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August 1, 2006

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

Re: **MSE Wall Evaluations**
823 over Shumway Hollow Road
SCI-823-0.00 Portsmouth Bypass
DLZ Job No.: 0121-3070.03
Document # 0018

Dear Mr. Weeks:

This letter includes the findings of evaluations of mechanically stabilized earth (MSE) retaining walls on the above-referenced project. The findings included in this letter pertain to the MSE walls at the interchange of proposed SR 823 and Shumway Hollow Road. The findings of other MSE wall evaluations will be submitted in separate documents.

It should be noted that the results of these evaluations are based upon the findings of four final and three preliminary structural borings. Borings B-1 through B-4 were drilled for a final bridge plan, essentially consisting of proposed SR 823 passing over a realigned Shumway Hollow Road. The preliminary borings were drilled for a different design, where Shumway Hollow Road passed over proposed SR 823. Due to the change in the design, borings B-1 through B-4 are considered most representative of soils in the area of the currently proposed structures. Boring logs for borings TR-24 through TR-26 and B-1 through B-4 are attached.

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.

At the time this letter was prepared, it was understood that the plan location of the bridge structure for proposed SR 823 over Shumway Hollow Road has not changed from the approved location, shown on the attached plan and profile sheet. It is understood that MSE walls will be placed at approximate stations 383+75 and 384+69 to contain the abutments and hold back the roadway embankment for proposed SR 823. Based upon cross-sections and profile information along proposed Shumway Hollow Road, it is assumed that the maximum height of the MSE wall at station 384+69 (Forward Abutment) will be approximately 29.0 feet high. This height is based upon the maximum difference between the proposed grade, and the approximate existing grade along realigned Shumway Hollow Road. See attached cross-section drawing.

A global stability analysis and bearing capacity analysis were performed for the MSE walls at this bridge location in accordance with ODOT and AASHTO guidelines. The MSE walls were also analyzed for sliding, overturning, and settlement. At the time this letter was prepared, it was understood that piles will be used at this site to support the bridge abutments. If the foundation type should change, DLZ should be informed so that the analyses may be revised as necessary.

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 guidelines, a unit weight of 120 pcf and a friction angle of 34 degrees were selected for the backfill material in the reinforced zone. Similarly, 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.

Due to similarities in the soils encountered at this location, the results of the analyses of the MSE wall at the forward abutment are considered representative of both walls at this site. In general, boring B-1 was found to have the most critical subsurface profile in the area of the proposed MSE walls.

MSE Wall Evaluation at Station 383+75 (Rear Abutment) and Station 384+69 (Forward Abutment)

In the area of the proposed MSE walls, boring B-1 generally encountered 5 inches of topsoil at the surface. Below the topsoil layer, primarily very stiff silt (A-4b) was encountered to a depth of 4.0 feet below ground surface. Below 4.0 feet, primarily stiff to very stiff clay (A-7-6) was encountered to a depth of approximately 21.5 feet below ground surface. Below 21.5 feet, primarily loose fine sand (A-3) was encountered to a depth of approximately 37.5 feet, at the top of bedrock. Underlying the soil, this boring encountered hard, slightly to moderately weathered sandstone to the bottom of the boring, at a depth of 42.5 feet.

The MSE walls at the rear and forward abutments are assumed to have a maximum height of approximately 29.0 feet. However, in the area of the most critical soil profile, boring B-1, the height of the MSE wall is assumed to be approximately 27.6 feet. Based upon stability and AASHTO guidelines, the minimum required embedment depth for this wall is three feet. The required length of the reinforcing straps was found to be 0.9 times the total height plus the embedment depth, or 28.8 feet.

The MSE walls were analyzed at this location for global stability. The results yielded acceptable factors of safety for global stability. See attached drawing illustrating the results of the global stability analyses. 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 2.2, slightly below the recommended 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 achieve the minimum recommended factor of safety.

Next, UTEXAS3 was utilized to evaluate the 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 the TOE of the MSE wall volume, this analysis can be said to be analyzing a global stability failure mode that is essentially a bearing capacity failure. Using this type of model for the MSE walls at SR 823 over Shumway Hollow Road, the factor of safety for undrained bearing capacity of the full height wall was calculated to be 2.3. Additionally, an analysis was 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 25 feet, with a factor of safety of 2.5. It was determined that a waiting period of approximately 44 days will be required before placing the additional 4 feet of fill to complete the full height 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 factor of safety of 2.5. Due to variations in the clay layer, 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.

45 days

← what is critical pore pressure

The total maximum settlement of the MSE wall volumes at this location was estimated to be approximately 8 inches at the centerline of the wall. Of the total of 8 inches, approximately 1 inch will occur instantaneously in the sand and gravel layers. Settlement was calculated using the computer program EMBANK, using the "end of fill" option to model the non-continuous embankments. Differential settlement at this location was estimated to be approximately 0.3%. 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).

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Time-rate of consolidation calculations have indicated that approximately 234 days will be required to achieve 90 percent consolidation of foundational soils without using wick drains or other methods. This calculation is based upon the coefficient of vertical consolidation. It should be noted that the clay layer was observed to be varved (containing thin silt and fine sand layers); however, without the use of wick drains, the horizontal drainage path to relieve pore pressures will be very long. The use of a higher coefficient of consolidation to model the horizontal drainage relies on the assumption that these layers are continuous throughout the embankment area. Due to variations in the soil profile under the proposed MSE wall area, this would not be a reasonable assumption. If the previously mentioned consolidation period is too long, the use of wick drains or other methods may be explored to accelerate the consolidation of foundation soils. These alternatives can be evaluated for this site upon request.

Calculations for bearing capacity, overturning, sliding, and settlement are attached for the MSE wall at the forward abutment. A drawing showing the results of the global stability analyses is also attached. Also, a summary of soil properties, summary of the results of calculations, and results of global stability analyses are attached.

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

Dorothy A. Adams, M.S.C.E., P.E.
Senior Geotechnical Engineer

Encl: As noted

cc: file

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Soil Parameters Used in MSE Wall Stability Analyses
Shumway Hollow Road

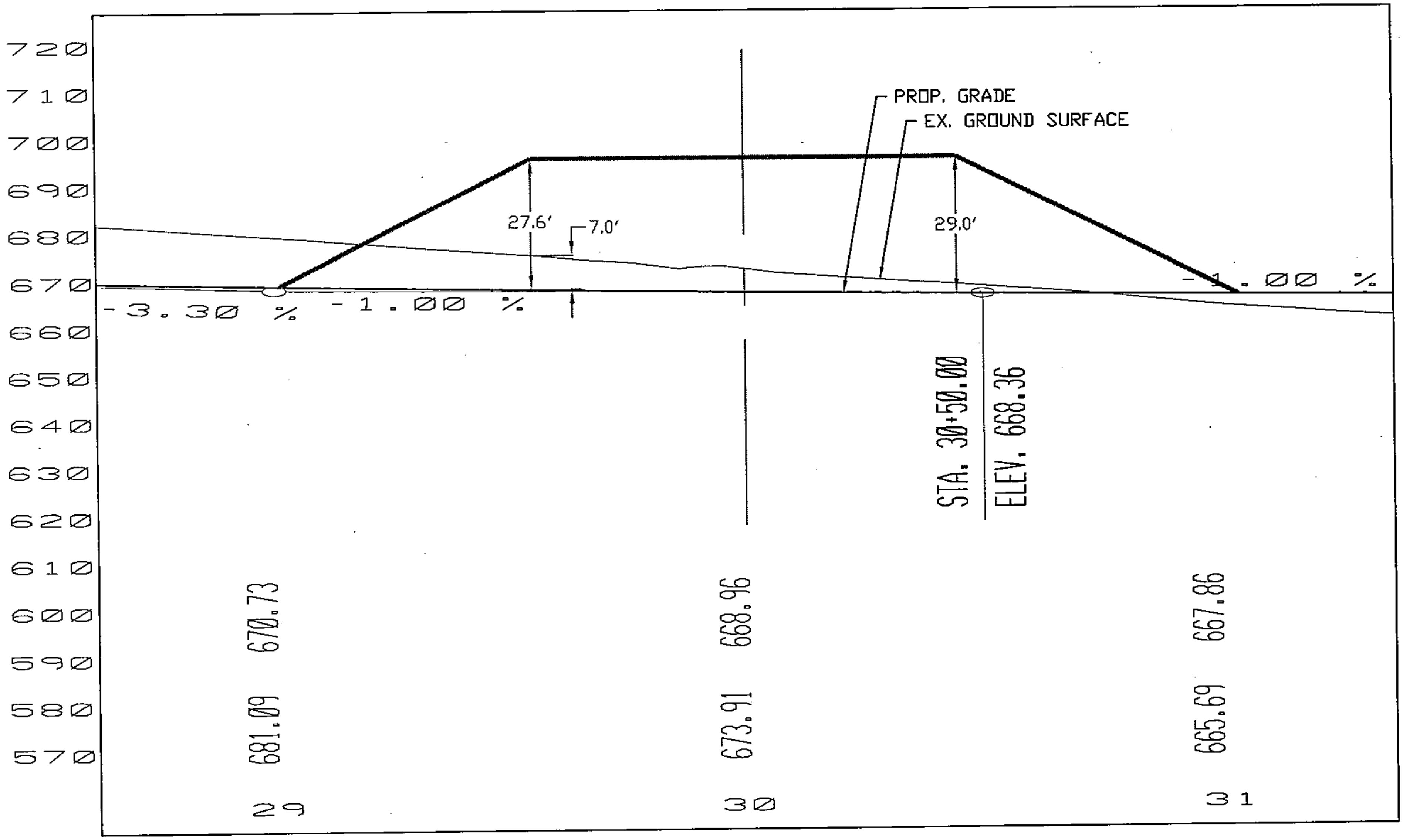
Zone	Soil Type	Unit Weight (pcf)	Strength Parameters			
			Undrained		Drained	
			c	ϕ	c'	ϕ'
Reinforced Fill	Compacted Granular Fill	120	0	34	0	34
Retained Soil	Compacted Embankment Fill	120	0	30	0	30
Foundation Soil (Rear and Forward Abutments) (Boring B-1)	Stiff Clay	120	2000	0	0	28

MSE Retaining Wall Parameters and Analyses Results
Portsmouth – Minford Road (Rear and Forward Abutments)
Analysis Based on Boring B-1

Retained Soil (New Embankment) Unit Weight = 120 pcf Coefficient of Active Earth Pressure (K_a) = 0.33 (Based on ϕ′= 30°)
Sliding along base of MSE wall Sliding Coefficient (μ)(0.67) = tan 28°(0.67) = 0.36 Use (μ)(0.67) =0.35 as a maximum value as per AASHTO, BDM,303.4.1.1
Allowable Bearing Capacity – Undrained Condition q_{all} = 4255 psf For MSE wall with minimum 28.8-foot long reinforcing
Allowable Bearing Capacity – Drained Condition q_{all} = 5,513 psf For MSE wall with minimum 28.8-foot long reinforcing
Global Stability Factor of Safety – Undrained Condition = 2.3 Factor of Safety – Drained Condition = 1.7 Factor of Safety – Seismic Condition = 1.6
Estimated Settlement of MSE volume Total settlement = 8 inches Differential settlement = 0.3% ≤ 1/100
Maximum Full Height of MSE Wall = 29.0 feet Minimum Embedment Depth = 3.0 feet Minimum Length of Reinforcement for External Stability = 28.8 feet

Laboratory Testing Summary

						Strength Testing			Consolidation Testing						
Boring	**Depth**	**PL**	**LL**	**PI**	**Soil Type**	**UC (tsf)**	**UU**	**CIU**	**C_c**	**C_r**	**e_0**	**P_c**	**C_v**	**γ_n (pcf)**	**G_s**
B-1	8.0	26	52	26	A-7-6	2.051									
B-1	8.0	26	52	26	A-7-6	2.107									
B-1	12.0	24	52	28	A-7-6	2.365									
B-1	18.0	26	49	23	A-7-6				0.21	0.10	0.955	2160	0.12	119.40	2.74
B-1	19.5	23	59	36	A-7-6	1.348									
B-1	19.5	23	59	36	A-7-6	1.349									
B-2	6.0	27	67	40	A-7-6	2.031			0.16	0.09	0.709	720	0.10	124.80	2.72
B-2	6.0	27	67	40	A-7-6	2.005									
B-2	11.0	22	52	30	A-7-6	2.572									
B-2	11.0	22	52	30	A-7-6	2.611									
B-2	12.5	24	78	54	A-7-6	2.198			0.18	0.08	0.833	1500	0.13	122.70	2.81
B-3	8.0	26	60	34	A-7-6	1.658									
B-3	10.0	19	44	25	A-7-6	2.204									



823 OVER SHUMWAY HOLLOW ROAD
PROFILE ALONG SHUMWAY HOLLOW ROAD
FORWARD ABUTMENT - VIEW LOOKING NORTH

1' = 30' HOR AND VERT

SCI-823-0.00

PROJECT NO. 0121-3070.03	CALC: SJR	DATE 07/28/06

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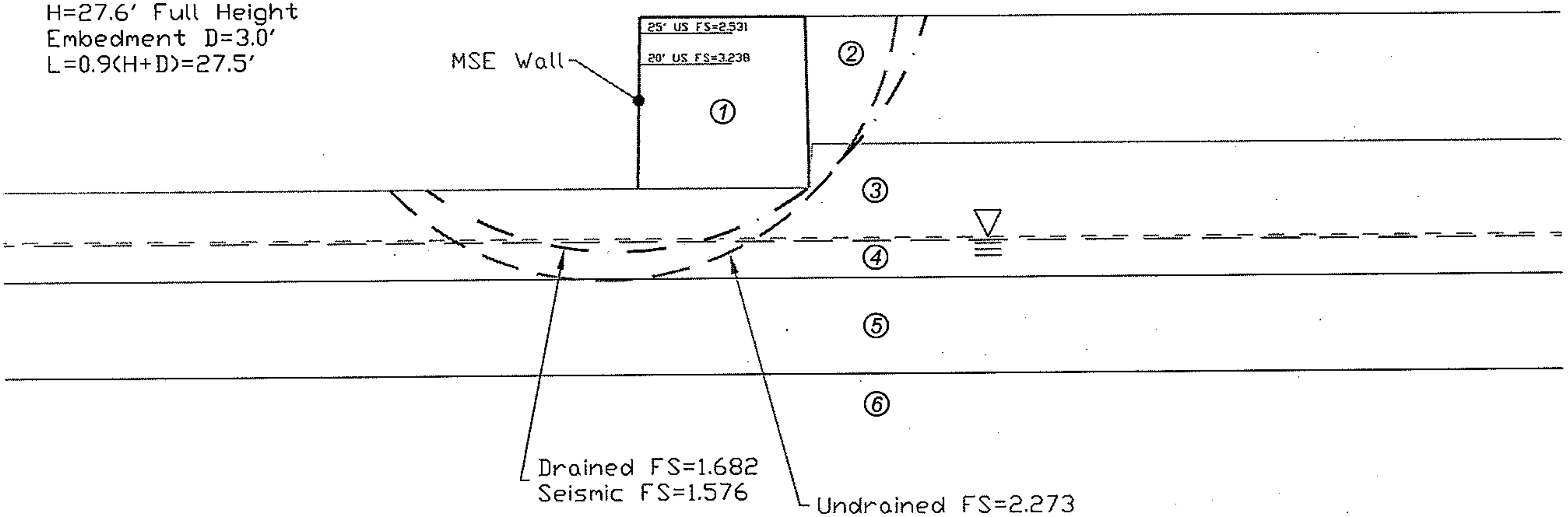
MSE Stability Analysis
B-1 Profile (7' Cut)
823 over Shumway Hollow RD
(Forward Abutment)
Sta. 384+75
Based on B-1
H=27.6' Full Height
Embedment D=3.0'
L=0.9(H+D)=27.5'

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	Emb. Fill	0	30	0	30	120
Material 3	Very Stiff	Clay	2000	0	0	28	125
Material 4	Stiff	Clay	1350	0	0	28	119
Material 5	M. Dense	Fine Sand	0	32	0	32	115
Material 6		Bedrock	10000	45	10000	45	145



823 OVER SHUMWAY HOLLOW ROAD
B-1 PROFILE 10' CUT - FORWARD ABUTMENT

MSE STABILITY ANALYSIS

SCI-823-0.00

PROJECT NO. 0121-3070.03	CALC: SJR	DATE 07/28/06

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SUBJECT			
Client	TranSystems ODOT D-9	JOB NUMBER	0121-3070.03
Project	SCI 823-0.00 Portsmouth Bypass	SHEET NO.	1 OF 8
Item	MSE Wall Stability - Forward Abutment	COMP. BY	SJR DATE 07/27/06
823 over Shumway Hollow Road		CHECKED BY	DAA DATE 8/1/06
Based on Boring B-1			

STABILITY OF MSE WALL

Assumptions:

1 Estimated height of embankment; H=30.6' (Full Height)
2 It is assumed that the bridge is supported on piles
3 Ground water; Dw=0.0'
4 Traffic loading is neglected in resisting forces
5

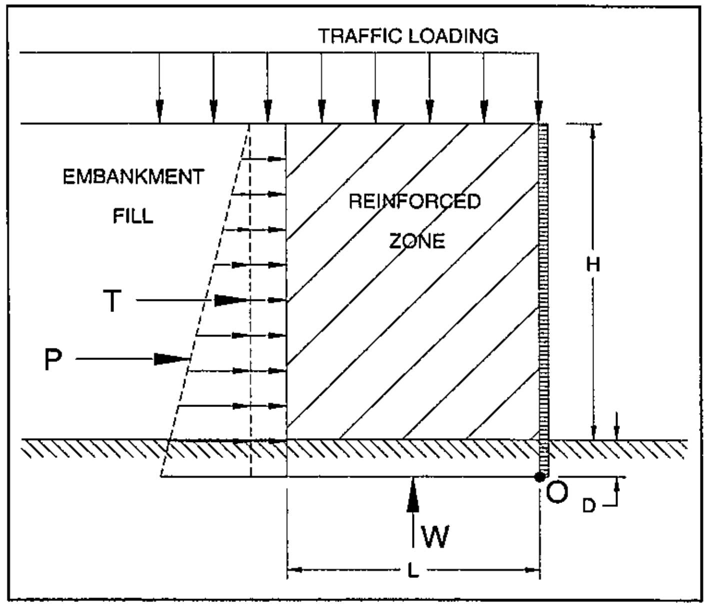
Wall Properties

H+D	=	32	feet
γ_{mse}	=	120	pcf
L	=	28.8	feet
L factor	=	0.90	Length factor-range (0.7 - 1.0)
ϕ	=	30	deg — Friction Angle of Embankment Fill

Foundational Soil Properties

c	=	2000	psf	Cohesion
ϕ'	=	28	deg	Friction angle
ω_T	=	240	psf	Traffic loading

RESISTANCE AGAINST SLIDING ALONG BASE



Thrust: $$P_a = K_a\left[\frac{1}{2}\gamma H^2 + \omega_T H\right]$$

where; $K_a = \tan^2(45 - \frac{\phi}{2})$ K_a = 0.33

P_a = 22,810 lbs per foot of wall

Resistance: $P_r = W(0.67)(\mu)$ (Drained)

where; $\mu = \tan(\phi)$ 0.67μ = 0.36

0.67μ Max. = 0.35 (AASHTO, Bridge Design Manual, 303.4.1.1)

P_r = 38,707 lbs per foot of wall

USE THIS VALUE

$P_r = L(c)$ (Undrained)

P_r = 57,600 lbs per foot of wall

Use Drained Value

$$FS = \frac{P_r}{P_a}$$

Calculated FS = **1.70**   Required 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

$\Sigma M_{resisting}$ = 1,592,525 lb-ft $$\Sigma M_{resisting} = \gamma H L\left(\frac{L}{2}\right)$$

$\Sigma M_{overturning}$ = 256,819 lb-ft $$\Sigma M_{overturning} = K_a\left[\frac{1}{2}\gamma H^2\left(\frac{H}{3}\right) + \omega_T H\left(\frac{H}{2}\right)\right]$$

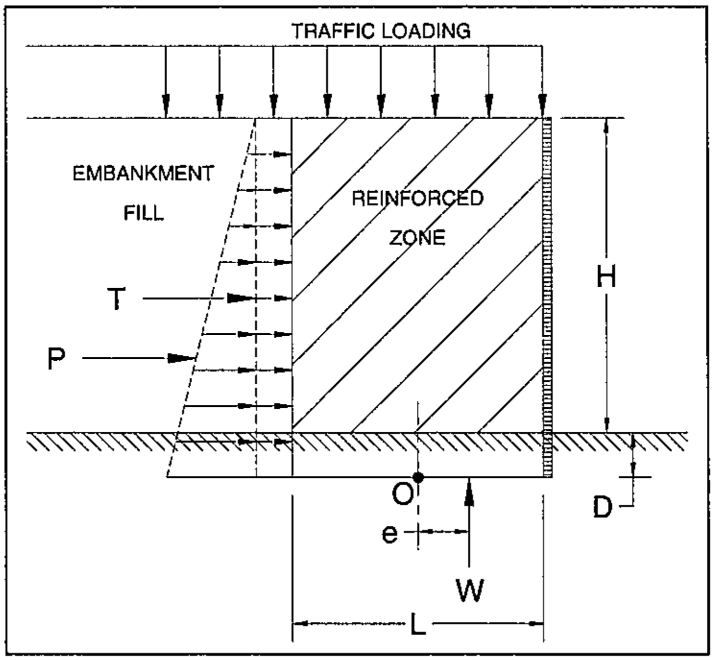
$$FS = \frac{\Sigma M_{resisting}}{\Sigma M_{overturning}}$$

Calculated FS = **6.20**   Required FS = 2.00

Resistance Against Overturning is **OK**

BEARING CAPACITY OF A MSE WALL

Ref: {AASHTO; STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 17th Edition, 2002}



Effective Bearing Pressure

$$\sigma_v = \frac{W_t + W_{MSE}}{L - 2e}$$

σ_v = 4,812 psf

Ultimate undrained bearing capacity, q_{ult}

$$q_{ULT} = c N_c + \sigma'_D N_q + \frac{1}{2}\gamma B N_\gamma$$

q_{ULT} = 10,453 psf

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 4,181 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} = 14,303 psf

$$q_{ALL} = \frac{q_{ULT}}{FS}$$

q_{ALL} = 5,721 psf

Factor of Safety = **2.97** **OK**

Soil Properties

γ_{EMB}	=	120	pcf	Unit weight	Embankment fill
ϕ'_{EMB}	=	30	deg.	Friction ang.	Embankment fill
γ_{FDN}	=	120	pcf	Unit weight	Foundation soil
c	=	2000	psf	Cohesion	Foundation soil
ϕ	=	0	deg.	Friction ang.	Foundation soil
c'	=	0	psf	Cohesion	Foundation soil
ϕ'	=	28	deg.	Friction ang.	Foundation soil

Loads and Parameters

ω_t	=	240	psf	Traffic loading
L=B	=	28.8	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	=	32	ft	
H	=	29	ft	Height of wall
Ka	=	0.33		
Γ Pa	=	10.667	ft	Moment arm
Γ Wt	=	16	ft	Moment arm
B'	=	24.42	ft	
γ'	=	57.6	pcf	
W_t		6,912	lb/ft of wall	Weight from traffic
W_{mse}	=	110,592	lb/ft of wall	Weight from MSE wall

Bearing Capacity Factors for Equations (AASHTO)

Undrained		Drained	
N_c	5.14	N_c	25.80
N_q	1.00	N_q	14.72
N_γ	0.00	N_γ	16.72

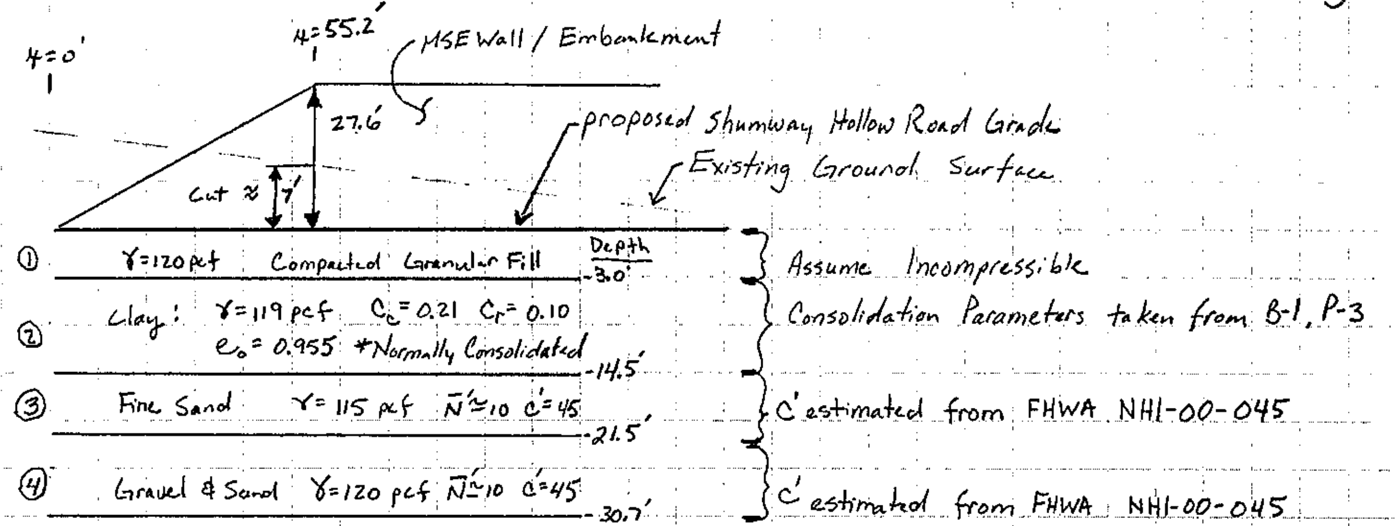
Eccentricity of Resultant Force

e = 2.19 ft

Kern

e < L/6 = 4.80 ft

Most Critical Soil Profile is at boring B-1 location
At B-1, the maximum embankment height is approximately 27.6'
(See attached Cross-Section Drawing)



* The computer program EMBANK requires inputs for C_c, C_r, and e_o.
To evaluate the settlement of the granular layers we must calculate equivalent consolidation parameters from C'.

$$\frac{1}{C'} = \frac{C_c}{1+e_o}$$ Say $e_o = 1.0$ in this case.

$$\frac{1}{C'} = \frac{C_c}{1+1.0} \rightarrow C' = \frac{2.0}{C_c} \rightarrow \boxed{C_c = \frac{2}{C'}}$$

When $C' = 45$, $C_c = \frac{2}{45} = 0.044$

For layers 3 and 4, Use $e_o = 1.0$ and $C_c = 0.044$

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* From Embank, $\delta_c \simeq 8''$ - Maximum Settlement for MSE Wall using "End of Fill" Condition.

Differential Settlement: $\delta_{max} = 8''$ Total Wall length = 196'

$$\text{Differential Settlement} = \frac{8''(1/12'')}{200.4'} = 0.003 = 0.3\%$$ ✓ OKAY

SH MSE

ÚÄÄÄÄÄ ONE DIMENSIONAL SETTLEMENT ANALYSIS/Federal Highway Administration ÄÄÄÄÄ¿

INCREMENT OF STRESSES BENEATH THE END OF FILL CONDITION

Project Name : SCI-823 Client : TranSystems
File Name : SH MSE Project Manager : Nix
Date : 7/27/10 Computed by : SJR checked DAA

Settlement for X-Direction

Embank. slope, x direc.	= 55.20 (ft)	Height of fill H	= 27.60 (ft)
y direc.	= 55.20 (ft)	Unit weight of fill	= 120.00 (pcf)
Embankment top width	= 90.00 (ft)	p load/unit area	= 3312.00 (psf)
Embankment bottom width	= 200.40 (ft)	Foundation Elev.	= 670.00 (ft)
Ground Surface Elev.	= 673.00 (ft)		
Water table Elev.	= 665.00 (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.	11.5	0.210	0.100	0.000	119.00	2.65	0.95
3	COMP.	7.0	0.044	0.044	0.000	115.00	2.65	1.00
4	COMP.	9.0	0.044	0.044	0.000	120.00	2.65	1.00

N§.	SUBLAYER THICK. (ft)	ELEV. (ft)	SOIL STRESSES INITIAL (psf)	MAX.PAST PRESS. (psf)
1	INCOMP.			
2	11.50	664.25	997.45	997.45
3	7.00	655.00	1507.00	1507.00
4	9.00	647.00	1950.30	1950.30

Layer	X = 0.00 Stress (psf)	Sett. (in.)	X = 10.00 Stress (psf)	Sett. (in.)	X = 20.00 Stress (psf)	Sett. (in.)	X = 30.00 Stress (psf)	Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	50.61	0.32	311.04	1.75	612.10	3.09	913.88	4.20
3	138.79	0.07	345.73	0.17	615.98	0.28	901.33	0.38
4	206.97	0.10	392.19	0.19	632.28	0.29	892.53	0.39
		0.49		2.11		3.65		4.96

Layer	X = 40.00 Stress (psf)	Sett. (in.)	X = 50.00 Stress (psf)	Sett. (in.)	X = 60.00 Stress (psf)	Sett. (in.)	X = 70.00 Stress (psf)	Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.	INCOMP.				
2	1214.24	5.14	1505.79	5.94	1660.96	6.33	1671.92	6.35
3	1182.09	0.46	1429.63	0.54	1580.83	0.58	1633.03	0.59
4	1146.38	0.48	1363.89	0.55	1511.08	0.59	1585.79	0.61
		6.08		7.02		7.49		7.56

SH MSE

Layer	X = Stress (psf)	80.00 Sett. (in.)	X = Stress (psf)	90.00 Sett. (in.)	X = Stress (psf)	100.00 Sett. (in.)
1	INCOMP.	INCOMP.	INCOMP.			
2	1673.38	6.36	1673.77	6.36	1673.86	6.36
3	1648.65	0.59	1653.87	0.59	1655.21	0.59
4	1618.14	0.62	1631.29	0.63	1634.95	0.63
		------		------		------
		7.57		7.58		7.58

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$\delta_{c_{max}} = 7.58''$

$\delta_{INSTANT} = 1.22''$

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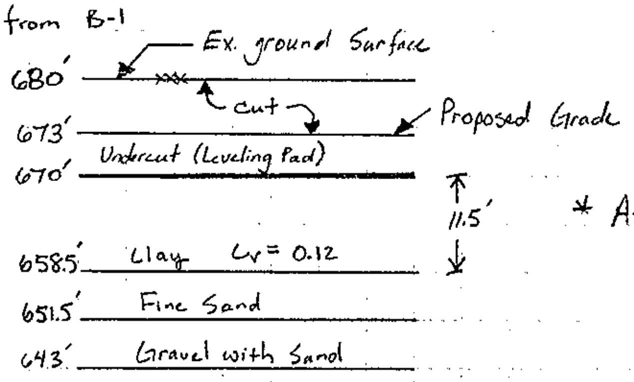
CLIENT	Tran Systems / ODOT D-9	PROJECT NO.	0121-3070.03
PROJECT	SCI-823 Portsmouth Bypass	SHEET NO.	6 OF 8
SUBJECT	Time-Rate of Consolidation	COMP. BY	SJR DATE 7-28-06
	823 over Shumway Hollow - MSE	CHECKED BY	DAA DATE 8/1/06

* Based upon soil profile at boring B-1 (Most Critical).
Consolidation Testing performed on sample P-3 in boring B-1.

Profile from B-1



* Assume Double Drainage

Time-Rate of Consolidation: $t_{90} = \dfrac{T \cdot H_v^2}{C_v}$

for U=90 (90% Consolidation) → T = 0.848

$t_{90} = \dfrac{(0.848)(11.5'/2)^2}{0.12\ ft^2/day} = \underline{234\ days}$ ← U=90% without Wick Drains

* As per UTEXAS, the maximum staged embankment height is 25'.

Based upon this hieght, the excess pore water pressure is equal to the applied load at t=0 for a saturated clay.

at $t=0$ $u_e = 25'(120\text{ pcf}) = 3{,}000\text{ psf}$ * This will be the critical pore water pressure.

additional applied load 4.0' ; → $\Delta u_e = 4(120) = 480\text{ psf}$

* Determine the amont of time to dissipate 480 psf of u_e.

$$\frac{u_e}{\Delta\sigma_z} = \frac{3000-480}{3000} = 0.84$$

From Graph (attached) $T_v \simeq 0.16$ when $\frac{u_e}{\Delta\sigma_z} = 0.84$ $\frac{Z_{dr}}{H_{dr}} = 1.0$ (Center of clay layer)

$$T_v = \frac{c_v \cdot t}{H_{dr}^2}$$ where from B-1: $c_v = 0.12\text{ ft}^2/\text{day}$
(Double Drainage) $H_{dr}^2 = 11.5/2 = 5.75'$

$$t = \frac{T_v \cdot H_{dr}^2}{c_v}$$

$$t = \frac{(0.16)(5.75')^2}{0.12\text{ ft}^2/\text{day}} = \boxed{44\text{ days}}$$

* At 44 days the additional 4.0' of embankment may be constructed while maintaining FS=2.5.

Time (days)	u_e (psf)	
t=0	3000	- End of Construction of 25' Stage
t=44	2520	- Excess Pore Water Pressures have Dissipated.
t=44	3000	- Add additional 4.0' to Completion height of 29.0'.

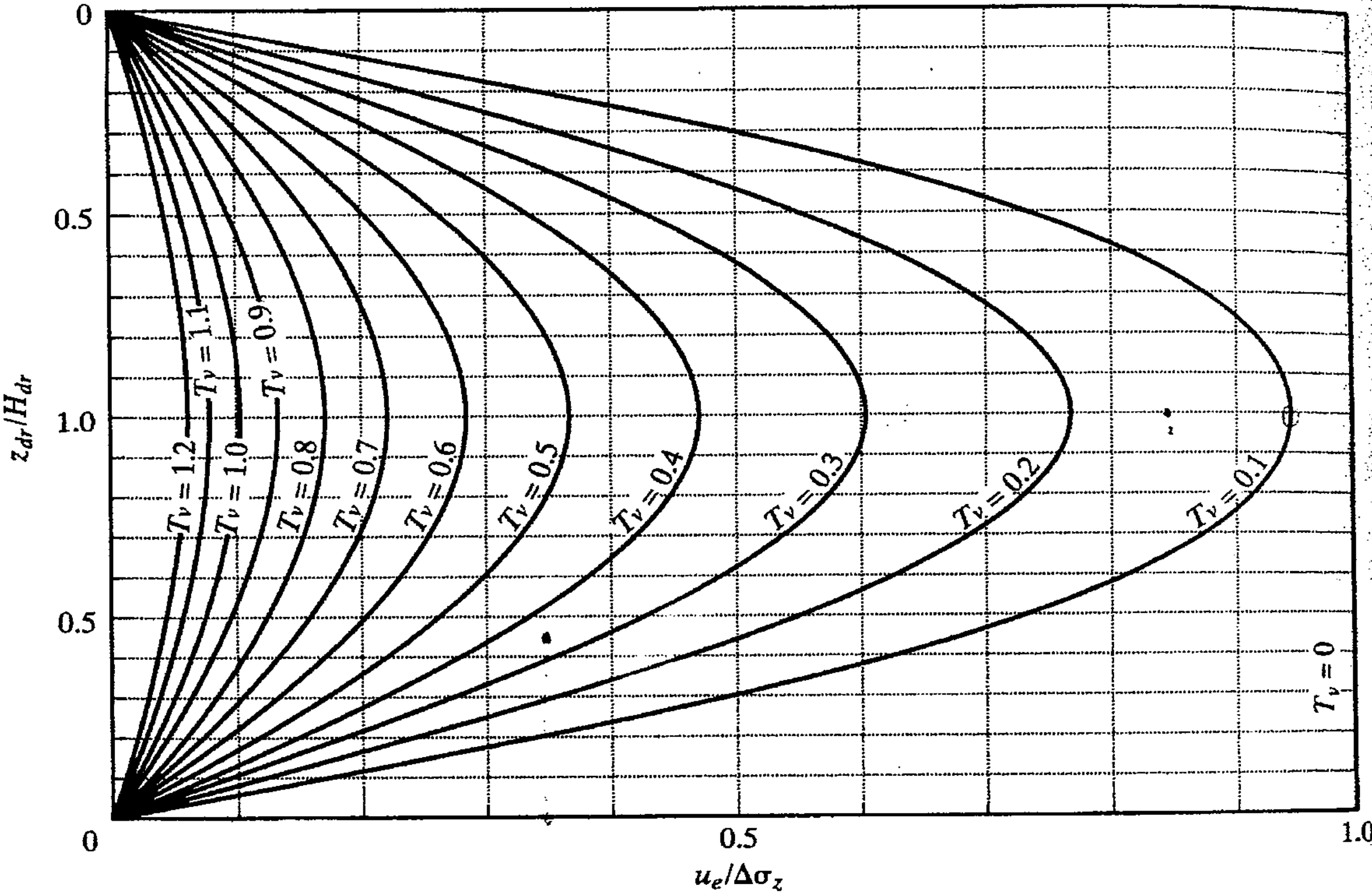
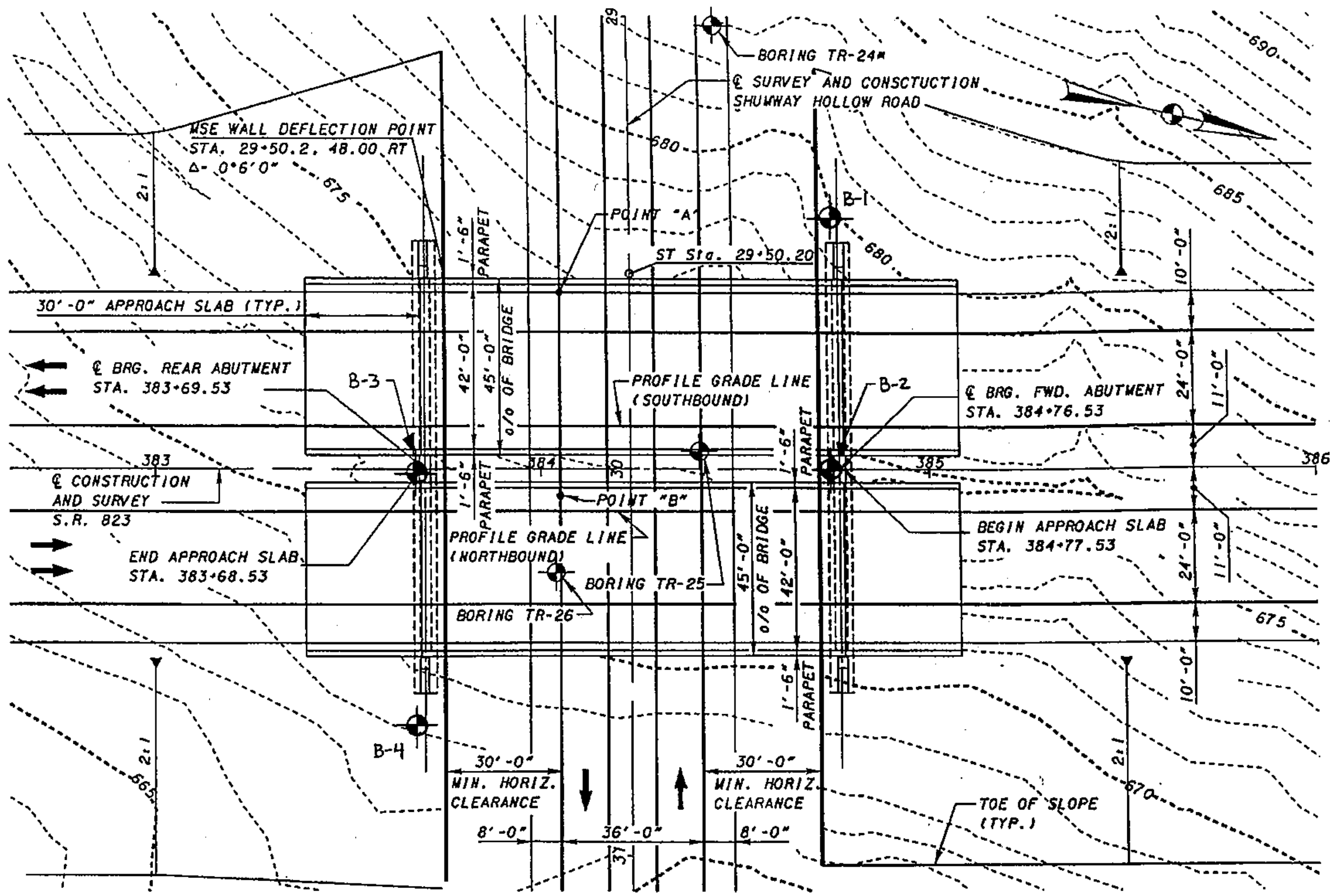
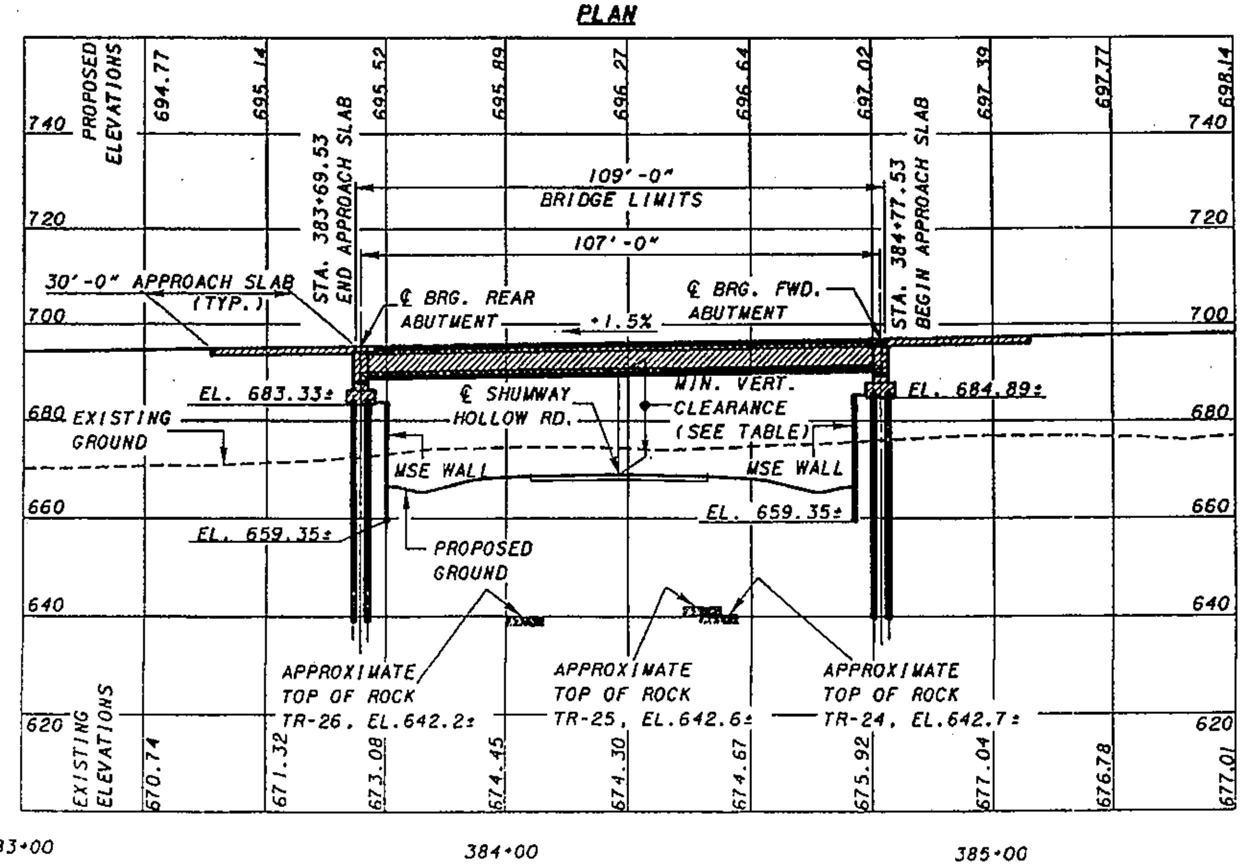


Figure 12.4 $u_e/\Delta\sigma_z$ for various values of T_v with double drainage. For the single drainage case, use only the upper half of this diagram.



PLAN



ELEVATIONS ALONG PROFILE GRADE LINE S.R. 823 LEFT BRIDGE

TABLE OF VERTICAL CLEARANCES

LOCATION	"A"	"B"
PROPOSED	18.88'	20.30'
PREFERRED	17.0'	17.0'

⊕ DENOTES BORING LOCATION

* BORING TR-24 NOT SHOWN TO SCALE

BORING LOCATIONS

BORING No.	STATION	OFFSET
TR-24	384+43.01	147.27' LT.
TR-25	384+40.48	4.45' LT.
TR-26	384+03.66	26.84' RT.

BENCHMARK 1	BENCHMARK 2
(TO BE PROVIDED LATER)	(TO BE PROVIDED LATER)

TRAFFIC DATA

S.R. 823

CURRENT YEAR ADT (2010) = 19,800
DESIGN YEAR ADT (2030) = 26,000
CURRENT YEAR ADTT (2010) =2,772
DESIGN YEAR ADTT (2030) = 3,640

PROPOSED STRUCTURE

TYPE: SINGLE SPAN, 72" TYPE 4 (MOD.) PRESTRESSED CONCRETE I-BEAM WITH COMPOSITE REINFORCED CONCRETE DECK SUPPORTED BY SEMI-INTEGRAL ABUTMENTS FOUNDED ON PILES AND MSE WALL EMBANKMENTS

SPANS: 107'-0" c/c BEARINGS
ROADWAY: 42' TOE TO TOE OF PARAPETS
LOADING: HS-25 AND ALTERTNATE MILITARY LOADING FWS=60 PSF
SKEW: NONE
CROWN: 0.016 FT/FT
ALIGNMENT: TANGENT
WEARING SURFACE: MONOLITHIC CONCRETE
APPROACH SLABS: AS-1-81 (30' LONG)
LATITUDE:
LONGITUDE:

NOTES:

1. ALL SHEETS WITH PLAN DIMENSIONS ARE SHOWN HORIZONTAL.
2. EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.

FOUNDATION DATA:

ALL NEW PILES SHALL BE HP 14x73 PILES AND HAVE A MAXIMUM CAPACITY OF 90 TONS PER PILE.

DESIGN AGENCY: TRANSYSTEMS CORPORATION

DESIGNED: PJP | DRAWN: CAS | REVIEWED: JRC | DATE: 04/25/06

PRELIMINARY SITE PLAN - ALTERNATIVE 2
BRIDGE NO. SCI-823-XXXX
S.R. 823 OVER SHUMWAY HOLLOW ROAD

SCIOTO COUNTY
STA. 383+65.53
STA. 384+77.53

SCI-823-0.00
PID 19415

1/2

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

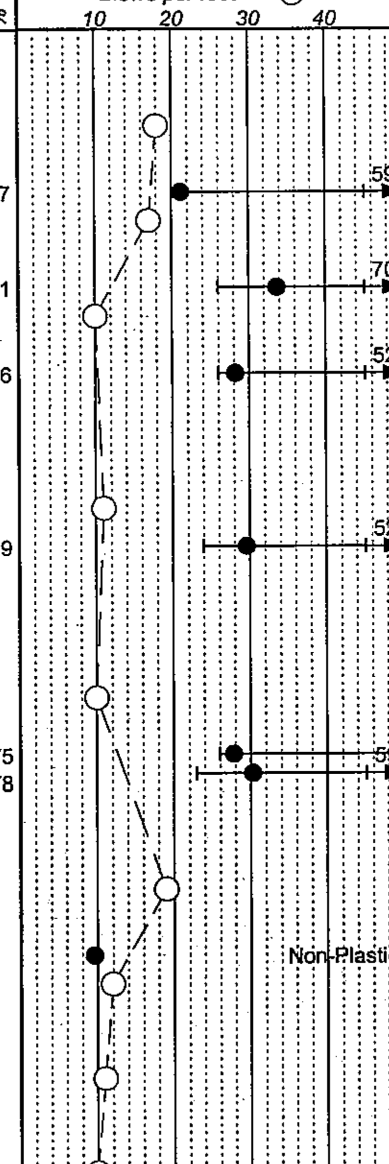
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring B-1 | Location: | Date Drilled: 06/13/06

WATER OBSERVATIONS: Water seepage at: 34.0' - 35.0'
Water level at completion: 31.0' (Measured inside augers)

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	680.0												
0.4	679.6						Topsoil - 5"						
		5 7 11	12	1		2.5	Very stiff brown SILT (A-4b), trace to little clay, trace fine sand; damp.						
4.0	676.0	6 6 11	13	2		4.5+	Stiff to very stiff brown CLAY (A-7-6), little to some silt, trace fine to coarse sand, trace gravel; moist.	2	0	--	1	30	67
5		3 4 6	16	3		2.0		5	0	--	0	5	91
					P-1	3.25		0	0	--	1	13	86
10		4 5 6	18	5		2.5							
					P-2	2.75		0	0	--	2	19	79
15		4 4 6	18	7		1.5							
					P-3	2.5		0	0	--	1	23	75
								0	0	--	1	21	78
20													
21.5	658.5	5 9 10	16	9			Medium dense light brown FINE SAND (A-3), trace silty clay; dry to damp.						
		4 5 7	17	10				0	0	--	80	20	
25							@ 25.0', Wet.						
		4 5 6	15	11									
							@ 28.0', Moist.						
28.5	651.5	5 5 5	13	12			Loose to medium dense brown GRAVEL WITH SAND (A-1-b)						
30													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ├──┤ LL
Blows per foot - ○



FILE: 0121-3070-03 [8/1/2006 1:58 PM]

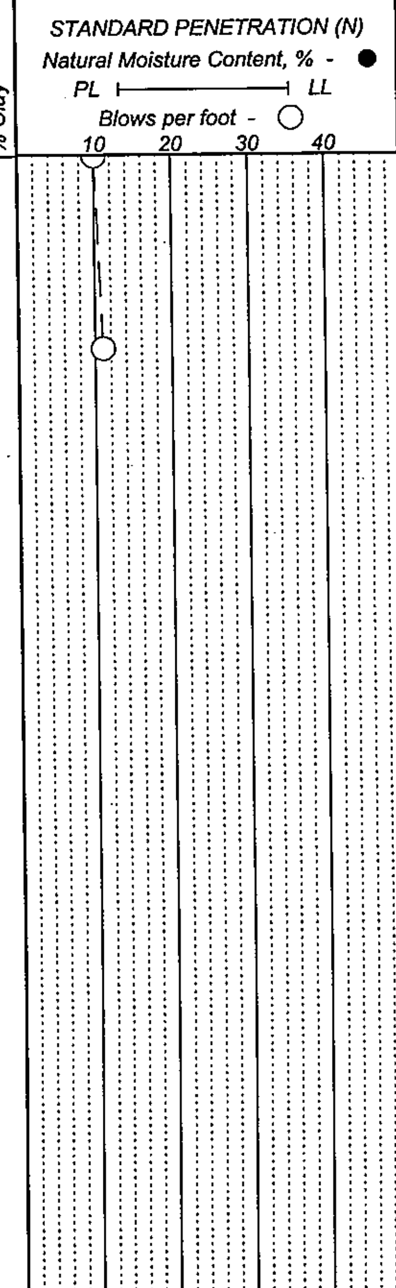
DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

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

LOG OF: Boring B-1 | Location: | Date Drilled: 06/13/06

WATER OBSERVATIONS: Water seepage at: 34.0' - 35.0'
Water level at completion: 31.0' (Measured inside augers)

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
30	650.0						Loose to medium dense brown GRAVEL WITH SAND (A-1-b), trace silty clay; moist.						
35		5 6 5	14	13									
37.5	642.5						Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, laminated to thinly bedded, moderately to highly fractured.						
40		Core 60"	Rec 54"	RQD 34%	R-1								
42.5	637.5						Bottom of Boring - 42.5'						
45													
50													
55													
60													



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

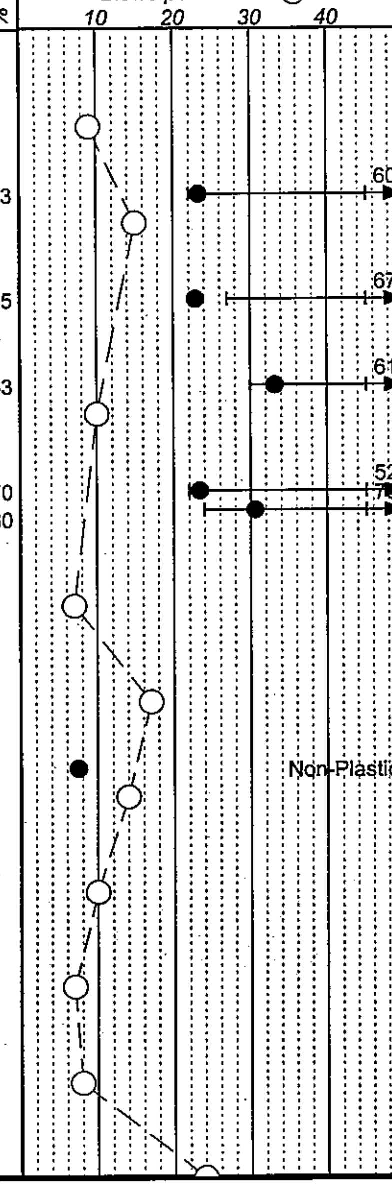
Client: TranSystems, Inc. | *Project:* SCI-823-0.00 | *Job No.* 0121-3070.03

LOG OF: Boring B-2 | *Location:* | *Date Drilled:* 06/13/06 to 06/14/06

WATER OBSERVATIONS: Water seepage at: 26.0' - 30.0'
Water level at completion: 20.0' (Measured inside augers)

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	675.0												
0.3	674.7						Topsoil - 4"						
		3 4 5	15	1		3.5	Very stiff brown SILT AND CLAY (A-6a), trace fine sand; damp.						
3.0	672.0						Stiff to very stiff brown CLAY (A-7-6), trace to some silt, trace fine to coarse sand, trace gravel; damp to moist.						
		6 7 8	14	2		3.5		2	1	–	3	11	83
					P-1	4.0		1	0	–	0	14	85
		3 4 6	17	4		2.75		4	2	–	2	9	83
					P-2	2.75		0	2	–	4	24	70
						2.50		5	1	–	3	12	80
		3 3 4	18	6		2.0							
16.2	658.8	5 7 10	18	7			Loose to medium dense brown FINE SAND (A-3), trace silty clay; damp to wet.						
		5 7 7	17	8				0	0	–	85	15	
		6 6 4	16	9									
		4 4 3	13	10									
		6 4 4	15	11									
30		6 13 11	15	12									

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ├──┤ *LL*
Blows per foot - ○



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

LOG OF: Boring B-2 | Location: | Date Drilled: 06/13/06 to 06/14/06

WATER OBSERVATIONS: Water seepage at: 26.0' - 30.0'
Water level at completion: 20.0' (Measured inside augers)

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)
30	645.0													
32.0	643.0	Core 60"	Rec 57"	RQD 49%	R-1		Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, laminated to thinly bedded, moderately fractured.							
37.0	638.0						Bottom of Boring - 37.0'							

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

Depth scale: 30, 35, 40, 45, 50, 55, 60

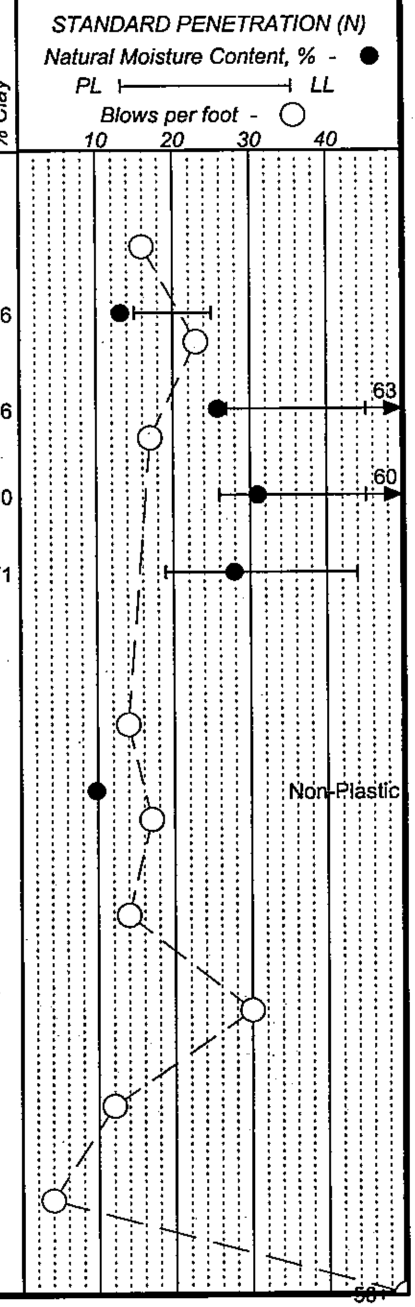
DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

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

LOG OF: Boring B-3 | Location: | Date Drilled: 06/14/06

WATER OBSERVATIONS: Water seepage at: 23.0' - 28.0'
Water level at completion: 16.5' (Includes Core Water, Measured Inside Augers)
23.0' (Prior to adding Core Water, Measured Inside Augers)

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	672.3												
0.4	671.9						Topsoil - 4" - 5"						
		6 6 10	13	1		2.5	Very stiff brown SANDY SILT (A-4a), "and" clay, trace gravel; damp.						
		8 12 11	14	2		4.0		2	4	--	9	48	36
4.5	667.8						Stiff to very stiff brown CLAY (A-7-6), "and" clay, trace gravel; damp to moist.						
		5 7 10	10	3		3.5		0	1	--	2	11	86
					P-1	1.75		0	0	--	1	9	90
					P-2	2.25		0	0	--	3	26	71
14.0	658.3	4 6 8	16	6			Medium dense to dense brown FINE SAND (A-3), trace silty clay, trace coarse sand; damp to moist.						
		7 8 9	18	7				0	1	--	80	19	
		6 7 7	16	8									
		9 12 18	16	9									
		6 6 6	15	10									
		2 3 1	12	11									
30		8 21 50/2	12	12									



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-3 | Location: | Date Drilled: 06/14/06

WATER OBSERVATIONS: Water seepage at: 23.0' - 28.0'
Water level at completion: 16.5' (Includes Core Water, Measured Inside Augers)
23.0' (Prior to adding Core Water, Measured Inside Augers)

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 - ○ 10 20 30 40
30.0	642.3	Core 60"	Rec 56"	RQD 58%	R-1		Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, laminated to thinly bedded, moderately fractured.							
35.0	637.3						Bottom of Boring - 35.0'							
40														
45														
50														
55														
60														

FILE: 0121-3070-03 [8/1/2006 1:58 PM]

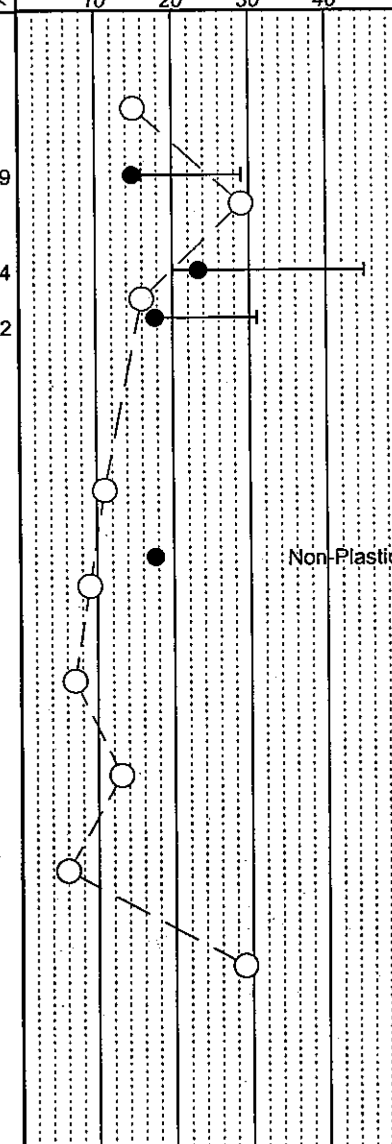
DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

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

LOG OF: Boring B-4 | *Location:* | *Date Drilled:* 06/14/06

WATER OBSERVATIONS: Water seepage at: 18.0' - 24.0'
Water level at completion: 22.5' (Prior to Coring, Measured Inside Augers)
15.0' (Includes Core Water, Measured Inside Augers)

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	668.7												
0.3	668.4						Topsoil - 4"						
		5 7 8	12	1		2.5	Very stiff to hard brown SILT AND CLAY (A-6a), trace fine to coarse sand, trace gravel; damp.						
		9 14 15	17	2		4.5+		3	6	--	8	44	39
5.0	663.7						Hard brown CLAY (A-7-6), some silt, trace fine to coarse sand, trace gravel; moist.						
		6 7 9	15	3		4.5+		3	2	--	4	27	64
7.5	661.2						Hard brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; damp.	2	5	--	8	43	42
8.2	660.5				P-1	2.25	Loose to medium dense brown FINE SAND (A-3), little silty clay; damp to wet.	0	8	--	89	3	
		4 6 5	16	5									
		4 5 4	18	6				0	0	--	83	17	
		3 4 3	14	7									
		4 6 7	12	8									
		3 3 3	17	9									
22.5	646.2						Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly weathered, laminated to thinly bedded, moderately fractured.						
		4 8 21	18	10									
		Core 60"	Rec 52"	RQD 45%	R-1								



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

LOG OF: Boring B-4 | *Location:* | *Date Drilled:* 06/14/06

WATER OBSERVATIONS: Water seepage at: 18.0' - 24.0'
Water level at completion: 22.5' (Prior to Coring, Measured Inside Augers)
15.0' (Includes Core Water, Measured Inside Augers)

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
30	638.7												
30.5	638.2						Bottom of Boring - 30.5'						
35													
40													
45													
50													
55													
60													

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ├──┤ *LL*
Blows per foot - ○
10 20 30 40

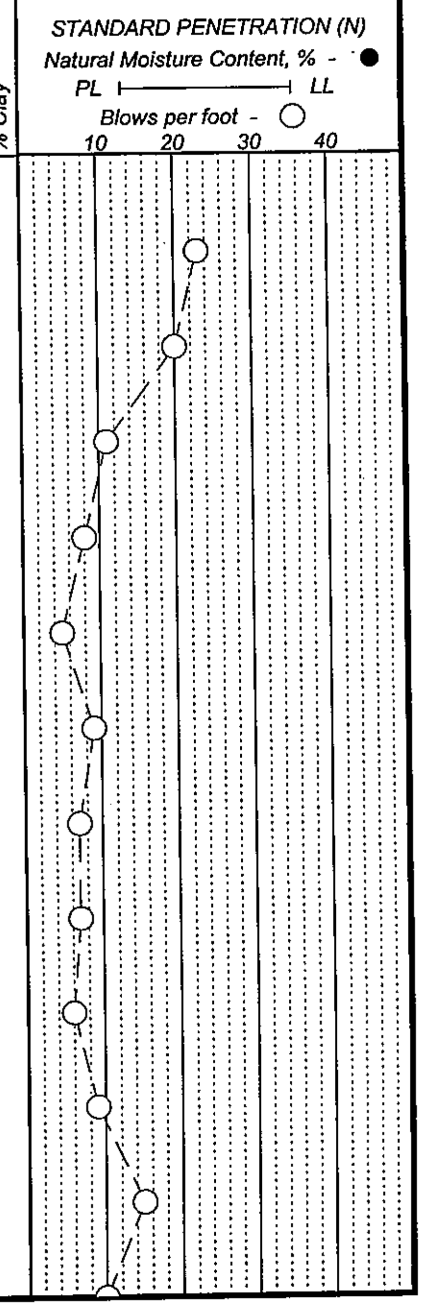
DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

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

LOG OF: Boring TR-24 | Location: | Date Drilled: 8/20/04 to 8/23/04

WATER OBSERVATIONS: Water seepage at: 6.0'
Water level at completion: 29.8' (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	686.2						Topsoil - 12"						
1.0	685.2	6 10 13	18	1		4.5+	Hard brown SILT AND CLAY (A-6a), little fine to coarse sand; damp.						
		13 10 10	18	2		4.5+							
6.0	680.2	3 3 8	12	3		2.75	Stiff to very stiff brown CLAY (A-7-6), little fine to coarse sand, little silt; varved; moist.						
		2 3 5	18	4		2.0							
		2 2 3	18	5		2.0							
		2 4 5	18	6		2.25							
		2 3 4	18	7		1.25							
		1 3 4	18	8		3.75							
		2 3 3	18	9		1.0							
		3 4 5	18	10		1.5							
27.0	659.2	4 3 12	18	11		1.75	Medium dense brown FINE SAND (A-3), trace gravel; damp.						
30		5 5 5	18	12									



FILE: 0121-3070-03 [8/1/2006 1:58 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

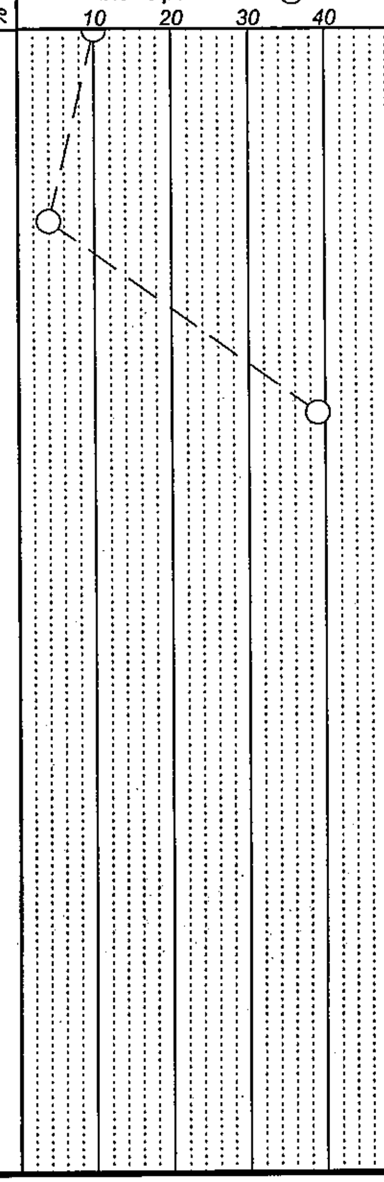
LOG OF: Boring TR-24 | Location: | Date Drilled: 8/20/04 to 8/23/04

WATER OBSERVATIONS: Water seepage at: 6.0'
Water level at completion: 29.8' (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
30	656.2						Medium dense brown FINE SAND (A-3), trace gravel; damp.						
34.0	652.2	4 2 2	18	13		0.5	Soft gray SILTY CLAY (A-6b), little fine to coarse sand, trace gravel; moist.						
37.0	649.2	10 17 22	18	14			Severely weathered gray SANDSTONE argillaceous. @ 43.0', augers encountered difficult drilling.						
43.5	642.7	Core 120"	Rec 118"	RQD 77%	R-1		Medium hard to hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, argillaceous, micaceous, moderately to highly fractured. @ 44.8' to 44.9',45.2',45.4',47.0' contains argillaceous laminations and fractures. @ 47.0', slightly weathered, unfractured to slightly fractured.						
53.5	632.7						Bottom of Boring - 53.5'						

Depth scale: 30, 35, 40, 45, 50, 55, 60

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ├──┤ LL
Blows per foot - ○



FILE: 0121-3070-03 [8/1/2006 1:58 PM]

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

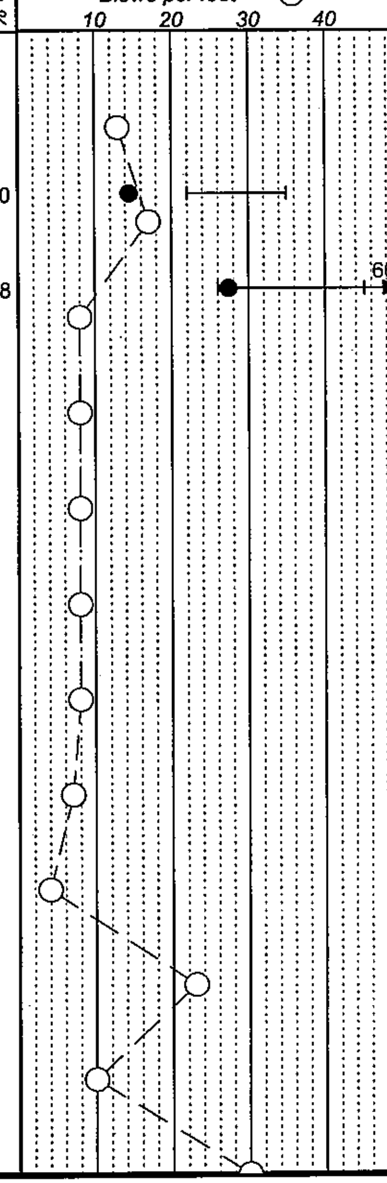
Client: TranSystems, Inc. | Project: SCI-823-0.00 | Job No. 0121-3070.03

LOG OF: Boring TR-25 | Location: | Date Drilled: 8/19/04 to 8/20/04

WATER OBSERVATIONS: Water seepage at: 16.0', 21.0'
Water level at completion: 16.4' (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	674.6						Hard brown SILT AND CLAY (A-6a), little fine to coarse sand, trace gravel; damp.						
		4 7 6	18	1		4.0							
		6 8 9	18	2		4.5		4	6	–	13	37	40
5.5	669.1						Stiff to very stiff brown CLAY (A-7-6), little silt, trace fine sand; damp to moist.						
		2 3 5	18	3		2.0		0	0	–	1	11	88
		2 3 5	18	4		1.25							
		2 4 4	18	5		1.75							
		3 3 5	18	6		2.5							
		2 3 5	18	7		2.25							
18.0	656.6						Loose to medium dense brown FINE SAND (A-3), trace silt; damp to wet.						
		4 3 4	18	8									
		1 1 3	18	9									
		9 11 12	18	10									
		7 3 7	18	11									
28.0	646.6						Dense brown GRAVEL WITH SAND (A-1-b); contains sandstone fragments; moist.						
30		2 14 16	18	12									

STANDARD PENETRATION (N)
Natural Moisture Content, % - ●
PL ├──┤ LL
Blows per foot - ○



FILE: 0121-3070-03 [8/1/2006 1:58 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-25 | Location: | Date Drilled: 8/19/04 to 8/20/04

WATER OBSERVATIONS: Water seepage at: 16.0', 21.0'
Water level at completion: 16.4' (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)
30.0	644.6	27 50/5	6	13			Severely weathered brown and gray SANDSTONE.							50+
32.0	642.6	Core 48"	Rec 46"	RQD 42%	R-1		Hard gray SANDSTONE; very fine to fine grained, slightly to moderately weathered, micaceous, argillaceous, massively bedded, slightly fractured. @ 32.0' to 37.0', highly fractured.							
		Core 72"	Rec 72"	RQD 90%	R-2									
42.0	632.6						Bottom of Boring - 42.0'							

STANDARD PENETRATION (N): Natural Moisture Content, % - ●; PL ├──┤ LL; Blows per foot - ○; 10, 20, 30, 40

Depth scale: 30, 35, 40, 45, 50, 55, 60

FILE: 0121-3070-03 [8/1/2006 1:58 PM]

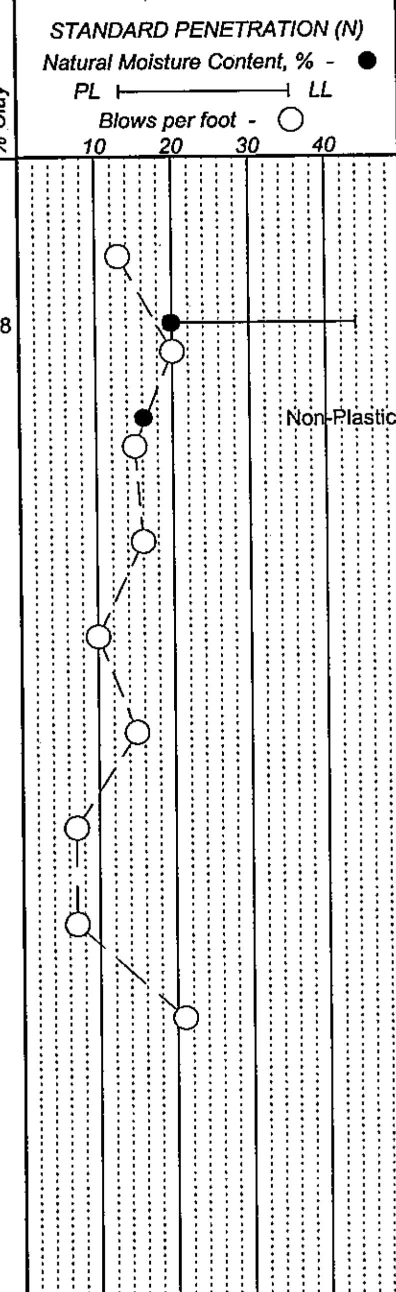
DLZ OHIO INC. * 6121 HUNTLEY ROAD, COLUMBUS, OHIO 43229 * (614)888-0040

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

LOG OF: Boring TR-26 | Location: | Date Drilled: 8/19/04

WATER OBSERVATIONS: Water seepage at: 8.5'
Water level at completion: 8.4' (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	665.2						Topsoil - 12"						
1.0	664.2	5 5 8	18	1		4.5	Hard brown CLAY (A-7-6), "and" fine to coarse sand, trace gravel, little silt; damp to moist.						
		8 9 11	18	2		4.5+		0	2	--	38	12	48
5.5	659.7	7 7 8	18	3			Loose to medium dense brown FINE SAND (A-3), little silty clay; moist to wet.	0	0	--	81	19	
		4 9 7	18	4									
		3 4 6	18	5									
		4 5 10	18	6									
		5 4 3	18	7			@ 16.0', wet.						
		2 3 4	18	8									
20.5	644.7	4 8 13	18	9			Medium dense gray GRAVEL WITH SAND (A-1-b); contains sandstone fragments; moist.						
23.0	642.2	Core 120"	Rec 111"	RQD 73%	R-1		Hard gray SANDSTONE; very fine to fine grained, argillaceous, micaceous, slightly to moderately weathered, massively bedded, slightly fractured. @ 23.0' to 25.5', moderately fractured. @ 23.1', 23.5', thin clay seams.						
30													



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

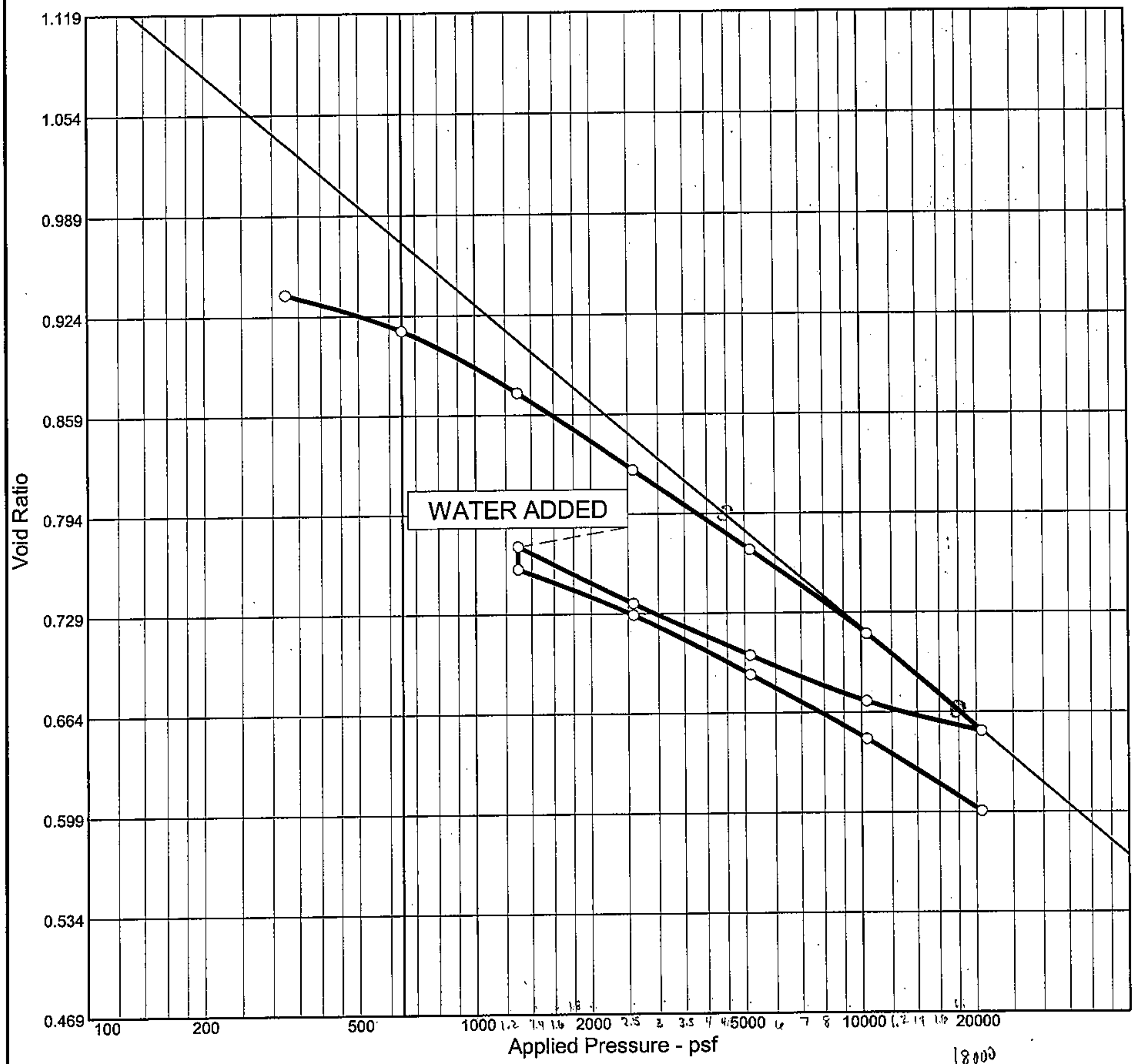
LOG OF: Boring TR-26 | Location: | Date Drilled: 8/19/04

WATER OBSERVATIONS: Water seepage at: 8.5'
Water level at completion: 8.4' (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 - ○ (10, 20, 30, 40)
30.0	635.2						Hard gray SANDSTONE; very fine to fine grained, argillaceous, micaceous, slightly to moderately weathered, massively bedded, slightly fractured.							
33.0	632.2						Bottom of Boring - 33.0'							

Depth scale: 35, 40, 45, 50, 55, 60

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
104.8 %	36.5 %	87.5	49	23	2.74	CL	A-7-6(27	0.955

MATERIAL DESCRIPTION

Lean clay

Project No. 0121- **Client:** TranSystems, Inc.

Project: SCI-823-0.00

Source: B-1 **Sample No.:** P-3 **Elev./Depth:** 18.0

DLZ

Remarks:

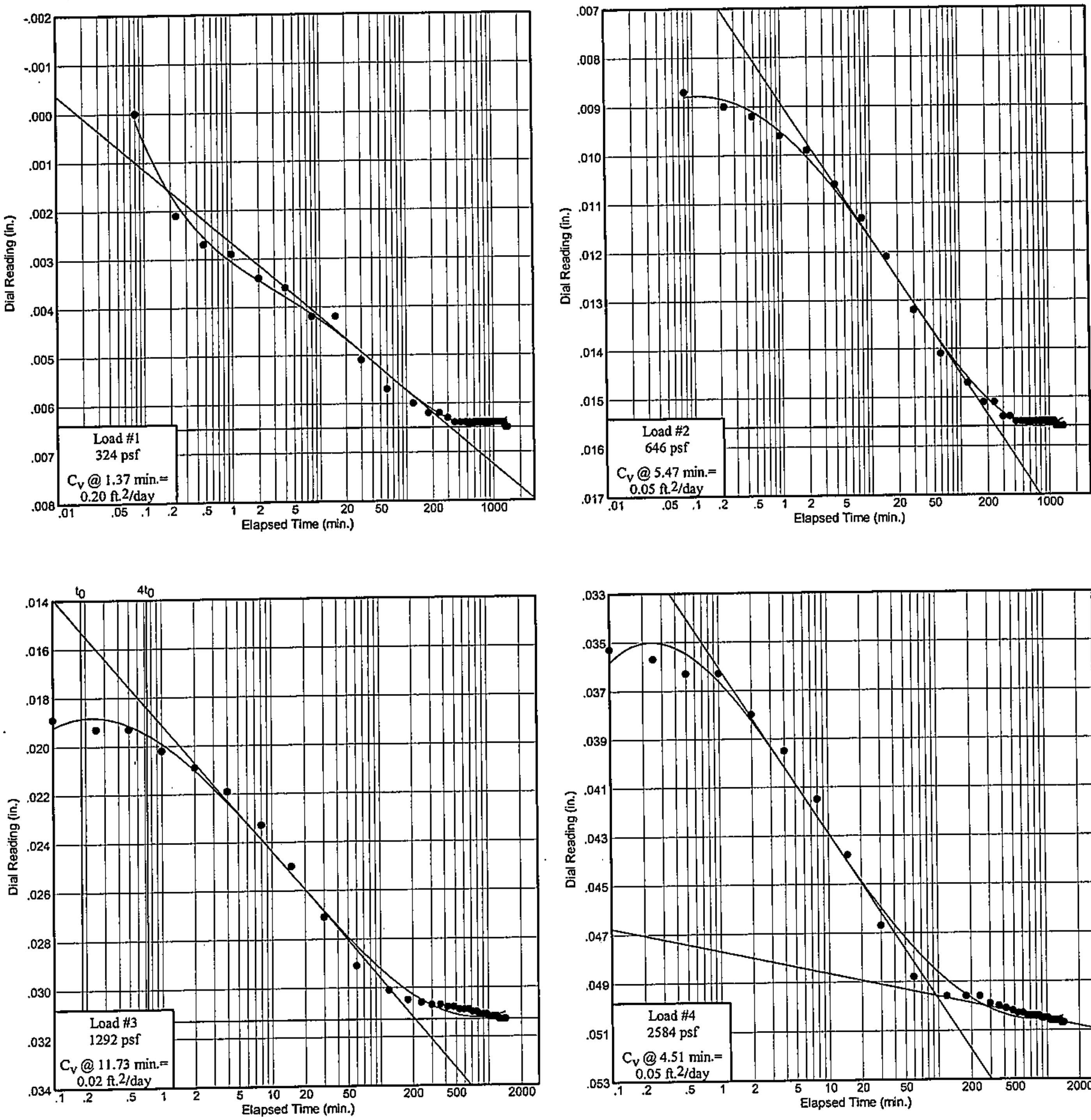
Specific Gravity= 2.74

Figure

Dial Reading vs. Time

Project No.: 0121-3070.03
Project: SCI-823-0.00

Source: B-1 | Sample No.: P-3 | Elev./Depth: 18.0



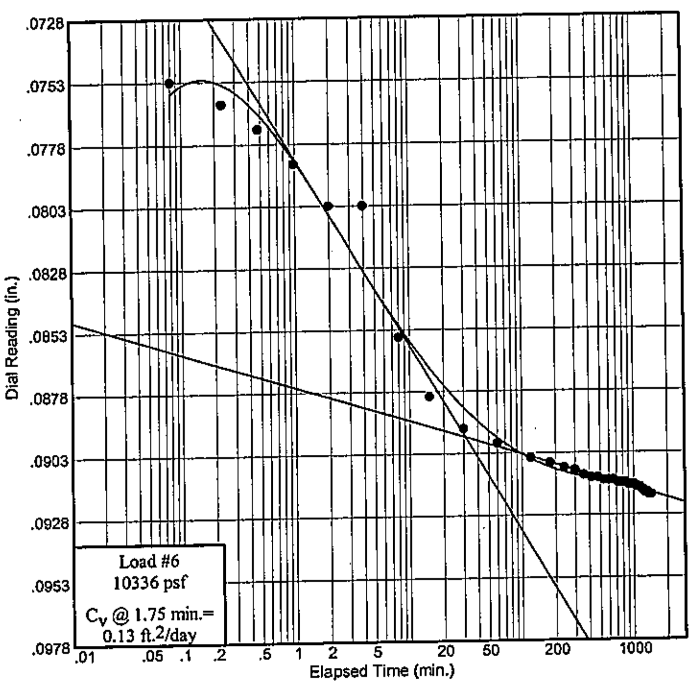
DLZ

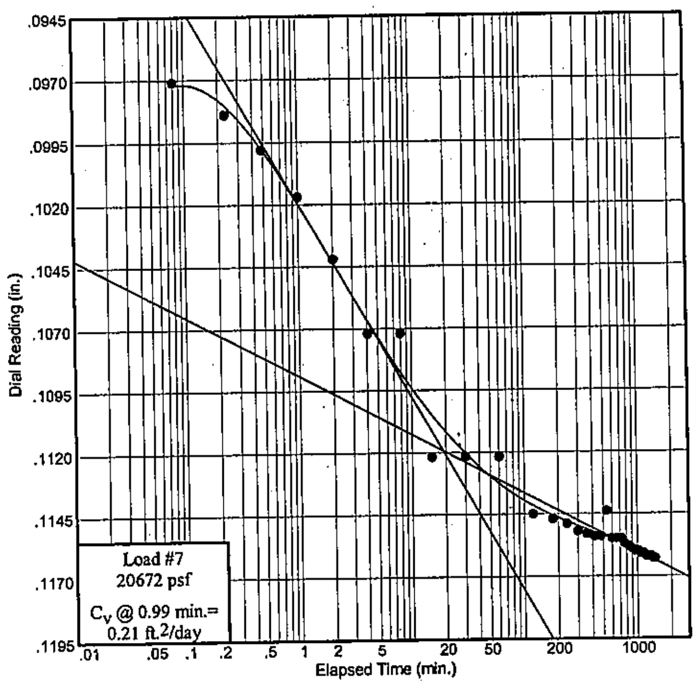
Figure

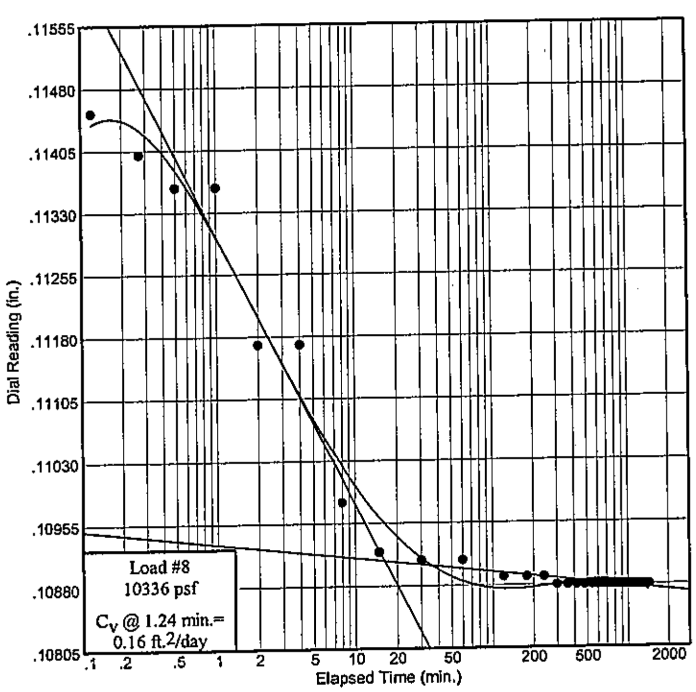
Dial Reading vs. Time

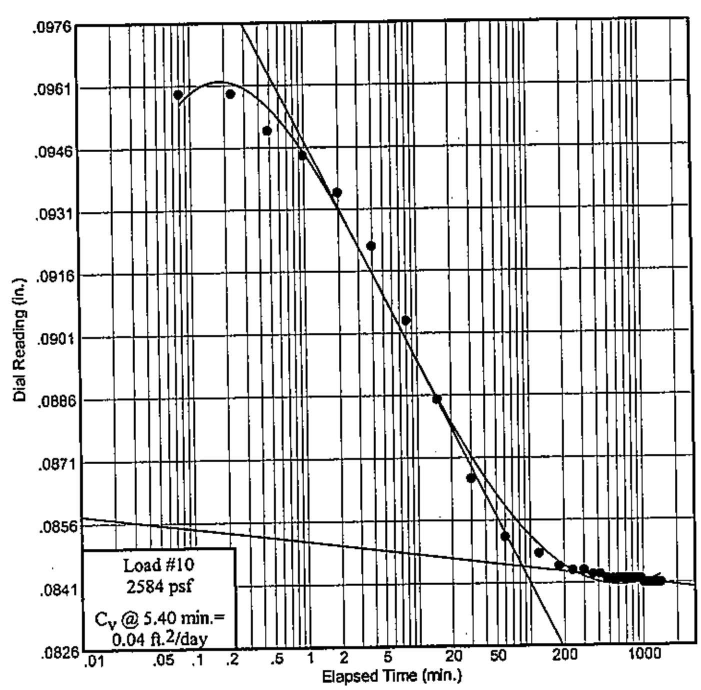
Project No.: 0121-3070.03
Project: SCI-823-0.00

Source: B-1 | Sample No.: P-3 | Elev./Depth: 18.0









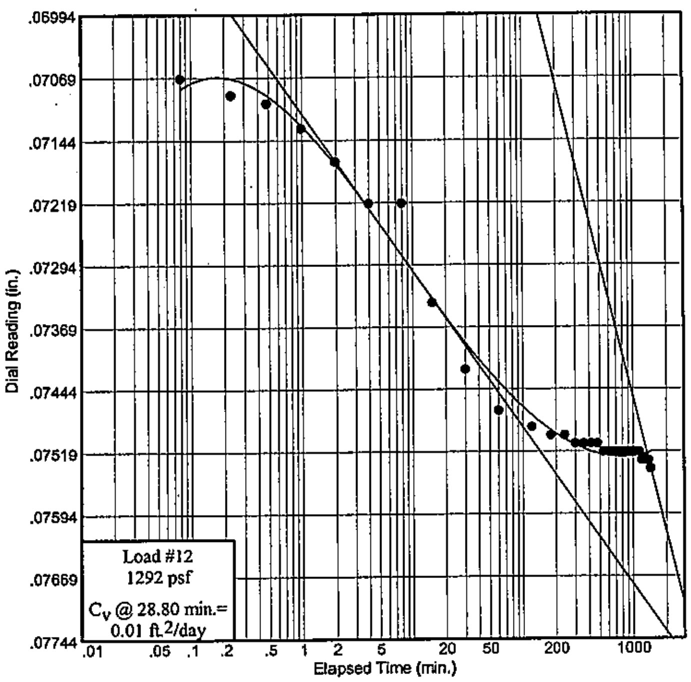
DLZ

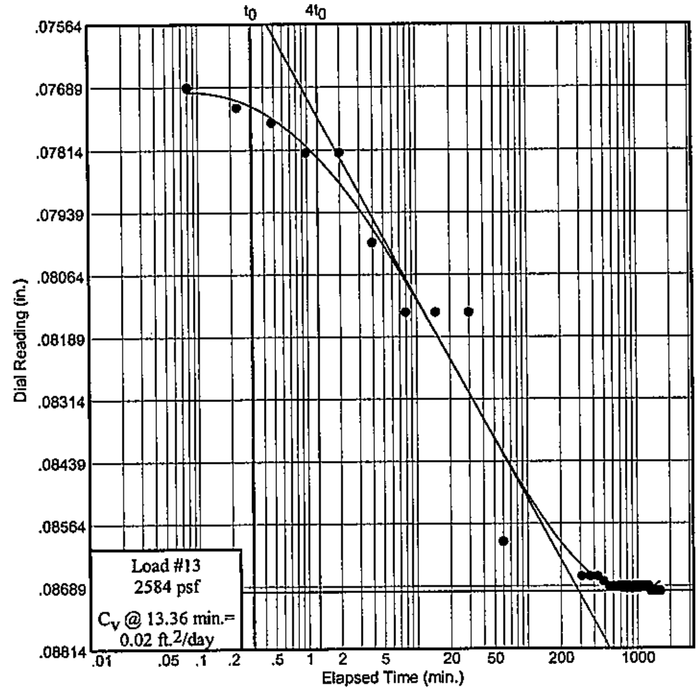
Figure

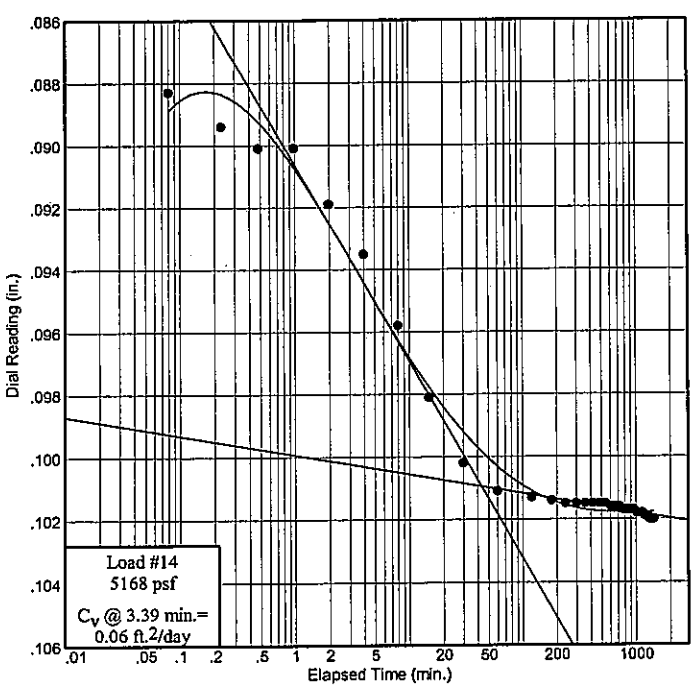
Dial Reading vs. Time

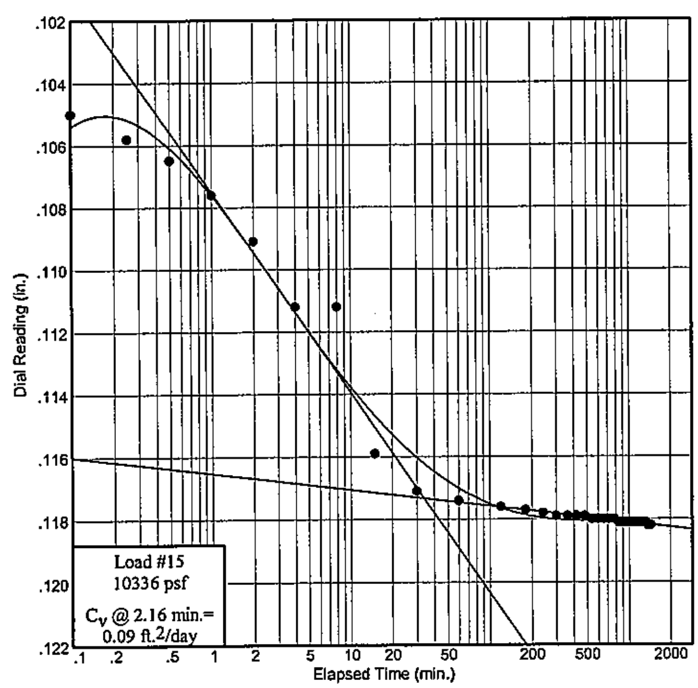
Project No.: 0121-3070.03
Project: SCI-823-0.00

Source: B-1 Sample No.: P-3 Elev./Depth: 18.0









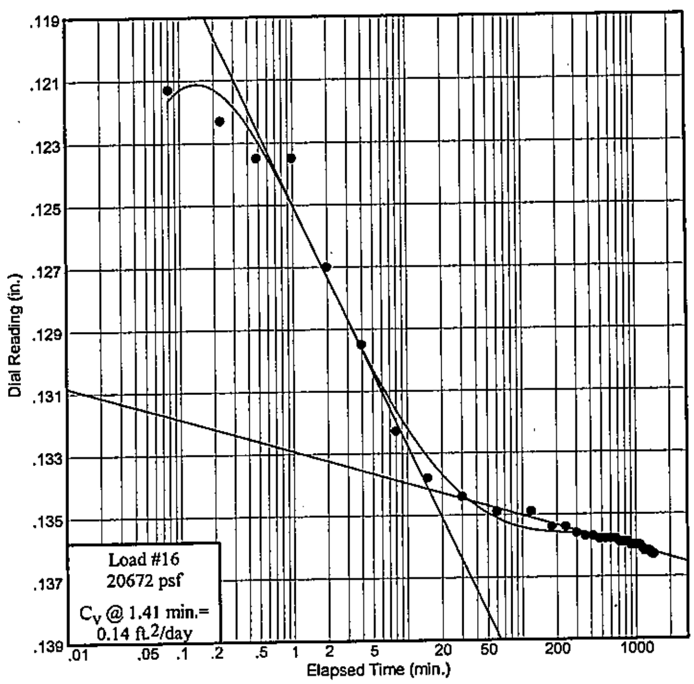
DLZ

Figure

Dial Reading vs. Time

Project No.: 0121-3070.03
Project: SCI-823-0.00

Source: B-1 Sample No.: P-3 Elev./Depth: 18.0



1 oc
2 oc
3 oc
4 0.05
~~5~~
6 0.13
7 —
8 0.16
~~9~~
10 0.04
~~11~~
12 —
13 —
14 0.06
15 0.09
16 0.14

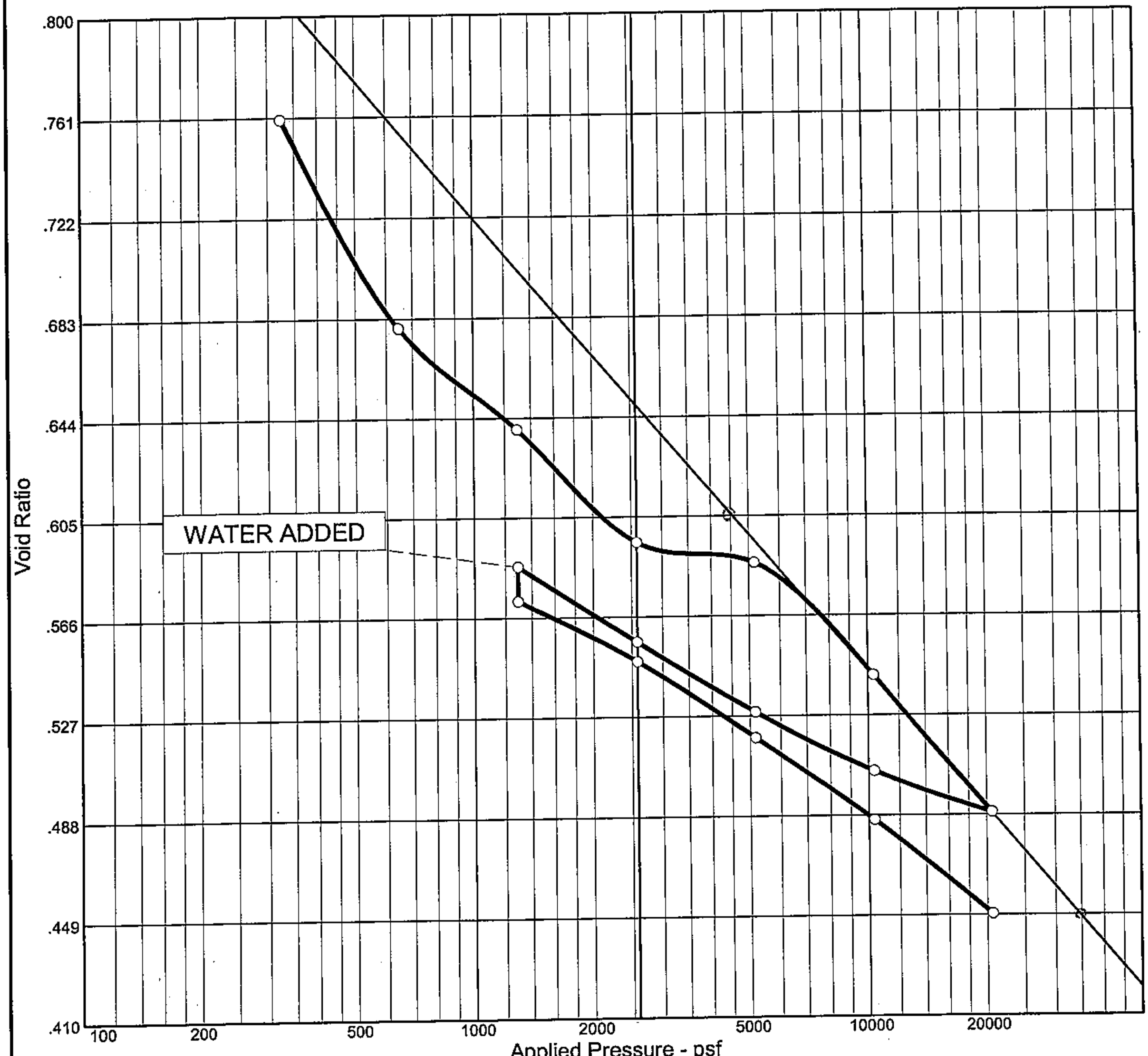
$$t = \frac{T_v H_{dr}^2}{C_v} = \frac{0.848\,(5.75)^2}{0.12}$$

= 234 days

DLZ

Figure

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
95.1 %	28.2 %	95.7	78	54	2.81	CH	A-7-6(56	0.833

MATERIAL DESCRIPTION

Project No. 0121- **Client:** TranSystems, Inc.

Project: SCI-823-0.00

Source: B-2 **Sample No.:** P-2B **Elev./Depth:** 12.5

DLZ

Remarks:

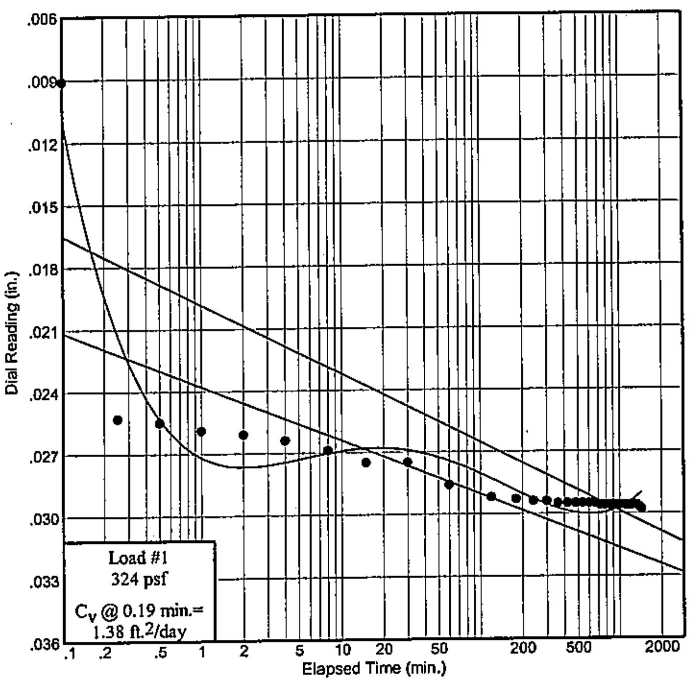
Specific Gravity= 2.81

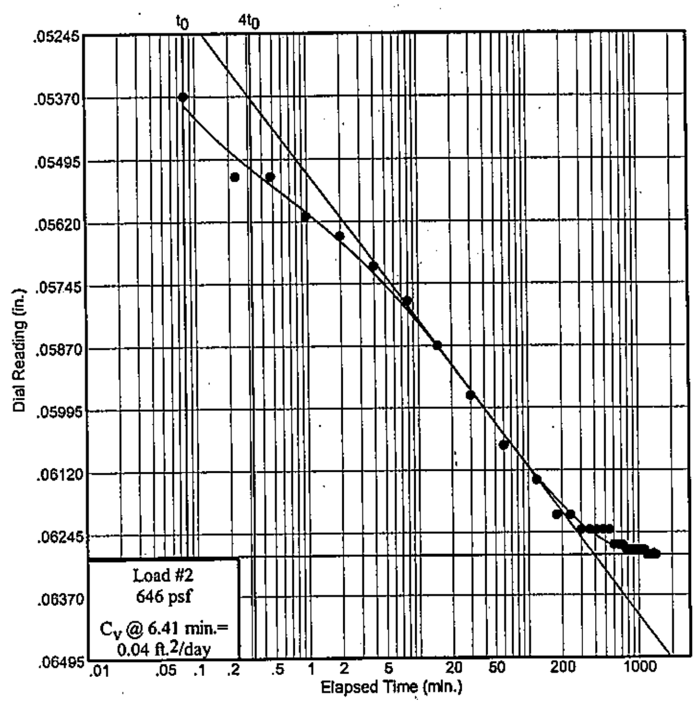
Figure

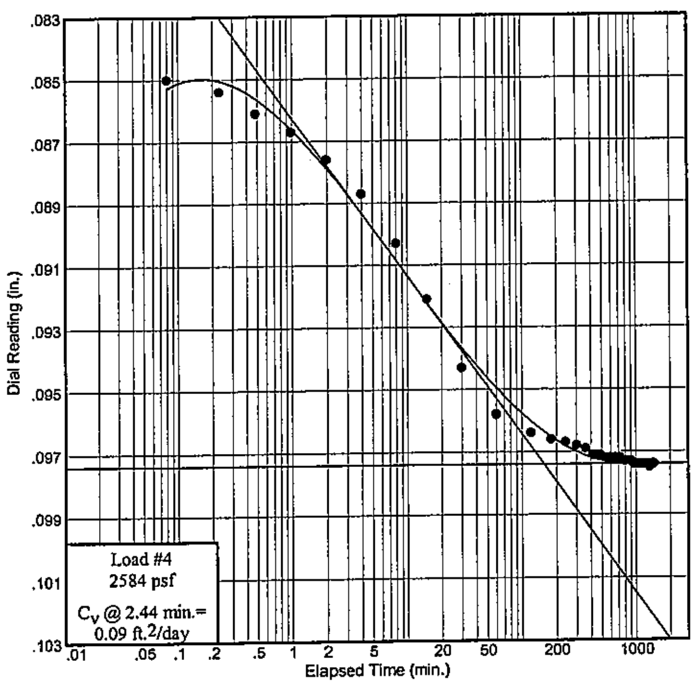
Dial Reading vs. Time

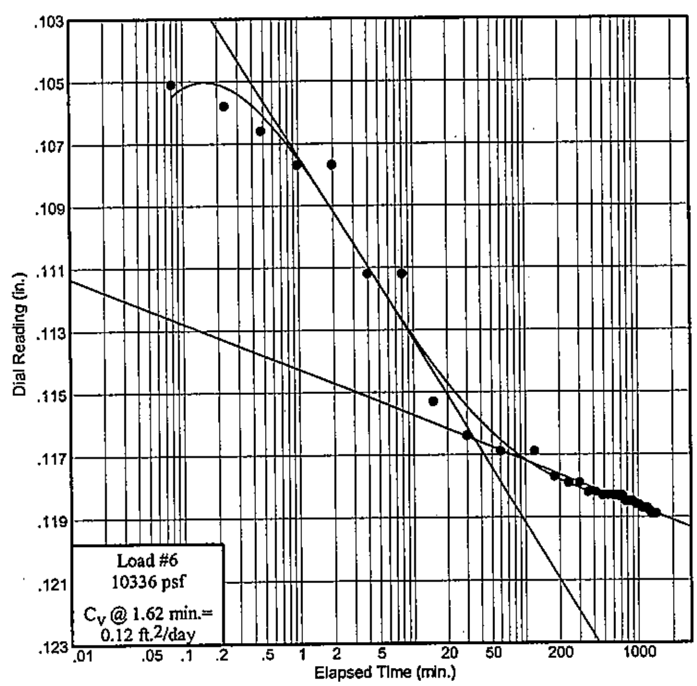
Project No.: 0121-3070.03
Project: SCI-823-0.00

Source: B-2 | Sample No.: P-2B | Elev./Depth: 12.5









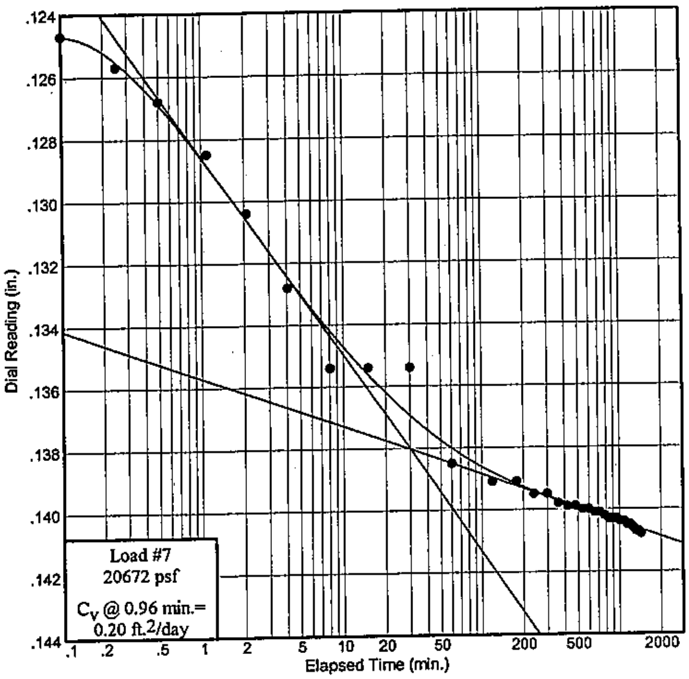
DLZ

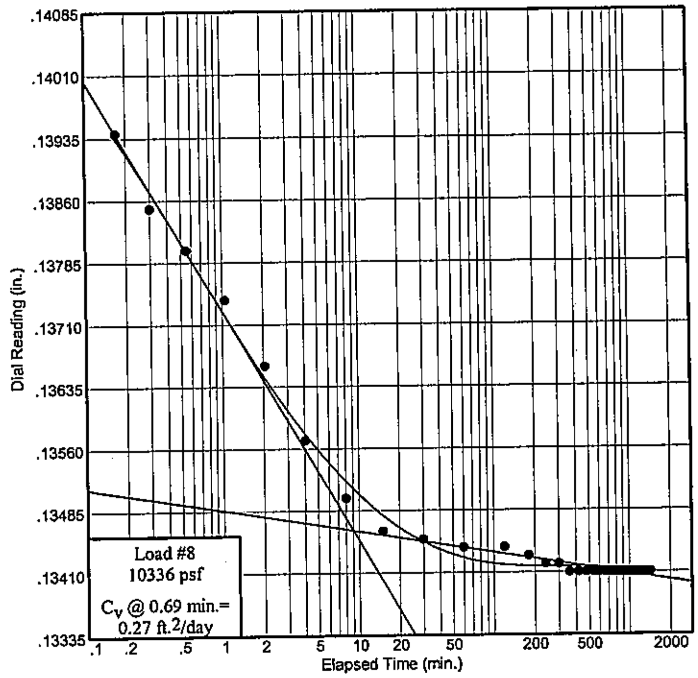
Figure

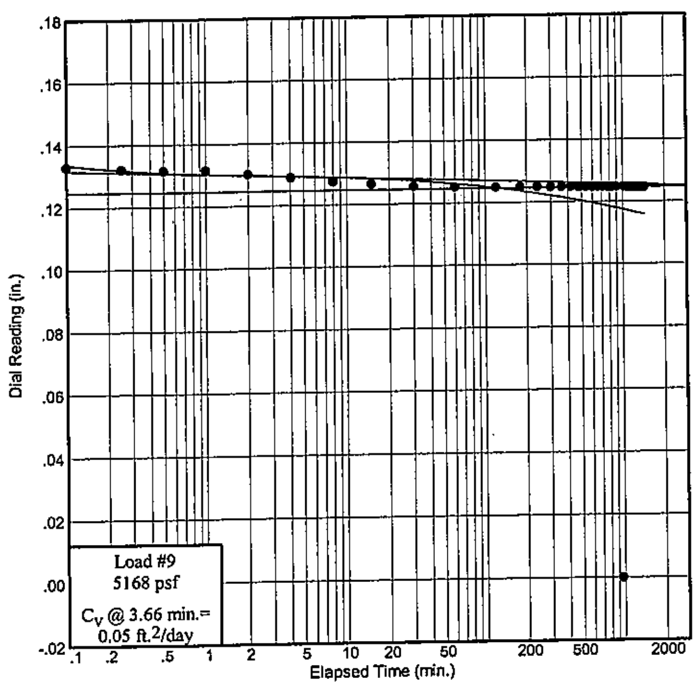
Dial Reading vs. Time

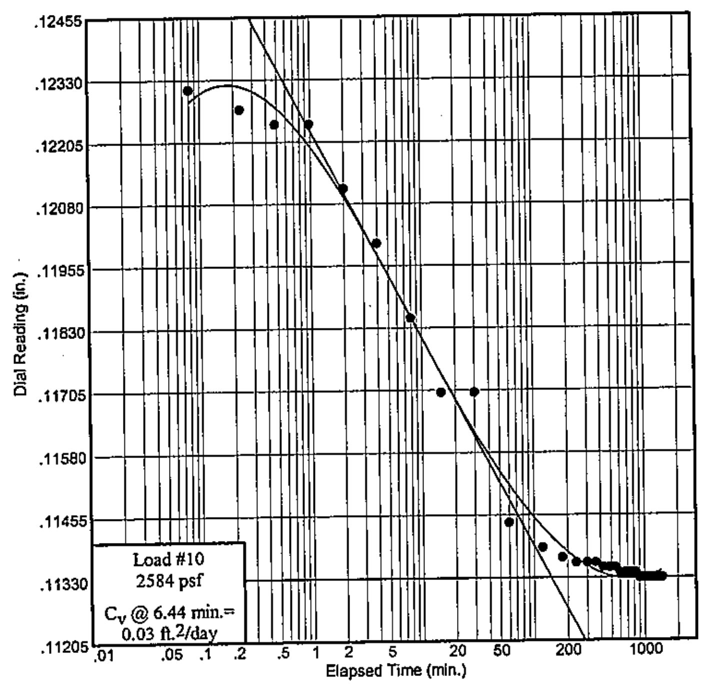
Project No.: 0121-3070.03
Project: SCI-823-0.00

Source: B-2 Sample No.: P-2B Elev./Depth: 12.5









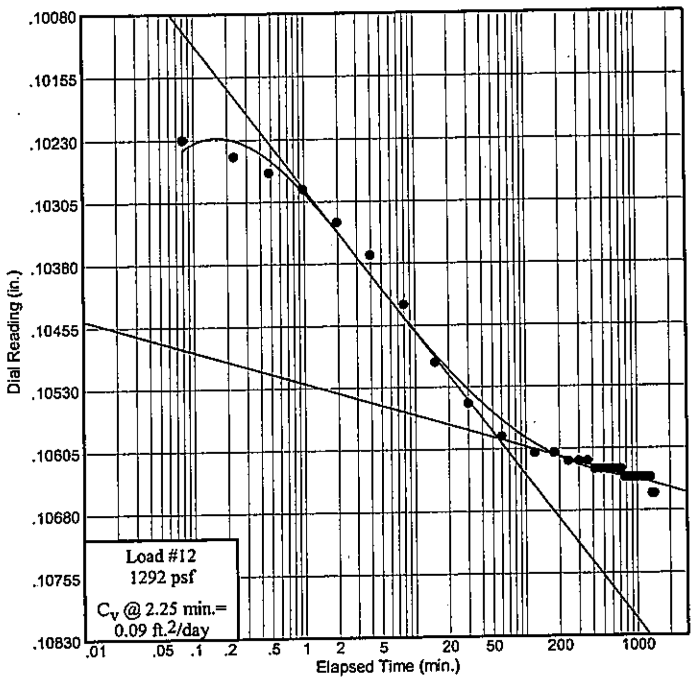
DLZ

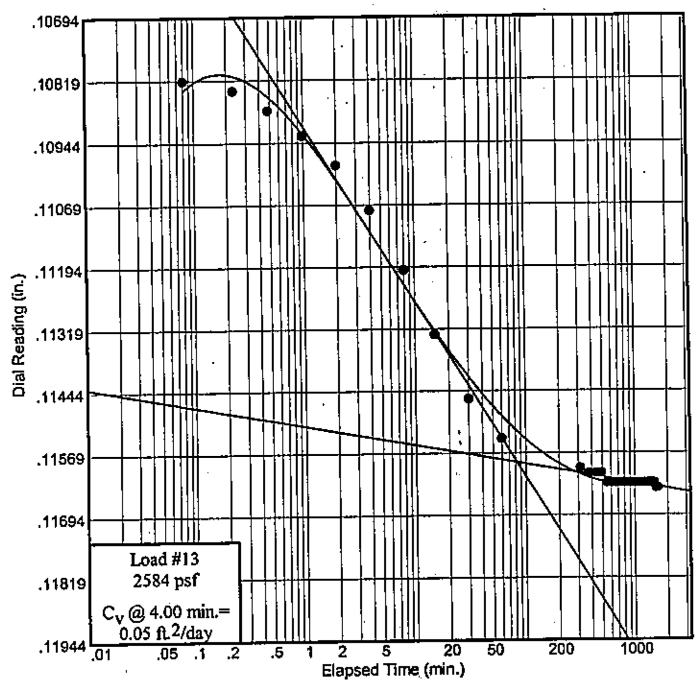
Figure

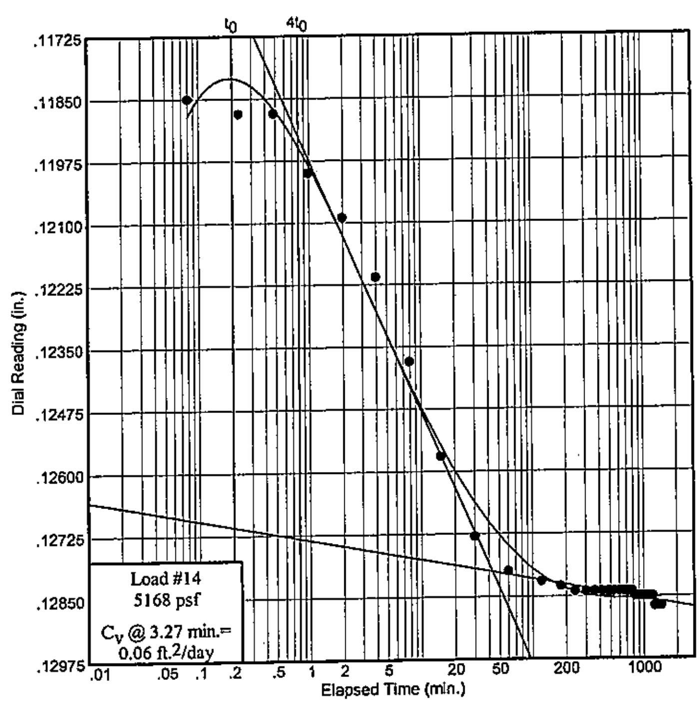
Dial Reading vs. Time

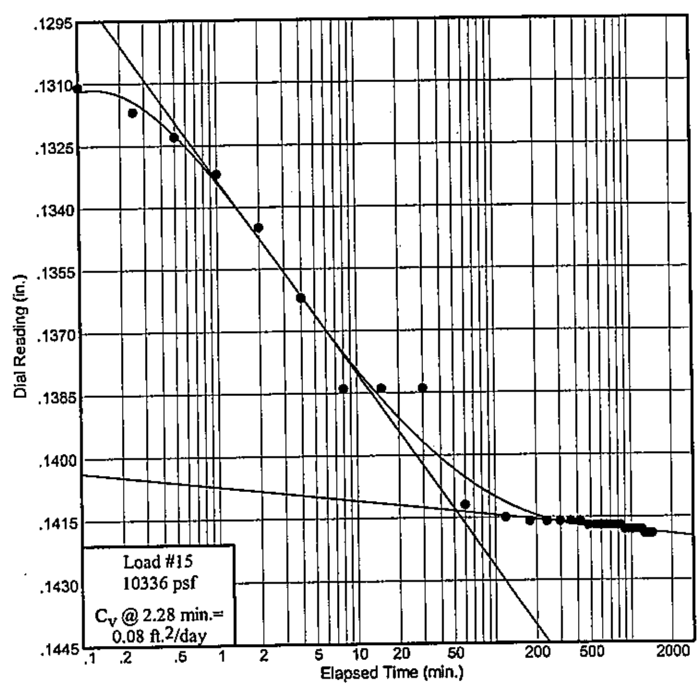
Project No.: 0121-3070.03
Project: SCI-823-0.00

Source: B-2 | Sample No.: P-2B | Elev./Depth: 12.5









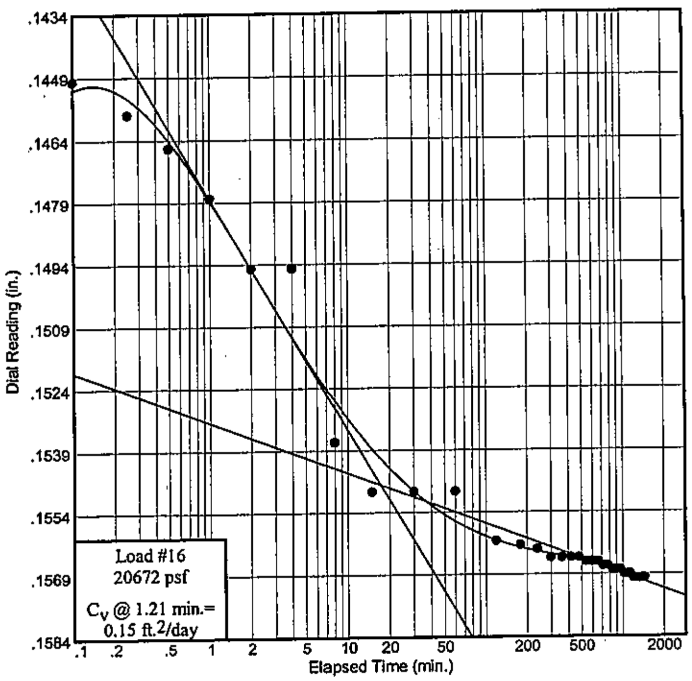
DLZ

Figure

Dial Reading vs. Time

Project No.: 0121-3070.03
Project: SCI-823-0.00

Source: B-2 Sample No.: P-2B Elev./Depth: 12.5



1 —
2 oc
4 0.09
6 0.12
7 0.20
8 0.27
9 —
10 0.03
12 0.09
13 0.05
14 0.06
15 0.08
16 0.15

0.2

DLZ

Figure

SWELL/CONSOLIDATION TEST DATA

Client: TranSystems, Inc.
Project: SCI-823-0.00
Project Number: 0121-3070.03

Sample Data

Source: B-2
Sample No.: P-1
Elev. or Depth: 6.0 **Sample Length(in./cm.):** 24
Location:
Description: Fat clay
Liquid Limit: 67 **Plasticity Index:** 40
USCS: CH **AASHTO:** A-7-6(47 **Figure No.:**
Testing Remarks: Specific Gravity= 2.72

Test Specimen Data

TOTAL SAMPLE

Wet w+t = 299.62 g.
Dry w+t = 251.16 g.
Tare Wt. = 62.40 g.
Height = .75 in.
Diameter = 2.50 in.
Weight = 120.64 g.

Moisture = 25.7 %
Wet Den. = 124.8 pcf
Dry Den. = 99.3 pcf

BEFORE TEST

Consolidometer # = 5

Spec. Gravity = 2.72
Height = .75 in.
Diameter = 2.50 in.
Defl. Table = n/a

Ht. Solids = 0.4387 in.
Dry Wt. = 96.00 g.*
Void Ratio = 0.709
Saturation = 98.4 %

AFTER TEST

Wet w+t = 180.72 g.
Dry w+t = 156.53 g.
Tare Wt. = 60.26 g.

Moisture = 25.1 %
Dry Wt. = 96.27 g.
Void Ratio = 0.568

* Initial dry weight used in calculations

End-of-Load Summary

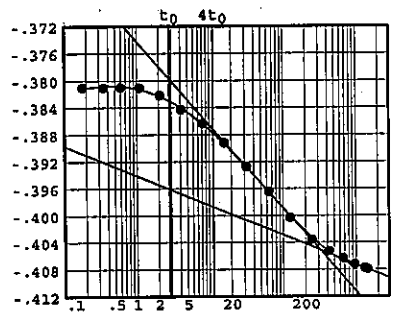
Pressure (psf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
start	-0.38112				0.709	
500000	-0.40796	0.00000	0.01		0.771	3.6 Swell
1000000	-0.40290	0.00000	0.48		0.759	2.9 Swell
2000000	-0.39167	0.00000	0.02	0.002	0.733	1.4 Swell
4000000	-0.37832	0.00000	0.05		0.703	0.4 Comprs.
8000000	-0.36112	0.00000	0.04	0.001	0.664	2.7 Comprs.
6000000	-0.34233	0.00000	0.09	0.002	0.621	5.2 Comprs.
2000000	-0.32098	0.00000	0.08	0.002	0.572	8.0 Comprs.
6000000	-0.33042	0.00000			0.594	6.8 Comprs.
8000000	-0.34194	0.00000	0.06		0.620	5.2 Comprs.
4000000	-0.35433	0.00000	0.02		0.648	3.6 Comprs.
2000000	-0.36705	0.00000	0.01	0.000	0.677	1.9 Comprs.
1000000	-0.37930	0.00000	2.61		0.705	0.2 Comprs.
500000	-0.39222	0.00000	0.00		0.735	1.5 Swell

Pressure (psf)	Final Dial (in.)	Machine Defl. (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Compression /Swell
1000000	-0.38786	0.00000	0.01		0.725	0.9 Swell
2000000	-0.37784	0.00000		0.004	0.702	0.4 Comprs.
4000000	-0.36724	0.00000	0.01		0.678	1.9 Comprs.
8000000	-0.35240	0.00000	0.05	0.002	0.644	3.8 Comprs.
6000000	-0.33675	0.00000	0.08	0.002	0.608	5.9 Comprs.
32000000	-0.31900	0.00000	0.09	0.001	0.568	8.3 Comprs.

C_c = 0.16 P_c = 2792612 psf C_r = 0.09

Pressure: 500000 psf **TEST READINGS** **Load No. 1**

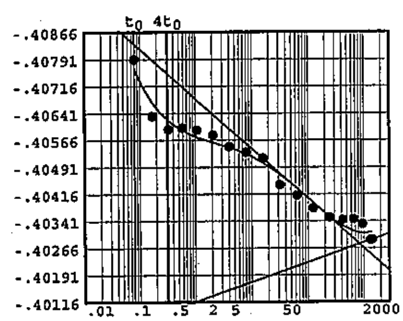
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.38112	11	64.12	-0.39645
2	0.18	-0.38106	12	124.12	-0.40034
3	0.35	-0.38105	13	244.12	-0.40361
4	0.60	-0.38099	14	424.12	-0.40531
5	1.10	-0.38106	15	664.12	-0.40634
6	2.10	-0.38218	16	964.12	-0.40727
7	4.10	-0.38432	17	1324.12	-0.40780
8	8.10	-0.38637	18	1440.07	-0.40796
9	16.10	-0.38924			
10	32.12	-0.39273			



Void Ratio = 0.771 **Swell** = 3.6 %
D_0 = -0.37822 D_{50} = -0.39165 D_{100} = -0.40508
C_v **at 25.5 min.** = 0.01 ft.^{2}/day

Pressure: 1000000 psf **TEST READINGS** **Load No. 2**

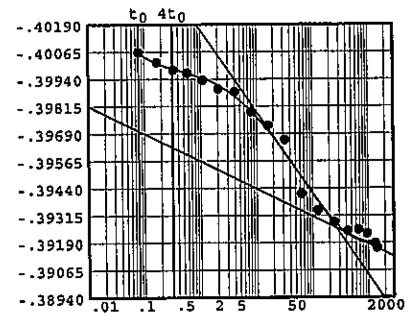
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.40795	11	32.08	-0.40441
2	0.08	-0.40791	12	64.10	-0.40411
3	0.17	-0.40633	13	124.10	-0.40376
4	0.33	-0.40596	14	244.10	-0.40351
5	0.58	-0.40600	15	424.10	-0.40344
6	1.08	-0.40594	16	664.10	-0.40346
7	2.08	-0.40580	17	964.10	-0.40332
8	4.08	-0.40548	18	1324.10	-0.40288
9	8.08	-0.40532	19	1440.20	-0.40290
10	16.08	-0.40516			



Void Ratio = 0.759 **Swell** = 2.9 %
D_0 = -0.40906 D_{50} = -0.40591 D_{100} = -0.40277
C_v **at 0.6 min.** = 0.48 ft.^{2}/day

Pressure: 2000000 psf	TEST READINGS	Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.40290	11	32.10	-0.39660
2	0.08	-0.40064	12	64.10	-0.39413
3	0.17	-0.40016	13	124.10	-0.39339
4	0.33	-0.39981	14	244.10	-0.39285
5	0.58	-0.39967	15	424.10	-0.39243
6	1.10	-0.39933	16	664.12	-0.39250
7	2.10	-0.39894	17	964.12	-0.39232
8	4.10	-0.39880	18	1324.12	-0.39187
9	8.10	-0.39789	19	1440.27	-0.39167
10	16.10	-0.39727			



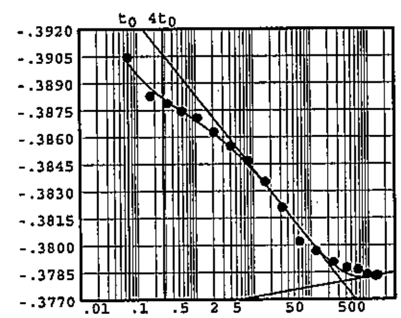
Void Ratio = 0.733 Swell = 1.4 %

D_0 = -0.40136 D_{50} = -0.39697 D_{100} = -0.39257

C_v at 16.8 min. = 0.02 ft.^{2}/day C_α = 0.002

Pressure: 4000000 psf	TEST READINGS	Load No. 4

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.39168	11	32.12	-0.38208
2	0.07	-0.39043	12	64.12	-0.38020
3	0.17	-0.38827	13	124.12	-0.37968
4	0.33	-0.38787	14	244.12	-0.37906
5	0.58	-0.38742	15	424.12	-0.37876
6	1.10	-0.38705	16	664.13	-0.37865
7	2.10	-0.38627	17	964.13	-0.37839
8	4.10	-0.38550	18	1324.13	-0.37830
9	8.12	-0.38467	19	1440.40	-0.37832
10	16.12	-0.38350			



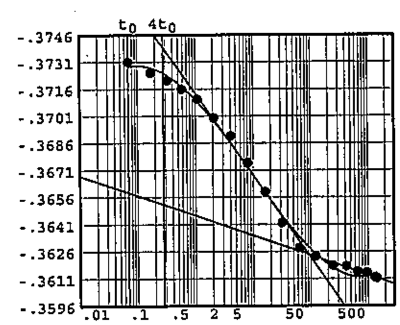
Void Ratio = 0.703 Compression = 0.4 %

D_0 = -0.39214 D_{50} = -0.38506 D_{100} = -0.37798

C_v at 5.2 min. = 0.05 ft.^{2}/day

Pressure: 8000000 psf	TEST READINGS	Load No. 5

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.37831	11	32.12	-0.36418
2	0.07	-0.37308	12	64.12	-0.36279
3	0.17	-0.37249	13	124.12	-0.36232
4	0.33	-0.37205	14	244.12	-0.36183
5	0.58	-0.37158	15	424.12	-0.36178
6	1.10	-0.37103	16	664.13	-0.36148
7	2.10	-0.36998	17	964.13	-0.36142
8	4.10	-0.36899	18	1324.13	-0.36116
9	8.10	-0.36749	19	1440.30	-0.36112
10	16.10	-0.36588			



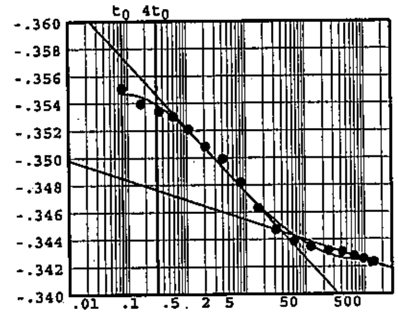
Void Ratio = 0.664 Compression = 2.7 %

D_0 = -0.37318 D_{50} = -0.36780 D_{100} = -0.36242

C_v at 6.1 min. = 0.04 ft.^{2}/day C_α = 0.001

Pressure: 16000000 psf | TEST READINGS | Load No. 6

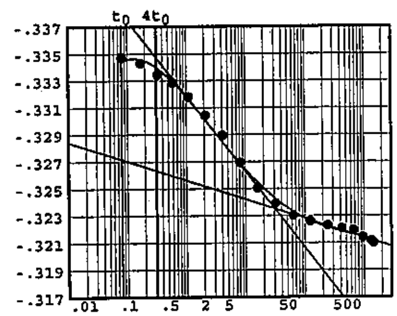
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.36113	11	32.12	-0.34471
2	0.08	-0.35506	12	64.13	-0.34387
3	0.17	-0.35394	13	124.13	-0.34346
4	0.35	-0.35337	14	244.15	-0.34317
5	0.60	-0.35302	15	424.15	-0.34308
6	1.10	-0.35207	16	664.15	-0.34277
7	2.10	-0.35081	17	964.15	-0.34256
8	4.10	-0.34992	18	1324.17	-0.34231
9	8.12	-0.34816	19	1440.08	-0.34233
10	16.12	-0.34631			



Void Ratio = 0.621 Compression = 5.2 %
D_0 = -0.35542 D_{50} = -0.35000 D_{100} = -0.34457
C_v at 2.9 min. = 0.09 ft.^{2}/day C_α = 0.002

Pressure: 32000000 psf | TEST READINGS | Load No. 7

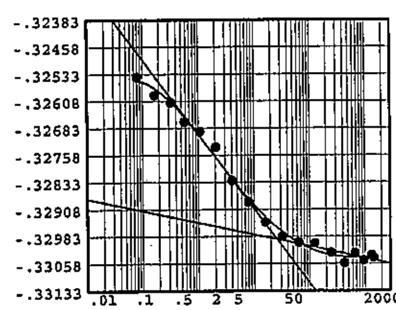
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.34232	11	32.12	-0.32390
2	0.08	-0.33472	12	64.12	-0.32300
3	0.17	-0.33428	13	124.12	-0.32259
4	0.33	-0.33342	14	244.13	-0.32228
5	0.60	-0.33284	15	424.13	-0.32205
6	1.10	-0.33181	16	664.13	-0.32189
7	2.10	-0.33042	17	964.15	-0.32140
8	4.10	-0.32893	18	1324.15	-0.32114
9	8.12	-0.32693	19	1440.45	-0.32098
10	16.12	-0.32503			



Void Ratio = 0.572 Compression = 8.0 %
D_0 = -0.33486 D_{50} = -0.32919 D_{100} = -0.32352
C_v at 3.0 min. = 0.08 ft.^{2}/day C_α = 0.002

Pressure: 16000000 psf | TEST READINGS | Load No. 8

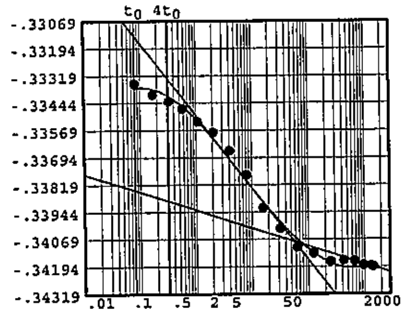
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.32098	11	32.10	-0.32983
2	0.08	-0.32541	12	64.10	-0.33000
3	0.17	-0.32592	13	124.10	-0.33002
4	0.33	-0.32612	14	244.12	-0.33028
5	0.58	-0.32666	15	424.12	-0.33057
6	1.08	-0.32693	16	664.13	-0.33030
7	2.10	-0.32736	17	964.13	-0.33050
8	4.10	-0.32829	18	1324.13	-0.33035
9	8.10	-0.32888	19	1440.33	-0.33042
10	16.10	-0.32944			



Void Ratio = 0.594 Compression = 6.8 %

Pressure: 8000000 psf — TEST READINGS — Load No. 9

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.33042	11	32.13	-0.34020
2	0.08	-0.33356	12	64.13	-0.34106
3	0.17	-0.33406	13	124.13	-0.34133
4	0.33	-0.33437	14	244.13	-0.34171
5	0.58	-0.33472	15	424.13	-0.34166
6	1.08	-0.33530	16	664.13	-0.34169
7	2.10	-0.33580	17	964.13	-0.34188
8	4.10	-0.33663	18	1324.13	-0.34191
9	8.12	-0.33775	19	1440.05	-0.34194
10	16.12	-0.33925			



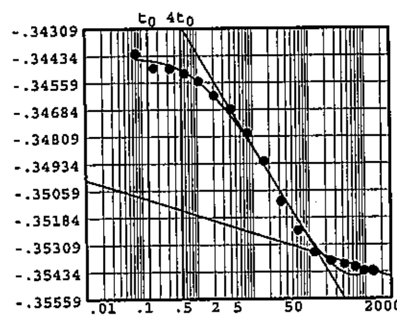
Void Ratio = 0.620 Compression = 5.2 %

D_0 = -0.33347 D_{50} = -0.33712 D_{100} = -0.34078

C_v at 4.4 min. = 0.06 ft.^{2}/day

Pressure: 4000000 psf — TEST READINGS — Load No. 10

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.34194	11	32.13	-0.35109
2	0.08	-0.34426	12	64.13	-0.35244
3	0.17	-0.34492	13	124.15	-0.35344
4	0.33	-0.34495	14	244.15	-0.35384
5	0.60	-0.34518	15	424.15	-0.35400
6	1.10	-0.34554	16	664.15	-0.35411
7	2.10	-0.34619	17	964.17	-0.35429
8	4.12	-0.34683	18	1324.17	-0.35430
9	8.12	-0.34794	19	1440.38	-0.35433
10	16.12	-0.34923			



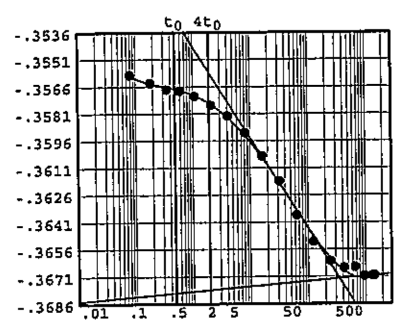
Void Ratio = 0.648 Compression = 3.6 %

D_0 = -0.34409 D_{50} = -0.34880 D_{100} = -0.35350

C_v at 11.4 min. = 0.02 ft.^{2}/day

Pressure: 2000000 psf — TEST READINGS — Load No. 11

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.35433	11	32.13	-0.36185
2	0.08	-0.35597	12	64.13	-0.36374
3	0.18	-0.35641	13	124.13	-0.36519
4	0.35	-0.35676	14	244.13	-0.36626
5	0.60	-0.35685	15	424.13	-0.36663
6	1.10	-0.35713	16	664.13	-0.36659
7	2.12	-0.35763	17	964.15	-0.36709
8	4.12	-0.35823	18	1324.15	-0.36706
9	8.12	-0.35915	19	1440.28	-0.36705
10	16.12	-0.36046			



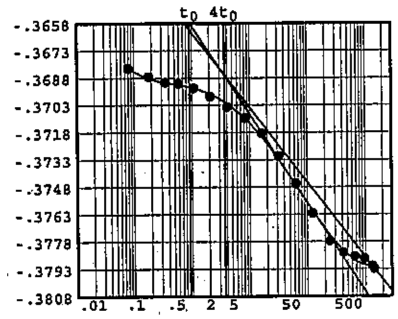
Void Ratio = 0.677 Compression = 1.9 %

D_0 = -0.35596 D_{50} = -0.36159 D_{100} = -0.36722

C_v at 26.9 min. = 0.01 ft.^{2}/day C_α = 0.000

Pressure: 1000000 psf	TEST READINGS	Load No. 12

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.36706	11	32.12	-0.37312
2	0.08	-0.36827	12	64.13	-0.37463
3	0.18	-0.36873	13	124.13	-0.37625
4	0.35	-0.36905	14	244.13	-0.37778
5	0.60	-0.36913	15	424.13	-0.37841
6	1.10	-0.36938	16	664.15	-0.37862
7	2.10	-0.36983	17	964.15	-0.37874
8	4.12	-0.37041	18	1324.15	-0.37915
9	8.12	-0.37102	19	1440.07	-0.37930
10	16.12	-0.37185			



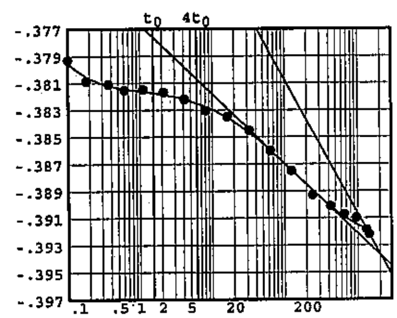
Void Ratio = 0.705 Compression = 0.2 %

D_0 = -0.36851 D_{50} = -0.36846 D_{100} = -0.36842

C_v at 0.1 min. = 2.61 ft.^{2}/day

Pressure: 500000 psf	TEST READINGS	Load No. 13

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.37927	11	32.17	-0.38452
2	0.10	-0.37932	12	64.17	-0.38603
3	0.18	-0.38088	13	124.17	-0.38753
4	0.37	-0.38111	14	244.18	-0.38932
5	0.62	-0.38154	15	424.18	-0.39013
6	1.12	-0.38150	16	664.18	-0.39074
7	2.13	-0.38171	17	964.20	-0.39100
8	4.13	-0.38223	18	1324.20	-0.39186
9	8.15	-0.38305	19	1440.13	-0.39222
10	16.15	-0.38350			



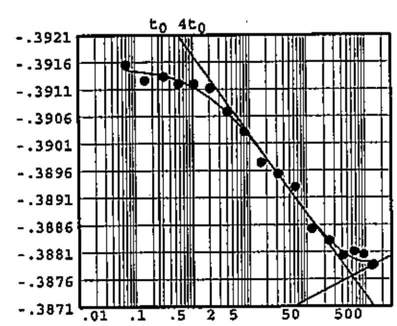
Void Ratio = 0.735 Swell = 1.5 %

D_0 = -0.38100 D_{50} = -0.38739 D_{100} = -0.39379

C_v at 120.1 min. = 0.00 ft.^{2}/day

Pressure: 1000000 psf	TEST READINGS	Load No. 14

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.39223	11	32.12	-0.38953
2	0.07	-0.39154	12	64.12	-0.38929
3	0.15	-0.39126	13	124.12	-0.38852
4	0.32	-0.39133	14	244.12	-0.38830
5	0.58	-0.39120	15	424.13	-0.38803
6	1.08	-0.39119	16	664.13	-0.38810
7	2.08	-0.39111	17	964.13	-0.38805
8	4.10	-0.39068	18	1324.15	-0.38784
9	8.10	-0.39031	19	1440.18	-0.38786
10	16.10	-0.38974			



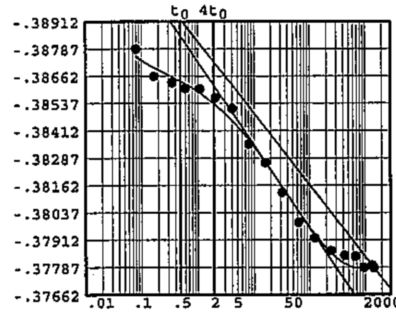
Void Ratio = 0.725 Swell = 0.9 %

D_0 = -0.39159 D_{50} = -0.38962 D_{100} = -0.38765

C_v at 27.5 min. = 0.01 ft.^{2}/day

Pressure: 2000000 psf	TEST READINGS	Load No. 15

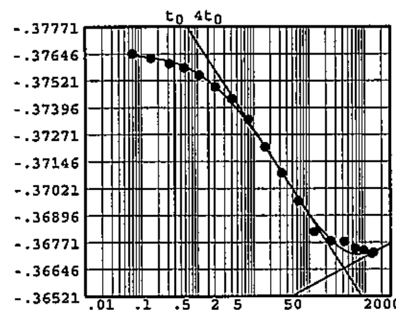
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.38786	11	32.12	-0.38128
2	0.08	-0.38786	12	64.12	-0.37992
3	0.17	-0.38660	13	124.12	-0.37920
4	0.35	-0.38630	14	244.13	-0.37862
5	0.60	-0.38604	15	424.13	-0.37840
6	1.10	-0.38602	16	664.13	-0.37836
7	2.10	-0.38562	17	964.13	-0.37786
8	4.10	-0.38512	18	1324.15	-0.37796
9	8.12	-0.38350	19	1440.48	-0.37784
10	16.12	-0.38266			



Void Ratio = 0.702 Compression = 0.4 %

Pressure: 4000000 psf	TEST READINGS	Load No. 16

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.37784	11	32.10	-0.37092
2	0.07	-0.37646	12	64.10	-0.36963
3	0.15	-0.37625	13	124.12	-0.36820
4	0.32	-0.37600	14	244.12	-0.36776
5	0.58	-0.37580	15	424.12	-0.36774
6	1.08	-0.37546	16	664.13	-0.36743
7	2.08	-0.37492	17	964.13	-0.36734
8	4.10	-0.37437	18	1324.15	-0.36719
9	8.10	-0.37341	19	1440.22	-0.36724
10	16.10	-0.37212			



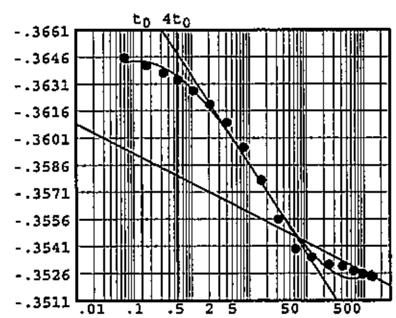
Void Ratio = 0.678 Compression = 1.9 %

D_0 = -0.37689 D_{50} = -0.37170 D_{100} = -0.36650

C_v at 20.8 min. = 0.01 ft.^{2}/day

Pressure: 8000000 psf	TEST READINGS	Load No. 17

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.36725	11	32.10	-0.35558
2	0.07	-0.36454	12	64.10	-0.35393
3	0.17	-0.36410	13	124.10	-0.35348
4	0.33	-0.36368	14	244.10	-0.35308
5	0.58	-0.36331	15	424.12	-0.35299
6	1.10	-0.36270	16	664.12	-0.35274
7	2.10	-0.36194	17	964.12	-0.35255
8	4.10	-0.36094	18	1324.12	-0.35246
9	8.10	-0.35956	19	1440.25	-0.35240
10	16.10	-0.35775			



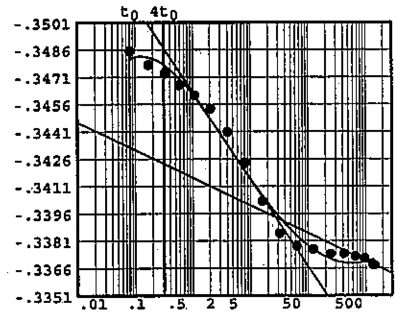
Void Ratio = 0.644 Compression = 3.8 %

D_0 = -0.36518 D_{50} = -0.35989 D_{100} = -0.35460

C_v at 5.5 min. = 0.05 ft.^{2}/day C_α = 0.002

Pressure: 16000000 psf	TEST READINGS	Load No. 18

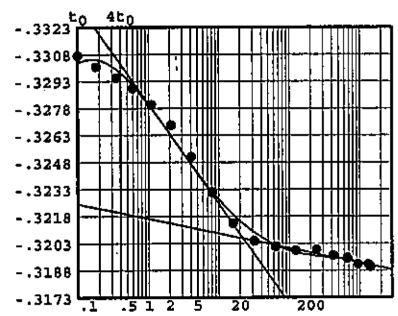
No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.35241	11	32.10	-0.33849
2	0.08	-0.34852	12	64.10	-0.33781
3	0.17	-0.34777	13	124.10	-0.33762
4	0.33	-0.34729	14	244.10	-0.33738
5	0.58	-0.34663	15	424.10	-0.33739
6	1.08	-0.34608	16	664.10	-0.33724
7	2.08	-0.34536	17	964.10	-0.33714
8	4.08	-0.34408	18	1324.12	-0.33681
9	8.10	-0.34237	19	1440.40	-0.33675
10	16.10	-0.34027			



Void Ratio = 0.608 Compression = 5.9 %
D_0 = -0.34841 D_{50} = -0.34390 D_{100} = -0.33939
C_v at 3.2 min. = 0.08 ft.^{2}/day C_α = 0.002

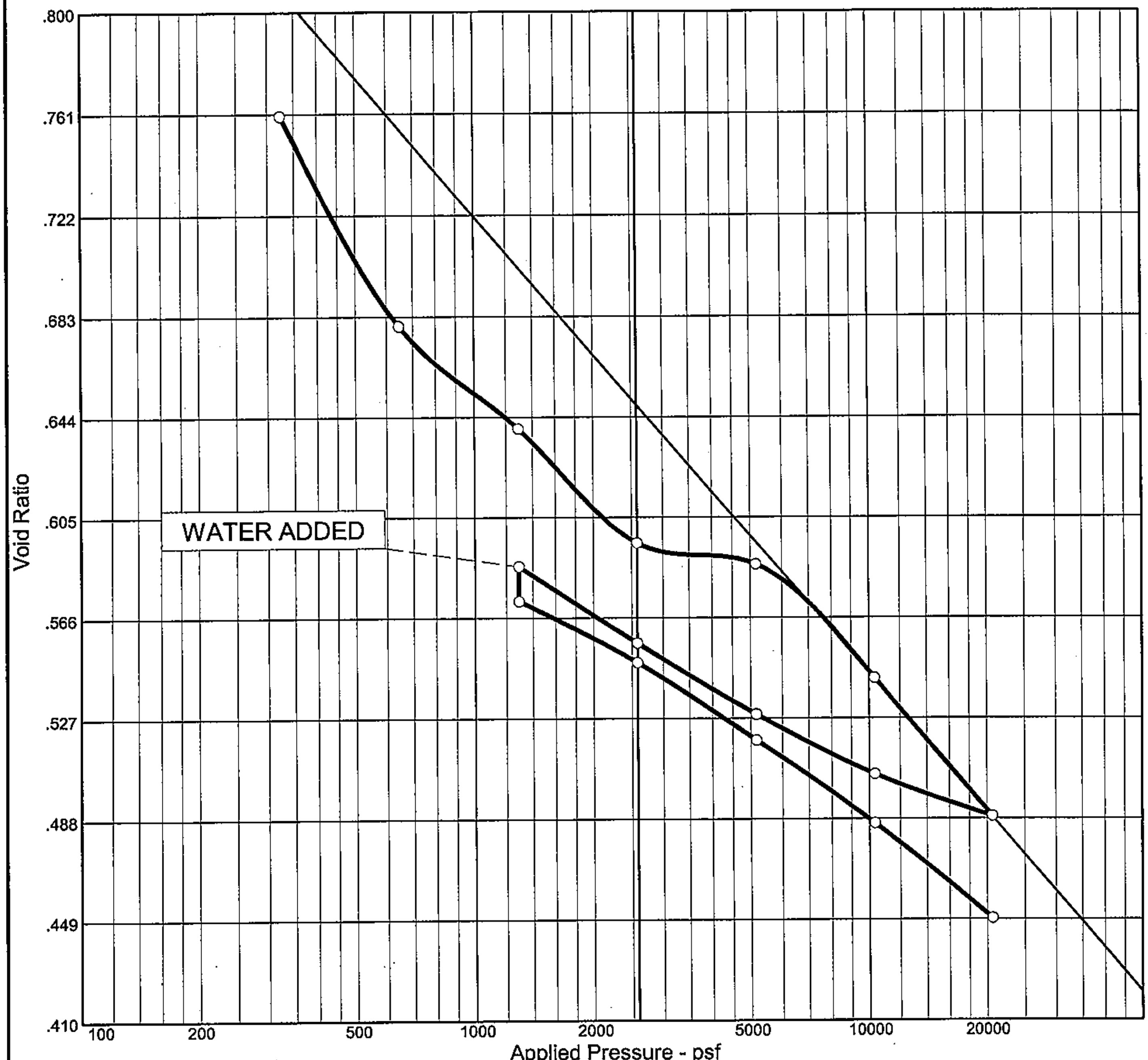
Pressure: 32000000 psf	TEST READINGS	Load No. 19

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	-0.33675	11	32.12	-0.32043
2	0.10	-0.33072	12	64.12	-0.32013
3	0.18	-0.33010	13	124.12	-0.31990
4	0.35	-0.32949	14	244.12	-0.31996
5	0.60	-0.32889	15	424.12	-0.31962
6	1.10	-0.32800	16	664.13	-0.31949
7	2.10	-0.32685	17	964.13	-0.31915
8	4.10	-0.32511	18	1324.13	-0.31914
9	8.10	-0.32313	19	1440.42	-0.31900
10	16.12	-0.32142			



Void Ratio = 0.568 Compression = 8.3 %
D_0 = -0.33084 D_{50} = -0.32571 D_{100} = -0.32058
C_v at 2.6 min. = 0.09 ft.^{2}/day C_α = 0.001

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	USCS	AASHTO	Initial Void Ratio
Saturation	Moisture							
95.1 %	28.2 %	95.7	78	54	2.81	CH	A-7-6(56	0.833

MATERIAL DESCRIPTION

Project No. 0121- **Client:** TranSystems, Inc.

Project: SCI-823-0.00

Source: B-2 **Sample No.:** P-2B **Elev./Depth:** 12.5

DLZ

Remarks:

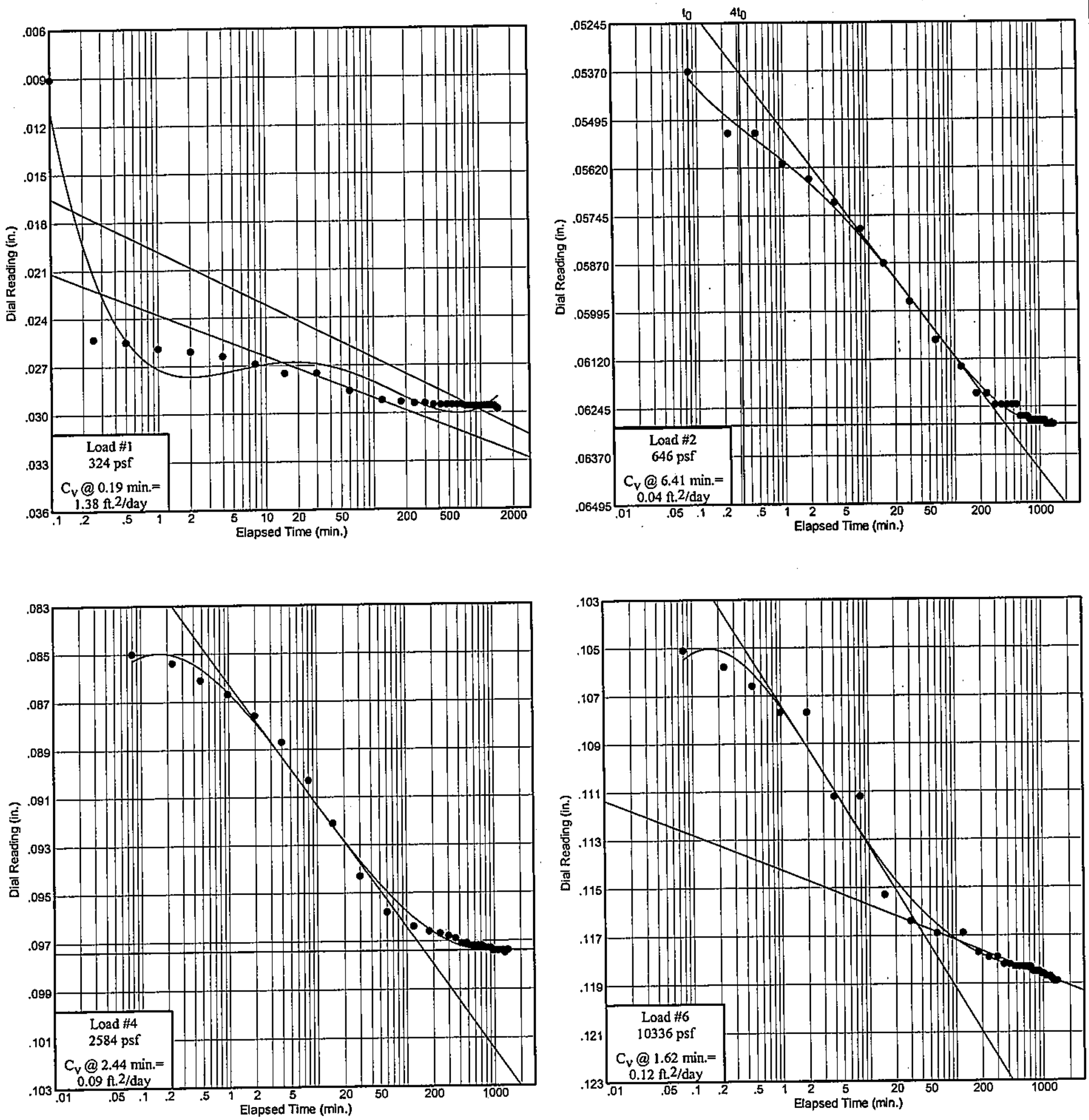
Specific Gravity= 2.81

Figure

Dial Reading vs. Time

Project No.: 0121-3070.03
Project: SCI-823-0.00

Source: B-2 Sample No.: P-2B Elev./Depth: 12.5



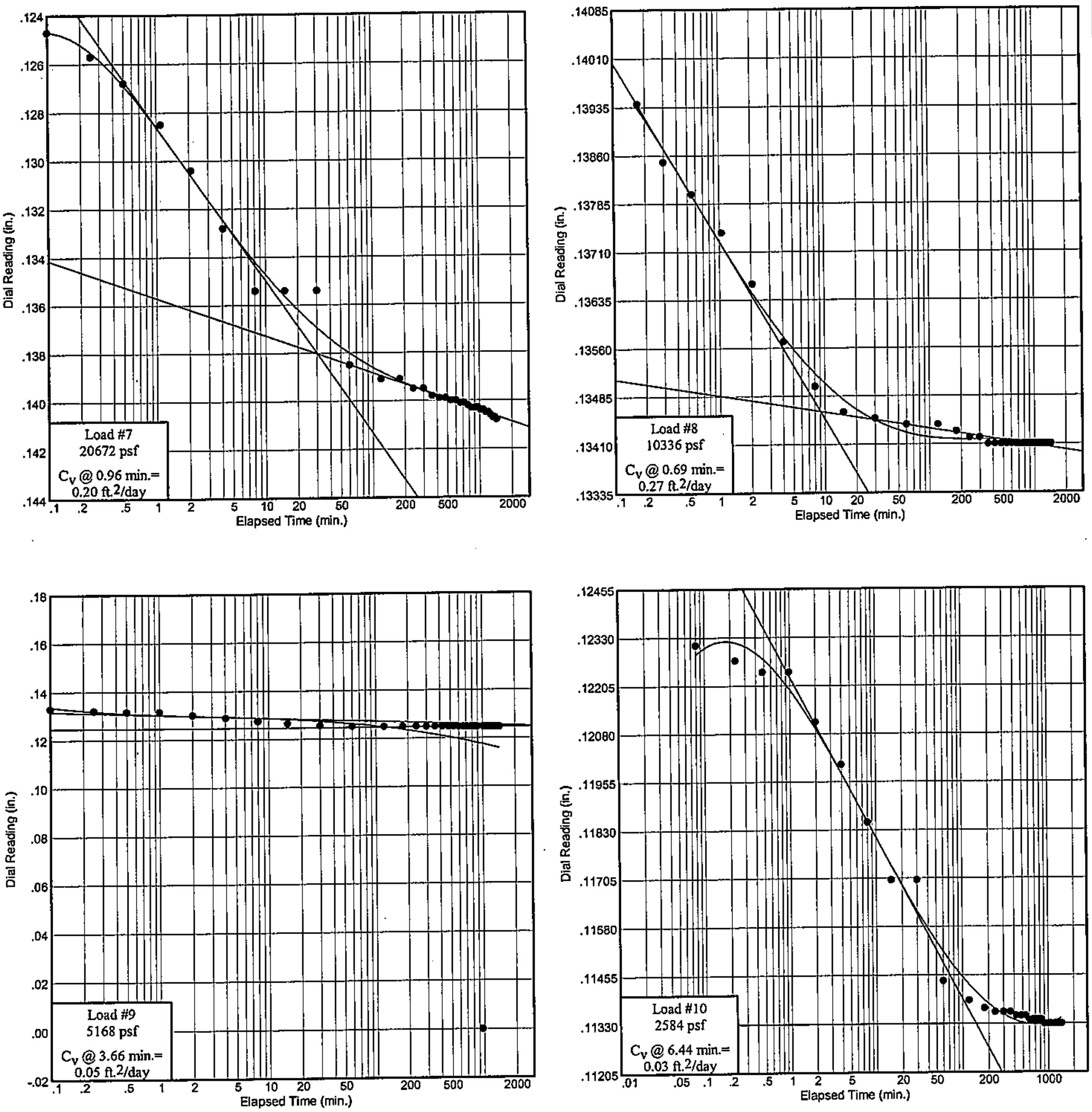
DLZ

Figure

Dial Reading vs. Time

Project No.: 0121-3070.03
Project: SCI-823-0.00

Source: B-2 Sample No.: P-2B Elev./Depth: 12.5



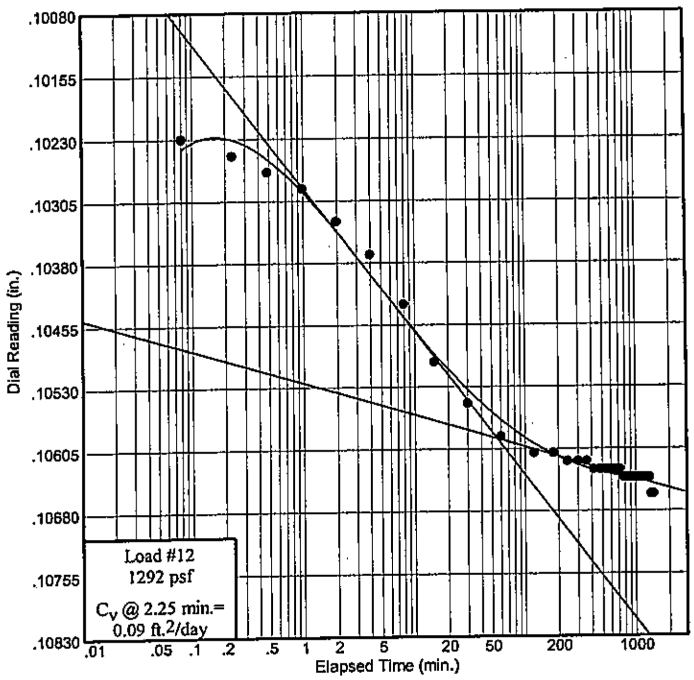
DLZ

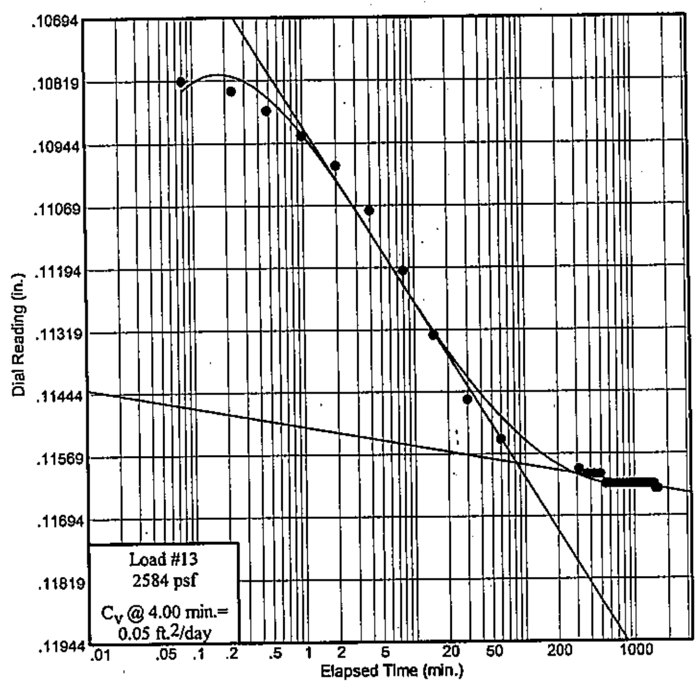
Figure

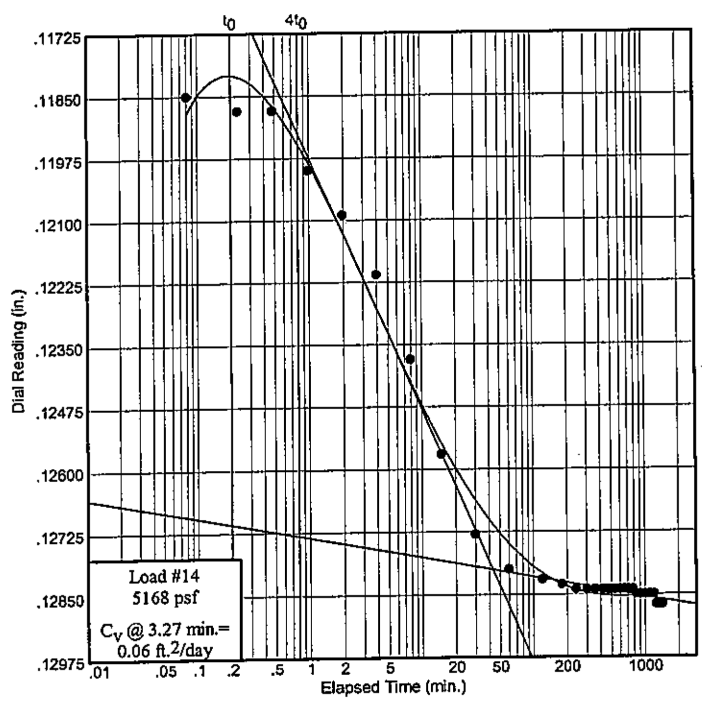
Dial Reading vs. Time

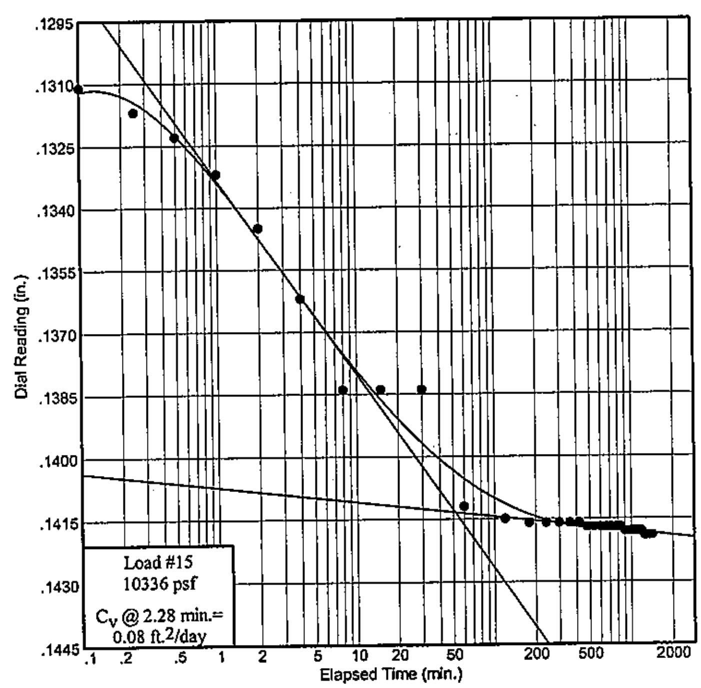
Project No.: 0121-3070.03
Project: SCI-823-0.00

Source: B-2 | Sample No.: P-2B | Elev./Depth: 12.5









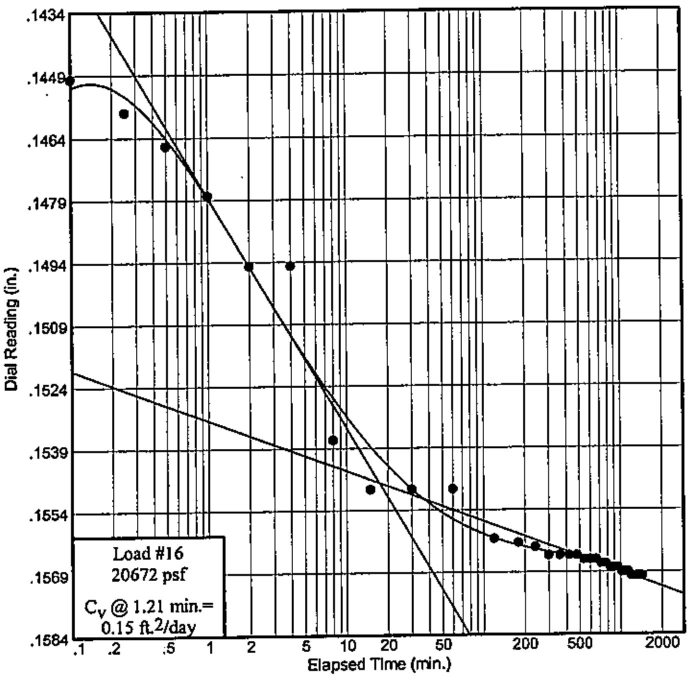
DLZ

Figure

Dial Reading vs. Time

Project No.: 0121-3070.03
Project: SCI-823-0.00

Source: B-2 | Sample No.: P-2B | Elev./Depth: 12.5



DLZ

Figure