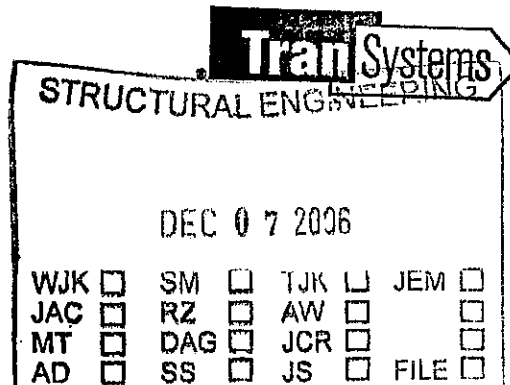


**RECEIVED**

November 9, 2006

NOV - 9 2006

Michael D. Weeks, P.E., P.S.  
TranSystems Corporation  
5747 Perimeter Drive, Suite 240  
Dublin, OH 43017



Re: **Retaining Wall Structure - SR-335**  
SCI-823-0.00 Portsmouth Bypass  
DLZ Job No.: 0121-3070.03  
Document # 0031

Dear Mr. Weeks:

This letter presents the findings of an evaluation for the proposed retaining wall structure along SR 335 at the proposed Shumway Hollow Road intersection on the above-referenced project.

Based upon information provided by TranSystems Corporation, it is understood that a retaining wall will be required along existing SR 335, from approximately station 10+26 to 13+82. The proposed retaining wall will hold back the existing soils and new fill placed for the addition of a turn lane on SR 335.

The evaluations and recommendations presented in this document are based upon the results of borings drilled for the proposed structure. Three borings (B-1340 through B-1342) were drilled for the proposed retaining wall structure. Borings were advanced to depths ranging between 45.0 and 49.5 feet below the ground surface. Additionally, borings B-1332 and B-1333 were drilled in the pavement surface of SR 335 for the purposes of evaluating the subgrade soils. The findings of these two borings were also considered in this evaluation. The surveyed coordinates and ground surface elevations of the borings are reported on the boring logs. The planned boring locations were determined by representatives of DLZ, Ohio, Inc. (DLZ), while the surveyed "as-drilled" locations and elevations were determined by representatives of Lockwood, Lanier, Mathias & Noland, Inc. (2LMN).

Borings drilled for this structure encountered a wide range of subsurface materials. The thickness and consistency of the soil layers varies between the borings. Both fine-grained and coarse-grained soils were encountered in all borings drilled for the proposed structure. The bedrock profile indicates that the depth to bedrock is deepest near boring B-1342 at approximately station 10+69. No seepage or groundwater was encountered prior to coring rock.

From recent conversations with representatives of TranSystems Corporation, it is understood that it would be advantageous to maintain two-lane traffic on existing SR 335 during construction of the proposed retaining wall. The subsurface materials encountered in the borings indicate that several wall types would be suitable for the proposed retaining structures. Based upon the boring results, it would be possible to use an MSE wall or traditional cantilever retaining wall to hold back the proposed roadway embankment in this area. However, the extensive excavations required for these

Michael D. Weeks, P.E., P.S.  
November 9, 2006  
Page 2

wall types preclude their use at this site. Assuming any excavation could be cut at a 1H:1V slope, the excavation for these walls would extend to well inside of the travel lanes of existing SR 335. If maintenance of traffic requirements change, we can provide information for the design of these wall types upon request.

Given the maintenance of traffic requirements and to prevent significant excavations, the use of a soldier pile retaining wall system is recommended at this site to retain the proposed roadway embankment fill or natural soils. It is anticipated that a reasonable steel section can provide sufficient shear and moment resistance. Furthermore, it is anticipated that precast concrete lagging could be used to span the area between the piles and contain the soil / fill material.

Laboratory testing was performed on both the soil and rock core samples to determine parameters used in the design of a soldier pile retaining wall. The results of laboratory tests are attached to this document. Additionally, the results of laboratory tests are presented on the boring logs.

It recommended that lagging be placed from the top of the wall to the soil-rock interface. Consequently, due to the required excavation and the slope near the railroad cut, it is prudent to assume no passive resistance from the soil overlying bedrock. It is then anticipated that the rock socket will provide all of the resistance to lateral earth pressures.

The unit weight of the rock core samples tested ranged from 134.6 to 145.7 pcf with an average unit weight of 139.9 pcf. Selected rock cores were tested for unconfined compressive strength as well as elastic modulus. The results of these tests indicate unconfined compressive strengths ranging from 11,643 to 13,315 psi with an average value of 12,853 psi. The rock quality designation (RQD) of the rock core ranged from 56 to 100 percent, with an average value of 87 percent. Additional parameters for the design of a soldier pile retaining wall system are presented in the table below.

#### Soldier Pile Wall Rock Socket Design Parameters

Boring	Station	Ground Surface Elevation (ft)	Depth to Top of Bedrock (ft)	Required Minimum Rock Socket (ft) <sup>+</sup>	Unconfined Compressive Strength (psi)*	Rock Elastic Modulus (psi)*
B-1340	13+51	657.0	14.5	10.0	11,500	2.2 x 10 <sup>6</sup>
B-1341	12+08	658.0	15.0			
B-1342	10+59	660.8	21.7			

\* Represents test results on intact rock cores. Lower bound value used for design.

<sup>+</sup> Analyses may determine that longer rock sockets are required for stability.

It will be necessary to compute lateral earth pressures from the retained soil and fill materials for the design of the retaining wall. Borings indicate that the groundwater table is likely well below the soil-rock interface. This is evident in the lack of seepage in the granular layers, as well as the dry exposed fractures in the nearby railroad rock cut. Consequently, typical moist unit weights above the water table are recommended for the calculation of the lateral earth pressures. Parameters for the calculation of lateral earth pressures are presented in the table on the following page.

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November 9, 2006  
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**Parameters for Calculation of Lateral Earth Pressures**

Boring	Station	Ground Surface Elevation (ft)	Depth of Retained Soil	$\gamma_N$ (pcf)*	$\Phi'$ (deg)	$K_a^+$
B-1340	13+51	657.0	14.5	120	30.0	0.33
B-1341	12+08	658.0	15.0			
B-1342	10+59	660.8	21.7			

<sup>+</sup> Active Earth Pressure Coefficient [EM 1110-2-2502 Retaining and Floodwalls]

\* Assumes groundwater table below soil-rock interface.


It should be noted that the elevations and depths presented in the preceding tables reflect conditions at the boring locations only. It should be noted that subsurface conditions may exist that are more critical than those encountered in the borings.

It is recommended that the rock socket diameter be 8 to 12 inches larger than the diagonal dimension of the selected steel section. Additionally, the spacing of the piles is typically in the range of 2B to 3B, where B is the diameter of the rock socket. For good quality sandstone, such as that found at this site, a reduction in efficiency is generally not required for group effects.


We appreciate having the opportunity to be of service to you on this project. Please do not hesitate to call if you have any questions concerning our preliminary findings.

Respectfully submitted,

**DLZ OHIO, INC.**



Steven J. Riedy  
Geotechnical Engineer

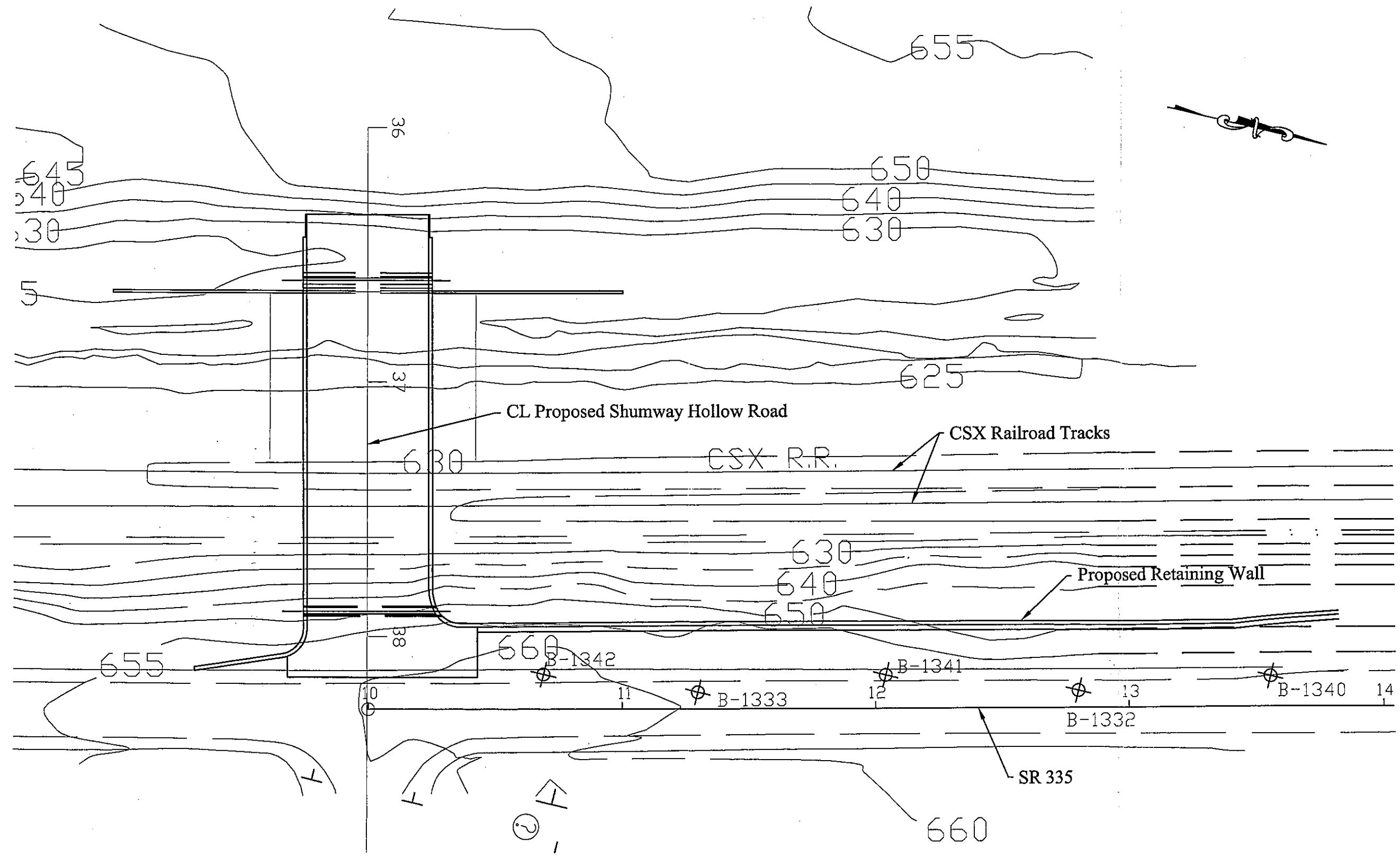


Arthur (Pete) Nix, P.E.  
Geotechnical Division Manager

Encl: Boring Location Plan, Plan and Profile Drawings, Borings, Cross Section Drawings, Calculations

cc: file

M:\proj\0121\3070.03\Stability Analyses\Retaining Walls\SR 335 Retaining Wall\SR 335 Retaining Wall ltr.doc





SEEDING  
END WIDTH 50- YDS.

END AREA		VOLUME		CALCULATED	CHECKED
CUT	FILL	CUT	FILL		

660

EXIST. RR R/W

640

620

450+00

EXIST. RR R/W

660

EXIST. RR R/W

640

620

450+50

EXIST. RR R/W

660

EXIST. RR R/W

640

620

451+00

EXIST. RR R/W

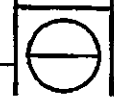
SHEET TOTAL

180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200

SHEET TOTAL

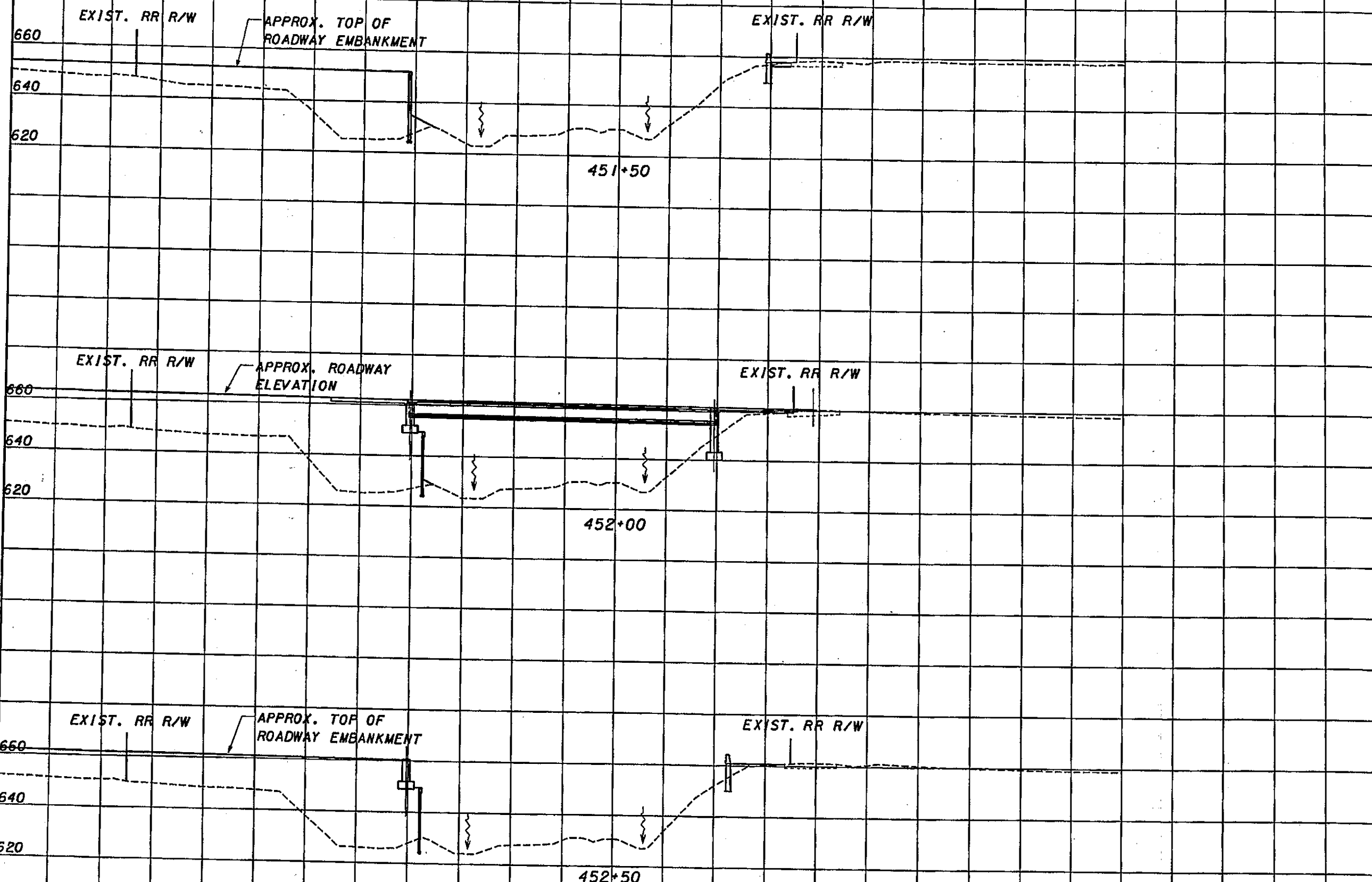
CROSS SECTIONS  
STA. 450+00 TO STA. 451+00

SCI-823-0.00



SEEDING  
END SO. WIDTH YDS.

END AREA VOLUME  
CUT FILL CUT FILL  
CALCULATED CHECKED



SHEET TOTAL	180	160	140	120	100	80	60	40	20	0	20	40	60	80	100	120	140	160	180	200	SHEET TOTAL
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CROSS SECTIONS  
STA. 451+50 TO 452+50

SCI-823-0.00



SEEDING

END SO. YDS. WIDTH

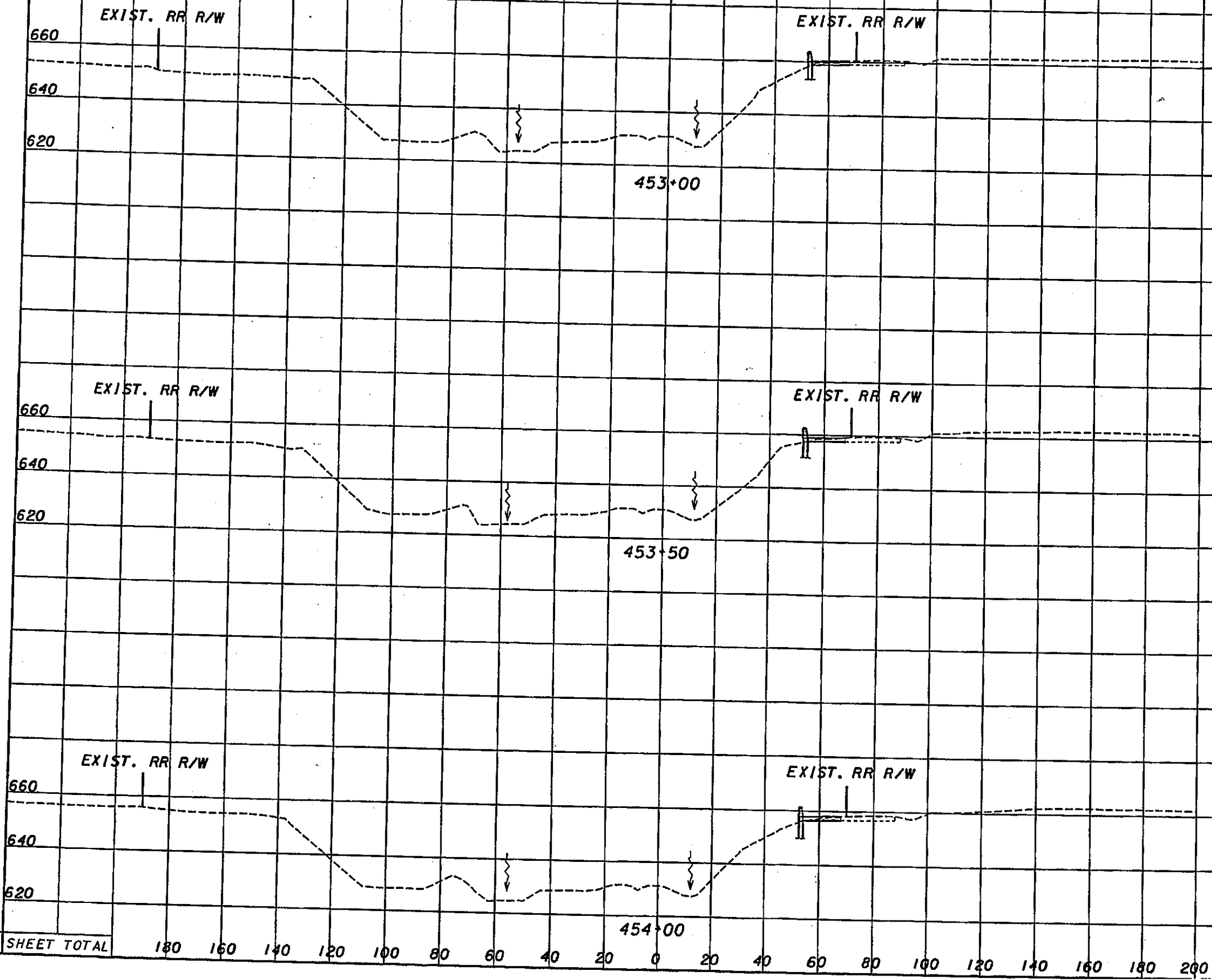
END AREA VOLUME

CUT FILL CUT FILL

CALCULATED CHECKED

CROSS SECTIONS  
STA. 453+00 TO 454+00

SCI-823-0.00

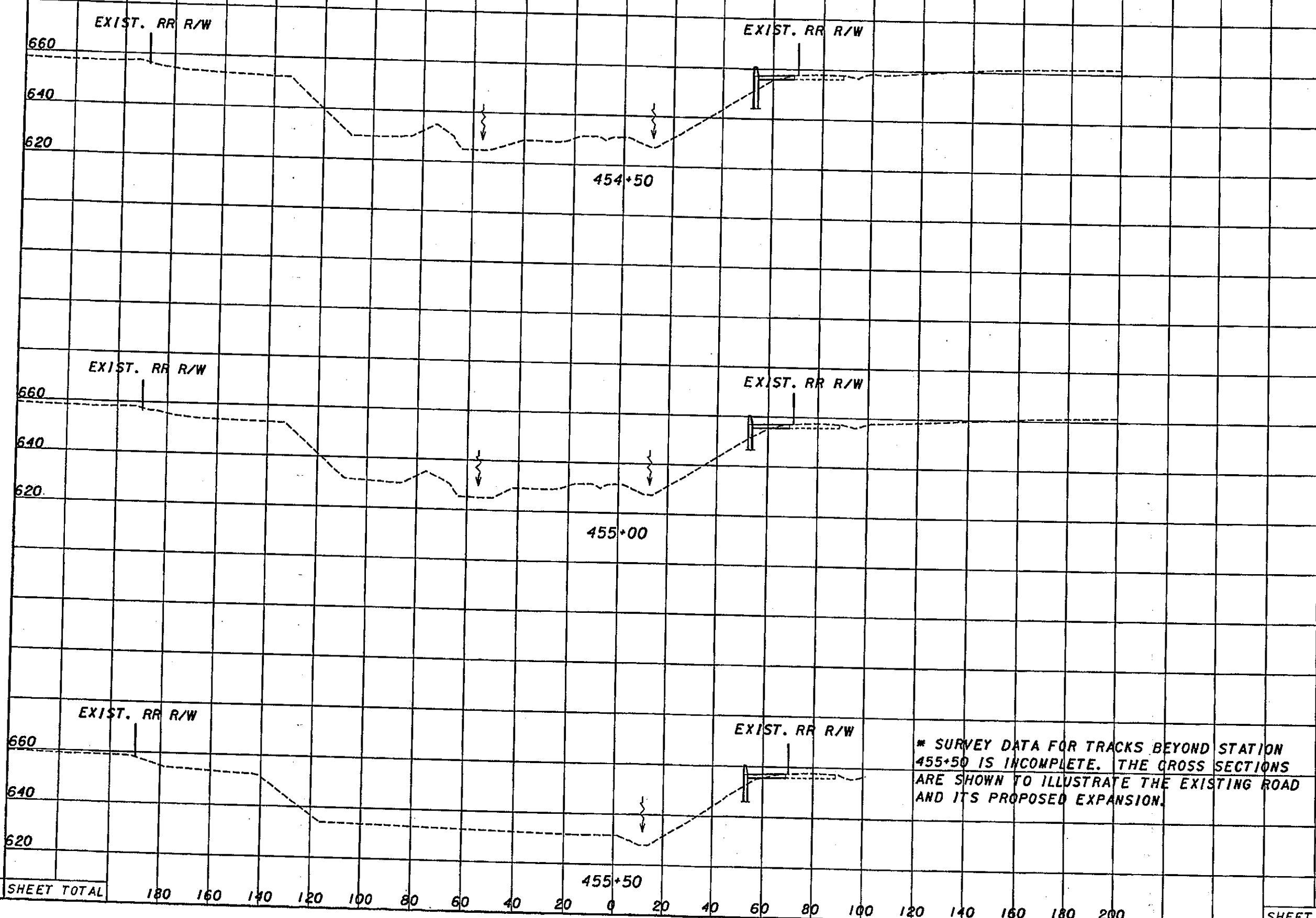


SHEET TOTAL



SEEDING  
END BIRTH SQ. YDS.

END AREA		VOLUME		CALCULATED	CHECKED
CUT	FILL	CUT	FILL		



CROSS SECTIONS  
STA. 454+50 TO 455+50

SCI-823-0.00

SHEET TOTAL

SHEET TOTAL

SEEDING  
END SO.  
WIDTH YDS.

END AREA VOLUME  
CUT FILL CUT FILL  
CALCULATED CHECKED

EXIST. RR R/W

EXIST. RR R/W

660

640

620

456+00

EXIST. RR R/W

EXIST. RR R/W

660

640

620

456+50

EXIST. RR R/W

EXIST. RR R/W

660

640

620

457+00

SHEET TOTAL

180 160 140 120 100 80 60 40 20 0 20 40 60 80 100 120 140 160 180 200

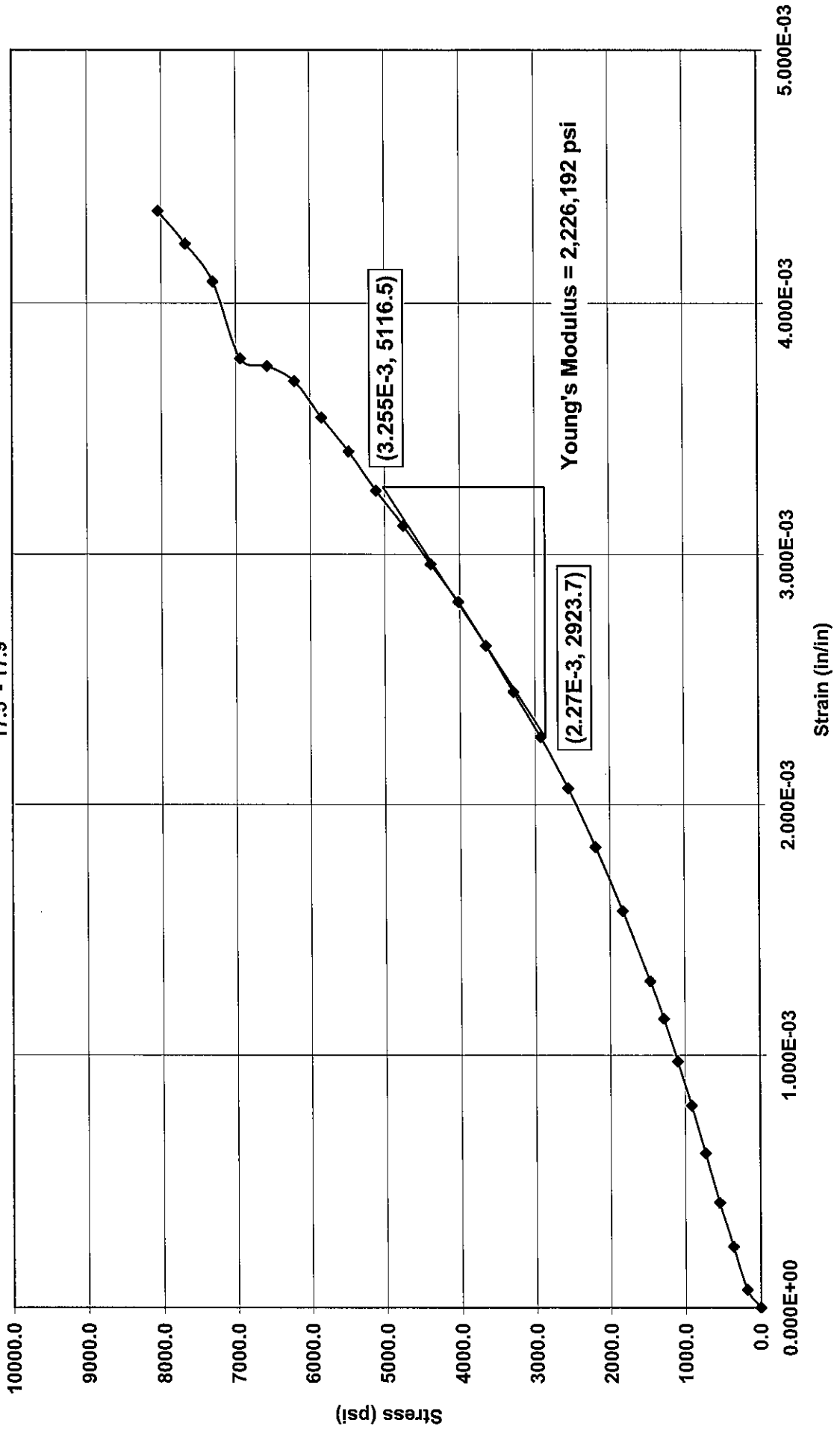
SHEET TOTAL

CROSS SECTIONS  
STA. 456+00 TO 457+00

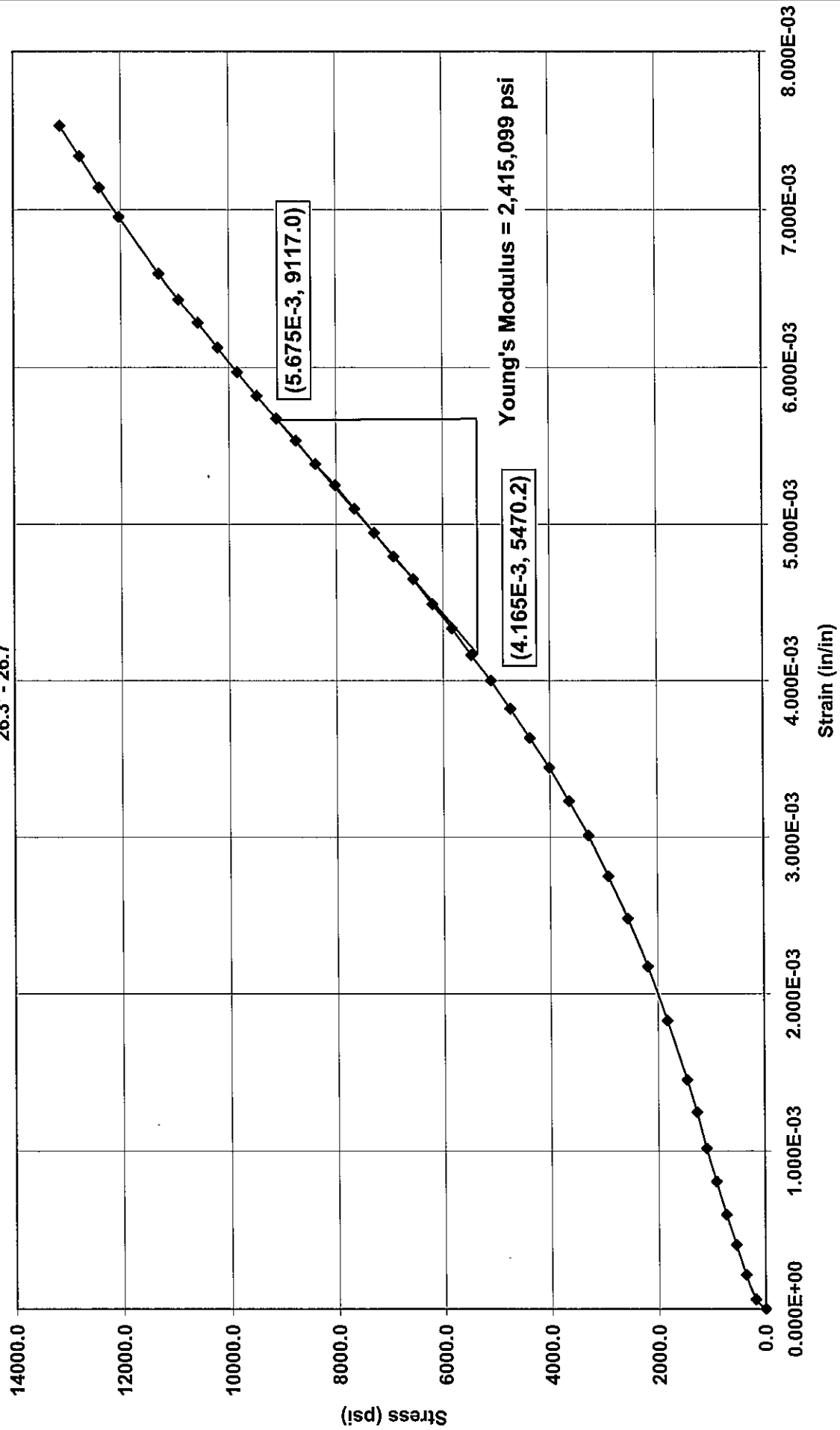
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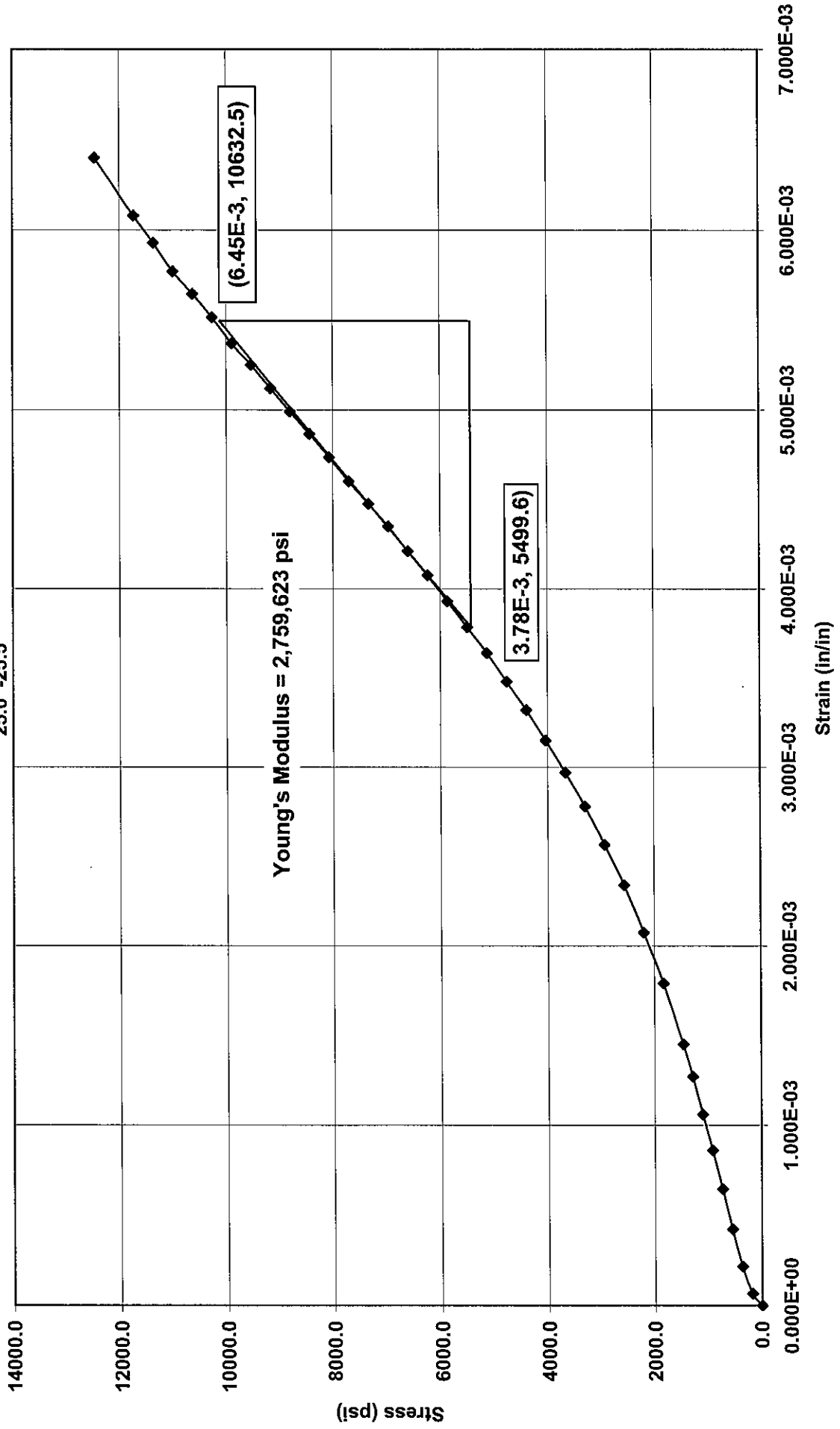
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0121-3070.03  
B-1340, R-1  
17.5' - 17.9'



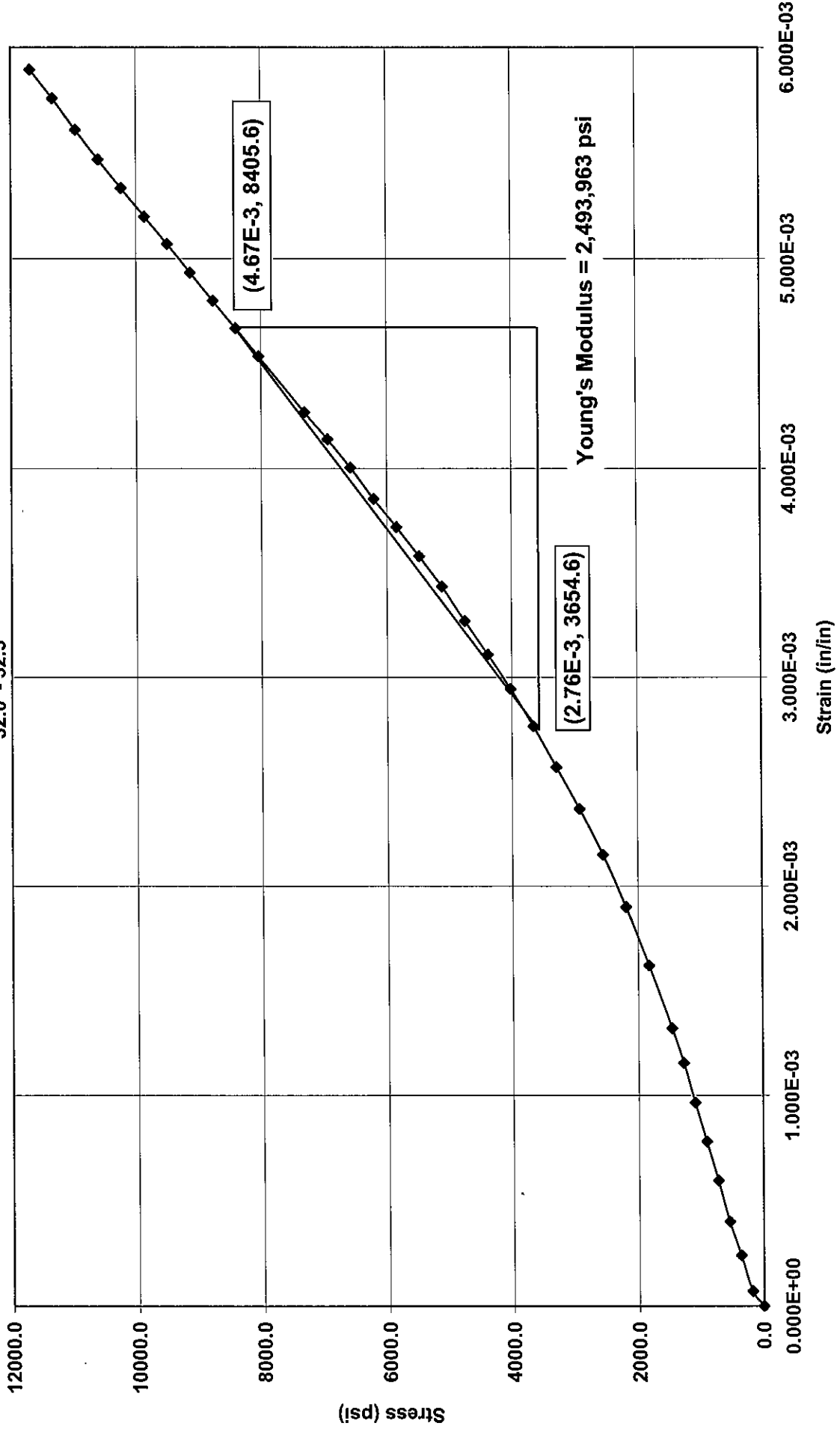
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0121-3070.03  
B-1340, R-2  
26.3' - 26.7'



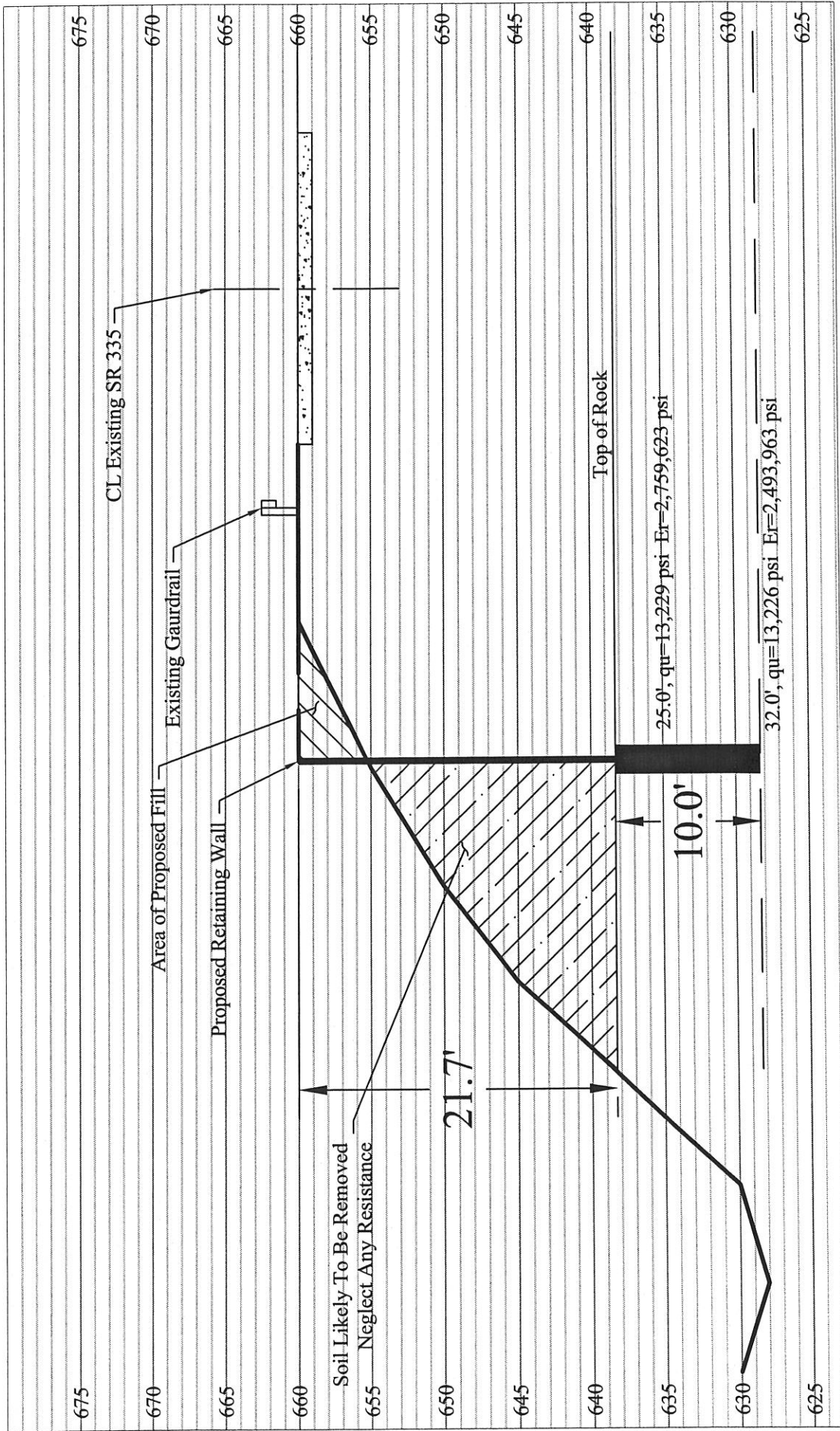
SCI-823-0.00  
0121-3070.03  
B-1342, R-1  
25.0' -25.5'



SCI-823-0.00  
0121-3070.03  
B-1342, R-2  
32.0' - 32.5'



CROSS SECTION <VIEW LOOKING NORTH>  
 SR 335 STATION 10+50  
 BORING B-1342



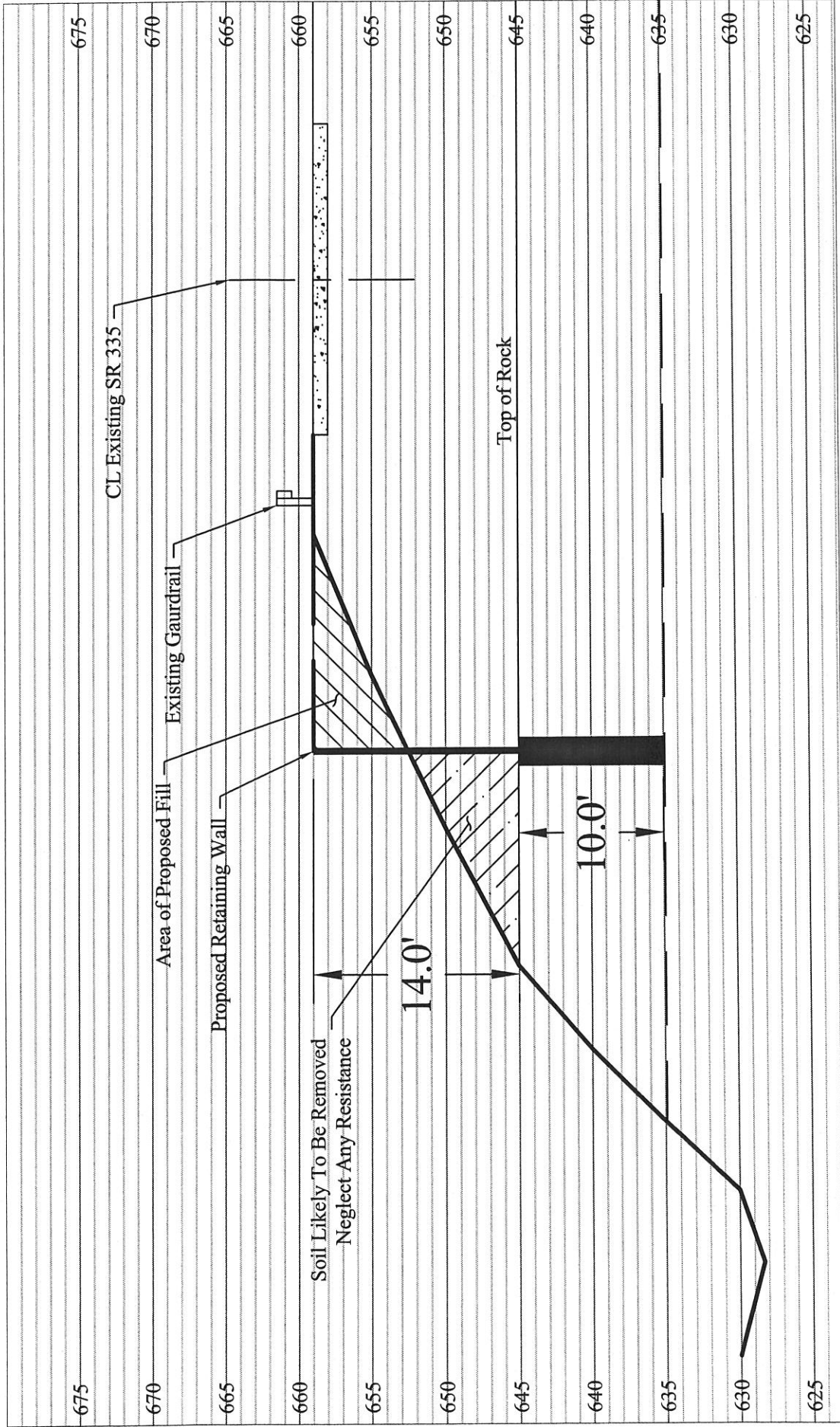
SR 335 AT RELOCATED SHUMWAY HOLLOW ROAD  
 RETAINING WALL STRUCTURE  
 SR 335 STATION 10+50

CROSS SECTION <VIEW LOOKING NORTH>  
 SCI-823-0.00 PORTSMOUTH BYPASS

PROJECT NO. 0121-3070.03    CALC.    SUR    DATE 11/01/06

SCALE: 1" = 10'

CROSS SECTION (VIEW LOOKING NORTH)  
 SR 335 STATION 12+00  
 BORING B-1341



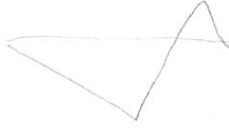
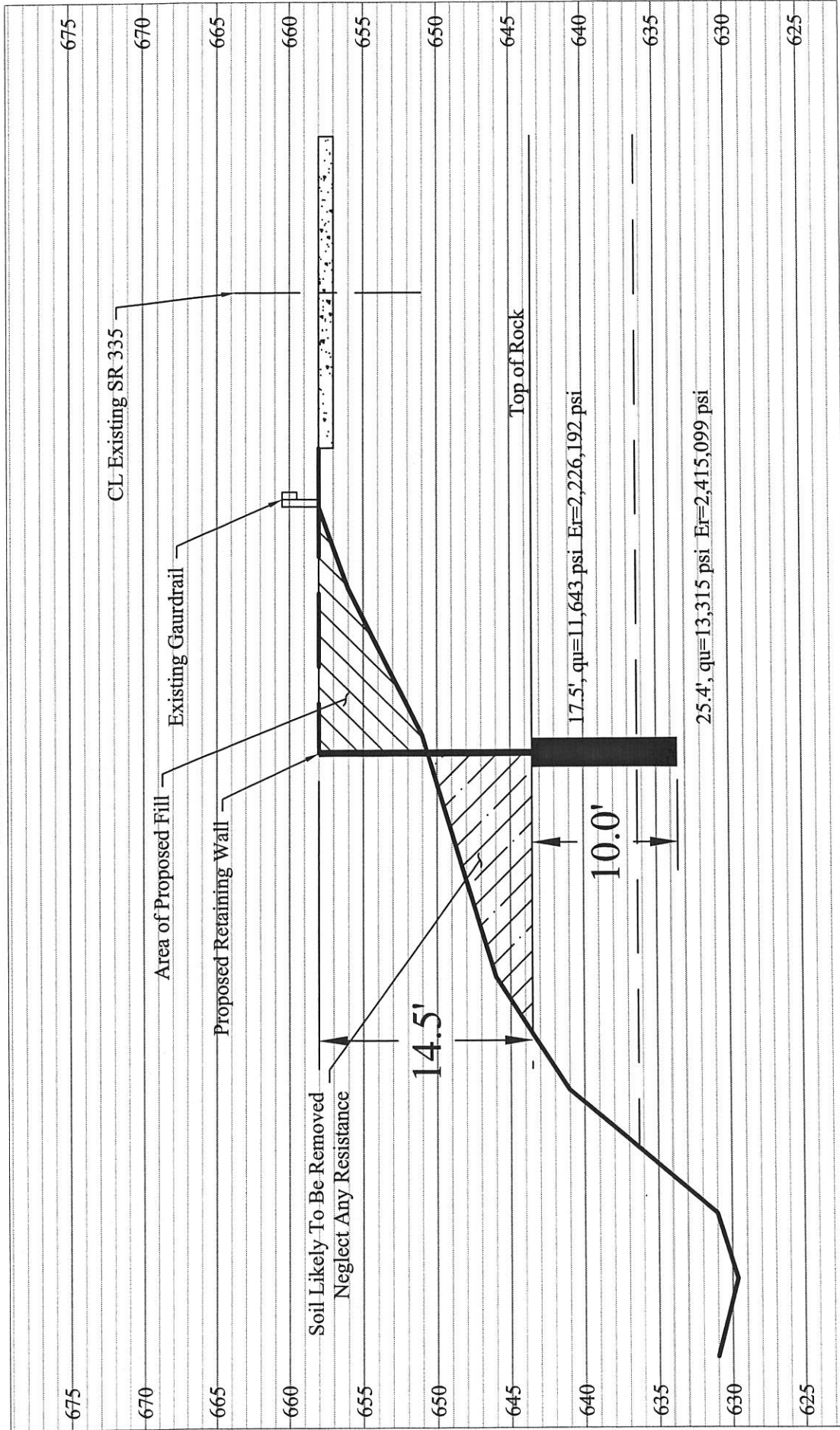
SR 335 AT RELOCATED SHUMWAY HOLLOW ROAD  
 RETAINING WALL STRUCTURE  
 SR 335 STATION 12+00

CROSS SECTION (VIEW LOOKING NORTH)  
 SCI-823-0.00 PORTSMOUTH BYPASS

SCALE: 1" = 10'



CROSS SECTION (VIEW LOOKING NORTH)  
 SR 335 STATION 13+50  
 BORING B-1340



SR 335 AT RELOCATED SHUMWAY HOLLOW ROAD  
 RETAINING WALL STRUCTURE  
 SR 335 STATION 13+50

CROSS SECTION (VIEW LOOKING NORTH)  
 SCI-823-0.00 PORTSMOUTH BYPASS

PROJECT NO. 0121-3070.03      CALC. SJR      DATE 11/01/06

Client: TranSystems, Inc. Project: SCI-823-0.00

Job No. 0121-3070.03

LOG OF: Boring B-1340 Location: Sta. 13+51.5, 11.6 ft. LT of SR 335 CL Date Drilled: 06/27/06

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No.	Drive	Hand Penetrometer (tsf)	WATER OBSERVATIONS:	GRADATION					STANDARD PENETRATION (N) Natural Moisture Content, % - PL ——— LL
								% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	
0.3	657.0						Water seepage at: None Water level at completion: None (Prior to coring) 11.0'(includes drilling water, Measured inside augers)						
5	656.7	5	4	1	1	1.5	Asphalt Concrete Pavement - 3" POSSIBLE FILL: Stiff brown SILT AND CLAY (A-6a), little fine sand, trace coarse sand, little gravel; damp to moist.						
4.0	653.0	3	2	2	2	0.75	Medium stiff brown SANDY SILT (A-4a), little clay, trace to little gravel; damp to moist. @ 5.5', soft to medium stiff, grayish brown, moist to wet.						
9.0	648.0	2	1	3	3	0.5							
10				4	4	0.25-0.5	Very soft to soft mottled brown and gray SILT AND CLAY (A-6a), some to "and" fine sand, trace coarse sand; moist.						
11.0	646.0	4	6	5	5	-	Loose to medium dense gray COARSE AND FINE SAND (A-3a), some silty clay; damp to moist.						
14.5	642.5	2	13	6	6	-	@ 14.0', thin clay layer. Medium hard gray SANDSTONE; very fine to fine grained, moderately weathered, laminated to thinly bedded, broken. @ 15.0' to 15.3', possible core loss.						
15		50/4					Medium hard to hard light gray SANDSTONE; fine to medium grained, moderately weathered, medium bedded to thickly bedded, moderately fractured. @ 17.5', qu = 11,643 psi. Er = 2,226,192 psi.						
16.0	641.0												
20		Core 120"	Rec 116"		RQD 82%								
21.7	635.3						Hard gray SANDSTONE; fine grained, slightly weathered, medium bedded to thickly bedded, moderately fractured.						
25							@ 25.4', slightly fractured. @ 26.3', qu = 13,315 psi. Er = 2,415,099 psi.						
30		Core 120"	Rec 120"		RQD 98%								



Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No.	Drive	Press / Core	Hand Penetrator (tsf) / Point-Load Strength (psi)	WATER OBSERVATIONS:	GRADATION					STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL ——— LL ——— Blows per foot - ○ ——— 40				
									% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt		% Clay			
0.3	658.0							Water seepage at: None Water level at completion: None (prior to coring) 2.0' (includes drilling water, measured inside augers)										
3.0	657.7	3 4 6	15	1				Topsoil - 3" Loose to medium dense dark brown GRAVEL WITH SAND AND SILT (A-2-4), trace to little silty clay; damp to moist.	0	7	—	48	15	30				
5.0	655.0	3 5 6	13	2				Medium dense reddish brown SANDY SILT (A-4a), some clay; moist.	0	8	—	78	14					
5.5	652.5	3 4 6	15	3				Medium dense reddish brown COARSE AND FINE SAND (A-3a), little silty clay; damp to moist.	0	1	—	2	62	36				
10.0		3 6 8	14	4				@ 8.5'; moist to wet.										
11.0	647.0	4 4 3	16	5			0.25	Very soft to soft brown SILT AND CLAY (A-6a), trace fine to coarse sand ; moist to wet.										
14.0	644.0	4 27 50/2	12	6				Medium hard gray SANDSTONE; very fine to fine grained, moderately weathered, laminated to thinly bedded, broken.										
15.0								Medium hard to hard light gray SANDSTONE; fine to medium grained, slightly to moderately weathered, medium bedded to thickly bedded, highly fractured.										
16.0	642.0							@ 17.1'; moderately fractured.										
20.0								@ 23.1'; highly fractured.										
24.1	633.9							Hard gray SANDSTONE; fine grained, slightly to moderately weathered, pyritic (holos), thickly bedded, slightly fractured.										
25.0																		
30.0																		



Client: TranSystems, Inc. Project: SCI-823-0.00

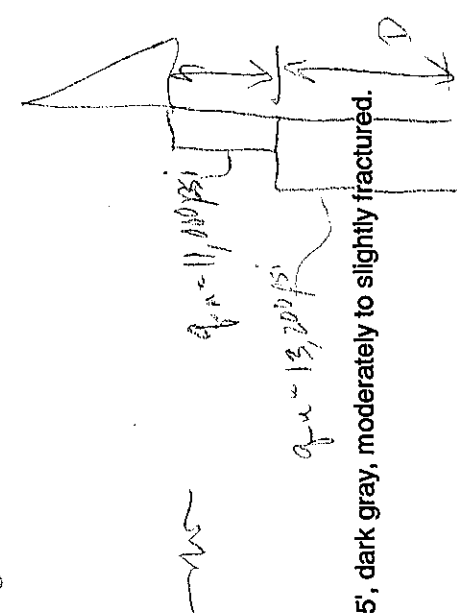
Job No. 0121-3070.03

LOG OF: Boring B-1342 Location: Sta. 10+59.4, 11.7 ft. LT of SR 335 CL Date Drilled: 6-21-06

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No.	Hand Penetrometer (tsf)	WATER OBSERVATIONS:	DESCRIPTION	GRADATION						STANDARD PENETRATION (N) Natural Moisture Content, % - ● PL — LL — ○ Blows per foot -				
								% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay					
0	660.8					Water seepage at: None Water level at completion: None (prior to coring) 13.0' (includes drilling water, inside hollowstem augers)												
4		4	15	1	1.5		Stiff brown SILT AND CLAY (A-6a), trace coarse sand, trace gravel, some fine sand; moist.	1	2	26	30	42						
6		6	16	2	-		@ 4.0', "and" fine sand.	0	4	56	14	26						
6.5	654.3	3	18	3	-		Medium dense brown COARSE AND FINE SAND (A-3a), little silty clay; damp.	0	8	79	14							
10		3	16	4	-		@ 11.5', moist to wet.											
14.0	646.8	5	18	6	1.0		Medium stiff to stiff brown SILTY CLAY (A-6b), trace fine to coarse sand, trace organic clay, trace gravel; moist.	1	1	2	63	34						
15.5	645.3	7	14	7			Dense brown GRAVEL WITH SAND AND SILT (A-2-4), trace organic clay; damp to moist.											
20		50/6	3	8			@ 19.5' to 21.7', possible core loss (coring in dense sand and gravel).											
21.7	639.1						Medium hard to hard light gray SANDSTONE; fine to medium grained, moderately weathered, thinly bedded to medium bedded, highly to moderately fractured.											
25		Core 120"	Rec 88"	RCD R-1 56%			@ 25.0', qu= 13,229 psi. Er= 2,759,623 psi.											
27.0							@ 27.0' to 27.4', possible core loss.											
27.5							@ 27.5' lost water return.											
29.0							@ 29.0' to 29.5', high angle fracture, broken.											

LOG OF: Boring B-1342 Location: Sta. 10+59.4, 11.7 ft. LT of SR 335 CL Date Drilled: 6-21-06

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No.	Hand Penetrometer (tsf)	WATER OBSERVATIONS:	GRADATION											
							% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay						
30	630.8					Water seepage at: None Water level at completion: None (prior to coring) 13.0' (includes drilling water, inside hollowstem augers)												
30.9	629.9					@ 29.5' to 30.9', possible core loss.												
35		Core 120"	Rec 104"	RQD 83%	R-2	Hard gray SANDSTONE; fine grained, slightly to moderately weathered, medium bedded to thickly bedded, moderately fractured. @ 32.0', qu= 13,226 psi. Er= 2,493,963 psi.												
40																		
45		Core 120"	Rec 120"	RQD 100%	R-3	@ 44.5', dark gray, moderately to slightly fractured.												
49.5	611.3																	
50																		
55																		
60																		



Bottom of Boring - 49.5'





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

LOG OF: Boring B-1333 Location: Sta. 11+30.6, 6.3 ft. LT of SR 335 CL Date Drilled: 09/13/05

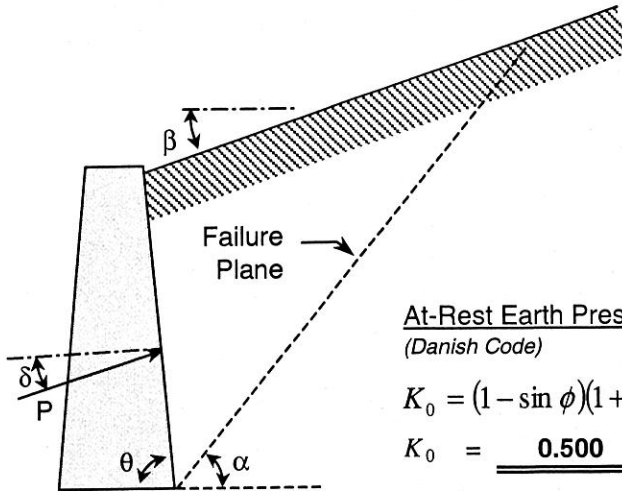
Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No.	Hand Penetrometer (tsf)	WATER OBSERVATIONS:	GRADATION						STANDARD PENETRATION (N) Natural Moisture Content, % - PL ——— LL ● Blows per foot - 10 20 30 40
							% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	
0.3	660.1	3	8	1		Water seepage at: 12.0' Water level at completion: 2.6' (includes drilling water)	32	18	-	21	22	7	Non-Plastic
0.3 - 0.6	659.8	3	8	1		Topsoil - 4"	0	7	-	61	10	22	Non-Plastic
0.6 - 1.0	656.1	3	18	2		Loose brown GRAVEL WITH SAND AND SILT (A-2-4), little to some clay, little to some silt; trace to some gravel gravel; damp.	0	2	-	69	9	20	Non-Plastic
1.0 - 1.5	656.1	3	18	3		Loose brown COARSE AND FINE SAND (A-3a), trace to little silt, little to some clay; damp to moist.	0	15	-	68	17	17	Non-Plastic
1.5 - 2.0	652.1	2	16	4		Loose brown FINE SAND (A-3), some coarse sand, trace silty clay; moist.	0	24	-	72	4	4	Non-Plastic
2.0 - 2.5	647.1	2	17	5		@ 11.0'-12.5', wet.	0	0	-	1	60	39	Non-Plastic
2.5 - 3.0	647.1	1	18	6	<0.25	Very soft brown SILT AND CLAY (A-6a), trace fine sand; moist.	0	0	-	1	60	39	Non-Plastic
3.0 - 3.5	644.1	1	18	7		Dense to very dense brown COARSE AND FINE SAND (A-3a) trace silty clay; damp to moist.							
3.5 - 4.0	642.1	50/4		8		Medium hard to hard gray SANDSTONE ; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, medium bedded to thickly bedded, slightly to moderately fractured. @ 19.6'-19.8'; 20.2'-20.5', broken zones.							
4.0 - 4.5						@ 25.0'-25.5', lost recovery.							
4.5 - 5.0													
5.0 - 5.5													
5.5 - 6.0													
6.0 - 6.5													
6.5 - 7.0													
7.0 - 7.5													
7.5 - 8.0													
8.0 - 8.5													
8.5 - 9.0													
9.0 - 9.5													
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21.0 - 21.5													
21.5 - 22.0													
22.0 - 22.5													
22.5 - 23.0													
23.0 - 23.5													
23.5 - 24.0													
24.0 - 24.5													
24.5 - 25.0													
25.0 - 25.5													
25.5 - 26.0													
26.0 - 26.5													
26.5 - 27.0													
27.0 - 27.5													
27.5 - 28.0													
28.0 - 28.5													
28.5 - 29.0													
29.0 - 29.5													
29.5 - 30.0													
30.0	630.1												

Bottom of Boring - 30.0'

### 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

$\phi =$	30	deg.	internal friction angle of soil
$\delta =$	0	deg.	angle of wall friction
$\theta =$	90	deg.	angle of wall face from horizontal
$\beta =$	0	deg.	angle of backfill slope from horizontal

#### At-Rest Earth Pressure (Danish Code)

$$K_0 = (1 - \sin \phi)(1 + \sin \beta)$$

$$K_0 = \underline{\underline{0.500}}$$

#### Passive Earth Pressure

(Coulomb's Theory, wall friction must be less than  $\phi/3$ )

$$K_p = \frac{\sin^2(\theta - \phi)}{\sin^2 \theta \cdot \sin(\theta + \delta) \left[ 1 - \sqrt{\frac{\sin(\phi + \delta) \sin(\phi + \beta)}{\sin(\theta + \delta) \sin(\theta + \beta)}} \right]^2}$$

$$K_p = \underline{\underline{3.000}}$$

#### Active Earth Pressure (Coulomb's Theory)

$$K_a = \frac{\sin^2(\theta + \phi)}{\sin^2 \theta \cdot \sin(\theta - \delta) \left[ 1 + \sqrt{\frac{\sin(\phi + \delta) \sin(\phi - \beta)}{\sin(\theta - \delta) \sin(\theta + \beta)}} \right]^2}$$

$$K_a = \underline{\underline{0.333}} \quad \text{Use } K_a = 0.33$$

Angle between active failure plane and horizontal,  $\alpha$

$$\tan \alpha = \tan \phi + \sqrt{1 + \tan^2 \phi - \frac{\tan \beta}{\sin \phi \cos \phi}}$$

$$\tan \alpha = 1.7321$$

$$\alpha = \underline{\underline{60.0^\circ}}$$

#### Recommended values for angle of wall friction, $\delta$

- from U.S. Army Corps of Engineers, EM 1110-2-2502 (1989), page 3-37  
 Active side,  $\delta \leq \phi/2$       Resisting side,  $\delta = 0$  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

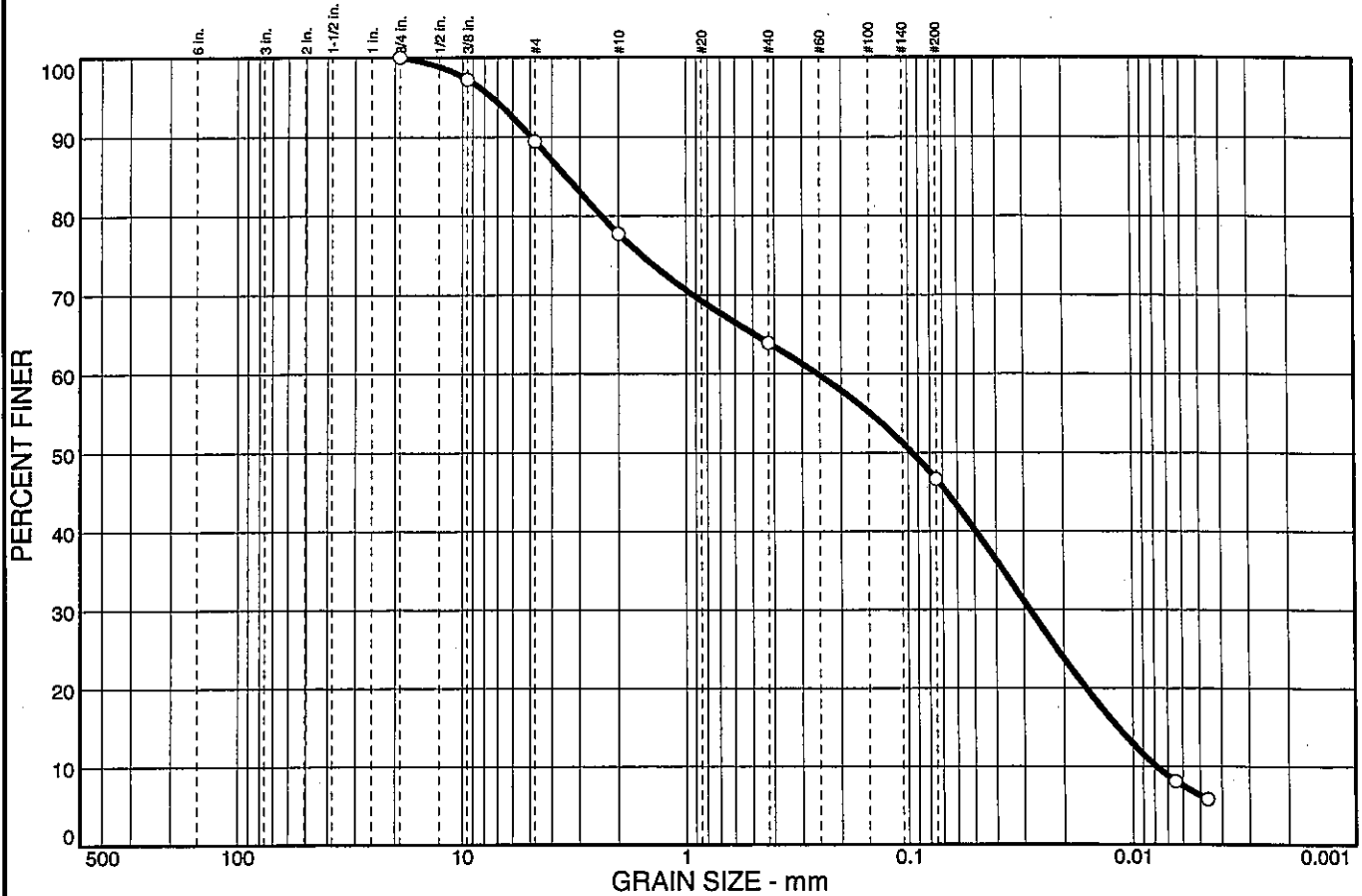


SUBJECT SCI-823 Portsmouth Bypass JOB NUMBER 0121-3070.03  
SR 335 Retaining Wall SHEET NO.  
Unconfined Strength - Rock Results COMP. BY SJR  
CHECKED BY

**Unconfined Compression Test Results - Rock**

Boring	Depth (ft.)	Avg Dia. (in.)	Avg L (in.)	X-Section			Unit Weight (pcf)	Load (lb-f)	Calculated Stress (psi)	Rock Type	
				L/D	Weight (g)	Area					
B-1340	17.5'-17.9'	1.867	4.670	2.501	451.54	2.74	0.007395	134.6	31,920	11,643	Sandstone
B-1340	26.3'-26.7'	1.869	4.568	2.444	479.03	2.75	0.007249	145.7	36,580	13,315	Sandstone
B-1342	25.0'-25.5'	1.864	4.650	2.495	458.59	2.73	0.007340	137.7	36,150	13,229	Sandstone
B-1342	32.0'-32.5'	1.867	4.451	2.384	451.92	2.74	0.007048	141.4	36,260	13,226	Sandstone

# PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	10.6	11.7	13.8	17.3	40.3	6.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.2		
#4	89.4		
#10	77.7		
#40	63.9		
#200	46.6		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL= NP      LL= NP      PI= NP

**Coefficients**  
 D<sub>85</sub>= 3.46      D<sub>60</sub>= 0.257      D<sub>50</sub>= 0.0962  
 D<sub>30</sub>= 0.0284      D<sub>15</sub>= 0.0117      D<sub>10</sub>= 0.0079  
 C<sub>u</sub>= 32.62      C<sub>c</sub>= 0.40

**Classification**  
 USCS= SM      AASHTO= A-4(0)

**Remarks**  
 Moisture Content= 11.1%  
 F.M.=0.13

\* (no specification provided)

Sample No.: 1      Source of Sample: B-1332      Date: 1/17/06  
 Location:      Elev./Depth: 1.0

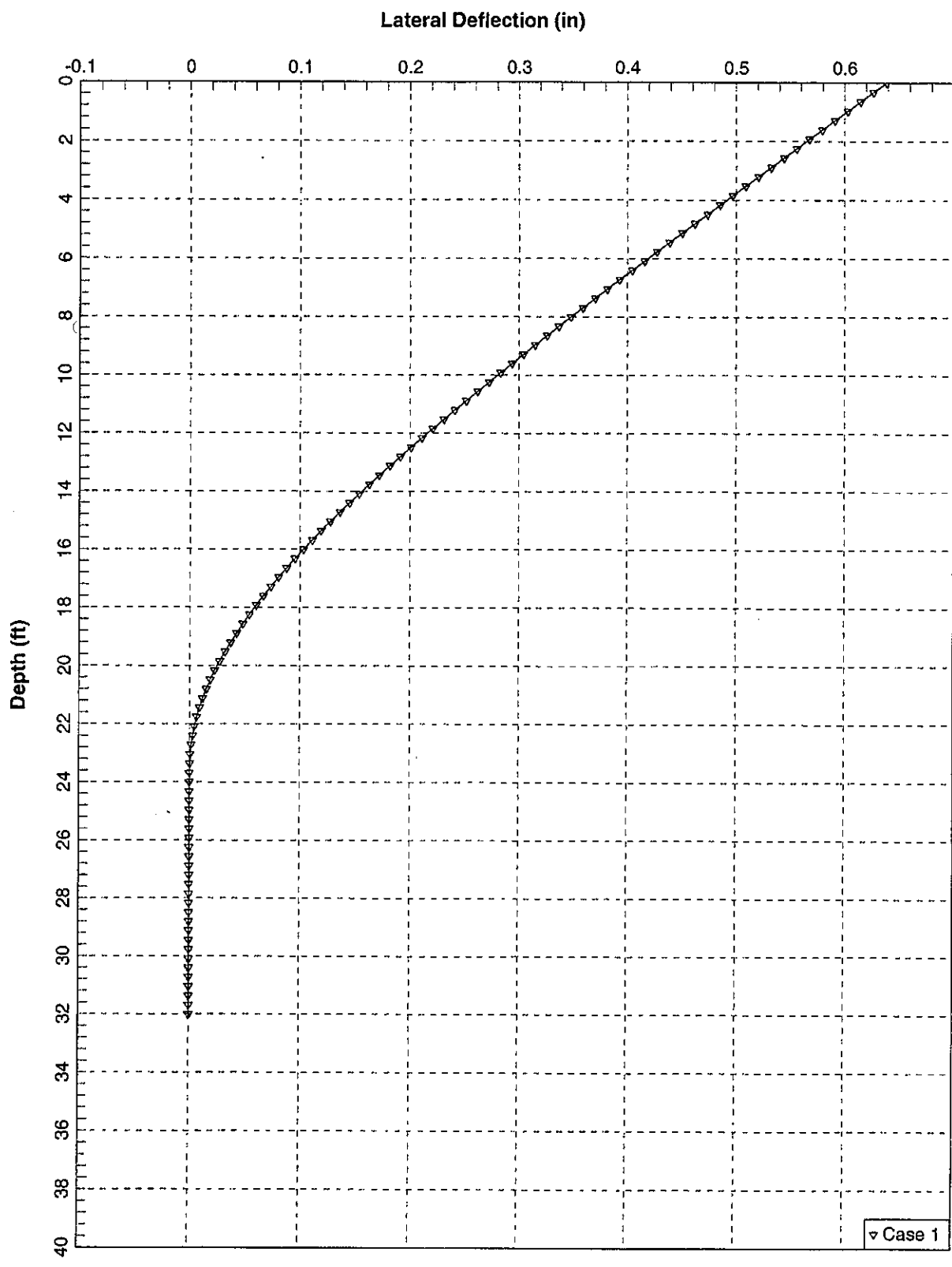


Client: TranSystems, Inc.  
 Project: SCI-823-0.00  
 Project No: 0121-3070.03

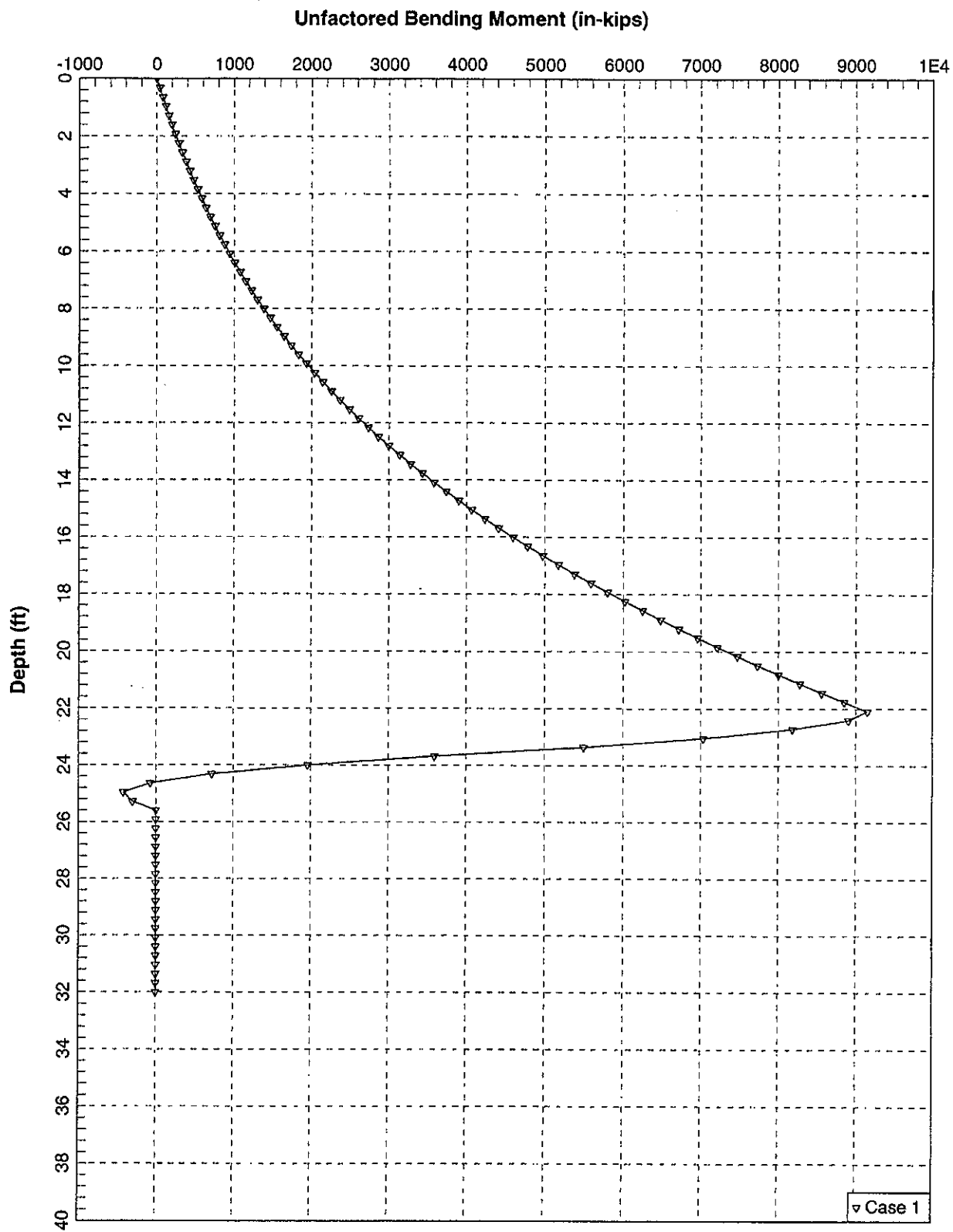
Figure

		Section Used in Analysis	$V_{max}$ (kips)	$M_{max}$ (kip-in)
Option 1	Section Only	W 27x258	460	9149
● Option 2	Shear Reinforced Section	W 18x175	485	9149
Option 3	Tieback Section	W 18x106	175	2154

This analysis assumes two 3/8 inch plates 15.5 inches long welded to the web as shear reinforcement  
Shear plates provide 232.5 kips of shear resistance  
In this analysis the tieback has approximately 26.6 kips of tension on it.

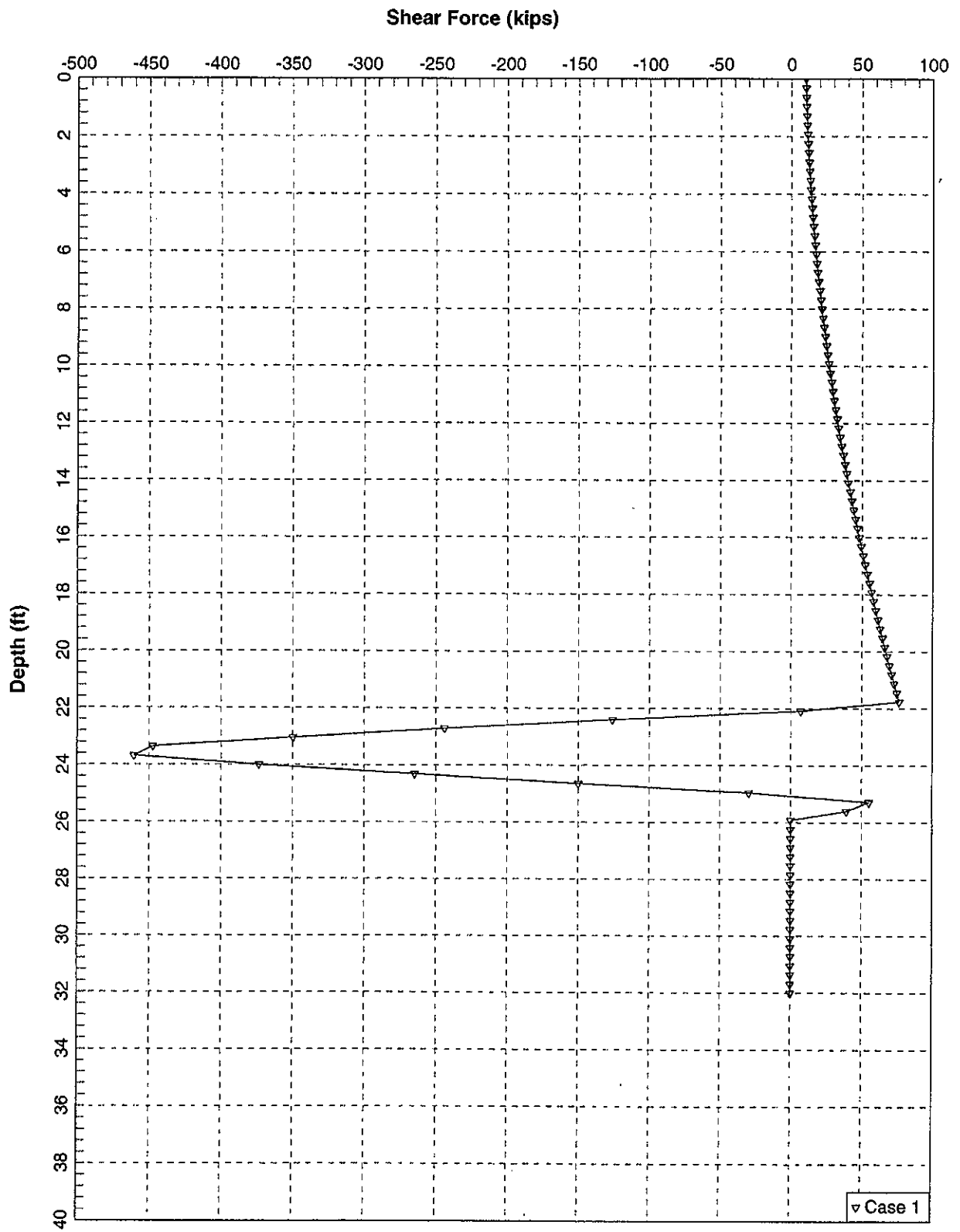


6' Spacing Section Only

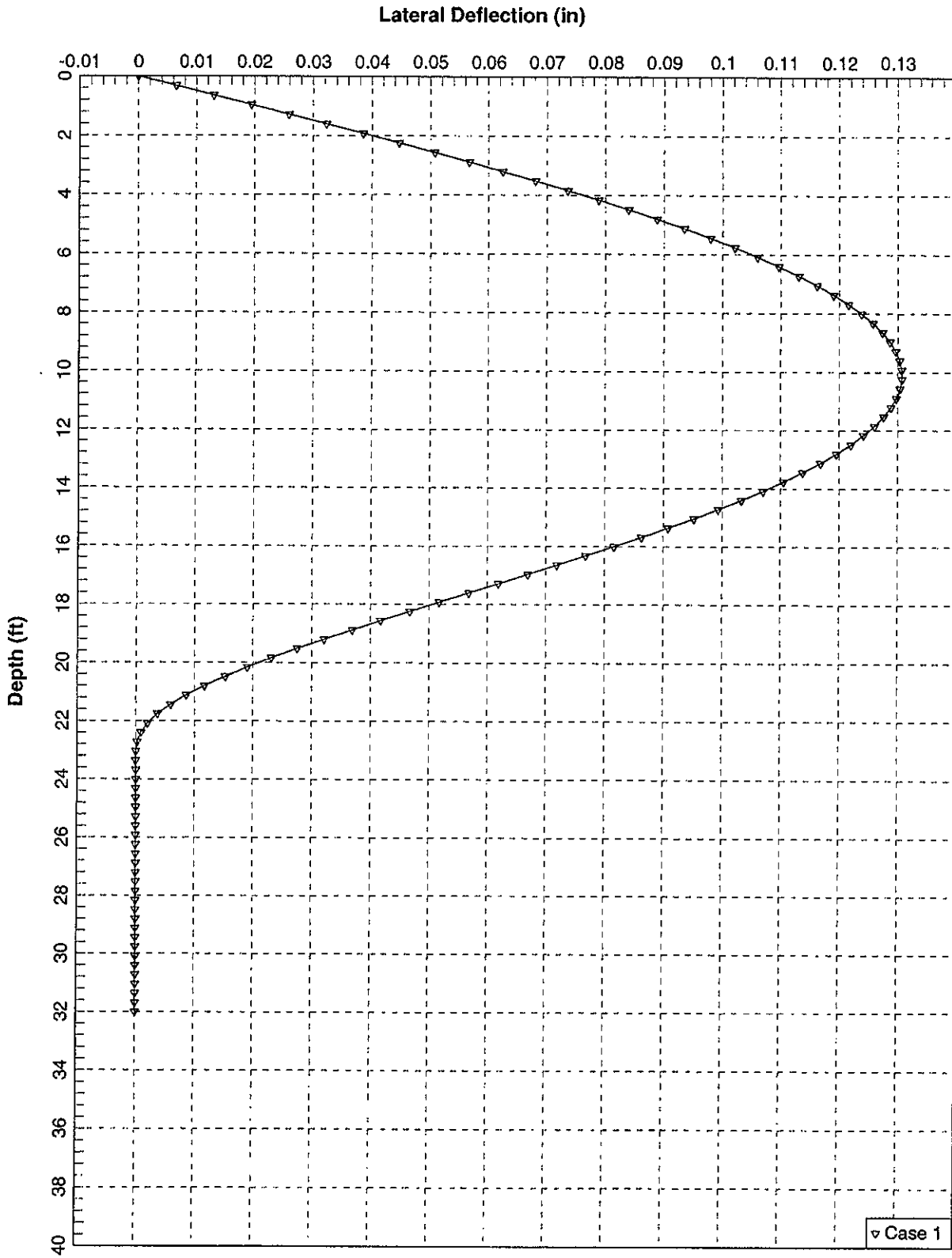


**6' Spacing Section Only**

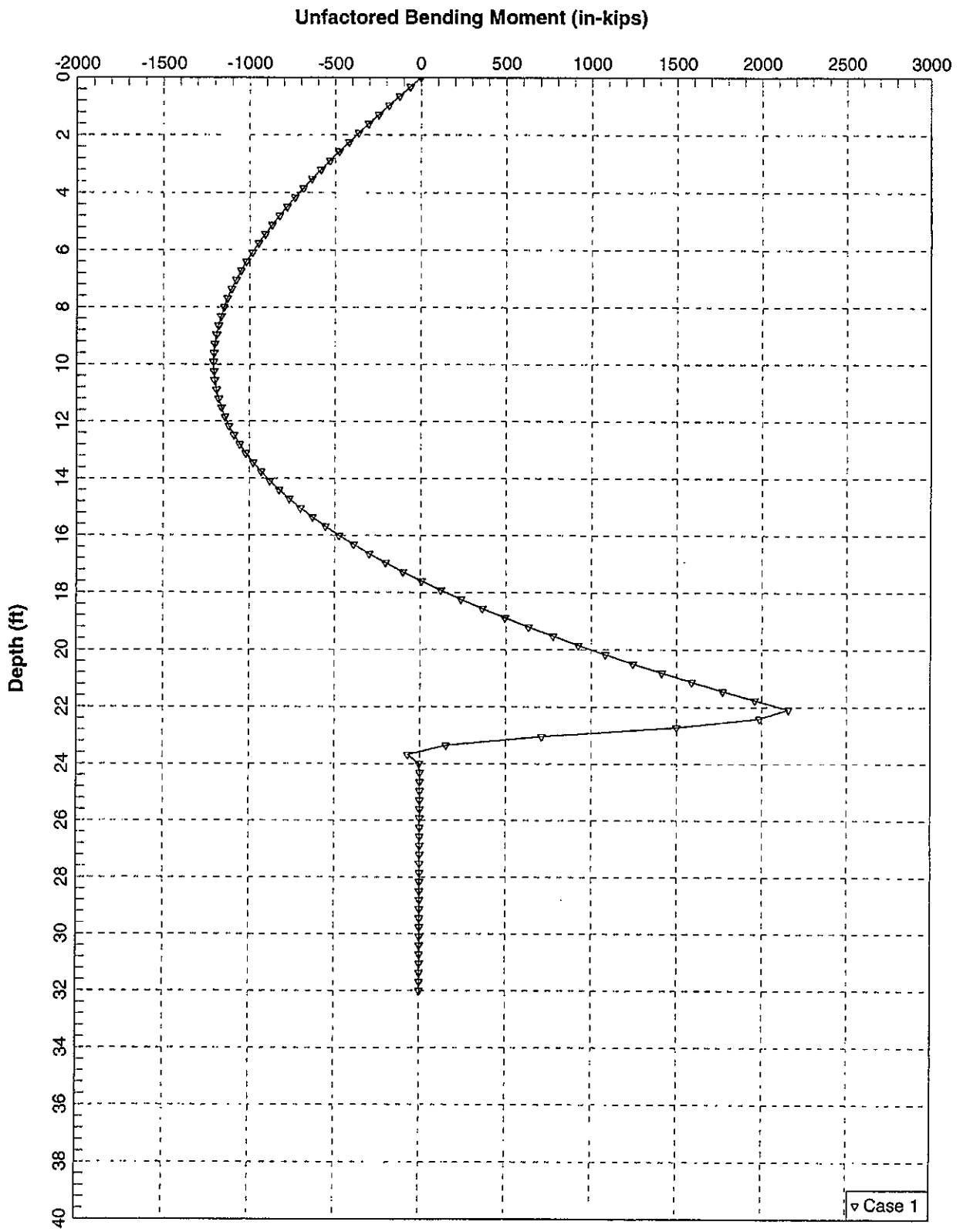




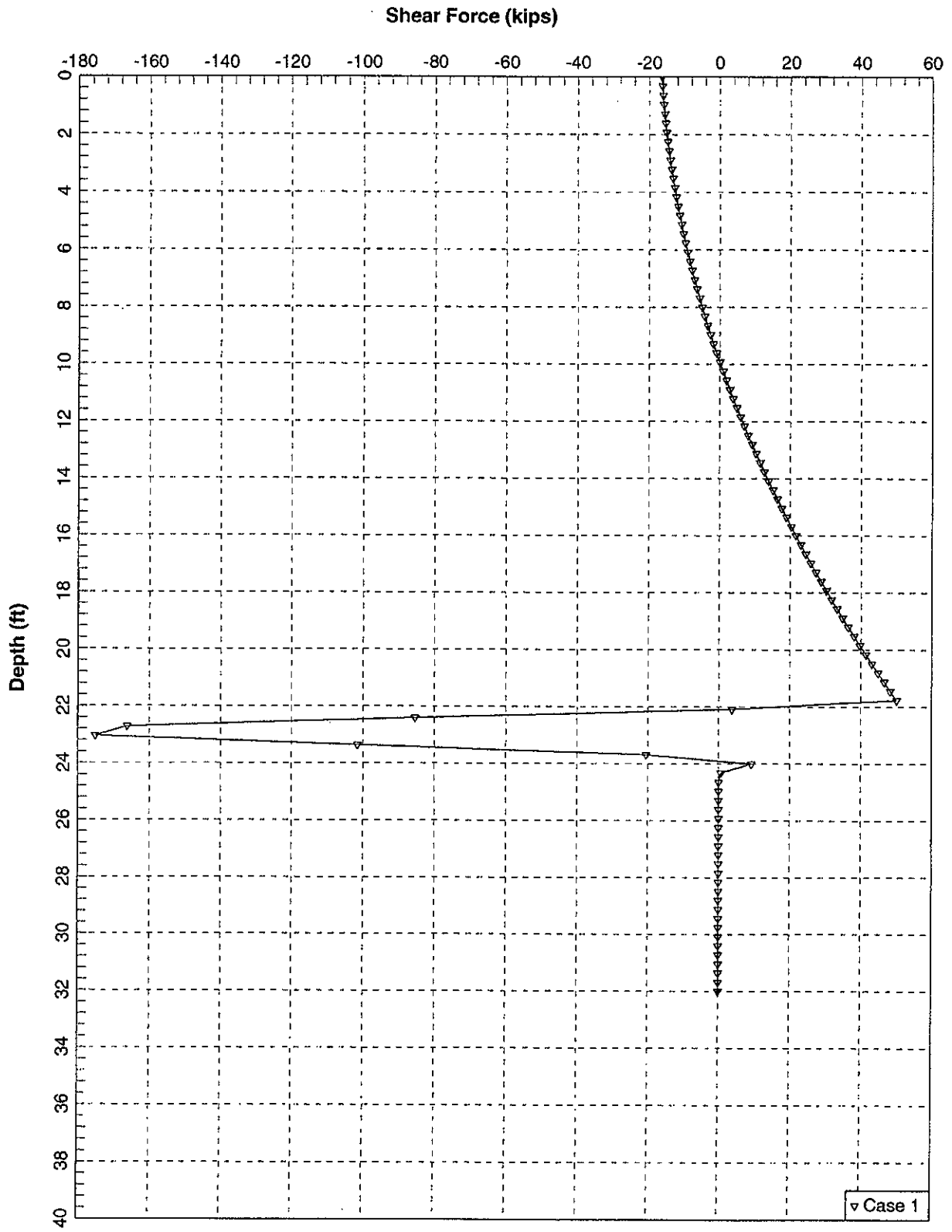
6' Spacing Section Only



6' Spacing Tieback

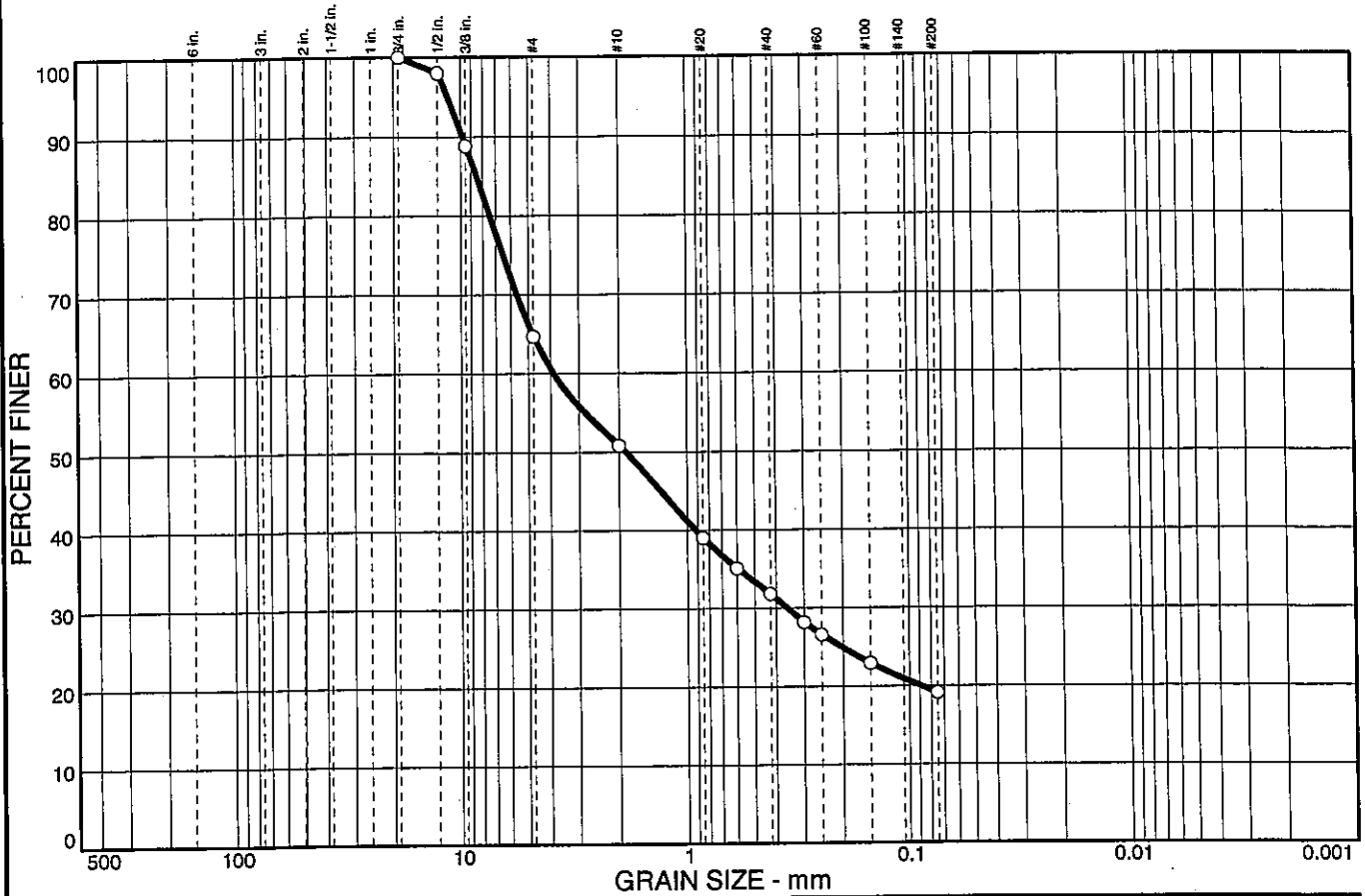


6' Spacing Tieback



6' Spacing Tieback

# PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	35.3	13.9	19.0	12.7	19.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.50 in.	98.0		
0.375 in.	88.8		
#4	64.7		
#10	50.8		
#20	39.0		
#30	35.1		
#40	31.8		
#50	28.2		
#60	26.6		
#100	22.9		
#200	19.1		

**Soil Description**

Silty sand with gravel

**Atterberg Limits**

PL= NP      LL= NP      PI= NP

**Coefficients**

D<sub>85</sub>= 8.55      D<sub>60</sub>= 3.88      D<sub>50</sub>= 1.88  
D<sub>30</sub>= 0.358      D<sub>15</sub>=      D<sub>10</sub>=  
C<sub>u</sub>=      C<sub>c</sub>=

**Classification**

USCS= SM      AASHTO= A-1-b

**Remarks**

Moisture Content= 7.4%  
F.M.=2.60

\* (no specification provided)

Sample No.: 2  
Location:

Source of Sample: B-1332

Date: 7/21/06  
Elev./Depth: 2.0

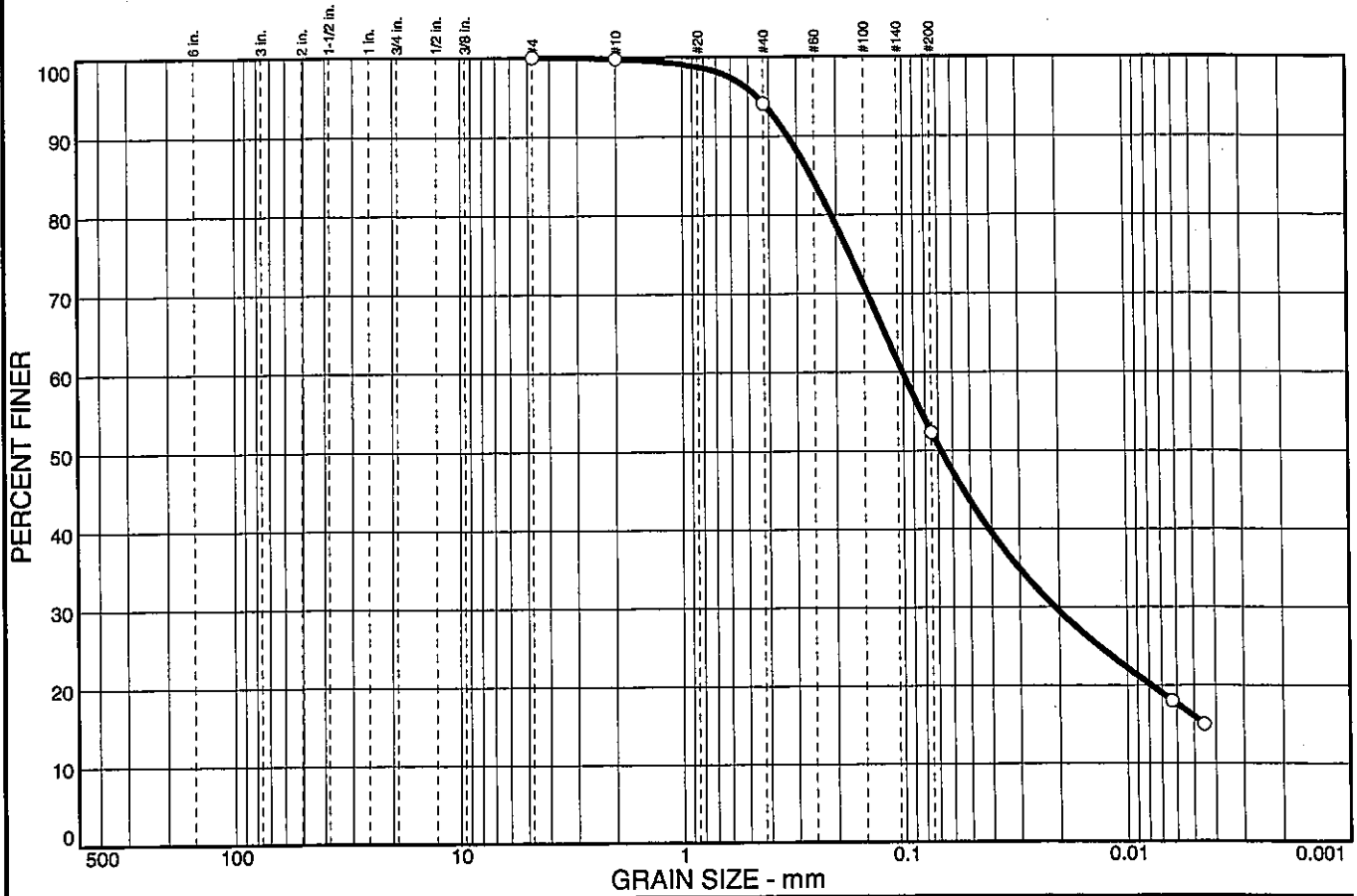


Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	5.7	41.8	36.3	16.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#40	94.1		
#200	52.3		

**Soil Description**

Sandy silt

**Atterberg Limits**

PL= NP      LL= NP      PI= NP

**Coefficients**

D<sub>85</sub>= 0.260      D<sub>60</sub>= 0.101      D<sub>50</sub>= 0.0680  
D<sub>30</sub>= 0.0210      D<sub>15</sub>= 0.0045      D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= ML                      AASHTO= A-4(0)

**Remarks**

Moisture Content= 16.9%

\* (no specification provided)

Sample No.: 3  
Location:

Source of Sample: B-1332

Date: 1/17/06  
Elev./Depth: 4.0

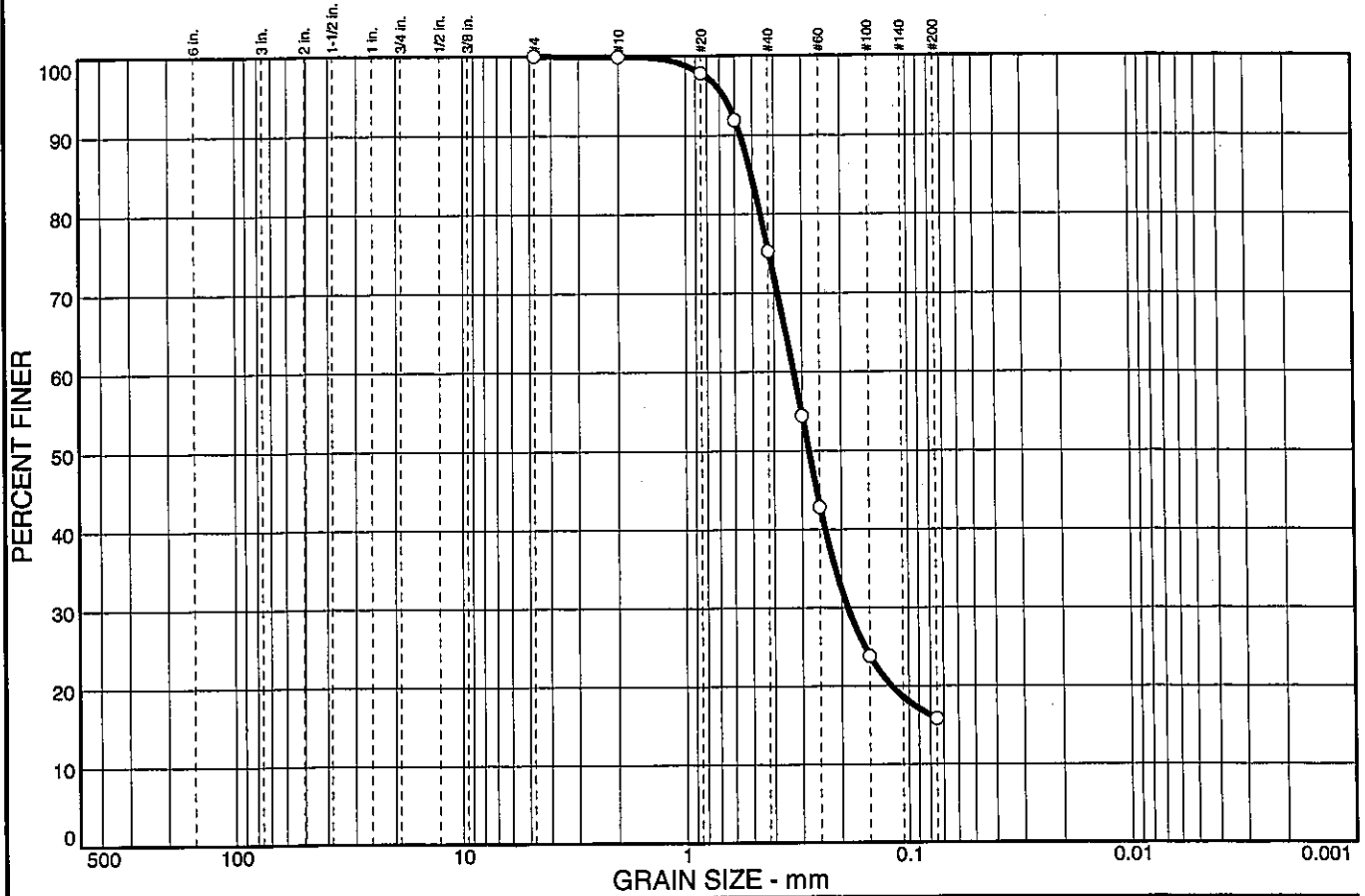


Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	24.6	59.5	15.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	97.8		
#30	91.9		
#40	75.3		
#50	54.4		
#60	42.8		
#100	23.8		
#200	15.8		

**Soil Description**

Silty sand

**Atterberg Limits**

PL= NP      LL= NP      PI= NP

**Coefficients**

D<sub>85</sub>= 0.509      D<sub>60</sub>= 0.328      D<sub>50</sub>= 0.280  
 D<sub>30</sub>= 0.189      D<sub>15</sub>=              D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM      AASHTO= A-2-4(0)

**Remarks**

Moisture Content= 18.2%  
 F.M.=1.30

\* (no specification provided)

Sample No.: 4  
 Location:

Source of Sample: B-1332

Date: 1/17/06  
 Elev./Depth: 6.0

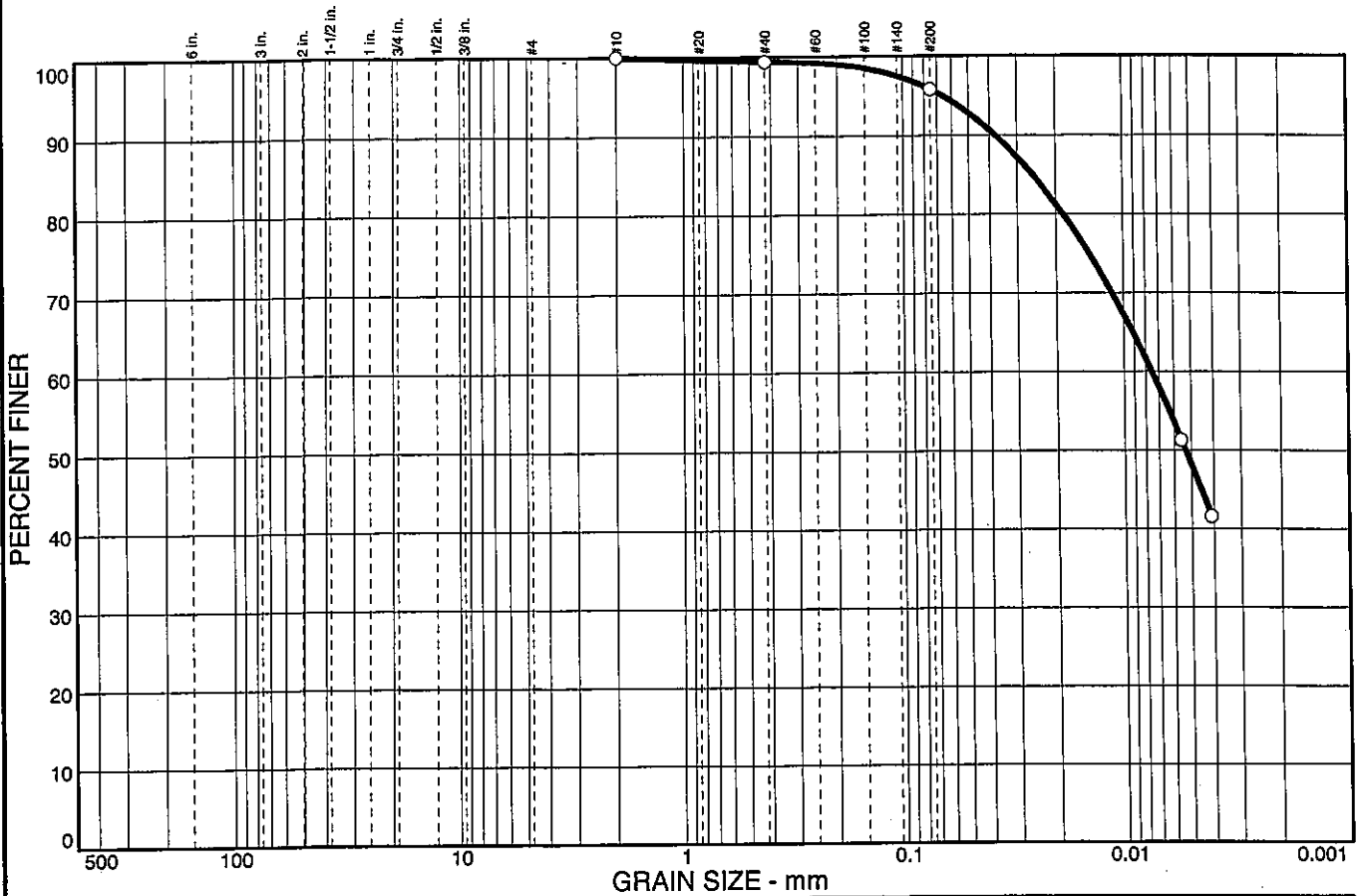


Client: TranSystems, Inc.  
 Project: SCI-823-0.00

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	3.6	47.8	48.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.4		
#200	95.8		

**Soil Description**  
Lean clay

**Atterberg Limits**  
 PL= 24      LL= 38      PI= 14

**Coefficients**  
 D<sub>85</sub>= 0.0256      D<sub>60</sub>= 0.0075      D<sub>50</sub>= 0.0053  
 D<sub>30</sub>=              D<sub>15</sub>=              D<sub>10</sub>=  
 C<sub>u</sub>=              C<sub>c</sub>=

**Classification**  
 USCS= CL      AASHTO= A-6(15)

**Remarks**  
 Moisture Content= 33.7%

\* (no specification provided)

Sample No.: 6  
Location:

Source of Sample: B-1332

Date: 1/17/06  
Elev./Depth: 11.0



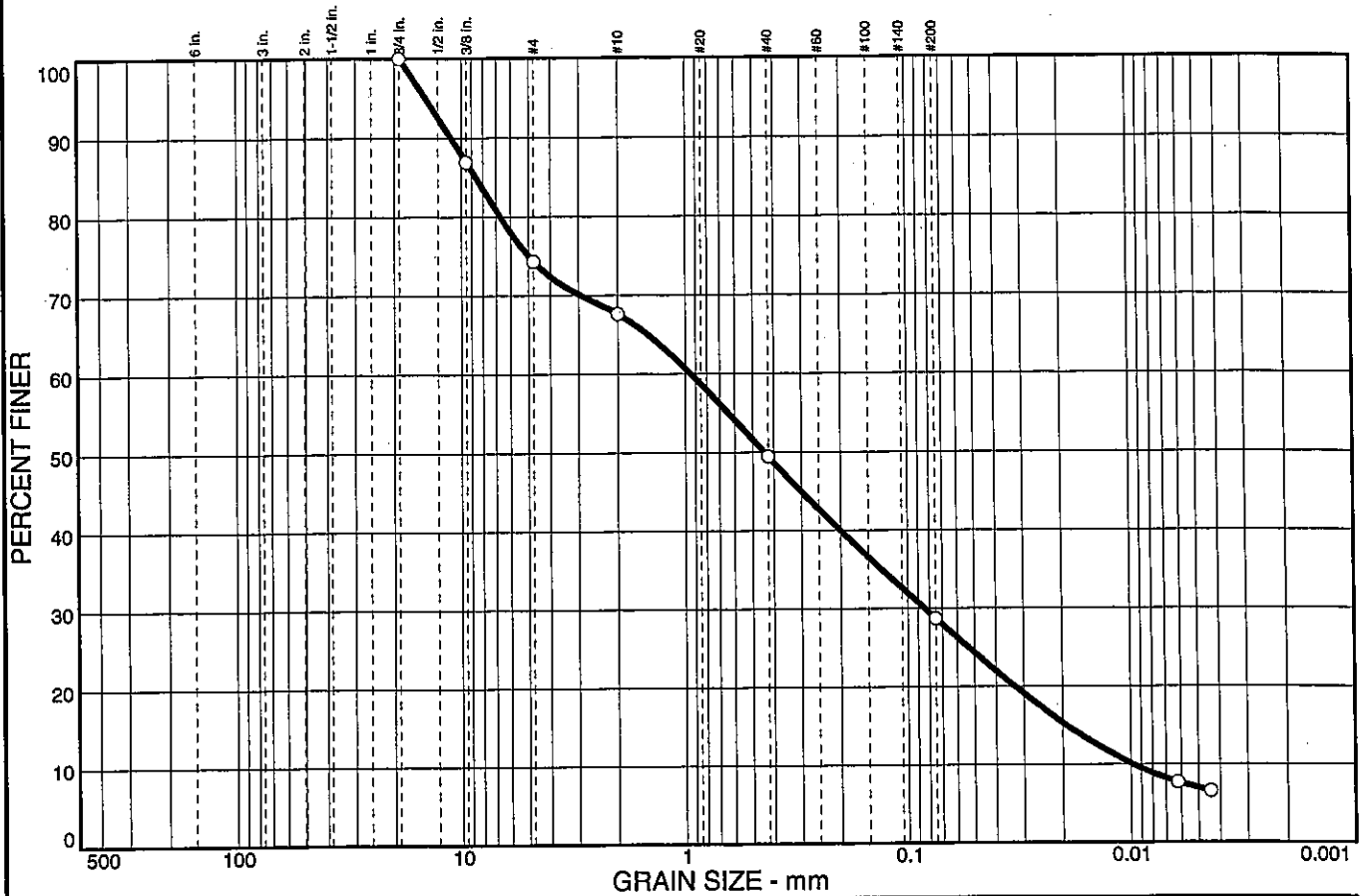
Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	6.7	18.2	20.7	21.7	7.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	86.9		
#4	74.3		
#10	67.6		
#40	49.4		
#200	28.7		

**Soil Description**

Silty sand with gravel

**Atterberg Limits**

PL= NP      LL= NP      PI= NP

**Coefficients**

D<sub>85</sub>= 8.66      D<sub>60</sub>= 0.946      D<sub>50</sub>= 0.445  
 D<sub>30</sub>= 0.0843      D<sub>15</sub>= 0.0193      D<sub>10</sub>= 0.0098  
 C<sub>u</sub>= 96.20      C<sub>c</sub>= 0.76

**Classification**

USCS= SM      AASHTO= A-2-4(0)

**Remarks**

Moisture Content= 5.6%  
 F.M.=0.39

\* (no specification provided)

Sample No.: 1  
 Location:

Source of Sample: B-1333

Date: 7/21/06  
 Elev./Depth: 0.0

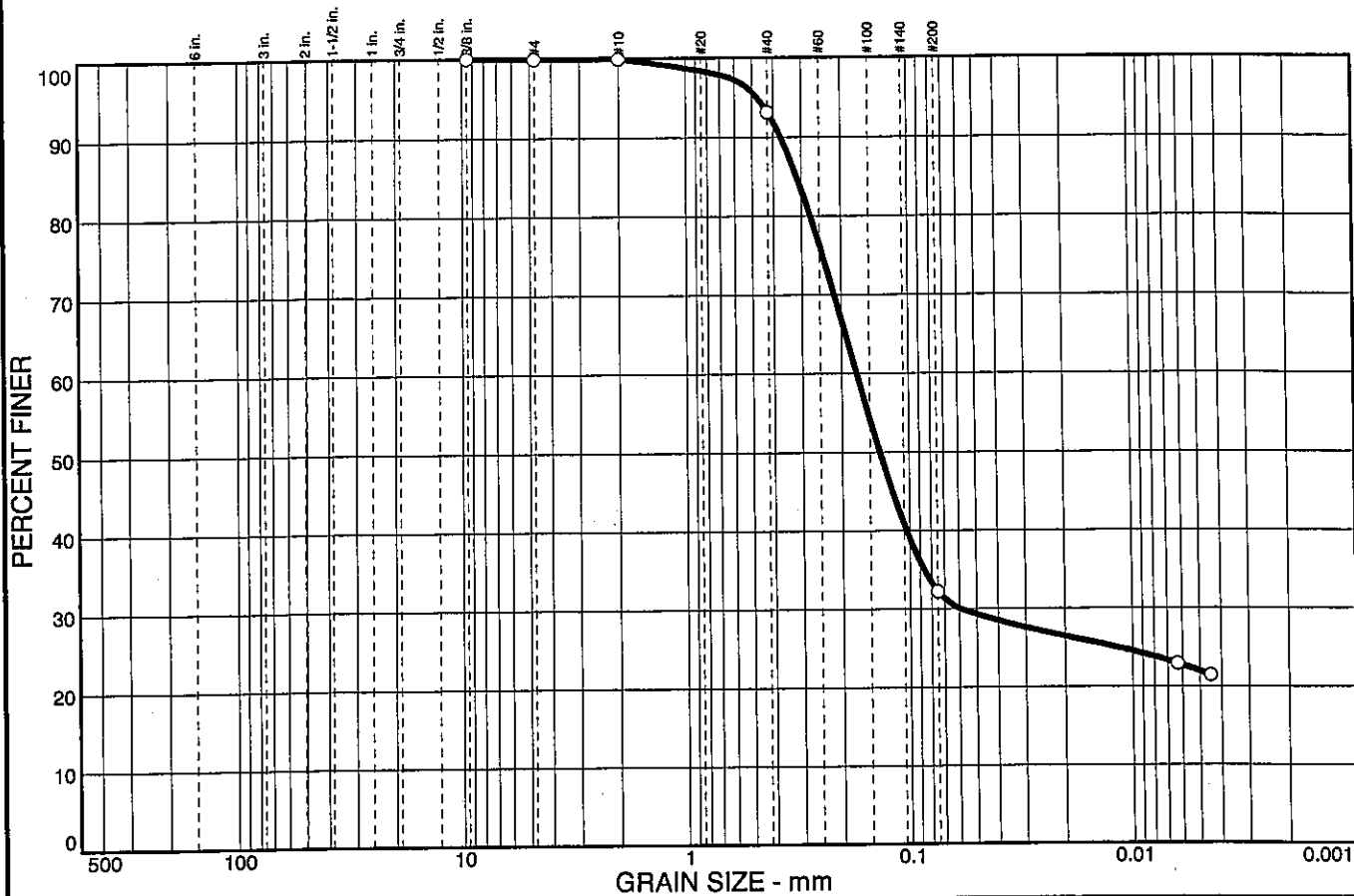


Client: TranSystems, Inc.  
 Project: SCI-823-0.00

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	0.0	6.8	60.9	10.3	21.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.9		
#10	99.9		
#40	93.1		
#200	32.2		

**Soil Description**

Clayey sand

**Atterberg Limits**

PL= 16      LL= 24      PI= 8

**Coefficients**

D<sub>85</sub>= 0.317      D<sub>60</sub>= 0.172      D<sub>50</sub>= 0.136  
D<sub>30</sub>= 0.0591      D<sub>15</sub>=      D<sub>10</sub>=  
C<sub>u</sub>=      C<sub>c</sub>=

**Classification**

USCS= SC      AASHTO= A-2-4(0)

**Remarks**

Moisture Content= 13.9%  
F.M.=0.00

\* (no specification provided)

Sample No.: 2  
Location:

Source of Sample: B-1333

Date: 1/17/06  
Elev./Depth: 2.0

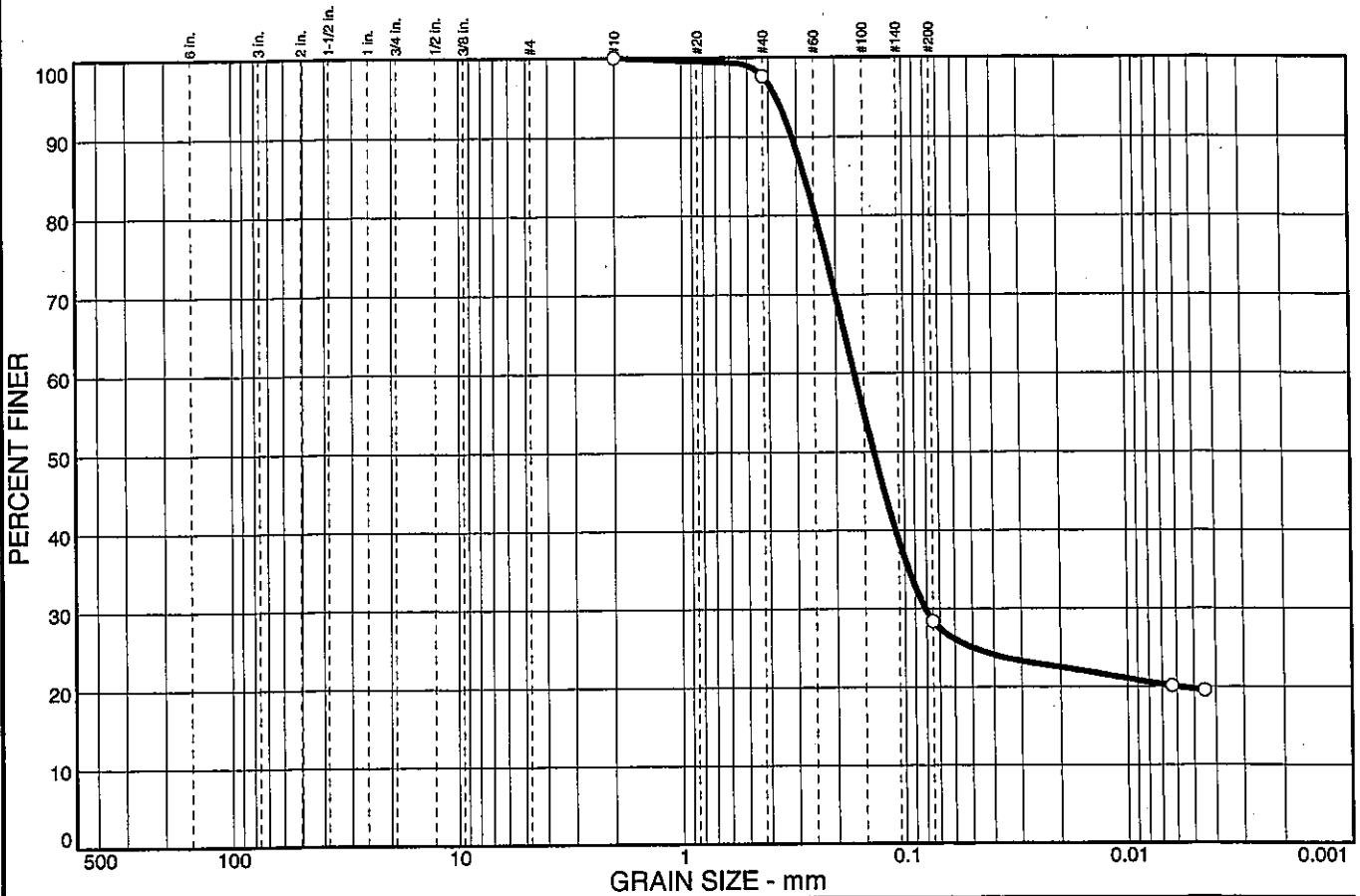


Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	69.2	8.7	19.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	97.6		
#200	28.4		

**Soil Description**

Silty sand

**Atterberg Limits**

PL= NP      LL= NP      PI= NP

**Coefficients**

D<sub>85</sub>= 0.277      D<sub>60</sub>= 0.167      D<sub>50</sub>= 0.137  
 D<sub>30</sub>= 0.0813      D<sub>15</sub>=              D<sub>10</sub>=  
 C<sub>u</sub>=              C<sub>c</sub>=

**Classification**

USCS= SM      AASHTO= A-2-4(0)

**Remarks**

Moisture Content= 12.2%

\* (no specification provided)

Sample No.: 3  
Location:

Source of Sample: B-1333

Date: 1/17/06  
Elev./Depth: 4.0

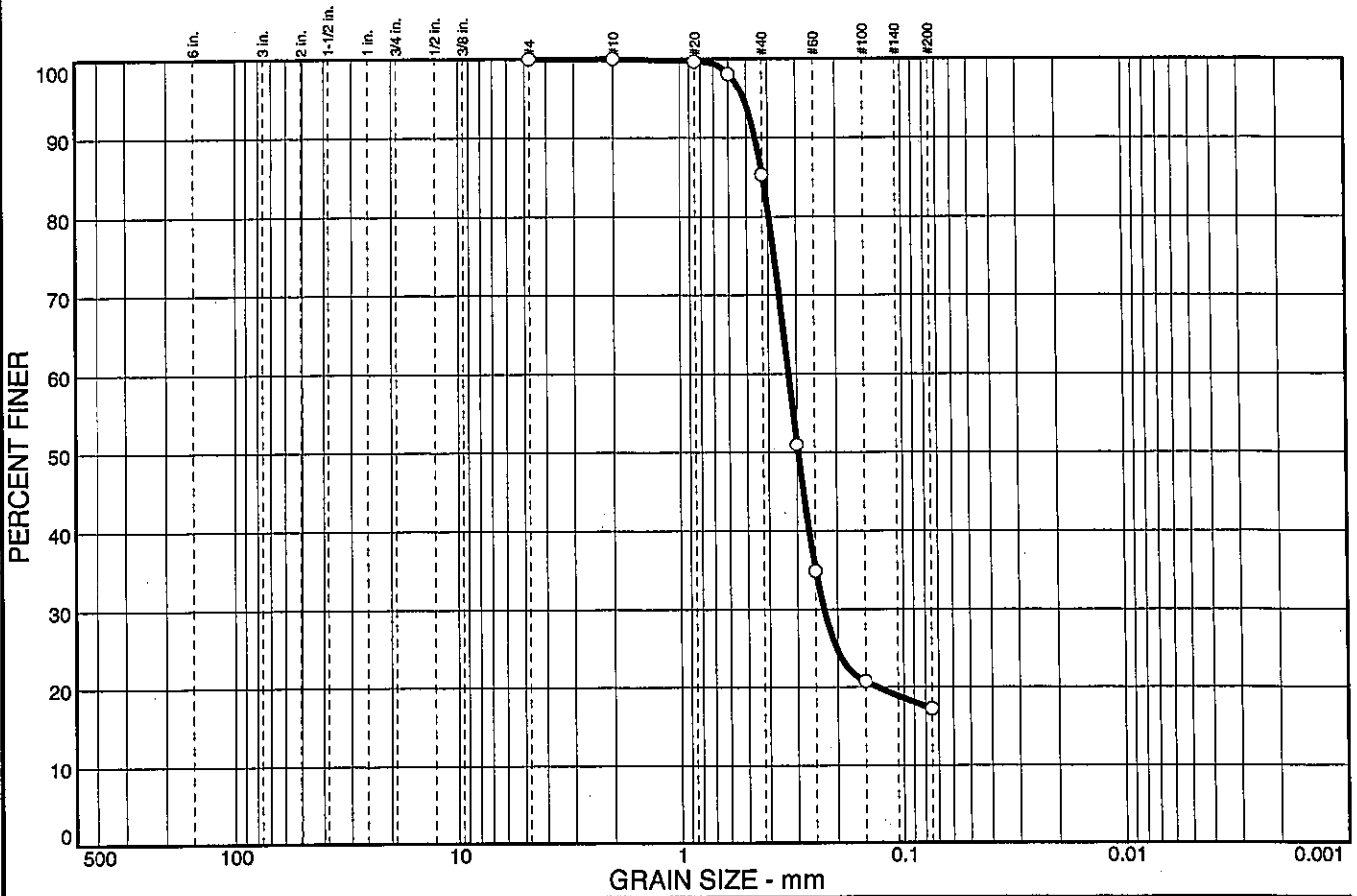


Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	14.7	68.1	17.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.7		
#30	98.1		
#40	85.3		
#50	51.0		
#60	34.9		
#100	20.7		
#200	17.2		

**Soil Description**

Silty sand

**Atterberg Limits**

PL= NP      LL= NP      PI= NP

**Coefficients**

D<sub>85</sub>= 0.423      D<sub>60</sub>= 0.327      D<sub>50</sub>= 0.297  
D<sub>30</sub>= 0.231      D<sub>15</sub>=              D<sub>10</sub>=  
C<sub>u</sub>=                  C<sub>c</sub>=

**Classification**

USCS= SM      AASHTO= A-2-4(0)

**Remarks**

Moisture Content= 11.5%  
F.M.=1.30

\* (no specification provided)

Sample No.: 4  
Location:

Source of Sample: B-1333

Date: 7/21/06  
Elev./Depth: 6.0

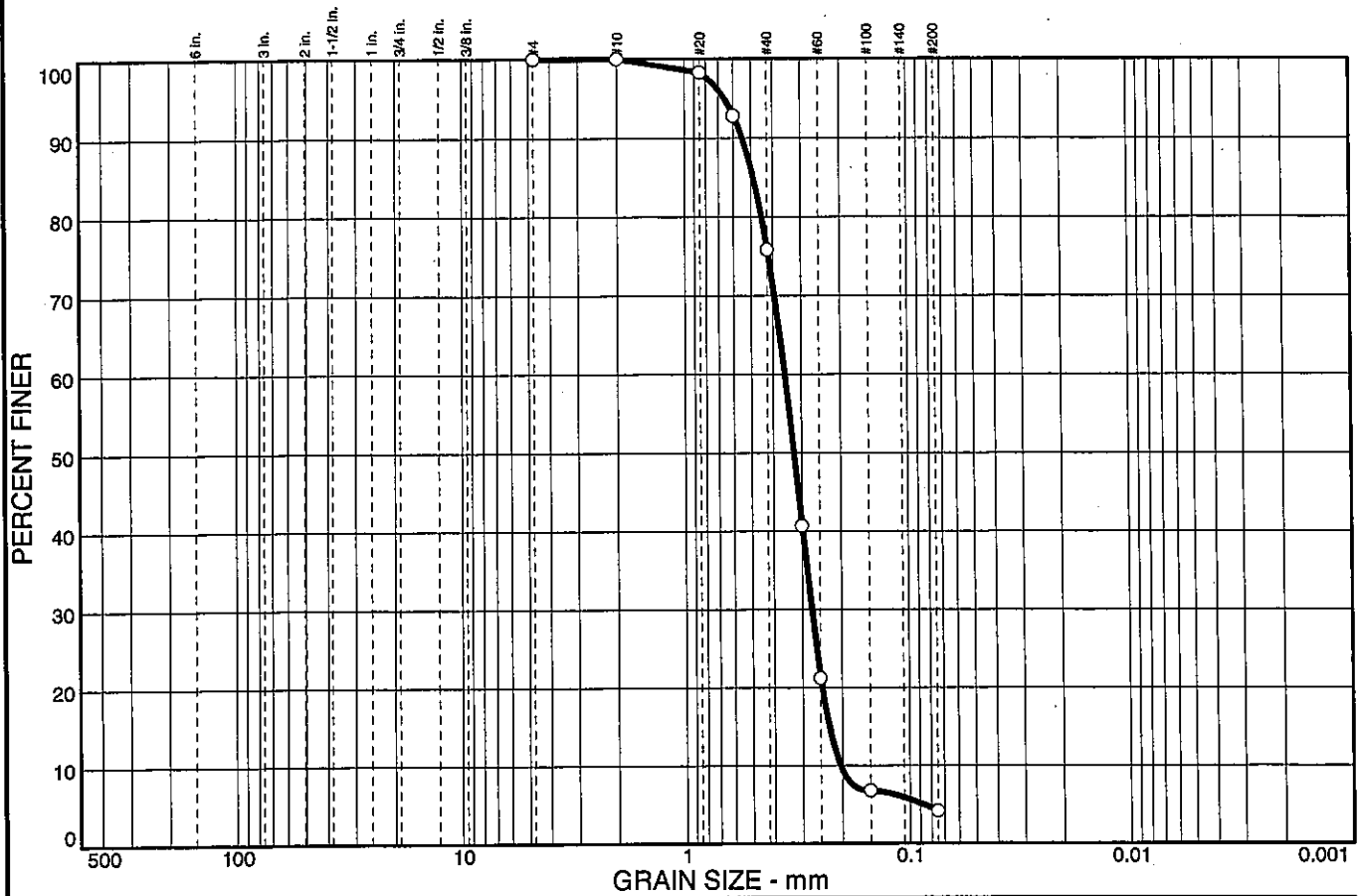


Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	24.2	71.6	4.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	98.3		
#30	92.8		
#40	75.8		
#50	40.7		
#60	21.2		
#100	6.8		
#200	4.2		

**Soil Description**

Poorly graded sand

**Atterberg Limits**

PL= NP      LL= NP      PI= NP

**Coefficients**

D<sub>85</sub>= 0.491      D<sub>60</sub>= 0.357      D<sub>50</sub>= 0.326  
 D<sub>30</sub>= 0.273      D<sub>15</sub>= 0.230      D<sub>10</sub>= 0.205  
 C<sub>u</sub>= 1.74      C<sub>c</sub>= 1.02

**Classification**

USCS= SP      AASHTO= A-3

**Remarks**

Moisture Content= 28.7%  
 F.M.=1.60

\* (no specification provided)

Sample No.: 6  
 Location:

Source of Sample: B-1333

Date: 1/17/06  
 Elev./Depth: 11.0

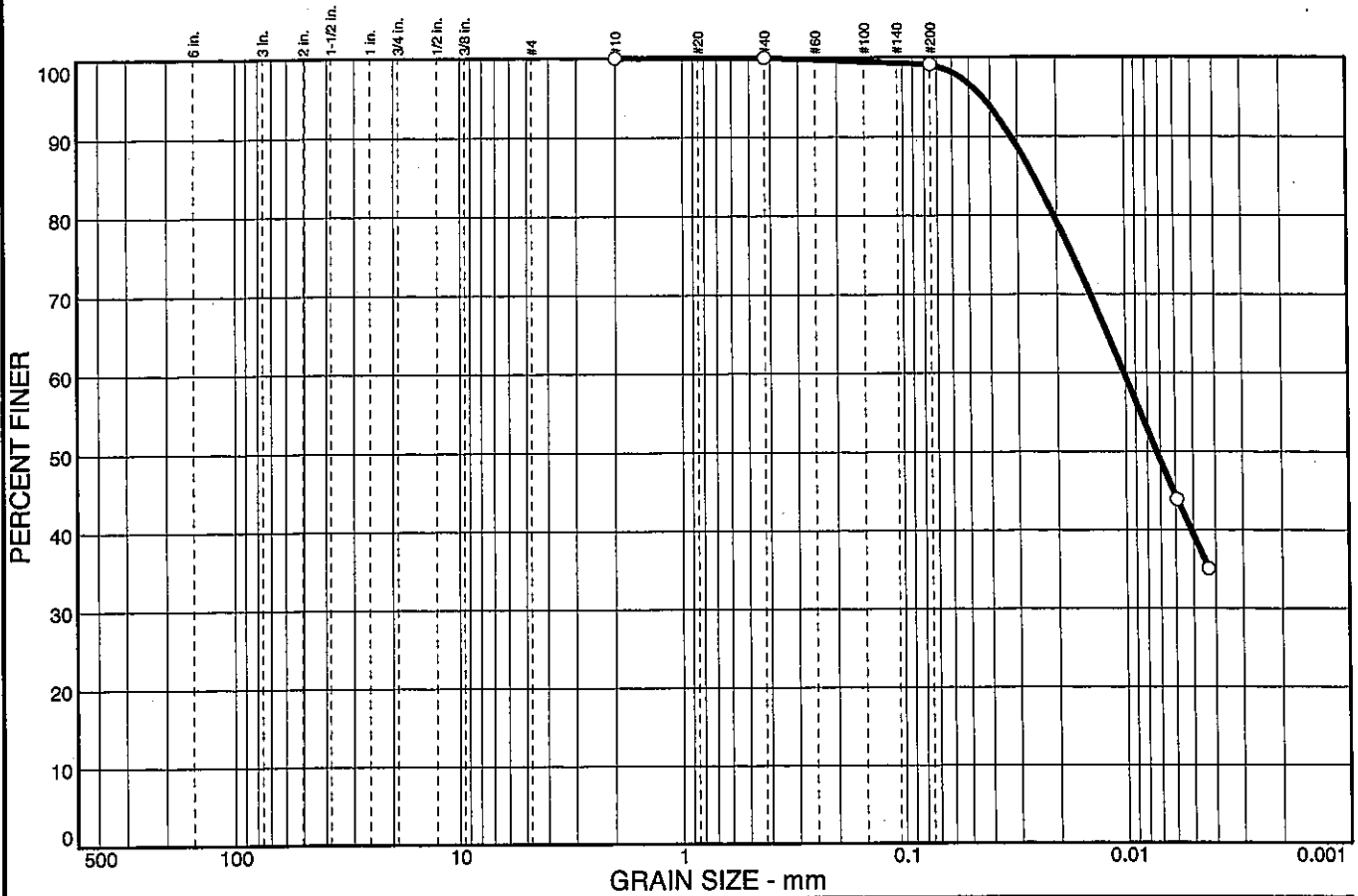


Client: TranSystems, Inc.  
 Project: SCI-823-0.00

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	0.9	59.9	39.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	100.0		
#200	99.1		

**Soil Description**

Lean clay

**Atterberg Limits**

PL= 24      LL= 35      PI= 11

**Coefficients**

D<sub>85</sub>= 0.0254      D<sub>60</sub>= 0.0102      D<sub>50</sub>= 0.0073  
 D<sub>30</sub>=              D<sub>15</sub>=              D<sub>10</sub>=  
 C<sub>u</sub>=                C<sub>c</sub>=

**Classification**

USCS= CL      AASHTO= A-6(12)

**Remarks**

Moisture Content= 31.7%

\* (no specification provided)

Sample No.: 7  
Location:

Source of Sample: B-1333

Date: 1/17/06  
Elev./Depth: 13.5

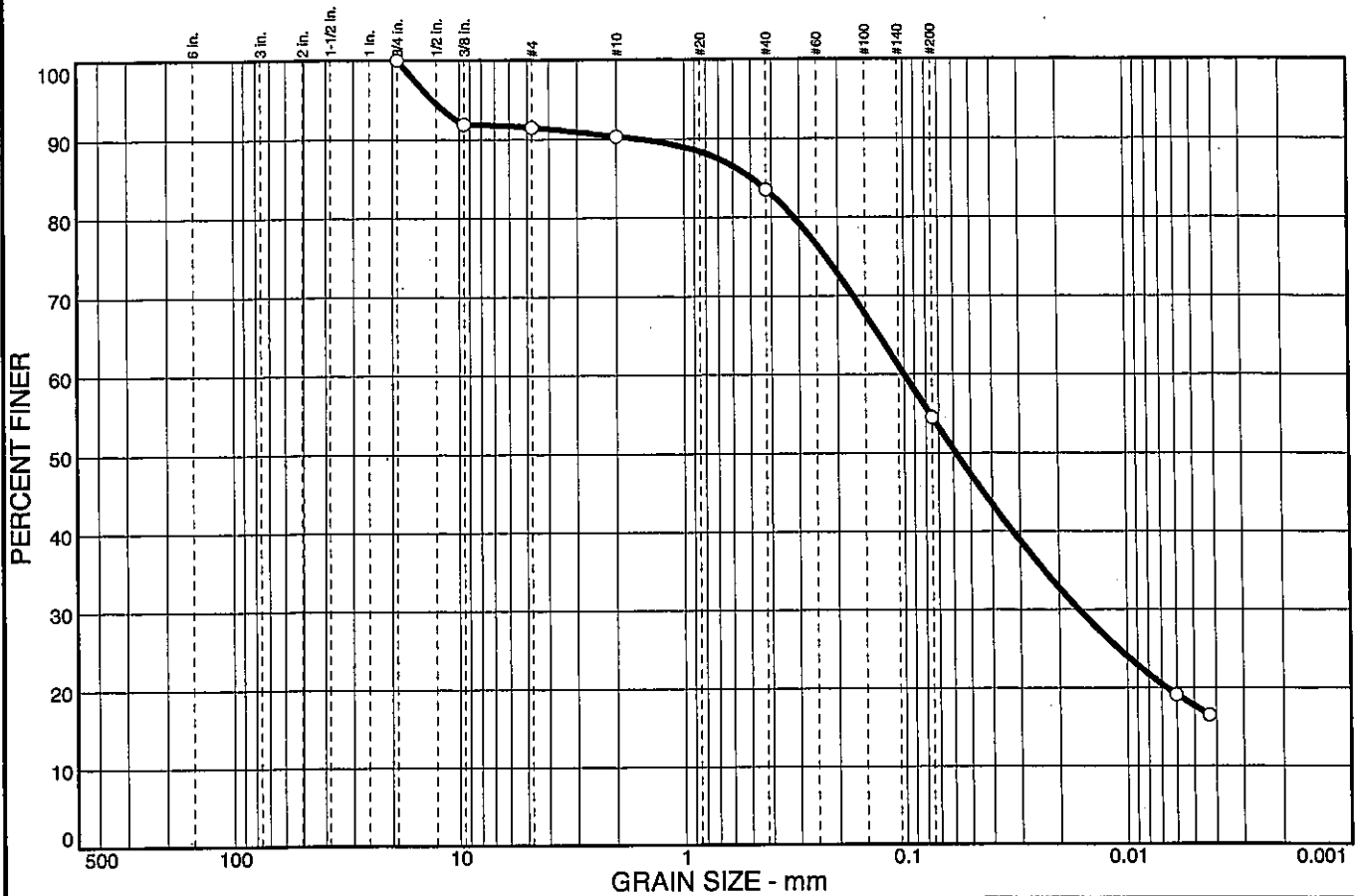


Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	8.5	1.2	6.8	29.0	36.8	17.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	91.9		
#4	91.5		
#10	90.3		
#40	83.5		
#200	54.5		

**Soil Description**

Sandy silty clay

**Atterberg Limits**

PL= 16      LL= 21      PI= 5

**Coefficients**

D<sub>85</sub>= 0.497      D<sub>60</sub>= 0.100      D<sub>50</sub>= 0.0586  
D<sub>30</sub>= 0.0164      D<sub>15</sub>=      D<sub>10</sub>=  
C<sub>u</sub>=      C<sub>c</sub>=

**Classification**

USCS= CL-ML      AASHTO= A-4(0)

**Remarks**

Moisture Content= 15.9%  
F.M.=0.17

\* (no specification provided)

Sample No.: 2  
Location:

Source of Sample: B-1340

Date: 7/21/06  
Elev./Depth: 3.5



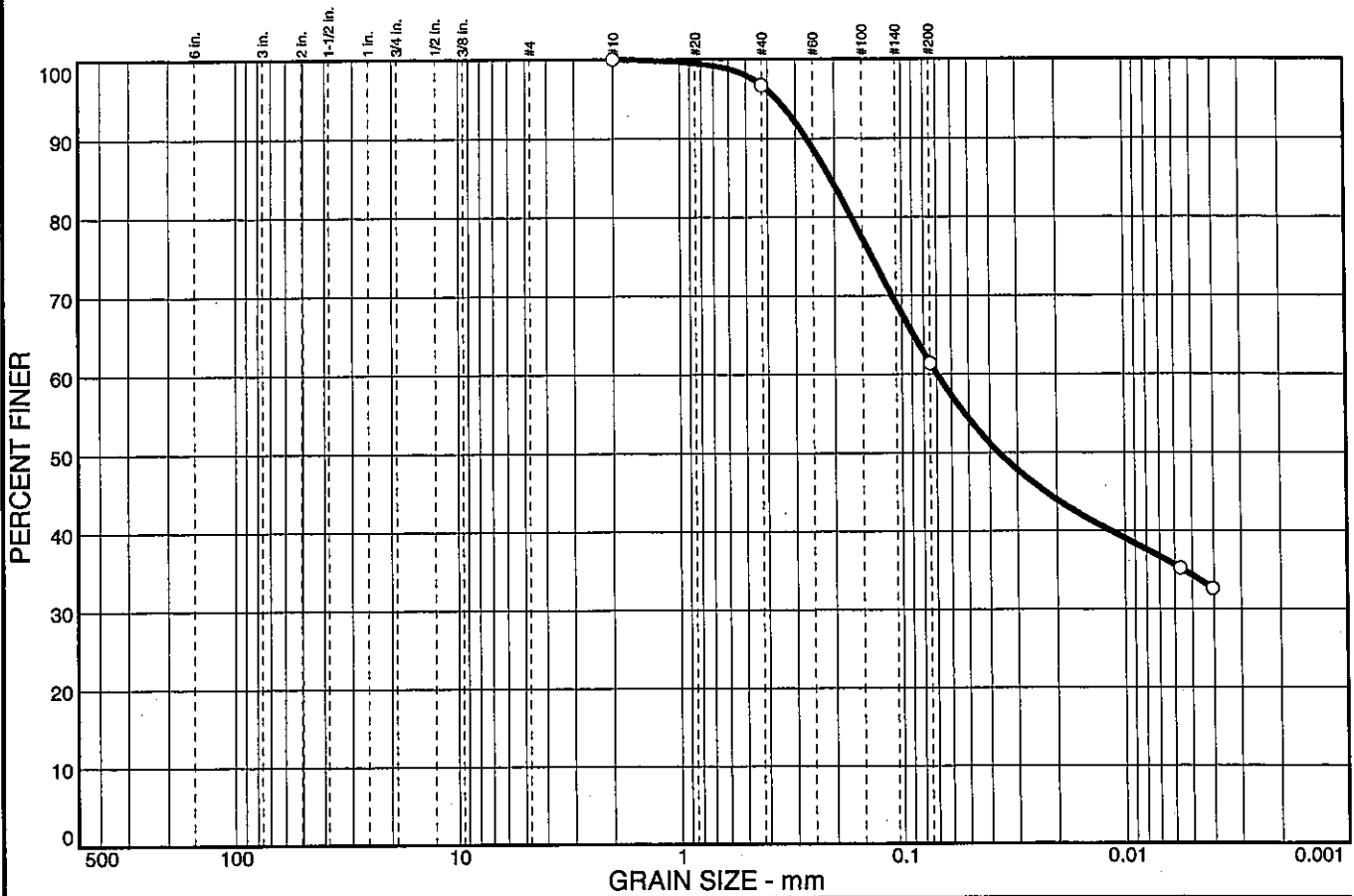
Client: TranSystems, Inc.

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	3.3	35.3	27.1	34.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	96.7		
#200	61.4		

**Soil Description**

Sandy lean clay

**Atterberg Limits**

PL= 13      LL= 26      PI= 13

**Coefficients**

D<sub>85</sub>= 0.210      D<sub>60</sub>= 0.0698      D<sub>50</sub>= 0.0366  
D<sub>30</sub>=              D<sub>15</sub>=              D<sub>10</sub>=  
C<sub>u</sub>=                C<sub>c</sub>=

**Classification**

USCS= CL      AASHTO= A-6(5)

**Remarks**

Moisture Content= 21.8%

\* (no specification provided)

Sample No.: 4  
Location:

Source of Sample: B-1340

Date: 7/21/06  
Elev./Depth: 8.5



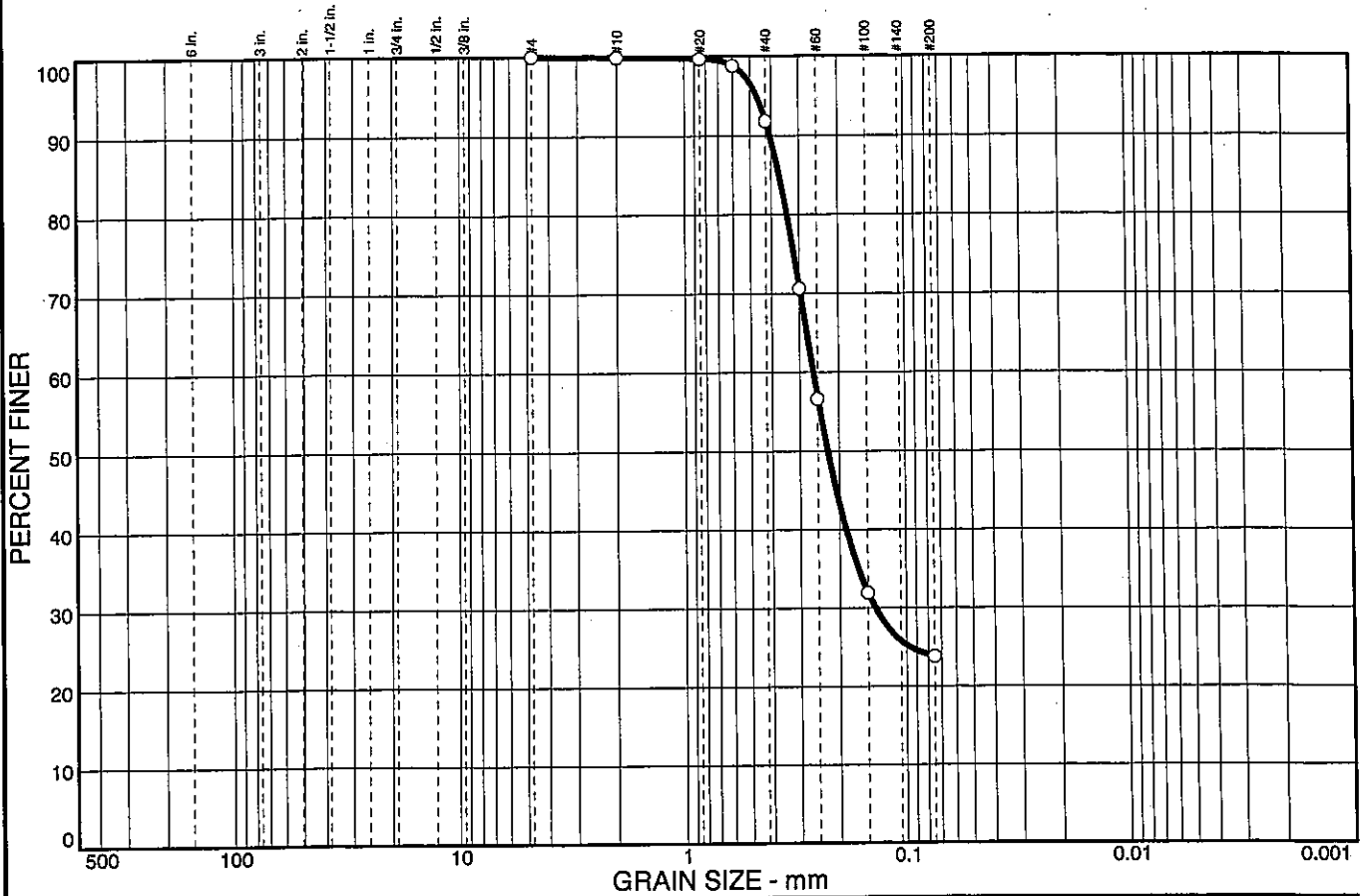
Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	8.1	68.0	23.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.7		
#30	98.8		
#40	91.8		
#50	70.6		
#60	56.6		
#100	31.9		
#200	23.8		

**Soil Description**

Silty sand

**Atterberg Limits**

PL= NP      LL= NP      PI= NP

**Coefficients**

D<sub>85</sub>= 0.370      D<sub>60</sub>= 0.262      D<sub>50</sub>= 0.227  
D<sub>30</sub>= 0.139      D<sub>15</sub>=              D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

Moisture Content= 15.6%  
F.M.=0.99

\* (no specification provided)

Sample No.: 5  
Location:

Source of Sample: B-1340

Date: 7/21/06  
Elev./Depth: 11.0



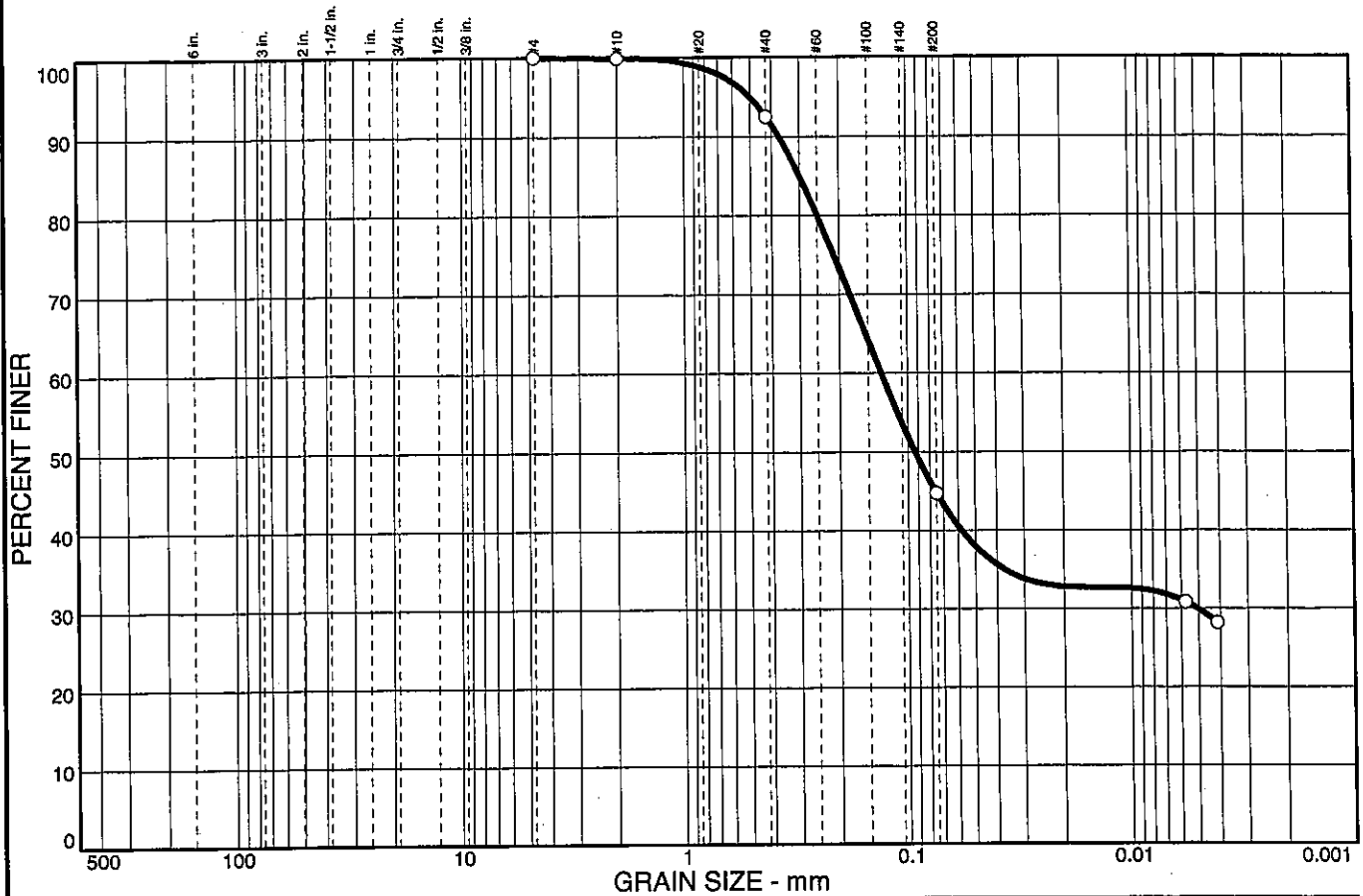
Client: TranSystems, Inc.

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	7.4	47.8	14.9	29.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#40	92.5		
#200	44.7		

**Soil Description**

Clayey sand

**Atterberg Limits**

PL= 13      LL= 23      PI= 10

**Coefficients**

D<sub>85</sub>= 0.301      D<sub>60</sub>= 0.132      D<sub>50</sub>= 0.0934  
D<sub>30</sub>= 0.0051      D<sub>15</sub>=              D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SC              AASHTO= A-4(1)

**Remarks**

Moisture Content= 15.0%

\* (no specification provided)

Sample No.: 2  
Location:

Source of Sample: B-1341

Date: 7/12/06  
Elev./Depth: 3.5

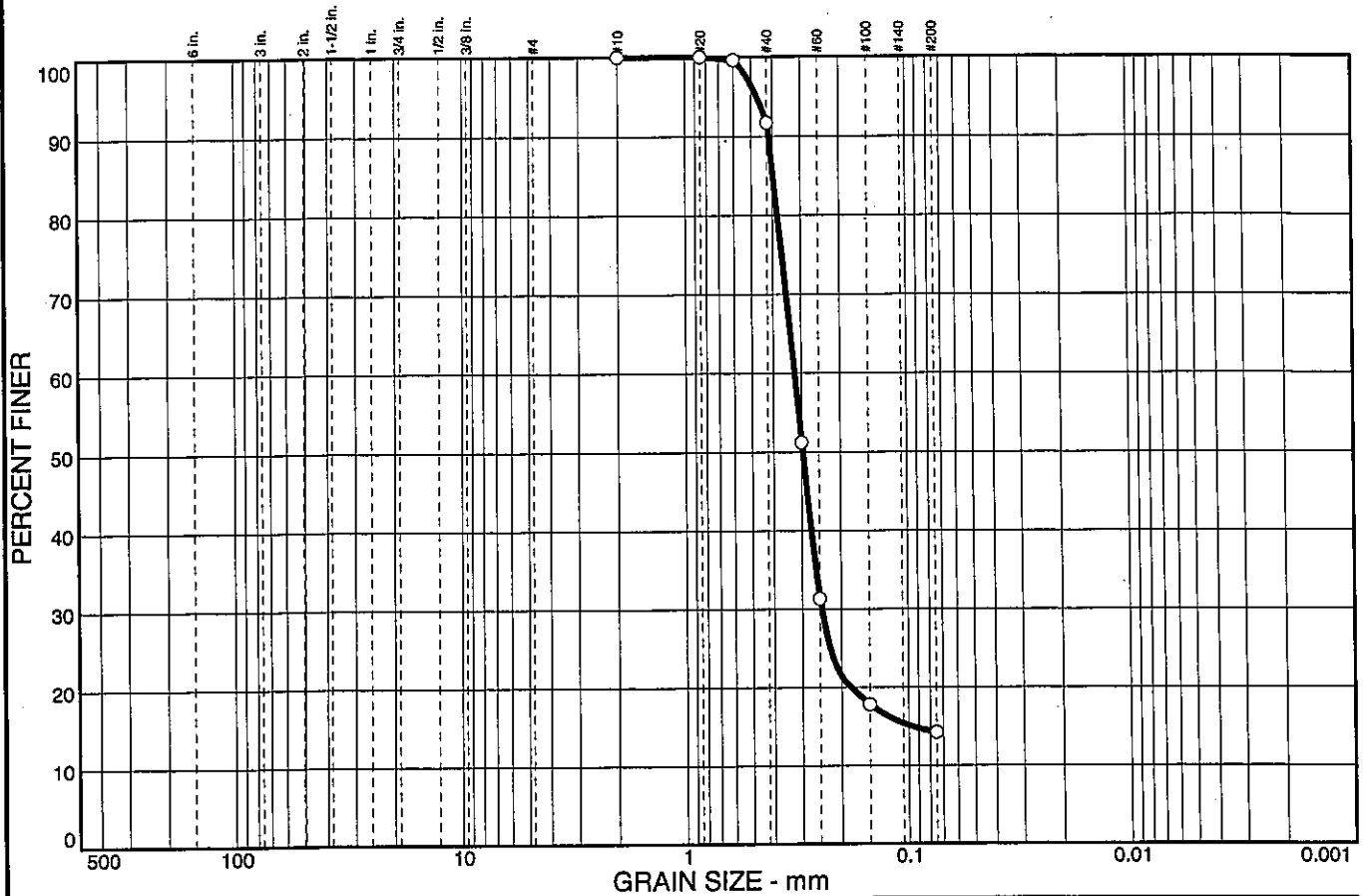


Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	8.3	77.5	14.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	100.0		
#30	99.6		
#40	91.7		
#50	51.2		
#60	31.3		
#100	17.8		
#200	14.2		

**Soil Description**

Silty sand

**Atterberg Limits**

PL= NP      LL= NP      PI= NP

**Coefficients**

D<sub>85</sub>= 0.400      D<sub>60</sub>= 0.323      D<sub>50</sub>= 0.297  
D<sub>30</sub>= 0.246      D<sub>15</sub>= 0.0969      D<sub>10</sub>=  
C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**

USCS= SM                      AASHTO= A-2-4(0)

**Remarks**

Moisture Content = 15.4%  
F.M.=1.31

\* (no specification provided)

Sample No.: 3  
Location:

Source of Sample: B-1341

Date: 07/12/06  
Elev./Depth: 6.0

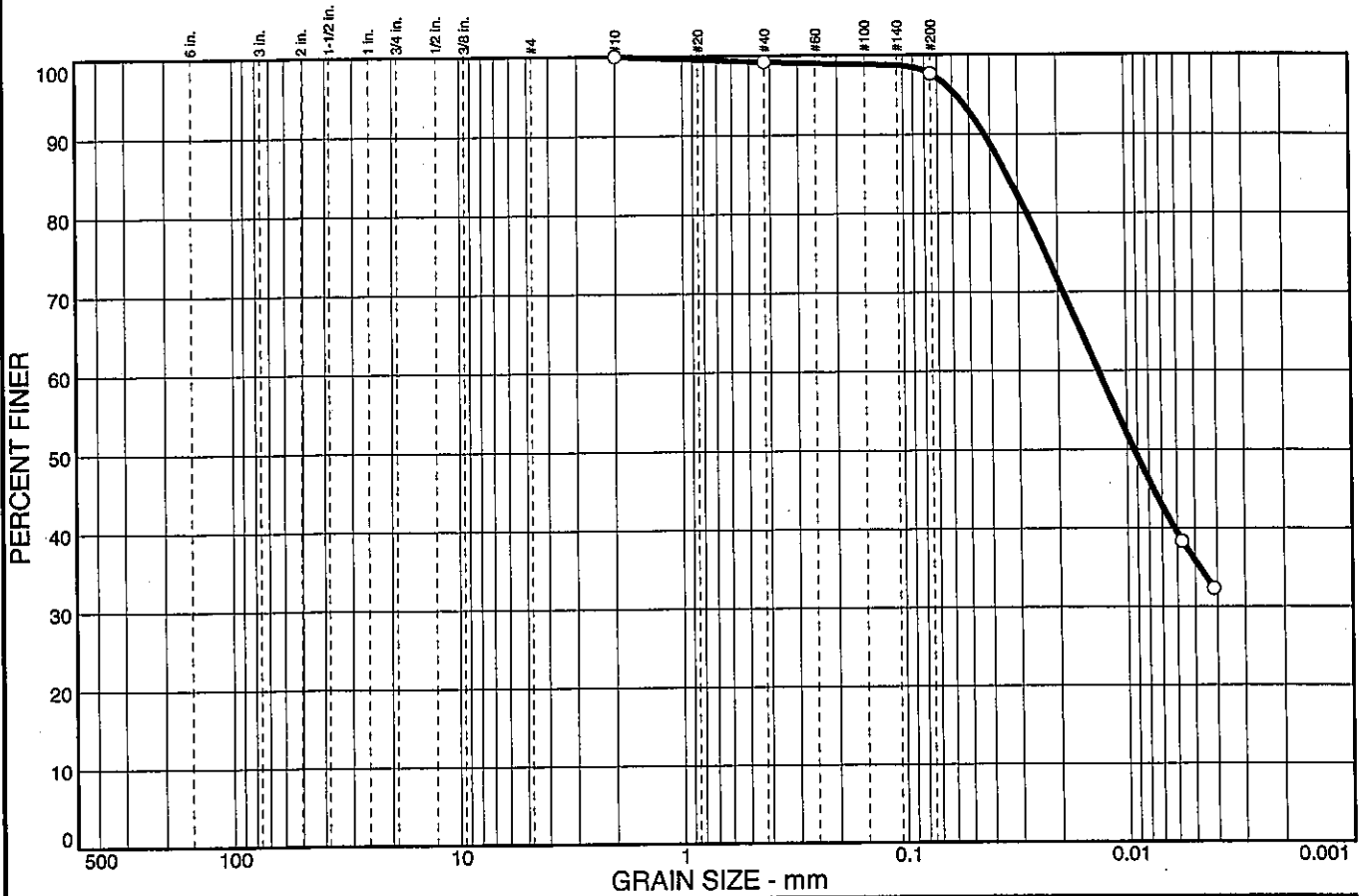


Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	1.6	61.8	35.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	99.2		
#200	97.6		

**Soil Description**

Lean clay

**Atterberg Limits**

PL= 20      LL= 35      PI= 15

**Coefficients**

D<sub>85</sub>= 0.0339      D<sub>60</sub>= 0.0134      D<sub>50</sub>= 0.0093  
 D<sub>30</sub>=              D<sub>15</sub>=              D<sub>10</sub>=  
 C<sub>u</sub>=                C<sub>c</sub>=

**Classification**

USCS= CL              AASHTO= A-6(15)

**Remarks**

Moisture Content = 31.0%

\* (no specification provided)

Sample No.: 5  
Location:

Source of Sample: B-1341

Date: 07/12/06  
Elev./Depth: 11.0

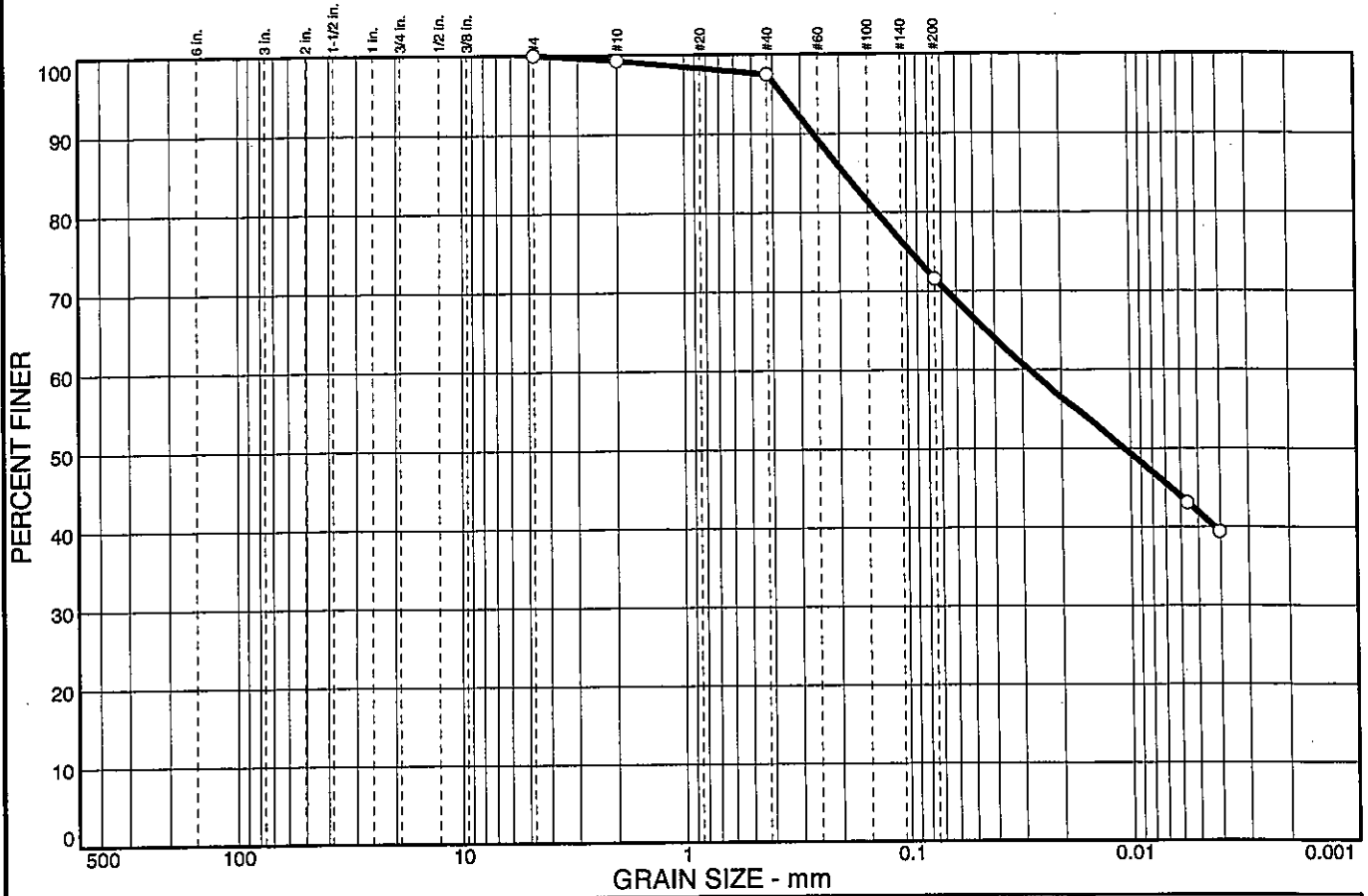


Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	1.8	25.9	29.8	41.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.3		
#40	97.5		
#200	71.6		

**Soil Description**

Lean clay with sand

**Atterberg Limits**

PL= 14      LL= 28      PI= 14

**Coefficients**

D<sub>85</sub>= 0.191      D<sub>60</sub>= 0.0280      D<sub>50</sub>= 0.0107  
D<sub>30</sub>=              D<sub>15</sub>=              D<sub>10</sub>=  
C<sub>u</sub>=                C<sub>c</sub>=

**Classification**

USCS= CL              AASHTO= A-6(7)

**Remarks**

Moisture Content = 19.1%

\* (no specification provided)

Sample No.: 1  
Location:

Source of Sample: B-1342

Date: 07/12/06  
Elev./Depth: 1.0

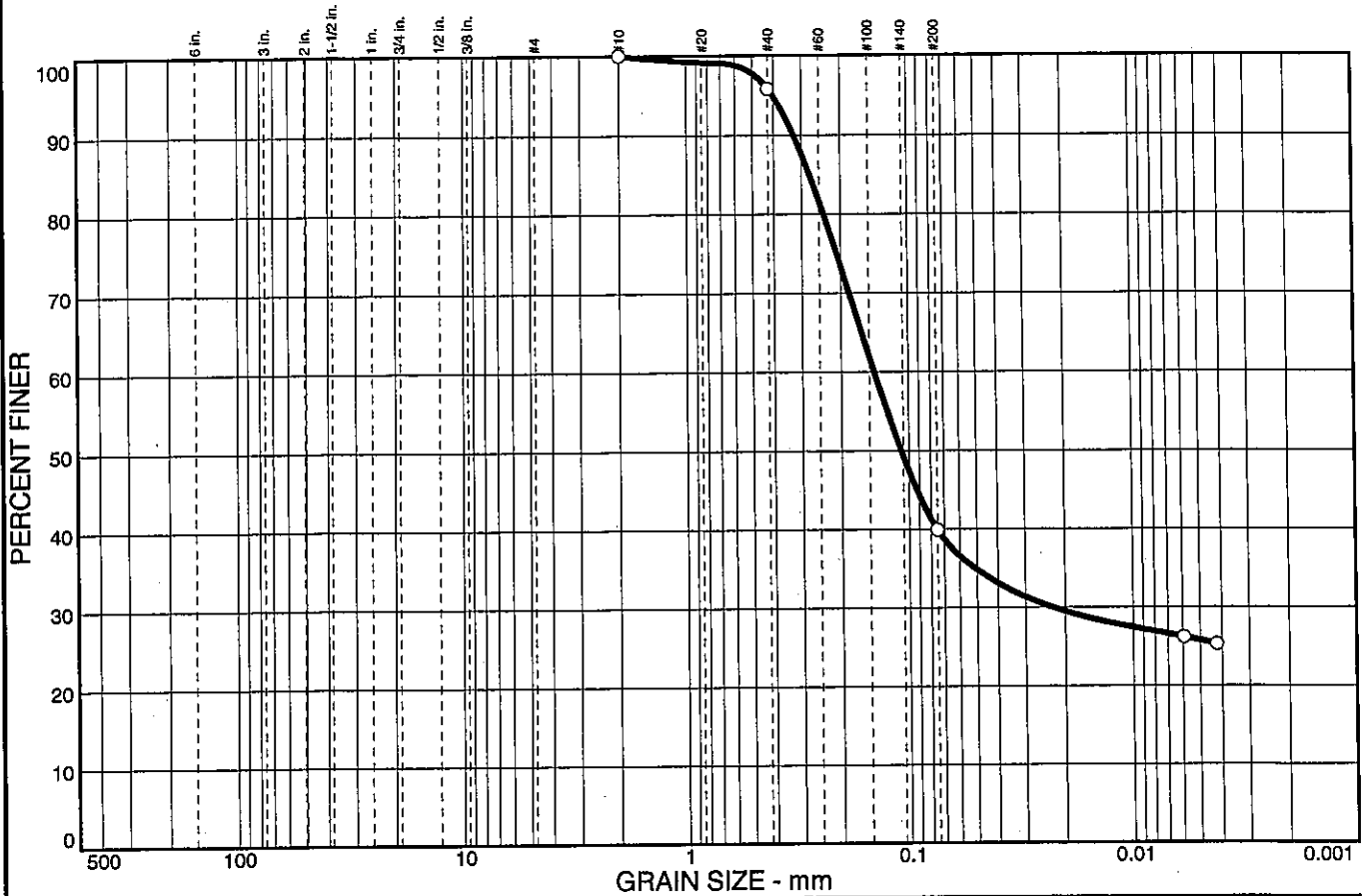


Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	4.2	55.9	14.1	25.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#40	95.8		
#200	39.9		

**Soil Description**  
Clayey sand

**Atterberg Limits**  
 PL= 13      LL= 26      PI= 13

**Coefficients**  
 D<sub>85</sub>= 0.277      D<sub>60</sub>= 0.143      D<sub>50</sub>= 0.109  
 D<sub>30</sub>= 0.0228      D<sub>15</sub>=      D<sub>10</sub>=  
 C<sub>u</sub>=      C<sub>c</sub>=

**Classification**  
 USCS= SC      AASHTO= A-6(1)

**Remarks**  
 Moisture Content = 17.3%

\* (no specification provided)

Sample No.: 2  
Location:

Source of Sample: B-1342

Date: 07/12/06  
Elev./Depth: 3.5

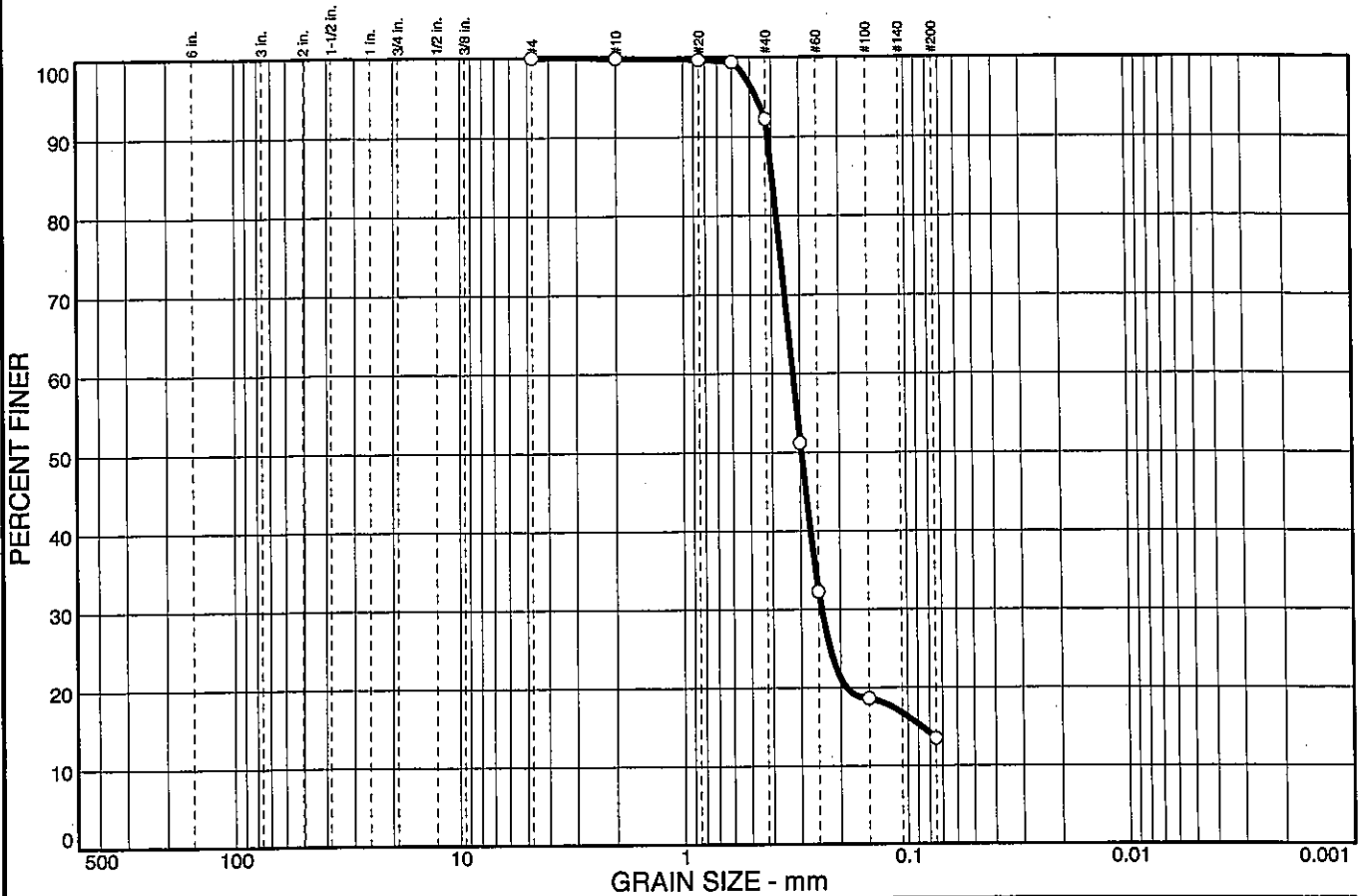


Client: TranSystems, Inc.  
Project: SCI-823-0.00

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	7.7	78.7	13.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.7		
#30	99.4		
#40	92.2		
#50	51.2		
#60	32.3		
#100	18.6		
#200	13.5		

**Soil Description**  
Silty sand

**Atterberg Limits**  
 PL= NP      LL= NP      PI= NP

**Coefficients**  
 D<sub>85</sub>= 0.399      D<sub>60</sub>= 0.323      D<sub>50</sub>= 0.297  
 D<sub>30</sub>= 0.243      D<sub>15</sub>= 0.0873      D<sub>10</sub>=  
 C<sub>u</sub>=                      C<sub>c</sub>=

**Classification**  
 USCS= SM                      AASHTO= A-2-4(0)

**Remarks**  
 Moisture Content = 13.4%  
 F.M.=1.31

\* (no specification provided)

Sample No.: 3  
Location:

Source of Sample: B-1342

Date: 07/12/06  
Elev./Depth: 6.0



Client: TranSystems, Inc.  
Project: SCI-823-0.00

Project No: 0121-3070.03

Figure

