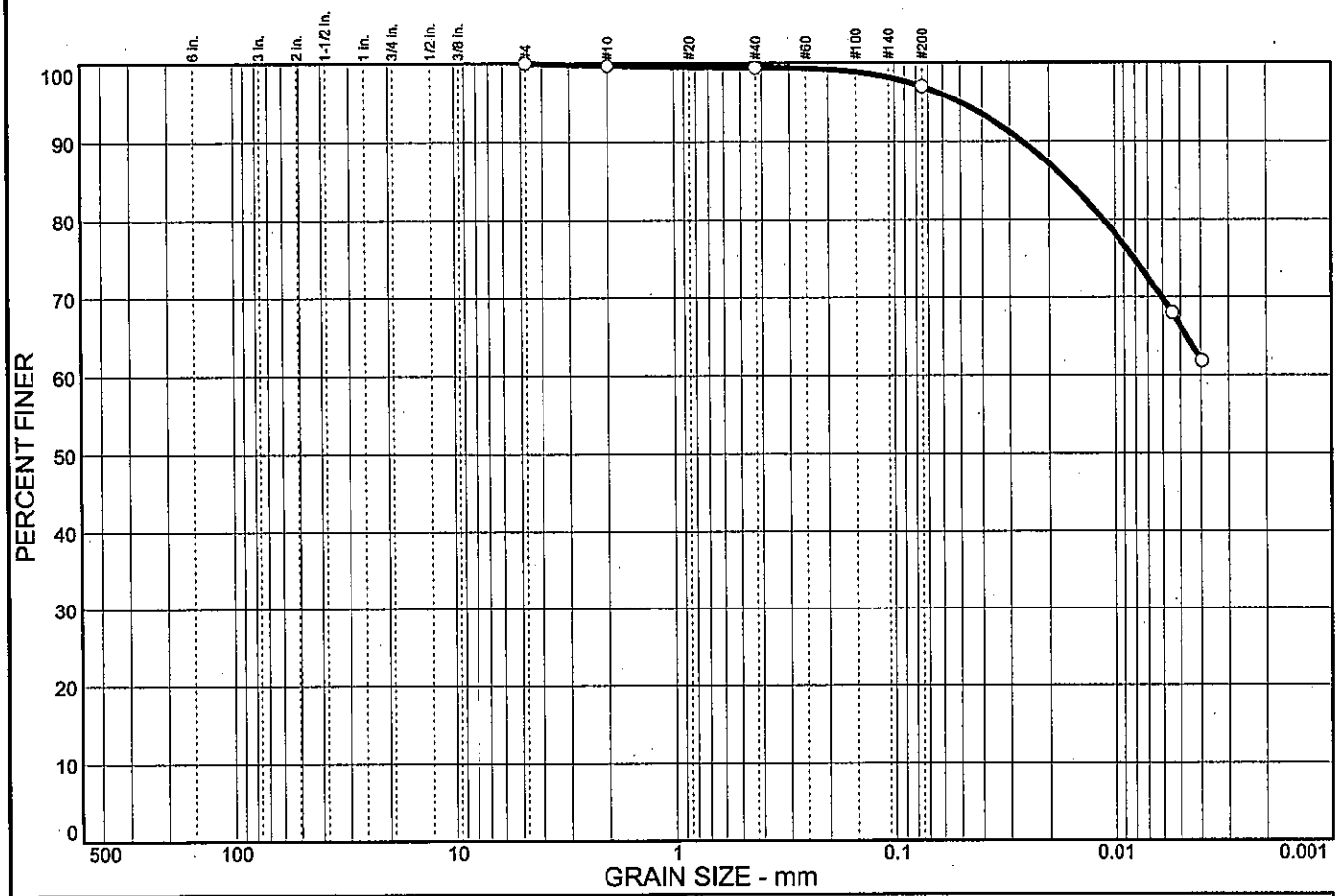
Sample No.: 7 **Source of Sample:** B-1118 **Date:** 11/1/05
Location: **Elev./Depth:** 16.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.3	0.3	2.4	30.6	66.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#40	99.4		
#200	97.0		

* (no specification provided)

Soil Description

Fat clay

Atterberg Limits

PL= 23 LL= 53 PI= 30

Coefficients

D_{85}= 0.0165 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(33)

Remarks

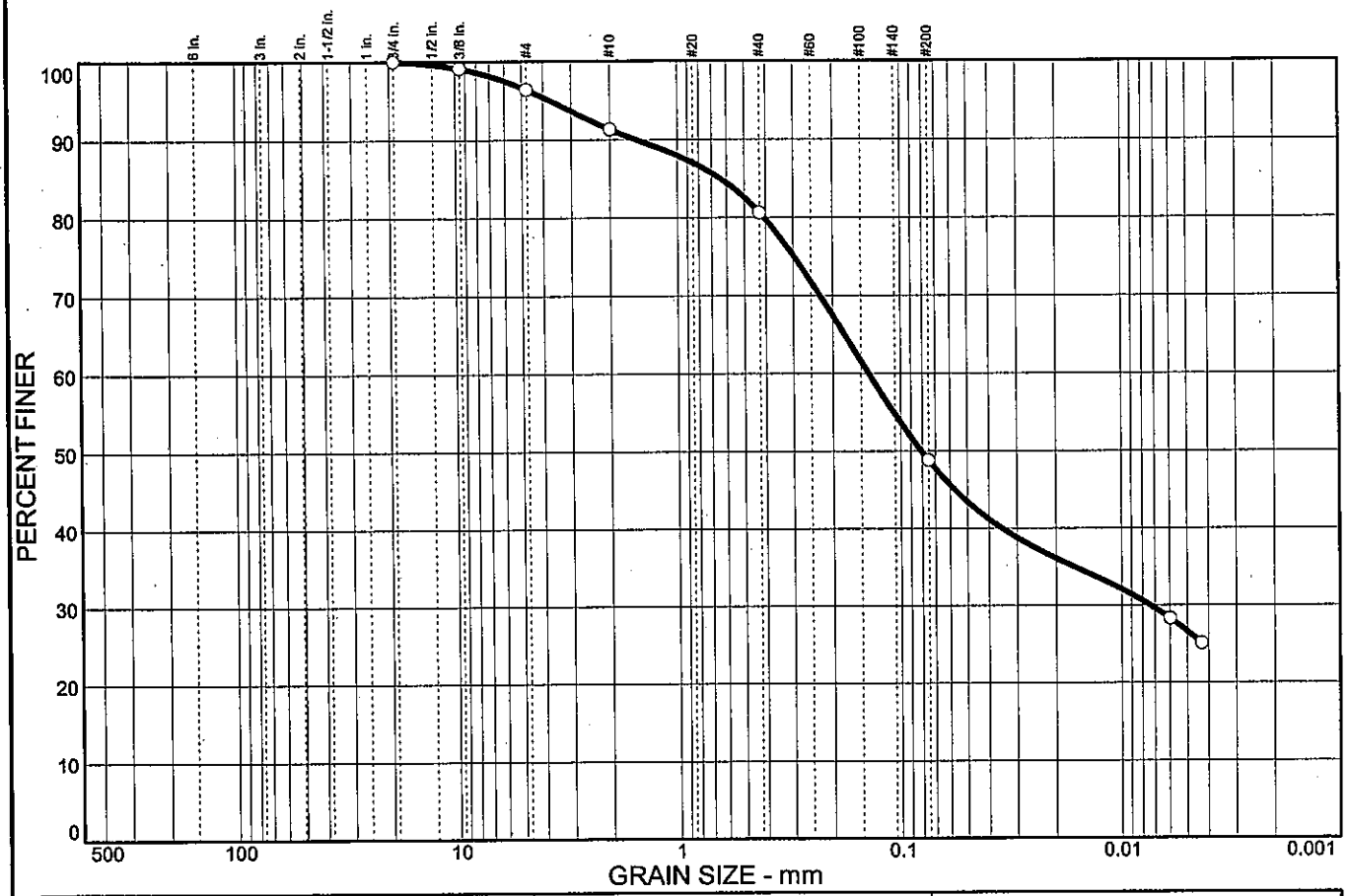
Moisture Content= 29.2%

Sample No.: 3 **Source of Sample:** B-1118 **Date:** 10/27/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.6	5.1	10.7	31.8	22.2	26.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.1		
#4	96.4		
#10	91.3		
#40	80.6		
#200	48.8		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 12 LL= 30 PI= 18

Coefficients

D_{85}= 0.640 D_{60}= 0.138 D_{50}= 0.0809
D_{30}= 0.0074 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(5)

Remarks

Moisture Content= 19.3%

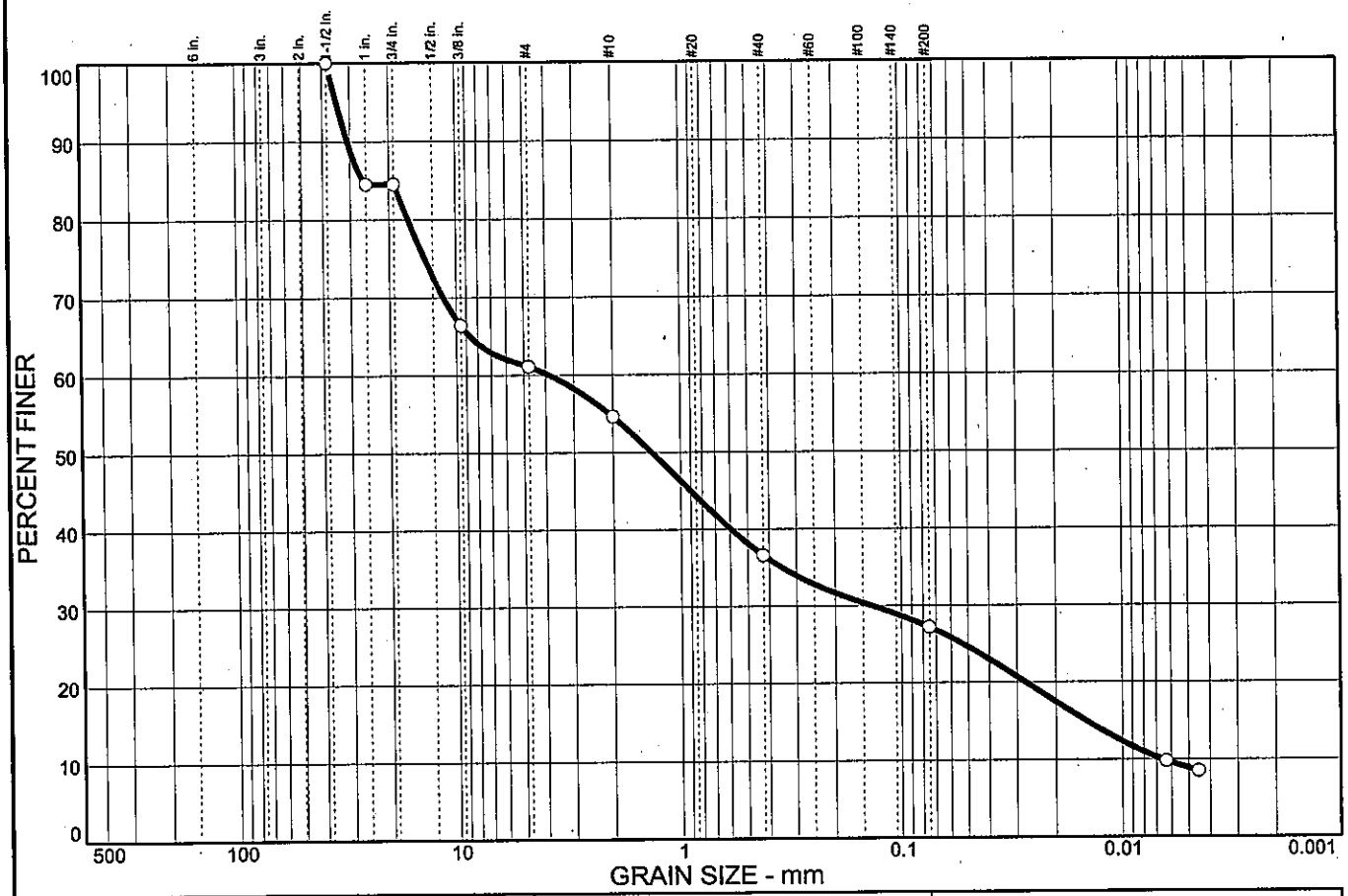
Sample No.: 3 **Source of Sample:** B-1119 **Date:** 9/23/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	15.5	23.4	6.5	18.0	9.4	18.3	8.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1.0 in.	84.5		
0.75 in.	84.5		
0.375 in.	66.4		
#4	61.1		
#10	54.6		
#40	36.6		
#200	27.2		

* (no specification provided)

Soil Description

Clayey gravel with sand

Atterberg Limits

PL= 17 LL= 25 PI= 8

Coefficients

D_{85}= 26.3 D_{60}= 3.85 D_{50}= 1.34
D_{30}= 0.136 D_{15}= 0.0146 D_{10}= 0.0066
C_u= 583.36 C_c= 0.73

Classification

USCS= GC AASHTO= A-2-4(0)

Remarks

Moisture Content= 15.0%

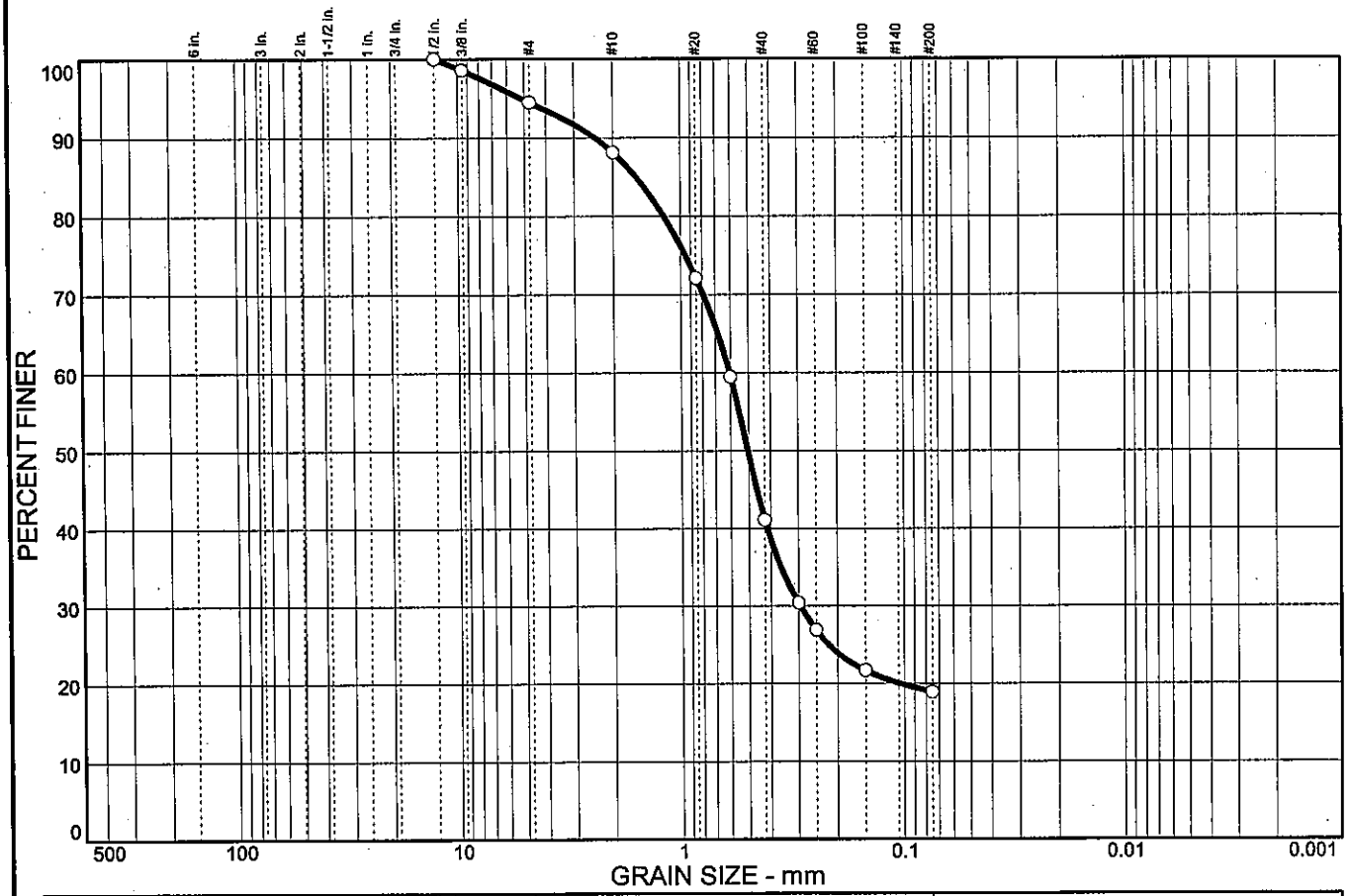
Sample No.: 4 **Source of Sample:** B-1119 **Date:** 9/23/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	5.5	6.4	47.0	22.2	18.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.50 in.	100.0		
0.375 in.	98.6		
#4	94.5		
#10	88.1		
#20	72.1		
#30	59.5		
#40	41.1		
#50	30.4		
#60	26.9		
#100	21.7		
#200	18.9		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 1.58 D_{60}= 0.606 D_{50}= 0.504
D_{30}= 0.294 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content= 19.5%

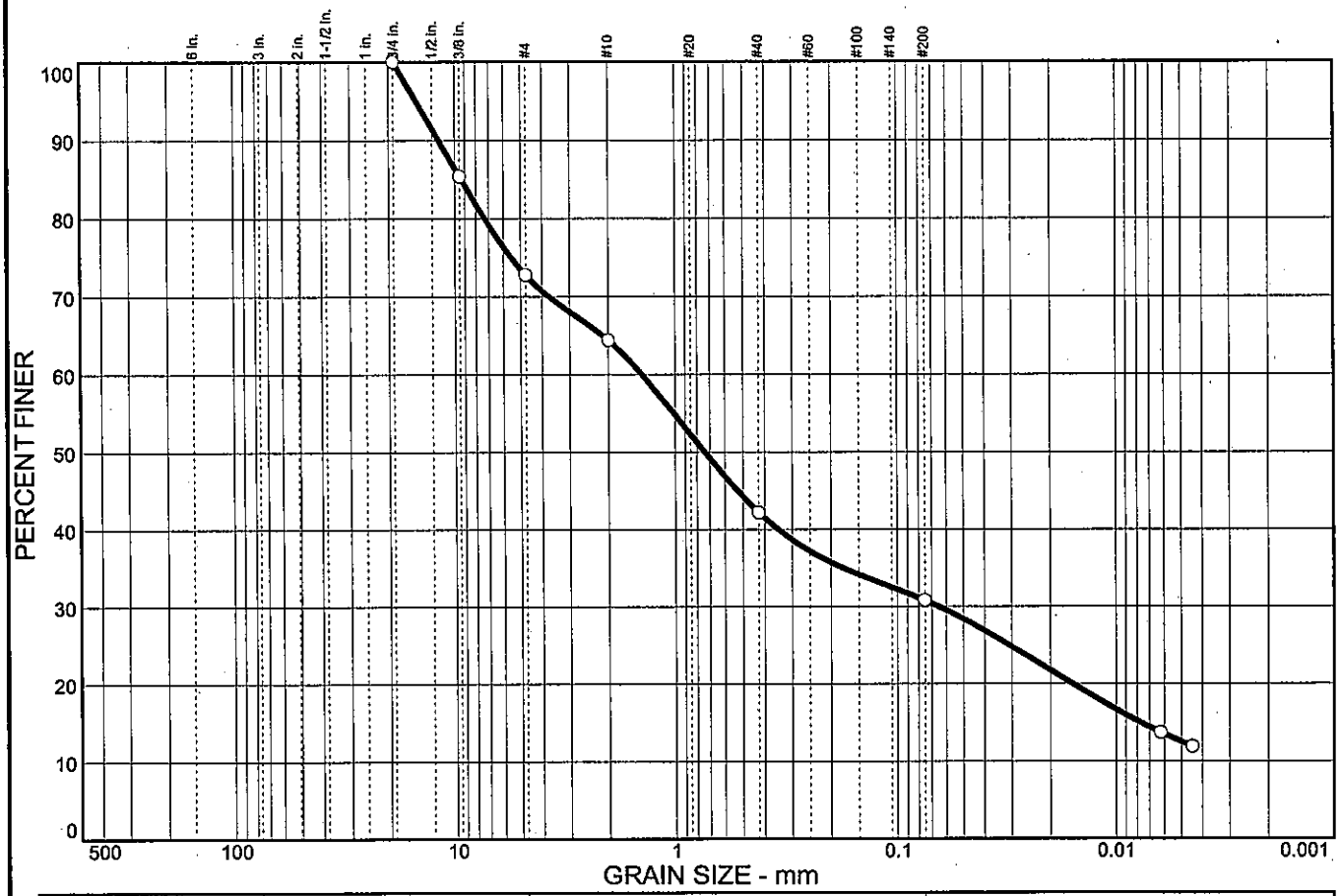
Sample No.: 7 **Source of Sample:** B-1119 **Date:** 9/23/05
Location: **Elev./Depth:** 16.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	27.2	8.4	22.2	11.4	18.3	12.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	85.4		
#4	72.8		
#10	64.4		
#40	42.2		
#200	30.8		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 9.34 D_{60}= 1.41 D_{50}= 0.736
D_{30}= 0.0650 D_{15}= 0.0077 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture Content= 15.3%

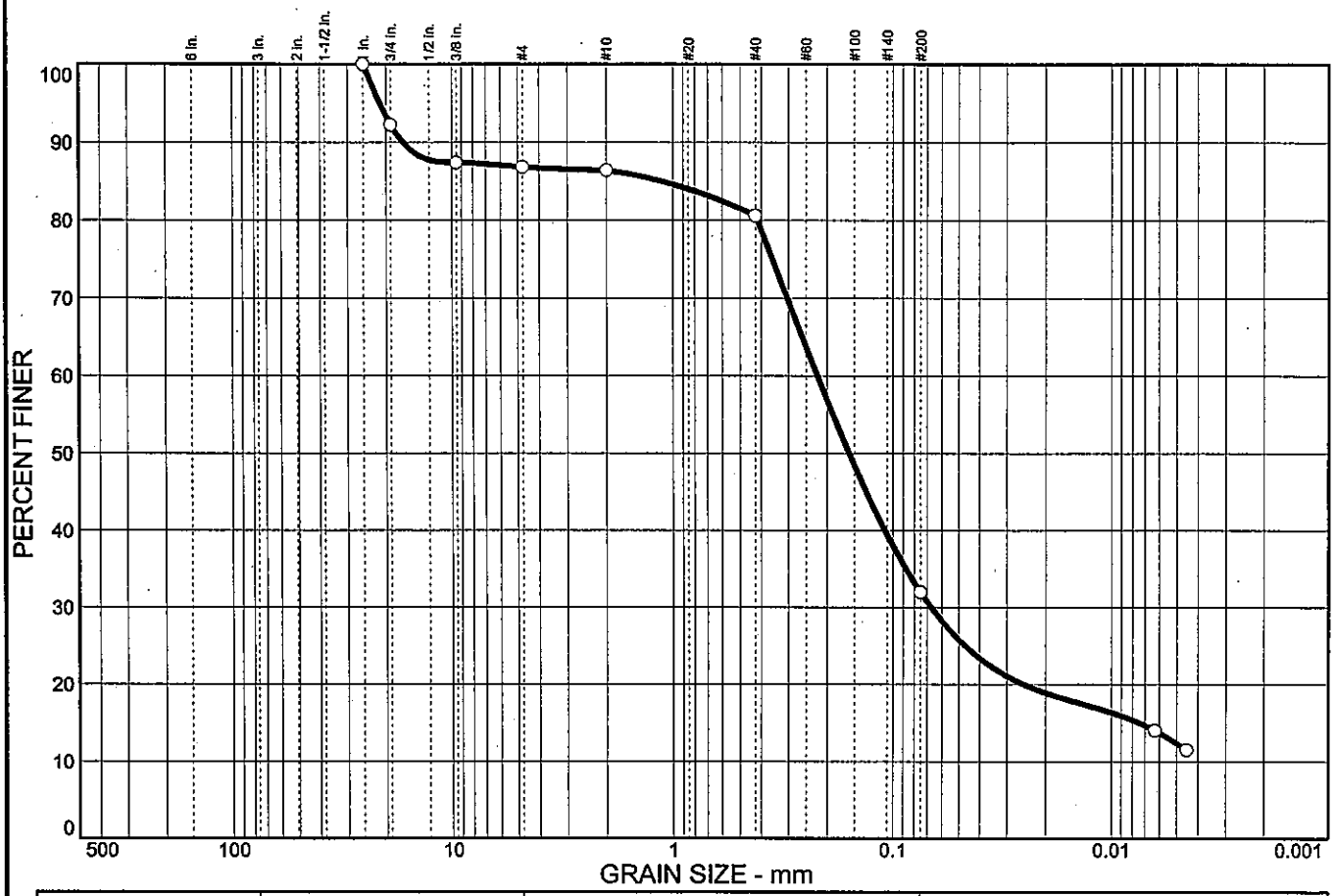
Sample No.: 8 **Source of Sample:** B-1119 **Date:** 9/23/05
Location: **Elev./Depth:** 18.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	7.8	5.4	0.4	5.8	48.6	19.7	12.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	92.2		
0.375 in.	87.4		
#4	86.8		
#10	86.4		
#40	80.6		
#200	32.0		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 1.12 D_{60}= 0.222 D_{50}= 0.158
D_{30}= 0.0669 D_{15}= 0.0074 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture Content= 17.3%

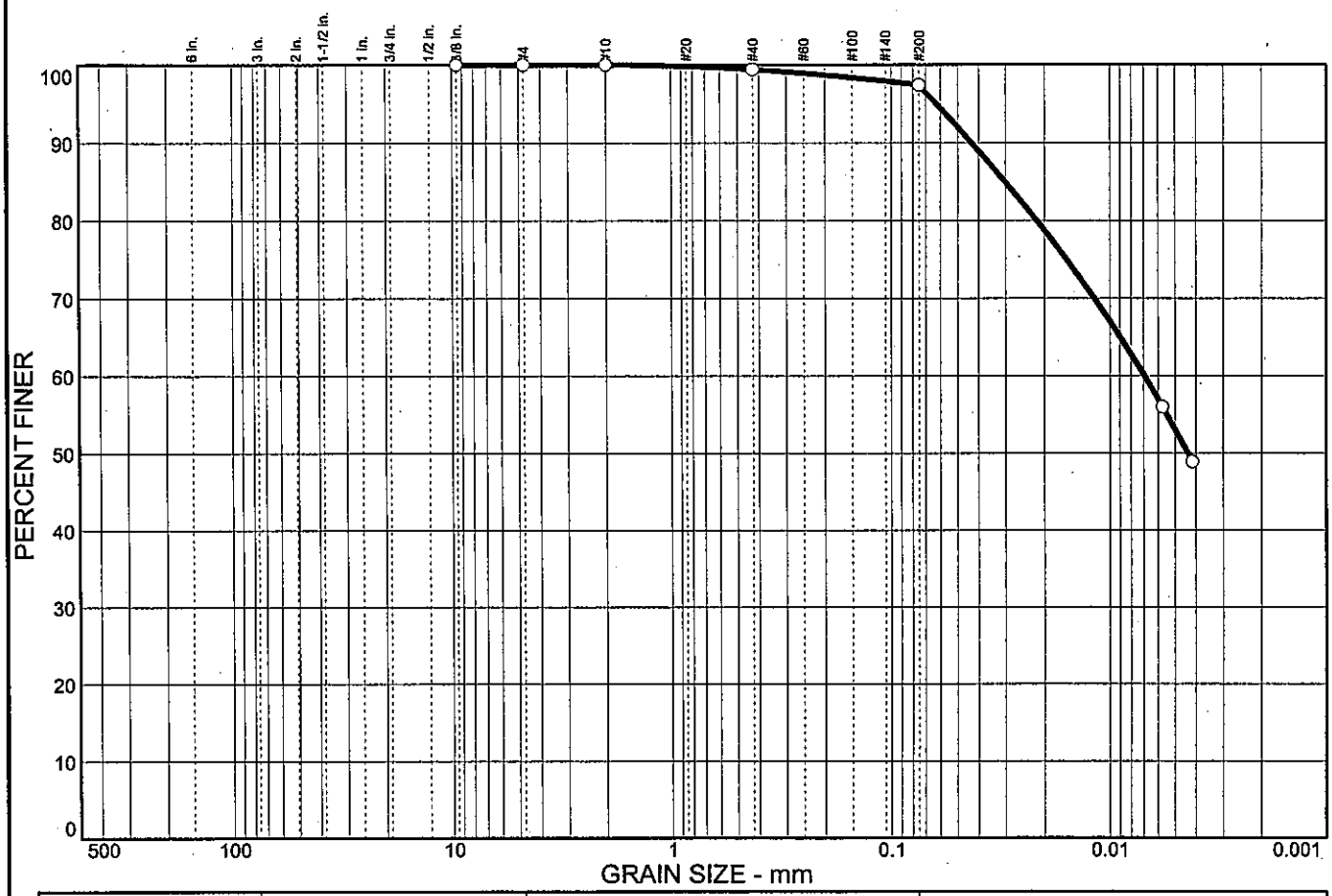
Sample No.: 9 **Source of Sample:** B-1119 **Date:** 9/23/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.6	2.0	44.3	53.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	100.0		
#40	99.4		
#200	97.4		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 22 LL= 41 PI= 19

Coefficients

D_{85}= 0.0303 D_{60}= 0.0069 D_{50}= 0.0044
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(20)

Remarks

Moisture Content= 19.4%

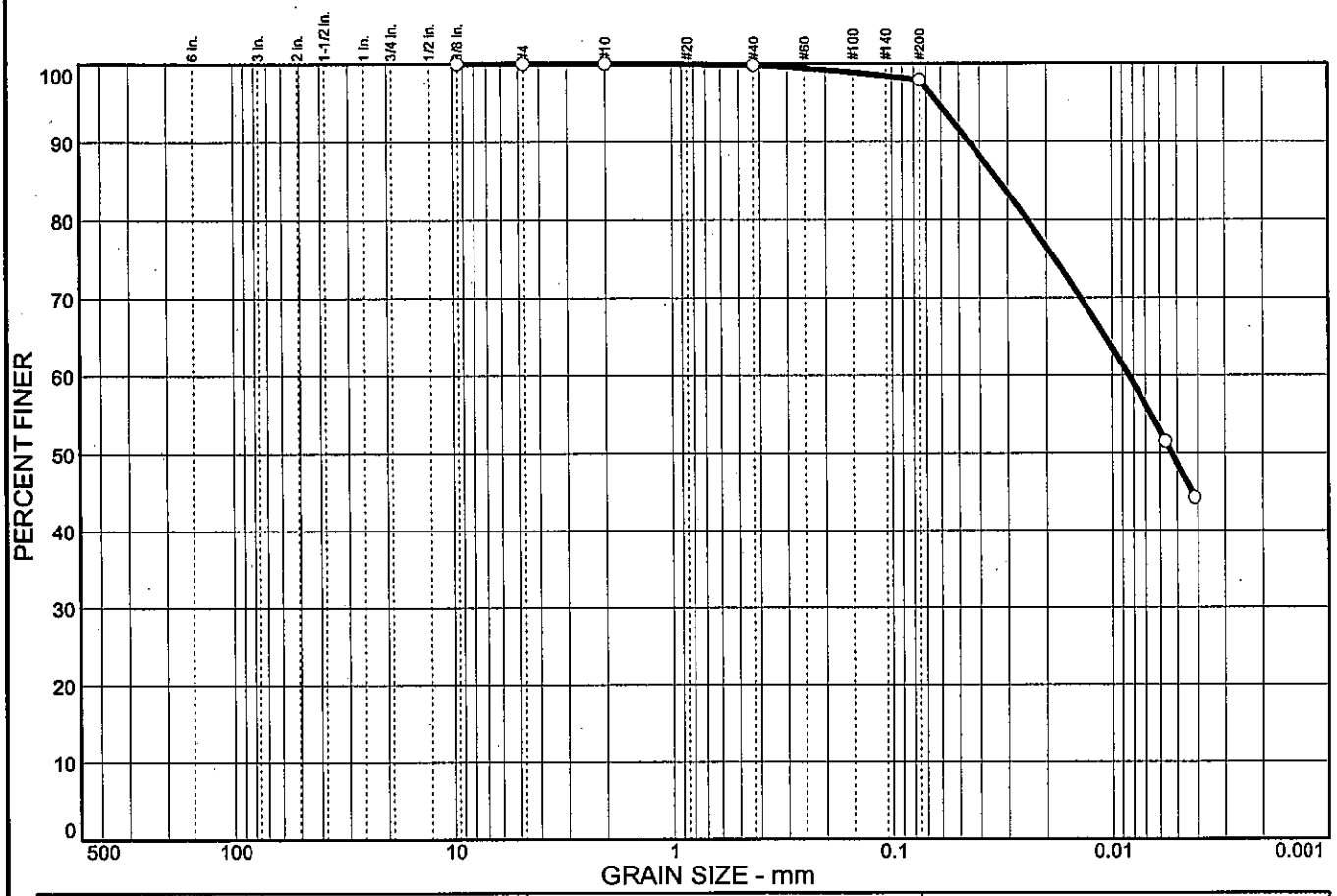
Sample No.: 1 **Source of Sample:** B-1120 **Date:** 11/1/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.2	1.9	49.3	48.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	100.0		
#40	99.8		
#200	97.9		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 24 LL= 42 PI= 18

Coefficients

D_{85}= 0.0330 D_{60}= 0.0084 D_{50}= 0.0053
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(20)

Remarks

Moisture Content= 21.1%

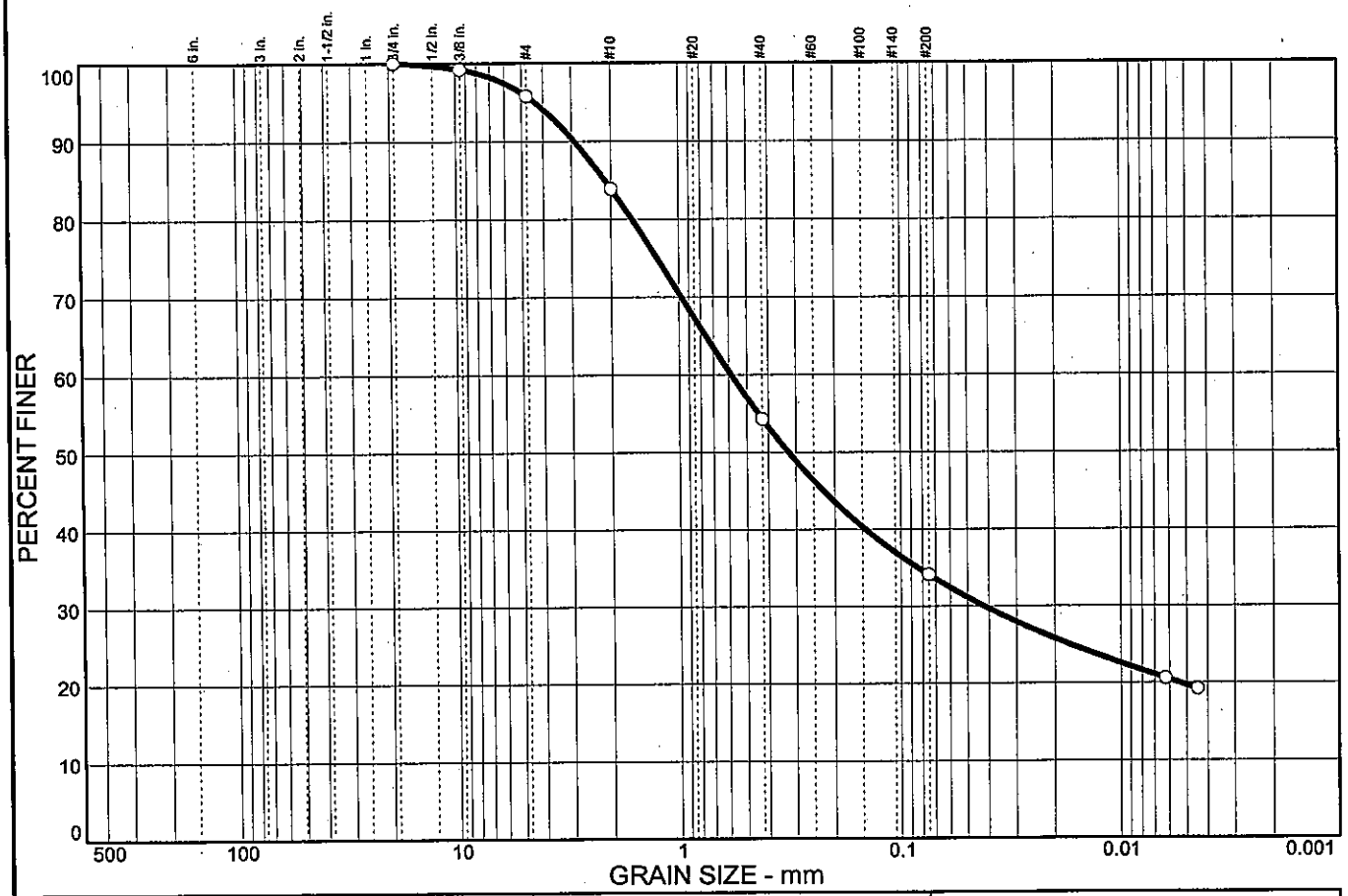
Sample No.: 2 **Source of Sample:** B-1120 **Date:** 11/1/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.2	11.9	29.6	20.2	14.4	19.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.2		
#4	95.8		
#10	83.9		
#40	54.3		
#200	34.1		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 17 LL= 35 PI= 18

Coefficients

D_{85}= 2.13 D_{60}= 0.584 D_{50}= 0.324
D_{30}= 0.0420 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(2)

Remarks

Moisture Content= 16.6%

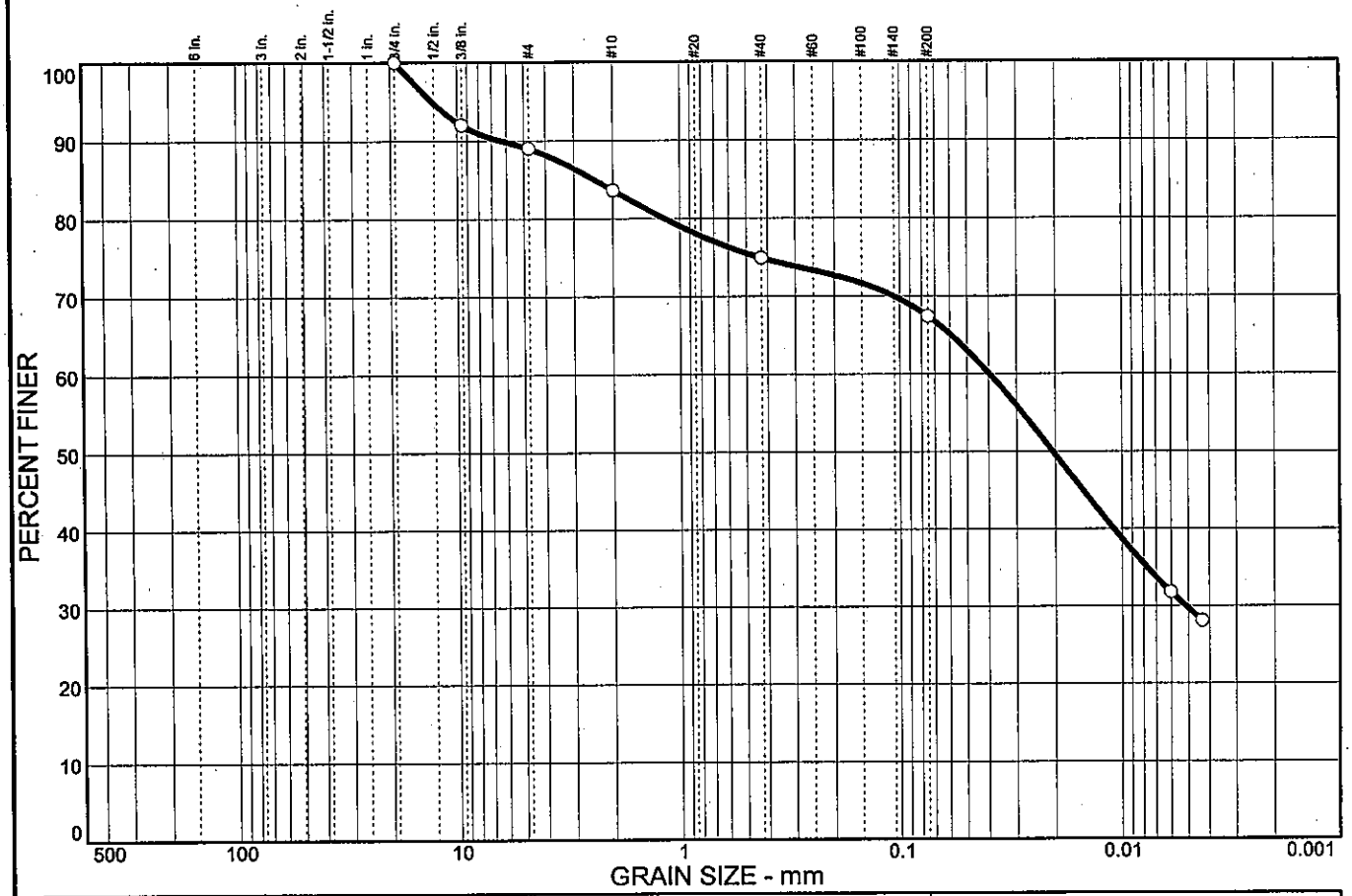
Sample No.: 3 **Source of Sample:** B-1120 **Date:** 11/1/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	11.0	5.4	8.7	7.5	37.7	29.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	92.0		
#4	89.0		
#10	83.6		
#40	74.9		
#200	67.4		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 23 LL= 36 PI= 13

Coefficients

D_{85}= 2.43 D_{60}= 0.0397 D_{50}= 0.0205
D_{30}= 0.0051 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(7)

Remarks

Moisture Content= 17.4%

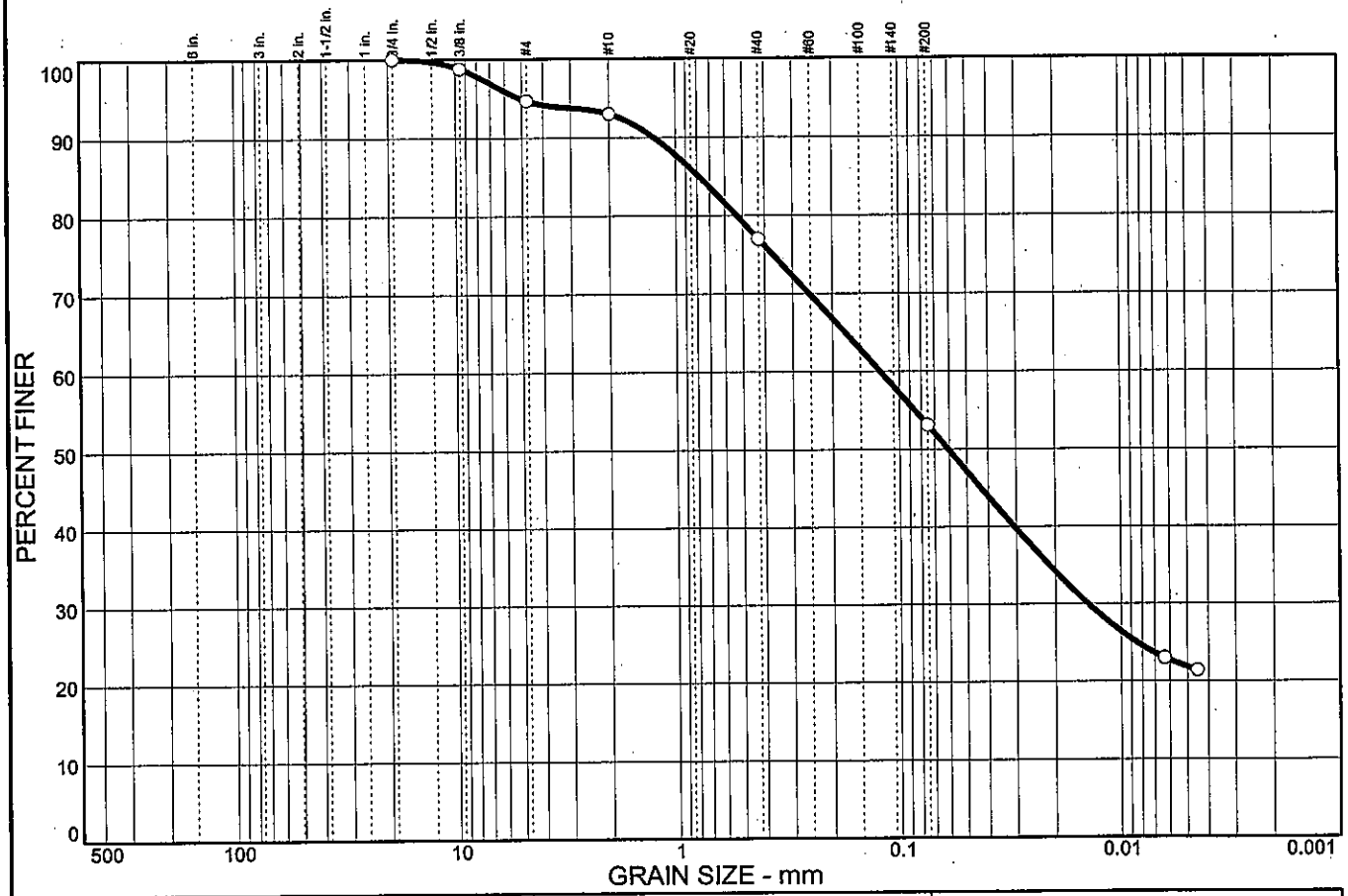
Sample No.: 1 **Source of Sample:** B-1121 **Date:** 11/1/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	5.3	1.7	16.0	23.9	31.2	21.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.8		
#4	94.7		
#10	93.0		
#40	77.0		
#200	53.1		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 14 LL= 23 PI= 9

Coefficients

D_{85}= 0.783 D_{60}= 0.122 D_{50}= 0.0607
D_{30}= 0.0141 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(2)

Remarks

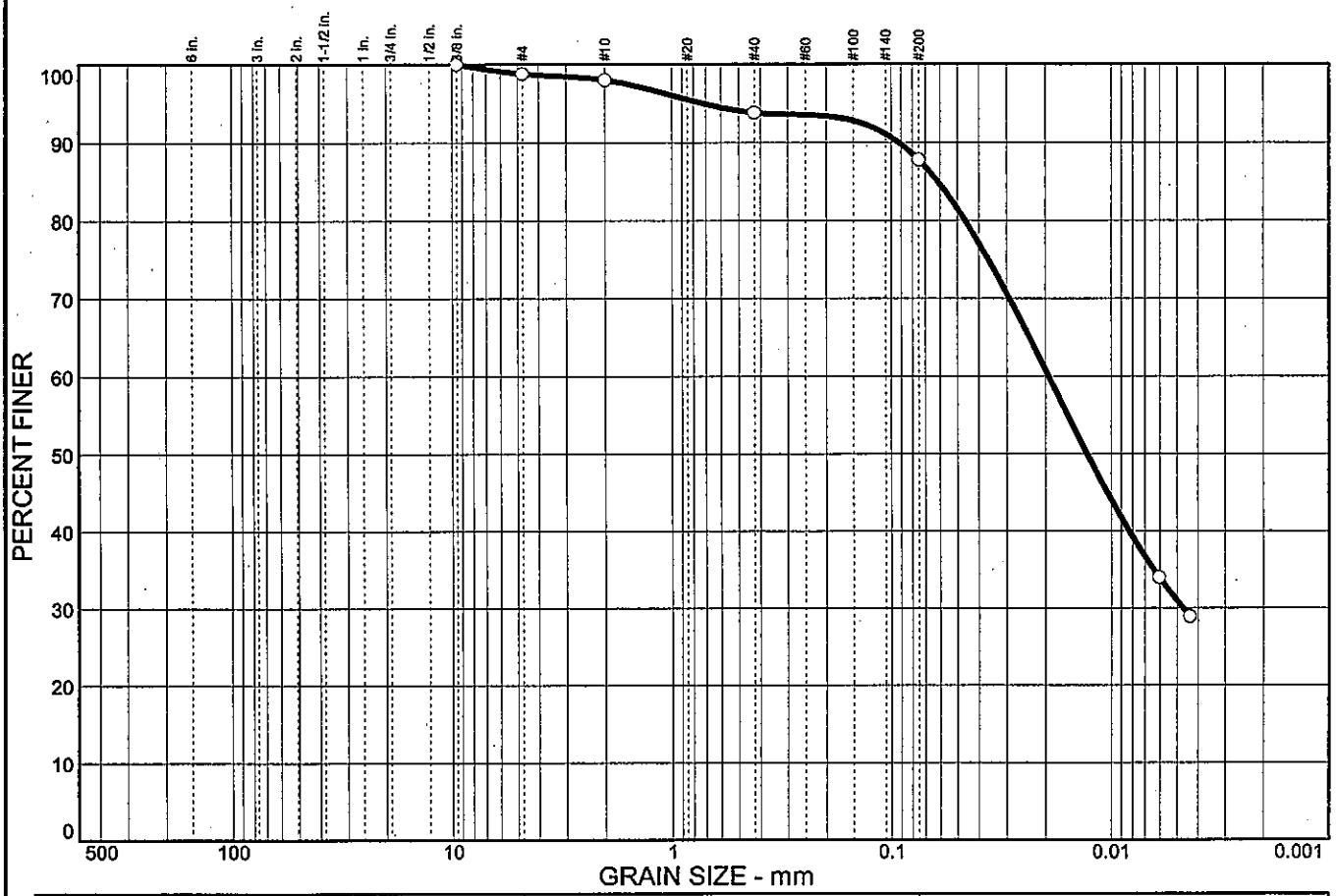
Moisture Content= 14.3%

Sample No.: 2 **Source of Sample:** B-1121 **Date:** 11/1/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.2	0.8	4.2	6.0	56.8	31.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.8		
#10	98.0		
#40	93.8		
#200	87.8		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 23 LL= 37 PI= 14

Coefficients

D_{85}= 0.0614 D_{60}= 0.0193 D_{50}= 0.0129
D_{30}= 0.0047 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

Remarks

Moisture Content= 28.4%

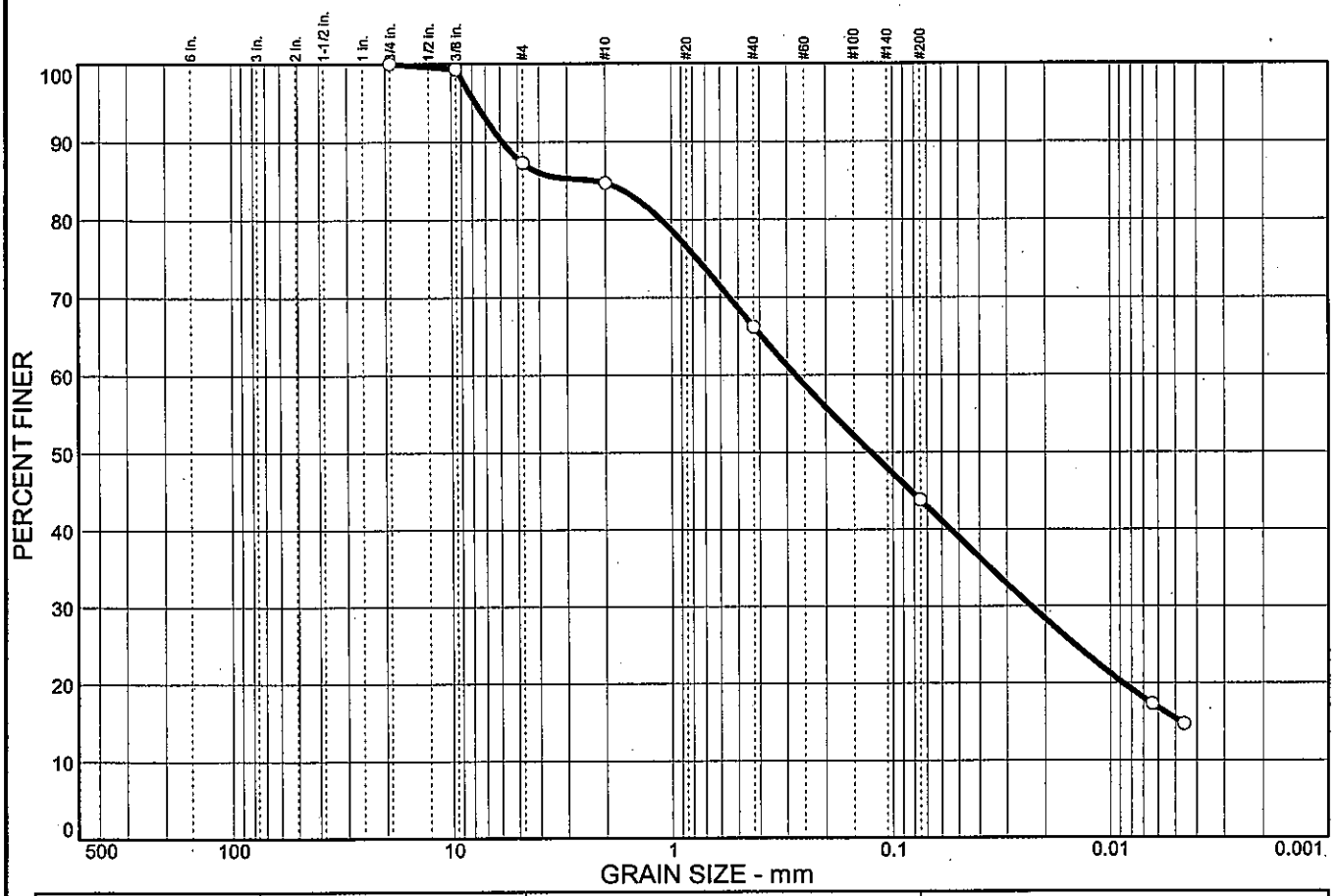
Sample No.: 3 **Source of Sample:** B-1121 **Date:** 11/1/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	12.7	2.6	18.5	22.4	28.4	15.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.3		
#4	87.3		
#10	84.7		
#40	66.2		
#200	43.8		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 16 LL= 24 PI= 8

Coefficients

D_{85}= 2.24 D_{60}= 0.274 D_{50}= 0.125
D_{30}= 0.0232 D_{15}= 0.0047 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-4(0)

Remarks

Moisture Content= 15.5%

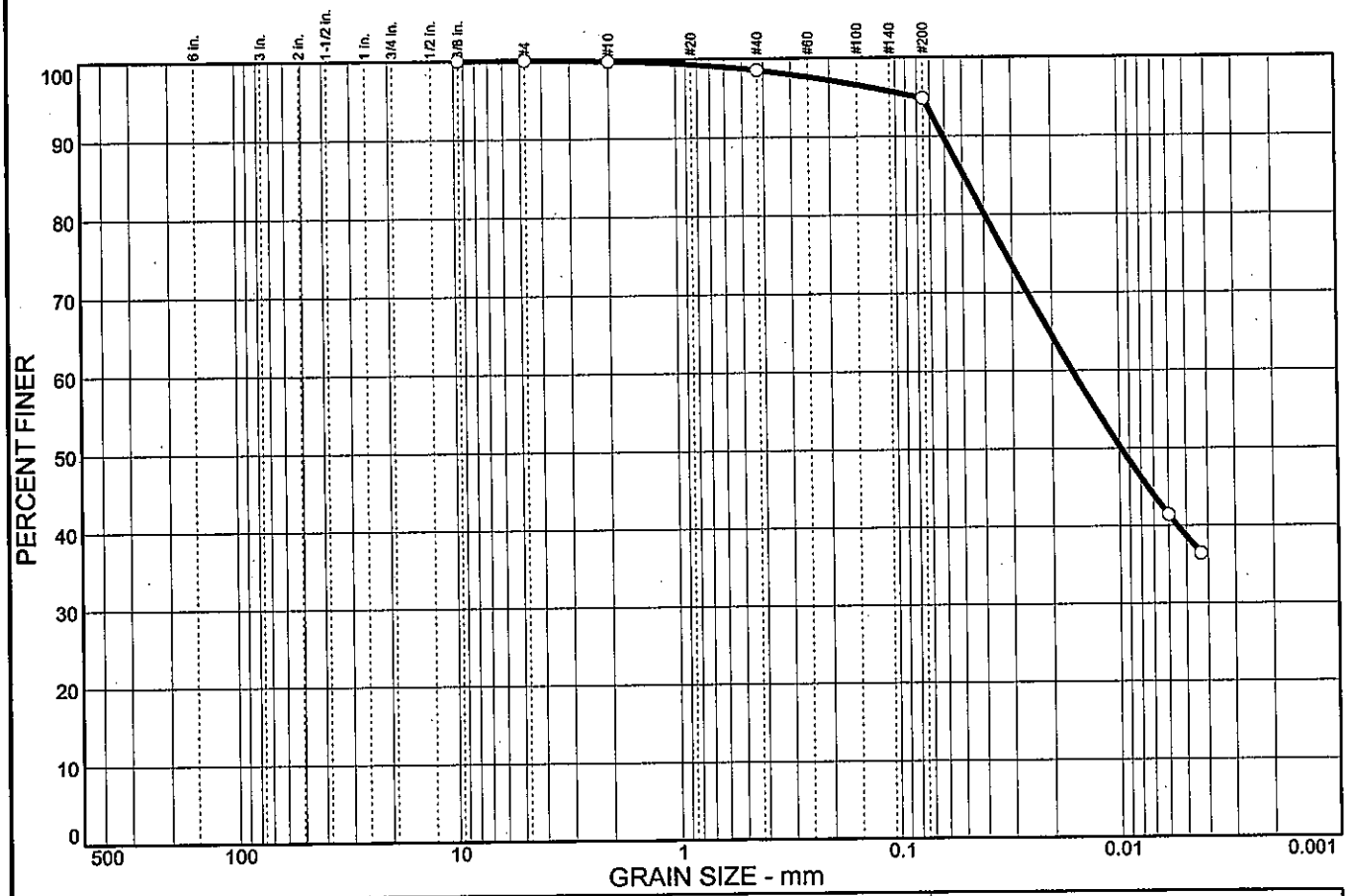
Sample No.: 1 **Source of Sample:** B-1122 **Date:** 11/1/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.2	1.3	3.7	56.2	38.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.8		
#40	98.5		
#200	94.8		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 18 LL= 34 PI= 16

Coefficients

D_{85}= 0.0493 D_{60}= 0.0162 D_{50}= 0.0098
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(15)

Remarks

Moisture Content= 17.2%

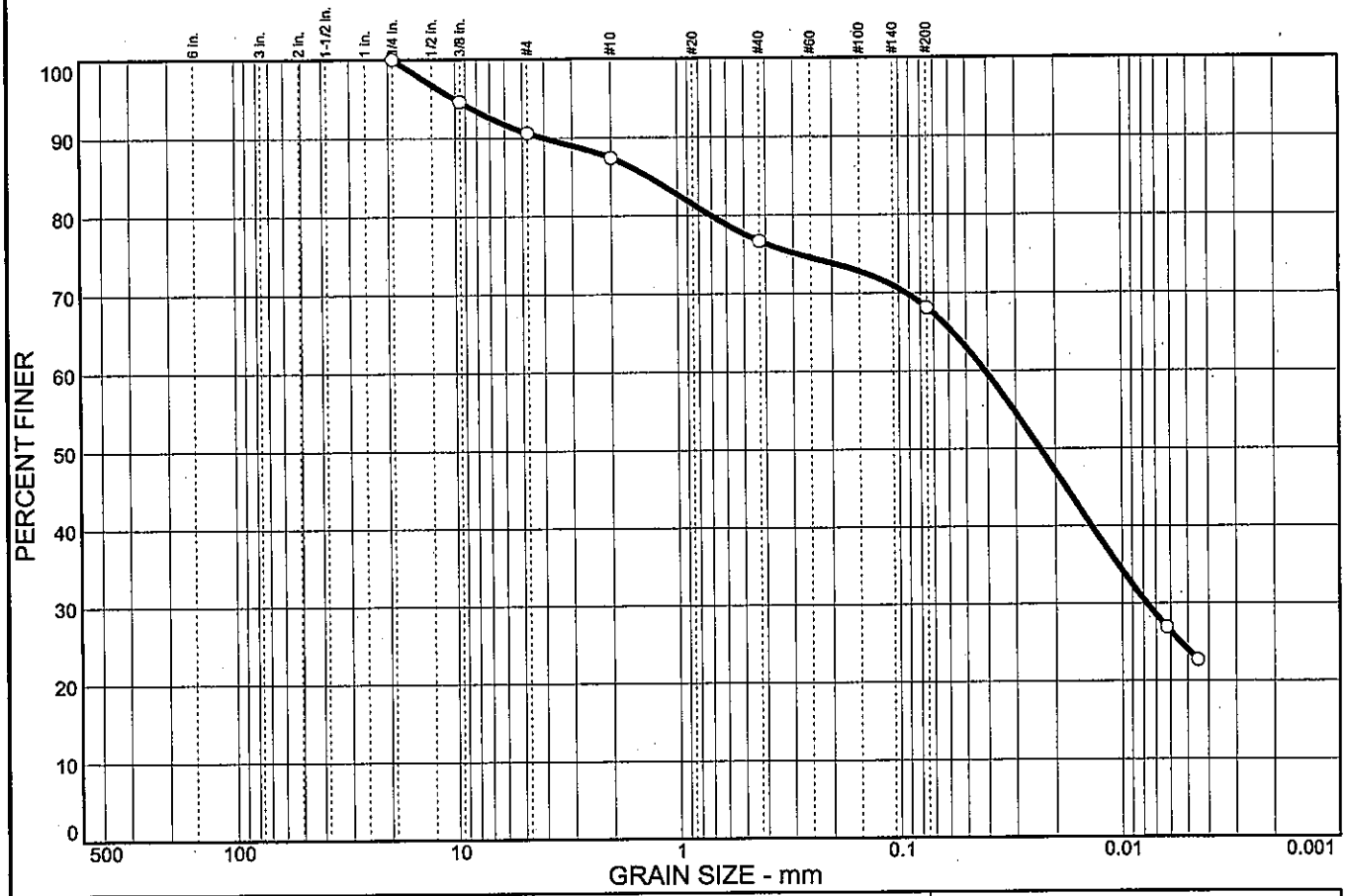
Sample No.: 2 **Source of Sample:** B-1122 **Date:** 11/1/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	9.4	3.2	10.7	8.6	44.0	24.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.6		
#4	90.6		
#10	87.4		
#40	76.7		
#200	68.1		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 17 LL= 29 PI= 12

Coefficients

D_{85}= 1.35 D_{60}= 0.0411 D_{50}= 0.0233
D_{30}= 0.0077 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(6)

Remarks

Moisture Content= 16.5%

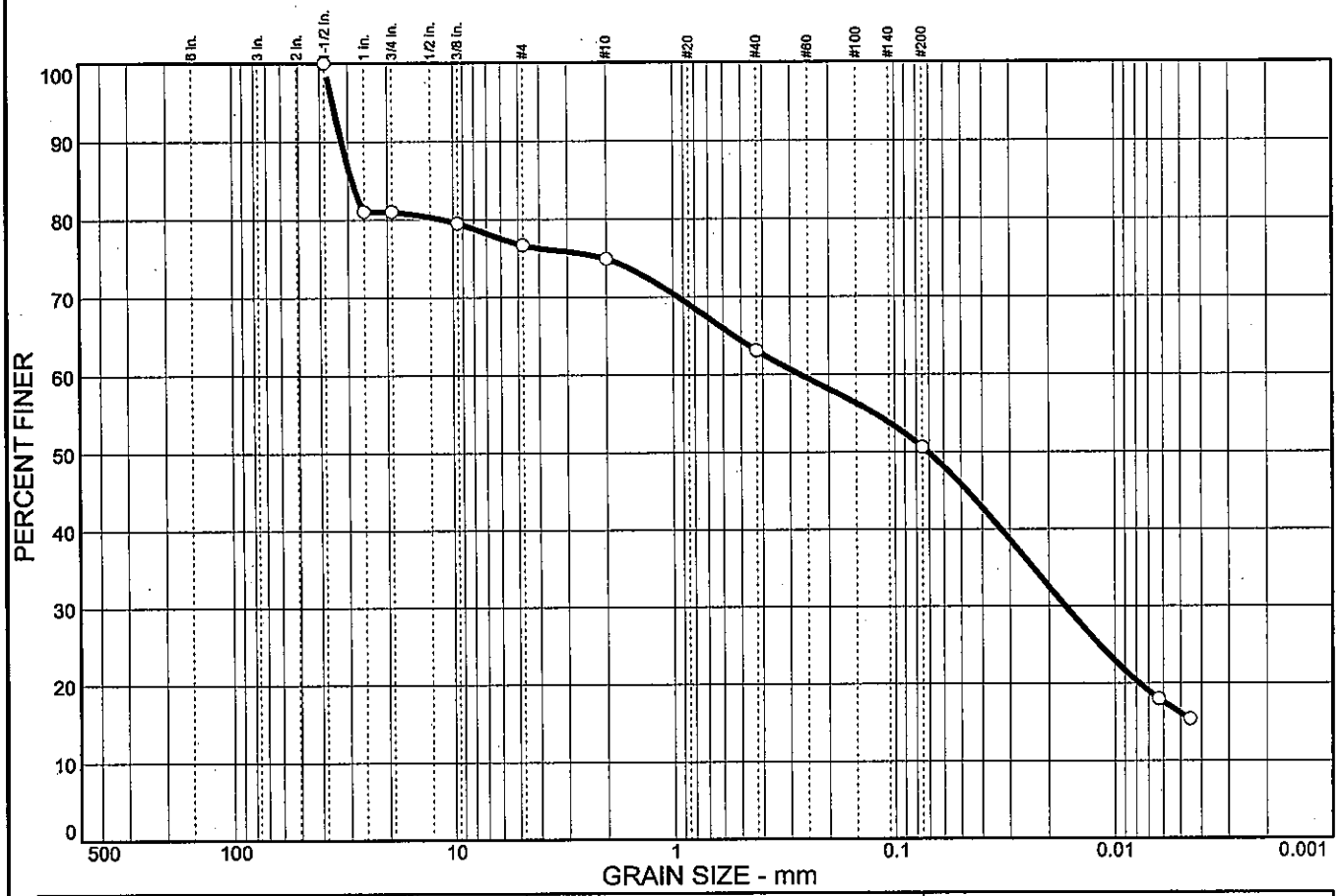
Sample No.: 3 **Source of Sample:** B-1122 **Date:** 11/1/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	19.0	4.3	1.8	11.8	12.5	34.4	16.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5 in.	100.0		
1 in.	81.0		
0.75 in.	81.0		
0.375 in.	79.5		
#4	76.7		
#10	74.9		
#40	63.1		
#200	50.6		

* (no specification provided)

Soil Description

Sandy lean clay with gravel

Atterberg Limits

PL= 18 LL= 26 PI= 8

Coefficients

D_{85}= 28.9 D_{60}= 0.270 D_{50}= 0.0709
D_{30}= 0.0168 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(1)

Remarks

Moisture Content= 14.3%

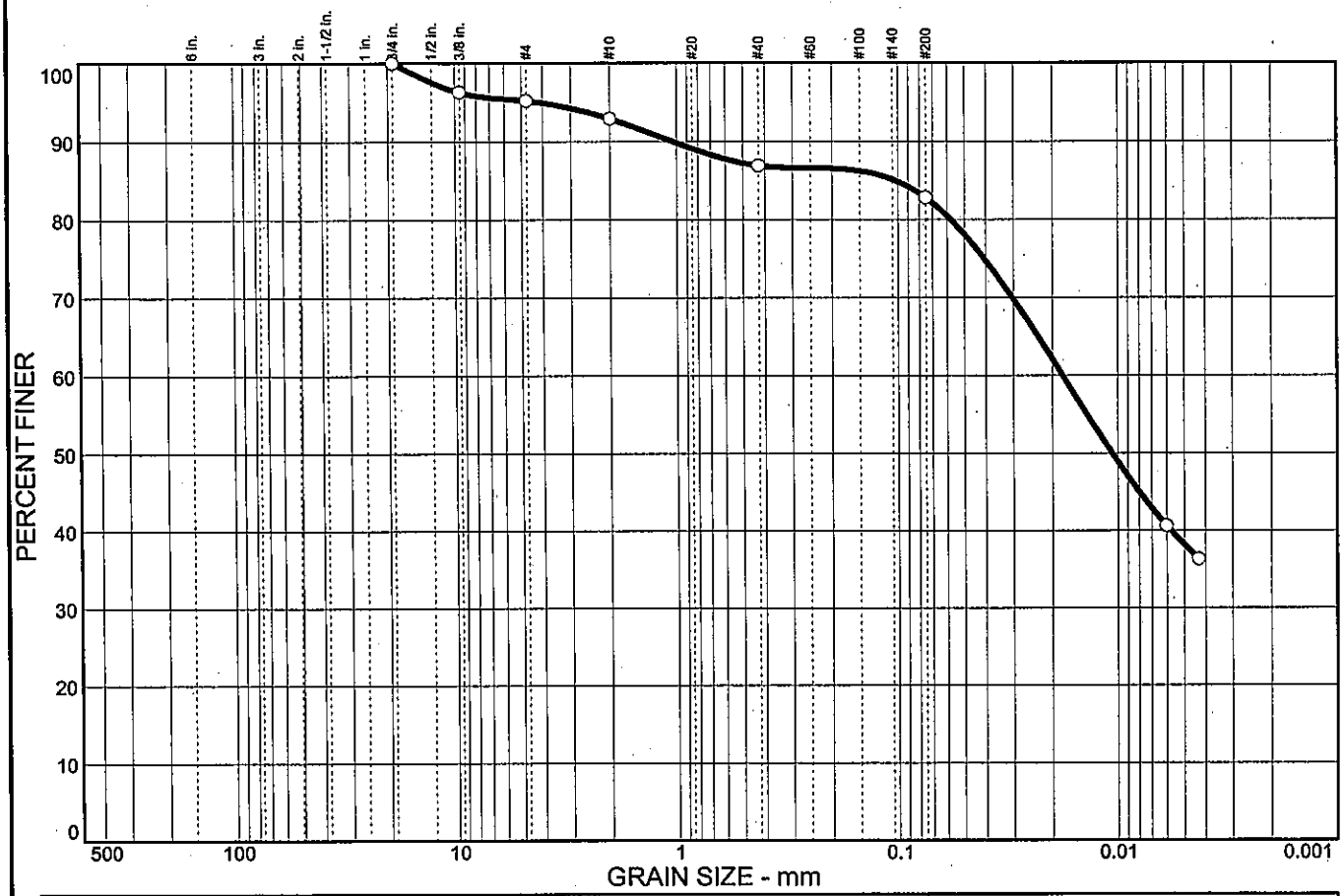
Sample No.: 1 **Source of Sample:** B-1123 **Date:** 11/1/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.8	2.3	6.0	4.1	44.6	38.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.3		
#4	95.2		
#10	92.9		
#40	86.9		
#200	82.8		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 19 LL= 34 PI= 15

Coefficients

D_{85}= 0.103 D_{60}= 0.0179 D_{50}= 0.0106
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(12)

Remarks

Moisture Content= 18.5%

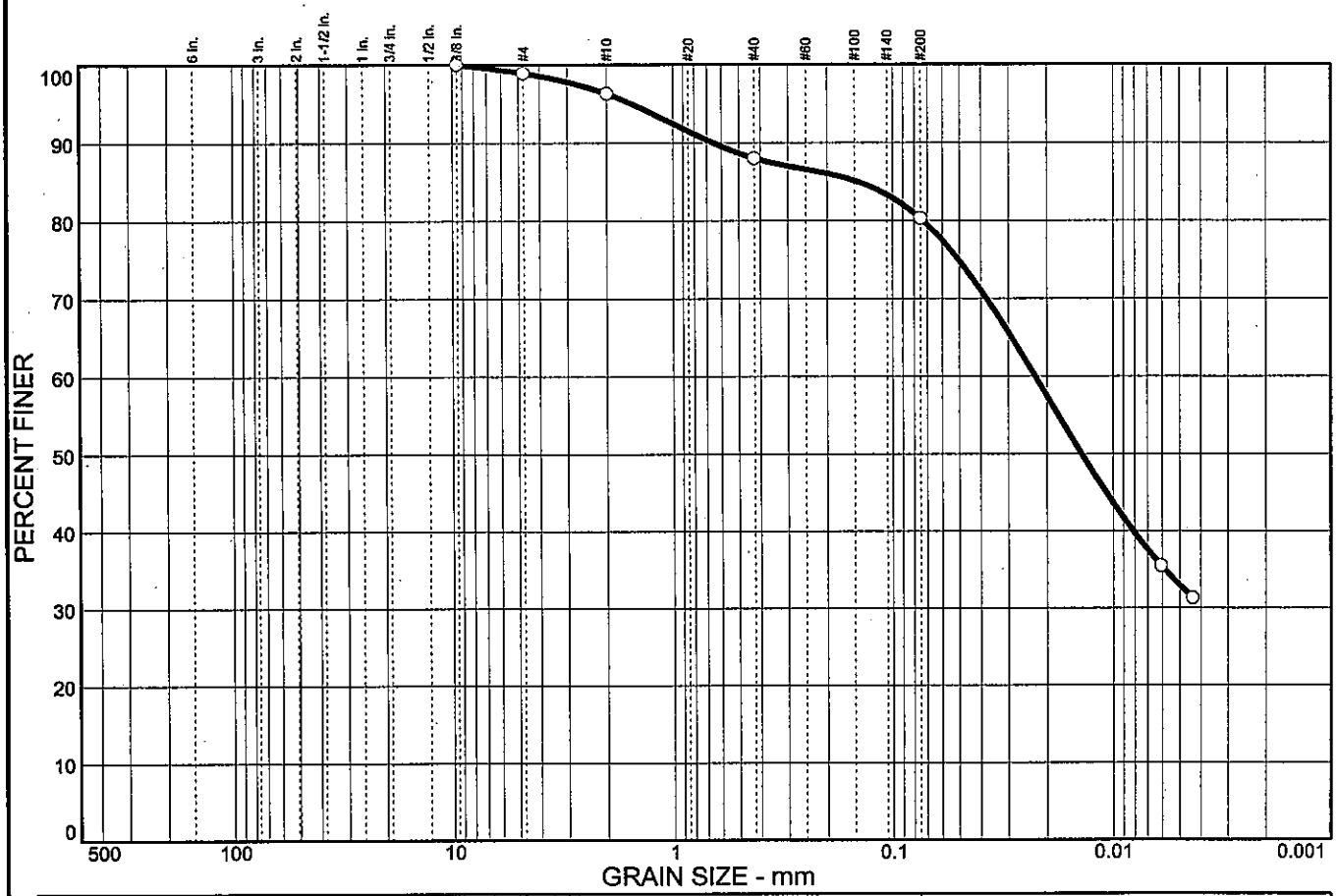
Sample No.: 2 **Source of Sample:** B-1123 **Date:** 11/1/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.1	2.6	8.3	7.7	47.3	33.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.9		
#10	96.3		
#40	88.0		
#200	80.3		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 19 LL= 32 PI= 13

Coefficients

D_{85}= 0.145 D_{60}= 0.0226 D_{50}= 0.0139
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

Moisture Content= 17.3%

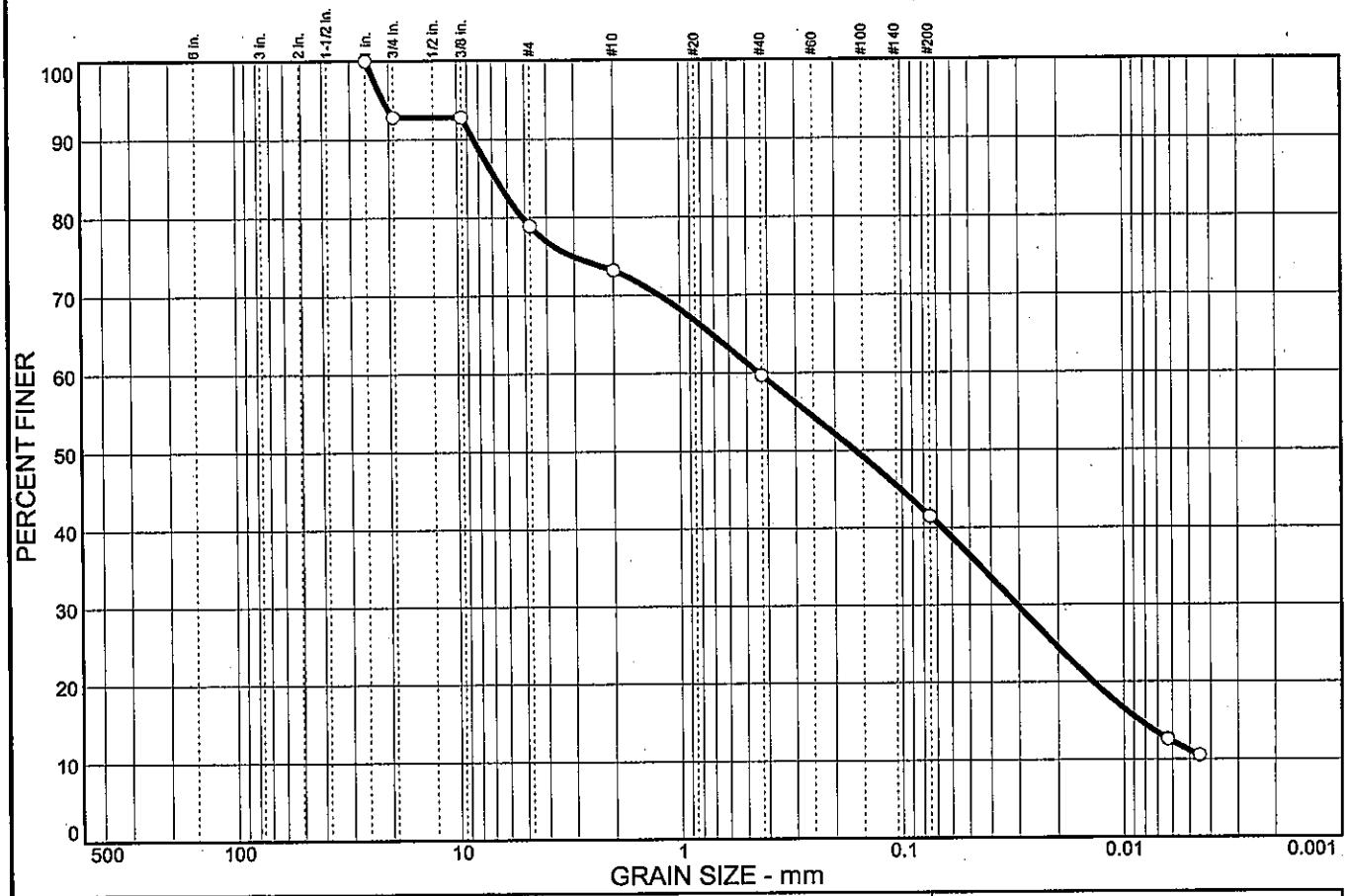
Sample No.: 3 **Source of Sample:** B-1123 **Date:** 11/1/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	7.2	13.9	5.7	13.5	18.2	30.4	11.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	92.8		
0.375 in.	92.8		
#4	78.9		
#10	73.2		
#40	59.7		
#200	41.5		

* (no specification provided)

Soil Description

Silty, clayey sand with gravel

Atterberg Limits

PL= 19 LL= 24 PI= 5

Coefficients

D_{85}= 6.72 D_{60}= 0.438 D_{50}= 0.162
D_{30}= 0.0307 D_{15}= 0.0085 D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

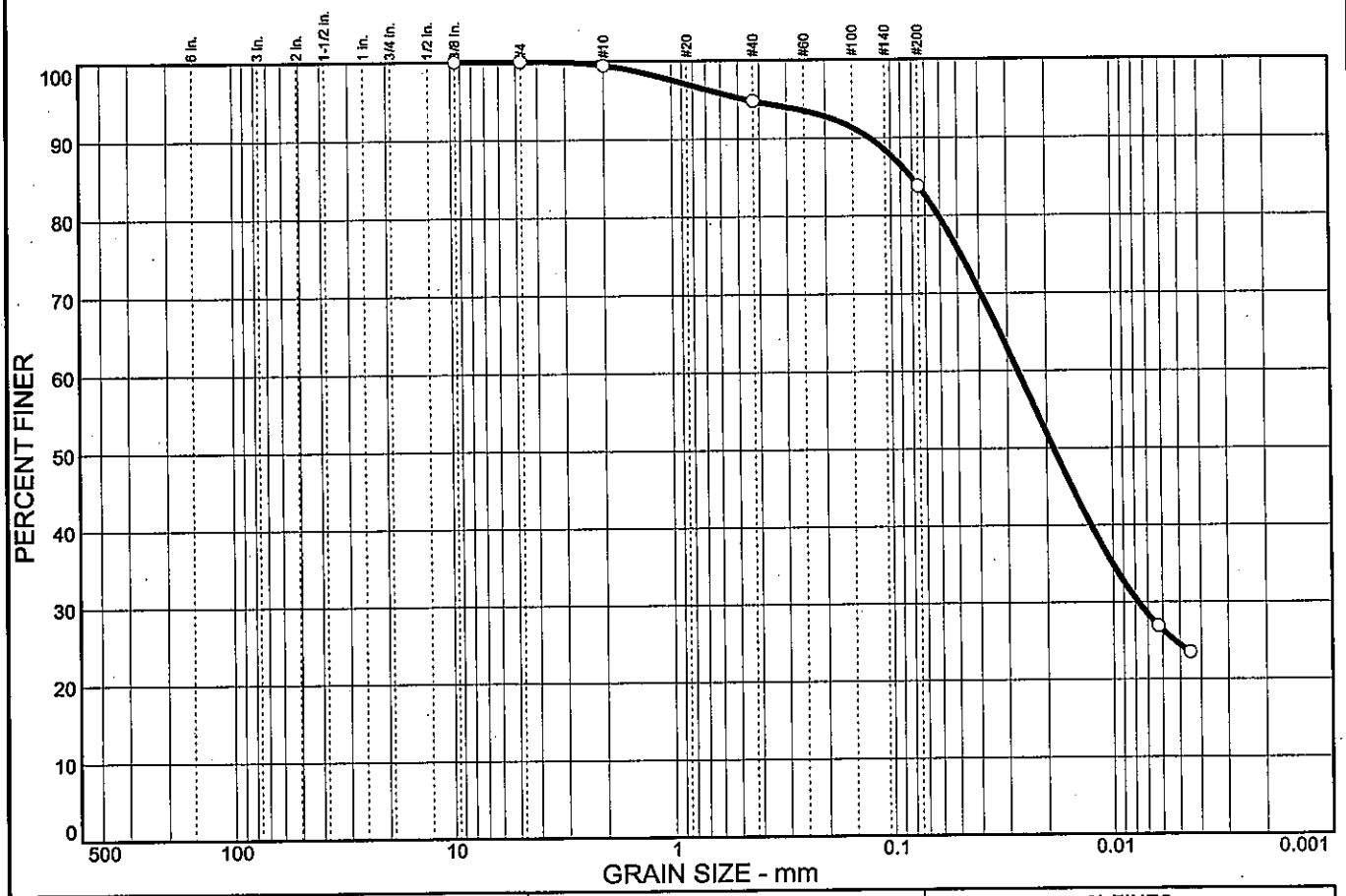
Moisture Content= 15.3%

Sample No.: 6 **Source of Sample:** B-1124 **Date:** 9/23/05
Location: **Elev./Depth:** 13.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.5	4.7	11.0	59.3	24.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.5		
#40	94.8		
#200	83.8		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 23 LL= 34 PI= 11

Coefficients

D_{85}= 0.0810 D_{60}= 0.0269 D_{50}= 0.0186
D_{30}= 0.0077 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

Moisture Content= 33.6%

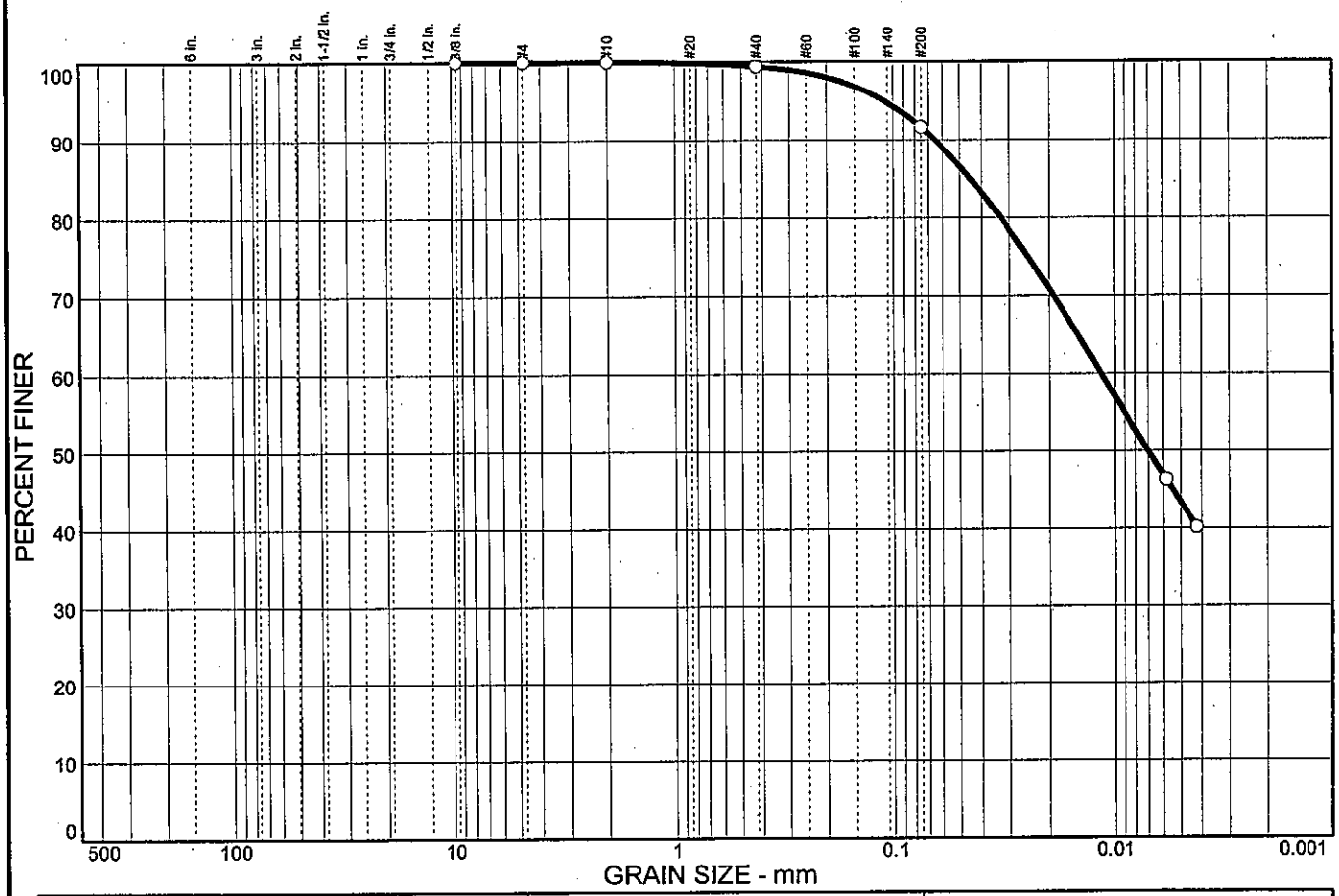
Sample No.: 1 **Source of Sample:** B-1124 **Date:** 11/1/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.6	7.8	48.2	43.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	100.0		
#40	99.4		
#200	91.6		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 21 LL= 42 PI= 21

Coefficients

D_{85}= 0.0449 D_{60}= 0.0115 D_{50}= 0.0070
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(20)

Remarks

Moisture Content= 26.8%

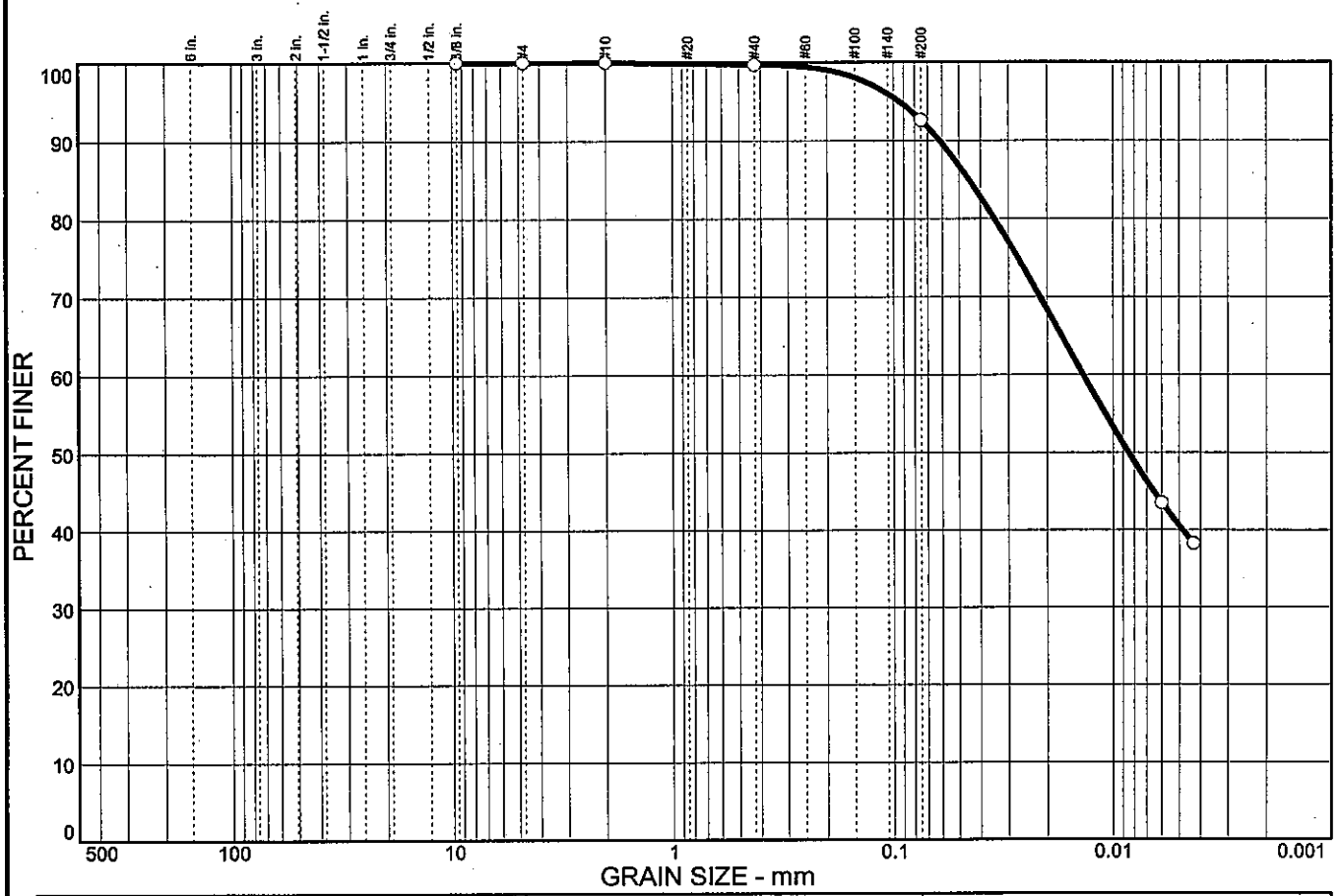
Sample No.: 2 **Source of Sample:** B-1124 **Date:** 11/1/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.3	7.1	52.0	40.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	100.0		
#40	99.7		
#200	92.6		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20 LL= 40 PI= 20

Coefficients

D_{85}= 0.0452 D_{60}= 0.0137 D_{50}= 0.0085
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(19)

Remarks

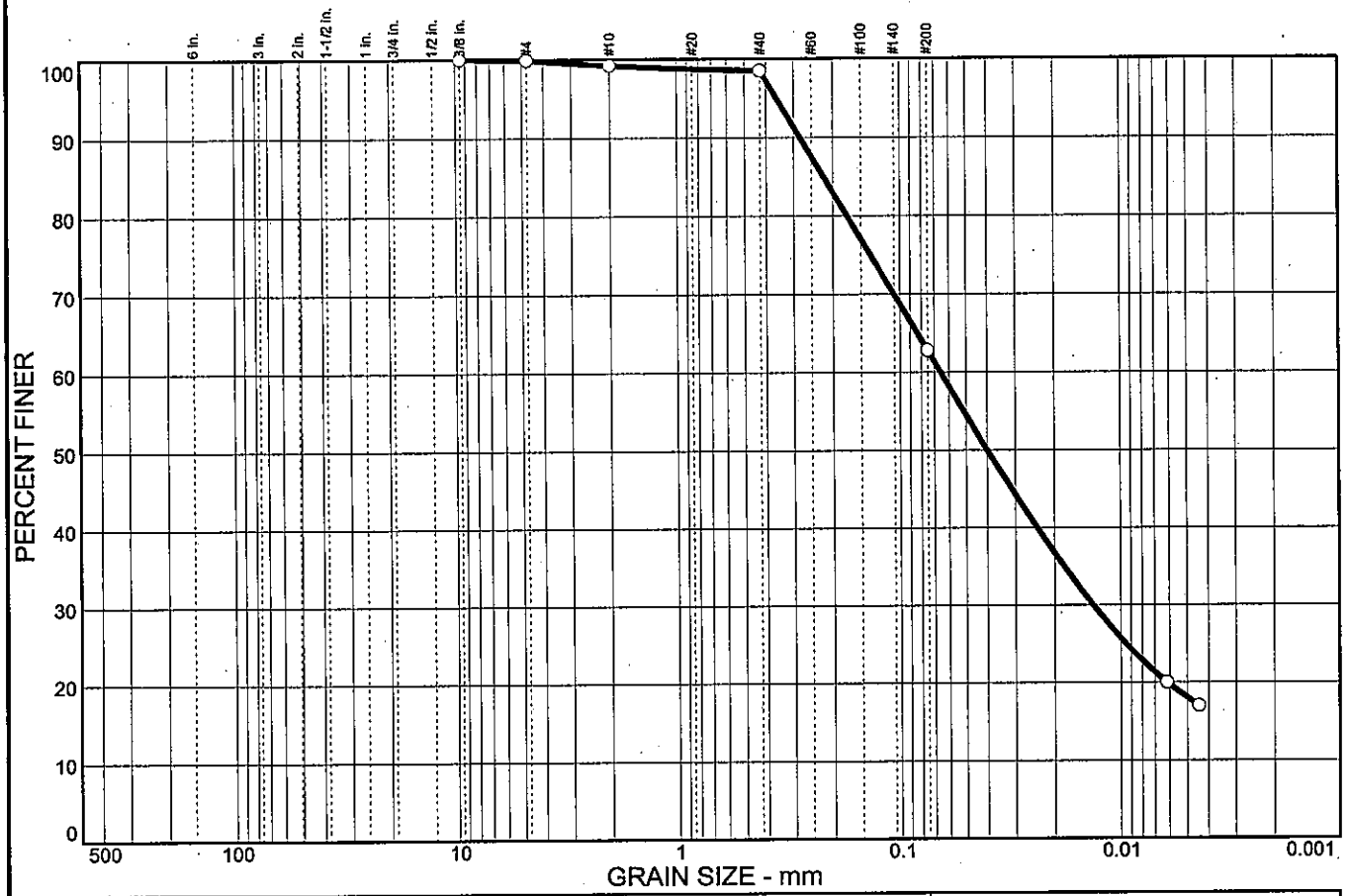
Moisture Content= 26.0%

Sample No.: 3 **Source of Sample:** B-1124 **Date:** 11/1/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.1	0.7	0.7	35.7	44.7	18.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.9		
#10	99.2		
#40	98.5		
#200	62.8		

* (no specification provided)

Soil Description

Sandy silty clay

Atterberg Limits

PL= 16 LL= 20 PI= 4

Coefficients

D_{85}= 0.221 D_{60}= 0.0655 D_{50}= 0.0401
D_{30}= 0.0134 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL-ML AASHTO= A-4(0)

Remarks

Moisture Content= 28.4%

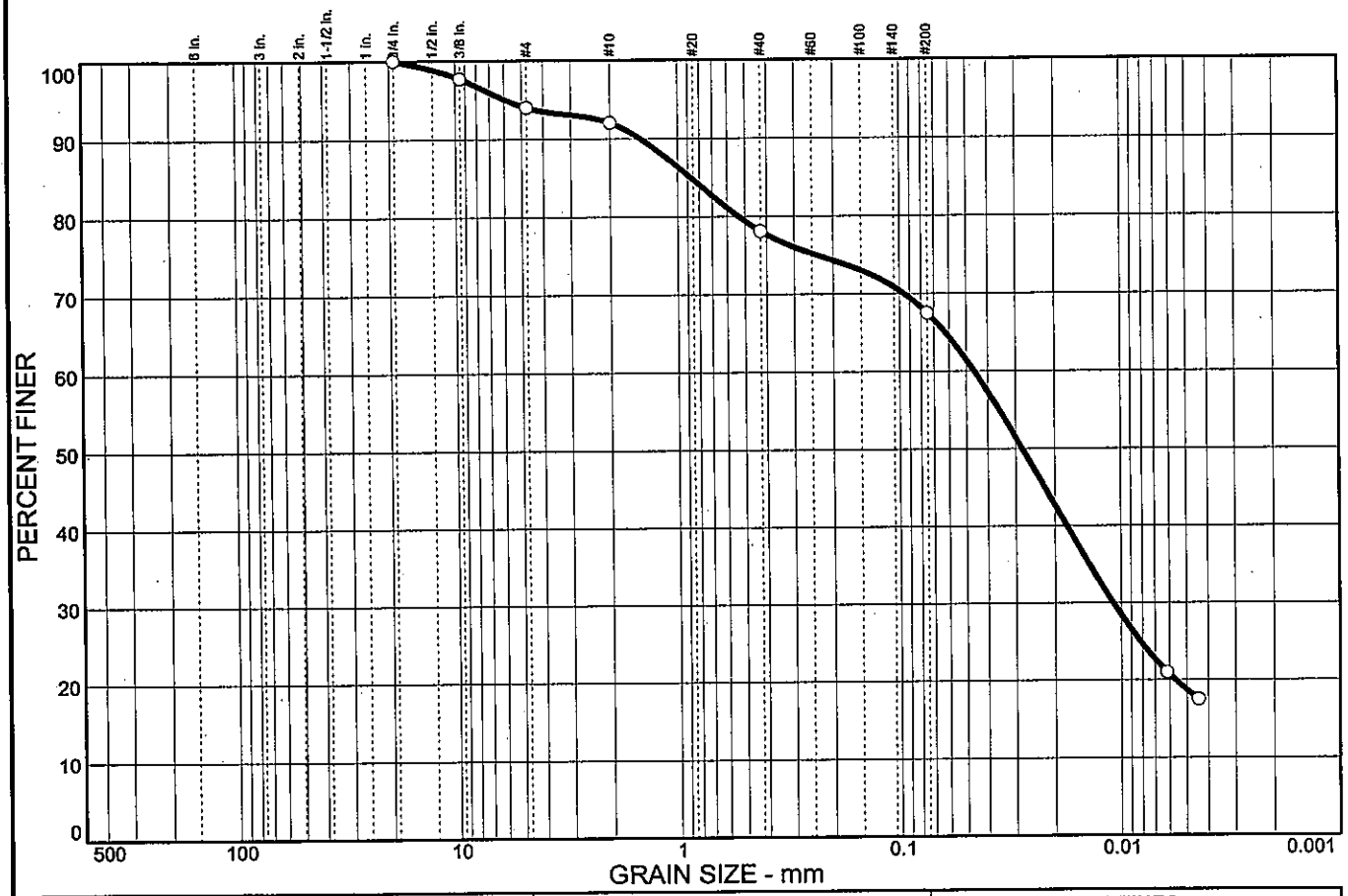
Sample No.: 5 **Source of Sample:** B-1124 **Date:** 9/23/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.0	2.0	13.9	10.6	48.8	18.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.7		
#4	94.0		
#10	92.0		
#40	78.1		
#200	67.5		

* (no specification provided)

Soil Description

Sandy silty clay

Atterberg Limits

PL= 20 LL= 27 PI= 7

Coefficients

D_{85}= 0.872 D_{60}= 0.0461 D_{50}= 0.0280
D_{30}= 0.0108 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL-ML AASHTO= A-4(3)

Remarks

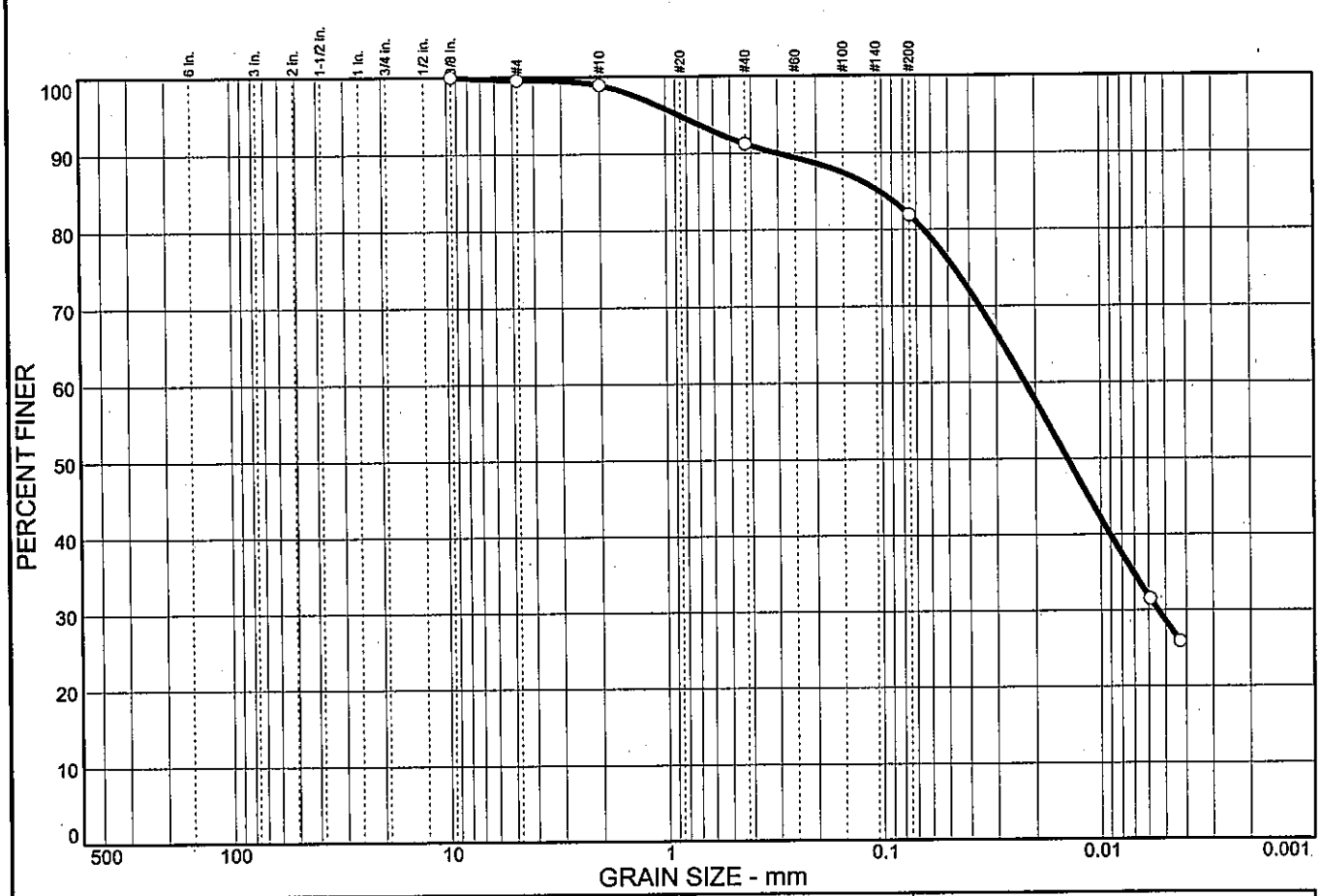
Moisture Content= 15.8%

Sample No.: 2 **Source of Sample:** B-1125 **Date:** 9-2-05
Location: **Elev./Depth:** 2.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.4	0.7	7.7	9.3	53.3	28.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.6		
#10	98.9		
#40	91.2		
#200	81.9		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 19 LL= 30 PI= 11

Coefficients

D_{85}= 0.103 D_{60}= 0.0223 D_{50}= 0.0142
D_{30}= 0.0054 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(8)

Remarks

Moisture Content= 21.4%

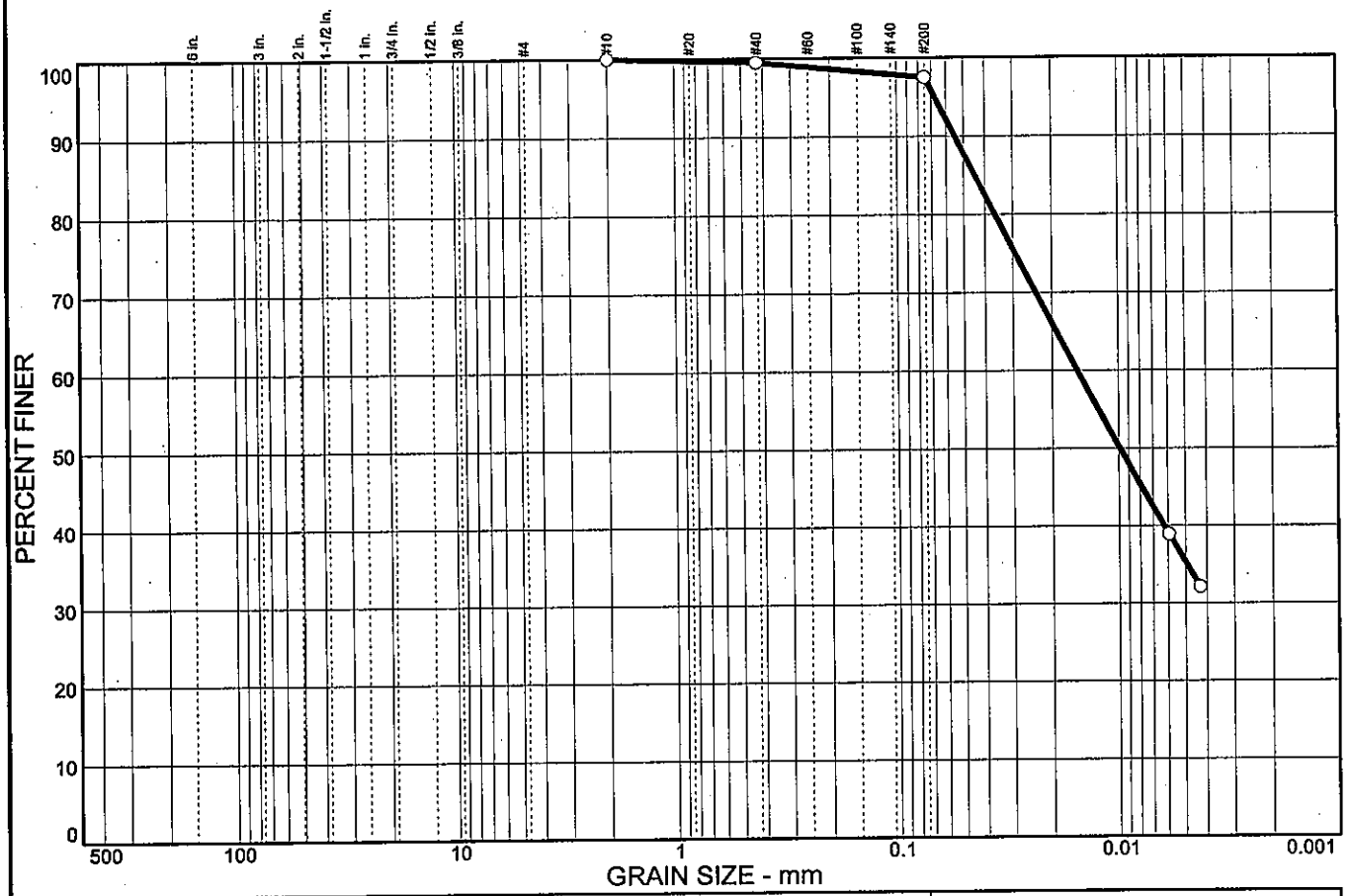
Sample No.: 3 **Source of Sample:** B-1125 **Date:** 9-2-05
Location: **Elev./Depth:** 4.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.5	2.0	62.2	35.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.5		
#200	97.5		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20 LL= 36 PI= 16

Coefficients

D_{85}= 0.0445 D_{60}= 0.0153 D_{50}= 0.0099
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(16)

Remarks

Moisture Content= 17.2%

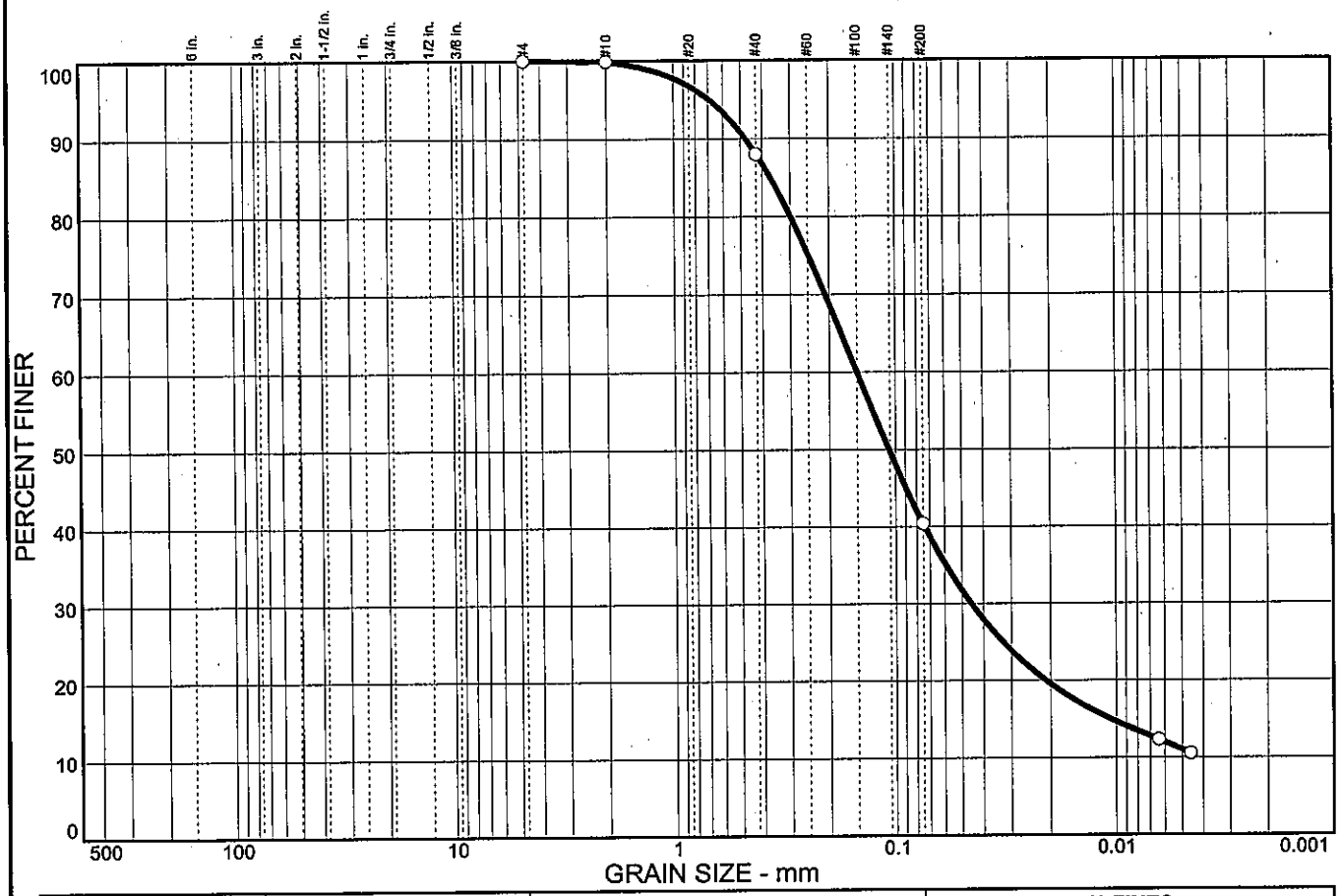
Sample No.: 1 **Source of Sample:** B-1126 **Date:** 9-2-05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	11.9	47.6	29.4	11.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#40	88.0		
#200	40.4		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.368 D_{60}= 0.150 D_{50}= 0.107
D_{30}= 0.0454 D_{15}= 0.0106 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Moisture Content= 28.8%

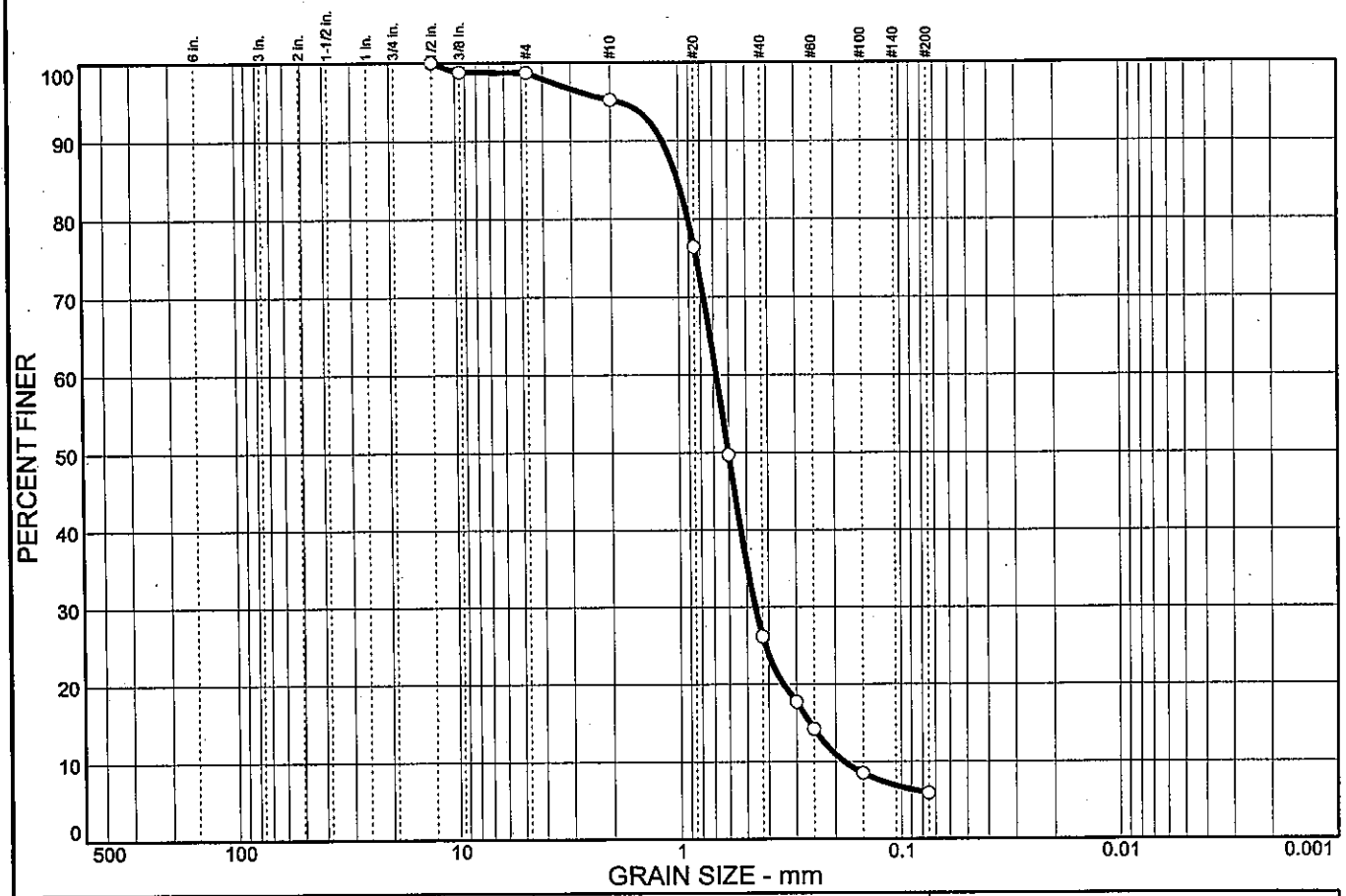
Sample No.: 10 **Source of Sample:** B-1126 **Date:** 9/29/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.3	3.5	69.0	20.3	5.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.50 in.	100.0		
0.375 in.	98.8		
#4	98.7		
#10	95.2		
#20	76.4		
#30	49.7		
#40	26.2		
#50	17.7		
#60	14.2		
#100	8.5		
#200	5.9		

* (no specification provided)

Soil Description

Poorly graded sand with silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 1.01 D_{60}= 0.680 D_{50}= 0.602
D_{30}= 0.458 D_{15}= 0.261 D_{10}= 0.183
C_u= 3.72 C_c= 1.69

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

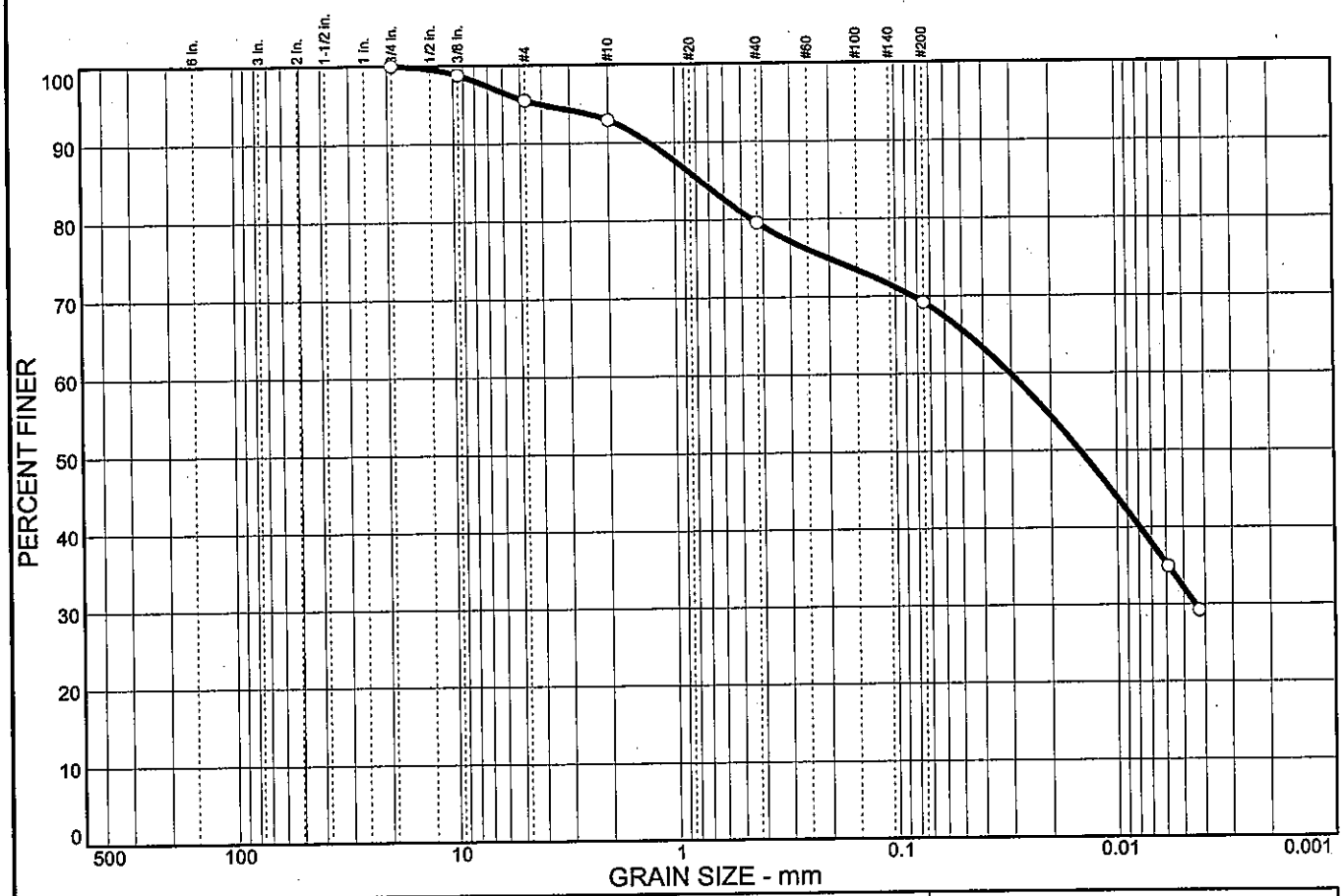
Moisture Content= 18.9%

Sample No.: 11 **Source of Sample:** B-1126 **Date:** 9/29/05
Location: **Elev./Depth:** 23.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.5	2.6	13.3	10.4	37.1	32.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.8		
#4	95.5		
#10	92.9		
#40	79.6		
#200	69.2		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 18 LL= 31 PI= 13

Coefficients

D_{85}= 0.763 D_{60}= 0.0303 D_{50}= 0.0147
D_{30}= 0.0044 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(7)

Remarks

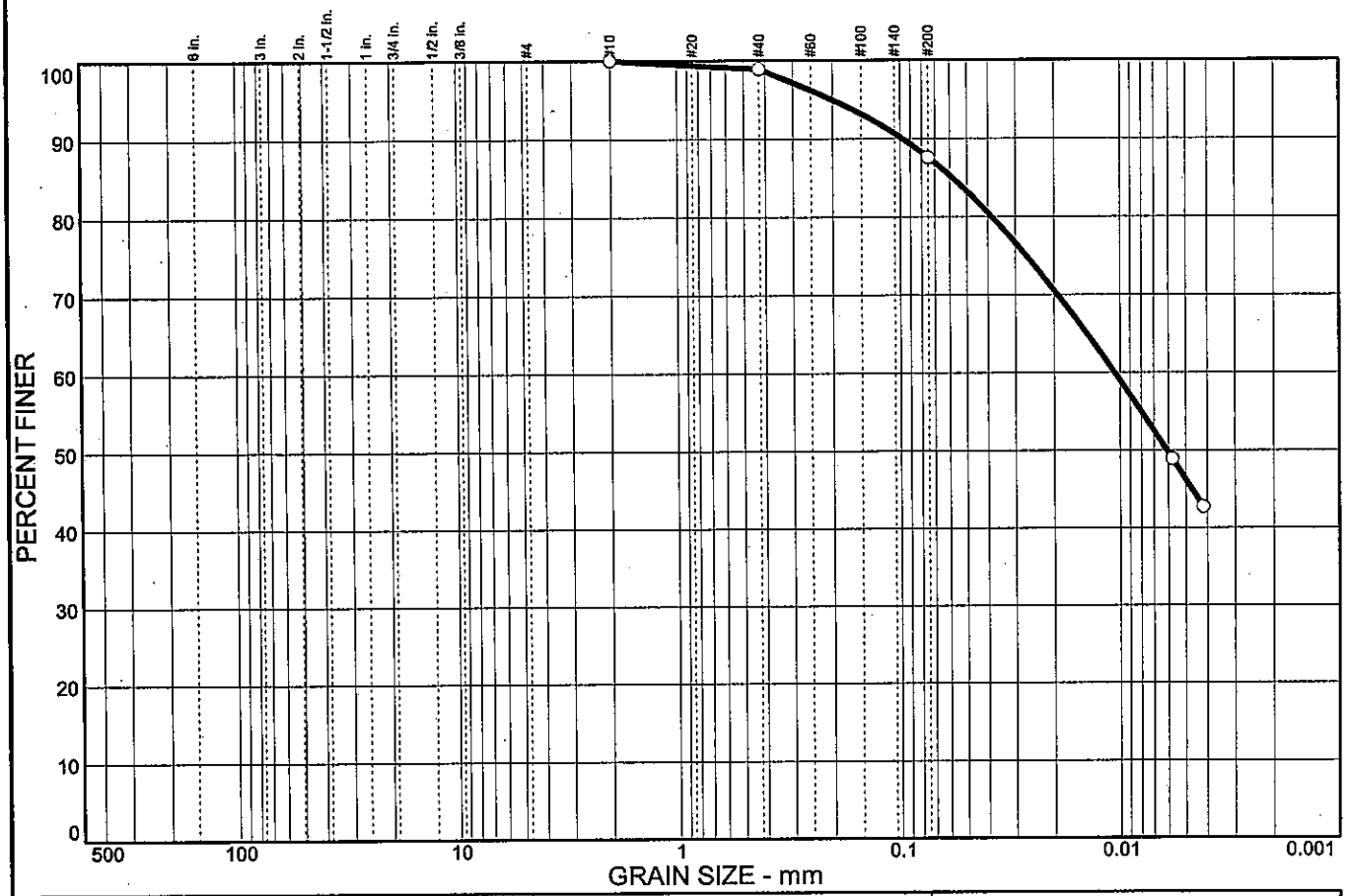
Moisture Content= 16.3%

Sample No.: 2 **Source of Sample:** B-1126 **Date:** 9-2-05
Location: **Elev./Depth:** 3.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	1.1	11.3	41.4	46.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	98.9		
#200	87.6		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 34 PI= 15

Coefficients

D_{85}= 0.0583 D_{60}= 0.0106 D_{50}= 0.0061
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

Remarks

Moisture Content= 21.5%

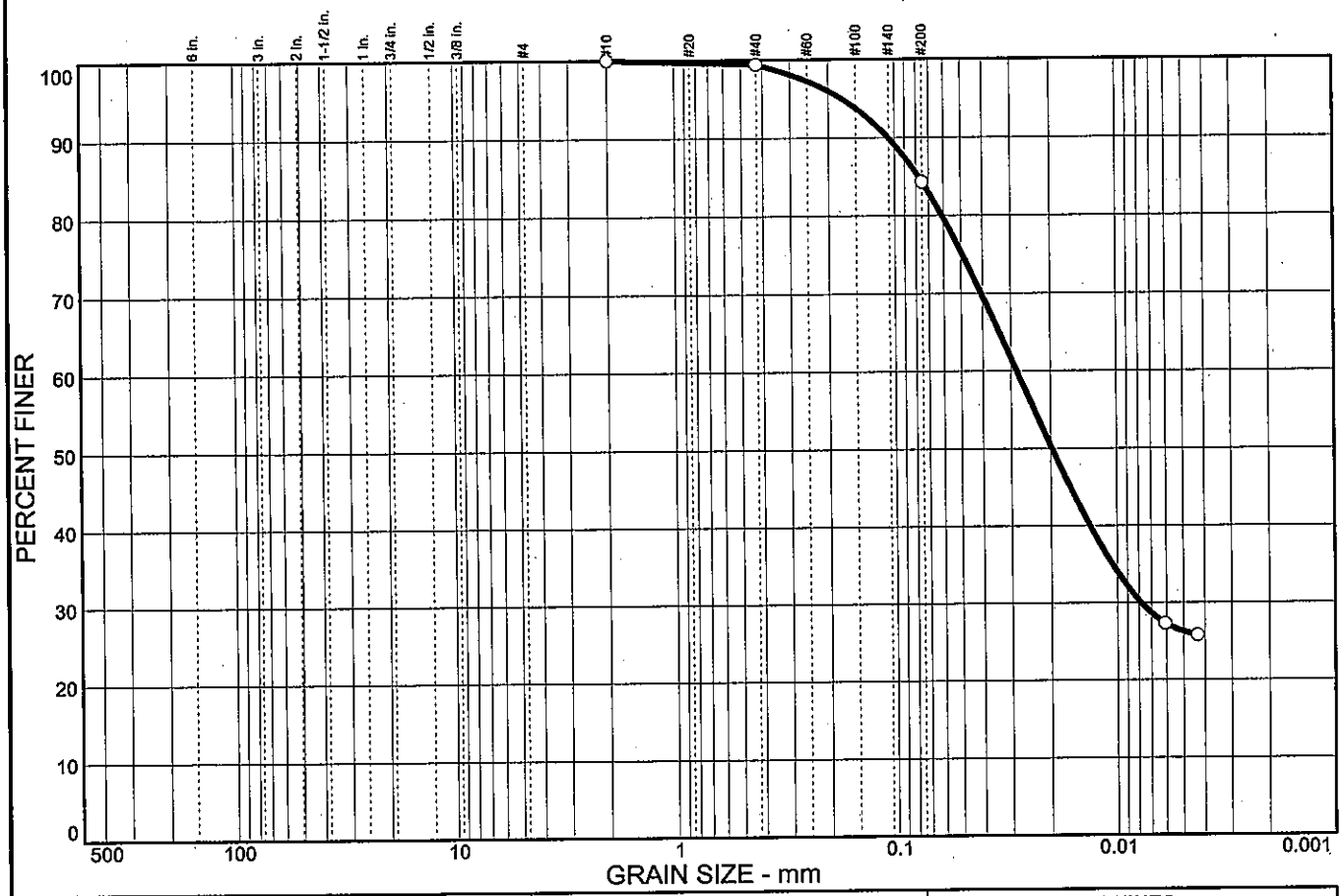
Sample No.: 5 **Source of Sample:** B-1126 **Date:** 9/29/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.6	15.1	58.0	26.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.4		
#200	84.3		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 18 LL= 26 PI= 8

Coefficients

D_{85}= 0.0779 D_{60}= 0.0283 D_{50}= 0.0197
D_{30}= 0.0078 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(5)

Remarks

Moisture Content= 29.0%

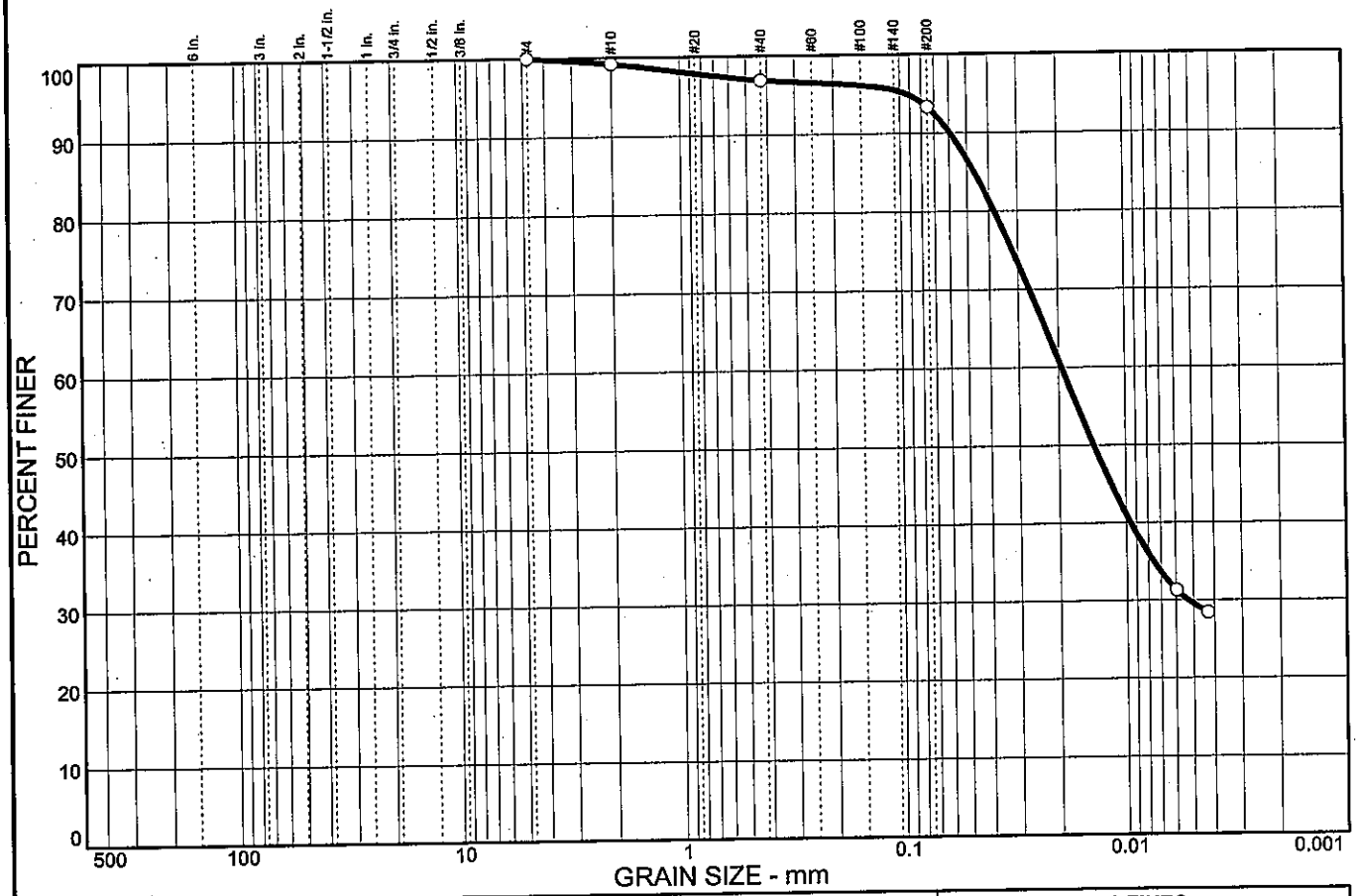
Sample No.: 6 **Source of Sample:** B-1126 **Date:** 9/29/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.8	2.3	3.6	63.7	29.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.2		
#40	96.9		
#200	93.3		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20 LL= 33 PI= 13

Coefficients

D_{85}= 0.0465 D_{60}= 0.0194 D_{50}= 0.0139
D_{30}= 0.0053 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(12)

Remarks

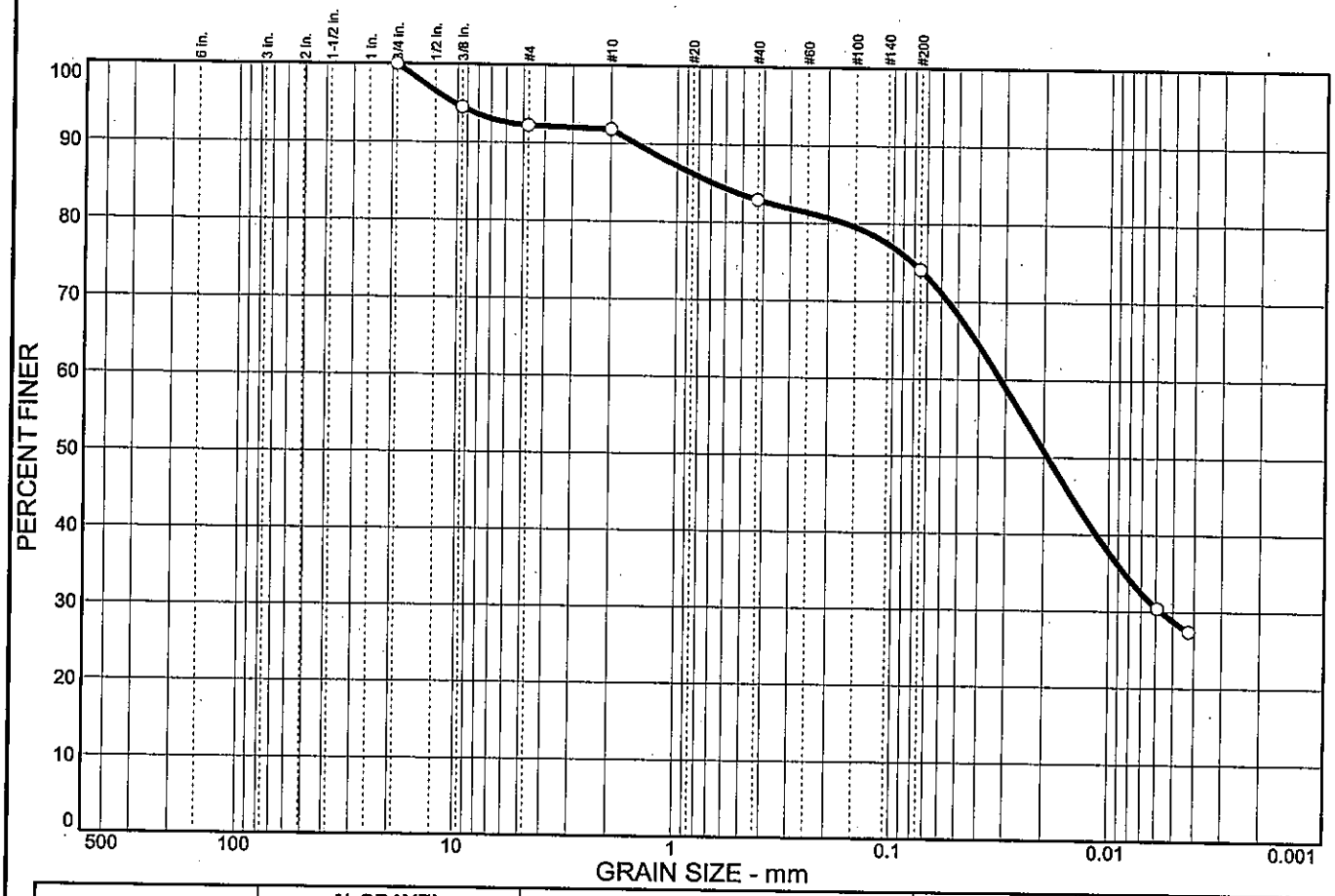
Moisture Content= 26.9%

Sample No.: 8 **Source of Sample:** B-1126 **Date:** 9/18/06
Location: **Elev./Depth:** 16.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	7.8	0.4	8.9	8.8	45.3	28.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.5		
#4	92.2		
#10	91.8		
#40	82.9		
#200	74.1		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 21 LL= 31 PI= 10

Coefficients

D_{85}= 0.681 D_{60}= 0.0316 D_{50}= 0.0192
D_{30}= 0.0057 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(6)

Remarks

Moisture Content= 15.8%

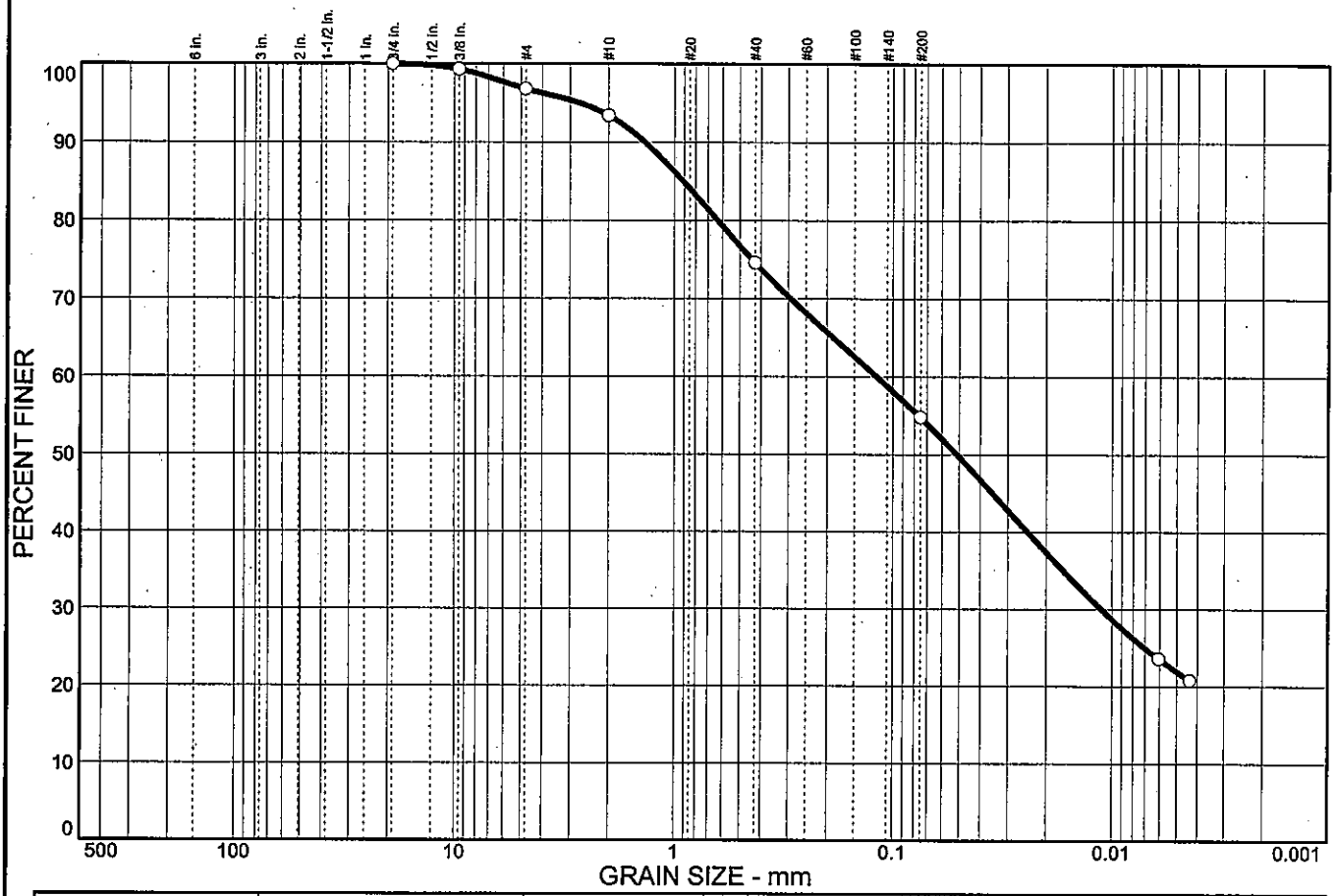
Sample No.: 1 **Source of Sample:** B-1127 **Date:** 8/15/05
Location: **Elev./Depth:** 0.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.2	3.4	18.8	19.8	32.9	21.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.3		
#4	96.8		
#10	93.4		
#40	74.6		
#200	54.8		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 16 LL= 24 PI= 8

Coefficients

D_{85}= 0.909 D_{60}= 0.118 D_{50}= 0.0512
D_{30}= 0.0112 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(2)

Remarks

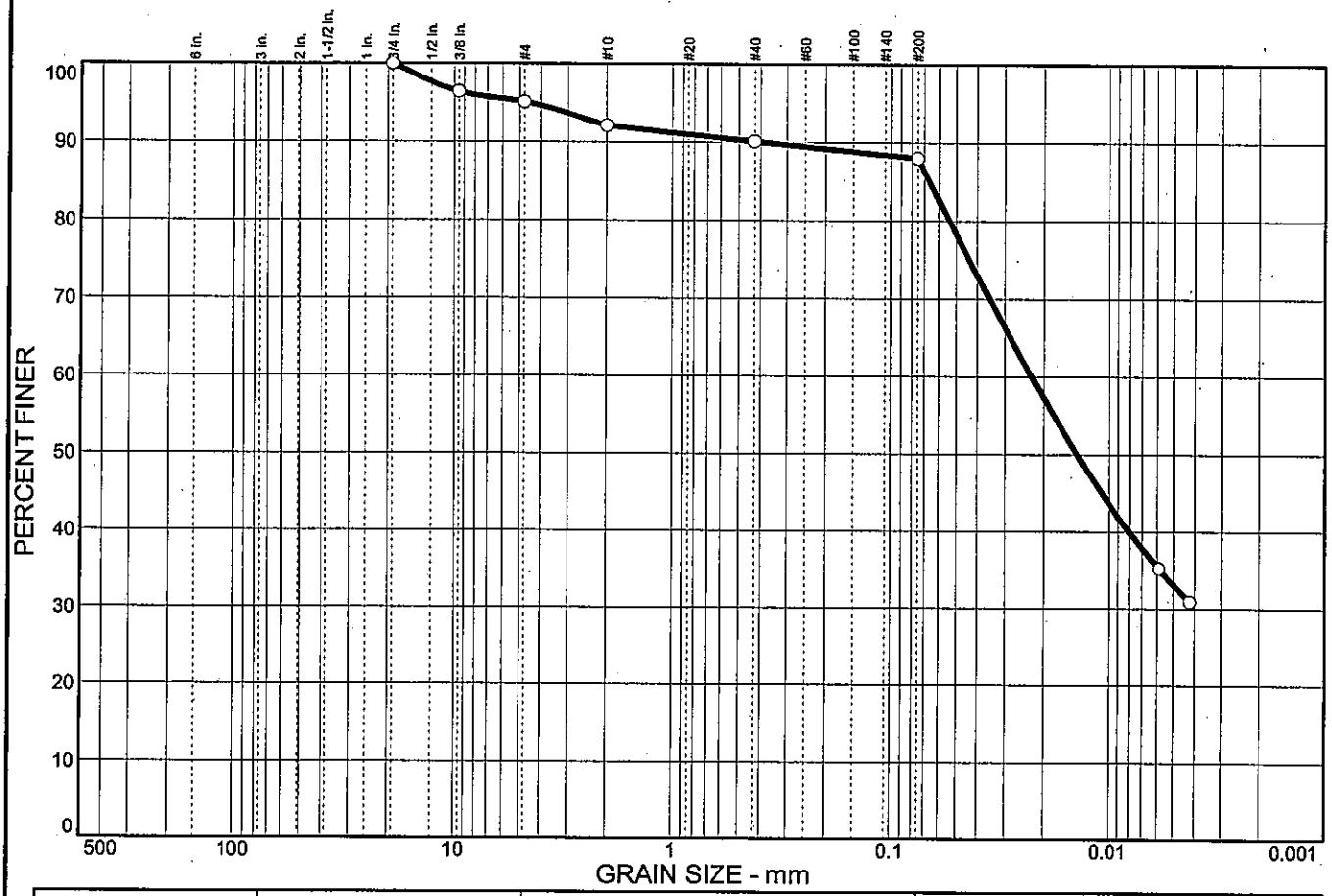
Moisture Content= 11.3%

Sample No.: 2 **Source of Sample:** B-1127 **Date:** 8/15/05
Location: **Elev./Depth:** 2.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.9	3.0	2.0	2.1	54.9	33.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.4		
#4	95.1		
#10	92.1		
#40	90.1		
#200	88.0		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 21 LL= 32 PI= 11

Coefficients

D_{85}= 0.0662 D_{60}= 0.0226 D_{50}= 0.0140
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

Moisture Content= 15.9%

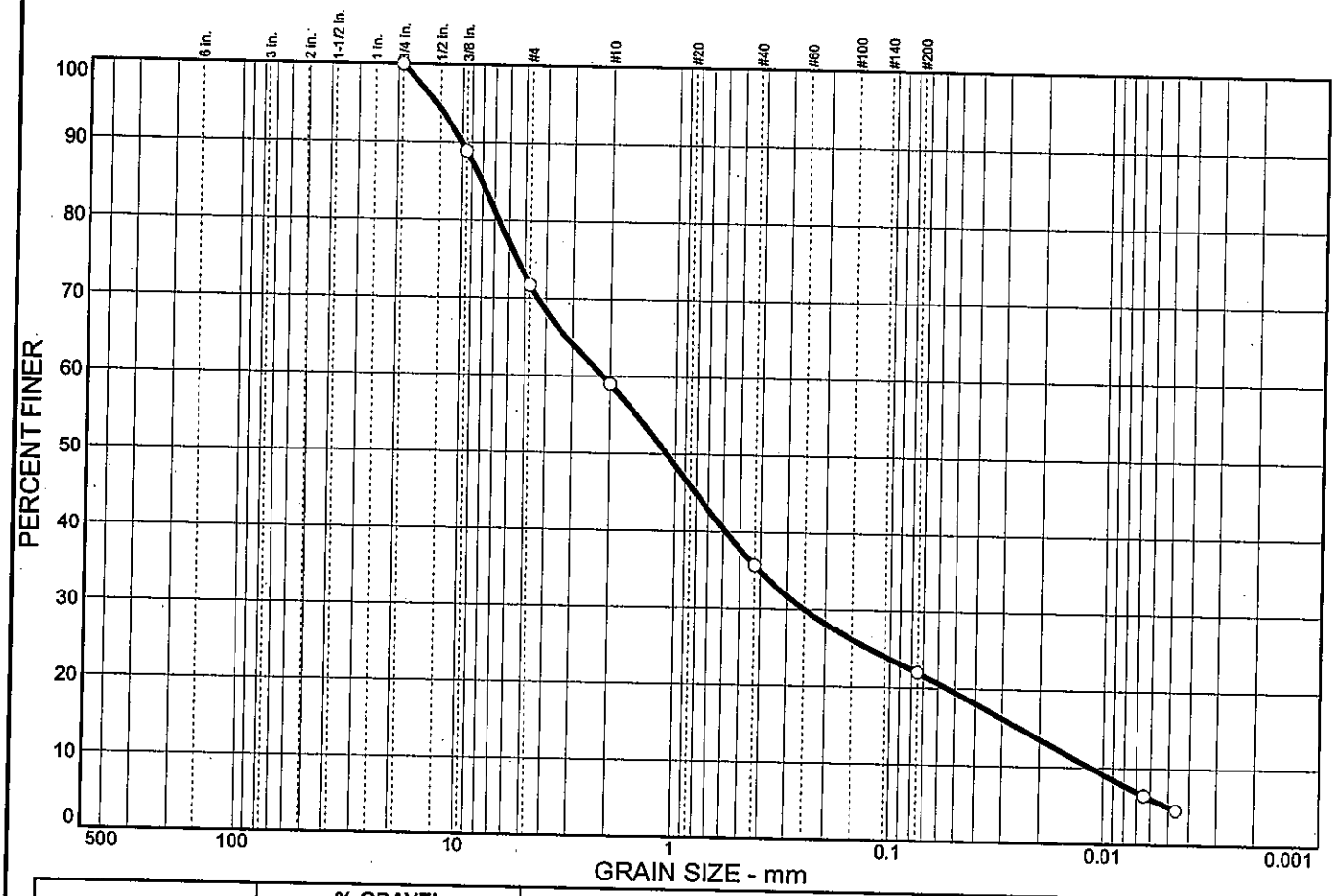
Sample No.: 1 **Source of Sample:** B-1128 **Date:** 8/15/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	28.3	12.7	23.4	13.6	17.0	5.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	88.9		
#4	71.7		
#10	59.0		
#40	35.6		
#200	22.0		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 8.08 D_{60}= 2.16 D_{50}= 1.10
D_{30}= 0.250 D_{15}= 0.0250 D_{10}= 0.0116
C_u= 186.40 C_c= 2.50

Classification

USCS= SM AASHTO= A-1-b

Remarks

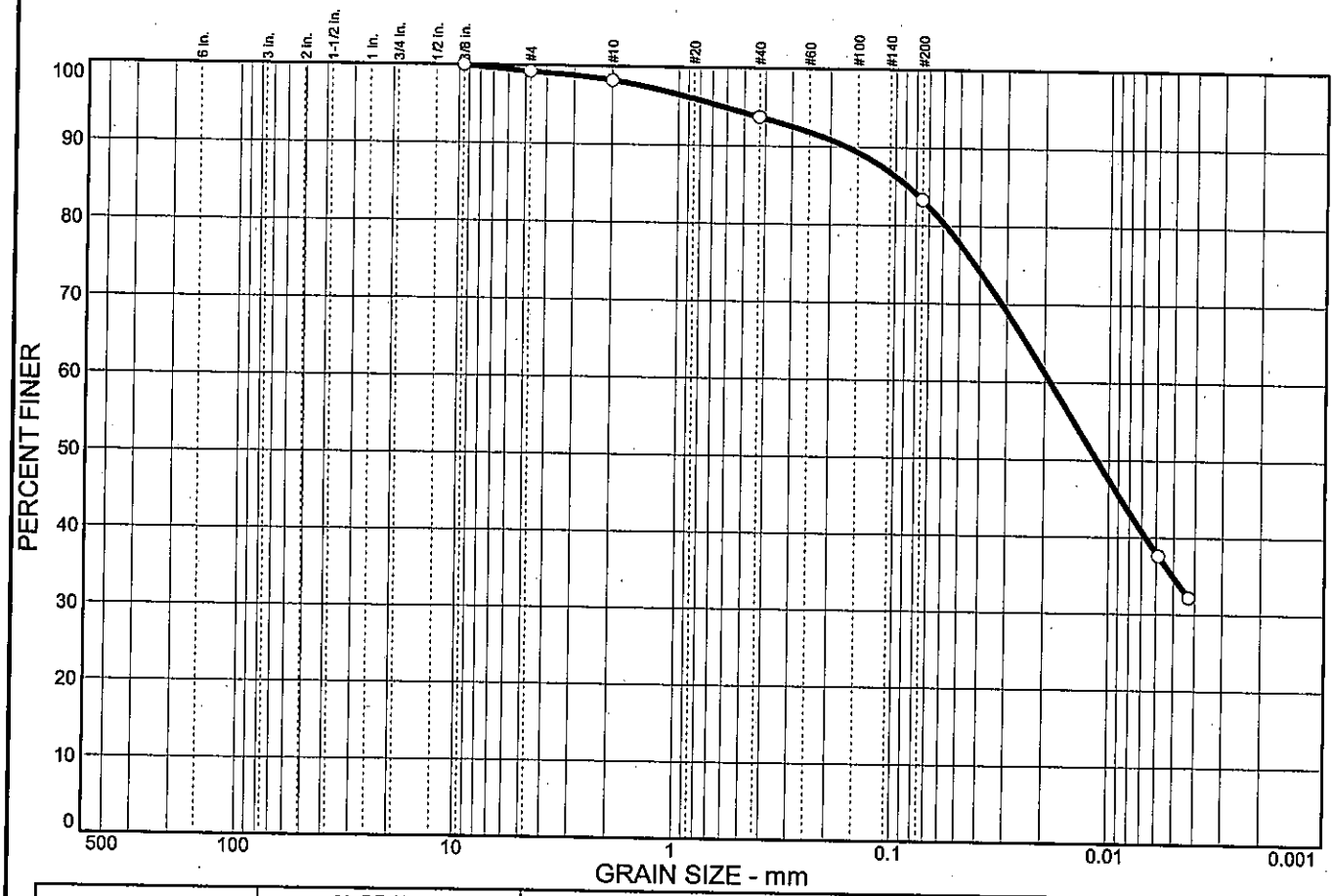
Moisture Content= 7.1%

Sample No.: 2 **Source of Sample:** B-1128 **Date:** 8/15/05
Location: **Elev./Depth:** 3.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.8	1.0	4.5	10.4	48.4	34.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.2		
#10	98.2		
#40	93.7		
#200	83.3		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 18 LL= 31 PI= 13

Coefficients

D_{85}= 0.0875 D_{60}= 0.0187 D_{50}= 0.0114
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

Moisture Content= 16.9%

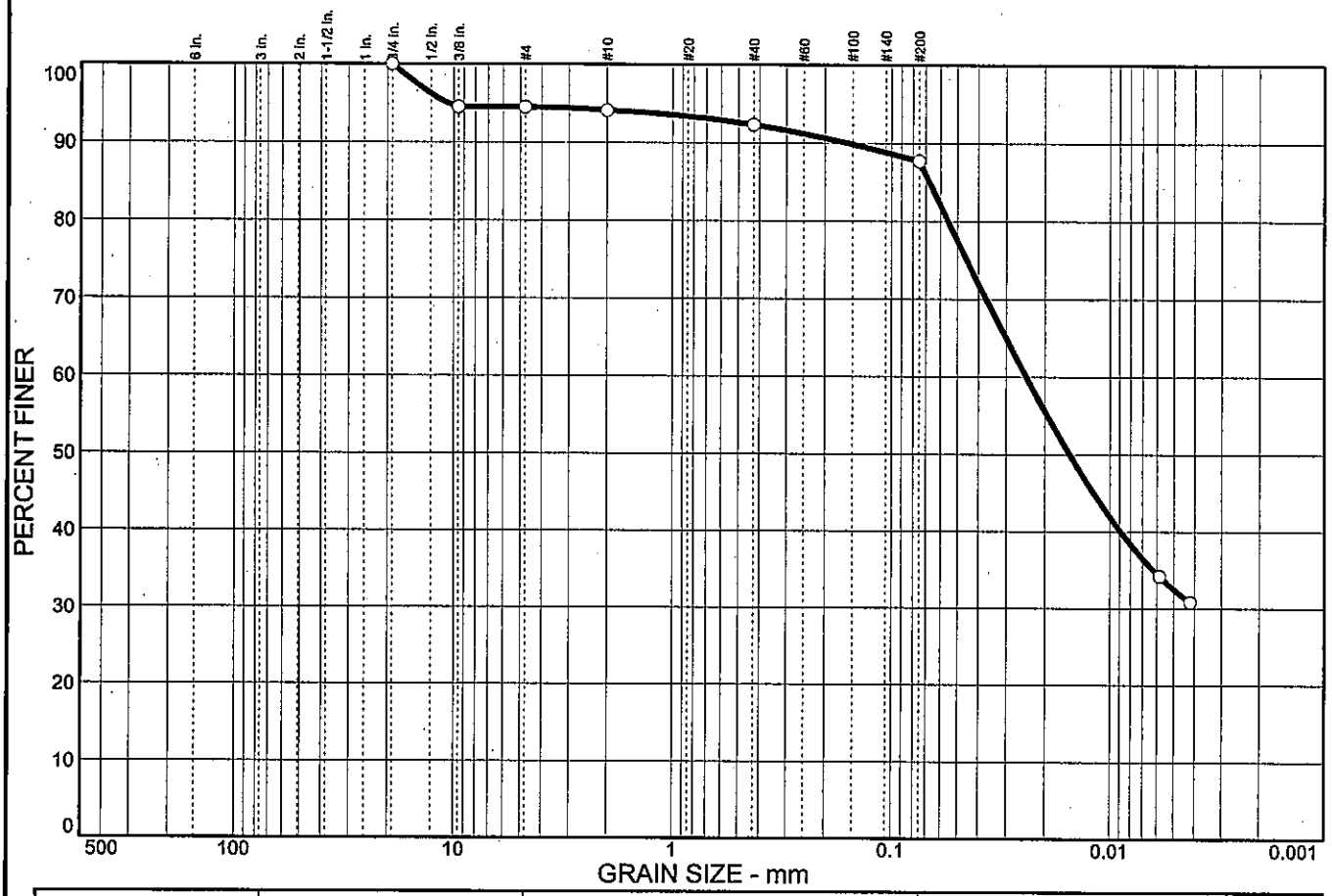
Sample No.: 3 **Source of Sample:** B-1128 **Date:** 7/29/06
Location: **Elev./Depth:** 5.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	5.5	0.4	1.8	4.6	55.2	32.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.5		
#4	94.5		
#10	94.1		
#40	92.3		
#200	87.7		

* (no specification provided)

Soil Description

Silt

Atterberg Limits

PL= 25 LL= 31 PI= 6

Coefficients

D_{85}= 0.0674 D_{60}= 0.0243 D_{50}= 0.0154
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(5)

Remarks

Moisture Content= 18.7%
LOI (Organic Content)= 6.12%

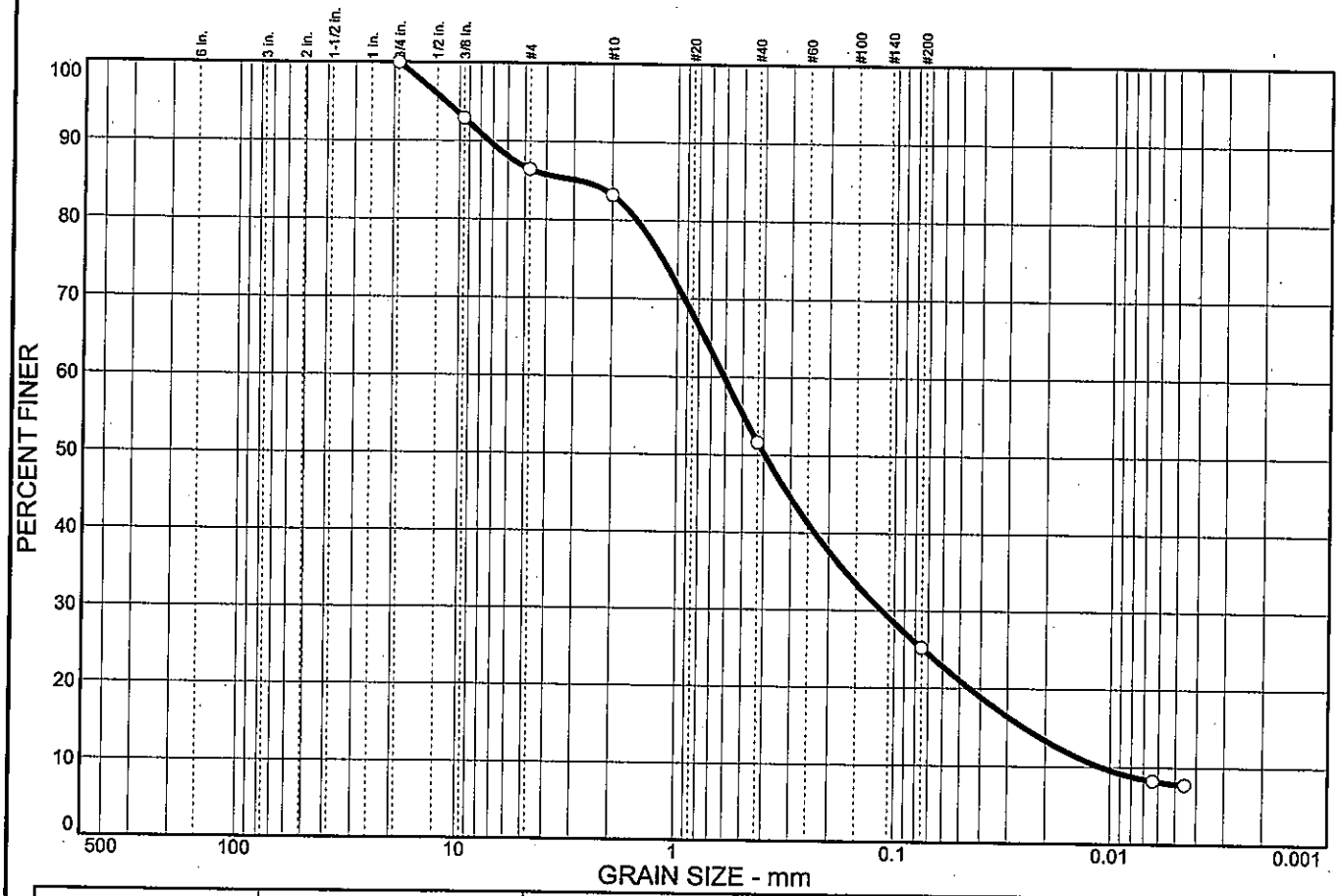
Sample No.: 1 **Source of Sample:** B-1129 **Date:** 8/15/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	13.6	3.2	31.6	26.4	17.4	7.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	92.9		
#4	86.4		
#10	83.2		
#40	51.6		
#200	25.2		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 2.83 D_{60}= 0.608 D_{50}= 0.395
D_{30}= 0.114 D_{15}= 0.0251 D_{10}= 0.0111
C_u= 55.02 C_c= 1.94

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture Content= 7.3%

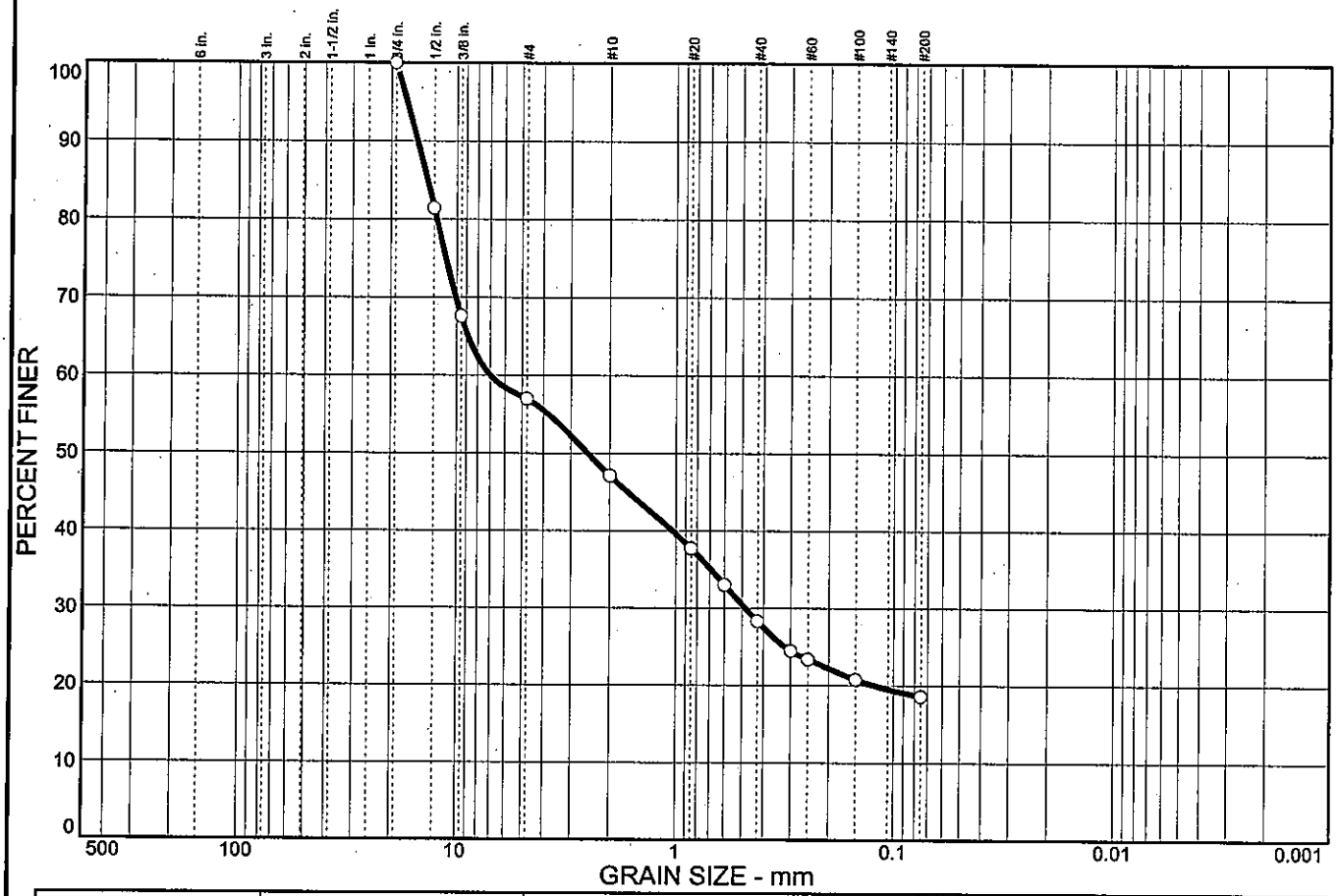
Sample No.: 2 **Source of Sample:** B-1129 **Date:** 8/15/05
Location: **Elev./Depth:** 3.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	43.0	9.9	18.8	9.7	18.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.50 in.	81.4		
0.375 in.	67.6		
#4	57.0		
#10	47.1		
#20	37.7		
#30	33.0		
#40	28.3		
#50	24.5		
#60	23.4		
#100	20.8		
#200	18.6		

* (no specification provided)

Soil Description

Silty gravel with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 13.7 D_{60}= 6.99 D_{50}= 2.52
D_{30}= 0.483 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= GM AASHTO= A-1-b

Remarks

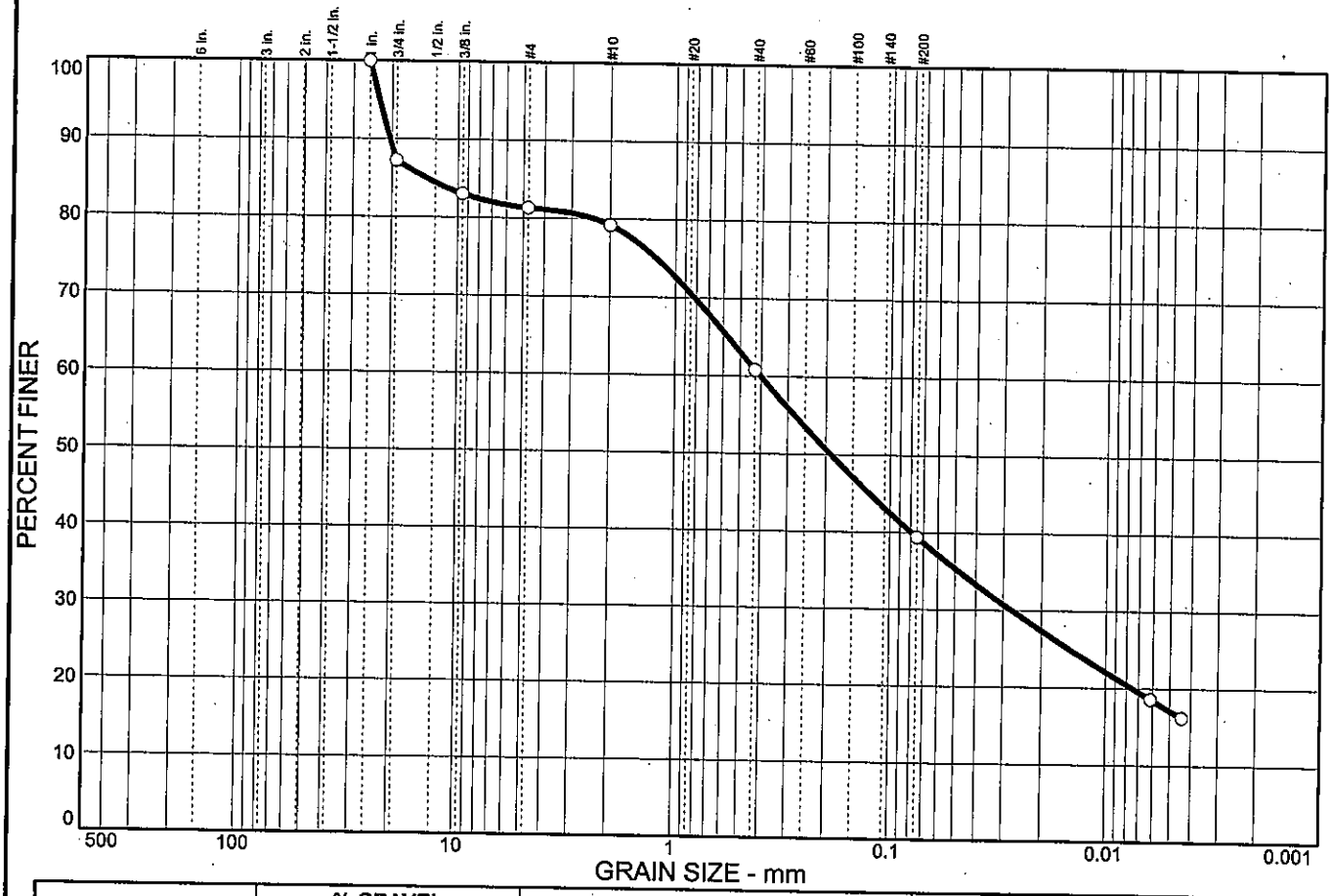
Moisture Content= 4.9%

Sample No.: 1 **Source of Sample:** B-1130 **Date:** 8/20/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	12.8	5.9	2.1	18.4	21.4	22.3	17.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
0.75 in.	87.2		
0.375 in.	83.0		
#4	81.3		
#10	79.2		
#40	60.8		
#200	39.4		

* (no specification provided)

Soil Description

Clayey sand with gravel

Atterberg Limits

PL= 15 LL= 24 PI= 9

Coefficients

D_{85}= 13.9 D_{60}= 0.402 D_{50}= 0.189
D_{30}= 0.0274 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-4(0)

Remarks

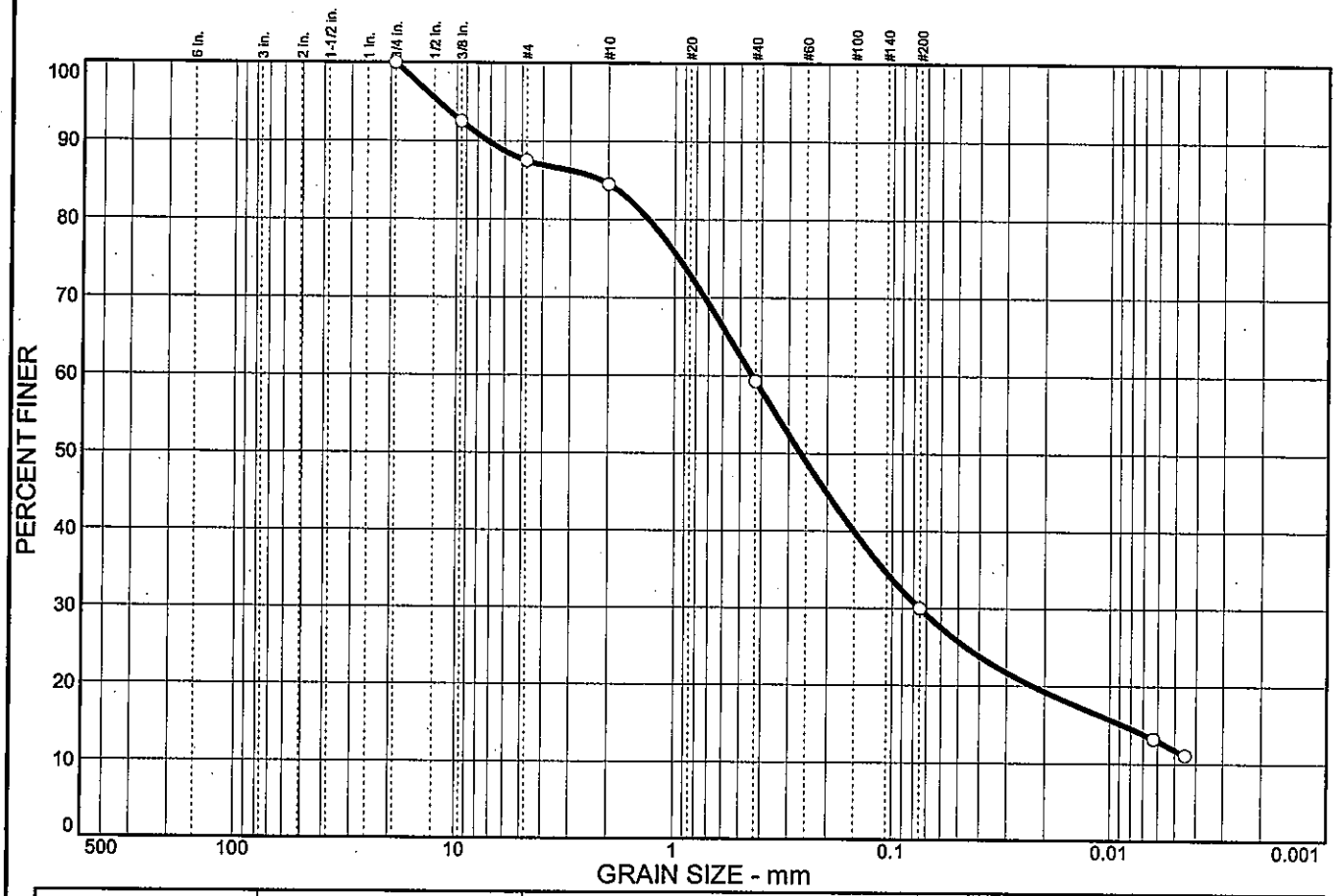
Moisture Content= 14.0%

Sample No.: 2 **Source of Sample:** B-1130 **Date:** 8/20/05
Location: **Elev./Depth:** 3.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	12.5	3.0	25.2	29.3	18.2	11.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	92.5		
#4	87.5		
#10	84.5		
#40	59.3		
#200	30.0		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 14 LL= 18 PI= 4

Coefficients

D_{85}= 2.16 D_{60}= 0.440 D_{50}= 0.264
D_{30}= 0.0750 D_{15}= 0.0087 D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

Moisture Content= 7.7%

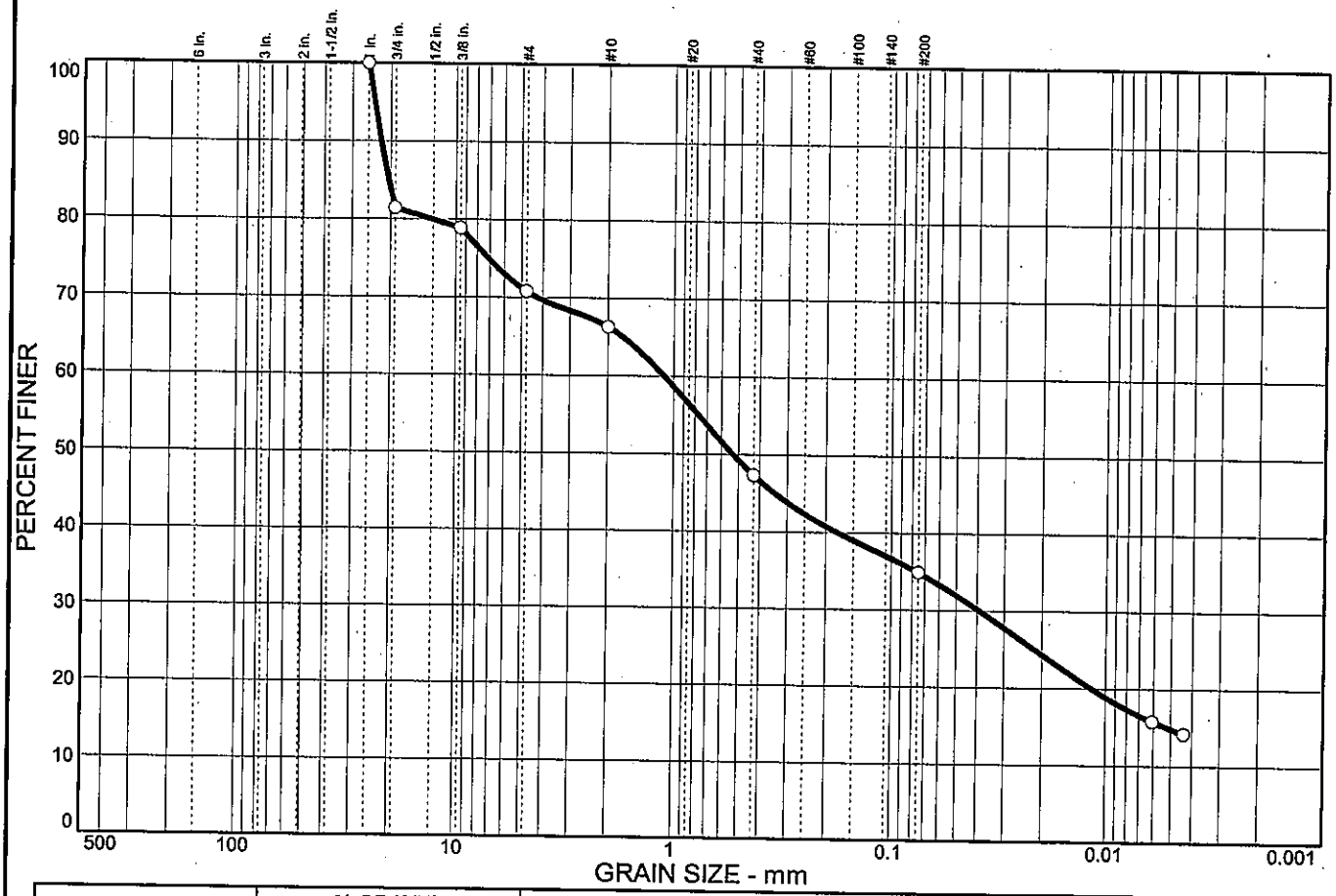
Sample No.: 1 **Source of Sample:** B-1131 **Date:** 8/20/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	18.6	10.6	4.5	19.0	12.4	20.1	14.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
0.75 in.	81.4		
0.375 in.	78.9		
#4	70.8		
#10	66.3		
#40	47.3		
#200	34.9		

* (no specification provided)

Soil Description

Clayey sand with gravel

Atterberg Limits

PL= 15 LL= 24 PI= 9

Coefficients

D_{85}= 20.4 D_{60}= 1.10 D_{50}= 0.530
D_{30}= 0.0390 D_{15}= 0.0052 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-2-4(0)

Remarks

Moisture Content= 8.4%

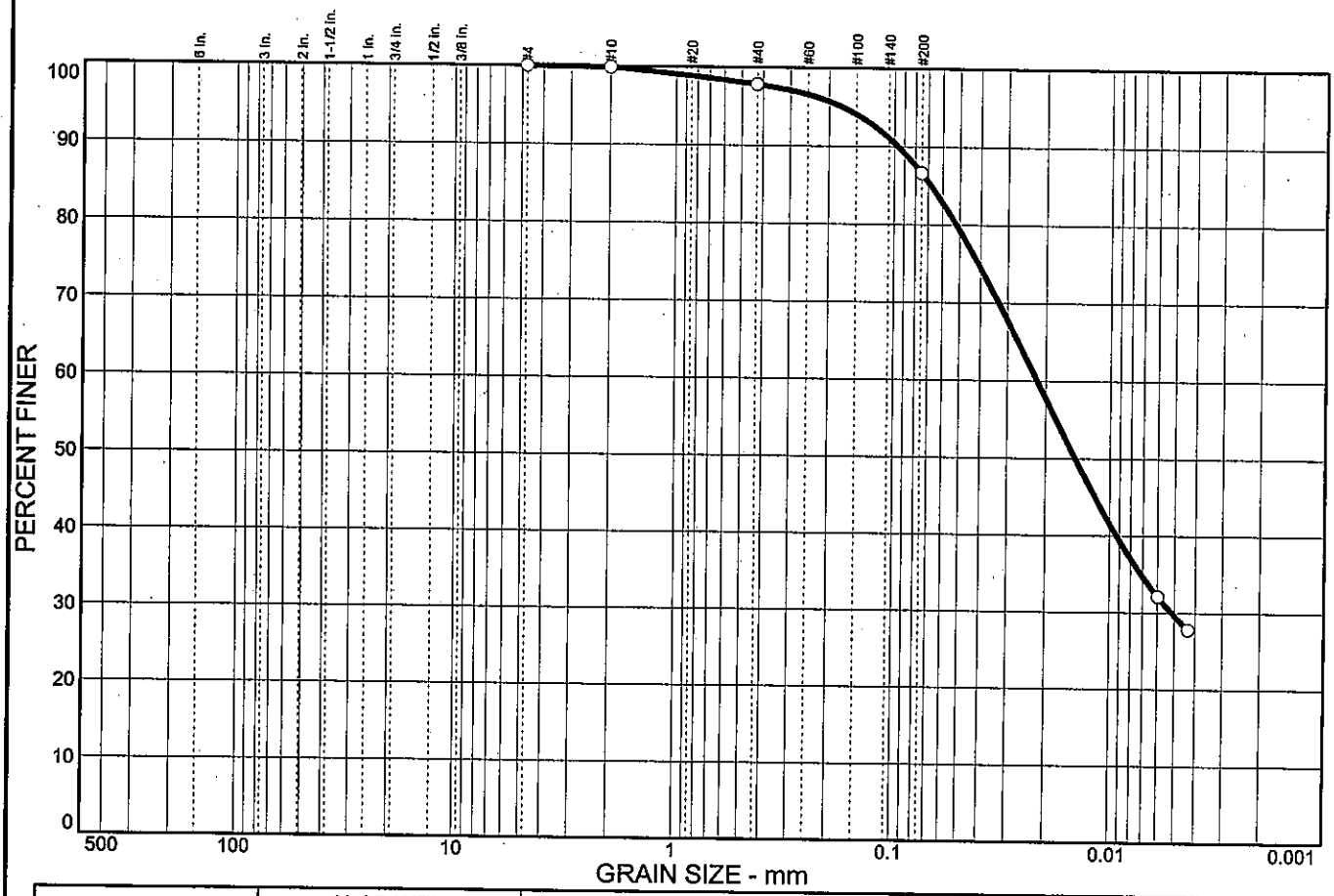
Sample No.: 2 **Source of Sample:** B-1131 **Date:** 8/20/05
Location: **Elev./Depth:** 3.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	2.1	11.2	57.0	29.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#40	97.8		
#200	86.6		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 17 LL= 30 PI= 13

Coefficients

D_{85}= 0.0679 D_{60}= 0.0219 D_{50}= 0.0145
D_{30}= 0.0051 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(10)

Remarks

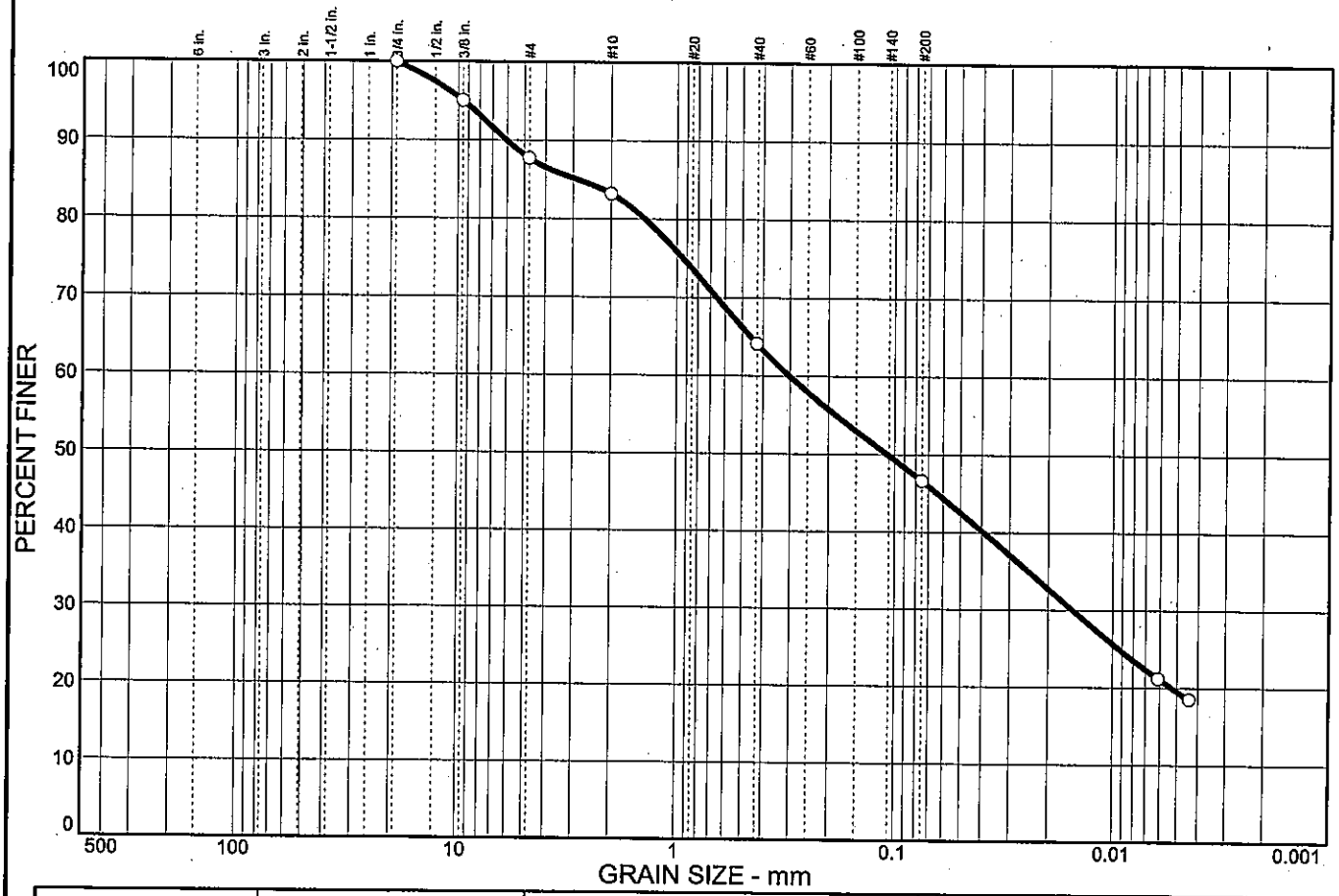
Moisture Content= 14.4%

Sample No.: 3 **Source of Sample:** B-1131 **Date:** 7/29/06
Location: **Elev./Depth:** 5.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	12.3	4.5	19.1	17.5	27.0	19.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	95.0		
#4	87.7		
#10	83.2		
#40	64.1		
#200	46.6		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 15 LL= 24 PI= 9

Coefficients

D_{85}= 2.85 D_{60}= 0.301 D_{50}= 0.108
D_{30}= 0.0154 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-4(1)

Remarks

Moisture Content= 11.2%

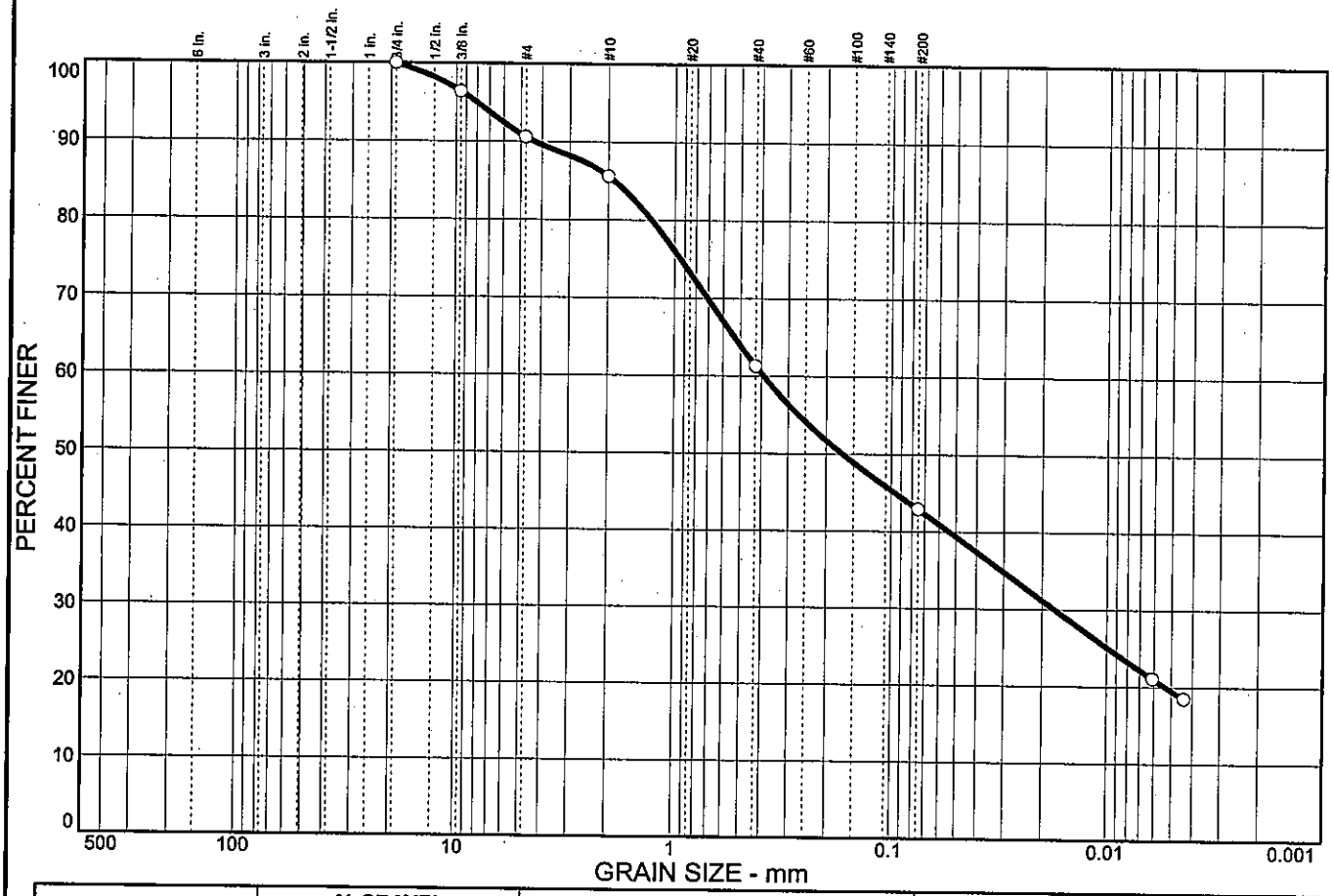
Sample No.: 1 **Source of Sample:** B-1132 **Date:** 8/15/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	9.4	5.0	24.3	18.4	23.4	19.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.4		
#4	90.6		
#10	85.6		
#40	61.3		
#200	42.9		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 15 LL= 26 PI= 11

Coefficients

D_{85}= 1.88 D_{60}= 0.390 D_{50}= 0.168
D_{30}= 0.0175 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(1)

Remarks

Moisture Content= 12.8%

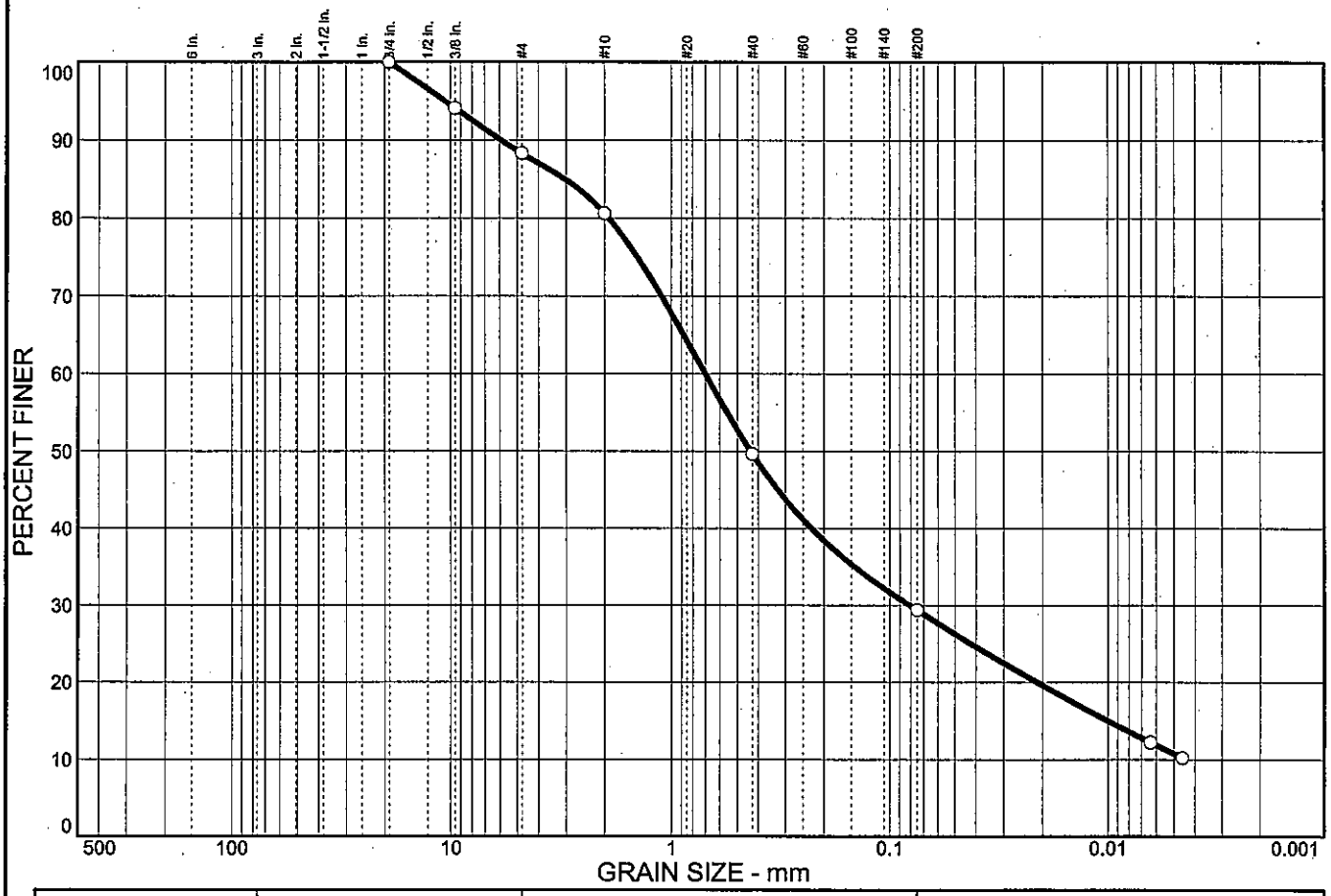
Sample No.: 2 **Source of Sample:** B-1132 **Date:** 8/15/05
Location: **Elev./Depth:** 3.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	11.7	7.7	31.0	20.2	18.6	10.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.1		
#4	88.3		
#10	80.6		
#40	49.6		
#200	29.4		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 13 LL= 20 PI= 7

Coefficients

D_{85}= 3.04 D_{60}= 0.701 D_{50}= 0.434
D_{30}= 0.0809 D_{15}= 0.0100 D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

Moisture Content= 7.4%

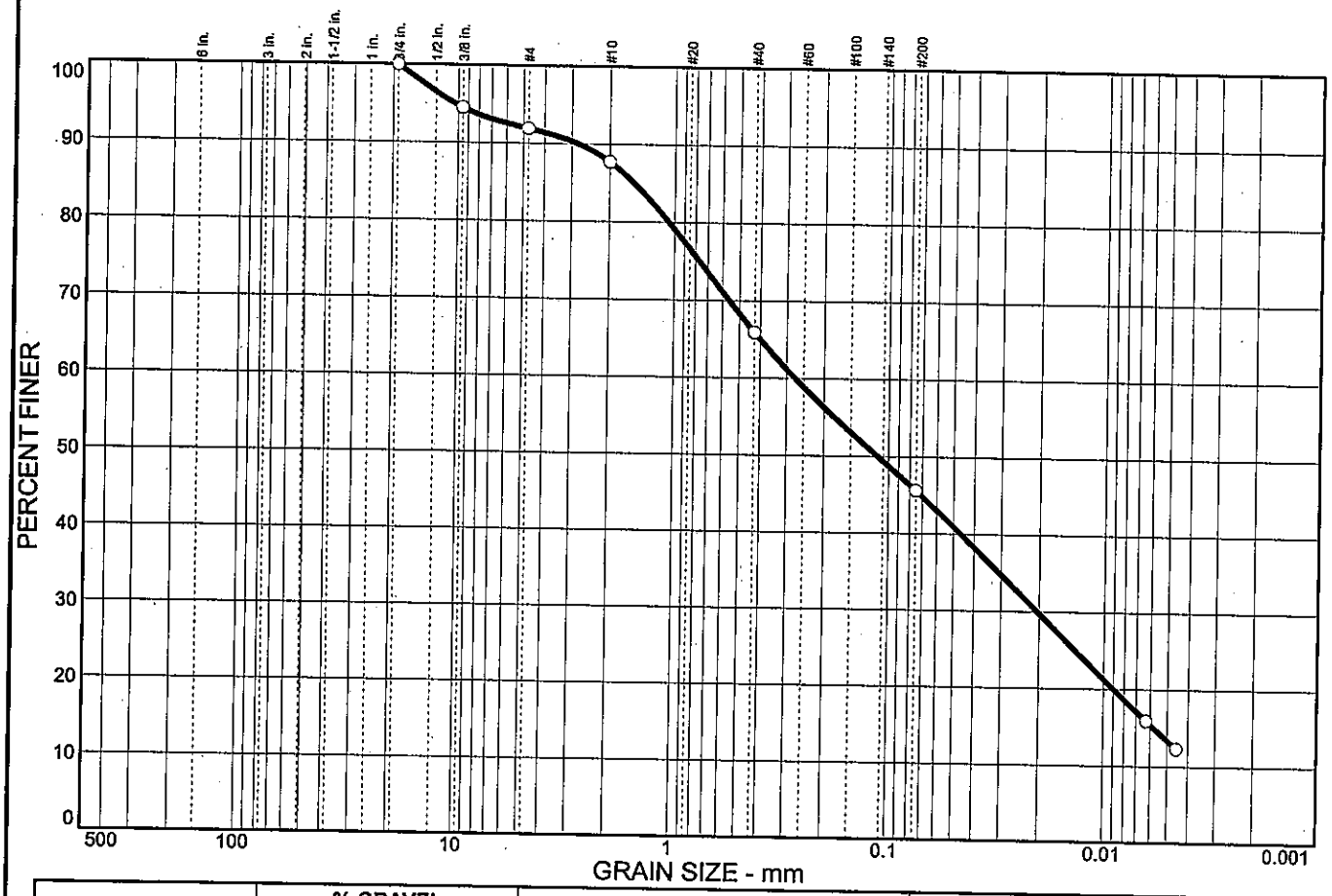
Sample No.: 3 **Source of Sample:** B-1132 **Date:** 7/29/06
Location: **Elev./Depth:** 5.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	8.1	4.2	21.8	20.3	32.2	13.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.5		
#4	91.9		
#10	87.7		
#40	65.9		
#200	45.6		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 15 LL= 24 PI= 9

Coefficients

D_{85}= 1.54 D_{60}= 0.273 D_{50}= 0.112
D_{30}= 0.0204 D_{15}= 0.0058 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-4(1)

Remarks

Moisture Content= 12.6%

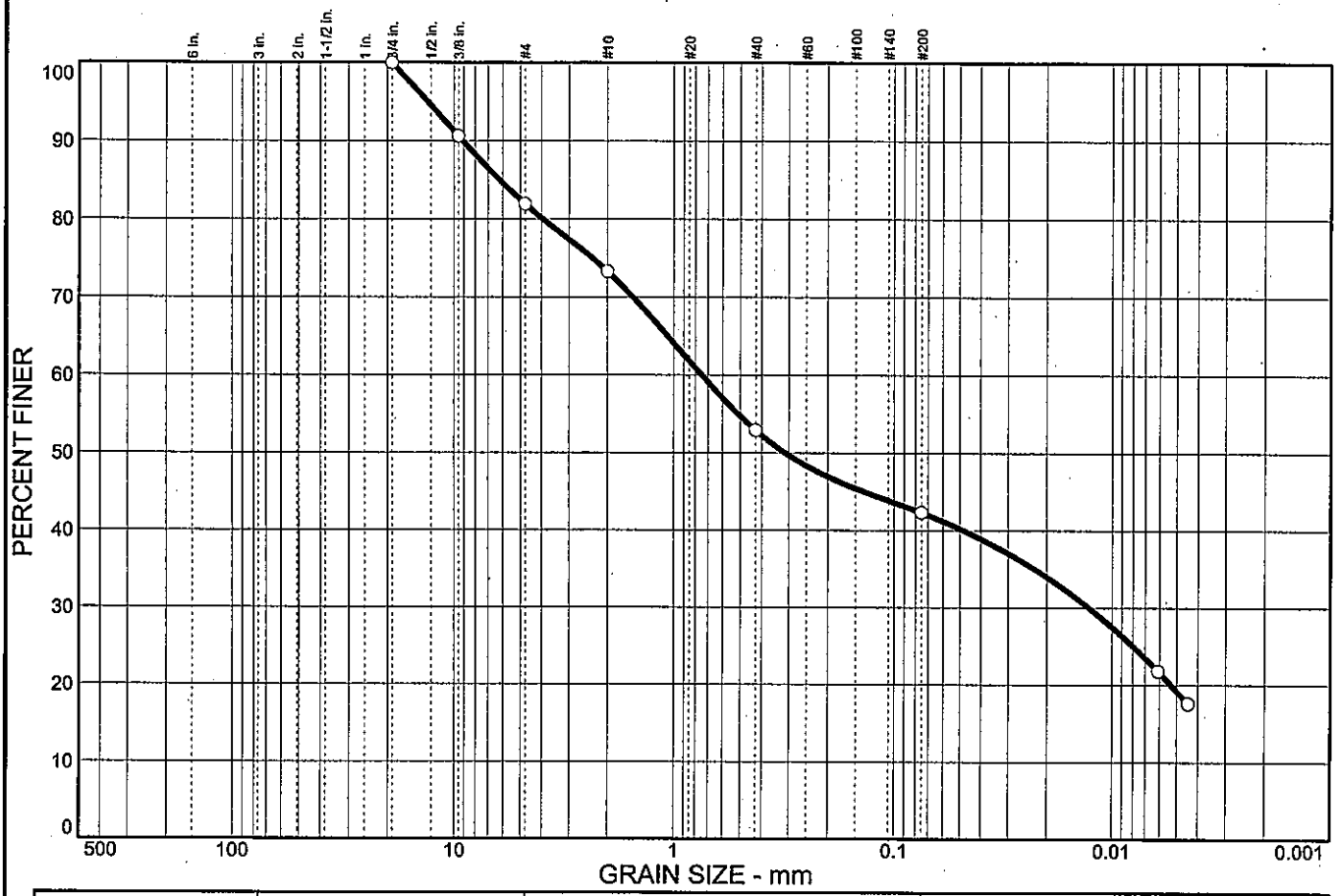
Sample No.: 1 **Source of Sample:** B-1133 **Date:** 7/28/06
Location: **Elev./Depth:** 0.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	18.1	8.6	20.4	10.6	23.1	19.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	90.6		
#4	81.9		
#10	73.3		
#40	52.9		
#200	42.3		

* (no specification provided)

Soil Description

Clayey sand with gravel

Atterberg Limits

PL= 16 LL= 30 PI= 14

Coefficients

D_{85}= 6.20 D_{60}= 0.747 D_{50}= 0.312
D_{30}= 0.0128 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(2)

Remarks

Moisture Content= 10.9%

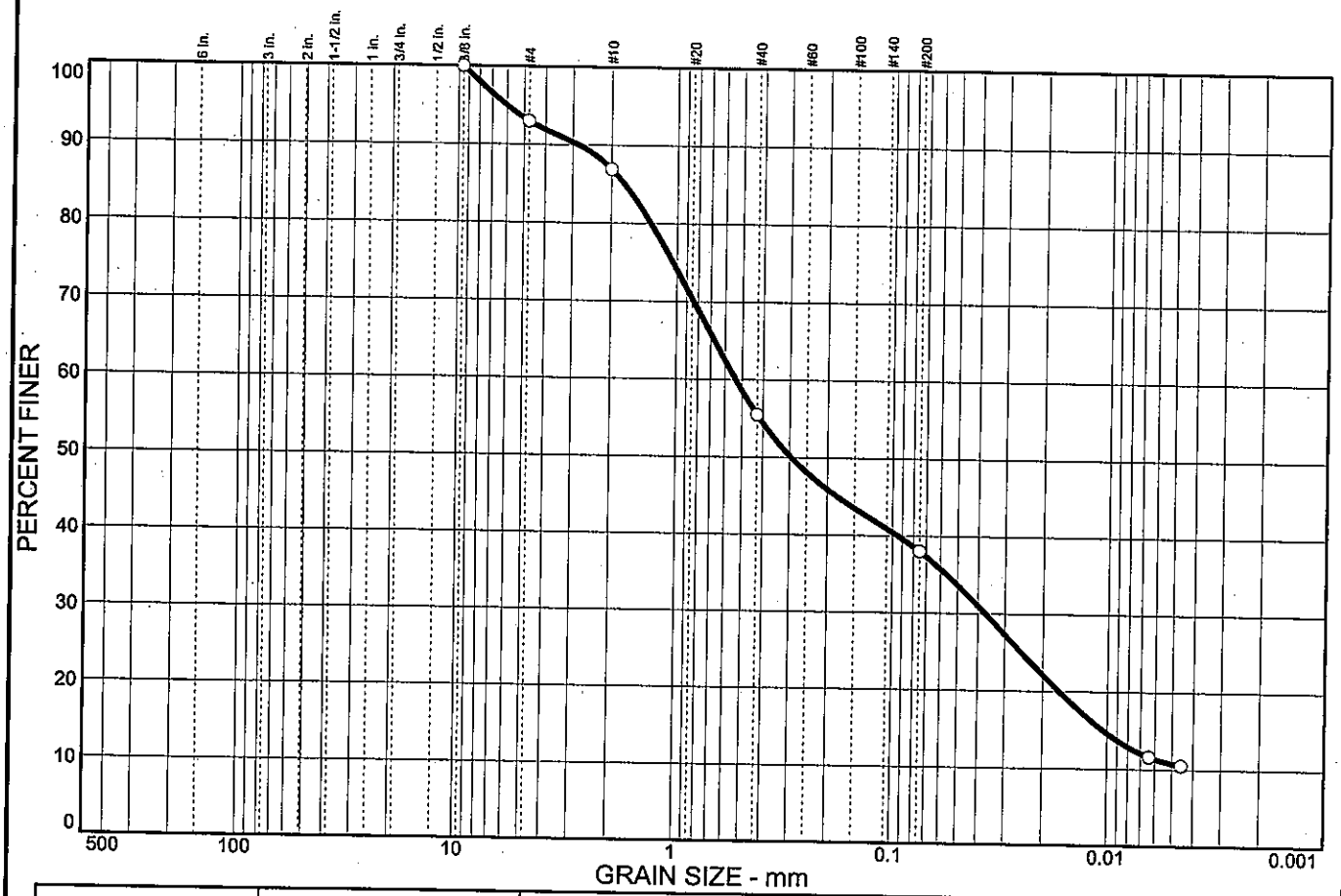
Sample No.: 2 **Source of Sample:** B-1133 **Date:** 7/28/06
Location: **Elev./Depth:** 2.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	7.0	6.1	31.4	17.5	27.2	10.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	93.0		
#10	86.9		
#40	55.5		
#200	38.0		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 15 LL= 20 PI= 5

Coefficients

D_{85}= 1.74 D_{60}= 0.535 D_{50}= 0.294
D_{30}= 0.0370 D_{15}= 0.0104 D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

Moisture Content= 8.9%

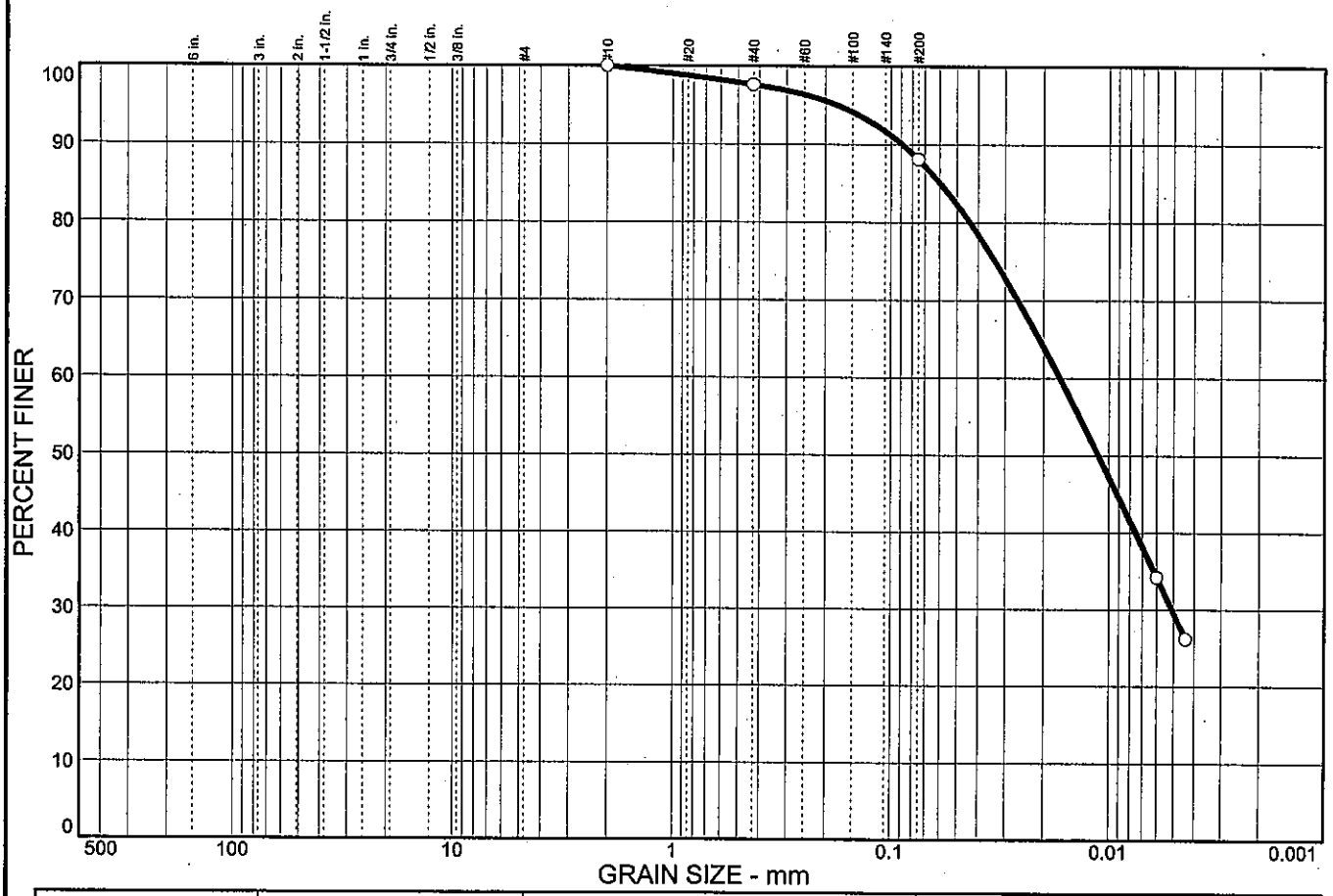
Sample No.: 3 **Source of Sample:** B-1133 **Date:** 7/28/06
Location: **Elev./Depth:** 4.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	2.4	9.5	58.6	29.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	97.6		
#200	88.1		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 24 LL= 39 PI= 15

Coefficients

D_{85}= 0.0595 D_{60}= 0.0168 D_{50}= 0.0112
D_{30}= 0.0051 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(14)

Remarks

Moisture Content= 22.6%

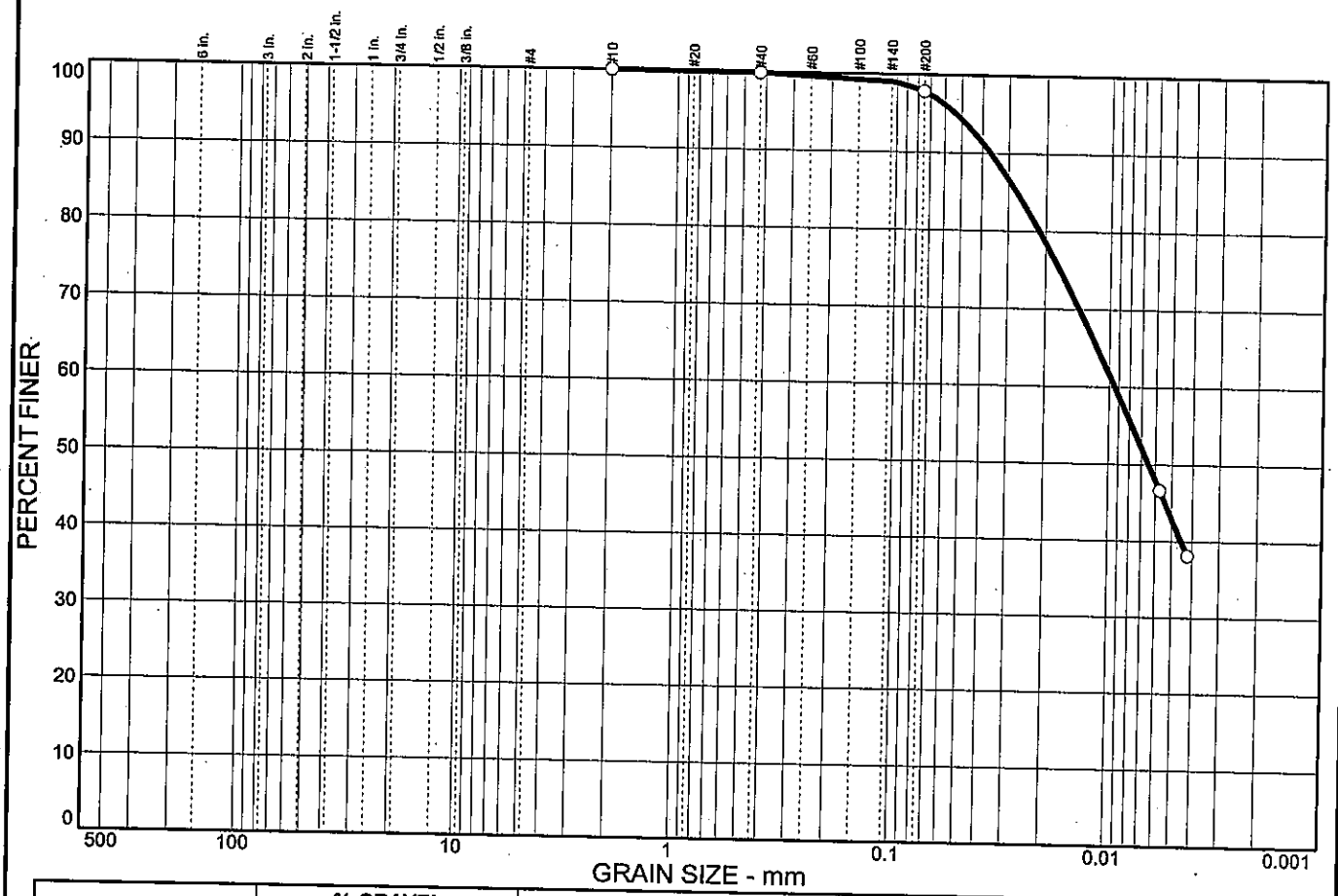
Sample No.: 1 **Source of Sample:** B-1134 **Date:** 7/28/06
Location: **Elev./Depth:** 0.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.1	2.1	54.9	42.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.9		
#200	97.8		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 38 PI= 19

Coefficients

D_{85}= 0.0275 D_{60}= 0.0094 D_{50}= 0.0065
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(19)

Remarks

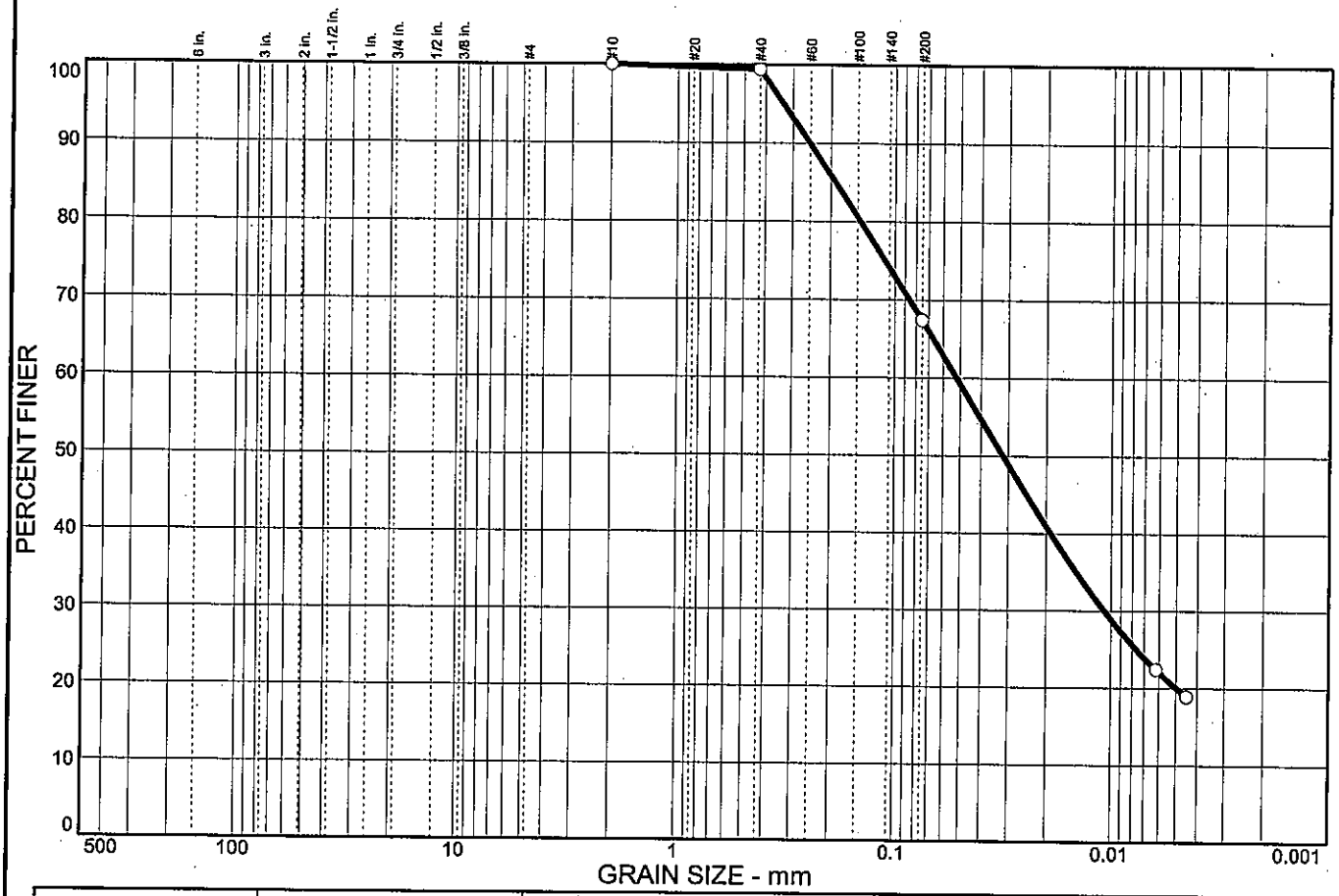
Moisture Content= 19.8%

Sample No.: 2 **Source of Sample:** B-1134 **Date:** 7/28/06
Location: **Elev./Depth:** 2.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.6	32.0	47.3	20.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.4		
#200	67.4		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 16 LL= 25 PI= 9

Coefficients

D_{85}= 0.190 D_{60}= 0.0519 D_{50}= 0.0317
D_{30}= 0.0107 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(3)

Remarks

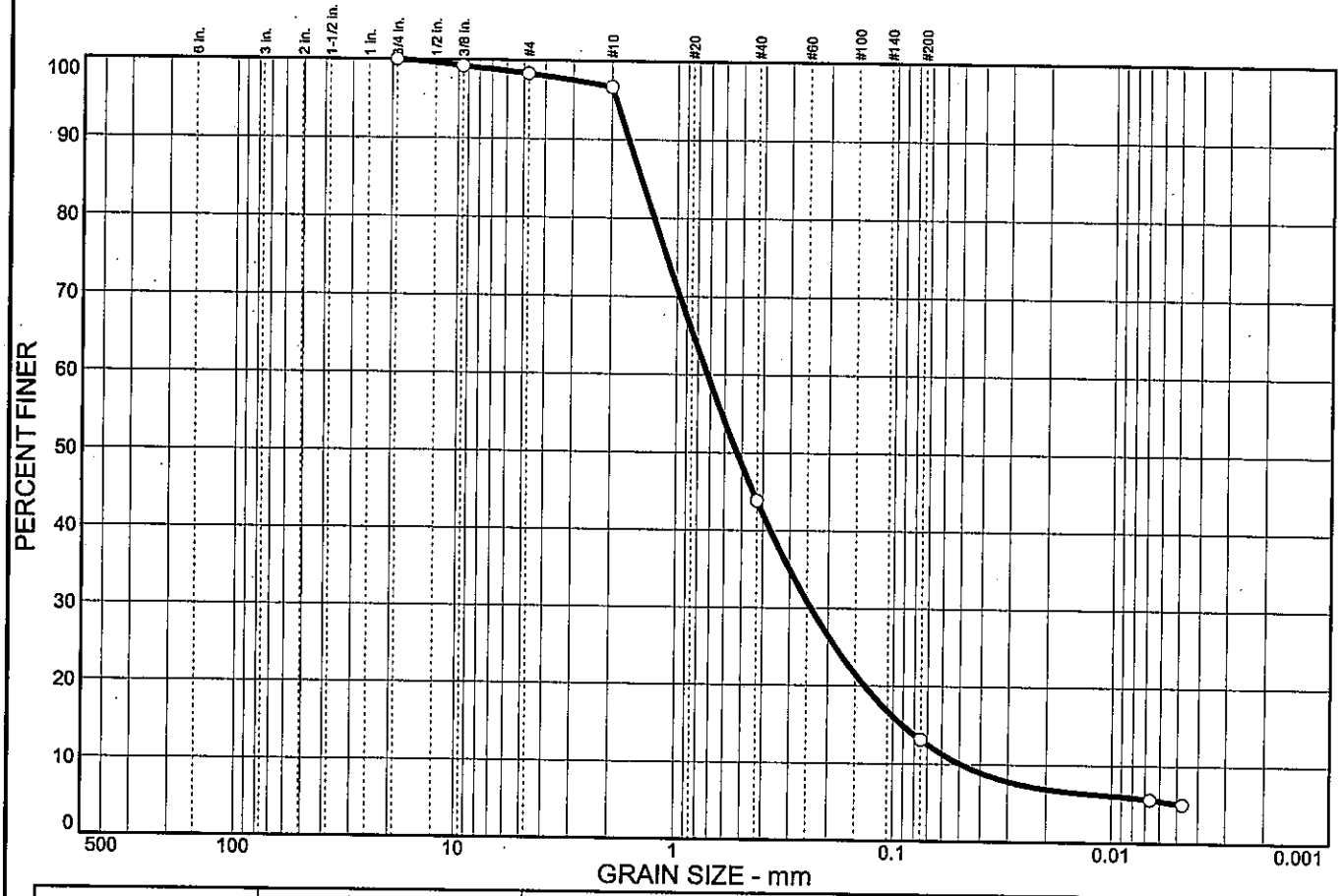
Moisture Content= 21.0%

Sample No.: 3 **Source of Sample:** B-1134 **Date:** 7/28/06
Location: **Elev./Depth:** 4.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.7	1.6	52.9	30.7	8.0	5.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.2		
#4	98.3		
#10	96.7		
#40	43.8		
#200	13.1		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 1.46 D_{60}= 0.721 D_{50}= 0.526
D_{30}= 0.240 D_{15}= 0.0909 D_{10}= 0.0493
C_u= 14.62 C_c= 1.61

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content= 25.5%

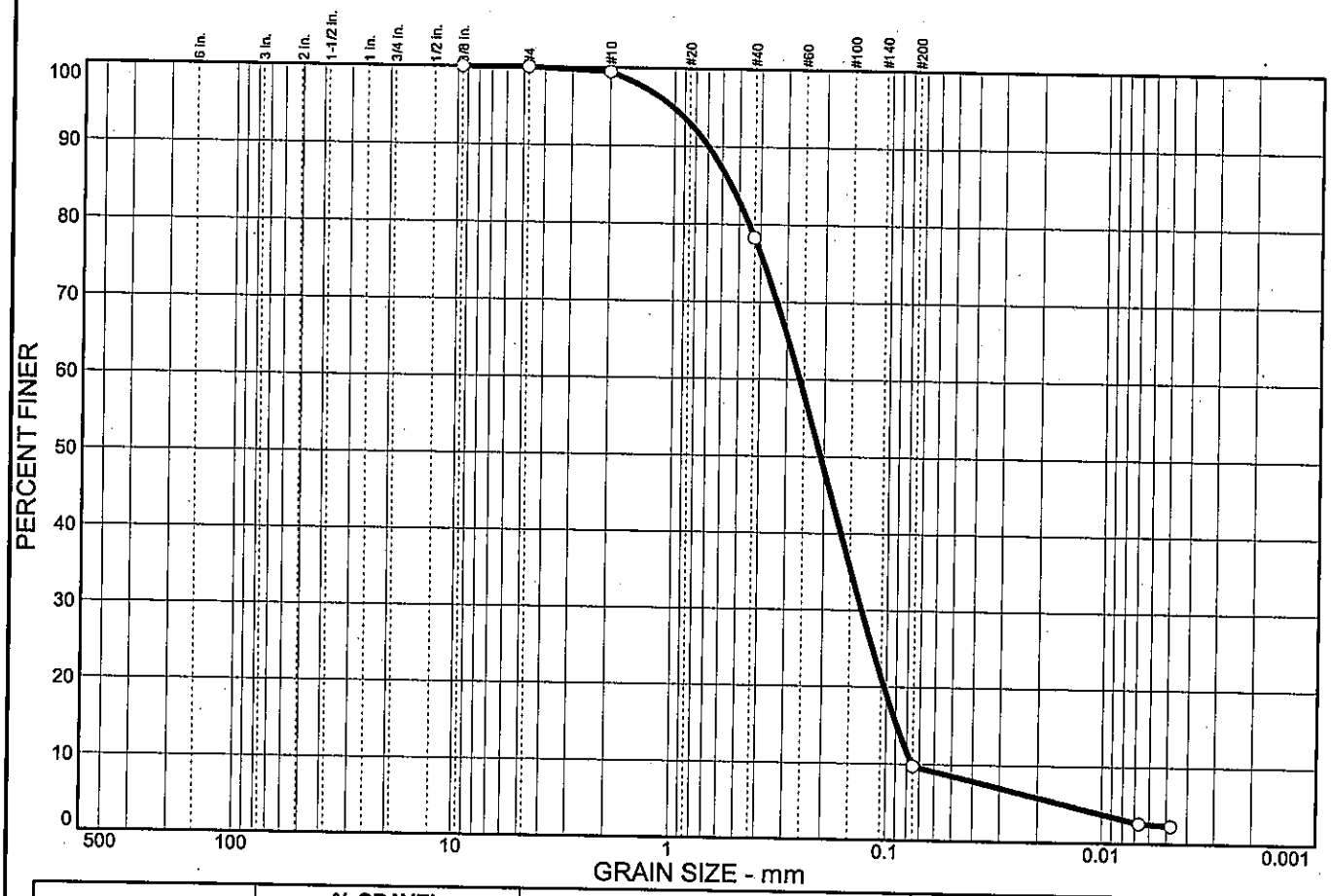
Sample No.: 6 **Source of Sample:** B-1139 **Date:** 11/1/05
Location: **Elev./Depth:** 13.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.5	21.2	68.6	7.4	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	99.5		
#40	78.3		
#200	9.7		

* (no specification provided)

Soil Description

Poorly graded sand with silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.544 D_{60}= 0.261 D_{50}= 0.208
D_{30}= 0.132 D_{15}= 0.0892 D_{10}= 0.0758
C_u= 3.44 C_c= 0.88

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Moisture Content= 23.6%

Sample No.: 9 **Source of Sample:** B-1139 **Date:** 11/1/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT

% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	9.9	5.1	9.6	8.6	38.7	28.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.4		
#4	90.1		
#10	85.0		
#40	75.4		
#200	66.8		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 18 LL= 32 PI= 14

Coefficients

D_{85}= 2.00 D_{60}= 0.0403 D_{50}= 0.0202
D_{30}= 0.0057 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(7)

Remarks

Moisture Content= 18.9%

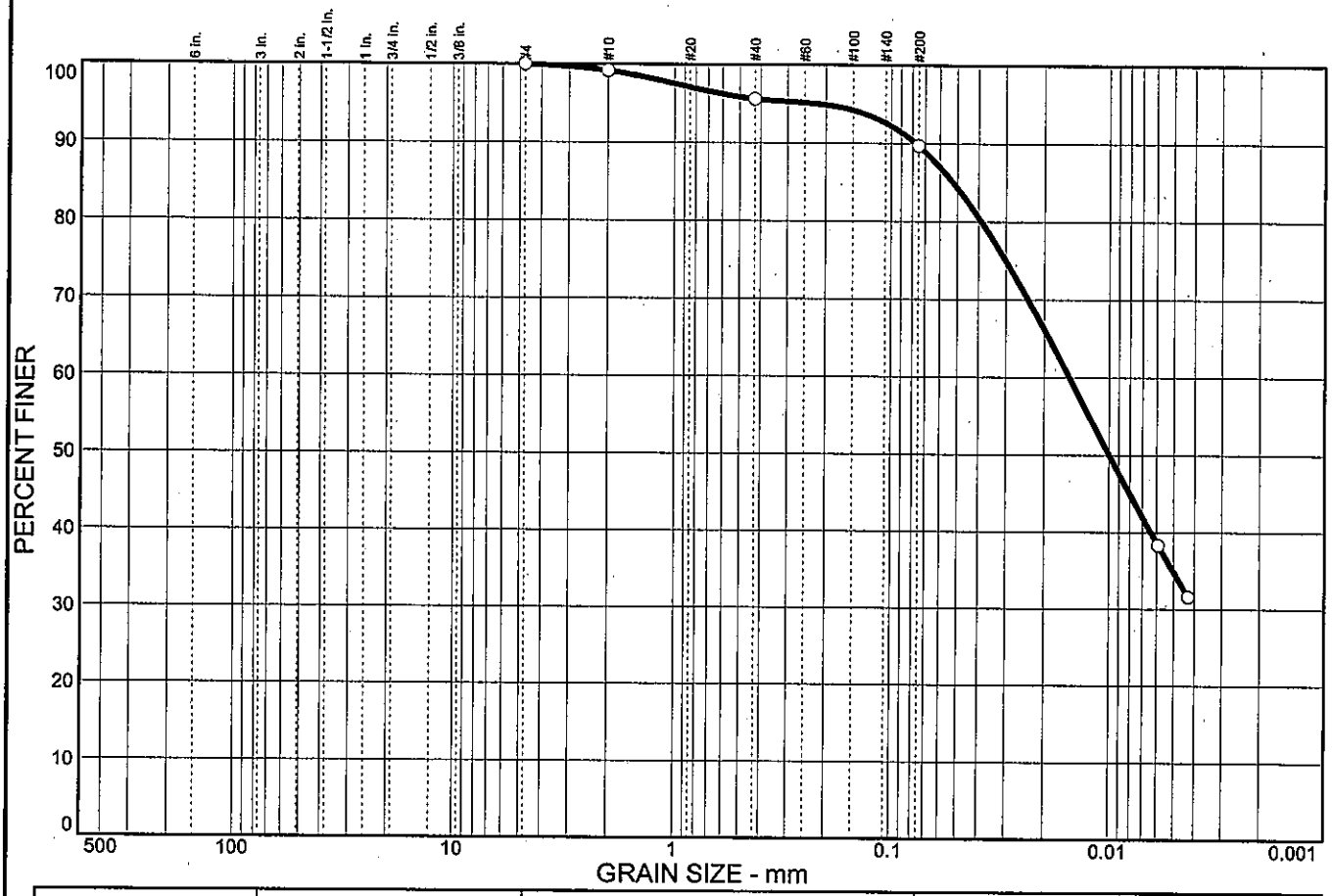
Sample No.: 3 **Source of Sample:** B-1140 **Date:** 9/23/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.8	3.6	5.9	54.9	34.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.2		
#40	95.6		
#200	89.7		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 18 LL= 33 PI= 15

Coefficients

D_{85}= 0.0523 D_{60}= 0.0153 D_{50}= 0.0100
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

Remarks

Moisture Content= 21.6%

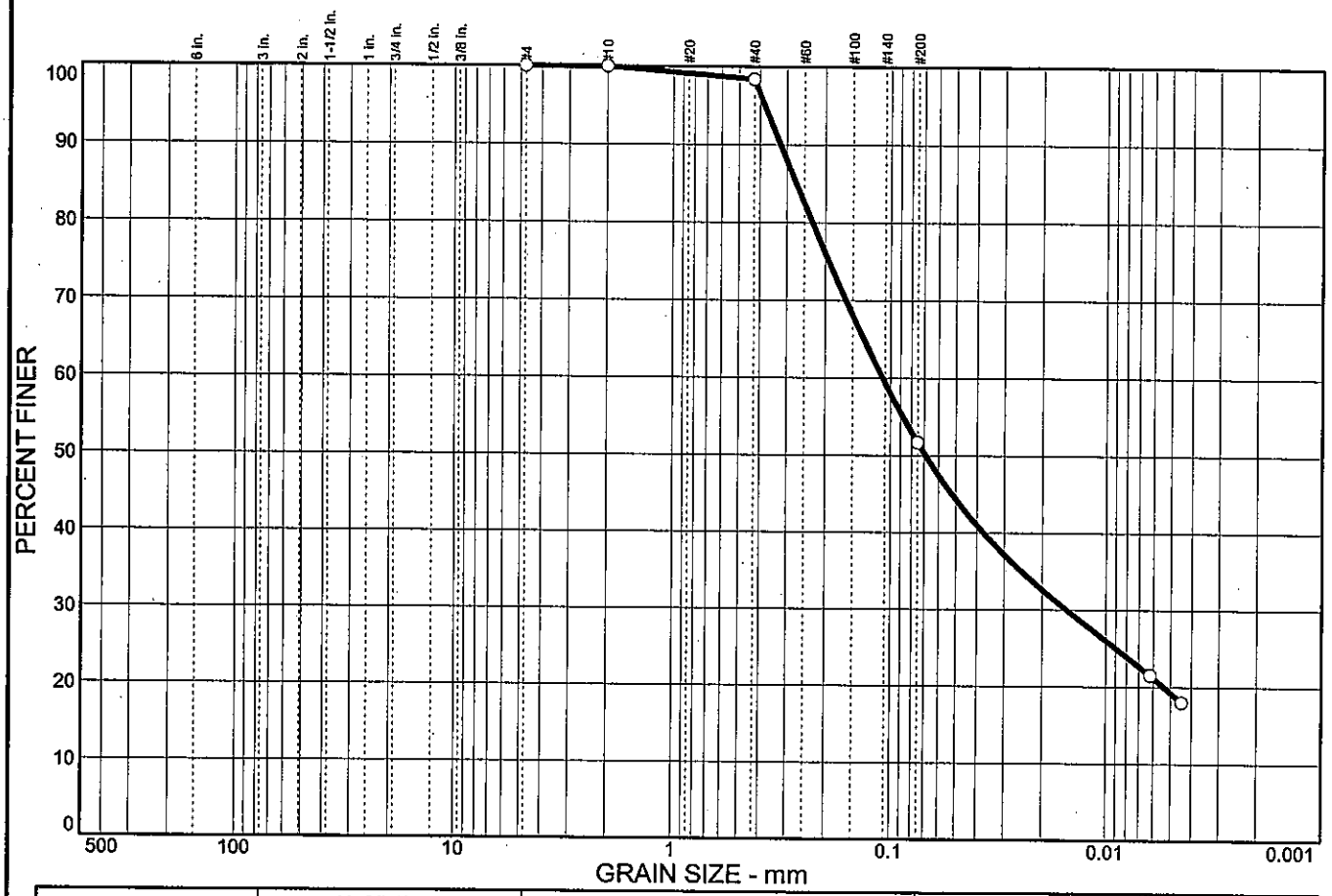
Sample No.: 4 **Source of Sample:** B-1140 **Date:** 9/23/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	1.6	46.7	32.4	19.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#40	98.4		
#200	51.7		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 14 LL= 22 PI= 8

Coefficients

D_{85}= 0.272 D_{60}= 0.109 D_{50}= 0.0688
D_{30}= 0.0153 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(1)

Remarks

Moisture Content= 19.3%

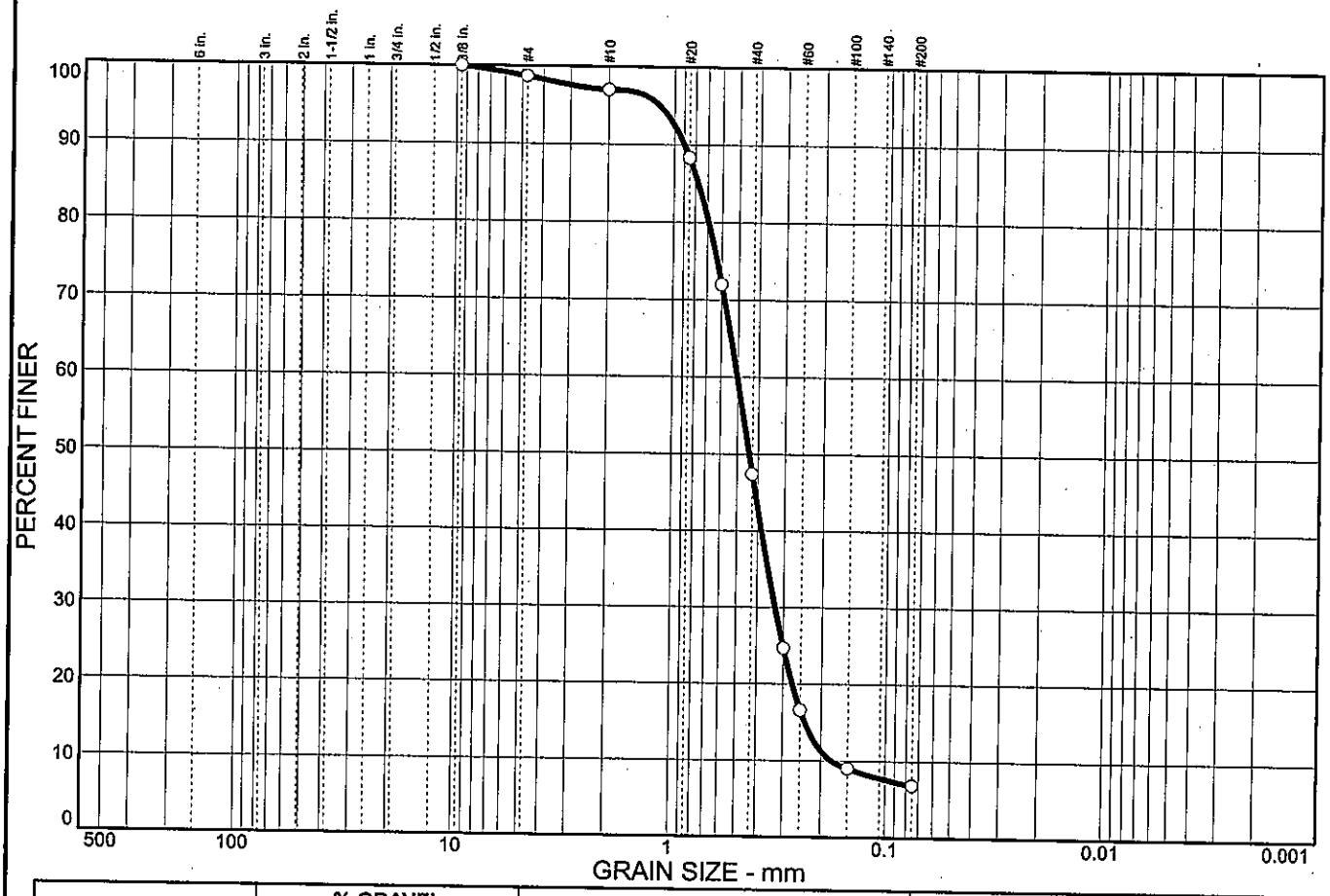
Sample No.: 5 **Source of Sample:** B-1140 **Date:** 9/23/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.3	1.7	49.6	40.6	6.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.7		
#10	97.0		
#20	88.3		
#30	72.0		
#40	47.4		
#50	24.7		
#60	16.6		
#100	9.0		
#200	6.8		

* (no specification provided)

Soil Description

Poorly graded sand with silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.775 D_{60}= 0.504 D_{50}= 0.440
D_{30}= 0.329 D_{15}= 0.238 D_{10}= 0.178
C_u= 2.83 C_c= 1.21

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Moisture Content= 21.4%

Sample No.: 9 **Source of Sample:** B-1140 **Date:** 9/23/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT

% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	10.5	0.7	8.4	27.0	31.5	21.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	91.9		
#4	89.5		
#10	88.8		
#40	80.4		
#200	53.4		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 18 LL= 27 PI= 9

Coefficients

D_{85}= 0.713 D_{60}= 0.112 D_{50}= 0.0602
D_{30}= 0.0119 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(2)

Remarks

Moisture Content= 19.6%

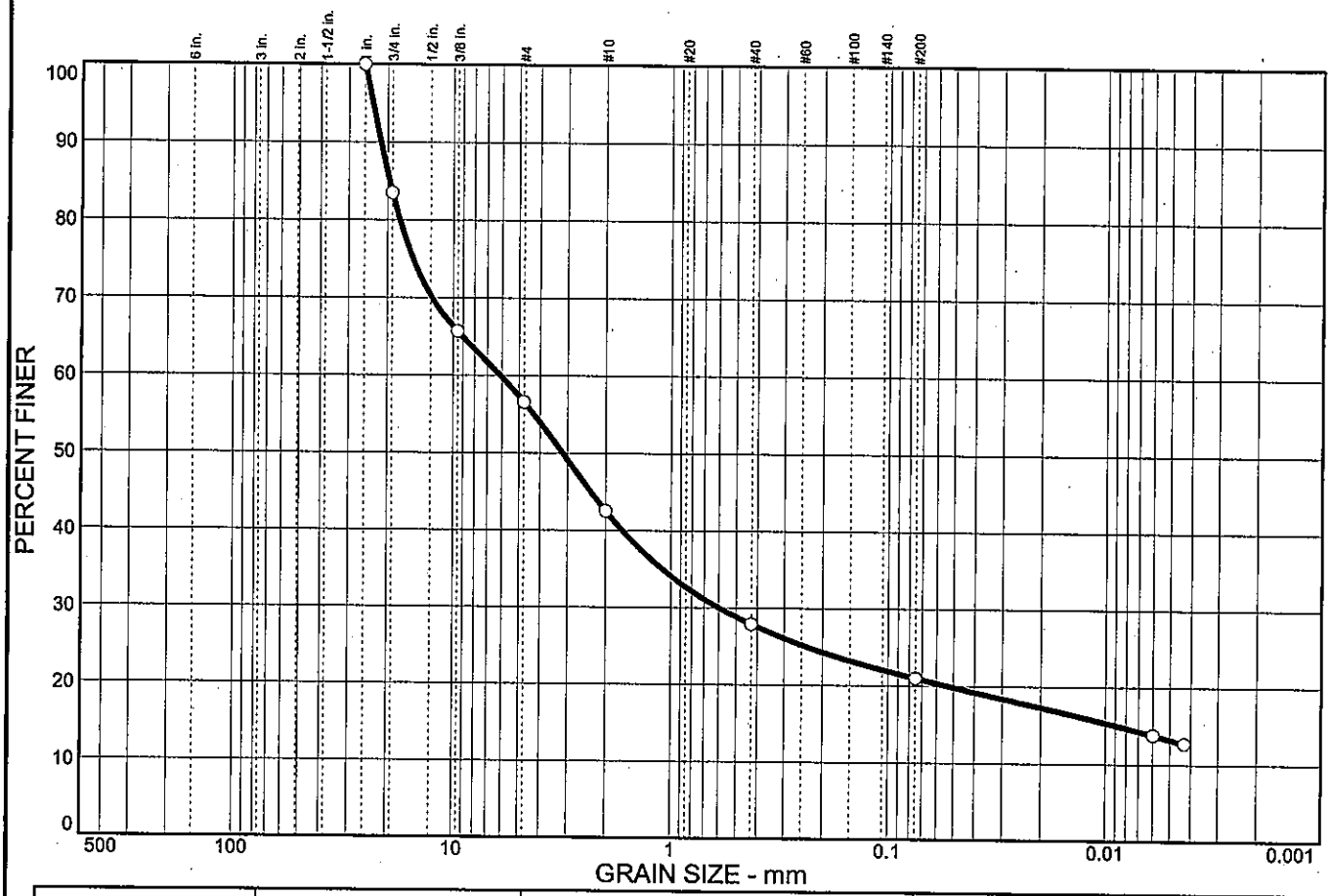
Sample No.: 12 **Source of Sample:** B-1141 **Date:** 10/27/05
Location: **Elev./Depth:** 28.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	16.5	26.9	14.1	14.6	6.9	7.8	13.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
0.75 in.	83.5		
0.375 in.	65.7		
#4	56.6		
#10	42.5		
#40	27.9		
#200	21.0		

* (no specification provided)

Soil Description

Clayey gravel with sand

Atterberg Limits

PL= 18 LL= 38 PI= 20

Coefficients

D_{85}= 19.6 D_{60}= 6.09 D_{50}= 3.16
D_{30}= 0.598 D_{15}= 0.0088 D_{10}=
C_u= C_c=

Classification

USCS= GC AASHTO= A-2-6(1)

Remarks

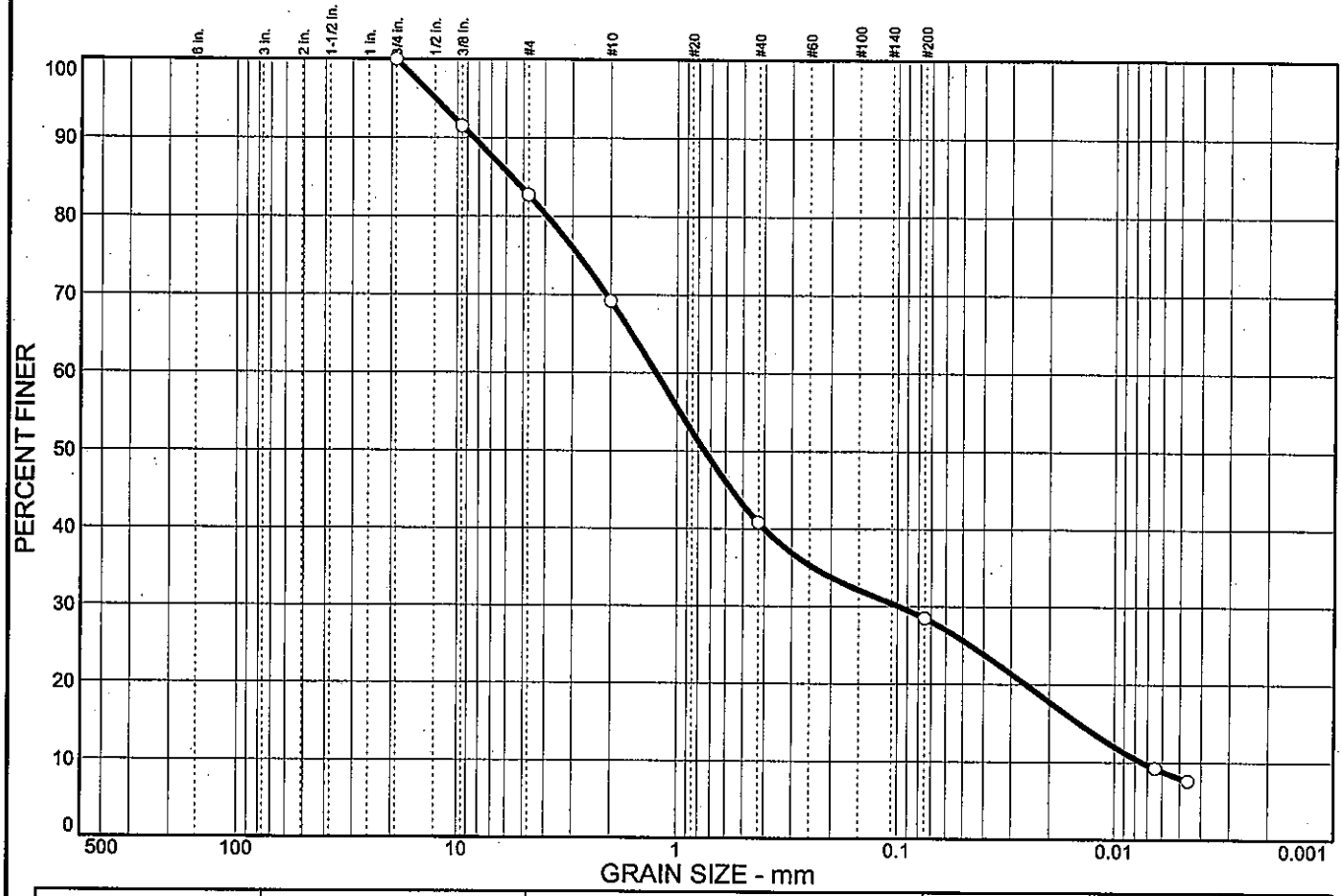
Moisture Content= 18.2%

Sample No.: 9 **Source of Sample:** B-1141 **Date:** 10/27/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	17.3	13.5	28.4	12.3	20.5	8.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	91.5		
#4	82.7		
#10	69.2		
#40	40.8		
#200	28.5		

* (no specification provided)

Soil Description

Silty, clayey sand with gravel

Atterberg Limits

PL= 20 LL= 24 PI= 4

Coefficients

D_{85}= 5.65 D_{60}= 1.24 D_{50}= 0.746
D_{30}= 0.0981 D_{15}= 0.0146 D_{10}= 0.0074
C_u= 167.34 C_c= 1.04

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

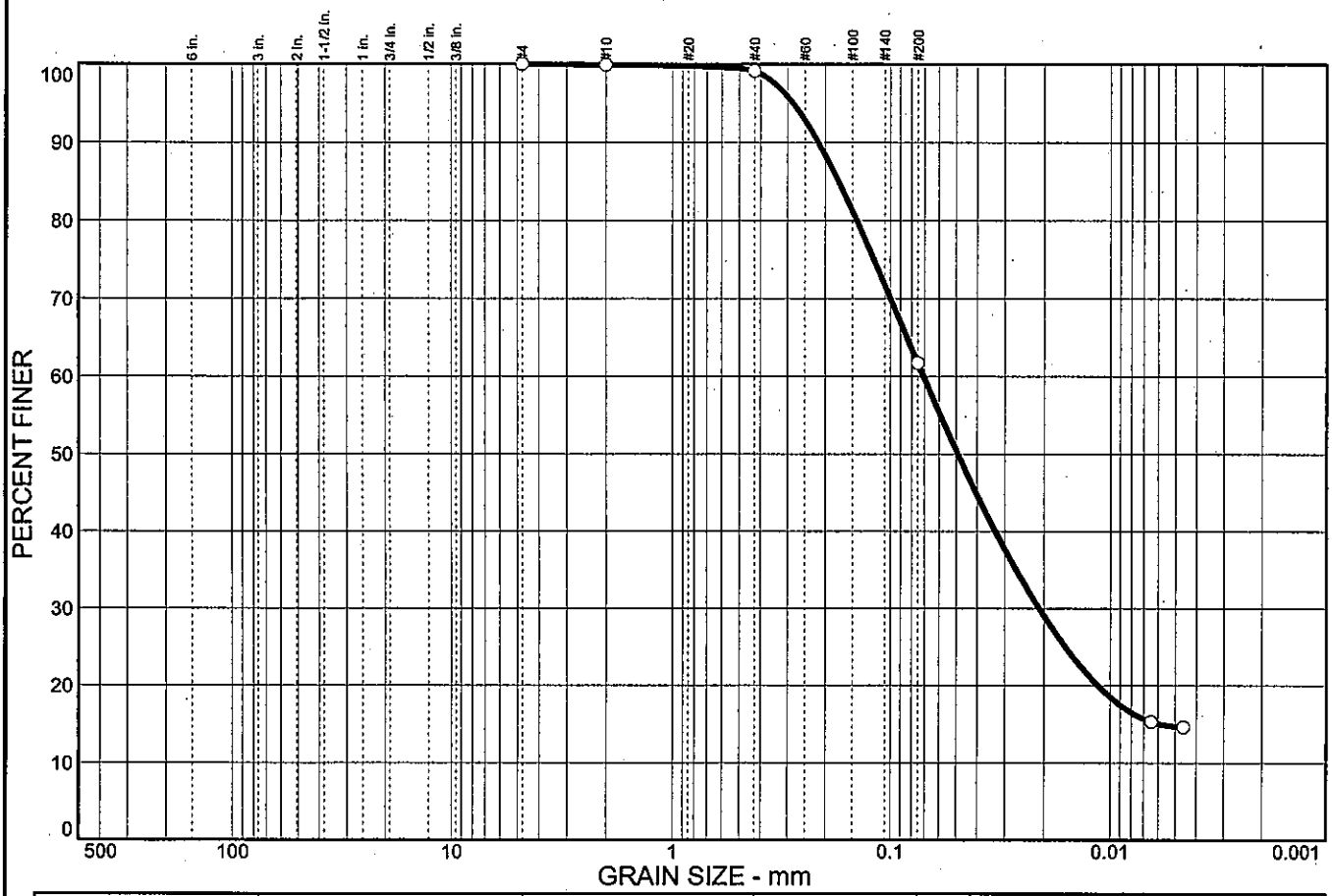
Moisture Content= 18.4%

Sample No.: 12B **Source of Sample:** B-1142 **Date:** 10/27/05
Location: **Elev./Depth:** 28.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.1	0.8	37.4	47.0	14.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#40	99.1		
#200	61.7		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 16 LL= 26 PI= 10

Coefficients

D_{85}= 0.174 D_{60}= 0.0707 D_{50}= 0.0492
D_{30}= 0.0210 D_{15}= 0.0059 D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(4)

Remarks

Moisture Content= 26.0%

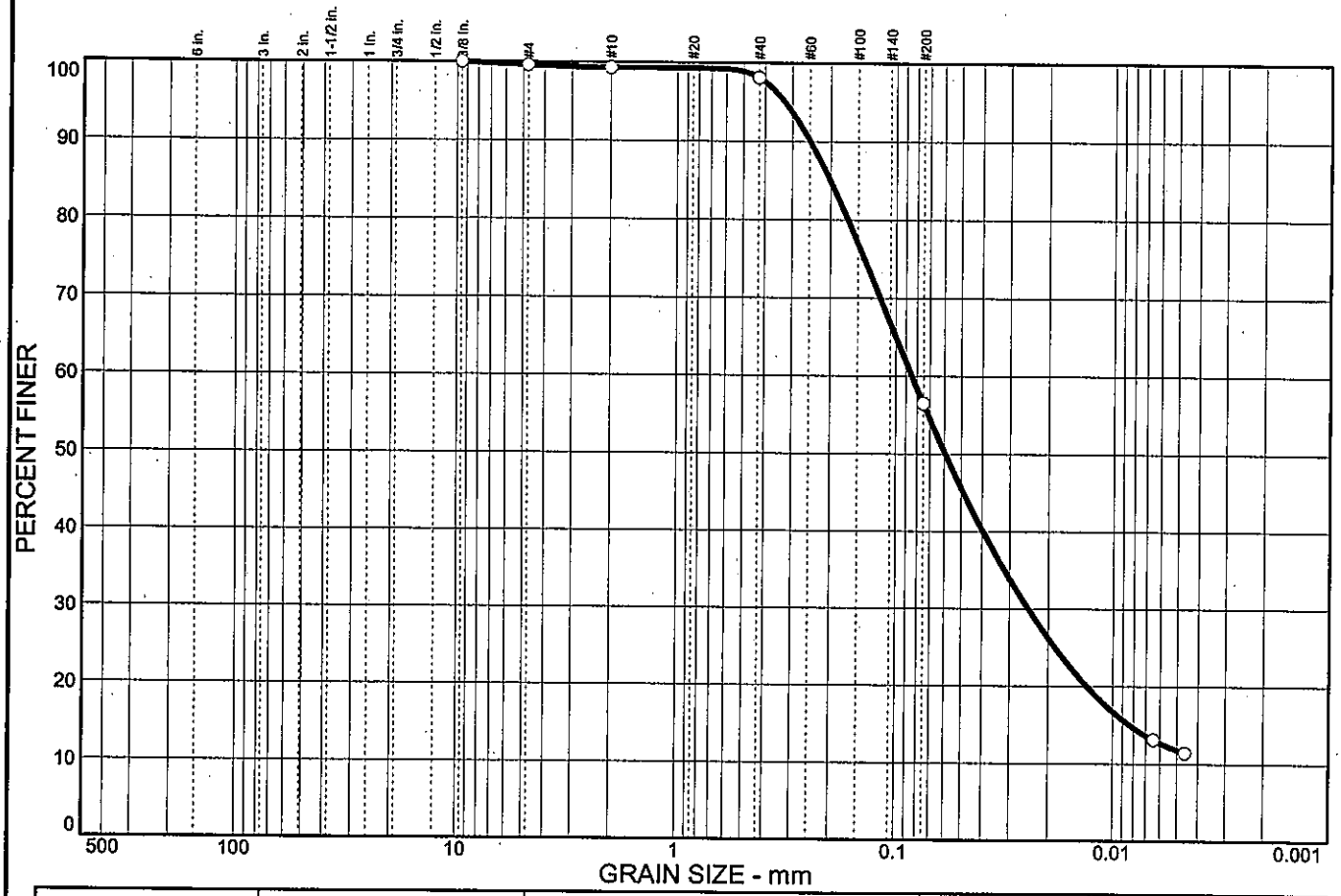
Sample No.: 13 **Source of Sample:** B-1142 **Date:** 10/27/05
Location: **Elev./Depth:** 31.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.4	0.3	1.2	41.6	44.7	11.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.6		
#10	99.3		
#40	98.1		
#200	56.5		

* (no specification provided)

Soil Description

Sandy silt

Atterberg Limits

PL= 15 LL= 17 PI= 2

Coefficients

D_{85}= 0.201 D_{60}= 0.0846 D_{50}= 0.0593
D_{30}= 0.0247 D_{15}= 0.0083 D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

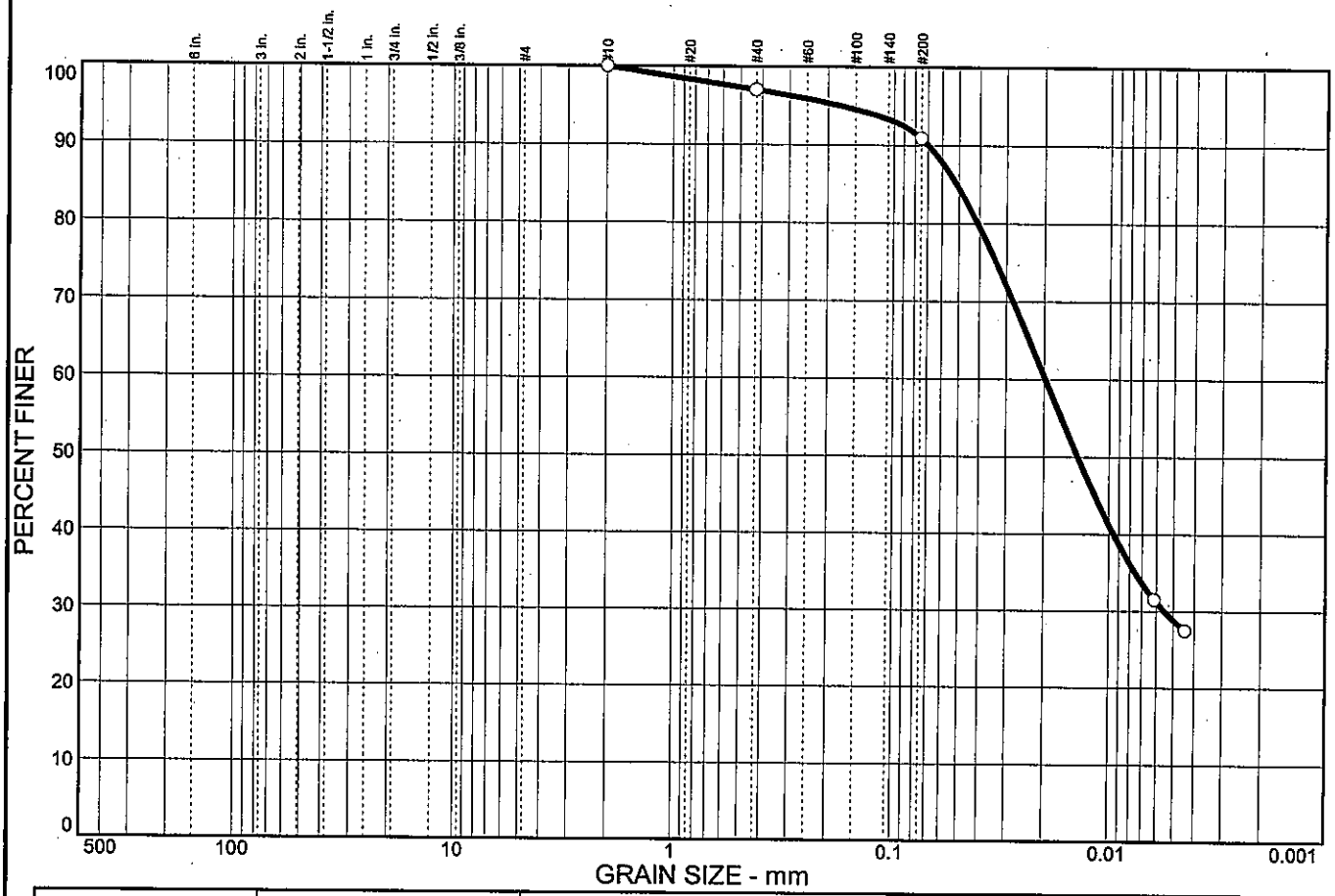
Moisture Content= 24.8%

Sample No.: 14A **Source of Sample:** B-1142 **Date:** 10/27/05
Location: **Elev./Depth:** 33.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	3.0	6.1	62.0	28.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	97.0		
#200	90.9		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 18 LL= 27 PI= 9

Coefficients

D_{85}= 0.0513 D_{60}= 0.0197 D_{50}= 0.0140
D_{30}= 0.0055 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(7)

Remarks

Moisture Content= 17.9%

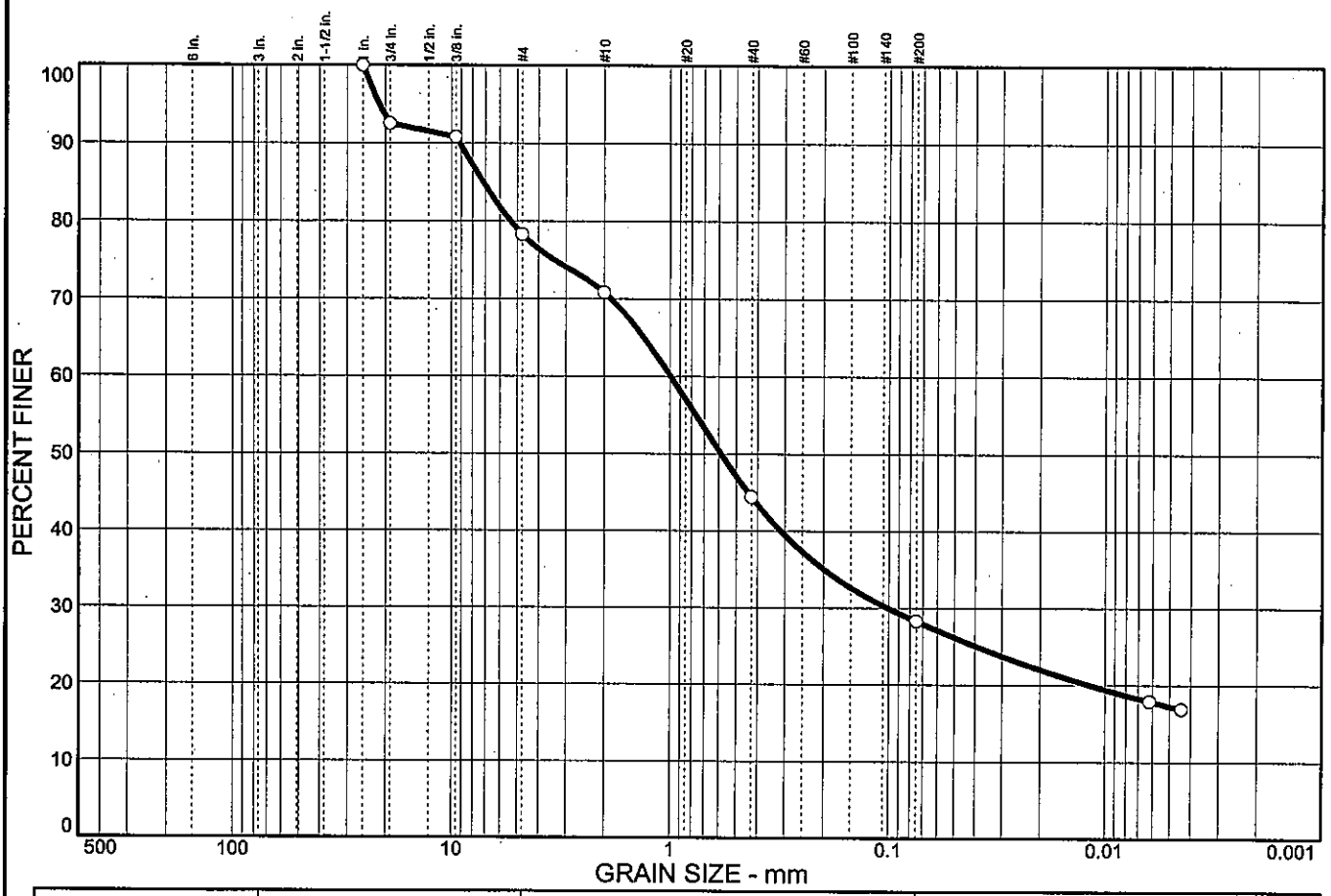
Sample No.: 7 **Source of Sample:** B-1142 **Date:** 10/27/05
Location: **Elev./Depth:** 16.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	7.5	14.2	7.5	26.4	16.1	11.0	17.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	92.5		
0.375 in.	90.8		
#4	78.3		
#10	70.8		
#40	44.4		
#200	28.3		

* (no specification provided)

Soil Description

Clayey sand with gravel

Atterberg Limits

PL= 16 LL= 34 PI= 18

Coefficients

D_{85}= 7.14 D_{60}= 0.991 D_{50}= 0.586
D_{30}= 0.101 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(1)

Remarks

Moisture Content= 15.6%

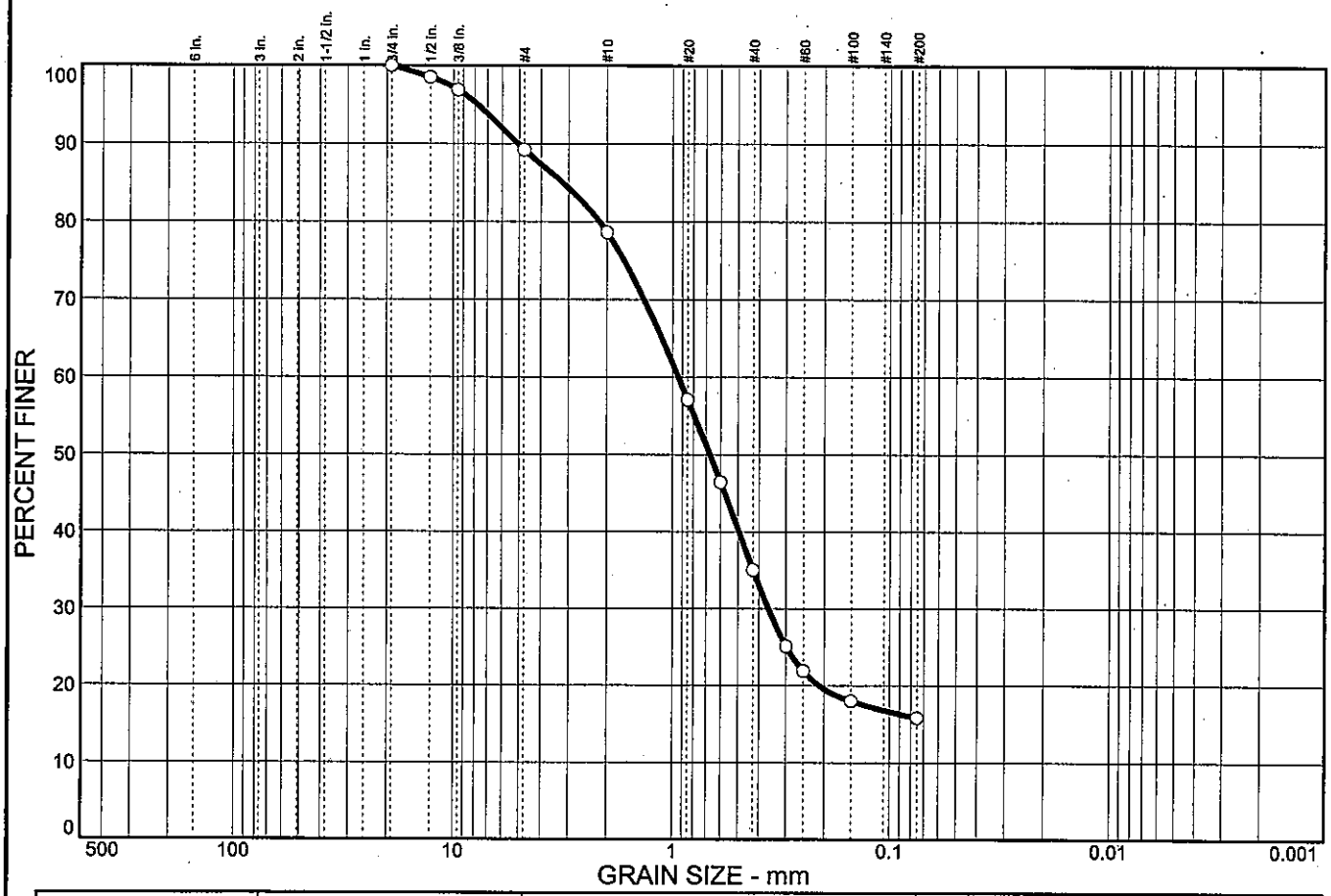
Sample No.: 9 **Source of Sample:** B-1142 **Date:** 10/27/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	10.8	10.6	43.6	19.2	15.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.50 in.	98.5		
0.375 in.	96.9		
#4	89.2		
#10	78.6		
#20	57.1		
#30	46.4		
#40	35.0		
#50	25.1		
#60	21.9		
#100	18.0		
#200	15.8		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 3.20 D_{60}= 0.938 D_{50}= 0.672
D_{30}= 0.362 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content= 4.8%

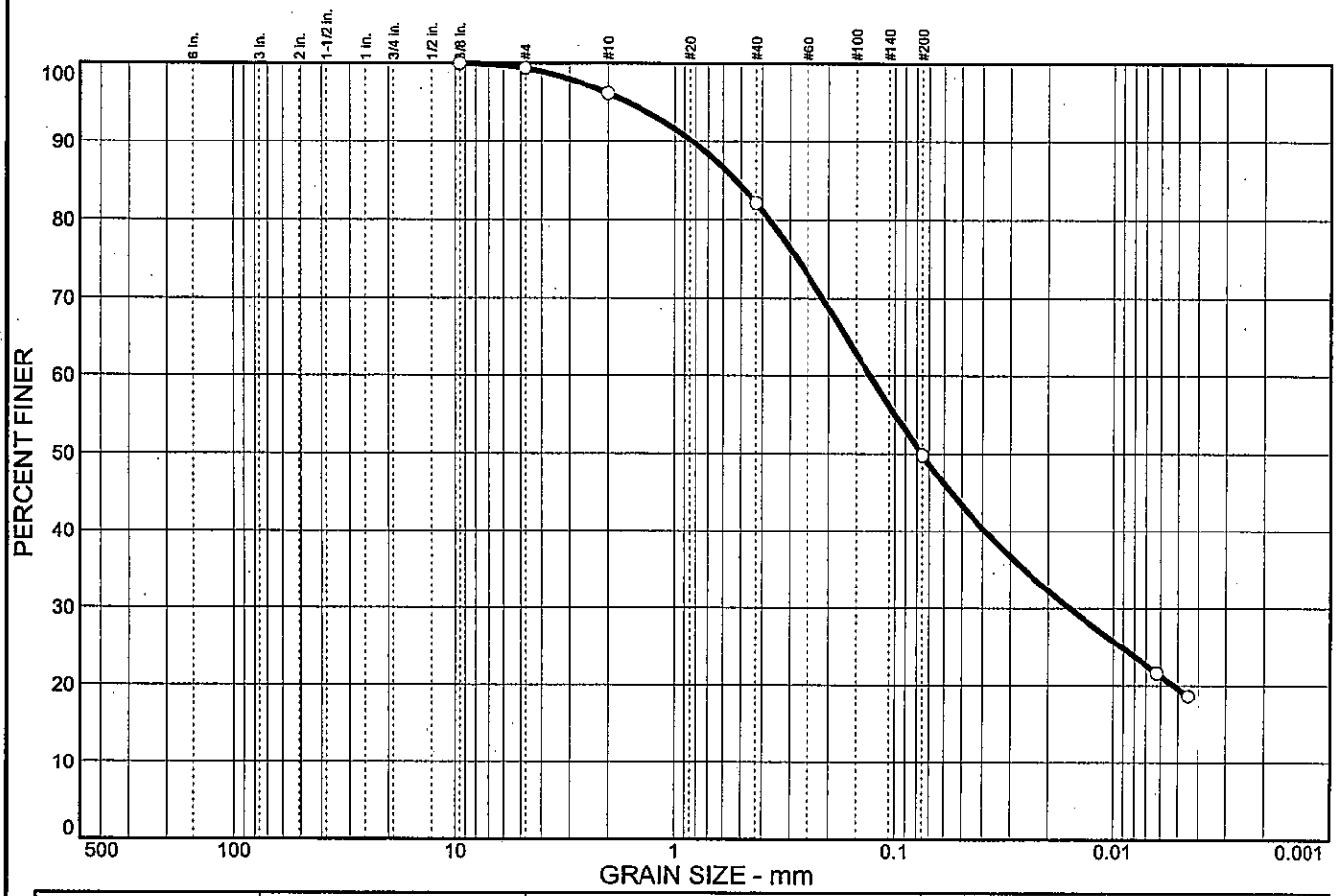
Sample No.: 5 **Source of Sample:** B-1143 **Date:** 10/27/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.6	3.3	14.0	32.3	30.2	19.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.4		
#10	96.1		
#40	82.1		
#200	49.8		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 12 LL= 19 PI= 7

Coefficients

D_{85}= 0.524 D_{60}= 0.129 D_{50}= 0.0759
D_{30}= 0.0159 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

Moisture Content= 8.5%

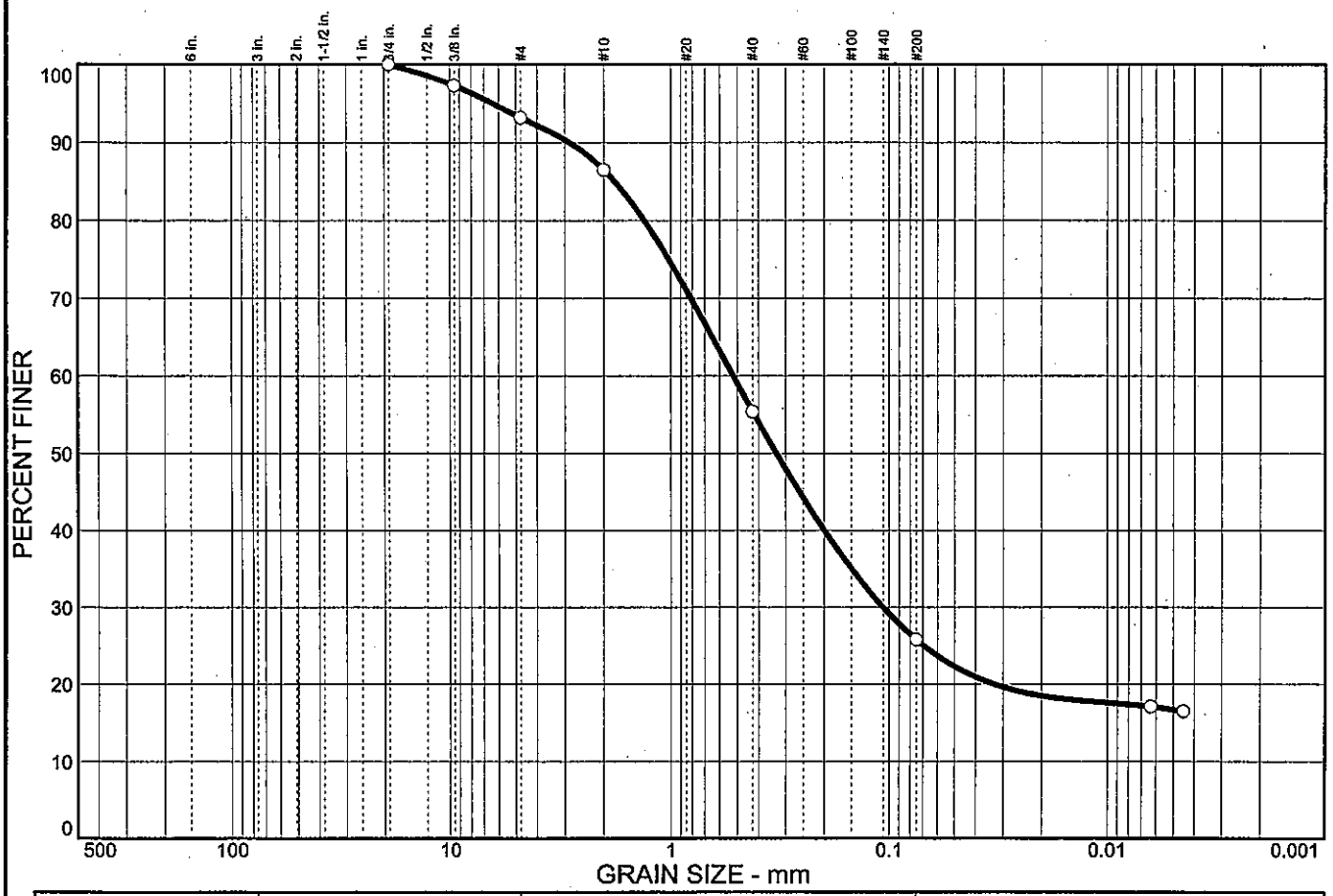
Sample No.: 2 **Source of Sample:** B-1144 **Date:** 10/27/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.8	6.7	31.1	29.6	9.1	16.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.3		
#4	93.2		
#10	86.5		
#40	55.4		
#200	25.8		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 15 LL= 32 PI= 17

Coefficients

D_{85}= 1.79 D_{60}= 0.521 D_{50}= 0.331
D_{30}= 0.107 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(1)

Remarks

Moisture Content= 18.3%

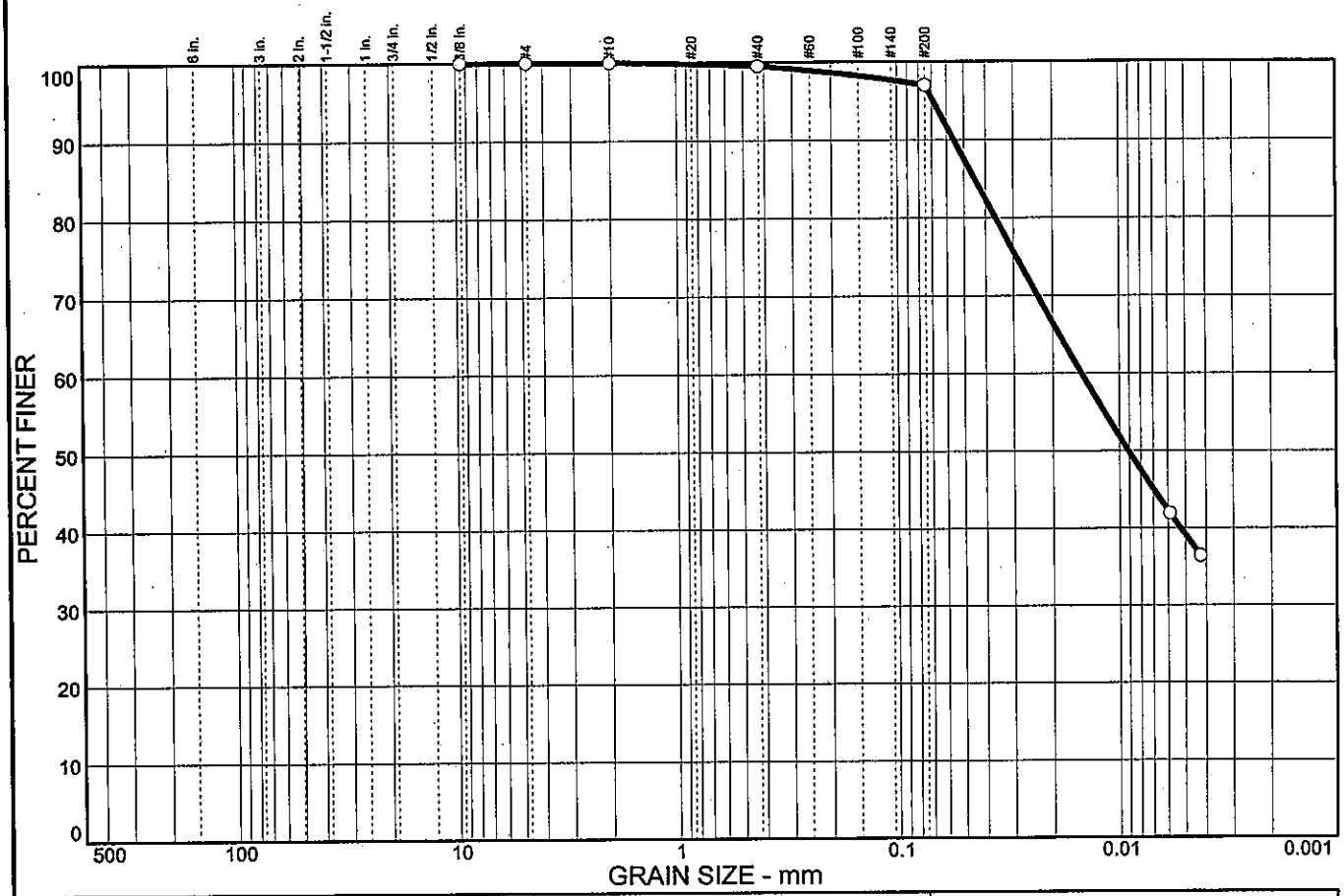
Sample No.: 6 **Source of Sample:** B-1144 **Date:** 10/27/05
Location: **Elev./Depth:** 13.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.5	2.5	57.9	39.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	100.0		
#40	99.5		
#200	97.0		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 18 LL= 37 PI= 19

Coefficients

D_{85}= 0.0449 D_{60}= 0.0148 D_{50}= 0.0091
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(19)

Remarks

Moisture Content= 20.1%

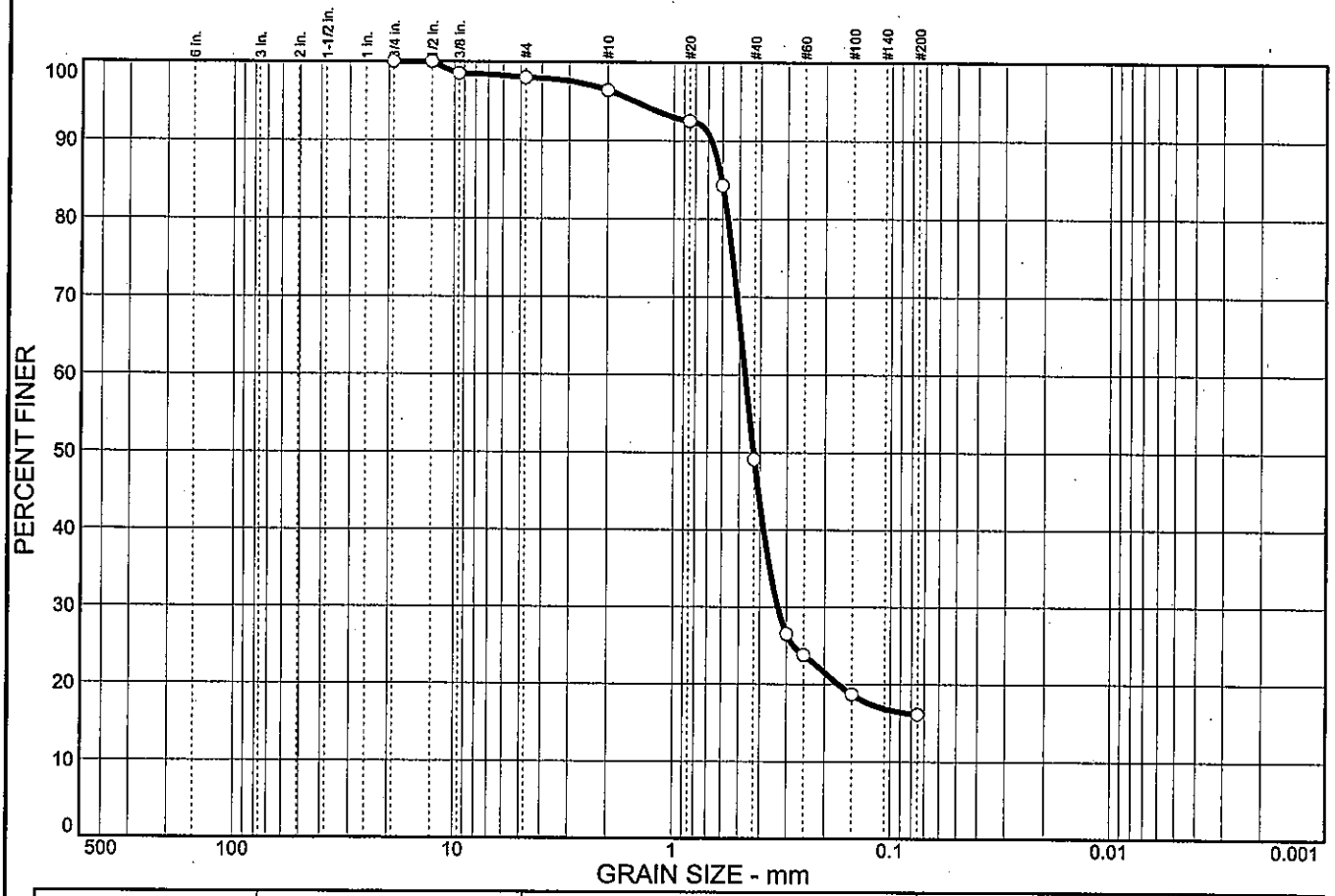
Sample No.: 2 **Source of Sample:** B-1145 **Date:** 10/27/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.0	1.6	47.3	33.0	16.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.50 in.	100.0		
0.375 in.	98.5		
#4	98.0		
#10	96.4		
#20	92.5		
#30	84.3		
#40	49.1		
#50	26.5		
#60	23.8		
#100	18.7		
#200	16.1		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.606 D_{60}= 0.470 D_{50}= 0.429
D_{30}= 0.329 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

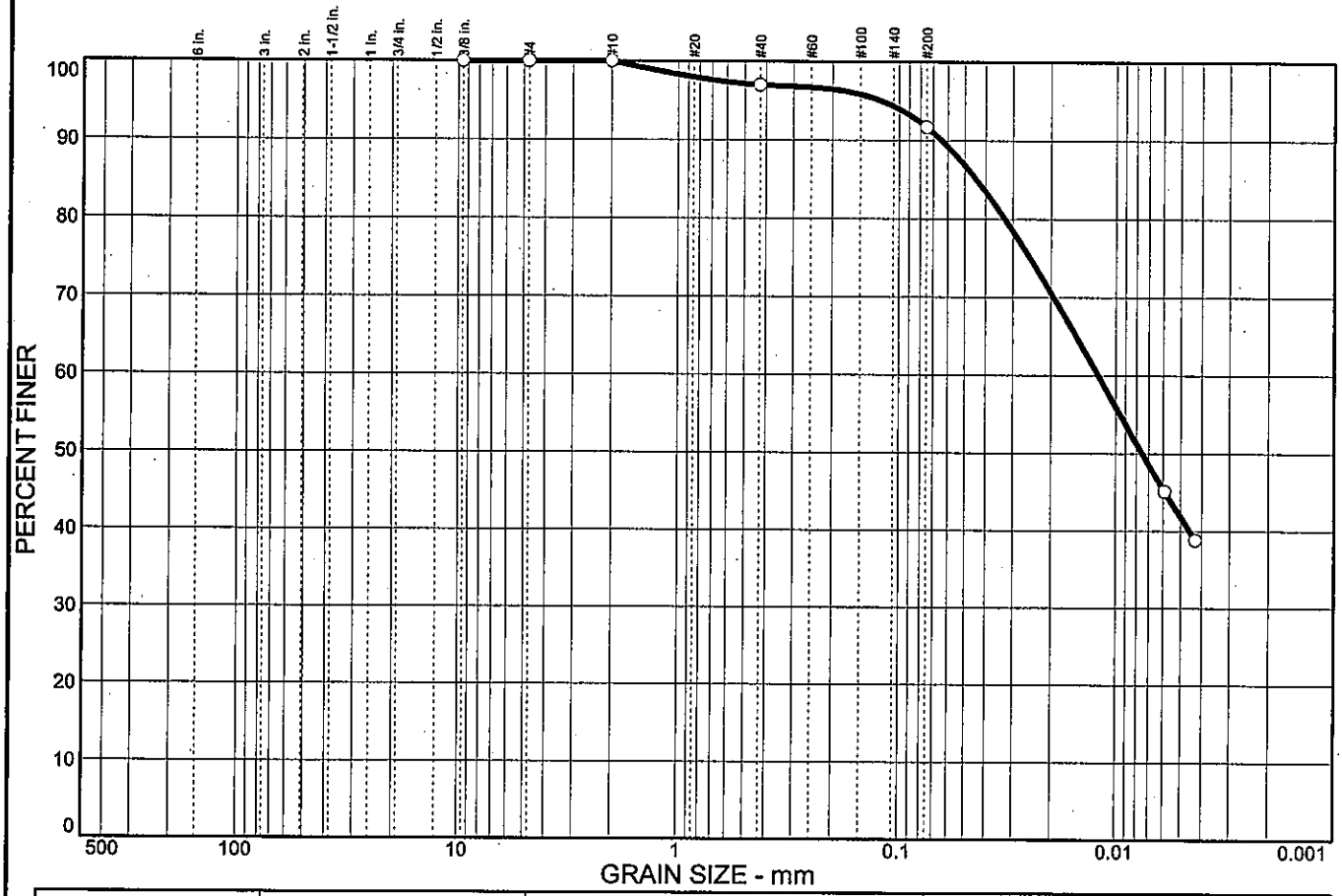
Moisture Content= 11.5%

Sample No.: 5 **Source of Sample:** B-1145 **Date:** 10/27/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	3.0	5.3	49.9	41.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	100.0		
#10	100.0		
#40	97.0		
#200	91.7		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20 LL= 35 PI= 15

Coefficients

D_{85}= 0.0441 D_{60}= 0.0121 D_{50}= 0.0075
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(14)

Remarks

Moisture Content= 18.4%

Sample No.: 1 **Source of Sample:** B-1146 **Date:** 10/27/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT

% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	19.9	9.7	28.6	25.4	16.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.50 in.	89.4		
0.375 in.	88.0		
#4	80.1		
#10	70.4		
#20	61.2		
#30	54.7		
#40	41.8		
#50	30.5		
#60	26.5		
#100	19.3		
#200	16.4		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 6.77 D_{60}= 0.777 D_{50}= 0.523
D_{30}= 0.294 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content= 14.0%

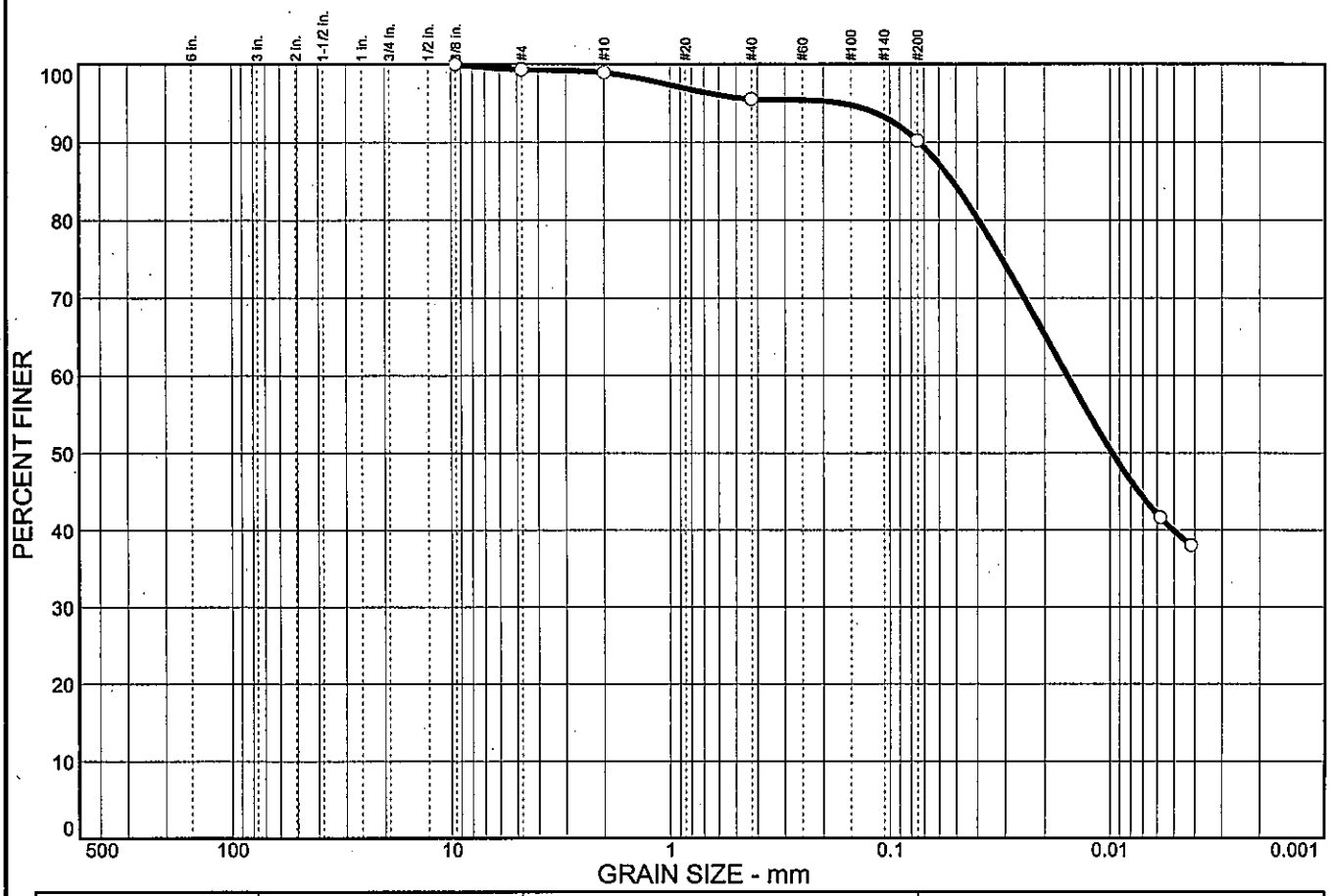
Sample No.: 5 **Source of Sample:** B-1146 **Date:** 10/27/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.7	0.4	3.4	5.3	50.3	39.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.3		
#10	98.9		
#40	95.5		
#200	90.2		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 34 PI= 15

Coefficients

D_{85}= 0.0520 D_{60}= 0.0157 D_{50}= 0.0097
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

Remarks

Moisture Content= 17.7%

Sample No.: 1 **Source of Sample:** B-1149 **Date:** 8/15/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT

% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	12.7	5.4	2.0	11.9	10.8	34.2	23.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0 in.	100.0		
0.75 in.	87.3		
0.375 in.	83.8		
#4	81.9		
#10	79.9		
#40	68.0		
#200	57.2		

* (no specification provided)

Soil Description

Sandy lean clay with gravel

Atterberg Limits

PL= 17 LL= 25 PI= 8

Coefficients

D_{85}= 12.5 D_{60}= 0.105 D_{50}= 0.0409
D_{30}= 0.0101 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(2)

Remarks

Moisture Content= 13.8%

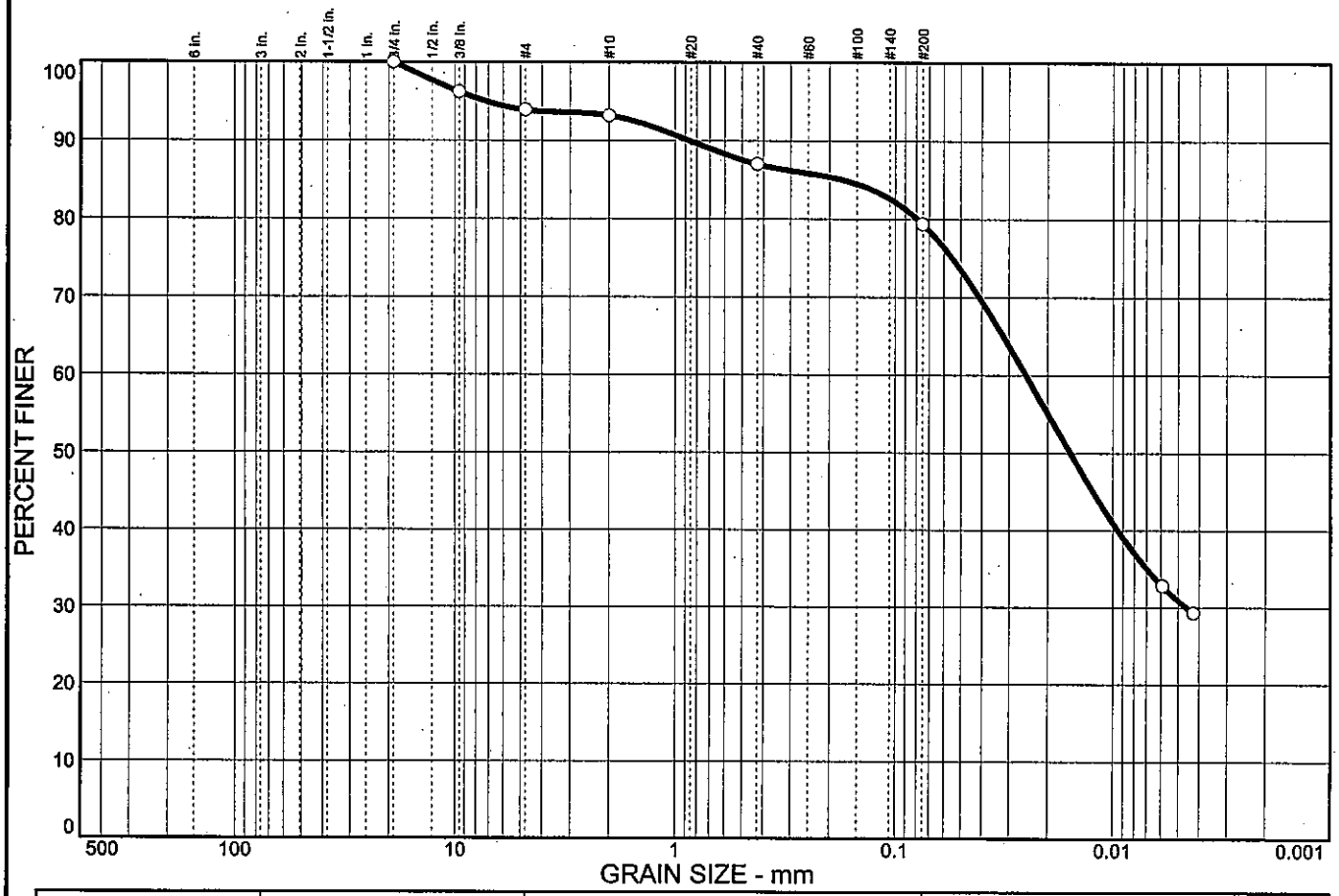
Sample No.: 2 **Source of Sample:** B-1149 **Date:** 8/20/05
Location: **Elev./Depth:** 3.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.1	0.7	6.2	7.6	48.5	30.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.2		
#4	93.9		
#10	93.2		
#40	87.0		
#200	79.4		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 20 LL= 30 PI= 10

Coefficients

D_{85}= 0.174 D_{60}= 0.0251 D_{50}= 0.0157
D_{30}= 0.0046 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(7)

Remarks

Moisture Content= 19.0%
LOI (Organic Content)= 5.42%

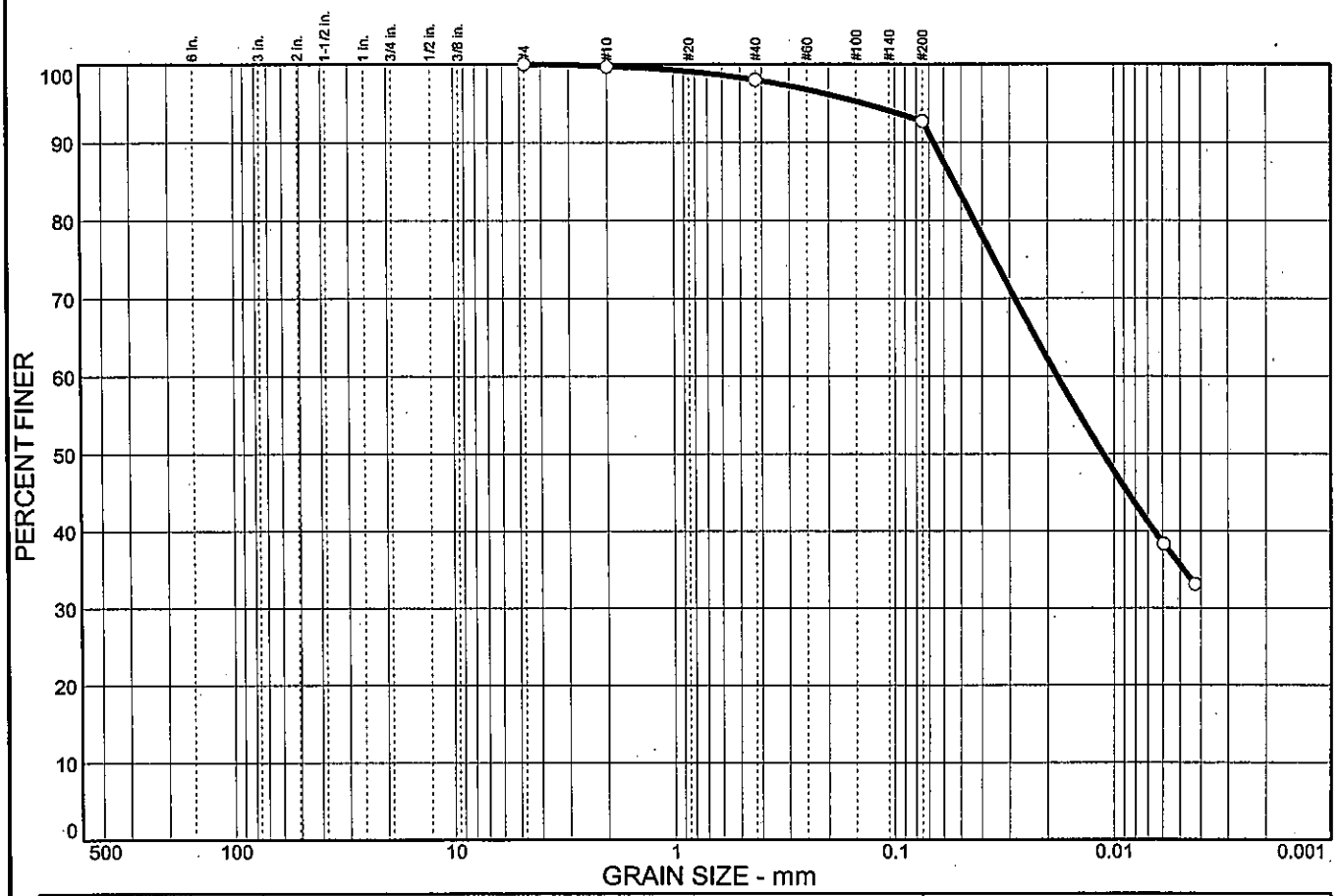
Sample No.: 1 **Source of Sample:** B-1150 **Date:** 8/20/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.3	1.7	5.3	57.1	35.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#40	98.0		
#200	92.7		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 33 PI= 14

Coefficients

D_{85}= 0.0539 D_{60}= 0.0181 D_{50}= 0.0112
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

Remarks

Moisture Content= 15.7%
LOI (Organic Content)= 3.74%

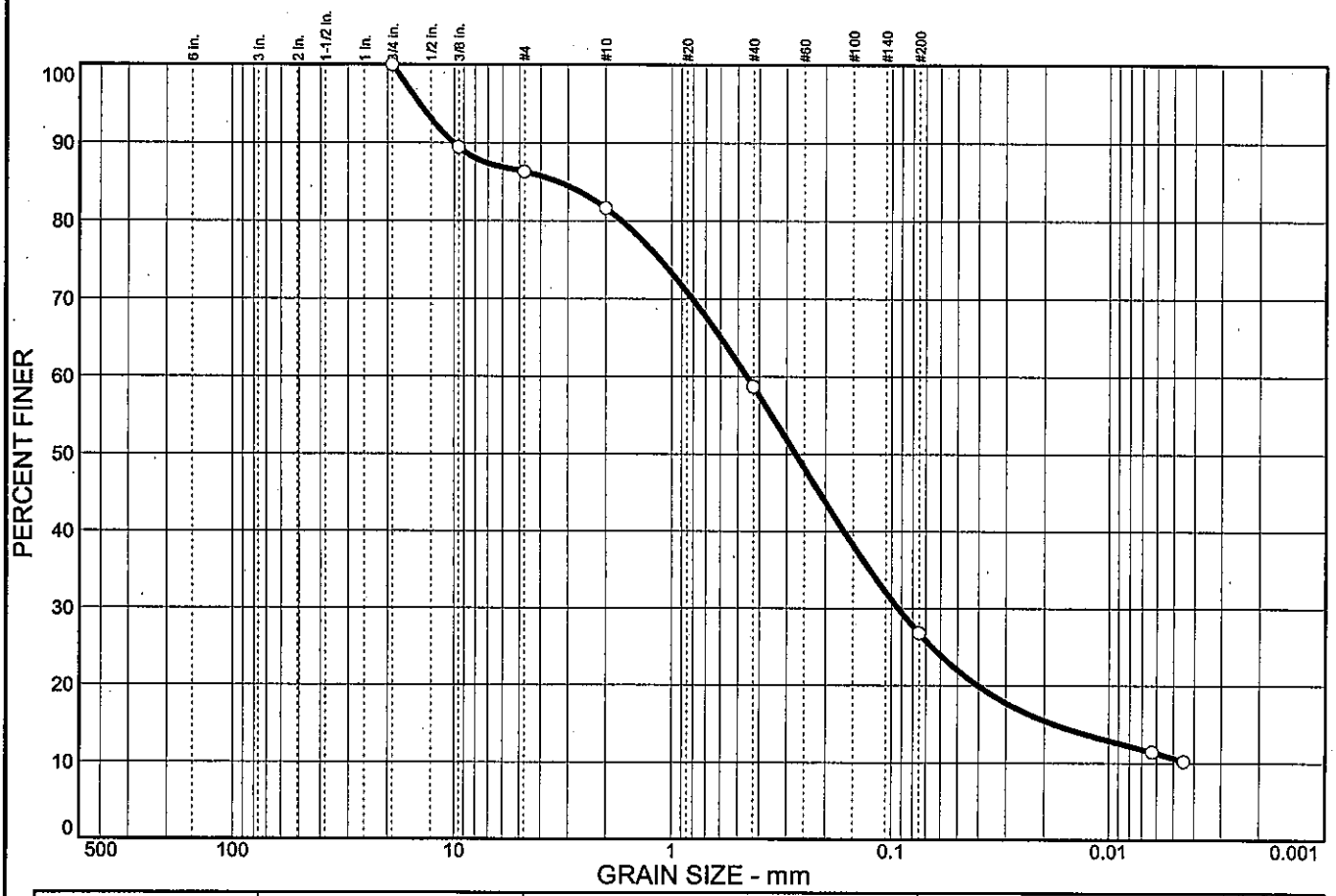
Sample No.: 2 **Source of Sample:** B-1150 **Date:** 8/20/05
Location: **Elev./Depth:** 3.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	13.7	4.7	22.9	31.9	16.2	10.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	89.4		
#4	86.3		
#10	81.6		
#40	58.7		
#200	26.8		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 3.33 D_{60}= 0.455 D_{50}= 0.273
D_{30}= 0.0932 D_{15}= 0.0180 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

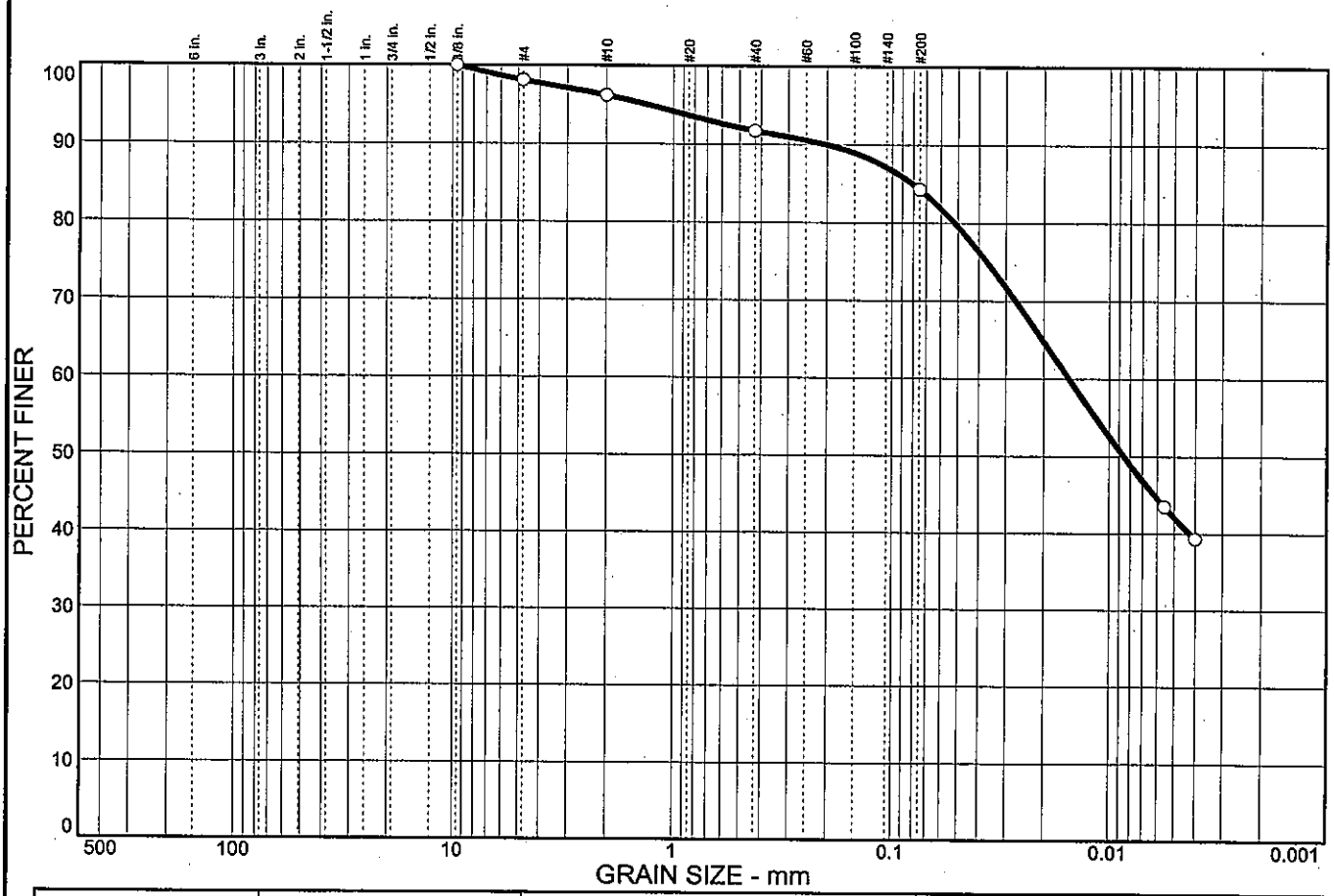
Moisture Content= 9.5%

Sample No.: 1 **Source of Sample:** B-1151 **Date:** 8/20/05
Location: **Elev./Depth:** 1.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.9	1.9	4.5	7.4	42.2	42.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.1		
#10	96.2		
#40	91.7		
#200	84.3		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 21 LL= 38 PI= 17

Coefficients

D_{85}= 0.0808 D_{60}= 0.0153 D_{50}= 0.0086
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(14)

Remarks

Moisture Content= 20.7%

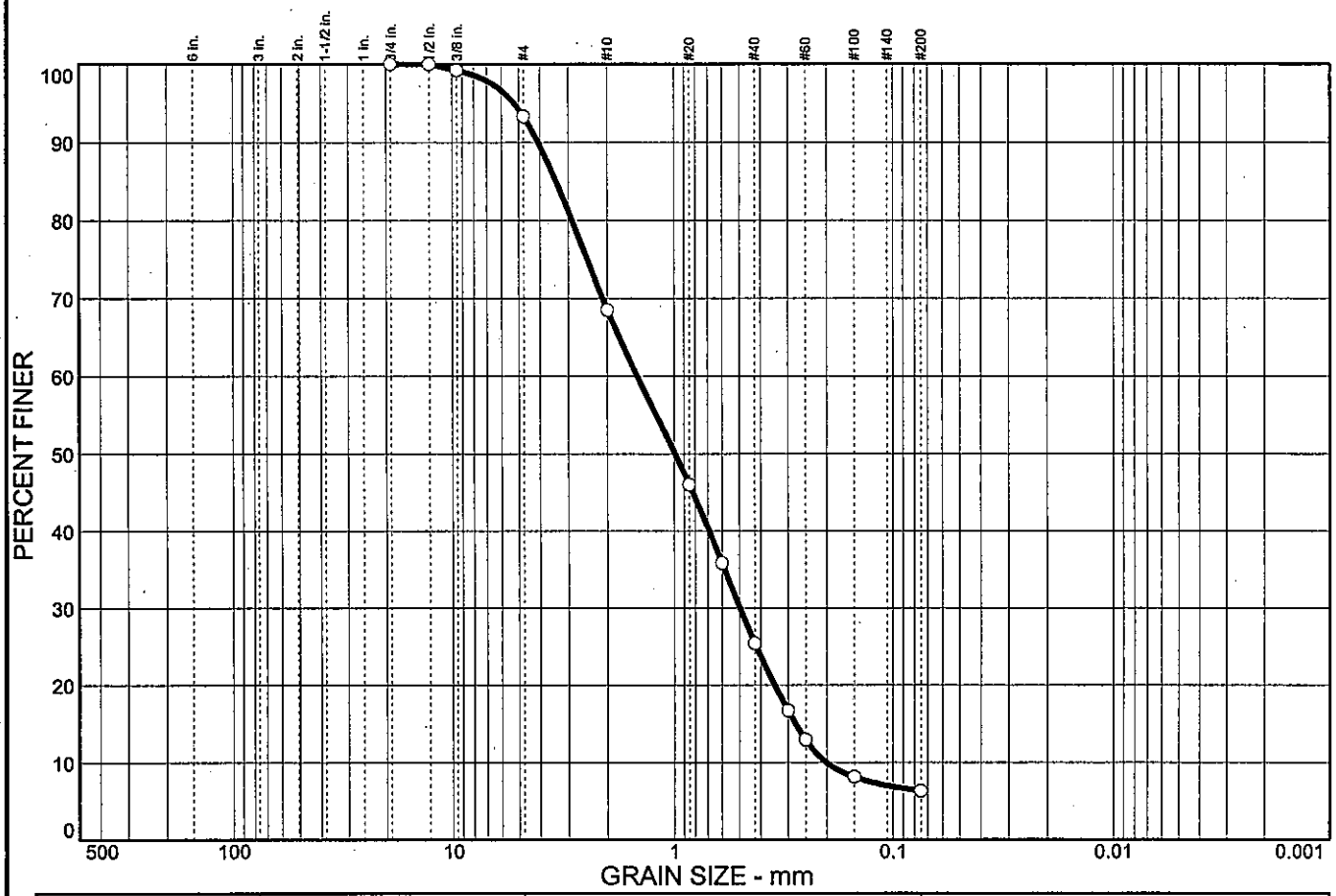
Sample No.: 2 **Source of Sample:** B-1151 **Date:** 8/20/05
Location: **Elev./Depth:** 3.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.7	24.8	43.1	19.1	6.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.50 in.	100.0		
0.375 in.	99.2		
#4	93.3		
#10	68.5		
#20	46.0		
#30	35.8		
#40	25.4		
#50	16.7		
#60	12.9		
#100	8.1		
#200	6.3		

* (no specification provided)

Soil Description

Poorly graded sand with silt

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 3.40 D_{60}= 1.47 D_{50}= 0.988
D_{30}= 0.497 D_{15}= 0.278 D_{10}= 0.202
C_u= 7.28 C_c= 0.84

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Moisture Content= 4.4%

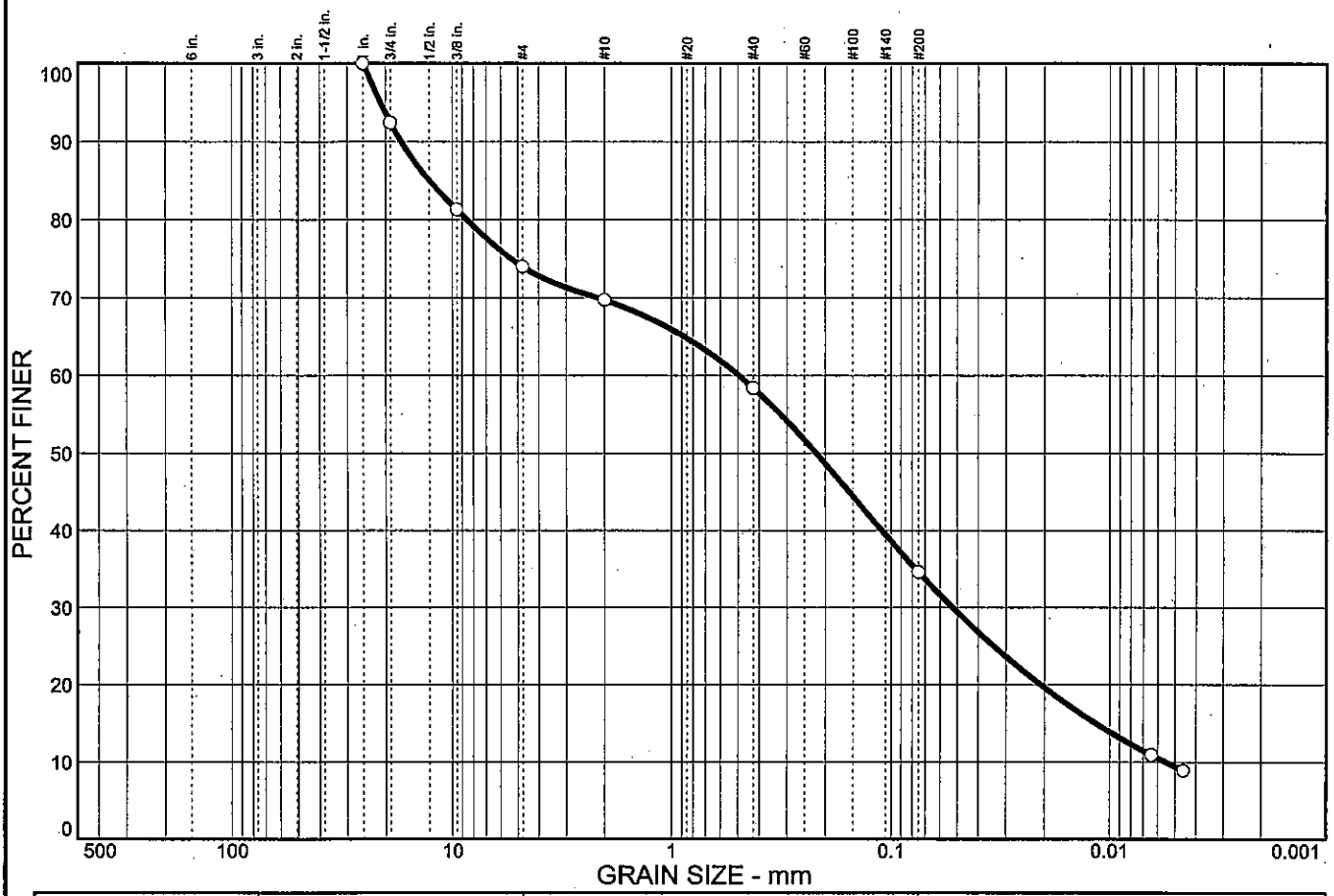
Sample No.: 4 **Source of Sample:** B-1152 **Date:** 11/1/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	7.6	18.4	4.3	11.3	23.8	25.2	9.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	92.4		
0.375 in.	81.3		
#4	74.0		
#10	69.7		
#40	58.4		
#200	34.6		

* (no specification provided)

Soil Description

Silty, clayey sand with gravel

Atterberg Limits

PL= 18 LL= 23 PI= 5

Coefficients

D_{85}= 12.7 D_{60}= 0.493 D_{50}= 0.221
D_{30}= 0.0525 D_{15}= 0.0116 D_{10}= 0.0055
C_u= 89.20 C_c= 1.01

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

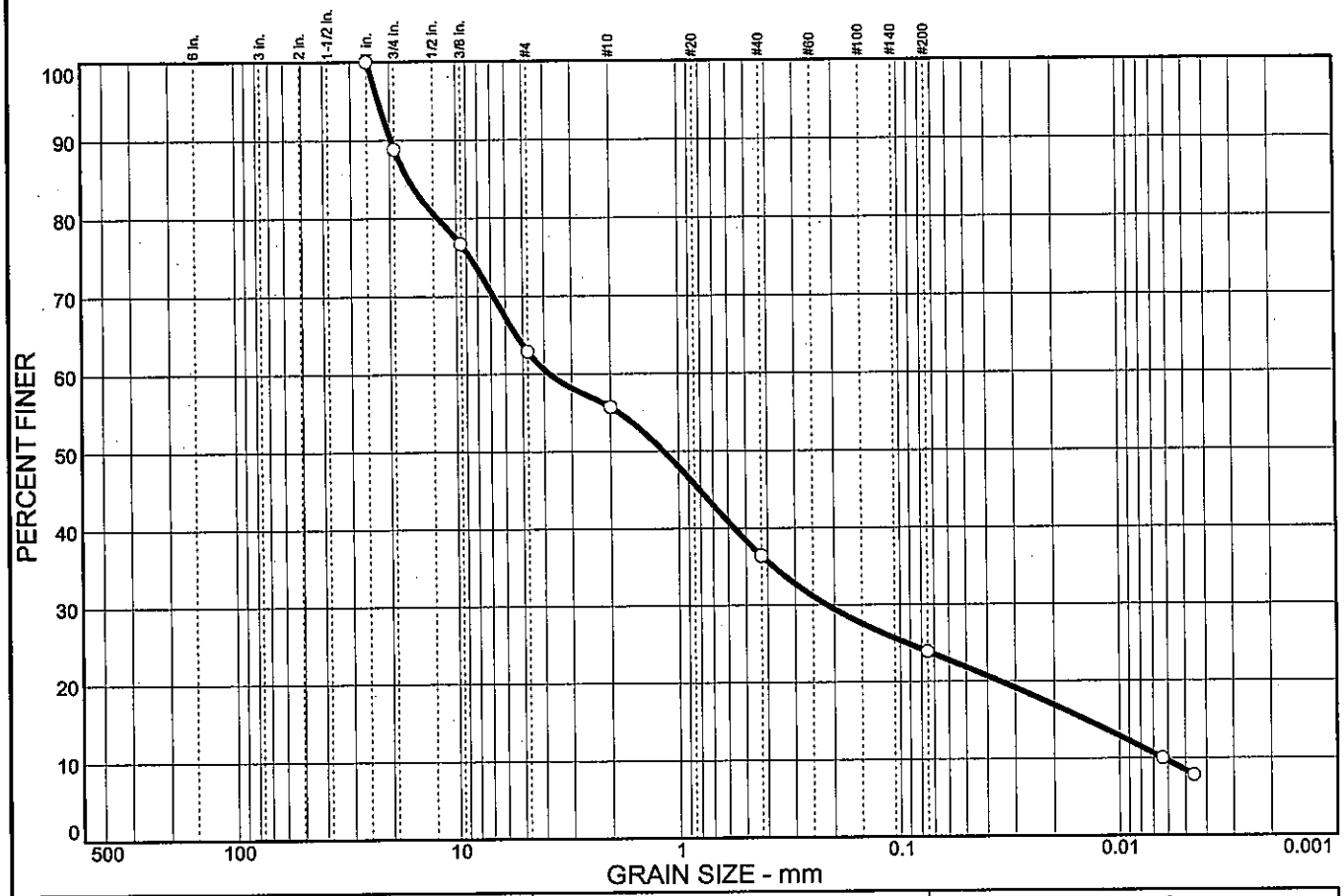
Moisture Content= 15.6%

Sample No.: 10 **Source of Sample:** TR-46 **Date:** 4/7/05
Location: **Elev./Depth:** 23.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	11.2	25.9	7.2	19.3	12.5	15.5	8.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	88.8		
0.375 in.	76.7		
#4	62.9		
#10	55.7		
#40	36.4		
#200	23.9		

* (no specification provided)

Soil Description

Silty, clayey sand with gravel

Atterberg Limits

PL= 21 LL= 26 PI= 5

Coefficients

D_{85}= 16.5 D_{60}= 3.77 D_{50}= 1.16
D_{30}= 0.216 D_{15}= 0.0143 D_{10}= 0.0064
C_u= 593.55 C_c= 1.94

Classification

USCS= SC-SM AASHTO= A-1-b

Remarks

Moisture Content= 13.3%

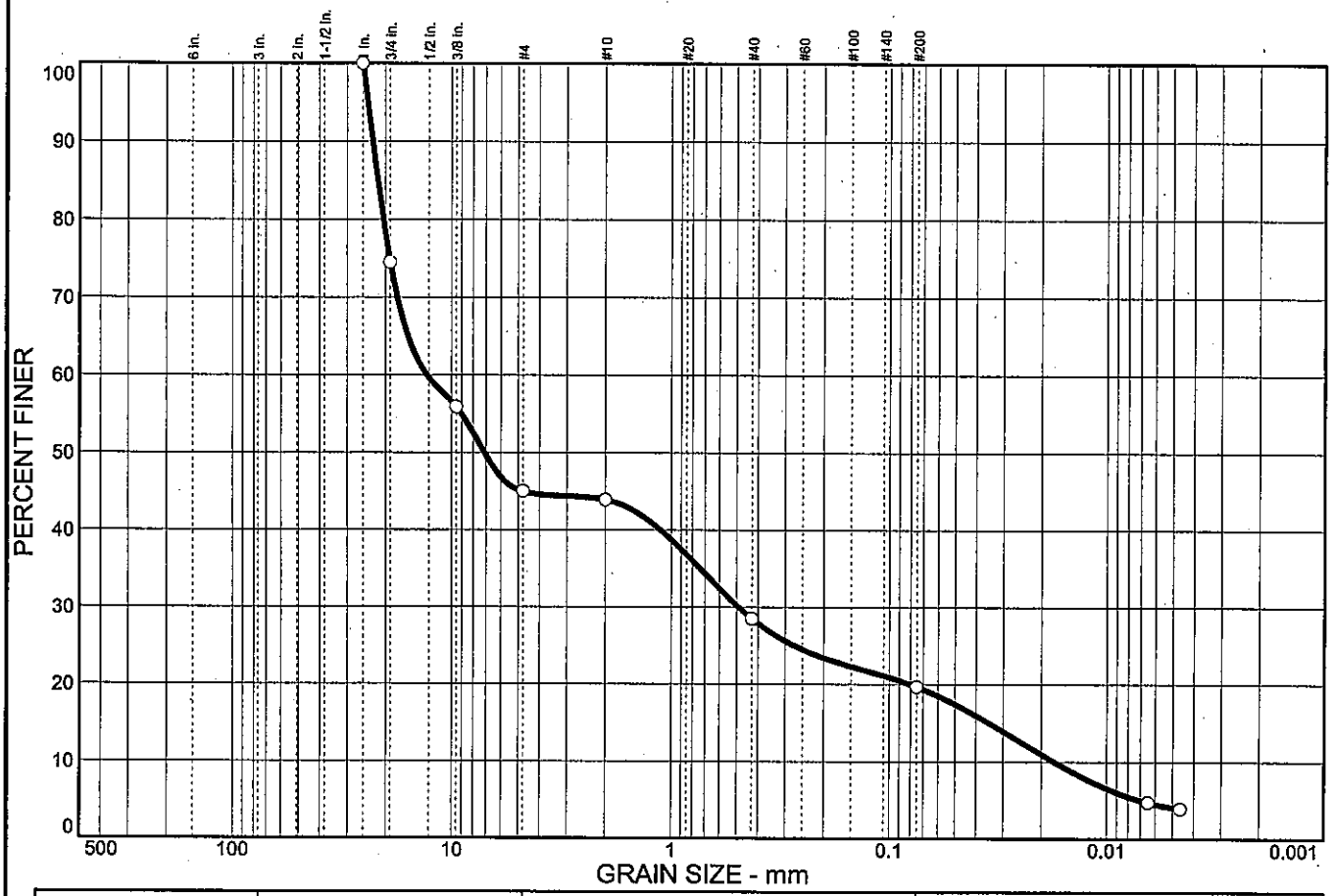
Sample No.: 2 **Source of Sample:** TR-46 **Date:** 4/7/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	25.5	29.5	1.1	15.4	8.8	15.6	4.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	74.5		
0.375 in.	55.9		
#4	45.0		
#10	43.9		
#40	28.5		
#200	19.7		

* (no specification provided)

Soil Description

Silty gravel with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 21.7 D_{60}= 13.0 D_{50}= 7.12
D_{30}= 0.490 D_{15}= 0.0348 D_{10}= 0.0174
C_u= 748.18 C_c= 1.06

Classification

USCS= GM AASHTO= A-1-b

Remarks

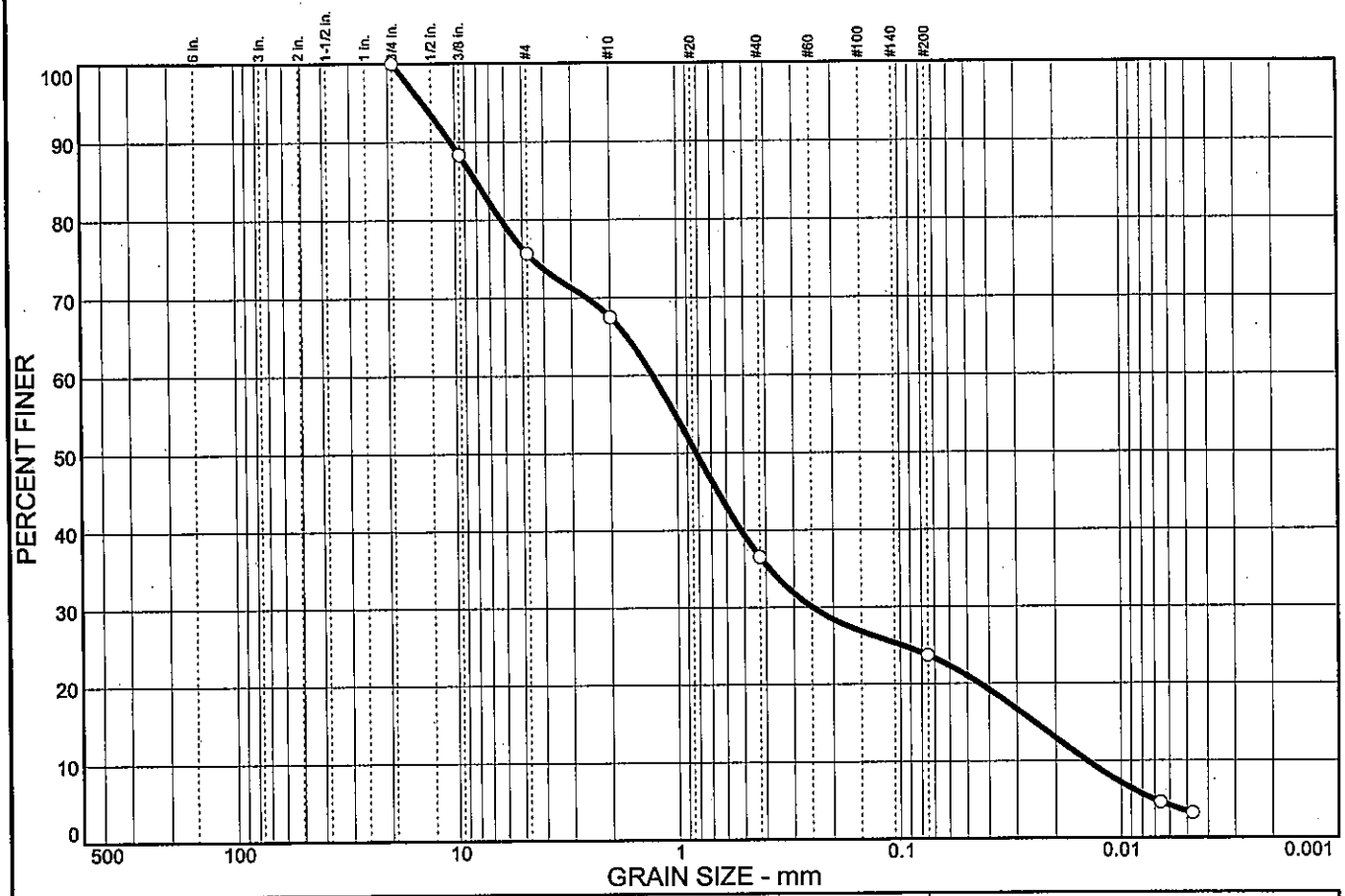
Moisture Content= 9.0%

Sample No.: 5 **Source of Sample:** TR-46 **Date:** 4/7/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	24.3	8.2	31.0	12.8	20.3	3.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	88.3		
#4	75.7		
#10	67.5		
#40	36.5		
#200	23.7		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 8.04 D_{60}= 1.29 D_{50}= 0.818
D_{30}= 0.248 D_{15}= 0.0249 D_{10}= 0.0143
C_u= 89.95 C_c= 3.35

Classification

USCS= SM AASHTO= A-1-b

Remarks

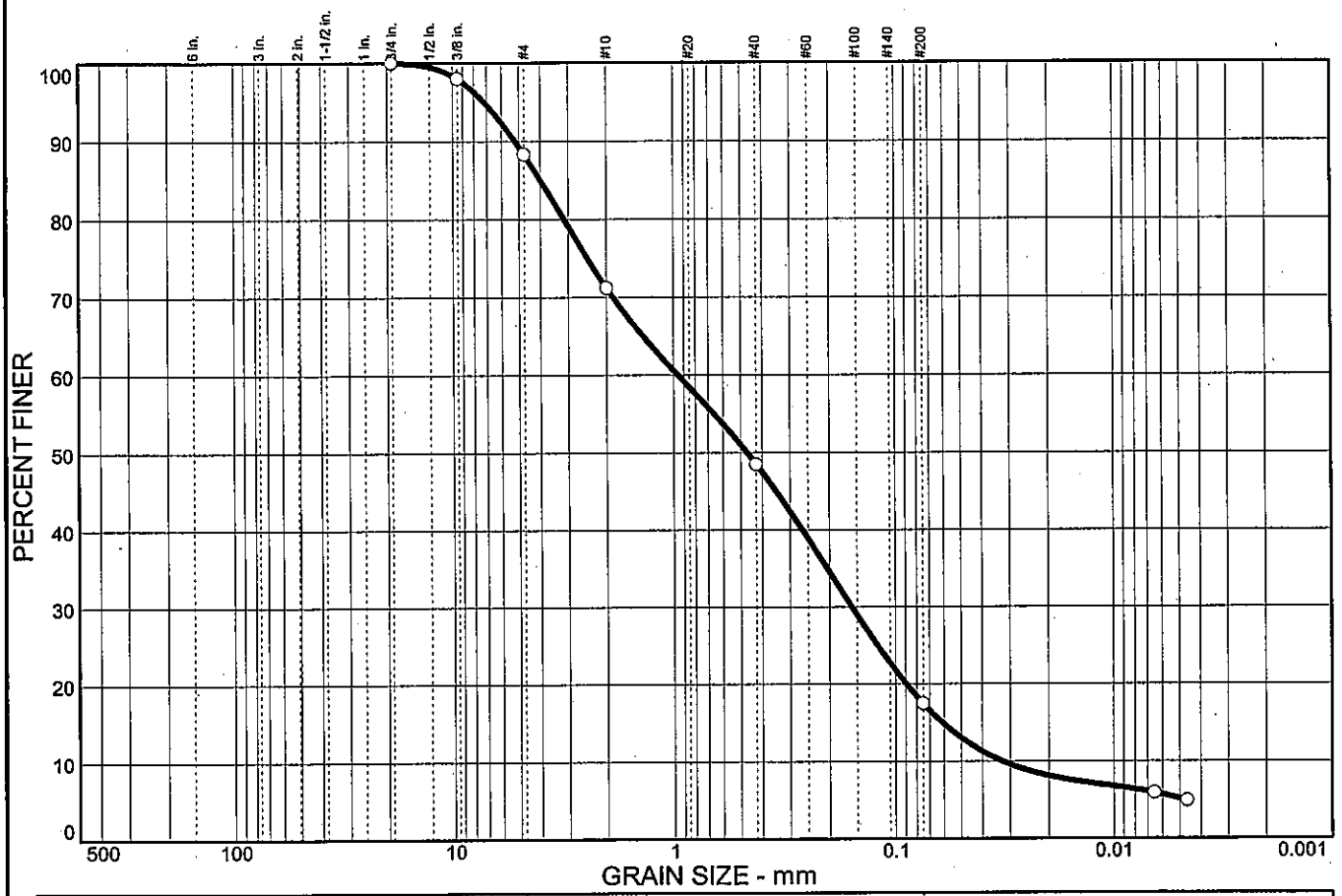
Moisture Content= 13.9%

Sample No.: 7 **Source of Sample:** TR-46 **Date:** 4/7/05
Location: **Elev./Depth:** 16.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	11.7	17.1	22.7	31.0	12.4	5.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.0		
#4	88.3		
#10	71.2		
#40	48.5		
#200	17.5		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 4.00 D_{60}= 0.955 D_{50}= 0.467
D_{30}= 0.158 D_{15}= 0.0610 D_{10}= 0.0324
C_u= 29.42 C_c= 0.81

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content= 13.1%

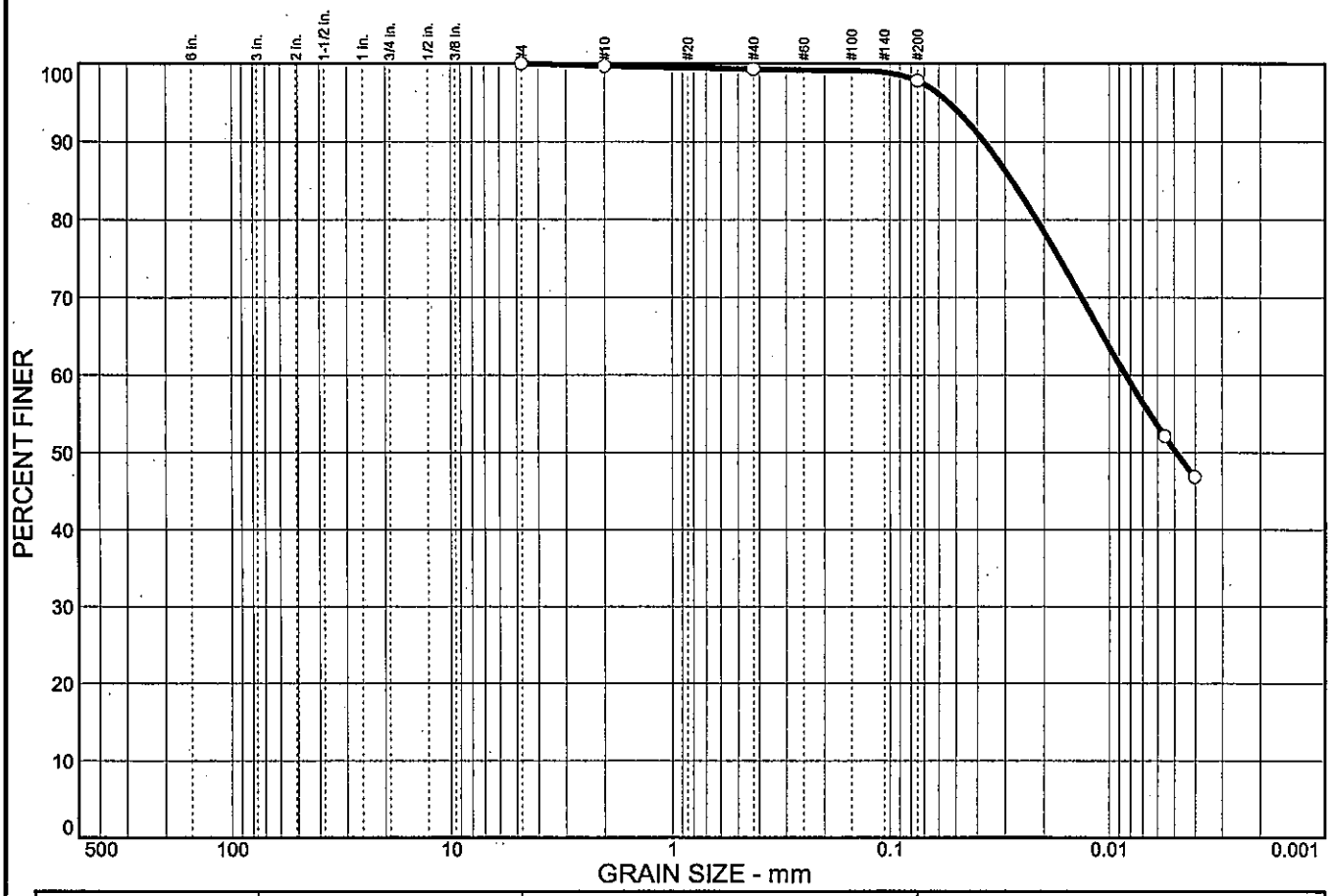
Sample No.: 10 **Source of Sample:** TR-47 **Date:** 4/11/05
Location: **Elev./Depth:** 23.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.3	0.4	1.5	47.5	50.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#40	99.3		
#200	97.8		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 21 LL= 42 PI= 21

Coefficients

D_{85}= 0.0279 D_{60}= 0.0084 D_{50}= 0.0049
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(22)

Remarks

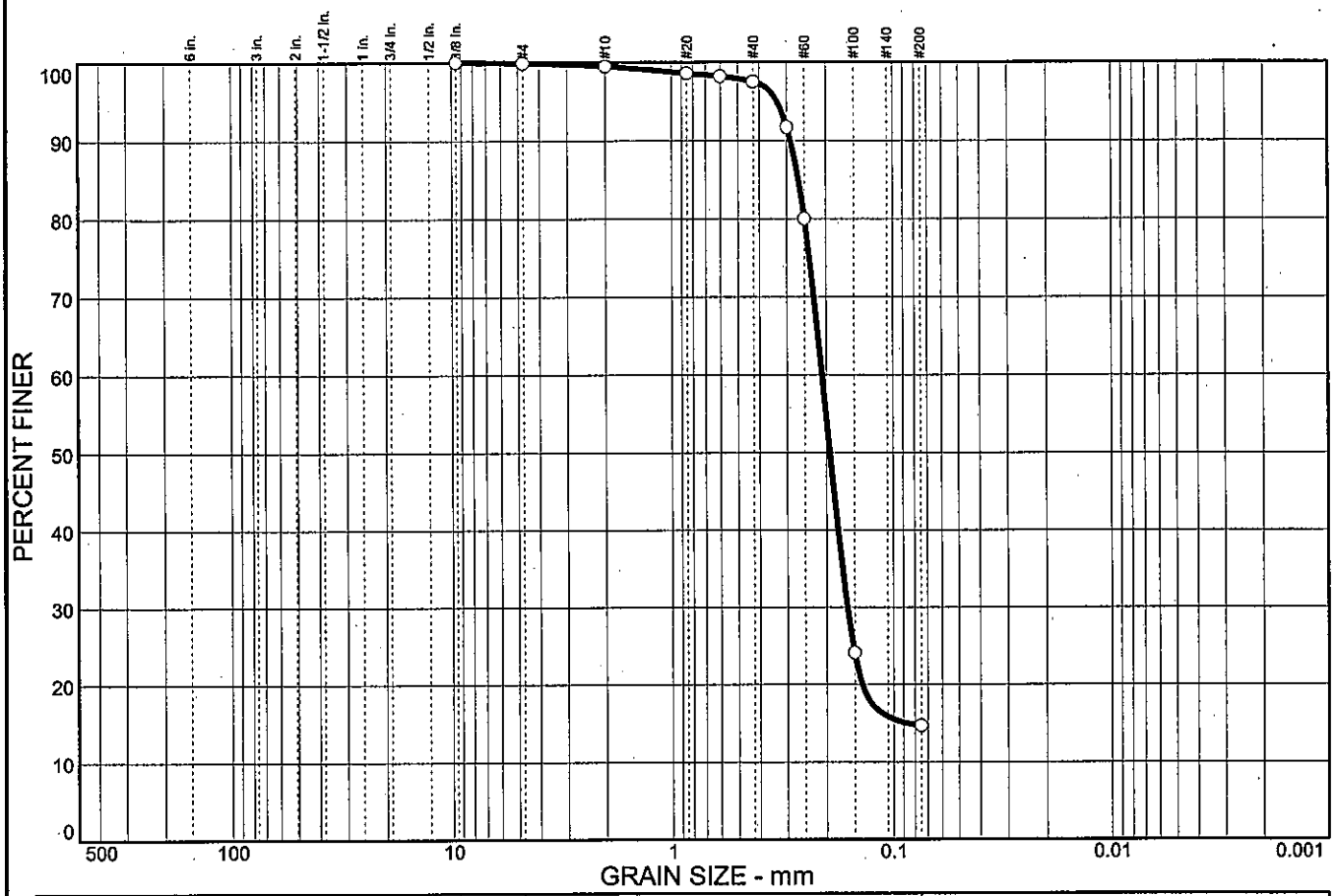
Moisture Content= 21.4%

Sample No.: 3 **Source of Sample:** TR-47 **Date:** 4/11/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.1	0.4	2.0	82.8	14.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.9		
#10	99.5		
#20	98.6		
#30	98.2		
#40	97.5		
#50	91.7		
#60	80.0		
#100	24.1		
#200	14.7		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.266 D_{60}= 0.209 D_{50}= 0.193
D_{30}= 0.161 D_{15}= 0.0864 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture Content= 35.5%

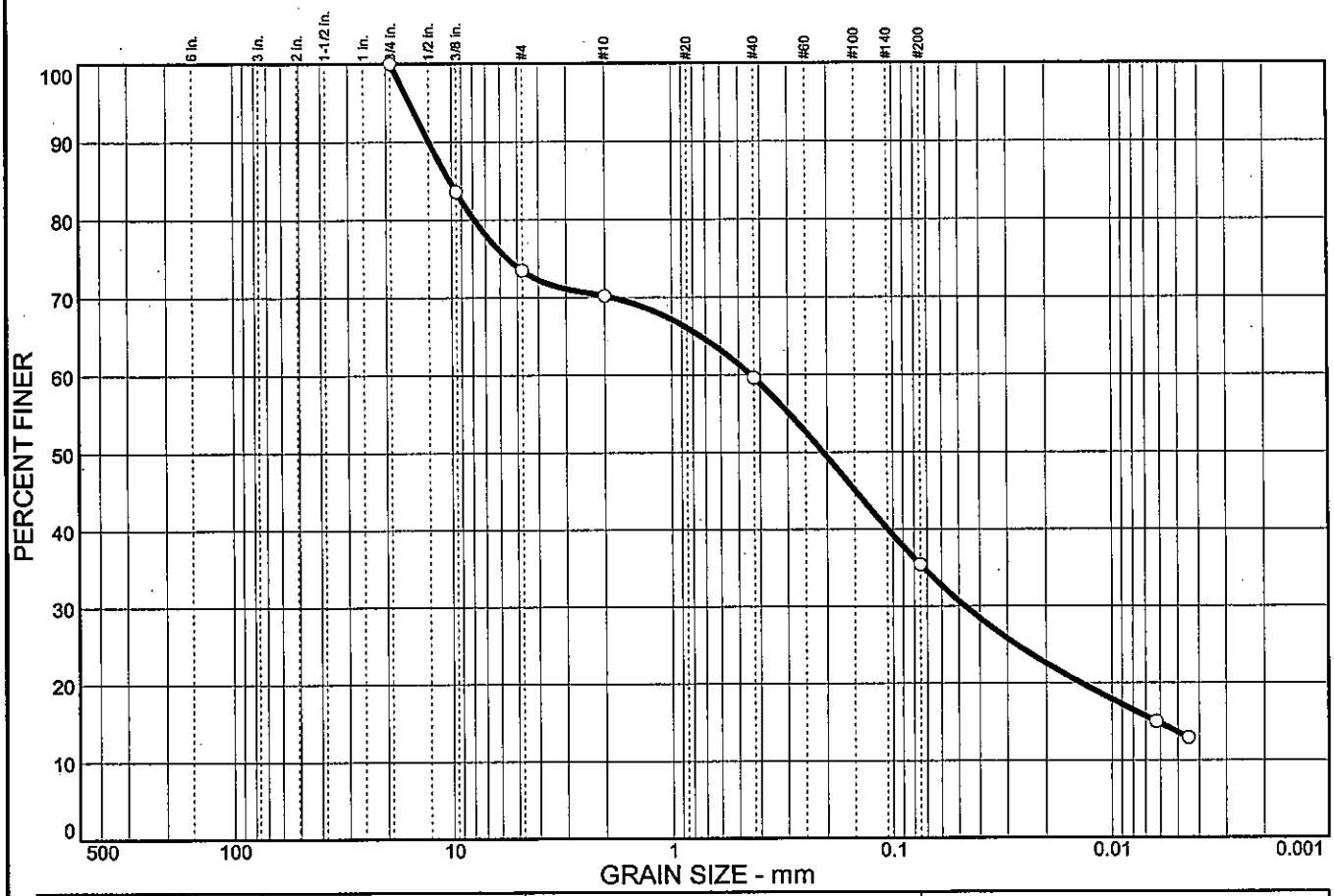
Sample No.: 6 **Source of Sample:** TR-47 **Date:** 4/23/05
Location: **Elev./Depth:** 13.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	26.5	3.3	10.6	24.2	21.8	13.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	83.6		
#4	73.5		
#10	70.2		
#40	59.6		
#200	35.4		

* (no specification provided)

Soil Description

Silty, clayey sand with gravel

Atterberg Limits

PL= 18 LL= 24 PI= 6

Coefficients

D_{85}= 10.2 D_{60}= 0.440 D_{50}= 0.208
D_{30}= 0.0468 D_{15}= 0.0062 D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Remarks

Moisture Content= 17.2%

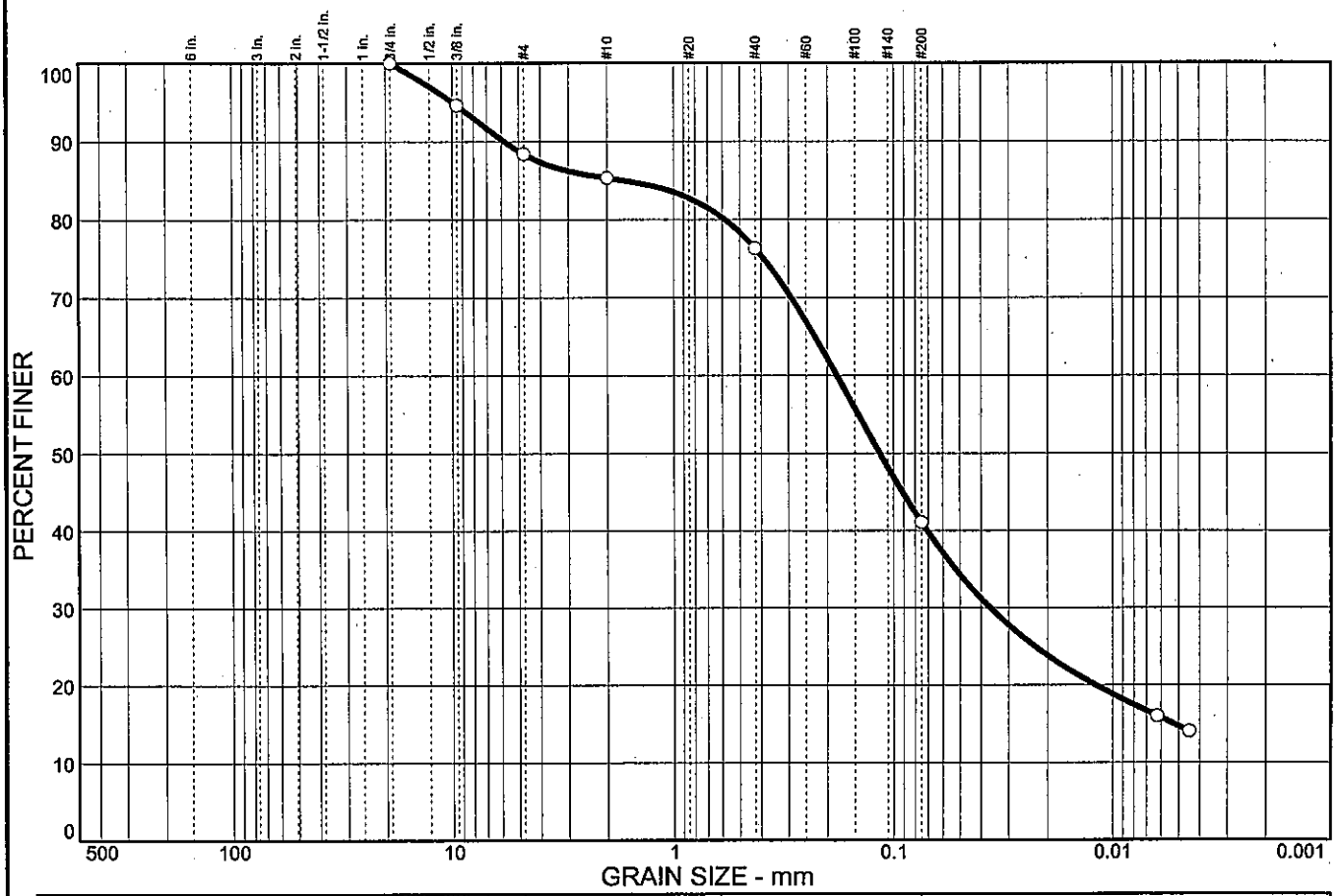
Sample No.: 8 **Source of Sample:** TR-47 **Date:** 4/11/05
Location: **Elev./Depth:** 18.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	11.6	3.1	9.0	35.2	26.4	14.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.6		
#4	88.4		
#10	85.3		
#40	76.3		
#200	41.1		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 16 LL= 22 PI= 6

Coefficients

D_{85}= 1.70 D_{60}= 0.181 D_{50}= 0.115
D_{30}= 0.0364 D_{15}= 0.0053 D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

Moisture Content= 15.1%

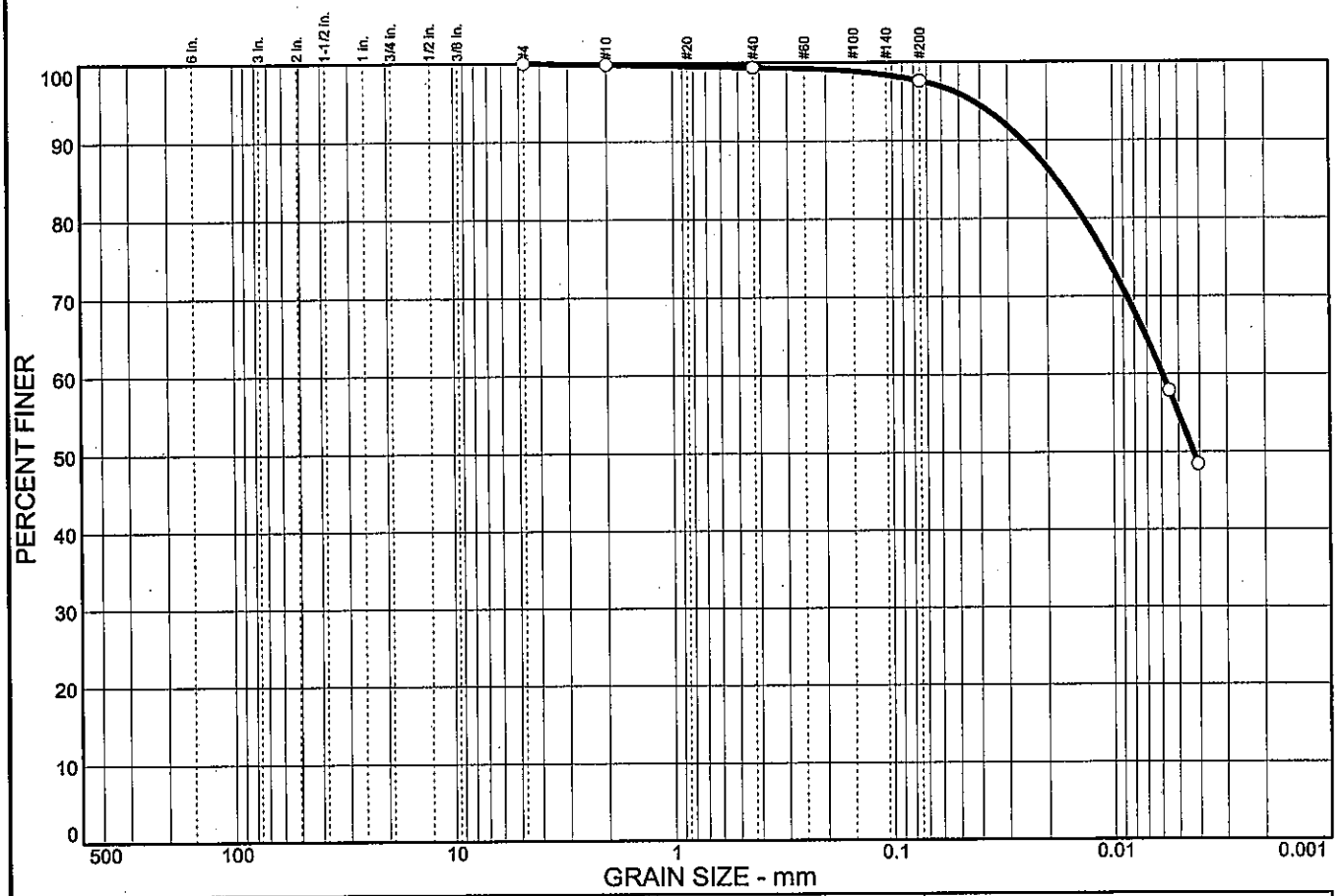
Sample No.: 9 **Source of Sample:** TR-47 **Date:** 4/11/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.2	0.4	1.8	42.7	54.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#40	99.4		
#200	97.6		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 23 LL= 49 PI= 26

Coefficients

D_{85}= 0.0181 D_{60}= 0.0059 D_{50}= 0.0043
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(29)

Remarks

Moisture Content= 23.5%

Sample No.: 4 **Source of Sample:** TR-48 **Date:** 4/15/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT

% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	33.5	3.6	26.5	16.9	19.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.50 in.	100.0		
0.375 in.	91.0		
#4	66.5		
#10	62.9		
#20	53.1		
#30	46.0		
#40	36.4		
#50	28.1		
#60	26.1		
#100	22.6		
#200	19.5		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 8.51 D_{60}= 1.42 D_{50}= 0.718
D_{30}= 0.332 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content= 18.7%

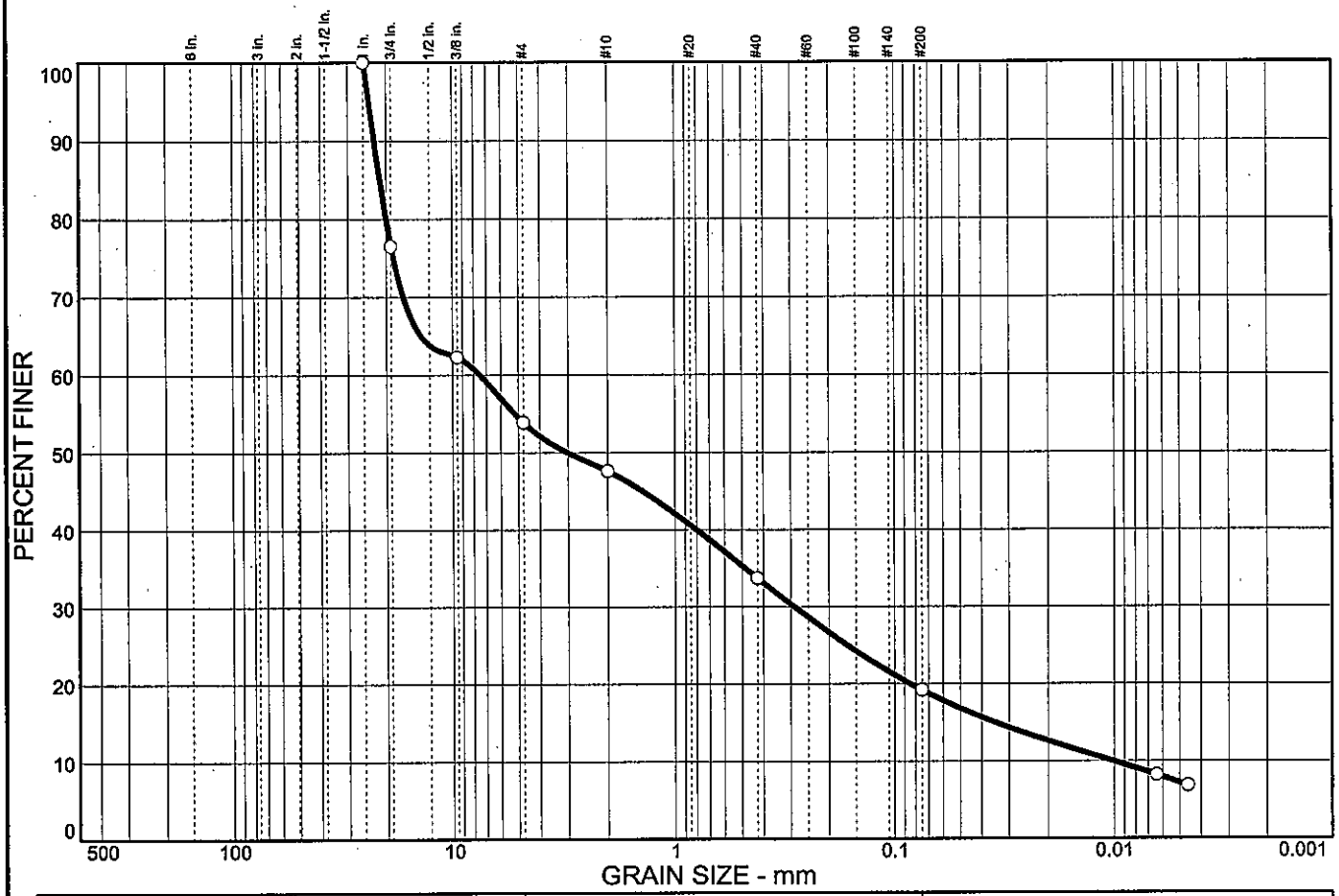
Sample No.: 7 **Source of Sample:** TR-48 **Date:** 4/15/05
Location: **Elev./Depth:** 16.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	23.5	22.6	6.3	13.9	14.5	12.0	7.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	76.5		
0.375 in.	62.3		
#4	53.9		
#10	47.6		
#40	33.7		
#200	19.2		

* (no specification provided)

Soil Description

Silty gravel with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 21.4 D_{60}= 7.47 D_{50}= 3.02
D_{30}= 0.289 D_{15}= 0.0348 D_{10}= 0.0101
C_u= 736.20 C_c= 1.10

Classification

USCS= GM AASHTO= A-1-b

Remarks

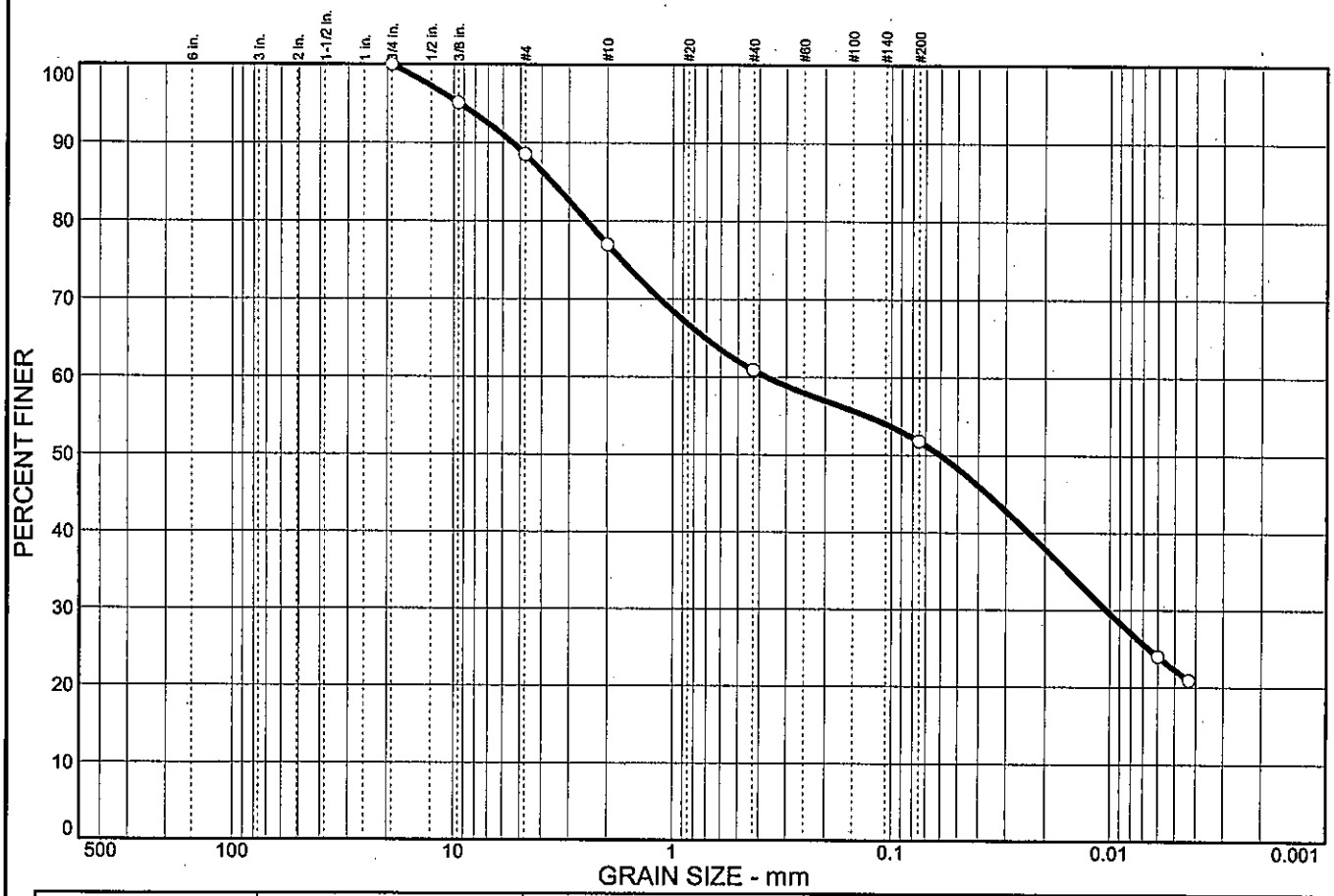
Moisture Content= 15.2%

Sample No.: 8 **Source of Sample:** TR-48 **Date:** 4/15/05
Location: **Elev./Depth:** 18.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	11.5	11.5	16.1	9.1	29.5	22.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	95.1		
#4	88.5		
#10	77.0		
#40	60.9		
#200	51.8		

* (no specification provided)

Soil Description

Sandy silt

Atterberg Limits

PL= 18 LL= 20 PI= 2

Coefficients

D_{85}= 3.59 D_{60}= 0.368 D_{50}= 0.0600
D_{30}= 0.0104 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Moisture Content= 16.8%

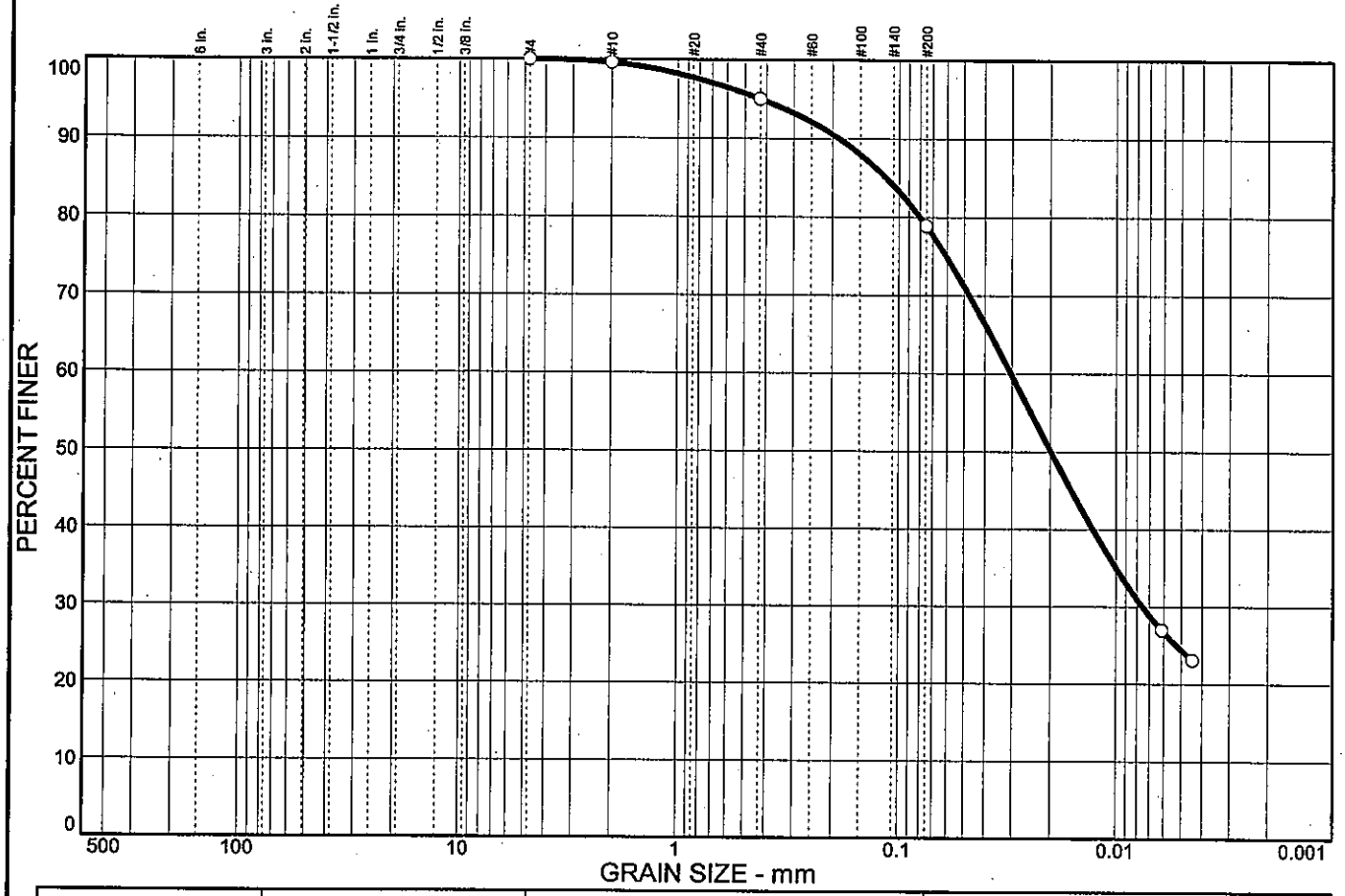
Sample No.: 5 **Source of Sample:** TR-49A **Date:** 4/15/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.4	4.6	16.1	54.4	24.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#40	95.0		
#200	78.9		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 17 LL= 28 PI= 11

Coefficients

D_{85}= 0.114 D_{60}= 0.0303 D_{50}= 0.0198
D_{30}= 0.0075 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(7)

Remarks

Moisture Content= 23.2%

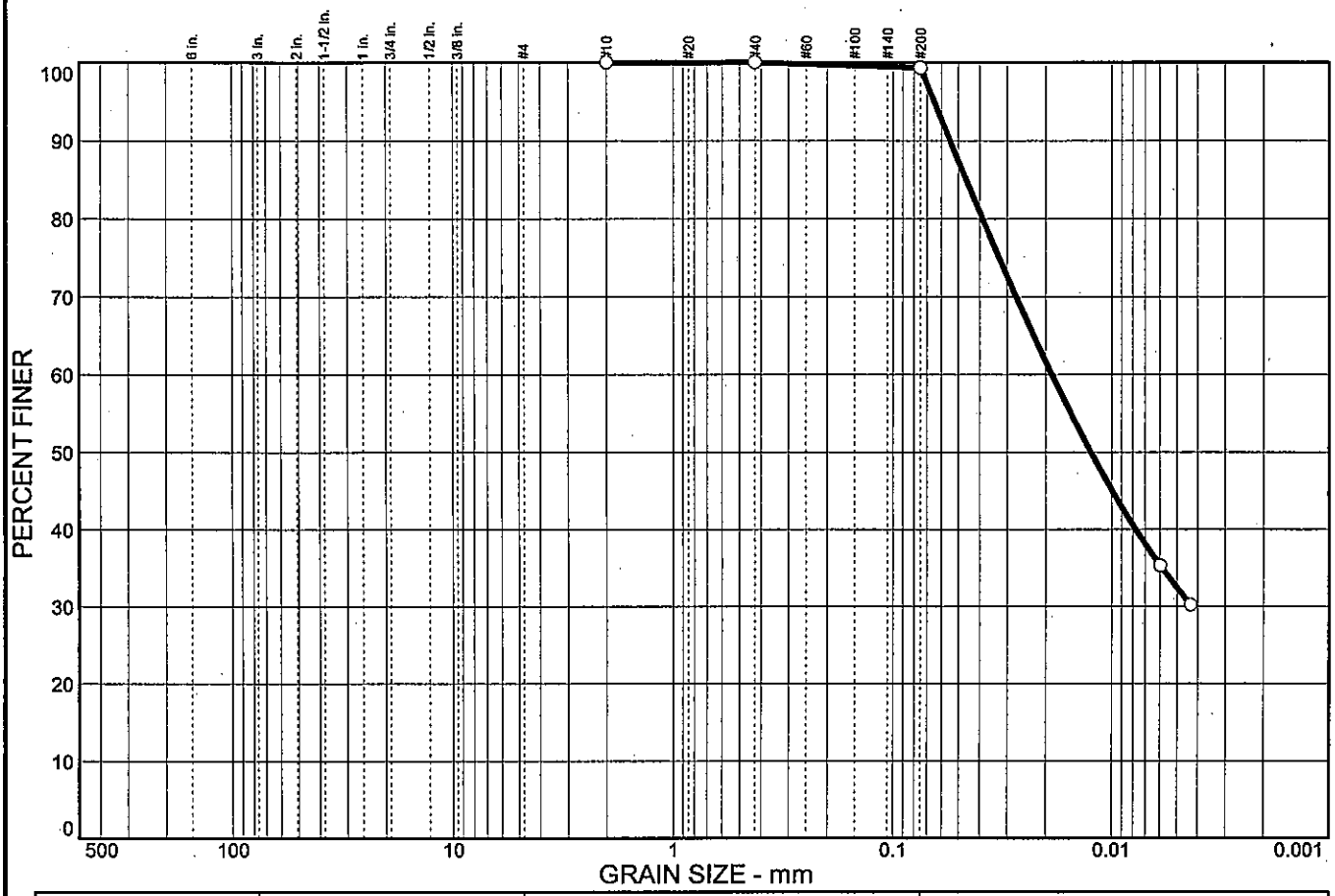
Sample No.: 6 **Source of Sample:** TR-49A **Date:** 4/15/05
Location: **Elev./Depth:** 13.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.0	0.7	66.8	32.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	100.0		
#200	99.3		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20 LL= 34 PI= 14

Coefficients

D_{85}= 0.0461 D_{60}= 0.0187 D_{50}= 0.0124
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(14)

Remarks

Moisture Content= 26.8%

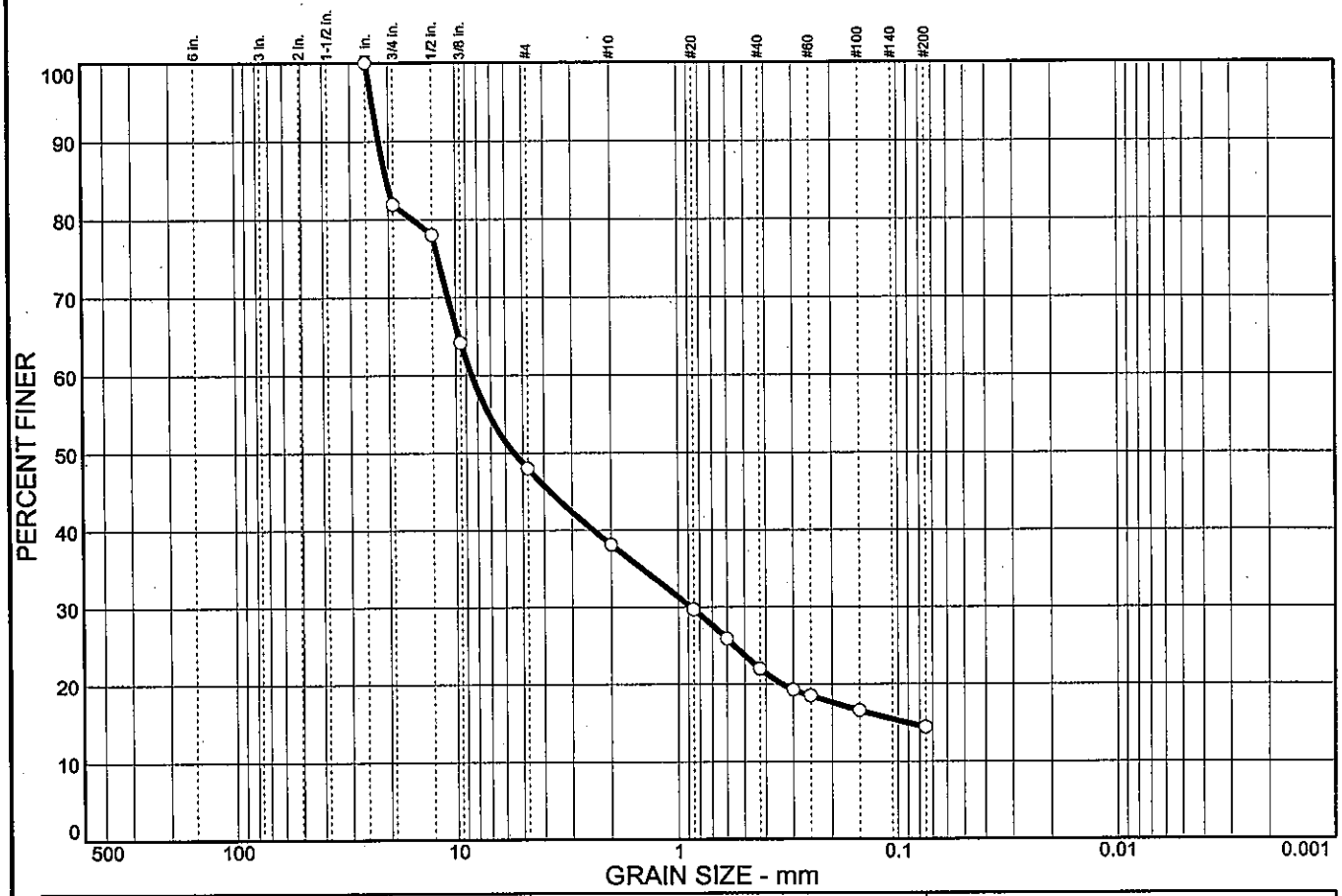
Sample No.: 7 **Source of Sample:** TR-49A **Date:** 4/15/05
Location: **Elev./Depth:** 16.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	18.1	33.9	9.9	16.1	7.6	14.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	81.9		
0.50 in.	78.0		
0.375 in.	64.2		
#4	48.0		
#10	38.1		
#20	29.7		
#30	25.9		
#40	22.0		
#50	19.3		
#60	18.5		
#100	16.6		
#200	14.4		

* (no specification provided)

Soil Description

Silty gravel with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 20.5 D_{60}= 8.50 D_{50}= 5.47
D_{30}= 0.875 D_{15}= 0.0914 D_{10}=
C_u= C_c=

Classification

USCS= GM AASHTO= A-1-a

Remarks

Moisture Content= 9.9%

Sample No.: 9 **Source of Sample:** TR-49A **Date:** 4/15/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT

% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.2	0.3	4.0	6.5	56.5	32.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.8		
#10	99.5		
#40	95.5		
#200	89.0		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 33 PI= 14

Coefficients

D_{85}= 0.0578 D_{60}= 0.0192 D_{50}= 0.0128
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(12)

Remarks

Moisture Content= 22.9%

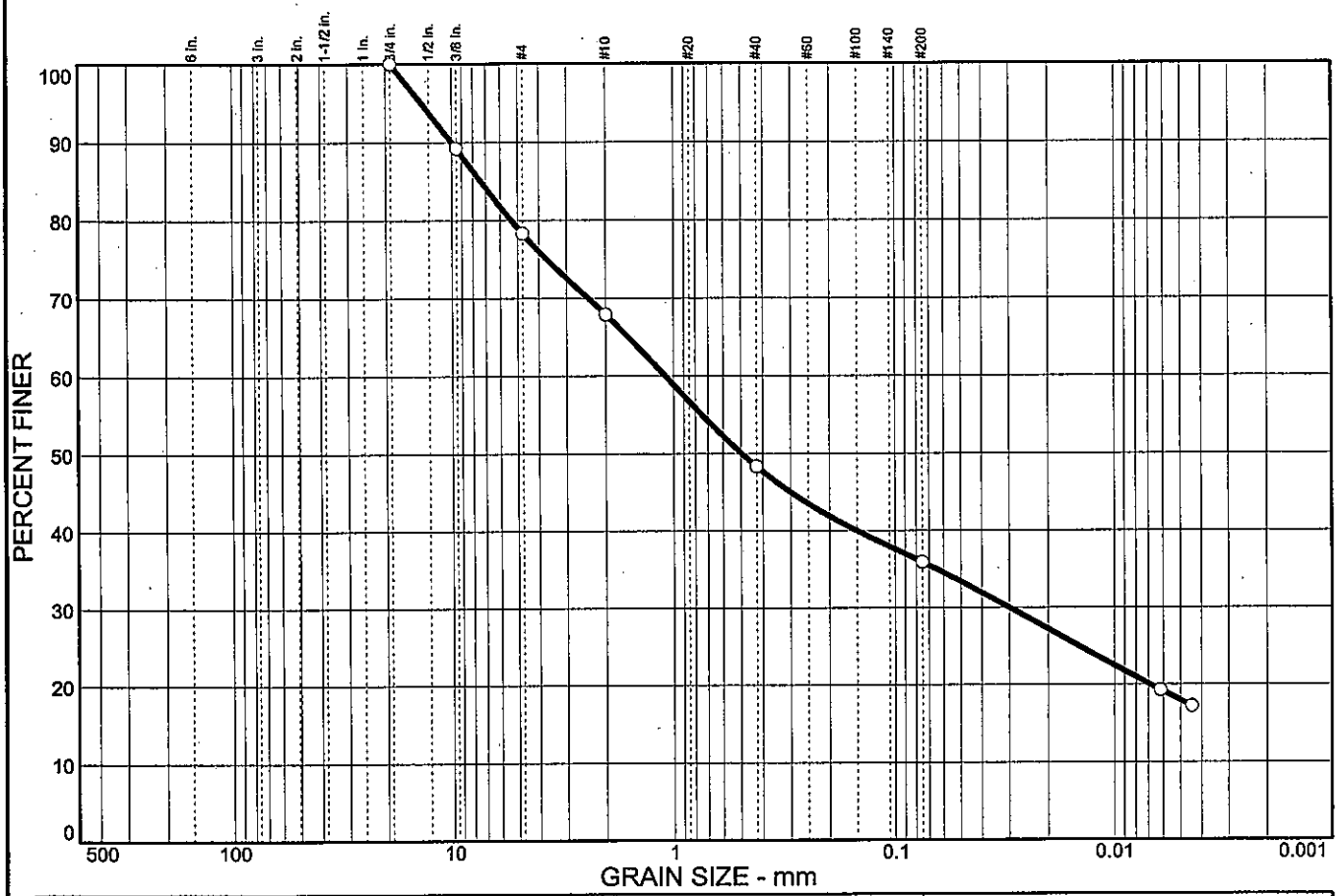
Sample No.: 4 **Source of Sample:** TR-50A **Date:** 4/13/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	21.7	10.4	19.6	12.4	17.9	18.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	89.2		
#4	78.3		
#10	67.9		
#40	48.3		
#200	35.9		

* (no specification provided)

Soil Description

Clayey sand with gravel

Atterberg Limits

PL= 17 LL= 33 PI= 16

Coefficients

D_{85}= 7.36 D_{60}= 1.09 D_{50}= 0.496
D_{30}= 0.0300 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(1)

Remarks

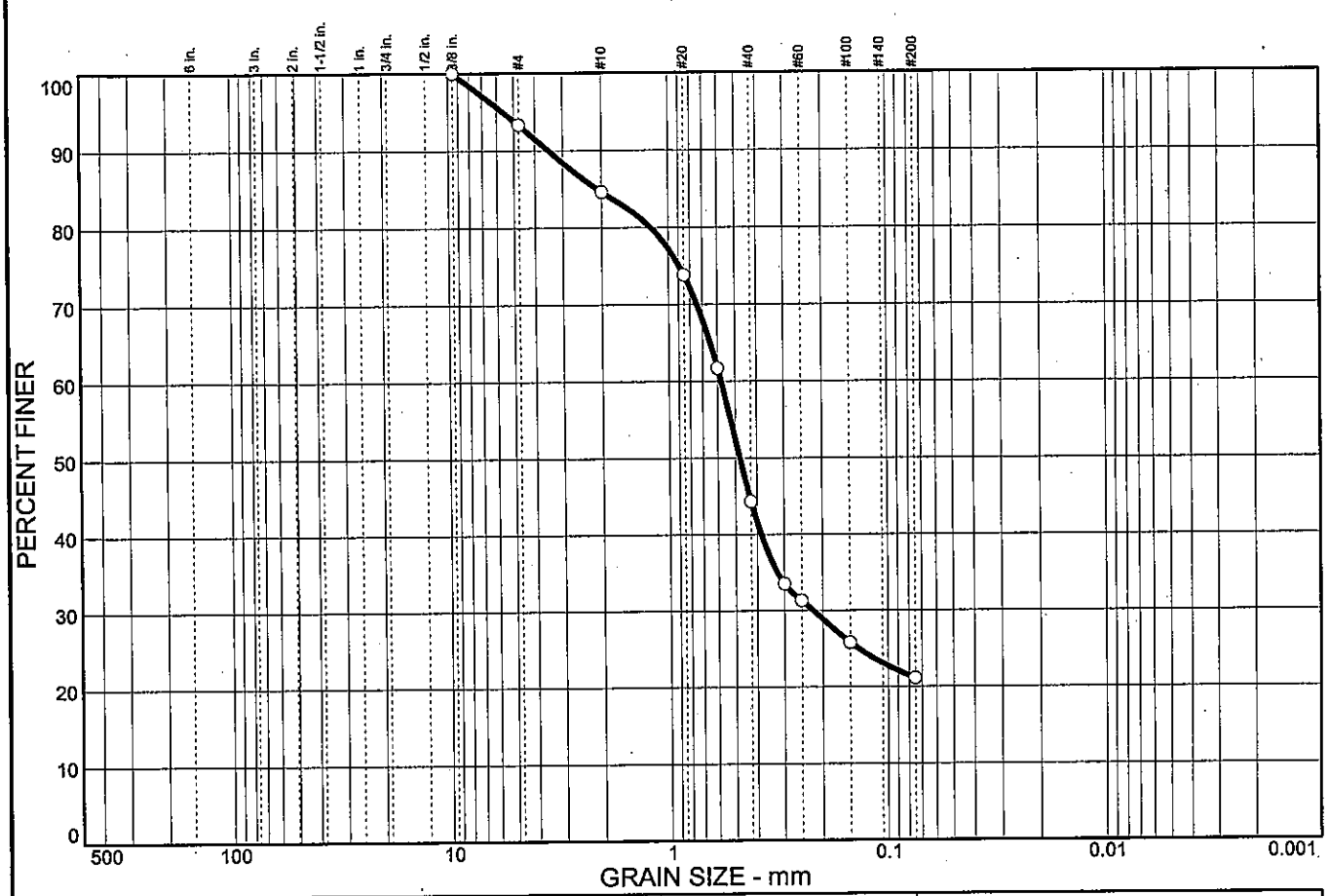
Moisture Content= 18.2%

Sample No.: 5 **Source of Sample:** TR-50A **Date:** 4/13/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.7	8.7	40.3	23.2	21.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	93.3		
#10	84.6		
#20	73.8		
#30	61.7		
#40	44.3		
#50	33.5		
#60	31.3		
#100	25.8		
#200	21.1		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 2.10 D_{60}= 0.579 D_{50}= 0.477
D_{30}= 0.221 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content= 20.7%

Sample No.: 8 **Source of Sample:** TR-50A **Date:** 4/15/05
Location: **Elev./Depth:** 18.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT

% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	18.9	23.3	23.7	20.1	14.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.50 in.	90.9		
0.375 in.	90.0		
#4	81.1		
#10	57.8		
#20	46.8		
#30	42.2		
#40	34.1		
#50	24.2		
#60	20.2		
#100	17.1		
#200	14.0		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 5.74 D_{60}= 2.20 D_{50}= 1.18
D_{30}= 0.369 D_{15}= 0.0896 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content= 12.4%

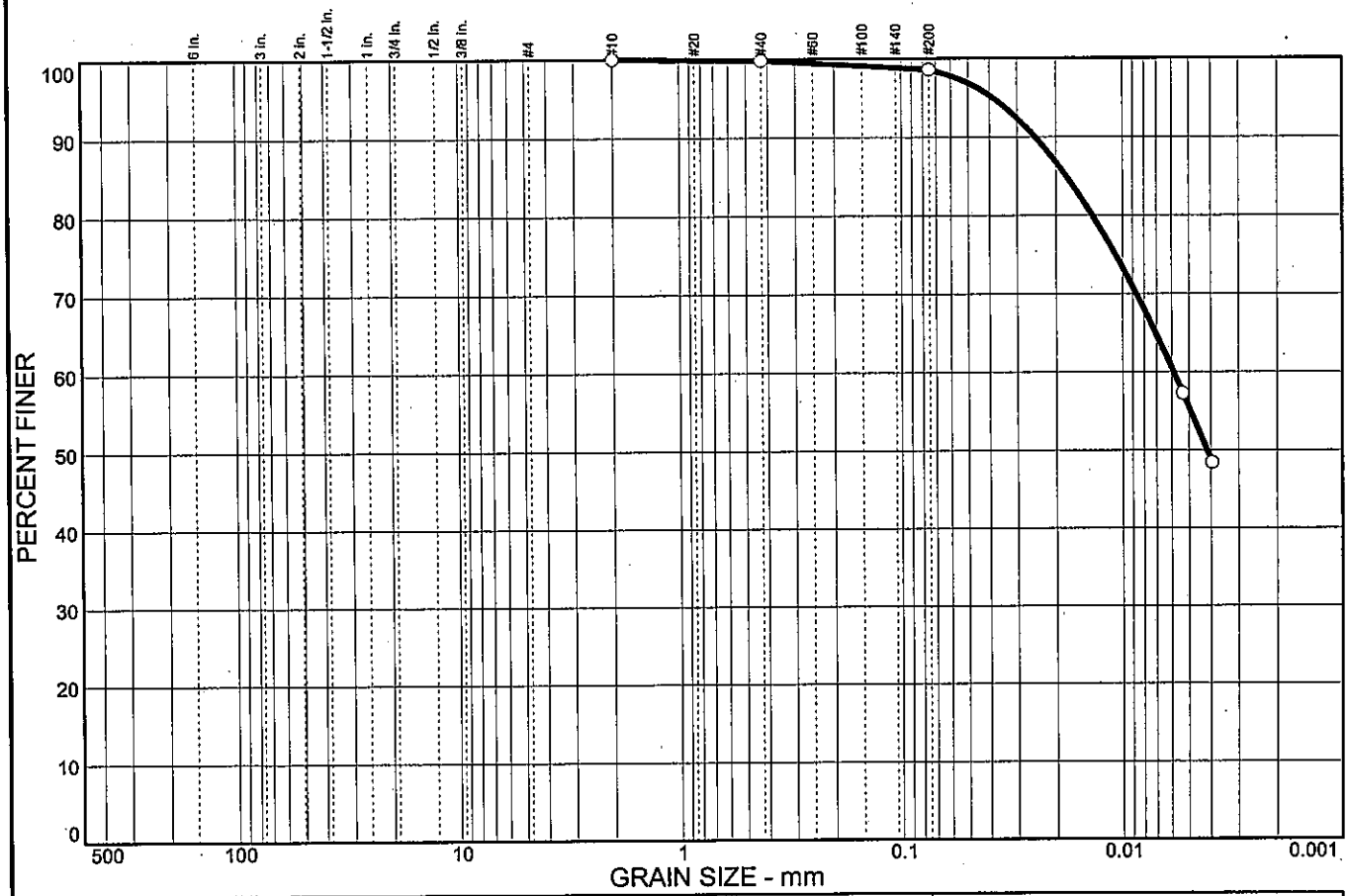
Sample No.: 9 **Source of Sample:** TR-50A **Date:** 4/15/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.2	1.2	43.2	55.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.8		
#200	98.6		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 22 LL= 42 PI= 20

Coefficients

D_{85}= 0.0179 D_{60}= 0.0059 D_{50}= 0.0042
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(22)

Remarks

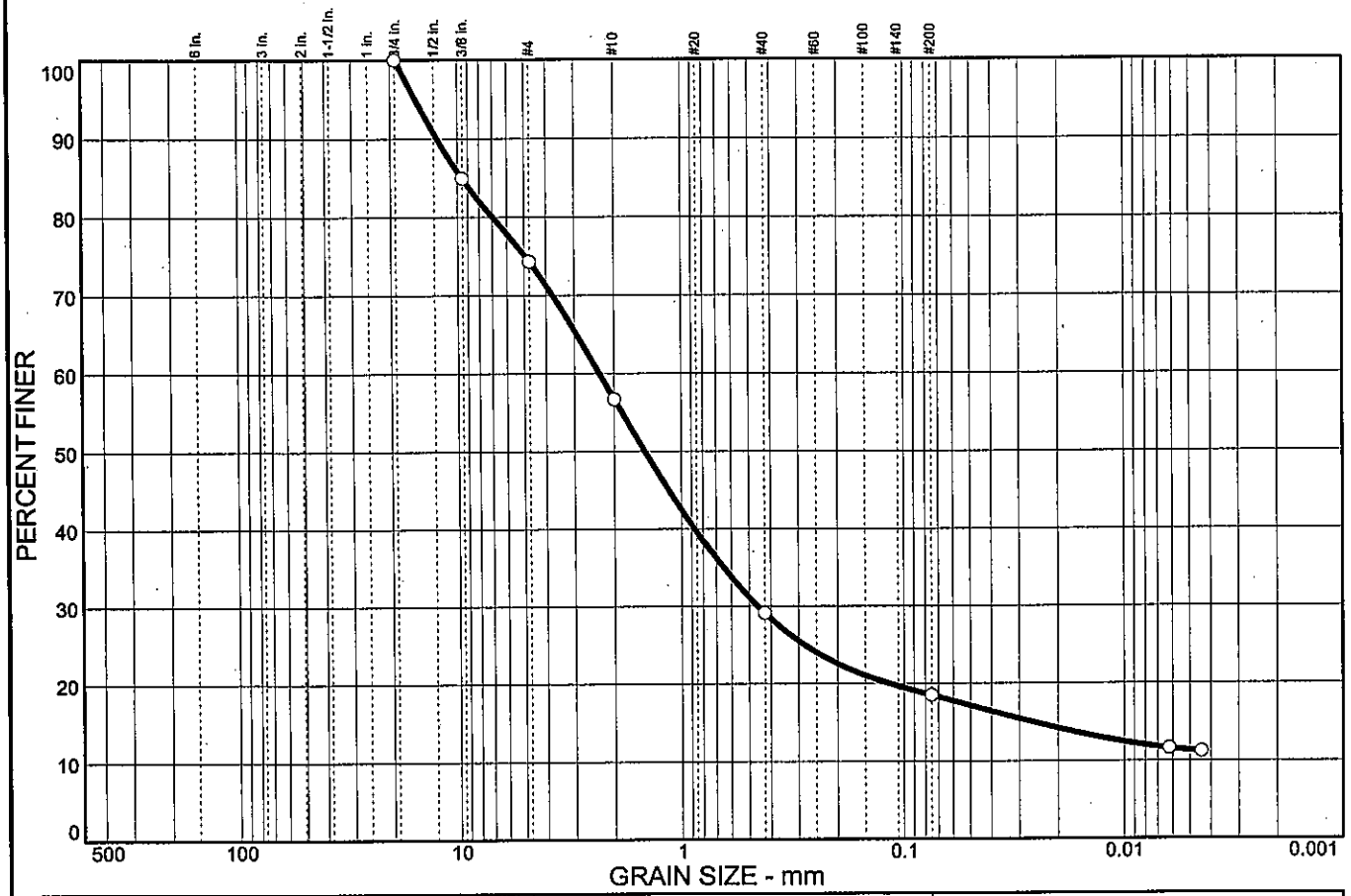
Moisture Content= 27.2%

Sample No.: 10 **Source of Sample:** TR-51 **Date:** 4/11/05
Location: **Elev./Depth:** 23.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	25.7	17.6	27.6	10.6	7.2	11.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	84.9		
#4	74.3		
#10	56.7		
#40	29.1		
#200	18.5		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 9.58 D_{60}= 2.33 D_{50}= 1.46
D_{30}= 0.457 D_{15}= 0.0259 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

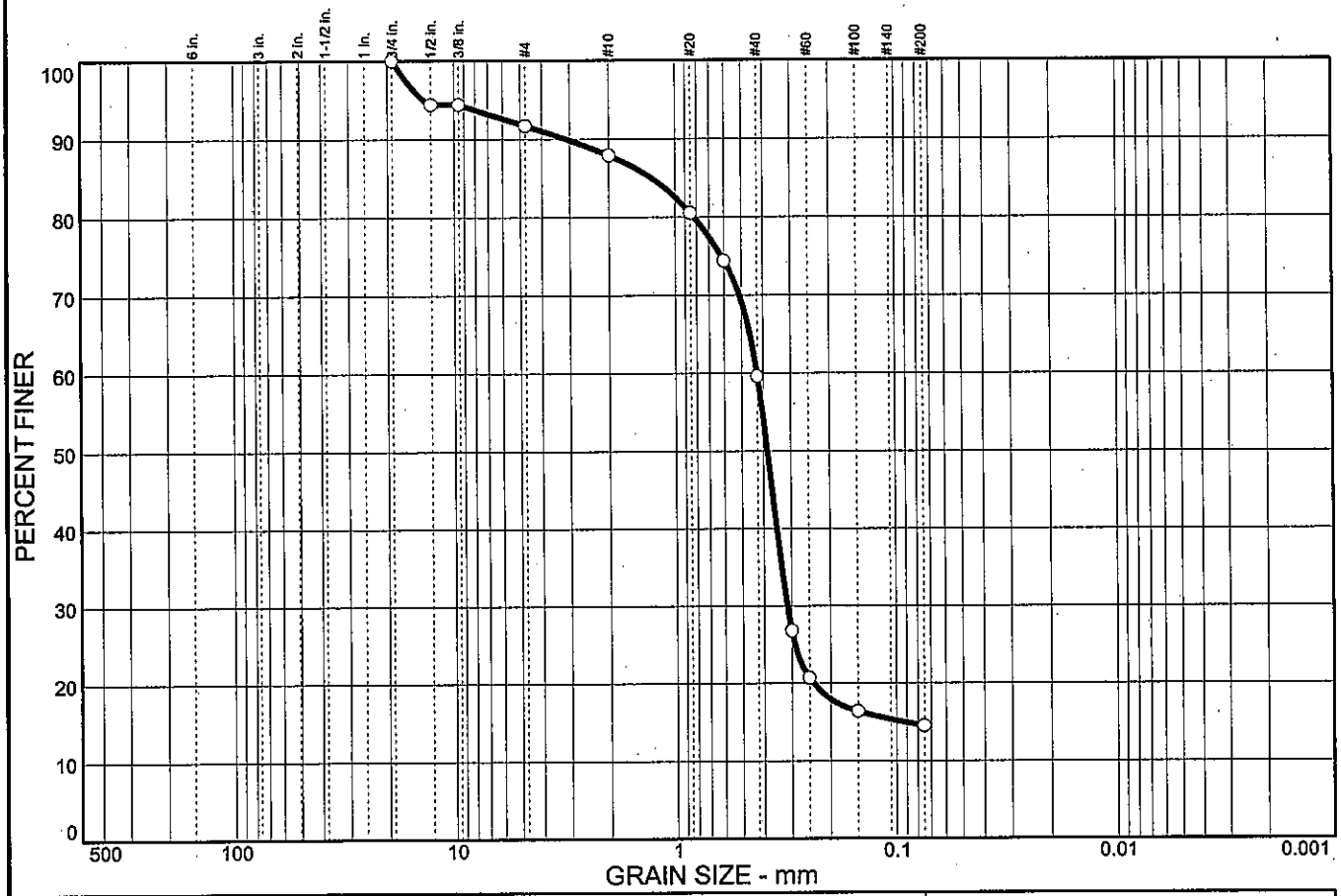
Moisture Content= 19.0%

Sample No.: 5 **Source of Sample:** TR-51 **Date:** 4/11/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	8.3	3.8	28.3	45.1	14.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.50 in.	94.4		
0.375 in.	94.4		
#4	91.7		
#10	87.9		
#20	80.5		
#30	74.4		
#40	59.6		
#50	26.8		
#60	20.7		
#100	16.4		
#200	14.5		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 1.28 D_{60}= 0.427 D_{50}= 0.384
D_{30}= 0.314 D_{15}= 0.0928 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture Content= 28.2%

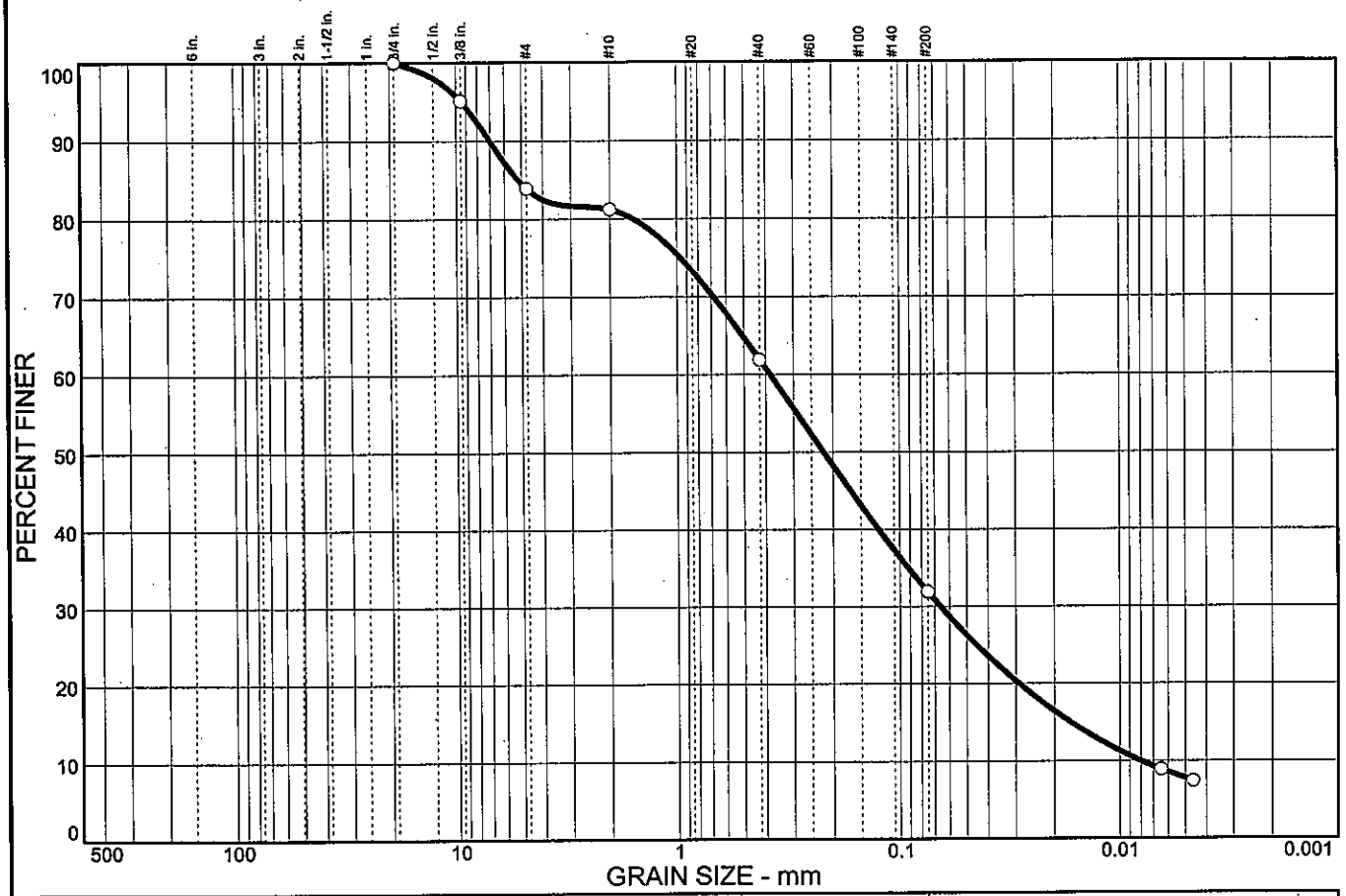
Sample No.: 6 **Source of Sample:** TR-51 **Date:** 4/11/05
Location: **Elev./Depth:** 13.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	16.1	2.7	19.3	30.0	24.1	7.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	95.1		
#4	83.9		
#10	81.2		
#40	61.9		
#200	31.9		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 5.19 D_{60}= 0.382 D_{50}= 0.220
D_{30}= 0.0658 D_{15}= 0.0168 D_{10}= 0.0080
C_u= 47.72 C_c= 1.41

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture Content= 15.2%

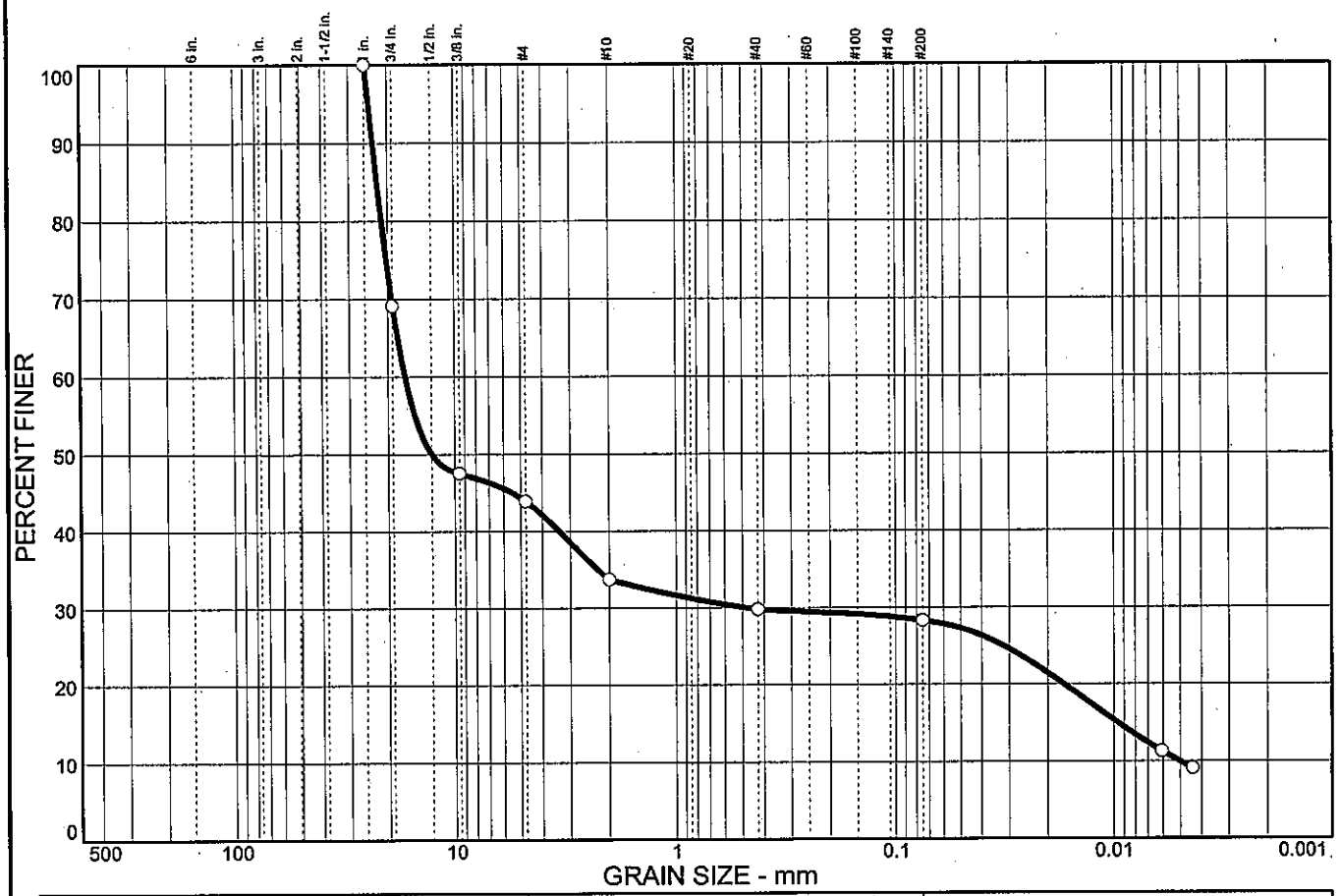
Sample No.: 9 **Source of Sample:** TR-51 **Date:** 4/11/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	30.9	25.2	10.2	3.9	1.5	18.3	10.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	69.1		
0.375 in.	47.5		
#4	43.9		
#10	33.7		
#40	29.8		
#200	28.3		

* (no specification provided)

Soil Description

Silty gravel with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 22.3 D_{60}= 16.8 D_{50}= 12.7
D_{30}= 0.475 D_{15}= 0.0096 D_{10}= 0.0050
C_u= 3332.72 C_c= 2.68

Classification

USCS= GM AASHTO= A-2-4(0)

Remarks

Moisture Content= 7.6%

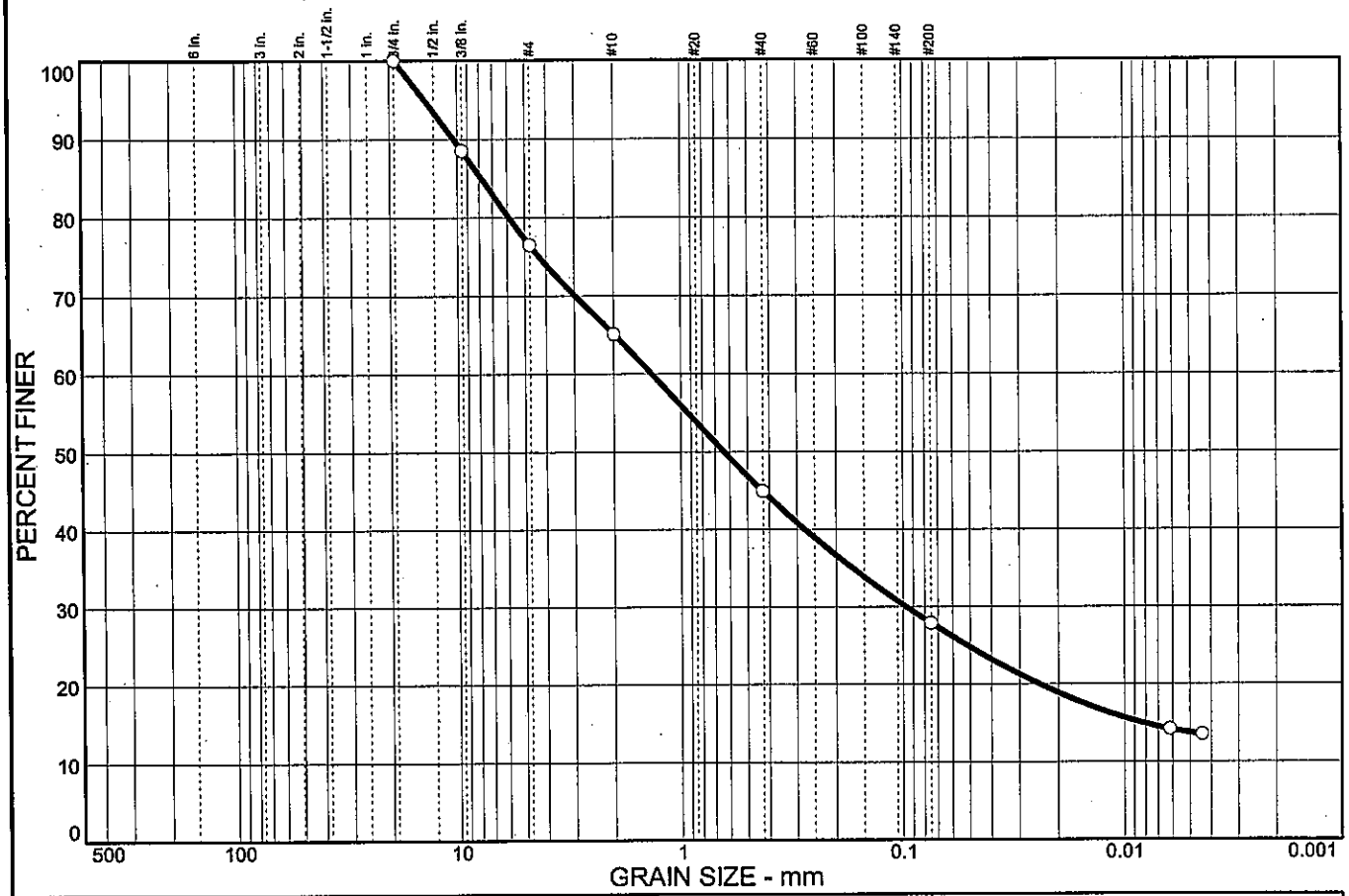
Sample No.: 5 **Source of Sample:** TR-52 **Date:** 4/26/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	23.5	11.4	20.2	17.0	14.2	13.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	88.5		
#4	76.5		
#10	65.1		
#40	44.9		
#200	27.9		

* (no specification provided)

Soil Description

Clayey sand with gravel

Atterberg Limits

PL= 18 LL= 33 PI= 15

Coefficients

D_{85}= 7.82 D_{60}= 1.35 D_{50}= 0.637
D_{30}= 0.0969 D_{15}= 0.0082 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(1)

Remarks

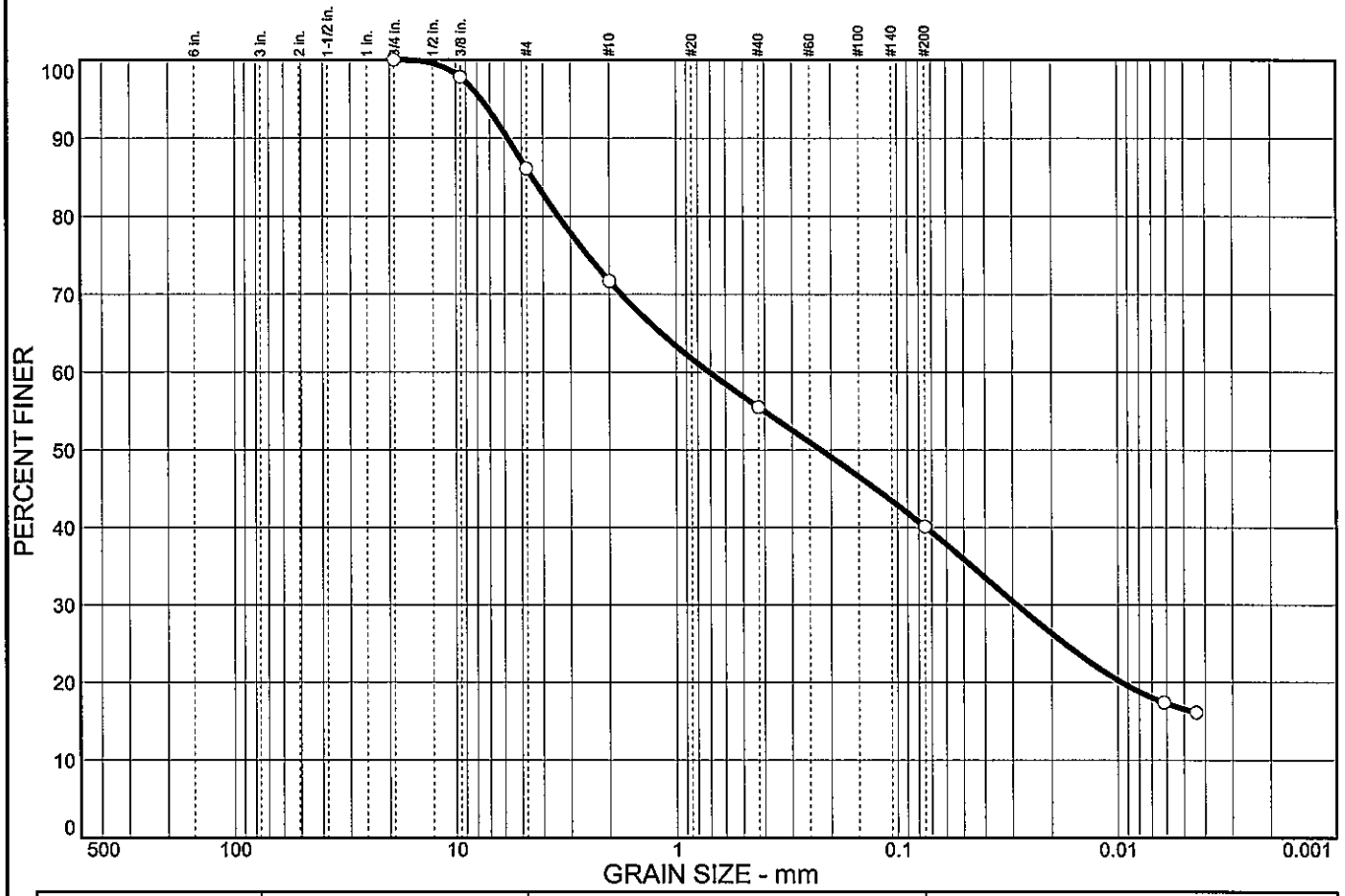
Moisture Content= 14.4%

Sample No.: 9 **Source of Sample:** TR-52 **Date:** 4/25/05
Location: **Elev./Depth:** 21.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	13.9	14.4	16.2	15.4	23.5	16.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.8		
#4	86.1		
#10	71.7		
#40	55.5		
#200	40.1		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 4.48 D_{60}= 0.708 D_{50}= 0.222
D_{30}= 0.0286 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Moisture Content= 13.9%

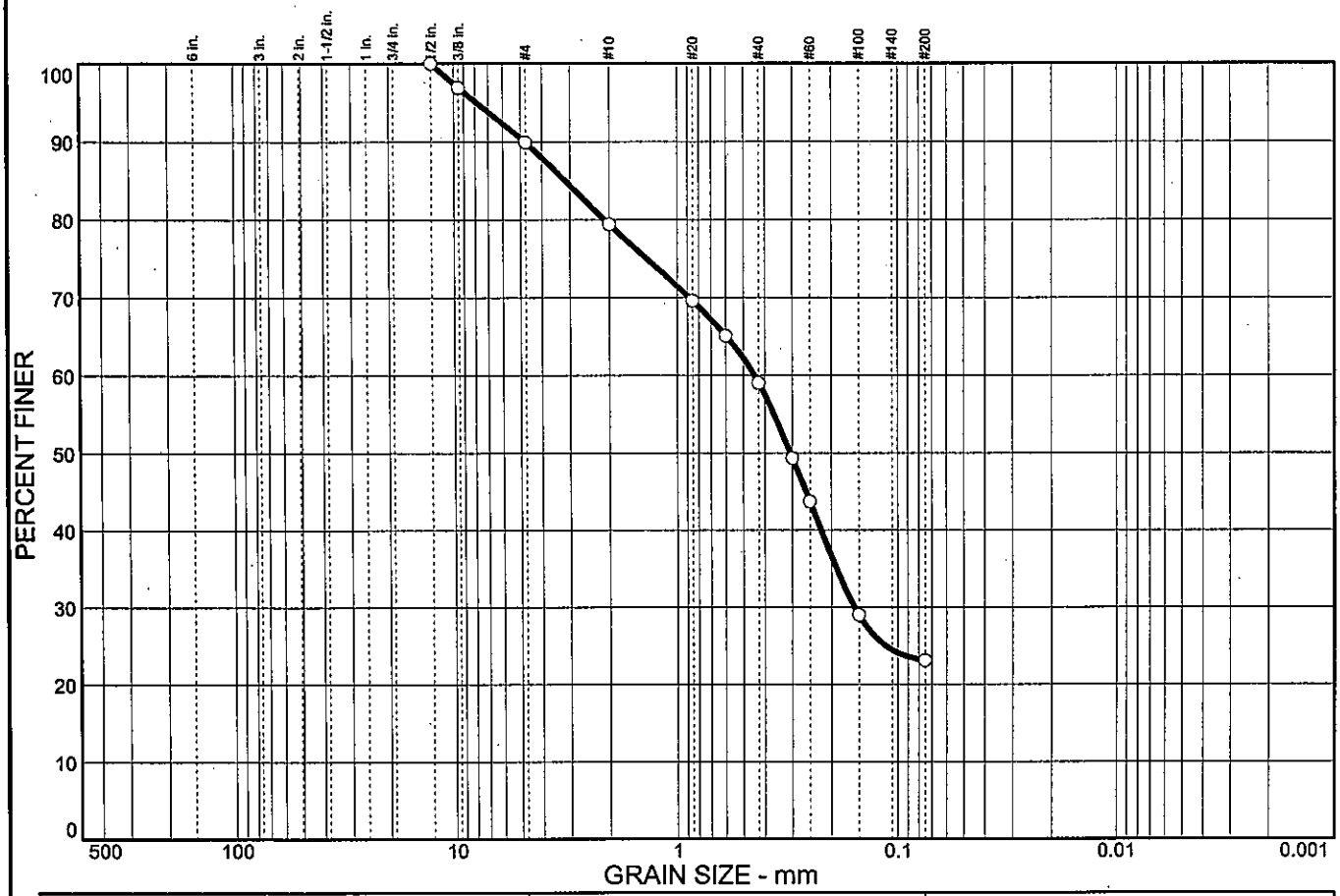
Sample No.: 2 **Source of Sample:** TR-53A **Date:** 4/11/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	10.1	10.5	20.4	35.9	23.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.50 in.	100.0		
0.375 in.	96.9		
#4	89.9		
#10	79.4		
#20	69.6		
#30	65.1		
#40	59.0		
#50	49.3		
#60	43.7		
#100	29.0		
#200	23.1		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 3.14 D_{60}= 0.445 D_{50}= 0.307
D_{30}= 0.157 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

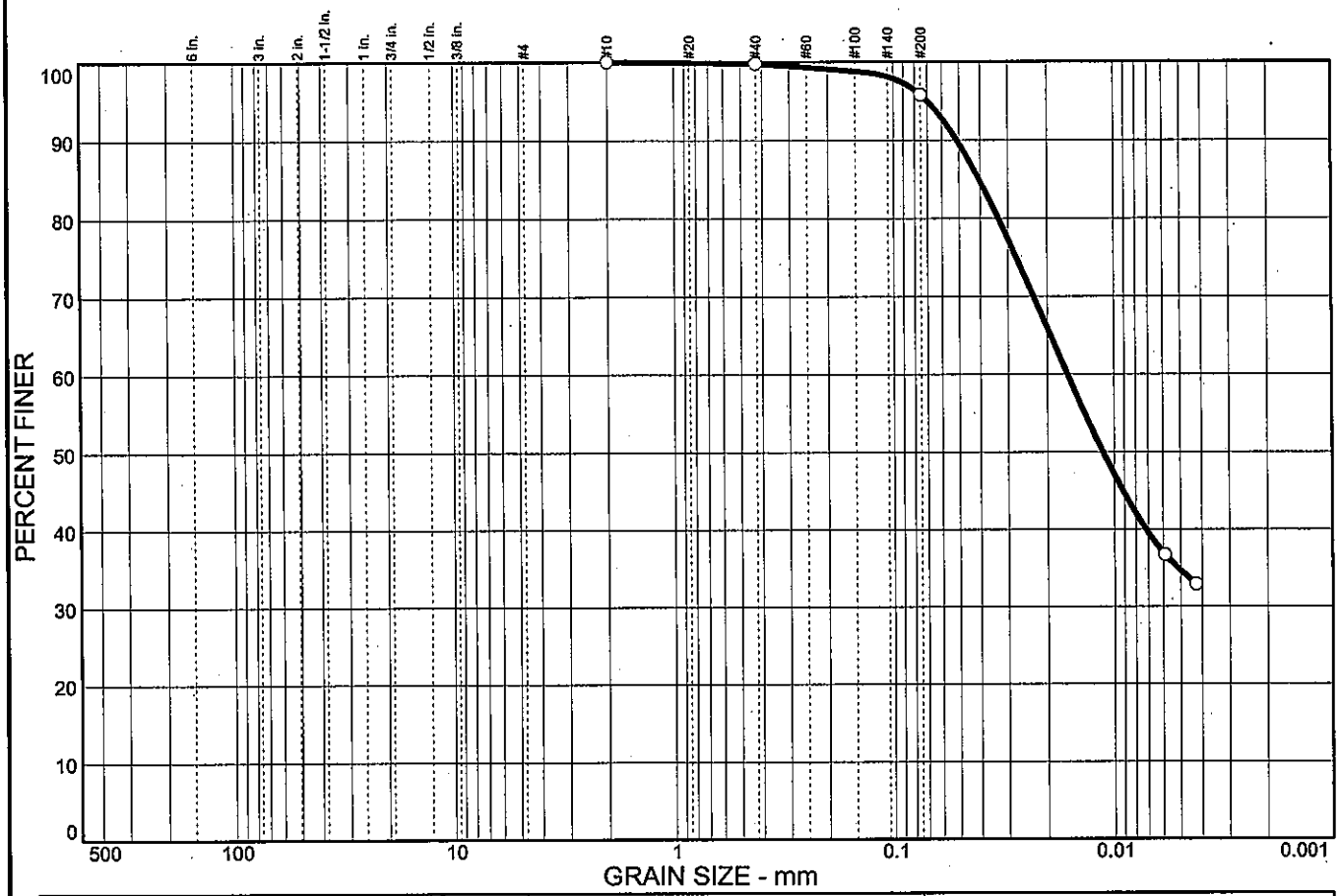
Moisture Content= 6.5%

Sample No.: 3 **Source of Sample:** TR-53A **Date:** 4/11/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.2	4.0	61.1	34.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.8		
#200	95.8		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 35 PI= 16

Coefficients

D_{85}= 0.0406 D_{60}= 0.0162 D_{50}= 0.0112
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(16)

Remarks

Moisture Content= 21.6%

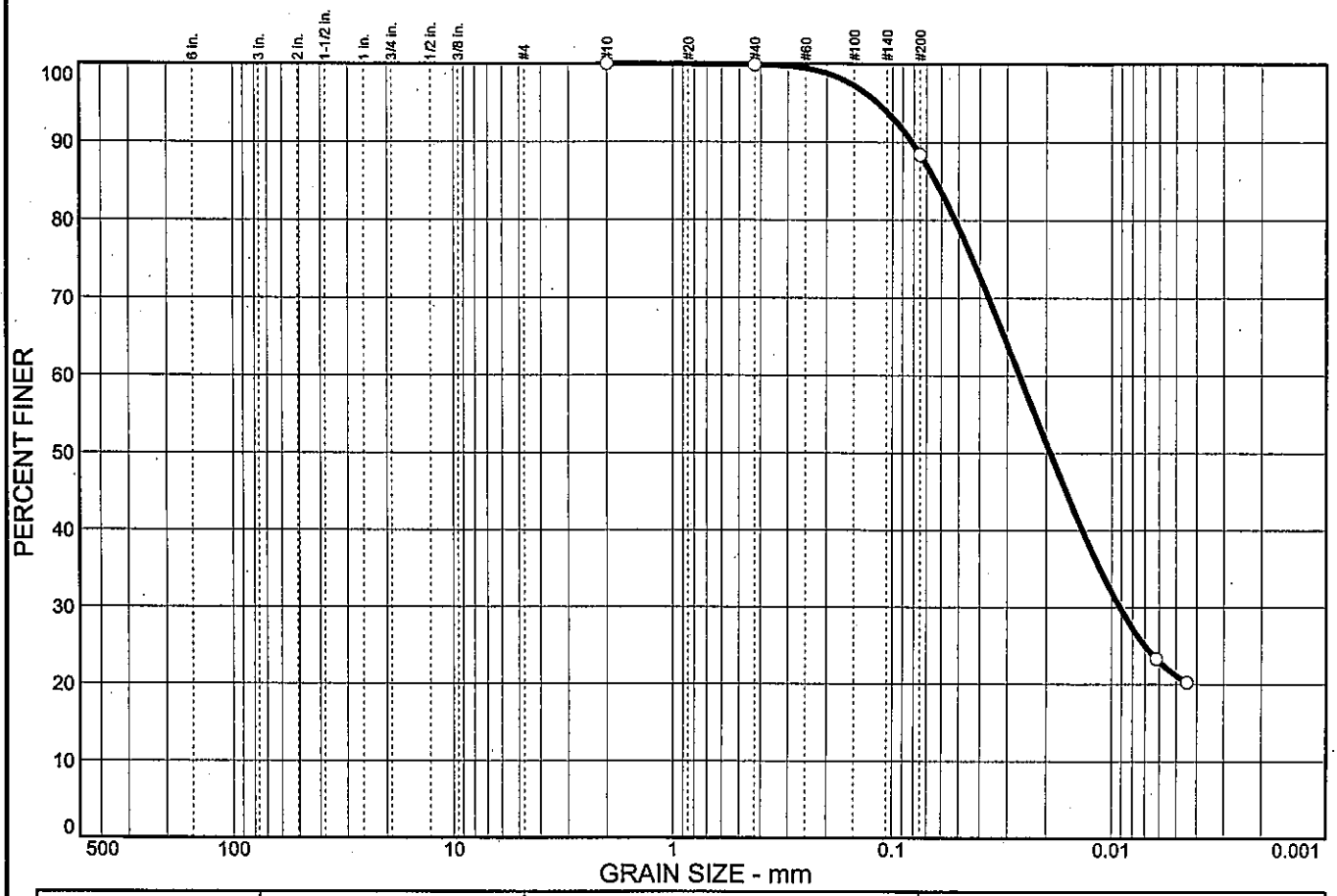
Sample No.: 2 **Source of Sample:** TR-54 **Date:** 4/12/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.1	11.5	67.3	21.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.9		
#200	88.4		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 18 LL= 28 PI= 10

Coefficients

D_{85}= 0.0638 D_{60}= 0.0264 D_{50}= 0.0191
D_{30}= 0.0091 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(7)

Remarks

Moisture Content= 20.2%

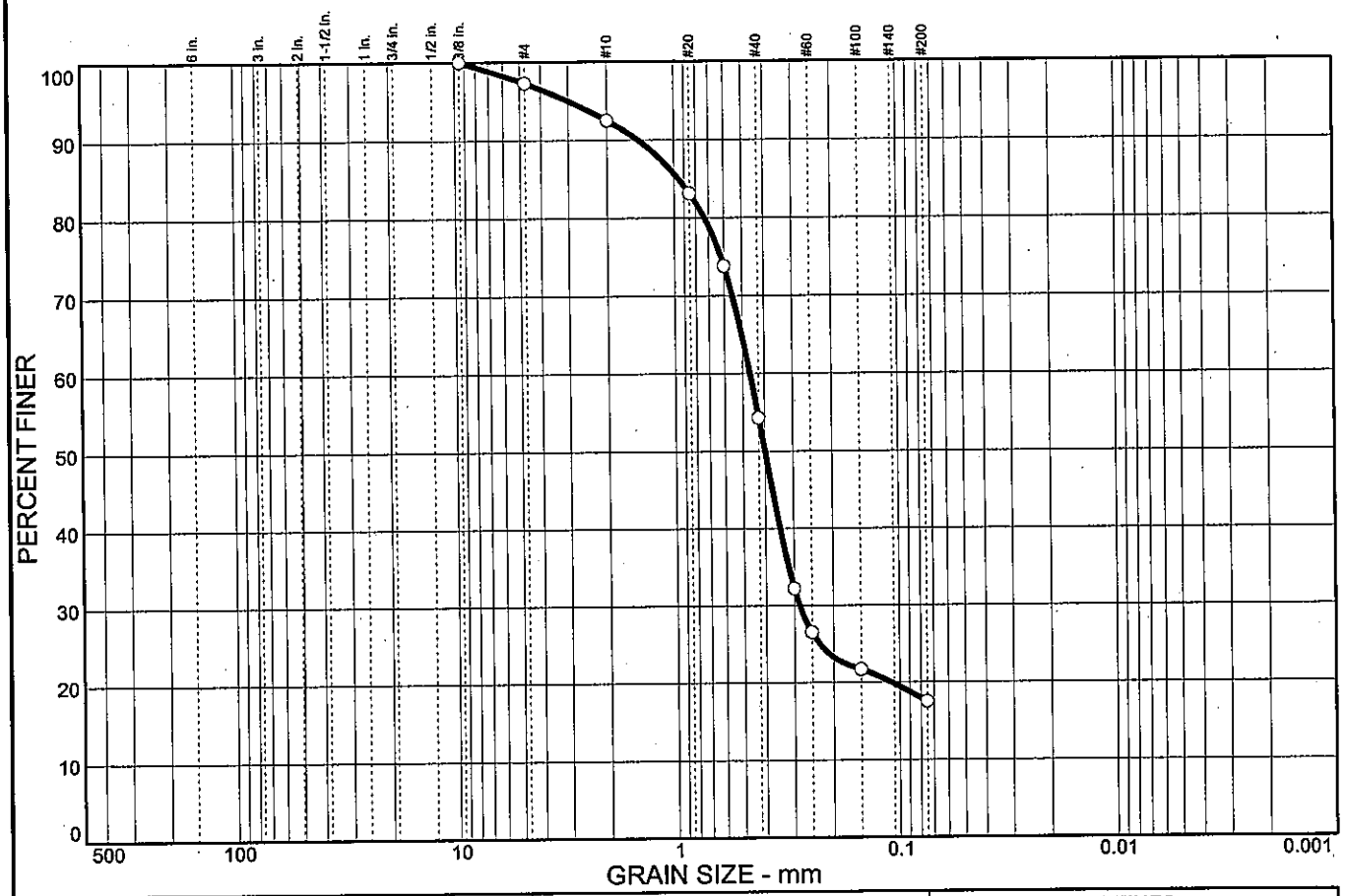
Sample No.: 3 **Source of Sample:** TR-54 **Date:** 4/12/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.7	4.8	38.2	36.8	17.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	97.3		
#10	92.5		
#20	83.1		
#30	73.8		
#40	54.3		
#50	32.2		
#60	26.5		
#100	21.7		
#200	17.5		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.954 D_{60}= 0.463 D_{50}= 0.400
D_{30}= 0.284 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

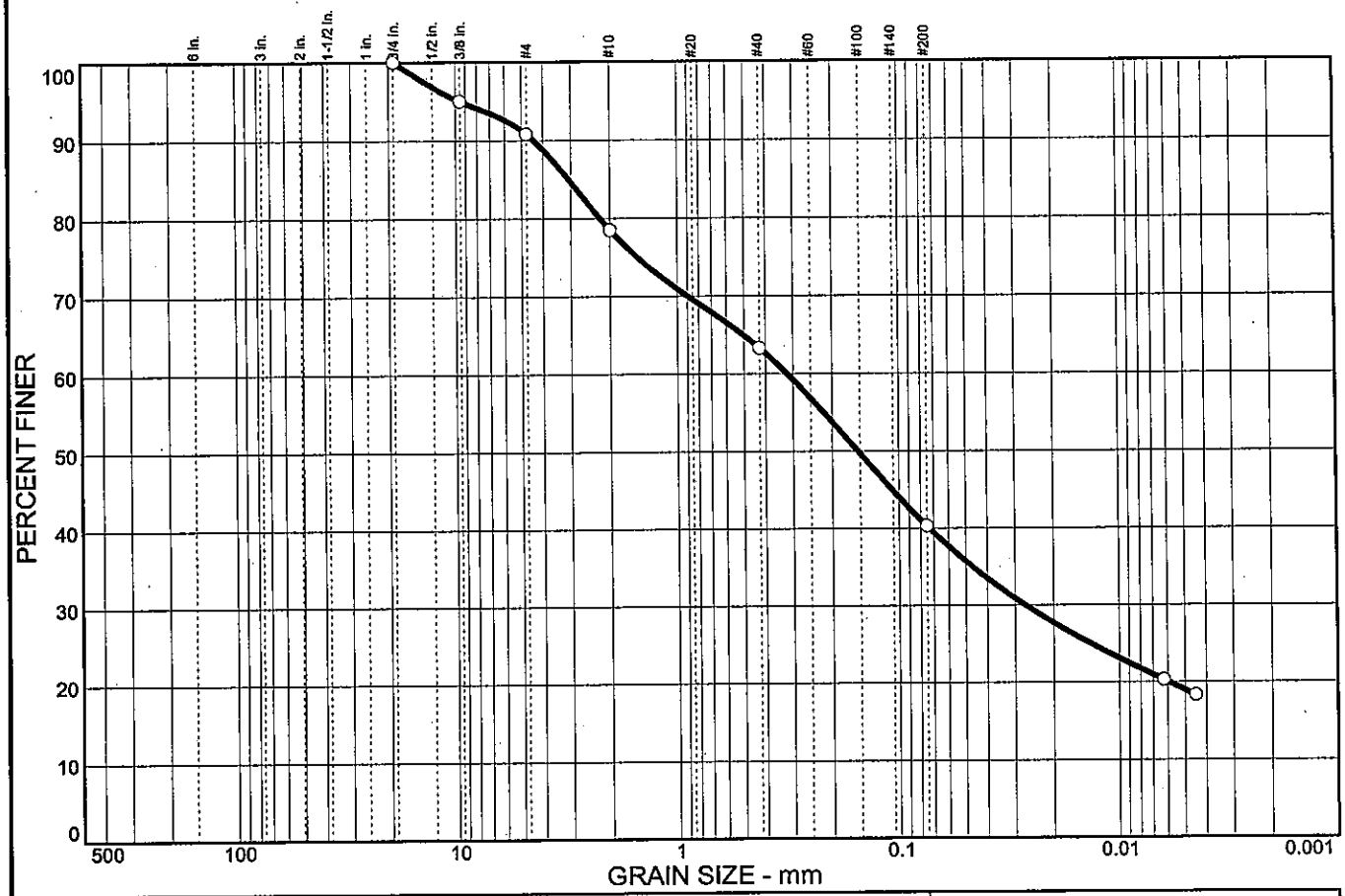
Moisture Content= 17.8%

Sample No.: 5 **Source of Sample:** TR-54 **Date:** 4/12/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	9.2	12.3	15.2	23.0	21.3	19.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	95.0		
#4	90.8		
#10	78.5		
#40	63.3		
#200	40.3		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 14 LL= 25 PI= 11

Coefficients

D_{85}= 3.07 D_{60}= 0.319 D_{50}= 0.153
D_{30}= 0.0269 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(1)

Remarks

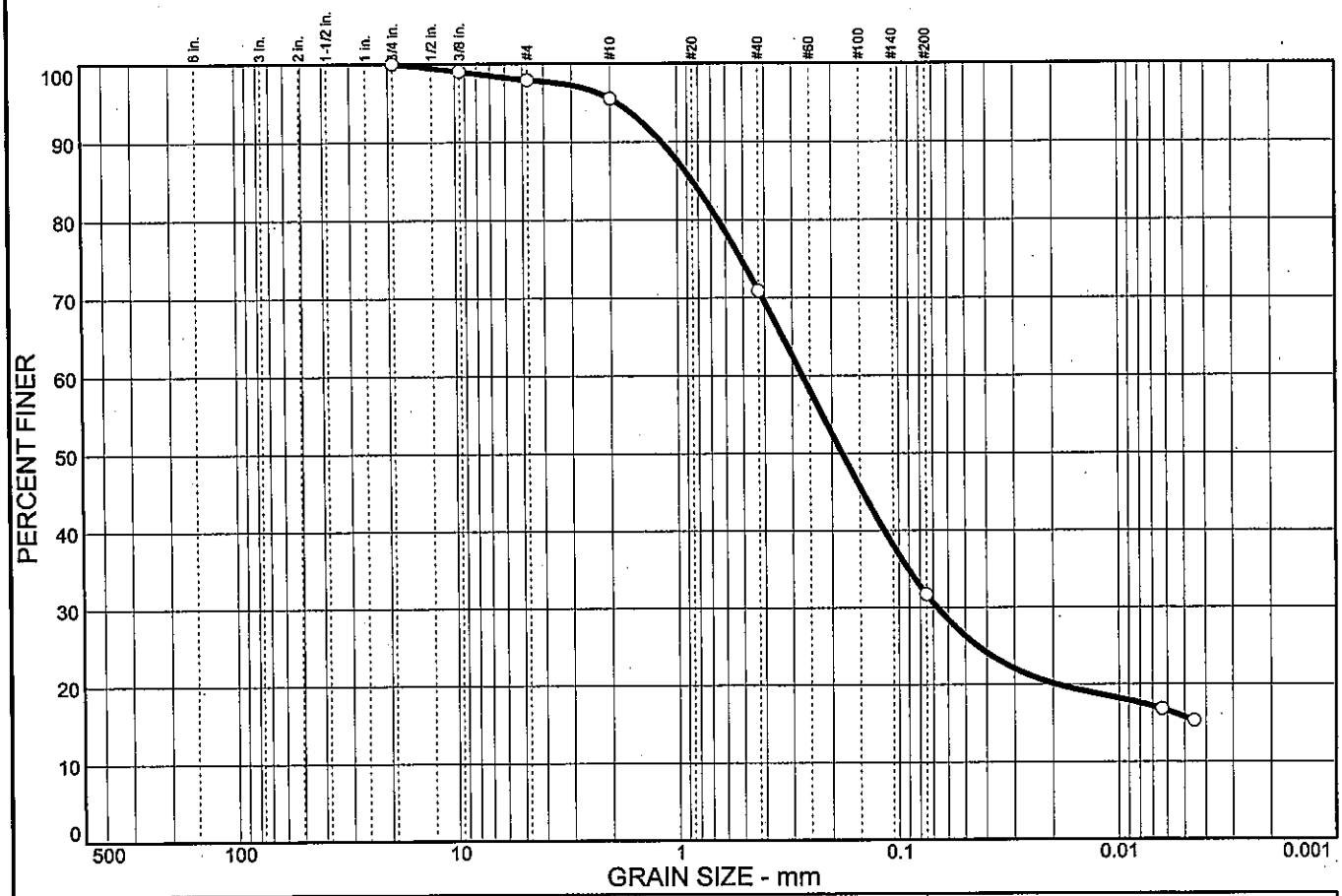
Moisture Content= 10.3%

Sample No.: 3 **Source of Sample:** TR-55A **Date:** 4/12/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.1	2.4	24.6	39.2	15.9	15.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.0		
#4	97.9		
#10	95.5		
#40	70.9		
#200	31.7		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.850 D_{60}= 0.270 D_{50}= 0.180
D_{30}= 0.0671 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

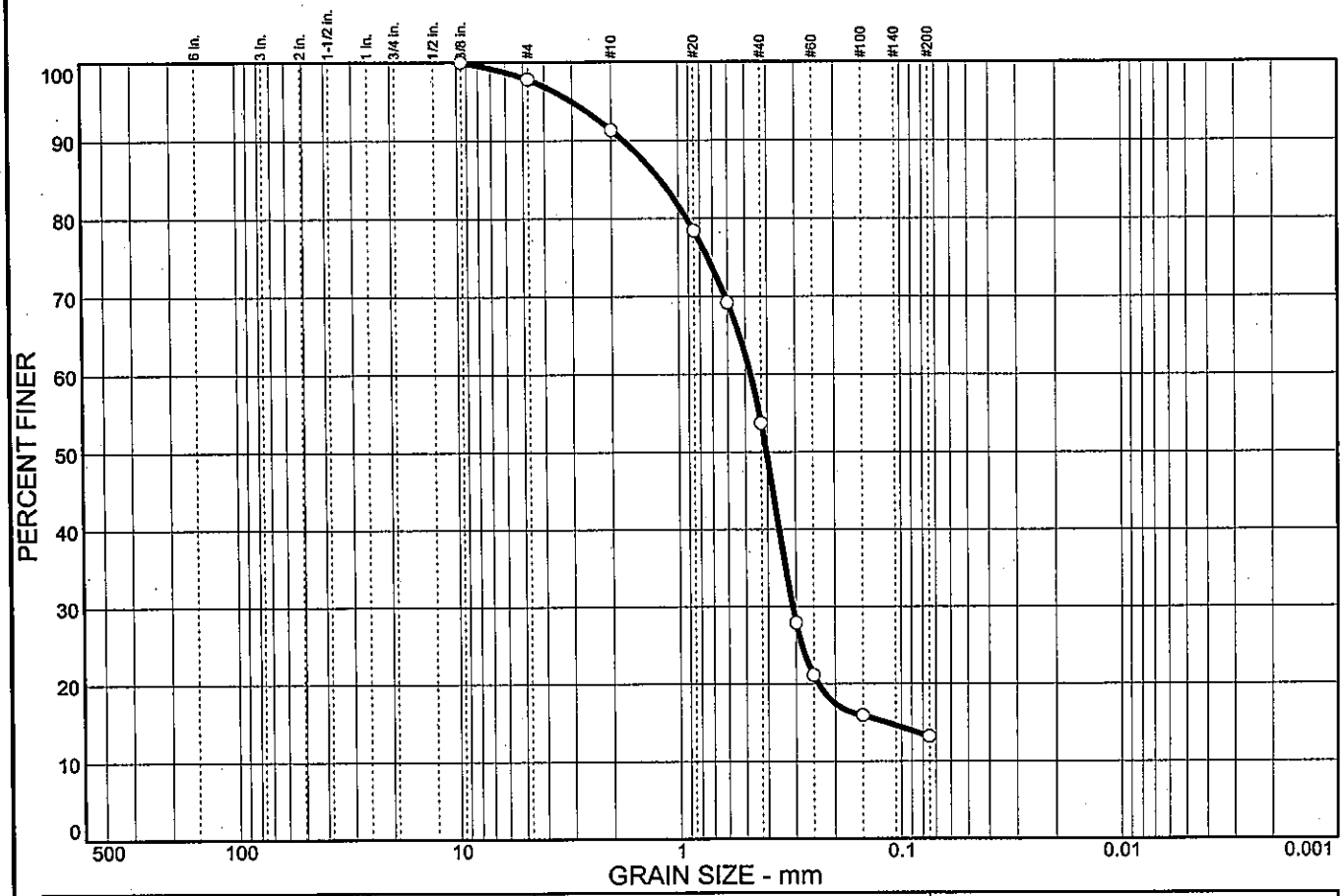
Moisture Content= 10.2%

Sample No.: 4 **Source of Sample:** TR-55A **Date:** 4/12/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.2	6.5	37.6	40.5	13.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	97.8		
#10	91.3		
#20	78.4		
#30	69.2		
#40	53.7		
#50	27.9		
#60	21.1		
#100	15.9		
#200	13.2		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 1.21 D_{60}= 0.473 D_{50}= 0.404
D_{30}= 0.311 D_{15}= 0.117 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Moisture Content= 19.5%

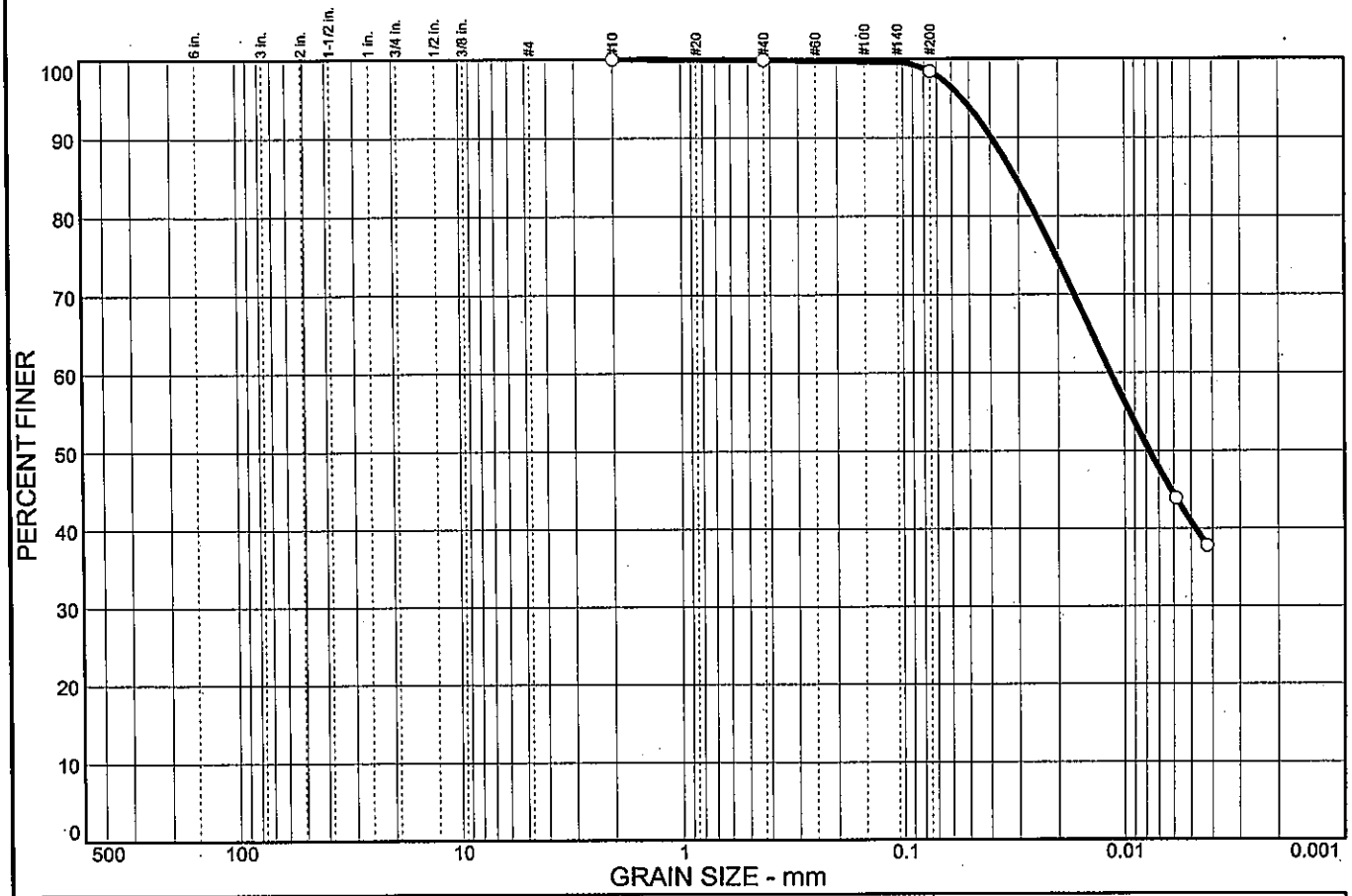
Sample No.: 6 **Source of Sample:** TR-55A **Date:** 4/12/05
Location: **Elev./Depth:** 13.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.1	1.5	57.5	40.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.9		
#200	98.4		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 39 PI= 20

Coefficients

D_{85}= 0.0311 D_{60}= 0.0115 D_{50}= 0.0077
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(21)

Remarks

Moisture Content= 20.3%

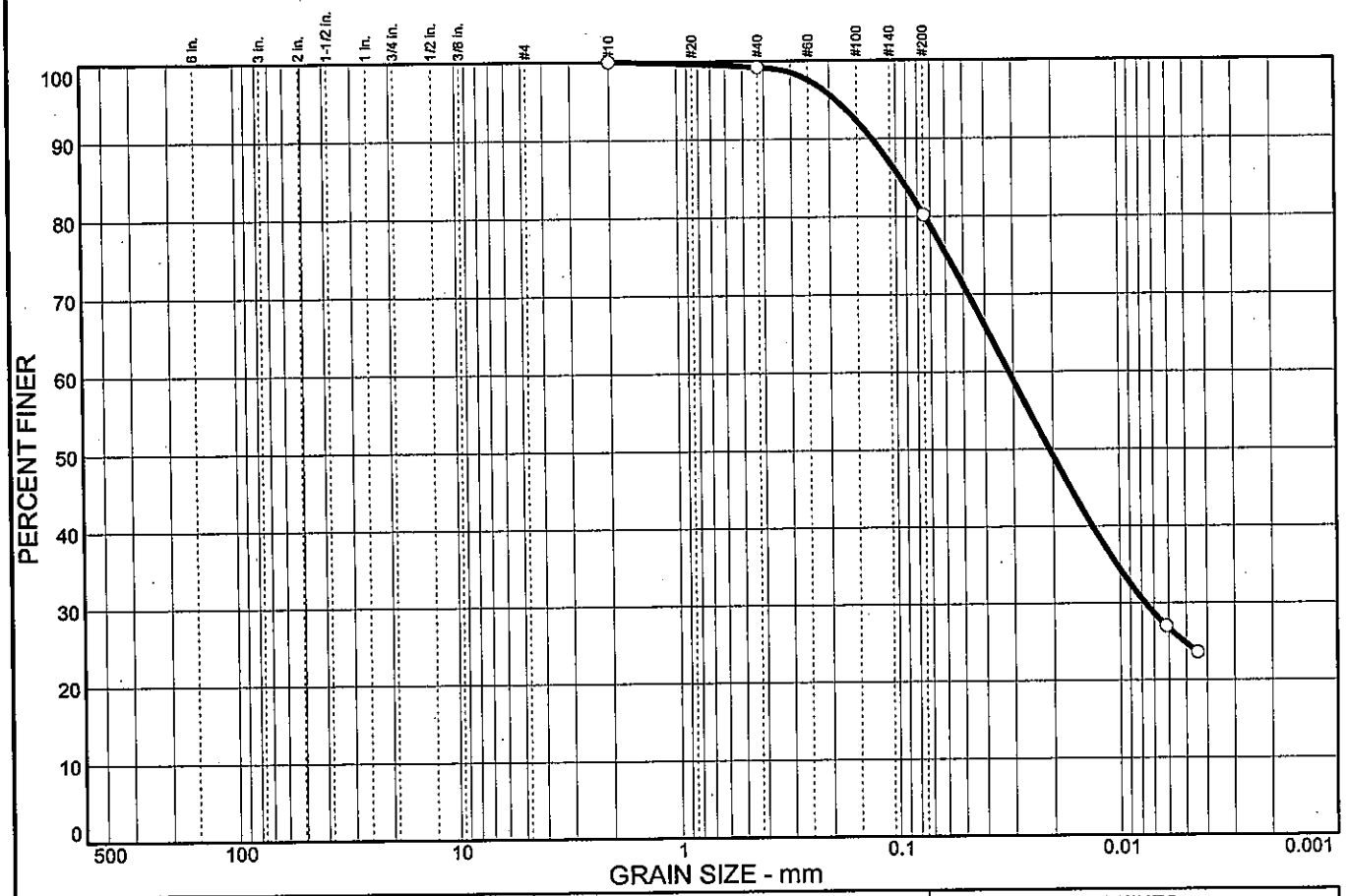
Sample No.: 3 **Source of Sample:** TR-56 **Date:** 4/12/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.8	19.0	55.4	24.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.2		
#200	80.2		

* (no specification provided)

Soil Description

Lean clay with sand

Atterberg Limits

PL= 16 LL= 26 PI= 10

Coefficients

D_{85}= 0.0957 D_{60}= 0.0314 D_{50}= 0.0207
D_{30}= 0.0077 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(6)

Remarks

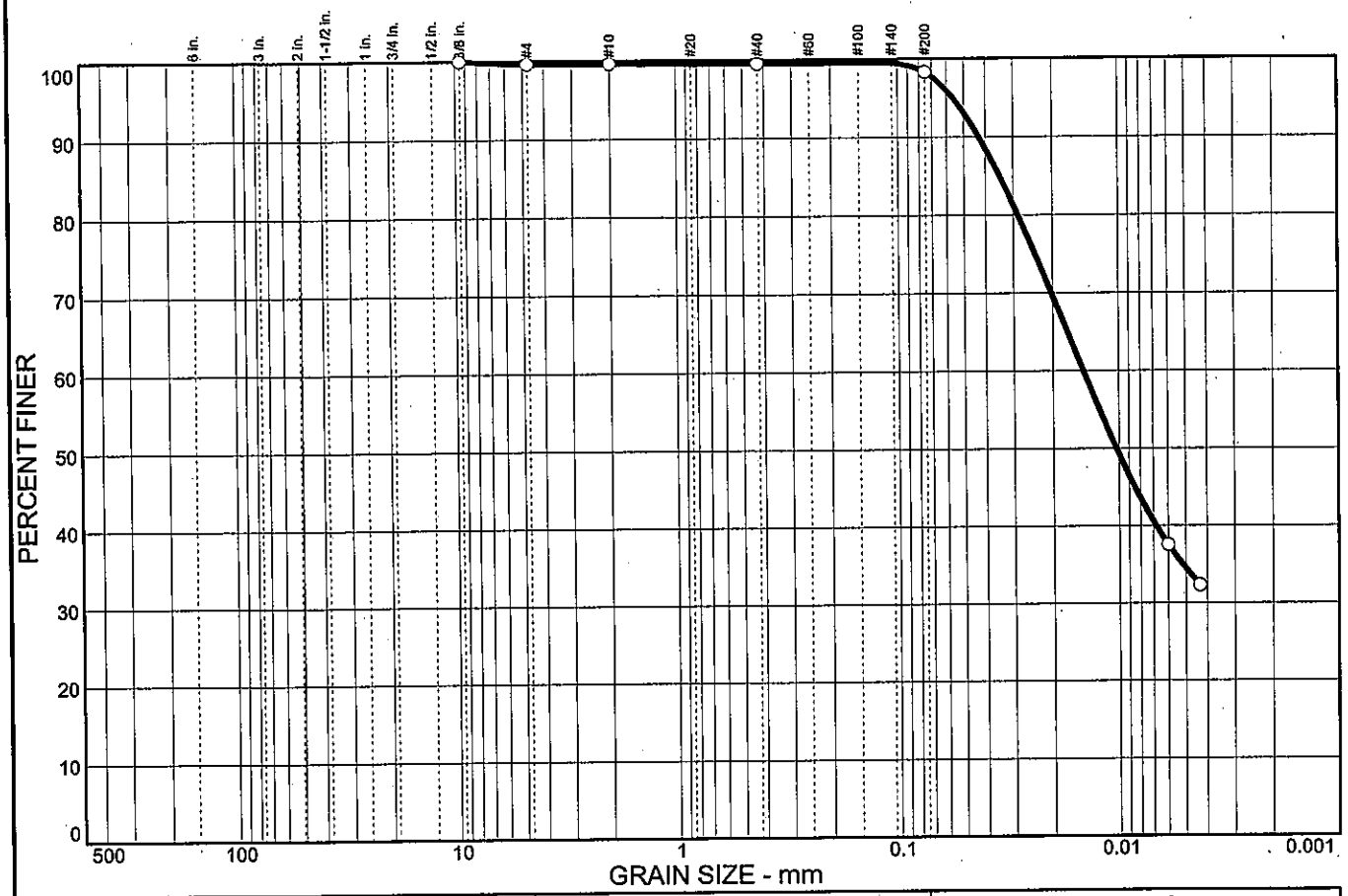
Moisture Content= 23.3%

Sample No.: 4 **Source of Sample:** TR-56 **Date:** 4/12/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.4	0.0	0.1	1.2	63.8	34.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.6		
#10	99.6		
#40	99.5		
#200	98.3		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 35 PI= 16

Coefficients

D_{85}= 0.0346 D_{60}= 0.0145 D_{50}= 0.0103
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(16)

Remarks

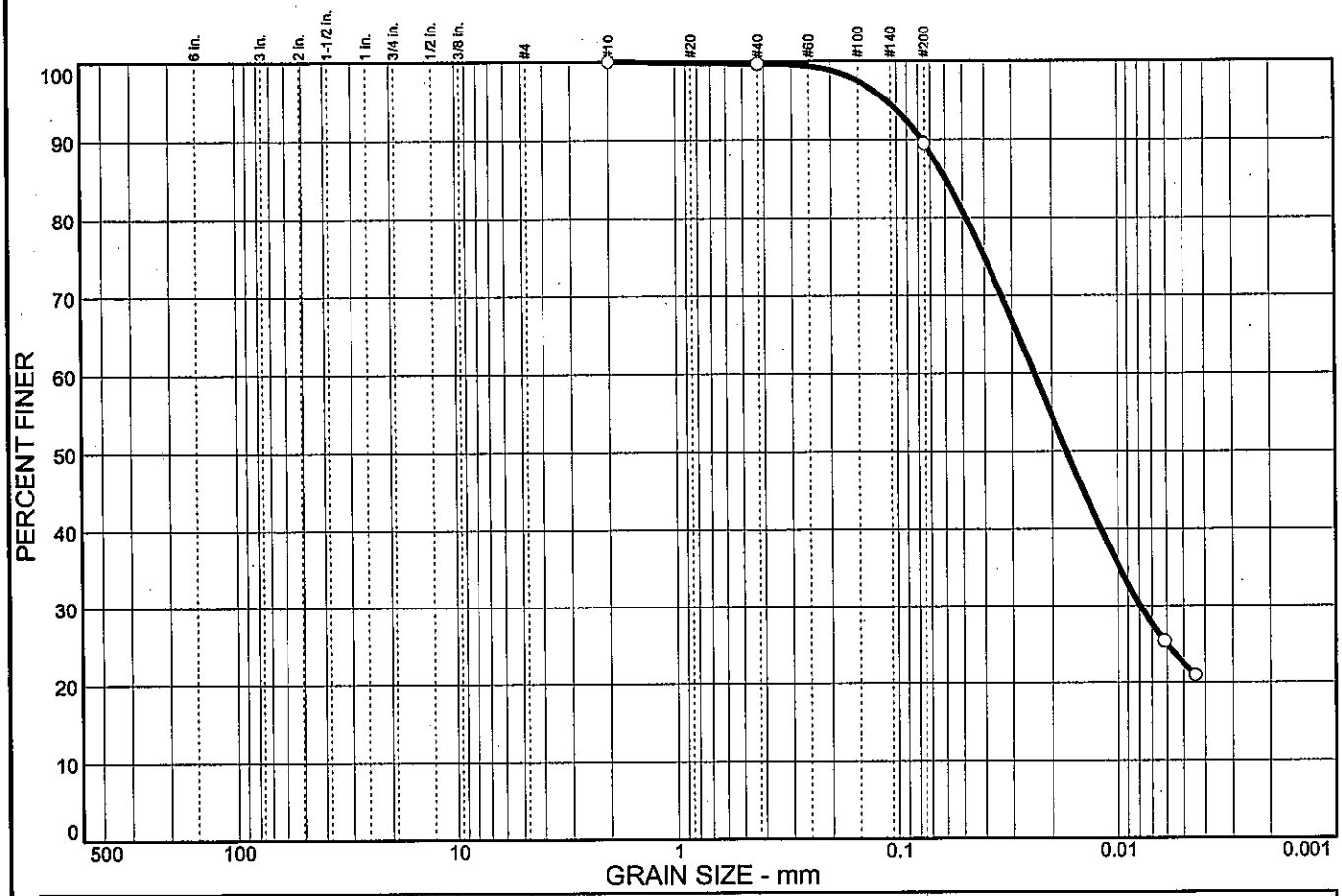
Moisture Content= 22.5%

Sample No.: 3 **Source of Sample:** TR-57 **Date:** 4/25/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.3	10.2	67.0	22.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.7		
#200	89.5		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 19 LL= 29 PI= 10

Coefficients

D_{85}= 0.0598 D_{60}= 0.0239 D_{50}= 0.0171
D_{30}= 0.0079 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-4(8)

Remarks

Moisture Content= 24.2%

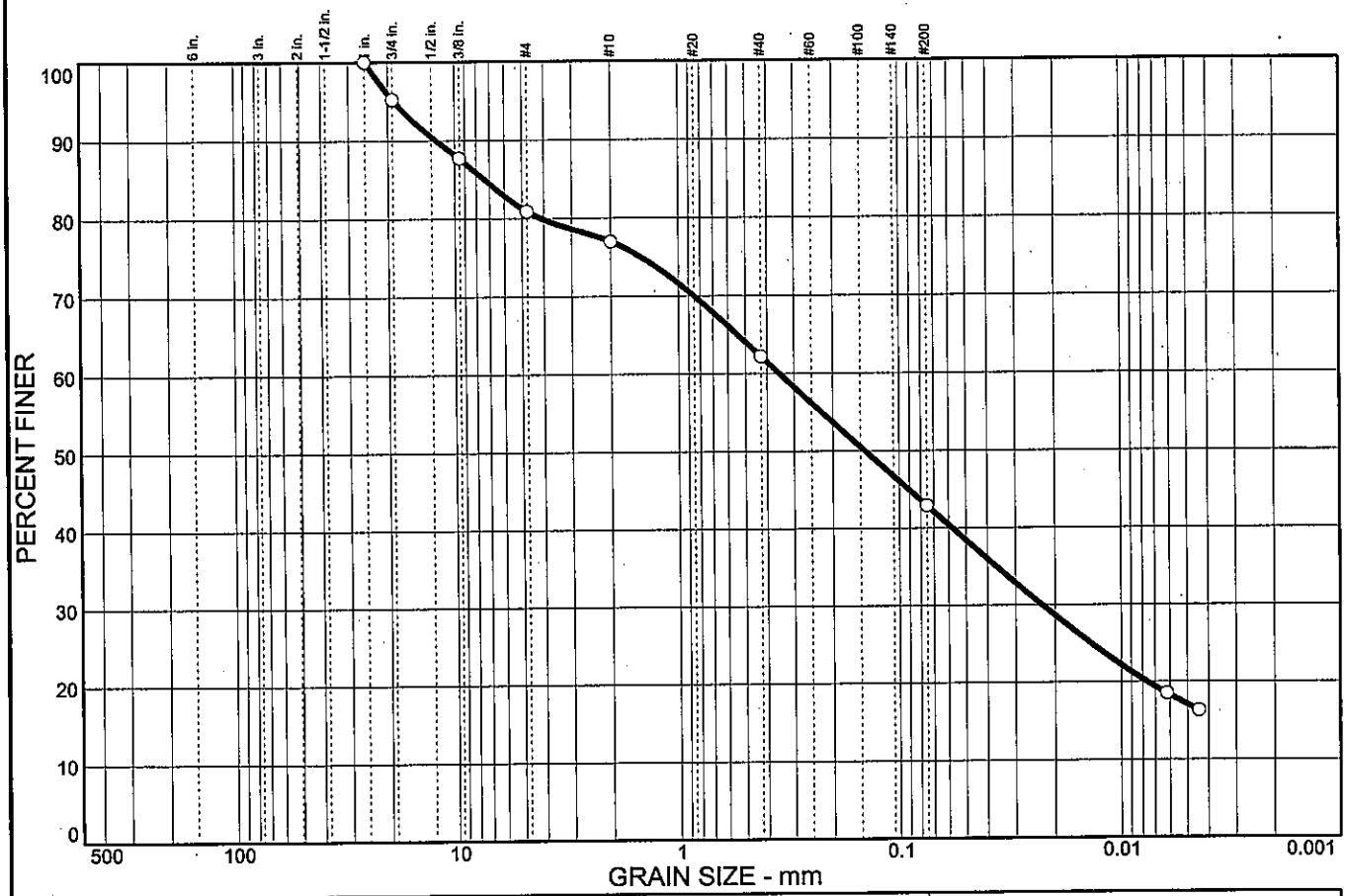
Sample No.: 4 **Source of Sample:** TR-57 **Date:** 4/26/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	4.8	14.3	3.9	14.8	19.3	25.8	17.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	95.2		
0.375 in.	87.7		
#4	80.9		
#10	77.0		
#40	62.2		
#200	42.9		

* (no specification provided)

Soil Description

Clayey sand with gravel

Atterberg Limits

PL= 19 LL= 32 PI= 13

Coefficients

D_{85}= 7.35 D_{60}= 0.351 D_{50}= 0.143
D_{30}= 0.0228 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-6(2)

Remarks

Moisture Content= 19.1%

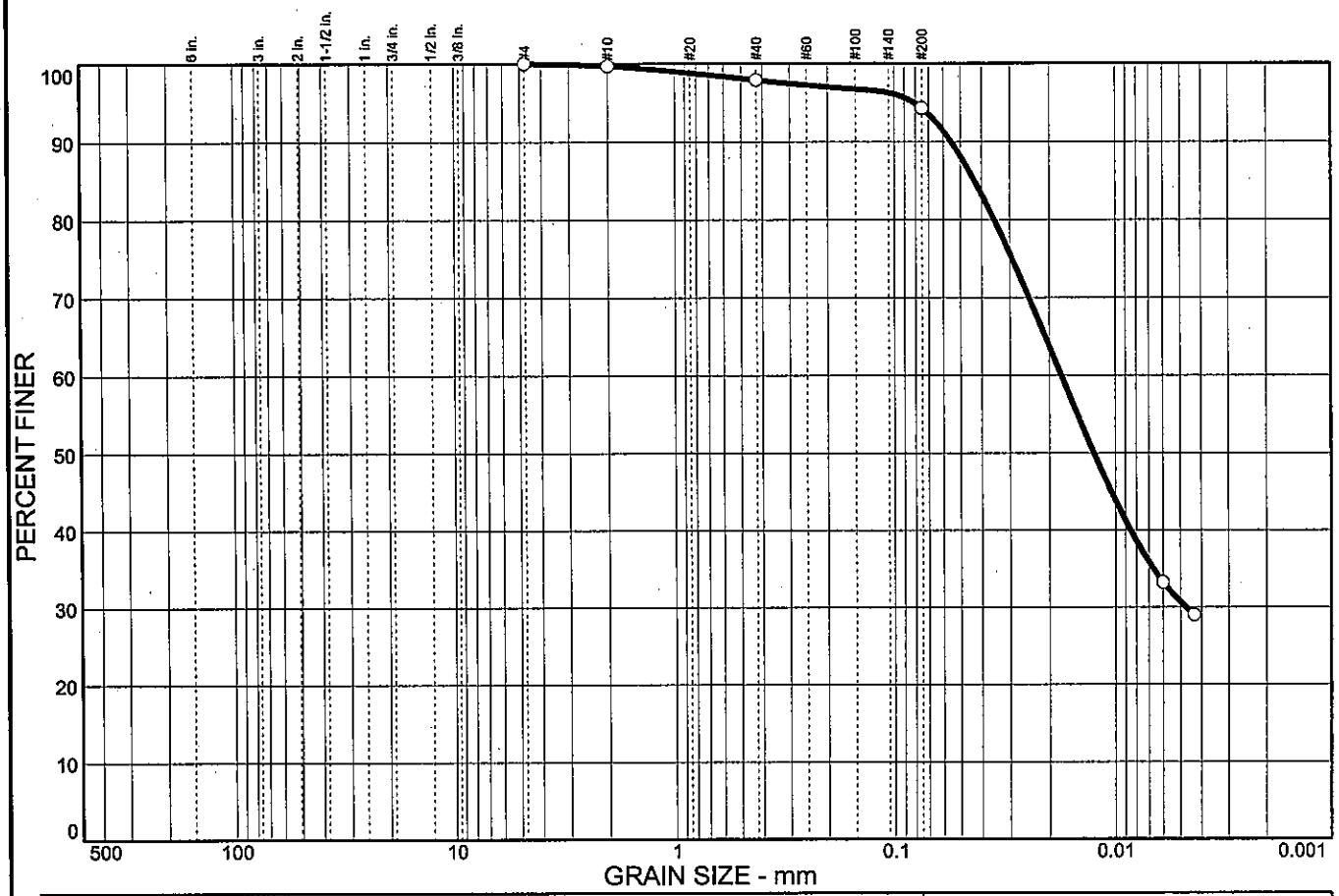
Sample No.: 5 **Source of Sample:** TR-57 **Date:** 4/25/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.3	1.8	3.6	63.6	30.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#40	97.9		
#200	94.3		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 20 LL= 31 PI= 11

Coefficients

D_{85}= 0.0433 D_{60}= 0.0177 D_{50}= 0.0125
D_{30}= 0.0047 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(10)

Remarks

Moisture Content= 23.0%

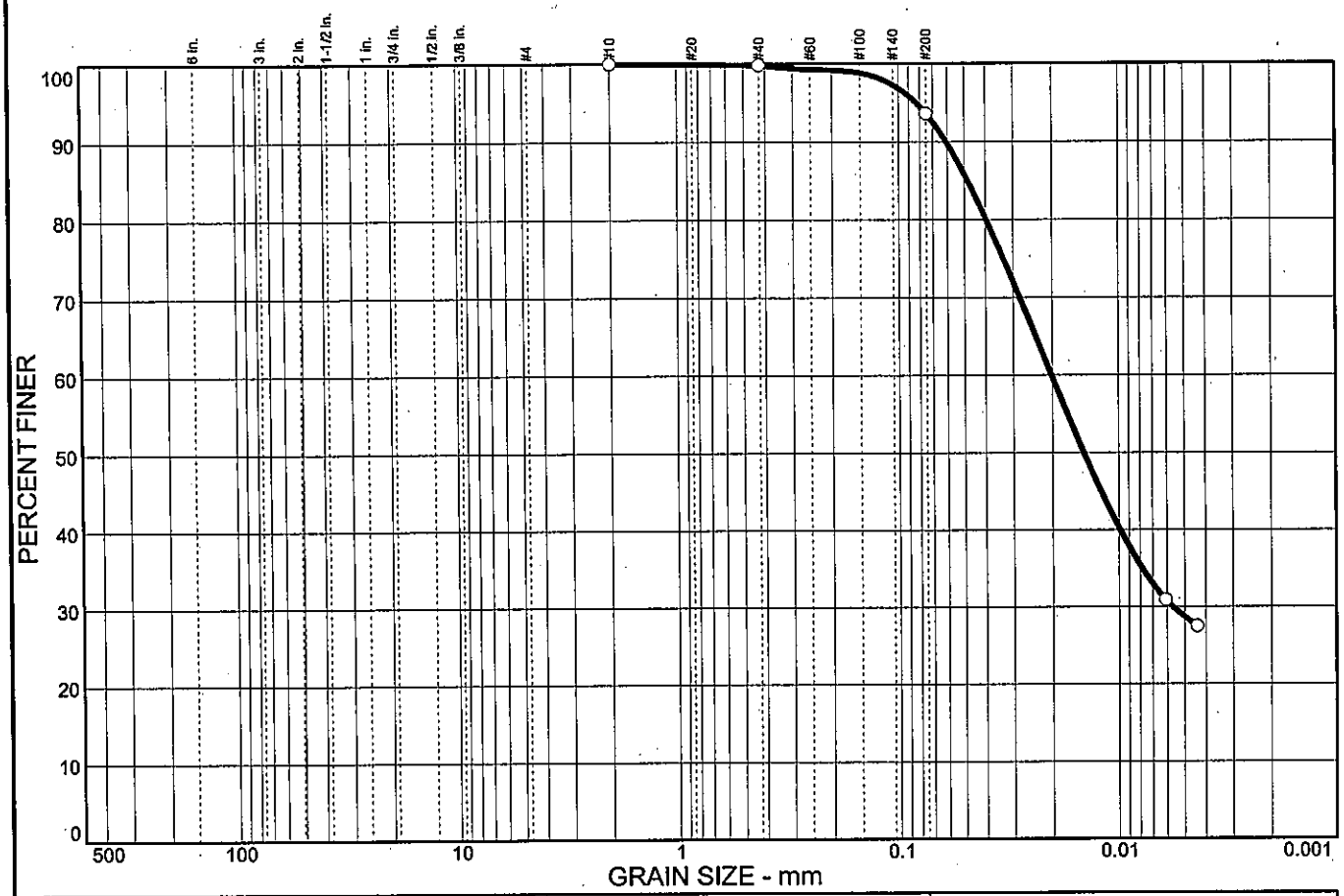
Sample No.: 6 **Source of Sample:** TR-57 **Date:** 4/25/05
Location: **Elev./Depth:** 13.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.2	6.2	64.9	28.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.8		
#200	93.6		

* (no specification provided)

Soil Description

Lean clay

Atterberg Limits

PL= 18 LL= 34 PI= 16

Coefficients

D_{85}= 0.0484 D_{60}= 0.0201 D_{50}= 0.0144
D_{30}= 0.0057 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-6(15)

Remarks

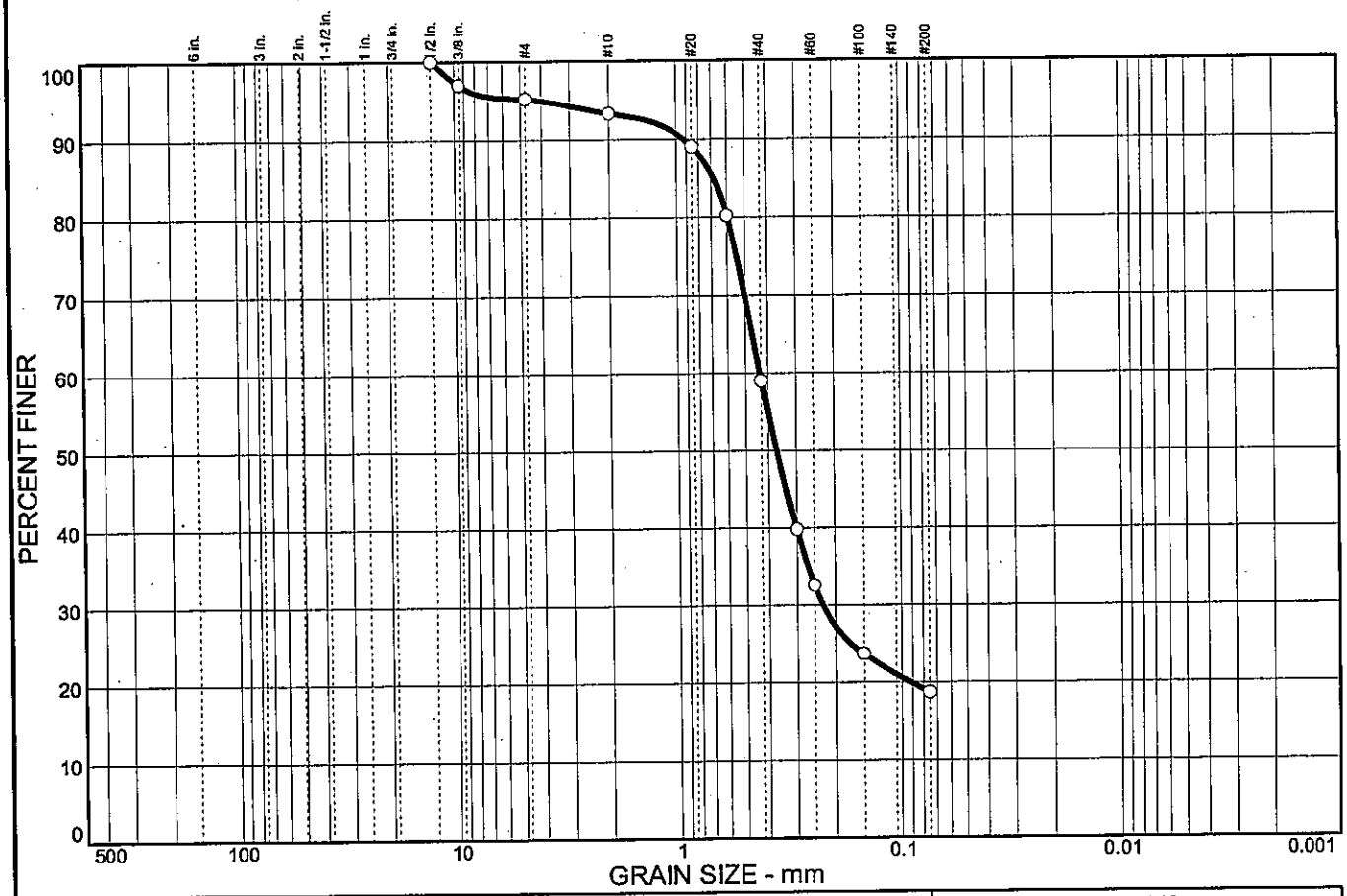
Moisture Content= 22.0%

Sample No.: 3 **Source of Sample:** TR-58 **Date:** 4/12/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.8	1.9	34.3	40.3	18.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.50 in.	100.0		
0.375 in.	97.0		
#4	95.2		
#10	93.3		
#20	89.0		
#30	80.2		
#40	59.0		
#50	39.8		
#60	32.6		
#100	23.7		
#200	18.7		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.685 D_{60}= 0.432 D_{50}= 0.366
D_{30}= 0.229 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

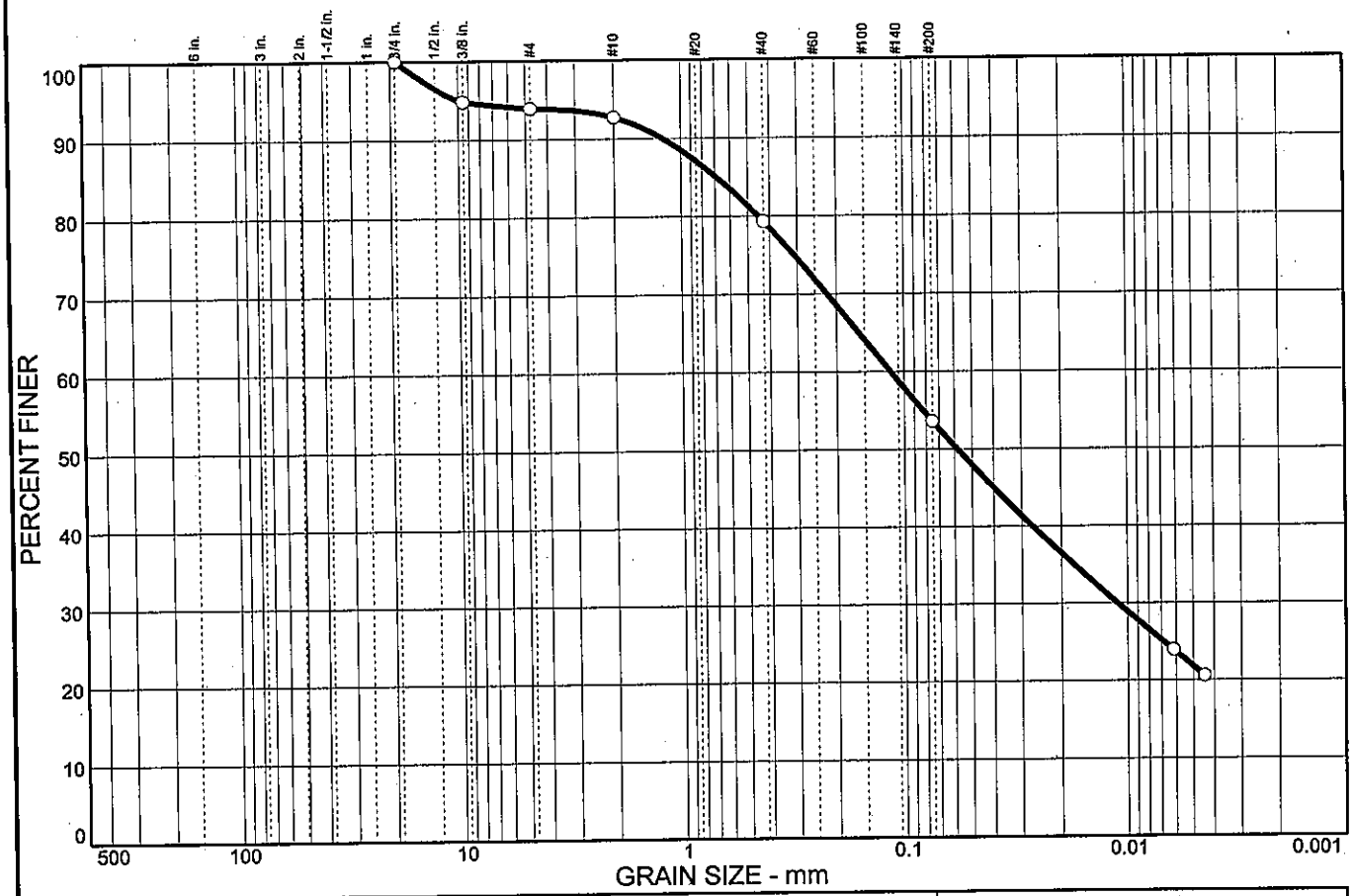
Moisture Content= 16.3%

Sample No.: 4 **Source of Sample:** TR-58 **Date:** 4/12/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.1	1.2	13.4	25.7	31.8	21.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	94.8		
#4	93.9		
#10	92.7		
#40	79.3		
#200	53.6		

* (no specification provided)

Soil Description

Sandy silty clay

Atterberg Limits

PL= 16 LL= 22 PI= 6

Coefficients

D_{85}= 0.689 D_{60}= 0.115 D_{50}= 0.0582
D_{30}= 0.0111 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL-ML AASHTO= A-4(1)

Remarks

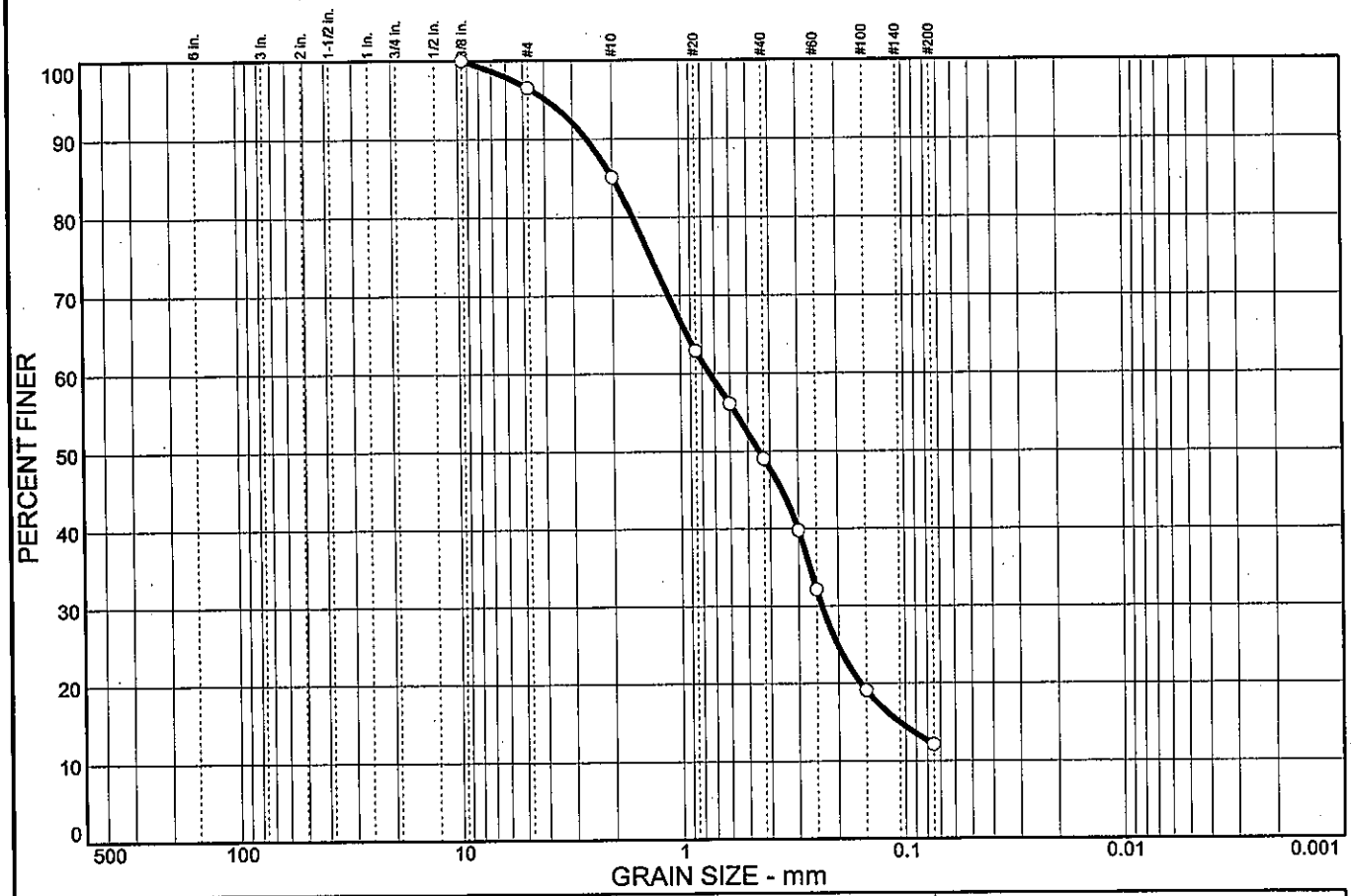
Moisture Content= 11.5%

Sample No.: 2 **Source of Sample:** TR-59A **Date:** 4/12/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.5	11.4	36.1	36.9	12.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	96.5		
#10	85.1		
#20	62.9		
#30	56.1		
#40	49.0		
#50	39.8		
#60	32.1		
#100	19.1		
#200	12.1		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 1.99 D_{60}= 0.737 D_{50}= 0.446
D_{30}= 0.237 D_{15}= 0.107 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content= 17.4%

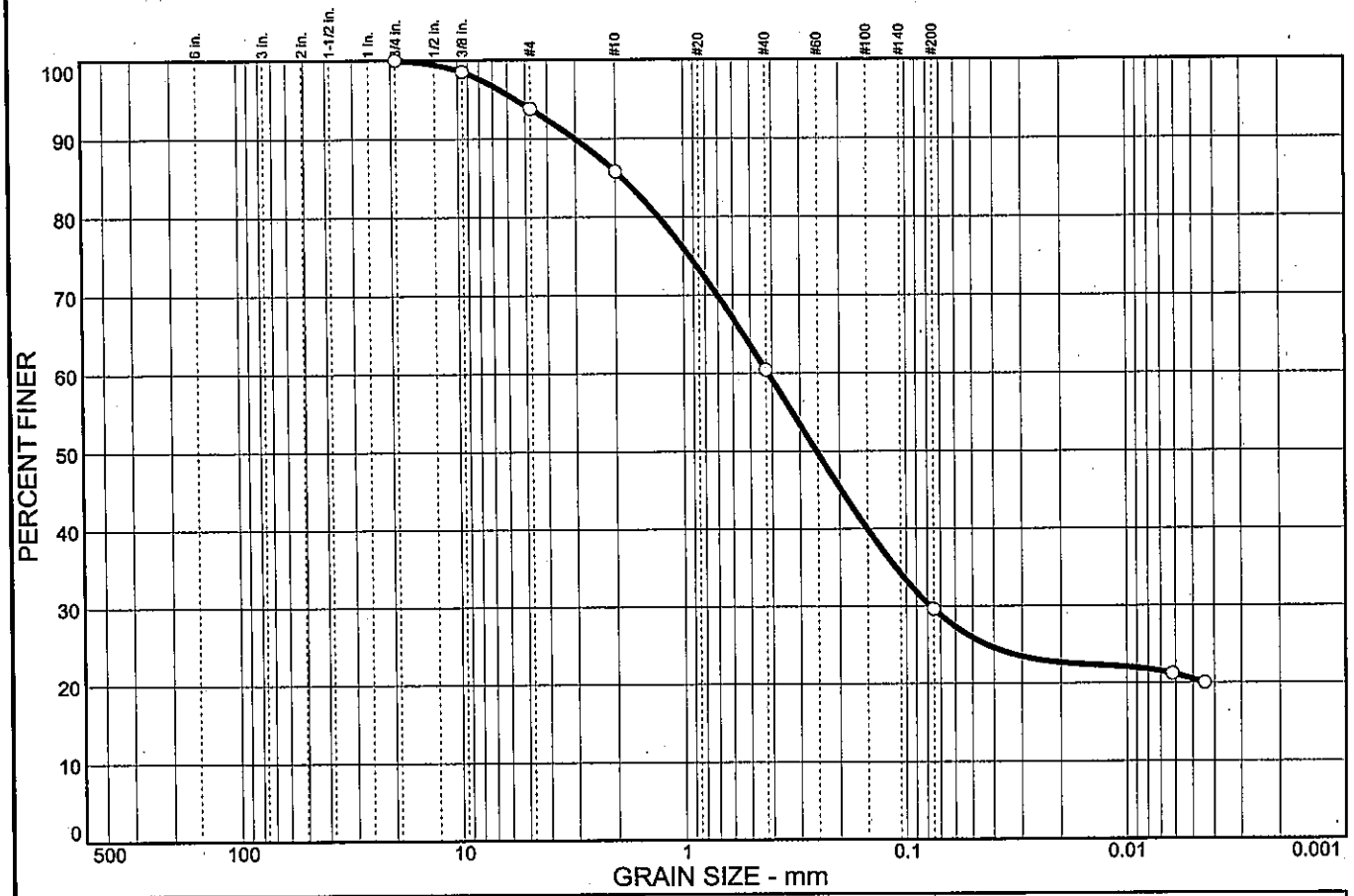
Sample No.: 3 **Source of Sample:** TR-59A **Date:** 4/12/05
Location: **Elev./Depth:** 6.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.2	8.0	25.4	30.8	9.1	20.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.5		
#4	93.8		
#10	85.8		
#40	60.4		
#200	29.6		

* (no specification provided)

Soil Description

Clayey sand

Atterberg Limits

PL= 14 LL= 31 PI= 17

Coefficients

D_{85}= 1.87 D_{60}= 0.417 D_{50}= 0.253
D_{30}= 0.0776 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-2-6(1)

Remarks

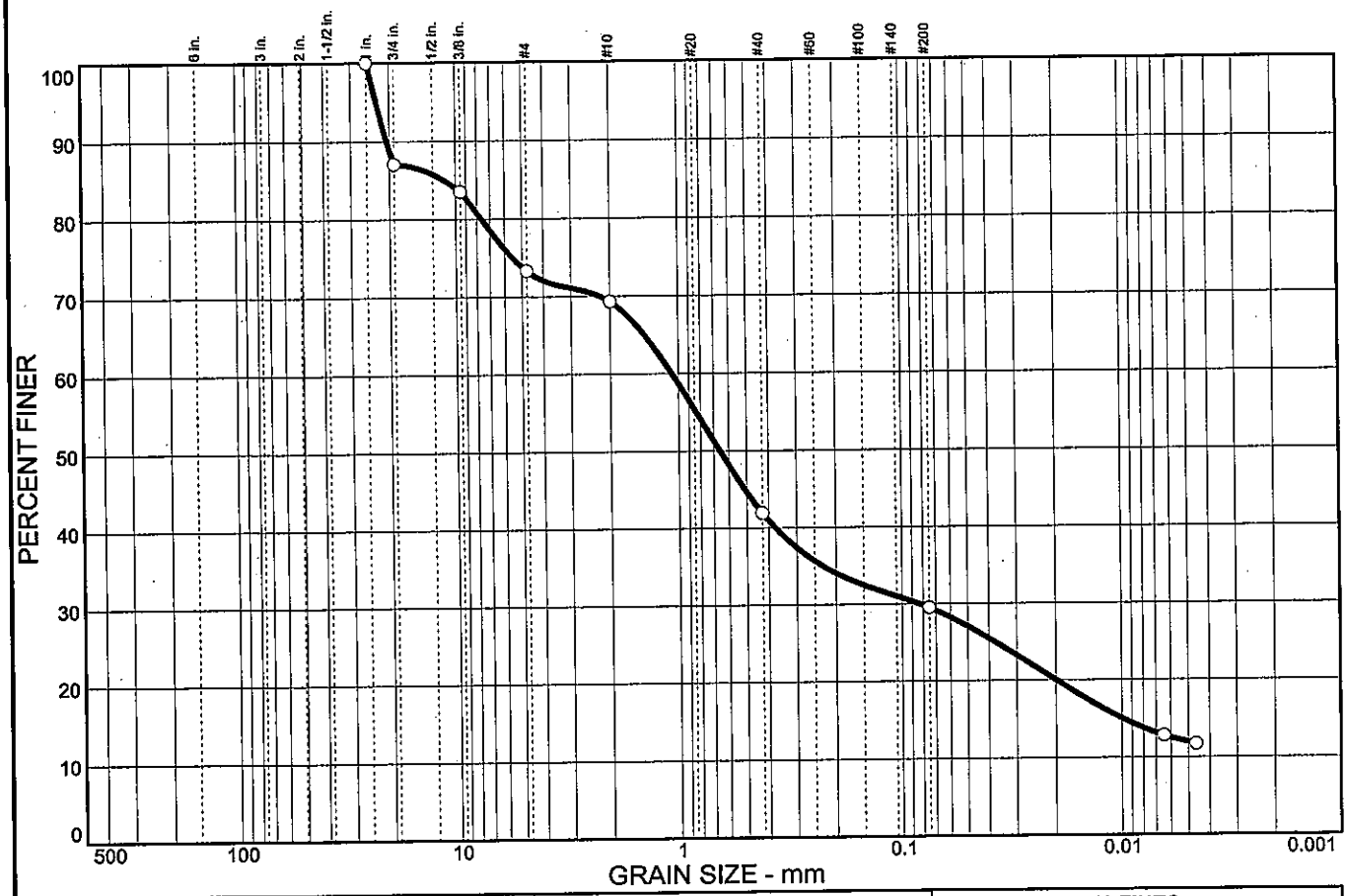
Moisture Content= 17.4%

Sample No.: 5 **Source of Sample:** TR-59A **Date:** 4/12/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	13.0	13.7	4.0	27.4	12.4	17.6	11.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	87.0		
0.375 in.	83.5		
#4	73.3		
#10	69.3		
#40	41.9		
#200	29.5		

* (no specification provided)

Soil Description

Clayey sand with gravel

Atterberg Limits

PL= 19 LL= 29 PI= 10

Coefficients

D_{85}= 11.3 D_{60}= 1.07 D_{50}= 0.657
D_{30}= 0.0832 D_{15}= 0.0099 D_{10}=
C_u= C_c=

Classification

USCS= SC AASHTO= A-2-4(0)

Remarks

Moisture Content= 22.0%

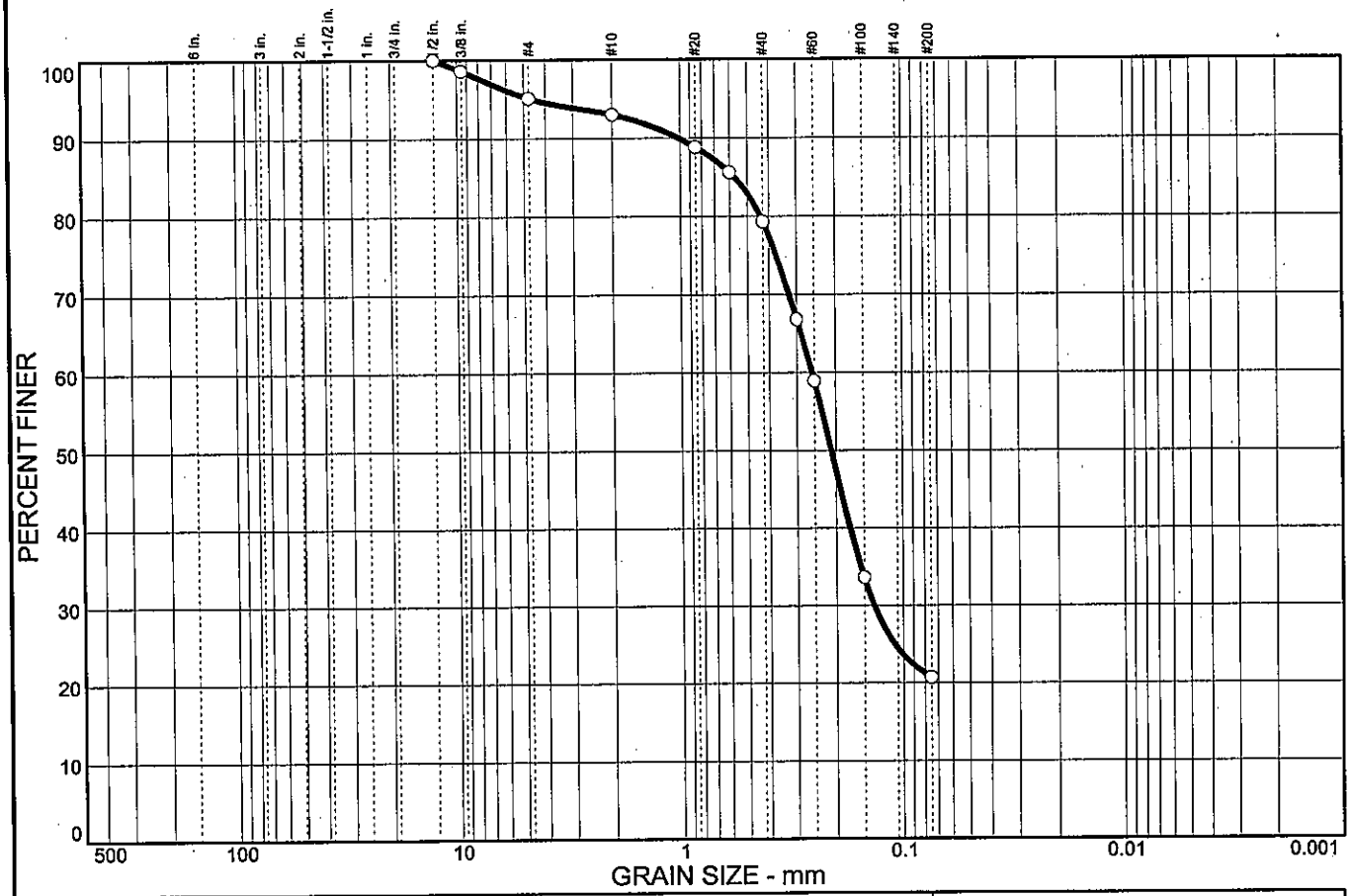
Sample No.: 10 **Source of Sample:** TR-60 **Date:** 4/23/05
Location: **Elev./Depth:** 23.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.9	2.1	13.7	58.6	20.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.50 in.	100.0		
0.375 in.	98.6		
#4	95.1		
#10	93.0		
#20	88.8		
#30	85.6		
#40	79.3		
#50	66.8		
#60	58.9		
#100	33.6		
#200	20.7		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.572 D_{60}= 0.256 D_{50}= 0.210
D_{30}= 0.135 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

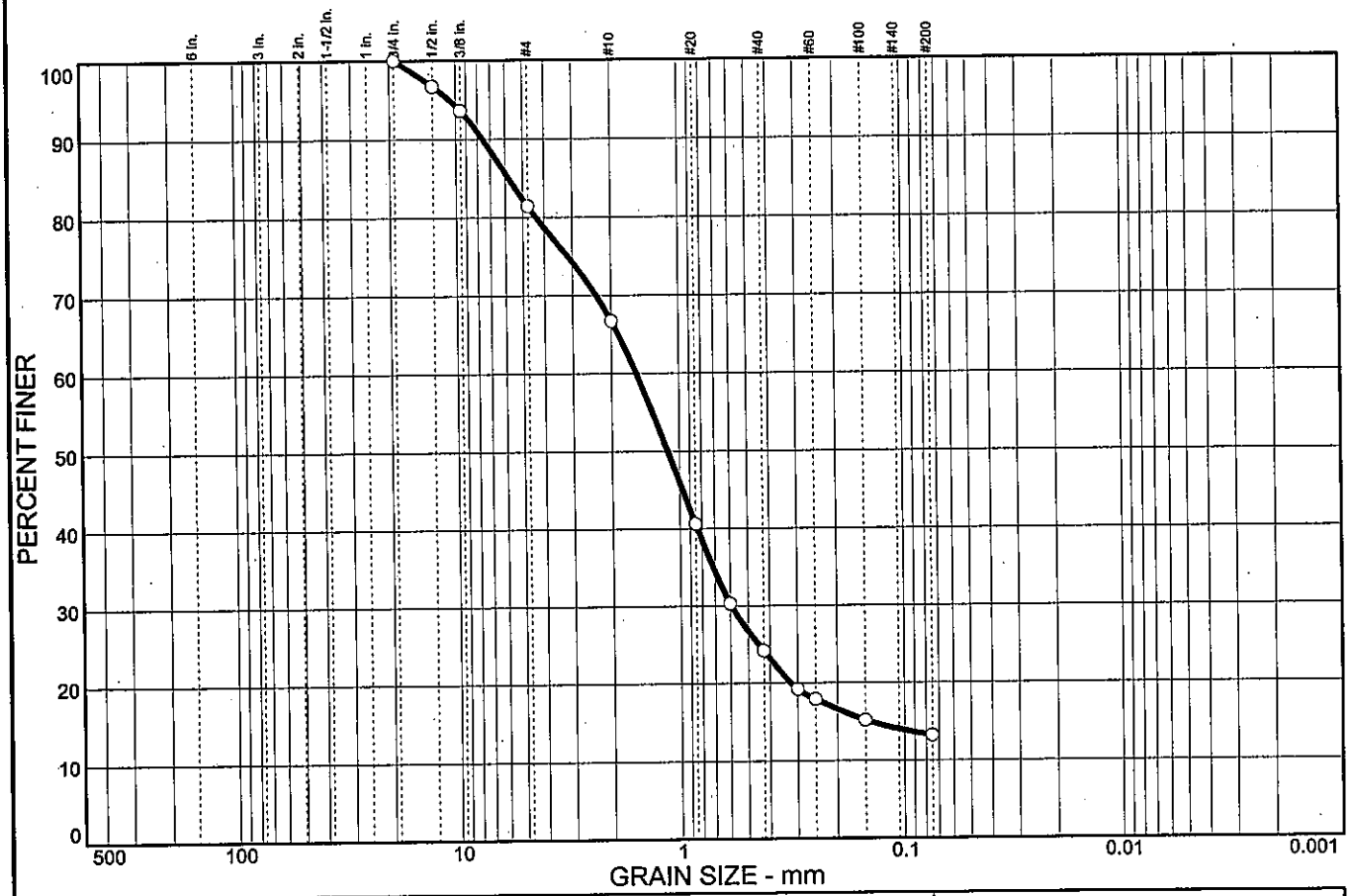
Moisture Content= 23.1%

Sample No.: 11 **Source of Sample:** TR-60 **Date:** 4/23/05
Location: **Elev./Depth:** 26.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	18.6	14.7	42.5	11.0	13.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.50 in.	96.7		
0.375 in.	93.6		
#4	81.4		
#10	66.7		
#20	40.6		
#30	30.3		
#40	24.2		
#50	19.2		
#60	17.9		
#100	15.2		
#200	13.2		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 5.79 D_{60}= 1.55 D_{50}= 1.13
D_{30}= 0.592 D_{15}= 0.143 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content= 7.5%

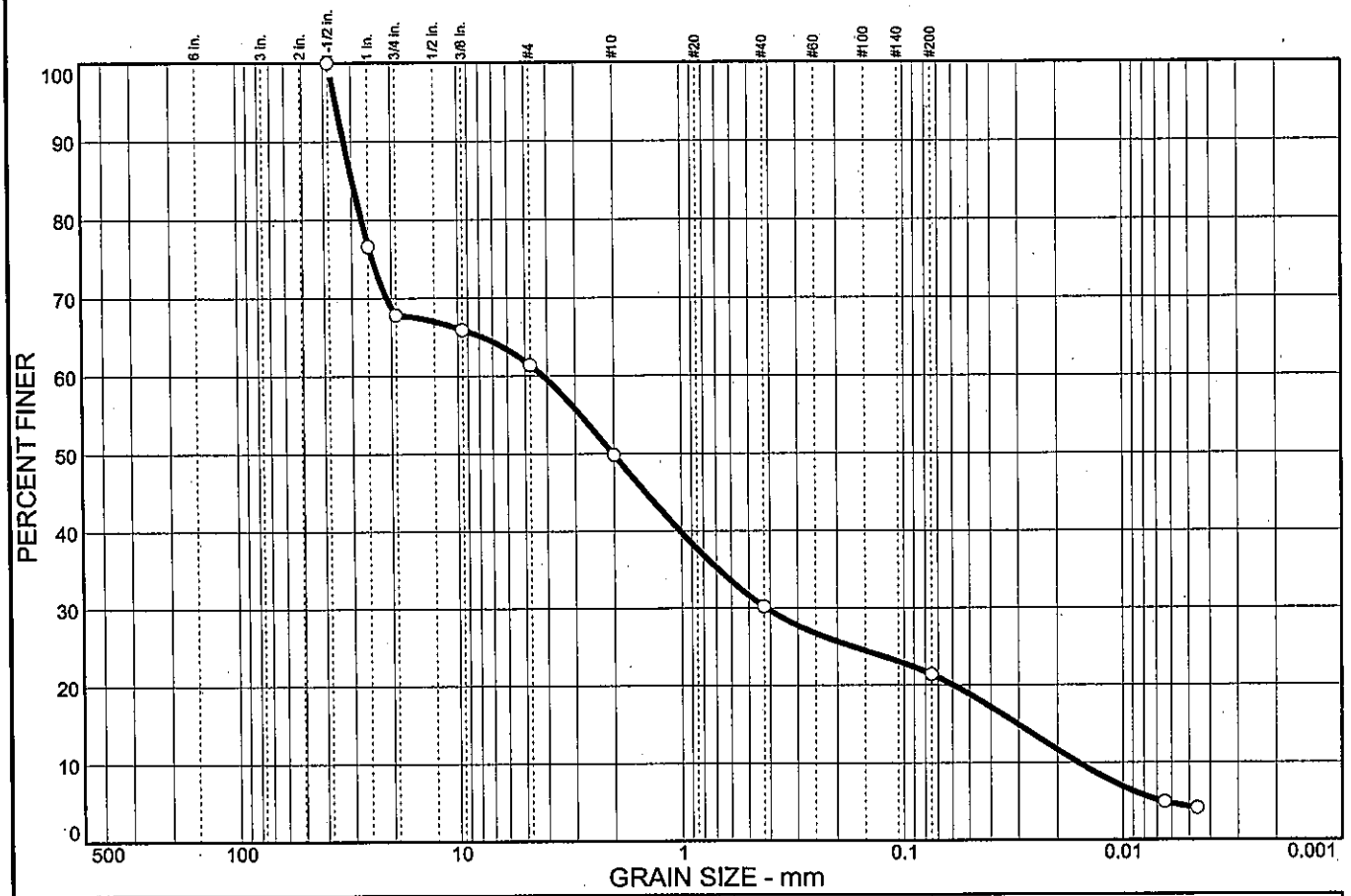
Sample No.: 2 **Source of Sample:** TR-60 **Date:** 4/26/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	32.2	6.4	11.6	19.6	8.8	17.1	4.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.50 in.	100.0		
1.00 in.	76.6		
0.75 in.	67.8		
0.375 in.	65.9		
#4	61.4		
#10	49.8		
#40	30.2		
#200	21.4		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 29.9 D_{60}= 4.17 D_{50}= 2.03
D_{30}= 0.415 D_{15}= 0.0304 D_{10}= 0.0161
C_u= 259.64 C_c= 2.57

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content= 9.7%

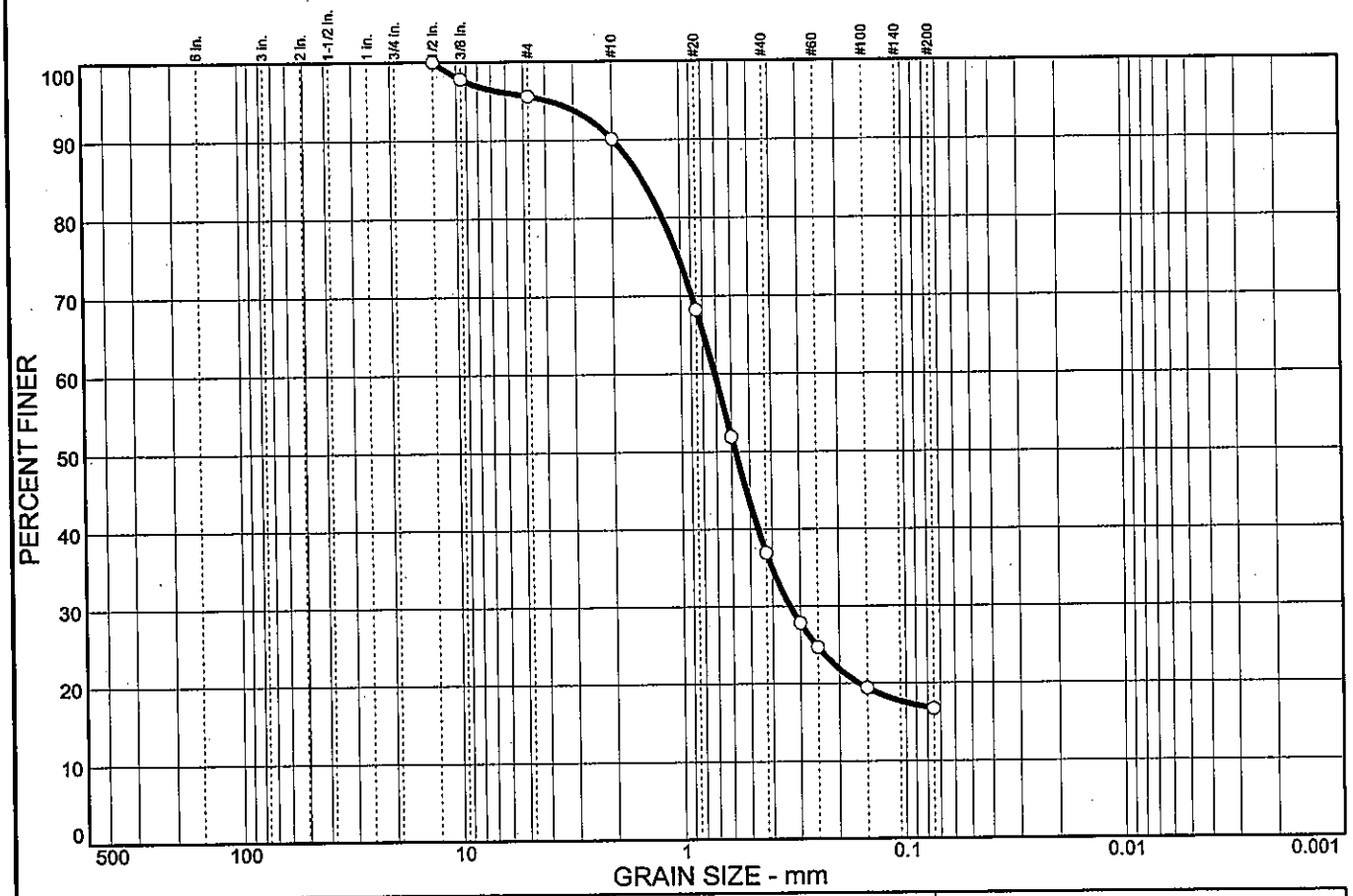
Sample No.: 5 **Source of Sample:** TR-60 **Date:** 4/26/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.4	5.5	53.2	20.2	16.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.50 in.	100.0		
0.375 in.	97.8		
#4	95.6		
#10	90.1		
#20	68.2		
#30	51.9		
#40	36.9		
#50	27.8		
#60	24.7		
#100	19.4		
#200	16.7		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 1.47 D_{60}= 0.709 D_{50}= 0.577
D_{30}= 0.333 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Moisture Content= 25.4%

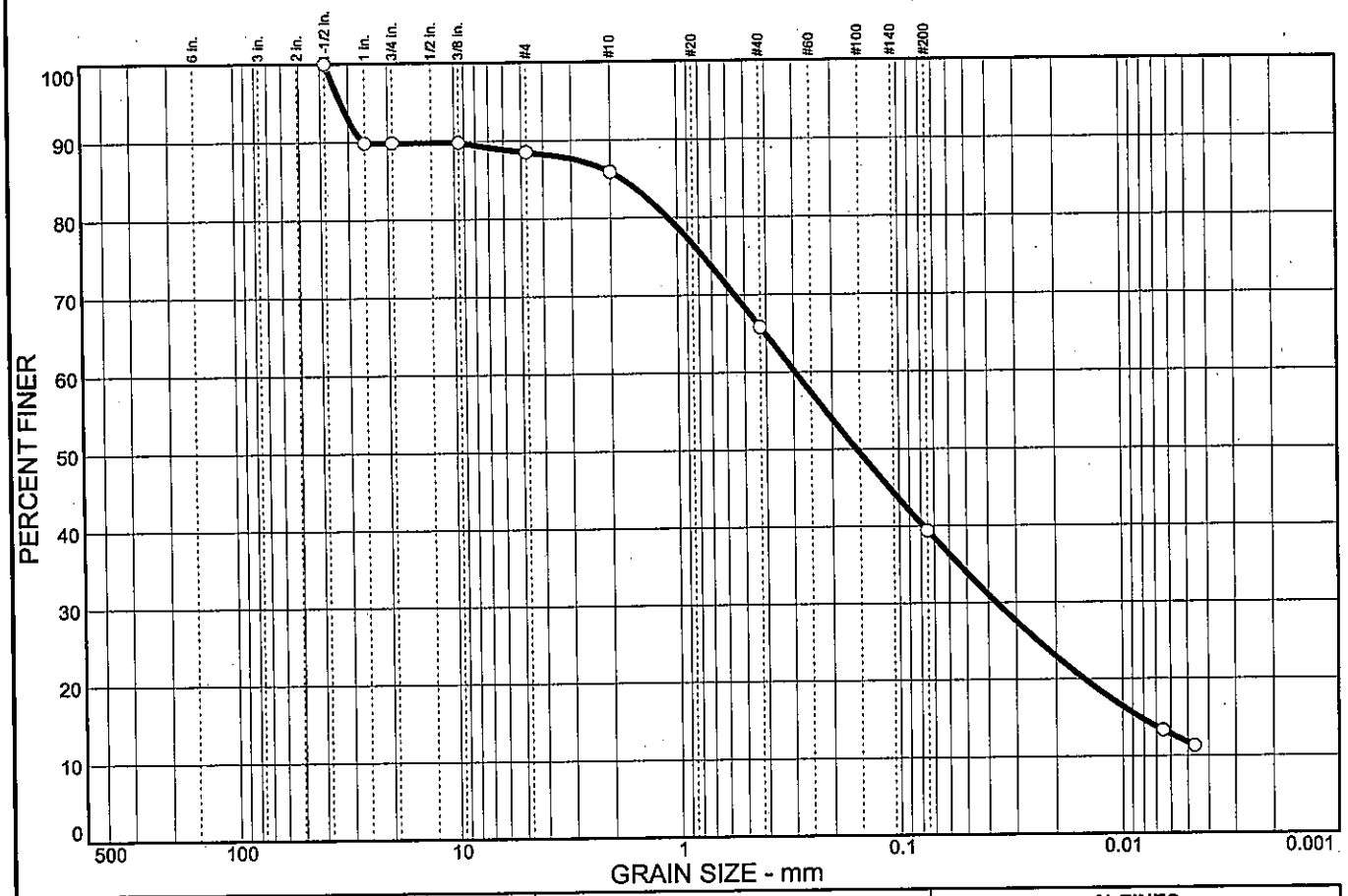
Sample No.: 8 **Source of Sample:** TR-60 **Date:** 4/26/05
Location: **Elev./Depth:** 18.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	10.2	1.3	2.6	20.1	26.4	27.7	11.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.50 in.	100.0		
1.00 in.	89.8		
0.75 in.	89.8		
0.375 in.	89.8		
#4	88.5		
#10	85.9		
#40	65.8		
#200	39.4		

* (no specification provided)

Soil Description

Silty, clayey sand

Atterberg Limits

PL= 21 LL= 26 PI= 5

Coefficients

D_{85}= 1.77 D_{60}= 0.295 D_{50}= 0.155
D_{30}= 0.0368 D_{15}= 0.0083 D_{10}=
C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

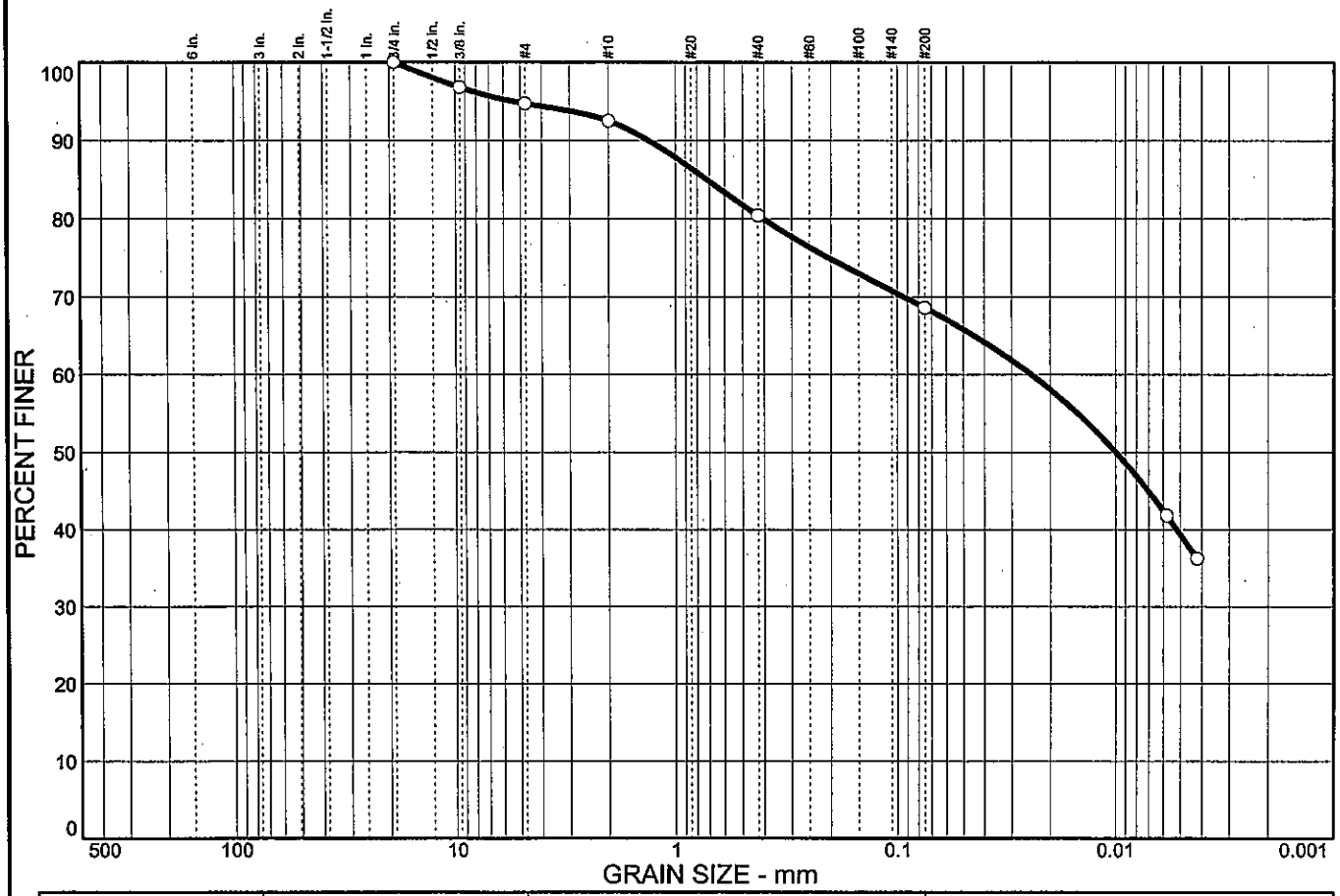
Moisture Content= 20.6%

Sample No.: 2 **Source of Sample:** TR-61 **Date:** 4/23/05
Location: **Elev./Depth:** 3.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	5.3	2.2	12.1	11.8	29.3	39.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.8		
#4	94.7		
#10	92.5		
#40	80.4		
#200	68.6		

* (no specification provided)

Soil Description

Sandy lean clay

Atterberg Limits

PL= 15 LL= 45 PI= 30

Coefficients

D_{85}= 0.718 D_{60}= 0.0243 D_{50}= 0.0099
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(18)

Remarks

Moisture Content= 24.9%

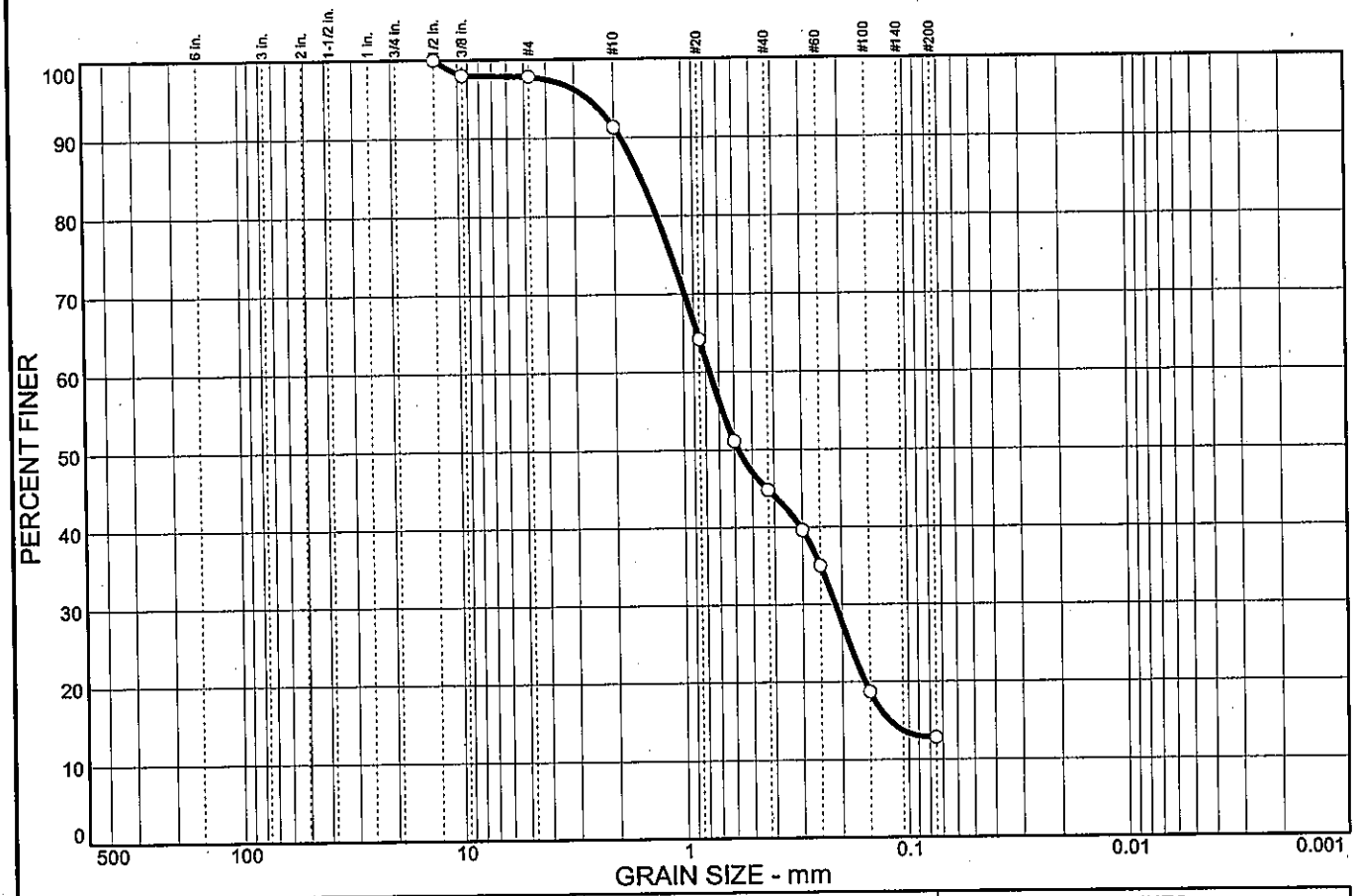
Sample No.: 4 **Source of Sample:** TR-61 **Date:** 4/23/05
Location: **Elev./Depth:** 8.5

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.2	6.5	46.5	32.0	12.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.50 in.	100.0		
0.375 in.	98.0		
#4	97.8		
#10	91.3		
#20	64.2		
#30	51.1		
#40	44.8		
#50	39.6		
#60	35.0		
#100	18.7		
#200	12.8		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 1.53 D_{60}= 0.768 D_{50}= 0.576
D_{30}= 0.214 D_{15}= 0.122 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

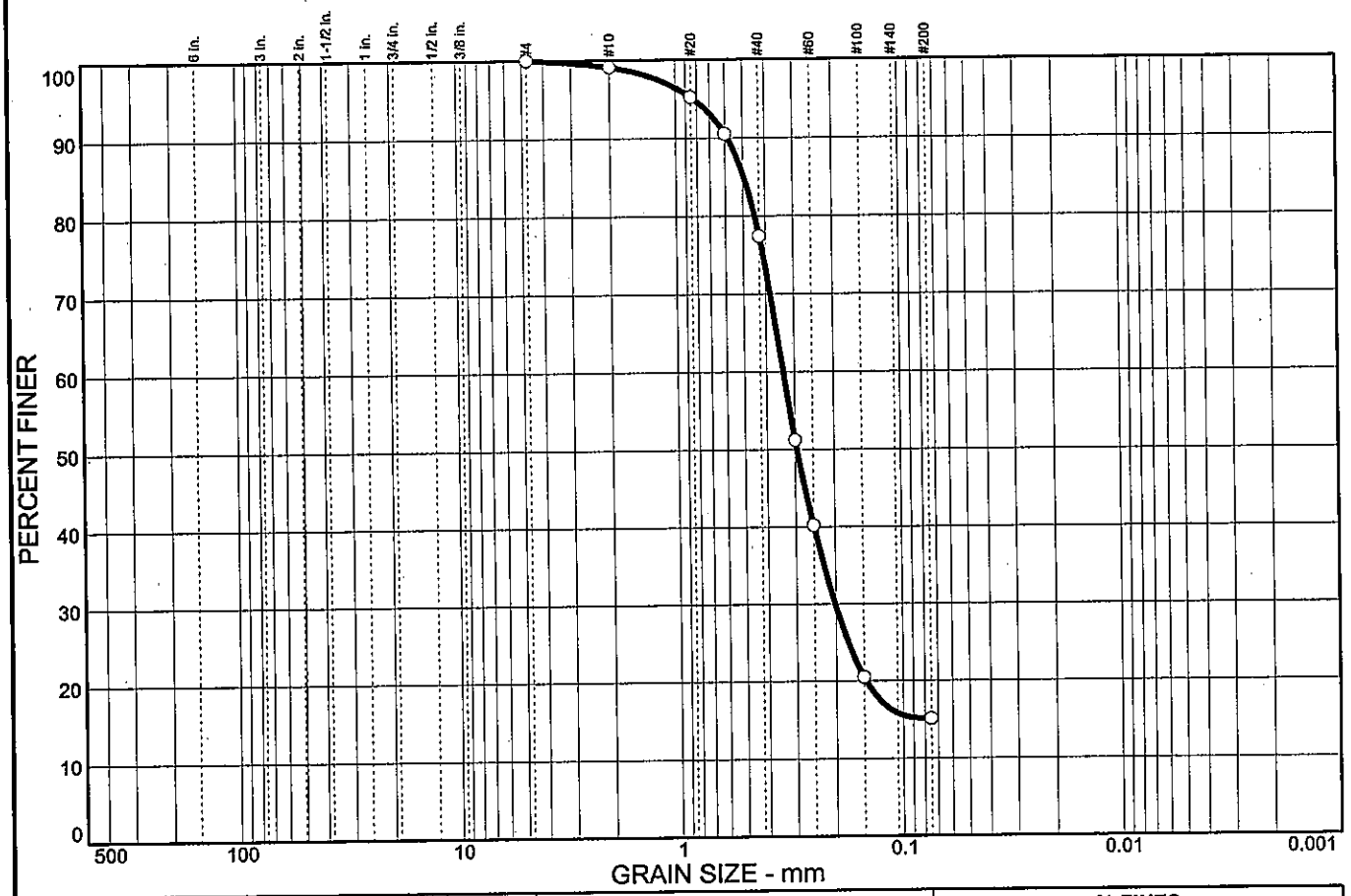
Moisture Content= 23.0%

Sample No.: 5 **Source of Sample:** TR-61 **Date:** 4/23/05
Location: **Elev./Depth:** 11.0

DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project No: 0121-3070.03 **Figure**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.9	21.7	62.3	15.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.1		
#20	95.2		
#30	90.5		
#40	77.4		
#50	51.2		
#60	40.2		
#100	20.5		
#200	15.1		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.495 D_{60}= 0.337 D_{50}= 0.295
D_{30}= 0.201 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

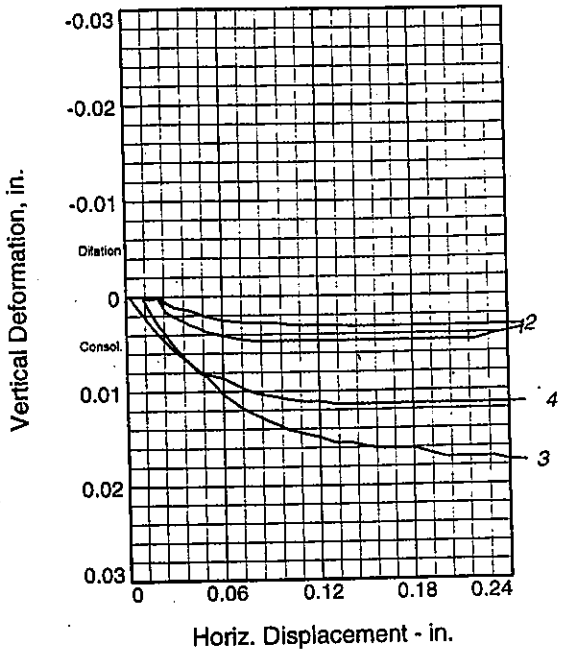
Moisture Content= 28.7%

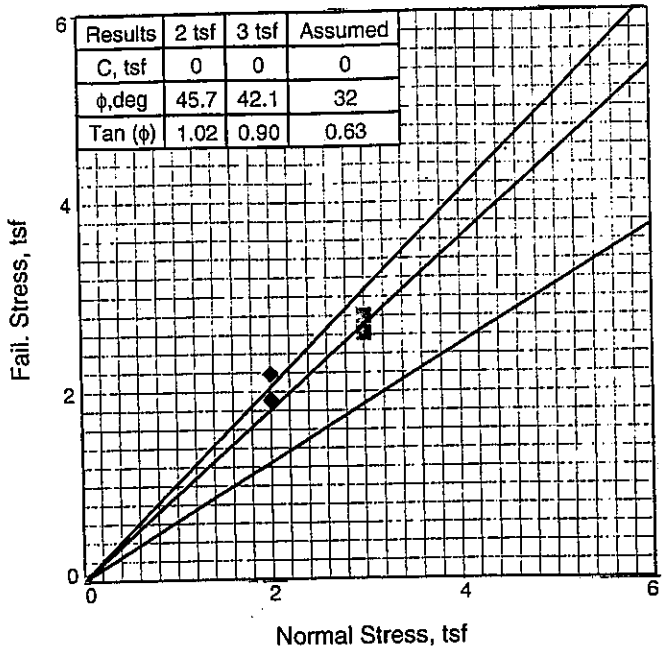
Sample No.: 6 **Source of Sample:** TR-61 **Date:** 11/7/05
Location: **Elev./Depth:** 13.5

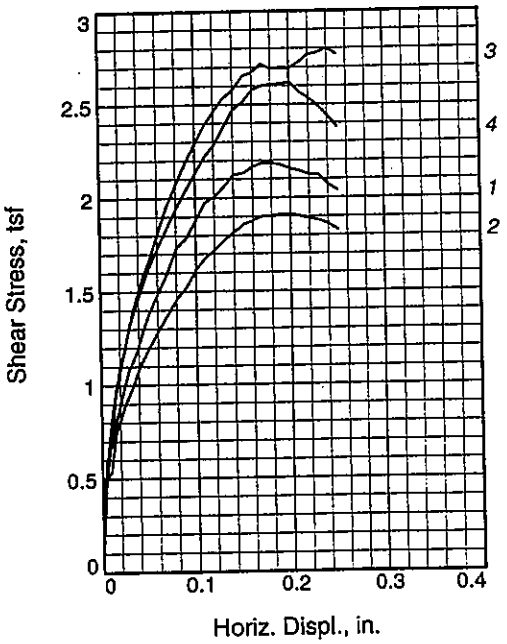
DLZ

Client: TranSystems, Inc.
Project: SCI-823-0.00

Project No: 0121-3070.03 **Figure**







Sample No.		1	2	3	4
Initial	Water Content, %	28.7	28.7	28.7	28.7
	Dry Density, pcf	106.4	101.0	98.5	101.4
	Saturation, %	132.3	115.7	108.8	116.8
	Void Ratio	0.5849	0.6691	0.7111	0.6628
	Diameter, in.	2.50	2.50	2.50	2.50
	Height, in.	1.02	1.21	1.27	1.21
At Test	Water Content, %	21.2	21.2	19.4	19.4
	Dry Density, pcf	111.1	104.8	102.5	104.9
	Saturation, %	110.7	94.1	81.2	86.3
	Void Ratio	0.5172	0.6089	0.6451	0.6069
	Diameter, in.	2.50	2.50	2.50	2.50
	Height, in.	0.98	1.16	1.22	1.17
Normal Stress, tsf		2.000	2.000	3.000	3.000
Fail. Stress, tsf		2.186	1.911	2.800	2.620
Displacement, in.		0.17	0.19	0.24	0.20
Ult. Stress, tsf					
Displacement, in.					
Strain rate, in./min.		0.01	0.01	0.01	0.01

Sample Type: Standard Penetration Test
Description: Silty sand
Coarse and Fine Sand
LL= NP **PL=** **PI=** NP
Assumed Specific Gravity= 2.7
Remarks: Due to small REC, S-6 & S-7 were combined for testing. Samples were completely saturated and contained "free water". Sample was stired prior to testing, to incorporate excess water.
Figure _____

Client: TranSystems, Inc.

Project: SCI-823-0.00

Source of Sample: TR-61 **Depth:** 13.5

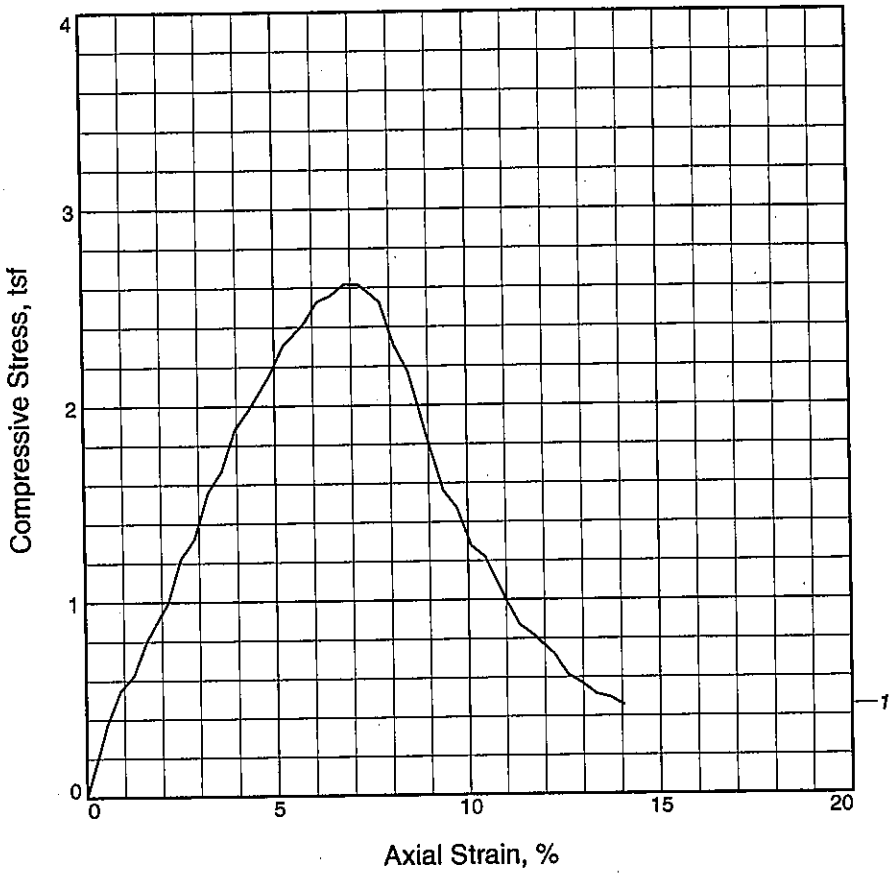
Sample Number: 6

Proj. No.: 0121-3070.03 **Date:** 11/7/05

DLZ

Tested By: JN

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	2.618			
Undrained shear strength, tsf	1.309			
Failure strain,	6.8			
Strain rate, in./min.	0.06			
Water content, %	22.4			
Wet density, pcf	126.5			
Dry density, pcf	103.4			
Saturation, %	93.1			
Void ratio	0.6602			
Specimen diameter, in.	2.83			
Specimen height, in.	5.55			
Height/diameter ratio	1.96			

Description: Moisture Content = 22.4%

LL = 36	**PL** = 21	**PI** = 15	**Assumed GS=** 2.75	**Type:** 3" Press Tubes

Project No.: 0121-3070.03

Date: 08/16/06

Remarks:

Figure _____

Client: TranSystems, Inc.

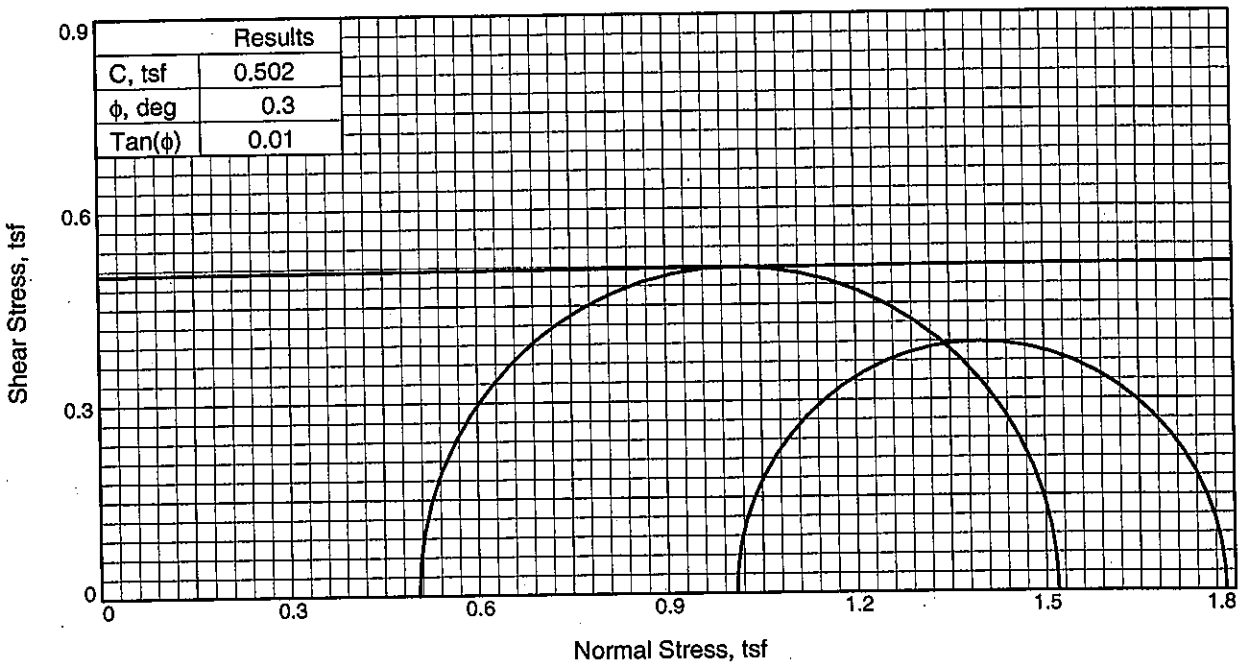
Project: SCI-823-0.00

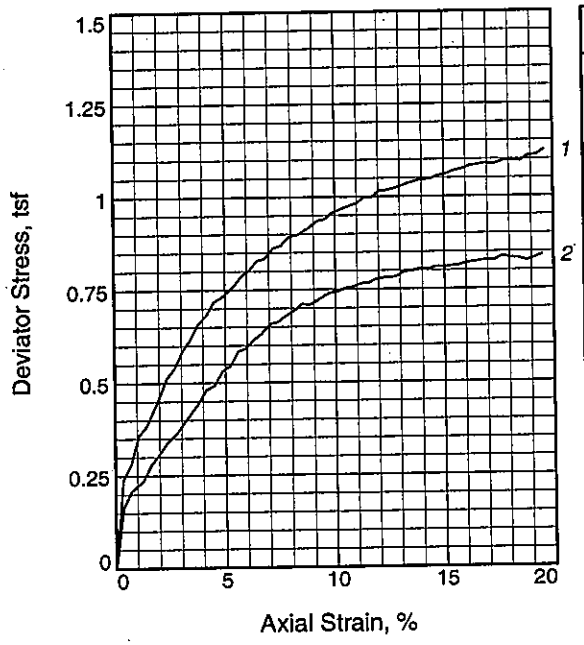
Source of Sample: B-1108A **Depth:** 10.0

Sample Number: ST-1

DLZ

Results	
C, tsf	0.502
ϕ, deg	0.3
Tan(ϕ)	0.01





Sample No.		1	2
Initial	Water Content,	30.2	32.6
	Dry Density, pcf	95.2	89.5
	Saturation,	103.3	97.8
	Void Ratio	0.8041	0.9172
	Diameter, in.	2.83	2.84
	Height, in.	5.56	5.54
At Test	Water Content,	27.0	31.8
	Dry Density, pcf	95.2	89.5
	Saturation,	92.2	95.2
	Void Ratio	0.8041	0.9172
	Diameter, in.	2.83	2.84
	Height, in.	5.56	5.54
Strain rate, in./min.		0.06	0.06
Back Pressure, tsf		0.00	0.00
Cell Pressure, tsf		0.50	1.01
Fail. Stress, tsf		1.02	0.78
Ult. Stress, tsf		1.02	0.78
σ_1 Failure, tsf		1.52	1.79
σ_3 Failure, tsf		0.50	1.01

Type of Test:
Unconsolidated Undrained
Sample Type: 3" Press Tube
Description: Lean clay with sand

LL= 38 **PL=** 19 **PI=** 19
Assumed Specific Gravity= 2.75
Remarks:

Client: TranSystems, Inc.

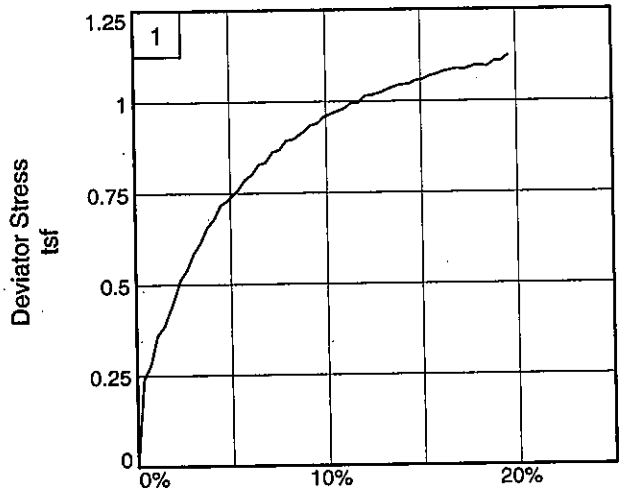
Project: SCI-823-0.00

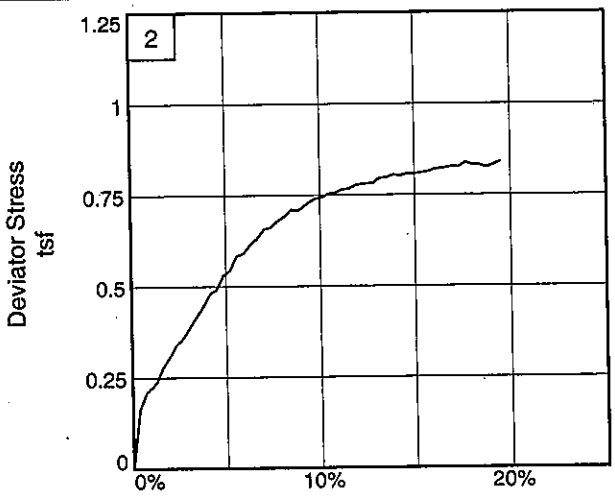
Source of Sample: B-1108A **Depth:** 14.0
Sample Number: ST-2

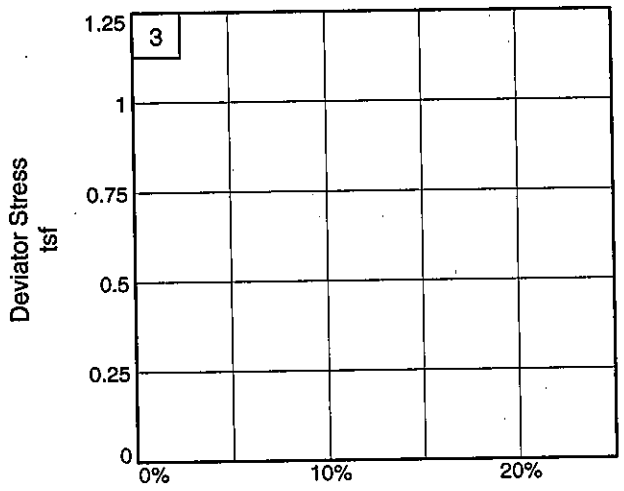
Proj. No.: 0121-3070.03 **Date:** 08/16/06

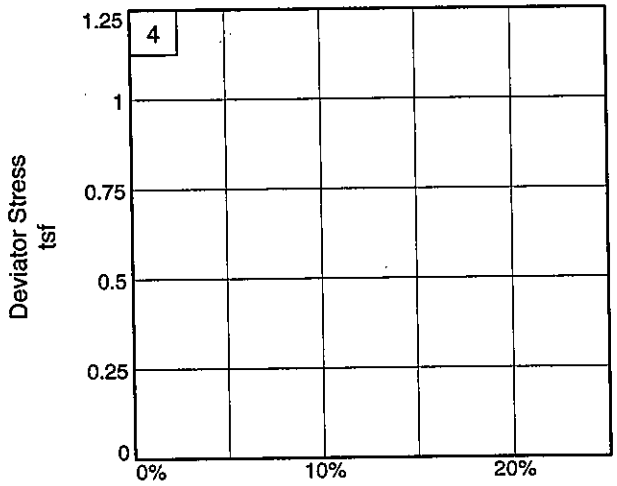
DLZ

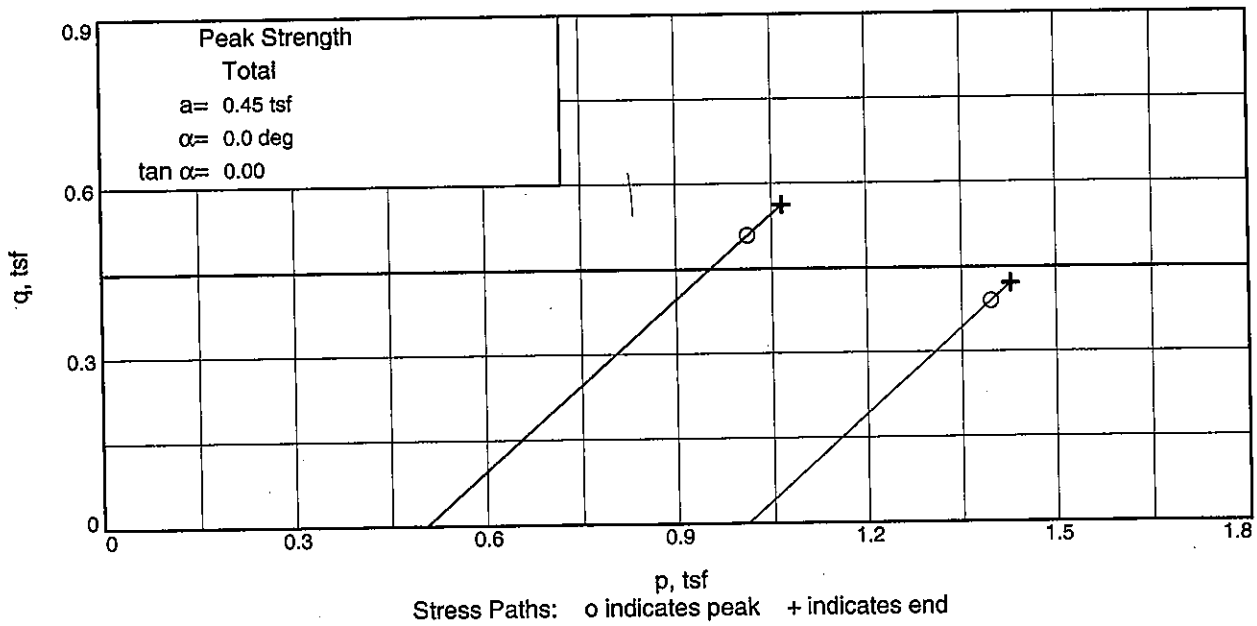
Figure _____











Stress Paths: o indicates peak + indicates end

Client: TranSystems, Inc.
Project: SCI-823-0.00
Source of Sample: B-1108A
Project No.: 0121-3070.03

Depth: 14.0
Figure _____

Sample Number: ST-2

DLZ, INC.

SWELL/CONSOLIDATION TEST DATA

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project Number: 0121-3070.03

Sample Data

Source: B-1108A
Sample No.: ST-1
Elev. or Depth: 10.0 **Sample Length(in./cm.):** 24
Location:
Description: Lean clay,
Specific Gravity= 2.65
Liquid Limit: 36 **Plasticity Index:** 15
USCS: CL **AASHTO:** A-6(15) **Figure No.:**
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE		BEFORE TEST		AFTER TEST	
Wet w+t =	271.71 g.	Consolidometer # = 4		Wet w+t =	181.25 g.
Dry w+t =	231.74 g.			Dry w+t =	160.98 g.
Tare Wt. =	58.03 g.	Spec. Gravity = 2.65		Tare Wt. =	63.44 g.
Height =	.75 in.	Height =	.75 in.		
Diameter =	2.50 in.	Diameter =	2.50 in.		
Weight =	120.01 g.	Defl. Table =	n/a		
Moisture =	23.0 %	Ht. Solids =	0.4577 in.	Moisture =	20.8 %
Wet Den. =	124.2 pcf	Dry Wt. =	97.56 g.*	Dry Wt. =	97.54 g.
Dry Den. =	101.0 pcf	Void Ratio =	0.639	Void Ratio =	0.478
		Saturation =	95.5 %		

* Initial dry weight used in calculations

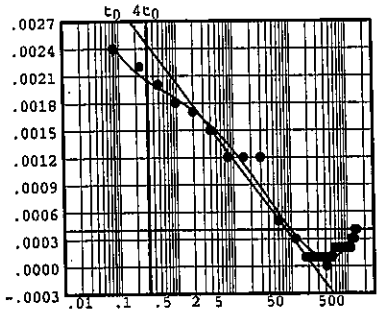
End-of-Load Summary

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (in.^{2}/sec.)	C_α	Void Ratio	% Compression /Swell
start	0.00490				0.639	
0.00 .32	0.00040	0.00000	0.0002	0.000	0.649	0.6 Swell
0.00 .65	0.00800	0.00000	0.0006	0.000	0.632	0.4 Comprs.
0.00 1.29	0.01830	0.00000	0.0023	0.002	0.609	1.8 Comprs.
0.00 2.58	0.03260	0.00000	0.0013	0.003	0.578	3.7 Comprs.
0.00 5.17	0.05180	0.00000	0.0004	0.004	0.536	6.3 Comprs.
0.01 10.32	0.07540	0.00000	0.0003	0.004	0.485	9.4 Comprs.
0.00 5.17	0.07340	0.00000	0.0004		0.489	9.1 Comprs.
0.00 2.58	0.07050	0.00000			0.495	8.7 Comprs.
0.00 1.29	0.06630	0.00000	0.0007		0.505	8.2 Comprs.
0.00 2.58	0.06810	0.00000	0.0036	0.000	0.501	8.4 Comprs.
0.00 5.17	0.07190	0.00000		0.000	0.492	8.9 Comprs.
0.01 10.32	0.07840	0.00000		0.001	0.478	9.8 Comprs.

C_c = 0.17 P_c = 0.00 tsf C_r = 0.03

Pressure: 0.00 tsf — **TEST READINGS** — **Load No. 1**

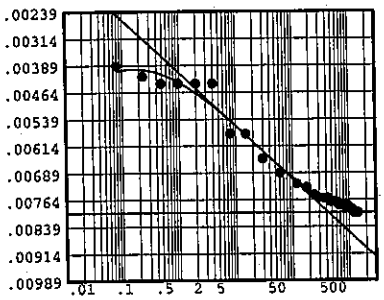
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00490	18	479.98	0.00010
2	0.08	0.00240	19	539.98	0.00010
3	0.23	0.00220	20	599.98	0.00020
4	0.48	0.00200	21	659.98	0.00020
5	0.98	0.00180	22	719.98	0.00020
6	1.98	0.00170	23	779.98	0.00020
7	3.98	0.00150	24	840.00	0.00020
8	7.98	0.00120	25	900.00	0.00020
9	14.98	0.00120	26	960.00	0.00020
10	29.98	0.00120	27	1020.00	0.00020
11	59.98	0.00050	28	1080.00	0.00020
12	119.98	0.00030	29	1140.00	0.00020
13	179.98	0.00010	30	1200.00	0.00030
14	239.98	0.00010	31	1260.00	0.00030
15	299.98	0.00010	32	1320.00	0.00030
16	359.98	0.00010	33	1380.00	0.00040
17	419.98	0.00000	34	1440.00	0.00040



Void Ratio = 0.649 **Swell** = 0.6 %
D_0 = 0.00284 D_{50} = 0.00162 D_{100} = 0.00040
C_v **at 3.1 min.** = 0.0002 in.^{2}/sec. C_α = 0.000

Pressure: 0.00 tsf 0.32 tsf — **TEST READINGS** — **Load No. 2**

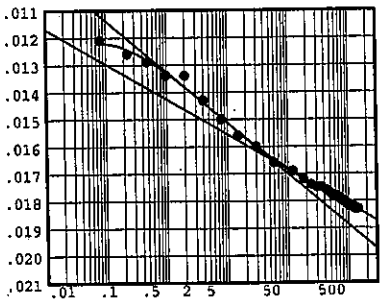
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00060	18	480.00	0.00770
2	0.08	0.00390	19	540.00	0.00770
3	0.23	0.00420	20	600.00	0.00770
4	0.48	0.00440	21	660.00	0.00780
5	0.98	0.00440	22	720.00	0.00780
6	2.00	0.00440	23	780.00	0.00780
7	4.00	0.00440	24	840.00	0.00780
8	8.00	0.00580	25	900.00	0.00780
9	15.00	0.00580	26	960.00	0.00780
10	30.00	0.00650	27	1020.00	0.00790
11	60.00	0.00690	28	1080.00	0.00790
12	120.00	0.00720	29	1140.00	0.00790
13	180.00	0.00730	30	1200.00	0.00800
14	240.00	0.00750	31	1260.00	0.00800
15	300.00	0.00760	32	1320.00	0.00800
16	360.00	0.00760	33	1380.00	0.00800
17	420.00	0.00760	34	1440.00	0.00800



Void Ratio = 0.632 **Compression** = 0.4 %
D_0 = 0.00060 D_{50} = 0.00430 D_{100} = 0.00800
C_v **at 0.8 min.** = 0.0006 in.^{2}/sec. C_α = 0.000

Pressure: 0.00 tsf — TEST READINGS — Load No. 3

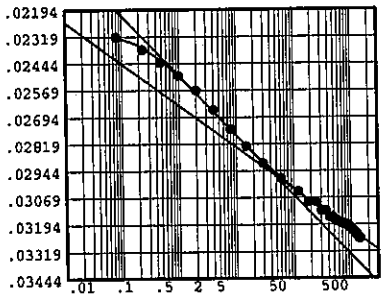
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00830	18	480.00	0.01770
2	0.08	0.01210	19	540.00	0.01780
3	0.23	0.01260	20	600.00	0.01780
4	0.48	0.01290	21	660.00	0.01790
5	0.98	0.01340	22	720.00	0.01790
6	2.00	0.01340	23	780.00	0.01800
7	4.00	0.01430	24	840.00	0.01800
8	8.00	0.01500	25	900.00	0.01810
9	15.00	0.01560	26	960.00	0.01810
10	30.00	0.01600	27	1020.00	0.01820
11	60.00	0.01660	28	1080.00	0.01820
12	120.00	0.01690	29	1140.00	0.01820
13	180.00	0.01720	30	1200.00	0.01820
14	240.00	0.01740	31	1260.00	0.01830
15	300.00	0.01750	32	1320.00	0.01830
16	360.00	0.01750	33	1380.00	0.01830
17	420.00	0.01760	34	1440.00	0.01830



Void Ratio = 0.609 Compression = 1.8 %
D_0 = 0.00830 D_{50} = 0.01238 D_{100} = 0.01646
C_v at 0.2 min. = 0.0023 in.^{2}/sec. C_α = 0.002

Pressure: 0.00 tsf — TEST READINGS — Load No. 4

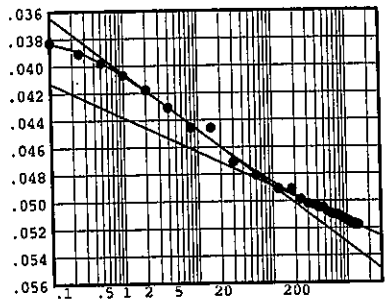
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.01840	18	480.00	0.03160
2	0.08	0.02320	19	540.00	0.03180
3	0.23	0.02380	20	600.00	0.03180
4	0.48	0.02440	21	660.00	0.03190
5	0.98	0.02500	22	720.00	0.03190
6	2.00	0.02570	23	780.00	0.03190
7	4.00	0.02660	24	840.00	0.03200
8	8.00	0.02750	25	900.00	0.03200
9	15.00	0.02830	26	960.00	0.03210
10	30.00	0.02910	27	1020.00	0.03220
11	60.00	0.02980	28	1080.00	0.03220
12	120.00	0.03040	29	1140.00	0.03230
13	180.00	0.03090	30	1200.00	0.03240
14	240.00	0.03090	31	1260.00	0.03240
15	300.00	0.03130	32	1320.00	0.03250
16	360.00	0.03130	33	1380.00	0.03260
17	420.00	0.03160	34	1440.00	0.03260



Void Ratio = 0.578 Compression = 3.7 %
D_0 = 0.01840 D_{50} = 0.02399 D_{100} = 0.02958
C_v at 0.3 min. = 0.0013 in.^{2}/sec. C_α = 0.003

Pressure: 0.00 tsf — **TEST READINGS** — **Load No. 5**

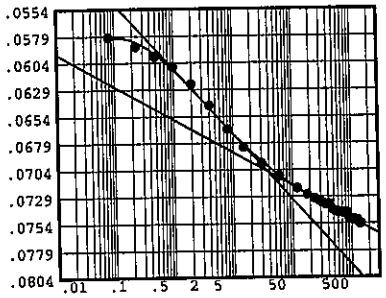
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.03260	18	480.00	0.05050
2	0.10	0.03830	19	540.00	0.05080
3	0.25	0.03910	20	600.00	0.05090
4	0.50	0.03980	21	660.00	0.05100
5	1.00	0.04070	22	720.00	0.05100
6	2.00	0.04180	23	780.00	0.05110
7	4.00	0.04310	24	840.00	0.05120
8	8.00	0.04460	25	900.00	0.05130
9	15.00	0.04460	26	960.00	0.05140
10	30.00	0.04710	27	1020.00	0.05150
11	60.00	0.04810	28	1080.00	0.05150
12	120.00	0.04910	29	1140.00	0.05160
13	180.00	0.04910	30	1200.00	0.05170
14	240.00	0.04990	31	1260.00	0.05170
15	300.00	0.05020	32	1320.00	0.05180
16	360.00	0.05030	33	1380.00	0.05180
17	420.00	0.05050	34	1440.00	0.05180



Void Ratio = 0.536 **Compression** = 6.3 %
D_0 = 0.03260 D_{50} = 0.04074 D_{100} = 0.04888
C_v **at 1.0 min.** = 0.0004 in.^{2}/sec. C_α = 0.004

Pressure: 0.01 tsf — **TEST READINGS** — **Load No. 6**

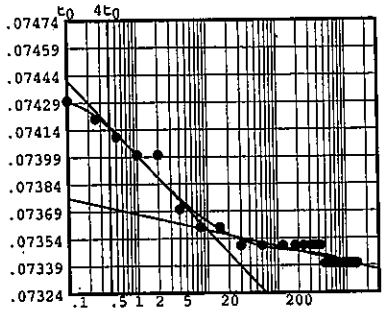
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.05240	18	480.00	0.07410
2	0.08	0.05800	19	540.00	0.07430
3	0.23	0.05890	20	600.00	0.07440
4	0.48	0.05980	21	660.00	0.07440
5	0.98	0.06080	22	720.00	0.07440
6	2.00	0.06240	23	780.00	0.07440
7	4.00	0.06440	24	840.00	0.07440
8	8.00	0.06660	25	900.00	0.07490
9	15.00	0.06830	26	960.00	0.07500
10	30.00	0.06980	27	1020.00	0.07500
11	60.00	0.07100	28	1080.00	0.07500
12	120.00	0.07210	29	1140.00	0.07510
13	180.00	0.07270	30	1200.00	0.07510
14	240.00	0.07310	31	1260.00	0.07510
15	300.00	0.07340	32	1320.00	0.07530
16	360.00	0.07360	33	1380.00	0.07540
17	420.00	0.07360	34	1440.00	0.07540



Void Ratio = 0.485 **Compression** = 9.4 %
D_0 = 0.05240 D_{50} = 0.06145 D_{100} = 0.07051
C_v **at 1.2 min.** = 0.0003 in.^{2}/sec. C_α = 0.004

Pressure: 0.00 tsf — **TEST READINGS** — **Load No. 7**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.07550	18	480.00	0.07340
2	0.10	0.07430	19	540.00	0.07340
3	0.25	0.07420	20	600.00	0.07340
4	0.50	0.07410	21	660.00	0.07340
5	1.00	0.07400	22	720.00	0.07340
6	2.00	0.07400	23	780.00	0.07340
7	4.00	0.07370	24	840.00	0.07340
8	8.00	0.07360	25	900.00	0.07340
9	15.00	0.07360	26	960.00	0.07340
10	30.00	0.07350	27	1020.00	0.07340
11	60.00	0.07350	28	1080.00	0.07340
12	120.00	0.07350	29	1140.00	0.07340
13	180.00	0.07350	30	1200.00	0.07340
14	240.00	0.07350	31	1260.00	0.07340
15	300.00	0.07350	32	1320.00	0.07340
16	360.00	0.07350	33	1380.00	0.07340
17	420.00	0.07350	34	1440.00	0.07340



Void Ratio = 0.489 **Compression** = 9.1 %
D_0 = 0.07443 D_{50} = 0.07401 D_{100} = 0.07359
C_v **at 1.0 min.** = 0.0004 in.^{2}/sec.

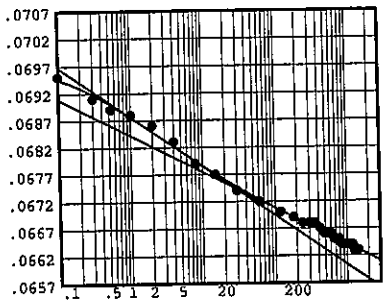
Pressure: 0.00 tsf — **TEST READINGS** — **Load No. 8**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.07340	13	180.00	0.07080	25	900.00	0.07050
2	0.10	0.07210	14	240.00	0.07080	26	960.00	0.07050
3	0.27	0.07200	15	300.00	0.07080	27	1020.00	0.07050
4	0.52	0.07200	16	360.00	0.07070	28	1080.00	0.07050
5	1.00	0.07180	17	420.00	0.07070	29	1140.00	0.07050
6	2.00	0.07160	18	480.00	0.07060	30	1200.00	0.07050
7	4.00	0.07140	19	540.00	0.07060	31	1260.00	0.07050
8	8.00	0.07120	20	600.00	0.07060	32	1320.00	0.07050
9	15.00	0.07120	21	660.00	0.07060	33	1380.00	0.07050
10	30.00	0.07100	22	720.00	0.07060	34	1440.00	0.07050
11	60.00	0.07100	23	780.00	0.07060			
12	120.00	0.07080	24	840.00	0.07050			

Void Ratio = 0.495 **Compression** = 8.7 %

Pressure: 0.00 tsf — **TEST READINGS** — **Load No. 9**

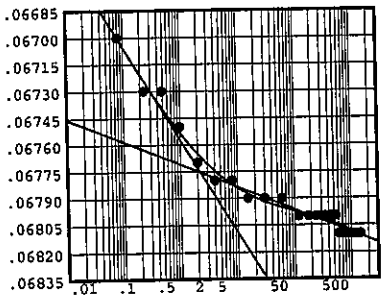
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.07050	18	480.00	0.06660
2	0.10	0.06950	19	540.00	0.06660
3	0.30	0.06910	20	600.00	0.06660
4	0.53	0.06890	21	660.00	0.06650
5	1.00	0.06880	22	720.00	0.06650
6	2.00	0.06860	23	780.00	0.06650
7	4.00	0.06830	24	840.00	0.06640
8	8.00	0.06790	25	900.00	0.06640
9	15.00	0.06770	26	960.00	0.06640
10	30.00	0.06740	27	1020.00	0.06640
11	60.00	0.06720	28	1080.00	0.06640
12	120.00	0.06700	29	1140.00	0.06640
13	180.00	0.06690	30	1200.00	0.06640
14	240.00	0.06680	31	1260.00	0.06630
15	300.00	0.06680	32	1320.00	0.06630
16	360.00	0.06680	33	1380.00	0.06630
17	420.00	0.06670	34	1440.00	0.06630



Void Ratio = 0.505 **Compression** = 8.2 %
D_0 = 0.07050 D_{50} = 0.06898 D_{100} = 0.06746
C_v **at 0.5 min.** = 0.0007 in.^{2}/sec.

Pressure: 0.00 tsf — **TEST READINGS** — **Load No. 10**

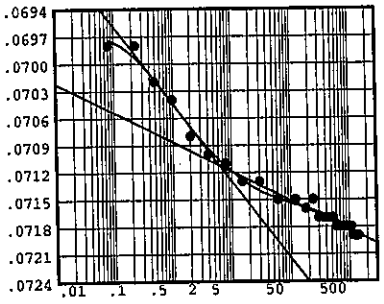
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.06630	18	480.00	0.06800
2	0.08	0.06700	19	540.00	0.06800
3	0.23	0.06730	20	600.00	0.06810
4	0.48	0.06730	21	660.00	0.06810
5	0.98	0.06750	22	720.00	0.06810
6	2.00	0.06770	23	780.00	0.06810
7	4.00	0.06780	24	840.00	0.06810
8	8.00	0.06780	25	900.00	0.06810
9	15.00	0.06790	26	960.00	0.06810
10	30.00	0.06790	27	1020.00	0.06810
11	60.00	0.06790	28	1080.00	0.06810
12	120.00	0.06800	29	1140.00	0.06810
13	180.00	0.06800	30	1200.00	0.06810
14	240.00	0.06800	31	1260.00	0.06810
15	300.00	0.06800	32	1320.00	0.06810
16	360.00	0.06800	33	1380.00	0.06810
17	420.00	0.06800	34	1440.00	0.06810



Void Ratio = 0.501 **Compression** = 8.4 %
D_0 = 0.06630 D_{50} = 0.06703 D_{100} = 0.06775
C_v **at 0.1 min.** = 0.0036 in.^{2}/sec. C_α = 0.000

Pressure: 0.00 tsf — **TEST READINGS** — **Load No. 11**

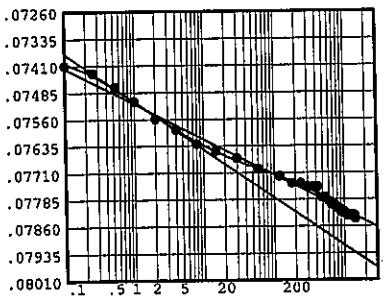
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.06820	18	480.00	0.07170
2	0.08	0.06980	19	540.00	0.07170
3	0.23	0.06980	20	600.00	0.07180
4	0.48	0.07020	21	660.00	0.07180
5	0.98	0.07040	22	720.00	0.07180
6	2.00	0.07080	23	780.00	0.07180
7	4.00	0.07100	24	840.00	0.07180
8	8.00	0.07110	25	900.00	0.07180
9	15.00	0.07130	26	960.00	0.07180
10	30.00	0.07130	27	1020.00	0.07180
11	60.00	0.07150	28	1080.00	0.07180
12	120.00	0.07150	29	1140.00	0.07190
13	180.00	0.07160	30	1200.00	0.07190
14	240.00	0.07150	31	1260.00	0.07190
15	300.00	0.07170	32	1320.00	0.07190
16	360.00	0.07170	33	1380.00	0.07190
17	420.00	0.07170	34	1440.00	0.07190



Void Ratio = 0.492 **Compression =** 8.9 %

Pressure: 0.01 tsf — **TEST READINGS** — **Load No. 12**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.07190	18	480.00	0.07780
2	0.10	0.07410	19	540.00	0.07780
3	0.25	0.07430	20	600.00	0.07790
4	0.53	0.07470	21	660.00	0.07800
5	1.00	0.07510	22	720.00	0.07800
6	2.00	0.07560	23	780.00	0.07810
7	4.00	0.07590	24	840.00	0.07810
8	8.00	0.07630	25	900.00	0.07820
9	15.00	0.07650	26	960.00	0.07820
10	30.00	0.07670	27	1020.00	0.07820
11	60.00	0.07700	28	1080.00	0.07830
12	120.00	0.07720	29	1140.00	0.07830
13	180.00	0.07740	30	1200.00	0.07830
14	240.00	0.07740	31	1260.00	0.07830
15	300.00	0.07750	32	1320.00	0.07830
16	360.00	0.07750	33	1380.00	0.07830
17	420.00	0.07750	34	1440.00	0.07840



Void Ratio = 0.478 **Compression =** 9.8 %

CONSOLIDATION TEST DATA

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project Number: 0121-3070.03

Sample Data

Source: B-1108A
Sample No.: ST-3
Elev. or Depth: 18.0
Sample Length(in./cm.): 24
Location:
Description: Lean clay
Liquid Limit: 38
Plasticity Index: 19
USCS: CL
AASHTO: A-6(17)
Figure No.:
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE		BEFORE TEST		AFTER TEST	
Wet w+t	= 220.33 g.	Consolidometer #	= 3	Wet w+t	= 176.84 g.
Dry w+t	= 185.79 g.			Dry w+t	= 154.09 g.
Tare Wt.	= 67.15 g.	Spec. Gravity	= 2.64	Tare Wt.	= 62.59 g.
Height	= .75 in.	Height	= .75 in.		
Diameter	= 2.50 in.	Diameter	= 2.50 in.		
Weight	= 118.57 g.	Defl. Table	= n/a		
Moisture	= 29.1 %	Ht. Solids	= 0.4324 in.	Moisture	= 24.9 %
Wet Den.	= 122.7 pcf	Dry Wt.	= 91.83 g.*	Dry Wt.	= 91.50 g.
Dry Den.	= 95.0 pcf	Void Ratio	= 0.734	Void Ratio	= 0.428
		Saturation	= 104.7 %		

* Initial dry weight used in calculations

End-of-Load Summary

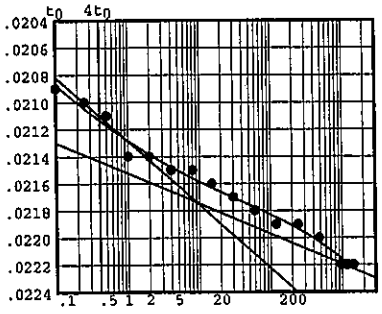
Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (in.^{2}/sec.)	C_α	Void Ratio	% Compression /Swell
start	0.00000				0.734	
0.00 .16	0.02220	0.00000	0.0009	0.000	0.683	3.0 Comprs.
0.00 .32	0.03210	0.00000	0.0001	0.001	0.660	4.3 Comprs.
0.00 .65	0.04630	0.00000	0.0001	0.001	0.627	6.2 Comprs.
0.00 1.29	0.05980	0.00000	0.0007	0.001	0.596	8.0 Comprs.
0.00 2.58	0.07780	0.00000	0.0006	0.003	0.554	10.4 Comprs.
0.00 5.17	0.09980	0.00000	0.0001	0.003	0.504	13.3 Comprs.
0.01 10.34	0.12740	0.00000	0.0001	0.004	0.440	17.0 Comprs.
0.00 5.17	0.12510	0.00000			0.445	16.7 Comprs.
0.00 2.58	0.12000	0.00000			0.457	16.0 Comprs.
0.00 1.29	0.11350	0.00000			0.472	15.1 Comprs.
0.00 .65	0.10630	0.00000			0.489	14.2 Comprs.
0.00 .32	0.09910	0.00000			0.505	13.2 Comprs.
0.00 .65	0.10020	0.00000	0.0001	0.000	0.503	13.4 Comprs.
0.00 1.29	0.10390	0.00000	0.0004	0.000	0.494	13.9 Comprs.

Pressure (tsf)	Final Dial (in.)	Machine Defl. (in.)	C_v (in.^{2}/sec.)	C_α	Void Ratio	% Compression /Swell
0.00 2.58	0.11060	0.00000	0.0001	0.001	0.479	14.7 Comprs.
0.00 5.17	0.11990	0.00000	0.0001	0.001	0.457	16.0 Comprs.
0.01 10.34	0.13230	0.00000	0.0002	0.002	0.428	17.6 Comprs.

C_c = 0.21 P_c = 0.00 tsf C_r = 0.05

Pressure: 0.00 tsf **TEST READINGS** **Load No. 1**

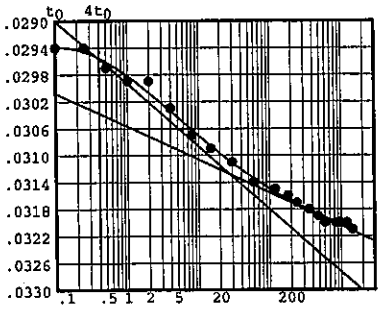
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00000	11	60.00	0.02180
2	0.10	0.02090	12	120.00	0.02190
3	0.25	0.02100	13	240.00	0.02190
4	0.50	0.02110	14	480.00	0.02200
5	1.00	0.02140	15	960.00	0.02220
6	2.00	0.02140	16	1140.00	0.02220
7	4.00	0.02150	17	1200.00	0.02220
8	8.00	0.02150	18	1440.00	0.02220
9	15.00	0.02160			
10	30.00	0.02170			



Void Ratio = 0.683 **Compression** = 3.0 %
D_0 = 0.02061 D_{50} = 0.02118 D_{100} = 0.02174
C_v **at 0.5 min.** = 0.0009 in.^{2}/sec. C_α = 0.000

Pressure: 0.00 tsf **TEST READINGS** **Load No. 2**

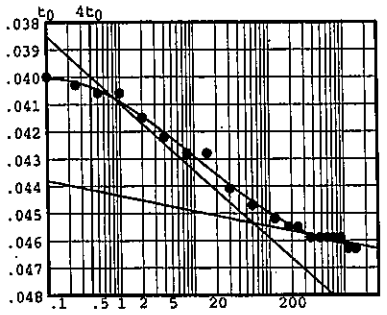
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.02220	12	120.00	0.03150
2	0.10	0.02940	13	180.00	0.03160
3	0.25	0.02940	14	240.00	0.03170
4	0.50	0.02970	15	360.00	0.03180
5	1.00	0.02990	16	480.00	0.03190
6	2.00	0.02990	17	600.00	0.03200
7	4.00	0.03030	18	840.00	0.03200
8	8.00	0.03070	19	960.00	0.03200
9	15.00	0.03090	20	1200.00	0.03200
10	30.00	0.03110	21	1440.00	0.03210
11	60.00	0.03140			



Void Ratio = 0.660 **Compression** = 4.3 %
D_0 = 0.02924 D_{50} = 0.03026 D_{100} = 0.03128
C_v **at 3.3 min.** = 0.0001 in.^{2}/sec. C_α = 0.001

Pressure: 0.00 tsf **TEST READINGS** **Load No. 3**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.03210	12	120.00	0.04520
2	0.10	0.04000	13	180.00	0.04550
3	0.25	0.04030	14	240.00	0.04550
4	0.50	0.04060	15	360.00	0.04590
5	1.00	0.04060	16	480.00	0.04590
6	2.00	0.04150	17	600.00	0.04590
7	4.00	0.04220	18	720.00	0.04590
8	8.00	0.04280	19	900.00	0.04590
9	15.00	0.04280	20	1140.00	0.04630
10	30.00	0.04410	21	1440.00	0.04630
11	60.00	0.04470			



Void Ratio = 0.627 **Compression** = 6.2 %

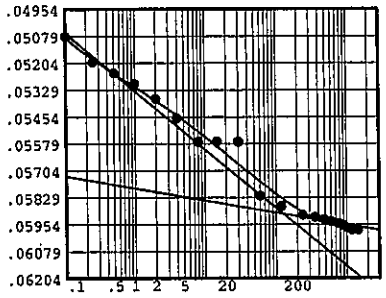
D_0 = 0.03977 D_{50} = 0.04256 D_{100} = 0.04536

C_v at 7.0 min. = 0.0001 in.^{2}/sec. C_α = 0.001

.75" - 0.0321 = 0.72

Pressure: 0.00 tsf **TEST READINGS** **Load No. 4**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.04630	12	120.00	0.05870
2	0.10	0.05080	13	240.00	0.05910
3	0.25	0.05200	14	360.00	0.05920
4	0.50	0.05250	15	480.00	0.05930
5	1.00	0.05300	16	600.00	0.05940
6	2.00	0.05370	17	780.00	0.05950
7	4.00	0.05460	18	900.00	0.05960
8	8.00	0.05570	19	1020.00	0.05970
9	15.00	0.05570	20	1200.00	0.05980
10	30.00	0.05570	21	1440.00	0.05980
11	60.00	0.05820			



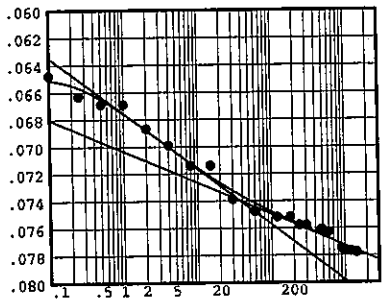
Void Ratio = 0.596 **Compression** = 8.0 %

D_0 = 0.04630 D_{50} = 0.05267 D_{100} = 0.05904

C_v at 0.6 min. = 0.0007 in.^{2}/sec. C_α = 0.001

Pressure: 0.00 tsf — **TEST READINGS** — **Load No. 5**

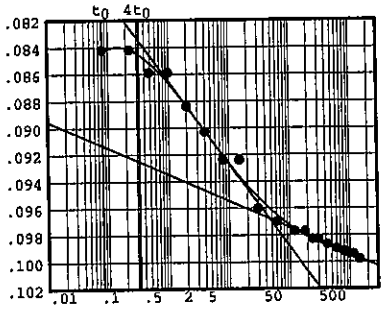
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.05980	12	120.00	0.07520
2	0.10	0.06480	13	180.00	0.07520
3	0.25	0.06630	14	240.00	0.07580
4	0.50	0.06690	15	300.00	0.07580
5	1.00	0.06690	16	480.00	0.07610
6	2.00	0.06870	17	600.00	0.07630
7	4.00	0.06990	18	900.00	0.07750
8	8.00	0.07140	19	1020.00	0.07760
9	15.00	0.07140	20	1200.00	0.07770
10	30.00	0.07390	21	1440.00	0.07780
11	60.00	0.07480			



Void Ratio = 0.554 **Compression** = 10.4 %
D_0 = 0.05980 D_{50} = 0.06688 D_{100} = 0.07396
C_v **at 0.6 min.** = 0.0006 in.^{2}/sec. C_α = 0.003

Pressure: 0.00 tsf — **TEST READINGS** — **Load No. 6**

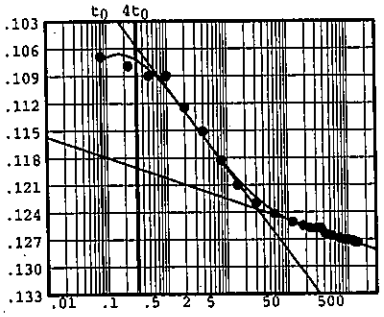
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.07780	12	120.00	0.09770
2	0.08	0.08420	13	180.00	0.09770
3	0.23	0.08420	14	240.00	0.09830
4	0.48	0.08590	15	300.00	0.09830
5	0.98	0.08590	16	420.00	0.09870
6	2.00	0.08840	17	600.00	0.09900
7	4.00	0.09030	18	780.00	0.09920
8	8.00	0.09240	19	900.00	0.09930
9	15.00	0.09240	20	1020.00	0.09940
10	30.00	0.09600	21	1140.00	0.09940
11	60.00	0.09700	22	1440.00	0.09980



Void Ratio = 0.504 **Compression** = 13.3 %
D_0 = 0.08410 D_{50} = 0.09042 D_{100} = 0.09674
C_v **at 4.3 min.** = 0.0001 in.^{2}/sec. C_α = 0.003

Pressure: 0.01 tsf — **TEST READINGS** — **Load No. 7**

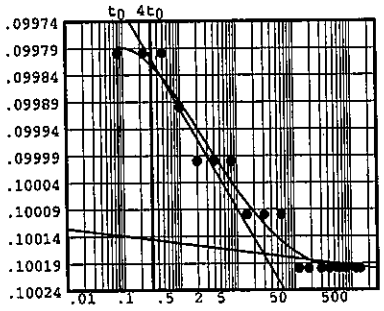
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.09980	14	240.00	0.12580
2	0.08	0.10690	15	300.00	0.12580
3	0.23	0.10790	16	360.00	0.12580
4	0.50	0.10900	17	420.00	0.12640
5	1.00	0.10900	18	480.00	0.12650
6	2.00	0.11250	19	540.00	0.12660
7	4.00	0.11510	20	720.00	0.12690
8	8.00	0.11830	21	780.00	0.12700
9	15.00	0.12100	22	900.00	0.12710
10	30.00	0.12300	23	1020.00	0.12710
11	60.00	0.12420	24	1200.00	0.12720
12	120.00	0.12510	25	1260.00	0.12730
13	180.00	0.12550	26	1440.00	0.12740



Void Ratio = 0.440 **Compression** = 17.0 %
D_0 = 0.10765 D_{50} = 0.11567 D_{100} = 0.12368
C_v **at 4.1 min.** = 0.0001 in.^{2}/sec. C_α = 0.004

Pressure: 0.00 tsf — **TEST READINGS** — **Load No. 13**

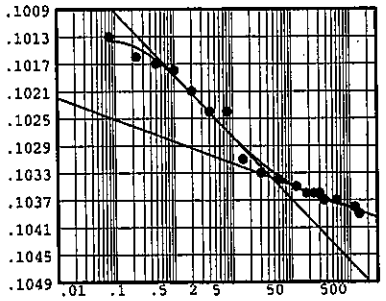
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.09910	11	60.00	0.10010
2	0.08	0.09980	12	120.00	0.10020
3	0.23	0.09980	13	180.00	0.10020
4	0.50	0.09980	14	300.00	0.10020
5	1.00	0.09990	15	420.00	0.10020
6	2.00	0:10000	16	600.00	0.10020
7	4.00	0.10000	17	800.00	0.10020
8	8.00	0.10000	18	1200.00	0.10020
9	15.00	0.10010	19	1400.00	0.10020
10	30.00	0.10010			



Void Ratio = 0.503 **Compression** = 13.4 %
D_0 = 0.09976 D_{50} = 0.09996 D_{100} = 0.10017
C_v **at 2.8 min.** = 0.0001 in.^{2}/sec. C_α = 0.000

Pressure: 0.00 tsf **TEST READINGS** **Load No. 14**

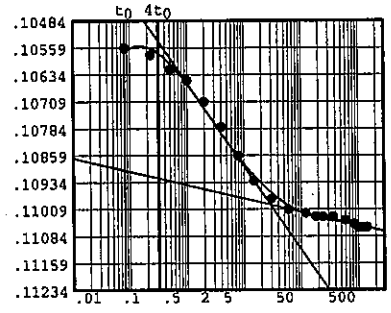
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.10020	11	60.00	0.10340
2	0.08	0.10130	12	120.00	0.10350
3	0.23	0.10160	13	180.00	0.10360
4	0.50	0.10170	14	240.00	0.10360
5	1.00	0.10180	15	300.00	0.10360
6	2.00	0.10210	16	360.00	0.10370
7	4.00	0.10240	17	600.00	0.10370
8	8.00	0.10240	18	1200.00	0.10380
9	15.00	0.10310	19	1440.00	0.10390
10	30.00	0.10330			



Void Ratio = 0.494 **Compression** = 13.9 %
D_0 = 0.10020 D_{50} = 0.10179 D_{100} = 0.10337
C_v **at 0.8 min.** = 0.0004 in.^{2}/sec. C_α = 0.000

Pressure: 0.00 tsf **TEST READINGS** **Load No. 15**

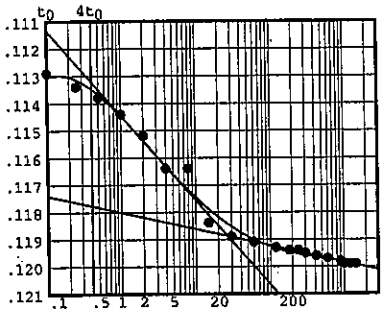
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.10390	11	60.00	0.11010
2	0.08	0.10560	12	120.00	0.11020
3	0.23	0.10580	13	180.00	0.11030
4	0.50	0.10620	14	240.00	0.11030
5	1.00	0.10650	15	360.00	0.11030
6	2.00	0.10710	16	600.00	0.11040
7	4.00	0.10780	17	840.00	0.11050
8	8.00	0.10860	18	1020.00	0.11060
9	15.00	0.10930	19	1200.00	0.11060
10	30.00	0.10980	20	1400.00	0.11060



Void Ratio = 0.479 **Compression** = 14.7 %
D_0 = 0.10566 D_{50} = 0.10781 D_{100} = 0.10996
C_v **at 3.4 min.** = 0.0001 in.^{2}/sec. C_α = 0.001

Pressure: 0.00 tsf — **TEST READINGS** — **Load No. 16**

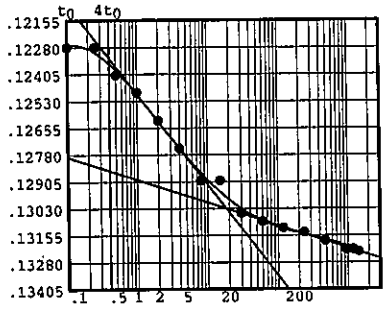
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.11060	12	120.00	0.11930
2	0.10	0.11290	13	180.00	0.11940
3	0.25	0.11340	14	240.00	0.11940
4	0.50	0.11380	15	300.00	0.11950
5	1.00	0.11440	16	420.00	0.11960
6	2.00	0.11520	17	600.00	0.11970
7	4.00	0.11640	18	900.00	0.11980
8	8.00	0.11640	19	1020.00	0.11990
9	15.00	0.11840	20	1200.00	0.11990
10	30.00	0.11890	21	1440.00	0.11990
11	60.00	0.11910			



Void Ratio = 0.457 **Compression** = 16.0 %
D_0 = 0.11263 D_{50} = 0.11575 D_{100} = 0.11888
C_v at 2.6 min. = 0.0001 in.^{2}/sec. C_α = 0.001

Pressure: 0.01 tsf — **TEST READINGS** — **Load No. 17**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.11990	11	60.00	0.13090
2	0.10	0.12280	12	120.00	0.13120
3	0.25	0.12280	13	240.00	0.13140
4	0.50	0.12410	14	480.00	0.13180
5	1.00	0.12490	15	960.00	0.13220
6	2.00	0.12620	16	1200.00	0.13220
7	4.00	0.12750	17	1440.00	0.13230
8	8.00	0.12900			
9	15.00	0.12900			
10	30.00	0.13050			



Void Ratio = 0.428 **Compression** = 17.6 %
D_0 = 0.12192 D_{50} = 0.12611 D_{100} = 0.13030
C_v at 1.9 min. = 0.0002 in.^{2}/sec. C_α = 0.002