

KINGSTON

Bottom Ash - From Pond

Grain Size Distribution Test Report
Moisture-Density Relationship (Standard Proctor)
Moisture-Density Relationship (Modified Proctor)
Relative Density Test
Hydraulic Conductivity - Constant Head (2 Pages)
California Bearing Ratio
Resilient Modulus (Standard Proctor) (9 Pages)
Resilient Modulus (Modified Proctor) (9 Pages)

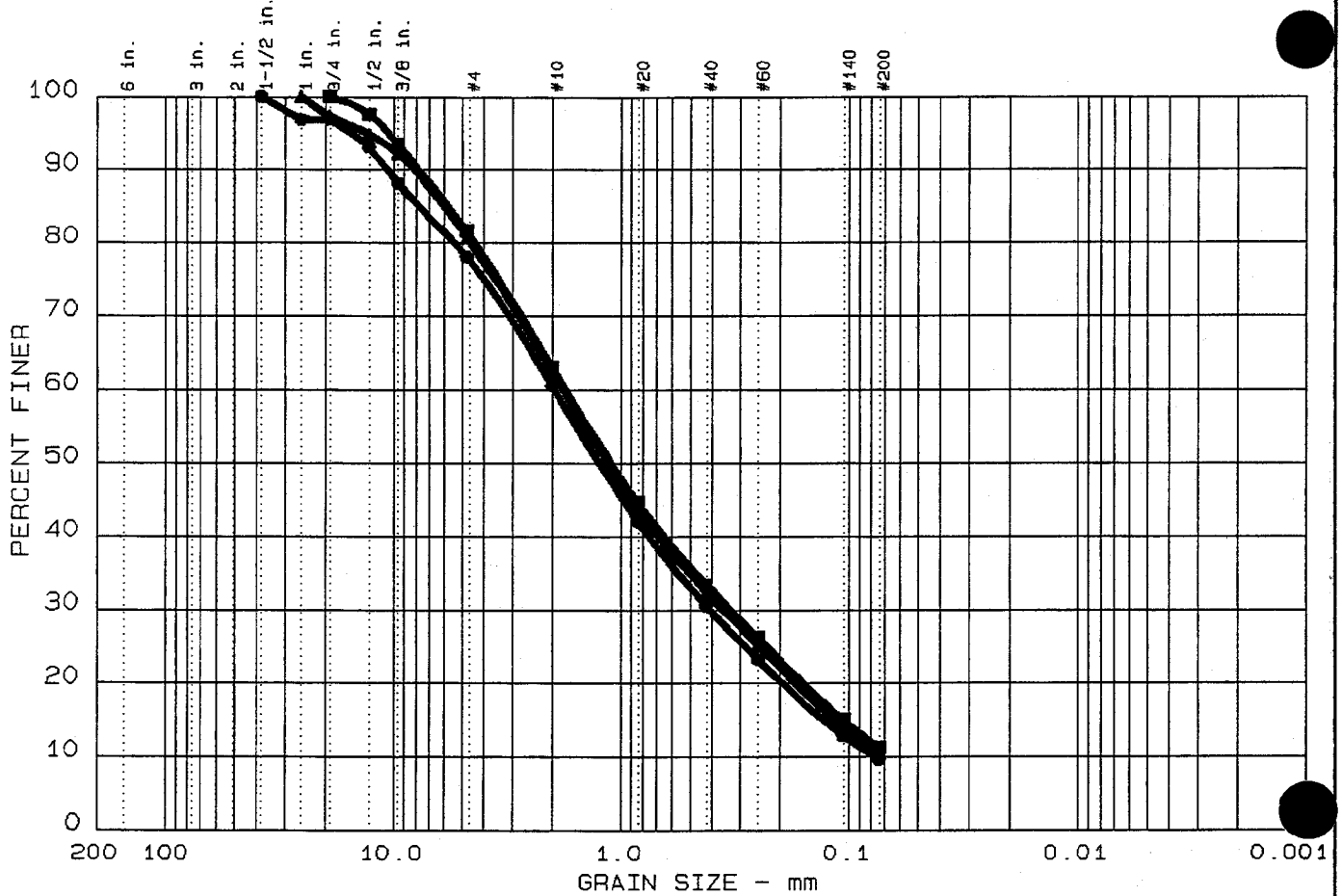


**TVA - KINGSTON
BOTTOM ASH - FROM POND**

Description	Test Method	Property	Sample 1	Sample 2	Sample 3
Grain Size	ASTM D 422	Percent Retained on the #4 Sieve	21.9	19.3	18.4
		Percent Passing the #200 Sieve	9.7	10.7	11.3
Atterberg Limits	ASTM D 4318	Liquid Limit	NL	NL	NL
		Plastic Limit	NP	NP	NP
		Plasticity Index	N/A	N/A	N/A
Specific Gravity	ASTM D 854	Specific Gravity at 20°C	2.37	2.34	2.33
Classification	ASTM D 2487	Unified Soil Classification System (USCS)	SW-SM	SP-SM	SP-SM
	AASHTO M 145	AASHTO Classification	A-1-b	A-1-b	A-1-b
Composite Sample					
Moisture-Density Relations (Standard Effort)	ASTM D 698	Maximum Dry Density, pcf	89.0		
		Optimum Moisture Content, %	24.1		
Moisture-Density Relations (Modified Effort)	ASTM D 1557	Maximum Dry Density, pcf	97.6		
		Optimum Moisture Content, %	21.0		
Relative Density	ASTM D 4254	Minimum Dry Density, pcf	71.0		
	ASTM D 4253	Maximum Dry Density (Dry Method), pcf	88.4		
			Result	Dry Density, pcf	Moisture Content, %
Hydraulic Conductivity	ASTM D 2434	Hydraulic Conductivity, cm/sec	9.1E-3	81.9	0.0
Angle of Repose	LAW TP6	Angle of Repose, degrees	31.3	71.0	0.0
California Bearing Ratio	ASTM D 1883	CBR, %	60	82.0	25.1
Resilient Modulus (Standard Compactive Effort)	SHRP P46	Resilient Modulus at 4psi axial stress and 4psi confining pressure	4,938	84.7	22.3
Resilient Modulus (Modified Compactive Effort)	SHRP P46	Resilient Modulus at 4psi axial stress and 4psi confining pressure	5,807	93.3	17.7
Soil Resistivity	AASHTO T 288	Minimum Resistivity, Ohm-cm	1,900		
pH of Soil	AASHTO T 289	pH	4.0		
Water Soluble Sulfate Ion	AASHTO T 290	Sulfate Ion Content, mg/kg	490		
Water Soluble Chloride Ion	AASHTO T 290	Chloride Ion Content, mg/kg	<10		

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GRAIN SIZE DISTRIBUTION TEST REPORT



Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 18	0.0	21.9	68.4	9.7	
▲ 19	0.0	19.3	70.0	10.7	
■ 20	0.0	18.4	70.3	11.3	

	LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
●	NL	NP	7.67	1.95	1.24	0.407	0.1287	0.0766	1.11	25.4
▲	NL	NP	5.96	1.78	1.15	0.355	0.1148			
■	NL	NP	5.69	1.74	1.10	0.327	0.1047			

MATERIAL DESCRIPTION	USCS	AASHTO
●	SW-SM	A-1-b
▲	SP-SM	A-1-b
■	SP-SM	A-1-b

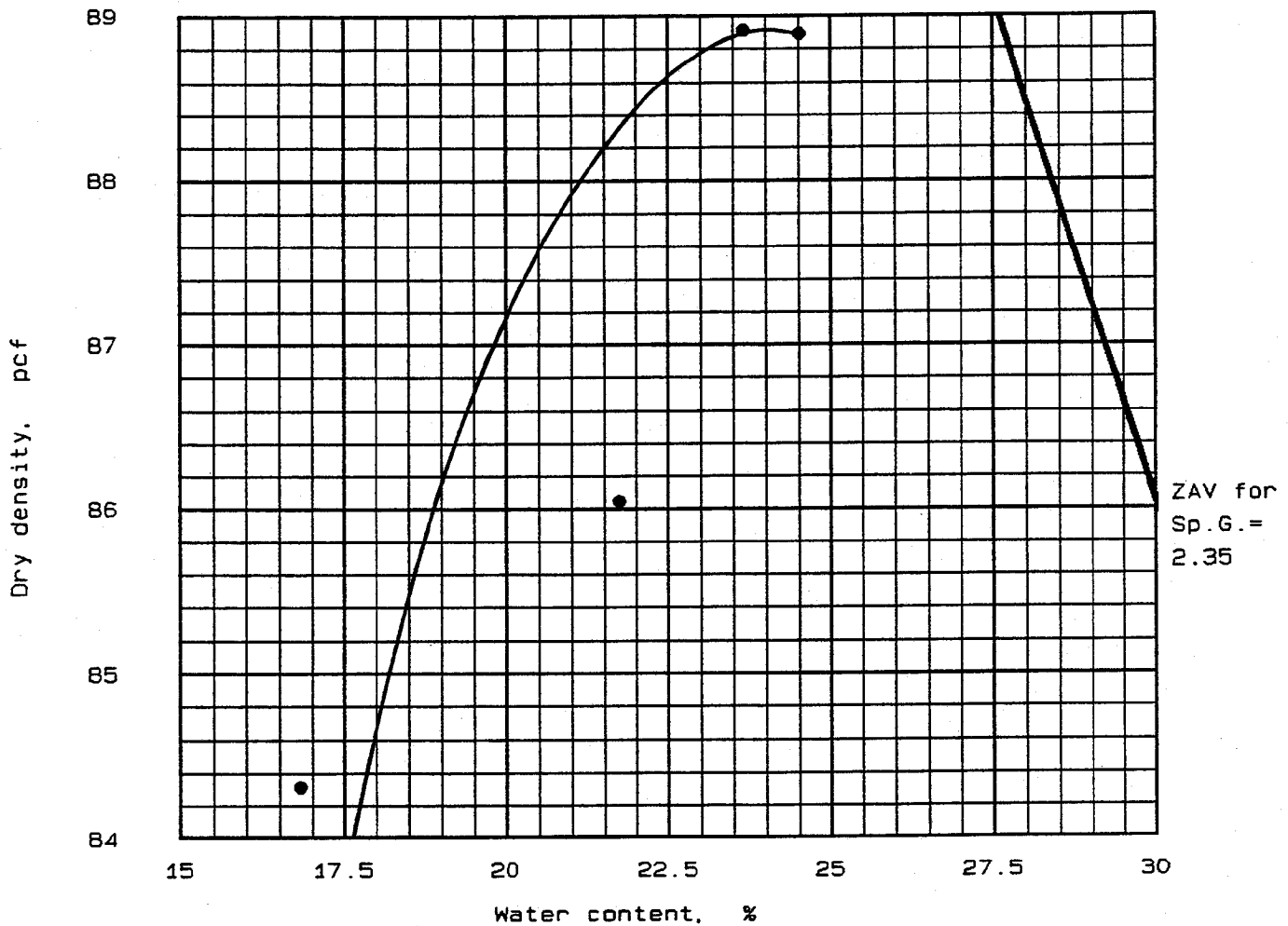
Project No.: 5810860101
 Project: TVA - Kingston
 ● Location: Bottom Ash A & B
 ▲ Location: Bottom Ash C & D
 ■ Location: Bottom Ash E & F
 Date: July 18, 1995

Remarks:
 Tested by: *JCE*
 Reviewed by: *HS*

GRAIN SIZE DISTRIBUTION TEST REPORT
LAW ENGINEERING, INC.

Figure No.

MOISTURE-DENSITY RELATIONSHIP



"Standard" Proctor, ASTM D 698, Method A

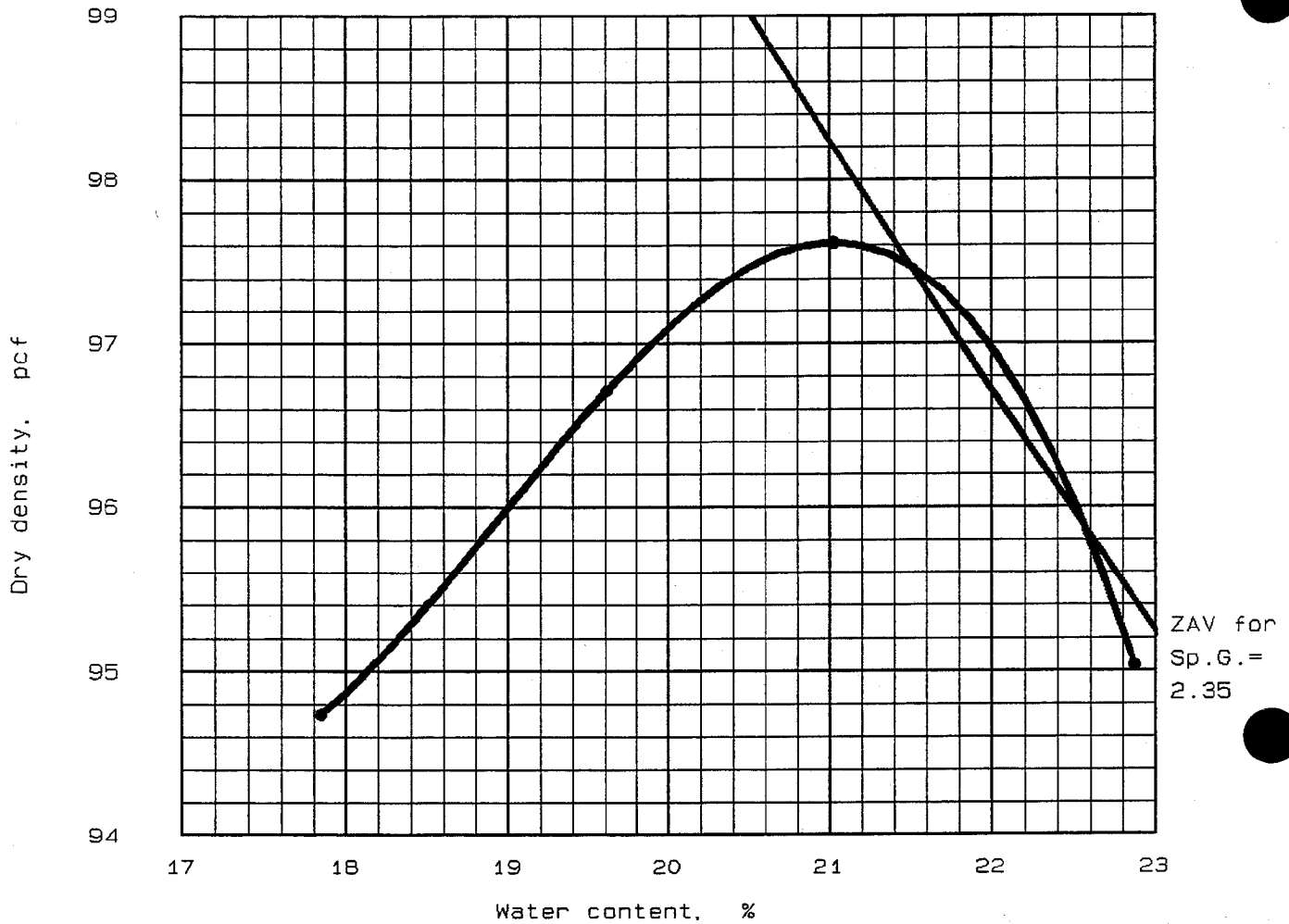
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
	SP-SM (SW-SM)	A-1-b	12.6 %	2.35	NL	NP	19.9 %	10.6 %

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 24.1 % Maximum dry density = 89.0 pcf	

Project No.: 5810860101 Project: TVA - Kingston Location: Bottom Ash Date: July 25, 1995	Remarks: Tested by: <i>CS</i> Reviewed by: <i>RUP</i>
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MOISTURE-DENSITY RELATIONSHIP LAW ENGINEERING, INC.	Figure No. _____
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MOISTURE-DENSITY RELATIONSHIP



"Modified" Proctor, ASTM D 1557, Method A

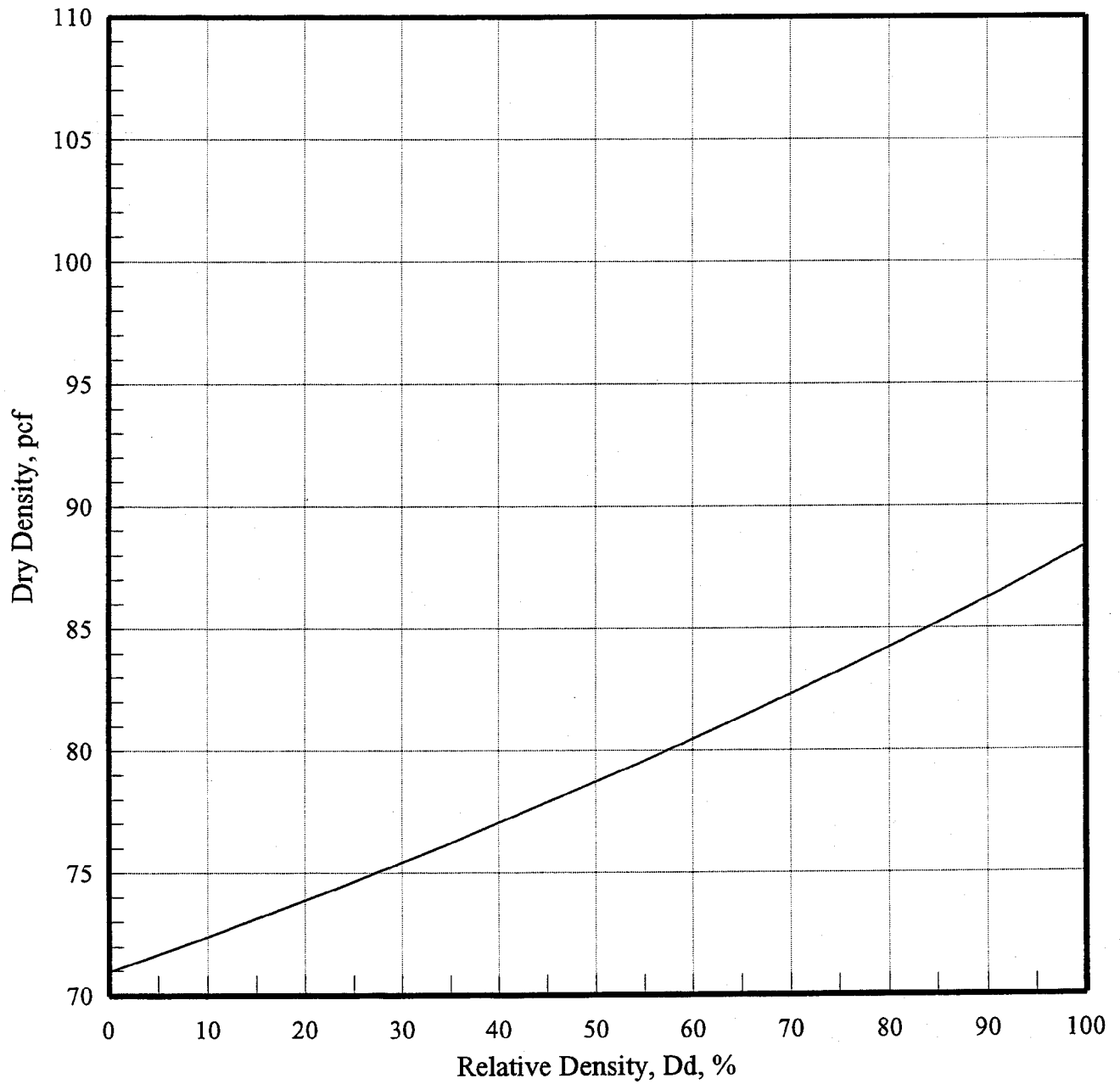
Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						
	SP-SM (SW-SM)	A-1-b	12.6 %	2.35	NL	NP	19.9 %	10.6 %

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 21.0 % Maximum dry density = 97.6 pcf	
Project No.: 5810860101 Project: TVA - Kingston Location: Bottom Ash Date: July 25, 1995	Remarks: Tested by: <i>CS/Jon</i> Reviewed by: <i>RPB</i>
MOISTURE-DENSITY RELATIONSHIP LAW ENGINEERING, INC.	Figure No. _____

Relative Density Test

TVA - Kingston, Bottom Ash

Law Project No. 5810860101



HYDRAULIC CONDUCTIVITY



Project No. **5810860101**
Project Name **TVA - Kingston**
Material **Bottom Ash**

Tested By **JCR**
Test Date **08/17/95**
Reviewed By **RLB**
Review Date **09/06/95**

ASTM D2434-68 Constant Head Permeability

Sample Type:	<i>Remolded</i>
Sample Orientation:	<i>Vertical</i>
Initial Water Content, %:	<i>0.0</i>
Wet Unit Weight, pcf:	<i>81.9</i>
Dry Unit Weight, pcf:	<i>81.9</i>
Compaction, %:	<i>92.1</i>
Hydraulic Conductivity, cm/sec. @20° C:	9.1E-03

PERMEABILITY TEST - Constant Head
(ASTM D2434 - 68)



Project No. 5810860101
 Project Name TVA - Kingston
 Material Bottom Ash

Tested By JCR
 Test Date 08/17/95
 Reviewed By RLB
 Review Date 09/06/95

Sample Data

Length, in		Diameter, in		Pan No.		
Location 1	5.161	Location 1	2.858	Wet Soil + Pan, grams	717.90	
Location 2	5.195	Location 2	2.875	Dry Soil+Pan, grams	717.90	
Location 3	5.153	Location 3	2.868	Pan Weight, grams	0.00	
Average	5.170	Average	2.867	Moisture Content, %	0.0	
			Sample wet weight, grams	717.90	Wet Unit Wt, pcf	81.9
			Membrane, Cap weight, grams	0.00	Dry Unit Wt, pcf	81.9

Time (sec)	Q (cm ³)	H (cm)	k (cm/sec)	Temp °C	k (cm/sec at 20° C)	i (cm/cm)
600	100.00	5.08	1.0E-02	20.0	1.0E-02	0.39
1200	175.00	5.08	9.1E-03	20.0	9.1E-03	0.39

No. of Trials	Sample Type	Max. Density (pcf)	Compaction %	Sample Orientation
2	Remolded	89.0	92.1	Vertical

L = length of sample in cm
 A = area of sample in cm²

H = constant head in cm
 t = time in seconds

A = 41.65 cm²
 L = 13.131 cm

Avg. k at 20° C 9.1E-03 cm/sec

California Bearing Ratio

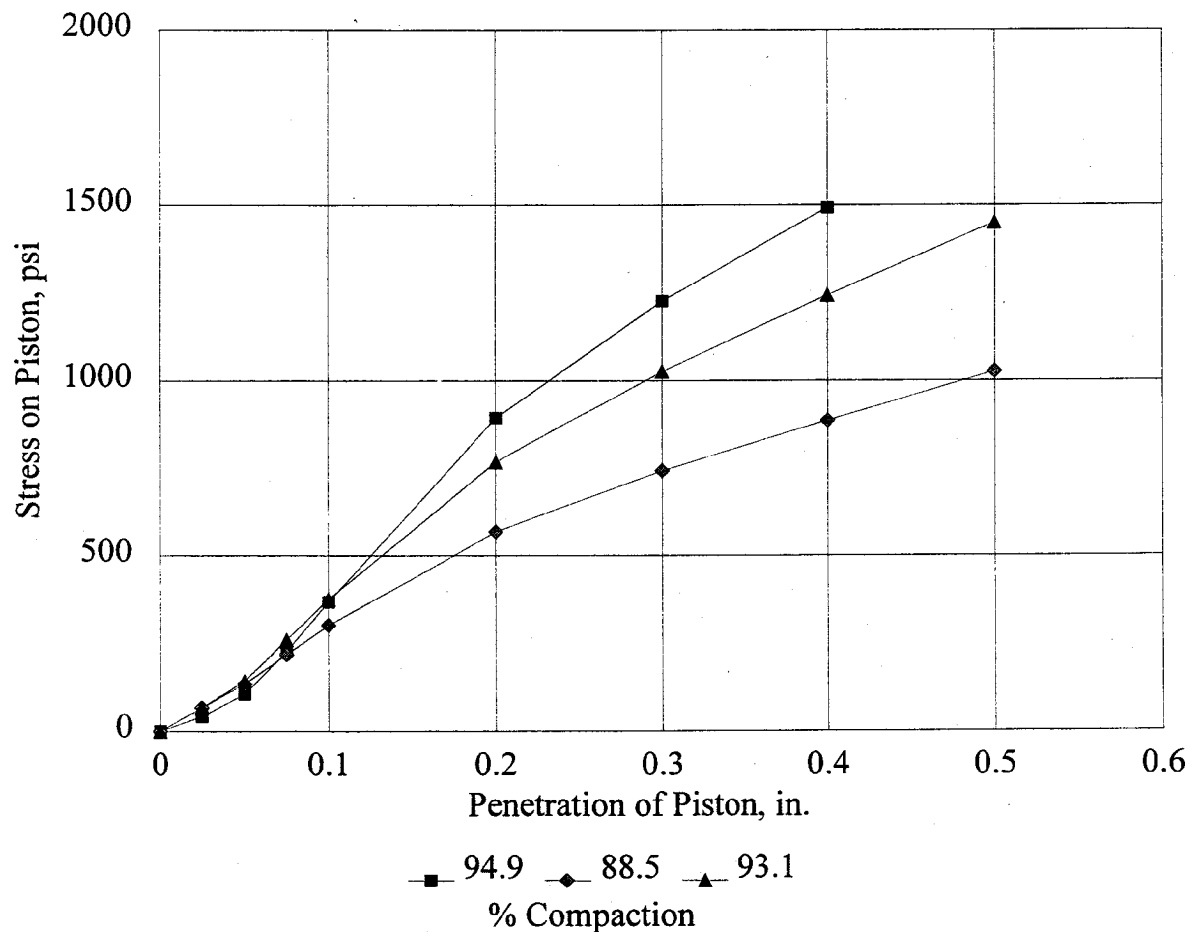
(ASTM D1883-92)



Project No. 5810860101
 Project Name TVA - Kingston
 Material (Source) Bottom Ash

Tested By EM
 Test Date 08/03/95
 Reviewed By RLB
 Review Date 08/16/95

Compaction, %	94.9	88.5	93.1
Before Soak Dry Density, pcf	84.5	78.7	82.8
Before Soak Moisture Content, %	24.8	25.5	25.0
After Soak Dry Density, pcf	84.7	78.8	82.8
After Soak Moisture Content, %	25.3	26.8	26.3
CBR @ 0.1 in.	36.7	30.0	37.5
CBR @ 0.2 in.	59.4	37.8	51.1



LABORATORY MATERIAL HANDLING AND TESTING
 LABORATORY MATERIAL TEST DATA
 RESILIENT MODULUS OF UNBOUND GRANULAR BASE/SUBBASE
 MATERIALS AND SUBGRADE SOILS
 LAB DATA SHEET T46 - RECOMPACTED SAMPLES

UNBOUND GRANULAR BASE/SUBBASE LAYERS AND SUBGRADE SOILS
 SHRP TEST DESIGNATION UG07, SS07/SHRP PROTOCOL P46

LABORATORY PERFORMING TEST: LAW ENGINEERING, INC. - ATLANTA, GEORGIA

PROJECT NAME: TVA - Fly Ash, Bottom Ash and Scrubber Gypsum Study

LAW PROJECT NO.: 5810860101

1.	MATERIAL SOURCE:	<u>Kingston</u>		
2.	MATERIAL DESCRIPTION:	<u>Bottom Ash</u>		
3.	REMOLDING TARGETS:	<u>95% Standard Dry Density at Optimum Moisture Content</u>		
4.	MATERIAL TYPE (Type 1 or Type 2)			<u>2</u>
5.	TEST INFORMATION			
	PRECONDITIONING - GREATER THAN 5% PERM. STRAIN? (Y = YES OR N = NO)			<u>N</u>
	TESTING - GREATER THAN 5% PERM. STRAIN? (Y = YES OR N = NO)			<u>N</u>
	TESTING - NUMBER OF LOAD SEQUENCES COMPLETED (0 - 15)			<u>15</u>
6.	SPECIMEN INFO :			
	SPECIMEN DIAM., inch			
	TOP			<u>2.86</u>
	MIDDLE			<u>2.85</u>
	BOTTOM			<u>2.86</u>
	AVERAGE			<u>2.86</u>
	MEMBRANE THICKNESS (1), inch			<u>0.01</u>
	MEMBRANE THICKNESS (2), inch			<u>0.01</u>
	NET DIAM., inch			<u>2.83</u>
	HEIGHT OF SPECIMEN, CAP AND BASE, inch			<u>6.05</u>
	HEIGHT OF CAP AND BASE, inch			<u>0.00</u>
	INITIAL LENGTH, L ₀ , inch			<u>6.05</u>
	INITIAL AREA, A ₀ , in ²			<u>6.30</u>
	INITIAL VOLUME A ₀ L ₀ , in ³			<u>38.13</u>
7.	SOIL SPECIMEN WEIGHT:			
	INITIAL WEIGHT OF CONTAINER AND WET SOIL, grams			<u>1037.90</u>
	FINAL WEIGHT OF CONTAINER AND WET SOIL, grams			<u>0.00</u>
	WEIGHT OF WET SOIL USED, grams			<u>1037.90</u>
8.	SOIL PROPERTIES :			
	IN SITU MOISTURE CONTENT (NUCLEAR), %			<u>N/A</u>
	IN SITU WET DENSITY (NUCLEAR), pcf			<u>N/A</u>
	or			
	OPTIMUM MOISTURE CONTENT, %			<u>24.1</u>
	MAX. DRY DENSITY, pcf			<u>89.0</u>
	95 % MAX. DRY DENSITY, pcf			<u>84.6</u>
9.	SPECIMEN PROPERTIES:			
	COMPACTION MOISTURE CONTENT, %			<u>22.3</u>
	MOISTURE CONTENT AFTER RESILIENT MODULUS TESTING, %			<u>22.3</u>
	COMPACTION DRY DENSITY, γ _d pcf			<u>84.7</u>
10.	QUICK SHEAR TEST			
	STRESS - STRAIN PLOT ATTACHED (Y = YES, N = NO)			<u>Y</u>
	TRIAXIAL SHEAR MAXIMUM STRENGTH (MAX. LOAD/X-SECTION AREA), psi			<u>26.4</u>
	SPECIMEN FAIL DURING TRIAXIAL SHEAR? (Y = YES, N = NO)			<u>Y</u>
11.	COMMENTS (Section 10.4 of Protocol P46)			
	(a) CODE	<u>0</u>	<u>0</u>	<u>0</u>
	(b) NOTE	<u>0</u>	<u>0</u>	<u>0</u>
12.	TEST DATE			<u>08-18-1995</u>

GENERAL REMARKS:

SUBMITTED BY, DATE

R. P. Bandman 9/10/95
 LABORATORY MANAGER

PROJECT NAME: TVA - Fly Ash, Bottom Ash and Scrubber Gypsum Study
 LAW/PROJECT NO.: 5810860101
 1. MATERIAL SOURCE: Kingston
 2. MATERIAL DESCRIPTION: Bottom Ash
 3. REMOLDING TARGETS: 95% Standard Dry Density at Optimum Moisture Content
 4. MATERIAL TYPE: 2
 5. TEST DATE: 08-18-1995
 6. RESILIENT MODULUS TESTING

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PARAMETER	Chamber Confining Pressure	Nominal Maximum Axial Stress	Cycle No.	Actual Applied Max. Axial Load	Actual Applied Cyclic Load	Actual Applied Contact Load	Actual Applied Max. Axial Stress	Actual Applied Cyclic Stress	Actual Applied Contact Stress	Recov. Def. LVDT #1 Reading	Recov. Def. LVDT #2 Reading	Average Recov. Def. LVDT 1 and 2	Resilient Strain	Resilient Modulus
DESIGNATION	S ₃	S _{eyclic}	C ₁	P _{max}	P _{eyclic}	P _{contact}	S _{max}	S _{eyclic}	S _{contact}	H ₁	H ₂	H _{avg}	ε _r	M _r
UNIT	psi	psi	---	lbs	lbs	lbs	psi	psi	psi	in.	in.	in.	in/in	psi
PRECISION														
SEQUENCE 1	6.0	2.0	1	12.8	11.6	1.2	2.0	1.8	0.2	0.00144	0.00146	0.00145	0.00024	7,637
			2	12.9	11.7	1.2	2.0	1.9	0.2	0.00145	0.00147	0.00146	0.00024	7,672
			3	12.9	11.7	1.2	2.1	1.9	0.2	0.00144	0.00148	0.00146	0.00024	7,712
			4	12.9	11.7	1.2	2.1	1.9	0.2	0.00146	0.00146	0.00146	0.00024	7,716
			5	13.0	11.8	1.2	2.1	1.9	0.2	0.00145	0.00147	0.00146	0.00024	7,733
COLUMN AVERAGE				12.9	11.7	1.2	2.0	1.9	0.2	0.00145	0.00147	0.00146	0.00024	7,694
STANDARD DEV.				0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00000	0.00000	39

Source: Kingston		Description: Bottom Ash										95% Standard Dry Density at Optimum Moisture Content									
SEQUENCE 2	6.0	4.0	1	25.3	23.0	2.3	4.0	3.7	0.4	0.00269	0.00269	0.00269	0.00044	0.00269	0.00269	0.00044	8,219				
			2	25.1	22.8	2.3	4.0	3.6	0.4	0.00269	0.00270	0.00270	0.00045	0.00270	0.00045	8,132					
			3	25.2	23.0	2.3	4.0	3.6	0.4	0.00268	0.00268	0.00268	0.00044	0.00268	0.00044	8,230					
			4	25.1	22.8	2.3	4.0	3.6	0.4	0.00267	0.00266	0.00267	0.00044	0.00267	0.00044	8,215					
			5	25.2	22.9	2.3	4.0	3.6	0.4	0.00268	0.00268	0.00268	0.00044	0.00268	0.00044	8,197					
			25.2	22.9	2.3	4.0	3.6	0.4	0.00268	0.00268	0.00268	0.00044	0.00268	0.00044	8,199						
			0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	0.00001	0.00000	39						
SEQUENCE 3	6.0	6.0	1	38.0	34.5	3.5	6.0	5.5	0.5	0.00399	0.00395	0.00397	0.00066	0.00397	0.00066	8,349					
			2	38.0	34.5	3.5	6.0	5.5	0.6	0.00400	0.00396	0.00398	0.00066	0.00398	0.00066	8,319					
			3	38.1	34.6	3.5	6.0	5.5	0.6	0.00402	0.00396	0.00399	0.00066	0.00399	0.00066	8,332					
			4	37.9	34.3	3.6	6.0	5.4	0.6	0.00401	0.00395	0.00398	0.00066	0.00398	0.00066	8,278					
			5	37.9	34.4	3.5	6.0	5.5	0.6	0.00400	0.00397	0.00399	0.00066	0.00399	0.00066	8,294					
			38.0	34.5	3.5	6.0	5.5	0.6	0.00401	0.00396	0.00398	0.00066	0.00398	0.00066	8,314						
			0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	0.00001	0.00000	29						
SEQUENCE 4	6.0	8.0	1	50.4	45.6	4.8	8.0	7.2	0.8	0.00535	0.00531	0.00533	0.00088	0.00533	0.00088	8,220					
			2	50.6	45.8	4.8	8.0	7.3	0.8	0.00536	0.00532	0.00534	0.00088	0.00534	0.00088	8,234					
			3	50.7	45.9	4.8	8.0	7.3	0.8	0.00537	0.00532	0.00534	0.00088	0.00534	0.00088	8,247					
			4	50.6	45.8	4.8	8.0	7.3	0.8	0.00538	0.00532	0.00535	0.00088	0.00535	0.00088	8,217					
			5	50.8	46.0	4.8	8.1	7.3	0.8	0.00539	0.00533	0.00536	0.00089	0.00536	0.00089	8,241					
			50.6	45.8	4.8	8.0	7.3	0.8	0.00537	0.00532	0.00534	0.00088	0.00534	0.00088	8,232						
			0.1	0.1	0.0	0.0	0.0	0.0	0.00002	0.00001	0.00001	0.00000	0.00001	0.00000	13						

Source:	Kingston	Description:	Bottom Ash	95% Standard Dry Density at Optimum Moisture Content										
SEQUENCE 5	6.0	10.0	1	63.2	57.2	6.0	10.0	9.1	0.9	0.00677	0.00671	0.00674	0.00111	8,149
			2	63.1	57.1	6.0	10.0	9.1	1.0	0.00675	0.00671	0.00673	0.00111	8,145
			3	63.0	57.0	6.0	10.0	9.0	1.0	0.00675	0.00669	0.00672	0.00111	8,142
			4	63.6	57.6	6.0	10.1	9.1	1.0	0.00678	0.00672	0.00675	0.00112	8,185
			5	63.3	57.3	6.0	10.0	9.1	0.9	0.00680	0.00673	0.00676	0.00112	8,139
	COLUMN AVERAGE		63.2	57.2	6.0	10.0	9.1	1.0	0.00677	0.00671	0.00674	0.00111	8,152	
	STANDARD DEV.		0.2	0.2	0.0	0.0	0.0	0.0	0.00002	0.00002	0.00002	0.00000	19	
SEQUENCE 6	4.0	2.0	1	13.4	11.7	1.6	2.1	1.9	0.3	0.00221	0.00220	0.00221	0.00036	5,107
			2	13.6	12.0	1.6	2.2	1.9	0.3	0.00221	0.00221	0.00221	0.00037	5,203
			3	13.4	11.8	1.6	2.1	1.9	0.3	0.00223	0.00220	0.00222	0.00037	5,113
			4	13.4	11.8	1.6	2.1	1.9	0.3	0.00221	0.00221	0.00221	0.00037	5,145
			5	13.4	11.7	1.6	2.1	1.9	0.3	0.00221	0.00223	0.00222	0.00037	5,072
	COLUMN AVERAGE		13.5	11.8	1.6	2.1	1.9	0.3	0.00222	0.00221	0.00221	0.00037	5,128	
	STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	49	
SEQUENCE 7	4.0	4.0	1	25.3	22.9	2.3	4.0	3.6	0.4	0.00439	0.00435	0.00437	0.00072	5,033
			2	25.2	22.8	2.4	4.0	3.6	0.4	0.00438	0.00435	0.00436	0.00072	5,025
			3	25.1	22.8	2.4	4.0	3.6	0.4	0.00437	0.00434	0.00435	0.00072	5,024
			4	25.3	23.0	2.4	4.0	3.6	0.4	0.00439	0.00436	0.00437	0.00072	5,047
			5	25.3	22.9	2.3	4.0	3.6	0.4	0.00438	0.00436	0.00437	0.00072	5,038
	COLUMN AVERAGE		25.2	22.9	2.3	4.0	3.6	0.4	0.00438	0.00435	0.00437	0.00072	5,033	
	STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	10	

Source: Kingston		Description: Bottom Ash										95% Standard Dry Density at Optimum Moisture Content				
SEQUENCE 8	4.0	6.0	1	38.3	34.8	3.6	6.1	5.5	0.6	0.00601	0.00596	0.00598	0.00099	5,578		
			2	38.4	34.8	3.6	6.1	5.5	0.6	0.00601	0.00597	0.00599	0.00099	5,582		
			3	38.5	34.9	3.6	6.1	5.5	0.6	0.00605	0.00598	0.00601	0.00099	5,568		
			4	38.4	34.9	3.6	6.1	5.5	0.6	0.00600	0.00597	0.00599	0.00099	5,591		
			5	38.4	34.9	3.5	6.1	5.5	0.6	0.00602	0.00597	0.00599	0.00099	5,592		
			COLUMN AVERAGE		38.4	34.9	3.6	6.1	5.5	0.6	0.00602	0.00597	0.00599	0.00099	5,582	
		STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00002	0.00001	0.00001	0.00000	10		
SEQUENCE 9	4.0	8.0	1	50.7	45.9	4.8	8.0	7.3	0.8	0.00755	0.00750	0.00752	0.00124	5,853		
			2	50.6	45.8	4.8	8.0	7.3	0.8	0.00755	0.00751	0.00753	0.00125	5,832		
			3	50.9	46.1	4.8	8.1	7.3	0.8	0.00756	0.00749	0.00753	0.00124	5,875		
			4	50.8	46.0	4.8	8.1	7.3	0.8	0.00754	0.00749	0.00751	0.00124	5,874		
			5	50.7	45.9	4.8	8.0	7.3	0.8	0.00755	0.00750	0.00752	0.00124	5,860		
			COLUMN AVERAGE		50.7	45.9	4.8	8.0	7.3	0.8	0.00755	0.00750	0.00752	0.00124	5,859	
		STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	18		
SEQUENCE 10	4.0	10.0	1	63.0	56.9	6.0	10.0	9.0	1.0	0.00898	0.00894	0.00896	0.00148	6,097		
			2	63.1	57.0	6.1	10.0	9.0	1.0	0.00898	0.00896	0.00897	0.00148	6,103		
			3	63.1	57.0	6.1	10.0	9.1	1.0	0.00900	0.00896	0.00898	0.00148	6,099		
			4	63.0	57.0	6.1	10.0	9.0	1.0	0.00896	0.00895	0.00896	0.00148	6,104		
			5	63.0	57.0	6.1	10.0	9.0	1.0	0.00898	0.00893	0.00896	0.00148	6,105		
			COLUMN AVERAGE		63.0	57.0	6.1	10.0	9.0	1.0	0.00898	0.00895	0.00896	0.00148	6,102	
		STANDARD DEV.		0.1	0.0	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	4		

Source:	Kingston	Description:	Bottom Ash	95% Standard Dry Density at Optimum Moisture Content										
SEQUENCE 11	2.0	2.0	1	13.7	11.7	2.1	2.2	1.8	0.3	0.00324	0.00320	0.00322	0.00053	3,472
			2	13.8	11.7	2.0	2.2	1.9	0.3	0.00326	0.00321	0.00323	0.00053	3,483
			3	13.6	11.5	2.1	2.2	1.8	0.3	0.00323	0.00319	0.00321	0.00053	3,432
			4	13.8	11.7	2.1	2.2	1.9	0.3	0.00326	0.00320	0.00323	0.00053	3,482
			5	13.8	11.8	2.1	2.2	1.9	0.3	0.00326	0.00320	0.00323	0.00053	3,495
				13.7	11.7	2.1	2.2	1.9	0.3	0.00325	0.00320	0.00323	0.00053	3,473
				0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	24
SEQUENCE 12	2.0	4.0	1	25.4	23.0	2.3	4.0	3.7	0.4	0.00614	0.00609	0.00611	0.00101	3,617
			2	25.5	23.1	2.3	4.0	3.7	0.4	0.00616	0.00609	0.00612	0.00101	3,627
			3	25.6	23.2	2.4	4.1	3.7	0.4	0.00618	0.00610	0.00614	0.00102	3,632
			4	25.5	23.2	2.4	4.1	3.7	0.4	0.00617	0.00608	0.00613	0.00101	3,633
			5	25.5	23.1	2.4	4.0	3.7	0.4	0.00616	0.00609	0.00612	0.00101	3,626
				25.5	23.1	2.4	4.0	3.7	0.4	0.00616	0.00609	0.00613	0.00101	3,627
				0.1	0.1	0.0	0.0	0.0	0.0	0.00002	0.00001	0.00001	0.00000	6
SEQUENCE 13	2.0	6.0	1	37.7	34.1	3.6	6.0	5.4	0.6	0.00783	0.00777	0.00780	0.00129	4,190
			2	37.8	34.2	3.6	6.0	5.4	0.6	0.00781	0.00774	0.00777	0.00129	4,229
			3	37.8	34.2	3.6	6.0	5.4	0.6	0.00780	0.00772	0.00776	0.00128	4,233
			4	37.9	34.4	3.6	6.0	5.5	0.6	0.00781	0.00774	0.00778	0.00129	4,241
			5	37.8	34.2	3.6	6.0	5.4	0.6	0.00779	0.00774	0.00777	0.00128	4,233
				37.8	34.2	3.6	6.0	5.4	0.6	0.00781	0.00774	0.00778	0.00129	4,225
				0.1	0.1	0.0	0.0	0.0	0.0	0.00002	0.00002	0.00002	0.00000	20

Source: Kingston		Description: Bottom Ash					95% Standard Dry Density at Optimum Moisture Content							
SEQUENCE 14	2.0	8.0	1	50.6	45.8	4.8	8.0	7.3	0.8	0.00926	0.00917	0.00921	0.00152	4,768
			2	50.6	45.7	4.8	8.0	7.3	0.8	0.00924	0.00915	0.00919	0.00152	4,776
			3	50.7	45.9	4.8	8.0	7.3	0.8	0.00926	0.00917	0.00921	0.00152	4,782
			4	50.7	45.9	4.8	8.0	7.3	0.8	0.00925	0.00915	0.00920	0.00152	4,785
			5	50.6	45.8	4.8	8.0	7.3	0.8	0.00924	0.00914	0.00919	0.00152	4,787
	COLUMN AVERAGE			50.6	45.8	4.8	8.0	7.3	0.8	0.00925	0.00916	0.00920	0.00152	4,780
	STANDARD DEV.			0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	8
SEQUENCE 15	2.0	10.0	1	62.8	56.7	6.1	10.0	9.0	1.0	0.01073	0.01063	0.01068	0.00177	5,097
			2	62.9	56.8	6.1	10.0	9.0	1.0	0.01075	0.01066	0.01071	0.00177	5,096
			3	63.2	57.1	6.1	10.0	9.1	1.0	0.01077	0.01062	0.01070	0.00177	5,122
			4	63.2	57.1	6.1	10.0	9.1	1.0	0.01073	0.01064	0.01069	0.00177	5,128
			5	63.3	57.2	6.1	10.0	9.1	1.0	0.01078	0.01067	0.01072	0.00177	5,120
	COLUMN AVERAGE			63.1	57.0	6.1	10.0	9.0	1.0	0.01075	0.01065	0.01070	0.00177	5,113
	STANDARD DEV.			0.2	0.2	0.0	0.0	0.0	0.0	0.00002	0.00002	0.00002	0.00000	15

SUBMITTED BY, DATE

R. P. Bunker 9/10/95

LABORATORY MANAGER

FIGURE 1 - Logarithmic Plot of Resilient Modulus (M_R) vs Cyclic Stress (S_c)

PROJECT NAME: TVA - Fly Ash, Bottom Ash and Scrubber Gypsum Study
 LAW PROJECT NO.: 5810860101
 1. MATERIAL SOURCE: Kingston
 2. MATERIAL DESCRIPTION: Bottom Ash
 3. REMOLDING TARGETS: 95% Standard Dry Density at Optimum Moisture Content
 4. MATERIAL TYPE: 2
 5. TEST DATE: 08-18-1995

$$M_R = K_1 (S_c)^{K_2} (1+S_3)^{K_5}$$

$$K_1 = \underline{\underline{1,427}}$$

$$K_2 = \underline{\underline{0.13665}}$$

$$K_5 = \underline{\underline{0.75876}}$$

$$R^2 = \underline{\underline{0.91}}$$

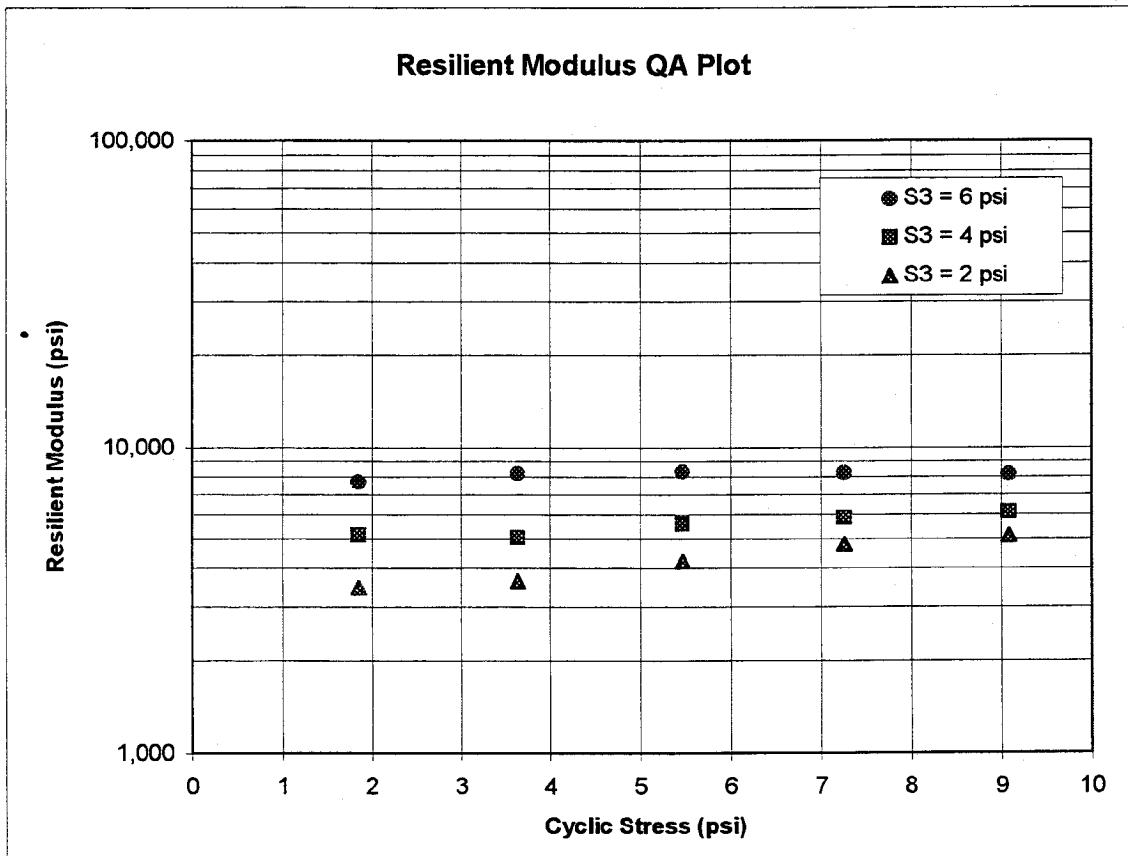
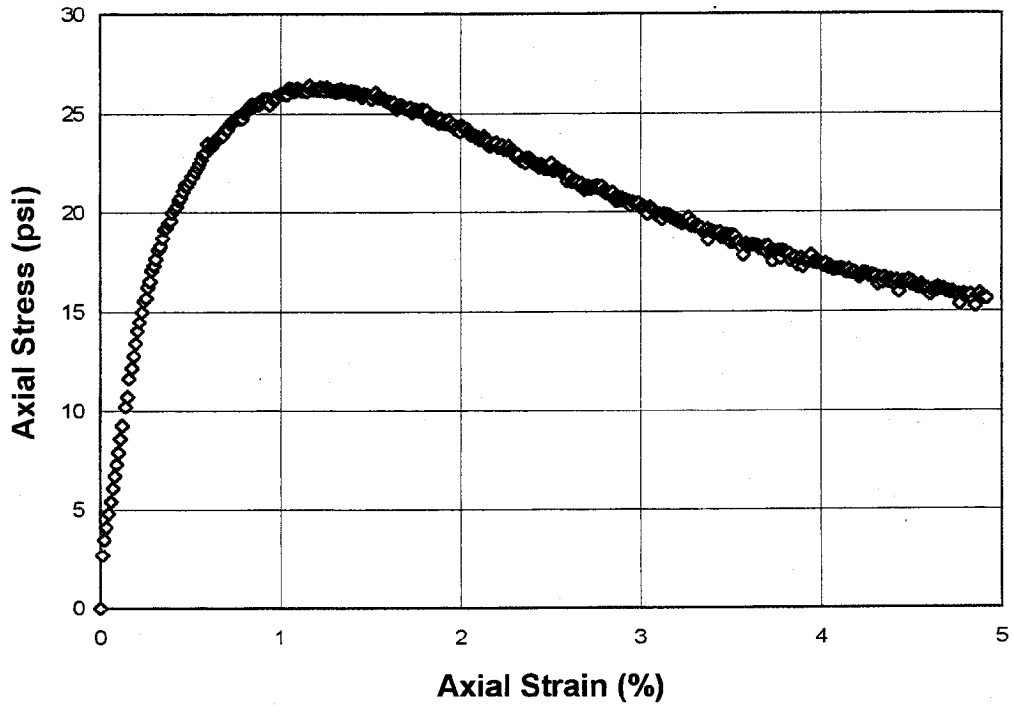


FIGURE 2 - Quick Shear Stress vs Strain

PROJECT NAME: TVA - Fly Ash, Bottom Ash and Scrubber Gypsum Study
LAW PROJECT NO.: 5810860101
1. MATERIAL SOURCE: Kingston
2. MATERIAL DESCRIPTION: Bottom Ash
3. REMOLDING TARGETS: 95% Standard Dry Density at Optimum Moisture Content
4. MATERIAL TYPE: 2
5. TEST DATE: 08-18-1995



LABORATORY MATERIAL HANDLING AND TESTING
 LABORATORY MATERIAL TEST DATA
 RESILIENT MODULUS OF UNBOUND GRANULAR BASE/SUBBASE
 MATERIALS AND SUBGRADE SOILS
 LAB DATA SHEET T46 - RECOMPACTED SAMPLES

SHEET NO 1 OF 2

UNBOUND GRANULAR BASE/SUBBASE LAYERS AND SUBGRADE SOILS
 SHRP TEST DESIGNATION UG07, SS07/SHRP PROTOCOL P46

LABORATORY PERFORMING TEST: LAW ENGINEERING, INC. - ATLANTA, GEORGIA

PROJECT NAME: TVA - Fly Ash, Bottom Ash and Scrubber Gypsum Study

LAW PROJECT NO.: 5810860101

1.	MATERIAL SOURCE:	<u>Kingston</u>	
2.	MATERIAL DESCRIPTION:	<u>Bottom Ash</u>	
3.	REMOLDING TARGETS:	<u>95% Modified Dry Density at Optimum Moisture Content</u>	
4.	MATERIAL TYPE (Type 1 or Type 2)		2
5.	TEST INFORMATION		
	PRECONDITIONING - GREATER THAN 5% PERM. STRAIN? (Y = YES OR N = NO)		N
	TESTING - GREATER THAN 5% PERM. STRAIN? (Y = YES OR N = NO)		N
	TESTING - NUMBER OF LOAD SEQUENCES COMPLETED (0 - 15)		15
6.	SPECIMEN INFO:		
	SPECIMEN DIAM., inch		
	TOP		2.86
	MIDDLE		2.86
	BOTTOM		2.86
	AVERAGE		2.86
	MEMBRANE THICKNESS (1), inch		0.01
	MEMBRANE THICKNESS (2), inch		0.01
	NET DIAM., inch		2.84
	HEIGHT OF SPECIMEN, CAP AND BASE, inch		6.08
	HEIGHT OF CAP AND BASE, inch		0.00
	INITIAL LENGTH, L ₀ , inch		6.08
	INITIAL AREA, A ₀ , in ²		6.33
	INITIAL VOLUME A ₀ L ₀ , in ³		38.50
7.	SOIL SPECIMEN WEIGHT:		
	INITIAL WEIGHT OF CONTAINER AND WET SOIL, grams		1785.00
	FINAL WEIGHT OF CONTAINER AND WET SOIL, grams		674.90
	WEIGHT OF WET SOIL USED, grams		1110.10
8.	SOIL PROPERTIES:		
	IN SITU MOISTURE CONTENT (NUCLEAR), %		N/A
	IN SITU WET DENSITY (NUCLEAR), pcf		N/A
	or		
	OPTIMUM MOISTURE CONTENT, %		21.0
	MAX. DRY DENSITY, pcf		97.6
	95 % MAX. DRY DENSITY, pcf		92.7
9.	SPECIMEN PROPERTIES:		
	COMPACTION MOISTURE CONTENT, %		17.7
	MOISTURE CONTENT AFTER RESILIENT MODULUS TESTING, %		17.7
	COMPACTION DRY DENSITY, γ _d pcf		93.3
10.	QUICK SHEAR TEST		
	STRESS - STRAIN PLOT ATTACHED (Y = YES, N = NO)		Y
	TRIAXIAL SHEAR MAXIMUM STRENGTH (MAX. LOAD/X-SECTION AREA), psi		66.8
	SPECIMEN FAIL DURING TRIAXIAL SHEAR? (Y = YES, N = NO)		Y
11.	COMMENTS (Section 10.4 of Protocol P46)		
	(a) CODE	0 0 0 0 0 0	
	(b) NOTE		
12.	TEST DATE		08-23-1995

GENERAL REMARKS:

SUBMITTED BY, DATE

RT Bourke 9/10/95
 LABORATORY MANAGER

PROJECT NAME: TVA - Fly Ash, Bottom Ash and Scrubber Gypsum Study
 LAW PROJECT NO.: 5810860101
 MATERIAL SOURCE: Kingston
 MATERIAL DESCRIPTION: Bottom Ash
 REMOLDING TARGETS: 95% Modified Dry Density at Optimum Moisture Content
 MATERIAL TYPE: 2
 TEST DATE: 08-23-1995
 RESILIENT MODULUS TESTING

COLUMN #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PARAMETER	Chamber Confining Pressure	Nominal Maximum Axial Stress	Cycle No.	Actual Applied Max. Axial Load	Actual Applied Cyclic Load	Actual Applied Contact Load	Actual Applied Max. Axial Stress	Actual Applied Cyclic Stress	Actual Applied Contact Stress	Recov. Def. LVDT #1 Reading	Recov. Def. LVDT #2 Reading	Average Recov Def. LVDT 1 and 2	Resilient Strain	Resilient Modulus
DESIGNATION	S ₃	S _{cyclic}	C ₁	P _{max}	P _{cyclic}	P _{contact}	S _{max}	S _{cyclic}	S _{contact}	H ₁	H ₂	H _{avg}	ε _r	M _r
UNIT	psi	psi	---	lbs	lbs	lbs	psi	psi	psi	in.	in.	in.	in/in	psi
PRECISION														
SEQUENCE 1	6.0	2.0	1	12.5	11.2	1.3	2.0	1.8	0.2	0.00144	0.00132	0.00138	0.00023	7,786
			2	12.5	11.2	1.3	2.0	1.8	0.2	0.00147	0.00136	0.00142	0.00023	7,638
			3	12.5	11.2	1.3	2.0	1.8	0.2	0.00144	0.00135	0.00139	0.00023	7,754
			4	12.5	11.2	1.3	2.0	1.8	0.2	0.00146	0.00136	0.00141	0.00023	7,664
			5	12.6	11.3	1.3	2.0	1.8	0.2	0.00146	0.00135	0.00141	0.00023	7,711
COLUMN AVERAGE				12.5	11.2	1.3	2.0	1.8	0.2	0.00146	0.00135	0.00140	0.00023	7,711
STANDARD DEV.				0.0	0.0	0.0	0.0	0.0	0.0	0.00001	0.00002	0.00001	0.00000	61

Source: Kingston		Description: Bottom Ash										95% Modified Dry Density at Optimum Moisture Content				
SEQUENCE 2	6.0	4.0	1	25.2	22.8	2.4	4.0	3.6	0.4	0.00272	0.00243	0.00258	0.00042	8,514		
			2	25.2	22.8	2.4	4.0	3.6	0.4	0.00272	0.00247	0.00259	0.00043	8,454		
			3	25.2	22.8	2.4	4.0	3.6	0.4	0.00275	0.00244	0.00259	0.00043	8,463		
			4	25.2	22.8	2.4	4.0	3.6	0.4	0.00275	0.00242	0.00259	0.00043	8,487		
			5	25.2	22.8	2.4	4.0	3.6	0.4	0.00275	0.00242	0.00258	0.00042	8,487		
	COLUMN AVERAGE			25.2	22.8	2.4	4.0	3.6	0.4	0.00274	0.00243	0.00259	0.00043	8,481		
	STANDARD DEV.			0.0	0.0	0.0	0.0	0.0	0.0	0.00002	0.00002	0.00001	0.00000	24		
SEQUENCE 3	6.0	6.0	1	38.0	34.4	3.7	6.0	5.4	0.6	0.00382	0.00343	0.00363	0.00060	9,112		
			2	38.0	34.4	3.7	6.0	5.4	0.6	0.00381	0.00344	0.00363	0.00060	9,108		
			3	38.0	34.4	3.6	6.0	5.4	0.6	0.00381	0.00344	0.00362	0.00060	9,120		
			4	38.0	34.3	3.6	6.0	5.4	0.6	0.00381	0.00343	0.00362	0.00059	9,124		
			5	38.0	34.3	3.7	6.0	5.4	0.6	0.00381	0.00344	0.00363	0.00060	9,100		
	COLUMN AVERAGE			38.0	34.4	3.6	6.0	5.4	0.6	0.00381	0.00344	0.00362	0.00060	9,113		
	STANDARD DEV.			0.0	0.0	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00000	0.00000	10		
SEQUENCE 4	6.0	8.0	1	50.8	45.9	4.9	8.0	7.3	0.8	0.00489	0.00447	0.00468	0.00077	9,429		
			2	50.7	45.8	4.9	8.0	7.2	0.8	0.00490	0.00447	0.00469	0.00077	9,404		
			3	50.8	45.9	4.9	8.0	7.2	0.8	0.00490	0.00448	0.00469	0.00077	9,400		
			4	50.8	45.9	4.9	8.0	7.3	0.8	0.00490	0.00446	0.00468	0.00077	9,432		
			5	50.8	45.9	4.9	8.0	7.3	0.8	0.00490	0.00448	0.00469	0.00077	9,411		
	COLUMN AVERAGE			50.8	45.9	4.9	8.0	7.3	0.8	0.00490	0.00447	0.00469	0.00077	9,415		
	STANDARD DEV.			0.0	0.0	0.0	0.0	0.0	0.0	0.00000	0.00001	0.00001	0.00000	15		

Source: Kingston Description: Bottom Ash 95% Modified Dry Density at Optimum Moisture Content

SEQUENCE 5	6.0	10.0	1	63.6	57.4	62	10.1	9.1	1.0	0.00599	0.00551	0.00575	0.00095	9.601
			2	63.6	57.4	62	10.1	9.1	1.0	0.00597	0.00552	0.00575	0.00094	9.611
			3	63.7	57.5	62	10.1	9.1	1.0	0.00598	0.00552	0.00575	0.00095	9.611
			4	63.7	57.5	62	10.1	9.1	1.0	0.00598	0.00554	0.00576	0.00095	9.597
			5	63.6	57.5	61	10.1	9.1	1.0	0.00599	0.00552	0.00575	0.00095	9.605
	COLUMN AVERAGE		63.6	57.5	62	10.1	9.1	1.0	0.00598	0.00552	0.00575	0.00095	9.605	
	STANDARD DEV.		0.0	0.0	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00000	0.00000	6	
SEQUENCE 6	4.0	2.0	1	12.8	11.1	1.7	2.0	1.8	0.3	0.00191	0.00178	0.00185	0.00030	5.801
			2	12.9	11.2	1.7	2.0	1.8	0.3	0.00193	0.00181	0.00187	0.00031	5.755
			3	12.9	11.2	1.7	2.0	1.8	0.3	0.00194	0.00182	0.00188	0.00031	5.738
			4	12.8	11.2	1.7	2.0	1.8	0.3	0.00193	0.00180	0.00187	0.00031	5.746
			5	12.8	11.2	1.7	2.0	1.8	0.3	0.00190	0.00179	0.00185	0.00030	5.821
	COLUMN AVERAGE		12.8	11.2	1.7	2.0	1.8	0.3	0.00192	0.00180	0.00186	0.00031	5.772	
	STANDARD DEV.		0.0	0.0	0.0	0.0	0.0	0.0	0.00002	0.00001	0.00001	0.00000	37	
SEQUENCE 7	4.0	4.0	1	25.1	22.7	2.4	4.0	3.6	0.4	0.00380	0.00351	0.00365	0.00060	5.985
			2	25.2	22.8	2.4	4.0	3.6	0.4	0.00380	0.00352	0.00366	0.00060	5.997
			3	25.2	22.8	2.4	4.0	3.6	0.4	0.00379	0.00351	0.00365	0.00060	6.015
			4	25.2	22.8	2.4	4.0	3.6	0.4	0.00381	0.00353	0.00367	0.00060	5.984
			5	25.2	22.9	2.3	4.0	3.6	0.4	0.00379	0.00351	0.00365	0.00060	6.027
	COLUMN AVERAGE		25.2	22.8	2.4	4.0	3.6	0.4	0.00380	0.00351	0.00366	0.00060	6.002	
	STANDARD DEV.		0.0	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	19	

Source:	Kingston	Description: Bottom Ash										95% Modified Dry Density at Optimum Moisture Content									
SEQUENCE 8	4.0	6.0	1	38.1	34.6	3.5	6.0	5.5	0.6	0.00527	0.00484	0.00505	0.00083	6,580							
			2	38.1	34.7	3.4	6.0	5.5	0.5	0.00525	0.00484	0.00505	0.00083	6,614							
			3	38.1	34.7	3.4	6.0	5.5	0.5	0.00527	0.00486	0.00506	0.00083	6,583							
			4	38.1	34.7	3.4	6.0	5.5	0.5	0.00527	0.00486	0.00506	0.00083	6,591							
			5	38.0	34.7	3.4	6.0	5.5	0.5	0.00525	0.00484	0.00504	0.00083	6,612							
	COLUMN AVERAGE			38.1	34.7	3.4	6.0	5.5	0.5	0.00526	0.00485	0.00505	0.00083	6,596							
	STANDARD DEV.			0.0	0.1	0.1	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	16							
SEQUENCE 9	4.0	8.0	1	51.1	46.3	4.8	8.1	7.3	0.8	0.00643	0.00594	0.00619	0.00102	7,195							
			2	51.2	46.3	4.9	8.1	7.3	0.8	0.00646	0.00595	0.00620	0.00102	7,185							
			3	51.2	46.4	4.8	8.1	7.3	0.8	0.00645	0.00596	0.00620	0.00102	7,190							
			4	51.4	46.5	4.8	8.1	7.4	0.8	0.00646	0.00597	0.00622	0.00102	7,201							
			5	51.2	46.3	4.9	8.1	7.3	0.8	0.00645	0.00595	0.00620	0.00102	7,185							
	COLUMN AVERAGE			51.2	46.4	4.8	8.1	7.3	0.8	0.00645	0.00595	0.00620	0.00102	7,191							
	STANDARD DEV.			0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	7							
SEQUENCE 10	4.0	10.0	1	63.9	57.8	6.1	10.1	9.1	1.0	0.00755	0.00701	0.00728	0.00120	7,634							
			2	64.0	57.8	6.1	10.1	9.1	1.0	0.00753	0.00701	0.00727	0.00120	7,647							
			3	63.9	57.8	6.1	10.1	9.1	1.0	0.00754	0.00701	0.00728	0.00120	7,634							
			4	63.9	57.8	6.1	10.1	9.1	1.0	0.00753	0.00702	0.00728	0.00120	7,635							
			5	63.8	57.7	6.1	10.1	9.1	1.0	0.00757	0.00702	0.00729	0.00120	7,612							
	COLUMN AVERAGE			63.9	57.8	6.1	10.1	9.1	1.0	0.00754	0.00701	0.00728	0.00120	7,633							
	STANDARD DEV.			0.0	0.0	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	13							

Source: Kingston Description: Bottom Ash 95% Modified Dry Density at Optimum Moisture Content

SEQUENCE 11	2.0	2.0	1	13.1	11.0	2.0	2.1	1.7	0.3	0.00263	0.00251	0.00257	0.00042	4,137
			2	13.1	11.0	2.0	2.1	1.7	0.3	0.00261	0.00249	0.00255	0.00042	4,159
			3	13.1	11.0	2.0	2.1	1.7	0.3	0.00262	0.00249	0.00256	0.00042	4,145
			4	13.1	11.0	2.0	2.1	1.7	0.3	0.00262	0.00249	0.00256	0.00042	4,142
			5	13.0	11.0	2.0	2.1	1.7	0.3	0.00263	0.00250	0.00257	0.00042	4,129
	COLUMN AVERAGE		13.1	11.0	2.0	2.1	1.7	0.3	0.00262	0.00250	0.00256	0.00042	4,143	
	STANDARD DEV.		0.0	0.0	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	11	
SEQUENCE 12	2.0	4.0	1	25.1	22.8	2.4	4.0	3.6	0.4	0.00515	0.00489	0.00502	0.00083	4,362
			2	25.1	22.8	2.4	4.0	3.6	0.4	0.00515	0.00487	0.00501	0.00082	4,369
			3	25.1	22.7	2.3	4.0	3.6	0.4	0.00517	0.00489	0.00503	0.00083	4,347
			4	25.1	22.8	2.4	4.0	3.6	0.4	0.00516	0.00489	0.00503	0.00083	4,350
			5	25.1	22.8	2.4	4.0	3.6	0.4	0.00515	0.00489	0.00502	0.00083	4,361
	COLUMN AVERAGE		25.1	22.8	2.4	4.0	3.6	0.4	0.00516	0.00489	0.00502	0.00083	4,358	
	STANDARD DEV.		0.0	0.0	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	9	
SEQUENCE 13	2.0	6.0	1	38.4	34.8	3.6	6.1	5.5	0.6	0.00678	0.00638	0.00658	0.00108	5,080
			2	38.4	34.7	3.6	6.1	5.5	0.6	0.00679	0.00640	0.00660	0.00108	5,063
			3	38.4	34.7	3.6	6.1	5.5	0.6	0.00681	0.00641	0.00661	0.00109	5,054
			4	38.3	34.7	3.6	6.1	5.5	0.6	0.00680	0.00640	0.00660	0.00108	5,057
			5	38.2	34.6	3.6	6.0	5.5	0.6	0.00679	0.00641	0.00660	0.00108	5,042
	COLUMN AVERAGE		38.3	34.7	3.6	6.1	5.5	0.6	0.00679	0.00640	0.00660	0.00108	5,059	
	STANDARD DEV.		0.1	0.1	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	14	

Source: Kingston		Description: Bottom Ash					95% Modified Dry Density at Optimum Moisture Content							
SEQUENCE 14	2.0	8.0	1	51.1	46.2	4.9	8.1	7.3	0.8	0.00796	0.00753	0.00774	0.00127	5,741
			2	51.1	46.2	4.8	8.1	7.3	0.8	0.00795	0.00753	0.00774	0.00127	5,743
			3	51.1	46.3	4.9	8.1	7.3	0.8	0.00796	0.00752	0.00774	0.00127	5,748
			4	51.1	46.3	4.9	8.1	7.3	0.8	0.00798	0.00753	0.00775	0.00127	5,739
			5	51.3	46.4	4.8	8.1	7.3	0.8	0.00799	0.00754	0.00776	0.00128	5,748
					51.1	46.3	4.8	8.1	7.3	0.8	0.00797	0.00775	0.00127	5,744
					0.1	0.0	0.0	0.0	0.0	0.00002	0.00001	0.00001	0.00000	4
SEQUENCE 15	2.0	10.0	1	64.2	58.1	6.1	10.1	9.2	1.0	0.00899	0.00852	0.00875	0.00144	6,384
			2	64.2	58.1	6.1	10.1	9.2	1.0	0.00899	0.00852	0.00875	0.00144	6,384
			3	64.2	58.2	6.1	10.2	9.2	1.0	0.00900	0.00853	0.00877	0.00144	6,380
			4	64.3	58.2	6.1	10.2	9.2	1.0	0.00899	0.00853	0.00876	0.00144	6,387
			5	64.3	58.2	6.1	10.2	9.2	1.0	0.00900	0.00855	0.00878	0.00144	6,377
					64.2	58.2	6.1	10.2	9.2	1.0	0.00899	0.00876	0.00144	6,382
					0.0	0.0	0.0	0.0	0.0	0.00001	0.00001	0.00001	0.00000	4

SUBMITTED BY, DATE

R J Brubaker 9/10/95

LABORATORY MANAGER

FIGURE 1 - Logarithmic Plot of Resilient Modulus (M_R) vs Cyclic Stress (S_C)

PROJECT NAME: TVA - Fly Ash, Bottom Ash and Scrubber Gypsum Study
 LAW PROJECT NO.: 5810860101
 1. MATERIAL SOURCE: Kingston
 2. MATERIAL DESCRIPTION: Bottom Ash
 3. REMOLDING TARGETS: 95% Modified Dry Density at Optimum Moisture Content
 4. MATERIAL TYPE: 2
 5. TEST DATE: 08-23-1995

$$M_R = K1 (S_C)^{K2} (1+S_3)^{K5}$$

K1 = 1,822
 K2 = 0.19126
 K5 = 0.64487
 R² = 0.95

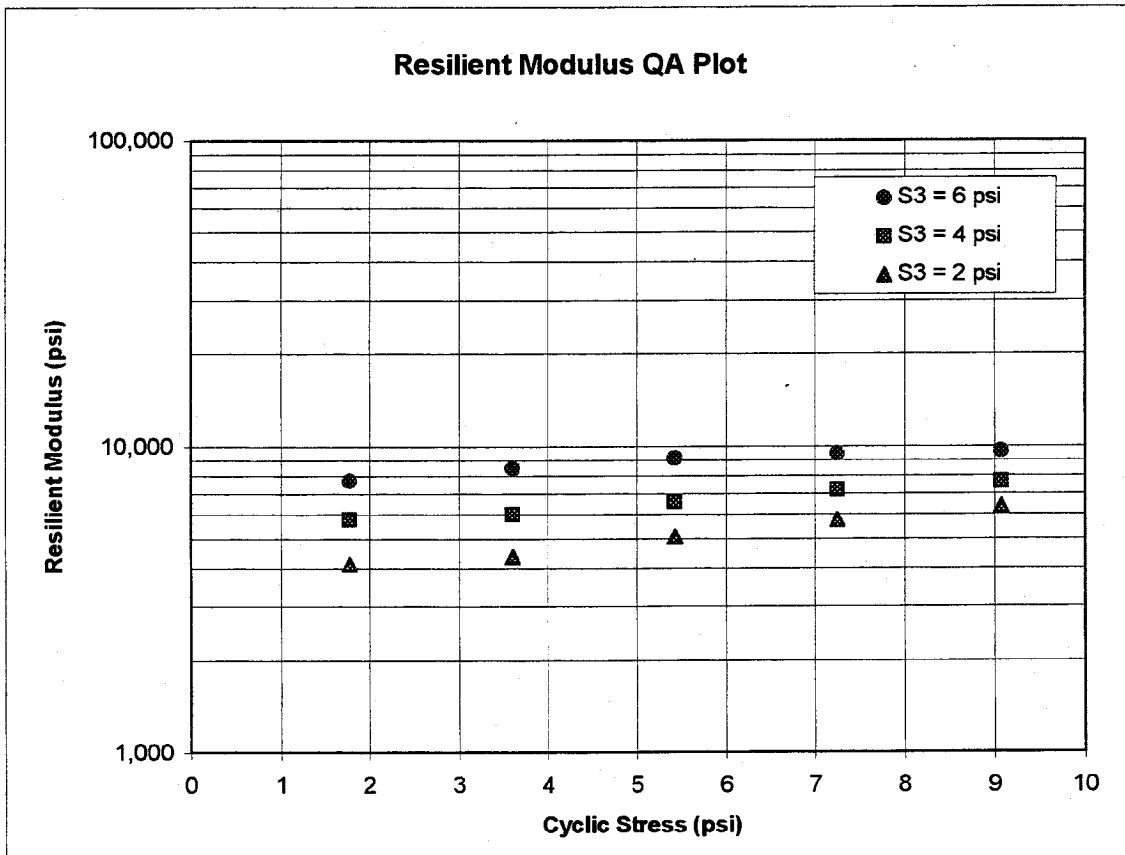


FIGURE 2 - Quick Shear Stress vs Strain

PROJECT NAME: TVA - Fly Ash, Bottom Ash and Scrubber Gypsum Study
LAW PROJECT NO.: 5810860101
1. MATERIAL SOURCE: Kingston
2. MATERIAL DESCRIPTION: Bottom Ash
3. REMOLDING TARGETS: 95% Modified Dry Density at Optimum Moisture Content
4. MATERIAL TYPE: 2
5. TEST DATE: 08-23-1995

